

Technológiai újdonságok a kábelezésben

- **iPatch: az intelligens rendező**
- **GigaSPEED X10D: kábelezési rendszer a 10GBase-T -hez**



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Patch Cord Management

The “Spaghetti” Challenge



*Photo: New York Times
Magazine article about
Amazon.com*

*“And where does
this one go?”*

Intelligent Infrastructure Management

Yesterday's Drivers

- Need for accurate documentation
- Productivity improvements
 - Centralized control
 - Guided patching
- Fault management
 - Alerts for patch connections/disconnections
- Novelty value
 - Cabling ...with lights!



iPatch



- Új kábelrendezési rendszer, a hatékonyság növelése érdekében.
- Intelligens, nem elektronikus!
- Garanciák: a kábelezés adatátviteli tulajdonságaiban azonos!!!

Hardware

Rézkábeles panelek



Hardware

Optikai panelek



Hardware

Rack Manager Plus



Software

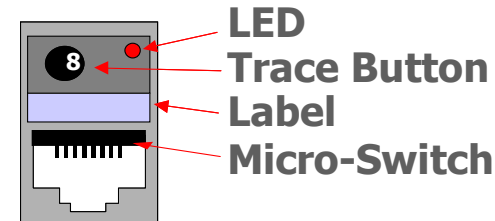
System Manager



Patch Sensing Technology Choices

Port-Sensing using Standard Cords

- Detects any copper or fiber cord
- Detects single-ended connections
- Always knows ports in use
- Instantaneous response on plug insertion



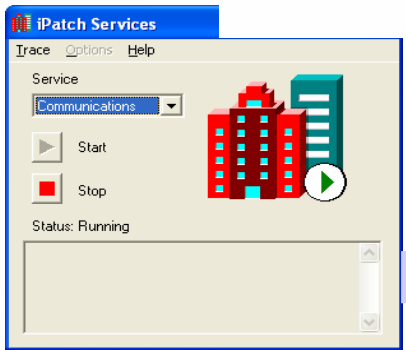
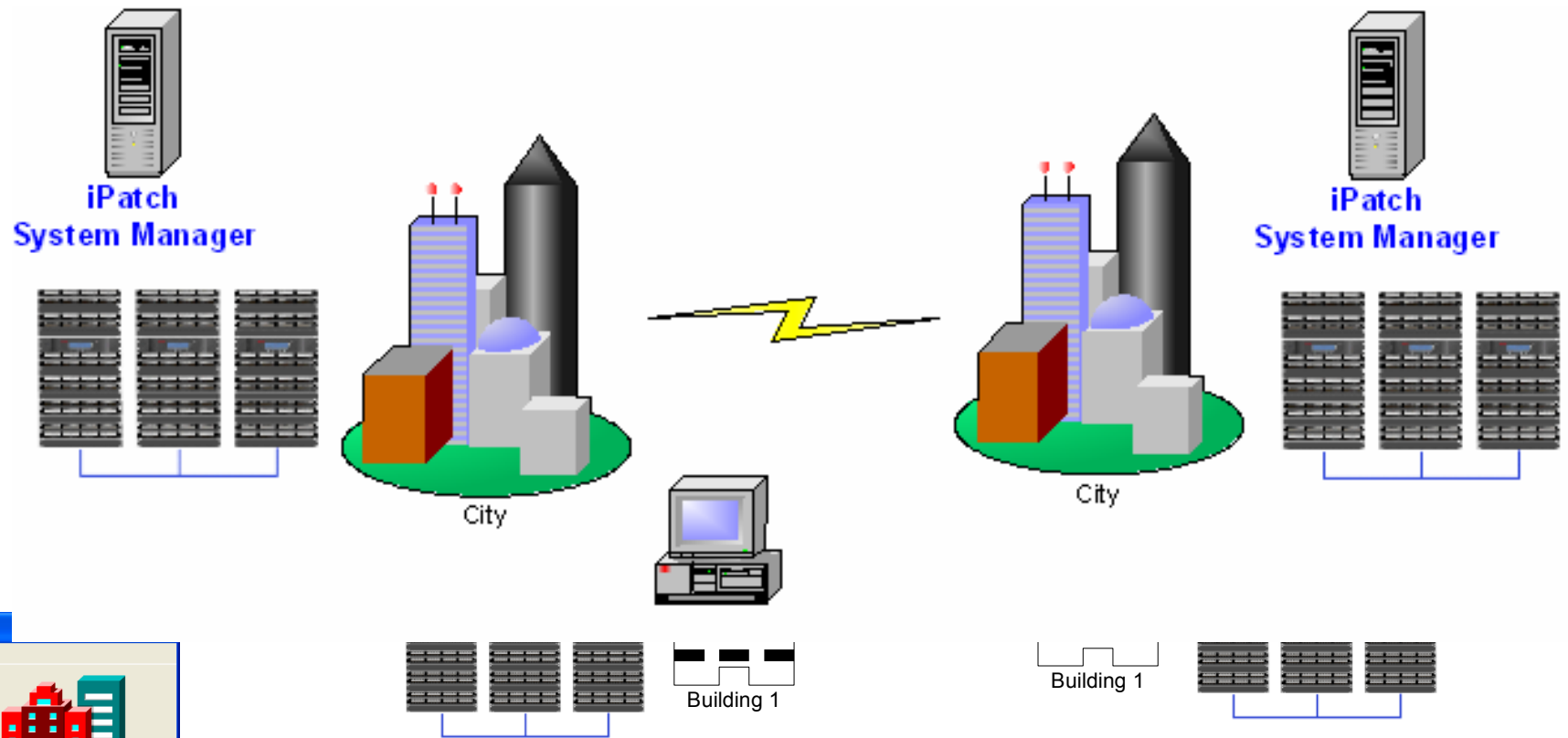
Standard Cord



**Sensing that makes sense
=
Intelligence you can trust**

Global Infrastructure Management

Within the building, across a campus, across the country/world



Communications, SNMP, Web, Event Notification

Beyond Cord-by-Cord Patch Mgmt

Service Provisioning Approach

Select the jack/device/port and service required, let the intelligent system do the rest...

The image displays two screenshots of a network management software interface, both titled "Trace for Jack 01".

The left screenshot shows the "View" section with "Current" selected. The "First Path" tab is active, showing a table with the following data:

Path	Object	Equipment
	01	Faceplate 01
	cabled to	
	01	Rack 001/Pane

The right screenshot shows the "View" section with "Scheduled" selected. The "First Path" tab is active, showing a table with the following data:

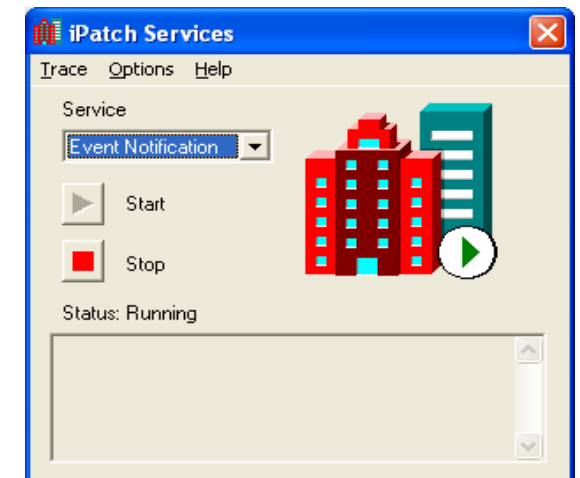
Path	Object	Equipment	Location
	Phone 1		Building 2/Floor 1/Room 2
	assigned to		
	01	Faceplate 01	Building 2/Floor 1/Room 2
	cabled to		
	01	Rack 001/Panel 01	Building 2/Floor 1/Room 1
	patched to		
	07	Rack 001/Panel 01	Building 2/Floor 1/Room 1
	cabled to		
	07	Rack 001/Panel 01	Building 1/Floor 1/Room 1
	patched to		
	01	Rack 001/PABX/Voice 1	Building 1/Floor 1/Room 1
	service provide...		
	Voice		

Buttons on the right side of the interface include "Locate", "Close", "Print", and "View Work".

If a port in the selected path is used before the work order is completed, the system reconfigures patching to another available port and/or issues alert

Event Notification

- Notification alerts for events of interest
- Work order notifications
- Profile configurations
 - Per user, location, ports, events, time of day
- Action configurations
 - email, sound, external application

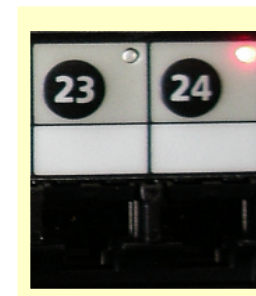


Electronic Work Orders

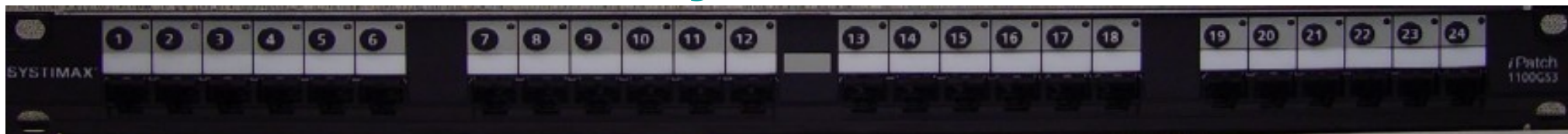
Fully electronic work orders including visual and audible guidance for accuracy and speed



Technician follows LEDs on ports and instructions on LCD screen



The iPatch System Excellence



One-Button Tracing

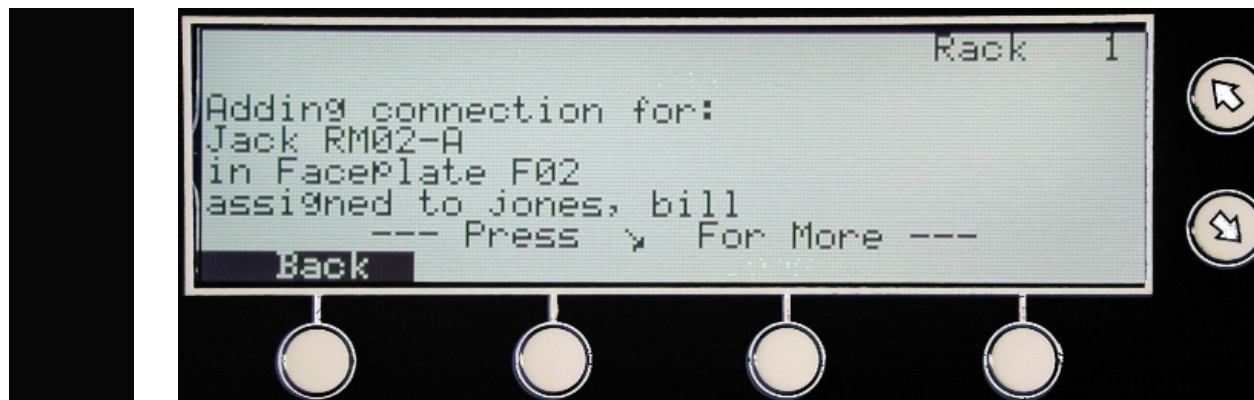
- Provides simple and accurate verification of patch cord connections
- Cuts the time to trace a patch cord
- Eliminates the errors that occur when changes are made to the network based on inaccurate records
- Reduces the possibility of inadvertently disconnecting a service for the wrong user



The iPatch System Excellence

One Button Access to the Connectivity Map

- Lets the technician quickly determine the location of the jack connected to a port and the service being provided to a particular port or jack



The iPatch System Excellence

One Button Access to the Connectivity Map

- Lets the administrator easily verify connections in the network

Trace for Jack 100A2

View
 Current Scheduled

First Path | Second Path

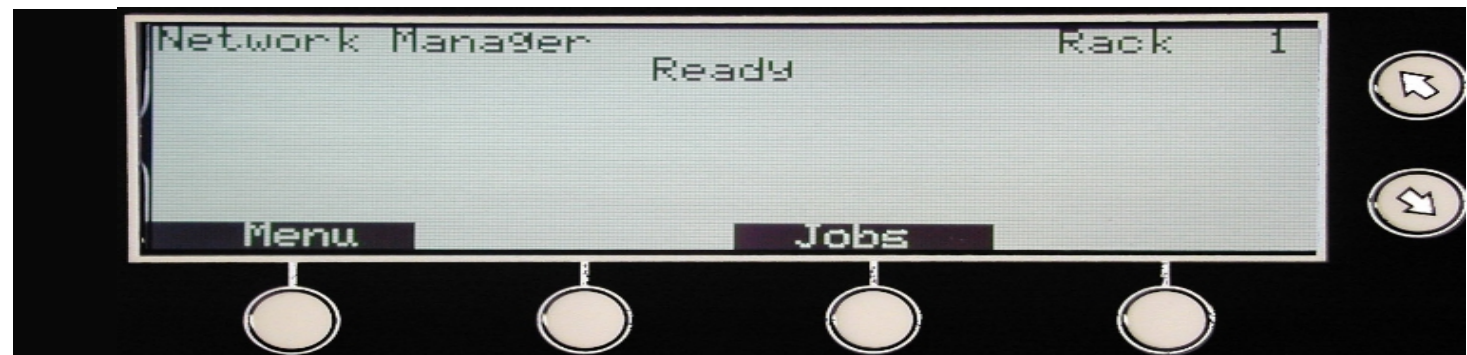
P...	Object	Equipment	Location
	IP x3333		Building A/1st/1A100
	assigned to		
	100A2	100A	Building A/1st/1A100
	cabled to		
	02	Rack 001/Panel 01	Building A/1st/TC1
	patched to		
	24	Rack 002/LAN1	Building A/1st/TC1
	cabled to		
	14	Rack 002/Switch 01/VoiceLan1	Building A/1st/TC1
	service provided to		
	Voice		

Buttons: Locate, Close, Print, View Work, Help

The iPatch System Excellence

Electronic Work Orders

- Lets the administrator electronically schedule changes and quickly dispatch a technician to implement them



The iPatch System Excellence

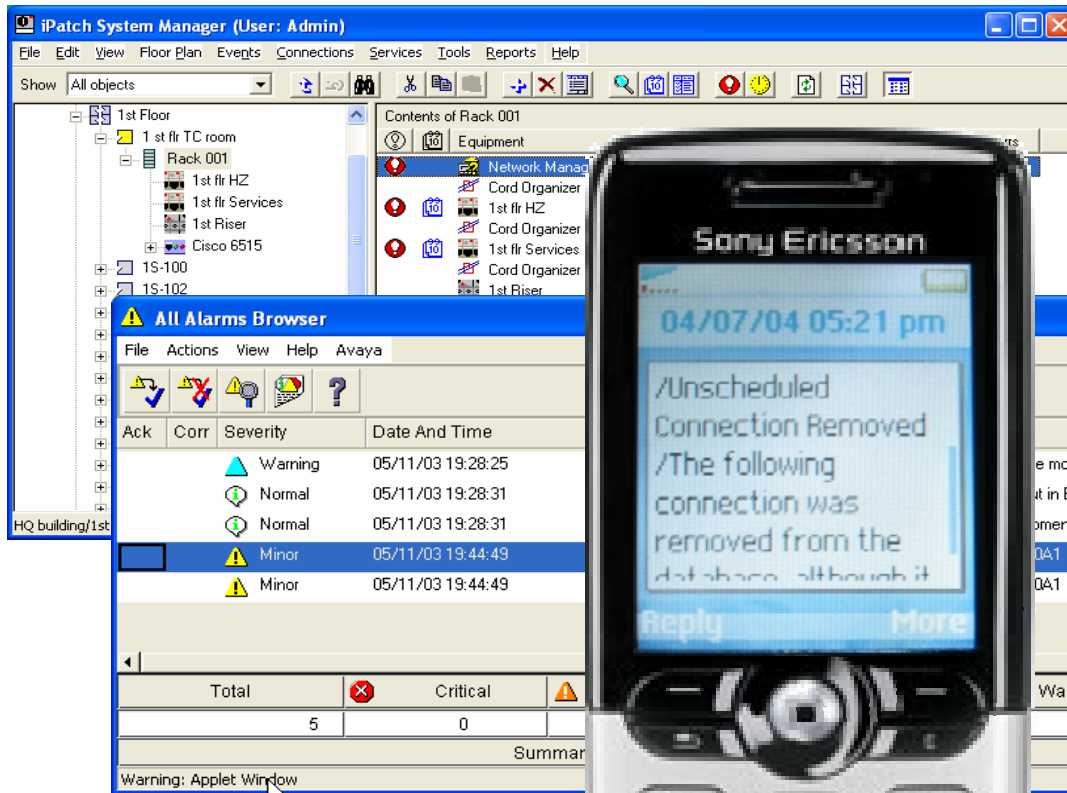
Advance Guidance System

- Provides extensive visual and audible guidance when making changes
- Reduces the time to complete a work order by guiding the technician
- Improves the accuracy of the technician when completing work orders
- Reduces the potential for error



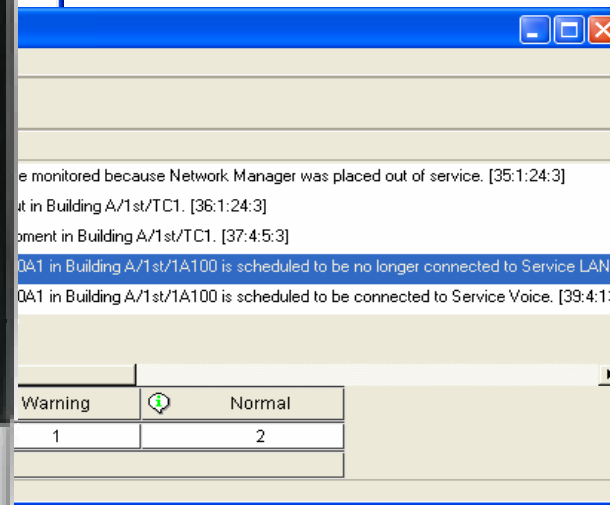
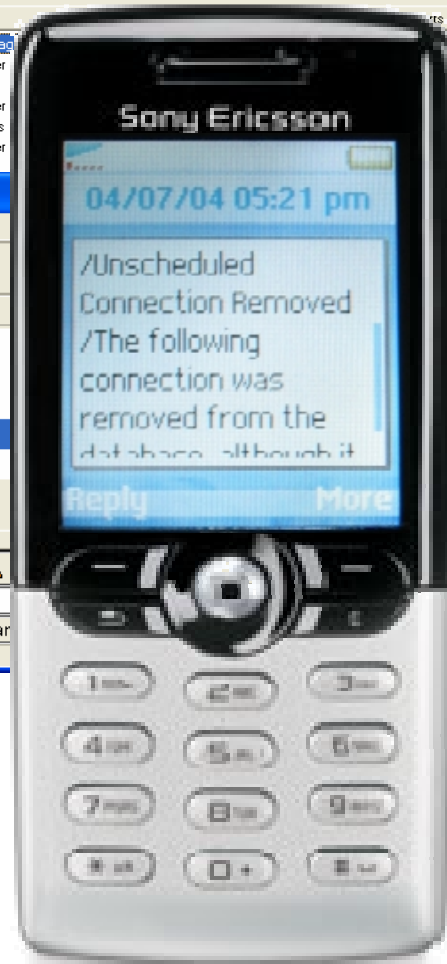
The iPatch System Excellence

Multiple Notification Capabilities



System Manager Events

SNMP Traps



Pop-up Message



Even When
Away from
the Office

The iPatch System Excellence

SM Integration with NMS

System Manager can send alerts to NMS systems for user-specified data links when

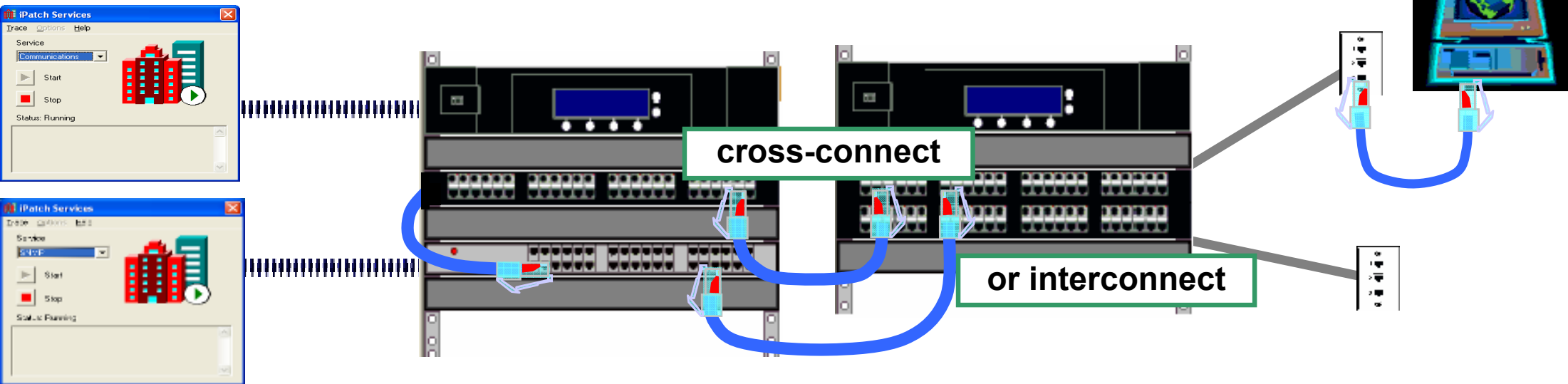
- **Unplanned patches occur that affect a designated link**
- **Future changes to a designated link are scheduled in System Manager**
- **Scheduled work affecting a designated link is completed**

The iPatch System Excellence

Integration of Managed Network Devices

- **Communication with Network Devices via SNMP**
- **Auto-configuration of Equipment in Database**
- **Scheduled or trap-triggered Device Discovery**
- **Enabling/Disabling of switch ports can be scheduled with work orders and job completion**
- **Event Notification for designated ports/devices**

Device Discovery with SNMP

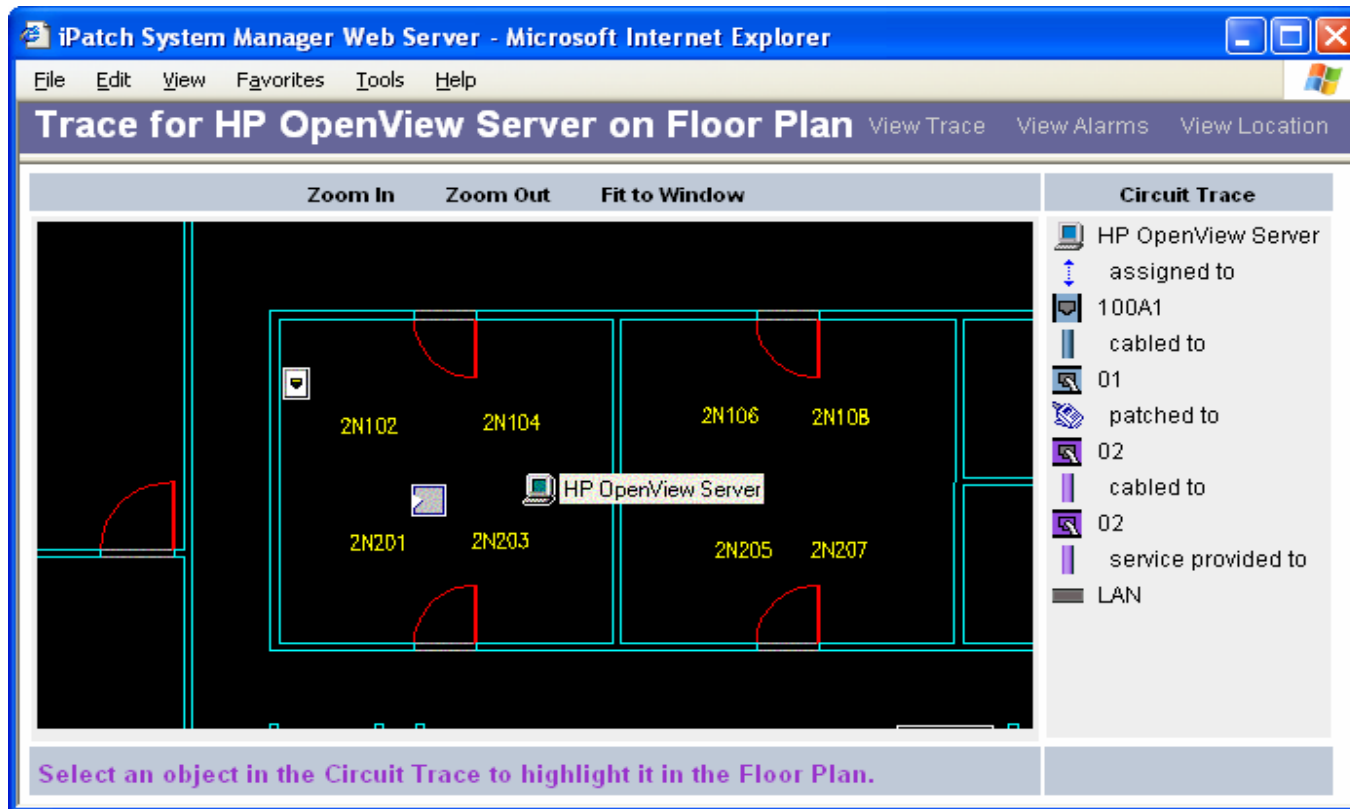


The screenshot shows a 'Trace for Jack 101 - A' window with the following table:

Path	Object	Equipment	Location
	PC		Building IT403/Floor 1 South/101
	connected to		
	101 - A	Faceplate 01	Building IT403/Floor 1 South/101
	cabled to		
	12	R02/Panel 01	Building IT403/Floor 1 South/1S TR
	patched to		
	01	R01/Panel 01	Building IT403/Floor 1 South/1S TR
	cabled to		
	01	R01/Cisco 2950/Built-In Ports	Building IT403/Floor 1 South/1S TR

The iPatch System Excellence

Import CAD Generated Floor Plan Drawings



- Allows user to place and manage objects directly from the floor plan
- Floor plan feature is accessible from System Manager and from NMS

The iPatch System Excellence

Ease of Installation

- Low profile iPatch components do not interfere with cabling of patch panels
- Panel bus eliminates need for custom cables to connect panels to the Rack Manager
- Racks are connected together using standard patch cords
- No external equipment required to configure components at installation



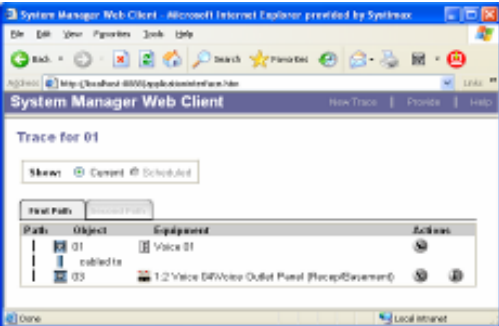
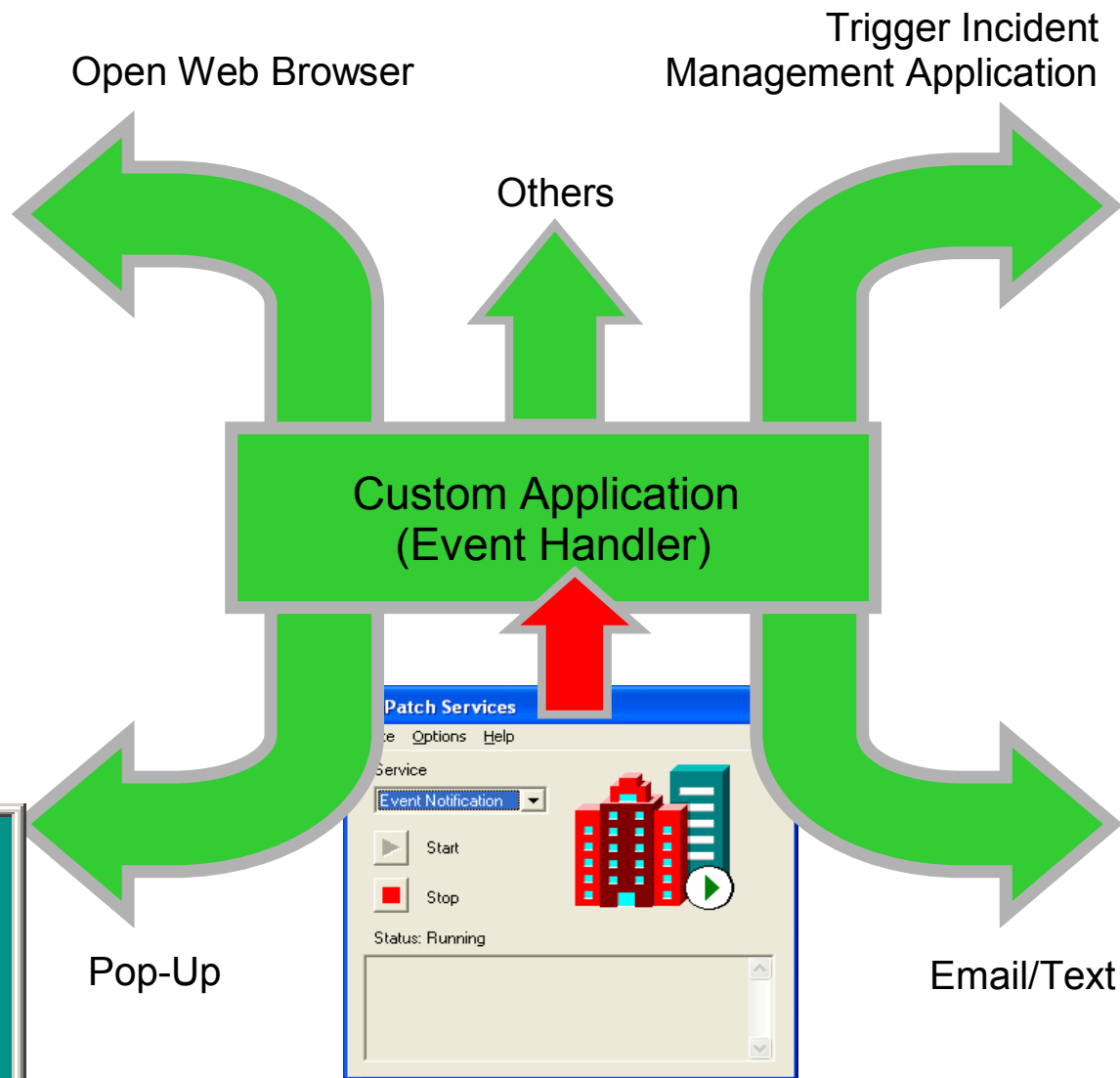
The iPatch System Excellence

Standards-Compliant Open Architecture

- Works with any standard copper or fibre patch cords
- Customers do not have to stock proprietary patch cords
- The iPatch System is the only intelligent patching system that is intelligent enough to detect any standard plug insertion



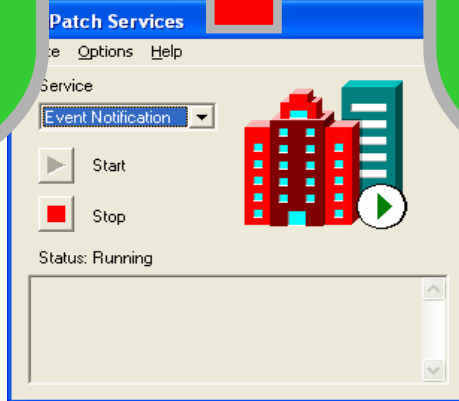
Example Event Handling



Request	Status	Cost Center	Project	Requested Building	Installation Date	Requestor
Install GATEWAY...Z18 to Merzen...	DCF review in process	DEVEV20	Development	Mergen	4/5/2003	Tom
Install COMPAG...PROLANT 8808 to Smith...	DCF review in process	FIN100	Financial Asset	Smith	4/5/2003	Andy
Install COMPAG...PROLANT 8808 to Smith...	DCF review in process	MKT0001	Web Server	Smith	5/2/2003	Frank
Install DELL...POWEREDGE 8808 to Merzen...	DCF review in process	MKT0001	Marketing	Mergen	5/7/2003	Administrator
Install COMPAG...PROLANT 8808 to Smith...	awaiting provisioning	SAL100	Sales Automation	Smith	6/2/2003	Shelly



iPatch Event:
Patching Change Scheduled for
Critical Circuit



- ➡ Open System Manager
- ➡ Continue what I was doing

The iPatch System Experience

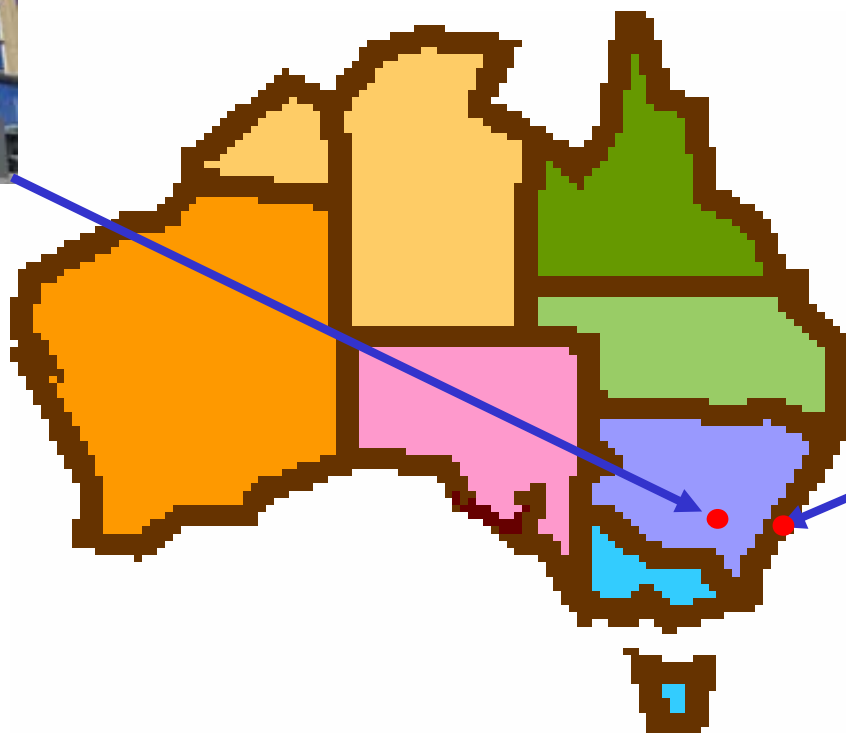


Case Studies:

1. Remote Branch Management
2. Convention Centre
3. Government Offices
4. Wireless Service Provider

The iPatch System Experience

Case 1: Remote Branch Management



The iPatch System Experience

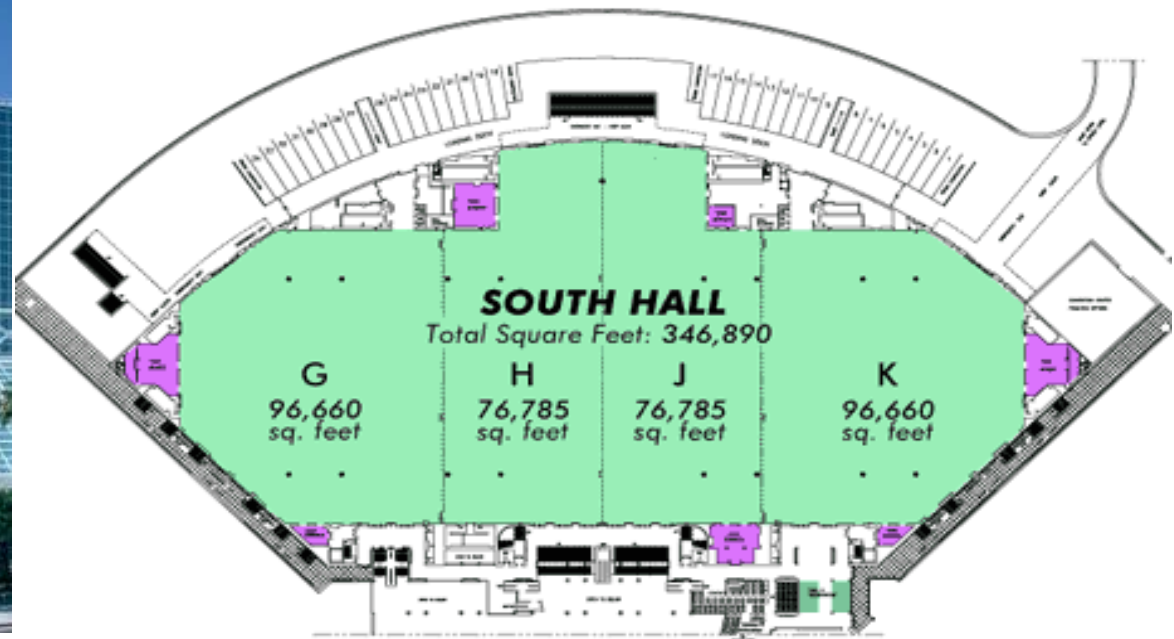
Case 1: Remote Branch Management

Problem:

- **Small remote location with 300 outlets**
 - does not justify a full time technician
- **Frequent re-arrangement of data and voice services**
- **Accuracy of Moves, Adds and Changes (MACs) is vital**
 - disconnecting a wrong service is not tolerable
- **Cost of MAC errors is high**

The iPatch System Experience

Case 2: Convention Centre



The iPatch System Experience

Case 2: Convention Centre

Problem:

- **Extensive connectivity rearrangements on a weekly basis**
- **Lack of accurate documentation for billing**
- **No room for errors**
 - limited time to install and even less time to troubleshoot
- **Installation and troubleshooting during weekend**
 - high cost of errors

The iPatch System Experience

Case 3: Government Offices



The iPatch System Experience

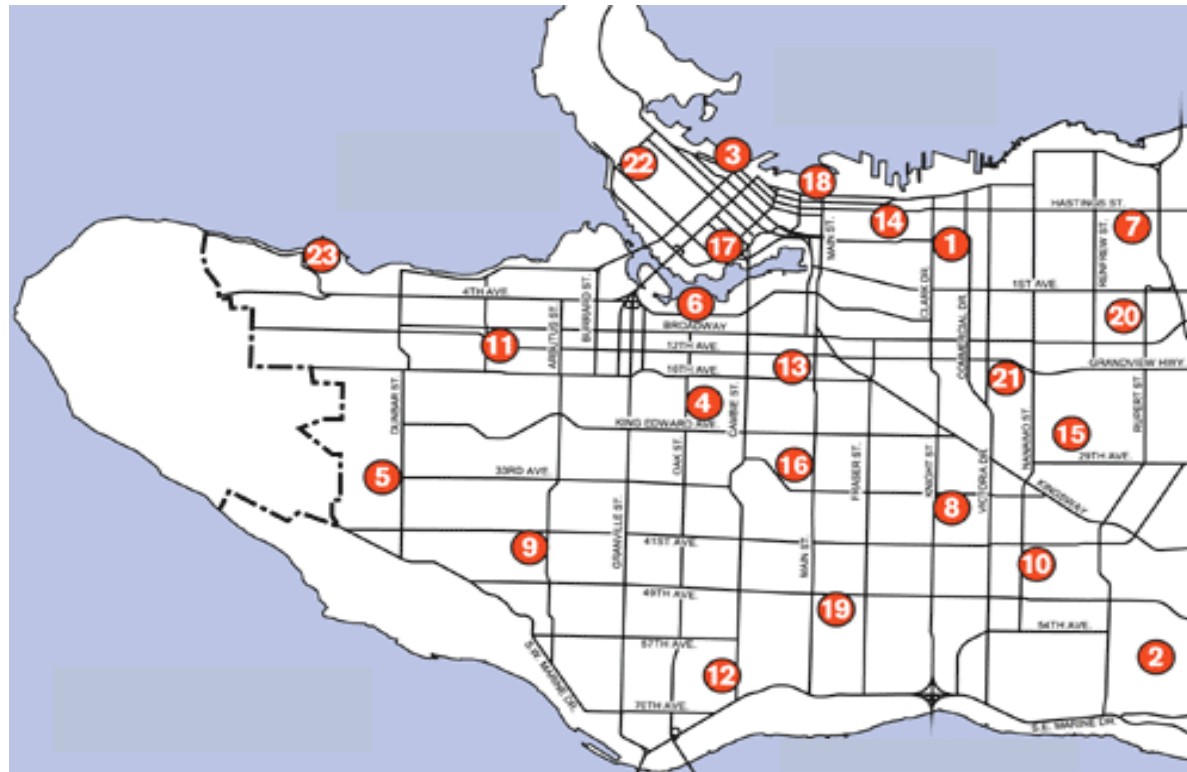
Case 3: Government Offices

Problem:

- **Multiple organisations located in the same building**
- **Each organisation controls its own services**
- **Security concerns – multiple technicians having unchecked access to everyone's patching fields**
- **Provide security for the fibre backbone cables**
- **Paper based documentation methods**

The iPatch System Experience

Case 4: Wireless Service Provider



The iPatch System Experience

Case 4: Wireless Service Provider

Problem:

- **Hundreds of small remote sites across the country**
 - cannot justify dedicated support personnel at each site
- **Security is paramount**
 - any patching activity needs to be monitored
- **Unscheduled service interruptions lead to revenue loss**
 - cost of downtime is high
- **Need accurate documentation for disaster recovery**

GigaSPEED X10D

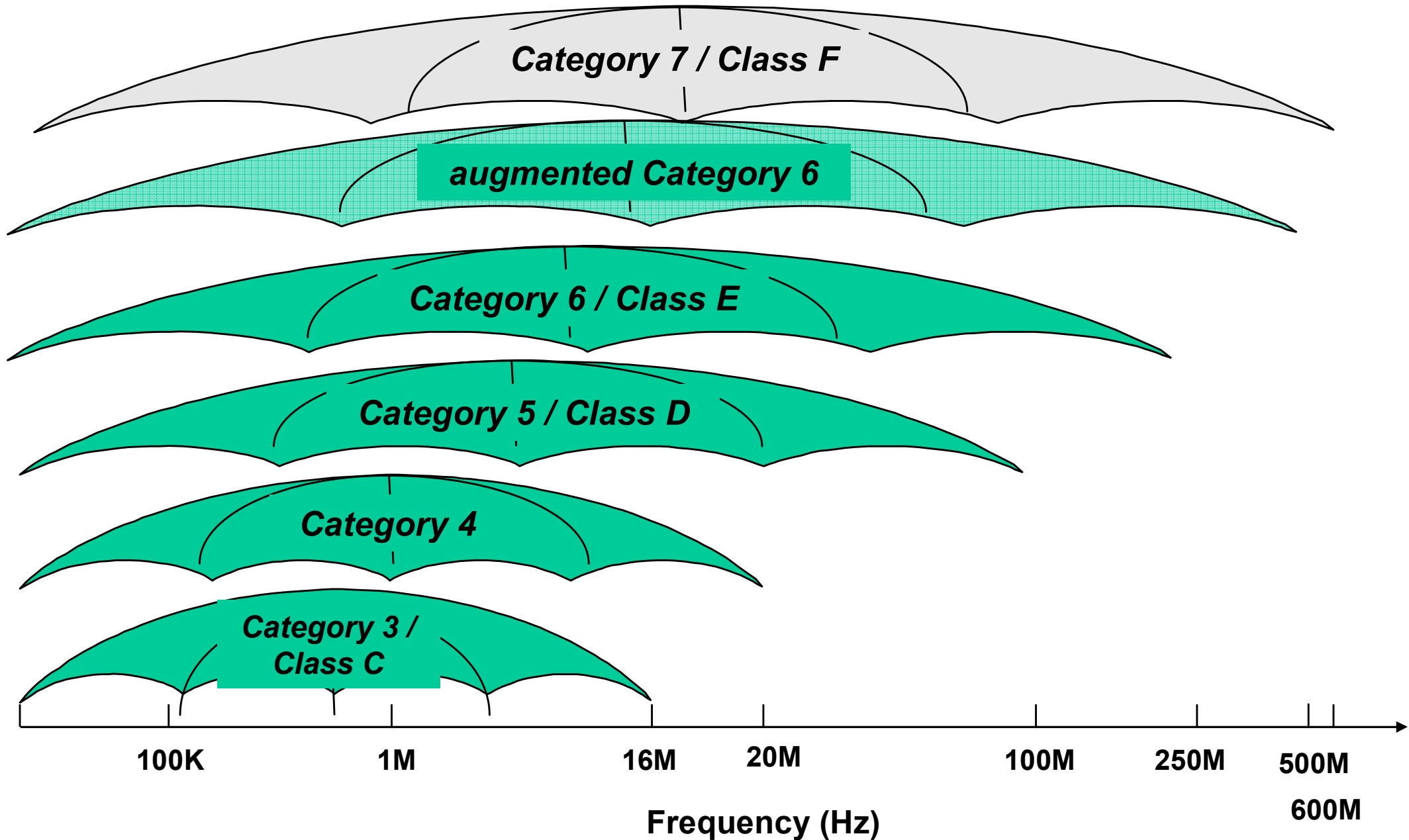
Extending Bandwidth Boundaries

10 Gb/s on Twisted Pair

The Challenges - Electronics

- **Lower the 10 Gb/s cost compared to fiber**
 - for widespread adoption of 10 Gigabit Ethernet
 - target is data centers, server farms, longer term: horizontal
- **Use standards-based cabling media**
 - initially hoped to re-use Cat 5e/Class D, but judged not feasible
 - now targeting at least **55 to 100 m over existing Cat 6/Class E**
- **Develop reliable electronics for 10 Gb/s**
 - will require sophisticated DSP for NEXT, ELFEXT, Echo cancellation, state-of-the art silicon, high speed & high precision A/D, multilevel coding (PAM12)
- **Complete standardization work by 2006**
 - ambitious IEEE 802.3an Task Force target

Rézkábeles minőségi kategóriák

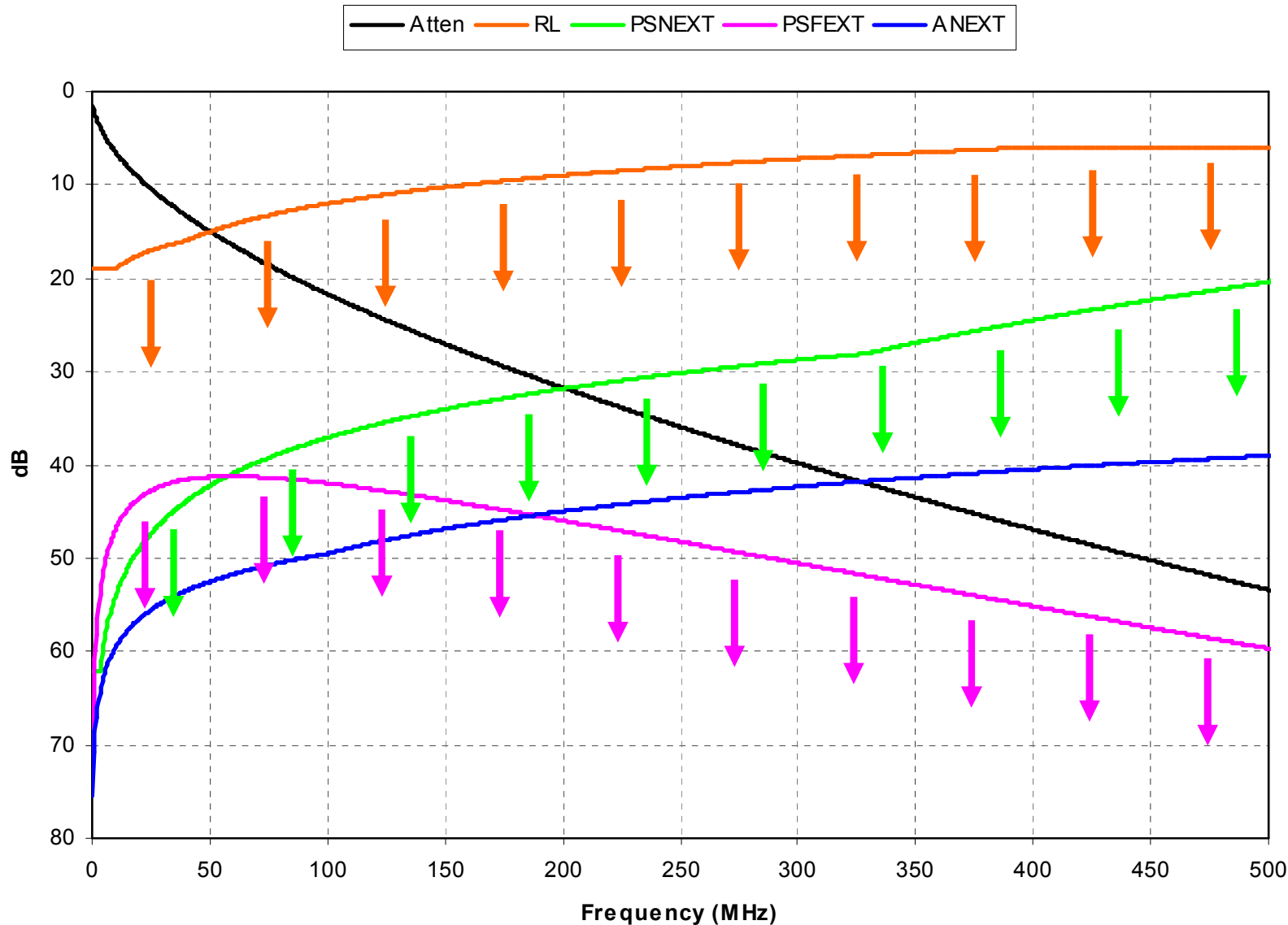


GigaSPEED X10D Channel Performance

Guaranteed Channel Performance Specifications for 4-Connection GigaSPEED X10D Systems

Freq (MHz)	Insertion Loss (dB)	PS ANEXT (dB)	Pr-Pr NEXT (dB)	ACR (dB)	PS NEXT (dB)	PS ACR (dB)	Pr-Pr ELFEXT (dB)	PS ELFEXT (dB)	Return Loss (dB)	Delay (ns)	Delay Skew (ns)
1.0	2.0	75.0	71.0	68.9	69.5	67.4	69.3	68.3	22.0	580	40
4.0	3.8	74.0	69.0	65.0	68.0	64.0	57.2	56.2	22.0	562	40
8.0	5.4	71.0	64.2	58.5	63.1	57.5	51.2	50.2	22.0	557	40
10.0	6.1	70.0	62.6	56.3	61.5	55.2	49.3	48.3	22.0	555	40
16.0	7.7	68.0	59.2	51.3	58.1	50.2	45.2	44.2	21.0	553	40
20.0	8.6	67.0	57.6	48.7	56.5	47.6	43.2	42.2	20.5	552	40
25.0	9.6	66.0	56.0	46.1	54.8	44.9	41.3	40.3	20.0	551	40
31.3	10.8	65.1	54.4	43.3	53.2	42.1	39.4	38.4	19.5	550	40
62.5	15.4	62.0	49.4	33.4	48.1	32.2	33.3	32.3	17.0	549	40
100.0	19.7	60.0	45.9	25.6	44.6	24.2	29.3	28.3	17.0	548	40
200.0	28.5	55.5	40.8	11.4	39.4	10.0	23.2	22.2	12.0	547	40
250.0	32.1	54.0	39.1	6.0	37.7	4.5	21.3	20.3	11.0	546	40
300.0	36.5	52.8	32.7	-3.8	31.3	-5.3	19.7	18.7	8.0	546	40
400.0	42.7	51.0	30.6	-12.2	29.1	-13.7	17.2	16.2	8.0	546	40
500.0	48.3	49.5	28.9	-19.4	27.3	-21.0	15.3	14.3	8.0	546	40

Cat-6 Channel Electrical Specifications



DSP cancellers
Per Pair

1 echo

3 NEXT

3 FEXT

ANEXT cannot
be cancelled
(must tolerate
noise hits)



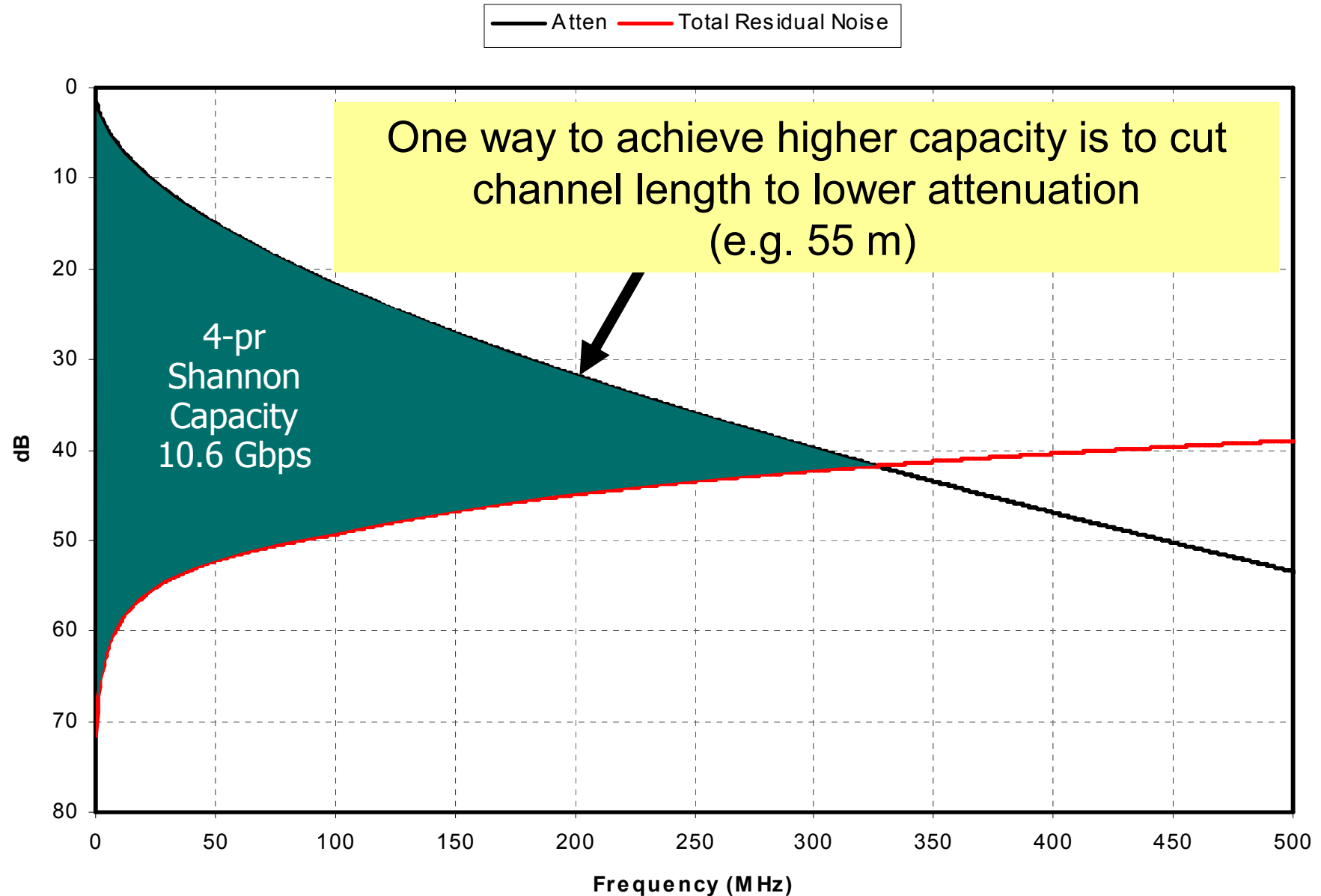
Shannon Capacity and DSP

- **Claude Shannon is considered “the father of information theory”**
 - Published “A Mathematical Theory of Communication” in 1948 while at Bell Labs
- **His work stimulated the technology that led to today’s “Information Age”**
- **Shannon Limit (or “Shannon Capacity”):**
$$C = W \cdot \log_2(1 + S/N)$$

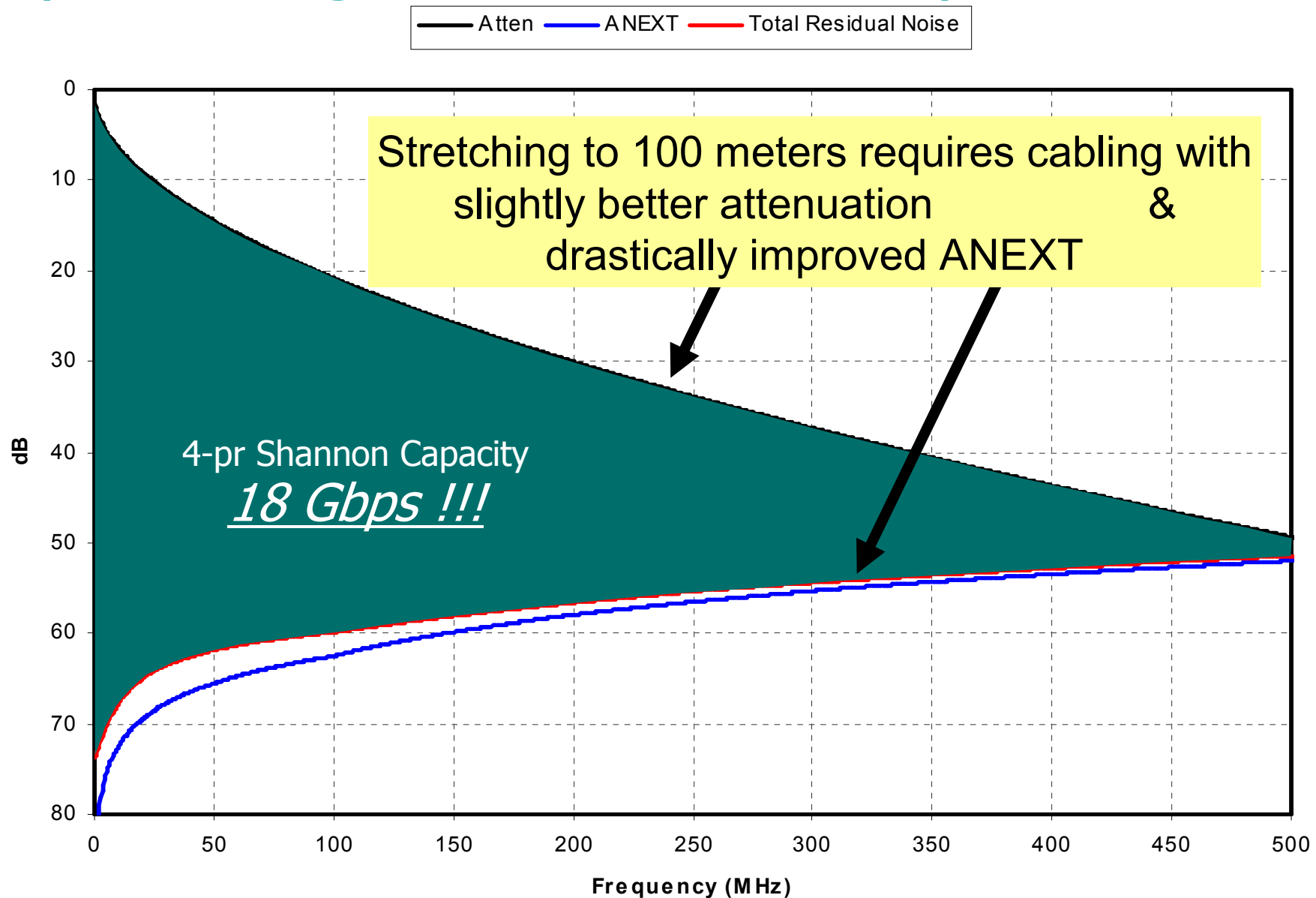
C = Channel Capacity (bits per second)
W = Channel Bandwidth (hertz)
S/N = Signal to Noise Ratio
- **Digital Signal Processing is widely used today to improve signal to noise ratio and approach theoretical Shannon limit**



Cat-6 Electrical Specifications (including DSP cancellation)



IEEE Model-1 (Cat-6A) Electrical Specs (including DSP cancellation)

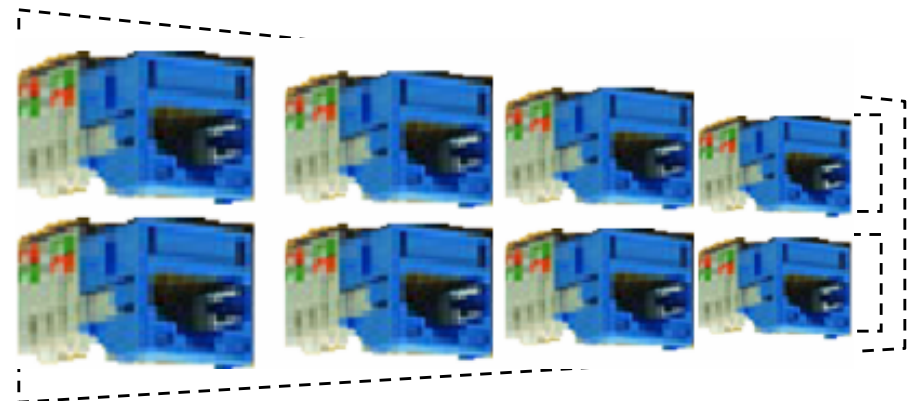
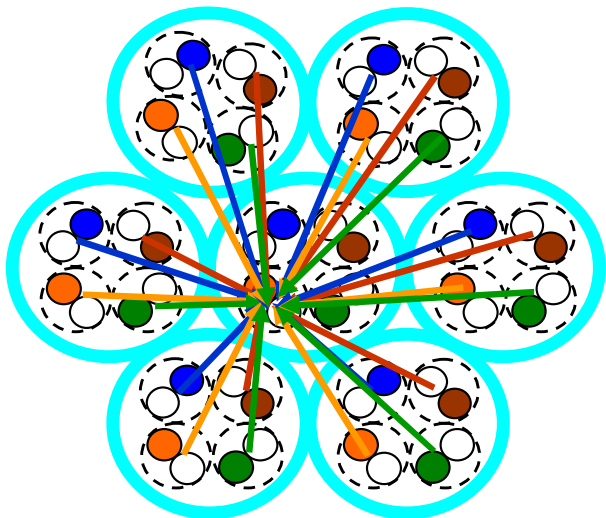


10Gb/s on Twisted Pair

The Challenges - Cabling

- **Alien Crosstalk**

- Alien Crosstalk is the undesired coupling of energy from adjacent channels
- 10GBASE-T includes Power Sum Alien Crosstalk requirements
- Alien Crosstalk occurs in cables and connectors, cannot be cancelled by electronics

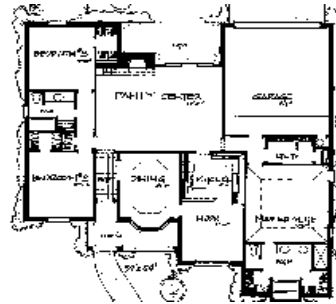


Top-Down Systems Approach

Visualize



Design



Specify



vs the Alternative Approach

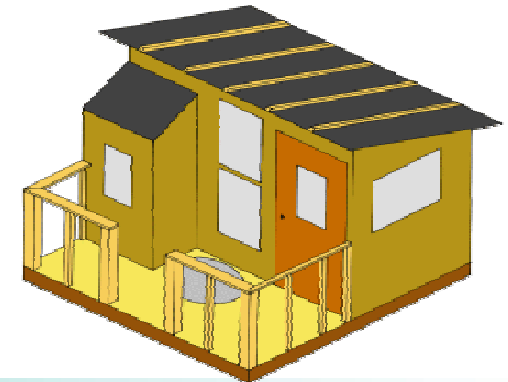
Pick Parts



Force Together



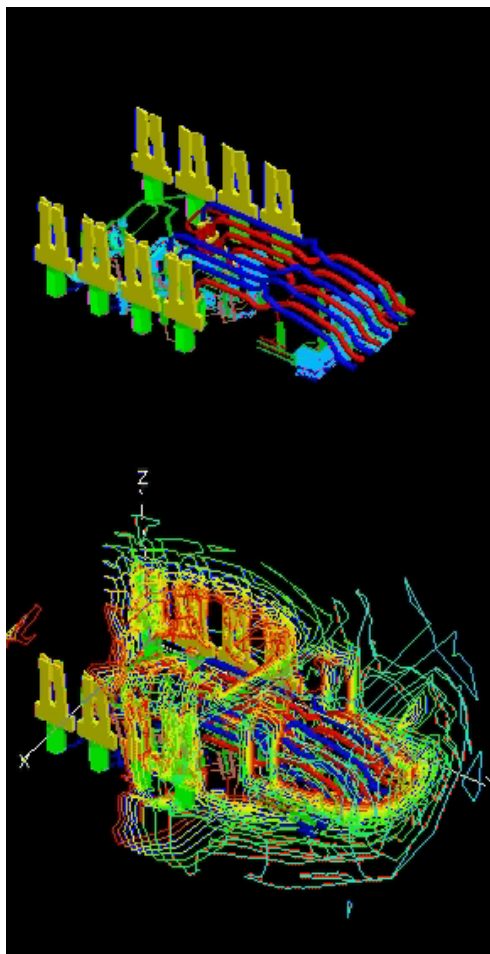
Settle



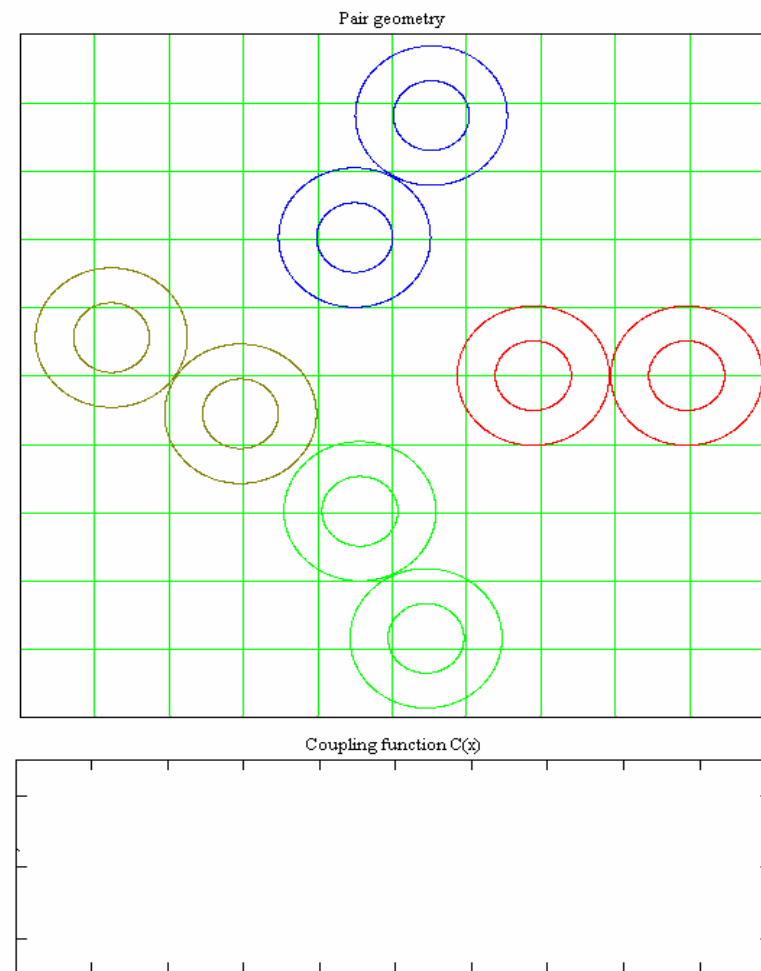
Enabled by Scientific Tools



Modal Decomposition Modeling



Connector Field
Pattern Modeling

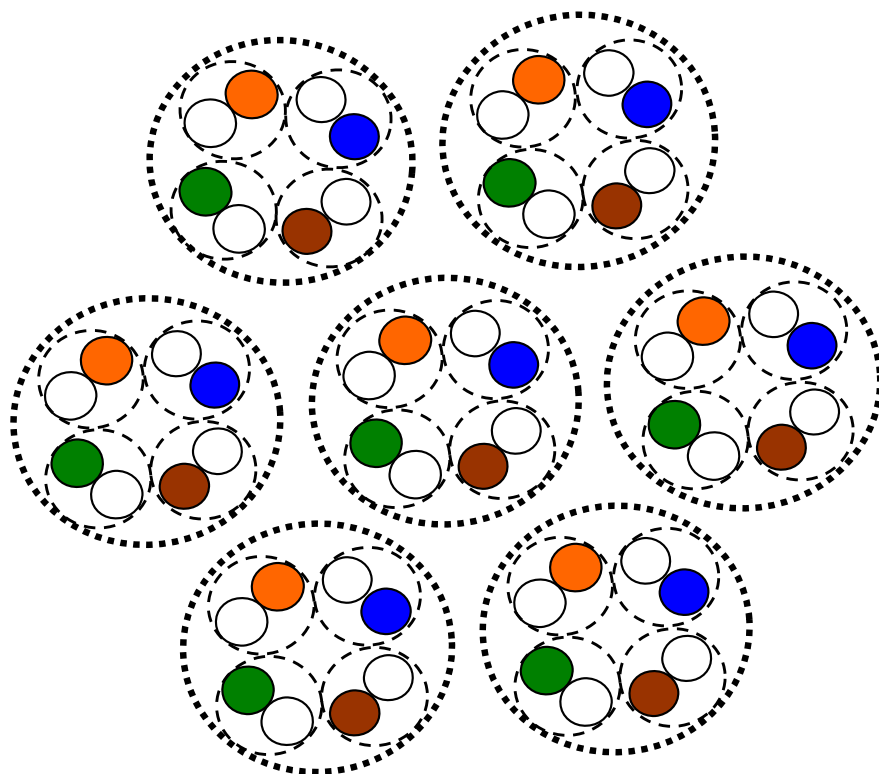


Cable Twist Accuracy Technology

Unique tools for system and component optimization

GigaSPEED X10D Cables

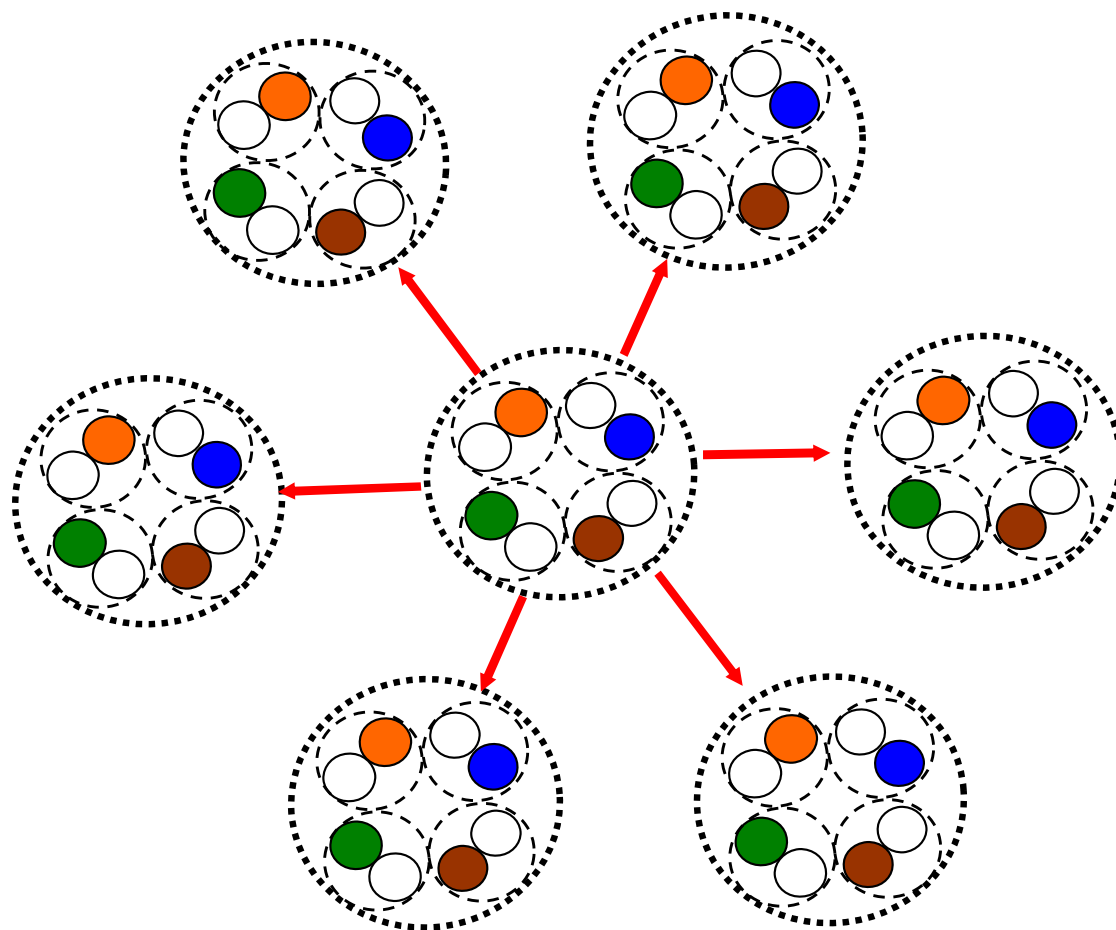
Achieving Revolutionary AXTLK in UTP



AXTLK affects cable
cores in close
proximity

GigaSPEED X10D Cables

Achieving Revolutionary AXTLK in UTP



core separation
improves AXTLK
dramatically

GigaSPEED X10D Cables

Achieving Revolutionary AXTLK in UTP

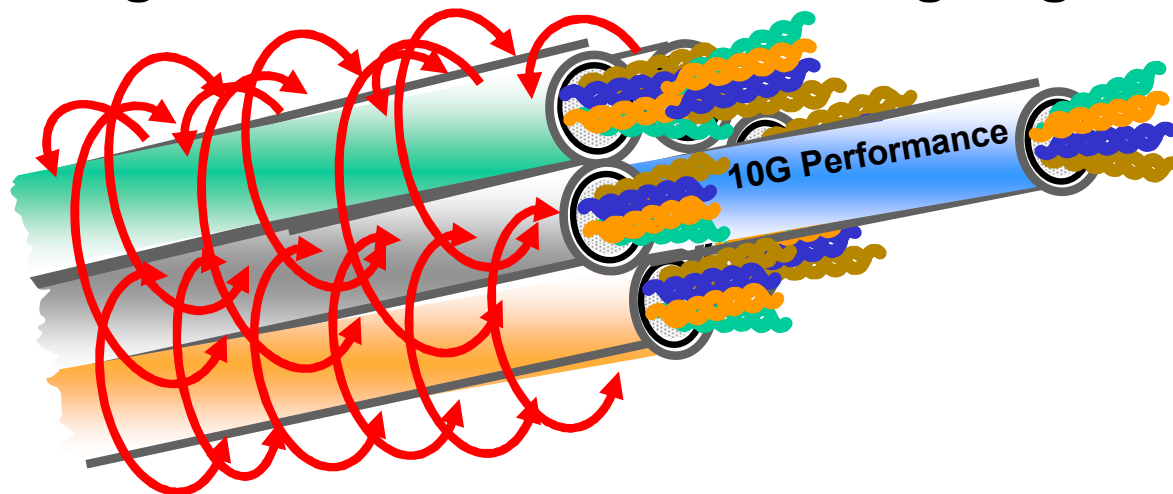


Revolutionary jacket
technology in 91
series cables
achieves
breakthrough AXTLK
performance

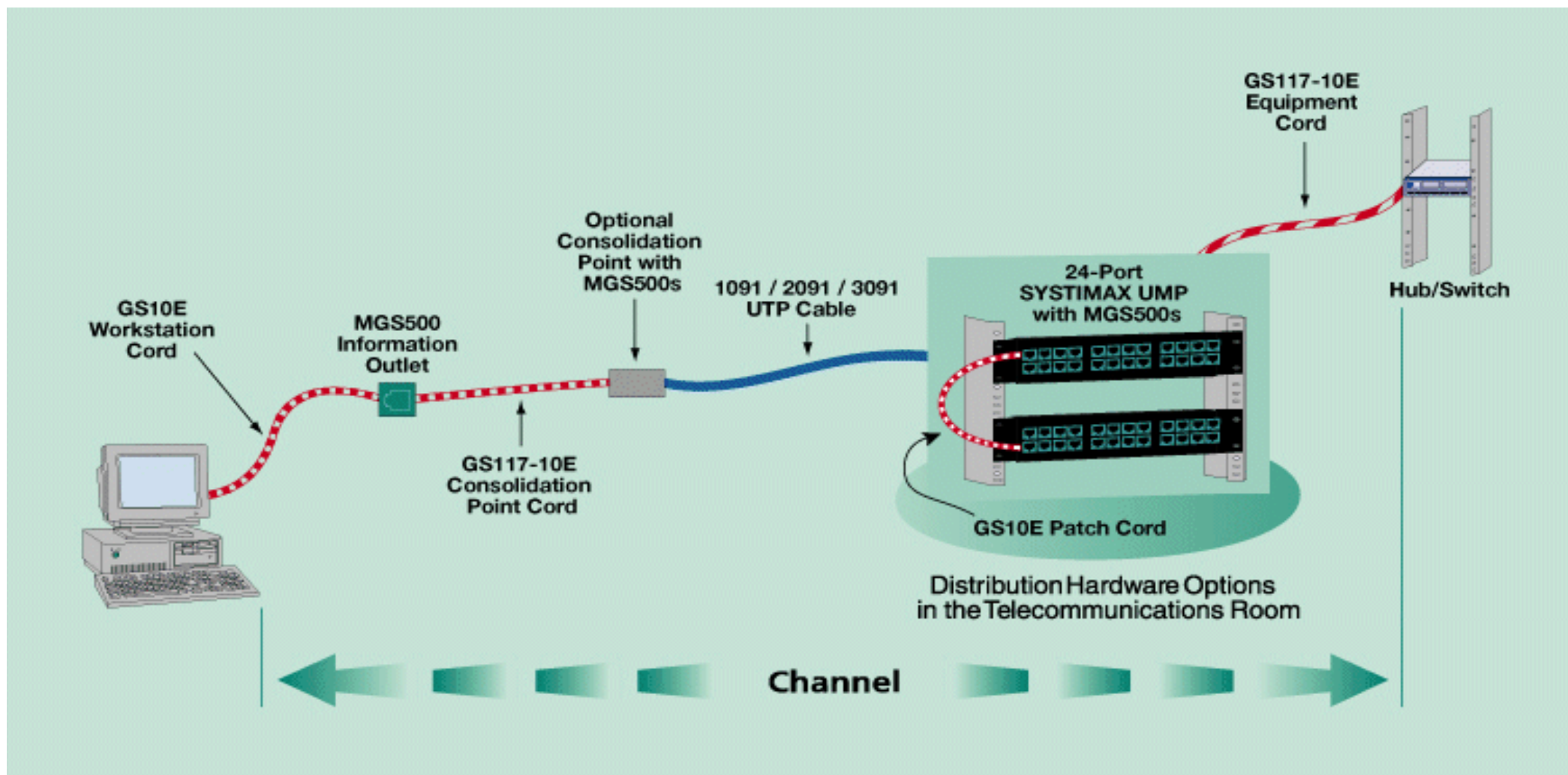
The GigaSPEED X10D Channel

supports pre-bundling, worst-case installation

- Designed to meet PSANEXT requirements for off-site pre-bundling and/or worst-case installation conditions
 - All PSANEXT measurements performed in channel configurations with cable in 6-around-1 continuous bundled arrangement and high density 8-port UMP module
- Considered the worst case configuration for alien crosstalk
 - also representative of energizing all cables in a large bundle
- Super-tight twists minimize handling degradation

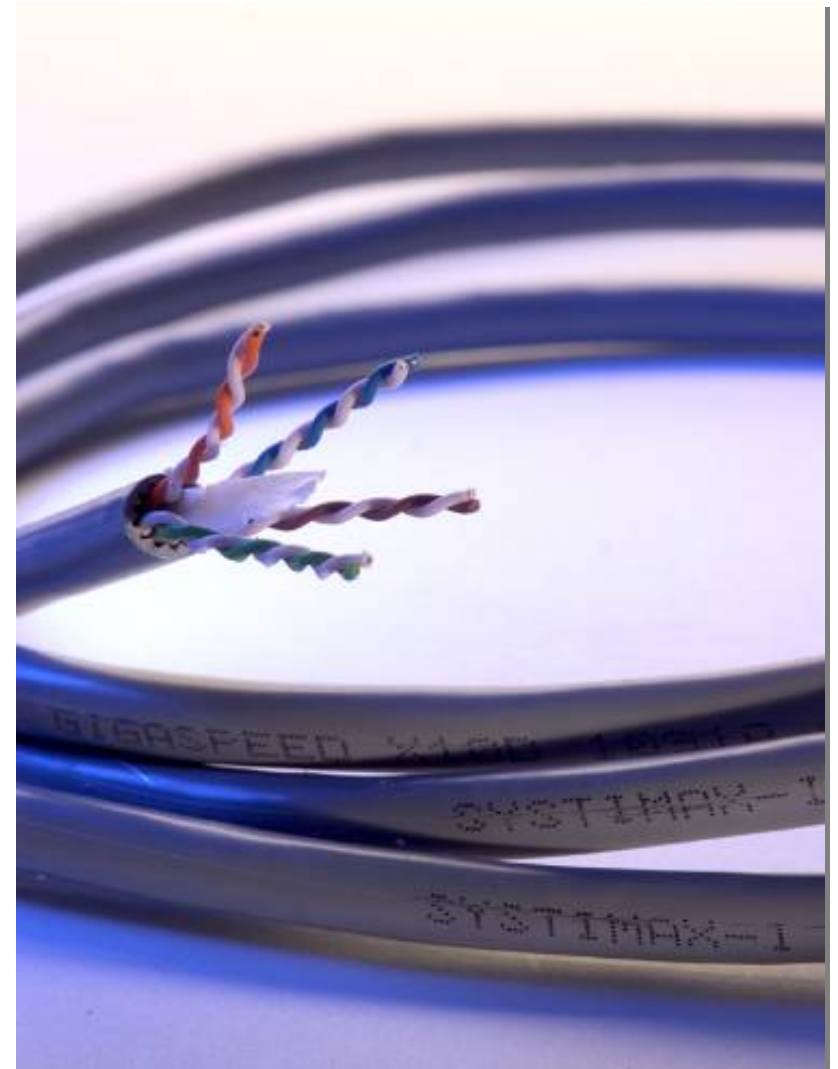


GigaSPEED X10D Channel



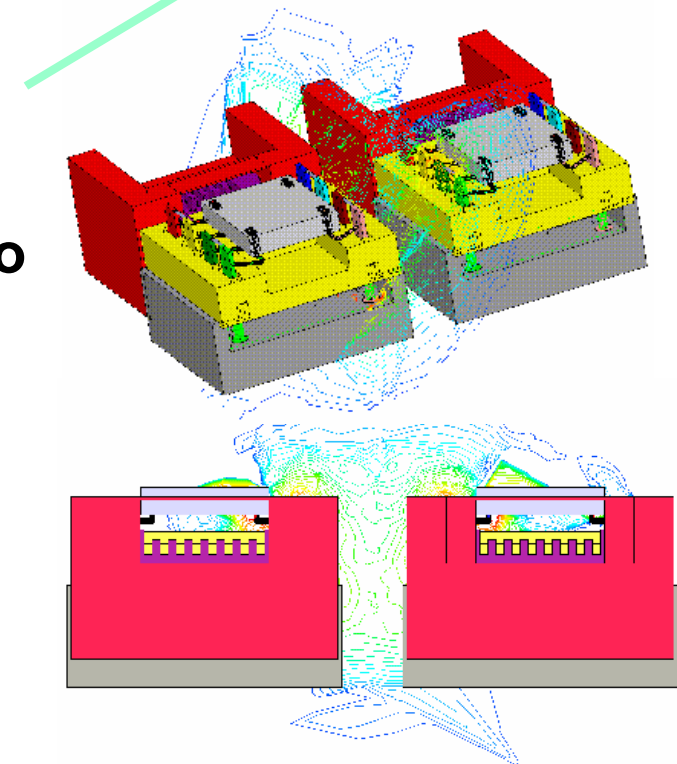
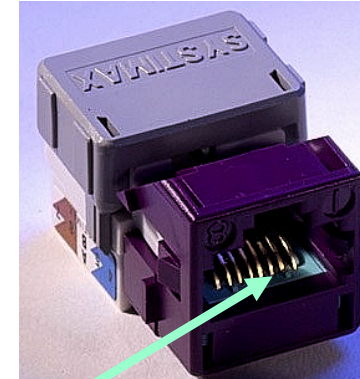
GigaSPEED X10D Cable: Evolutionary design; Revolutionary performance

- **Traditional round UTP cable design with bisector tape**
 - CTAT based breakthroughs for improved alien NEXT and extended frequency performance
 - Innovative manufacturing and materials processes
 - Maintains excellent internal crosstalk performance



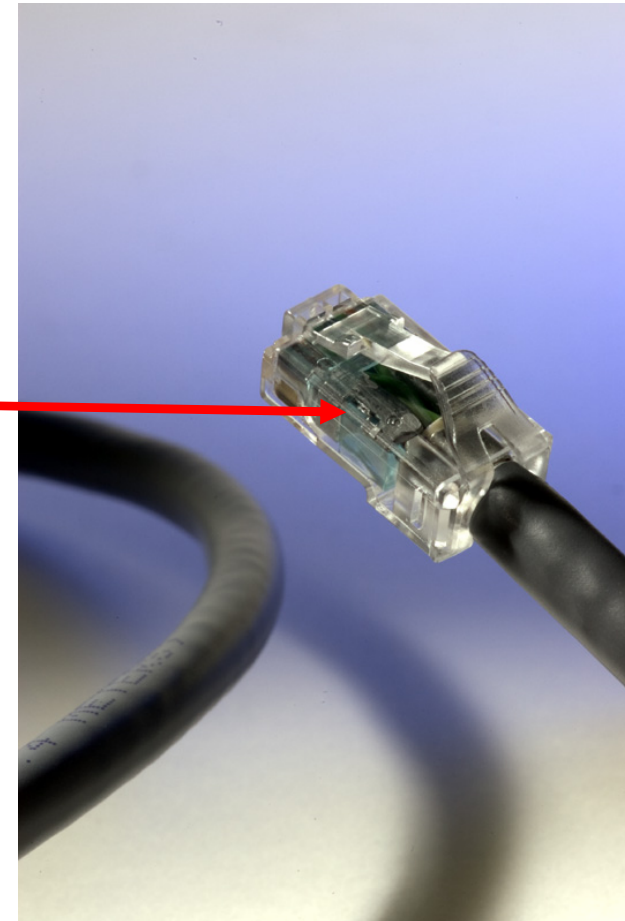
The GigaSPEED X10D MGS500: Evolutionary design; Revolutionary performance

- Introducing the new MGS500 connector
- Evolution of M-Series design
 - craft friendly installation, follows MGS400 installation techniques
 - termination puck now also available
 - distinctive aqua colored inner pin guide
- CFPM-based breakthroughs deliver:
 - revolutionary high-frequency performance to meet extrapolated channel limits
 - revolutionary Alien Crosstalk performance minimizes coupling between adjacent connections and channels



The GigaSPEED X10D Cords: Evolutionary design; Revolutionary performance

- Introducing the new GS10E cords
- Evolutionary design
 - Innovative “finned jacket” technology for superior PSANEXT and Insertion Loss
 - flexible, round, smooth and easy to administer solid conductor cordage
 - built in anti-snag feature
 - Distinctive aqua color inner housing
- CFPM-based breakthroughs deliver:
 - Revolutionary high-frequency internal performance
 - Improvements in inner plug sled for superior consistency
 - ANEXT performance designed to minimize crosstalk coupling between adjacent connections and channels



The New SYSTIMAX UMP: The Universal Module Panel for GigaSPEED X10D

- Craft friendly MGS installation
- Front and rear access
- Integrated cord and cable management
- 3 x Individual Universal Modules in 1U
 - 8-port bezels for GS X10D -24 ports in 1U
 - 12-port bezels also available for PS and XL - 36 ports in 1U
- Multimedia support
 - PowerSum, GigaSPEED XL, Optical Connector Modules, InstaPatch Module, coax, RCA, S-Video



GigaSPEED X10D Channel Demo

Alien cross talk channel tests

Look for demo video
Demo white paper



Commercially Available
CAT 6 Product



FAILED



Commercially Available
Product Claiming 10G
Performance



FAILED



PERFECT



GigaSPEED X10D
Channel