

AT&T INNOVATION BRIEFS

The briefs in this section are summaries of recent discoveries and developments within AT&T Bell Laboratories. AT&T readers who would like to contribute future items, and readers who would like further information as well, are encouraged to contact the AT&T Technical Journal editor.

WDM Channel Strength Equalization in Guiding-Filter Soliton Systems

The technique of “sliding-frequency guiding filters,” conceived and developed at AT&T Bell Laboratories, greatly increases the bit rate in ultra long-distance soliton transmission. By efficiently quenching amplitude and timing jitter, it has already enabled robust, error-free transmission over nearly the circumference of the earth in a single channel at 10 Gbits/s— and even 20 Gbits/s has been achieved over transoceanic distances. But the filters also automatically provide for equalization of the signal strengths among wave-division multiplexing (WDM) channels, in the face of considerable amplifier gain variation with wave length. The equalization occurs simply because a soliton’s bandwidth, and hence the loss it experiences in passing through the chain of narrowband guiding filters, increases/decreases with increasing/decreasing soliton pulse energy. This equalizing effect has been confirmed both in computer simulations and in recent experiments on two- and three-channel transmissions. It is especially important for soliton transmission, where for error-free performance the strength of each channel must be maintained to within about ± 25 percent of the ideal level. (Without equalization, such close maintenance of signal powers would be nearly impossible in long-distance systems, where the accumulated amplifier gain can be as great as $\sim 2,000$ dB.) Thus, by enabling, through WDM, the unprecedented net capacity of many tens of Gbits/s on a single fiber, this effect should help AT&T’s undersea cable division to stay far ahead of the competition.

New Version of the S Language

Techniques for analyzing, managing, and presenting data are critical for modern business and science. Creating such techniques and transferring them to users requires the best possible software environment. S is a language and programming environment created by AT&T Bell Laboratories researchers for all kinds of problems involving the analysis of data. S allows users to program prototype solutions to their problems quickly—in hours, as opposed to days or weeks needed for other programming languages. Because the prototype is written in a sophisticated language and environment, it can later be reused. It has often been developed into an extensive application tool. S has become the environment for implementing research in data analysis at AT&T for transferring this research to others and for related computing in engineering, business

analysis, and other disciplines. S is also a de facto standard for statistics research in universities and other research organizations. Currently under way is a major revision of S that will enhance its advantages for rapid prototyping, while strengthening it for the serious software development phase that often follows. Specialized object-oriented software and graphical user interfaces are among the programming activities to be supported by the new version. Compared to other languages, the new version of S will do more work for the programmer, providing more explicit control, for example, over the concepts in object-oriented programming. Improving the effectiveness of the user/programmer remains the central goal.

AT&T Directory on the Internet

AT&T recently initiated a new Internet service, the 800 Directory, accessible through World Wide Web browsers. It combines the Business and Shoppers Guides and contains 157,000 records, with an 800 number, company name, city, state, and category. An estimated 30 million Internet users can look up numbers by company or category (“yellow pages”) or company name (“white pages”); there are also textual search interfaces. In the first six weeks after the service was announced, it was used more than 32,000 times by more than 20,000 distinct Internet sites; there are typically 1,200 to 1,500 connections a day. The service is provided by a computer running the Plan 9 distributed operating system, developed in the Computing Science Research Center at AT&T Bell Laboratories. Plan 9 provides stronger security than UNIX systems, and thus is a better vehicle for making information accessible via the Internet. (UNIX is a registered trademark of Novell in the United States and other countries, licensed exclusively through X/Open Company Limited.) AT&T has moved ahead with a practical, universal application—a national directory source that enables Internet users to look up 800 numbers for their favorite products and services for the first time. In the near future, AT&T’s electronic 800 directory on the Internet will contain display ads like those shown in the printed directories. These ads will provide valuable information on a myriad of products and services being offered by the business community—and the toll-free numbers to reach them. Future versions of the service will enable AT&T Internet directory advertisers to update messages in their ads to reflect current promotions, sales, or new business offerings. The 800 directory is available at <http://att.net/dir800>.