

### IT Monitor at SDG&E



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San Diego Gas & Electric
September 16, 2004
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

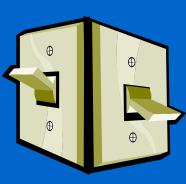


- Service territory includes San Diego County and Southern Orange County
- 3,960 MW system peak load (8/31/98)
- 130 Transmission RTUs (69kV, 138kV, 230kV, and 500kV) – GE XA21 EMS
- 900 Distribution RTUs (12kV)
  - -ACS Prism DMS

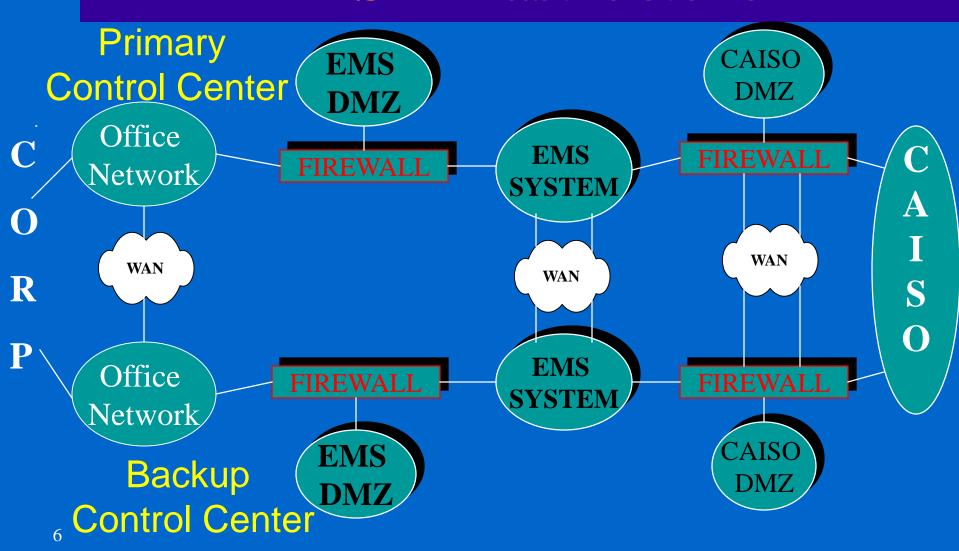
# **NERC Cyber Security Standard**

 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



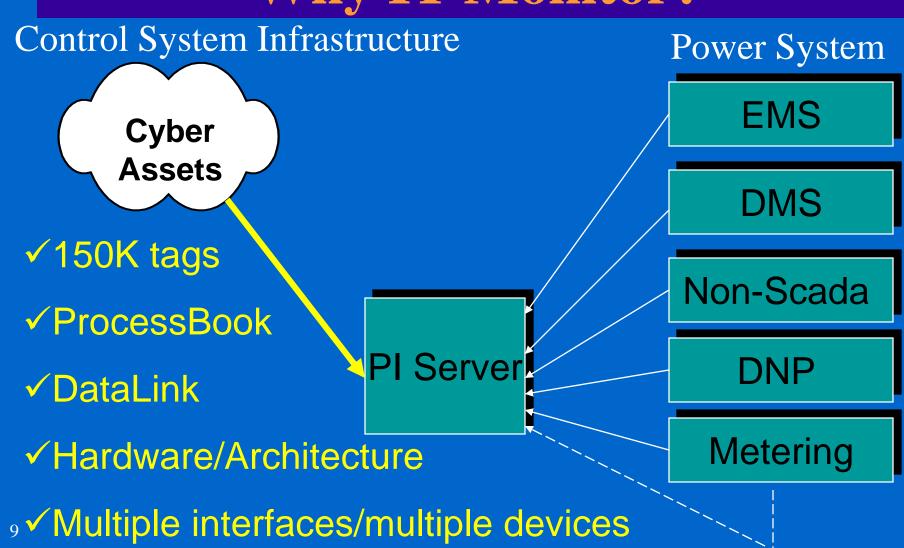
### **Critical Cyber Assets**

- 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
- Network Devices: switches, routers, and firewalls

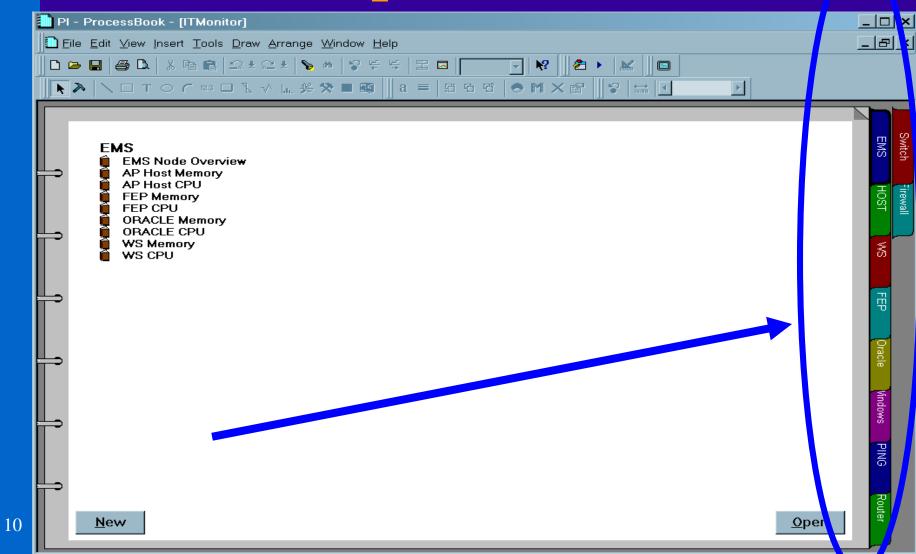
### **Monitoring All**

- 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?



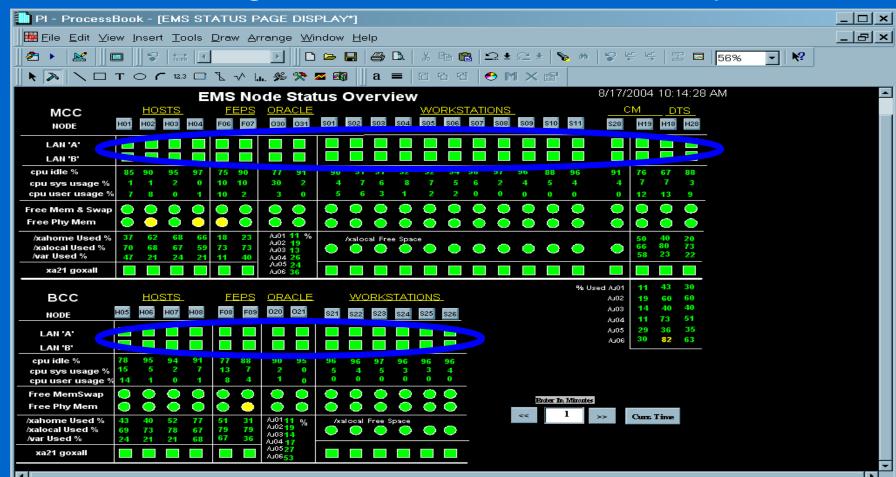
# Multiple Devices



Ready

### **PING**

Monitoring the network connectivity



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# 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

Party Control of the					
PI - ProcessBook - [PI_SERVER]					×
File Edit View Insert Tools Draw Arrange Window Help					_ a ×
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<b>▶</b>				FI.	
		2004 11:16:27 AM			
PI-Servers (PI-01 & PI-02	Enter	In Minutes			
	<<	1 >> Curr. Time			
	PI-Mission-01 (MCC)	PI-Mission-02 (BCC)			
	PI-WISSION-01 (MCC)	FI-MISSION-02 (BCC)	_		
Interface 1	UP	DOWN			
Memery Available MB	920.00	129.00			
Memery 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		0.00			
1					<b>▼</b>

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# SQL & Web Server Status

PI - ProcessBook - [AP_S	ERVER]			×
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AP-Servers (AP-	03 & A	(P-04)	8/19/2004 3:59:36 PM	
	AP-03 (MC	CC) AP-04 (BCC)	<< 1 >> Curr. Time	
Interface Memery Available MB	UP 77.00	UP 272.00		
Memery Committed Bytes Memory Pages/sec	977.51 0.04	647.73 0.03	AP-03 (MCC) AP-04 (BCC)	
C Drive Free GB D Drive Free GB Processor(0) % Process Time Processor(1) % Process Time Processor Total % Process Time Paging File % Usage Processor(0) % User Time Processor(1) % User Time Processor Total % User Time Processor Total % User Time Server Bytes Received/sec Server Bytes Transmitted/sec Server Errors Logon Server Errors System WWW Bytes Received/sec WWW Bytes Sent/sec	9.73 64.80 1.04 0.96 1e 0.98 32.22 0.24 0.39 0.32 3.63 157.57 0.00 0.00	11.79 67.42 0.04 0.04 0.15 2.82 0.03 0.01 0.05 3.76 143.29 0.00 0.00	SQL Access Indx Search/sec       4.43       3.17         SQL Access Full Scans/sec       0.05       0.05         SQL Access Page Splits/sec       0.00       0.00         SQL Buffer Cache Hit Ratio       99.83       99.84         SQL Buffer Proc Cache Pages       1198.00       648.00         SQL Buffer Total Pages       84571.00       53846.00         SQL Master Data File Size KB       0.02       0.02         SQL Master Log % Used       33.00       32.00         SQL McCSQL Data File Size KB       0.00       0.00         SQL MCCSQL Log % Used       4.00       4.00         SQL MCCSQL Log File Size KB       1.06       0.96         SQL MCCSQL Transactions/sec       0.00       0.00         SQL Memory Server Total KB       665.44       426.06         SQL Model Data File Size KB       640.00       640.00	
WWW Bytes Current Connection WWW Get Requests/sec WWW Not Found Errors/sec WWW Post Requests/sec WWW Put Requests/sec WWW Service Uptime (Days)		0.00 0.00 0.00 0.00 0.00 1.52 196.00 46.00 2.00	SQL Model Log % Used       71.00       67.00         SQL Model Log File Size KB       0.00       0.00         SQL msdb Data File Size KB       0.04       0.02         SQL msdb log % Used       44.00       54.00         SQL msdb Log File Size KB       0.01       0.00         SQL Total# Deadlocks/sec       0.00       0.00         SQL User Connections       4.00       3.00         SQL Memory Lock/Dynamic KB       0.41       0.49	<u></u>

### **SNMP**

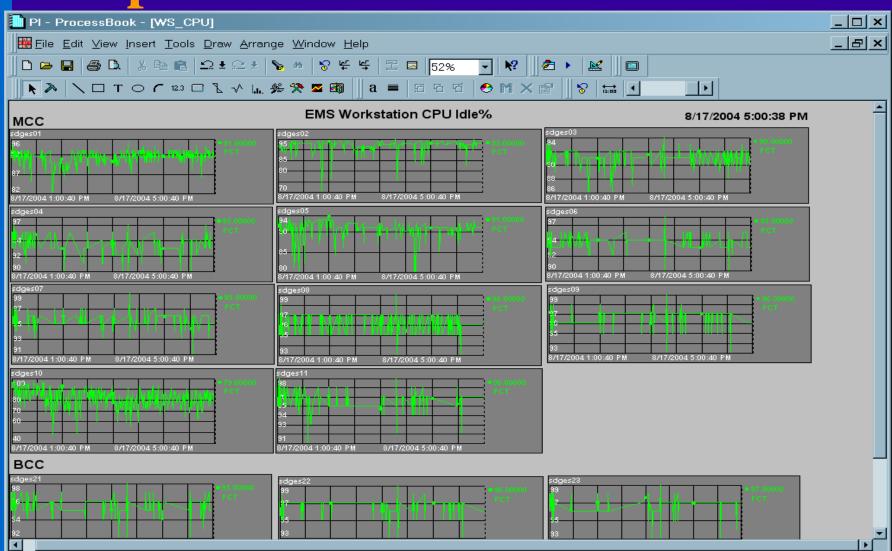
- Simple Network Management Protocol
- Get statistics from any SNMP enabled devices
- SNMP query agent configuration in IBM AIX and SUN Solaris very challenging
- Different MIB (Management Information Base) variables (containing OID's-Object Identifier) describing different aspects of computer/device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

### **EMS Node Status Overview**



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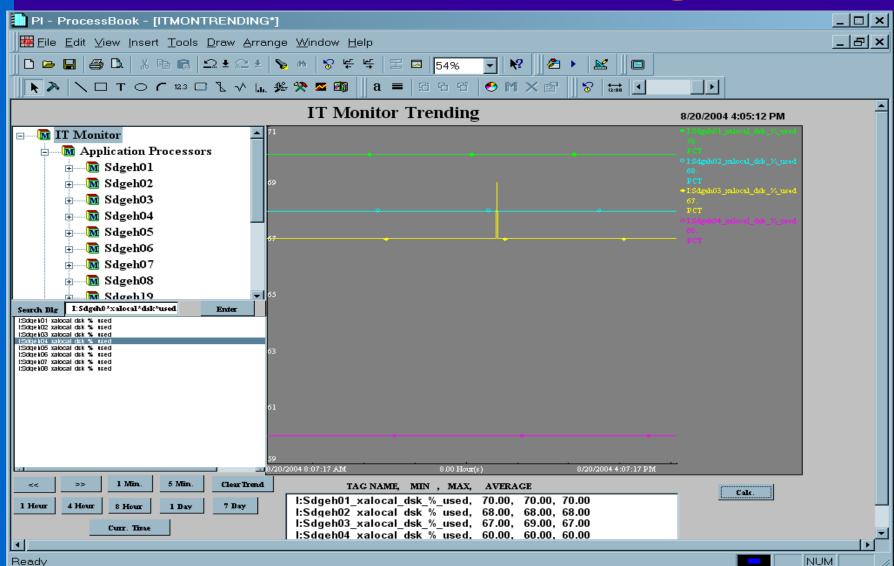
### **Dispatcher Workstation CPU**



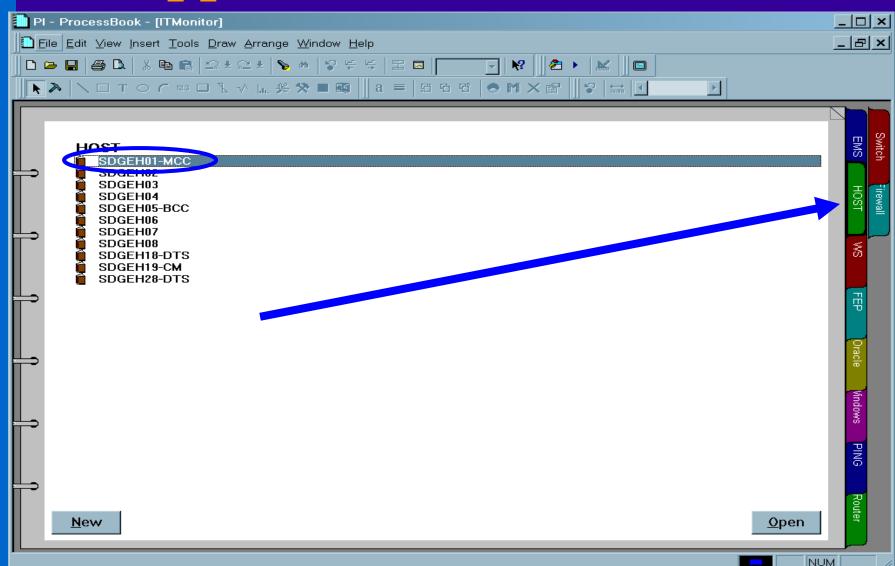
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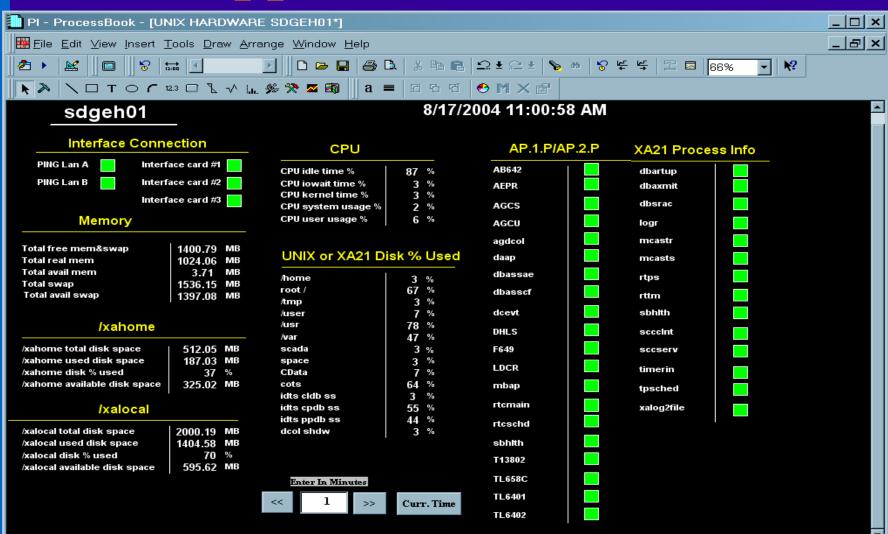
## **IT Monitor Trending**



### **Application Host Index**



# **Application Host 1**



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Ready

# **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!!** 

