

IT Monitor at SDG&E

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PI T&D Users Group Meeting-St. Louis



Agenda

- SDGE – Who we are and What we do
- Why monitoring
- Monitoring what
- Why “IT Monitor”
- What is “IT Monitor”
- Implementation and Accomplishment
- Future Development

Sempra Energy

- Sempra Energy is a Fortune 500 energy services holding company with over 12,000 employees
 - **Sempra Energy Utilities**
 - ✓ **San Diego Gas & Electric (SDG&E)**
 - ✓ Southern California Gas Company (SoCalGas)
 - **Sempra Energy Global Enterprises**
 - ✓ Sempra Energy International
 - ✓ Sempra Energy LNG Corp.
 - ✓ Sempra Energy Solutions
 - ✓ Sempra Energy Resources
 - ✓ Sempra Energy Trading
 - ✓ Sempra Fiber Links



Sempra Energy
headquarters
San Diego, CA

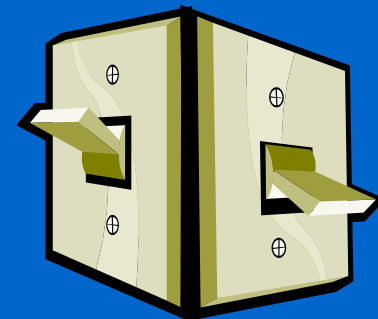
SDGE & Electric T&D

- 1.3 million customers
- 3 million population
- Service territory includes San Diego County and Southern Orange County
- 3,960 MW system peak load (8/31/98)
- 130 Transmission RTUs (69kV, 138kV, 230kV, and 500kV) – GE XA21 EMS
- 900 Distribution RTUs (12kV) – ACS Prism DMS

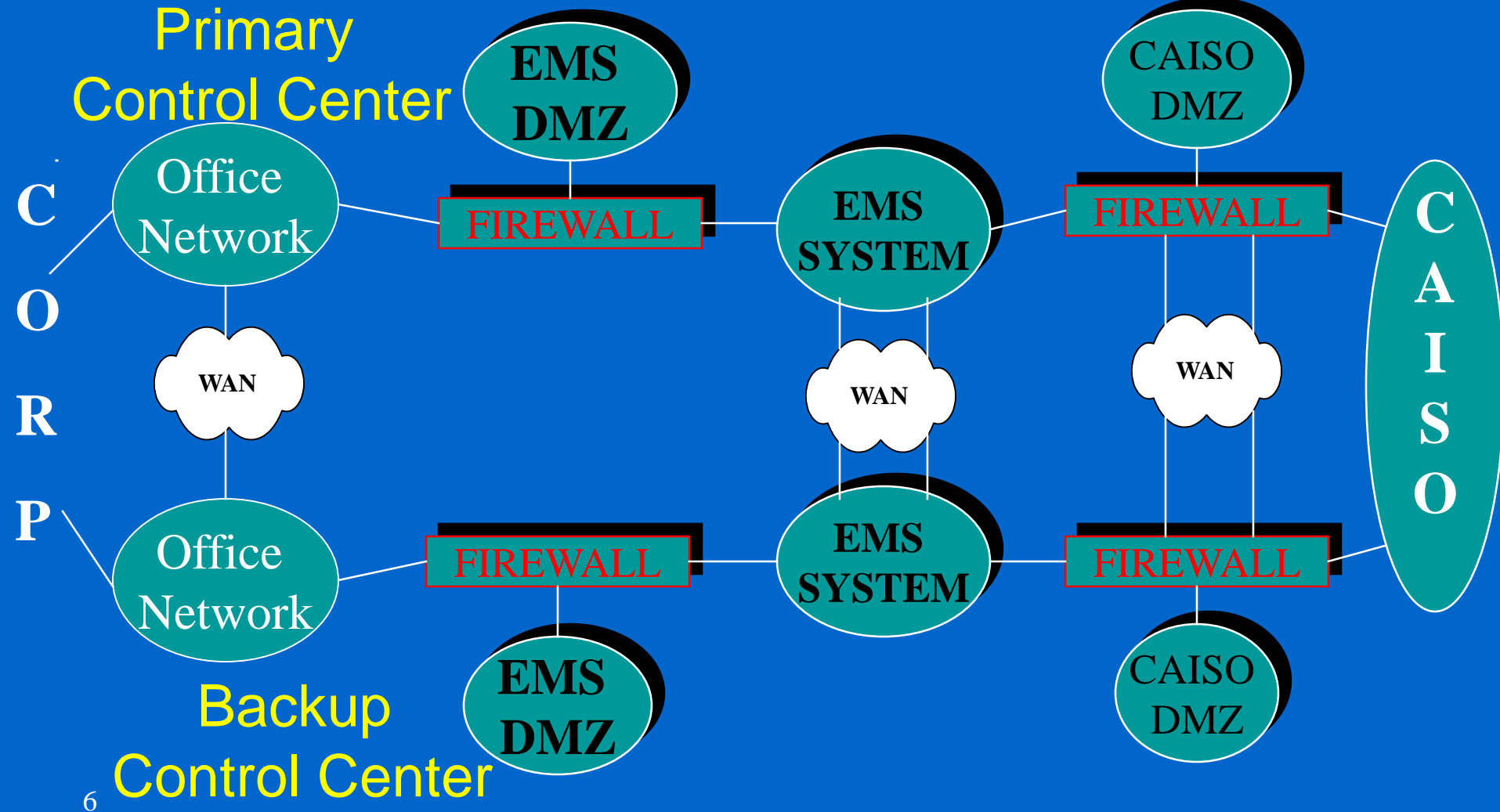


NERC Cyber Security Standard

- NERC Urgent Action Standard 1200 presents standards to “monitor” and protect critical cyber assets
- At Sempra, we take compliance seriously
 - SDGE Self-Certification – 3/1/04
 - “Substantial Compliance” – 3/1/04
 - “Full Compliance” – 3/1/05



EMS Infrastructure



Critical Cyber Assets

- **EMS nodes**: 40+ UNIX boxes
 - Application Hosts: IBM AIX
 - Oracles: IBM AIX
 - Front End Processors: IBM AIX
 - Dispatcher Workstations: SUN Solaris
- **Windows Servers**: 10+ servers
 - PI Servers
 - PI OPC/Interfaces
 - SQL-Servers
 - Web Servers
- 7 • **Network Devices**: switches, routers, and firewalls

Monitoring All

- A **proactive** and **preventive** way to monitor EMS infrastructure resource health to ensure the system reliability and performance
- Monitoring all EMS infrastructure for disk, file, paging, cpu, swap and memory usage, ...etc.
- Monitoring **EMS processes and applications**
- Establish performance **baseline** standards
- Avoid finger pointing
- Root cause analysis and problem solving
- Automatic **notification** via email and cell phone

Why IT Monitor?

Control System Infrastructure

Power System



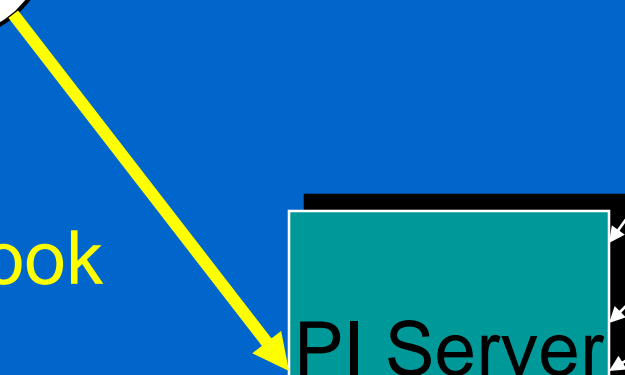
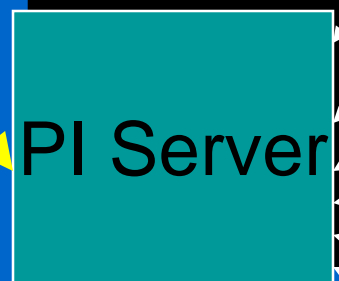
✓ 150K tags

✓ ProcessBook

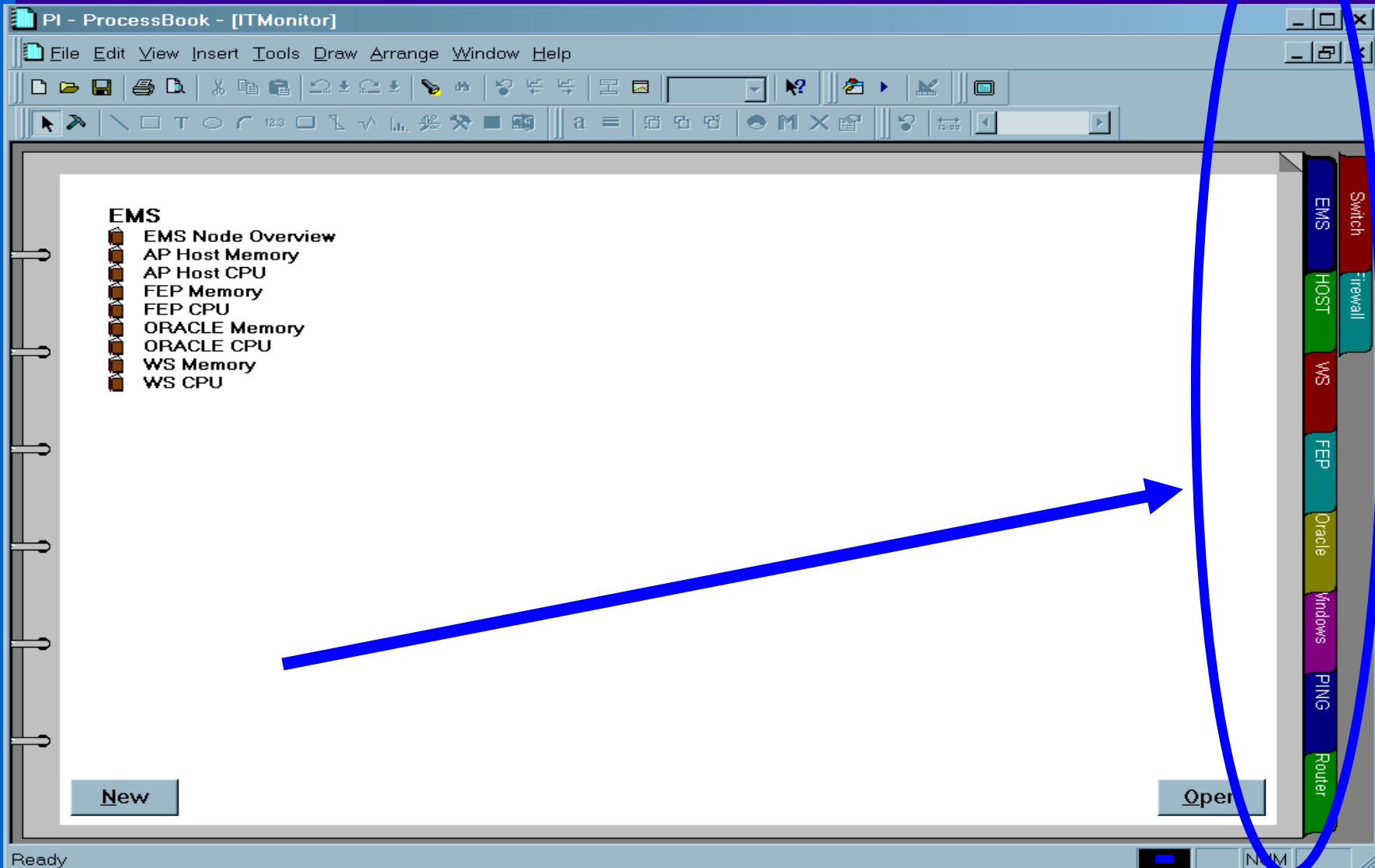
✓ DataLink

✓ Hardware/Architecture

9 ✓ Multiple interfaces/multiple devices

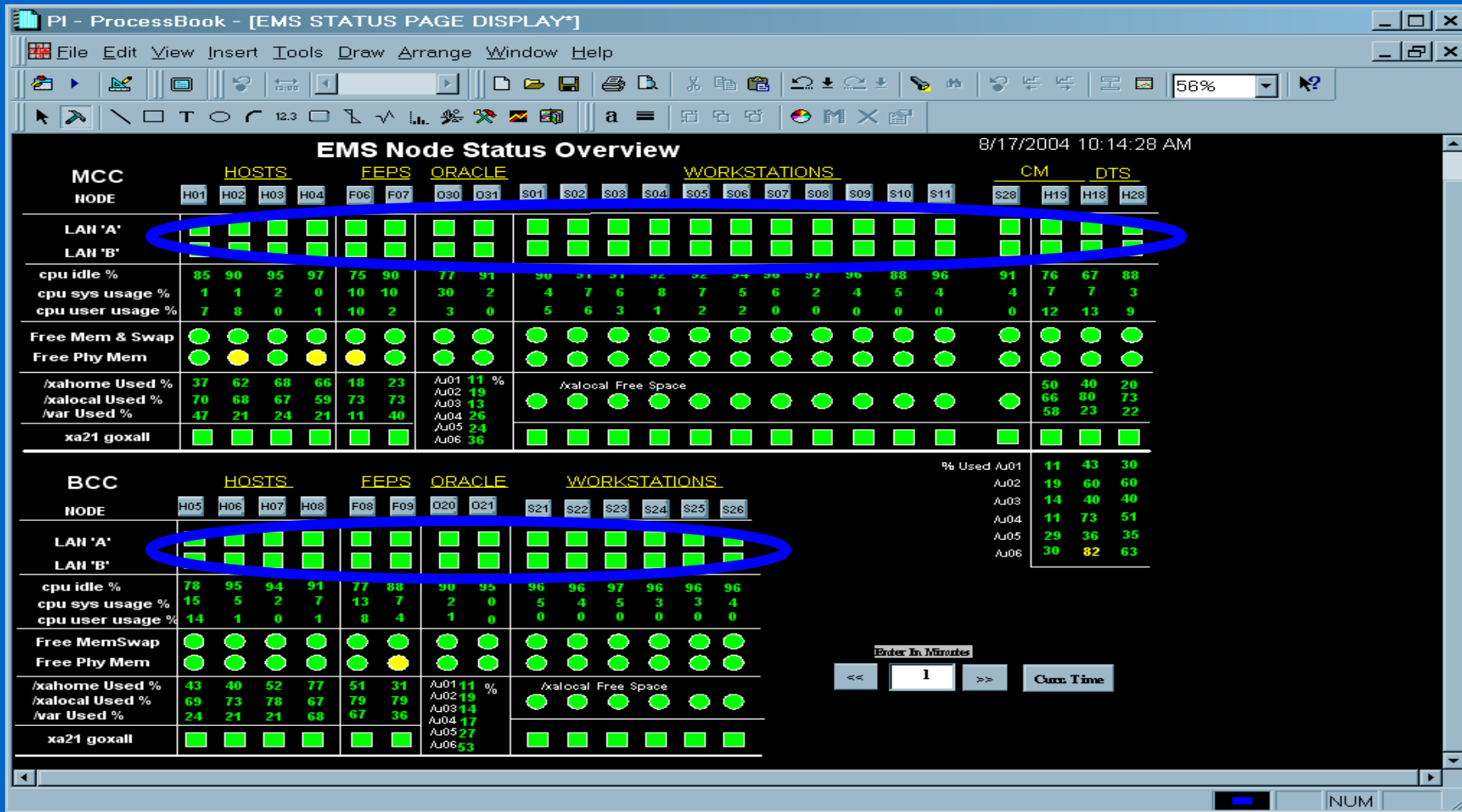


Multiple Devices



PING

- Monitoring the network connectivity



TCP Response/NetFlow/PerfMon

- TCP Response
 - Monitoring network service response times, like telnet, ftp, ...etc.
- NetFlow
 - Monitoring network traffic, to and from the device
- PerfMon
 - Monitoring Windows servers performance counter and statistics

PI Server Status

PI - ProcessBook - [PI_SERVER]

File Edit View Insert Tools Draw Arrange Window Help

66%

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PI-Servers (PI-01 & PI-02)

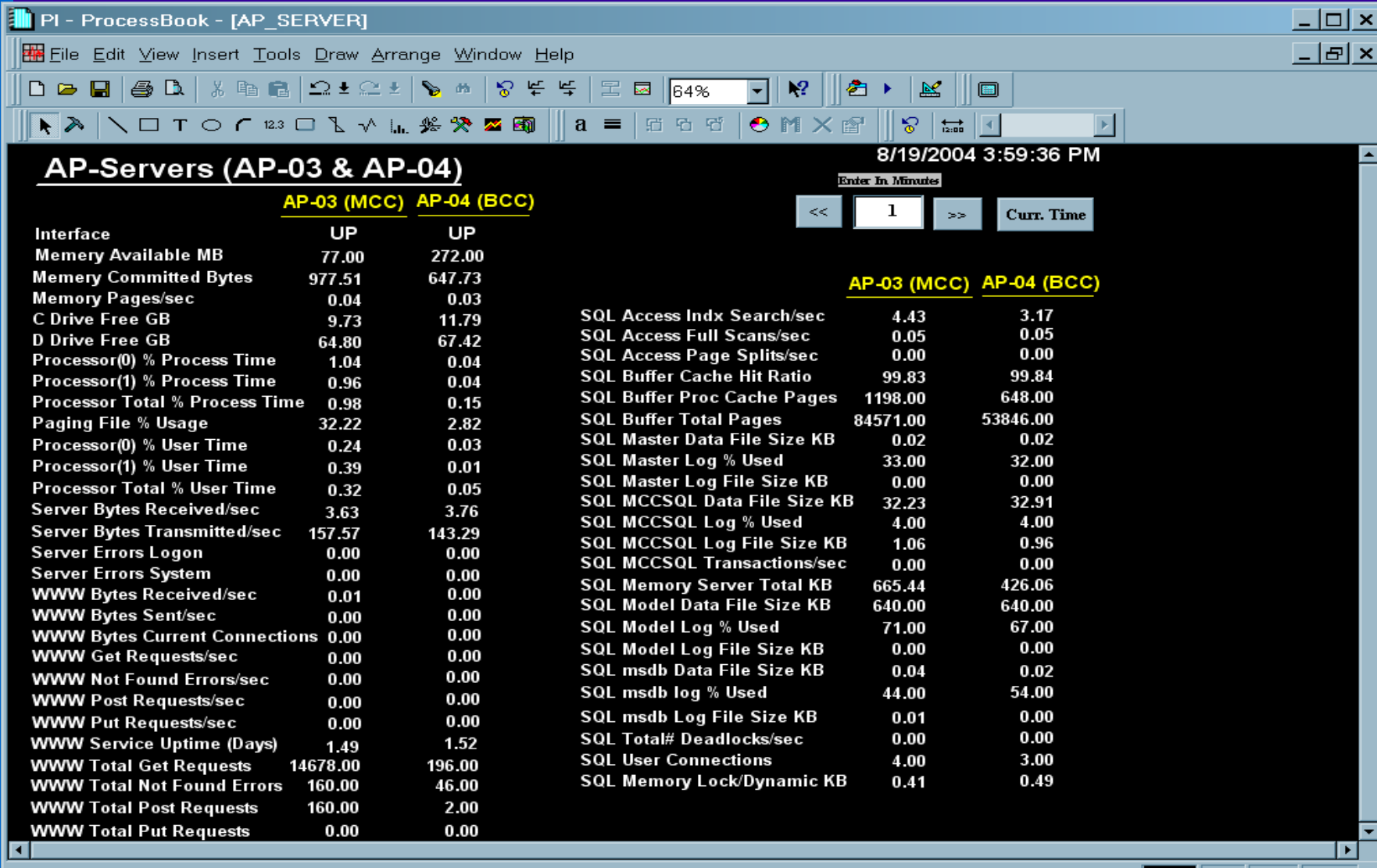
Enter In Minutes

<< 1 >> Curr. Time

	PI-Mission-01 (MCC)	PI-Mission-02 (BCC)
Interface 1	UP	DOWN
Memory Available MB	920.00	129.00
Memory Page Faults/sec	208.58	28.39
Memory Pages/sec	80.38	3.08
C Drive Free GB	11.46	13.38
D Drive Free GB	46.77	75.37
Processor(0) % Process Time	12.09	0.60
Processor(1) % Process Time	30.47	0.50
Processor(2) % Process Time	8.08	0.41
Processor(3) % Process Time	9.16	0.35
Archive-Cache Records in Memory	12516.00	10811.00
Archive-Cache Records Deleted	3.69	3.73
Archive-Cache Disk Reads	25.30	3.56
Archive-Cache Disk Writes	4.72	14.86
Archive-Cache Memory Hits	202.26	152.48
Archive-Rate of Successful Event	202.86	153.37
Archive-Records Creates	4.26	3.43
Snapshot-Events Read From Snapshots	47.79	1.34
Snapshot-Out of Order	0.20	0.15
Snapshot-Pending posts	0.00	0.00
Snapshot-Queued Events	206.96	153.37
Snapshot-Events Sent to Snapshot	373.79	348.18
Upd-Mgr-Consumer Total	27.00	12.00
Upd-Mgr-Lost Events in PI Update Manager	0.00	0.00
Upd-Mgr-Events Sent to PI Update Manager	3.82	0.00

Ready NUM

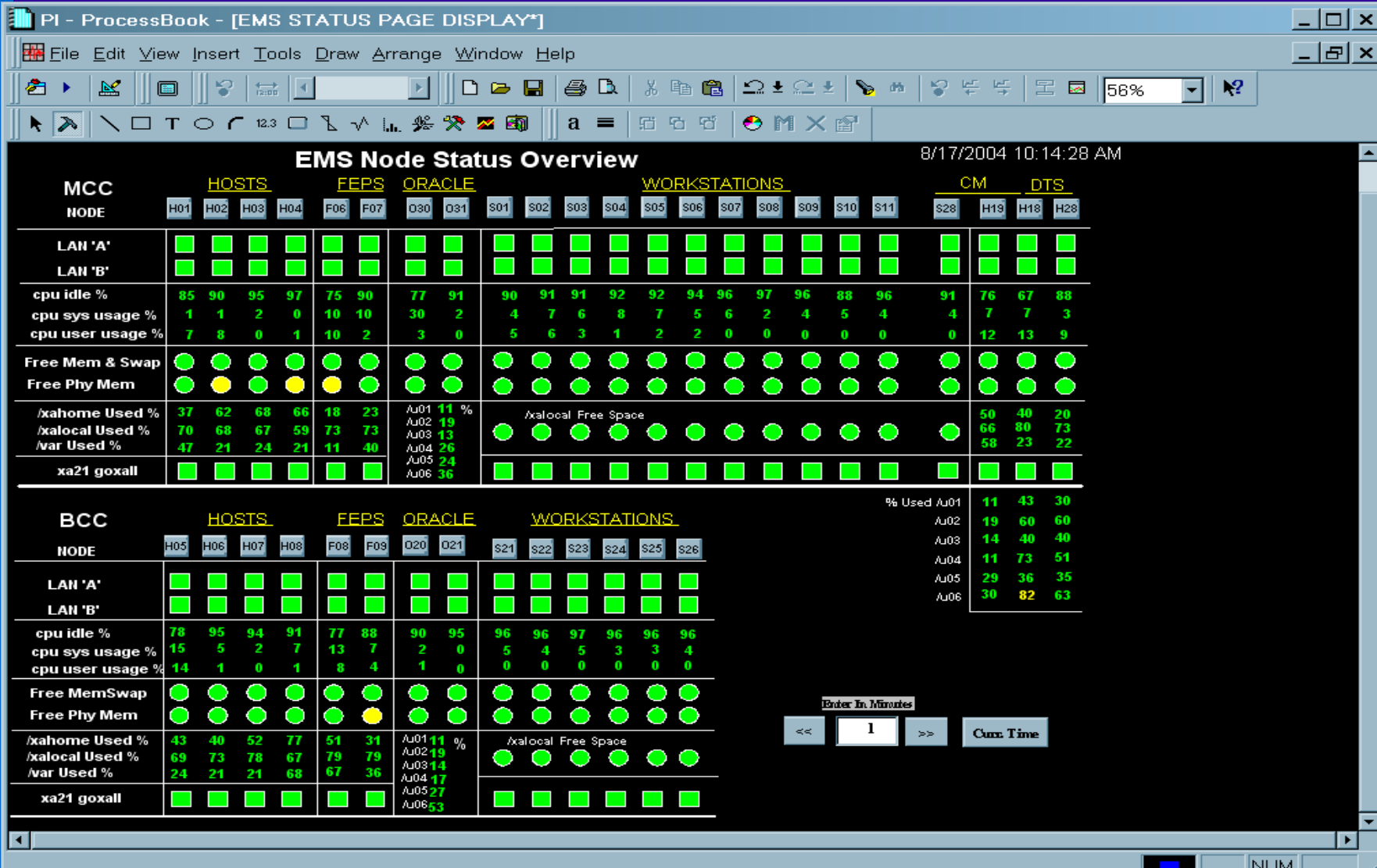
SQL & Web Server Status



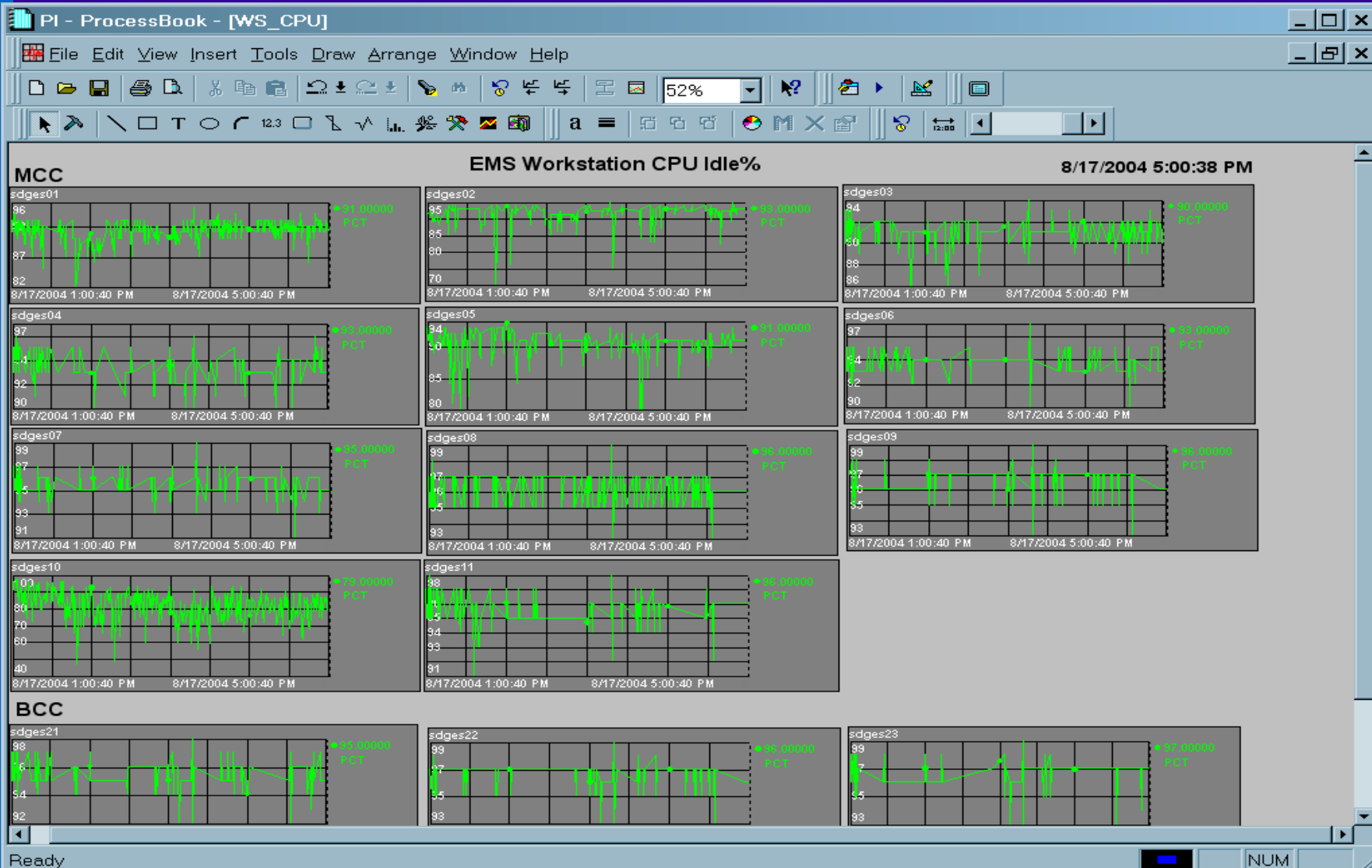
SNMP

- Simple Network Management Protocol
- Get statistics from any SNMP enabled devices
- SNMP query agent configuration in IBM AIX and SUN Solaris - very challenging
- Different MIB (Management Information Base) variables (containing OID's-Object Identifier) describing different aspects of computer/device operations
- Matching snmpd.conf, Getif info and OID's in PI tag "exdesc"

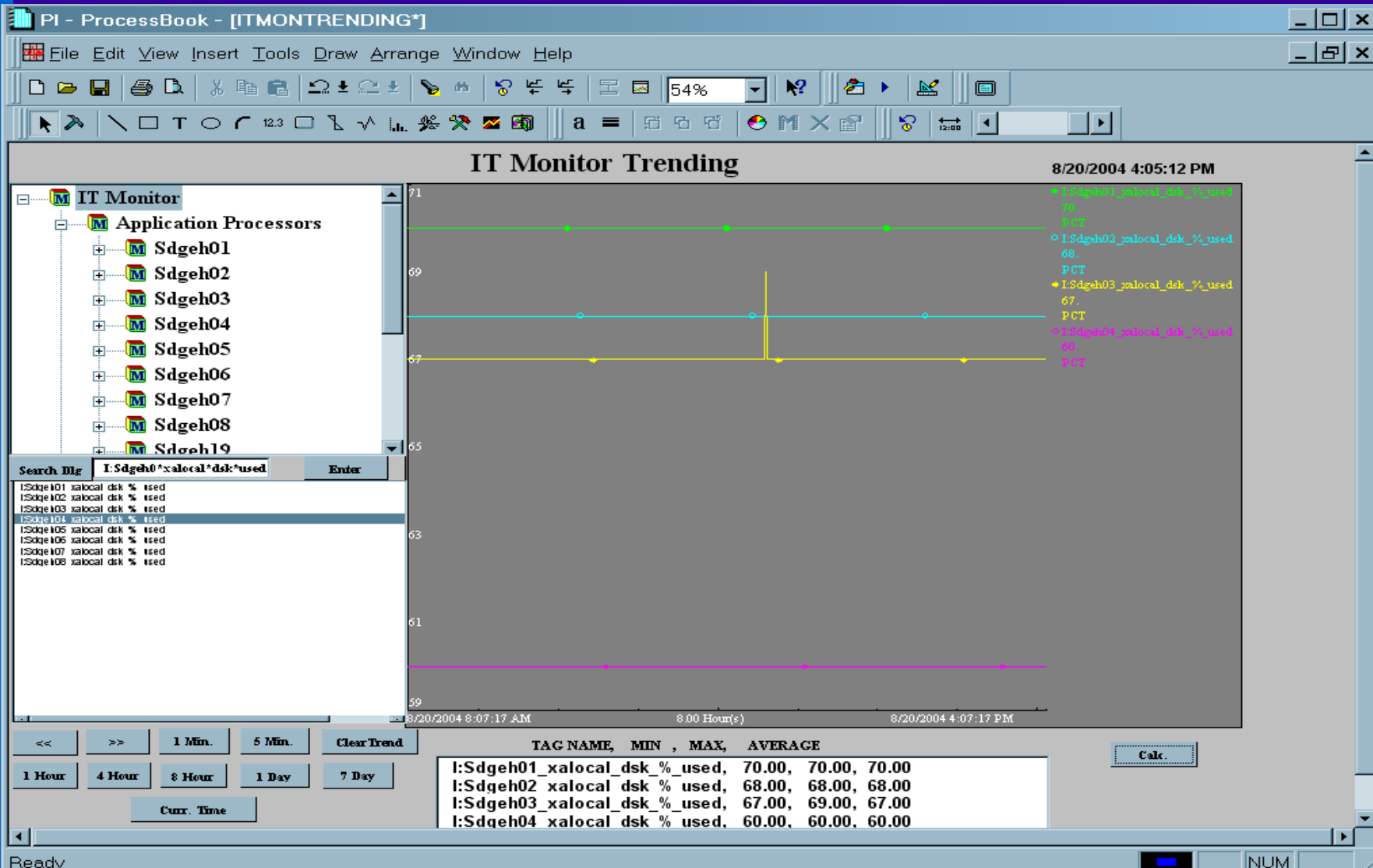
EMS Node Status Overview



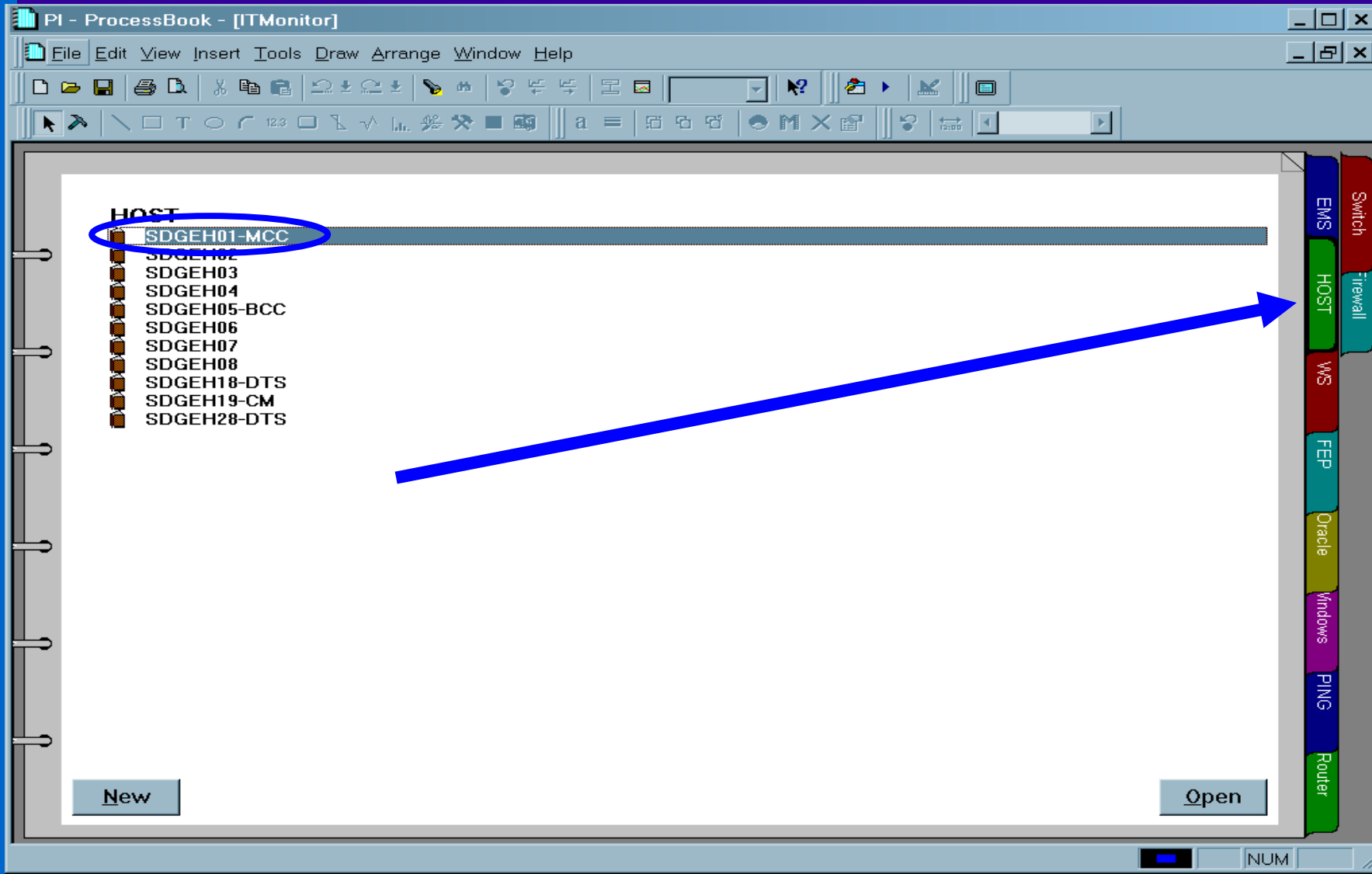
Dispatcher Workstation CPU



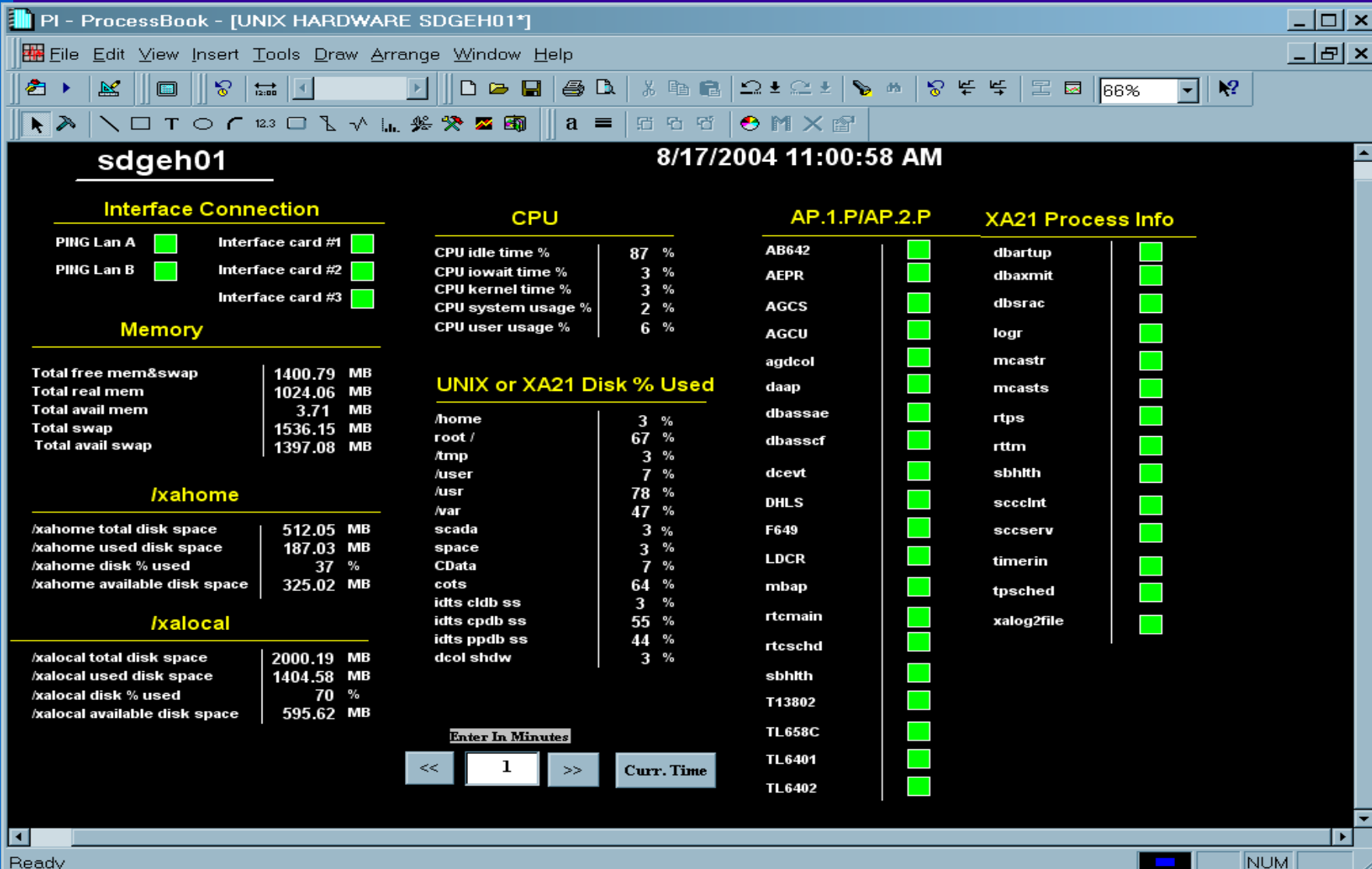
IT Monitor Trending



Application Host Index



Application Host 1



Future Development

- Monitoring Oracle database – Using SNMP
- Monitoring ipcs
- Implementing SNMP Traps
- SNMP agent in facility equipments
- Secured SNMP traffic (encrypting SNMP?)
- Utilizing Syslog interface
- Integrating with Cisco Works, IDS and HP Openview, ...etc.

THANKS!!