INTEROP 90

Solutions Showcase™ Demonstration

"Real-World Solutions for Today's Networks"

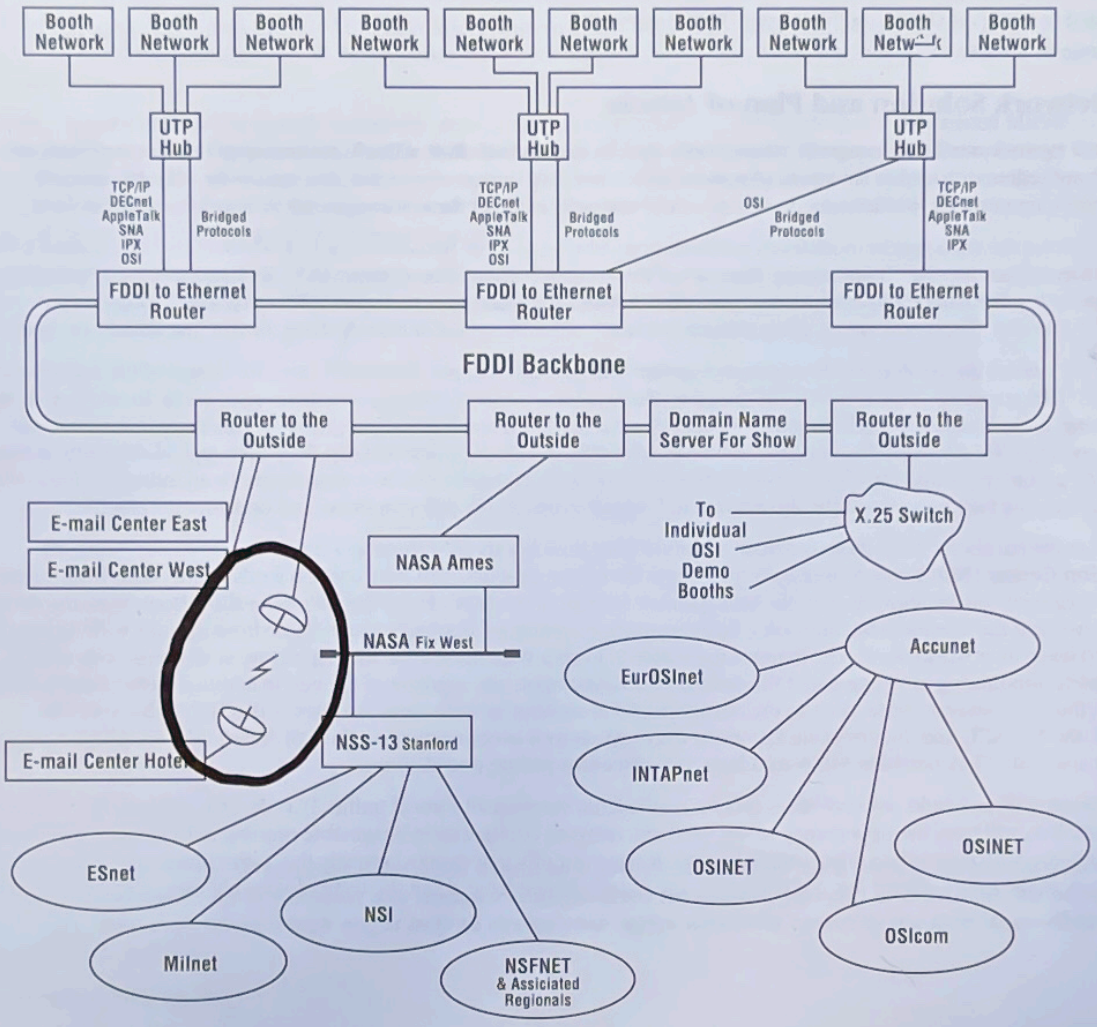
INTEROP 90

Introduction to the INTEROP Shownet

Welcome to INTEROP 90! Because the layout and workings of a network are not always obvious at first sight, we have included in this short essay the necessary hints to guide you through this year's Shownet topology.

It is Interop Inc.'s philosophy that the INTEROP Exhibition should be first and foremost an educational experience. As everyone knows, merely learning about a subject in class is not usually enough to gain a complete understanding of the matter. Having learned about the technologies, it is most useful to immediately have the opportunity to see the technologies in action—to bring the subject matter to life. Thus, the INTEROP Shownet is a natural follow-on from the INTEROP Tutorials and Conference Sessions.

Topology of the INTEROP Shownet



INTEROP 90 Shownet Core Team

The INTEROP 90 Shownet core team is the group of experts responsible for the generation of the topological design and layout of this year's network. The core team consists of Stev Knowles, FTP Software, Inc.; and Karl Auerbach, Dave Bridgham, and John Romkey, all of Epilogue Technology Corporation; and Peter de Vries, Interop, Inc.

Assistance with the installation of the network was provided by a group of volunteers from many of the exhibiting companies as well as several who are *not* exhibitors. A list of the major team members—the ones devoted enough to be here from midnight on Sunday morning until the network was finally up—will be supplied later for your reference. Thanks to the individuals who worked so hard.

General Description of the INTEROP Shownet

The Situation:

At INTEROP 90 there are 192 booths for 197 exhibitors, with an approximate total of 1,000 computer systems distributed among them. This total does not include the machines located "off campus" at several companies' headquarter sites that are linked-in via leased data lines and the like. Because most of the exhibited systems are of the larger and more powerful variety (running protocols like SNMP, NFS®, and the X Window System™) there exists the possibility of a serious drain on our show network's bandwidth (speed).

To further complicate matters, apart from having to plan for this heavy network traffic, we *had* to be able to install the entire cable system—which has currently been calculated to be around 23 miles of cable—*in eight hours!* This includes both the unshielded twisted pair (UTP) and fiber-optic (FDDI) segments.

The Network Solution and Plan of Attack:

One of the best ways to keep a network's bandwidth up is to limit the number of machines on any given wire segment, and then link subsegments together by means of routers and/or learning bridges. Since this idea creates by default a modular topology for the network, we determined that we could take advantage of these subsegments to install the network faster.

We constructed the subsegment modules as individual pre-fabricated cable harnesses, each of which constitutes a small LAN. The exhibition floor involves fairly regular rows of booths, so we dedicated one of these LANs (or harnesses) to approximately every two aisles. We named these segments "ribs." The individual ribs are constructed of UTP "telephone" wire running 10BASE-T Ethernet. These ribs are, in turn, connected to each other by means of routers along a main "backbone" or "spine."

In order to connect the 10-Megabit rib segments together without suffering any bandwidth loss, we designed the main backbone using the FDDI standard—which uses a 100-Megabit token-passing protocol running over fiber-optic cable. In addition to the FDDI spine, there is also a second Ethernet for backup and a third Ethernet for bridged protocols (anything that we are not already routing). We intended that our show network echo what would be a practical topology for a typical corporate network. So, if each group of booths (rib) clustered on an Ethernet hub were considered to be a department or an individual floor of a building, then the backbone would be the internet link which connects the different floors and departments together.

Apart from the backbone itself, there is a main umbilical cord from booth 1020 (Interop's center booth) to our **Network Operation Center (NOC)** which overlooks the exhibit floor from upstairs. This wire harness feeds connections from all the network segments on the show floor to the management stations in the NOC. Every device on the show floor, from the domain name server and the routers to the individual Ethernet ports at exhibitors' booths, is controllable from upstairs without anyone having to leave their workstation. The intent is to be able to keep a watchful eye on the big picture at all times, with alarms immediately announcing anything out of the ordinary occurring upon any segment of the net. In addition to the exhibit floor internet, there are several connections to the outside world to monitor as well: there are lines to the TCP/IP Internet (the MILNET, the NSFNET, and the emerging European Internet), as well as connections to the OSI community via AT&T Accunet (OSINet and OSI^{ONE}), nationwide SMDS data lines and numerous private outside links.

The Shownet will, as would any real-life corporate network, be carrying all sorts of traffic: TCP/IP, OSI, DECnet, IPX, AppleTalk, and so on. You will have the opportunity to see most any network configuration imaginable running at INTEROP. We hope that it provides you with some ideas which might help to design your office networks correctly the *first* time—thus saving you time and money in the future. Please ask our exhibitors any questions you have about the technologies utilized—they will be pleased to assist you!

Acknowledgements

I would like to thank the many companies which generously provided the equipment that we needed to create the marvellous network that you have seen. In particular, we must mention **Siecor Corporation**, who donated much of the 7.6 miles of FDDI cabling with which we built the backbone and FDDI Demo rings. The 10-Megabit Ethernet-over-Microwave link to the Fairmont Hotel (for the hotel's electronic mail center) was provided by **Microwave Bypass Systems, Inc.** The UTP connectors, patch panels, and other 10BASE-T cable installation and test hardware were supplied by **Nevada Western**. Terminals used in the electronic mail centers were provided by **GraphOn** and **Wyse Technology**, while terminal servers used there and in the main backbone administration came from **Xylogics**. **GraphOn** also supplied X terminals for the e-mail centers.

For having loaned the FDDI-to-Ethernet routing equipment used on the backbone, we thank **cisco Systems, Inc.**, **Proteon, Inc.**, **Timeplex, Inc.**, and **Wellfleet Communications, Inc. Vitalink Communications Corporation** provided routing and CSU/DSU equipment, while media bridging devices were supplied by **Halley Systems** and **Network Applications Technology**. All the UTP 10BASE-T Ethernet equipment was supplied by **Cabletron Systems, Inc.**, **DAVID Systems, Inc.**, and **SynOptics Communications**. Links for the PPP Demo as well as X.25 segments of the OSI Demo were provided by **Telebit Corporation**. The OSI X.25 switch was supplied by **Unisys Corporation**, and the OSI X.25-to-Ethernet routers were provided by **3Com Corporation** and **cisco Systems, Inc.** The FDDI Demo ring is connected to the Shownet FDDI backbone using equipment from **Network Systems**. Shownet token ring drops were made by means of **Star-Tek** hubs.

Network management was possible thanks to monitoring equipment supplied by **Advanced Computer Communications**, **LANalyzer Products Division—Novell, Inc.**, **Hewlett-Packard**, **Micro Technology**, **Network General**, **Silicon Graphics**, **Spider Systems**, and **Tekelec, Inc.** Actual SNMP network management stations were supplied by the above, as well as **BBN Communications**, **Cabletron Systems, Inc.**, **Digital Equipment Corporation**, **Network Application Technology**, **NYNEX**, **SNMP Research**, **Sun Microsystems, Inc.**, **Unisys Corporation**, and **Wellfleet Communications, Inc.**

The BIND System name server was provided by **Sun Microsystems, Inc.**, with **TGV, Inc.** supplying our Shownet's backup name server. We thank the management of **NASA Ames Research Center** for our link to the Internet, and **AT&T's Accunet** for our OSI connections.

Getting all the equipment staged and ready before the show was a major production; our thanks go to **Advanced Micro Devices**, **Digital Equipment Corporation**, **Pacific Bell**, **University of New Hampshire**, **Ungermann-Bass**, **Unisys Corporation**, and **Xyplex, Inc.** for allowing the demo groups to use their sites for group testing. A special thanks also to the people who served as steering committees for the various special technical demonstrations. It was only because of their unswerving support that all these demos you have seen today came to pass.

Last, but definitely not least, we thank all the personnel from the companies who assisted in installing their equipment in such record time. In particular, **fotec inc.**, **Fibronics International**, and **T&R Communications, Inc.** provided testing expertise for the FDDI rings.

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—Peter de Vries, Interop, Inc.