Lucent Technologies
Bell Labs Innovations

TMX 880 Times

VOLUME 2, NUMBER 2, MARCH 2002
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THE TMX 880 IS LAUNCHED - BON VOYAGE!

On March 12, 2002, Lucent Technologies announced the launch of the TMX 880™ MPLS Core Switch, our new ATM and MPLS internetworking platform that enables customers to deliver more reliable and profitable voice, video and data services over a unified multiprotocol label switching (MPLS) network.

The launch of the TMX 880 system was featured in Network World's *The Edge*. Jim Duffy, managing editor, had positive comments on the system:

"...Unlike competitive offerings based on ATM cell switches, the TMX 880 is a packet switch, because a cell-based architecture is inefficient for packet traffic and may be shortsighted given the expected growth of IP.

The TMX 880 system's distinctive internetworking capabilities satisfy customer needs for a unified backbone that can expand and scale profitable asynchronous transfer mode (ATM) and frame relay services today and prepare for the emerging demand for Internet protocol (IP) services...

...One of the key features of the TMX 880, and one that may aid carriers in migrating their ATM cores to IP and Multiprotocol Label Switching (MPLS), is fluid signaling. Fluid signaling maps bidirectional ATM permanent virtual circuits into two unidirectional MPLS label-switched paths, and vice versa. It maintains quality-of-service... The TMX 880 also supports Lucent proprietary VNN signaling so a company's installed base of GX 550 and CBX 500 switches can also participate in the TMX 880 core."

In a recent press release, Lucent Technologies described how fluid signaling is used on the TMX 880 system. "The TMX 880 uses 'fluid signaling' to integrate ATM and MPLS traffic, and streamline service provider infrastructures. Fluid signaling is intelligent internetworking between ATM and MPLS in three areas - transport, Quality of Service and operations - across a single unified 'control plane' to provide the industry's only translation of the signaling information between frame relay, ATM and IP/MPLS services.

The result is a packet-based architecture that is optimized to grow ATM and frame relay services while efficiently delivering new IP services that minimize operations expense. The TMX 880 can eliminate the need for complicated, expensive overlay networks, and it facilitates the evolution to MPLS core networks."

LUCENT FEATURES THE TMX 880 AT CEBIT

The TMX 880 MPLS Core Switch is being featured in the Multiservice Solution Demonstration at the CeBit 2002 show in Germany, March 13 through March 20.
See details on page 2.

CLOSING NORMANDY GATE 4

A highly-focused product team met an aggressive schedule to deliver the TMX 880 product. The 8.0 project started with the Omaha Beach demo of ATM to MPLS cross connects in mid-October, and ended with CI in February. During this time the Development team added 500,000 lines of code and SQA executed 3,000 test cases.

Development, SQA, and Technical Services worked closely together to resolve issues discovered during Development and SQA testing.

With 3,600 'bugs' logged during the product cycle, 2,000 were found during the Development unit test stage and ultimately fixed. Of the 1,600 issues discovered during the final SQA testing, 1,000 issues were resolved. Of the issues resolved, only 1.2% were rejected by subsequent testing—an extremely low fix-rejected rate.

The product was tested for interoperability with the Jade MR2.2 release and the Europa 8.0 release, with test results showing 100% compatibility.

Many other groups in Lucent, such as Product Management, Marketing, and Program Management, worked tirelessly to coordinate launch activities to bring the product to market. A true team effort made this launch possible.

Lucent features the TMX 880 at CeBit

The demo highlights the TMX 880 system's ability to:

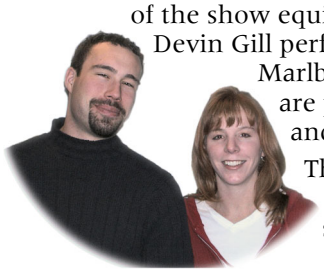
- Expand and add MPLS capabilities to existing CBX 500 and GX 550 networks, providing an economical solution to increase network capabilities, efficiency and speed.
- Increase revenues and protect the existing multiservice core infrastructure investment while enabling new, revenue-generating IP services.
- Grow core capacity by scaling existing FR, ATM or IP/MPLS network to meet increasing traffic requirements.
- Manage costs by removing the need for a separate IP overlay network and reduce operating expenses by using the existing embedded NavisCore and integrated Navis TMX 880 management systems.
- Provide high-speed QoS, packet-based core for speed with a connection-oriented architecture to guarantee QoS.

This live demo highlights the Lucent TMX 880, CBX 500 and PSAX 4500 and 1000 products. In this demonstration, two streams of traffic flow end-to-end:

- AAL1 voice traffic over a CBR circuit from PSAX to PSAX. The PSAX systems at the edge connect to separate CBX 500 systems which connect to the TMX 880 MPLS core
- AAL5 video streaming traffic over a VBR-nrt circuit created from a CBX 500 system to CBX 500 system through the TMX 880 MPLS core
- To ease operability and management, Lucent will integrate the cross-connect functionality into NavisCore for point and click capabilities to create end-to-end circuits through the "Service aware" TMX 880 core.

The following key people helped pull the demo together, though there were many others behind the scenes we may miss:

Sean O'Neil, provided technical coordination for the demo; Doug Lunsford helped with TMX testing and configuration assistance; Justin Gibson provided equipment coordination, upgrade and shipment between here and Hilversum; John Stowe made sure we kept it true; the folks in Hilversum, Engelbert Torremans, Jan Visser and Clemens Muller, supplied remote pre-staging of the show equipment; Loralee Ferryall and Devin Gill performed technical setup in Marlboro for the backup demo and are providing onsite CeBit setup and technical support.



Devin Gill and Loralee Ferryall

Thanks to all the engineering and ETS folks who are standing by prepared to help us out during the show.

The Dover Strategy

Dover is in phase 3 of the product schedule. The MRD is complete and the PRD is nearing completion. Development is writing specifications for the 8.1 release. These documents are being stored in Documentum for the first time!

Vasudevan Jothilingam is the Technical Lead for the Dover release, providing a single contact in Development for issues and questions. He is working closely with both the Platform and Protocols groups, leading a cross-functional team that is fully integrated.

The primary goal of release 8.1 is to improve system robustness, stability and scalability. The Dover release will complete the story on redundancy for all necessary features. This release plans for 50-100 ms switching time for MPLS fast reroute, Multiclass OPTimum cell trunks, cross connects over an MPLS domain, and additional security enhancements to make the TMX 880 system and network more secure.

The release also adds other MPLS features, such as Diff-Serv support, Layer 3 VPN support for MPLS on GigE interfaces, and RSVP associated enhancements.

Improvements to the Navis TMX 880 Element Management System will simplify extending OPTimum cell trunks through a TMX 880 MPLS core. Significant UI redesign will make the application easier to use.

In addition, this release partitions the system software into two different base operating systems—one for IP and one for MPLS—to target customer needs. Each base operating system supports a feature pack to compliment the base operating system.

Development is also working on CPU Utilization Monitor, ATM enhancements, External bits timing, and MBGP.

The release provides support for the ATM Single OC-48 card. It will permit up to 64k VCs and raise the ATM interface speeds from that of the present OC12c interface.

Dave Keever in the Spot Light

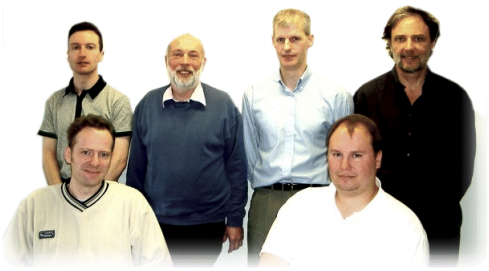
Dave Keever, Director, Technical Services brings twenty-three years of expertise to the TMX 880 team. Dave managed one of the trials for the first ATM network, funded by the National Science Foundation and Advanced Research Projects Agency (ARPA). To advance this new technology, Dave went on to manage the deployment of the North Carolina information highway, the first ATM Network in the world. Several of the people Dave worked with on the ATM Network are now working at Lucent in our business unit.

Dave's primary functions at Lucent have been in new product introduction into the field, building customer relations, strengthening customer service, and revamping the technical services organization to keep up with changing times.

"I see a developing market opportunity with the passing of the deregulatory Tauzin-Dingell bill in Congress. This is a huge incentive for the RBOCs to spend money (approximately ninety percent of the CapEx budget this year and next year is from RBOC and IXCs). The TMX 880 is perfectly positioned to build out this infrastructure as the RBOCs scramble to converge disparate networks and bridge the networks that are currently segmented by local access and transport areas (LATA)."

Dover Team Members

Getting team members together for a group photo was difficult at best. The following photos are of the TMX 880 team members we were able to catch with our cameras



Dover team UK: Back Row. From Left to Right: Chris Chapman, Neil Turner, Peter Higginson, Pete Strickson
Front Row. From left to Right: Pete Livesey, Tim Martin.

Left to right: Shyamala Deeduvanu, Mike Satz, Feihong Chen, Xiangzhong Sun, Tsu-Jung Kung, Vasudevan Jothilingam, Hua Autumn Liu, Michael Ussrey, James Ni

Standing (l to r): Mark Adrian, Bob Wiersbe, Lisa Davis, Ronald Rousseau, Eric Ruan, Bert Hickman, Tariq Ahmad, Thuc Vu, Dave Newkirk, Chris Hartley, Jianying Peng, Mark Johnson, Jim Bamford, Mark Lynch, Bruce Mewborne, Darien Stolte, Dave Kerns, John Daly, Kuey-Yeou Tsao, and Jerry Sam
Seated (l to r): Ron Poole, Jeremy Mahan, Mike Lazar, Teresa Domszy, Pete Morgano, Oscar Godinez, and Jeff DeSando
Missing from photo: Michael Johnson, Chris McBride, Larry Merrill, Akiva Naiman, John Ostrander, Ron Sunderman

Technical Services In the Spotlight!

The Technical Services team is directed by Dave Keever and managed by Rich Brandeis. The TS team is comprised of an outstanding group of network certified, Tier-4 support engineers, working on the leading edge of product development and with product use in the field. They support both pre-sales and post-sales activities.

"It's a challenging environment, with brand-new, cutting-edge technology" said Tim Scanlon. "Working here provides the opportunity to continually learn and grow."

Instrumental for holding to the schedule, they helped to write and execute SQA testplans for the 1.6.x, 1.7.x and 8.0 releases. Getting all this testing completed and meeting the tight schedule was an incredible amount of work.

"You get to wear a lot of hats," said Steve Scheidler "We can work on the pre-sales side, not just product support. We help SQA with testing and have an impact on new features, increasing the system capabilities."

Acceptance test plans and trial test plans that demonstrate system features and performance are developed for use in the field. These test plans are high-quality and very complete. LWS and SE customer teams have called them the most thorough and best field test plans they have seen from a product unit.

Pat Berglund said about the TS team: "They are willing to transfer their knowledge to get the LWS Westford Support group up to speed and they are very forthcoming with troubleshooting information. They make the job much easier!"

As the voice of the customer for the TMX 880™ system, they collect user input and improve SQA by providing the customer viewpoint. "We work with customers and sustaining to improve the product and to resolve issues. It's the closest level of support you can be without writing the code to fix it; very exciting work." Mark Taranto.

Providing post-sales support, Technical Services keeps Winfirst and Xspedius updated with the latest software and hardware upgrades and accompanying documentation in over 30 labs or customer teams worldwide.

The team implemented a Return Material Authorization process with Boxboro and Liberty-Way, RMA Center in Westford. Integrating the new RMA process into the Lucent RMA structure was a huge accomplishment.

While studying the system's ability to operate large-scale networks, they are learning and documenting how all the multiservice switching products work to address interoperatability issues, make them transparent to the user, and to provide our customer revenue generating applications that are robust, scalable and with reduced operational complexities.

"Network Engineering is a new element, further work is being done to improve performance, scalability and reliability," said Dave Keever. "This is where the rubber meets the road." The group's success may be attributed to the way they work together as a team. Everyone agrees that the best part of working in the group is the common

fascination with the rapidly evolving technology and the willingness to collaborate to provide a solution to a problem.

Describing the working atmosphere, John Johnson said, "Dave is driven, he inspires us to excel!" Tom Casey is also motivated by the TS working environment: "In this time of operating like a start-up, knowing that I am part of such a dedicated and talented team helps me to push further than I normally would do on my own."

Both Dave and Rich agreed: "This is a team of major players. We've never been so proud of or had a better team."

From left to right: John Kassin, Arianne Lewis, Michael Procanik, Khaled Shuaib, John Bonvino, Sean O'Neil, Steve Scheidler, Tom Casey, Nanda Katikaneni, Douglas Lunsford, John Johnson, Dave Keever, Justin Gibson, Stephen Younger, Rich Brandeis, Timothy Scanlon, Mark Taranto

Poised for Success

The Core Routing Division Development leadership has been strengthened in order to meet the ends of our growing product and demanding schedule.

Jill Calendar joined us as Director—Platform Development. Jill and her team are responsible for system software, driver and device software, platform management software and platform management and diagnostics.

Danny Canton assumes the position of Director—Protocol and Software. Danny and his team are responsible for the ATM application software, VNN, MPLS application software, IP routing, and software design and performance verification.

John Ostrander, Director—Hardware Development, and his group are responsible for hardware design and development, hardware sustaining and FPGA development.

Peter Higginson and Sandy Goldfless Technical Directors—TMX Architecture, are responsible for architectural oversight, standards, RFI and RFP Engineering responses, and performance and reliability initiatives and guidance.

New! ATM Single OC-48

The ATM Single OC-48 IOD is an IOD being developed for first introduction this summer. Using a flexible network processor, all the IOD custom logic is on two FPGAs. One of these FPGAs is the largest available from Xilinx. The network processor is made up of four large ICs with supporting memories. Simulation of the complete board level design is well along. Layout is with High Density Interconnect technology using fine lines and spaces and buried vias. This is the first time HDI has been used in TMX 880.

Diagnostics and low-level drivers are completed, and there functional specs and are being coded. Signal integrity, a major effort, has been carefully done and is being monitored as the layout progresses. The printed wire boards are manufactured and the models will be made shortly. Plans to test these models are now being constructed.

Behind the scenes with Engineering Services

Brian C Benson

The Engineering Services team works behind the scenes, creating the environment necessary for the distributed development effort to succeed. Dave Newkirk, Jianying Peng, Brian Benson, Peter Higginson, Ann Valkoun and Ron Poole make up the members of the ES team. You can find contact information and a list of the services we provide on: http://charlotte.inse.lucent.com/~avalkoun.

The Engineering Services team: from Left to right: Christopher Lee, Brian Benson, Christopher Kapusta (our college intern), Ann Valkoun, Jianying Peng, and Dave Newkirk
(missing from the photo is Ron Poole)

Recently, the ES team has been working to provide virtual chassis testing capability through the use of the MTX, a software engineering development modeler. The modeler provides system level testing of prototype code changes by breaking a single chassis into sub systems that contain up to 4 Input/Output cards, allowing the developers to share resources. This is a great productivity enhancement and cost savings for development.

We also master the source code for three sites doing development work on a highly available Veritas Cluster Server with custom agents written for Clearcase and Multisite. This provides 99.9 percent uptime for access to the code base, and failover support in the event of a hardware failure. The implementation of this system has reduced our build times from four hours to two hours, presenting significant time and cost savings.

Currently, we are working on a pair of build servers that will allow parallel builds, reducing the build interval from two hours to possibly one or one and a half hours.

All this good work has been done by and managed by the Engineering services group, in addition to the daily tasks that keep the competitive advantage required for cutting edge development work, through a consistent and well managed development environment.

On the Move

Two of our groups are moving this spring.

The Marlboro Move

The Marlboro group will be moving to the Robbins Road facility in Westford, building 1, floor 1 on March 22. A smooth transition is anticipated with the help of the experienced A-class moving team. Watch for an email containing detailed instructions.

In the Westford facility, the TMX 880 team will be sitting in one, all-inclusive area that has been spiffed and cleaned up just for us. Once again we will also have our own kitchenette, a working cafeteria and a fitness center.

The lab is centrally located, close by to both the new office area and the shipping dock. The lab was built to be flexible and multipurpose for development, SQA, and Customer Support. The new air conditioning system and the DC and AC power were designed to meet current and future needs.

The new TMX 880 Lab is showcased in the atrium area behind large glass windows. It was completely redesigned and renovated for the TMX 880 system. A demonstration area is set up to mirror the CeBit Demo with a large plasma screen, TMX 880 MPLS Core Switch, TMX EMS integration with Navis, CBX 500 Multiservice WAN Switch, PSAX 4500 Multiservice Media Gateway and PSAX 1000 Multiservice Media Gateway.

Both the Marlboro and the Westford lab management teams worked together to completely gut the existing Shortline lab. The older cooling system was reused to update the cooling system in the Pompeii lab, realizing significant savings for the company.

The UK Group

Chiltern House

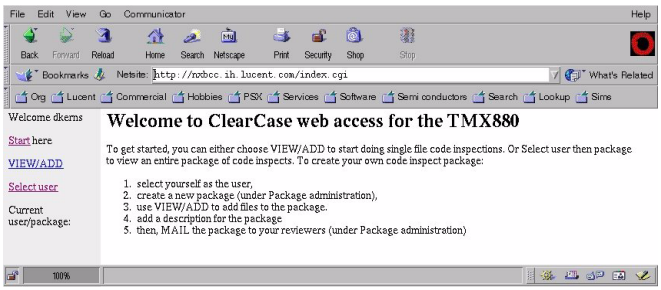
The UK team will be moving to Sterling Court, Broad Lane Bracknell, fourteen miles east of where they are located now. They don't have a definite date yet but LRE is trying to schedule the move for the end of April. They will occupy part of the 2nd Floor in the Lucent Chiltern House.

Hot Topic

Web-based Code Inspection Tool Available

Dave Kerns at Indian Hill has completed a web-based code inspection tool. It's currently up and running at both Indian Hill and Massachusetts. You can access the tool using your UNIX login and password.

For views based in IH use: http://nxbcc.ih.lucent.com. For views based in MA use: http://charlotte.inse.lucent.com/insp/index.cgi



Using the web-based tool you can:

- Perform single file code inspections, or
- Create a package of code inspections and then email the package URL to a list of reviewers for inspection. Comments and metrics are recorded.

Contact Dave at dkerns@lucent.com for detailed information.