

Developments in DSL technology and practice

Broadband in general and DSL in particular have been at the leading edge of e-hype around the world as nations, companies and individuals drive for competitive advantage in the modern, always-connected age. *William Rodey, DSL Forum*

As economies have slowed as part of normal cycles, dotcom start-ups have stumbled or fallen due to a lack of robust business models and the telecommunications sector has exploded and consolidated, pessimists have predicted the demise of broadband and DSL before the technologies have really hit their first market deployment wave. The reality is that DSL — and broadband — are here to stay. As each day passes, more people experience their benefits — and there is no more likelihood of them returning to a dial-up world than there is of them deliberately choosing pigeon post for their information distribution.

There is no doubt that ‘always-available’ internet access and the capacity to deliver and receive content-heavy data for business or entertainment — and more — are no longer ‘tomorrow’s world’ capabilities. They are very much ‘today’: possible, practical, tried and tested.

What is more, using DSL alone, there are now some ten million end-users proving the case. That number is growing daily — by several thousand in Europe, Asia-Pacific and the Americas — as commercial deployments roll out around the world. With over 0.9 billion copper telephone lines in place globally, each one potentially a DSL line, there is a long way to go before market saturation is reached — and there is no lack of appetite for the benefits of broadband. Businesses, tele-workers, students, shoppers and gamblers are but a few of the interest groups who demand information and entertainment when and where they want it, without waiting; without being dependent on a distributor’s scheduling.

With the end-user demand and technical capability in place, it is fair to ask why people are waiting to be broadband enabled. The answer is in the expectation.

As with science and medicine, new technical innovations today become — or are made — news as soon as the first experimental achievement is made. Sometimes they are news even before that first milestone. In today’s high-speed world, we all expect that latest development to be available now — or at least within the month.

DSL Forum was established in 1994. In six years, it has moved through defining the core technology to delivering maximum effectiveness in its deployment and use. It has global standardisation of ADSL and SHDSL. VDSL and more will follow. These will provide a complete portfolio of digital subscriber line technologies designed to deliver ubiquitous broadband services for a wide range of

situations and applications, which will continue the transformation of our day-to-day lives in an online world.

DSL technology: full of flavours

DSL technology exploits unused frequencies on copper telephone lines to transmit traffic typically at multi-megabit speeds. DSL can allow voice and data to be sent simultaneously over the same line and, because the service is always available, there is no need to dial in. DSL comes in a variety of ‘flavours’ and has symmetric and asymmetric variations.

Asymmetric flavours: full-rate asymmetrical DSL (ADSL). Standardised ADSL offers differing upload and download speeds, and is usually configured to deliver data at up to 6Mbps (6000k) from the network to the customer — this is 100 times faster than ISDN. ADSL enables voice and high-speed data to be sent simultaneously over existing telephone and ISDN lines. It requires a special type of modem and is most predominantly in commercial use for smaller businesses, employees working from home and residential customers around the world.

G.lite ADSL is a medium-bandwidth version of ADSL that is also standardised. Developed for the consumer market segment, it allows internet access at up to 30 times the speed of the fastest 56k analogue modems. It is an International Telecommunications Union (ITU) standard ADSL service for the delivery of speeds of up to 1.5Mbps downstream and up to 500Kbps upstream. In most cases, it will operate over existing home telephone wiring (and can be installed by the familiar ‘plug-and-play’ process on most home computers).

Equipment for use at telecommunications central offices (DSLAMs) and at customer premises for ADSL services has been the subject of rigorous testing for interoperability over plain old telephone service (POTS) copper lines and over ISDN. This testing work, and the development of testing plans, has been a key part of DSL Forum’s agenda over the past two years to facilitate progress towards mass-market deployment.

Symmetric flavours: symmetric DSL (SDSL). Some applications require more upstream capacity than ADSL offers — this is where symmetric varieties are best deployed. SDSL supports the same data rates for upstream and downstream traffic. The equal speeds make this ideal for LAN access, distributed applications, videoconferencing and for sites hosting their own websites. SDSL

is an umbrella term for which a number of supplier-specific implementations over a single copper pair providing variable rates of symmetric service exist, with or without ordinary telephone service. SHDSL is also now standardised and significant work is in progress on equipment interoperability.

Further developments in DSL

One rapidly evolving development is voice over DSL (VoDSL). DSL technology can convert voice calls into digital data packets and send them over existing copper phone lines. They can be transmitted as multiple calls (lines) over a single access line — minimising the need for additional telephone line installation, which is particularly important where existing copper infrastructure is fully used. Packet-based calls only consume bandwidth when a call is active on a line. When no call is active, the bandwidth is available for other services such as high-speed internet access.

With much of the core technology definition work completed — continuous updates and addressing new developments excepted — the focus for DSL Forum is now on developing and promoting best practice to facilitate mass-market deployment of DSL throughout the industry. There is one constant requirement that is fundamental: automation.

Auto-qualification of the local loop, auto-configuration, auto-provisioning, remote diagnostics for line-fault resolution, and maximising common generic management processes and equipment standards are all core requirements for effective, scalable DSL deployment. To capitalise on the phone lines — as one part of the world's broadband infrastructure — the industry has recognised and is addressing the need to provide clear, common operational management processes that will accelerate and facilitate mass-market deployment.

The one underpinning message for the Forum's technical working groups is to keep focused on the fast-track programme to deliver standardised, simplified and automated operations and management processes.

The latest development from that agenda is a Working Text (WT): WT-59 — Auto-configuration for Basic Internet Services. This identifies best practice in the auto-configuration of connections between customer premises equipment (CPE) and the network, for high-speed internet access at the local loop level. The WT is in straw ballot among DSL Forum members and is expected to achieve Technical Report status following the Forum's meeting in New Orleans, USA, at the end of August 2001.

This will be the second Technical Report (TR) on auto-configuration. TR-37, published in March 2001, covers auto-configuration for the connection between the DSL broadband network termination and the network, using ATM. DSL Forum and ATM Forum worked in parallel on this aspect of auto-configuration, drawing on the existing work of both organisations to provide an integrated technical solution.

Information flows: key success criteria

Effectiveness in delivering competitive services is predicated on the quality and timeliness of information flows between all parties.

Competitive carriers reliant on incumbents for data on local loop qualification, line configuration for service, fault resolution and more will only meet end-user requirements if that information is readily and quickly available. There can be no question of an end-user being expected to call their service provider and be passed off to their provider's supplier if the line fails in a vicious circle of 'someone else's problem'. Down that road lost confidence lies — confidence in the whole of telecommunications deregulation, in all services and their providers.

To address this issue, DSL Forum technical working groups have fast-tracked developments on flow-through provisioning, producing a new Technical Report in 2001 (TR-38 — DSL Service Fulfilment). This specifies the recommended, complete information-flow process between the various parties in the DSL service supply chain for maximum effectiveness and consistent service quality.

Also in 2001, DSL Forum completed TR-41 — CORBA Specification for ADSL EMS-NMS Interface. This identifies how service providers can implement and manage DSLAMs from multiple vendors in their growing broadband networks.

These documents are more milestones on the road to efficient and effective mass-market deployment of the DSL broadband portfolio. The VDSL document covers the next step that is high on many service providers' agendas. Network management best practices addressed in TR-41 are fundamental to delivering effective and efficient services, and will continue to be high on the work agenda. In parallel, the Forum is focusing on the immediate issues of auto-configuration for high-speed internet access, as this is currently the most prevalent mass-market application of DSL.

We are already living in an online world. Businesses expect their teams to be able to: share documents and intelligence at any time and in any place without coming face to face; transact commerce at a time that is convenient to their time zone; and give their input from home, the office or on the road. Youngsters increasingly expect to have access to the world's knowledge base, to the latest expertise in any subject, and to the current popular games.

Data traffic in Europe exceeded voice traffic for the first time at the end of 2000 — two years after the same shift occurred in North America. There is no way back, only a way forward: the smarter, faster and more efficient use of our most valued commodity, time. For that we need broadband, and DSL is one of the most effective technologies available for its delivery.

AUTHOR

William Rodey is one of the founders of DSL Forum, where he has been a member of the board of directors since its inception in 1995, working to assist in the stimulation of a mass market for DSL technologies and services. Mr Rodey served as DSL Forum's vice-chairman and treasurer from 1996 until his appointment as chairman and president in March 2001. Mr Rodey is also an active member of the International Engineering Consortium's Executive Council.