NET-7 Planet

Network Optimization and Planning

Vital Information To Support Network Planning

NET-7 Planet provides a wealth of information that supports network planning. Traffic statistics feature an innovative presentation, designed around the day-to-day tasks of the network-planning engineer, from configuration checking to load analysis.

Traffic Statistics for Informed Network Planning

Network planning is driven through feedback. The network planning department maintains a model of the network. This model is continuously updated according to network configuration changes, including modification of routing tables, modification of Global Title translation rules, assignment of physical resources such as circuits and signaling links, provisioning of new network elements, and much more.

Network planning relies on traffic statistics, which provide information about the load and behavior of the network, as seen in Figure 1. This information is used to satisfy the targets set by the marketing department. These targets may include factors such as quality level, cost, coverage, and implementation of new services.

Once the changes are implemented, traffic statistics provide a feedback for the entire process – the actual result of configuration changes is measured, and then possible additional network optimization initiatives are undertaken.

The Advantages of an Independent Approach

Planet generates traffic statistics by relying on the non-intrusive capabilities of NET-7. This approach provides Planet with significant advantages over “built-in” measurements:

- **Independence –** No effects on network performance
- **Availability –** No need to activate the measurements in advance on a subset of the network
- **Scope –** Correlated information from throughout the network

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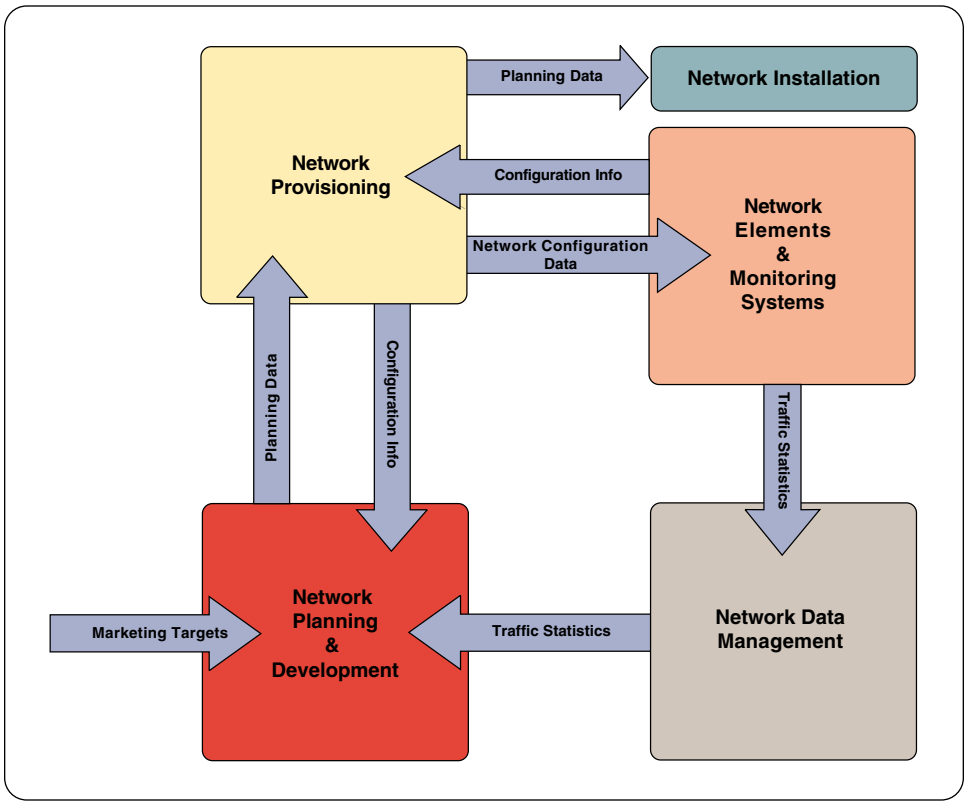
Benefits of Planet

Rightsizing

Network optimization relies on the experience of the network engineers and their ability to analyze and correlate the available data. NET-7 Planet automates this process, making it more precise and less prone to human error.

Traffic statistics are traditionally provided by the network elements. NET-7 Planet complements and surpasses these measurements by providing an analytical view of traffic flow across the network. Correlation of data from different parts of the network is necessary to achieve this level of visibility.

Planning and dimensioning of the network are based on the peak traffic values. For both signaling and voice traffic, NET-7 Planet reports the Busy Hour and Busy Quarter values as the more convenient parameters to analyze the traffic distribution.



▶ ***Figure 1.*** *The role of traffic statistics in network planning.*

Cost Reduction

Network planning activities are coordinated on different time scales and may involve the whole network or just a portion of it. Routing tables, for example, undergo daily configuration, while major optimization efforts resulting in provisioning of new transmission and/or switching equipment depend on longer-term observations. Planet automates the repetitive task of data collection and report generation, thus reducing the associated costs.

Troubleshooting

Network planning departments are also responsible for troubleshooting activities. Improper configuration of the network, such as a loop in a signaling route set, may cause severe problems. Network planning engineers benefit from NET-7 Planet's capability to highlight potential problems and to analyze their impact on the network behavior.

Planet/TR BSC-BSC Application

Traffic analysis on the A-interface is invaluable for network optimization. Unlike other network optimization tools, Planet/TR generates statistical information by correlating each and every call, network-wide, from origin to termination.

Traffic Matrix

NET-7 Planet's BSC-BSC application generates a full matrix of traffic indexes as seen in Figure 2:

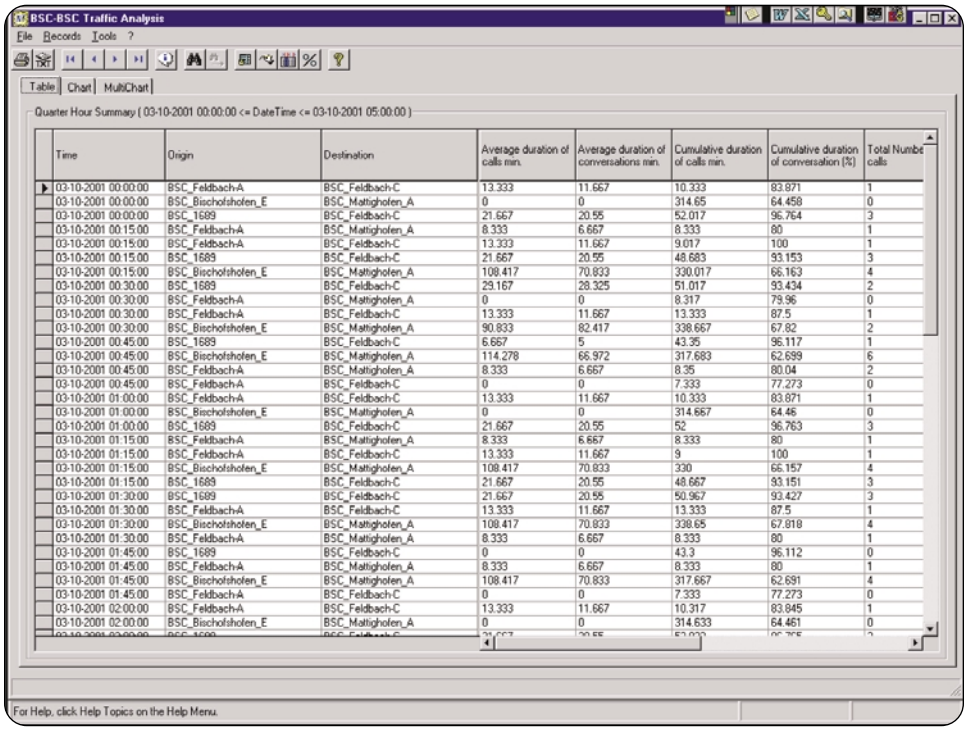
- Each row of the matrix represents the traffic originated in a BSC and terminated on another BSC

For every BSC, the following indexes are also generated:

- Traffic coming from other networks and terminated on home subscribers, split by interconnected operator
- Traffic directed to other networks, split by final destination network

Reports are organized in tables, according to the following timing choices:

- 15 minutes
- Same quarter-hour interval
- Daily summary
- Busy hour



▶ ***Figure 2.*** *BSC-BSC Traffic Matrix.*

Measurements

The application provides the following indexes:

- Traffic Load
- Total Number of Seizures
- Total Conversation Time
- Average Conversation Time
- ASR

Planet/TR Core Application

Planet/TR Core analyzes traffic routing between core network nodes, including MSC, VMS, Interconnection Gateway, and Transit Switch (see Figure 3). The planning engineer can feed the application with the ISUP routing tables used by the network elements and analyze in detail the volume and quality of the different traffic flows.

Analysis of Traffic Components

The analysis of traffic components is centered on each node, or observation point (see Figure 4). For each observation point, measurements are grouped in the following traffic categories:

- Terminating Traffic
- Originating Traffic
- Transit Traffic
- Mobile Internal Traffic (between the BSCs of an MSC)

Originating Traffic and Transit Traffic are further split into:

- (OPC, DPC) relations
- Destinations (B-number)

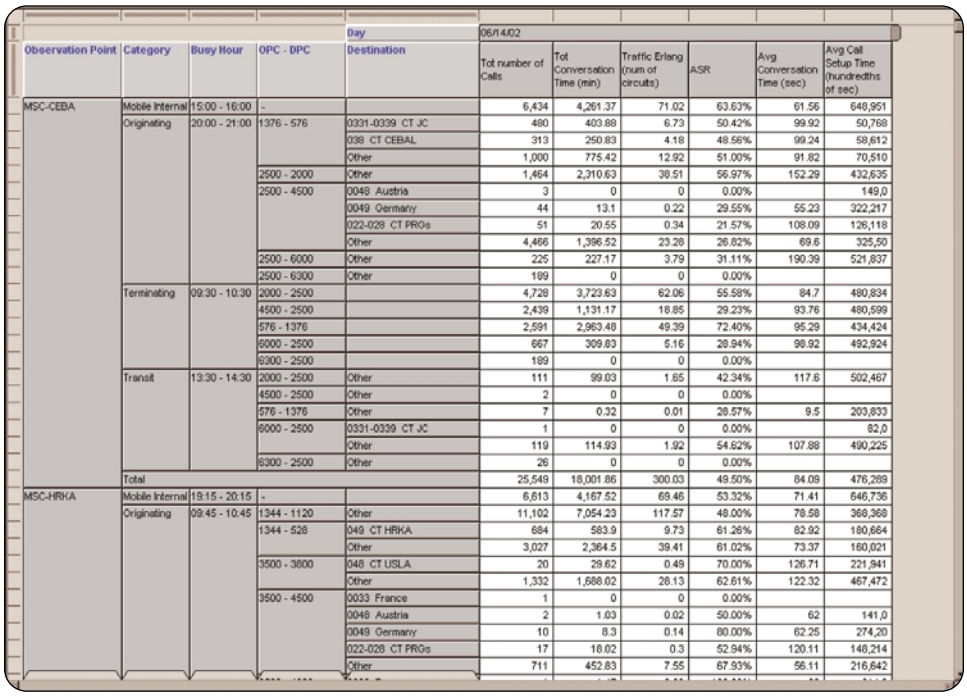
Terminating Traffic is further split into

- (OPC, DPC) relations

Measurements

The application provides the Busy Hour values of the following indexes:

- Traffic Load
- Total Number of Seizures
- Total Conversation Time
- Average Conversation Time
- Average Call Setup Time
- ASR



				Day	06/14/02					
Observation Point	Category	Busy Hour	OPC - DPC	Destination	Tot number of Calls	Tot Conversation Time (min)	Traffic Erlang (num of circuits)	ASR	Avg Conversation Time (sec)	Avg Call Setup Time (hundredths of sec)
MSC-CEBA	Mobile Internal	15:00 - 16:00	-		6,434	4,261.37	71.02	63.63%	61.56	648,951
	Originating	20:00 - 21:00	1376 - 576	0331-0339 CT JC	480	403.88	6.73	50.42%	99.92	50,768
				038 CT CEBAL	313	250.83	4.18	48.56%	99.24	58,612
				Other	1,000	775.42	12.92	51.00%	91.82	70,510
			2500 - 2000	Other	1,464	2,310.63	38.51	56.97%	152.29	432,635
			2500 - 4500	0048 Austria	3	0	0	0.00%		149,0
				0049 Germany	44	13.1	0.22	29.55%	55.23	322,217
				022-028 CT PROs	51	20.55	0.34	21.57%	108.09	126,118
				Other	4,466	1,396.52	23.28	26.82%	69.6	325,50
			2500 - 6000	Other	225	227.17	3.79	31.11%	190.39	521,837
			2500 - 6300	Other	189	0	0	0.00%		
	Terminating	09:30 - 10:30	2000 - 2500		4,728	3,723.63	62.06	55.58%	84.7	480,834
			4500 - 2500		2,439	1,131.17	18.85	29.23%	93.76	480,599
			576 - 1376		2,591	2,963.48	49.39	72.40%	95.29	434,424
			6000 - 2500		667	309.83	5.16	28.94%	98.92	492,924
			6300 - 2500		189	0	0	0.00%		
	Transit	13:30 - 14:30	2000 - 2500	Other	111	99.03	1.65	42.34%	117.6	502,467
			4500 - 2500	Other	2	0	0	0.00%		
			576 - 1376	Other	7	0.32	0.01	28.57%	9.5	203,833
			6000 - 2500	0331-0339 CT JC	1	0	0	0.00%		82,0
				Other	119	114.93	1.92	54.62%	107.88	490,225
			6300 - 2500	Other	26	0	0	0.00%		
	Total				25,549	18,001.86	300.03	49.50%	84.09	476,289
MSC-HRKA	Mobile Internal	19:15 - 20:15	-		6,613	4,167.52	69.46	53.32%	71.41	646,736
	Originating	09:45 - 10:45	1344 - 1120	Other	11,102	7,054.23	117.57	48.00%	78.58	368,368
			1344 - 528	049 CT HRKA	684	583.9	9.73	61.26%	82.92	180,664
				Other	3,027	2,364.5	39.41	61.02%	73.37	160,021
			3500 - 3800	048 CT USLA	20	29.62	0.49	70.00%	126.71	221,941
				Other	1,332	1,688.02	28.13	62.61%	122.32	467,472
			3500 - 4500	0033 France	1	0	0	0.00%		
				0048 Austria	2	1.03	0.02	50.00%	62	141,0
				0049 Germany	10	8.3	0.14	80.00%	62.25	274,20
				022-028 CT PROs	17	18.02	0.3	52.94%	120.11	148,214
				Other	711	452.83	7.55	67.93%	56.11	216,642

Figure 3. *Planet/TR Core.*

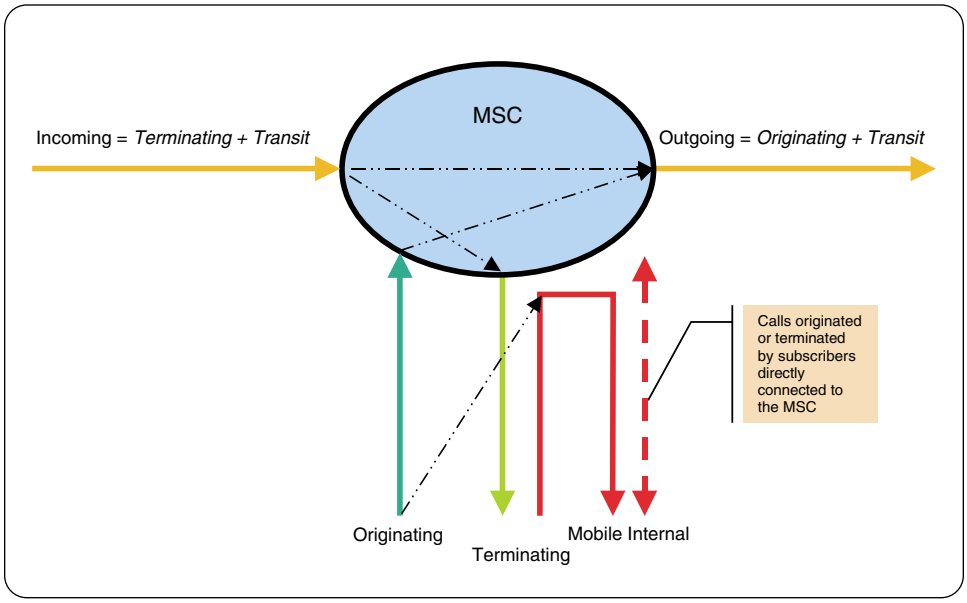


Figure 4. *Observation point and traffic categories.*

Handover Matrix

Performance and distribution analysis of handovers is crucial for network optimization and planning down to the cell level. When the cells are rearranged, analysis of handovers indicates possible configuration errors; for example, mismatch between the number of Handover Required messages and the number of Handover Command and Handover Success messages between two adjacent cells. NET-7 maintains a full matrix, cell vs. cell, of handover metrics.

Measurements

The following counters are available, for any pair of cells:

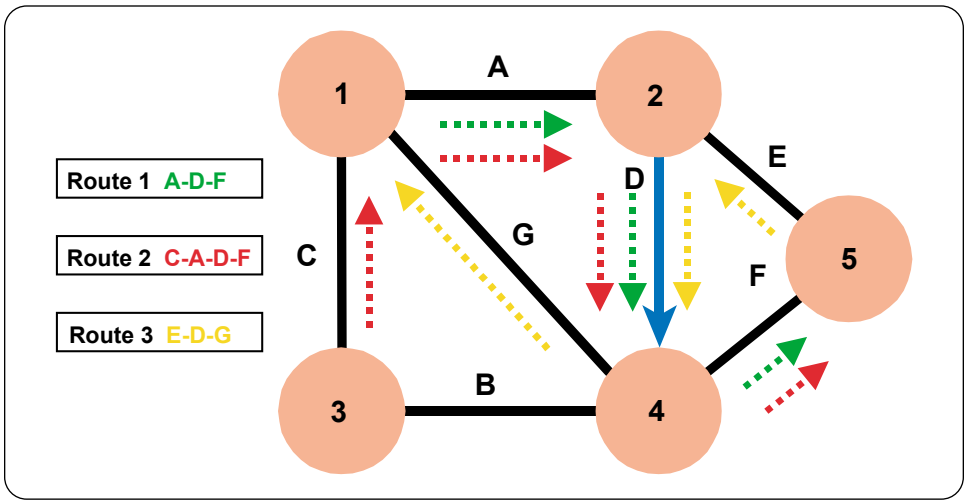
- Handover Request
- Handover Request Acknowledge
- Handover Complete
- Handover Required
- Handover Command
- Handover Success
- Handover Performed

Planet/SIG Application

Planet/SIG provides a new level of visibility of MTP signaling traffic distribution. The application enhances the measurements defined in ITU-T Q.752 with innovative features such as auto-discovering and analysis of the Signaling Route Sets as seen in Figure 5.

These data are used to:

- Select optimum signaling paths between the network nodes
- Determine capacity requirements
- Control effectiveness of the optimization
- Control load sharing
- Diagnose focused signaling overloads
- Check the bi-directional operation of individual routes



▶ ***Figure 5.*** *Planet/SIG – signaling route sets analysis.*

Planet/SIG adopts a two-level approach.

First Level Analysis

The first level of analysis concerns the network elements:

- Nodes
- Signaling Link Sets
- Signaling Links

Second Level Analysis – Route Sets Discovery

The second level of analysis concerns the Signaling Route Sets. Given a Link Set, Direction, and Time Period, Planet/SIG automatically discovers the Signaling Routes that include the selected Link Set and calculates their contribution to the Busy Hour/Busy Quarter traffic. In Figure 5, “D” represents the Link Set under observation.

Measurements

The application provides the Busy Hour and the Busy Quarter values of the following indexes, as seen in Figure 6:

- Total number of bytes
- Number of bytes SIF/SIO
- Number of MSUs
- MSU rate (MSUs/second)
- Average length of MSUs
- Load (Erlang)

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Sort NODE by Label using Sum

NODE	Direction	Day	Busy Quarter	Link Set	Tot Bytes SIF+SIO	Tot Bytes	Erlang	Utilization%	MSU Rate (MSUs/sec)	Avg Length of MSU
MSC-PRGA-NAT0-5120	Incoming	06/16/02	20:00 - 20:15	SLS_SHLR1:5120:5121 (NAT0-5121-->NAT0-5120)	2,302,291	2,407,033	0.33431	5.57%	19.4	137.88
				SLS_SHLR2:5120-6121 (NAT0-6121-->NAT0-5120)	1,057,765	1,111,231	0.15434	3.86%	9.9	124.7
				SLS_SHLR3:5120-5124 (NAT0-5124-->NAT0-5120)	1,691,390	1,772,612	0.2462	6.15%	15.04	130.95
				SLS_SINT:5159-5120 (NAT0-5159-->NAT0-5120)	216	378	0.00005	0.01%	0.03	14
				SLS_SPRGA0:4000-5120 (NAT0-4000-->NAT0-5120)	549,015	588,297	0.08171	2.72%	7.27	89.86
				SLS_SPRGA0:4300-5120 (NAT0-4300-->NAT0-5120)	115,011	126,039	0.01751	0.44%	2.04	68.57
				SLS_SPRGF0:5120-4500 (NAT0-4500-->NAT0-5120)	5,680,427	6,036,821	0.83845	13.97%	66	101.63
				SLS_SPRGG0:5120-4600 (NAT0-4600-->NAT0-5120)	2,525,027	2,707,265	0.37601	6.27%	33.75	89.13
				SLS_SPRGH0:5120-4700 (NAT0-4700-->NAT0-5120)	405,326	435,266	0.06045	2.02%	5.54	87.23
				SLS_SSMSC:5120-5139 (NAT0-5139-->NAT0-5120)	6,184,734	6,496,938	0.90235	11.28%	57.82	124.86
				Total	20,511,202	21,681,880	3.01137	6.69%	216.79	111.12
	Outgoing	06/16/02	20:00 - 20:15	SLS_SHLR1:5120:5121 (NAT0-5120-->NAT0-5121)	1,264,061	1,363,685	0.1894	3.16%	18.45	82.13
				SLS_SHLR2:5120-6121 (NAT0-5120-->NAT0-6121)	947,134	1,021,396	0.14186	3.55%	13.75	82.52
				SLS_SHLR3:5120-5124 (NAT0-5120-->NAT0-5124)	996,408	1,074,228	0.1492	3.73%	14.41	82.82
				SLS_SPRGA0:4000-5120 (NAT0-5120-->NAT0-4000)	866,928	920,790	0.12789	3.20%	9.97	102.57
				SLS_SPRGA0:4300-5120 (NAT0-5120-->NAT0-4300)	127,013	135,383	0.0188	0.63%	1.55	97.05
				SLS_SPRGF0:5120-4500 (NAT0-5120-->NAT0-4500)	4,326,677	4,646,171	0.6453	10.76%	59.17	87.25
				SLS_SPRGG0:5120-4600 (NAT0-5120-->NAT0-4600)	4,190,771	4,487,159	0.62322	10.39%	54.89	90.84
				SLS_SPRGH0:5120-4700 (NAT0-5120-->NAT0-4700)	636,080	675,872	0.09387	2.35%	7.37	101.91
				SLS_SSMSC:5120-5139 (NAT0-5120-->NAT0-5139)	5,554,873	5,844,217	0.8117	10.15%	53.58	121.19
				Total	18,909,945	20,168,901	2.80124	6.22%	233.14	96.12
MSC-PRGB-NAT0-5500	Incoming	06/16/02	20:00 - 20:15	SLS_S5131:5500-5131 (NAT0-5131-->NAT0-5500)	780	960	0.00013	0.01%	0.03	32
				SLS_S5720:5500-5720 (NAT0-5720-->NAT0-5500)	750,833	940,751	0.13066	4.36%	35.17	29.72
				SLS_S5733:5500-5733 (NAT0-5733-->NAT0-5500)	102,289	128,317	0.01782	1.78%	4.82	29.58
				SLS_S5737:5500-5737 (NAT0-5737-->NAT0-5500)	449,250	562,740	0.07816	1.95%	21.02	29.75
				SLS_S5744:5500-5744 (NAT0-5744-->NAT0-5500)	689,433	863,487	0.11993	3.00%	32.23	29.77
				SLS_S5747:5500-5747 (NAT0-5747-->NAT0-5500)	215,869	269,965	0.0375	1.87%	10.02	29.94
				SLS_SHLR1:5500-5121 (NAT0-5121-->NAT0-5500)	1,213,672	1,272,100	0.17668	4.42%	10.82	130.63
				SLS_SHLR2:5500-6121 (NAT0-6121-->NAT0-5500)	1,049,069	1,101,569	0.153	3.82%	9.72	125.89
				SLS_SHLR3:5500-5124 (NAT0-5124-->NAT0-5500)	971,676	1,021,794	0.14192	3.55%	9.28	122.33
				SLS_SINT:5159-5500 (NAT0-5159-->NAT0-5500)	216	378	0.00005	0.01%	0.03	14
				SLS_SPRGF0:5500-4500 (NAT0-4500-->NAT0-5500)	1,218,063	1,317,903	0.18304	3.05%	18.49	79.2
				SLS_SSMSC2:5500-5139 (NAT0-5139-->NAT0-5500)	4,471,954	4,665,106	0.64793	8.10%	35.77	144.92
				Total	11,133,104	12,145,070	1.68682	4.02%	187.4	72.01

Figure 6. *Planet/SIG – Busy Quarter analysis by Signaling Routes.*

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K1297-G20 / K1205

The K1297-G20 and K1205 are portable multi-protocol testers offering modular expandability and upgradeability to help you keep pace with emerging standards. The K1205 is designed for non-intrusive network monitoring and analysis, while the K1297-G20 offers extended simulation, emulation, and conformance test capabilities for telecom networks and network gateways.

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08/02 TD/BT 2GW-16024-0

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