Bridging the Digital Divide: Open Systems Fill the Bill

According to the latest report of the National Telecommunications and Information Administration (NTIA), Internet growth continues to skyrocket. For example, the share of US households with Internet access soared by 58%, from 26.2% in December 1998 to 41.5% in August 2000. More than half of all households (51%) now have computers, up from 42.1% in December 1998. In August 2000, 116.5 million Americans went online at some location, 31.9 million more than only 20 months earlier. And the share of Americans using the Internet rose by 35.8%, from 32.7% in December 1998 to 44.4% in August 2000. If growth continues at that rate, more than half of all Americans will be using the Internet by the middle of 2001.

The report cautions that although great strides have been taken, Blacks and Hispanics, though demonstrating impressive gains in Internet access, still lag behind other groups. These two groups experienced the lowest household Internet penetration rates at 23.5% and 23.6%, respectively, as of August 2000. The gap between Internet access rates for Black households and the national average stood at 18.0 percentage points, 3 percentage points wider than the December 1998 survey. Similarly, the gap for Hispanic households stood at 17.9 percentage points, 4.3 percentage points wider than the 13.6 gap in December 1998.

Increasingly low cost computers and low cost or free Internet access have spurred this tremendous growth. To fully bridge the digital divide, ISPs can take advantage of low-cost, high-performance open systems solutions. Compared to proprietary systems, the open systems approach leverages the tremendous system assets available on existing Windows NT or Linux based servers for remote access services (RAS). The open systems approach allows ISPs to deliver optimum service with a system that can be rapidly scaled at the lowest possible cost per port.

With an open system approach, ISPs can leverage their existing software, hardware, and human skill sets. Since the POP provides the dial-up interface between businesses, home subscribers, and the Internet, keeping installed costs per port to a minimum is vital. Lower cost per port allows service providers to efficiently provide low-cost or even free Internet access in rural, underserved, and urban impoverished areas.

Proprietary vs. Open Systems RAS

POPs consist of the eight major components shown in Fig. 1. In a "proprietary" POP produced by legacy RAS suppliers like Cisco and 3Com, each of these components are designed and manufactured in-house, using proprietary hardware and software. The very proprietary nature of these POPs makes them expensive to build, maintain, and support.

By contrast, the newer "smart" POPs utilize Linux and Windows NT PCs. These low-cost, widely available computers provide most of the baseline hardware and software functionality needed to configure a POP. The PC and accompanying system software includes the CPU, operating system, utilities, network software, remote access services,

and basic I/O. To obtain POP capability, an ISP needs to only provide the RAS application software and the PSTN interface. The ISP can thus turn an existing NT or Linux server into a "smart" dial-up 56K/ISDN POP by simply plugging in a high-density PCI card such as Ariel's 96 port RS4200.

"Smart" POPs utilize off-the-shelf components that allow an ISP to leverage economies of scale and widespread industry familiarity with NT and Linux systems. This makes it dramatically less expensive to build, operate, and maintain. By providing added intelligence, smart ISP tech managers can further reduce costs by integrating functions like authentication, DNS, and caching – all functions that normally require dedicated servers in networks based on "dumb" proprietary POPs.

ISPs can apply "smart" POP technology across the board in their networks at an installed cost of about 50% of the cost per port versus proprietary POP servers. ISPs can take advantage of these low installed costs and improved performance to profitably bridge the digital divide. The open systems approach also means that ISPs can expand without having to hire specialized technicians for proprietary servers. The ISP can draw upon a much wider body of NT or Linux trained technicians to install, maintain, and service their "smart" open systems networks.

Bridging the Digital Divide in Somalia

Three different ISPs located in Somalia, Puerto Rico, and Florida have implemented different, but successful business models. Their businesses have all benefited from the advantages of the open system "smart" POP approach.

Bossaso, Somalia, a community of 800,000 located on the northeast coast of Africa, has one phone company that served 2,500 telephone subscribers prior to offering Internet access. The company recently joined forces with major telephone companies in three other Somali cities to form the Somalia Telephone Group (STG). In 2000, STG implemented long-distance service for the four cities via an Intelsat satellite link, which also accesses the Internet backbone in the United States.

In addition to local and long distance phone service, Netco now offers dial-up 56K and ISDN Internet access. Netco also offers access to subscribers who are not equipped with PCs through two Internet cafes with a total of six terminals. Dial-up customers pay a flat fee (about $15.00 per month) plus a per minute connection charge. Café users pay a per-minute connection charge.

When Netco installed their POP servers, equipment, and software, Bossaso had no computer stores, few computers, and no computer-trained workforce. Because the satellite link only operates at about 200 kbit/sec. and service is intermittent, the company required ultra-reliable ISP equipment. Apart from the fact that proprietary POP vendors' equipment was nearly twice as expensive, none of those vendors could provide any installation, training, or service support to the company's remote location.

Netco selected a "smart" POP NT-based solution using Ariel's RS4200 56K/ISDN PCI plug-in cards. The system uses off-the-shelf PC parts, works efficiently with an intermittent backbone connection, and requires minimal training. Additionally, the servers integrate authentication, web hosting, email, and DNS. The systems also act as proxy servers and run custom billing software.

This system began the process of bridging the digital divide in a remote, undeveloped country. Netco's ISP service has stimulated not only Internet growth, but also a significant and noticeable growth in the local computer and communications infrastructure. Prior to deployment, there were only three or four computers in the entire city. Within three months of the launch of services, there were four computer stores up and running.

More importantly, Netco provides service access to the Internet for thousands of Somalis. The service enables residents to communicate with the one million Somali expatriates who have fled the war-torn country, many of whom now reside in the United States. The new service also provides Internet access to foreigners travelling to the city and by international relief and peace keeping organizations such as the United Nations, UNESCO, and UNICEF.

Free Internet in Puerto Rico

Veggon.com provides free Internet service and free email in San Juan, Puerto Rico. Recognizing that the island's booming Internet subscribers, totaling over 500,000 in a recent study, represent a significant economic force, the family run business sought a way to capture significant market share.

The company offers its users free Internet service and free email at a variety of weekly promotions in high-traffic locations. The free service is only available to residential customers who fill out a questionnaire that establishes a user profile and includes personal data, interests, hobbies, preferences, etc. The ISP generates revenue by broadcasting banner ads for advertisers that target their users' profiles.

For the "free" business model to work efficiently, the new ISP sought out high-performance, cost-effective solutions for their network design. They settled on a "smart" open system RAS solution. The company recently paused their consumer promotions because they had reached capacity with their present system. Even so, the firm still has between 40 and 60 sign-ups a day by phone. The company is currently scaling up their service capabilities with ten new servers. Nine of the servers are each equipped with two of Ariel's SS7 enabled RS4200 96 port 56K/ISDN PCI boards. The company is also adding a DS3 connection that will increase their dial-up capacity by over 800 lines.

The company's efforts have helped to dramatically expand the number of Puerto Rican households with access to the Internet. However, the company notes that the island's 500,000 current subscribers spend over $36 million annually on the Internet, almost all of which is spent off-island. One of the company's new initiatives is to offer easy online e-

commerce to help the island's merchants capture a significant share of the current off-island spending.

High Growth Florida ISP

Located in a relatively smaller market, Earthmax set up shop in Flagler County, Florida. The entire county boasts a population of only 50,000, but according to US Census Department figures, the county's population growth has consistently ranked as one of the fastest growing counties in America throughout the '90s.

The company provides Internet service for local citizens and also includes over 1,400 remote access dial-up numbers nationwide through ports leased from local telephone companies. All told the company serves over 15,000 accounts with dial-up access, email, web hosting, and web design.

When the company designed their network architecture, they wanted to leverage their in-house Windows NT expertise, keep equipment costs low, and deliver high quality service to their customers. The design team selected Ariel's NT-compatible PowerPOP architecture and RS4200 56K/ISDN PCI plug-in cards. The cards transform the NT system into a full-featured remote access system, complete with remote dial-in and LAN dial-out capabilities. Earthmax was able to save nearly $10,000 on a 96 port system compared to proprietary boxes from Lucent. The low-cost, high performance, reliable RAS system leverages NT capabilities and allows the company to easily scale up services to meet ongoing customer growth.

Summary

Increasingly lower computer and Internet access costs have spurred high growth in household access to the Internet in the United States and begun to make "Digital Inclusion" a reality to everyone. To reach rural, underserved, and impoverished urban communities, ISPs can utilize highly reliable, low-cost, open systems solutions. These systems utilize allow service providers to leverage their existing hardware, integrate multiple functions in the same server, and utilize widely disseminated Windows NT and Linux system expertise. As a result, more people will have more Internet access in the United States and around the world.