Voices of Authority

Cutting Costs with Network Performance Management

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Service Agreements, Technology Plans and Budgets

- Service agreement = levels of service that any gear should support = your responsibility to assure at least the minimum levels at your facility
- Technology plan = 5 to 10 year look in the crystal ball
  - Takes into account downtime, lost productivity, operating environments and business needs
  - Part of the justification is cost avoidance
- Budget = daily operating costs + portion from above that must be paid for during the budget year

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What is It?

- A view of the network and protocols to determine utilization, throughput and overall network health
- A necessary tool for real-time applications such as voice and video
- Important for “heavy” applications
- Helps to determine what devices may be necessary
- Helps to determine how well existing devices are operating
- A constant cycle – this is not a once and done process!

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Performance Management Can Help Check…

- **Web page performance**
  - Key when you are using your Web portal for transactions
- **LAN performance**
  - Performance on the local area side of your network
- **WAN performance**
  - Performance on the wide area side of your network and through your circuits
- **VPN performance**
  - Performance through VPN circuits
- **Application specific performance**
  - Key when you have large databases and large applications
  - Also key for custom applications!
- **Cabling performance**
  - Over 50% of all category 5e installed and in use won't pass 5e testing!

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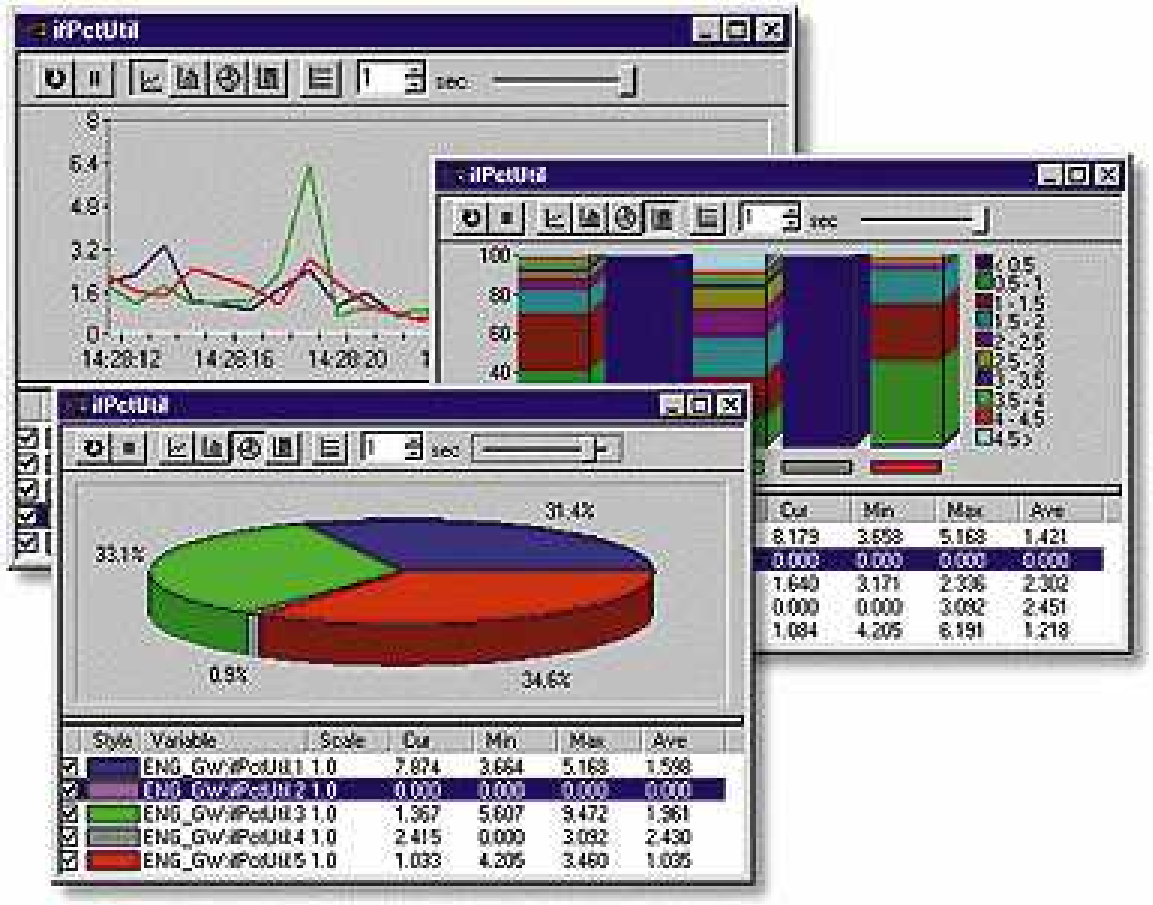
What Else Can It Do?

- Assist with capacity planning
- Help with problems
- Help alert you to suspicious activities
- Document your network
- Save money on hardware
- Save money on software

What It Looks Like (partial version)



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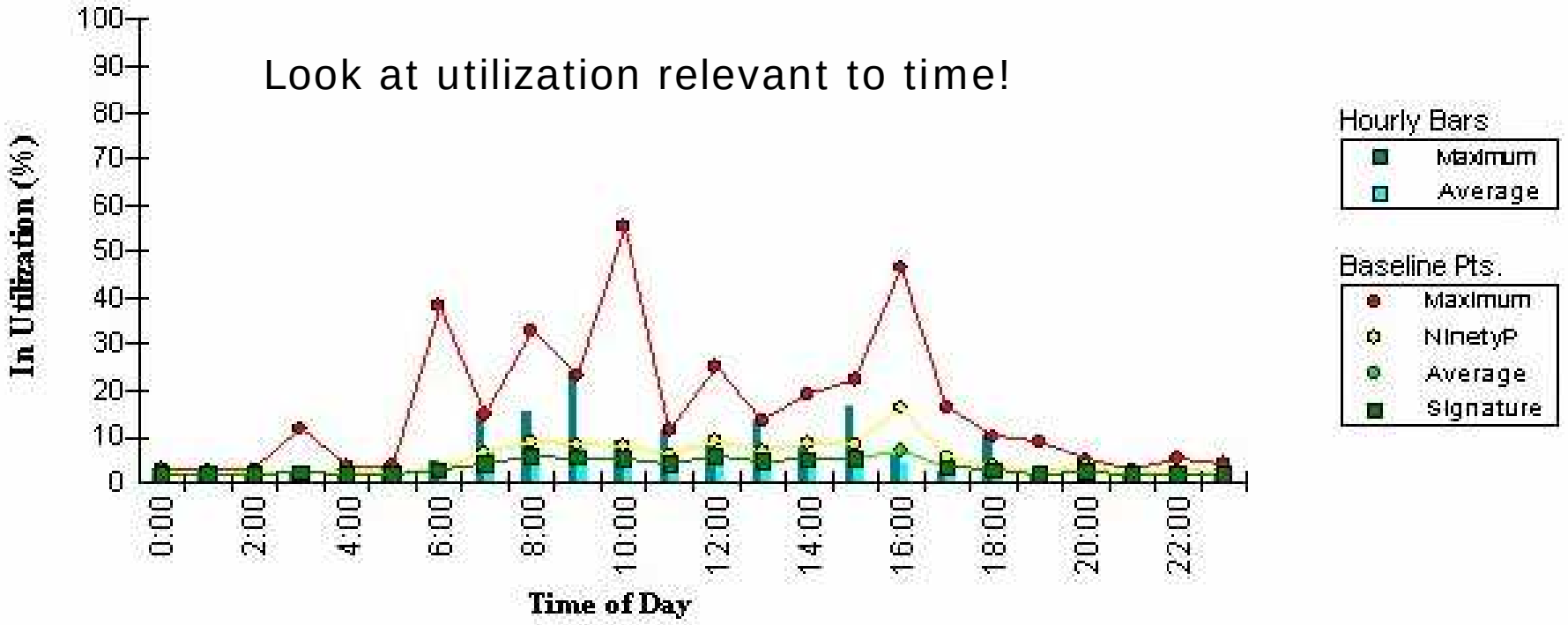
A Quick Word About Utilization



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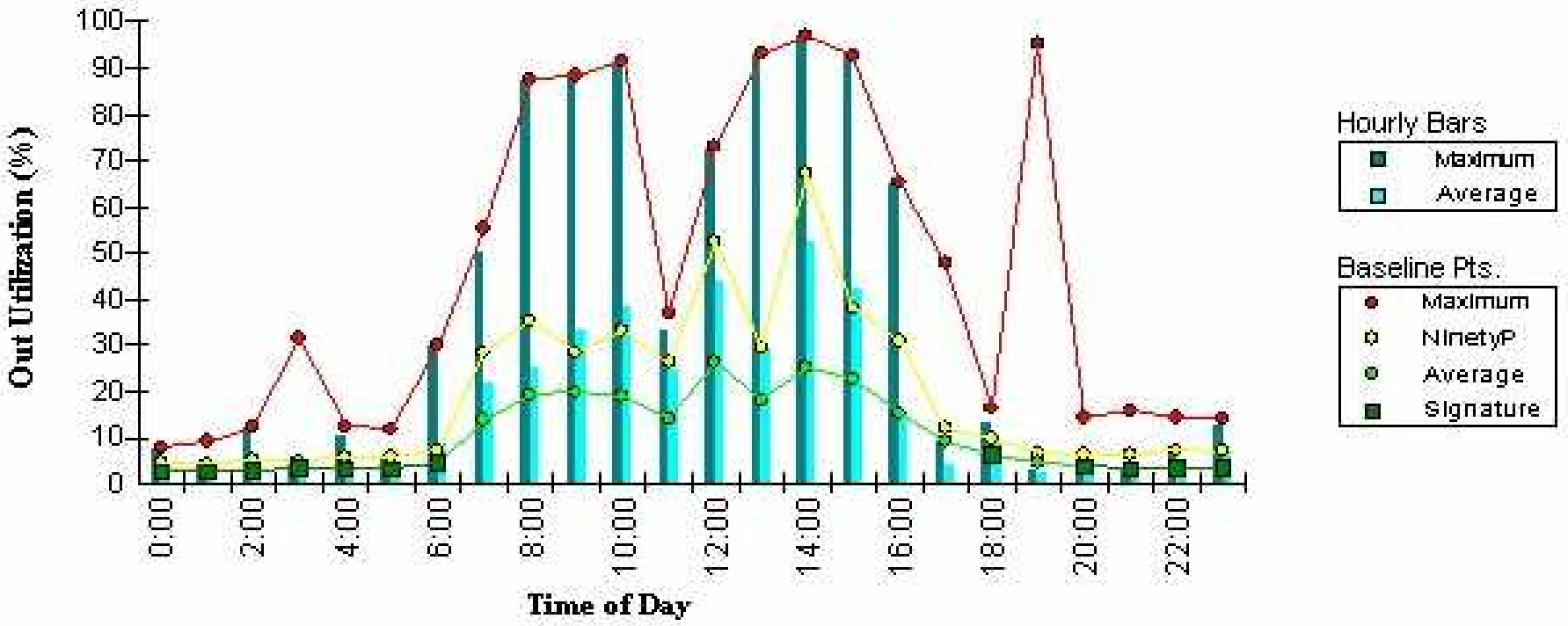
Contrast the Last One to This One…



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Caching! Money Savings $$$

- Have you ever thought about moving some ports around?
- Move devices that are bandwidth hogs to devices with bandwidth to spare
- Determine if your infrastructure is using bandwidth unnecessarily
- Determine if your devices are bullies

When Planning for Real-Time Applications

- You must plan peak intervals as if they are the norm
- Data does not mind retransmissions
- Voice does!
- Your cable plant can cause elevated bit errors and retransmissions which will deplete network resources

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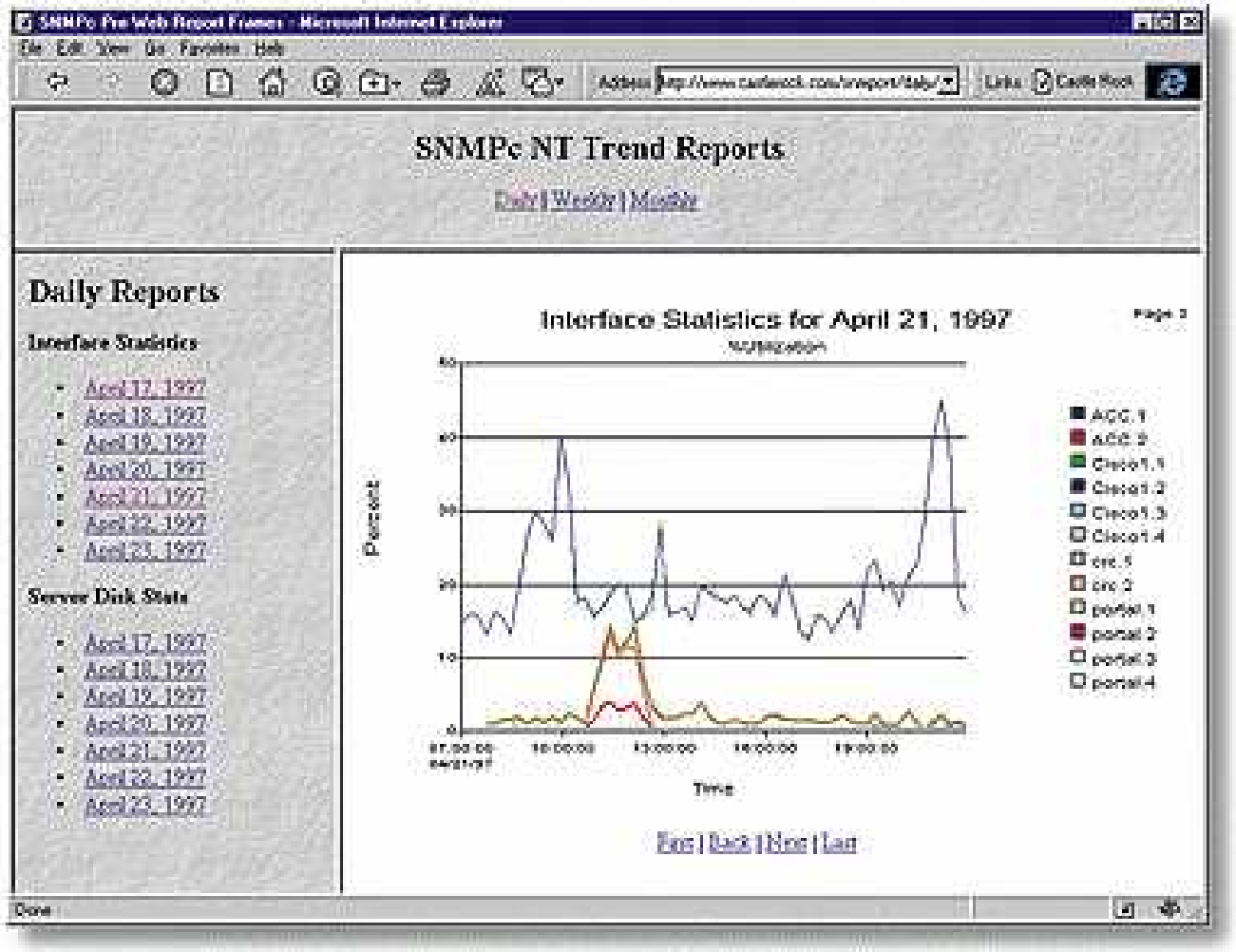
Trend Reports



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All Statistics, All Interfaces

- Node address
- Index
- MTU
- Speed
- WLAN address
- Admin status
- Operational status
- Last change
- InOctets
- In unicast packets
- In non-unicast packets
- In discards
- In errors
- In unknown protocols
- Out octets
- Out unicast packets
- Out non-unicast packets
- Out discards
- Out errors
- Out unknown protocols
- Out Q length

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You Can Drill Down for Types of Errors

- Alignment errors
- FCS errors
- Collision frames
- Deferred transmissions
- Carrier sense errors
- Frame too long errors
- Internal Mac receive errors
- Etherchipset errors

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What Do Network Errors Mean?

- May be cabling channel – may not
- Rule out channel first
  - Beware some problems may be intermittent
  - Stops runaway electronics spending
  - Lowers administration costs needed to reroute and troubleshoot
- Check environment of electronics
- Interference problems, etc.

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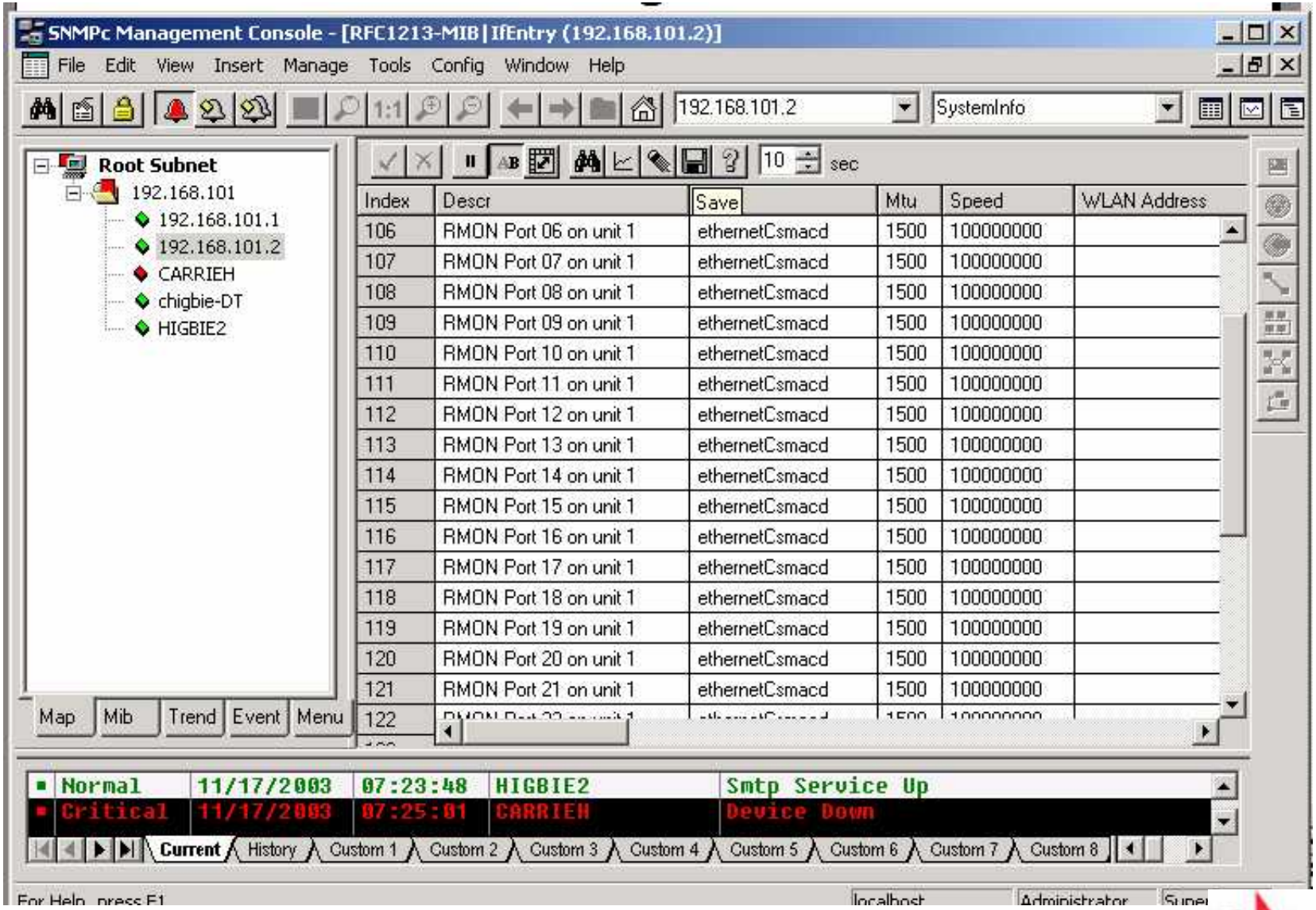
Sorted Reports

1	Node	Index	Descr	Mtu	Speed	In Octets	In Errors	In Unknown Protos	In Ucast Pkts	In
2	192.168.1.9	23	BayStack 450-24T - 23	1514	200000000	3,609,426,192	6,975,445	0	89,929,360	7
3	192.168.1.9	11	BayStack 450-24T - 11	1514	200000000	3,116,050,917	761,862	0	28,569,371	1
4	192.168.2.11	7	BayStack 350-24T - 7	1514	200000000	2,841,840,312	507,894	0	19,597,299	1
5	192.168.1.9	6	BayStack 450-24T - 6	1514	200000000	619,369,476	302,031	0	47,325,945	5
6	192.168.2.11	5	BayStack 350-24T - 5	1514	200000000	2,099,071,371	227,351	0	14,368,380	1
7	192.168.1.9	22	BayStack 450-24T - 22	1514	200000000	1,274,947,502	155,459	0	10,434,284	2
8	192.168.1.104	1	BayStack 450-24T - 1	1514	200000000	2,490,061,169	47,177	0	24,999,361	3
9	192.168.1.9	2	BayStack 450-24T - 2	1514	200000000	742,847,434	43,743	0	16,097,240	1
10	192.168.1.104	3	BayStack 450-24T - 3	1514	200000000	162,306,489	25,890	0	1,665,195	1
11	192.168.2.11	4	BayStack 350-24T - 4	1514	200000000	1,130,881,154	16,234	0	19,193,968	4
12	192.168.1.104	6	BayStack 450-24T - 6	1514	200000000	54,190,705	15,670	0	313,640	1
13	192.168.1.104	15	BayStack 450-24T - 15	1514	200000000	445,094,503	15,031	0	2,871,641	1
14	192.168.1.104	18	BayStack 450-24T - 18	1514	200000000	152,346,003	14,778	0	483,582	1
15	192.168.2.11	16	BayStack 350-24T - 16	1514	200000000	1,077,239,333	13,864	0	3,682,526	2
16	192.168.2.11	2	BayStack 350-24T - 2	1514	200000000	3,455,568,628	13,615	0	434,927,816	1
17	192.168.3.71	1	AIR I/O DS-SS Radio	2048	2000000	88,145,604	12,184	0	2,017,210	6
18	192.168.1.104	9	BayStack 450-24T - 9	1514	200000000	50,564,444	11,889	0	227,204	1
19	192.168.1.104	10	BayStack 450-24T - 10	1514	200000000	53,670,114	11,455	0	308,039	6
20	192.168.2.11	15	BayStack 350-24T - 15	1514	10000000	159,618,694	10,967	0	85,580,239	5
21	192.168.1.104	21	BayStack 450-24T - 21	1514	200000000	266,461,364	8,923	0	1,607,143	1
22	192.168.1.104	19	BayStack 450-24T - 19	1514	200000000	65,505,805	8,312	0	466,491	1
23	192.168.1.104	13	BayStack 450-24T - 13	1514	200000000	258,793,050	8,206	0	2,180,965	1
24	192.168.1.104	14	BayStack 450-24T - 14	1514	200000000	40,060,044	6,426	0	148,315	1

Round 2 Results | Speed by Device | Speed | Traffic % | **Bit Error Ranking**



Application
Presentation
Session
Transport
Network
Data link
Physical

Comfort zone ± expertise ± sales interest = value

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Actual Audit Data

Node	Index	Mtu	Speed	In Octets	In Errors
192.168.1.91	23	1514	200000000	3,609,426,192	6,975,445
192.168.1.9	11	1514	200000000	3,116,050,917	5,761,862
192.168.2.11	7	1514	200000000	2,841,840,312	1,507,894
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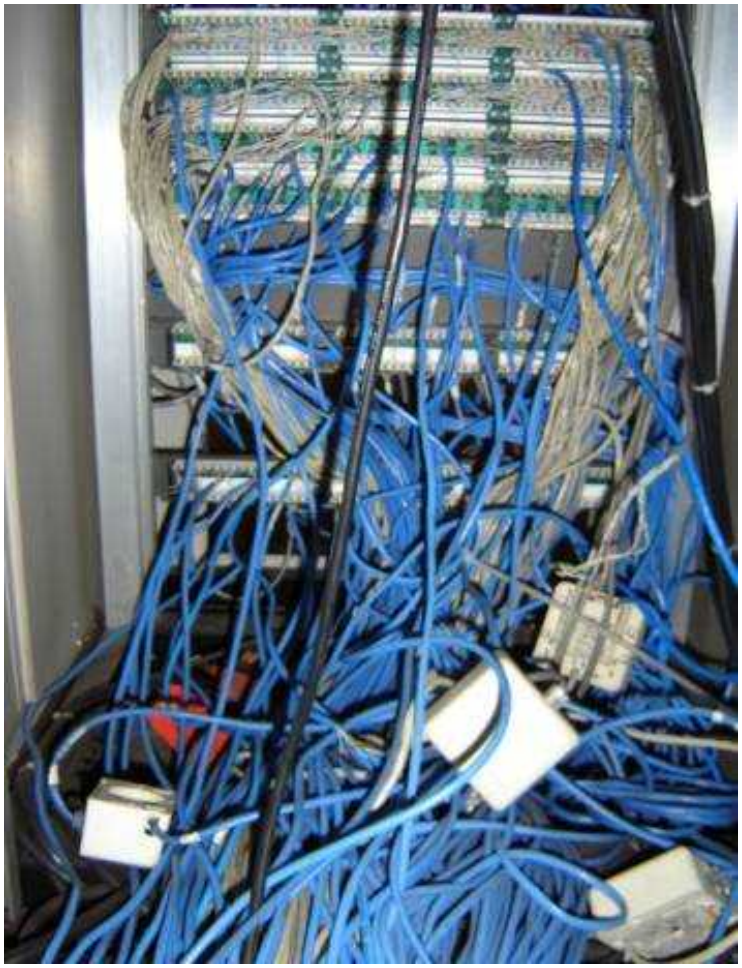
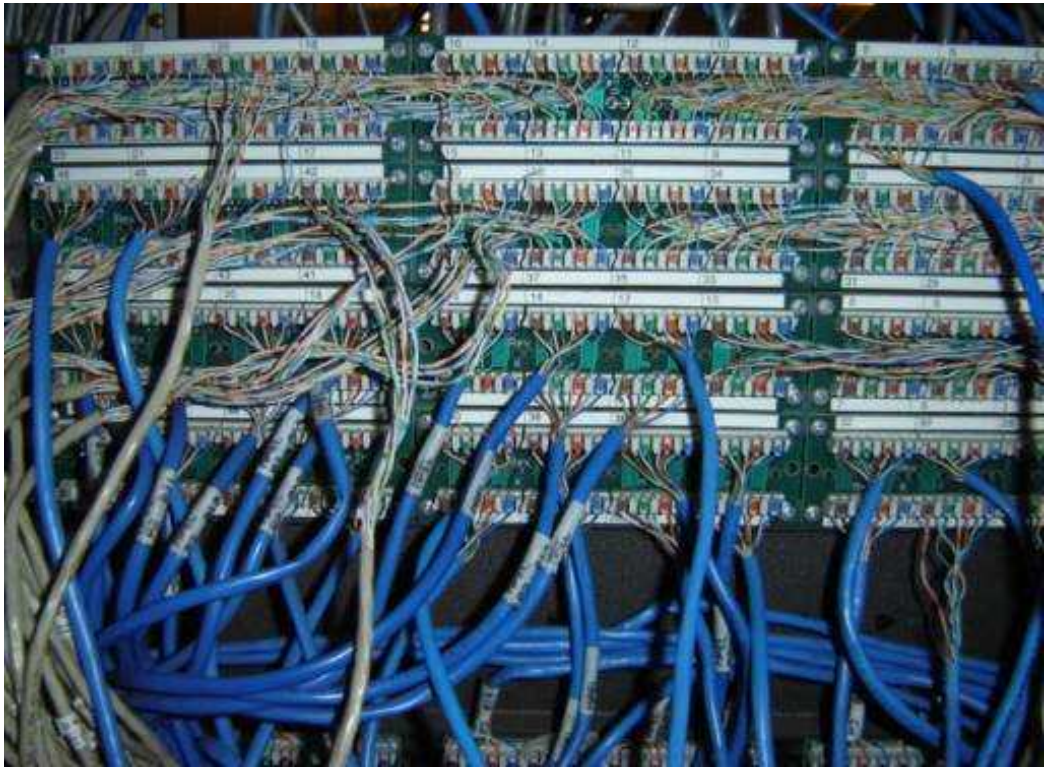
192.168.1.94	22	1514	200000000	1,274,947,502	3,155,459
192.168.1.104	1	1514	200000000	2,490,061,169	5,247,177
192.168.1.97	2	1514	200000000	742,847,434	3,437,434
192.168.1.14	3	1514	200000000	162,306,489	8,258,906
192.168.2.11	4	1514	200000000	1,130,881,154	7,166,234
192.168.1.124	6	1514	200000000	54,190,705	11,145,670
192.168.1.114	15	1514	200000000	445,094,503	1,315,031
192.168.1.105	18	1514	200000000	152,346,003	6,514,778
192.168.2.11	16	1514	200000000	1,077,239,333	1,913,864
192.168.2.11	2	1514	200000000	3,455,568,628	14,413,615
192.168.1.108	21	1514	200000000	266,461,364	1,789,253
192.168.1.102	9	1514	200000000	50,564,444	3,115,889
192.168.1.101	10	1514	200000000	53,670,114	1,112,455
192.168.2.11	15	1514	10000000	159,618,694	1,109,967





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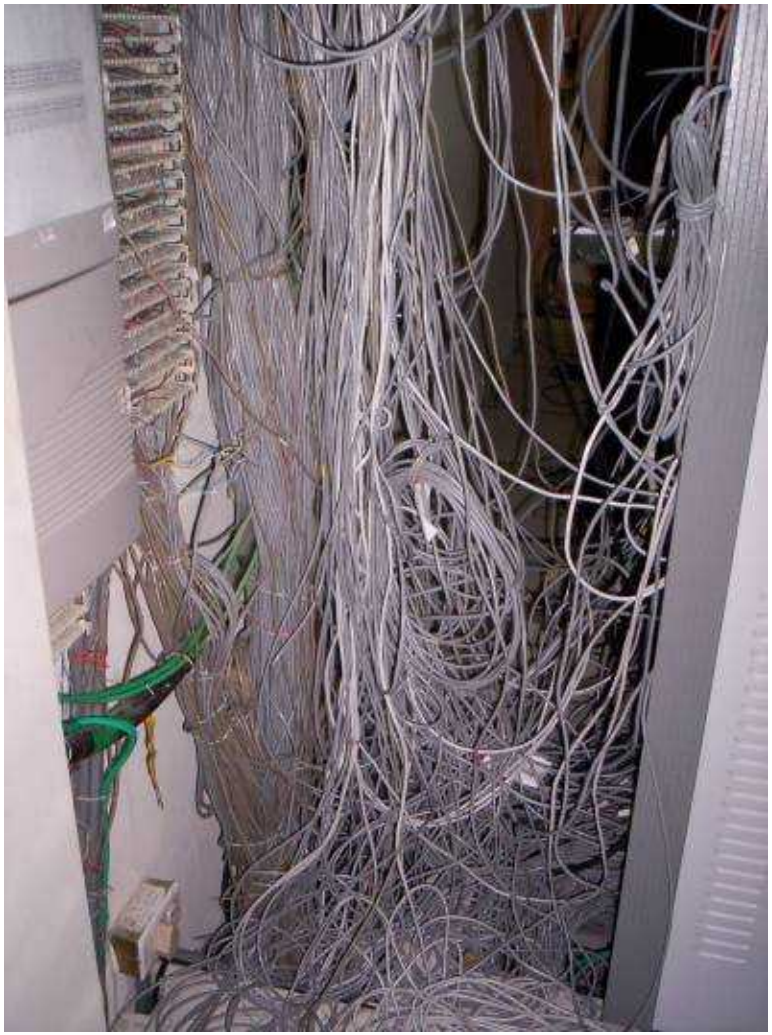

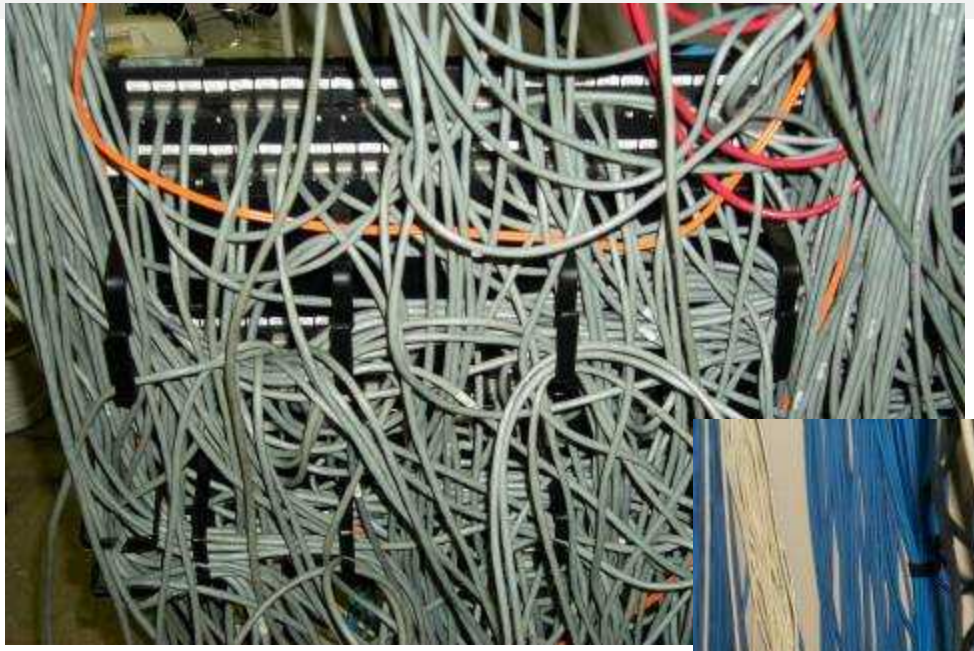

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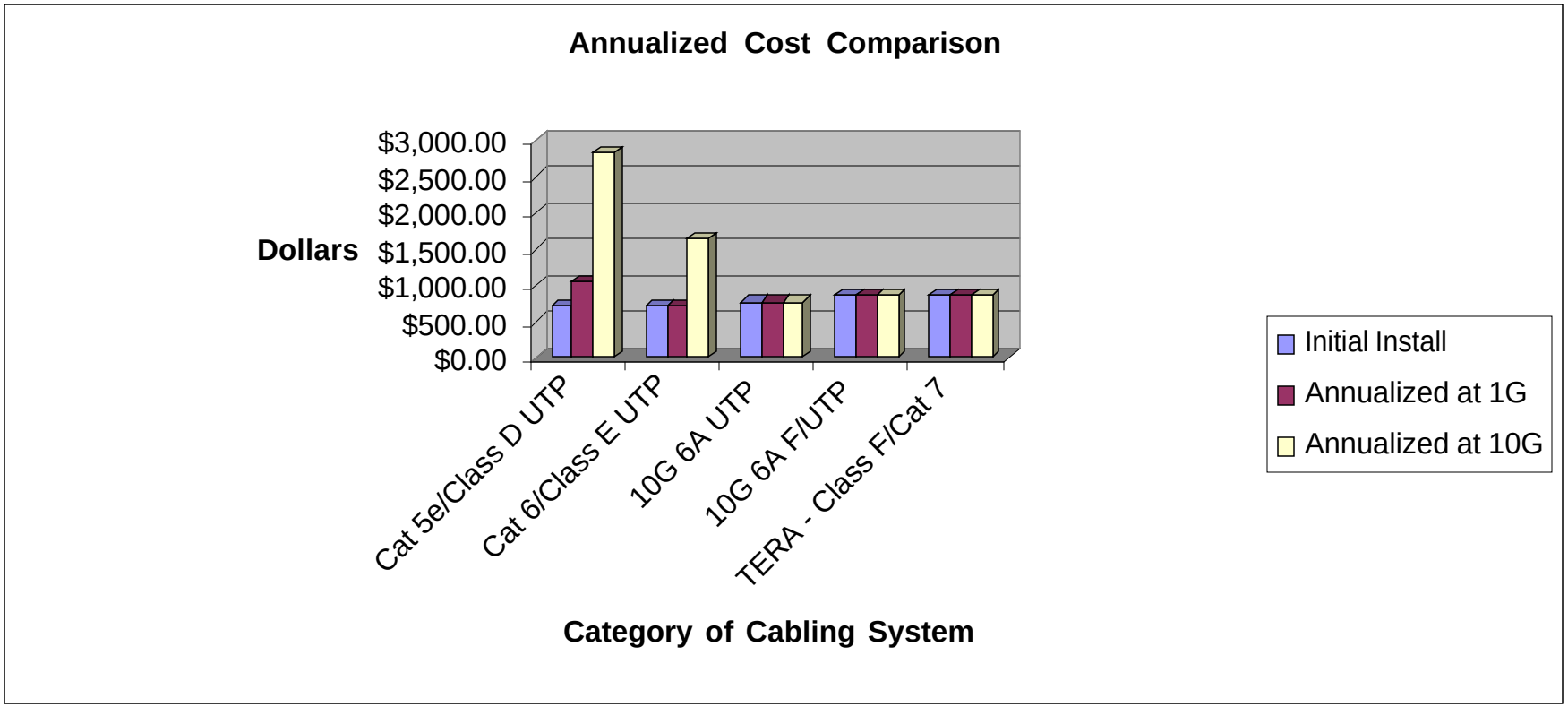
Comparison Chart of Annualized Costs



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System Cycles

- Business need – definition of problem
- Find solutions – custom development, COTS, mixture
- Evaluate solutions – Will it work? Will they use it? Can we afford it?
- Define hardware requirements – Here is where the fun begins!
- Define software/ OS requirements – The fun continues!
- Evaluate overall TCO/ROI and performance to TCO ratio
- Test in development environment – Too many companies skip this step! This is where performance management should start!

To Evaluate TCO to Performance Ratio

- You must include any and all remediation steps necessary to support every technology that it is expected to support
- Every company has a finite amount of budget dollars – beware of vendor statements that may not be in your best interest
- Use real figures that you can support – do not use figures that you can not support
- Remember it is not a savings if you wouldn't have had the expense anyway
- Business processes must be included – minutes count
- Downtime and cost avoidance must be included as well

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Downtime Costs

- Revenue per employee per hour
  - Revenue divided by number of employees / 2080
- Salary expense weighted per hour
  - Salary * 1.4% / 2080
- Combined is hourly downtime costs
- Lost productivity = number of users X time lost X combined cost above

Trends for ‘05

- **Gates’ Law revisited**
- **“640k ought to be enough for anybody”**
  -- Bill Gates, 1981

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Application Growth - Bloat

Office 95	Office XP	Windows 95	Windows XP
386 – 486 recommended	PIII recommended 133MHz min	486 recommended	233MHz min 300MHz rec.
8 MB RAM	128 MB RAM + 8MB for each program	4 MB RAM, 8 recommended	128 MB RAM+ recommended 64MB min
40 MB min disk space 128 all features	245MB disk space + 115MB +50 MB	50-55 MB	1.5 GB disk space

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Moore's Law

- Number of processors on a chip doubles every 18 months
- More importantly….
  - The cost to make that chip is cut in half in the same 18 month period!

Systems Cycle Continues…

- **Put into production – You must monitor the live environment – especially if you skipped the last step.**
- **Listen to the complaints – This is where the fun stops!**
- **Calling all resources! – Find out the true cause**
- **Don’t assume anything!**
- **Solve the complaints – determine if it is an error or a performance problem**
- **Solve the problem(s)**
- **Start over!**

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Where Performance May Take a Hit

- Poorly installed infrastructure (copper or fiber)
- Poorly written code – not all programmers understand efficiency!
- Server side services
- WAN or provider side services
- Networking hardware and traffic services
- Undesirable traffic
- Poor VLAN management
- Addressing errors
- Multicast and broadcast errors

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Other Hits….

- Undesirable code
- Things just not working like they are supposed to!
- Meddlesome individuals! Domino theory!
- Poorly maintained cabling
  - Will auto-negotiate down to lower speeds
  - Retransmissions
- Too many protocols – unnecessary protocols
- Routing loops
- Address pool too large – large subnets

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What Performance Management Should Do…

- Watch the traffic patterns
  - Look for software that does not require decodes for simple tasks
  - Software should be able to examine actual IP ports
  - Watch for trends
- Re-examine traffic patterns based on varied processor loads
- Look for retransmissions and discards as well as errant packets.
  - Ask for “common network errors and causes”
- How many users are affected? Should help you find bottlenecks

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Network Changes

- Has anything changed that you know of?
- Can you find things that have changed that you didn't know of?
- What upgrades have occurred?
- Remember there is a difference between the various types of IP packets and their data content

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Remember -

- There is a distinct advantage to having manageable electronics
- Management tools should provide more than just statistics
- It should let you see errors and track traffic!
- It should be vendor neutral if you have multiple vendors
- It should be robust and support more than just SNMP
- Check out bandwidth simulators – remember they are simulators – actual results could vary

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Troubleshooting 101

- CEO calls – why is this application so slow? Or maybe it timed out entirely.
- Where would you start?
  - Ya'll reboot!
  - At his desk?
  - At the server?
  - At you ISP?
  - In your active electronics/networking hardware?
  - At you network management package?
  - At you performance monitoring package?

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A Little "CSI" is in Order

- Are all applications affected?
- Is it just one?
- Are all users affected?
- Is it just some or one?
- What is common – this is your most important question!
- If you don't narrow things down a bit you will be looking for a needle in a haystack
- Beware – when you are looking for one problem you may find others – stay focused! Log extra problems for later resolution

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At His Desk…

- Performance monitoring at the desktop
  - Look at network traffic
  - Look at CPU cycles
  - Look for memory leaks
  - Watch for other processes
  - Check the connection speed
  - Ping…
  - Tracert….

At Your ISP – or Other WAN Services Provider

- Kind of dumb if the application is local? Not really!
  - You could have unwanted guests
- If the application is across the WAN
  - You will want a performance monitoring tool and package that will look beyond the router
  - There are tools for all level circuits
  - You will also want to look at your router
  - Look at the buffers
  - Look at the types of traffic
- Call your ISP – WAN provider – but it won't be their fault!
- Make sure you ask for an intrusive test!

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At the Server

- Look at the number of connections
- Look at the network traffic in and out of the NIC
- Look at the CPU and memory utilization
- Look at the connection speed
- You could – start and stop the database
- You could – check with your performance management package
- You could – get fired for doing the wrong thing at the wrong time!

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If the Common Element is a Switch or Router..

- Check the utilization on the ports
- Check the buffers
- Look at the traffic
- Look at what protocol traffic is moving through the switch
  - IP port may be enough, but you still need to know which port is most active
- Check addressing schemes
- Check you performance management
- Check the port speeds!

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Other Features in Performance Management Software…

- You should be able to sort utilization by port with a report of all you query
- It should provide a feature rich reporting tool that does not require a PhD to interpret
- Protocol packet decodes can be important but may be a security risk and not allowed
- Should allow you to save reports so that you can check your solution and see if it worked (before and after)
- Should provide addresses and machine names with the traffic
- Should understand QoS and whatever else you need it to
- Should not require 10 tools – you'll never be effective

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This Will Never be a One-Time Exercise

- The number of elements (devices) and applications are factorial
- The number of outside influences on your network grows daily
- The number and functionality of applications changes daily
- Data stores increase – searches take longer
- Larger result sets are delivered via the network
- Converged services may need special attention

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Think of a Network and System Cycles As

- A giant circle of arrows
- Business needs change, too!
- Remember application speeds are cut in half every 18 months
  - Gates' Law
- Processing power doubles every 18 months
  - That does not mean that all applications can take advantage of this
- You have to study performance to know what it is
- Never assume!

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Look at the Lifecycle of Your Systems

- Infrastructure – 10 years
- Active electronics – 2 to 3 years, although many remain in use 5 years
- Servers and attached equipment – 5 years
- Applications – varies – 1-5 years
- Remember – new applications are written expecting new equipment
- New applications can cripple older equipment

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Have a Technology Plan – 5 Years Minimum

- Should address technology progression and expectations
- Can not be written in a vacuum
- Must have input from every department!
- Security must be included
- Technology trends must be included
- Growth must be included
- Real (not marketing) information must be included

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Questions

- Check SearchNetworking.com for lots of good tools and tips
- Check with your vendors – but more importantly
- Check with the application developers for your network management
- Not all vendors and resellers keep their training up to date!
- Some just sell stuff!
- Check manufacturer resources
- Beware of us against them – the best manufacturer will bring a blend of resolutions

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Thanks!

Questions?

- Again, for questions, you can contact Carrie via
  - www.SearchNetworking.com
  - www.SearchDataCenter.com
  - www.SearchEnterpriseVoice.com
- Carrie_higbie@siemon.com

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