SYBASE®

Component Integration Services User's Guide

Adaptive Server Enterprise

12.5

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Contents

About This Book

Audience

This book is written for Sybase® Adaptive Server™ Enterprise System Administrators, database administrators, and users.

How to use this book

This guide will assist you in configuring and using Component Integration Services. The book includes the following chapters:

- Chapter 1, “Introduction,” provides an overview of Component Integration Services.
- Chapter 2, “Understanding Component Integration Services,” provides a framework for understanding how Component Integration works. This chapter includes both basic concepts and in-depth topics.
- Chapter 3, “SQL Reference,” describes the Component Integration Services server classes required to access remote databases.
- Appendix A, “Tutorial,” includes a tutorial designed to help new users get Component Integration Services up and running.
- Appendix B, “Troubleshooting,” provides troubleshooting tips if you encounter a problem with Component Integration Services.

Adaptive Server Enterprise documents

The following documents comprise the Sybase Adaptive Server Enterprise documentation:

- The release bulletin for your platform – contains last-minute information that was too late to be included in the books.

A more recent version of the release bulletin may be available on the World Wide Web. To check for critical product or document information that was added after the release of the product CD, use the Sybase Technical Library.

- The *Installation Guide* for your platform – describes installation, upgrade, and configuration procedures for all Adaptive Server and related Sybase products.
- *Configuring Adaptive Server Enterprise* for your platform – provides instructions for performing specific configuration tasks for Adaptive Server.
- *What's New in Adaptive Server Enterprise?* – describes the new features in Adaptive Server version 12.5, the system changes added to support those features, and the changes that may affect your existing applications.
- *Transact-SQL User's Guide* – documents Transact-SQL, Sybase's enhanced version of the relational database language. This manual serves as a textbook for beginning users of the database management system. This manual also contains descriptions of the pubs2 and pubs3 sample databases.
- *System Administration Guide* – provides in-depth information about administering servers and databases. This manual includes instructions and guidelines for managing physical resources, security, user and system databases, and specifying character conversion, international language, and sort order settings.
- *Reference Manual* – contains detailed information about all Transact-SQL commands, functions, procedures, and datatypes. This manual also contains a list of the Transact-SQL reserved words and definitions of system tables.
- *Performance and Tuning Guide* – explains how to tune Adaptive Server for maximum performance. This manual includes information about database design issues that affect performance, query optimization, how to tune Adaptive Server for very large databases, disk and cache issues, and the effects of locking and cursors on performance.
- The *Utility Guide* – documents the Adaptive Server utility programs, such as isql and bcp, which are executed at the operating system level.
- The *Quick Reference Guide* – provides a comprehensive listing of the names and syntax for commands, functions, system procedures, extended system procedures, datatypes, and utilities in a pocket-sized book. Available only in print version.

- The *System Tables Diagram* – illustrates system tables and their entity relationships in a poster format. Available only in print version.
- *Error Messages and Troubleshooting Guide* – explains how to resolve frequently occurring error messages and describes solutions to system problems frequently encountered by users.
- *Component Integration Services User's Guide* – explains how to use the Adaptive Server Component Integration Services feature to connect remote Sybase and non-Sybase databases.
- *Java in Adaptive Server Enterprise* – describes how to install and use Java classes as datatypes, functions, and stored procedures in the Adaptive Server database.
- *Using Sybase Failover in a High Availability System* – provides instructions for using Sybase's Failover to configure an Adaptive Server as a companion server in a high availability system.
- *Using Adaptive Server Distributed Transaction Management Features* – explains how to configure, use, and troubleshoot Adaptive Server DTM features in distributed transaction processing environments.
- *EJB Server User's Guide* – explains how to use EJB Server to deploy and execute Enterprise JavaBeans in Adaptive Server.
- *XA Interface Integration Guide for CICS, Encina, and TUXEDO* – provides instructions for using Sybase's DTM XA interface with X/Open XA transaction managers.
- *Glossary* – defines technical terms used in the Adaptive Server documentation.
- *Sybase jConnect for JDBC Programmer's Reference* – describes the jConnect for JDBC product and explains how to use it to access data stored in relational database management systems.
- *Full-Text Search Specialty Data Store User's Guide* – describes how to use the Full-Text Search feature with Verity to search Adaptive Server Enterprise data.
- *Historical Server User's Guide* –describes how to use Historical Server to obtain performance information for SQL Server and Adaptive Server.
- *Monitor Server User's Guide* – describes how to use Monitor Server to obtain performance statistics from SQL Server and Adaptive Server.

- *Monitor Client Library Programmer's Guide* – describes how to write Monitor Client Library applications that access Adaptive Server performance data.

Other sources of information

Use the SyBooks™ and SyBooks-on-the-Web online resources to learn more about your product:

- SyBooks documentation is on the CD that comes with your software. The DynaText browser, also included on the CD, allows you to access technical information about your product in an easy-to-use format.

  Refer to *Installing SyBooks* in your documentation package for instructions on installing and starting SyBooks.

- SyBooks-on-the-Web is an HTML version of SyBooks that you can access using a standard Web browser.

  To use SyBooks-on-the-Web, go to http://www.sybase.com, and choose Documentation.

Conventions

What you type to the computer screen is shown as:

```
Enter text in an entry field
```

Computer output is shown as:

```
CIS returns results.
```

Command arguments you replace with a non-generic value are shown in italics:

machine_name

If you need help

Each Sybase installation that has purchased a support contract has one or more designated people who are authorized to contact Sybase Technical Support. If you cannot resolve a problem using the manuals or online help, ask a designated person at your site to contact Sybase Technical Support.

CHAPTER 1

Introduction

Component Integration Services is a feature that extends Adaptive Server capabilities and provides enhanced interoperability.

Component Integration Services provides both location transparency and functional compensation.

Location transparency means that Component Integration Services allows Adaptive Server to present a uniform view of enterprise data to client applications. Enterprise-wide data from heterogeneous sources can be accessed as if it were local.

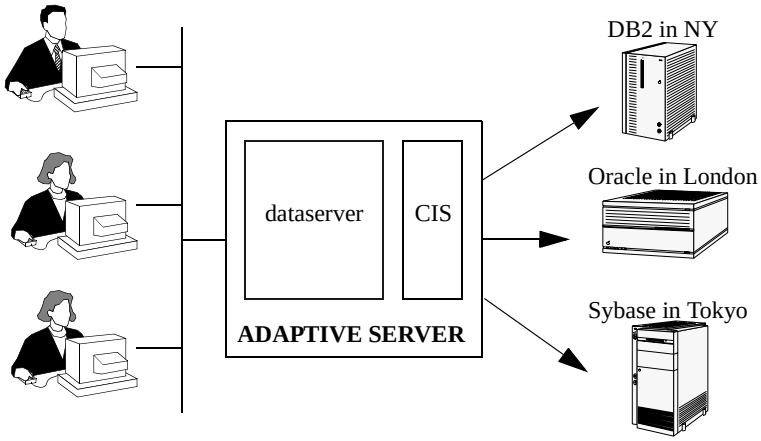
Functional compensation allows Component Integration Services to emulate all features of the Transact-SQL language, and interact with a data source only when actual data is needed. With this capability, the full range and power of Transact-SQL can be applied to any data source, whether the data source provides support for a particular feature of Transact-SQL or not. Examples of this capability are built-in functions and Java functions. Component Integration Services allows statements to use these functions even though the data on which these functions may operate is derived from external sources that cannot support the functions.

Component Integration Services together with Adaptive Server Anywhere, Adaptive Server IQ and various DirectConnect interfaces, extends the reach of Adaptive Server Enterprise by enabling transparent access to database management systems anywhere in the enterprise. This transparent, extended reach of Adaptive Serve Enterprise makes it easy for Enterprise Portal components to:

- Access data from anywhere, and present it as dynamic content to web pages.
- Execute transactions that span heterogeneous boundaries
- View an entire enterprise through a single view provided by the global metadata stored in the ASE/CIS system catalogs.

Component Integration Services allows users to access both Sybase and non-Sybase databases on different servers. These external data sources include host data files and tables, views and RPCs (remote procedure calls) in database systems such as Adaptive Server, Oracle, and DB2, as shown in Figure 1-1.

Figure 1-1: Component Integration Services connects to multiple vendor databases



Using Component Integration Services, you can:

- Access tables in remote servers as if the tables were local.
- Perform joins between tables in multiple remote, heterogeneous servers. For example, it is possible to join tables between an Oracle database management system (DBMS) and an Adaptive Server, and between tables in multiple Adaptive Servers.
- Transfer the contents of one table into a new table on any supported remote server by means of a **select into** statement.
- Maintain referential integrity across heterogeneous data sources.
- Access native remote server capabilities using the Component Integration Services passthrough mode.

New features in Adaptive Server Enterprise 12.5

Component Integration Services is fully compatible with the new features of Adaptive Server Enterprise version 12.5.

There are also many new or enhanced features in Component Integration Services.

- Distributed Query Optimization Enhancements
- Distributed Transaction Management Enhancements
- Enhanced Data Access via File System
- Login name/password mapping to remote systems
- XNL - Extensible new limits
- Unicode support - new datatypes for support of Unicode character set
- LDAP
- SSL
- Union in views
- Administration and Diagnostic Enhancements
- Cascading Proxy Support
- Quoted Identifier Support
- Enhanced Full Text Search Capabilities
- select into existing tables
- Enhancements to Proxy Table Support for Remote Procedures
- Proxy Database Support
- New Global Variables and Set Commands

Who can use Component Integration Services

Component Integration Services can be used by anyone who needs to access multiple data sources or legacy data. It can also be used by anyone who needs to migrate data from one server to another.

A single server is often used to access data on multiple external servers. Component Integration Services manages the data regardless of the location of the external servers. Data management is transparent to the client application.

Component Integration Services, in combination with EnterpriseConnect™ and MainframeConnect™ products, provides transparent access to a wide variety of data sources, including:

- Oracle
- Informix
- IBM databases including:
  - DB2 for MVS
  - DB2/400
  - DB2/2
  - DB2 for VM (SQL/DS)
- Microsoft SQL Server
- Adaptive Server Enterprise
- Adaptive Server Anywhere™
- Adaptive Server IQ™
- Mainframe data, including:
  - ADABAS
  - IDMS
  - IMS
  - VSAM

The list of certified and supported sources and front-end tools is increasing. For current information on all data sources, versions supported, and products required for support, please call the Sybase FAX on Demand at 1-800-423-8737. Request the “Partner Certification Report.”

Steps needed to use Component Integration Services

To get Component Integration Services running:

- Install DirectConnect server(s) or gateways for the external data sources you choose to access (Oracle, DB2, Informix).
- Configure the server to access remote objects as described in Chapter 2, “Understanding Component Integration Services.”

CHAPTER 2

Understanding Component Integration Services

This chapter explains how to use Component Integration Services. It is intended to help you understand how Adaptive Server works with the Component Integration Services option configured. The chapter includes the following topics:

Basic concepts

The ability to access remote (or external) tables as if they were local is a hallmark of Component Integration Services. Component Integration Services presents tables to a client application as if all the data in the tables were stored locally. Remote tables are mapped to local proxy tables which hold metadata. Internally, when a query involving remote tables is executed, the storage location is determined, and the remote location is accessed so that data can be retrieved.

The access method used to retrieve remote data is determined by two attributes of the external object:

- The server class associated with the remote object
- The object type

To achieve location transparency, tables must first be mapped to their corresponding external locations.

Access methods

Access methods form the interface between the server and an external object. For each server class, there are separate access methods that handle all interaction between Adaptive Server and remote servers of the same class and object type.

Server classes

A server class must be assigned to each server when it is added by means of the system procedure **sp_addserver**. Server classes determine the access method used to interact with the remote server. The server classes are:

- *ASEnterprise* – Used if the server is an Adaptive Server Enterprise version 11.5 or later. This is the default server class.
- *ASAnywhere* – Used if the server is an Adaptive Server Anywhere version 6.0 or later.
- *ASIQ* – Used if the server is an Adaptive Server IQ version 12.5

- *sql_server* – indicates that the server is a Sybase SQL Server™ . Component Integration Services determines whether the Sybase server is a release 10.0 or later server (supports cursors and dynamic SQL) or a pre-release 10.0 server (does not support cursors or dynamic SQL).
- *local* – the local server. There can be only one.
- *direct_connect* – indicates that the server is an Open Server™ application that conforms to the interface requirements of a DirectConnect™ server. For access to Microsoft SQL Server a DirectConnect must be used.
- *access_server* – a synonym for server class *direct_connect* for compatibility with previous releases.
- *db2* – indicates that the server is a gateway to DB2 or DB2-compatible databases. This class is provided only for backward compatibility. The preferred class is *direct_connect*.
- *sds* – indicates that the server conforms to the interface requirements of a Specialty Data Store.

Object types

The server presents a number of object types to client applications as if they were local tables. Supported object types are:

- *table* – The object in a remote server of any class is a relational table. This is the default type.
- *view* – The object in a remote server of any class is a view. Component Integration Services treats views as if they were local tables without any indexes.
- *rpc* – The object in a remote server of any class is an remote procedure. Component Integration Services treats the result set from the remote procedure as a read-only table.
- *file* – The object is an individual file within a file system.
- *directory* – The object is a file system directory.

Interface to remote servers

The interface between the server and remote servers is handled by the Open Client software, Client-Library™. The Client-Library features that are used to implement the interface are dependent upon the class of server with which Component Integration Services is interacting.

For example, if the server class is *direct_connect (access_server)*, a number of features such as cursor and dynamic requests are used. These features are not used by a server of class *db2*.

Before the server can interact with a remote server, you need to configure the following:

- Remote server addition to directory services
- Remote server definition
- Remote server login information
- Remote object definition

Directory services

Before accessing remote tables with Component Integration Services, you must either have access to LDAP directory services, or an *interfaces* file (*sql.ini* file on Windows NT). For information on setting up directory services, see the configuration documentation for your platform. You may wish to refer to Appendix A which serves as a basic tutorial for Component Integration Services users.

Remote server definition

Remote servers are defined by means of the stored procedure **sp_addserver**. This procedure is documented in the *Adaptive Server Reference Manual*. When using release 12.0 or greater you must name the local server.

Logging into remote servers

Once the remote server has been configured, login information must be provided. By default, the server uses the names and passwords of its clients whenever it connects to a remote server on behalf of those clients. However, this default can be overridden by the use of the stored procedure **sp_addexternlogin**. This procedure allows a system administrator to define the name and password for each user who connects to a remote server.

Using **connect to** *server_name*, you can verify that the server configuration is correct. This command establishes a passthrough mode connection to the remote server. Passthrough mode allows clients to communicate with remote servers in native syntax. This passthrough mode remains in effect until you issue a **disconnect** command.

Defining remote objects

Once a remote server has been properly configured, objects in that remote server cannot be accessed as tables until a mapping between them and a local object (proxy table) has been established.

You can create new tables on remote servers, and you can define the schema for an existing object in a remote server. The procedures for both are similar.

You can use one of two methods for defining the storage location of remote objects:

1 Define the storage location of individual objects

2 Define the default location of all objects in a database

Defining the storage location of individual objects

Defining individual object storage locations is done by means of the system procedure **sp_addobjectdef** or the use of the **at pathname** syntax. This procedure allows you to associate a remote object with a local proxy table name. The remote object may or may not exist before you do the mapping. Complete syntax for **sp_addobjectdef** is provided in the *Adaptive Server Reference Manual*.

An easier method for defining storage locations is with the **create proxy_table** command.

```
create proxy_table <table_name>
    [external file] at "pathname"
```

Creating proxy tables

Once you have defined the storage location, you can create the table as a new or existing object. If the table does not already exist at the remote location, use the **create table** syntax. If it already exists, use the **create existing table** syntax. If the object type is *rpc*, only the **create existing table** syntax is allowed.

When a **create existing table** statement is received, and the object type is either *table* or *view*, the existence of the remote object is checked by means of the catalog stored procedure **sp_tables**. If the object exists, then its column and index attributes are obtained. Column attributes are compared with those defined for the object in the **create existing table** statement. Column name, type, length, and null property are checked. Index attributes are added to the *sysindexes* system table.

The **create proxy_table** command is easier to use than **create existing table**. Proxy tables can also be created using the Adaptive Server Enterprise system administration tool, Sybase Central.

Once the object has been created, either as a new or an existing object, the remote object can be queried by using its local name.

Proxy tables

Proxy tables are the key to location transparency. A proxy table is a local table containing metadata which points to a remote or external table. The remote table is mapped to the proxy table to make it appear as if it were a local table.

There are three ways to create proxy tables:

- The **create table** command allows the creation of new external tables with the following syntax:

  create table table_name (column_list) [[external {table | file}] at "pathname"]]

  create table allows external object type *table* and *file*.

- The **create existing table** command is used to map existing remote tables. It provides datatype conversion and allows the user to specify which columns are to be mapped with the following syntax:

  create existing table *table_name* (*column_list*)
  [on *segment_name*]
  [[external {table | procedure | file}] at pathname]

  create existing table allows external object type *table*, *procedure* and *file*.

- The **create proxy_table** command creates proxy tables which automatically inherit all the columns, column names and datatypes of the external table using the following syntax:

  create proxy_table *table_name*
  [external *type*] at *pathname*

  create proxy table allows external object type *table*, *file* and *directory*.

Complete syntax for these commands are found in Chapter 3 of this book.

Using the *create table* command

The **create table** command creates a proxy table and a remote table at the same time with the following syntax:

create table table_name (column_list) [[external {table | file}] at "pathname"]]

The remote location is specified with the **at pathname** clause. **create table** allows external object type *table* and *file*. The datatype of each column is passed to the remote server without conversion except with server class *db2*.

Using the *create existing table* command

The **create existing table** command allows the definition of existing tables (proxy tables). The syntax for this option is similar to the **create table** command and reads as follows:

```
create existing table table_name (column_list)
 [ on segment_name ]
[[external {table | procedure | file}] at pathname]
```

The action taken by the server when it receives this command is quite different from the action it takes when it receives the **create table** command, however. In this case, a new table is not created at the remote location; instead, the table mapping is checked, and the existence of the underlying object is verified. If the object does not exist (either host data file or remote server object), the command is rejected with an error message.

If the object does exist, its attributes are obtained and used to update system tables *sysobjects*, *syscolumns,* and *sysindexes*.

- The nature of the existing object is determined.
- For remote server objects (other than RPCs), column attributes found for the table or view are compared with those defined in the *column_list*. Column names must match identically (although case is ignored), column types and lengths must match, or at least be convertible, and the NULL attributes of the columns must match.
- Index information from the host data file or remote server table is extracted and used to create rows for the system table *sysindexes*. This defines indexes and keys in server terms and enables the query optimizer to consider any indexes that may exist on this table.
- The **on** *segment_name* clause is processed locally and is not passed to a remote server.

After successfully defining an existing table, issue an **update statistics** command for the table.This allows the query optimizer to make intelligent choices regarding index selection and join order.

Datatype Conversions

When you use the **create table** or **create existing table** commands, you must specify all datatypes, using recognized Adaptive Server datatypes. If the remote server tables reside on a class of server that is heterogeneous, the datatypes of the remote table are converted into the specified Adaptive Server types automatically when the data is retrieved. If the conversion cannot be made, the **create table** or **create existing table** commands do not allow the table to be created or defined.

Example of Remote Table Definition

The following example illustrates the steps necessary to define the remote Adaptive Server table, *authors*, starting with the server definition:

1 Define a server named SYBASE. Its server class is *sql_server*, and its name in the interfaces file is SYBASE:

```
exec sp_addserver SYBASE, sql_server, SYBASE
```

2 Define a remote login alias. This step is optional. User “sa” is known to remote server SYBASE as user “sa,” password “timothy”:

```
exec sp_addexternlogin SYBASE, sa, sa, timothy
```

3 Define the remote *authors* table:

```
create existing table authors
 (
 au_id    id           not null,
 au_lname varchar(40)  not null,
 au_fname varchar(20)  not null,
 phone    char(12)     not null,
 address  varchar(40)  null,
 city     varchar(20)  null,
 state    char(2)      null,
 country  varchar(12)  null,
 postalcodechar(10)    null
 )
at "SYBASE.pubs2.dbo.authors", "table"
```

4 Update statistics in tables to ensure reasonable choices by the query optimizer:

```
update statistics authors
```

5 Execute a query to test the configuration:

```
select * from authors where au_lname = 'Carson'
```

Using the create proxy_table command

create proxy_table is a variant of the **create existing table** command. Use **create proxy_table** to create a proxy table, but (unlike **create existing table**) you do not specify a column list. CIS derives the column list from the metadata it obtains from the remote table.

The **create proxy_table** command creates proxy tables which automatically inherit all the columns, column names and datatypes of the external table using the following syntax:

```
create proxy_table table_name
[ external type ] at pathname
```

create proxy table allows external object type *table*, *file* and *directory*.The location information provided by the **at** keyword specifies the pathname to the remote object.

External type can be one of the following:

- **external table** specifies that the object is a remote table or view. **external table** is the default, so this clause is optional.
- **external directory** specifies that the object is a directory with a path similar to the following: "*/tmp/directory_name* [;R]". The option "R" indicates recursive
- **external file** specifies that the object is a file with a path similar to: "*/tmp/filename*"

Remote Procedures as proxy tables

An optional clause may be added to the **create existing table** statement to indicate the remote object is actually a stored (or other) procedure instead of a table. Without this clause, the remote object is assumed to be a table or view:

```
create existing table t1
    (
        column_1int,
        column_2int
    )
    EXTERNAL PROCEDURE AT "SERVER_A.mydb.dbo.p1"
```

In the case where the remote object is type procedure, several processing differences occur:

- No indexes are created for objects of this type.

- A column list must be provided which matches the description of the remote procedure's result set. This column list is the responsibility of the user, and no verification of its accuracy is provided.
- Column names beginning with underscore ('_') can be used to specify parameters, which are not part of the remote procedure's result set. These columns are referred to as *parameter columns*. For example:

```
create existing table rpc1
(
    a       int,
    b       int,
    c       int,
    _p1     int null,
    _p2     int null
)
external procedure
at "SYBASE.sybsystemprocs.dbo.myproc"

select a, b, c from t1
where _p1 = 10 and _p2 = 20
```

- In this example, the parameter columns *_p1* and *_p2* are not expected in the result set, but can be referenced in the query. CIS passes the search arguments to the remote procedure via parameters, using the names *@p1* and *@p2*.
- If a parameter column is included in the **select** list, its value is equivalent to the values specified for it in the **where** clause, if it was passed to the remote procedure as a parameter. If the parameter column did not appear in the **where** clause, or was not able to be passed to the remote procedure as a parameter, but was included in the **select** list, its value would be NULL.
- A parameter column can be passed to the remote procedure as a parameter if it is what the Adaptive Server Enterprise query processor considers to be a searchable argument, or SARG. It is generally a SARG if it is not included in any **or** predicates. For example, the following query would prevent the parameter columns from being used as parameters:

```
select a, b, c from t1
where _p1 = 10 OR _p2 = 20
```

- Rules exist for the definition of parameter columns in the **create existing table** statement:
  - parameter columns must allow NULL.
  - parameter columns cannot precede normal, result columns (i.e. they must appear at the end of the column list).

Allowing the definition of remote procedures as local tables gives CIS the ability to treat the result set of a remote procedure as a 'virtual table,' which can be sorted, joined with other tables, or inserted into another table via **insert/select** syntax. However, tables of this type are considered read only:

- You cannot issue a **delete**, **update** or **insert** command against a table of type *procedure*;
- You cannot issue a **create index**, **truncate table** or **alter table** command against tables of this type.

Component Integration Services users can map remote or external objects of the type *rpc* to local proxy tables**.** If a table is created in this way, it can be referenced only by the **select** and **drop** commands. The commands **insert**, **delete**, and **update** generate error messages, since the table is assumed to be read-only. Proxy definitions should only be created for procedures which return data.

If an object of the type *rpc* has been defined within the server, a query is not issued to the remote server on which the object resides. Instead, the server issues an RPC and treats the results from the RPC as a read-only table.

Examples

```
create existing table rtable
 (col1 int,
 col2  datetime,
 col3  varchar(30)
 )
external procedure at "RMTSERVER...myproc"

select * from rtable
```

When this query is issued, the server sends the RPC named *myproc* to server RMTSERVER. Row results are treated like the results from any other table; they can be sorted, joined with other tables, grouped, inserted into another table, and so forth.

RPC parameters should represent arguments that restrict the result set. If the RPC is issued without parameters, the entire result set of the object is returned. If the RPC is issued with parameters, each parameter further limits the result set. For example, the following query:

```
select * from rtable where col1 = 10
```

results in a single parameter, named *@col1*, that is sent along with the RPC. Its value is 10.

Component Integration Services attempts to pass as many of the search arguments as possible to the remote server, but depending on the SQL statement being executed, Component Integration Services might perform the result set calculation itself. Each parameter represents a search for an exact match, for example, the **=** operator.

The following are rules which define the parameters sent to the RPC. If an RPC is used as a Component Integration Services object, these rules should be kept in mind during development.

- Component Integration Services sends **=** operators in the **where** clause as parameters. For example, the query:

  ```
  select * from rpc1 where a = 3 and b = 2
  ```

  results in Component Integration Services sending two parameters. Parameter *a* has a value of 3 and parameter *b* has a value of 2. The RPC is expected to return only result rows in which column *a* has a value of 3 and column *b* has a value of 2.

- Component Integration Services does not send any parameters for a **where** clause, or portion of a **where** clause, if there is not an exact search condition. For example:

  ```
  select * from rpc1 where a = 3 or b = 2
  ```

  Component Integration Services does not send parameters for *a* or *b* because of the **or** clause.

  Another example:

  ```
  select * from rpc1 where a = 2 and b < 3
  ```

  Component Integration Services does not send parameters because there is nothing in the **where** clause representing an exact search condition. Component Integration Services performs the result set calculation locally.

New server limits

Limits on length of char, varchar, binary and varbinary datatypes - In version 12.5 as in prior releases of Adaptive Server Enterprise, a row cannot span page boundaries, therefore column size has been limited by row size. However, in version 12.5 of Adaptive Server Enterprise, configuration allows page sizes of 2K, 4K, 8K or 16K bytes. Also, the arbitrary limit of 255 bytes for char/binary columns has been removed. The version 12.5 supports extended sizes of char, varchar, binary and varbinary data types. The new limit depends on the page size of the server. For various page sizes, the new limits are as follows:

Table 2-1: New Limits

Pagesize	Max. Column Size
2048	2048
4096	4096
8192	8192
16384	16384

Note that these sizes are still approximate. The basic rule specifies that the limit is the maximum size that still allows a single row to fit on a page. These limits also vary depending on the locking scheme specified when the table is created. It is assumed that the bulk of proxy tables are created with the default locking scheme, which is all page locking.

- Limits on length of Transact-SQL variables and parameters - the size of char, varchar, binary and varbinary variables are extended to equal the maximum size of columns of the same datatype for a given server. This allows variables to be passed to stored procedures (or RPCs) whose length exceeds the current limit of 255 bytes.
- Limits on number of columns per table- the old limit of 250 are removed, and up to 1024 columns per table are allowed, as long as the columns can still fit on a page. Note that there is a limit of 254 variable length columns (null columns are also considered variable length).
- Limits on the width of an index - the total width of an index within Adaptive Server Enterprise can be larger than in prior releases, depending on server page size. In the following table, maximum index width is shown according to pagesize:

Table 2-2: Maximum Index Width

Pagesize	Index Width
2048	600
4096	1250

Pagesize	Index Width
8192	2600
16384	5300

- Limits on the number of columns per index - the current limit of 31 columns per index are unchanged in version 12.5.

What these changes mean to CIS and remote servers CIS connects to is described in the following sections.

Remote server capabilities

When communicating with a remote server, CIS needs to know the maximum length of a char/varchar column that can be supported by the DBMS.

For connections to servers in classes ASEnterprise, ASAnywhere, ASIQ, sql_server and db2, the maximum size is determined based on known attributes of these servers (according to version).

For servers in class direct_connect and sds, this information is provided by an addition to the result set returned by the **sp_capabilities** RPC. A new capability is specified to allow the Direct Connect to indicate the maximum length of columns supported by the DBMS for which the Direct Connect is configured.

Additionally, it is necessary for the Direct Connect to know about the maximum length of char columns that can be supported by CIS. For this reason, changes to the existing RPC **sp_thread_props** are required:

sp_thread_props "maximum ASE column length", n

This RPC is sent to a Direct Connect after CIS has established a connection for the first time. The value of *n* is an integer indicating the maximum column size, in bytes, allowed by ASE/CIS.

create new proxy table

The **create table** command allows columns of datatype char, varchar, binary and varbinary to be specified with extended lengths, as described above. These datatypes and lengths are forwarded to the remote server on which the table is to be created.

create existing proxy table

The **create existing table** command also allows columns to be specified with a length of greater than 255 bytes. This allows CIS to treat columns in remote databases as char, varchar, binary or varbinary that previously had to be treated as text or image columns.

There is still an opportunity for column size mismatch errors. For example, in the case where the remote database contains a table with a column length of 5000 bytes, and the Adaptive Server Enterprise processing the **create existing table** command only supports columns up to 1900 bytes, a size mismatch error would occur. In this case, it is necessary to re-specify the column as a text or image column.

In the case where the proxy table column size exceeds that of the corresponding column in the remote table, a size mismatch error is detected and the command is aborted.

create proxy_table

The **create proxy_table** command imports metadata from a remote server and converts column information into an internal **create existing table** command, with a column list derived from the imported metadata. When obtaining the column metadata, conversion from the remote DBMS type to internal Adaptive Server Enterprise types is required.

If the size of remote columns (char, varchar, binary or varbinary datatypes) exceeds 255 bytes but is still less than or equal to the maximum Adaptive Server Enterprise column size, then equivalent Adaptive Server Enterprise datatypes are used for the proxy table. However, if the size of a remote column exceeds the column size supported by Adaptive Server Enterprise, then CIS converts the corresponding proxy table column to text or image (as is the case with the current in-market implementation).

alter proxy table

If this command operates on a proxy table, it is first processed locally, then forwarded to the remote server for execution. If the remote execution fails, the local changes are backed out and the command is aborted.

The remote server must process the command appropriately, or raise an error. If an error is produced, the CIS side of the command is aborted and rolled back.

select, insert, delete, update

CIS handles large column values when proxy tables are involved in DML operations. CIS handles DML using one of several strategies:

- TDS Language commands - if the entire SQL statement can be forwarded to a remote server, then CIS does so using TDS Language commands generated by Ct-Library - **ct_command** (CS_LANG_CMD).

  The text of the language buffer may contain data for long char or binary values that exceeds 255 bytes, and remote servers must handle parsing of these command buffers.

- TDS Dynamic commands - if CIS cannot forward the entire SQL statement to a remote server (i.e. CIS is forced to provide functional compensation for the statement), then an **insert**, **update** or **delete** may be handled by using TDS Dynamic commands, with parameters as needed, using the Ct-Library function **ct_dynamic** (CS_PREPARE_CMD, CS_EXECUTE_CMD, CS_DEALLOC_CMD).

  The parameters for the dynamic command may be CS_LONGCHAR_TYPE or CS_LONGBINARY_TYPE.

- TDS Cursor commands - Ct-Library cursor operations can be used to handle proxy table operations for **select**, **update** and **delete** if functional compensation has to be performed. For example, if updating a proxy table and there are multiple tables in the **from** clause, CIS may have to fetch rows from multiple data sources, and for each qualifying row, apply the **update** to the target table. In this case, CIS uses **ct_cursor** ({CS_DECLARE_CMD, CS_OPEN_CMD, CS_CURSOR_UPDATE_CMD, CS_CLOSE_CMD, CS_DEALLOC_CMD}).

  After a cursor is prepared, parameters are specified. These parameters may now include those of type CS_LONGCHAR or CS_LONGBINARY.

- Bulk insert commands - when performing a **select/into** operation, if the target server supports the bulk interface (only true of remote ASE's), then the remote server must be prepared to handle char/binary values > 255 (via CS_LONGCHAR, CS_LONGBINARY values).

Columns from remote servers may be returned to CIS as type CS_LONGCHAR_TYPE or CS_LONGBINARY_TYPE.

RPC handling

RPCs sent to remote servers can contain parameters of types CS_LONGCHAR and CS_LONGBINARY. The CIS command **cis_rpc_handling** supports these new types.

Note that sending long parameters to pre-12.5 servers is not allowed, as prior versions of Adaptive Server Enterprise do not support CS_LONGCHAR or CS_LONGBINARY data. CIS examines TDS capabilities for the remote server prior to sending the RPC, and if the remote server cannot accept these datatypes, an error results.

Cascading proxy tables

Issues have arisen surrounding attempts to have a proxy table in one instance of CIS reference a proxy table in another instance. Version 12.5 addresses those issues, allowing cascading proxy table configurations between any number of instances of CIS.

There are obviously conditions where this can cause problems, such as circular references, or transactions in which the second proxy table references a local table on the same server as the first proxy table. In this case, application deadlocks can result that will not be detected by CIS. Configuring systems to avoid these potential pitfalls is left to the customer.

Proxy databases

There are two types of proxy databases: user and system proxy databases. This section describes the behavior of each.

User proxy databases

When a user proxy database is created, metadata for the proxy tables is imported automatically from the remote location which contains the actual tables. This metadata is then used to create proxy tables within the proxy database.

Proxy database creation is done through syntax which extends the **create database** command:

```
create database <dbname>
    [create database options]
    [with default_location = 'pathname']
    [for proxy_update]]
```

The use of the clause **with default_location** allows the database creator to specify the storage location of any new tables, and the location from which metadata may be imported for automatic proxy table creation if the **for proxy_update** clause is also specified. The **for proxy_update** clause establishes the database as a proxy database; the **with default_location** clause defines the location from which proxy tables are imported. Without the **for proxy_update** clause, the behavior of the **with default_location** clause is the same as that provided by the stored procedure **sp_defaultloc** - a default storage location is established for new and existing table creation, but automatic import of proxy table definitions is not done during the processing of the **create database** command.

The value of pathname is a string identifier in the following format: *servername.dbname.owner*.

Note: the dots are significant, and all three must be present! Each field in this string is described as follows:

- *servername* - required field; represents the name of the server that owns the objects to be referenced by proxy tables. Must exist in *master.dbo.sysservers.srvname*.
- *dbname* - may be omitted. The name of the database within *servername* which contains objects to be referenced by proxy tables

- *owner* - may be omitted. The name of the owner of objects to be referenced by proxy tables. This may be restrictive, so that if more than one user owns objects in *dbname*, specifying the owner will **select** only those objects owned by that user. Proxy tables must not be created for objects owned by other users.

If **for proxy_update** is specified with no **default_location**, an error is reported.

When a proxy database is created (using the **for proxy_update** option), CIS functions are called upon to:

- Provide an estimate of the database size required to contain all proxy tables representing the actual tables/views found in the primary server's database. This estimate is provided in terms of the number of database pages needed to contain all proxy tables and indexes. This size is used if no size is specified, and no database devices are specified.

  Note: if the database is created with specific size specifications [**on device_name = nn**], or if a device name is specified with no size [**on device_name**], then the size requirements for the proxy database are not estimated; it is assumed in this case that the user or dba wants to override the default size calculated for the proxy database.

  If you are importing metadata from another Adaptive Server, remote database users are imported before proxy tables are created. Each imported database user must have a corresponding system user name in *syslogins*.

- Create all proxy tables representing the actual tables/views found in the companion server's database. Proxy tables are not created for system tables.

  Note: Before the proxy tables are created, the quoted identifier state is turned on, and each table is created with quotes surrounding the table name and column name. This allows the creation of tables containing names that may be Sybase Transact-SQL reserved words. When all proxy tables are created, the quoted identifier state is restored to its original setting.

- grant all permissions on proxy tables to PUBLIC
- add the GUEST user to the proxy database
- import database users from remote site (if Adaptive Server Enterprise)
- grant **create table** permission to PUBLIC

- The database status is set to indicate that this database is a user proxy database. This is done by setting a status field in *master.dbo.sysdatabases.status*3 (0x0001, DBT3_USER_PROXYDB).

After the database has been created, it contains a proxy table for each table or view found in the default_location. Then the behavior for a user proxy database, is identical to prior database behavior. Users can create additional objects, such as *procedure*, *views*, *rules*, *defaults*, etc., and both DDL and DML statements that operate on proxy tables behave as documented in the *Component Integration Services User's Guide*.

The only exception to this is the **alter database** command. New syntax and capabilities of this command are described in the next section.

User Proxy Database Schema Synchronization

At times, it may be necessary for a DBA to force re-synchronization of the proxy tables contained within the proxy database. This can be done through the alter database command:

```
alter database <dbname>
        [alter database options]
        [for proxy_update]
```

If the **for proxy_update** clause is entered with no other options, the size of the database will not be extended; instead, the proxy tables, if any, are dropped from the proxy database and re-created from the metadata obtained from the *pathname* specified during **create database ... with default_location = 'pathname'**

If this command is used with other options to extend the size of the database, the proxy table synchronization is performed after the size extensions are made.

The purpose of this **alter database** extension is to provide a DBA with an easy-to-use, single step operation with which to obtain an accurate and up-to-date proxy representation of all tables at a single remote site.

This re-synchronization is supported for all external data sources, and not just the primary server in a HA-cluster environment. Also, a database need not have been created with the **for proxy_update** clause. If a default storage location has been specified, either through the **create database** command or using **sp_defaultloc**, the metadata contained within the database can be synchronized with the metadata at the remote storage location.

Certain behavior is implied by the use of create/alter database to specify a proxy database:

- Modification to the default location specified with the **create database** command is not allowed using **alter database**.
- Local tables cannot be created in the proxy database. **create table** commands result in the creation of proxy tables, and the actual table is created at the default location.
- The default location of the table may be specified in the **create table** command, using the **at 'pathname'** syntax. If the pathname differs from the default location, then the **alter database** command will not synchronize the metadata for this table.
- In order to change the default location, it is necessary to first drop the database then re-create it with a new pathname specified in the with **default_location = 'pathname'** clause. If the location is changed using **sp_defaultloc**, then the new location is used to provide metadata synchronization, and proxy tables that were created with the prior location not be synchronized, and in fact may be dropped and replaced if the name conflicts with that of tables at the new location.

System proxy databases

System proxy databases are provided which behave like user proxy databases, with some notable enhancements and exceptions. These differences are described in this section. System proxy databases are only used in an HA configuration.

The purpose of providing system proxy databases is to allow customer-written applications to run on either node in a high-availability cluster. This does not imply 'single-system image' capability; rather, it suggests an environment in which most user-written applications will be able to execute on either node in the cluster. This means that both databases and user-created objects should be visible to both nodes. To facilitate this capability, the notion of a system proxy database was introduced in version 12.0 of Adaptive Server Enterprise.

A system proxy database has the same name as the database in the primary node which it references, and contains handling for the user-defined objects that are necessary to support the application: Proxy tables are created for each user table and view found in the primary database, and stored procedures are converted to RPCs and forwarded to the node referenced by the proxy database.

System proxy database creation

A system proxy database is created automatically under the following circumstances:

- The HA cluster is being configured through the use of the stored procedure

  sp_companion ServerName, 'configure', with_proxydb

  In this case, a system proxy database is created for each user database found in server indicated by ServerName.

- A **create database** command is issued in a server whose HA state is one of MODE_APNC, MODE_SNC or MODE_ASNC.

When the creation of the system proxy database is complete, CIS functions will then be called upon to:

- **grant create table to public** - this will allow table creation on the primary server to result in proxy table creation in the system proxy database.

Schema synchronization when current database has a system proxy database

In an HA cluster, some of the changes to a primary server's database need to be forwarded to the companion server, in order to keep both servers synchronized.

Several DDL commands, when executed within a database that has a system proxy database, will cause notification of the companion server and result in automatic synchronization of the resulting changes:

- **create table** and **drop table** - local operation executes, resulting in the local table being created or dropped. The command is then forwarded to the companion server, for execution in the system proxy database, so that a proxy table can be created or dropped
- **create index** and **drop index** - local operation executes, resulting in an index being created or dropped. The server owning the system proxy database is then notified, and the proxy table is dropped and re-created, allowing the change to the index to be represented within the proxy table.
- **create view** and **drop view** - the local operation succeeds, resulting in the local view being created or dropped. The server owning the system proxy database is then notified, and a proxy table is either created or dropped.

If these commands are executed within the system proxy database, similar behavior occurs:

- **create table** and **drop table** - local proxy table is created or dropped. The command is then forwarded to the primary server, so that a local table referenced by the proxy table can be created or dropped.
- **create index** and **drop index** - local operation on the proxy table executes, resulting in an index being created or dropped. The server owning the primary database is then notified, and an index is either created or dropped on the local table referenced by the proxy table
- **create view** and **drop view** - not allowed within a system proxy database. Error 12818 is produced (see below).

Stored procedure execution within a system proxy database

If a stored procedure request is encountered when the current database is a system proxy database, the stored procedure request is automatically converted to an RPC and sent to the server referenced by the system proxy's default location.

Additional behavior of the system proxy database

Certain commands, when executed within a system proxy database, will be rejected with an error:

- **create procedure** and **drop procedure**
- **create view** and **drop view**
- **create trigger** and **drop trigger**
- **create rule** and **drop rule**
- **create default** and **drop default**

The error generated in these cases is: Msg 12818, Severity 16: Cannot create an object of this type in system-created proxy database

DDL commands behavior affected by proxy databases

Some commands will be affected by the implementation of proxy databases, others will not. This section contains a list of DDL commands which are affected by system proxy databases.

- dump database -
- dump transaction -

- load database -
- load transaction -
- create table -
- create view -
- create index -
- create database -
- drop table -
- drop view -
- drop index -
- drop database -

All other DDL commands remain unaffected by the existence of system proxy databases.

File system access

Version 12.5 provides access to the file system through the SQL language. With file system access, you can create proxy tables that are mapped to file system directories, or to individual files.

These features are bundled as an option and must be purchased separately.

Directory access

A new class of proxy tables is allowed in version 12.5 that enables SQL access to file system directories and their underlying files. In order to create proxy tables mapped to directories or files, you must have “System Administrator” or “System Security Officer” privileges. The supported syntax is:

```
create proxy_table <table_name>
external directory at "directory pathname[;R]"
```

The directory pathname must reference a file system directory visible to and searchable by the Adaptive Server Enterprise process. A proxy table is created which maps column names to attributes of files that exist within the directory. If the ’;R’ (indicating "recursion") extension is added to the end of pathname, CIS includes entries in all subordinate directories. The following table contains a description of the proxy table columns that are created when this command successfully completes:

Table 2-3: Proxy table columns

Column Name	Datatype	Description
id	numeric(24)	Identity value consisting of values from st_dev and st_ino (See stat(2)). These two values are converted first to a single string (format: "%d%014ld"), and the string is then converted to a numeric value.
filename	varchar(n)	The name of the file within the directory specified in at ’pathname’, or within directories subordinate to pathname. While the length of pathname is limited to 255 bytes, the total length (n) of filename is system dependent, and specified by the definition of MAXNAMLEN. For Solaris systems, this value is 512 bytes; for most other systems this will be 255 bytes.

Column Name	Datatype	Description
size	int	For regular files - specifies the number of bytes in the file. For directories - block special or character special, this is not defined.
filetype	varchar(4)	the file type - legal values are: FIFO, for pipe files; DIR for directories; CHRS for character special files; BLKS for block special files; REG for ordinary files; UNKN for all other file types. Links are automatically expanded, and will not appear as a separate file type.
access	char(10)	access permissions, presented in a more or less 'standard' Unix format: "drwxrwxrwx"
uid	varchar(n)	The name of the file owner. The value of n is specified by the system definition L_cuserid, which is 9 on all systems except Compaq Tru64, where it is 64. This value is 0 on NT systems.
gid	varchar(n)	The name of the owning group. The value of n is specified by the system definition L_cuserid, which is 9 on all systems except Compaq Tru64, where it is 64. This value is 0 on NT systems.
atime	datetime	Date/time file data was last accessed
mtime	datetime	Date/time when file was last modified
ctime	datetime	Date/time when file status was last changed
content	image	The actual physical content of the file (for regular files only). NULL if the file is not a regular file.

A proxy table that maps to a file system directory can support the following SQL commands:

- **select** - File attributes and content can be obtained from the proxy table using the select command. Built-in functions that are designed to handle text values are fully supported for the content column. (i.e. textptr, textvalid, patindex, pattern).
- **insert** - A new file or files can be created using the **insert** command. The only column values that have meaning are filename and content; the rest of the columns should be left out of the **insert** statement. If they are not left out, they are ignored.
- **delete** - files may be removed by the use of the **delete** command.
- **update** - Only the name of a file may be changed using the **update** command;

- **readtext** - the contents of a file may be retrieved using the **readtext** command;
- **writetext** - the contents of a file may be modified using the **writetext** command;

No other SQL commands will operate on tables of this type.

Regular file content is available only if the Adaptive Server Enterprise process has sufficient privileges to access and read the file, and if the file type indicates an 'ordinary file.' In all other cases, the content column will be null. For example:

```
select filename, size, content
    from directory_table
    where filename like '%.html'
```

returns the name, size and content of regular files with a suffix of '.html', if the Adaptive Server Enterprise process has access privileges to the file. Otherwise, the content column will be NULL.

The **create proxy_table** command fails if the pathname referenced by directory pathname is not a directory, or is not searchable by the Adaptive Server Enterprise process.

If traceflag 11206 is turned ON, then messages are written to the errorlog that contain information about the contents of the directories and the query processing steps needed to obtain that information.

Recursion through subordinate directories

If the "pathname" specified in the **create proxy_table** statement contains the ;R extension, CIS traverses all directories subordinate to pathname, returning information for the contents of each subordinate directory. When this is done, the filename returned by a query contains the complete name of the file relative to the pathname. In other words, all subordinate directory names appear in the filename. For example, if pathname specifies "/work;R":

```
create proxy_table d1 external directory at "/work;R"
select filename, filetype from d1
```

returns values for files in subordinate directories as follows:

Table 2-4: Values for files

Filename	Filetype
dir1	DIR
dir1/file1.c	REG

Filename	Filetype
dir1/file2.c	REG
dir2	DIR
dir2/file1.c	REG

File access

Another new class of proxy tables are allowed in version 12.5 that enables SQL access to individual files within a file system. The supported syntax is:

```
create proxy_table <table_name>
    external file at " pathname" [column delimiter “<string>”]
```

When this command is used, a proxy table with one column (named ’record’, type varchar(255)) will be created. It is assumed in this case that the contents of the file are readable characters, and individual records within the file are separated by the newline (\n) character.

It is also possible to specify your own column names and datatypes, using the **create [existing] table** command:

```
create existing table fname (
    column1 int  null,
    column2 datetime null,
    column3 varchar(1024)  null
    etc. etc.
) external file at "pathname" [column delimiter “<string>”]
```

Columns may be any datatype except text, image, or a Java ADT. The use of the **existing** keyword is optional, and has no effect on the processing of the statement. In all cases (**create table**, **create existing table**, **create proxy_table**), if the file referenced by pathname does not exist, it is created. If it does exist, its contents are not overwritten. There is no difference in behavior between the **create table** and **create existing table** commands.

When a proxy table is mapped to a file, some assumptions about the file and its contents are made:

1 The file is a regular file (i.e. not a directory, block special, or character special file);

2 The Adaptive Server Enterprise server process has at least read access to the file. If the file is to be created, the server process must have write access to the directory in which the file is to be created;

3 The contents of an existing file are in human-readable form;

4 Records within the file are delimited by a newline character;

5 The maximum supported record size is 32767 bytes;

6 Individual columns, except for the last one, are delimited by the **column delimiter** string, which can be up to 16 bytes long; the default is a single tab character;

7 There is a correspondence between delimited values within each record of the file and the columns within the proxy table.

With proxy tables mapped to files, it is possible to:

1 Back-up database tables to the file system using either **select/into** or **insert/select**. When an **insert** statement is processed, each column is converted to characters in the default character set of the server. The results of the conversion are buffered, and all columns (except for the last) are delimited by a single tab. The last column is terminated by a newline. The buffer is then written to the file, representing a single row of data.

2 Provide a SQL alternative to using **bcp in** and **bcp out**. The use of a **select/into** statement can easily back-up a table to a file, or copy a file's contents into a table.

3 Query file content with the **select** statement, qualifying rows as needed with search arguments or functions. For example, it is possible to read the individual records within the Adaptive Server Enterprise errorlog file:

```
create proxy_table errorlog
    external file at "/usr/sybase/ase12_5/install/errorlog"
select record from errorlog where record like "%server%"
```

The query will return all rows from the file that match the **like** pattern. If the rows are longer than 255 bytes, they will be truncated. It is possible to specify longer rows:

```
create existing table errorlog
(
    record    varchar(512) null
)
external file at "/usr/Sybase/ase12_5/install/errorlog"
```

In this case, records up to 512 bytes in length will be returned. Again, since the proxy table contains only one column, the actual length of each column will be determined by the presence of a newline character.

Only the **select**, **insert** data access statements are supported for file access. **update** and **delete** will result in errors if the file proxy is the target of these commands.

When inserting values into a file, all datatypes are first converted to char values and then delimited by the column delimiter.

Important: **truncate table** sets the file size to 0.

Traceflag 11206 is also used to log message to the errorlog. These messages contain information about the stages of query processing that are involved with file access.

Security considerations

Only Adaptive Server Enterprise users with System Administrator (sa) or System Security Officer (sso) roles are allowed to create proxy tables that are mapped to files or directories. This requirement addresses the concerns over the security aspects of accessing file system data from within the Adaptive Server Enterprise server process (which may have root permission as it runs).

ANSI joins

ANSI joins are fully supported for remote data access. If a query cannot be translated, CIS will compensate functionally. The following rules apply to ANSI joins with remote data:

When the remote server supports only ANSI joins

All queries containing outer joins are converted to ANSI joins.

When the remote server supports both ANSI joins and T-SQL joins

Queries containing ANSI join syntax are sent using ANSI join syntax. Queries containing T-SQL outer join syntax are sent with T-SQL syntax.

When the remote server supports only DB2-ANSI

The query to the remote server will be sent in ANSI if all tables in the from clause participate in an ANSI join.

- Not sent:

  ```
  select * from T1 left join T2 on
  T1.a = T2.a, T3
  ```

- Sent

  ```
  select * from T1 Left Join T2 on
  T1.a = T2.a Left Join T3 on
  T3.a = T2.a
  ```

When an ANSI query is received for a server that does not support ANSI syntax

The query will be converted to T-SQL if possible.

50-Table join limit

The 50-table join limit is fully functional with remote servers that support it.

CIS first checks the capabilities of remote servers. If the 50-table join is supported by the remote server, the requested query is passed onto the remove server.

If the remote server does not support a 50-table join, a query is sent that references 16 tables or less at a time.

Union in views

New syntax to support the inclusion of the **union** operator within a view has been added to version 12.5. Note that the resulting view is not updatable, meaning that **insert**, **delete** and **update** operations are not allowed on views containing the **union** operator.

Component Integration Services supports **union** in views when proxy tables are referenced on either side of the **union** operator by forwarding as much syntax as possible to a remote site. This makes it possible to create a 'virtual table' consisting of separate tables in Oracle and DB2, for example.

This feature is internal to ASE/CIS, and does not directly affect remote servers. However, when a statement is executed involving a view of this type, and all tables referenced by the view reside on the same remote server, the previously defined **union** capability will be examined to determine whether the **union** operator can be sent to the remote server.

Referential integrity

You can use Component Integration Services to maintain referential integrity between remote tables. See the section on constraints in the *Transact-SQL User's Guide*. During **update**, **insert**, and **delete** operations, Component Integration Services checks the referenced table. If the check fails, the transaction is rolled back.

Remote servers

This section explains how component Integration Services interacts with remote server.

Defining remote servers

Use the system procedure **sp_addserver** to add entries to the *sysservers* table for the local server and for each remote server that is to be called. The **sp_addserver** syntax is:

sp_addserver *server_name [,server_class [,network_name]]*

where:

- *server_name* is the name used to identify the server. It must be unique.
- *server_class* is the type of server. The supported server classes with the types of servers that are in each class are described in the following sections. The default is server class *ASEnterprise*.
- *network_name* is the server name in the interfaces file. This name may be the same as *server_name*, or it may differ. The *network_name* is sometimes referred to as the *physical name*. The default is the same name as *server_name*.

Server class ASEnterprise

A server with server class *ASEnterprise* is Adaptive Server Enterprise version 11.5 or later. When CIS first establishes a connection to a server in this class, CIS determines the version (i.e. 11.5, 11.9.2, 12.0, etc.) and establishes server capabilities based on the version found. For example, version 12.0 supports ANSI syntax for outer joins, while prior versions do not.

Server class ASAnywhere

A server with server class *ASAnywhere* is an instance of Adaptive Server Anywhere or Adaptive Server IQ:

- Adaptive Server Anywhere 6.0 or later

Server class ASIQ

A server with server class *ASIQ* is any version of Adaptive Server IQ of 12.0 or later.

Server class *sql_server*

A server with server class *sql_server* is:

- SQL Server release 4.9 or earlier

Server class *db2*

A server with server class *db2* is an IBM DB2 database accessed through:

- DirectConnect for MVS / TRS (can also be configured as server class *direct_connect*)
- Direct (gateway less) access to Mainframe Connect

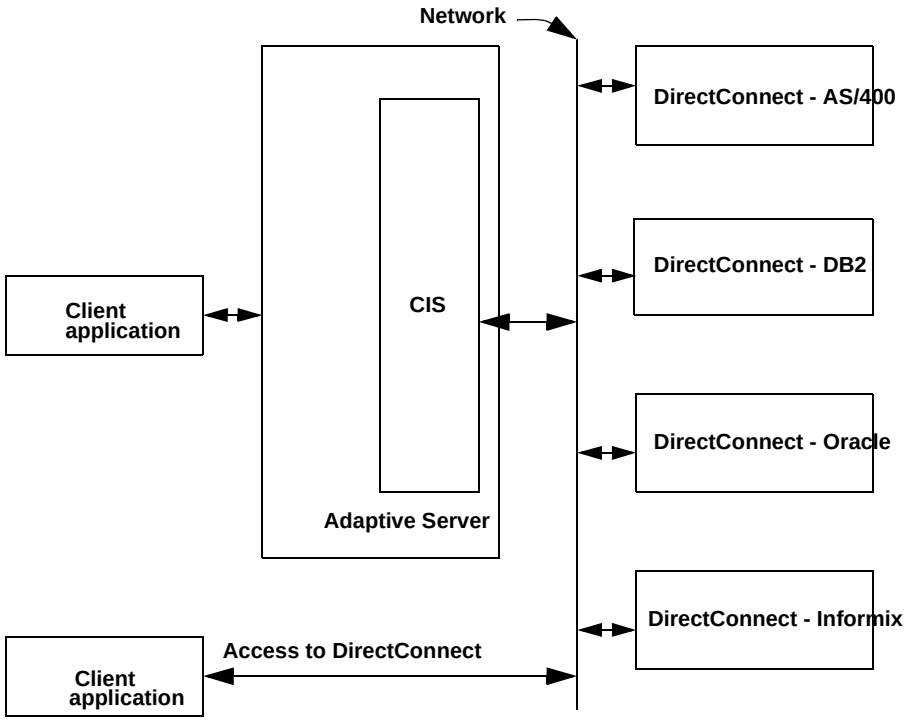
Server class *direct_connect*

A server with server class *direct_connect* is an Open Server-based application that conforms to the *direct_connect* interface specification. Server class *access_server is* synonymous with server class *direct_connect*. It is used for compatibility with previous releases.

Open Server-based applications using server class *direct_connect* are the preferred means of accessing all external, non-Sybase data sources.

Figure 2-1 illustrates the manner in which Adaptive Server with Component Integration Services enabled interacts with clients and Open Server-based applications. The data sources are not limited to those in this diagram:

Figure 2-1: Adaptive Server with CIS interacts with clients and other servers



Server class *sds*

A server with server class *sds* conforms to the interface requirements of a Specialty Data Store™ as described in the *Adaptive Server Specialty Data Store Developer's Kit* manual. A Specialty Data Store is an Open Server application you design to interface with Adaptive Server.

Connection management

When connecting to a remote server on behalf of a client, CIS uses Client-Library functions. Once the first connection to a remote server is established for a given client, that connection remains open until the client disconnects from Component Integration Services.

For servers of class *ASA, ASE, ASIQ, direct_connect (access_server)* and *sql_server* (release 10.0 and later), only one connection is established to that server for each client that requires access to that server. All interaction with these servers is done within this single connection context.

However, for pre-release 10.0 SQL Server, and servers of class *db2*, it may be necessary to establish more than one connection to that server in order to process a single client request. In this case, multiple connections are established as needed, and all but one are closed when the Transact-SQL command requiring them has completed.

LDAP directory services

The LDAP directory services means that it is no longer necessary to use an interfaces file in both the client and the server. Version 12.5 supports LDAP services for obtaining server information, and so does Component Integration Services. When a connection to a remote server is attempted, CIS instructs Open Client software to reference either the interfaces file or an LDAP server.

CIS uses LDAP services only when the configuration file (*libtcl.cfg*) specifies it. *libtcl.cfg* can be found at *$SYBASE/$SYBASE_OCS/config/libtcl.cfg*.

Note: When an LDAP Server is specified in *libtcl.cfg* then server information becomes accessible from the LDAP Server only and ASE/CIS ignores any (traditional) interfaces file.

Secure communication with SSL

Using SSL, you can establish secure connections from CIS to any number of remote servers that support the SSL protocol (Adaptive Server enterprise 12.5 and some DirectConnects).

CIS handles SSL connections as follows:

- The location of the trusted roots file is established. If the current server is SSL-enabled, then all outbound CIS connections will use the same trusted roots file as Adaptive Server Enterprise.
- If the current server is SSL-enabled, then a connection property is established to define the Open Client callback that will be used to respond to a challenge from a remote SSL-enabled server. If the current server is not SSL-enabled, then the callback used will fail any connection to a remote SSL-enabled server.

Trusted root files

The trusted roots file contains certificates for other servers that the local server treats as trusted when properly added to the system. A trusted roots file is accessible by the local server (Adaptive Server Enterprise) in:

```
$SYBASE_CERT/servername.txt
```

if $SYBASE_CERT is defined. Otherwise it is in:

```
$SYBASE/$SYBASE_ASE/certificates/servername.txt (for UNIX)
%SYBASE%\%SYBASE_ASE%\certificates\servername.txt (for NT)
```

where *servername* is the name of the current Adaptive Server.

Security issues

When establishing a connection to a remote Adaptive Server, Client-Library functions are used instead of a site handler when either **cis_rpc_handling** or **set transactional_rpc** is **on**. This method of establishing connections prevents the remote server from distinguishing these connections from those of other clients. Thus, any remote server security configured on the remote server to allow or disallow connections from a given server does not take effect.

Another Adaptive Server with Component Integration Services enabled cannot use *trusted mode* for remote server connections. This forces the Adaptive Server to be configured with all possible user accounts if it is going to be used with Component Integration Services.

Passwords are stored internally in encrypted form.

Remote server logins

To fully support remote logins, Client-Library provides new connection properties which enable CIS to request a *server connection*. This connection is recognized at the receiving server as a server connection (as opposed to an ordinary client connection), allowing the remote server to validate the connection through the use of *sysremotelogins* as if the connection were made by a site handler.

This feature is not enabled automatically. Instead, the SSO or DBA must request it by executing **sp_serveroption**:

```
exec sp_serveroption <server_name>,
    'server login', true | false
```

You cannot change the *server login* property if the current server's **@@servername** global variable is currently NULL.

If the *server login* option is enabled (set to TRUE), then CIS uses Client-Library connection properties to establish connections to the specified server:

Remote passwords specified by the client application are passed unchanged to the remote server. The use of and rules associated with remote passwords in server logins are identical to those associated with site handler connections.

These connection properties are only established if:

- The server option '*server login*' is set to TRUE
- The remote server is configured with server class *ASEnterprise*
- There is a local server name defined for the CIS-enabled server (i.e. the query **select @@servername** returns something other than NULL)

Trusted mode

Trusted mode can be used with CIS connections if "server logins" is set for a remote server.

Mapping of external logins

Adaptive Server Enterprise users who invoke CIS, knowingly or unknowingly, require login names/passwords to remote servers. By default, the username/password pair used by CIS to connect to a remote server is the same username/password used by the client to connect to Adaptive Server Enterprise.

This default mapping is frequently insufficient, and since its first release CIS has supported a one-to-one mapping of Adaptive Server Enterprise login names and passwords to remote server login names and passwords. For example, using the stored procedure **sp_addexternlogin**, it is possible to map Adaptive Server Enterprise user *steve*, password *sybase* to DB2 login name *login1*, password *password1*:

```
sp_addexternlogin DB2, steve, login1, password1
```

In version 12.5, it is possible to provide a many-to-one mapping so that all Adaptive Server Enterprise users who need a connection to DB2 can be assigned the same name and password:

```
sp_addexternlogin DB2, NULL, login2, password2
```

One-to-one mapping has precedence, so that if user *steve* has an external login for DB2, that would be used rather than the many-to-one mapping.

In addition to this, it is possible to assign external logins to Adaptive Server Enterprise roles. With this capability, anyone with a particular role can be assigned a corresponding login name/password for any given remote server:

```
sp_addexternlogin DB2, null, login3, password3, rolename
```

The use of the fifth argument to this procedure, containing the role name, identifies the name of a role, rather than the name of a user. Whenever a user with this role active requires a connection to DB2, the appropriate login name/password for the role is used to establish the connection. When establishing a connection to a remote server for a user that has more than one role active, each role is searched for an external login mapping, and the first mapping found is used to establish the login. This is the same order as displayed by the stored procedure **sp_activeroles**.

The general syntax for **sp_addexternlogin** is:

```
sp_addexternlogin
    <servername>,
    <loginname>,
    <external_loginname>,
    <external_password>
    [, <rolename>]
```

<rolename> is optional; if specified then the loginname parameter is ignored.

Precedence for these capabilities are as follows:

- If one-to-one mapping is defined, it is used - this has the highest precedence.
- If no one-to-one mapping is defined, then if a role is active and a mapping for it can be found, the role mapping is used to establish a remote connection;
- If neither of the above are true, then many-to-one mapping is used if defined.
- If none of the above is true, then the Adaptive Server Enterprise login name and password are used to make the connection.

If role mapping is done, and a user's role is changed (via **set role**), then any connections made to remote servers that used role mapping is disconnected.

The stored procedure **sp_helpexternlogin** has been updated to allow viewing the various types of extern logins that have been added using **sp_addexternlogin**. The syntax for **sp_helpexternlogin** is:

```
sp_helpexternlogin [<servername> [,<loginname> [,<rolename>]]]
```

All three parameters are optional, and any of the parameters can be NULL.

The stored procedure **sp_dropexternlogin** has also been modified to accept a third argument, <rolename>. If <role name> is specified then the second argument, <login name>, is ignored.

Remote server connection failover

A standard feature of Ct-Library version 12.0 and greater is the ability to automatically failover connections from a server that is no longer available to one that is configured as a failover server. This feature is supported by CIS, but requires modifications to directory services in order for it to take effect. For example, server S2 can be configured to serve as a failover server for S1, and vice-versa, by additions to the interfaces file, as shown in this example:

```
S1
        master tcp ether host1 8000
        query tcp ether host1 8000
        hafailover S2
S2
        master ether host2 9000
        query ether host2 9000
        hafailover S1
```

If the interfaces file (or LDAP directory service) is set up to define a failover configuration, then CIS takes advantage of it by automatically failing over connections to the failover server if a connection to the primary server fails.

Remote server capabilities

The first time Adaptive Server establishes a connection to a remote server of class *sds* or *direct_connect*, it issues an RPC named **sp_capabilities** and expects a set of results in return. This result set describes functional capabilities of the remote server so that Component Integration Services can adjust its interaction with that remote server to take advantage of available features. Component Integration Services forwards as much syntax as possible to a remote server, according to its capabilities.

For servers in other classes, CIS sets remote server capabilities for the remote server based on a set of assumptions. For example, server class *db2* inherits a set of assumptions based on known capabilities of IBM's DB2 database management system. For server class *ASEnterprise*, capabilities are established based on the version of ASE represented by the remote server.

Query processing

The following section describes query processing within Component Integration Services.

Processing steps

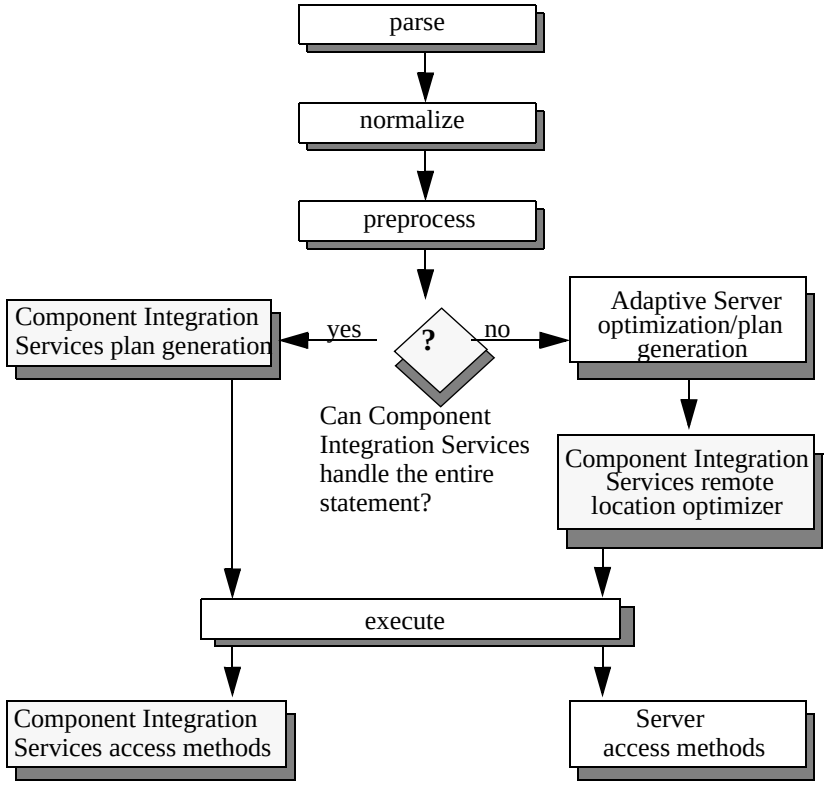
The query processing steps taken when Component Integration Services is enabled are similar to the steps taken by Adaptive Server, except for the following:

- If a client connection is made in passthrough mode, the Adaptive Server query processing is bypassed and the SQL text is forwarded to the remote server for execution.
- When **select**, **insert**, **delete** or **update** statements are submitted to the server for execution, additional steps may be taken by Component Integration Services to improve the query's performance, if local proxy tables are referenced.

The query processing steps are shown in Figure 2-2.

An overview of these steps follows.

Figure 2-2: Query processing steps



☐ Shaded boxes indicate steps taken by Component Integration Services.

Query parsing

The SQL parser checks the syntax of incoming SQL statements, and raises an error if the SQL being submitted for execution is not recognized by the Transact-SQL parser.

Query normalization

During query normalization, each object referenced in the SQL statement is validated. Query normalization verifies the objects referenced in the statement exist, and the datatypes are compatible with values in the statement.

Example

```
select * from t1 where c1 = 10
```

The query normalization stage verifies that table *t1* with a column named *c1* exists in the system catalogs. It also verifies that the datatype of column *c1* is compatible with the value 10. If the column's datatype is *datetime*, for example, this statement is rejected.

Query preprocessing

Query preprocessing prepares the query for optimization. It may change the representation of a statement such that the SQL statement Component Integration Services generates will be syntactically different from the original statement.

Preprocessing performs view expansion, so that a query can operate on tables referenced by the view. It also takes steps such as reordering expressions and transforming subqueries to improve processing efficiency. For example, subquery transformation may convert some subqueries into joins.

Decision point

After preprocessing, a decision is made as to whether Component Integration Services or the standard Adaptive Server query optimizer will handle optimization.

Component Integration Services will handle optimization (using a feature known as quickpass mode) when:

- Every table represented in the SQL statement resides within a single remote server.
- The remote server is capable of processing all the syntax represented by the statement.

  Component Integration Services determines the query processing capabilities of the remote server by its server class. Servers with server class *sql_server*, or *db2*, have implied capabilities. For example, Component Integration Services assumes that any server configured as server class *sql_server* is capable of processing all Transact-SQL syntax.

  For remote servers with server class *access_server* or *direct_connect*, Component Integration Services issues an RPC to ask the remote server for its capabilities the first time a connection is made to the server. Based on the server's response to the RPC, Component Integration Services determines the syntax of the SQL it will forward to the remote server.
- The following is true of the SQL statement:

- It is a **select**, **insert**, **delete**, or **update** statement
- If it is an **insert**, **update**, or **delete** statement, there are no identity or timestamp columns, or referential constraints
- It contains no text or image columns
- It contains no **compute by** clauses
- It contains no **for browse** clauses
- It is not a **select...into** statement
- It is not a cursor-related statement (for example, **fetch**, **declare**, **open**, **close**, **deallocate**, **update** or **delete** statements that include **where current of cursor**)

If the above conditions are not met, quickpass mode cannot be used, and the standard Adaptive Server query optimizer handles optimization.

Component Integration Services plan generation

If quickpass mode can be used, Component Integration Services produces a simplified query plan. When statements contain proxy tables, they are executed more quickly when processed by the remote server than when processed through the Adaptive Server plan generation phase.

Adaptive Server optimization and plan generation

Adaptive Server optimization and plan generation evaluates the optimal path for executing a query and produces a query plan that tells the Adaptive Server how to execute the query.

If the **update statistics** command has been run for the tables in the query, the optimizer has sufficient data on which to base decisions regarding join order. If the **update statistics** command has not been run, the Adaptive Server defaults apply.

For more information on Adaptive Server optimization, refer to Chapter 7, "The Adaptive Server Query Optimizer," in the *Performance and Tuning Guide*.

Component Integration Services remote location optimizer

Adaptive Server generates a query plan containing the optimal join order for a multitable query *without* regard to the storage location of each table. If remote tables are represented in the query, Component Integration Services, which takes the storage location into account, performs additional optimization for the following conditions:

- Join processing
- Aggregate processing

In order to make intelligent evaluations of a query to improve performance in the above areas, statistics are required. These are obtained by executing the command **update statistics** for a specific table.

update statistics

When updating statistics on a remote table, Component Integration Services intercepts the request and provides meaningful statistics for the remote table and all of its indexes (if any). The result of executing an **update statistics** command is a distribution statistics page stored in the database, for each index.

In Adaptive Server, data used to create this distribution page comes from local index pages. When you are updating statistics on a remote table, the data used to create the distribution statistics page comes from the keys used to make up the index on the remote table.

The Adaptive Server issues a query to the remote server to obtain all columns making up the index, sorted according to position within the index. For example, if *table1* has an index made up of two columns, *col1* and *col2*, then the query to that server is sent as follows when **update statistics** is executed:

```
select col1, col2 from table1 order by col1, col2
```

The results are then used to construct a distribution page in the format needed by the optimizer.

The detailed distribution statistics are used to determine optimal join order. This gives the server the ability to generate optimal queries against remote databases that may not support cost-based query optimization.

On large tables, **update statistics** can take a long time. To speed up the process, turn on trace flag 11209 before executing **update statistics**. This trace flag instructs **update statistics** to obtain only row counts on remote tables. The Adaptive Server query optimizer uses the row count information to make assumptions about the selectivity of a particular index. While these assumptions are not as complete as the full distribution statistics, they provide the minimal information needed to handle query optimization.

Join processing

Component Integration Services remote location optimizer isolates join conditions represented in the query plan. For each remote server that is represented by two or more tables in the join, Component Integration Services modifies the query plan to appear as though a single virtual table is being processed for that server. Component Integration Services then forwards the join conditions to the remote server during query execution.

For example, if a query involves four tables, two that are located on the remote server SERVERA and two that are located on the remote server SERVERB, Component Integration Services processes the query as though it were a two-way join. The following query:

```
select * from A1, A2, B1, B2
 where A1.id = A2.id and A2.id = B1.id
 and B1.id = B2 id
```

gets converted to:

```
select * from V1, V2 where V1.id = V2.id
```

V1 is the virtual table representing the results of the join between *A1* and *A2* (processed by SERVERA), and *V2* is the virtual table representing the results of the join between *B1* and *B2* (processed by SERVERB). Since the Adaptive Server uses nested iteration (looping) to process inner tables of a join, the query is processed as follows:

```
open cursor on V1
 fetch V1 row
 for each row in V1
 open a cursor on V2
 fetch V2
 route results V1, V2 to client
 close cursor on V2
```

Aggregate processing

Component Integration Services optimizes queries containing ungrouped aggregate functions (**min**, **max**, **sum,** and **count**) by passing the aggregate to the remote server if the remote server is capable of performing the function.

For example, consider the following query on the remote table *A1*:

```
select count(*) from A1 where id > 100
```

The **count(*)** aggregate is forwarded to the remote server that owns *A1*.

Query execution

The query execution stage receives a query plan, generated either as a result of an adhoc query or a stored procedure, and executes each step of the plan, according to the information stored in the plan. Query plan structures are tagged with information that indicates which access method is to be invoked. If a table is local, then normal Adaptive Server access methods used to process a query are activated as required by the plan execution logic. If the table is remote, then Component Integration Services access methods are invoked to process each table (or virtual table) represented in the query.

Distributed query optimization

The performance of queries involving proxy tables that reference two or more remote servers is critical to the success of the CIS features incorporated into Adaptive Server Enterprise. Several optimization strategies are provided to make distributed query processing as optimal as possible within the constraints of the current Adaptive Server Enterprise query processor.

Optimizer cost model for proxy tables

In previous releases, the Adaptive Server Enterprise optimizer has been modified to incorporate the cost of network access to remote servers. The network cost was pretty much hard-coded into Adaptive Server Enterprise's optimizer as an algorithm that assumes network exchanges will be required to

- open a cursor
- fetch 50 rows
- close a cursor.

An exchange is required for each 50 rows. The cost of an exchange in prior releases was hard-coded at 100 milliseconds. With version 12.5, the cost of a single exchange is under the user's control, and is specified on a per-server basis, defaulting to 1000 milliseconds, by the **sp_serveroption** stored procedure:

```
sp_serveroption <servername>,  "server cost", "nnnn"
```

Where *nnnn* is a string of numeric digits representing the number of milliseconds to be used per exchange during the optimizer's calculation of network cost. The string "server cost" represents a new server option introduced with version 12.5.

Note The server cost limit is 32767. If you exceed that limit, an arithmetic overflow error occurs.

When a new server is added to *sysservers* using the stored procedure **sp_addserver**, the default cost, 1000ms, is stored in *sysattributes* for that server. The use of **sp_serveroption** may be used to specify a greater or lesser cost for a given server. The stored procedure **sp_helpserver** has also been modified to show the current network cost associated with the server.

Sort/Merge joins

In the Adaptive Server Enterprise 12.0, sort/merge joins were enabled as a possible join strategy for joining local tables. However, this strategy is disabled if any table in a query is a proxy table. Joins between proxy tables will not be managed by the sort/merge algorithm.

Semi joins (Reformatting)

Reformatting allows the contents of the inner table of a nested loop join to be transferred to a work table. A clustered index is created on the join column of the work table, and subsequent join operations use this work table rather than the original.

When a proxy table is chosen to be the inner table of a nested loop join, the reformatting strategy can result in significant performance improvements, as the network is only accessed once, rather than for each row obtained by the outer table(s).

Component Integration Services access methods

The Component Integration Services access methods interact with the remote servers that contain objects represented in a query. In Adaptive Server 12.5, all interaction is done through Client-Library.

When an entire statement can be forwarded to the remote server, the statement is taken from the query plan. After any parameters have been substituted into the text of the statement, the entire statement is forwarded to the appropriate remote server.

When the Adaptive Server optimizer and plan generator are involved, the statement or fragment of a statement that is to be executed remotely is constructed from data structures contained within the query plan. The statement or fragment of a statement is then forwarded to the appropriate remote server.

The results from the remote servers are then converted into the necessary internal data types, and processed as if they were derived from local tables.

When an **order by** is processed by the remote server, the results may be different from what Adaptive Server would return for the same query, because the sort order is determined by the remote server, not by Adaptive Server.

Query plan execution

Any command that could affect a table is checked by the server to determine whether the object has a local or remote storage location. If the storage location is remote, then the appropriate access method is invoked when the query plan is executed in order to apply the requested operation to the remote objects. The following commands are affected if they operate on objects that are mapped to a remote storage location:

- **alter table**
- **begin transaction**
- **commit**
- **create index**
- **create table**
- **create existing table**
- **deallocate table**
- **declare cursor**

- **delete**
- **drop table**
- **drop index**
- **execute**
- **fetch**
- **insert**
- **open**
- **prepare transaction**
- **readtext**
- **rollback**
- **select**
- **set**
- **setuser**
- **truncate table**
- **update**
- **update statistics**
- **writetext**

create table command

When the server receives a **create table** command, the command is interpreted as a request for new table creation. The server invokes the access method appropriate for the server class of the table that is to be created. If it is remote, the table is created. If this command is successful, system catalogs are updated, and the object appears to clients as a local table in the database in which it was created.

The **create table** command is reconstructed in a syntax that is appropriate for the server class. For example, if the server class is *db2*, then the command is reconstructed using DB2 syntax before being passed to the remote server. Datatype conversions are made for datatypes that are unique to the Adaptive Server environment.

Some server classes have restrictions on what datatypes can and cannot be supported.

The **create table** command is passed to remote servers as a language request.

create existing table command

When a **create existing table** command is received, it is interpreted as a request to import metadata from the remote or external location of the object for updating system catalogs. Importing this metadata is performed by means of three RPCs sent to the remote server with which the object has been associated:

- **sp_tables** – verifies that the remote object actually exists.
- **sp_columns** – obtains column attributes of the remote object for comparison with those defined in the **create existing table** command.
- **sp_statistics** – obtains index information in order to update the local system table, *sysindexes*.

alter table command

When the server receives the **alter table** command, it passes the command to an appropriate access method if:

- The object on which the command is to operate has been associated with a remote or external storage location.
- The command consists of an **add column** request. Requests to add or drop constraints are not passed to the access methods; instead, they are handled locally.

The **alter table** command is passed to remote servers as a language request.

create index command

When the server receives the **create index** command, it passes the command to an appropriate access method, if the object on which the command is to operate has been associated with a remote or external storage location.

The command is reconstructed using a syntax appropriate for the class and is passed to the remote server for execution.

The **create index** command is passed to remote servers as a language request.

drop table command

When the server receives the **drop table** command for a remote table, a check is made to determine whether the table to be dropped has been created with the **existing** option. If so, references to the object within the system tables are removed, and the operation is complete.

If the table was not created with the **existing** option, the command is passed to an appropriate access method, if the object on which the command is to operate has been associated with a remote or external storage location.

The **drop table** command is reconstructed using a syntax appropriate for the class and is passed to the remote server for execution.

This command is passed to remote servers as a language request.

In all cases, references to the object from within the system catalogs are removed.

drop index command

When the server receives the **drop index** command, it passes the command to an appropriate access method, if the object on which the command is to operate has been associated with a remote or external storage location.

The **drop index** command is reconstructed using a syntax appropriate for the class and is passed to the remote server for execution.

This command is passed to remote servers as a language request.

truncate table command

When the server receives the **truncate table** command, it passes the command to an appropriate access method, if the object on which the command is to operate has been associated with a remote or external storage location.

The command is reconstructed using a syntax appropriate for the class and is passed to the remote server for execution. Since this syntax is unique to the Adaptive Server environment, a server of class *db2* would receive a **delete** command with no qualifying **where** clause:

```
delete from t1
```

The **truncate table** command is passed to remote servers as a language request.

Passthrough mode

Passthrough mode is provided within Component Integration Services as a means of enabling a user to perform native operations on the server to which the user is being "passed through."

For example, requesting passthrough mode for an Oracle server, allows you to send native Oracle SQL statements to the Oracle DBMS. Results are converted into a form that is usable by the Open Client™ application and passed back to the user.

The Transact-SQL® parser and compiler are bypassed in this mode, and each language batch received from the user is passed directly to the server to which the user is connected in passthrough mode. Results from each batch are returned to the client.

There are several ways to use passthrough mode:

- The **connect to** command
- The **sp_autoconnect** stored procedure
- The **sp_passthru** stored procedure
- The **sp_remotesql** stored procedure

The *connect to* command

The **connect to** command enables users to specify the server to which a passthrough connection is required. The syntax of the command is as follows:

```
connect to server_name
```

where *server_name* is the name of a server added to the *sysservers* table, with its server class and network name defined. See **sp_addserver** in the *Adaptive Server Reference Manual*.

When establishing a connection to *server_name* on behalf of the user, the server uses:

- A remote login alias set using **sp_addexternlogin**, or
- The name and password used to communicate with the Adaptive Server.

In either case, if the connection cannot be made to the server specified, the reason is contained in a message returned to the user.

Once a passthrough connection has been made, the Transact-SQL parser and compiler are bypassed when subsequent language text is received. Any statements received by the server are passed directly to the specified remote server.

Note Some database management systems do not recognize more than one statement at a time and produce syntax errors if, for example, multiple **select** statements were received as part of a single language text buffer.

After statements are passed to the requested server, any results are converted into a form that can be recognized by the Open Client interface and sent back to the client program.

To exit from passthrough mode, issue the **disconnect**, or **disc**, command. Subsequent language text from this client is then processed using the Transact-SQL parser and compiler.

Permission to use the **connect to** command must be explicitly granted by the System Administrator. The syntax is:

grant connect to *user_name*

To revoke permission to use the **connect to**, the syntax is:

revoke connect from *user_name*

The **connect to** permissions are stored in the *master* database. To globally grant or revoke permissions to "public", the System Administrator sets the permissions in the *master* database; the effect is server-wide, regardless of what database is being used. The System Administrator can only grant or revoke permissions to or from a user, if the user is a valid user of the *master* database.

The System Administrator can grant or revoke "all" permissions to or from "public" within any database. If the permissions are in the *master* database, "all" includes the **connect to** command. If they are in another database, "all" does not include the **connect to** command.

Example

The System Administrator wants to revoke permission from "public" and wants only the user "fred" to be able to execute the **connect to** command. "fred" must be made a valid user of *master*. To do this, the System Administrator issues the following commands in *master*:

```
revoke connect from public
 sp_adduser fred
 grant connect to fred
```

sp_autoconnect

Some users may always require a passthrough connection to a given server. If this is the case, Component Integration Services can be configured so that it automatically connects these users to a specified remote server in passthrough mode when the users connect to the server. This feature is enabled and disabled by the system procedure **sp_autoconnect** using the following syntax:

sp_autoconnect *server_name*, true|false [,*loginname*]

Before using **sp_autoconnect**, add the *server_name* to *sysservers* by using **sp_addserver**.

A user can request automatic connection to a server using **sp_autoconnect**, but only the System Administrator can enable or disable automatic passthrough connection for another user. Thus, only the System Administrator can specify a third argument to this procedure.

If the second argument is **true**, the **autoconnect** feature is enabled for the current user (or the user specified in the third argument). If the second argument is **false**, the **autoconnect** feature is disabled.

Anytime a user connects to the server, that user's **autoconnect** status in *syslogins* is checked. If enabled, the *server_name*, also found in *syslogins* (placed there by **sp_autoconnect**), is checked for validity. If the server is valid, the user is automatically connected to that server, and a passthrough status is established. Subsequent language statements received by the server from this user are handled exactly as if the user explicitly entered the **connect** command. This user then views the server very much like a passthrough gateway to the remote server.

When an "autoconnected" user executes a **disconnect**, she or he is returned normally to the server.

If the remote server cannot be reached, the user (unless the user is assigned the "sa" role) will not be connected to the local Adaptive Server. A "login failed" error message is returned.

sp_passthru

The **sp_passthru** procedure allows the user to pass a SQL command buffer to a remote server. The syntax of the SQL statement(s) being passed is assumed to be the syntax native to the class of server receiving the buffer; no translation or interpretation is performed. Results from the remote server are optionally placed in output parameters. The syntax for **sp_passthru** follows:

sp_passthru *server, command, errcode, errmsg, rowcount*
[*, arg1, arg2, ... arg*n]

where:

- *server* is the name of the server that is to receive the SQL command buffer; the datatype is varchar(30).
- *command* is the SQL command buffer; the datatype is varchar(255).
- *errcode* is the error code returned by the remote server; the datatype is int output.
- *errmsg* is the error message returned by the remote server; the datatype is varchar(255) output.
- *rowcount* is the number of rows affected by the last command in the command buffer; the datatype is int output.
- *arg1–argn* are optional parameters. If provided, these output parameters will receive the results from the last row returned by the last command in the command buffer. The datatypes may vary. All must be output parameters.

Example

```
sp_passthru ORACLE, "select date from dual", @errcode
output, @errmsg output, @rowcount output, @oradate
output
```

This example returns the date from the Oracle server in the output parameter **@oradate**. If an Oracle error occurs, the error code is placed in **@errcode** and the corresponding message is placed in **@errmsg**. The **@rowcount** parameter is set to 1.

For more information on **sp_passthru** and its return status, refer to the *Adaptive Server Reference Manual*.

sp_remotesql

sp_remotesql allows you to pass native syntax to a remote server. The procedure establishes a connection to a remote server, passes a query buffer, and relays the results back to the client. The syntax for **sp_remotesql** is as follows:

sp_remotesql server_name, *query_buf1*
[, *query_buf2*, ... , *query_buf254*]

where:

- *server_name* is the name of a server that has been defined using **sp_addserver**.

- *server_name* is a varchar(30) field. If *server_name* is not defined or is not available, the connection fails, and the procedure is aborted. This parameter is required.
- *query_buf1* is a query buffer of type char or varchar with a maximum length of 255 bytes. This parameter is required.

Each additional buffer is char or varchar with a maximum length of 255 bytes. If supplied, these optional arguments are concatenated with the contents of *query_buf1* into a single query buffer.

Example

```
sp_remotesql freds_server, "select @@version"
```

In this example, the server passes the query buffer to *freds_server*, which interprets the **select** *@@version* syntax and returns version information to the client. The returned information is not interpreted by the server.

For more information on **sp_remotesql** and its return codes, refer to the *Adaptive Server Reference Manual*.

Quoted identifier support

In version 12.5, quoted identifiers will be forwarded to remote servers that support them. This is triggered by a set command:

set quoted identifier on

If this thread property is enabled, CIS will quote identifiers before sending SQL statements to remote servers.

Remote servers must have the ability to support quoted identifiers. There is a capability in the **sp_capabilities** result set reserved for this purpose:

- Capability id: 135
- Capability name: quoted identifier
- Capability value: 0 = no support; 1 = supported

The capability defaults to 0 for Direct Connects that do not provide a value for this capability. Lack of support for this ability has resulted in CR 140298.

auto identity option

When the Adaptive Server **auto identity** database option is enabled, an IDENTITY column is added to any tables that are created in the database. The column name is *CIS_IDENTITY_COL*, for proxy tables, or *SYB_IDENTITY_COL*, for local tables. In either case, the column can be referenced using the **syb_identity** keyword.

Triggers

Component Integration Services allows triggers on proxy tables; however their usefulness is limited. It is possible to **create** a trigger on a proxy table and the trigger will be invoked just as it would be for a normal Adaptive Server table. However, before and after image data is not written to the log for proxy tables because the **insert**, **update** and **delete** commands are passed to the remote server. The *inserted* or *deleted* tables, which are actually views into the log, contain no data for proxy tables. Users cannot examine the rows being inserted, deleted, or updated, so a trigger with a proxy table has limited value.

RPC handling and Component Integration Services

When Component Integration Services is enabled, you can choose between the site handler or Component Integration Services to handle outbound remote procedure calls (RPCs). Each of these mechanisms is described in the following sections.

Site handler and outbound RPCs

Within an Adaptive Server, outgoing RPCs are transmitted by means of a site handler, which multiplexes multiple requests through a single physical connection to a remote server. The RPC is handled as part of a multistep operation:

1 Establish connection – The Adaptive Server site handler establishes a single physical connection to the remote server. Each RPC requires that a logical connection be established over this physical connection. The logical connection is routed through the site handler of the intended remote server.

   The connection validation process for these connect requests is different than that of normal client connections. First, the remote server must determine if the server from which the connect request originated is configured in its *sysservers* table. If so, then the system table *sysremotelogins* is checked to determine how the connect request should be handled. If trusted mode is configured, password checking is not performed. (For more information about trusted mode, see “Trusted Mode” on page 2-32.)

2 Transmit the RPC – The RPC request is transmitted over the logical connection.

3 Process results – All results from the RPC are relayed from the logical connection to the client.

4 Disconnect – The logical connection is terminated.

Because of the logical connect and disconnect steps, site handler RPCs can be slow.

Component Integration Services and outbound RPCs

If Component Integration Services has been enabled, a client can use one of two methods to request that Component Integration Services handle outbound RPC requests:

- Configure Component Integration Services to handle outbound RPCs as the default for all clients by issuing:

  ```
  sp_configure "cis rpc handling", 1
  ```

  If you use this method to set the **cis rpc handling** configuration parameter, all new client connections inherit this behavior, and outbound RPC requests are handled by Component Integration Services. This is a server property inherited by all future connections. The client can, if necessary, revert back to the default Adaptive Server behavior by issuing the command:

  ```
  set cis_rpc_handling off
  ```

- Configure Component Integration Services to handle outbound RPCs for the current connection only by issuing:

  ```
  set cis_rpc_handling on
  ```

  This command enables **cis rpc handling** for the current thread only, and will not affect the behavior of other threads.

When **cis rpc handling** is enabled, outbound RPC requests are not routed through the Adaptive Server's site handler. Instead, they are routed through Component Integration Services, which uses persistent Client-Library connections to handle the RPC request. Using this mechanism, Component Integration Services handles outbound RPCs as follows:

1 Determines whether the client already has a Client-Library connection to the server in which the RPC is intended. If not, establish one.

2 Sends the RPC to the remote server using Client-Library functions.

3 Relays the results from the remote server back to the client program that issued the RPC using Client-Library functions.

RPCs can be included within a user-defined transaction. In fact, all work performed by Component Integration Services on behalf of its client can be performed within a single connection context. This allows RPCs to be included in a transaction's unit of work, and the work performed by the RPC can be committed or rolled back with the other work performed within the transaction. This transactional RPC capability is supported only when release 10.0 or later Servers or DirectConnect servers are involved.

The side effects of using Component Integration Services to handle outbound RPC requests are as follows:

- Client-Library connections are persistent so that subsequent RPC requests can use the same connection to the remote server. This can result in substantial RPC performance improvements, since the connect and disconnect logic is bypassed for all but the first RPC.
- Work performed by an RPC can be included in a transaction, and is committed or rolled back with the rest of the work performed by the transaction. This transactional RPC behavior is currently supported only when the server receiving the RPC is another Adaptive Server or a DirectConnect which supports transactional RPCs.
- Connect requests appear to a remote server as ordinary client connections. The remote server cannot distinguish the connection from a normal application's connection. This affects the remote server management capabilities of an Adaptive Server, since no verification is performed against *sysremotelogins*, and all connections must have valid Adaptive Server login accounts established prior to the connect request (trusted mode cannot be used in this case). .

Text parameters for RPCs

A new feature has been added to Adaptive Server Enterprise that provides the ability to send large chunks of data in a single remote procedure call. This is done by treating certain parameters as text pointers, then de-referencing these text pointers to obtain the text values associated with them. The text data is then packaged into 32k chunks and handed to Client Library as parameters to the RPC.

A text pointer is identified as a parameter of type binary(16) or varbinary(16). The text value referenced by each text pointer parameter will be obtained when the RPC is executed, and expanded into 32k chunks, each of which is passed to Client Library as a parameter of type CS_LONGCHAR_TYPE.

This behavior is triggered by a new set command:

```
set textptr_parameters ON
```

When an RPC is requested (cis_rpc_handling must be ON), text pointers are de-referenced in the CIS layer, and the text value obtained is used to construct one or more parameters for Client Library.

In order for this to work, the text pointers must be preceded by a pathname argument, which is used to identify the table from which the text pointers have been derived. For example:

```
declare @pathname varchar(90)
declare @textptr1 binary(16)
declare @textptr2 binary(16)
select @pathname = "mydatabase.dbo.t1",
            @textptr1 = textptr(c1),
            @textptr2 = textptr(c2)
      from mydatabase.dbo.t1
      where ... (whatever)
set textptr_parameters ON
exec NETGW...myrpc @pathname, @textptr1, @textptr2
set textptr_parameters OFF
```

When the RPC named 'myrpc' gets sent to server NETGW, the @pathname parameter is not actually sent, but is used to help locate the text values referenced by the textptr's @textptr1 and @textptr2.

The varchar parameter @pathname must immediately precede the binary(16) parameter, otherwise @textptr1 will be considered an ordinary parameter and will be transmitted to the server NETGW as a normal binary(16) value.

If the text values of a text pointer exceed 32k bytes in size, the text will be broken into 32k chunks, each of which will be a separate parameter of type CS_LONGCHAR_TYPE.

The current value of @@textsize will be ignored.

This scheme is also designed to work with proxy tables mapped to remote procedures. For example:

```
create existing table myrpctable
(
      id int,     -- result column
      crdate datetime, -- result column
      name varchar(30), -- result column
      _pathname varchar(90), -- parameter column
      _textptr1 binary(16), -- parameter column
      _textptr2 binary(16), -- parameter column
) external procedure at 'NETGW...myrpc'
go
declare @textptr1 binary(16)
declare @textptr2 binary(16)
select @textptr1 = textptr(c1), @textptr2 = textptr(c2)
from mydatabase.dbo.t1 where <whatever>
set textptr_parameters ON
select id, crdate, name
from myrpctable
where_pathname = "mydatabase.dbo.t1" and
```

```
_textptr1 = @textptr1 and
_textptr2 = @textptr2
```

When the query against the proxy table *myrpctable* is processed, CIS will send an RPC named 'myrpc' to the server 'NETGW'. The parameters will be derived from the search arguments contained in the **where** clause of the query. Since the 'textptr_parameters' option has been set ON, the textptr's will be expanded to CS_LONGCHAR_TYPE, just as in the case of the RPC example shown previously.

Text parameter support for XJS/390

Because of the ability to forward large blocks of text as RPC parameters, it is now possible for CIS to interact with IBM mainframes using XJS/390. XJS/390 scripts (Javascript-like syntax) can be stored within Adaptive Server Enterprise tables (or files accessible via proxy tables), and forwarded to the mainframe using an RPC. The syntax of the script is analyzed and executed by XJS/390 facilities, and result sets are generated according to the procedural logic of the script.

In this way, several new features are enabled:

- It is now possible for database events within Adaptive Server Enterprise to result in the generation of an MQ Series message. Since XJS/390 Mscript supports the generation of messages, an RPC can be sent to the mainframe to request that such a message be generated in response to a triggered event within the database. This can be thought of as SEEB-like functionality, without the use of Replication Server.
- CIS users now have access to VSAM, IMS and MQ Series data without the need to install third party middleware such as InfoHub.

Note that version 2.0 or later of XJS/390 is required for handling scripts as RPC parameters. Please refer to the XJS/390 specification for details.

Transaction management

Transactions provide a way to group Transact-SQL statements so that they are treated as a unit—either all work performed by the statements is committed to the database, or none of it is.

For the most part, transaction management with Component Integration Services is the same as transaction management in Adaptive Server, but there are some differences. They are discussed in the following section.

Two-phase commit

Two-phase commit transaction management is now available for remote data. It is transparent to user-written applications.

This service tracks the state of a transaction in the local CIS-enabled server, as well as in all remote servers participating in transactions. When a user application commits a transaction, the commit is propagated to all participating remote servers using the Adaptive Server Transaction Coordinator (ASTC).

The management of multi-site transactions is handled by the ASTC; CIS registers new participating servers for each transaction, then turns over control of the transaction coordination to ASTC.

Configure *sybsystemdb* for at least 10MB.

Version 12.5 introduces a powerful mechanism for supporting distributed transaction management transparently, using only the services of Adaptive Server Enterprise. This feature is now used to support transparent two-phase commit services between local and remote Adaptive Server Enterprise 12.0 servers, involving both RPC and DML (**select**, **insert**, **delete**, **update**) operations.

In version 12.0, transparent two-phase commit was limited to DTM-enabled Adaptive Server Enterprise's. However, with version 12.5, this limit has been removed and support for DTM-enabled DirectConnects has been provided. A Direct Connect will indicate its ability to handle two-phase commit transactions by means of the capability for Transactions:

Table 2-5: Transaction capabilities

CAP ID	Value	Description
109	0	No support for transactions is provided. CIS sends no transaction control statements or RPCs to remote servers in this case.

CAP ID	Value	Description
109	1	'Best Effort' support is provided. This requires CIS to send begin tran, prepare tran, commit tran, rollback tran commands to the DirectConnect when appropriate, and the DirectConnect will to the best it can to properly handle the commands (and report errors/failures).
109	2	Can participate in two-phase commit operations managed by ASTC, implying support for ASTC's Native RPCs.

DDL is not supported within a distributed transaction. An attempt to do so results in an exception.

Server classes and ASTC

Internally, ASTC views a server as one of three types: DTM-enabled, Pre-DTM, or No-DTM. These types map to the three sets of callbacks used, and map to server classes as indicated in the following table:

Table 2-6: ASTC and CIS server classes

ASTC Server Type	CIS Server Class
DTM-enabled	ASEnterprise (12.x or greater)
Pre-DTM	ASEnterprise (pre-12.x) ASAnywhere sql_server(10.x or greater) sds
No-DTM	ASIQ sql_server (pre-system 10) db2

Transaction processing through an Adaptive Server Enterprise release 12.x server to pre-DTM and No-DTM remote servers should produce the same output as transaction processing through a pre-12.x server to the same remote servers.

Before starting distributed transactions, the local server must be named.

Strict DTM enforcement

To ensure complete two-phase commit capability, ASTC uses the concept of **strict dtm enforcement**. When enabled, **strict dtm enforcement** causes a transaction to abort if an attempt is made to include a pre-DTM or no-DTM server in the transaction.

Enable xact coordination

ASTC uses the configuration option **enable xact coordination**. This option, enabled by default, allows ASTC to manage all transactions involving remote servers. You must enable CIS before **xact coordination** is enabled. While **xact coordination** is enabled, CIS cannot be disabled. When **xact coordination** is enabled, **transactional_rpc**'s are implicitly enabled.

Enable CIS

ASTC relies on CIS to handle all communication with remote servers. Since ASTC is enabled by default (**enable xact coordination**), CIS is also enabled by default.

CIS set commands

The behavior of the **cis rpc handling** configuration property and the **set transactional_rpc** commands has changed with the introduction of ASTC. In earlier releases, enabling **cis rpc handling** caused all RPCs to be routed through CIS Client-Library connection. As a result, whenever **cis rpc handling** was enabled, **transactional_rpc** behavior occurred whether or not it had been specifically set.

With Adaptive Server Enterprise release 12.x, this behavior has changed. If **cis rpc handling** is enabled and **transactional_rpcs** is **off**, RPCs within a transaction are routed through the site handler. RPCs executed outside a transaction are sent via the CIS Client-Library connection. The following table illustrates this change in functionality. As with previous releases, **cis rpc handling** is disabled by default.

Table 2-7: CIS RPC Handling and Transactional RPCs

	12.x	**Pre-12.x**
CIS RPC handling OFF Transactional RPCs OFF	Non-transactional	Non-transactional
CIS RPC handling ON Transactional RPCs OFF	Non-transactional	Transactional
CIS RPC handling ON Transactional RPCs ON	Transactional	Transactional

Attach and detach

ASTC provides the capability to attach and detach from a transaction. This allows a user to detach from a transaction that will later be attached to a TP monitor for completion.

An exception results if you attempt to detach from a transaction that includes pre-DTM and no-DTM servers.

Pre-12.x servers

Component Integration Services makes every effort to manage user transactions for pre-12.x servers reliably. However, the different access methods incorporated into the server allow varying degrees of support for this capability. The general logic described below is employed by server classes *direct_connect (access_server)*, *sql_server* (when the server involved is release 10.0 or later), and *sds* if the Specialty Data Store supports transaction management.

The method for managing transactions involving remote servers uses a two-phase commit protocol. Adaptive Server 11.5 implements a strategy that ensures transaction integrity for most scenarios. However, there is still a chance that a distributed unit of work will be left in an undetermined state. Even though two-phase commit protocol is used, no recovery process is included.

The general logic for managing a user transaction is as follows:

Component Integration Services prefaces work to a remote server with a **begin transaction** notification. When the transaction is ready to be committed, Component Integration Services sends a **prepare transaction** notification to each remote server that has been part of the transaction. The purpose of **prepare transaction** is to "ping" the remote server to determine that the connection is still viable. If a **prepare transaction** request fails, all remote servers are told to roll back the current transaction. If all **prepare transaction** requests are successful, the server sends a **commit transaction** request to each remote server involved with the transaction.

Any command preceded by **begin transaction** can begin a transaction. Other commands are sent to a remote server to be executed as a single, remote unit of work.

Transactional RPCs

The server allows RPCs to be included within the unit of work initiated by the current transaction.

Before using transactional RPCs, issue the **set transactional_rpc on** or **set cis_rpc_handling on** command.

Assuming that the remote server can support the inclusion of RPCs within transactions, the following syntax shows how this capability might be used:

```
begin transaction
 insert into t1 values (1)
 update t2 set c1 = 10
 execute @status = RMTSERVER.pubs2.dbo.myproc
 if @status = 1
      commit transaction
 else
      rollback transaction
```

In this example, the work performed by the procedure *myproc* in server RMTSERVER is included in the unit of work that began with the **begin transaction** command. This example requires that the remote procedure *myproc* return a status of "1" for success. The application controls whether the work is committed or rolled back as a complete unit.

The server that is to receive the RPC must allow RPCs to be included in the same transactional context as Data Manipulation Language (DML) commands (**select**, **insert**, **delete**, **update**). This is true for Adaptive Server and is expected to be true for most DirectConnect products being released by Sybase. However, some database management systems may not support this capability.

Restrictions on transaction management

Restrictions on transaction management are as follows:

- If nested **begin transaction** and **commit transaction** statements are included in a transaction that involves remote servers, only the outermost set of statements is processed. The innermost set, containing the **begin transaction** and **commit transaction** statements, is not transmitted to remote servers.

- The transaction model described in “Pre-12.x servers” on page 75 is not supported in server class *db2*. It is also not supported in server class *sql_server* when the remote server is a pre-release 10.0 SQL Server or a Microsoft SQL Server. In these cases, the transactions are committed after each statement is completed.

Using *update statistics*

The **update statistics** command helps the server make the best decisions about which indexes to use when it processes a query, by providing information about the distribution of the key values in the indexes. **update statistics** is *not* automatically run when you create or re-create an index on a table that already contains data. It can be used when a large amount of data in an indexed column has been added, changed, or deleted. The crucial element in the optimization of your queries is the accuracy of the distribution steps. Therefore, if there are significant changes in the key values in your index, rerun **update statistics** on that index.

Only the table owner or the System Administrator can issue the **update statistics** command.

The syntax is:

update statistics *table_name* [*index_name*]

Try to run **update statistics** at a time when the tables you need to specify are not heavily used. **update statistics** acquires locks on the remote tables and indexes as it reads the data. If trace flag 11209 is used, tables will not be locked.

The server performs a table scan for each index specified in the **update statistics** command.

Since Transact-SQL does not require index names to be unique in a database, you must give the name of the table with which the index is associated.

After running **update statistics**, run **sp_recompile** so that triggers and procedures that use the indexes will use the new distribution:

```
sp_recompile authors
```

Finding index names

You can find the names of indexes by using the **sp_helpindex** system procedure. This procedure takes a table name as a parameter.

To list the indexes for the *authors* table, type:

```
sp_helpindex authors
```

To update the statistics for all of the indexes in the table, type:

```
update statistics authors
```

To update the statistics only for the index on the *au_id* column, type:

```
update statistics authors auidind
```

Java in the database

Java in the Database is supported for remote data access with Component Integration Services.

The following restrictions apply:

- Java is supported for remote Adaptive Server Enterprise 12.x servers only.
- Java is supported for language events only (no dynamic SQL can be used with remote tables.)

Before using Java for remote data access, read the section elsewhere in this book entitled“Java class definitions” on page 83. Then, after installing your Java class files on the local server, install the required Java class files on the remote server.

@@textsize

Data is returned as a serialized Java object using the image datatype format and then deserialized on the local server. **@@textsize** must be set large enough to hold the serialized object. If **@@textsize** is set too small, the object will be truncated, and the deserialization will fail.

@@stringsize

@@stringsize indicates the amount of character data to be returned from a **toString()** method. It is similar in behavior to **@@textsize**, except it applies only the char data returned by the Java **Object.toString()** method. The default will value is 50. The max value is 16384. A value of zero means “use the default.” This value can be modified by a new set command:

```
set stringsize n
```

where *n* is an integer value between 0 and 16384. The new value will immediately show up in the global variable, **@@stringsize**.

Constraints on Java class columns

Constraints defined on Java columns of remote tables must be checked on the remote server. If the constraint checking is attempted on the local server, it will fail. Therefore, you must enable trace flag 11220 when you **insert**, **update** or **delete** data for which constraint checking will be done on Java data types. See "Trace Flags" in Chapter 3.

Error messages

There are two new error messages that are specific to Java use with remote data access:

- Error 11275 – A statement referencing an extended datatype contained syntax that prevented it from being sent to the remote server. Rewrite the statement or remove the extended datatype reference.
- Error 11276 – An object in column '<colname>' could not be deserialized, possibly because the object was truncated. Check that the value of @@textsize is large enough to accommodate the serialized object.

SQLJ in Adaptive Server Enterprise

The SQLJ effort in Adaptive Server Enterprise version 12.5 consists of enhancements to the 12.0 Java Classes in Server project in order to bring the implementation into compliance with the current SQLJ standard proposal. In particular, the SQLJ proposal addresses Part 1 of the SQLJ standard - which specifies conventions for calling static Java methods as stored procedures and user-defined functions (UDF's)

Changes to CIS

The create function statement will allow a new keyword, exportable, that determines whether or not a function can be exported to a remote site. It does not specify that the function must be exported, it specifies only that the function may be exported. The new statement syntax is:

```
create function
    sql_function_name
    sql_function_signature
    sql_properties
    external_java_reference
```

```
sql_function_name ::= [[identifier1.]identifier2.]identifier3
sql_function_signature ::= ( [sql_parameters]) returns sql_datatype
sql_parameters ::= sql_parameter [{, sql_parameter}...]
sql_parameter ::= [parameter_mode] [sql_identifier] sql_datatype
parameter_mode ::= in | out | inout
sql_properties ::=
      [modifies sql data]
      | [dynamic result sets integer]
      | [deterministic | not deterministic ]
      | [returns null on null input | called on null input ]
      | [exportable]
      | language java
      | parameter style java
external_java_reference ::=
      external name 'java_method_name [java_method_signature]'
java_method_name ::= java_class_name.method_identifier
java_class_name ::= [packages.]class_identifier
packages ::= package_identifier[.package_identifier]...
package_identifier ::= java_identifier
class_identifier ::= java_identifier
method_identifier ::= java_identifier
java_method_signature ::= ( [ java_parameters ])
java_parameters ::= java_datatype [{, java_datatype}...
```

When CIS encounters a SQL function, a check for the presence of the **exportable** keyword will be made during CIS's query decomposition phase. If the function is exportable, the statement will be a candidate for *quickpass* mode. If the function is not exportable, it will cause the statement to be thrown out of *quickpass* mode.

In *quickpass* mode, the function name and argument list will be forwarded to a remote server, even if the capability for JAVA UDF indicates that Java functions are not supported. This will allow a CIS administrator to create packages of functions that, for example, emulate behavior of foreign database systems (Oracle, DB2, etc.). In this way, SQLJ functions can be created within CIS that will allow CIS to forward statements in *quickpass* mode even though the function named in the query is not a standard Transact-SQL built-in.

If the statement containing the function cannot be forwarded to the remote server in *quickpass* mode, CIS still provides for the correct execution of the function by retrieving data from remote sites, then invoking the function locally to operate on the recently-fetched remote data.

Java Abstract Datatypes (ADTs)

Java Classes in SQL (JCS) is the method of storing and using Java objects within the Adaptive Server. CIS interaction in this implementation is needed to support Java objects and Java functions on remote servers.

CIS supports JCS on remote Adaptive Server Enterprise version 12.0 or greater.

Objects are passed between the local and remote servers in a serialized format, i.e. a binary representation that is used to re-instantiate the object. CIS treats a serialized object as an image blob, using text and image handling functions to pass objects between servers. The object is re-instantiated on the destination server before processing continues.

When handling queries containing references to Java objects and functions on remote servers, CIS attempts to forward as much syntax as possible to the remote server. Any portion of the query that cannot be passed to the remote server is handled on the local server, requiring the serialization and de-serialization of all necessary remote objects. Due to the overhead associated with serializing and de-serializing the java objects, performance of such queries is significantly less than comparable local access.

To facilitate the interchange of Java objects between servers, CIS issues the command:

```
set raw_object_serialization ON
```

to each ASEnterprise server that is Java-enabled. This allows CIS to easily de-serialize the object obtained from the remote site.

Java class definitions

The Java class definitions on the local and remote servers must be compatible to facilitate passing objects between servers. For this reason, CIS assumes that compatibility exists, and any errors in object definition will be detected during de-serialization efforts. Objects are considered compatible if the serialized form of the object on the remote server can be used to successfully instantiate an object on the local server, or vise versa. Also, any Java method referenced in the local server in conjunction with a remotely mapped object must be defined on the remote object as well.

It is the responsibility of the database administrator to ensure that class definitions on local and remote servers are compatible. Incompatible objects and invalid method references will result in de-serialization errors or Java exceptions that will cancel the requesting query.

To improve overall performance, the **cis packet size** configuration variable should be increased to better facilitate passing serialized objects between servers. Serialized objects are passed between servers with a datatype of image, and can vary in size from a few bytes to 2 gigabytes.

Datatypes

The following section discusses how Component Integration Services deals with various datatype issues.

Unicode support

The Adaptive Server Enterprise version 12.5 contains formal support for the Unicode character set. The new datatypes provided are unichar, and univarchar. They comprise 2-byte characters expressed in Unicode. Adaptive Server Enterprise 12.5 provides conversion functions between Unicode data and all other datatypes, consistent with current handling of char, and varchar datatypes. By supporting these new datatypes in combination with XNL features, CIS is able to present a view of all enterprise character data expressed in Unicode. Character data from mainframes and all other foreign or legacy systems is converted into Unicode when columns of type unichar or univarchar are used to defined columns in proxy tables.

The following CIS features are affected by these new datatypes:

create table

The **create table** statement may contain columns described using the new Unicode datatypes. If the table to be created is a proxy table, CIS forwards the entire command, including the Unicode datatype names (unichar, univarchar) to the remote server where the new table is to be created. If the remote server cannot handle the datatypes, it will be expected to raise an error.

create existing table

When comparing Adaptive Server Enterprise column types and lengths with the metadata obtained from a remote server, Unicode datatypes in the proxy table are allowed under the following circumstances:

- The remote server datatype for a column is either unichar or univarchar with equal length (expressed in characters, not bytes)
- The remote server datatype for a given column is char or varchar. In this case, it will be the responsibility of CIS to perform conversions to Unicode on data fetched from the remote server, and conversions from Unicode to the default Adaptive Server Enterprise character set (UTF8) on data transmitted as part of DML commands (**select**, **insert**, **delete**, **update**).

- The remote server datatype for a Unicode column is binary or varbinary. In this case, the length of the remote server column must be twice the length of the Unicode column. In this case, CIS performs conversions as required when transmitting data to or from the remote server.

No other datatype mapping for Unicode datatypes is allowed when mapping a proxy table to a remote table. Other types result in a type mismatch error. Using this mechanism, it is possible to convert data from legacy systems into Unicode simply by creating a proxy table that maps a Unicode column to an existing char or varchar column.

create proxy_table

By using **create proxy_table**, an Adaptive Server Enterprise user does not have to specify the column list associated with the proxy table. Instead, the column list is derived from column metadata imported from the remote server on which the actual table resides. Unicode columns from the remote server are mapped to Unicode columns in the proxy table only when the remote column is datatype unichar or univarchar.

alter table

The **alter table** command allows column types to be modified. With the Adaptive Server Enterprise version 12.5, a column's type can be modified to and from Unicode datatypes. If the command operates upon a proxy table, the command is reconstructed and forwarded to the remote server that owns the actual table. If the remote server (or DirectConnect) cannot process the command, an error is expected, and the Adaptive Server Enterprise command will be aborted.

If traceflag 11221 is ON, then the **alter table** command does not get forwarded to a remote server; adding, deleting or modifying columns is only done locally on the proxy table.

select, *insert*, *update* and *delete* statements

Unicode datatypes impact the processing of **select** statements in two ways when proxy tables are involved. The first involves the construction of SQL statements and parameters that are passed to remote servers; the second involves the conversion of data to Unicode when CIS fetches non-Unicode data.

A DML command involving a proxy table is handled using either TDS Language requests or TDS Cursor requests when interacting with the remote server. If a **select** statement contains predicates in the **where** clause that involve Unicode columns and constants, it will be necessary to handle the Unicode constants in one of two ways, depending on whether Language or Cursor commands will be used to process the statement:

1 TDS Language: Generate clear-text values that can be included in the language text buffer. This involves converting a constant Unicode value to clear text values that can be transmitted as part of a language request.

2 TDS Cursor: Generate Unicode parameters for Ct-Library cursor requests. Parameter values may be Unicode data, requiring CIS to use parameter types of CS_UNICHAR_TYPE.

CIS handles an **insert** command involving a proxy table using either TDS Language requests or TDS Dynamic requests.

If the **insert** command can be processed in quickpass mode, then TDS Language requests are used. If the command cannot be handled in quickpass mode, then the **insert** will be processed using TDS Dynamic requests.

In the case of language requests, the issues are the same as with **select** - Unicode values have to be converted to clear text form so they can be transmitted with the rest of the SQL statement. In the case of dynamic requests, Unicode data (along with all other data values) will be transmitted as parameters to the dynamic command. The receiving server is expected to process parameters of type CS_UNICHAR_TYPE.

The issues with **update** and **delete** commands are the same as for **select** and **insert**. Unicode values have to be converted either to clear text characters for transmission with the rest of the SQL statement, or they have to be converted into parameters of type CS_UNICHAR_TYPE.

Datatype conversions

Datatype conversion can take place whenever the server receives data from a remote source, be it DB2, Adaptive Server, or an Open Server-based application.

Depending on the remote datatype of each column, data is converted from the native datatype on the remote server to a form that the local server supports.

Datatype conversions are made when the **create table, alter table** and **create existing table** commands are processed. The datatype conversions are dependent on the remote server's server class. See the **create table, alter table** and **create existing table** commands in the following reference pages for tables that illustrate the datatype conversions that take place for each server class when the commands are processed.

text and *image* datatypes

The text datatype is used to store printable character data, the column size of which depends on the logical page size of the Adaptive Server. The image datatype is used to store a number of bytes of hexadecimal-encoded binary data that, again, depends on the logical page size of the Adaptive Server. The maximum length for text and image data is defined by the server class of the remote server to which the column is mapped.

Restrictions on *text* and *image* columns

text and *image* columns cannot be used:

- As parameters to stored procedures except when set textptr_parameters is ON.
- As local variables.
- In **order by**, **compute**, or **group by** clauses.
- In indexes.
- In subqueries.
- In **where** clauses, except with the keyword **like.**
- In joins.

Limits of @@*textsize*

select statements return text and image data up to the limit specified in the global variable @@*textsize*. The **set textsize** command is used to change this limit. The initial value of @@*textsize* is 32K; the maximum value for @@*textsize* is 2147MB.

Odd bytes padded

image values of less than 255 bytes that have an odd number of bytes are padded with a leading zero (an insert of "0xaaabb" becomes "0x0aaabb"). It is an error to **insert** an image value of more than 255 bytes if the value has an odd number of bytes.

Converting *text* and *image* datatypes

You can explicitly convert text values to char or varchar and image values to binary or varbinary with the **convert** function, but you are limited to the maximum length of the character and binary datatypes, which depends on the logical page size of the Adaptive Server. If you do not specify the length, the converted value has a default length of 30 bytes. Implicit conversion is not supported.

Pattern matching with *text* data

Use the **patindex** function to search for the starting position of the first occurrence of a specified pattern in a text, varchar, or char column. The % wildcard character must precede and follow the pattern (except when you are searching for the first or last character).

You can use the **like** keyword to search for a particular pattern. The following example selects each text data value from the *blurb* column of the *texttest* table that contains the pattern “Straight Talk%”:

```
select blurb from texttest
 where blurb like "Straight Talk%"
```

Entering *text* and *image* values

The DB-Library™ functions **dbwritetext** and **dbmoretext** and the Client-Library function **ct_send_data** are the most efficient ways to enter text and image values.

When inserting text or image values using the **insert** command, the length of the data is limited to 450 bytes.

readtext using bytes

If you use the **readtext using bytes** command on a text column, and the combination of size and offset result in the transmission of a partial character, then errors result.

text and *image* with *bulk copy*

When you use **bulk copy** to copy text and image values to a remote server, the server must store the values in data pages before sending them to the remote server. Once the values have been issued to the remote server, the data pages are released. Data pages are allocated and released row by row. Users must be aware of this for the following reasons:

- The overhead of allocating and releasing data pages impacts performance.
- The data pages are allocated in the database where the table resides, so the database must be large enough to accommodate enough data pages for the largest text and image values that exist for any given row.

Error logging

Processing of text and image data (with remote servers only) can be logged by using trace flag 11207.

text and *image* data with server class *sql_server*

- A pointer in a text or image column is assigned when the column is initialized. Before you can enter text or image data into a column, the column must be initialized. This causes a 2K page to be allocated on the remote or Adaptive Server. To initialize text or image columns, use the **update** with a NULL or a non-null **insert** command. See **writetext** for more information.
- Before you use **writetext** to enter text data or **readtext** to read it, the text column must be initialized. Use **update** or **insert** non-null data to initialize the text column, and then use **writetext** and **readtext**.
- Using **update** to replace existing text and image data with NULL, reclaims all of the allocated data pages, except the first page, in the remote server.
- **writetext**, **select into**, DB-Library functions, or Client-Library functions must be used to enter text or image values that are larger than 450 bytes.
- **insert select** cannot be used to insert text or image values.
- **readtext** is the most efficient way to access text and image data.

text and *image* data with server class *direct_connect (access_server)*

- Specific DirectConnect servers support text and image data to varying degrees. Refer to the DirectConnect documentation for information on text and image support.
- The server uses the length defined in the global variable *@@textsize* for the column length. Before issuing **create table**, the client application should set *@@textsize* to the required length by invoking the **set textsize** command.
- For DirectConnect servers that support text and image datatypes but do not support text pointers, the following restrictions apply:
  - The **writetext** command is not supported.
  - The **readtext** command is not supported.
  - Client-Library functions that use text pointers are not supported.
  - DB-Library functions that use text pointers are not supported.
- For DirectConnect servers that support text and image datatypes but do not support text pointers, some additional processing is performed to allow the following functions to be used:
  - **patindex**
  - **char_length**
  - **datalength**

  If text pointers are supported, the server performs these functions by issuing an RPC to the DirectConnect server.
- For DirectConnect servers that do not support text pointers, the server stores data in the *sysattributes* system table. Data pages are preallocated on a per column per row basis. The column size is determined by the *@@textsize* global variable. If this value is not sufficient an error is returned.
- Specific DirectConnect servers may or may not support pattern matching against the text datatype. If a DirectConnect server does not support this pattern matching, the server copies the text value to internal data pages and performs the pattern matching internally. The best performance is seen when pattern matching is performed by the DirectConnect server.
- **writetext**, **select into**, or **insert...select** must be used to enter text or image values that exceed 450 bytes.

- **select into** and **insert...select** can be used to insert text or image values, but the table must have a unique index.

db2 server issues

text and image datatypes for a server of class *db2* are not supported. If you need text and image datatypes, you must use a DirectConnect server.

Fine-grained access control

CIS users can employ the features of FGAC because access rules can be bound to columns on proxy tables.

When queries against proxy tables are processed, the access rule is added to the query tree during query normalization, thus making its existence transparent to downstream query processing. Therefore, CIS users can forward additional predicates to remote servers to restrict the amount of data transferred, according to the expression defined by the access rule.

CIS can function as an FGAC hub to the entire enterprise through the use of access rules bound to columns on proxy tables.

The select into command

An Adaptive Server Enterprise 12.5 server with a 2K page configuration cannot be automatically upgraded to a 4K, 8K or 16K configuration, nor can the dump / load backup facilities provide this upgrade through the Backup Server. Instead, data (and metadata) must be transferred, or migrated, from one server to another. To accomplish this task, use the 'ddlgen' feature of Sybase Central for Adaptive Server Enterprise. Version 12.5 fully supports DDL, and enables the transfer of server schema and configuration data from one server to another. In addition, a migration tool serves as a driver for the data transfer.

Once the metadata has been transferred from one server to another, the migration tool is used to coordinate the data transfer. Do this by creating proxy tables at the source server for each table on the target server, and then execute a **select into** statement to effect the transfer from the source table, which is on local disk, to the target, which is a proxy table referencing the target server.

To facilitate this process, three significant changes to the manner in which the **select into** command is executed have been made:

1 *Parallel data transfer:* If the source table is partitioned, and is local, then the data transfer is achieved through worker threads, one per partition.

2 *Allow bulk transfer to existing tables:* since the remote tables will already be in place, thanks to the migration tool, it is necessary to enable data transfer via **select into** even if the target table already exists. This is done with new syntax: **select <column_list> into existing table <table_name> from ...** The option **existing table** is new, and allows the command to operate on tables that have previously been created. A check is made to ensure that the datatypes of the <column_list> match, in type and length, the data types of the target table.

3 *Enable bulk insert arrays:* when performing a bulk transfer of data from Adaptive Server Enterprise to another Adaptive Server Enterprise, CIS buffers rows internally, and asks the Open Client bulk library to transfer them as a block. The size of the array is controlled by a new configuration parameter **cis bulk insert array size**. The default is 50 rows, and the property is dynamic, allowing it to be changed without server reboot.

To achieve performance levels required, the bulk interface currently in use by CIS has been modified to support bulk insert array binding. This allows CIS to buffer a specified number of rows in local memory, and transfer them all with a single bulk transfer command. An Adaptive Server Enterprise configuration property has been implemented to specify the size of the bulk insert array:

```
sp_configure "cis bulk insert array size", n
```

where *n* is an integer value greater than 0. The default is 50.

select into syntax

In addition to the **existing table** syntax described in the previous section, additional syntax is provided to allow the specification of proxy table attributes when you want to create a proxy table through the **select into** statement. The new syntax is:

```
select <column_list> into <newtablename>
[[external <type>] at "location_string"
[column delimiter "<string>"]]
from <source_table(s)  [where...]
```

Using this syntax, you don't need to use **sp_addobjectdef** to specify the location of a proxy table. All attributes of a proxy table can be specified with this new **select into** syntax.

The new table created will be a proxy table if the clause at *location_string* is provided. The **external <type>** qualifier is used to indicate that the new proxy table is mapped to a remote table, a directory, or a file. The column delimiter is only valid if the new type is *file*., and if used to specify the string used to delimit separate fields within the file. The default is a tab character.

In addition to the above syntax, new syntax is provided to enable the **select into** command when tables already exist:

```
select <column_list> into existing table <newtablename>
    from <source_table(s) [where...]
```

The option **existing table** is new, and allows the command to operate on tables that have previously been created. A check is made to ensure that the datatypes of the *column_list* match, in type and length, the data types of the target table. If the source columns can be NULL, the corresponding column in the target table must also allow NULL. Additional restrictions on the use of **existing table** syntax exist:

- The statement containing the **existing table** option cannot be used in a procedure, trigger or view.
- The target table (the "existing table") must be a proxy table. Using this syntax for local tables is not allowed. (Use **insert select** instead.)

Execute immediate

The **execute immediate** feature is fully supported when using Component Integration Services.

Configuration and tuning

This section is intended for System Administrators. It provides information about configuration, tuning, trace flags, backup and recovery, and security issues.

The System Administrator or database owner may elect to use the server in such a way as to optimize performance or to allow use by a required number of clients. Configuration choices might involve being able to review total numbers of reads and writes for a given SQL command.

Once an application is up and running, the System Administrator should monitor performance and may choose to customize and fine-tune the system. The server provides tools for these purposes. This section explains:

- Changing system parameters with the **sp_configure** procedure
- Using **update statistics** to ensure that Component Integration Services makes the best use of existing indexes
- Monitoring server activity with the **dbcc** command.
- Setting trace flags
- Executing **ddlgen** and related backup and recovery issues
- Determining database size requirements

Using *sp_configure*

The configuration parameters in the **sp_configure** system procedure control resource allocation and performance. The System Administrator can reset these configuration parameters in order to tune performance and redefine storage allocation. In the absence of intervention by the System Administrator, the server supplies default values for all the parameters.

The procedure for resetting configuration parameters is:

- Execute the system procedure **sp_configure,** which updates the values field of the system table *master..sysconfigures.*
- Restart the server if you have reset any of the static configuration parameters. The parameters listed below are dynamic; all others are static:

  cis rpc handling
  cis cursor rows
  cis connect timeout

cis bulk insert batch size
cis bulk insert array size
cis packet size

sysconfigures table

The *master..sysconfigures* system table stores all configuration options. It contains columns identifying the minimum and maximum values possible for each configuration parameter, as well as the configured value and run value for each parameter.

The *status* column in *sysconfigures* cannot be updated by the user. Status 1 means dynamic, indicating that new values for these configuration parameters take effect immediately. The rest of the configuration parameters (those with status 0) take effect only after the **reconfigure** command has been issued and the server restarted.

You can display the configuration parameters currently in use (run values) by executing the system procedure **sp_configure** without giving it any parameters.

Changing the configuration parameters

The stored procedure **sp_configure** displays all the configuration values when it is used without an argument. When used with an option name and a value, the server resets the configuration value of that option in the system tables.

See the *System Administration Guide* for a complete discussion of **sp_configure** with syntax options.

To see the Component Integration Services options enter:

```
sp_configure "Component Integration Services"
```

To change the current value of a configuration parameter, execute **sp_configure** as follows:

```
sp_configure "parameter", value
```

Component Integration Services configuration parameters

The following configuration parameters are unique to Component Integration Services:

- **enable cis**

- **enable file access**
- **enable full-text search**
- **max cis remote connections**
- **cis bulk insert batch size**
- **cis bulk insert array size**
- **cis connect timeout**
- **cis cursor rows**
- **cis packet size**
- **cis rpc handling**

enable cis

Use this parameter with **sp_configure** to enable Component Integration Services as follows:

1 Log into Adaptive Server as the System Administrator and issue the following command:

```
sp_configure "enable cis", 1
```

2 Restart Adaptive Server.

Issuing the command **sp_configure "enable cis", 0** disables Component Integration Services after restarting the server.

enable file access

This configuration parameter enables access through proxy tables to eXternal File System. Requires a license for ASE_XFS.

enable full-text search

This configuration parameter enables Enhances Full-Text Search services. Requires a license for ASE_EFTS.

max cis remote connections

This configuration property is no longer needed, as RDES structs will be allocated as needed from shared memory. The default values are sufficient. With version 12.5, this value will be set to KMAXFD (a platform-dependent value) for each engine.

cis bulk insert batch size

This configuration parameter determines how many rows from the source table(s) are to be bulk copied into the target table as a single batch using **select into**, when the target table resides in an Adaptive Server or in a DirectConnect server that supports a bulk copy interface.

If left at zero (the default), all rows are copied as a single batch. Otherwise, after the count of rows specified by this parameter has been copied to the target table, the server issues a bulk commit to the target server, causing the batch to be committed.

If a normal client-generated bulk copy operation (such as that produced by the **bcp** utility) is received, the client is expected to control the size of the bulk batch, and the server ignores the value of this configuration parameter.

cis bulk insert array size

When performing a bulk transfer of data from Adaptive Server Enterprise to another Adaptive Server Enterprise, CIS buffers rows internally, and asks the Open Client bulk library to transfer them as a block. The size of the array is controlled by a new configuration parameter **cis bulk insert array size**. The default is 50 rows, and the property is dynamic, allowing it to be changed without server reboot.

cis connect timeout

This configuration parameter determines the wait time in seconds for a successful Client-Library connection. By default, no timeout is provided.

cis cursor rows

This configuration parameter allows users to specify the cursor row count for **cursor open** and **cursor fetch** operations. Increasing this value means more rows will be fetched in one operation. This increases speed but requires more memory. The default is 50.

cis packet size

This configuration parameter allows you to specify the size of Tabular Data Stream™ (TDS) packets that are exchanged between the server and a remote server when connection is initiated.

The default packet size on most systems is 512 bytes, which is adequate for most applications. However, larger packet sizes may result in significantly improved query performance, especially when text and image or bulk data is involved.

If a packet size larger than the default is specified, and the requested server is release 10.0 or later, then the target server must be configured to allow variable-length packet sizes. Adaptive Server configuration parameters of interest in this case are:

- **additional netmem**
- **maximum network packet size**

Refer to the *System Administration Guide* for a complete explanation of these configuration parameters.

cis rpc handling

This global configuration parameter determines whether Component Integration Services will handle outbound RPC requests by default. When this is enabled using **sp_configure "cis rpc handling" 1**, all outbound RPCs are handled by Component Integration Services. When you use **sp_configure "cis rpc handling" 0**, the Adaptive Server site handler is used. The thread cannot override it with **set cis_rpc_handling on**. If the global property is disabled, a thread can enable or disable the capability, as required.

For more information on using the Adaptive Server site handler vs. using Component Integration Services to handle outbound RPCs, see “RPC handling and Component Integration Services” on page 67.

Dynamic reconfiguration

Dynamic reconfiguration refers to the ability to re-configure Adaptive Server Enterprise without having to reboot the server in order for the configuration changes to become effective. Prior to version 12.5, there are 5 memory pools used to contain various CIS resources:

- SRVDES - pool size is independent of other configuration values;
- OMNI_DES - pool size dependent upon value of "open objects" - one OMNI_DES is allocated per ’open object’ (DES);
- OMNI_PSS - pool size is dependent upon value of "user connections" - one OMNI_PSS is allocated per user connection (PSS).
- OMNI_CURSOR - pool size is dependent upon value of "user connections" - one OMNI_CURSOR is allocated per SDES; 16 SDES’s are allocated per user connection.
- RDES - pool size is dependent upon value of "user connections" - there are four RDES’s allocated for each user connection.

With versions before 12.5, if insufficient resources were configured to accommodate actual server usage, the configuration had to be changed and rebooted. With the changes to version 12.5, resource pools will be dynamic, allowing expansion as needed.

CIS dbcc commands

The CIS dbcc command **dbcc cis("rusage")** has been replaced by the Adaptive Server Enterprise command: **dbcc mempools**.

Global variables for status

The following global variables have been added for CIS users:

- **@@cis_rpc_handling**
- **@@transactional_rpc**
- **@@textptr_parameters**

- **@@stringsize**

These global variables show the current status of the corresponding configuration parameters. For instance, to see the status of **cis_rpc_handling**, issue the following command:

```
select @@cis_rpc_handling
```

This returns either 0 (off) or 1 (on).

CHAPTER 3

SQL reference

This chapter provides reference material on the server classes supported by Component Integration Services. The topics include:

Each server class has a set of unique characteristics that System Administrators and programmers need to know about in order to configure the server for remote data access. These properties are:

- Types of servers that each server class supports
- Datatype conversions specific to the server class
- Restrictions on Transact-SQL statements that apply to the server class

dbcc commands

All **dbcc** commands used by Component Integration Services are available with a single **dbcc** entry point.

The syntax for **dbcc cis** is:

```
dbcc cis ("subcommand"[, vararg1, vararg2...])
```

If Component Integration Services is not configured or loaded, the command will result in a run-time error.

The use of the **dbcc cis** command is unrestricted.

dbcc options

The following **dbcc** options are unique to Component Integration Services.

remcon

remcon displays a list of all remote connections made by all Component Integration Services clients. It takes no arguments.

rusage

rusage returns a report describing the total memory used by each Component Integration Services resource utilizing shared memory. The report describes total configured items, number of items used, number of items available, and total memory used for each resource. The CIS dbcc command **dbcc cis("rusage")** has been replaced by the Adaptive Server Enterprise command: **dbcc mempools**

srvdes

srvdes returns a formatted list of all in-memory SRVDES structures, if no argument is provided. If an argument is provided, this command syncs the in-memory version of a SRVDES with information found in **sysservers**. The command takes an optional argument as follows:

```
srvdes, [ srvid ]
```

showcaps

showcaps shows a list of all capabilities for *servername* by capability name, ID, and value as follows:

```
showcaps, servername
```

Example:

dbcc cis(“showcaps”, “servername”)

Trace flags

The **dbcc traceon** option allows the System Administrator to turn on trace flags within Component Integration Services. Trace flags enable the logging of certain events when they occur within Component Integration Services. Each trace flag is uniquely identified by a number. Some are global to Component Integration Services while others are *spid*-based and affect only the user who enabled the trace flag. **dbcc traceoff** turns off trace flags.

The syntax is:

dbcc traceon (*traceflag* [, *traceflag*...])

Trace flags and their meanings are shown in Table 3-1:

Table 3-1: Component Integration Services trace flags

Trace Flag	Description
3703	Disables proxy table index creation during create existing table or create proxy_table command execution. If this flag is set on, then no index metadata will be imported from the remote site referenced by the proxy table, and no indexes for the proxy table will be created. This trace flag is global and should be used with care and turned off when no longer necessary. (global)
11201	Logs client connect events, disconnect events, and attention events. (global)
11202	Logs client language, cursor declare, dynamic prepare, and dynamic execute-immediate text. (global)
11203	Logs client rpc events. (global)
11204	Logs all messages routed to client. (global)
11205	Logs all interaction with remote server. (global)
11206	Logs file/directory processing steps
11207	Logs text and image processing. (global)
11208	Prevents the create index and drop table statements from being transmitted to a remote server. *sysindexes* is updated anyway. (*spid*)
11209	Instructs update statistics to obtain just row counts rather than complete distribution statistics, from a remote table. (*spid*)
11210	Disables Component Integration Services enhanced remote query optimization. (*spid*)
11211	Not used.
11212	Prevents escape on underscores ("_") in table names. (*spid*)
11213	Prevents generation of column and table constraints. (*spid*)

Trace Flag	Description
11214	Disables Component Integration Services recovery at start-up. (global)
11215	Sets enhanced remote optimization for servers of class *db2*. (global)
11216	Disables enhanced remote optimization. (*spid*)
11217	Disables enhanced remote optimization. (global)
11220	Disables constraint checking of remote tables on the local server. This avoids duplicate checking. Setting this trace flag ON ensures that a query won't be rejected by the quickpass mode because of constraints. (*spid*)
11221	Disables alter table commands to the remote server when ON. This allows users to modify *type*, *length* and *nullability* of columns in a local table without changing columns in the remote table. Use trace flag 11221 with caution. It may lead to tables which are "out of sync." (*spid*)

Transact-SQL commands

The following pages are reference pages, presented in alphabetical order, which discuss Transact-SQL commands that either directly or indirectly affect external tables, and, as a result, Component Integration Services. For each command, a description of its effect on Component Integration Services, and the manner in which Component Integration Services processes the command, is described. For a complete description of each command, see the *Adaptive Server Reference Manual*.

If Component Integration Services does not pass all of a command's syntax to a remote server (such as all clauses of a **select** statement), the syntax that is passed along is described for each server class.

Each command has several sections that describe it:

Function - contains a brief description of the command.

Syntax - contains a description of the full Transact-SQL syntax of the command.

Comments - contains a general, server class-independent description of handling by Component Integration Services.

Server Class ASEnterprise - contains a description of handling specific to server class *ASEnterprise*. This includes syntax that is forwarded to a remote server of class *ASEnterprise*.

Server Class ASAnywhere - contains a description of handling specific to server class *ASAnywhere*. This includes syntax that is forwarded to a remote server of class *ASAnywhere*.

Server Class ASIQ - contains a description of handling specific to server class *ASIQ*. This includes syntax that is forwarded to a remote server of class *ASIQ*.

Server Class sql_server - contains a description of handling specific to server class *sql_server*. This includes syntax that is forwarded to a remote server of class *sql_server*.

Server Class direct_connect - contains a description of handling specific to server class *direct_connect* (*access_server*). This includes syntax that is forwarded to a remote server of class *direct_connect* (*access_server*). In this release, all comments that apply to server class *direct_connect*, also apply to server class *sds*.

Server Class db2 - contains a description of handling specific to server class *db2*. This includes syntax that is forwarded to a remote server of class *db2*.

alter database

Description

Increases the amount of space allocated to a database. Synchronizes proxy table metadata with tables at remote location.

Syntax

alter database *database_name*
[on {default | *database_device* } [= size]
[, database_device [= size]]...]
[log on { default | *database_device* } [= *size*]
[, *database_device* [= *size*]]...]
[with override]
[for load]
[for proxy_update]]

Usage

Usage

- If a database has been created with the optional clause with **default_location = *pathname***, then the **alter database** command, with the **for proxy_update** clause, will re-synchronize the proxy tables in the named database with tables and views found in the pathname to the remote location.
- The default location may also have been specified with the system stored procedure **sp_defaultloc**. The **for proxy_update** clause of **alter database** works the same way in this case.
- This is a convenient, one-step procedure for keeping the proxy table definition in sync with the definition of actual tables and views in a remote database.
- If **for proxy_update** is specified with no size or device name, then the size is not altered; only proxy table synchronization is performed.
- In some cases, a database may not be large enough to contain all proxy table definitions; therefore, it may be necessary to change the size as well when the **for proxy_update** clause is used.
- When **for proxy_update** is used, the names of remote tables and views are obtained from the server specified in the default location for the database (*master.dbo.sysdatabases.default_loc*) using the RPC named **sp_tables**. For each user table and view, column attributes are then obtained, using the RPC named **sp_columns**. Once all metadata has been obtained for a table (or view), an internal command is executed which is equivalent to **create existing table**, causing the proxy table to be created within the named database.
- If the proxy table already exists, it is automatically dropped before the internal **create existing table** command is executed.

- After the proxy table is created, index metadata is obtained from the remote location so that indexes on the proxy table can also be created. Index metadata is obtained from the remote server using the RPC **sp_statistics**.
- This command behaves the same way for all server classes; interaction with the remote server associated with the database default location is limited to the RPCs **sp_tables**, **sp_columns** and **sp_statistics** (to import index information).

See also

See Also

create database in the *Adaptive Server Reference Manual* and later in this chapter.

alter table

Description

Adds, changes or drops columns; adds, changes, or drops constraints; partitions or unpartitions an existing table; changes the locking scheme for an existing table; specifies ascending or descending index order when **alter table** is used to create referential integrity constraints that are based on indexes; specifies the ratio of filled pages to empty pages, to reduce storage fragmentation.

Syntax

```
alter table [database.[owner].]table_name
 {add column_name datatype
    [default {constant_expression | user | null}]
     {identity | null | not null}
     | [[constraint constraint_name]
       {{unique | primary key}
          [clustered | nonclustered] [asc | desc]
          [with { { fillfactor = pct
                  | max_rows_per_page = num_rows }
                  , reservepagegap = num_pages }]
         [on segment_name]
       | references [[database.]owner.]ref_table
          [(ref_column)]
       | check (search_condition) ] ... }
     [, next_column]...

| add { [constraint constraint_name]
      { {unique | primary key}
          [clustered | nonclustered]
          (column_name [asc | desc]
              [, column_name [asc | desc]...])
        [with { { fillfactor = pct
                | max_rows_per_page = num_rows}
                , reservepagegap = num_pages}]
        [on segment_name]
  | foreign key (column_name [{, column_name}...])
        references [[database.]owner.]ref_table
           [(ref_column [{, ref_column}...])]
    | check (search_condition)}

| drop {[column_name [, column_name]] |
            [constraint constraint_name]}

| modify column_name {[data_type] [null] |
            [not null]] [, column_name]

| replace column_name
    default {constant_expression | user | null}

| partition number_of_partitions

| unpartition
```

| lock {allpages | datarows | datapages } }

| with exp_row_size = num_bytes

Usage

Usage

- Component Integration Services processes the **alter table** command when the table on which it operates has been created as a proxy table. Component Integration Services forwards the request (or part of it) to the server that owns the actual object.
- When Component Integration Services forwards the **alter table** command to a remote server, it is assumed that the column names on the proxy table and on the remote server are the same.
- The only portions of the **alter table** command that are forwarded to a remote server are **add**, **modify, drop column, partition,** and **unpartition**. The rest of the syntax is processed internally, and not forwarded to a remote server. The only exception to this is the **lock** clause, and then only for *ASEnterprise*-class servers.

Server Class *ASEnterprise*

Component Integration Services forwards the following syntax to a server configured as class sql_server:

```
alter table [database.[owner].]table_name
{add column_name datatype [{identity | null}]
       {[, next_column]}...}
| [drop column_name [, column_name]}
| modify column_name [data_type] [NULL] |
   [not null]] [, column_name]}
```

- When a user adds a column with the **alter table** command, Component Integration Services passes the datatype of each column to the remote server without type name conversions.
- For *ASEnterprise* class servers only, the **lock** clause is also forwarded, if contained in the original query, if the version of ASE is 11.9.2 or later.

Server Class *ASAnywhere*

- Handling of the **alter table** command by servers in this class is the same as for *ASEnterprise* servers.

Server Class *ASIQ*

Handling of the **alter table** command by servers in this class is the same as for *ASEnterprise* servers.

- text and image datatypes are not supported by server class *ASIQ*. If text and image datatypes are used, Component Integration Services raises Error 11205:

  Datatype <typename> is unsupported for server <servername>.

Server Class *sql_server*

- Handling of the **alter table** command by servers in this class is the same as for *ASEnterprise* servers.

Server Class *direct_connect*

- Component Integration Services forwards the following syntax to a remote server configured as class *direct_connect*:

```
alter table [database.[owner].]table_name
 add column_name datatype [{identity | null}]
        {[, next_column]}...
```

- Although Component Integration Services requests a capabilities response from a server with class *direct_connect*, support for **alter table** is not optional. Component Integration Services forwards the **alter table** command to the remote server regardless of the capabilities response.
- The behavior of the server with class *direct_connect* is database dependent.*alter table [database .[owner].]table_name {add column_name datatype [{identity | null}] {[, next_column]}...* The Transact-SQL syntax is forwarded, and errors may or may not be raised, depending on the ability of the remote database to handle this syntax.
- If the syntax capability of the remote server indicates Sybase Transact-SQL, Adaptive Server datatypes are sent to the remote server. If the syntax capability indicates DB2 SQL, DB2 datatypes are sent. The mapping for these datatypes is shown in Table 3-2

Table 3-2: DirectConnect datatype conversions for alter table

Adaptive Server Datatype	DirectConnect Default Datatype	DirectConnect DB2 Syntax Mode Datatype
binary(*n*)	binary(*n*)	char(*n*) for bit data
bit	bit	char(1)
char	char	char
datetime	datetime	timestamp
decimal(*p*, *s*)	decimal(*p*, *s*)	decimal(*p*, *s*)
float	float	float

Adaptive Server Datatype	DirectConnect Default Datatype	DirectConnect DB2 Syntax Mode Datatype
image	image	varchar(*n*) for bit data; the value of *n* is determined by the global variable *@@textsize*
int	int	int
money	money	float
numeric(*p*, *s*)	numeric(*p*, *s*)	decimal(*p*, *s*)
nchar(*n*)	nchar(*n*)	graphic(*n*)
nvarchar(*n*)	nvarchar(*n*)	vargraphic(*n*)
real	real	real
smalldatetime	smalldatetime	timestamp
smallint	smallint	smallint
smallmoney	smallmoney	float
timestamp	timestamp	varbinary(8)
tinyint	tinyint	smallint
text	text	varchar(*n*); the value of *n* is determined by the global variable *@@textsize*
unichar	unichar	varchar(*n*) for bit data
univarchar	univarchar	varchar(*n*) for bit data
varbinary(*n*)	varbinary(*n*)	varchar(*n*) for bit data
varchar(*n*)	varchar(*n*)	varchar(*n*)

Server Class *db2* •Component Integration Services forwards the following syntax to a remote server configured as class *db2*:

```
alter table [database.[owner].]table_name
 add column_name datatype [null]
        {[, next_column]}...
```

- text and image datatypes are not supported by server class *db2*. If text and image datatypes are used, Component Integration Services raises Error 11205:

  Datatype <typename> is unsupported for server <servername>

The datatype specification contains DB2 datatypes that are mapped from Adaptive Server datatypes. The datatype conversions are shown in Table 3-3.

Table 3-3: DB2 datatype conversions for alter table

Adaptive Server Datatype	DB2 Datatype
binary(n)	char(n) for bit data, where *n* <= 254
bit	char(1)
char(n)	char(n), where *n* <= 254
datetime	timestamp
decimal*(p, s)*	decimal*(p, s)*
float	float
image	Not supported
int	int
money	float
nchar	char(n)
nvarchar	varchar(n)
numeric*(p, s)*	decimal*(p, s)*
real	real
smalldatetime	timestamp
smallint	smallint
smallmoney	float
tinyint	smallint
text	Not supported
unichar	varchar(n) for bit data
univarchar	varchar(n) for bit data
varbinary(n)	varchar(n) for bit data, where *n* <=254
varchar(n)	varchar(n), where *n* <= 254

See also

See Also

alter table in the *Adaptive Server Reference Manual*.

begin transaction

Description

Marks the starting point of a user-defined transaction.

Syntax

begin tran[saction] [*transaction_name*]

Usage

Usage

- When the Distributed Transaction Manager (DTM) is enabled, DTM handles all transaction processing for servers of server class *ASEnterprise* with a version of 12.0 or later.
- If the Adaptive Server is configured with **strict dtm enforcement = 1**, any attempt to include a remote server in the transaction that has a server class other than *ASEnterprise* will cause the transaction to be aborted.
- For all server classes, when Adaptive Server receives a **begin transaction** command, an internal state is set which marks the beginning of a transaction. At this point, Component Integration Services is not involved, and the command is not immediately forwarded to remote locations.
- *transaction_name* is not used by Component Integration Services in this release.

Sever Class ASEnterprise

- Transaction process for servers in class *ASEnterprise* with a version prior to 12.0 is identical to that of server class *sql_server* (release 10.0 or later).
- When DTM is not enabled, transaction processing for all servers in class *ASEnterprise* is identical to that of server class *sql_server* (release 10.0 or later).
- Component Integration Services checks the transaction state of the connection to a server of class *ASEnterprise*. If the internal transaction state indicates that a transaction is in progress, and the state of the connection to the remote participant indicates that no transaction is in progress, Component Integration Services informs the Distributed Transaction Manager that the server has become a participant in the transaction. The Distributed Transaction Manager then issues a **BeginXact** RPC to the remote server.

Server Class *ASAnywhere*

- Transaction processing for servers in class *ASAnywhere* is identical to that of server class *sql_server* (release 10.0 or later).

Server Class *ASIQ*

- Transaction processing for servers in class *ASIQ* is identical to that of server class *sql_server* (release 10.0 or later).

Server Class *sql_server*

- Component Integration Services checks the transaction state of the connection to a server of class *sql_server*. If the internal transaction state indicates that a transaction is in progress, and the state of the connection to the server indicates that no transaction is in progress, Component Integration Services forwards the **begin transaction** command to the server prior to forwarding the first command to that server. In the example below, assume tables *t1* and *t2* are both located on the same remote SQL Server:

```
begin transaction


insert into t1 values (...)
 update t2 ...


commit transaction
```

  At the time the **begin transaction** command is processed, no interaction with the remote SQL Server occurs.

  When the **insert** command is processed, the transaction state of the connection to the server that owns *t1* is checked. Since this is the first command within the transaction, the connection is in a NO TRANSACTION ACTIVE state, and the **begin transaction** command is forwarded to the server. The **insert** command is then forwarded to the remote location, and the transaction state for the connection is marked as TRANSACTION ACTIVE.

  When processing the **update** command, the transaction state of the server that owns table *t2* is checked. Since it is the same server that owns table *t1*, it is in the TRANSACTION ACTIVE state, and the **begin transaction** command is not forwarded.

Note These comments apply only to release 10.0 or later, which supports cursors. For pre-release 10.0 SQL Server and Microsoft SQL Server, transaction handling is similar to server class *db2*, described below.

Server Class *direct_connect*

- Transaction processing for servers in class *direct_connect* is identical to that of server class *sql_server* (release 10.0 or later).

Server Class *db2*

- Transactions are supported only at the statement level for servers in class *db2*. When the internal state of a client connection indicates that there is an active transaction, Component Integration Services precedes each statement forwarded to the server with a **begin transaction** command. Component Integration Services then issues a **commit** or **rollback transaction** (depending on the success or failure of the statement) immediately after the statement is complete.

See also

See Also

begin transaction in the *Adaptive Server Reference Manual*.

case

Description

Supports conditional SQL expressions; can be used anywhere a value expression can be used.

Syntax

```
case
        when search_condition then expression
        [when search_condition then expression]...
        [else expression]
end
```

Usage

Usage

- **case** expression simplifies standard SQL expressions by allowing you to express a search condition using a **when...then** construct instead of an if statement.
- **case** expressions can be used anywhere an expression can be used in SQL.
- If your query produces a variety of datatypes, the datatype of a **case** expression result is determined by datatype hierarchy. If you specify two datatypes that Adaptive Server cannot implicitly convert (for example, char and int), the query fails.

Server Class *ASEnterprise*

The capability for handling **case** expressions is set for ASE 11.5 and all later versions. The presence of a case expression in the original query syntax will not cause the query optimizer to reject quickpass mode.

Server Class *ASAnywhere*

The capability for handling **case** expressions is set for ASA 6.0, ASIQ 12.0, and all later versions. The presence of a **case** expression in the original query syntax will not cause the query optimizer to reject quickpass mode.

Server Class *ASIQ* •The capability for handling **case** expressions is not set for servers in this class. When a SQL statement containing a **case** expression is optimized, the presence of the **case** expression will cause CIS quickpass optimization to reject the statement. When this happens, the **case** expression must be evaluated by the local ASE after retrieving data from the remote server.

Server Class *sql_server*

- The capability for handling **case** expressions is not set for servers in this class. When a SQL statement containing a **case** expression is optimized, the presence of the **case** expression will cause CIS quickpass optimization to reject the statement. When this happens, the **case** expression must be evaluated by the local ASE after retrieving data from the remote server.

Server Class *direct_connect*

The capability for handling **case** expressions is determined by the result set from the RPC **sp_capabilities**. If the *direct_connect* indicates that it can handle case expressions, then CIS will forward them to the *direct_connect* when quickpass mode is used to handle the query.

Server Class *db2*

The capability for handling case expressions is, by default, not set for servers in this class. When a SQL statement containing a **case** expression is optimized, the presence of the **case** expression will cause CIS quickpass optimization to reject the statement. When this happens, the **case** expression must be evaluated by the local ASE after retrieving data from the remote server.

- If traceflag 11215 is turned **on**, the default capabilities for server class *db2* are modified to enable more capabilities, and case expressions are enabled by default. Note that DB2 does recognize case expression syntax. Also, the traceflag must be turned on before CIS makes its first connection to the remote server, or else the capabilities set by the first connection will remain in effect until the server is rebooted.

close

Description

Deactivates a cursor.

Syntax

close *cursor_name*

Usage

Usage

- If the cursor specified by *cursor_name* contains references to proxy tables, Adaptive Server notifies Component Integration Services to close and deallocate its remote cursors for those tables.
- Component Integration Services uses Client-Library to manage cursor operations to a remote server. When Component Integration Services receives a **close** command, it uses the following Client-Library functions to interact with the remote server:

  ```
  ct_cursor(command, CS_CURSOR_CLOSE, NULL,
   CS_UNUSED, NULL, CS_UNUSED, CS_UNUSED)
  ```

  ```
  ct_cursor(command, CS_CURSOR_DEALLOC, NULL,
   CS_UNUSED, NULL, CS_UNUSED, CS_UNUSED)
  ```

- If the cursor contains references to more than one proxy table, Component Integration Services must close a remote cursor for each server represented by the proxy tables.

See also

See Also

deallocate cursor, **declare cursor**, **fetch**, **open** in this chapter.

close in the *Adaptive Server Reference Manual*.

commit transaction

Description

Marks the successful ending point of a user-defined transaction.

Syntax

commit [tran[saction] | work] [*transaction_name*]

Usage

Usage

- When Adaptive Server receives the **commit transaction** command, it notifies Component Integration Services, and Component Integration Services attempts to commit work associated with remote servers involved in the current transaction.
- For all other server classes, when Adaptive Server receives the **commit transaction** command, it notifies Component Integration Services, and Component Integration Services attempts to commit work associated with remote servers involved in the current transaction.
- Multiple remote servers can be involved in a single transaction, each with their own unit of work which is associated with the Adaptive Server unit of work.
- Remote work is committed before local work. If the remote servers do not respond, or respond with errors, the transaction is aborted, including any local work.
- Work performed by transactional RPC's must be part of an explicit transaction.
- *transaction_name* is not used by Component Integration Services in this release.

Server Class ASEnterprise

- Transaction process for servers in class *ASEnterprise* with a version prior to 12.0 is identical to that of server class *sql_server* (release 10.0 or later)
  - When DTM is not enabled, transaction processing for all servers in class *ASEnterprise* is identical to that of server class *sql_server* (release 10.0 or later).
  - In all other cases, when the Adaptive Server receives notification to commit a transaction, the Distributed Transaction Manager issues a **CommitXact** RPC to all remote participants having a server class of *ASEnterprise*.

Server Class *ASAnywhere*

- Transaction processing for servers in class *ASAnywhere* is identical to that of server class *sql_server* (release 10.0 or later).

Server Class *ASIQ*

- Transaction processing for servers in class *ASIQ* is identical to that of server class *sql_server* (release 10.0 or later).

Server Class *sql_server*

- When Component Integration Services receives notification to commit a transaction, it checks the TRANSACTION ACTIVE state of all remote participants associated with the client application. If there is more than one remote server involved in a transaction, Component Integration Services first sends a **prepare transaction** command to each connection with an active transaction. If all remote servers respond with no error, Component Integration Services sends a **commit transaction** command to each server involved in the transaction. If all remote servers again respond with no error, Component Integration Services notifies the Adaptive Server that it can commit local work.

  This process applies to release 10.0 or later. Transaction handling is the same as server class *db2*, described below, if the server represented by server class *sql_server* is:

  - Pre-release 10.0 SQL Server
  - Microsoft SQL Server (any version)
  - Sybase IQ

Server Class *direct_connect*

- Transaction processing for servers in class *direct_connect* is identical to that of server class *sql_server* (release 10.0 or later).

Server Class *db2*

- Transactions are supported only at the statement level for servers in class *db2*. When the internal state of a client connection indicates that there is an active transaction, a **begin transaction** command precedes all **insert**, **update** and **delete** commands. Component Integration Services issues a **commit** or **rollback transaction** (depending on the success or failure of the statement) immediately after the statement is complete.

See also

See Also

commit in the *Adaptive Server Reference Manual*.

connect to...disconnect

Description

Connects to the specified server to establish a passthrough-mode connection; takes the connection out of passthrough mode.

Syntax

```
connect to server_name
disconnect
```

Usage

Usage

- connect to specifies the server to which a passthrough connection is required. Passthrough mode enables you to perform native operations on a remote server.
- *server_name* must be the name of a server in the sysservers table, with its server class and network name defined.
- When establishing a connection to *server_name* on behalf of the user, Component Integration Services uses one of the following identifiers:

  - A remote login alias described in *sysattributes*, if present

  - The user's name and password

  In either case, if the connection cannot be made to the specified server, Adaptive Server returns an error message.
- For more information about adding remote servers, see **sp_addserver**.
- After making a passthrough connection, Component Integration Services bypasses the Transact-SQL parser and compiler when subsequent language text is received. It passes statements directly to the specified server, and converts the results into a form that can be recognized by the Open Client interface and returned to the client program.
- To take the connection created by the **connect to** command out of passthrough mode, use the **disconnect** command. You can use this command only after the connection has been made using connect to.
- **disconnect** does not actually cause the termination of the connection to the remote server; instead, it simply takes the connection out of passthrough mode, leaving the connection available for subsequent DDL or DML statements that are processed normally by the ASE query processor.
- The **disconnect** command can be abbreviated to **disc**.
- The **disconnect** command returns an error unless **connect to** has been previously issued and the server is connected to a remote server.

Server Class ASEnterprise

- When the **disconnect** command is issued, CIS will forward the **disconnect** command to the remote server, to take it out of passthrough mode. If not in passthrough mode, syntax errors may occur, but they are ignored by CIS and not forwarded to the client.

Server Class *ASAnywhere*

- No interaction occurs with *ASAnywhere* when the **connect** or **disconnect** commands are issued.

Server Class *ASIQ*

- No interaction occurs with *ASIQ* when the **connect** or **disconnect** commands are issued.

Server Class *sql_server*

No interaction occurs with *sql_server* when the **connect** or **disconnect** commands are issued.

Server Class direct_connect

When the **connect** command is issued using a server in class *direct_connect*, the direct_connect is sent an RPC:

```
sp_thread_props “passthru mode”, 1
```

- When the **disconnect** command is issued, and the server for which a passthrough-mode connection has been established is a direct_connect, the direct_connect is sent an RPC:

  ```
  sp_thread_props “passthru mode”, 0
  ```

Server Class *db2*

- No interaction occurs with *db2* when the **connect** or **disconnect** commands are issued.

See also

See Also

commit in the *Adaptive Server Reference Manual*.

create database

Description

Creates a new database

Syntax

```
create database database_name
[on {default | database_device} [= size]
    [, database_device [= size]]...]
[log on database_device [= size]
    [, database_device [= size]]...]
[with override]
[with default_location = “pathname”]
[for proxy_update]
[for load]
```

Usage

Usage

- This command creates a new database within Adapter Server Enterprise. The new syntax with **default_location = *pathname*** and **for proxy_update** have been added to allow automatic creation of proxy tables representing tables and views found in a remote location.
- If the clause with **default_location = *pathname*** is used, the *pathname* is stored in *master.dbo.sysdatabases.default_loc*, and serves the same purpose as the default location added via the system stored procedure **sp_defaultloc**
- If the clause for **proxy_update** is used, the **with default_location = *pathname*** clause must also be used. This clause indicates that the database is to be a proxy database, and all tables created in it will become proxy tables, referencing objects contained at the default location.
- When a database is created as a proxy database, and no device or size specification is included in the syntax, the default size will be calculated based on the number of proxy tables that it will be expected to contain. The formula for calculating the number of 2k, 4k, 8k, and 16k pages for the database is as follows:

  ```
  pages = #rmt_tbls * 32/* 4 extents per table */
  overhead = (pages * 1.1) /* add 10% */
  if overhead < 500 pages
        then overhead = 500 pages
  total_pages = pages + overhead
  add pages in model db
  ```

- The new database is placed on the default device, if no device name is specified.

- After the database is created, but before the command is complete, the presence of the **for proxy_update** clause will instruct CIS to create a proxy table in the new database for each remote table or view. When the **create database** command is finished, the newly created database will be populated with proxy tables representing all user tables and views found at the remote location.

See also

See Also

alter database in the *Adaptive Server Reference Manual*.

create existing table

Description

Creates a new proxy table representing an existing object in a remote server.

Syntax

```
create existing table [database.[owner].]table_name (column_name datatype
   [default {constant_expression | user | null}]
    {[{identity | null | not null}]
    | [[constraint constraint_name]
       {{unique | primary key}
        [clustered | nonclustered]
        [with {fillfactor |max_rows_per_page}= x]
       [on segment_name]
       | references [[database.]owner.]ref_table
          [(ref_column)]
       | check (search_condition)}]}...

| [constraint constraint_name]
    {{unique | primary key}
       [clustered | nonclustered]
       (column_name [{, column_name}...])
        [with {fillfactor |max_rows_per_page}= x]
        [on segment_name]
    | foreign key (column_name [{, column_name}...])
       references [[database.]owner.]ref_table
          [(ref_column [{, ref_column}...])]
     | check (search_condition)}

[{, {next_column | next_constraint}}...])

 [with max_rows_per_page = x] [on segment_name]
[external {table | procedure}]
[at “pathname”]
```

Usage

Usage

- Adaptive Server processes the **create existing table** command as if the table being created is a new local table.
- After creating the local table, Adaptive Server passes the **create existing table** command to Component Integration Services, with the external location for the existing remote object.

  Component Integration Services verifies that the table exists by issuing the **sp_tables** RPC to the remote server that owns the existing object.
- Component Integration Services verifies the column list by sending the **sp_columns** RPC to the remote server. Column names, datatypes, lengths, identity property, and null properties are checked for the following:

  - Datatypes in the **create existing table** command must match or be convertible to the datatypes of the column on the remote location. For example, a local column datatype might be defined as money, while the remote column datatype might be numeric. This is a legal conversion, therefore, no errors are reported.
  - Each column's null property is checked. If the local column's null property is not identical to the remote column's null property, a warning message is issued, but the command is not aborted.
  - Each column's length is checked. If the length of char, varchar, binary, varbinary, decimal and numeric columns do not match, a warning message is issued, but the command is not aborted.

- The column names used in the syntax must match with those found at the remote location.
- The proxy table need not contain the exact number of columns as found in the remote table. However, all columns referenced in by the proxy table must be found in the remote table. If the count of columns in the proxy table is less than the actual number of columns in the remote server, then a warning is issued, but the command is not aborted.
- The remote column name is stored in *syscolumns.remote_name* and is used during query processing when a statement is forwarded to the remote server. This name is not affected by **sp_rename**, so after the proxy table is created, if any column name is changed, it won't affect processing of subsequent SQL commands.
- Column datatypes do not need to be identical, but they must be convertible in both directions, or a column datatype mismatch error is raised, and the command is aborted.
- The column length defined for columns of type char, varchar, binary, and varbinary must match the length of the corresponding columns in the remote table.
- Scale and precision of columns of type numeric or decimal must match the scale and precision of the corresponding columns in the remote table.
- If the null property is not identical to the remote column's null property, a warning message is issued, but the command is not aborted.

Server Class *ASEnterprise*

- Table 3-4 describes the allowable datatypes that can be used when mapping remote Adaptive Server columns to local proxy table columns:

Table 3-4: Adaptive Server datatype conversions for create existing table

Remote Adaptive Server Datatype	Allowable Adaptive Server Datatypes
binary(*n*)	image, binary(*n*), and varbinary(*n*); if not image, the length must match
bit	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
char(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*), varchar(*n*), unichar, univarchar; if not text, the length must match
datetime	datetime and smalldatetime
decimal(*p*, *s*)	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
float	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
image	image
int	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
money	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
nchar(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*), varchar(*n*); if not text, the length must match
numeric(*p*, *s*)	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
nvarchar(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*), varchar(*n*), unichar, univarchar; if not text, the length must match
real	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
smalldatetime	datetime and smalldatetime
smallint	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
smallmoney	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
text	text
timestamp	timestamp
tinyint	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
unichar	char, varchar, unichar, univarchar, text, datetime, and smalldatetime

Remote Adaptive Server Datatype	Allowable Adaptive Server Datatypes
univarchar	char, varchar, unichar, univarchar, text, datetime, and smalldatetime
varbinary(*n*)	image, binary(*n*), and varbinary(*n*); if not image, the length must match
varchar(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*), varchar(*n*) unichar, univarchar; if not text, the length must match

Server Class *ASAnywhere*

- Table 3-5 describes the allowable datatypes that can be used when mapping remote Adaptive Server columns to local proxy table columns:

Table 3-5: Adaptive Server Anywhere datatype conversions for create existing table

Remote Adaptive Server Datatype	Allowable Adaptive Server Datatypes
binary(*n*)	image, binary(*n*), and varbinary(*n*); if not image, the length must match
bit	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
char(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*), varchar(*n*), unichar, univarchar; if not text, the length must match
datetime	datetime and smalldatetime
decimal(*p*, *s*)	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
float	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
image	image
int	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
money	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
nchar(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*), varchar(*n*), unichar, univarchar; if not text, the length must match
numeric(*p*, *s*)	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint

Remote Adaptive Server Datatype	Allowable Adaptive Server Datatypes
nvarchar(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*), varchar(*n*), unichar, univarchar; if not text, the length must match
real	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
smalldatetime	datetime and smalldatetime
smallint	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
smallmoney	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
text	text
timestamp	timestamp
tinyint	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
varbinary(*n*)	image, binary(*n*), and varbinary(*n*), unichar, univarchar; if not image, the length must match
varchar(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*), varchar(*n*), unichar, univarchar; if not text, the length must match

Server Class *ASIQ*

- text and image datatypes are not supported by ASIQ.
- Other than text and image datatypes, behavior is the same as for server class *ASAnywhere.*

Server Class *sql_server*

- Allowable datatype conversions are the same as for server class ASEnterprise.

Server Class *direct_connect*

- The RPC **sp_columns** queries the datatypes of the columns in the existing table.
- Local column datatypes do not need to be identical to remote column datatypes, but they must be convertible as shown in Table 3-6. If not, a column type error is raised, and the command is aborted.

Table 3-6: DirectConnect datatype conversions for create existing table

DirectConnect Datatype	Allowable Adaptive Server Datatypes
binary(*n*)	image, binary(*n*), varbinary(*n*); if the length does not match, the command is aborted
binary(16)	timestamp
bit	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
char(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*) and varchar(*n*), unichar, univarchar; if the length does not match, the command is aborted
datetime	datetime, smalldatetime
decimal(*p*, *s*)	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
float	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
image	image
int	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
money	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
nchar(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*) and varchar(*n*), unichar, univarchar; if the length does not match, the command is aborted
numeric(p, s)	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
nvarchar(*n*)	text, nchar(*n*), nvarchar(*n*), char(*n*) and varchar(*n*), unichar, univarchar; if the length does not match, the command is aborted
real	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
smalldatetime	datetime, smalldatetime
smallint	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
smallmoney	bit, decimal, float, int, money, numeric, real, smallint, smallmoney, and tinyint
text	text
timestamp	timestamp, binary(8), varbinary(8)
unichar	text, nchar(*n*), nvarchar(*n*), char(*n*), varchar(*n*), unichar, univarchar; if not text, the length must match

DirectConnect Datatype	Allowable Adaptive Server Datatypes
univarchar	text, nchar(*n*), nvarchar(*n*), char(*n*), varchar(*n*), unichar, univarchar; if not text, the length must match

- Datatype information is passed in the CS_DATAFMT structure associated with the parameter. The following fields of the structure contain datatype information:
  - *datatype* – the CS_Library datatype representing the Adaptive Server datatype. For example, CS_INT_TYPE.
  - *usertype* – the native DBMS datatype. **sp_columns** passes this datatype back to Component Integration Services during a **create existing table** command as part of its result set (see **sp_columns** in the *Adaptive Server Reference Manual*). Adaptive Server returns this datatype in the *usertype* field of parameters to assist the DirectConnect in datatype conversions.

Server Class *db2*

- Column names are checked in a case-insensitive manner. If there is no match, a column name error is raised, and the command is aborted.

  Note The Adaptive Server table can contain fewer columns than the remote table, but each column in the Adaptive Server table must have a matching column in the remote table.

- text and image datatypes are not supported by server class *db2*.
- When a **create existing table** command is processed, the datatype for each column specifies the type of conversion to perform between the DB2 and Adaptive Server datatypes during query processing. Table 3-7 describes the allowable Adaptive Server datatypes that can be used for existing DB2 datatypes:

Table 3-7: DB2 datatype conversions for create existing table

DB2 Datatype	Allowable Adaptive Server Datatypes
int	int
smallint	int, smallint, and tinyint; if length does not match, a warning message is issued
tinyint	int, smallint, and tinyint; if length does not match, a warning message is issued
float	real, float, and money

DB2 Datatype	Allowable Adaptive Server Datatypes
double precision	real, float, and money
real	real, float, and money
decimal(scale > 0)	float, money, decimal, and numeric; for decimal and numeric, scale and precision must match
decimal (scale = 0)	float, money, decimal, and numeric; for decimal and numeric, scale and precision must match
numeric (scale > 0)	float, money, decimal, and numeric; for decimal and numeric, scale and precision must match
numeric (scale = 0)	float, money, decimal, and numeric; for decimal and numeric, scale and precision must match
char	char, varchar, bit, binary, varbinary, text and image, unichar, univarchar; if not text or image, length must match
char(*n*) for bit data	binary(*n)*, varbinary(*n)*, unichar, univarchar, and image; if not image, length must match
varchar	char, varchar, bit, binary, varbinary,unichar, univarchar, text and image; if not text or image, length must match
varchar(*n*) for bit data	binary(*n)*, varbinary(*n)*,unichar, univarchar, and image; if not image, length must match
long varchar (length of maximum column size depends on the logical page size of the Adaptive Server)	char, varchar, bit, binary, varbinary, unichar, univarchar, text and image; if not text or image, length must match
date	char(10), varchar(10), and datetime (time set to 12:00AM)
time	char(8), varchar(8), and datetime (date set to 1/1/1900)
timestamp	char(26), varchar(26), datetime, and smalldatetime
graphic	Not supported
vargraphic	Not supported
long vargraphic	Not supported

- If the data contained in a long varchar column exceeds the length allowed by the logical page size of the Adapted Server, it is truncated, or, if the gateway is so configured, an error is returned.
- DB2 table names are limited to 18 characters.
- DB2 authorization IDs (owner names) are limited to 8 characters.

- The maximum string length for columns returned by DB2 is 254 characters for char and varchar datatypes. For long varchar, the length is 32,704 bytes.
- DB2 can return date values that are not within the range of the Adaptive Server datetime datatype. DB2's range is 0001-01-01 to 9999-12-31. The Adaptive Server's range is 1753-01-01 to 9999-12-31. When a date earlier than 1753-01-01 is retrieved from DB2, it is converted to 1753-01-01.
- Check DB2 documentation for the maximum number of columns per DB2 table. This varies with the DB2 version.

See also

See Also

create existing table in the *Adaptive Server Reference Manual*.

create index

Description

Creates an index on one or more columns in a table.

Syntax

```
create [unique] [clustered | nonclustered]
    index index_name
 on [[database.]owner.]table_name (column_name
   [, column_name]...)
 [with {{fillfactor | max_rows_per_page} = x,
    ignore_dup_key, sorted_data,
    [ignore_dup_row | allow_dup_row]}]
 [on segment_name]
```

Usage

Usage

- Component Integration Services processes the **create index** command when the table involved has been created as a proxy table. The actual table resides on a remote server, and Component Integration Services forwards the request to the remote server after Adaptive Server catalogs are updated to represent the new index.
- Trace flag 11208 changes the behavior of the **create index** command. If trace flag 11208 is turned on, Component Integration Services does not send the **create index** command to the remote server. Instead, Adaptive Server processes the command locally, as if the table on which it operates is local. This is useful for creating an index on a proxy table that maps to a remote view.
- Adaptive Server performs all system catalog updates in order to identify the index. However, just as there are no data pages in the server for proxy tables, there are no index pages.
- When Component Integration Services forwards the **create index** command to a remote server, the table name used is the remote table name, and the column names used are the remote column names. These names may not be the same as the local proxy table names.

Server Class *ASEnterprise*

- Component Integration Services forwards everything except the **on** *segment_name* clause to the remote server.

Server Class *ASAnywhere*

- Component Integration Services forwards everything except the **on** *segment_name* clause to the remote server.

Server Class *ASIQ*

- Component Integration Services forwards everything except the **on** *segment_name* clause to the remote server.

Server Class *sql_server*

- For pre-release 10.0 SQL Server or Microsoft SQL Server 6.5, neither the **max_rows_per_page** or **on** *segment_name* clause is forwarded to the remote server.

Server Class *direct_connect*

- When the language capability is set to "Transact-SQL", Component Integration Services forwards all syntax except the **max_rows_per_page** and **on** *segment_name* clauses to the remote server.
- When the language capability is set to "DB2", the behavior is the same as for server class *db2*.
- The DirectConnect must either translate the Sybase extensions to equivalent native syntax or ignore them.

Server Class *db2*

- Component Integration Services does not forward the following clauses to the remote server:
  - **on segment_name**
  - **max_rows_per_page**
  - **ignore_dup_key**
  - **ignore_dup_row**
  - **allow_dup_row**
- Component Integration Services converts the **fillfactor** option to **pctfree** and then forwards it to the remote server.

See also

See Also

create index in the *Adaptive Server Reference Manual*.

create proxy_table

Description

Creates a proxy table without specifying a column list. Component Integration Services derives the column list from the metadata it obtains from the remote table.

Syntax

create proxy_table *table_name*
[external *type*] at *pathname*

Usage

Usage

- **create proxy_table** is a variant of the **create existing table** command. You use **create proxy_table** to create a proxy table, but (unlike **create existing table**) you do not specify a column list. CIS derives the column list from the metadata it obtains from the remote table.
- The location information provided by the **at** keyword specifies the pathname to the remote object.
- If the remote server object does not exist, the command is rejected with an error message.
- If the remote object exists, column metadata is obtained from the remote server, and an internal **create existing table** command is processed.
- If the remote server is case insensitive (as is the case with DB2, Oracle, perhaps others), then the case of the generated table and column names is determined by the case of the table_name used with the create proxy_table statement:
  - if *table_name* is lower case, the generated proxy table name is also lower case, as are all of its columns
  - if *table_name* is uppercase, the generated proxy table name is also upper case, as are all of its columns
- The **external type** can be of three types
  - **external table** specifies that the object is a remote table or view. **external table** is the default, so this clause is optional.
  - **external directory** specifies that the object is a directory with a path in the following format: "*/tmp/directory_name* [;R]". The option "R" indicates recursive
  - **external file** specifies that the object is a file with a path in the following format: "*/tmp/filename*"

See also

See Also

create table and **create existing table** in the *Adaptive Server Reference Manual*.

create table

Description

Creates new tables and optional integrity constraints; specifies a locking scheme for the table being created; specifies ascending or descending index order when creating referential integrity constraints that depend on indexes; specifies the expected row size, to reduce row forwarding; specifies a ratio of empty pages to be left for each filled page; allows you to map the table to a table, view, or procedure at a remote location.

Syntax

```
create table [database.[owner].]table_name (column_name datatype
   [default {constant_expression | user | null}]
   {[{identity | null | not null}]
                  [off row | in row]
   | [[constraint constraint_name]
      {{unique | primary key}
     [clustered | nonclustered] [asc | desc]
     [with { { fillfactor = pct
                | max_rows_per_page = num_rows }
                , reservepagegap = num_pages }]
      [on segment_name]
      | references [[database.]owner.]ref_table
         [(ref_column)]
      | check (search_condition)}]}...
           | [constraint constraint_name]
   {{unique | primary key}
      [clustered | nonclustered]
      (column_name [asc | desc]
                        [{, column_name [asc | desc]}...])
     [with { {fillfactor = pct
                         | max_rows_per_page = num_rows },
                        reservepagegap = num_pages } ]
       [on segment_name]
   |foreign key (column_name [{, column_name}...])
      references [[database.]owner.]ref_table
         [(ref_column [{, ref_column}...])]
    | check (search_condition) ... }
[{, {next_column | next_constraint}}...])
[lock {datarows | datapages | allpages }]
[with { max_rows_per_page = num_rows ,
                exp_row_size = num_bytes ,
                reservepagegap = num_pages } ]
[on segment_name]
[ [ external {table | file}] at “pathname” ]]
```

Usage

Usage

- If the table being created is mapped to a remote location, a proxy table is created. A proxy table is identical to a local table, except that the *sysobjects.sysstat2* column contains a status flag that indicates the table is mapped to an external location.

- The external location must be previously defined using the **at pathname** clause.
- After the Adaptive Server processes the **create table** command, it notifies Component Integration Services of the need to forward the command to the remote location (if a location has been previously specified).

  Component Integration Services reconstructs the SQL necessary to create the table, and forwards the SQL to the remote server. It does not forward all the original syntax to the remote server. The following clauses are processed by Adaptive Server:

  - **on** *segment name*
  - **check** constraints
  - **default**
  - **with max_rows_per_page**
- Trace flag 11213 changes the behavior of the **create table** command. Referential constraints and unique or primary key constraints are forwarded to the remote server unless trace flag 11213 is turned on, in which case they are processed locally.
- For each column, the column name, datatype, length, identity property, and null property are reconstructed from the original statement.
- Component Integration Services passes a NULL char column as a NULL varchar column.
- Component Integration Services passes a NULL binary column as a NULL varbinary column.

Server Class *ASEnterprise*

- Component Integration Services passes the datatype of each column to the remote server without conversion.

Server Class *ASAnywhere*

- Component Integration Services passes the datatype of each column to the remote server without conversion.

Server Class *ASIQ*

- Component Integration Services passes the datatype of each column to the remote server without conversion.

Server Class *sql_server*

- Component Integration Services passes the datatype of each column to the remote server without conversion.

Server Class *direct_connect*

- Component Integration Services reconstructs the **create table** command and passes commands to the targeted DirectConnect. The gateway transforms the commands into a form that the underlying DBMS recognizes.
- Some DirectConnects support DB2 syntax mode, which is described in the DirectConnect documentation. When the DirectConnect enables DB2 syntax mode, Component Integration Services constructs DB2 SQL syntax and converts the column to a datatype DB2 supports.
- Adaptive Server datatypes are converted to either the DirectConnect or DB2 syntax mode datatypes shown in Table 3-8, depending on whether the DirectConnect supports DB2 syntax mode

Table 3-8: DirectConnect datatype conversions for create table

Adaptive Server Datatype	DirectConnect Default Datatype	DirectConnect DB2 Syntax Mode Datatype
binary*(n)*	binary*(n)*	char*(n)* for bit data
bit	bit	char(1)
char	char	char
datetime	datetime	timestamp
decimal*(p, s)*	decimal*(p, s)*	decimal*(p, s)*
float	float	float
image	image	varchar*(n)* for bit data; the value of *n* is determined by the global variable *@@textsize*
int	int	int
money	money	float
numeric*(p, s)*	numeric*(p, s)*	decimal*(p, s)*
nchar(n)	nchar(n)	graphic(n)
nvarchar(n)	nvarchar(n)	vargraphic(n)
real	real	real
smalldatetime	smalldatetime	timestamp
smallint	smallint	smallint
smallmoney	smallmoney	float
timestamp	timestamp	varbinary(8)
tinyint	tinyint	smallint

Adaptive Server Datatype	DirectConnect Default Datatype	DirectConnect DB2 Syntax Mode Datatype
text	text	varchar*(n)*; the value of *n* is determined by the global variable *@@textsize*
unichar(n)	unichar	char*(n)* for bit data
univarchar(n)	char*(n)* for bit data	varchar*(n)* for bit data
varbinary*(n)*	varbinary*(n)*	varchar*(n)* for bit data
varchar*(n)*	varchar*(n)*	varchar*(n)*

Server Class *db2*

Table 3-9 shows the datatype conversions that are performed when a **create table** command is processed. Adaptive Server datatypes are converted to the DB2 datatypes shown.

Table 3-9: DB2 datatype conversions for create table

Adaptive Server Datatype	DB2 Datatype
binary(n)	char(n) for bit data, where *n* <= 254
bit	char(1)
char(n)	char(n), where *n* <= 254
datetime	timestamp
decimal(p, s)	decimal*(p, s)*
float	float
image	Not supported
int	int
money	float
nchar	char(n)
nvarchar	varchar(n)
numeric*(p, s)*	decimal*(p, s)*
real	real
smalldatetime	timestamp
smallint	smallint
smallmoney	float
tinyint	smallint
text	Not supported
varbinary(n)	varchar(n) for bit data, where *n* <=254

Adaptive Server Datatype	DB2 Datatype
varchar(n)	varchar(n), where *n* <= 254

See also

See Also

create table in the *Adaptive Server Reference Manual*.

create trigger

Description

Creates a trigger, a type of stored procedure that is often used for enforcing integrity constraints. A trigger executes automatically when a user attempts a specified data modification statement on a specified table.

Syntax

```
create trigger [owner.]trigger_name
on [owner.]table_name
for {insert, update, delete}
as SQL_statements
```

Or, using the if **update** clause:

```
create trigger [owner.]trigger_name
on [owner.]table_name
for {insert, update}
as
   [if update (column_name)
      [{and | or} update (column_name)]...]
      SQL_statements
   [if update (column_name)
      [{and | or} update (column_name)]...
      SQL_statements]...
```

Usage

Usage

- When a trigger is created on a proxy table, it will execute after an insert, delete or update statement on that proxy table completes. However, the special tables inserted and deleted, which normally are views into the local transaction log, will not contain any data, since changes to remote data are not logged locally.
- Some direct_connects have the ability to support the special tables inserted and deleted. If this is the case, CIS will forward references to these tables when found within a trigger. The reference will be constructed as in this example:

```
select ...
      from dbname.owner.tablename inserted,
            dbname.owner.tablename deleted
      where inserted.id = deleted.id
```

- The names for the inserted and deleted tables are passed to the direct_connect as alias names, and the table name in the **from** clause is the actual name of the table in the DBMS accessed by the DirectConnect.

Server Class *ASEnterprise*

- Servers in this class do not support access to remote *inserted* and *deleted* tables.

Server Class *ASAnywhere*

- Servers in this class do not support access to remote *inserted* and *deleted* tables.

Server Class *ASIQ*

- Servers in this class do not support access to remote *inserted* and *deleted* tables.

Server Class *sql_server*

- Servers in this class do not support access to remote *inserted* and *deleted* tables.

Server Class *direct_connect*

- The ability to support *inserted* and *deleted* tables is determined by a capability. If enabled, CIS will forward syntax referencing these tables to the DirectConnect.
- With version 12.0, the only DirectConnect supporting this capability is the DirectConnect for Oracle.

Server Class *db2*

- Servers in this class do not support access to remote *inserted* and *deleted* tables.

Server Class *genereic*

- Servers in this class do not support access to remote *inserted* and *deleted* tables.

deallocate cursor

Description

Makes a cursor inaccessible and releases all memory resources committed to that cursor.

Syntax

deallocate cursor *cursor_name*

Usage

Usage

- If the cursor specified by *cursor_name* contains references to proxy tables, Adaptive Server notifies Component Integration Services to deallocate its remote cursors for those tables.
- If the remote cursor is not closed, Component Integration Services closes and deallocates it. If the remote cursor is already closed, no additional actions are taken.
- Component Integration Services uses Client-Library to manage cursor operations to a remote server. When Component Integration Services receives a **deallocate cursor** command and the cursor has not been explicitly closed with a **close** command, Component Integration Services uses the following Client-Library functions to interact with the remote server:

  ct_cursor(*command*, CS_CURSOR_CLOSE, NULL, CS_UNUSED, NULL, CS_UNUSED, CS_UNUSED)

  ct_cursor(*command*, CS_CURSOR_DEALLOC, NULL, CS_UNUSED, NULL, CS_UNUSED, CS_UNUSED)

- If the cursor contains references to more than one proxy table, Component Integration Services must deallocate a remote cursor for each server represented by the proxy tables.

See also

See Also

close, **declare cursor**, **fetch**, **open** in this chapter.

deallocate cursor in the *Adaptive Server Reference Manual*.

declare cursor

Description

Defines a cursor.

Syntax

declare *cursor_name* cursor
for *select_statement*
[for {read only | update [of *column_name_list*]}]

Usage

Usage

- If the cursor specified by *cursor_name* contains references to proxy tables, Adaptive Server notifies Component Integration Services to establish a connection to the remote servers referenced by the proxy tables.

  A separate connection is required for each server represented by all proxy tables. For example, if all proxy tables in the cursor reference the same remote server, only one connection is required while the **declare cursor** command is processed. However, if two or more servers are referenced by the proxy tables, a separate connection to each server is required.

See also

See Also

close, **deallocate cursor**, **fetch**, **open** in this chapter.

declare cursor in the *Adaptive Server Reference Manual*.

delete

Description

Removes rows from a table.

Syntax

```
delete [from] [[database.]owner.]{view_name|table_name}
 [where search_conditions]

delete [[database.]owner.]{table_name | view_name}
 [from [[database.]owner.]{view_name|table_name
 [(index index_name [ prefetch size ][lru|mru])]}
  [, [[database.]owner.]{view_name|table_name
 (index index_name [ prefetch size ][lru|mru])]} ]...]
 [where search_conditions]

delete [from] [[database.]owner.]{table_name|view_name}
 where current of cursor_name
```

Usage

Usage

- Component Integration Services processes the **delete** command when the table on which it operates has been created as a proxy table. Component Integration Services forwards the entire request (or part of it) to the server that owns the actual object.
- Component Integration Services executes the **delete** command using one of two methods:
  a The entire command is forwarded to the remote server as a single statement in close to its original syntax. If the syntax and remote capabilities match, the entire statement is forwarded and processed remotely. This is referred to as *quickpass mode*.
  b If the entire command cannot be forwarded to a remote server, Component Integration Services declares and opens one or more cursors in update mode, and begins a scan on the remote table. Each cursor forwards as much of the original statement's predicates to the remote server as possible. For each row fetched that meets the search criteria, a positioned delete is executed.
- When Component Integration Services forwards the **delete** command to a remote server, the table name used is the remote table name, and the column names used are the remote column names. These names may not be the same as the local proxy table names.
- Component Integration Services generally passes the original **delete** syntax to remote servers as a single statement, but the following conditions will likely cause the statement to be executed using method 2, above:
  - The statement contains multiple tables that are not located in the same remote server

    - The statement contains local tables (including temporary tables)
    - The statement contains **case** expressions
    - The statement contains text or image columns
    - The statement contains certain referential integrity checks
    - The statement contains system functions in the predicate list
    - The statement contains syntax that the remote server does not support
- The format involving **where current of** is never forwarded to a remote server and causes the statement to be executed using method 2 above.
- If Component Integration Services cannot pass the entire statement to a remote server, a unique index must exist on the table.

Server Class *ASEnterprise*

- If Component Integration Services cannot forward the original query without alteration, it performs the delete using method 2.

Server Class *ASAnywhere*

- If Component Integration Services cannot forward the original query without alteration, it performs the delete using method 2.

Server Class *ASIQ*

- If Component Integration Services cannot forward the original query without alteration, it performs the delete using method 2.

Server Class *sql_server*

- If Component Integration Services cannot forward the original query without alteration, it performs the delete using method 2.

Server Class *direct_connect*

- The syntax forwarded to servers of class *direct_connect* is dependent on the capabilities negotiation which occurs when Component Integration Services first connects to the remote DirectConnect. Examples of negotiable capabilities include: subquery support, **group by** support, and built-in support.
- A DirectConnect can request that the **delete** command be generated in DB2 syntax.

- Component Integration Services passes data values as parameters to either a cursor or a dynamic SQL statement. Language statements can also be used if the DirectConnect supports it. The parameters are in the datatype native to Adaptive Server and must be converted by the DirectConnect into formats appropriate for the target DBMS.

Server Class *db2* •Server's of class *db2* do not contain the capabilities negotiation features of server class *direct_connect*, so the syntax passed to the remote server is simpler than that allowed by Transact-SQL. The syntax does not contain the following:

  - Search conditions containing subqueries, **group by**, or **order by** clauses
  - Transact-SQL built-in functions
  - Transact-SQL operators (such as bitwise operators)
  - Syntax not allowed by DB2

  Component Integration Services processes the **delete** command using method 2, described above, when the statement is complex.

- If the server is a DB2 system, use traceflag 11215 to instruct Component Integration Services that the remote server is capable of handling all DB2 syntax. This assumption is not made automatically because not all gateways using the *db2* server class are actually connected to DB2 systems. When trace flag 11215 is turned on, *quickpass mode* is used unless the following conditions exist:
  - The statement cannot be expressed in DB2 syntax
  - The statement contains outer joins
  - The statement contains **like** clauses with Sybase extensions
  - The statement contains built-in functions that are not supported by DB2

See also

See Also

delete in the *Adaptive Server Reference Manual*.

drop database

Description

Removes one or more databases from Adaptive Server.

Syntax

drop database *database_name* [, *database_name*]...

Usage

Usage

- For each database being dropped, Component Integration Services scans *sysobjects* to check for proxy tables in the database. Each proxy table that was not created with the **existing** keyword is dropped in the remote server that owns the object.

Server Class *ASEnterprise* •Component Integration Services issues a **drop table** command for each table that was not created with the **existing** keyword.

Server Class *ASAnywhere*

- Component Integration Services issues a **drop table** command for each table that was not created with the **existing** keyword.

Server Class *ASIQ*

- Component Integration Services issues a **drop table** command for each table that was not created with the **existing** keyword.

Server Class *sql_server*

- Component Integration Services issues a **drop table** command for each table that was not created with the **existing** keyword.

Server Class *direct_connect*

- Component Integration Services issues a **drop table** command for each table that was not created with the **existing** keyword.

Server Class *db2*

- Component Integration Services issues a **drop table** command for each table that was not created with the **existing** keyword.

See also

See Also

drop database in the *Adaptive Server Reference Manual*.

drop index

Description

Removes an index from a table in the current database.

Syntax

drop index *table_name.index_name*
[, *table_name.index_name*]...

Usage

Usage

- Component Integration Services processes the **drop index** command when the table involved has been created as a proxy table. The actual table and index reside on a remote server. Component Integration Services forwards the request to the remote server, and removes the index from the proxy table.
- When Component Integration Services forwards the **drop index** command to a remote server, the table name used is the remote table name, and the index names used are the remote index names. These names may not be the same as the local proxy table names.
- If multiple indexes are dropped in a single command, each index is sent as an individual **drop index** command.
- Trace flag 11208 changes the behavior of the **drop index** command. If trace flag 11208 is turned on, the **drop index** command is not sent to the remote server. Instead, Adaptive Server processes the command locally, as if the table on which it operates is local. This is useful for synchronizing the local Adaptive Server schema with the schema of the remote database.

Server Class *ASEnterprise*

- Component Integration Services forwards the following **drop index** syntax to a remote server configured as class *ASEnterprise*:

  drop index *table_name.index_name*

  Component Integration Services precedes this statement with a **use** *database* command since the **drop index** syntax does not allow you to specify the database name.

Server Class *ASAnywhere*

- Component Integration Services forwards the following **drop index** syntax to a remote server configured as class *ASAnywhere*:

  drop index *table_name.index_name*

  Component Integration Services precedes this statement with a **use** *database* command since the **drop index** syntax does not allow you to specify the database name.

Server Class *ASIQ*

- Component Integration Services forwards the following **drop index** syntax to a remote server configured as class *ASIQ*:

  drop index *table_name.index_name*

  Component Integration Services precedes this statement with a **use** *database* command since the **drop index** syntax does not allow you to specify the database name.

Server Class *sql_server*

- Component Integration Services forwards the following **drop index** syntax to a remote server configured as class *sql_server*:

  drop index *table_name.index_name*

  Component Integration Services precedes this statement with a **use** *database* command since the **drop index** syntax does not allow you to specify the database name.

Server Class *direct_connect*

- Component Integration Services forwards the following **drop index** syntax to a remote server configured as class *direct_connect*:

  drop index *table_name.index_name*

Server Class *db2*

- Component Integration Services forwards the following **drop index** syntax to a remote server configured as class *db2*:

  drop index *index_name*

See also

See Also

drop index in the *Adaptive Server Reference Manual*.

drop table

Description

Removes a table definition and all of its data, indexes, triggers, and permissions from the database.

Syntax

drop table [[*database*.]*owner*.]*table_name*
[, [[*database*.]*owner*.]*table_name*]...

Usage

Usage

- Component Integration Services processes the **drop table** command when the table on which it operates has been created as a proxy table. Component Integration Services forwards the entire request (or part of it) to the server that owns the actual object if the table was not created with the **existing** keyword.
- When Component Integration Services forwards the **drop table** command to a remote server, the table name used is the remote table name. This name may not be the same as the local proxy table name.
- If multiple tables are dropped in a single command, each table is sent as an individual **drop table** command.
- A table in use by another user or process cannot be dropped and an error stating that the table is in use is returned.

Server Class *ASEnterprise* •Component Integration Services forwards the following **drop table** syntax to a remote server configured as class *ASEnterprise*:

drop table *database*.*owner*.*table_name*

Server Class *ASAnywhere*

- Component Integration Services forwards the following **drop table** syntax to a remote server configured as class *ASAnywhere*:

drop table *database*.*owner*.*table_name*

Server Class *ASIQ*

- Component Integration Services forwards the following **drop table** syntax to a remote server configured as class *ASIQ*:

drop table *database*.*owner*.*table_name*

Server Class *sql_server*

- Component Integration Services forwards the following **drop table** syntax to a remote server configured as class *sql_server*:

drop table *database*.*owner*.*table_name*

Server Class *direct_connect*

- Component Integration Services requests a capabilities response from a remote server with server class *direct_connect*, but support for **drop table** is not optional. The behavior of the DirectConnect is database dependent.

Server Class *db2*

- Component Integration Services forwards the following **drop table** syntax to a remote server configured as class *db2*:

  drop table *owner.table_name*

See also

See Also

drop table in the *Adaptive Server Reference Manual*.

execute

Description

Runs a system procedure or a user-defined stored procedure.

Syntax

```
[execute] [@return_status = ]
 [[[server.]database.]owner.]procedure_name[;number]
    [[@parameter_name =] value |
       [@parameter_name =] @variable [output]
    [,[@parameter_name =] value |
       [@parameter_name =] @variable [output]...]]
 [with recompile]
```

Usage

Usage

- When the **execute** command is used to issue an RPC to a remote server, Adaptive Server issues the RPC via one of two methods. The method used to issue the RPC determines whether the work performed by the RPC can be part of an on-going transaction. The two methods are as follows:
  - The RPC is issued via the Adaptive Server's site handler. This is the Adaptive Server's default method of issuing RPCs. In this case, the RPC cannot be part of an on-going transaction.
  - The RPC is issued via Component Integration Services. In this case, the RPC can be part of an on-going transaction. To issue RPCs using this method, **cis rpc handling** must be turned on. This is done via the **set** command or the **sp_configure** system procedure.

See also

See Also

"RPC handling and Component Integration Services" on page 67.

set in this chapter.

execute in the *Adaptive Server Reference Manual*.

fetch

Description

Returns a row or a set of rows from a cursor result set.

Syntax

fetch *cursor_name* [into *fetch_target_list*]

Usage

Usage

- When the first **fetch** is received, Component Integration Services constructs the query defined by the **declare cursor** command and sends it to the remote server.

  If the remote server supports Client-Library cursors, Component Integration Services takes the following steps:

  a Declares a cursor:

  ```
  ct_cursor(command, CS_CURSOR_DECLARE...)
  ```

  b Establishes the cursor row count:

  ```
  ct_cursor(command, CS_CURSOR_ROWS,...
  cursor_row_count)
  ```

  c Opens a Client-Library client cursor to the remote server:

  ```
  ct_cursor(command, CS_CURSOR_OPEN...)
  ```

  If the remote server does not support Client-Library cursors, Component Integration Services sends a language request to the server. This may require an additional connection to that server.

- If the **declare cursor** command included a **for update** clause, the cursor row count is set to 1; otherwise, it is set to the value of the configuration parameter **cis_cursor_rows**.

- After the cursor is opened or the language request is sent, Component Integration Services issues a Client-Library **ct_fetch** command to obtain the first row. Client-Library array binding is used to establish the buffer in which to place the fetched results, whether Client-Library cursors or language requests are used to generate the fetchable results. The number of rows that are buffered by a single fetch is determined by the cursor row count discussed above.

  Subsequent **fetch** requests retrieve rows from the buffered results, until the end of the buffer is reached. At that time, Component Integration Services issues another Client-Library **ct_fetch** command to the remote server.

- A **fetch** against a cursor that has no remaining rows in its result set causes Component Integration Services to close the remote cursor.

Server Class *ASEnterprise*

If the cursor is read only, Component Integration Services sends a language request to the remote server when the first **fetch** is received after the cursor is opened. Otherwise, Component Integration Services declares a cursor to the remote server by means of Client-Library.

Server Class *ASAnywhere*

- Handling of the fetch statement is the same as for ASEnterprise.

Server Class *ASIQ*

- Component Integration Services sends a language request to the remote server when the first **fetch** is requested after the cursor is opened.

Server Class *sql_server*

- For pre-version 10.0 SQL Server, Component Integration Services sends a language request to the remote server when the first **fetch** is received after the cursor is opened.
- For version 10.0 or later servers, Component Integration Services declares a cursor to the remote server by means of Client-Library.

Server Class *direct_connect*

- Component Integration Services treats servers in class *direct_connect* as if they were version 10.0 or later of class *sql_server*.

Server Class *db2*

- Component Integration Services sends a language request to the remote server when the first **fetch** is requested after the cursor is opened.

See also

See Also

close, **deallocate cursor**, **declare cursor**, **open** in this chapter.

fetch in the *Adaptive Server Reference Manual*.

Functions

Description

The following section defines the compatibility of the CIS server classes with the built-in ASE functions.

Support for Functions within Component Integration Services

When a SQL statement such as a **select**, **insert**, **delete** or **update** contains a built-in function, CIS has to determine whether or not the function can be forwarded to the remote server, or if it must be evaluated within the local server using remote data.

Functions are only sent to a remote server if the statement containing them can be handled by *quickpass mode* (see the **select** command).

In the tables shown below, support for function by server class is indicated by a 'Y'; an 'N' indicates no support is provided, and 'C' indicates support for it is determined by capabilities of the underlying DBMS (often the case for DirectConnects).

Aggregate Functions

The aggregate functions generate summary values that appear as new columns in the query results. The aggregate functions are:

Table 3-10: Server Class Support for Aggregate Functions

Function	ASE	ASA	ASIQ	sql_serv	dir_con	db2
avg	Y	Y	Y	Y	C	Y
count	Y	Y	Y	Y	C	Y
max	Y	Y	Y	Y	C	Y
min	Y	Y	Y	Y	C	Y
sum	Y	Y	Y	Y	C	Y

Datatype Conversion Functions

Datatype conversion functions change expressions from one datatype to another and specify new display formats for date/time information. The datatype conversion functions are:

Table 3-11: Server Class Support for Datatype Conversion Functions

Function	ASE	ASA	ASIQ	sql_serv	dir_con	db2
convert()	Y	Y	Y	Y	C	N
inttohex()	Y	Y	N	Y	C	N
hextoint()	Y	Y	N	Y	C	N

Date Functions

The date functions manipulate values of the datatype datetime or smalldatetime. Note that the **getdate()** function is always expanded by the local server; the presence of this builtin function will not cause a query to be eliminated from *quickpass mode* optimizations, however.

Table 3-12: Server Class Support for Date Functions

Function	ASE	ASA	ASIQ	sql_serv	dir_con	db2
dateadd	Y	Y	Y	Y	C	N
datediff	Y	Y	Y	Y	C	N
datename	Y	Y	N	Y	C	N
datepart	Y	Y	Y	Y	C	N

Mathematical Functions

Mathematical functions return values commonly needed for operations on mathematical data. Mathematical function names are not keywords.

Each function also accepts arguments that can be implicitly converted to the specified type. For example, functions that accept approximate numeric types also accept integer types. Adaptive Server automatically converts the argument to the desired type

Table 3-13: Server Class Support for Mathematical Functions

Function	ASE	ASA	ASIQ	sql_serv	dir_con	db2
abs	Y	Y	Y	Y	C	N
acos	Y	Y	N	Y	C	N
asin	Y	Y	N	Y	C	N
atan	Y	Y	N	Y	C	N
atn2	Y	Y	N	Y	C	N
ceiling	Y	Y	Y	Y	C	N
cos	Y	Y	N	Y	C	N
cot	Y	Y	N	Y	C	N
degrees	Y	Y	N	Y	C	N
exp	Y	Y	N	Y	C	N
floor	Y	Y	Y	Y	C	N
log	Y	Y	N	Y	C	N
log10	Y	Y	N	Y	C	N
pi	Y	Y	N	Y	C	N
power	Y	Y	N	Y	C	N
radians	Y	Y	N	Y	C	N
rand	Y	Y	Y	Y	C	N
round	Y	Y	N	Y	C	N
sign	Y	Y	N	Y	C	N
sin	Y	Y	N	Y	C	N
sqrt	Y	Y	Y	Y	C	N
tan	Y	Y	N	Y	C	N

Security Functions

Security functions return security-related information.The security functions are:

Table 3-14: Server Class Support for Security Functions

Function	ASE	ASA	ASIQ	sql_serv	dir_con	db2
ic_sec_service_on()	N	N	N	N	N	N
show_sec_services)	N	N	N	N	N	N

String Functions

String function operate on binary data, character strings, and expressions. The string functions are:

Table 3-15: Server Class Support for String Functions

Function	ASE	ASA	ASIQ	sql_serv	dir_con	db2
ascii	Y	Y	N	Y	C	N
char	Y	Y	N	Y	C	N
charindex	Y	Y	N	Y	C	N
char_lengt	Y	Y	N	Y	C	N
difference	Y	Y	Y	Y	C	N
lower	Y	Y	Y	Y	C	N
ltrim	Y	Y	Y	Y	C	N
patindex	N	N	N	N	N	N
replicate	Y	Y	N	Y	C	N
reverse	Y	N	N	Y	Y	N
right	Y	Y	Y	Y	C	N
rtrim	Y	Y	Y	Y	C	N
soundex	Y	N	Y	Y	C	N
space	Y	Y	N	Y	C	N
str	Y	Y	N	Y	C	N
stuff	Y	Y	N	Y	C	N
substring	Y	Y	Y	Y	C	N
upper	Y	Y	Y	Y	C	N

System Functions

System functions return special information from the database. The system functions are:

Table 3-16: Server Class Support for System Functions

Function	ASE	ASA	ASIQ	sql_serv	dir_con	db2
col_length	Y	Y	N	Y	C	N
col_name	Y	Y	N	Y	C	N

Function	ASE	ASA	ASIQ	sql_serv	dir_con	db2
curunreservedpgs	N	N	N	N	N	N
data_pgs	N	N	N	N	N	N
datalength	Y	Y	N	Y	C	N
db_id	N	N	N	N	N	N
db_name	N	N	N	N	N	N
host_id	N	N	N	N	N	N
host_name	N	N	N	N	N	N
index_col	N	N	N	N	N	N
isnull	Y	Y	N	Y	N	N
lct_admin	N	N	N	N	N	N
mut_excl_roles	N	N	N	N	N	N
object_id	N	N	N	N	N	N
object_name	N	N	N	N	N	N
proc_role	N	N	N	N	N	N
ptn_data_pgs	N	N	N	N	N	N
reserved_pgs	N	N	N	N	N	N
role_contain	N	N	N	N	N	N
role_id	N	N	N	N	N	N
role_name	N	N	N	N	N	N
rowcnt	N	N	N	N	N	N
show_role	N	N	N	N	N	N
suser_id	N	Y	Y	N	N	N
suser_name	N	Y	Y	N	N	N
tsequal	Y	Y	N	Y	N	N
used_pgs	N	N	N	N	N	N
user	Y	Y	Y	N	N	N
user_id	Y	Y	Y	Y	N	N
user_name	Y	Y	Y	Y	N	N
valid_name	N	N	N	N	N	N
valid_user	N	N	N	N	N	N

Text and Image Functions

Text and image functions operate on text and image data. The text and image functions are:

Table 3-17: Server Class Support for Text and Image Functions

Function	ASE	ASA	ASIQ	sql_serv	dir_con	db2
textptr()	Y	Y	N	Y	C	N

Function	ASE	ASA	ASIQ	sql_serv	dir_con	db2
textvalid)	Y	Y	N	Y	C	N

insert

Description

Adds new rows to a table or view.

Syntax

insert [into] [*database*.[*owner*.]]{*table_name*|*view_name*}
[(*column_list*)]
{values (*expression* [, *expression*]...)
|*select_statement* }

Usage

Usage

- Component Integration Services processes the **insert** command when the table on which it operates has been created as a proxy table. Component Integration Services forwards the entire request (or part of it) to the server that owns the actual object.
- When Component Integration Services forwards the **insert** command to a remote server, the table name used is the remote table name, and the column names used are the remote column names. These names may not be the same as the local proxy table names.

Server Class *ASEnterprise*

- **insert** commands using the **values** keyword are fully supported.
- **insert** commands using a **select** command are supported for all datatypes except text and image. text and image columns are only supported when they contain null values.
- If all **insert** and **select** tables reside on the same remote server, the entire statement is forwarded to the remote server for execution. This is referred to as *quickpass mode*. Quickpass mode is not used if the **select** statement does not conform to all the quickpass rules for a **select** command (see “select” on page 175).
- If the **select** tables reside on one remote server, and the **insert** table resides on a different server, Component Integration Services selects each row from the source tables, and inserts the row into the target table.

Server Class *ASAnywhere*

- Handling of the insert statement is the same as for *ASEnterprise*.

Server Class *ASIQ*

- Handling of the insert statement is the same as for *ASEnterprise*.

Server Class *sql_server*

- Handling of the insert statement is the same as for *ASEnterprise*.

Server Class *direct_connect*

- **insert** commands using the **values** keyword are fully supported.
- **insert** commands using a **select** command are fully supported, but the table must have a unique index if the table has text or image columns. When using **insert** with a **select** command, the entire command is sent to the remote server if:
  - All tables referenced in the command reside on the remote server
  - The capabilities response from the DirectConnect indicates that **insert-select** commands are supported

  If both conditions are not met, Component Integration Services selects each row from the source tables, and inserts the row into the target table.
- Component Integration Services passes data values as parameters to either a cursor or a dynamic SQL statement. Language statements can also be used if the DirectConnect supports it. The parameters are in the datatype native to Adaptive Server and must be converted by the DirectConnect into formats appropriate for the target DBMS.

Server Class *db2*

- **insert** commands using the **values** keyword are fully supported for all valid DB2 datatypes.
- **insert** commands using a **select** command are fully supported for all valid DB2 datatypes.
- When using **insert** with a **select** command, the entire statement is sent to the remote server if:
  - All tables referenced in the statement reside on the remote server
  - Trace flag 11215 is enabled

  If both conditions are not met, Component Integration Services selects each row from the source tables, and inserts the rows into the target table.

See also

See Also

insert in the *Adaptive Server Reference Manual*.

open

Description

Opens a cursor for processing.

Syntax

open *cursor_name*

Usage

Usage

- **open** opens a cursor. Cursors allow you to **modify** or **delete** rows on an individual basis. You must first open a cursor to use the **fetch**, **update**, and **delete** statements. For more information about cursors, see the *Transact-SQL User's Guide.*
- Adaptive Server returns an error message if the cursor is already open or if the cursor has not been created with the **declare cursor** statement.
- Opening the cursor causes Adaptive Server to evaluate the **select** statement that defines the cursor (specified in the **declare cursor** statement) and makes the cursor result set available for processing.
- When the cursor is first opened, it is positioned before the first row of the cursor result set.
- When you set the chained transaction mode, Adaptive Server implicitly begins a transaction with the **open** statement if no transaction is currently active.

See also

See Also

close, **deallocate cursor**, **declare cursor**, **fetch** in this chapter.

open in the *Adaptive Server Reference Manual*.

prepare transaction

Description

Used by two-phase commit applications to see if a server is prepared to commit a transaction.

Syntax

prepare tran[saction]

Usage

Usage

- When the Distributed Transaction Manager (DTM) is enabled, DTM handles all transaction processing for servers of server class *ASEnterprise* with a version of 12.0 or later.
- **prepare transaction** is ignored for servers with a server class of *db2*.
- For all other server classes, Adaptive Server notifies Component Integration Services when it receives a *prepare transaction* command so that remote servers involved in the current transaction can enter the prepared state.
- For each server that is involved in the current transaction, a **prepare transaction** command is sent to the server and the results are monitored. If there are no errors reported, each remote server is assumed to be in a prepared state and Component Integration Services returns control to the Adaptive Server. Adaptive Server then enters a prepared state for local work performed by the transaction.

Server Class *ASEnterprise*

- Transaction process for servers in class *ASEnterprise* with a version prior to 12.0 is identical to that of server class *sql_server* (release 10.0 or later).
- When DTM is not enabled, transaction processing for all servers in class *ASEnterprise* is identical to that of server class *sql_server* (release 10.0 or later).
- When the Adaptive Server receives notification to prepare a transaction, the Distributed Transaction Manager issues a **PrepareXact** RPC to all remote participants having a server class of *ASEnterprise*. When all remote participants have acknowledged the **PrepareXact** RPC, any local data changes are written to the database.

Server Class *ASAnywhere*

- Transaction processing for servers in class *ASAnywhere* is identical to that of server class *sql_server* (release 10.0 or later).

Server Class *ASIQ*

- Transaction processing for servers in class *ASIQ* is identical to that of server class *sql_server* (release 10.0 or later).

Server Class *sql_server*

- Component Integration Services sends a **prepare transaction** command to each server in class *sql_server* that is version 10.0 or later.
- The **prepare transaction** command is not sent to the following types of servers:
  - Sybase IQ 11.x
  - Microsoft SQL Server
  - Pre-version 10.0 SQL Server
  - OmniSQL Server 10.1.2

Server Class *direct_connect*

- Handling of the **prepare transaction** command for servers in class *direct_connect* is identical to that of server class *sql_server* (version 10.0 or later).

Server Class *db2*

- Component Integration Services does not send the **prepare transaction** command to servers in class *db2*.

See also

See Also

prepare transaction in the *Adaptive Server Reference Manual*.

readtext

Description

Reads text and image values, starting from a specified offset and reading a specified number of bytes or characters.

Syntax

```
readtext [[database.]owner.]table_name.column_name
text_pointer offset size
[holdlock | noholdlock] [readpast]
[using {bytes | chars | characters}]
[at isolation {
        [ read uncommitted | 0 ] |
        [ read committed | 1 ] |
        [ repeatable read | 2 ]|
        [ serializable | 3 ] } ]]
```

Usage

Usage

- Component Integration Services processes the **readtext** command when the table on which it operates has been created as a proxy table. Component Integration Services forwards the entire request (or part of it) to the server that owns the actual object.
- When Component Integration Services forwards the **readtext** command to a remote server, the table name used is the remote table name, and the column names used are the remote column names. These names may not be the same as the local proxy table names.
- The **using bytes** and **at isolation** clauses are ignored.
- The **holdlock**, **noholdlock** and **readpast** options are ignored.

Server Class *ASEnterprise* •Component Integration Services forwards the following syntax to the remote server when the underlying table is a proxy table:

```
readtext [[database.]owner.]table_name.column_name
 text_pointer offset size
[using {chars | characters}]
```

Server Class *ASAnywhere*

- Handling of the **readtext** statement is the same as for *ASEnterprise*.

Server Class *ASIQ*

- Handling of the **readtext** statement is the same as for *ASEnterprise*.

Server Class *sql_server*

- Handling of the **readtext** statement is the same as for *ASEnterprise*.

Server Class *direct_connect*

- If the DirectConnect does not support text pointers, **readtext** cannot be sent and its use results in errors.
- If the DirectConnect does support text pointers, Component Integration Services forwards the following syntax to the remote server:

  ```
  readtext
   [[database.]owner.]table_name.column_name
  text_pointer offset size
   [using {chars | characters}]
  ```

- **readtext** is issued anytime text or image data must be read. **readtext** is called when a **select** command refers to a text or image column in the select list, or when a **where** clause refers to a text or image column.

  For example, you have a proxy table *books* that is mapped to the *books* table on the remote server *foo*. The columns are *id*, *name*, and the text column *blurb*. When the following statement is issued:

  ```
  select * from books
  ```

  Component Integration Services sends the following syntax to the remote server:

  ```
  select id, name, textptr(blurb) from foo_books
  readtext foo_books.blurb @p1 0 0 using chars
  ```

Server Class *db2*

- **readtext** is not supported since text and image datatypes are not supported for servers in class *db2*.

See also

See Also

readtext in the *Adaptive Server Reference Manual*.

rollback transaction

Description

Rolls a user-defined transaction back to the last savepoint inside the transaction or to the beginning of the transaction.

Syntax

rollback {transaction | tran | work}
[*transaction_name* | *savepoint_name*]

Usage

Usage

- When the Distributed Transaction Manager (DTM) is enabled, DTM handles all transaction processing for servers of server class *ASEnterprise* with a version of 12.0 or later.
- For all other server classes, Adaptive Server notifies Component Integration Services when it receives a **rollback transaction** command and Component Integration Services attempts to rollback work associated with remote servers in the current transaction.
- Multiple remote servers can be involved in a single transaction, each with their own unit of work which is associated with the Adaptive Server unit of work.
- Remote work is rolled back before local work.
- Work performed by transactional RPC's is included in the local transaction and can be rolled back if the remote server supports RPC's within transactions.
- *transaction_name* and *savepoint_name* is not used by Component Integration Services in this release.

Server Class *ASEnterprise*

- Transaction processing for servers in class *ASEnterprise* with a version prior to 12.0 is identical to that of server class *sql_server* (release 10.0 or later).
- When DTM is not enabled, transaction processing for all servers in class *ASEnterprise* is identical to that of server class *sql_server* (release 10.0 or later).
- When the Adaptive Server receives notification to rollback a transaction, the Distributed Transaction Manager issues a **RollbackXact** RPC to all remote participants having a server class of *ASEnterprise*.

Server Class *ASAnywhere*

- Transaction processing for servers in class *ASAnywhere* is identical to that of server class *sql_server* (version 10.0 or later).

Server Class *ASIQ*

- Transaction processing for servers in class *ASIQ* is identical to that of server class *sql_server* (version 10.0 or later).

Server Class *sql_server*

- When Component Integration Services receives notification that a transaction is to be rolled back, it checks the TRANSACTION ACTIVE state of all remote connections associated with the client application. For each connection with an active transaction, Component Integration Services sends a **rollback transaction**. If all remote servers respond with no error, Component Integration Services notifies the Adaptive Server that it can begin to roll back local work.

  This process applies to version 10.0 or later, but not to the following servers represented by server class *sql_server* is:

  - Pre-version 10.0 SQL Server
  - Microsoft SQL Server (any version)
  - Sybase IQ

  For these types of servers, transaction handling is similar to server class *db2*, described below.

Server Class *direct_connect*

- Transaction processing for servers in class *direct_connect* is identical to that of server class *sql_server* (version 10.0 or later).

Server Class *db2*

- Transactions are supported only at the statement level for servers in class *db2*. When the internal state of a client connection indicates that there is an active transaction, Component Integration Services precedes each **insert**, **update** and **delete** command with a **begin transaction** command. It then issues a **commit** or **rollback transaction** (depending on the success or failure of the statement) immediately after the statement is complete.

Object type = file

- *files* are not part of transaction management. They can not be committed or rolled back.

Object type = directory

- *directories* are not part of transaction management. They can not be committed or rolled back.

See also

See Also

rollback in the *Adaptive Server Reference Manual*.

select

Description

Retrieves rows from database objects.

Syntax

```
select [all | distinct] select_list
 [into [[database.]owner.]table_name]
 [from [[database.]owner.]{view_name|table_name
  [(index index_name [ prefetch size ][lru|mru])]}
        [holdlock | noholdlock] [shared]
     [,[[database.]owner.]{view_name|table_name
  [(index index_name [ prefetch size ][lru|mru])]}
        [holdlock | noholdlock] [shared]]... ]

 [where search_conditions]

 [group by [all] aggregate_free_expression
    [, aggregate_free_expression]... ]
 [having search_conditions]

 [order by
 {[[[database.]owner.]{table_name.|view_name.}]
     column_name | select_list_number | expression}
        [asc | desc]
 [,{[[[database.]owner.]{table_name|view_name.}]
     column_name | select_list_number | expression}
        [asc | desc]]...]

 [compute row_aggregate(column_name)
        [, row_aggregate(column_name)]...
     [by column_name [, column_name]...]]

 [for {read only | update [of column_name_list]}]

 [at isolation {read uncommitted | read committed |
            serializable}]

 [for browse]
[plan "abstract plan"]
```

Usage

Usage

- Component Integration Services processes the **select** command when any table on which it operates has been created as a proxy table. When possible, Component Integration Services forwards the entire syntax of a **select** command to a single remote server. This is referred to as *quickpass mode*.
- When Component Integration Services forwards the **select** command to a remote server, the table name used is the remote table name, and the column names used are the remote column names.

- The following keywords are ignored for all servers except Sybase System 10 and later versions of Adaptive Server Enterprise, but they do not prevent Component Integration Services from using quickpass mode:
  - **lock**
  - **index**
  - **parallel**
  - **prefetch size**
  - **holdlock**
  - **noholdlock**
  - **readpast**
  - **shared**
  - **at isolation**
- The following keywords are never forwarded to a remote server and they do prevent Component Integration Services from using quickpass mode:
  - **compute by**
  - **for browse**
  - **into**
  - **plan "abstract plan"**
- Quickpass mode is not used if any of the following conditions exist:
  - All tables referenced in the **from** clause do not reside on the same remote server
  - Any tables are local (including temporary tables)
  - The query contains syntax that the remote server does not support
- **select** commands in a **union** operation can all be forwarded to a remote server, including the **union** operator, if all tables in the **select** commands reside on the same remote server.

- If the **select** command returns a sorted result set involving a character column from a remote server (for example, in a **union** operation, a **group by** clause, or an **order by** clause), the rows may be returned in an unexpected sort order if the remote server is configured with a different sort order than Adaptive Server. You can rerun the query with traceflag 11216 turned on to receive the expected sort order. This traceflag is global and should be turned off as soon as the query is executed.

Server Class *ASEnterprise*

- All syntax is supported. Since the remote server is assumed to have all capabilities necessary to process Transact-SQL syntax, all elements of a **select** command, except those mentioned above, are forwarded to a remote server, using quickpass mode.
- A bulk copy transfer is used to copy data into the new table when a **select...into** command is issued and the **into** table resides on a remote Adaptive Server. Both the local and remote databases must be configured with **dboption** set to **select into / bulkcopy.**

Server Class *ASAnywhere*

- All syntax is supported. Since the remote server is assumed to have all capabilities necessary to process Transact-SQL syntax, all elements of a **select** command, except those mentioned above, are forwarded to a remote server, using quickpass mode.
- If the **select...into** format is used and the **into** table is accessed through the *ASAnywhere* interface, bulk inserts are not used. Instead, Component Integration Services uses Client-Library to prepare a parameterized dynamic **insert** command, and executes it for each row returned by the **select** portion of the command.

Server Class *ASIQ*

- All syntax is supported. Since the remote server is assumed to have all capabilities necessary to process Transact-SQL syntax, all elements of a **select** command, except those mentioned above, are forwarded to a remote server, using quickpass mode.
- If the **select...into** format is used and the **into** table is accessed through the *db2* interface, bulk inserts are not used. Instead, a separate connection is used to handle the text of a CIS-generated **insert** command.

Server Class *sql_server*

- All syntax is supported. Since the remote server is assumed to have all capabilities necessary to process Transact-SQL syntax, all elements of a **select** command, except those mentioned above, are forwarded to a remote server, using quickpass mode.
- A bulk copy transfer is used to copy data into the new table when a **select...into** command is issued and the **into** table resides on a remote Adaptive Server. Both the local and remote databases must be configured with **dboption** set to **select into / bulkcopy.**

Server Class *direct_connect*

- The first time Component Integration Services requires a connection to a server in class *direct_connect*, a request for capabilities is made of the DirectConnect. Based on the response, Component Integration Services determines the parts of a **select** command to forward to the DirectConnect. In most cases, this is determined by the capabilities of the DBMS with which the DirectConnect is interfacing.
- If the entire statement cannot be forwarded to the DirectConnect using quickpass mode, Component Integration Services compensates for the functionality that cannot be forwarded. For example, if the remote server cannot handle the **order by** clause, quickpass is not used and Component Integration Services performs a sort on the result set.
- Component Integration Services passes data values as parameters to either a cursor or a dynamic SQL statement. Language statements can also be used if the DirectConnect supports it. The parameters are in the datatype native to Adaptive Server and must be converted by the DirectConnect into formats appropriate for the target DBMS.
- The **select...into** command is supported, but the table must have a unique index if the table has text or image columns.
- If the **select...into** format is used and the **into** table is accessed through a DirectConnect, bulk inserts are not used. Instead, Component Integration Services uses Client-Library to prepare a parameterized dynamic **insert** command, and executes it for each row returned by the **select** portion of the command.

Server Class *db2*

- By default, Component Integration Services does not forward syntax involving **order by**, **group by**, **union**, **distinct**, **all**, and expressions that involve more than column names.

- When you turn traceflag 11215 on, the full capabilities of a DB2 database are assumed, and Component Integration Services forwards as much syntax to the remote server (gateway) as DB2 can process, including **order by**, **group by**, **union**, and so forth.

See also

See Also

select in the *Adaptive Server Reference Manual*.

set

Description

Sets Adaptive Server query processing options for the duration of the user's work session. The subset of options listed below affects behavior unique to Component Integration Services. For a complete list of options, see the *Adaptive Server Reference Manual*.

Syntax

set cis_rpc_handling {on | off}

set strict_dtm_enforcement {on | off}

set transaction_isolation_level {on | off}

set transactional_rpc {on | off}

set textptr_parameters {on | off}

set textsize *value*

Usage

Usage

- Normally, all outbound RPCs are routed through Adaptive Server's site handler. These RPCs cannot participate in any transactions, and the performance characteristics of routing many RPCs through the site handler may necessitate the use of an alternate method for RPC handling.
- Component Integration Services provides an alternate means of handling outbound RPCs. If **cis_rpc_handling** is **on**, outbound RPCs are routed through a Client-Library connection that is persistent through the life of the client's connection to the Adaptive Server. This means that any number of RPCs can be routed through the same connection, without a connect and disconnect between each RPC. This connection is the same connection used by Component Integration Services to handle all interaction with the remote server, including processing of **select**, **insert**, **delete** and **update** commands.
- The client application issues **set cis_rpc_handling on** or **off** to control whether an outbound RPC is to be routed through the Adaptive Server's site handler or through a Component Integration Services connection. If **cis_rpc_handling** is **on**, Component Integration Services processes the RPC request; if **cis_rpc_handling** is **off**, the site handler processes the RPC.
- When a client application makes a new connection to Adaptive Server, the connection inherits the setting for the configuration parameter **cis rpc handling** (default is **off**). This determines the default handling for outbound RPCs.

strict_dtm_enforcement

- If this property is ON, then transactions that involve participants that are not DTM-enabled servers (i.e. non-ASE 12.0 servers) are aborted.
- The default is OFF, in which case the behavior of transaction management for remote servers is “best-effort”, which is compatible with prior release behavior.

transaction_isolation_level

- The isolation level state between the local thread and the thread created by the connection to the remote server is maintained. If the isolation level changes, then the state is synchronized between the local and remote servers by sending the appropriate set transaction_isolation_level command.
- This state synchronization is only performed for connections to servers in class *ASEnterprise*.

transactional_rpc

- Setting **transactional_rpc on** results in the same behavior as setting **cis_rpc_handling on**, except that RPCs that are issued outside of a transaction will continue to be routed through the site handler if **cis_rpc_handling** is off.

textptr_parameters

- This command will affect the behavior of parameters to RPCs that are managed by CIS.
- Any RPC parameter that is of type binary(16) or varbinary(16) is assumed to be a **textptr** if the setting for **textptr_parametrs** is **on** - only if the binary parameter is preceded by a char or varchar parameter that contains a string reference to a table that was the source of the **textptr** (Please refer to the discussion of **textptr_parameter** handling in Chapter 3 of this book).
- The **textptr** is expanded into as many 32k chunks of text as are needed to contain the full text value, and sent to the remote server as CS_LONGCHAR parameters if the remote server supports the TDS LONGCHAR data type. If this type is not supported, then the expansion is disabled, and the setting of **textptr_parameters** is assumed to be **off**.

See also

See Also

set in the *Adaptive Server Reference Manual*.

setuser

Description	Allows a Database Owner to impersonate another user.
Syntax	setuser ["*user_name*"]
Usage	Usage

- The Database Owner uses the **setuser** command to adopt the identity of another user in order to use another user's database objects. When using Component Integration Services, these objects can be either local or remote.
- Component Integration Services processes the **setuser** command—it does *not* forward the command to the remote server. Component Integration Services drops all current connections that have been made on behalf of the current user.
- The **setuser** command cannot be executed when a transaction is current.
- Permissions that are set on a remote server override permissions set by Component Integration Services. Component Integration Services cannot change permissions of a user on a remote server.
- Prior to using the **setuser** command, the user to be impersonated must have an external login mapped to the remote server. This is set by the **sp_addexternlogin** system procedure (for more information on **sp_addexternlogin**, see the *Adaptive Server Reference Manual*).

See also	See Also

setuser in the *Adaptive Server Reference Manual*.

truncate table

Description

Removes all rows from a table.

Syntax

truncate table [[*database*.]*owner*.]*table_name*

Usage

Comments

- Component Integration Services processes the **truncate table** command when the table on which it operates has been created as a proxy table.
- When Component Integration Services forwards the **truncate table** command to a remote server, the table name used is the remote table name. This name may not be the same as the local proxy table name.

Server Class *ASEnterprise*

- Component Integration Services forwards the **truncate table** command to servers of class *ASEnterprise*.

Server Class *ASAnywhere*

- Component Integration Services forwards the **truncate table** command to servers of class *ASAnywhere*.

Server Class *ASIQ*

- Component Integration Services forwards the **truncate table** command to servers of class *ASIQ*.

Server Class *sql_server*

- Component Integration Services forwards the **truncate table** command to servers of class *sql_server*.

Server Class *direct_connect* and *sds*

- If the remote server has requested DB2 syntax, the following statement is forwarded:

  delete from [*owner*.]*table_name*

  Otherwise, Transact-SQL syntax is sent:

  truncate table [[*database*.]*owner*.]*table_name*

Server Class *db2*

- The following syntax is forwarded to the remote server:

  delete from [*owner*.]*table_name*

See also

truncate table in the *Adaptive Server Reference Manual*.

update

Description

Changes data in existing rows, either by adding data or by modifying existing data.

Syntax

```
update [[database.]owner.]{table_name | view_name}
 set [[[database.]owner.]{table_name.|view_name.}]
    column_name1 =
       {expression1|NULL|(select_statement)}
    [, column_name2 =
       {expression2|NULL|(select_statement)}]...
 [from [[database.]owner.]{view_name|table_name
[(index index_name [ prefetch size ][lru|mru])]}

     [,[[database.]owner.]{view_name|table_name
[(index index_name [ prefetch size ][lru|mru])]}]
 ...]
 [where search_conditions]
```

```
update [[database.]owner.]{table_name | view_name}
 set [[[database.]owner.]{table_name.|view_name.}]
    column_name1 =
       {expression1|NULL|(select_statement)}
    [, column_name2 =
       {expression2|NULL|(select_statement)}]...
 where current of cursor_name
```

Usage

- Component Integration Services processes the **update** command when the table on which it operates has been created as a proxy table. Component Integration Services forwards the entire request (or part of it) to the server that owns the actual object.
- The **update** command specifies the row or rows you want to change, and the new data. The new data can be a constant, an expression, or data pulled from other tables.
- Component Integration Services executes the **update** command using one of two methods:
  - The entire command is forwarded to the remote server as a single statement in close to its original syntax. If the syntax and remote capabilities match, the entire statement is forwarded and processed remotely. This is referred to as *quickpass mode*.
  - If the entire command cannot be forwarded to a remote server, Component Integration Services declares and opens one or more cursors in update mode, and begins a scan on the remote table. Each cursor forwards as much of the original statement's predicates to the remote server as possible. For each row fetched that meets the search criteria, a positioned update is executed.

- When Component Integration Services forwards the **update** command to a remote server, the table name used is the remote table name, and the column names used are the remote column names. These names may not be the same as the local proxy table names.
- Component Integration Services generally passes the original **update** syntax to remote servers as a single statement, but the following conditions will likely cause the statement to be executed using method 2, above:
  - The statement contains multiple tables that are not located in the same remote server
  - The statement contains local tables (including temporary tables)
  - The statement contains certain referential integrity checks
  - The statement contains system functions in the predicate list
  - The statement contains syntax that the remote server does not support
- The following keywords are ignored and do not prevent Component Integration Services from using quickpass mode:
  - **prefetch**
  - index
  - lru | mru
- The format involving **where current of** is never forwarded to a remote server and causes the statement to be executed using method 2 above.

Server Class *ASEnterpriser*

- If Component Integration Services cannot pass the entire statement to a remote server, a unique index must exist on the table.
- The **update** command is fully supported for all datatypes except text and image. text and image data cannot be changed with the **update** command, except when setting the text or image value to null. Use the **writetext** command instead.
- If *quickpass mode* is not used, data is retrieved from the source tables, and the values in the target table are updated using a separate cursor designed for handling a positioned **update**.

Server Class *ASAnywhere*

- Handling of the **update** statement is the same as for *ASEnterprise*.

Server Class *ASIQ*

- Handling of the **update** statement is the same as for *ASEnterprise*.

Server Class *sql_server*

- Handling of the **update** statement is the same as for *ASEnterprise*.

Server Class *direct_connect*

- The following syntax is supported by servers of class *direct_connect*:

  ```
  update [[database.]owner.]{table_name | view_name}
   set [[[database.]owner.]{table_name.|view_name.}]
      column_name1 =
         {expression1|NULL|(select_statement)}
      [, column_name2 =
         {expression2|NULL|(select_statement)}]...

      [where search_conditions]
  ```

  update commands that conform to this syntax use quickpass mode, if the capabilities response from the remote server indicates that all elements of the command are supported. Examples of negotiable capabilities include: subquery support, **group by** support, and built-in support.

- If the remote server does not support all elements of the command, or the command contains a **from** clause, Component Integration Services issues a query to obtain the values for the **set** clause, and then issues an **update** command to the remote server.

- Component Integration Services passes data values as parameters to either a cursor or a dynamic SQL statement. Language statements can also be used if the DirectConnect supports it. The parameters are in the datatype native to Adaptive Server and must be converted by the DirectConnect into formats appropriate for the target DBMS.

Server Class *db2*

- The following syntax is supported by servers of class *db2*:

  ```
  update [[database.]owner.]{table_name | view_name}
   set [[[database.]owner.]{table_name.|view_name.}]
      column_name1 =
         {expression1|NULL|(select_statement)}
      [, column_name2 =
         {expression2|NULL|(select_statement)}]...

      [where search_conditions]
  ```

- Server's of class *db2* do not contain the capabilities negotiation features of server class *direct_connect*, so the syntax passed to the remote server is simpler than that allowed by Transact-SQL. The syntax does not contain the following:

- Search conditions containing subqueries, **group by**, or **order by** clauses
- Transact-SQL built-in functions
- Transact-SQL operators (such as bitwise operators)
- Syntax not allowed by DB2

Component Integration Services processes the **update** command using method 2, described above, when the statement is complex.

- If the server is a DB2 system, use traceflag 11215 to instruct Component Integration Services that the remote server is capable of handling all DB2 syntax. This assumption is not made automatically because not all gateways using the *db2* server class are actually connected to DB2 systems. When trace flag 11215 is turned on, *quickpass mode* is used unless the following conditions exist:
  - The statement cannot be expressed in DB2 syntax
  - The statement contains outer joins
  - The statement contains **like** clauses with Sybase extensions
  - The statement contains built-in functions that are not supported by DB2
- When an **update** statement contains a **select** statement, Component Integration Services issues a query to obtain the values for the **set** clause, and then issues an **update** command to the remote server, unless trace flag 11215 is enabled.
- When an **update** statement contains a **from** clause, Component Integration Services issues a query to obtain the values for the **set** clause, and then issues an **update** command to the remote server.

See also **update** in the *Adaptive Server Reference Manual*.

update statistics

Description

Updates information about the distribution of key values in specified indexes. Also updates row count information.

Syntax

update statistics *table_name* [*index_name*]

Usage

- When the **update statistics** command is issued against a proxy table, Component Integration Services provides meaningful statistics on the remote table and the given index or on all indexes if no index is specified. The results are used to construct a distribution page for each index. This distribution page is stored in the database. When a new distribution page is created for an index, any previous distribution page for that index is freed.
- Using **update statistics**, Component Integration Services creates extremely accurate distribution statistics for remote tables. This information is used to determine the optimal join order, giving Component Integration Services the ability to generate optimal queries against remote databases which may not support cost-based query optimization.
- When Component Integration Services forwards the command to a remote server, the table name used is the remote table name, and the column names used are the remote column names. These names may not be the same as the local proxy table names.
- Obtaining information on an index, and especially on a number of indexes, can be time consuming on large tables. Trace flag 11209 can be used to indicate that **update statistics** is to obtain row count only. When this flag is on, previous distribution pages for indexes are not replaced.
- Component Integration Services retrieves row count information even if no indexes exist.

Server Class *ASEnterprise*

- If the table on which the statistics are requested has no indexes, Component Integration Services issues the following command:

  select count(*) from *table_name*

  It is also the only command issued when trace flag 11209 is on.
- If the table has an index and the index is specified in the command, Component Integration Services issues the following commands:

  select count(*) from *table_name*

```
select count(*) column_name [,column_name, ...]
 from table_name
 group by column_name [,column_name, ..]
```

The column name(s) represent the column or columns that make up the index.

For example, when the following command is issued:

```
update statistics customers ind_name
```

Component Integration Services issues:

```
select count(*) from customers

select count(*) last_name, first_name
 from customers
 group by last_name, first_name
```

- If the table has one or more indexes but no index is specified in the statement, Component Integration Services issues the **select count (*)** once, and the **select/order by** commands for each index.

Server Class *ASAnywhere*

- The processing of **update statistics** in this server class is identical to that of server class *ASEnterprise* described above.

Server Class *ASIQ*

- The processing of **update statistics** in this server class is identical to that of server class *ASEnterprise* described above.

Server Class *sql_server*

- The processing of **update statistics** in this server class is identical to that of server class *ASEnterprise* described above.

Server Class *direct_connect*

- The processing of **update statistics** in this server class is identical to that of server class *ASEnterprise* described above.
- If the direct_connect indicates that is cannot handle the **group by** or the **count(*)** syntax, statistics are not collected for the direct_connect.

Server Class *db2*

- The processing of **update statistics** in server class *db2* is identical to that of server class ASEnterprise described above.

See also

update statistics in the *Adaptive Server Reference Manual.*

writetext

Description

Permits non-logged, interactive updating of an existing text or image column.

Syntax

writetext [[*database*.]*owner*.]*table_name.column_name*
text_pointer [with log] *data*

Usage

- Component Integration Services processes the **writetext** command when the table on which it operates has been created as a proxy table.
- If the remote server referenced by the proxy table does not support text pointers, **writetext** is not supported.
- To process the **writetext** command, Component Integration Services issues the following Client Library commands using the connection established to the remote server:

  ```
  ct_command(command, CS_SEND_DATA_CMD, NULL,
   CS_UNUSED, CS_COLUMN_DATA);
  ct_data_info(command, CS_SET, CS_UNUSED, iodesc)
  ct_send_data(command, (CS_VOID *) start, length)
  ```

Server Class *ASEnterprise*

- The **writetext** command is processed using a separate connection to the remote server.

Server Class *ASAnywhere*

- The **writetext** command is processed using a separate connection to the remote server.

Server Class *ASIQ*

- The **writetext** command is processed using a separate connection to the remote server.

Server Class *sql_server*

- The **writetext** command is processed using a separate connection to the remote server.

Server Class *direct_connect*

- If the DirectConnect supports text pointers, Component Integration Services treats the DirectConnect as if it were a server in class *sql_server*.

Server Class *db2*

- **writetext** is not supported for tables owned by servers in this class.

See also

writetext in the *Adaptive Server Reference Manual*.

APPENDIX A

Tutorial

This chapter provides a beginner's tutorial for setting up Component Integration Services and accessing a remote server.

Getting Started with Component Integration Services

This section is intended to help first-time users get Component Integration Services running quickly. It provides a step-by-step guide to configuring the server to access remote data sources. It includes instructions for:

- Adding a remote server
- Mapping remote objects to local proxy tables
- Performing joins between remote tables

Routine system administration tasks such as starting and stopping Adaptive Server, creating logins, creating groups, adding users, granting permissions, and password administration are explained in the Adaptive Server documentation.

Adding a Remote Server

You can use the server to access data on remote servers. Before you can do this, you must configure Component Integration Services.

Follow these steps to configure the server to access remote data:

Overview of the Procedure

1 Add the remote server to the interfaces file, using the **dsedit** or **dscp** utility.

2 Add the name, server class, and network name of the remote server to system tables, using the system procedure **sp_addserver**.

3 Assign an alternate login name and password, using the system procedure **sp_addexternlogin**. This step is optional.

Step 1: Add the Remote Server to the Interfaces File

Use the **dsedit** or **dscp** utility to edit the interfaces file located in the *$SYBASE* directory on the UNIX platform:

- In UNIX, the interfaces file is called *interfaces.*
- In Windows NT, the interfaces file is called *sql.ini.*

For a complete discussion of the interfaces file, see the Adaptive Server configuration guide for your platform.

Step 2: Create Server Entries in System Tables

Use the system procedure **sp_addserver** to add entries to the *sysservers* table. **sp_addserver** creates entries for the local server and an entry for each remote server that is to be called. The **sp_addserver** syntax is:

sp_addserver *server_name [,server_class [,network_name]]*

where:

- *server_name* is the name used to identify the server. It must be unique.
- *server_class* is one of the supported server classes. Server classes are defined in Chapter 4, "Server Classes." The default value is *sql_server*. If *server_class* is set to **local**, *network_name* is ignored.
- *network_name* is the server name in the interfaces file. This name may be the same as *server_name*, or it may differ. The *network_name* is sometimes referred to as the *physical name*.

Example

The following examples create entries for the local server named DOCS and for the remote server CTOSDEMO with server class *sql_server*.

```
sp_addserver DOCS, local
sp_addserver CTOSDEMO, sql_server, CTOSDEMO
```

Step 3: Add an Alternate Login and Password

Use the system procedure **sp_addexternlogin** to assign an alternate login name and password to be used when communicating with a remote server. This step is optional. The syntax for **sp_addexternlogin** is:

sp_addexternlogin *remote_server*, *login_name*, *remote_name* [, *remote_password*]

where:

- *remote_server* is the name of the remote server. The *remote_server* must be known to the local server by an entry in the *master.dbo.sysservers* table.
- *login_name* is an account known to the local server. *login_name* must be represented by an entry in the *master.dbo.syslogins* table. The "sa" account, the "sso" account, and the *login_name* account are the only users authorized to modify remote access for a given local user.
- *remote_name* is an account known to the *remote_server* and must be a valid account on the node where the *remote_server* runs. This is the account used for logging into the *remote_server*.
- *remote_password* is the password for *remote_name*.

Examples

```
sp_addexternlogin FRED, sa, system, sys_pass
```

Allows the local server to gain access to remote server FRED using the remote name "system" and the remote password "sys_pass" on behalf of user "sa".

```
sp_addexternlogin OMNI1012, bobj, jordan, hitchpost
```

Tells the local server that when the login name "bobj" logs in, access to the remote server OMNI1012 is by the remote name "jordan" and the remote password "hitchpost". Only the "bobj" account, the "sa" account, and the "sso" account have the authority to add or modify a remote login for the login name "bobj".

Verifying Connectivity

Use the **connect to** *server_name* command to verify that the configuration is correct. **connect to** requires that "sa" explicitly grant connect authority to users other than "sa." The **connect to** command establishes a passthrough mode connection to the remote server. This passthrough mode remains in effect until you issue a **disconnect** command.

Mapping Remote Objects to Local Proxy Tables

Location transparency of remote data is enabled through remote object mapping.

Once a remote server has been properly configured, users can reference the remote objects that have been defined. Users can create new tables on remote servers and can define the schema for an existing table on a remote server.

Overview of the Procedure

1 Use the stored procedure **sp_addobjectdef** to define the storage location of a remote object.

2 Use the **create table** or the **create existing table** command to map the remote table schema to the server.

Step 1: Define the Storage Location of a Remote Object

The **at pathname** syntax used with **create existing table** command is the preferred method for defining the storage location of remote objects. The following method using **sp_addobjectdef** is also supported.

The stored procedure **sp_addobjectdef** defines the storage location of a remote object. This procedure allows the user to associate a remote object name with a local table name. The remote object may or may not exist before the storage location is defined. The syntax for **sp_addobjectdef** is:

sp_addobjectdef *object_name,* "*object_loc*" [,"*object_type*"]

where:

- *object_name* is the local proxy table name to be used by subsequent statements. *object_name* takes the form:

  ```
  dbname.owner.object
  ```

  where *dbname* and *owner* are optional and represent the local database and owner name. If not present, the object is defined in the current database owned by the current owner. If either *dbname* or *owner* is specified, the entire *object_name* must be enclosed in quotes. If only *dbname* is present, a placeholder is required for *owner*.

- *object_loc* is the storage location of the remote object. It takes the form:

  ```
  server_name.dbname.owner.object;aux1.aux2
  ```

  where:

  - *server_name* is the name of the server that contains this remote object (required.)

- *dbname* is the name of the database managed by the remote server that contains this object (optional). If the server is class *db2*, this is the *location_name* portion of a DB2 table name.
- *owner* is the name of the remote server user that owns the remote object (optional). If the server is class *db2*, this is the DB2 authorization ID.
- *object* is the name of the remote table, view, or rpc.
- *aux1*.*aux2* is a string of characters that is passed to the remote server during a **create table** or **create index** command as the segment name; the meaning of this string is dependent upon the class of the server that receives it. If the server is class *db2*, *aux1* is the DB2 database in which to place the table, and *aux2* is the DB2 tablespace in which to place the table. *aux1*.*aux2* is optional.

- *object_type* is the type of remote object. It can be a table, view, file, or rpc. This parameter is optional; the default is **table**.

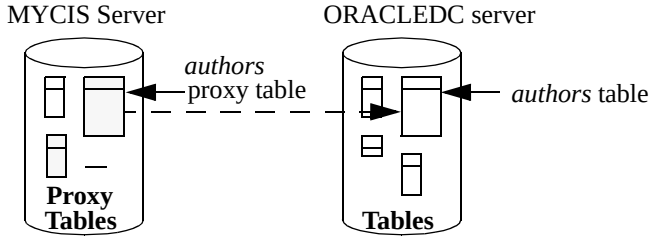
  When present, the *object_type* option must be enclosed in quotes.

Example

To map the proxy table *authors* to the remote *authors* table, use the following syntax for the database shown in Figure A-1:

```
sp_addobjectdef authors, "ORACLEDC...authors", "table"
```

Figure A-1: Using sp_addobjectdef to map a remote table to a proxy table



Step 2: Map Remote Table Schema to Adaptive Server

Once you have defined the storage location, you can create the table as a new object or as an existing object. If the table does not exist at the remote storage location, use the **create table** syntax. If it already exists, use the **create existing table** syntax. If the object type is **rpc**, only the **create existing table** syntax is allowed.

When a **create existing table** statement is received and the object type is either **table** or **view**, the existence of the remote object is checked using the catalog stored procedure **sp_tables**.

If the object exists, column and index attributes are obtained and compared with those defined for the object in the **create existing table** command. The server checks the column name, type, length and null property and adds index attributes to the *sysindexes* system table.

Once the object has been created, either as a new or existing object, users can query the remote object by using the local proxy name.

See **create table** and **create index in** the *Adaptive Server Reference Manual*.

Join Between Two Remote Tables

With Component Integration Services, you can perform joins across remote tables. The following steps show how to join two Adaptive Server tables:

Overview of the Procedure

1 Add the remote servers to the interfaces file.

2 Define each remote server using **sp_addserver**.

3 Map the remote tables to the server using **create existing table**.

4 Perform the join using **select**.

Step 1: Add the Remote Servers to the Interfaces File

Edit the interfaces file using the **dsedit** utility.

Step 2: Define the Remote Servers

Use the system procedure **sp_addserver** to add entries to the *sysservers* system table. On the server originating the call, there must be an entry for each remote server that is to be called. The **sp_addserver** syntax is:

sp_addserver *server_name [,server_class] [,network_name]*

where:

- *server_name* is the name used to identify the server. It must be unique.

- *server_class* is one of the supported server classes, defined in Chapter 4, "Server Classes." The default value is **sql_server**. If the value is *local*, *network_name* is ignored.
- *network_name* is the server name in the interfaces file. This name may be the same as the *server_name* specification, or it may be different. If *network_name* is not provided, the default value is the *server_name*.

Example

The following examples create entries for the local server named DOCS and for the remote server SYBASE of class *sql_server*.

```
sp_addserver DOCS, local
sp_addserver CTOSDEMO, sql_server, SYBASE
```

Step 4: Map the Remote Tables to Adaptive Server

The **create existing table** command enables the definition of existing (proxy) tables. The syntax for this option is similar to the **create table** command and reads as follows:

```
create existing table table_name (column_list)
 [ on segment_name ]
at "pathname"
```

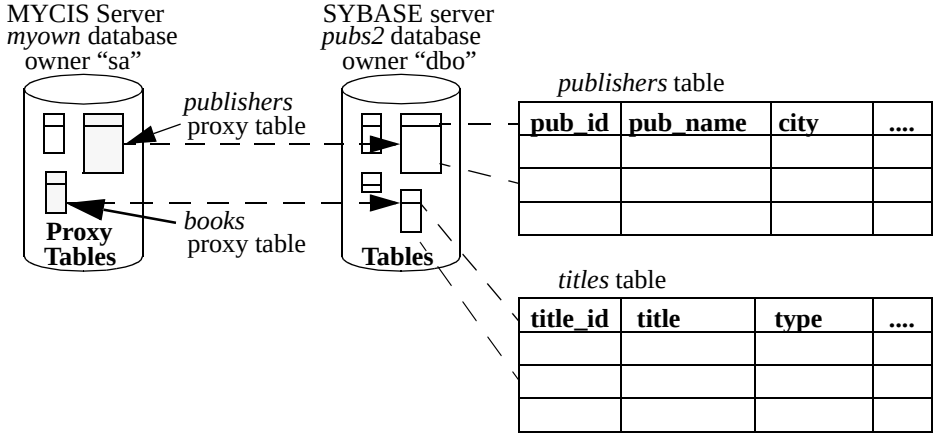
When the server processes this command, it does not create a new table. Instead, it checks the table mapping and verifies the existence of the underlying object. If the object does not exist (either host data file or remote server object), the server rejects the command and returns an error message to the client.

After you define an existing table, it is good practice to issue an **update statistics** command for that table. This helps the query optimizer make intelligent choices regarding index selection and join order.

Example

Figure A-2 illustrates the remote Adaptive Server tables *publishers* and *titles* in the sample *pubs2* database mapped to a local server.

Figure A-2: Defining remote tables in a local server



Mapping the Remote Tables

The steps required to produce the mapping illustrated above are as follows:

1 Define a server named SYBASE. Its server class is *sql_server*, and its name in the interfaces file is SYBASE:

```
exec sp_addserver SYBASE, sql_server, SYBASE
```

2 Define a remote login alias. This step is optional. User "sa" is known to remote server SYBASE as user "sa," password "timothy":

```
exec sp_addexternlogin SYBASE, sa, sa, timothy
```

3 Add an object definition for the remote *publishers* table:

```
exec sp_addobjectdef publishers,
"SYBASE.pubs2.dbo.publishers", "table"
```

4 Define the remote *publishers* table:

```
create existing table publishers
 (
 pub_id   char(4)   not null,
 pub_name varchar(40)null,
 city     varchar(20)null,
 state    char(2)   null
 )
at "SYBASE.pubs2.dbo.titles"
```

5 Define the remote *titles* table:

```
create existing table books
 (
```

```
title_id tid       not null,
title    varchar(80)not null,
type     char(12)  not null,
pub_id   char(4)   null,
price    money     null,
advance  money     null,
total_salesint     null,
notes    varchar(200)null,
pubdate  datetime  not null,
contract bit       not null
)
```

6 Update statistics in both tables to ensure reasonable choices by the query optimizer:

```
update statistics publishers
update statistics books
```

Step 5: Perform the Join

Use the **select** statement to perform the join.

```
select Publisher = p.pubname, Title = b.title
 from publishers p, books b
 where p.pub_id = b.pub_id
 order by p.pubname
```

APPENDIX B

Troubleshooting

This appendix provides troubleshooting tips for problems that you may encounter when using Component Integration Services. The purpose of this chapter is:

- To provide enough information about certain error conditions so that you can resolve problems without help from Technical Support
- To provide lists of information that you can gather before calling Technical Support, which will help resolve your problem quickly
- To provide you with a greater understanding of Component Integration Services

Error Messages and the *Troubleshooting Guide* should also be used for troubleshooting. While this appendix provides troubleshooting tips for most frequently asked Component Integration Services questions, *Error Messages* lists all error messages with a one-line recovery procedure; the *Troubleshooting Guide* provides tips on SQL Server problems that are not specific to Component Integration Services.

For the most up-to-date information on troubleshooting and technical tips, refer to Sybase's electronic services. See "Other sources of information" on page x.

Problems Accessing Component Integration Services

If you issue a command that accesses a remote object and Component Integration Services is not found, the following error message appears:

```
4050 cis extension not enabled or installed
```

Do the following:

- Verify that the **enable cis** configuration parameter is set to 1 by running:

  ```
  sp_configure "enable cis"
  ```

sp_configure returns the following row for the **enable cis** parameter:

```
name          min    max    config value  run value
 enable cis    0     1          1                  1
```

Both “config value” and “run value” should be 1. If both values are 0, set the **enable cis** configuration parameter to 1, and restart the server. Use the syntax:

```
sp_configure "enable cis" 1
```

If “config value” is 1 and “run value” is 0, the **enable cis** configuration parameter is set, but will not take effect until the server is restarted.

- Check the error log. If Component Integration Services loaded correctly, you will see the following line at the start of the error log:

  ```
  Distributed services option loaded.
  ```

  If there was a problem loading Component Integration Services, the message stating the problem is displayed instead. Contact Sybase Technical Support to correct the problem. (See “If You Need Help” on page 208.)

Problems Using Component Integration Services

This section provides tips on how to correct problems you may encounter when using Component Integration Services.

Unable to Access Remote Server

When you cannot access a remote server, the following error message is returned:

```
11206 Unable to connect to server server_name.
```

The message will be preceded by one of the following Client-Library messages:

```
Requested server name not found
Driver call to connect two endpoints failed
Login failed
```

The Client-Library message indicates why you cannot access the remote server as described in the following sections.

Requested Server Name Not Found

The server is not defined in the interfaces file when the following messages display:

```
Requested server name not found
11206 Unable to connect to server server_name.
```

When a remote server is added using the **sp_addserver** stored procedure, the interfaces file is not checked. It is checked the first time you try to make a connection to the remote server. To correct this problem, add the remote server to the interfaces file that is being used by Component Integration Services.

Driver Call to Connect Two Endpoints Failed

If the remote server is defined in the interfaces file, but no response was received from the connect request, the following messages are displayed:

```
Driver call to connect two endpoints failed
11206 Unable to connect to server server_name.
```

Check the following:

- Is your environment set up correctly?

  To test this, try to connect directly to the remote server using **isql** or a similar tool. Do this by following these steps:

  - Log into the machine where Component Integration Services is running.
  - Set the SYBASE environment variable to the same location that was used when Component Integration Services was started. Component Integration Services uses the interfaces file in the directory specified by the SYBASE environment variable, unless it is overridden in the *runserver* file by the **-i** argument.

    Note These first two steps are important to ensure that the test environment is the same environment that Component Integration Services was using when you could not connect to the remote server.

  - Use **isql** or a similar tool to connect directly to the remote server.

  If the environment is set up correctly and the connection fails, continue through this list. If the connection is made, there is a problem with the environment being used by Component Integration Services.

- Is the remote server up and running?

Log into the machine where the remote server is located to verify the server is running. If the server is running, continue through this list. If the server is hung, restart the server and try your query again.

- Is the entry for the remote server in the interfaces file correct:
  - Is the machine name the correct name for the machine the software is loaded on?
  - If the interfaces file is a text file, do the query and master lines start with a tab and not spaces?
  - Is the port number available? Check the *services* file in the */etc* directory to ensure that the port number is not reserved for another process.

    If the port is available, is it already in use? To determine this on UNIX, run the command:

    ```
    netstat -a
    ```

Login Failed

If the remote server is accessed, but the login name and password are not correct, the following messages display:

```
Login failed
11206 Unable to connect to server server_name.
```

Check to see if there is an external login established for the remote server by executing:

```
exec sp_helpexternlogin server_name
```

If no external login is defined, Component Integration Services uses the user login name and password that was used to connect to Adaptive Server. For example, if the user connected to Adaptive Server using the “sa” account, Component Integration Services uses the login name “sa” when making a remote connection. Unless the remote server is another Adaptive Server, the "sa" account probably does not exist, and an external login must be added using **sp_addexternlogin**.

If an external login is defined, verify that the user’s login name is correct. Remote server logins are case sensitive; for example, DB2 logins are all uppercase. Is the case correct for the user login name you are using and the entry in *externlogins*?

If the login name is correct, the password might be incorrect. It is not possible to display the password. If the user login name is incorrect or if the password might be incorrect, drop the existing external login and redefine it by executing the commands:

```
exec sp_dropexternlogin server_name, login_name
go
 exec sp_addexternlogin server_name, login_name,
remote_login, remote_password
go
```

Unable to Access Remote Object

When you are unable to access a remote object, the following error message appears:

```
Error 11214  Remote object object does not exist.
```

The problem may be in the local proxy table definition or in the table itself on the remote server.

Verify the following:

- Has the object been defined in Component Integration Services?

  To confirm, run:

  ```
  sp_help object_name
  ```

  If the object does not exist, create the object in Component Integration Services (see “Mapping Remote Objects to Local Proxy Tables” on page 3-4).

- If the object has been defined in Component Integration Services, is the definition correct?

  Table names can have four parts with the format *server.dbname.owner.tablename*. The *dbname* part is not valid for DB2, Oracle or InfoHUB servers.

  If the object definition is incorrect, delete it using **sp_dropobjectdef**, and define correctly using **sp_addobjectdef**.

- If the local object definition is correct, check the table on the remote server:

  - Are permissions set to allow access to both the database and table?
  - Has the database been marked suspect?

- Is the database available?
- Can you access the remote table using a native tool (for example, SQL on Rdb or SQL*Plus on Oracle)?

Problem Retrieving Data From Remote Objects

When you receive error messages pertaining to mismatches in remote objects, the Component Integration Services object definition does not match the remote object definition. This happens if:

- The object definition was altered outside of Component Integration Services
- An index was added or dropped outside of Component Integration Services

Object Is Altered Outside Component Integration Services

Once an object is defined in Component Integration Services, alterations made to an object at the remote server are not made to the local proxy object definition. If an object is altered outside of Component Integration Services, the steps to correct the problem differ, depending on whether **create existing table** or **create table** was used to define the object.

To determine which method was used to define the object, run the statement:

```
sp_help object_name
```

If the object was defined via the **create existing table** command, the following message is returned in the result set:

```
Object existed prior to CIS.
```

If this message is not displayed, the object was defined via the **create table** command.

If **create existing table** was used to create the table in Component Integration Services:

1 Use the **drop table** command in Component Integration Services.

2 Create the table again in Component Integration Services using **create existing table.** This creates the table using the new version of the table on the remote server.

If the table was created in Component Integration Services using **create table**, you will drop the remote object when you use **drop table**. To prevent this, follow these steps:

1 Rename the table on the remote server so the table is not deleted when you use **drop table**.

2 Create a table on the remote server using the original name.

3 Use **drop table** in Component Integration Services to drop the table in Component Integration Services and on the remote server.

4 Rename the saved table in step 1 with its original name on the remote server.

5 Create the table again in Component Integration Services using **create existing table.**

Warning! Do not use **drop table** in Component Integration Services prior to renaming the table on the remote server, or you will delete the table on the remote server.

A good rule to follow is to create the object on the remote server, and then do a **create existing table** to create the object in Component Integration Services. This enables you to correct mismatch problems with fewer steps and with no chance of deleting objects on the remote server.

Index Is Added or Dropped Outside CIS

Component Integration Services is unaware of indexes that are added or dropped outside Component Integration Services. Verify that the indexes used by Component Integration Services are the same as the indexes used on the remote server. Use **sp_help** to see the indexes used by Component Integration Services. Use the appropriate command on your remote server to verify the indexes used by the remote server. For example, you can use the **describe** command with an Oracle server or **select * from syscolumns, sysindexes** for a DB2 server.

If the indexes are not the same, the steps to correct the problem differ, depending on whether **create existing table** or **create table** was used to define the object.

To determine which method was used to define the object, run the statement:

```
sp_help object_name
```

If the object was defined via the **create existing table** command, the following message is returned in the result set:

```
Object existed prior to CIS.
```

If this message is not displayed, the object was defined via the **create table** command.

If **create existing table** was used to create the object:

1 Use **drop table** in Component Integration Services**.**

2 Re-create the table in Component Integration Services using **create existing table**. This will update the indexes to match the indexes on the remote table.

If **create table** was used to create the object:

1 Use **drop table** to drop the index from the remote table.

2 Re-create the index in Component Integration Services using **create index**. This creates the index in Component Integration Services and the remote server.

An alternative method if **create table** was used to define the object is to turn on trace flag 11208. This trace flag prevents the **create index** statement from transmitting to the remote server. To use trace flag 11208, follow these steps:

1 Turn on trace flag 11208:

```
dbcc traceon(11208)
```

2 Create the index using **create index**.

3 Turn off trace flag 11208:

```
dbcc traceoff(11208)
```

If You Need Help

If you encounter a problem that you cannot resolve using the manuals, ask the designated person at your site to contact Sybase Technical Support. Gather the following information prior to calling Technical Support to help resolve your problem more quickly.

- If a problem occurs while you are trying to access remote data, execute the same script against a local table. If the problem does not exist on the local table, it is specific to Component Integration Services and you should continue through this list.
- Find out what version of Component Integration Services you are using:

  ```
  select @@cis_version
  ```

- Note the SQL script that reproduces the problem. Include the script that was used to create the tables.
- Find the processing plan for your query. This is generated using **set showplan.** An example of this is:

  ```
  set showplan, noexec on
   go
   select au_lname, au_fname from authors
   where au_id = 'A1374065371'
   go
  ```

  The output for this query will look like this:

  ```
  STEP1
   The type of query is SELECT.
   FROM TABLE
   authors
   Nested iteration
   Using Clustered Index
  ```

  The **noexec** option compiles the query, but does not execute it. No subsequent commands are executed until **noexec** is turned off.
- Obtain the event logging when executing the query by turning on trace flags 11201 – 11205. These trace flags log the following:
  - 11201 – Client connect, disconnect, and attention events
  - 11202 – Client language, cursor declare, dynamic prepare, and dynamic execute-immediate text
  - 11203 – Client rpc events
  - 11204 – Messages routed to client
  - 11205 – Interaction with remote servers

  After executing the script with the trace flags turned on, the logging is found in the error log in the *$SYBASE/install* directory. For example:

  ```
  dbcc traceon (11201,11202,11203,11204,11205)
   go
  ```

```
select au_lname, au_fname from authors
where au_id = 'A1374065371'
go
dbcc traceoff (11201,11202,11203,11204,11205)
go
```

The error log output is as follows (the timestamps printed at the beginning of each entry have been removed to improve legibility):

```
server  LANGUAGE, spid 1: command text:
 select au_lname, au_fname from authors where au_id
= 'A1374065371'
 server  SIGDISABLE, spid 1: signals disabled on
endpoint 10
 server  RMT_CONNECT, spid 1: connected to server
'SYBASE', using language/charset
'us_english.iso_1', packet size 512
 server  SYB_TSCN, spid 1, server SYBASE:
 SELECT au_id, au_lname, au_fname FROM
pubs2.dbo.authors WHERE au_id = "A1374065371"
 server  OMNIENDS, spid 1: closing cursor 'O1_16'
 server  OMNICLOS, spid 1: deallocating cursor
'O1_16', type CONNECTION.
```

This tracing is global, so once the trace flags are turned on, any query that is executed will be logged; therefore, turn tracing off once you have your log. Also, clean out the error log periodically by bringing the server down, renaming the error log, and restarting the server. This creates a new error log.

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