Portfolio of Telecommunications Projects

Lucent Technologies, Network Simulation

Lucent Technologies' Education organization was facing a resource problem because of the skyrocketing demand for product training services. The education organization could not get Lucent's own switch products fast enough to meet the rising demand for training, nor could the network equipment be easily taken to their customers locations for on-site training. The solution might lie in the use a simulator instead of actual networks. A simulator would allow Lucent to offer more classes, train more people, and provide training almost anywhere, all at a lower cost than using actual networking hardware.

Dot4 worked with Lucent to define the requirements of the simulator for switches, routers and the networks that these devices could form. Dot4 analyzed various design approaches and functional tradeoffs, and built a fully functioning prototype for Lucent's evaluation. The prototype was implemented in C and C++ under Linux using a standard PC platform. It can operate successfully on laptop PC hardware for an extremely portable configuration.

The prototype is able to simulate Lucent's B-STX-9000, CBX-500 and GX-550 product lines by performing all functions of the actual device accept the switching/ routing of actual network traffic. Instructors and students are able to interact with the simulator as they would with the actual switches/routers. The prototype simulates each product line's network functionality, Command Line Interface (CLI), it interacts with SNMP based management systems, and interacts with actual switches and routers.

In practice, instructors use the simulator's GUI based tools to create a network of simulated devices. Their students then methodically configure and administer the network, as they would have during a classroom session with the actual switch/router hardware. Traffic loads are simulated, as are the observable symptoms of erroneous configuration and administration actions.

Sycamore Networks, Network Simulation

The training organization at Sycamore Networks faced a resource problem. Sycamore's intention was to build a flagship on-line training facility that they'd named Sycamore Virtual University (SNVU). Sycamore's on-line training would involve a full multimedia experience for the student by incorporating audio, video, and animated clips as well as live human interaction. Dot4 was asked to design a simulator that to support the mission of SNVU.

Drawing upon it's deep simulation background Dot4 designed a simulation solution that would be able to provide each on-line student with his/her own simulated network and allow the student to interact with the network as if it were equipment in a traditional classroom. A minimal prototype was built to demonstrate the intended user interface experience.

Madge Networks

Dot4's initial task with Madge Networks was to contribute to the design of Madge's next generation AccessSwitch product line. The AccessSwitch family is a voice/video/data Layer 3 switching product line used extensively for video conferencing applications coupled with data networking. It supported Basic Rate Interface (BRI) ISDN and Primary Rate Interface (PRI)ISDN ports as well as T1/E1.

Dot4's first responsibility was to assess the existing product's support of network protocols over the device's ISDN ports. Dot4 analyzed Madge's software to determine the level of protocol compliance of the current product against the standards for ISDN in the United States and in other countries throughout the world.

Dot4 engineers then designed the protocol enhancements necessary for the next generation AccessSwitch to support various standard switches such as the AT&T 4E, AT&T 5E, DMS-100, DMS-250, SYS85, NTT, ETSI 3000, Globand, VN-2, VN-3, DASS, and DASS2.

During the implementation phase of this project, Dot4 was tasked with porting a large amount of the AccessSwitch code base from a Madge-customized version of pSOS, to the VxWorks RTOS from Wind River.

Dot4 was later tasked to design and implement a highly enhanced package of on-board diagnostics for the multiprocessor Slotted Hub AccessSwitch. This package of diagnostic software included complete Hardware Analysis components, as well as protocol and application test components. The protocols/ standards tested included X.21, V.35, RS-449, Ethernet, HDLC, TCP/IP, and others.

The implementation of the diagnostic test suite components encompassed several operating systems including Solaris, Windows 95, Windows NT and pSOS. This project was implemented using a combination of high level and assembly level languages, including C, C++, MASM 4.10, 680x0 Assembler, and Intel 80486 & Pentium Assembler.

Dot4 then ported the newly designed package of on-board diagnostics to Madge's IntelliSwitch Video Conference System.

US Army, NICE Bridge Replacement

Dot4 is developing a customized network router and bridge for the US Army's GuardRail program. This device will replace an aging custom designed network device currently in use. The project is referred to as the NICE Bridge Replacement project.

The NICE Bridge Replacement that Dot4 is developing allows networks of varying security levels to be bridged across satellite links to their counterparts on the other networks. The NICE Bridge Replacement ensures that packets from a more secure network cannot 'leak' onto a less secure network.

The NICE Bridge Replacement is an SNMP managed device that supports multiple FDDI networks, multiple HDLC links to communication satellites, multiple ethernet networks, and is easily adaptable to other networking technologies as the need arises.

Dot4's design manages and optimizes network traffic across the satellite link by discovering the hosts that exist on each LAN it is connected to, and forwarding only those packets that are destined for non-local hosts. The NICE Bridge is designed to be a fully conformant 802.1D-1998 MAC Bridge, but it is also backward-compliant with the original NICE Bridge, which was implemented before the 802.1D-1998 standard was ratified, and thus behaves very differently.

Dot4 designed this device to utilize Commercial-Off-The-Shelf (COTS) hardware components and custom software developed by Dot4. The platform chosen for the prototype includes VxWorks on an embedded Pentium based single board computer. Dot4 designed and developed the software using an object model for the flexibility and expandability that can be achieved with an OO approach.

Successful demonstration of this router/gateway will result in a broad adaptation of this technology throughout the US Army's GuardRail program.

BBN Technologies, NTDR

BBN Technologies was contracted by ITT to develop early models of a wireless internet device known as the New Technology Digital Radio (NTDR) for the US Army. This digital radio is capable of forming a wireless TCP/IP network with other NTDR units for voice and data communication.

Dot4 ported a set of real-time extensions from VenturCom's legacy VENIX product to the then-current version of SCO's UnixWare operating system. These extensions would permit UnixWare to operate in an embedded environment (without keyboard, monitor, or disk drive), and provide some real-time management of events. Since VenturCom had exited the Unix market, a Unix kernel development company such as Dot4 was needed to bring these technologies to a current Unix operating system.

Dot4's work involved the Virtual Memory subsystem, file system, creating a FlashROM reloading utility, and integrating these enhancements with the PC/104 hardware selected for the NTDR. Dot4's efforts allowed the NTDR's x86 based hardware to boot UnixWare 7 and operate as an embedded device.

Do4 was then contracted to resolve several issues with the ethernet device driver, and to address problems with the build and packaging of the operating system components for FlashROM resident operation.

Octave Communications

As a newly formed start-up company, Octave perceived an opportunity in the market for very high-end audio conferencing bridge products. Their OCI-1000 product line is capable of handling over 1300 ports of voice traffic and is built around CompactPCI hardware and SCO's UnixWare 7 (SVR5.0) Unix operating system.

Dot4's initial task was to develop a UnixWare STREAMS based device driver and associated C++ interface library for a DSP Research PCI board containing a single TI TMS3206201 DSP. Octave used this board as a prototype and demonstration vehicle in advance of the initial delivery of their own hardware.

The prototype allowed Octave's engineers to develop the product's DSP heavy applications using Dot4's interface library and communication infrastructure well ahead of the delivery of the custom hardware. By the time Octave's own hardware became available, the software developers had a stable, reliable mechanism by which to communicate, and continue on with their development.

When Octave's hardware became available, the driver was then modified to work with the new board, which contained 6 TMS3206201 DSP's. The driver not only provided the mechanism for download and execution of code for the DSP chips on each board, it also provided the communications mechanism between each of the DSP's and the host application code.

Dot4 then assisted the hardware developers with the initial debug of the hardware by developing diagnostic and exerciser software for the boards.

Octave also developed a smaller version of the audio bridge product called OnSemble that is intended for the Enterprise market. The OnSemble product line is capable of handling a maximum of 192 ports of voice traffic and utilized Windows NT as the operating systems. Dot4 ported the UnixWare driver and diagnostic software for the DSP boards to Windows NT.