HP Technology Forum 2006

A Cow of a Different Color
Advanced Status with HP OpenView Network Node Manager

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Housekeeping

- This session will be useful if you:
  - Are using *netmon* and want to learn more about the APA
  - Tried using APA or ET and it didn't work out and want to know why
  - Are using APA now and want to get more out of it
- This session will not be much use to you if you:
  - Are happy using *netmon* for status polling, or don't have a choice
  - Don't or can't customize NNM
  - Aren't interested in detailed technical content
  - Can't sit still for 4 hours
  - Prefer presentations with only 6 bullets per slide
- Assumptions:
  - Thoroughgoing knowledge of NNM 6.0+ will help a lot
- Introductions (if group is small enough):
  - Name, company, current NNM version
  - Experience with APA? Est. # objects

NNM status subsystems in a nutshell

- *netmon* performs discovery and status polling (old poller)
  - 4 areas of polling: Discovery, Configuration, Status, Path
  - *netmon* continues to be responsible for Discovery/Config after switch to APA
  - Predominantly ICMP – SNMP in limited cases - never both for a given object
  - Multiple configuration entry points; limited dynamic reconfiguration

- APA *(Active Problem Analyzer)* in 7.01+; *ovet_poll* (new poller)
  - Based on Extended Topology's understanding of the network
  - Used for HSRP & OAD by default for ET-discovered devices
  - Issues ICMP *and* SNMP polls; layer two-based status, path analysis
  - Address-aware; Intelligent algorithms for status based on ET knowledge

- *Event Correlation* (ECS embedded runtime; correlation composer)
  - Provides state-based logic that is applied to both poller's status streams
  - Some overlap between APA fault analysis and ECS correlation
  - APA fault analysis is performed before events are generated
  - ECS acts on events after they have been sent into the NNM event subsystem

netmon default status

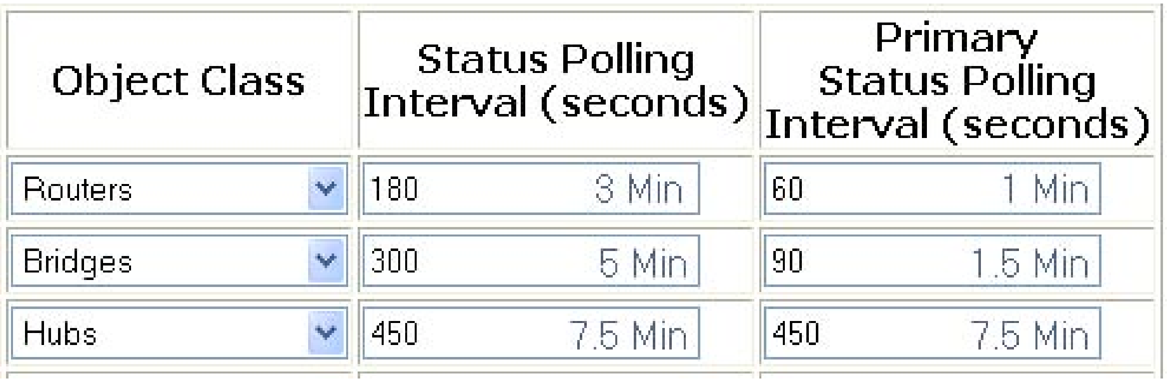
- Global default defined in SNMP configuration: 15 minutes

- Dynamically-adjusting polling by *netmon*
  - V6.0 *netmon* enhancement to support ConnectorDown
    - Doubles intervals for polls issued to secondary failure-mode If's Status
  - V6.31 *netmon* enhancement to support 3 new correlations
    - Connector interfaces immediately polled when one's status changes
    - All interfaces changing status re-polled at 2 and 4 minutes

- Object-based polling (V6.2+)
  - Allows different polling intervals for primary vs secondary interfaces
  - Objects defined via NNM standard filters and filter definition language
  - Configure via "Poll Objects" - front-end to configure *netmon.statusIntervals*
  - Tightens default polling intervals for Routers, Bridges, Hubs
  - ***Loosens*** default polling intervals for Nodes to 1 hour (V6.4+)
  - Uses *netmon's* critical path analysis to determine primary interface

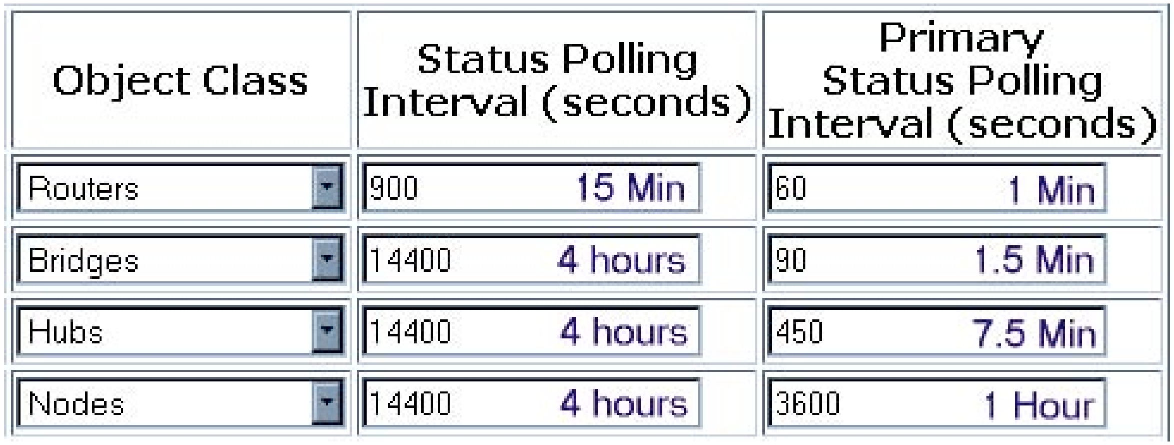
netmon object-based polling defaults

- NNM V6.2:
- NNM V6.31:



Object Class	Status Polling Interval (seconds)	Primary Status Polling Interval (seconds)
Routers	180 3 Min	60 1 Min
Bridges	300 5 Min	90 1.5 Min
Hubs	450 7.5 Min	450 7.5 Min

- NNM V6.4:
- NNM V7.0:
- NNM V7.5:



Object Class	Status Polling Interval (seconds)	Primary Status Polling Interval (seconds)
Routers	900 15 Min	60 1 Min
Bridges	14400 4 hours	90 1.5 Min
Hubs	14400 4 hours	450 7.5 Min
Nodes	14400 4 hours	3600 1 Hour

- Use `xnmsnmpconf -resolve target` to determine *netmon*-based intervals
- Use `nmdemandpoll -i target` to force issue status polls (*netmon* status only)

netmon layer 2 status polling defaults

- Support for Bridge, MAU, Repeater MIB; VLANs
- Un-numbered ifs inferred from port table, polled via ARP
  - V5-V6.1: Critical/Normal; V6.2+: Unknown/Normal; V7.0+: Off
- SNMP status mapping fixed from V5 until V6.2
  - Status reflected in maps only; alarms are log-only

ifAdminStatus	ifOperStatus	OV Status	Map Color
down	any	DISABLED	Dark Brown
testing	any	TESTING	Tan
up	up	NORMAL	Green
up	down	CRITICAL	Red
up	testing	TESTING	Tan

– Note APA based SNMP status mapping unexposed

netmon layer 2 status polling

- NNM 6.2+: *netmon.statusMapping* defines customizable SNMP status levels

ifAdminStatus	ifOperStatus	OV Status
up	up	unset
down	down	unknown
testing	testing	normal, up
any	unknown	critical, down
	dormant	disabled
	notpresent	unmanaged
	lowerlayerdown	restricted
	any	testing

- $OV_CONF/*netmon.snmpStatus* - Define L3 IP ranges to poll via SNMP
  - Intended for firewalls: ICMP polling disabled for these devices
  - netmon.lrf –k snmpTimeoutImplies=status[unknown, unchanged, critical (default)

netmon status event varbinds

- varbinds used by NodeIf, ConnectorDown event correlations

IF Status Varbind #	Node Status Varbind #	Description
$2	$2	Hostname of node that caused the event
$5	$5	Timestamp event occured
$7		Interface Name or Label
$8		IP Address of Interface or “0”
$11		Number of bits in the interface subnet mask
✸ $12		Interface ifAlias
✸ $13	$8	Local list of capabilities
✸ $14	$9	Name of primary failure host
✸ $15	$10	Name of primary failure entity
✸ $16	$11	OV OID of primary failure entity
✸ $17	$12	Description of primary failure entity
✸ $18	$13	Primary failure entity list of capabilities

- Event text NNM V6.31+: **`IF $7 Down $12, Capabilities: $13 Root Cause $14 $15`**
- Event text NNM V6.2-: **`IF $7 Down`**

✸ = Introduced in NNM 6.31+

netmon vs. APA status polling pros & cons

- *netmon* Cons
  - Single-threaded, single protocol poller, with many legacy issues (IP, DNS)
  - Polls via ICMP *or* SNMP, but never both, SNMP polling is limited.
  - Secondary status determination mechanisms complex, layered, and inadequate
  - Rudimentarily dynamic w.r.t intervals and polled object relations
  - Cannot poll into OAD's, cannot handle HSRP, NAT, etc.
  - Cannot separate the concept of an IP address from that of a physical interface
  - All status derived from interface-level via topology propagation rules
  - Is not "connection aware," i.e. can't relate failures detectable from other paths
  - Rudimentary path analysis: Only 1 path to each interface to determine primary
  - Disparate and legacy configuration switches, files, and dependencies

- *netmon* Pros
  - Behavior characterizable and configurable, less FUD for installed base
  - Due to its lack of in-depth analysis capabilities, still scales OK
  - GUI's available for most polling customization and configuration
  - Excellent discovery - not dependent on Extended Topology discovery
  - Layer 2 SNMP status granularity more configurable (but not by entity)

netmon vs. APA status polling pros & cons

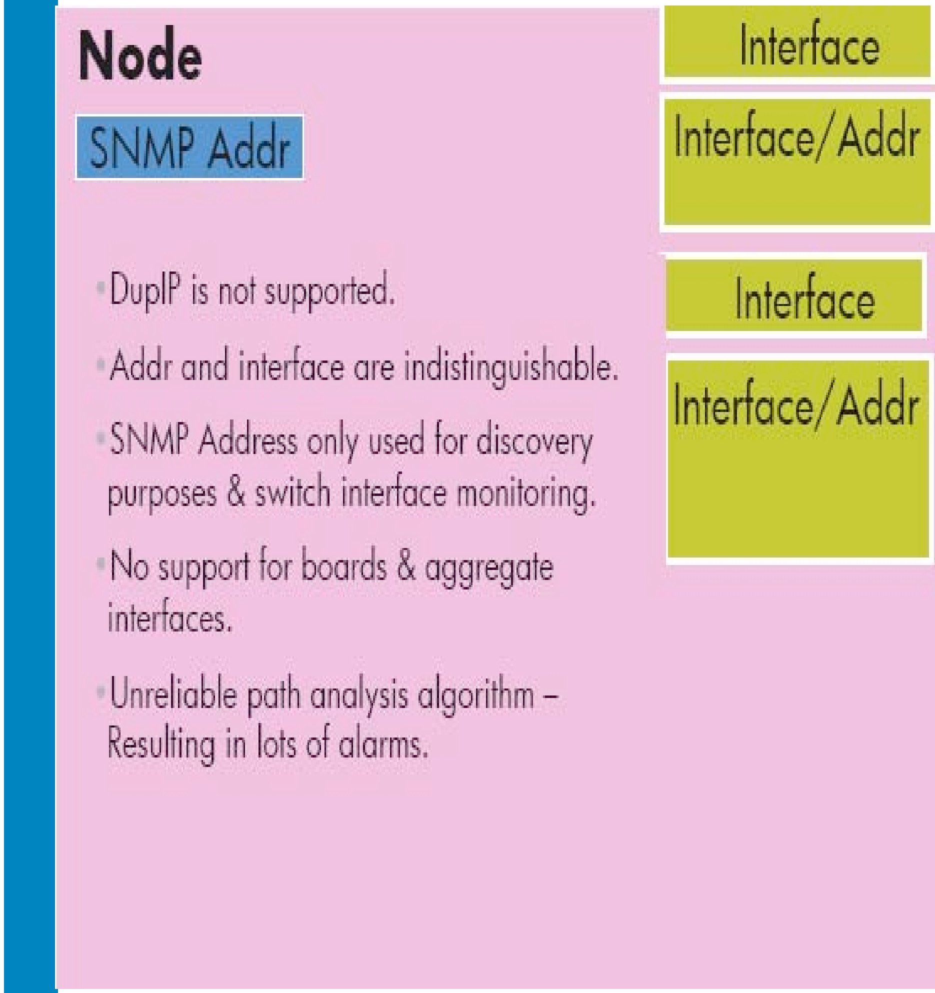
- APA Pros
  - Multi-threaded, multi-protocol (combines ICMP & SNMP, other protocols)
  - Switched-topology-aware, duplicate IP-aware, neighbor state-aware
  - Event-triggered polling based on NNM and device-generated events
  - Provides status at six different entity levels:
    - Address
    - Interface
    - Node
    - Connection
    - Aggregated Port
    - Board
  - Provides more dynamic polling based on queued status & ET-stored state
  - Grouped SNMP queries
  - Uses/interprets some SNMP generic events
  - Special support for OAD, HSRP, IPv6, RAMS
  - Provides advanced connection-oriented & device-oriented status analysis
  - Provides neighbor analysis algorithm that uses traceroute
  - Less reliant on complexities of ECS – more corellation at the source
  - Generates fewer log-only and correlated status events by default
  - Direct migration paths from NNM 6.2, 6.41, 7.01

netmon vs. APA status polling pros & cons

- APA Cons
  - Dependent on ET Discovery, which is difficult to scale
  - Analysis engine is complex - difficult to interpret behaviors
  - Does not do its own discovery – ET relies on *netmon* for discovery
  - Polling customizations require modifying XML file; no configuration GUI
  - Handling of complex devices is difficult (switching routers, slide 84)
  - Many *netmon*-based customizations not inherited by APA, e.g:
    - Poller settings in SNMP Configuration GUI ignored
    - Interfaces unmanaged in NNM topology or by ovautoifmgr still may be polled
    - Object based polling settings based on filters (APA uses ET filters)
    - Separate definition files/filters for Important Nodes (MyHostID.xml)
  - Cannot be used on management stations in DIDM environments (CS only)
  - IPX and Service Guard polling not available after switching to APA
  - Initial setup can cause message floods in highly-scaled environments
  - Initial ET configuration must be done in proper order with proper timing
  - Status bridge not perfect: IPMAP topology status/APA status mismatches
  - Lag time for polling new nodes in dynamic environments (ET Dependence)

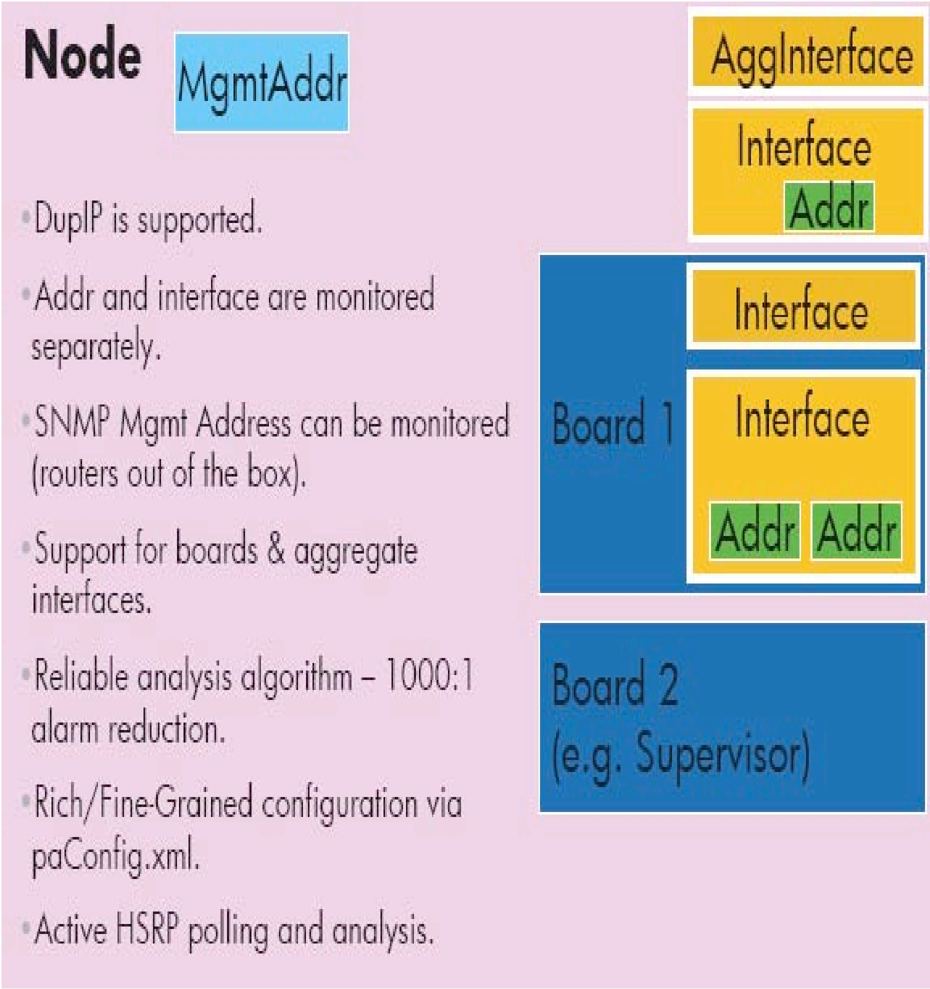
Netmon vs APA topology model

netmon



- DupIP is not supported.
- Addr and interface are indistinguishable.
- SNMP Address only used for discovery purposes & switch interface monitoring.
- No support for boards & aggregate interfaces.
- Unreliable path analysis algorithm – Resulting in lots of alarms.

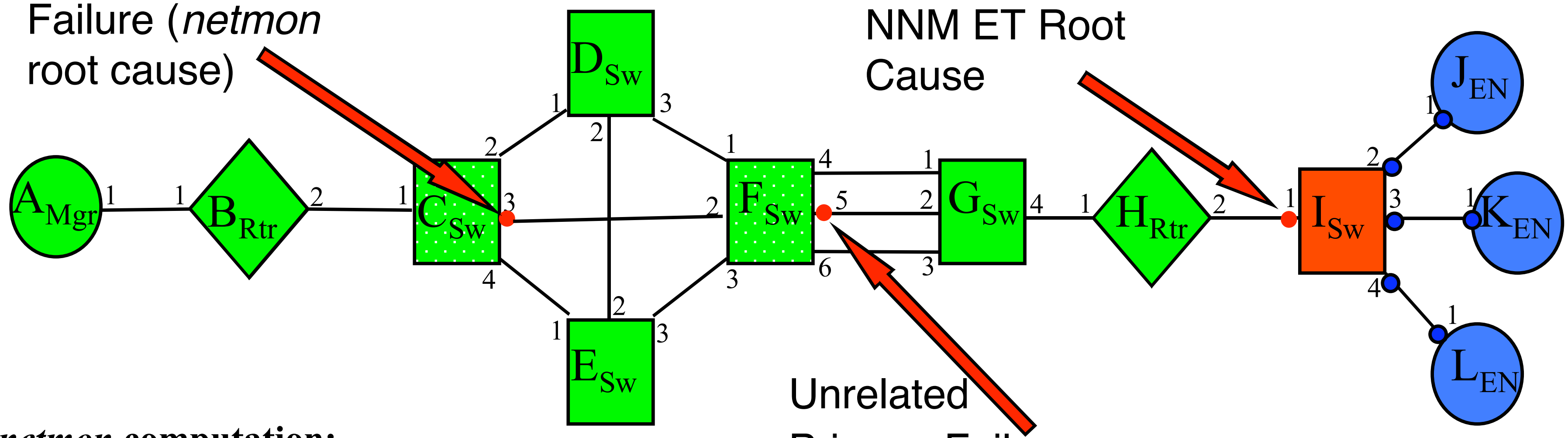
APA



- DupIP is supported.
- Addr and interface are monitored separately.
- SNMP Mgmt Address can be monitored (routers out of the box).
- Support for boards & aggregate interfaces.
- Reliable analysis algorithm – 1000:1 alarm reduction.
- Rich/Fine-Grained configuration via paConfig.xml.
- Active HSRP polling and analysis.

netmon vs. ET/APA Path Analysis

Unrelated Primary Failure (*netmon* root cause)



NNM ET Root Cause

Unrelated Primary Failure

***netmon* computation:**

A.1 B.1 B.2 C.1 **C.3 F.2** **F.5 G.2** G.4 H.1 H.2 I.1 I.2 J.1

Netmon-based events: Primary: C3; Secondary to C3: F5,I1,J1,K1,L1

ET path engine computation (APA) using connector fault analysis (CFA):

A.1 B.1 B.2 C.1 - **MESH(**C.2 D.1 **C.3 F.2** C.4 E.1 D.2 E.2 D.3 F.1 E.3 F.3**)**

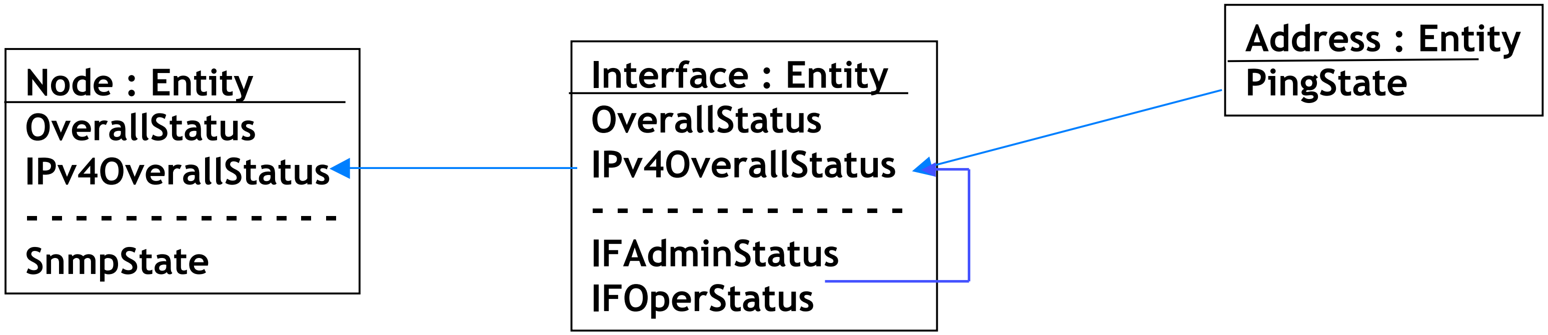
AGGR(F.4 G.1 **F.5 G.2** F.6 G.3**)** - G.4 H.1 H.2 I.1 I.2 J.1

APA-based events: Primary: C3, F5, I1; Secondary to I1: J1, K1, L1

Understanding APA Status

- APA is stateful, *netmon* is generallt not

- Simplified IPv4 state entity diagram:



Node : Entity
OverallStatus
IPv4OverallStatus
- - - - - - - - - - - - - -
SnmpState

Interface : Entity
OverallStatus
IPv4OverallStatus
- - - - - - - - - - - - - -
IFAdminStatus
IFOperStatus

Address : Entity
PingState

Node

Interface
SNMP/ICMP

Address
ICMP

- HSRP, IPv6 and OAD status is layered on top of this

APA Ping State Values in Dynamic Views

- responding:

  Address responds to ping.

- not_responding:

  Address does not respond to ping and is the Primary Failure.

- unreachable:

  Address does not respond to ping and is a Secondary Failure.

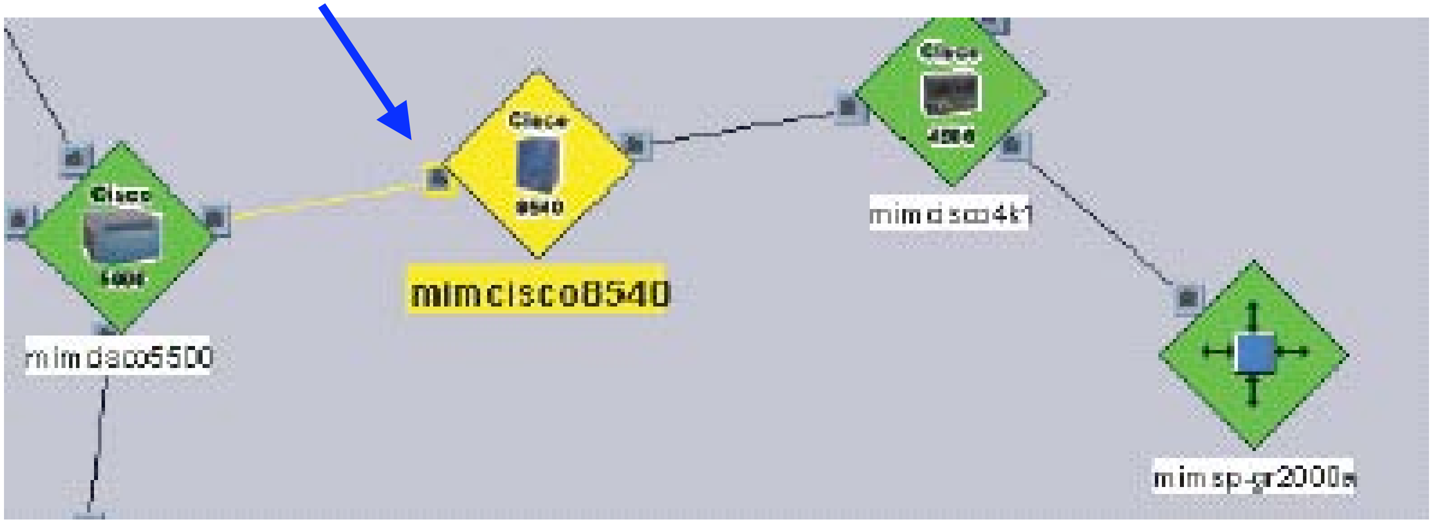
- disabled:

  This address is not monitored.

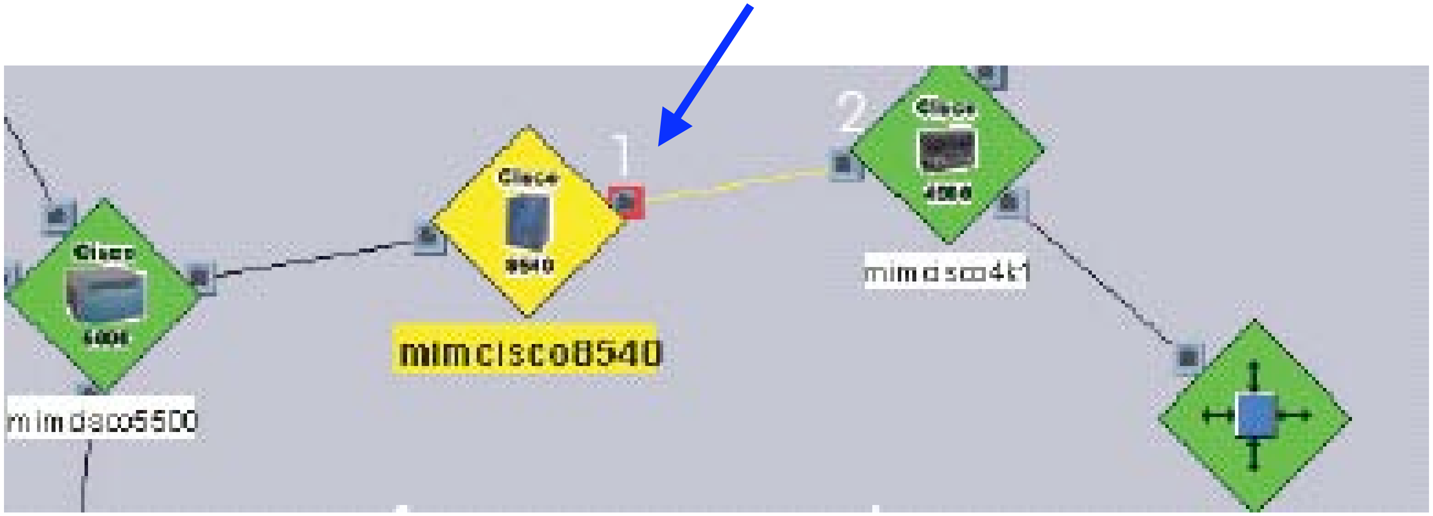
APA address status conveyed to IPMAP topology via status bridge

ET Topology Status

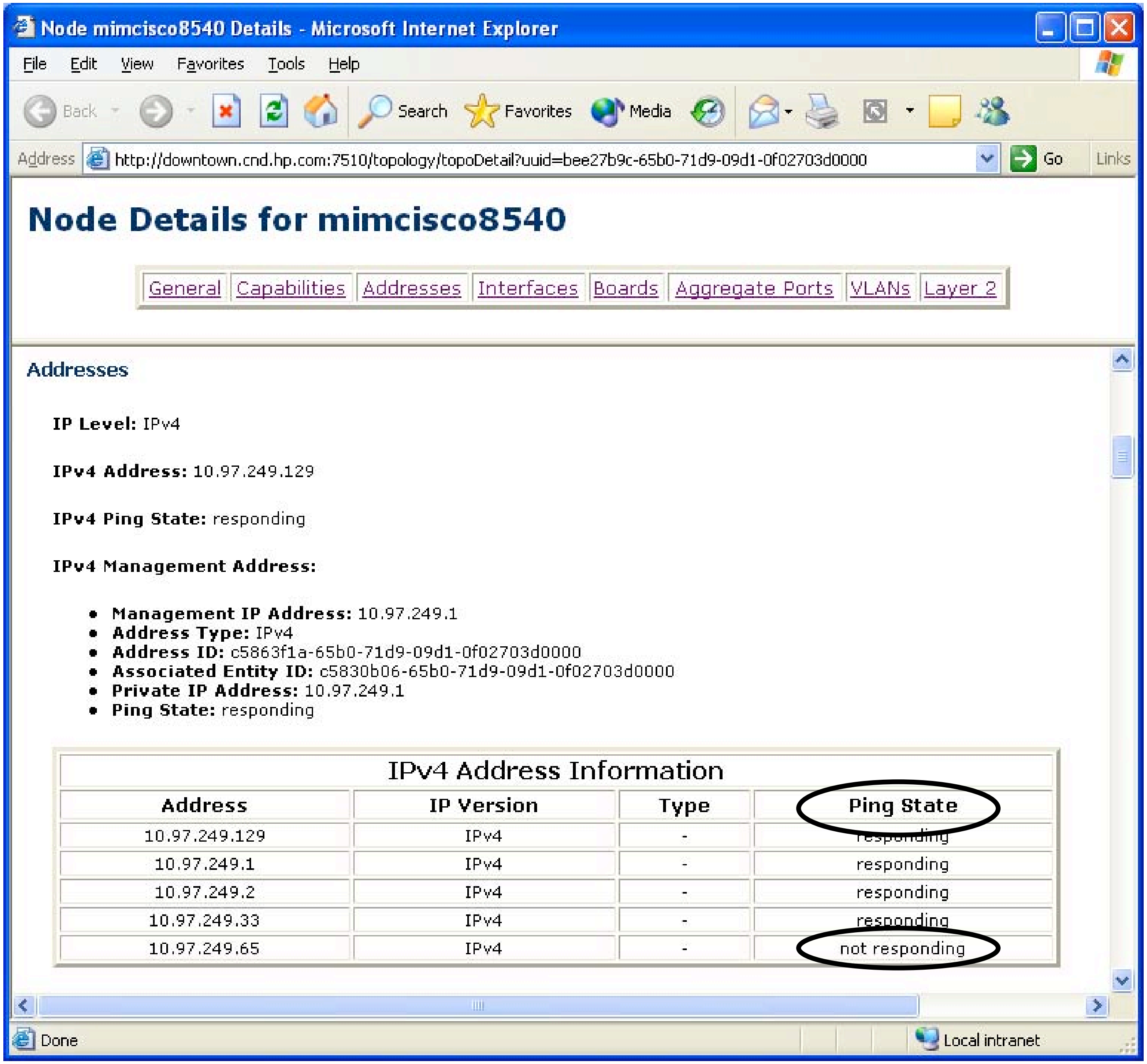
Address Failure:



Interface Failure:



Address Status


Node mimcisco8540 Details - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Media
Address
http://downtown.cnd.hp.com:7510/topology/topoDetail?uuid=bee27b9c-65b0-71d9-09d1-0f02703d0000
Go
Links
Done
Local intranet

Node Details for mimcisco8540

General | Capabilities | Addresses | Interfaces | Boards | Aggregate Ports | VLANs | Layer 2

Addresses

IP Level: IPv4

IPv4 Address: 10.97.249.129

IPv4 Ping State: responding

IPv4 Management Address:

- **Management IP Address:** 10.97.249.1
- **Address Type:** IPv4
- **Address ID:** c5863f1a-65b0-71d9-09d1-0f02703d0000
- **Associated Entity ID:** c5830b06-65b0-71d9-09d1-0f02703d0000
- **Private IP Address:** 10.97.249.1
- **Ping State:** responding

IPv4 Address Information

Address	IP Version	Type	Ping State
10.97.249.129	IPv4	-	responding
10.97.249.1	IPv4	-	responding
10.97.249.2	IPv4	-	responding
10.97.249.33	IPv4	-	responding
10.97.249.65	IPv4	-	not responding

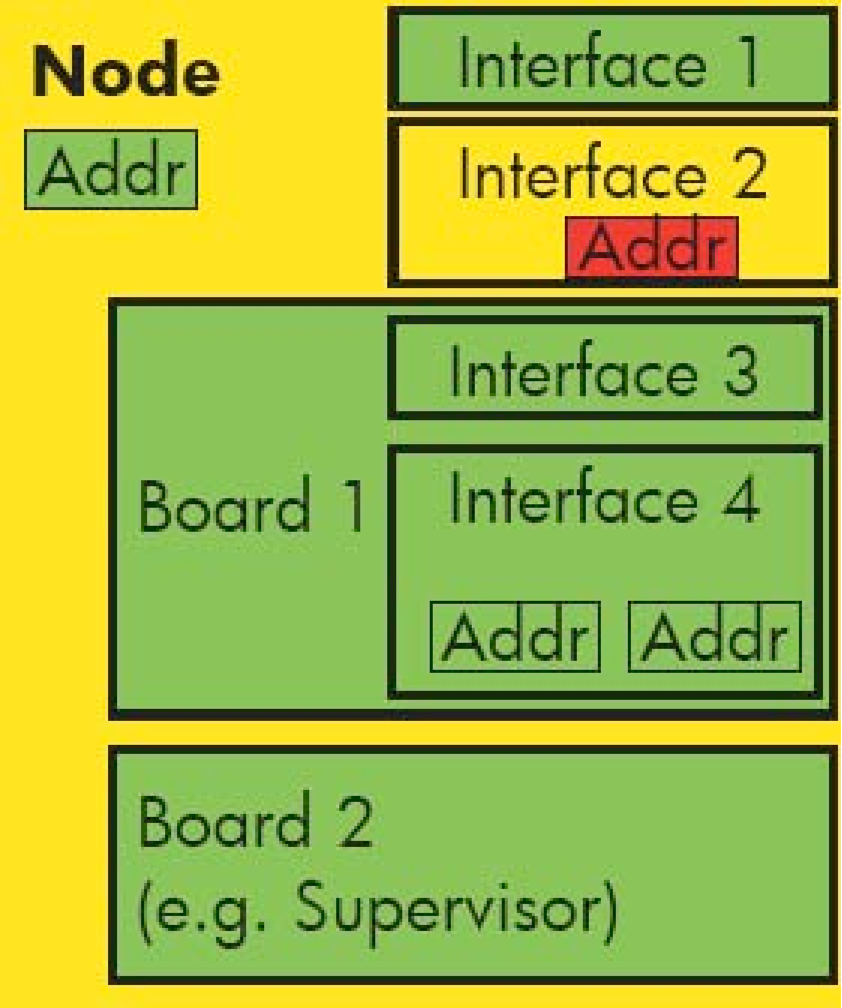
Address Status communicated as Ping State.

Address Status vs. Interface Status

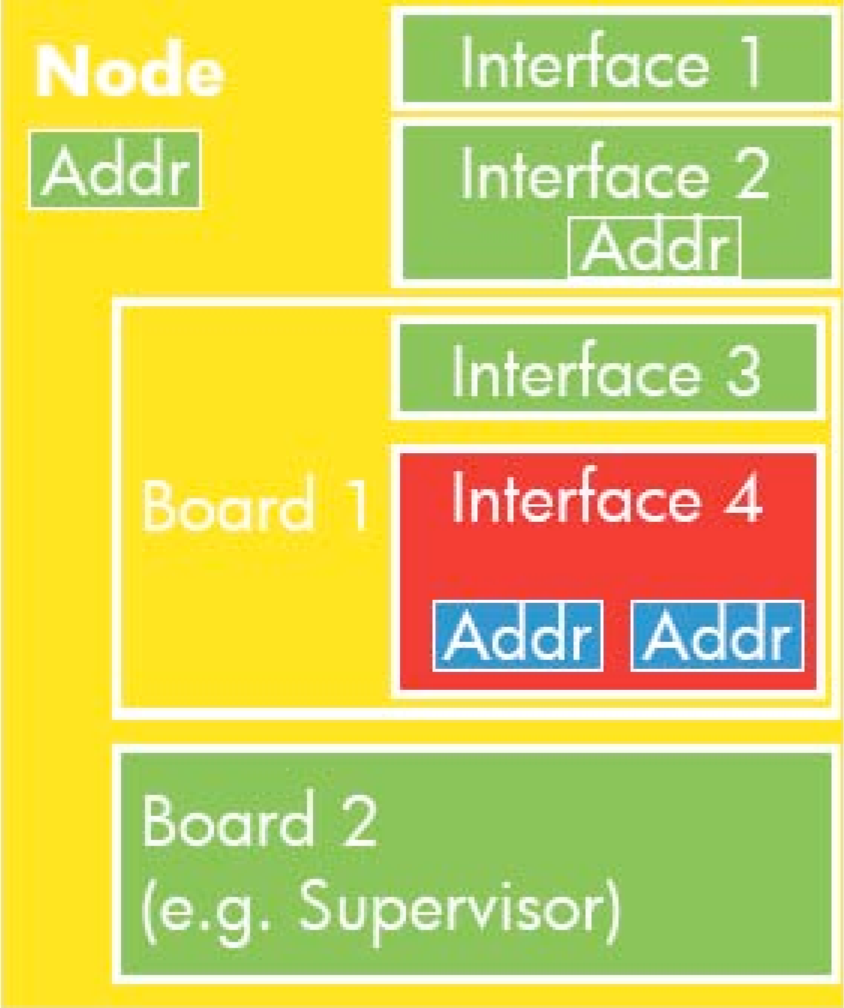
`

ET Topology Status

Address Failure



Interface failure



APA varbinds (Node, Connector, Address, Interface Status)

- Example event texts:
  - IF Down $5 $10 $6 Capabilities: $15
  - Node Down $10 Capabilities: $15
  - Address Down $5 $10 $6 Capabilities: $15
  - Connection Down $5 $10 connected to $16 $18 $23 Capabilities

Varbind #	Description
$2	Timestamp event occurred *Note this exception to general rule
$3	Hostname of node that caused the event
$5	Label of the responsible interface
$6	ifAlias of the responsible interface
$8	ifIndex of the responsible interface
$9	ifDescr of the responsible interface
$10	Responsible Level 3 address or port #
$11	Responsible Level 2 address
$12	Number of bits in the Subnet Mask
$13	Route Distinguisher
$15	Capabilities
$16-$28	Varbinds associated with double-object failures if connector failure
$29-$42	Varbinds associated with primary failure if a secondary failure

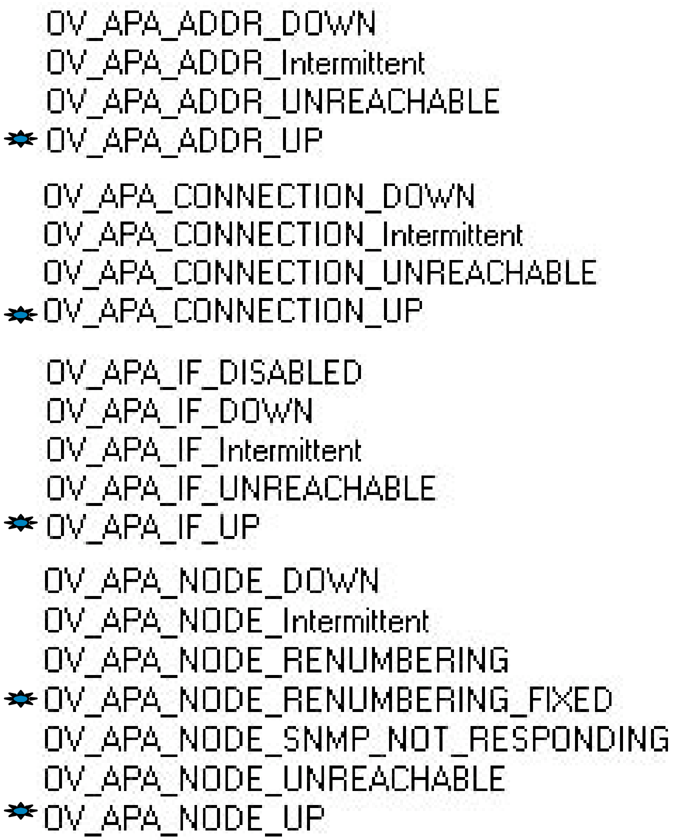
APA events and poller granularity

- APA-generated status events: OV_APA_IF_DOWN (58983012)
  - APA status results propagated through 5 entity levels:
    - **Address, Interface, Node, Connection**
    - **AggPort** and **Board**-level's distinguished in NNM 7.5
  - Polling granularity defined using **ET Topology filters** (7.01 defaults below)
    - Full list on slides 52 & 53
  - OV_APA_IF_REMOVED sent if ifOperStatus returns noSuchObj (7.5 patch)

- NNM 7.01 filtered polling matrix (NNM)
  - NNM 7.5 greatly expands on this – looses standards-based only approach
  - Default: Poll via both ICMP and SNMP

	IsRouter	isSwitch	isEndNode	UncRtrIf	UncSwchIf	UncEndNode	NotConnIf
snmpEnable	true	true	false	true	false	false	false
pingEnable	true	false	true	true	false	true	false

APA status events – summary

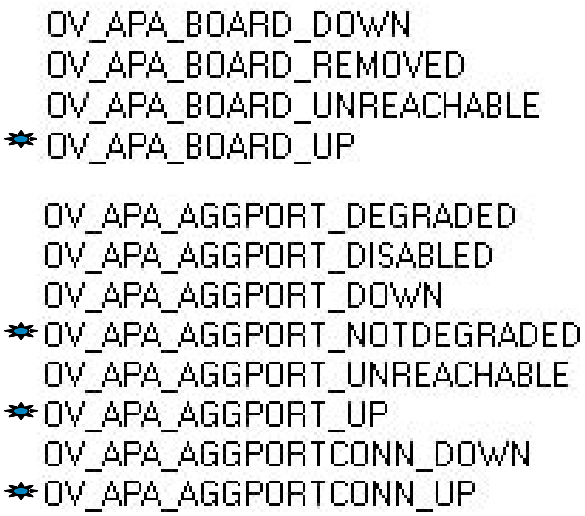


OV_APA_ADDR_DOWN
OV_APA_ADDR_Intermittent
OV_APA_ADDR_UNREACHABLE
✸ OV_APA_ADDR_UP

OV_APA_CONNECTION_DOWN
OV_APA_CONNECTION_Intermittent
OV_APA_CONNECTION_UNREACHABLE
✸ OV_APA_CONNECTION_UP

OV_APA_IF_DISABLED
OV_APA_IF_DOWN
OV_APA_IF_Intermittent
OV_APA_IF_UNREACHABLE
✸ OV_APA_IF_UP

OV_APA_NODE_DOWN
OV_APA_NODE_Intermittent
OV_APA_NODE_RENUMBERING
✸ OV_APA_NODE_RENUMBERING_FIXED
OV_APA_NODE_SNMP_NOT_RESPONDING
OV_APA_NODE_UNREACHABLE
✸ OV_APA_NODE_UP



OV_APA_BOARD_DOWN
OV_APA_BOARD_REMOVED
OV_APA_BOARD_UNREACHABLE
✸ OV_APA_BOARD_UP

OV_APA_AGGPORT_DEGRADED
OV_APA_AGGPORT_DISABLED
OV_APA_AGGPORT_DOWN
✸ OV_APA_AGGPORT_NOTDEGRADED
OV_APA_AGGPORT_UNREACHABLE
✸ OV_APA_AGGPORT_UP
OV_APA_AGGPORTCONN_DOWN
✸ OV_APA_AGGPORTCONN_UP

✸ = "Log-Only" Events

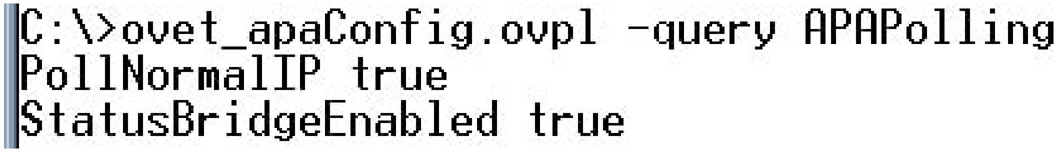
This list excludes Informational, OAD, HSRP, & RAMS-based APA Events
OV_APA_IF_REMOVED and OV_APA_AGGPORT_REMOVED added
in V7.5 patch to handle case where ifOperStatus returns 'NoSuchObject"

Big Switch

- Read $OV_DOC/whitepapers/Active_Problem_Analyzer.pdf
- Exit GUI sessions
- Run setupExtTopo.ovpl, then etrestart.ovpl. Wait a while!
- Enable APA:
  - ovet_apaConfig.ovpl -enable APAPolling
  - ovet_apaConfig.ovpl -disable APAPolling
- What does this script do?
  - Runs xnmpolling options to switch polling control between netmon/ovet_poll
    - xnmpolling -statPollOff -ovetPollingOn
    - xnmpolling -ovetPollingOff -statPollOn
  - Makes changes to the $OV_CONF/nnmet/paConfig.xml APA configuration file
  - Populates $OV_DB/nnmet/hosts.nnm from *netmon*-discovered topology
    - *ovet_bridge* uses this file to designate what hosts are polled by APA
  - Restarts appropriate background processes, including ovet_poll
- Watch ovstatus carefully
  - ovstatus –v *netmon* Should say “Polling 0 interfaces”
  - ovstatus –v *ovet_poll*Should say “Polling devices”

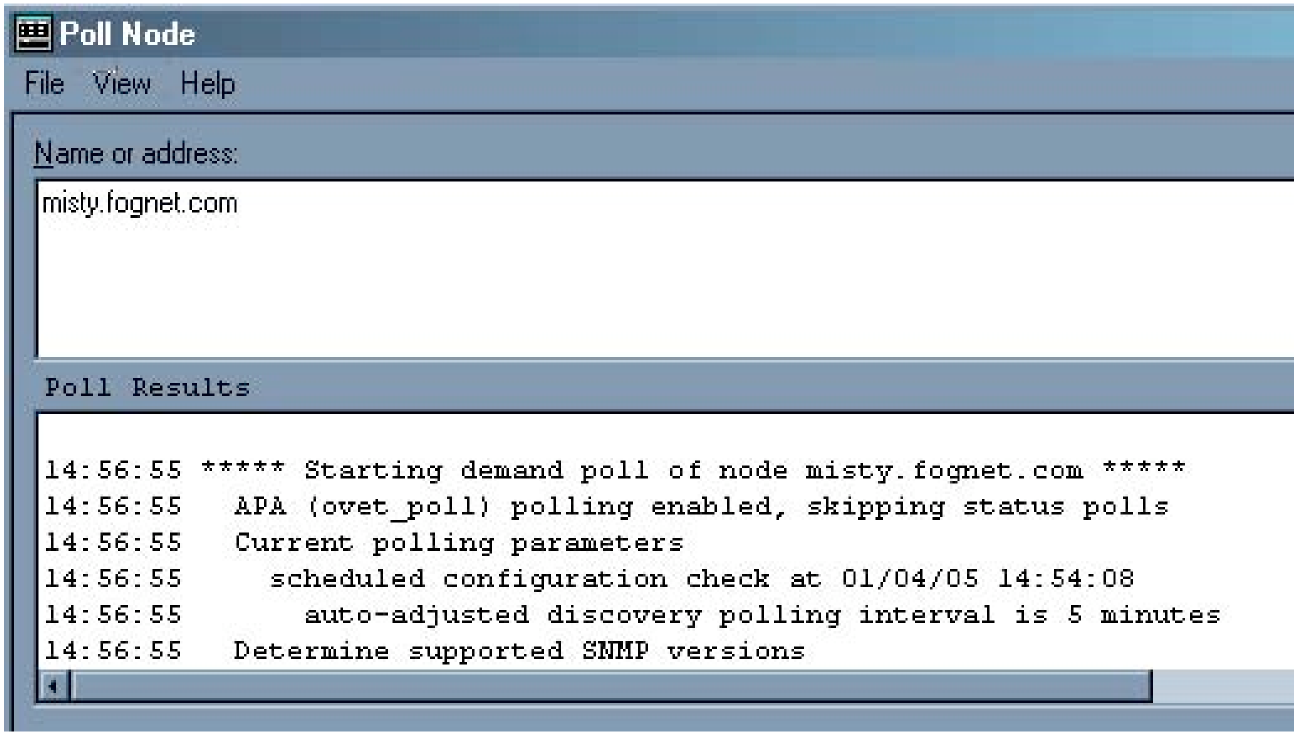
Determining poller control

V7.5:
APA on:



```
C:\>ovet_apaConfig.ovpl -query APAPolling
PollNormalIP true
StatusBridgeEnabled true
```

Fault ->
Network Connectivity ->
Poll Node
(nmdemandpoll)



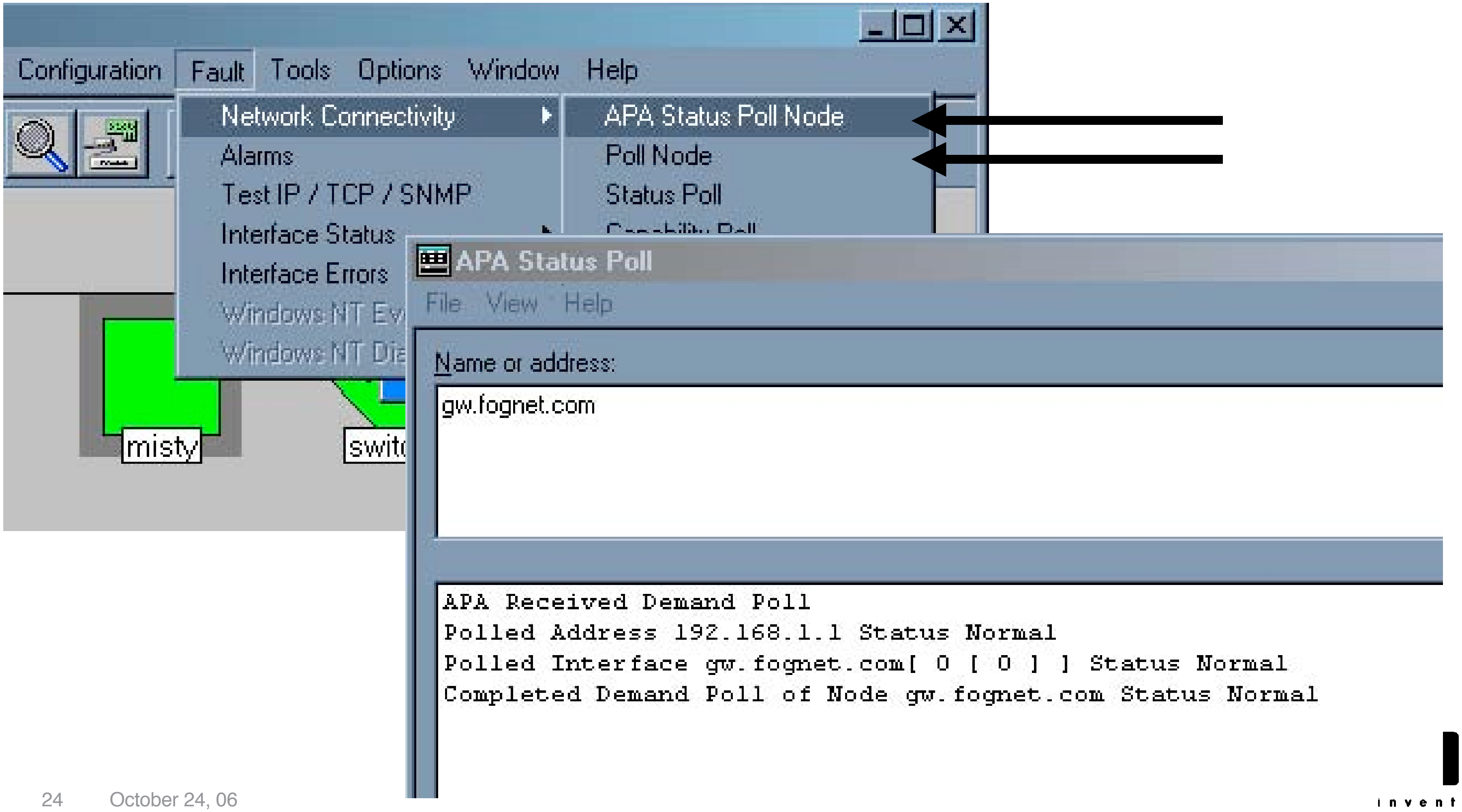
misty.fognet.com

Poll Results

```
14:56:55 ***** Starting demand poll of node misty.fognet.com *****
14:56:55   APA (ovet_poll) polling enabled, skipping status polls
14:56:55   Current polling parameters
14:56:55     scheduled configuration check at 01/04/05 14:54:08
14:56:55       auto-adjusted discovery polling interval is 5 minutes
14:56:55   Determine supported SNMP versions
```

Ad hoc status polls:

- ovet_demandpoll.ovpl (not available in 7.01)



gw.fognet.com

```
APA Received Demand Poll
Polled Address 192.168.1.1 Status Normal
Polled Interface gw.fognet.com[ 0 [ 0 ] ] Status Normal
Completed Demand Poll of Node gw.fognet.com Status Normal
```

ovet_demandpoll.ovpl

- Issues APA Configuration Poll
  - Gathers Board and Interface data:
  - ifAlias, ifName, ifDescr, PhysAddress, etc
- Scheduled through paConfig.xml to run for every polled node
  - 24 hours by default
- Detects interface (ifIndex) and board renumbering.
  - Issues OV_APA_NODE_RENUMBERING event
- Provides detailed update/tracing (patch to V7.5)
  - -V option provides verbose tracing to std out
  - -B forces status bridge update, correcting inconsistencies
  - -d dumps internal state of APA objects without polling device

Troubleshooting APA Migration

- Issues with ET discovery are the #1 cause of issues with APA

- Improving ET Discovery:

  - Enable discovery protocols like CDP, FDP, or EDP.

  - If the above protocols aren't available, run discovery at active time on your network to better grab Forwarding Database tables in switches.

  - Managing end nodes improves L2 connectivity accuracy but causes more events.

  - Check DNS performance. ET as dependent on DNS as netmon.

Troubleshooting APA Migration – Specific Devices

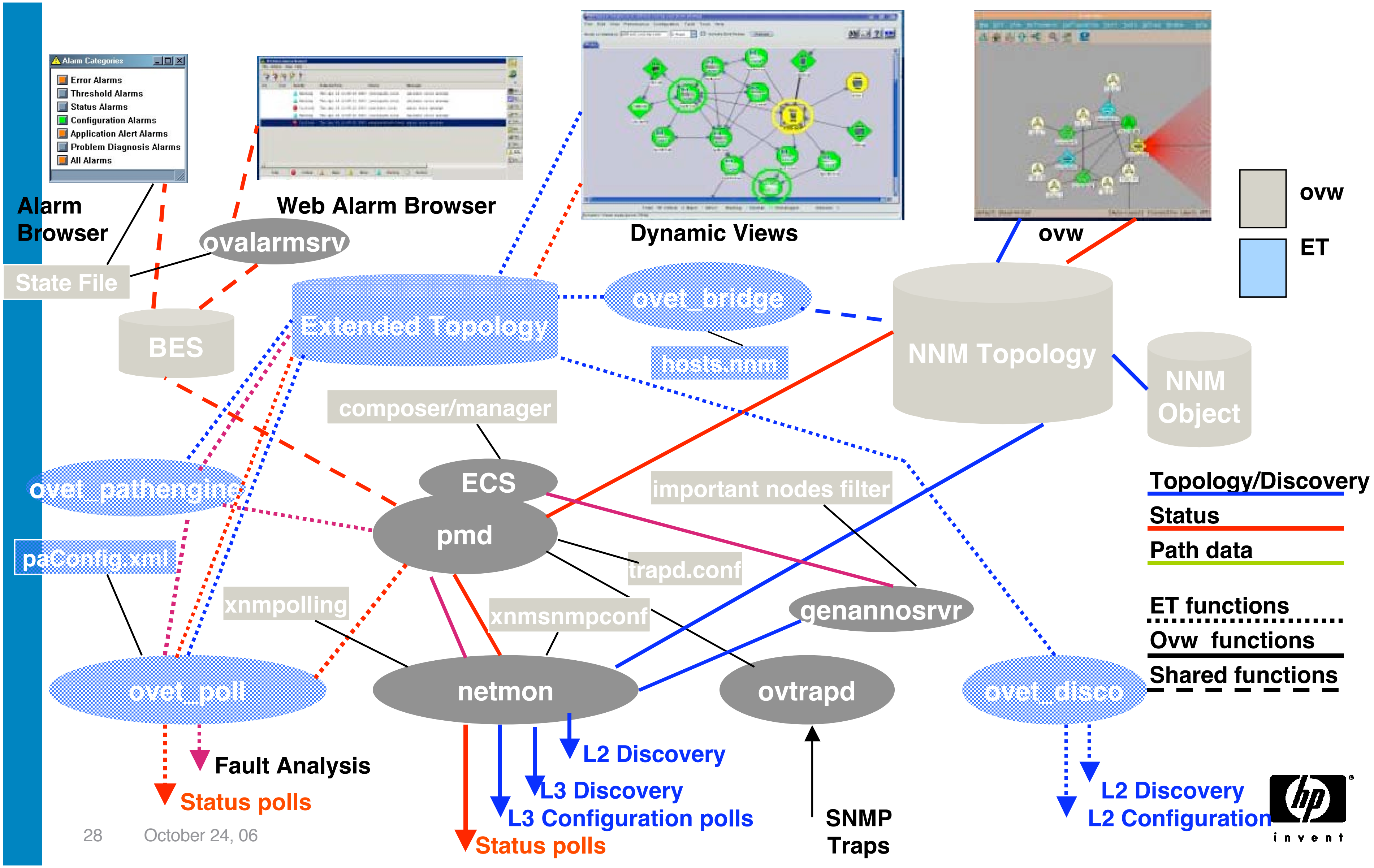
- ovet_topoconndump.ovpl
  - Dump ET connections for a node supplied or all if no args
  - $OV_SUPPORT/NM/ovet_topoconndump.ovpl

- ovet_topoconnedit.ovpl
  - Add, Delete or Ignore connection between two interfaces
  - $OV_SUPPORT/NM/ovet_topoconnedit.ovpl
  - Example of the connectionEdits file:

```
insert into disco.connectionEdits
 (m_Name,m_NbrName,m_Command)
 values ('4kfct5me6m01.fognet.com[ 0 [ 1 ] ]','24c3lk09.fognet.com[ 0 [ 25 ] ]',0);
```

  - More info - Connection Editor White Paper

Status Architecture



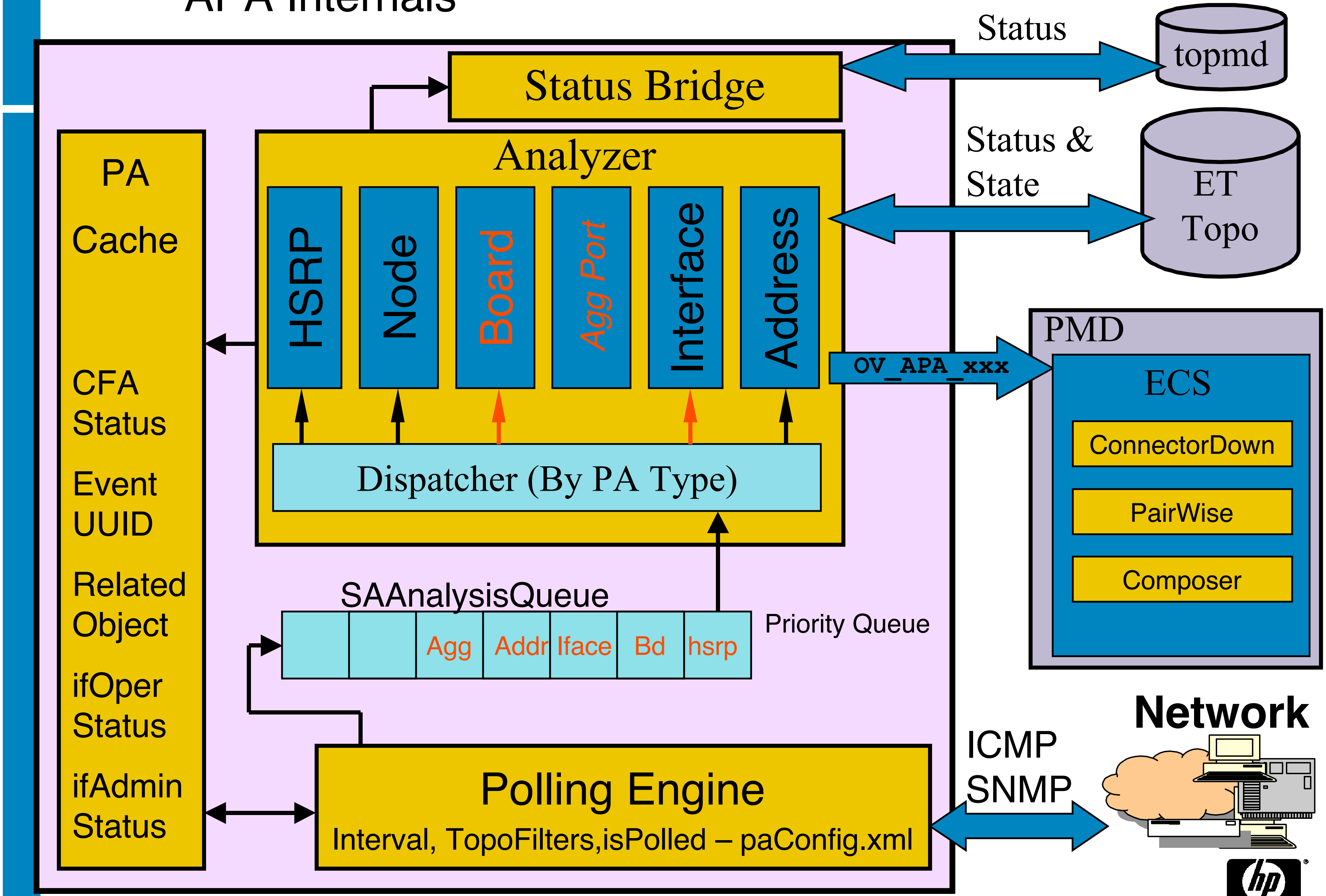
Alarm Categories

- Error Alarms
- Threshold Alarms
- Status Alarms
- Configuration Alarms
- Application Alert Alarms
- Problem Diagnosis Alarms
- All Alarms

APA Analysis Overview

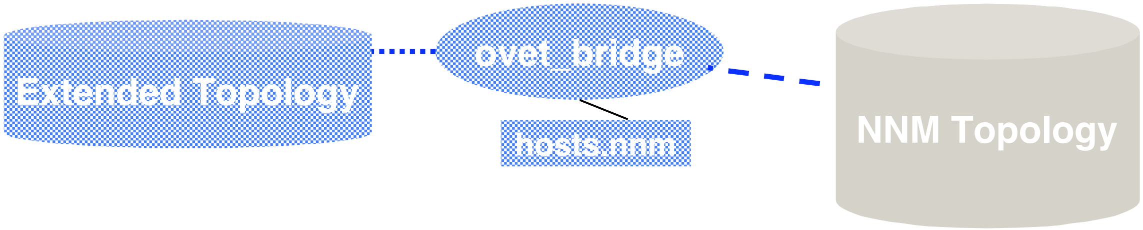
- Polling engine
  - Issues ICMP and SNMP polls
  - Uses traceroute
  - Uses SNMP events, e.g. link down
- Status Analyzer
  - Connectivity Fault Analysis
    - Uses traceroute for determining fault area
  - Performs Neighbor Analysis
    - uses ET topology data
  - Handles complex entities (HSRP, OAD, AgPort, Boards)

APA Internals



Bridge Status

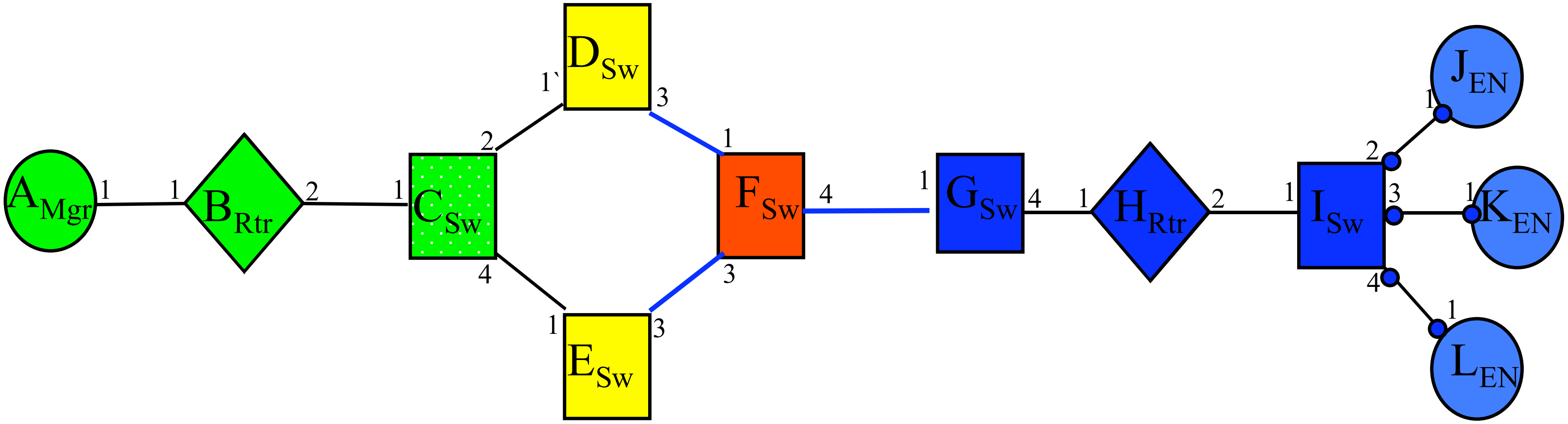
- ovet_bridge
- Propagates from APA interface to IPMAP ifs (not nodes)
- Addresses and Boards not modeled at all in IPMAP
- Unmanaged interfaces ignored if APA has status
- Interfaces in IPMAP that are not polled in APA = Normal
- Interfaces in IPMAP that don’t exist in ET = Unknown
  - Most common question/concern about APA
- Primary failures = Critical
- Secondary Failures do not update status in IPMAP



Map Status – Dynamic Views vs. IPMAP Topology

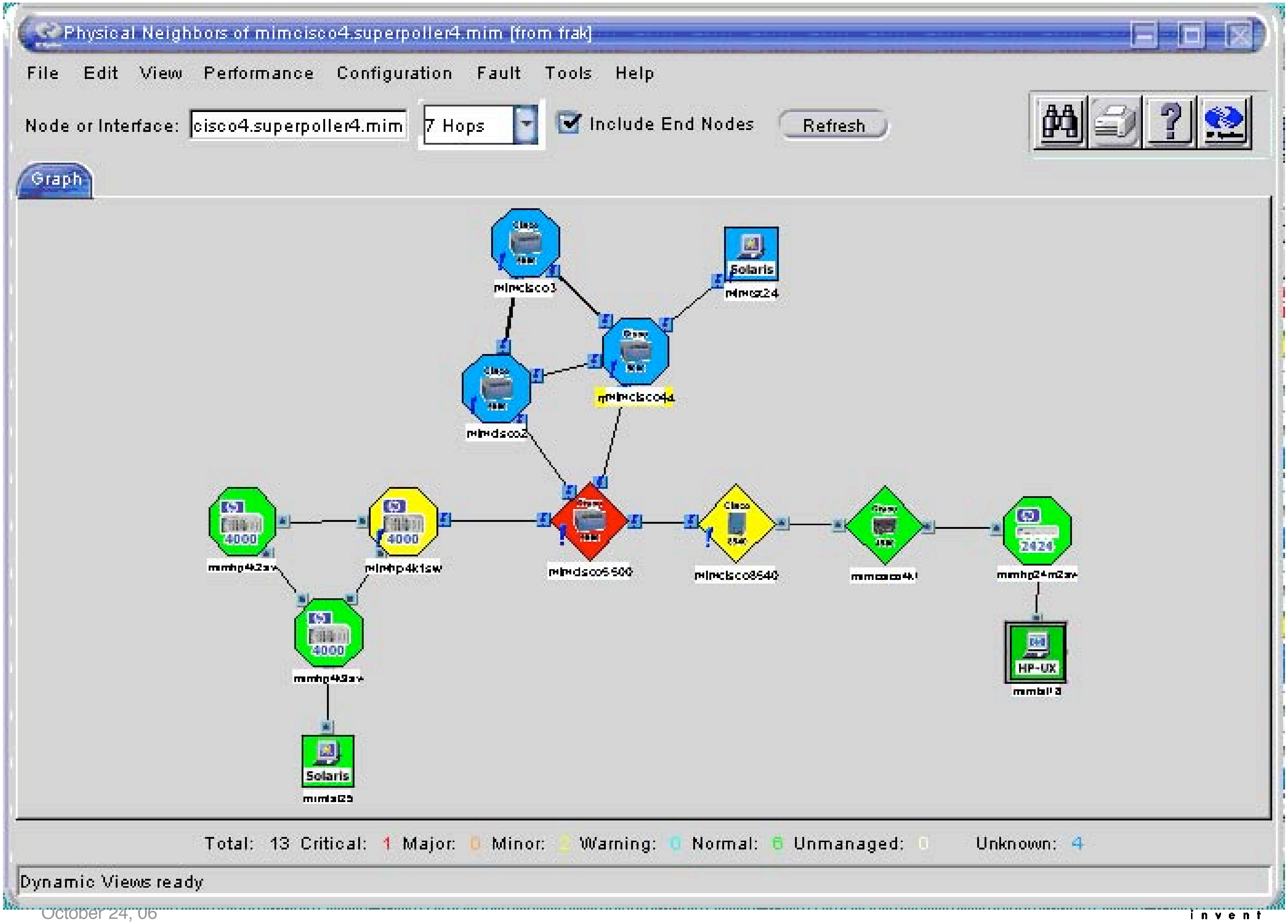
VALUE	COLOR	IPMAP (*netmon*)	IPMAP (Bridge)	Dyn Views –APA
Normal	Green	N: All IFs Up I: IF or Addr is Up	N: All Ifs Up I: IF or Addr is Up	Object Up
Warning	Cyan	N: One IF Down / I: NA	N: One IF Down / I: NA	Not Used
Minor	Yellow	N: >1 IF Down / I: NA	N: >1 IF Down/ I: NA	O: Contents Down
Major	Orange	N: One IF Up / I: NA	N: One IF Up / I: NA	Not Used
Critical	Red	PrimaryFail	PrimaryFail	PrimaryFail
Unmanaged	EggShell	Unmanaged	N: Not Discovered I: Left Unmanaged	Not Used
Unknown	Blue	SecondaryFail	N/I: Not mapped/ Normal	SecondaryFail
Restricted	Pink	NA	NA	NA
Testing	Tan	ifAdminStatus=Testing	NA	NA
Disabled	Brown	ifAdminStatus=Down	ifAdminStatus=Down	ifAdminStatus=Down
NoStatus	EggShell	Not used	Left Normal	Not Monitored

Example of Neighbor Analysis



- ET Topology Status:
  - If node responds to ICMP but not SNMP, issue <u>SnmpAgentNotResponding</u> alarm and set the node critical.
  - If ICMP and SNMP don’t respond, do Neighbor Analysis, correlate alarms.
  - Nodes D, E Marginal; F Critical
  - Interfaces D3, E3, F1, F3, F4, Unknown
- Alarms correlated by ConnectorDown:
  - OV_APA_Node_Down: F:
    - OV_APA_CONNECTION_UNREACHABLE: D3-F1
    - OV_APA_CONNECTION_UNREACHABLE: E3-F3
      - OV_APA_INTERFACE_UNREACHABLE: F4

Neighbor View showing downstream failures



Physical Neighbors of mimcisco4.superpoller4.mim [from frak]

Node or Interface: cisco4.superpoller4.mim

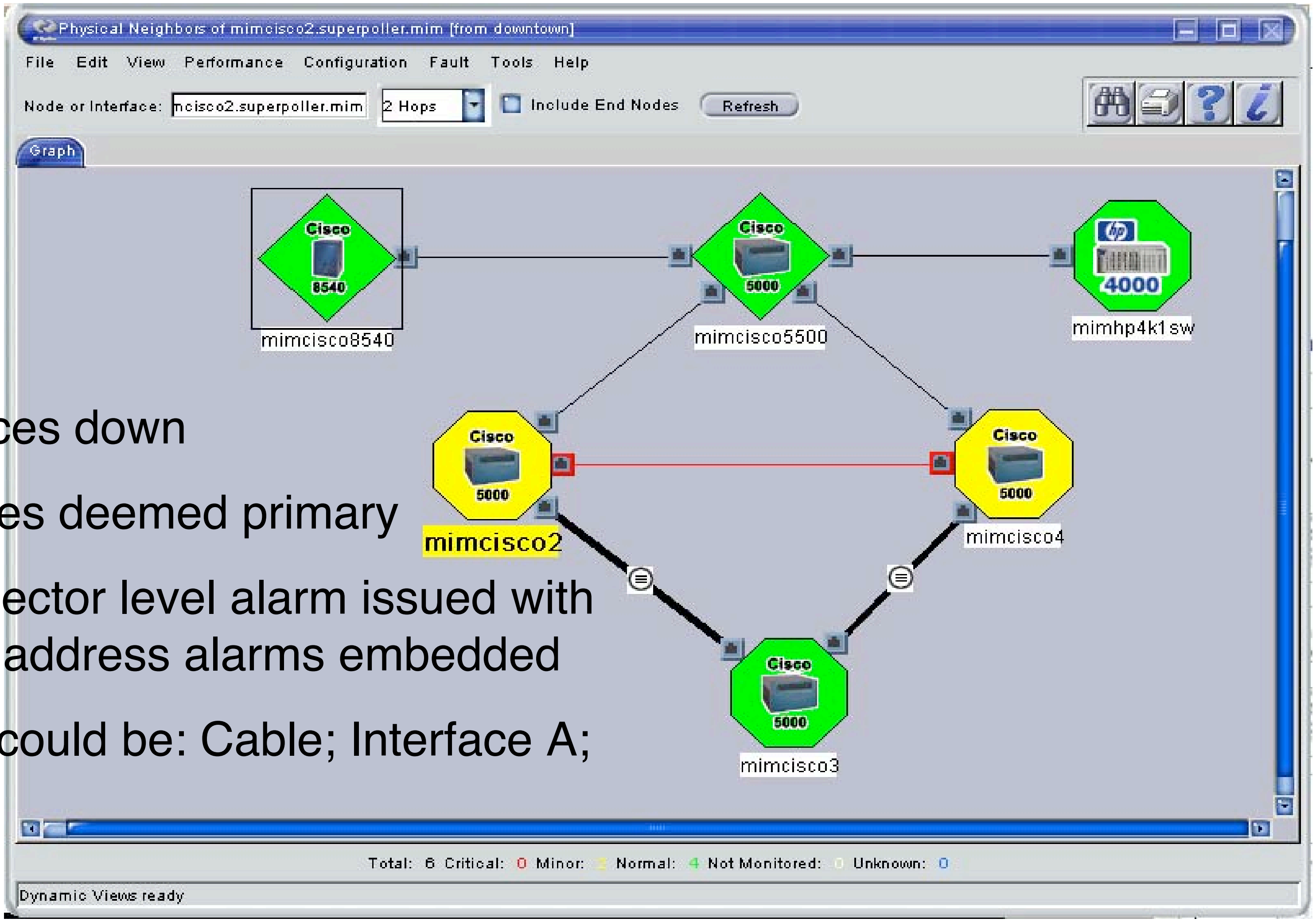
7 Hops

☑ Include End Nodes

Total: 13 Critical: 1 Major: 0 Minor: 2 Warning: 0 Normal: 6 Unmanaged: 0 Unknown: 4

Dynamic Views ready

Connection Down Analysis targets both interfaces



Physical Neighbors of mimcisco2.superpoller.mim [from downtown]

File Edit View Performance Configuration Fault Tools Help

Node or Interface: ncisco2.superpoller.mim 2 Hops □ Include End Nodes Refresh

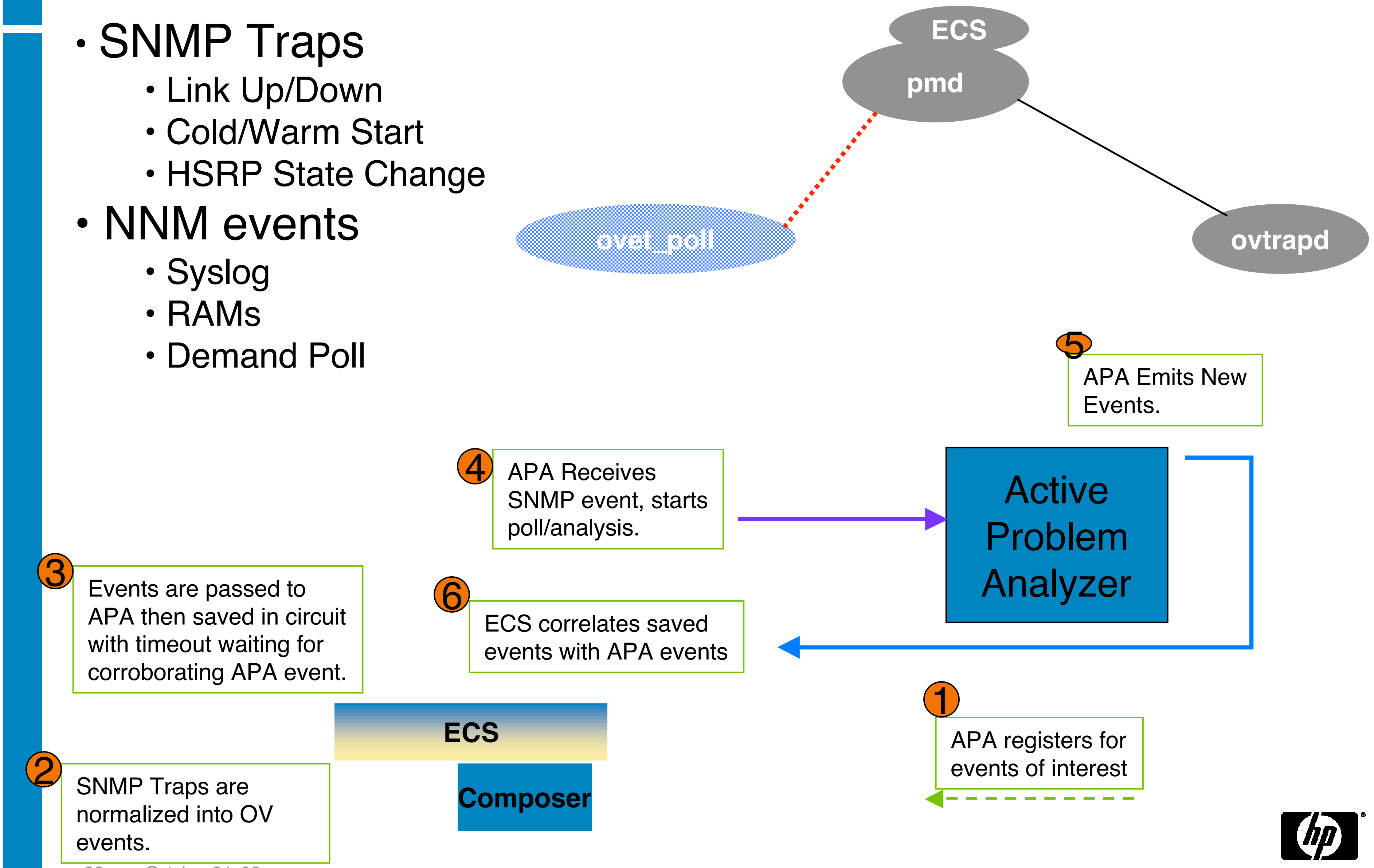
Total: 6 Critical: 0 Minor: 2 Normal: 4 Not Monitored: 0 Unknown: 0

Dynamic Views ready

- Both Interfaces down
- Both If failures deemed primary
- Single Connector level alarm issued with Interface and address alarms embedded
- Root cause could be: Cable; Interface A; Interface B

Event-triggered Polling

- SNMP Traps
  - Link Up/Down
  - Cold/Warm Start
  - HSRP State Change
- NNM events
  - Syslog
  - RAMs
  - Demand Poll



1 APA registers for events of interest

2 SNMP Traps are normalized into OV events.

3 Events are passed to APA then saved in circuit with timeout waiting for corroborating APA event.

4 APA Receives SNMP event, starts poll/analysis.

5 APA Emits New Events.

6 ECS correlates saved events with APA events

Layer 3 Edge Connectivity

- ET Utilizes Subnet + Subnet Mask info (V7.5+)
  - Derives Point-to-Point edge connectivity
  - APA uses this info in status analysis.
  - Some issues with devices ET has no connectivity info for.
    - Addressed in patch via CriticalNodes.xml file

- Supported Devices:
  - Forwarding DB Tables (Switches)
  - CDP (Cisco + Procurve)
  - EDP (Extreme)
  - ILMI (Where ATM MIB supported)
  - FDP (Foundry)

APA Aggregated Port – V7.5

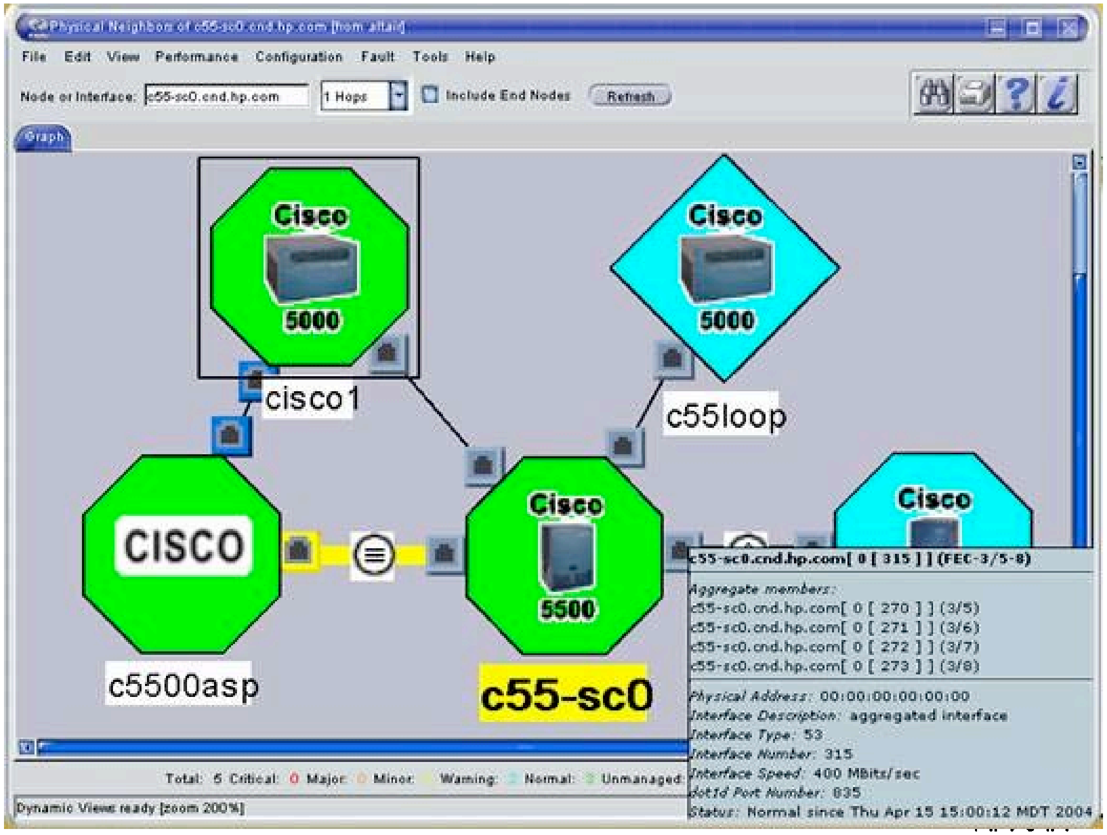
- Multiple physical ports = an ET trunk virtual port
- Support for Cisco PAgP only
- Previus NNM Trunk support now called “redundant connection support”
- Fine tuning via the following ET Topology filters

  isAggregatedIF

  virtual interface

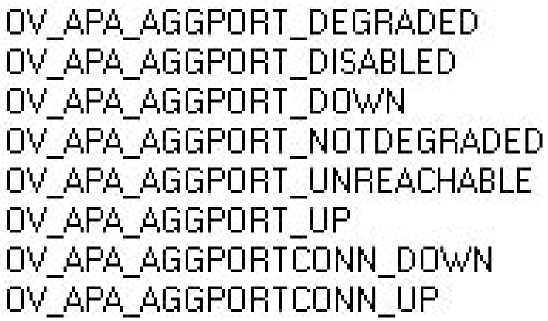
  isPartOfAggregatedIF

  physical interface
- Scenario:
- One physical port goes down on a trunk; TrunkDegraded event issued; Trunk virtual port status changes to Minor in ET; Physical Interface changes to Critical; Interface Down APA event correlated/embedded by ConnectorDown correlation


Physical Neighbors of c55-sc0.cnd.hp.com [from altair]
File
Edit
View
Performance
Configuration
Fault
Tools
Help
Node or Interface: c55-sc0.cnd.hp.com
1 Hops
□ Include End Nodes
Refresh
Graph
Cisco
5000
cisco1
Cisco
5000
c55loop
CISCO
c5500asp
Cisco
5500
c55-sc0
Cisco
Total: 5 Critical: 0 Major: Minor: Warning: Normal: Unmanaged:
Dynamic Views ready [zoom 200%]

```
c55-sc0.cnd.hp.com[ 0 [ 315 ] ] (FEC-3/5-8)
Aggregate members:
c55-sc0.cnd.hp.com[ 0 [ 270 ] ] (3/5)
c55-sc0.cnd.hp.com[ 0 [ 271 ] ] (3/6)
c55-sc0.cnd.hp.com[ 0 [ 272 ] ] (3/7)
c55-sc0.cnd.hp.com[ 0 [ 273 ] ] (3/8)
Physical Address: 00:00:00:00:00:00
Interface Description: aggregated interface
Interface Type: 53
Interface Number: 315
Interface Speed: 400 MBits/sec
dot1d Port Number: 835
Status: Normal since Thu Apr 15 15:00:12 MDT 2004
```

APA Aggregated Port Status Events



```
OV_APA_AGGPORT_DEGRADED
OV_APA_AGGPORT_DISABLED
OV_APA_AGGPORT_DOWN
OV_APA_AGGPORT_NOTDEGRADED
OV_APA_AGGPORT_UNREACHABLE
OV_APA_AGGPORT_UP
OV_APA_AGGPORTCONN_DOWN
OV_APA_AGGPORTCONN_UP
```

- **Degraded**: The aggregate port connection between two nodes is responding to polls and some of the interfaces are down.
- **Disabled**: the primary aggregated port is not responding to polls in a normal fashion. This could be because all the interfaces' ifAdminStatus are Down|Testing.
- **Down**: the aggregate port connection between two nodes is not responding to polls and all interfaces on this side of the connection may be down.
- **Unreachable**: The aggregate port connection between two nodes is not responding to polls, but the problem is due to another entity (secondary failure).
- **Connection Down**: the aggregate port connection between two nodes is not responding to polls and all interfaces may be down on both sides of the connection.
- **Port Removed**: Added in patch to V7.5 when ifOperStatus returns noSuchObj

APA Aggregated Port status events varbinds

Description	Entity 1 Varbind #	Entity 2 Varbind #
Timestamp event occurred	$2	$2
Hostname of node	$3	$21
Label of the Aggregated interface	$5	$23
ifAlias of the responsible interface	$6	$24
ifIndex of the responsible interface	$8	$26
ifDescr of the responsible interface	$9	$27
# of contained interfaces down	$10	$28
# of contained interfaces	$11	$29
Management address of host	$12	$30
Number of bits in the subnet mask	$13	$31
Route Distinguisher	$15	$33
Capabilities	$16	$34

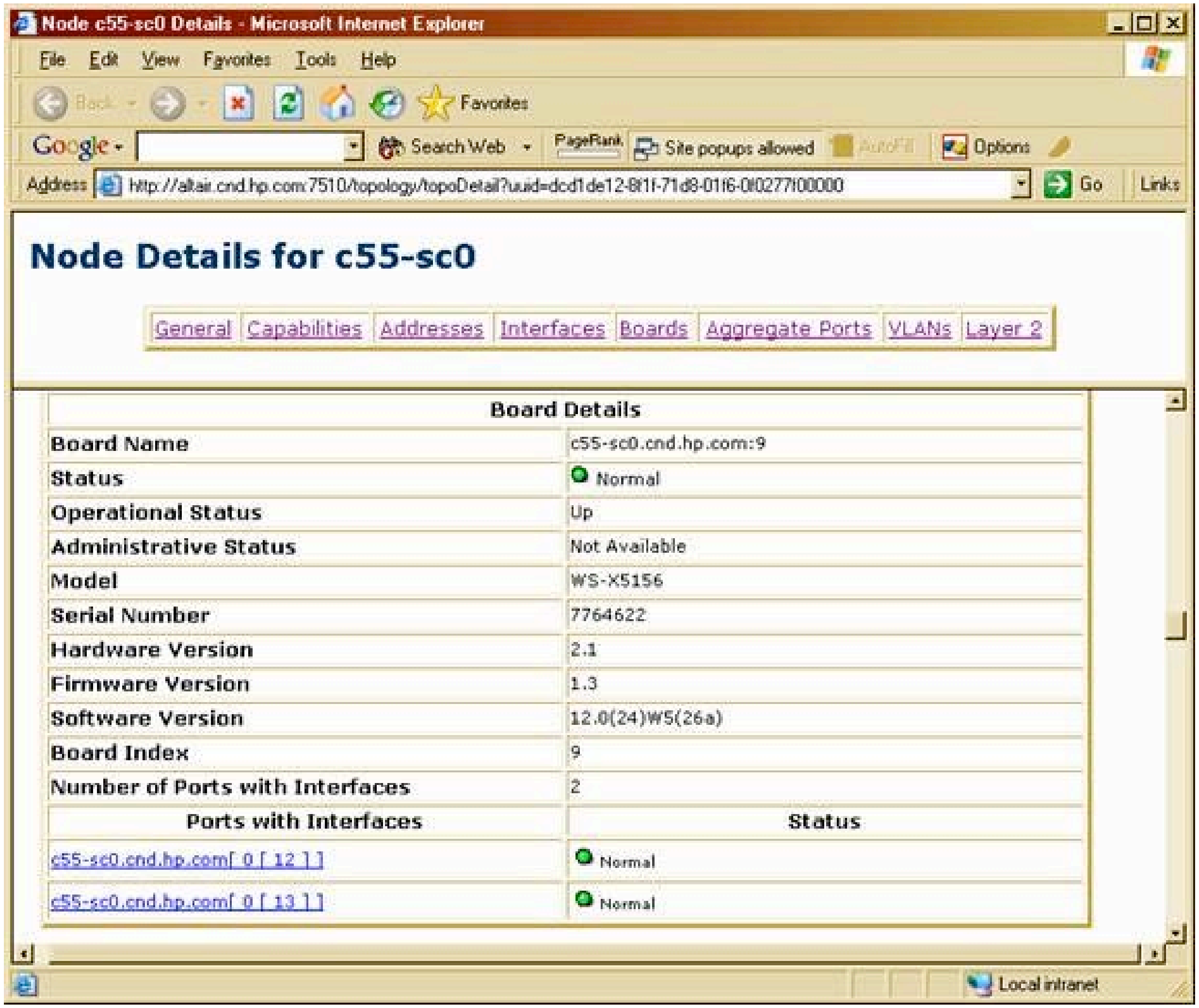
- Default event text: **Aggregate Port Down $5 $6 connected to $21 $23 $24**

APA events – Board Entities - 7.5

- Only Cisco Stack, Rhino and C2900 MIBs Supported
- SubBoards treated as boards in V7.5
- Look for more support in future
- Unreachable means secondary failure

- Events:

```
OV_APA_BOARD_DOWN
OV_APA_BOARD_REMOVED
OV_APA_BOARD_UNREACHABLE
OV_APA_BOARD_UP
```



Address: http://altair.cnd.hp.com:7510/topology/topoDetail?uuid=dcd1de12-8f1f-71d8-01f6-0f0277f00000

Node Details for c55-sc0

Board Details	
Board Name	c55-sc0.cnd.hp.com:9
Status	● Normal
Operational Status	Up
Administrative Status	Not Available
Model	WS-X5156
Serial Number	7764622
Hardware Version	2.1
Firmware Version	1.3
Software Version	12.0(24)WS(26a)
Board Index	9
Number of Ports with Interfaces	2
Ports with Interfaces	**Status**
c55-sc0.cnd.hp.com[0 [12]]	● Normal
c55-sc0.cnd.hp.com[0 [13]]	● Normal

APA Board status events varbinds (NNM 7.5)

Varbind #	Description
$2	Timestamp event occured
$3	Name of the node that contains the board
$5	Capabilities
$6	Management Address
$7	Route Distinguisher
$9	index of the responsible board
$11	subBoard index of the responsible board
$13	Serial Number
$14	Module Name
$15	Module Description
$16	Hardware Version
$17	Software Version

- Default event text: **Board Down - $14**

APA configuration files

- paConfig.xml
  - Central configuration point
- topofilters.xml
  - Topology filters file
- MyHostID.xml
  - Important node filter for secondary status
  - Set far nodes status to Critical vs. Unreachable
- CriticalNodes.xml
  - NOT the important nodes filter for secondary status
  - This file should contain devices that ET can’t determine status for
  - Example: Edge router minor when down - ET has no connectivity
  - Added via Patch to NNM V7.5

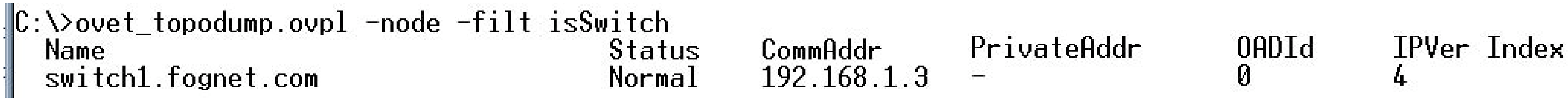
APA default status configuration file: paConfig.xml

- $OV_CONF/nnmet/paConfig.xml
- Schema defined in paConfigSchema.xsd
- Changes take affect when *ovet_poll* process restarted with ovstart
- Backup pxConfig.xml file before making changes
- Simplified schema with parameterList examples:

```
<paConfig>
   <subSystemConfig> PollingEngine, StatusAnalyzer, Talker, StatusBridge
     <globalParameters> statisticsEnable, statusAnalyzerThreadPoolSize
     <configGroupList>
       <configGroup>  pollingSettings; Traceroute; PingSettings; configPollSettings
         <generalParameters> cfaDebugLevel, GenerateDegradedEvent
         <classSpecificParameters>
           <defaultParameters> interval; snmpEnable ; timeout
           <classSpecification> isRouter, isSwitch, isEndNode
              <parameterList> interval; snmpEnable ; timeout
```

paConfig.xml polling settings and topology filters

- ClassSpecifications defined using extended topology filters
- Extended topology filters are separate entity from NNM traditional filters
- Run ovet_topodump.ovpl -lfilt to see a list of all existing filters.
- To see a dump of discovered devices that pass a given filter, run:
  - ovet_topodump.ovpl -node -filt [filtername]



```
C:\>ovet_topodump.ovpl -node -filt isSwitch
  Name                                     Status    CommAddr      PrivateAddr     OADId     IPVer Index
  switch1.fognet.com                       Normal    192.168.1.3   -               0         4
```

- ClassSpecification filters are evaluated in xml file order
  - First match found in file applies.
  - Example: Device matching isSwitch *and* isRouter: isRouter rules apply
- Extended Topology Filters
  - Defined in $OV_CONF/nnmet/topology/filter/TopoFilters.xml
    - Similar filter definition logic to traditional NNM filters, only in xml

APA configuration file – major configuration groups

- PollingEngine
  - Manages APA Tasks
  - Issues ICMP and SNMP polls
- StatusAnalyzer
  - Queues poller results (states)
  - Determines connectivity faults
  - Generates events based on poller results
- StatusBridge
  - Communicates status info to ovw topology DB and IPMAP
- Talker
  - Communicates, via talker modules, to ET device-specific processes

paConfig.xml polling settings – Engine Settings

- SubSystemConfig: PollingEngine
- ConfigGroup: PollingSettings
- Global Parameters:

• BasicPollingEnable	All entities	true
• PollNormalIP	Entities not in OAD	true
• ReceiveEvents	i.e. Link down/up	true
• HSRPPollingEnable		true
• StatisticEnable		true
• StatisticInterval		300
• ReportBusyObjectsAtStatisticInterval		
	• XPL trace objects busy in PA Cache	false
• ReportBusyObjectsInAlarmBrowser		
	• Send object busy in PA cahce data to browser	false
• ReportPollingResultsInAlarmBrowser		
	• Send polling result trace data with polling results	false
• PollingEngineThreadPoolSize		16

`

paConfig.xml polling settings – Engine Settings

- SubSystemConfig: PollingEngine
- ConfigGroup: PollingSettings
- Class Specific default Parameters:

• interval	- default interval (300 sec)
• snmpEnable	- true
• pingEnable	- true
• hsrpEnable	- true

paConfig.xml polling settings – Engine Settings

- SubSystemConfig: PollingEngine
- ConfigGroup: PollingSettings
- Class Specific default Parameters: pickManagementAddress
  - MgmtAddrAddrInhibited false

    If mgmt address fails, use pickManagemtAddress. False means use pickManagementAddress; true implies node will be set down if mgmt address becomes unreachable.

  - MgmtAddr-Preferred false

    “If true, the address will be considered for a new management address over an address where this parameter if false as a management address if the current management address fails.”

  - MgmtAddrMaxSnmpQueries 10
    - Max number of simultaneous queries during search for new mgmt addr.
  - Note: Mgmt Addr fixed during netmon discovery; use nmdemandpoll to update
    - Example procedure for limiting pickManagementAddr choices slide 85

paConfig.xml polling settings – Engine Settings

- SubSystemConfig: PollingEngine
- ConfigGroup: PollingSettings
- Class Specific default parameters: pollingBackoff
  - pollingBackoff_FFF 8

    Far From Fault backoff multiplier. 5 min * 8 = 40 minutes (SNMP, ICMP)
  - pollingBackoff_NodeDown 6

    Node inside fault area polling backoff multiplier (SNMP, ICMP)
  - pollingBackoff_AdminDown 10

    Address or Interface that is administratively down (ifAdminStatus) (SNMP)
  - pollingBackoff_OperDown 2

    Administratively up (ifAdminStatus), operationally down (ifOperStatus) (SNMP)
  - pollingBackoff_OperUp 4

    ifAdminStatus up and ifOperStatus up, but ICMP fails (ICMP)

paConfig.xml polling settings – Engine Settings

- SubSystemConfig: PollingEngine
- ConfigGroup: PollingSettings
- Class Specifications

Class Specification	snmpEnable	pingEnable	Filter Definitons
APANoPollNodes ✱	false	false	Do not poll entries in APANoPollNodes.xml
isIpPhone	false	false	46xx Avaya phones w/ IP Telephony SPI
ifsWithAnycastAddrs	n/a	false	Interfaces with duplicate IP addresses
isRouter	true	true	Inherited from NNM topodb capability flag
AvayaIptDevices	true	true	Avaya IPT equipment, e.g. s8700CM, etc.
NotConnectedSnmpSwitch	n/a	true	ET finds no L2 connection to managed devic
isSwitch	true	false	Inherited from NNM topodb capability flag
isEndNode	false	true	Not a switch or a router
WanIf ✱	true	false	Defined in filters xml via ifType & ifSpeed
IfTypeFilter ✱	n/a	false	Placeholder for filters based on ifType

✱ = “commented out” xml file definitions

paConfig.xml polling settings – Engine Settings

- SubSystemConfig: PollingEngine
  - ConfigGroup: PollingSettings
    - Class Specifications

Class Specification	snmpEnable	pingEnable	Filter Definitons
isPartOfAggregatedIF	true	n/a	Interfaces not port aggregating
IFInNotConnectedSwitch	n/a	true	ET finds no connection to mgd device
UnconnectedAdminUpOrTestRouterIf	true	true	Unconnected If is admin up or testing
UnconnectedAdminUpOrTestSwitchIf	false	false	Unconnected If is admin up or testing
UnconnectedAdminDownRouterIf	false	false	Unconnected If is admin down
UnconnectedAdminDownSwitchIf	false	false	Unconnected If is admin down
UnconnectedEndNode	false	true	Unconnected and isEndNode
NotConnectedIF	false	false	Matches any unconnected interface
AllBoards ✸	false	n/a	Only Cisco boards supported
NoPingAddresses ✸	n/a	false	Do not ping addrs matching this filter

✸ = “commented out” xml file definitions

paConfig.xml polling settings – Engine Settings (Cont'd)

- SubSystemConfig: PollingEngine
- ConfigGroup: ConfigPollSettings (these apply to ovet_demandpoll.ovpl)
- Class Specific Default Parameters: :
  - interval 86400 (1 day)
  - enable true
  - interfaceDetailFields ifAlias,ifName,ifPhysAddress,ifDescr

    Fields used in interface re-numbering check
    Interface Renumbering event: OV_APA_NODE_RENUMBERING
    Also logged to $OV_PRIV_LOG/ovet_poll.log.txt
  - boardDetailFields serialNumber

    Fields used in board renumbering check
  - noSuchObjectEnabled false

    Enable IF renumber event if SNMP No Such Object error returned
- Class Specific Parameters:
  - isAggregatedIF (applies to noSuchObjectEnabled)
  - APANoPollNodes filter as placeholder (commented out in topoFilters.xml)

paConfig.xml polling settings – Engine Settings

- SubSystemConfig: PollingEngine
- ConfigGroup: TraceRoute
- ClassSpecific default parameters:

• timeout (milliseconds)	3000
• minTimeToLive (initial ttl in first outgoing probe packet)	1
• maxTimeToLive (max ttl number of hops)	30
• maxTimeOuts (max # timeouts before ending traceroute)	0 = never

- SubSystemConfig: PollingEngine
- ConfigGroup: PingSettings
- ClassSpecific default parameters:

• timeout (milliseconds)	1000
• numberOfRetries	2

Note timeout redoubles on every retry, so default = 7 seconds

Regular poll:	1 sec
1st retry:	2 sec
2nd retry:	4 sec

paConfig.xml Status Analyzer settings

- SubSystemConfig: StatusAnalyzer
- GlobalParameters:
  - validateOnStartup false

    perform full ovet_poll validate and status bridge sync for every node in topology. Set this to true only in stable and smaller scaled environments
  - loadOnlyPolledObjectsIntoMemory false

    When this parameter is true, ovet_poll will perform the validate and status bridge sync operation at startup on every node in topology
  - statusAnalyzerThreadPoolSize 10
  - statusAnalyzerQueueSize (input queue of poll results) 65000
  - PAStatusAnalyzerDebugLevel 0

    0 is no debugging; 1-4 debug other areas such as polling engine, status analyzer, etc.
  - PAStatusAnalyzerMasterDebugSwitchNode (null)

    FQDN of host to start detailed tracing for
  - newNodeAlarmCategory (category for newly-discovered nodes) “”
  - PASendStatusAnalyzerSyncEvent (send OV_PESA_Message) false

    Sends a sync message upon completion of each analysis

paConfig.xml Connectivity Fault Analyzer

- SubSystemConfig: StatusAnalyzer
- ConfigGroup: ConnectivityFaultAnalyzer (distinguishes primary/secondary failures)
- General Parameters:
  - cfaEventFunctionTracingEnabled (generate function trace events) false
  - cfaDebugLevel (4 is most verbose, 0 is no tracing) 0
  - cfaDoCompositeRoute (enable traceroute & findActiveRoute to determine primary) false

    Should be set to true under normal circumstances
  - cfaTraceRouteSeedPattern (null)

    The value of the parameter is of form: cfaTraceRouteSeedPattern = A B C D cfaTraceRouteSeedValue = E F G H ...where each letter is an ipAddress. If a trace route result comes back that exactly matches the pattern part (A B C D) then substitute the result with the value part (E F G H).
  - cfaTraceRouteSeedValue (see above) (null)
  - cfaTraceRouteThroughFirewall false

    False means composite route algorithm will use trace route results only when route distinguisher = 0. Excluded path obtained by findActiveRoute which computes a path by examining ipRouteTable MIBs along the path
  - cfaStpConvergenceTimeSecs (time to delay polling for STP Convergence) 50

paConfig.xml Connectivity Fault Analyzer

- SubSystemConfig: StatusAnalyzer
- ConfigGroup: ConnectivityFaultAnalyzer (distinguishes primary/secondary failures)
- Class Specific Default Parameters: :
  - analysisMaxNumberRetries (overrides snmp config timeouts during analysis) 1

    Issues one retry to reduce expected SNMP timeouts during analysis
  - isImportantNode (suppress/enable secondary failure reporting) false

    True: node or connection goes down and is symptomatic: primary alarm generated
    False: node/connection goes down and is symptomatic: Symptomatic alarm embedded
  - useIcmpIfSnmpNoSuchObj true

    Only if the ICMP query also timesout, will the interface be considered down or unreachable by the APA CFA analyzer
  - isCriticalNode false

    On a secondary failure due to CFA, a node unreachable event is sent. If true, generate node down/up instead. Use on WAN edge routers which may not have connectivity through a cloud.

- ClassSpecifications:
  - ImportantNodes: filterName for nodes not to suppress entered into MyHostID.xml file
  - CriticalNodes: filterName for edge nodes to set down vs. unreachable entered into CriticalNodes.xml file

paConfig.xml HSRP and Talker Settings

- SubSystemConfig: StatusAnalyzer
- ConfigGroup: HSRP
- General Parameters:
  - HSRPTransientWait Millisec to wait for failover to stabilize (1 min) 60000
  - GenerateNoStandbyEvent (generate “No Standby” events) true
  - GenerateDegradedEvent (generate “degraded” events) true
  - GenerateFailoverEvent (generate failover events) true
  - GenerateStandbyChangedEvent (send “standby changed” events) true

- SubSystemConfig: Talker
- ConfigGroup: SnmpTalker
- General Parameters:
  - snmpTalkerSessionCacheSize (# of open SNMP sessions) **3**

    Increase to speed polling performance at expense of system resources
  - NumberOfOIDsPerPDU (controls size of SNMP PDUs) 50

paConfig.xml Status Bridge Settings

- SubSystemConfig: StatusBridge
- Global Parameters:
  - StatusBridgeEnabled (ovet_apaConfig.ovpl -enable APAPolling) false
  - FullTopoSync (full topology synchronization at initialization) false

- ConfigGroup: BridgeSettings
- Class Specific Default Parameters:
  - DisableNNMPolling (ovet_apaConfig.ovpl -enable APAPolling) true
  - PrimaryStatusOnly (topology changes only reflected for primaries) **false**
  - SecondaryFailureStatus **ET**

    If PrimaryStatusOnly = false, SecondaryFailureStatus will match whatever CFA determines the status to be. Allowable values are "ET", "Critical", and "Unknown".
  - CorrelateSecondaryFailures **true**

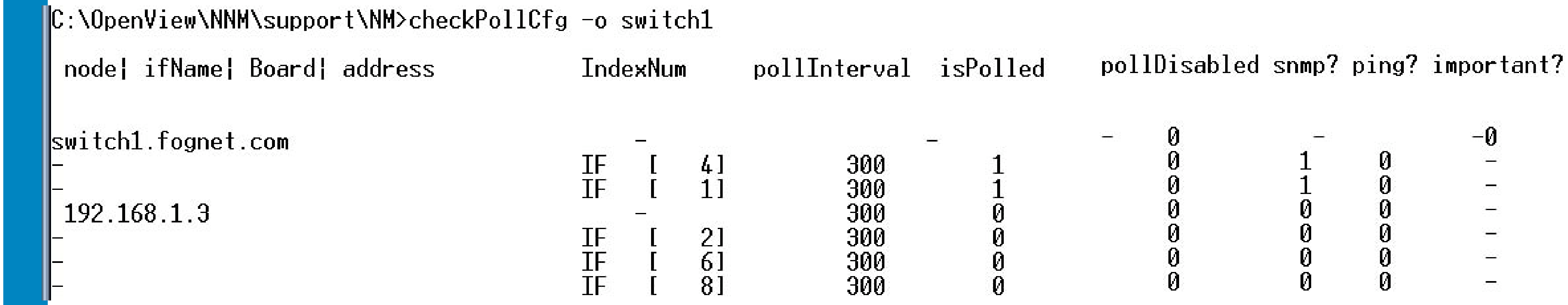
    If PrimaryStatusOnly = false, then the status bridge will attempt to correlate the interface failure with a primary interface failure. If set to false, then the status bridge will not attempt to correlate symptomatic failures, with the result that the status message will be a primary failure in NNM

APA XML configuration file best practices

1. Make a backups of the paConfig.xml file, track revisions for reverting
2. Document (offline) *netmon* and APA configuration customizations
3. Set intervals for custom class spec to unique values for checkPollCfg
4. Use ovet_topodump.ovpl to test that the nodes or interfaces pass the class filter
5. Validate your XML syntax using your favorite xml editor or any web browser
6. Test changes using checkPollCfg in the support subdirectory
7. Restart the ovet_poll process to begin using the new settings

Determining a Device’s poll setttings using checkPollCfg

- -o option for specific objects:

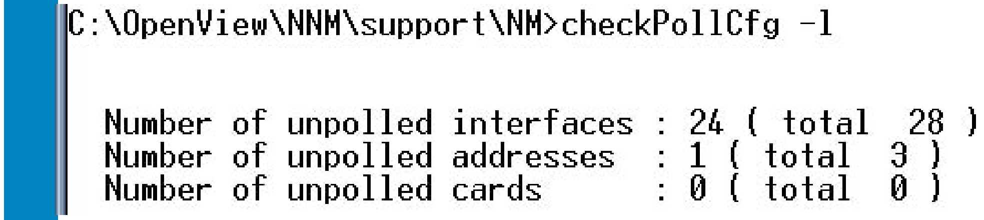


```
C:\OpenView\NNM\support\NM>checkPollCfg -o switch1

 node| ifName| Board| address            IndexNum     pollInterval  isPolled     pollDisabled snmp? ping? important?


switch1.fognet.com                           -                      -            -    0          -           -0
-                                        IF   [   4]          300         1            0         1      0       -
-                                        IF   [   1]          300         1            0         1      0       -
 192.168.1.3                                 -               300         0            0         0      0       -
-                                        IF   [   2]          300         0            0         0      0       -
-                                        IF   [   6]          300         0            0         0      0       -
-                                        IF   [   8]          300         0            0         0      0       -
```

- -A option for all
- -l [ell] option for summary:



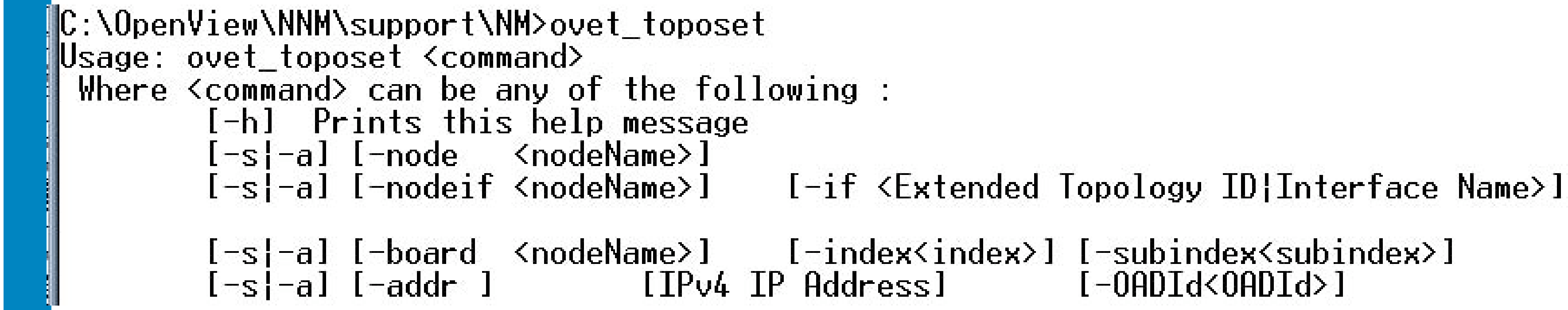
```
C:\OpenView\NNM\support\NM>checkPollCfg -l


  Number of unpolled interfaces : 24 ( total  28 )
  Number of unpolled addresses  : 1 ( total  3 )
  Number of unpolled cards      : 0 ( total  0 )
```

Fine Tuning polling setttings using ovet_toposet

- -a option ***allows*** APA polling for that entity
- -s option ***suppresses*** APA polling for that entity
- Use in conjunction with ovw ovtopofix -G to unmanage devices
- V7.5+ only
- Notification of ovet_toposet via OV_TOPOLOGY_Attr_Change_Notification

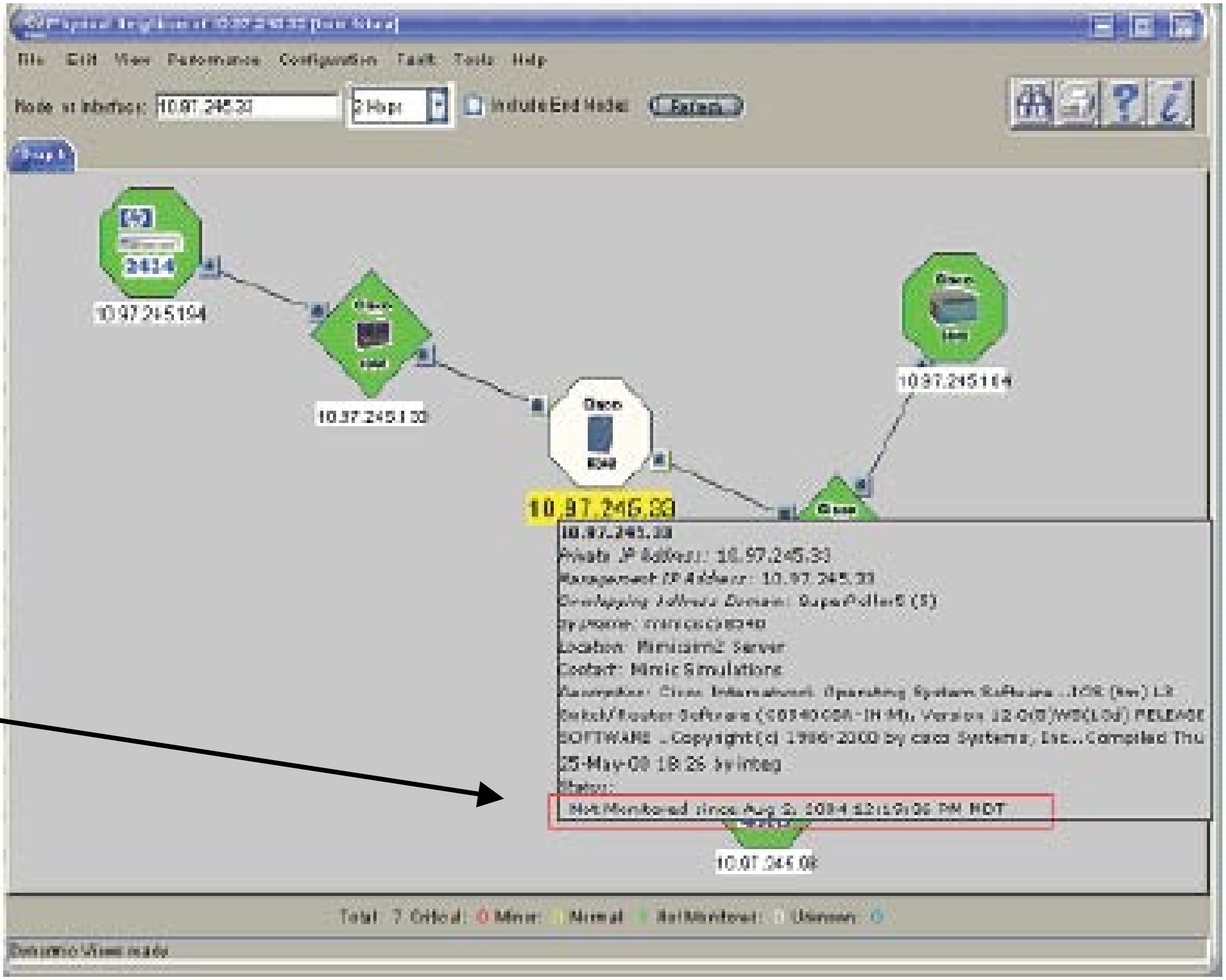
- Usage:



```
C:\OpenView\NNM\support\NM>ovet_toposet
Usage: ovet_toposet <command>
 Where <command> can be any of the following :
        [-h]  Prints this help message
        [-s¦-a] [-node   <nodeName>]
        [-s¦-a] [-nodeif <nodeName>]    [-if <Extended Topology ID¦Interface Name>]

        [-s¦-a] [-board  <nodeName>]    [-index<index>] [-subindex<subindex>]
        [-s¦-a] [-addr ]        [IPv4 IP Address]       [-OADId<OADId>]
```

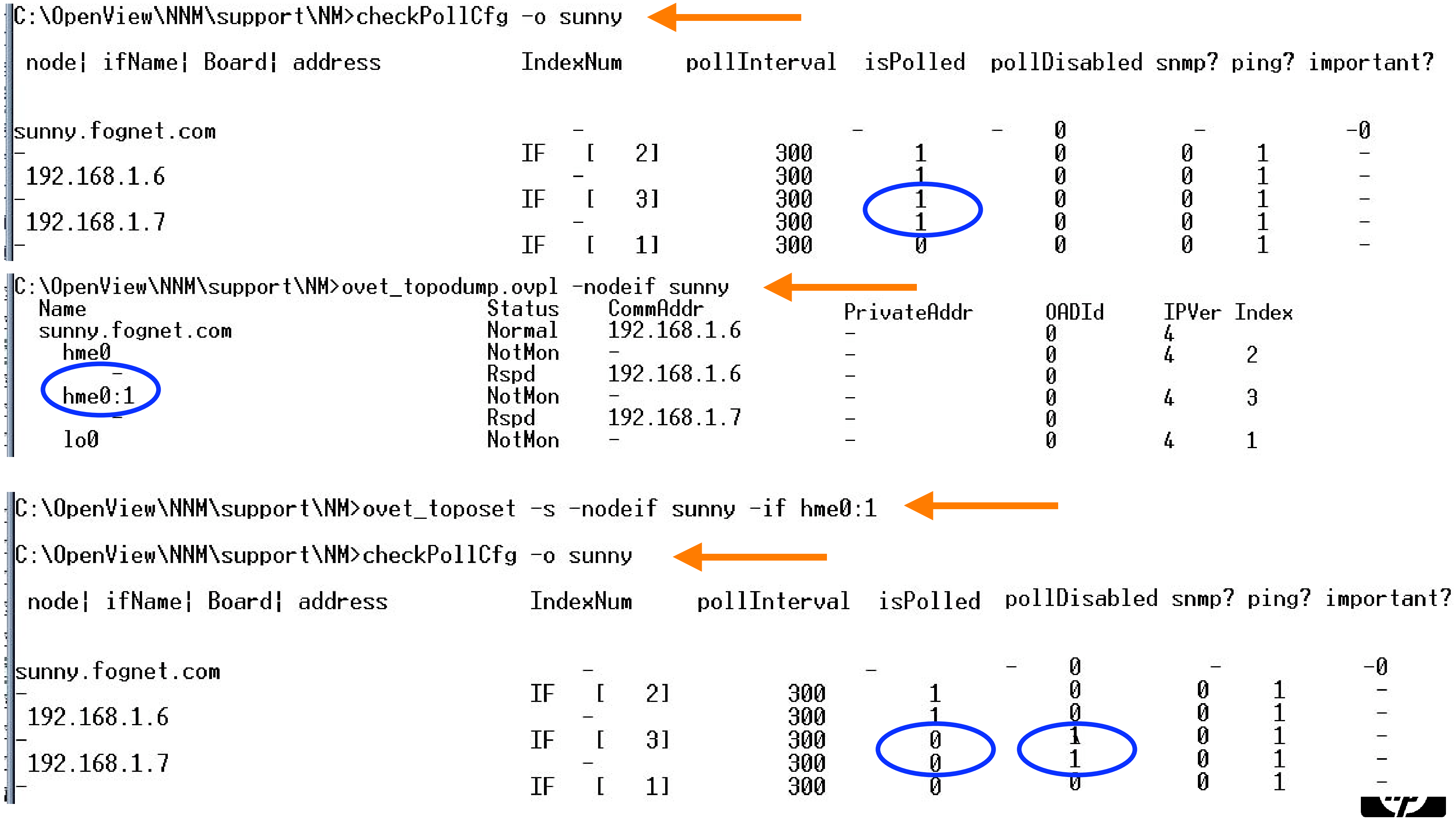
Fine Tuning polling setttings using ovet_toposet



10.97.245.33
Private IP Address: 10.97.245.33
Management IP Address: 10.97.245.33
Overlapping Address Domain: SuperPoller5 (5)
SysName: mimiccisco8540
Location: Mimicsim2 Server
Contact: Mimic Simulations
Description: Cisco Internetwork Operating System Software ..IOS (tm) L3 Switch/Router Software (C8540CSR-IN-M), Version 12.0(5)W5(13d) RELEASE SOFTWARE ..Copyright (c) 1986-2000 by cisco Systems, Inc..Compiled Thu 25-May-00 18:26 by integ
Status:
Not Monitored since Aug 2, 2004 12:19:06 PM MDT

Details show when polling was disabled

ovet_toposet example: disable polling to an interface



```
C:\OpenView\NNM\support\NM>checkPollCfg -o sunny

 node| ifName| Board| address            IndexNum     pollInterval  isPolled  pollDisabled snmp? ping? important?


sunny.fognet.com                             -                     -           -    0          -              -0
-                                    IF   [   2]         300        1               0         0     1            -
 192.168.1.6                                 -           300        1               0         0     1            -
-                                    IF   [   3]         300        1               0         0     1            -
 192.168.1.7                                 -           300        1               0         0     1            -
-                                    IF   [   1]         300        0               0         0     1            -
```

```
C:\OpenView\NNM\support\NM>ovet_topodump.ovpl -nodeif sunny
  Name                          Status     CommAddr
  sunny.fognet.com              Normal     192.168.1.6         PrivateAddr      OADId     IPVer  Index
    hme0                        NotMon     -                   -                0         4
       -                        Rspd       192.168.1.6         -                0         4      2
    hme0:1                      NotMon     -                   -                0
       -                        Rspd       192.168.1.7         -                0         4      3
    lo0                         NotMon     -                   -                0
                                                               -                0         4      1
```

```
C:\OpenView\NNM\support\NM>ovet_toposet -s -nodeif sunny -if hme0:1

C:\OpenView\NNM\support\NM>checkPollCfg -o sunny

 node| ifName| Board| address            IndexNum     pollInterval  isPolled  pollDisabled snmp? ping? important?


sunny.fognet.com                             -                     -           -    0          -              -0
-                                    IF   [   2]         300        1               0         0     1            -
 192.168.1.6                                 -           300        1               0         0     1            -
-                                    IF   [   3]         300        0               1         0     1            -
 192.168.1.7                                 -           300        0               1         0     1            -
-                                    IF   [   1]         300        0               0         0     1            -
```

paConfig.xml Example: Disable ICMP polling on a Firewall

- Create a new node assertion and new class specification.
- Steps:
  - Backup paConfig.xml and TopoFilters.xml
  - Determine the SNMP sysObjectID of the firewall:
    - Neighbor View, Right Click, details, or
    - snmpget –T <firewallName> system.sysObjectID.0
  - In TopoFilters.xml, copy and paste an entire OID-based node assertion block
    - Change the name, title, description and OID block to match your firewall device
  - Check xml syntax and confirm filter matches your devices by running:
    - ovet_topodump.ovpl –node –filt <newNodeAssertionName>
  - In paConfig.xml, copy entire isRouter ClassSpecification; paste *before* isRouter
    - Change the ClassSpecification Name to match new nodeAssertion filter name
    - Change pingEnable parameter to false
  - Check xml syntax and confirm polling settings updates for firewall by running
    - $OV_SUPPORT/checkPollCfg –o <firewallName>
  - Apply your changes by running ovstop/ovstart on ovet_poll

paConfig.xml Example: Filtering by ifType

- Two default filters shipped with paConfig.xml in NNM 7.5
  - Both commented out by default
  - IfTypeFilter sets Ping to false; useful to prevent polls “waking” ifs
  - WanIf stops polling of matching interfaces to suppress *connection* level events
    - WanIf is defined as wanIfTypes filter anded with slowIfSpeeds filter
    - slowIfSpeeds include: 9k, 16k, 56K, 64K
    - slowIfSpeeds changed from bits/sec to kb/sec - patch to NNM V7.5

- To Enable:
  - In paConfig.xml remove comments at end & beginning of filter definition
  - Modify default ifTypes in TopoFilters.xml if desired
  - ovstop ovet_poll; ovstart ovet_poll

paConfig.xml Example: Filtering by ifType

IfType Filter definition in TopoFilters.xml:

```
<interfaceAssertion name=“IfTypeFilter" title=“IfTypeFilter“
description=“Interfaces of a particular type">
   <operator oper="OR">
      <attribute>
         <ifType>
             <address>20</address>
         </ifType>
      </attribute>
      <attribute>
         <ifType>
             <address>28</address>
         </ifType>
      </attribute>
    </operator>
</interfaceAssertion>
```

ifTypes used to suppress using WanIf or IfTypeFilter

- Complete/Official list at: www.iana.org/assignments/ianaiftype-mib
  - ifTypes used by IfTypeFilter:

    20 - basicISDN
    28 - SLIP (Serial Line IP)

  - ifTypes used by WanIf and wanIfType:

    23 - ppp
    63 - ISDN and X.25 (basic rate ISDN)
    75 - ISDN S/T interface
    76 - ISDN U interface
    77 - lapd, Link Access Protocol D
    81 – ds0

  - Additional ifTypes of interest

    18 - ds1 (t1 carrier)
    21 – primaryISDN
    22 - proprietary Point to Point Serial, found on voip routers
    53 - proprietary virtual/internal, like fxp0 on Junipers, etc.

Switching Routers

AKA routing switches; multi-layer switches; Swouters

- Generally, APA treats these as routers
  - isRouter class specification precedes isSwitch in paConfig.xml
  - In some cases swapping placing in xml file can produce desired results
- Routers APA polled for all ifs, connected and unconnected
  - Connected means: connected to another node in ET - no user ports
  - but what if we want to SNMP poll just connected interfaces on device?
- How to handle:
  - Create a node filter for these devices in TopoFilters.xml
  - Create matching interface and if assertion filters in TopoFilters.xml
  - Add new class for device, and connected and unconnected IF classes
  - checkpollcfg, restart ovet_poll and ovet_demandpoll device

pickManagementAddr function (patch to V7.5)

- APA has ability to pick new SNMP address if primary address not available
- Switching routers may provide separate mgmt addrs for controlling layers
- No easy way to force address selection by APA, but telling APA what addresses NOT to pick may offer a solution:

- Create new assertion group in TopoFilters.xml for undesired mgmt addrs
    - See next slide for example
    - Check filter with ovet_topodump.ovpl
    - Create new class specification in paConfig.xml using filter
    - See two slides forward for example
    - Place above NoPingAddresses class specification
    - Check with checkpollcfg, restart ovet_poll, ovet_topodump.ovpl
    - Test by temporarily changing SNMP addresses' community string

Switching Routers

topoFilters.xml node assertion for limiting pickManagementAddr:

```
<addressAssertion name="NoMgmtAddresses" title="No Management Addresses"
description="Addresses which should not be used as management addresses">
   <operator oper="OR">
      <attribute>
         <IPAddress>
            <IPv4>
               <address>10.*.*.*</address>
            </IPv4>
         </IPAddress>
      </attribute>
      <attribute>
         <IPAddress>
            <IPv4>
               <address>127.0.0.1</address>
            </IPv4>
         </IPAddress>
      </attribute>
   </operator>
</addressAssertion>
```

Switching Routers

paConfig.xml class specification for limiting pickManagementAddr:

```
<!-- This class specification to disallow IP addresses to become management
addresses -->
<classSpecification>
   <filterName>NoMgmtAddresses</filterName>
      <parameterList>
         <parameter>
            <name>MgmtAddrInhibited</name>
            <title>Mgmt Address Inhibited</title>
            <description>
               Inhibit the address from being a management address
            </description>
            <varValue>
               <varType>Bool</varType>
               <value>true</value>
            </varValue>
        </parameter>
    </parameterList>
</classSpecification>
```

Troubleshooting multi-layer devices

- Check for isSwitch and isRouter capability flags on the device.
    - Flags assigned by *netmon* during discovery
    - Check Firewalls for SNMP/ICMP blocking.
    - Force isRouter with G flag; isSwitch with B flag in oid_to_type
- Check for multiple SNMP agent support on the device
    - Some support discreet SNMP agents
    - Consider mapping as multiple devices
        - Set multiple loopbacks for discrete agents
        - Separate addresses from a DNS perspective (remove CNAMEs)

Troubleshooting Devices (In General)

- isSwitch and isRouter issue common across many sorts of devices
  - See previous slides

- Firewalls
  - Check Firewalls for SNMP/ICMP blocking.
  - Browse SNMP MIBS; check for cut tables that may prevent visbility to:

.1.3.6.1.2.1.1	systemTable	OID for oid_to_type
.1.3.6.1.2.1.17.1	dot1dBaseTable	isSwitch
.1.3.6.1.2.1.4.20.1	ipAdEntTable	
.1.3.6.1.2.1.2.1	ifTable	isRouter/isSwitch
.1.3.6.1.2.1.31.1.1.1.1	ifName	
.1.3.6.1.2.1.31.1.1.1.18	ifAlias	
.1.3.6.1.2.1.4.1.0	ipForwardingTable	isRouter
.1.3.6.1.2.1.4.21	ipRouteTable	isRouter
.1.3.6.1.2.1.4.22.1	ipNetToMediaTable	isSwitch
.1.3.6.1.2.1.3.1.	atTable	

  - Example query:

```
snmpwalk <target> 1.3.6.1.2.1.1
```

Characterizing status behaviors

- APA E-Care white papers (requires login):
  - APA_Adjustments
  - ET_Filters
  - APA_Swouters
  - APA_FAQs
  - APA_Mgmt_Addr
- APA logfiles
  - UNIX:
    - /var/opt/OV/log/ovet_poll.log.txt
    - /var/opt/OV/log/ovet_poll_err.log
  - Windows:
    - <install_dir>data/log/ovet_poll.log.bin
      - Use <install_dir>\bin\ovlogdump.exe to view log
    - <install_dir>data/log/ovet_poll_err.log
- APA Tracing
  - Mostly XPL based tracing (See XPL tracing guide)
  - See ovtrcadm, ovtrccfg, and ovtrcgui (Win only) in $OV_SUPPORT

Forcing ET/APA to Recognize New Objects

- After discovering new objects, or forcing via loadhosts:
  - netmon discovered devices show in IPMAP topology, but not ET topology
  - No command to force an object into ET Topology
- Crude methods: ovstop/ovstart will force update, or etRestart.ovpl -disco
- Better: from home base, select Discovery Status, then ET Configuration
  - Initiate full discovery now
  - Or change “enable discovery for a specified number of NNM changes”
    - Default threshold is 2500
    - Schedule discovery for times when the network is active
- Be patient – slow disco means ET isn’t flooding your network with SNMP

APA tracing via log-only events

- OV_TOPOLOGY_Attr_Change_Notification
  - Issued whenever an ET topology object’s attribute changes
- OV_TOPOLOGY_Life_Cycle_Notification
  - Issued when an ET object is created or deleted
- OV_TOPOLOGY_Topology_State_Notification
  - Rich data pertaining to the status of ET Discovery
- OV_TOPOLOGY_Status_Change_Notification
  - Issued for every ET topology status change

OV_TOPOLOGY_Status_Change_Notification varbinds of interest

2 The name of the object whose attribute changed

6 The Entity Type whose status changed. This value could be:

E_Unknown=0, E_Node=1, E_Interface=2,
E_LogicalInterface=3, E_Vlan=4, E_Card=5,
E_PSU=6, E_Subnet=7, E_Module=8,
E_Mesh=10, E_HSRP=11, E_IfC=12,
E_Address=25

7 The new status of the object:

NoStatus=0, Normal=1, Unknown=2,
Warning=3, Marginal=4, Major=5,
Critical=6

8 The previous status of the object

9 IPv6 entity status types

OV_TOPOLOGY_Attr_Change_Notification varbinds of interest

2 The name of the object whose attribute changed

5 The Entity Type whose status changed. This value could be:

E_Unknown=0, E_Node=1, E_Interface=2,
E_LogicalInterface=3, E_Vlan=4, E_Card=5,
E_PSU=6, E_Subnet=7, E_Module=8,
E_Mesh=10, E_HSRP=11, E_IfC=12,
E_Address=25

6 The type of the Attribute that changed

HSRP_State=0, HSRP_Certainty=1, IfAdmin_Status=2,
IfOper_Status=3, Ping_State=4, Snmp_State=5,
HSRP_Priority=6 IfC_AssocState=7, Extensible_Attribute=8

7 The data type of the Attribute Val that changed. (E_Integer or E_String)

8 The Value of attribute 6 if attribute 7 is is E_Integer (0)

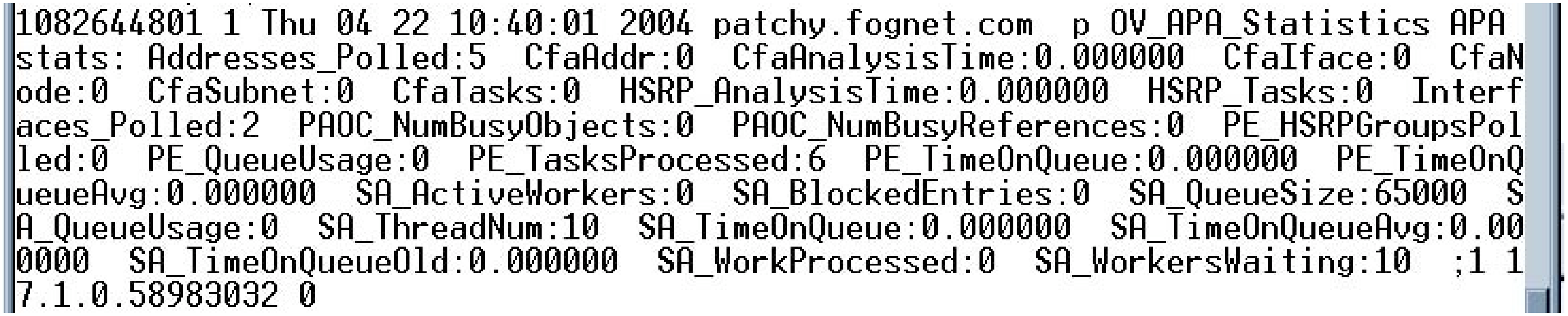
9 The Value of attribute 6 if attribute 7 isE_String (1)

10 The Address Id if entity type is HSRP.

12 The name of the User Defined Extensible

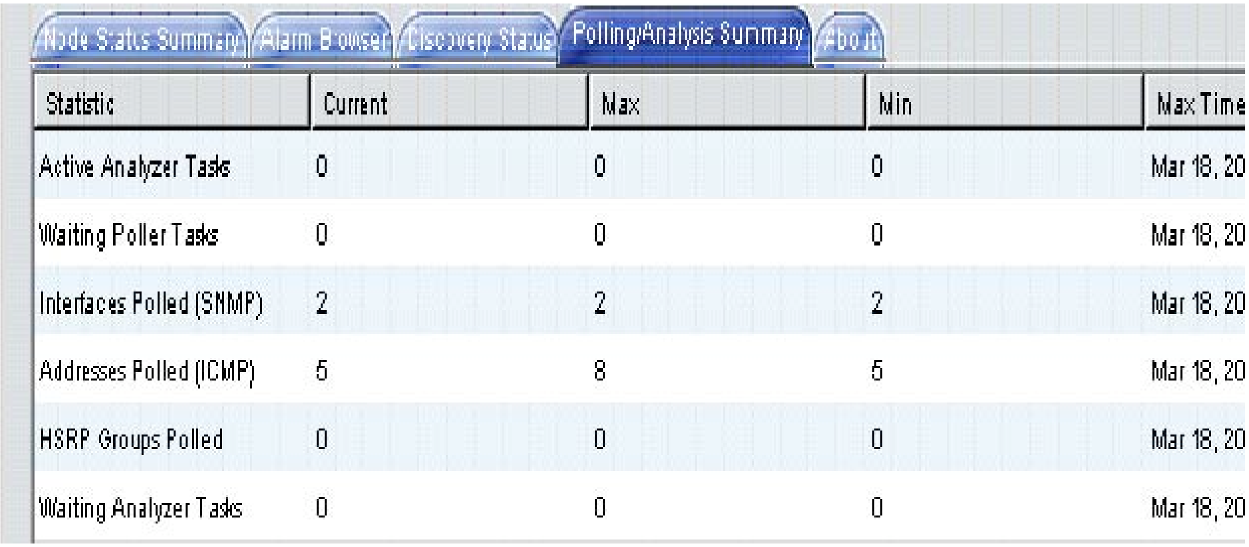
APA Polling Statistics

- Collected/updated on 5 minute intervals – details next slide
  - OV_APA_Statistics log-only event (see ovdumpevent output):



```
1082644801 1 Thu 04 22 10:40:01 2004 patchy.fognet.com  p OV_APA_Statistics APA
stats: Addresses_Polled:5  CfaAddr:0  CfaAnalysisTime:0.000000  CfaIface:0  CfaN
ode:0  CfaSubnet:0  CfaTasks:0  HSRP_AnalysisTime:0.000000  HSRP_Tasks:0  Interf
aces_Polled:2  PAOC_NumBusyObjects:0  PAOC_NumBusyReferences:0  PE_HSRPGroupsPol
led:0  PE_QueueUsage:0  PE_TasksProcessed:6  PE_TimeOnQueue:0.000000  PE_TimeOnQ
ueueAvg:0.000000  SA_ActiveWorkers:0  SA_BlockedEntries:0  SA_QueueSize:65000  S
A_QueueUsage:0  SA_ThreadNum:10  SA_TimeOnQueue:0.000000  SA_TimeOnQueueAvg:0.00
0000  SA_TimeOnQueueOld:0.000000  SA_WorkProcessed:0  SA_WorkersWaiting:10  ;1 1
7.1.0.58983032 0
```

  - Statistics available from home base main window:



Statistic	Current	Max	Min	Max Time
Active Analyzer Tasks	0	0	0	Mar 18, 20
Waiting Poller Tasks	0	0	0	Mar 18, 20
Interfaces Polled (SNMP)	2	2	2	Mar 18, 20
Addresses Polled (ICMP)	5	8	5	Mar 18, 20
HSRP Groups Polled	0	0	0	Mar 18, 20
Waiting Analyzer Tasks	0	0	0	Mar 18, 20

APA Polling Statistics, more details in APA White Paper

- Active Analyzer Tasks
  - The # of polling results currently under analysis. Should trend toward zero.
  - If not trending down, increase # of threads in the status analyzer thread pool.
- Waiting Poller tasks
  - Maximum # of polling tasks waiting to be completed during the last interval.
  - If trending up, the APA poller may be unable to keep up with the polling load.
- Addresses Polled (ICMP):
  - The number of addresses pinged during the last statistics reporting interval.
- Interfaces Polled (SNMP):
  - The number of interfaces queried for status through SNMP in the reporting interval.
- Waiting Analyzer Tasks:
  - The number of polling results waiting to be analyzed. Should trend toward zero.
  - Temporary surges should be expected when there are many failures.
- HSRP Groups Polled:
  - The number of HSRP groups queried for status in the last reporting interval.

APA Polling Statistics in APA_Statistics event

Note all statistics based on the statistics polling interval (5 minutes)

- PE_HSRPGroupsPolled Same as the stat in “Polling/Analysis Summary” table
- PE_TimeOnQueue Time last task is waiting in Polling Engine Queue
- PE_TimeOnQueueAvg Average time Polling Engine Queue tasks are waiting
- PE_TasksProcessed # tasks in Polling Engine Queue processed in interval
- PE_QueueUsage Current number of tasks on the Polling Engine Queue
- SA_TimeOnQueue Time the last task waiting in the Status Analyzer Q
- SA_TimeOnQueueAvg Average time tasks waiting on Status Analyzer Q
- SA_TimeOnQueueOld Current max time task waiting on Status Analyzer Q
- SA_WorkProcessed # of tasks processed in Status Analyzer Q in interval
- cfaAnalysisTime Total time analysis has taken since last statistics event
- HSRP_AnalysisTime Total time HSRP analysis has taken since last event

Event correlation circuits related to NNM-derived status

- NNM 6.0:
  - ConnectorDown differentiates primary from secondary failures
  - Repeated Event applied to Node_up
  - Pair-wise applied to many status events
- NNM 6.2:
  - No Changes to ECS
- NNM 6.31:
  - NodeIF supplements Connector Down, AKA “Router/Switch Health”
  - Pair-wise behavior updated ; IntermittentStatus added
- NNM 6.41
  - De-duplication introduced and applied to status events
  - Intervals, some ECS circuit parameters changed to reduce status alarms
- NNM 7.01
  - APA-based events as sources for ConnectorDown, de-dup, and PairWise
  - OV_PollerPlus correlator added as contributed app to supplement APA
- NNM 7.5
  - Internal circuit for passing generic traps to APA

RepeatedEvent Correlation

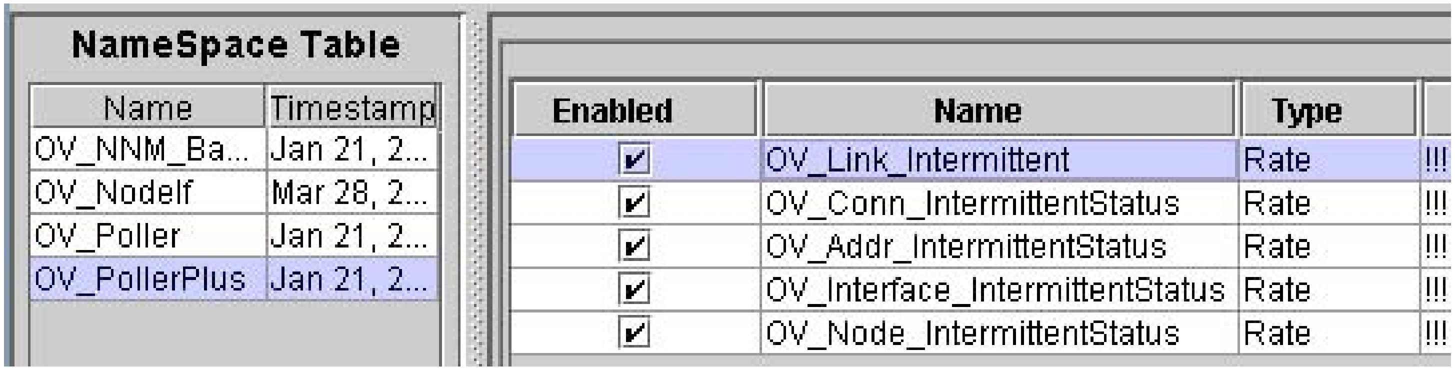
- Repeated event correlation becomes a “legacy” correlation with De-dup
- Embeds subsequent matches under original event in alarm browser
- Only indication to users is incrementing of correlated message count
- Default Time Window = 10 minutes
- Repeated event default correlations affecting status:
    - OV_Interface_Unknown
    - OV_Interface_Down
    - OV_Node_Up in V6.x, disabled in NNM 7.x
- Several other events still configured to use Repeated Event:
    - OV_IF_Intermittent
    - OV_BadSubnetMask
    - OV_PhysAddrMismatch

IntermittentStatus Correlation

- IntermittentStatus correlation behavior
  - Detects flapping interfaces/nodes otherwise “hidden” by PairWise
  - AKA “Router/Switch Intermittent Status,” in NNM Docs and “OV_Connector_IntermittentStatus” in correlation composer
  - Applies only to connector interfaces polled by *netmon*
  - Irrelevant when using APA Polling
  - New Alarm in V6.31:
    - OV_IF_Intermittent – OpenView enterprise 58982423
  - RATE_COUNT
    - Default is 4 in V6.31, 5 in V6.4
    - Default is 4 in V7.0, 7.01, 7.5
    - RATE_PERIOD Default is 30 minutes
  - Configure via Correlation Composer OV_NNM_Basic namespace
  - netmon.lrf: –k shortPollTime=120; netmon.lrf:-k shortPollDownCount=2

OV_PollerPlus correlations

- Behavior:
  - Same as IntermittentStatus for APA status events affected by PairWise
  - Unsupported. NOT enabled by default, must be manually loaded
  - Four individual circuits for APA connection, interface, address, node events
  - Fifth addititional circuit which is for Link Down traps (Generic 2)
- Status Alarms:
  - Four Alarms in V7.x:
    OV_APA_[INTERFACEINODEIADDRICONN**]_Intermittent**
  - RATE_COUNT
    - Default is 2
    - RATE_PERIOD Default is 30 minutes
- Configuration:
  - See note in APA white paper for configuration instructions



NameSpace Table

Name	Timestamp
OV_NNM_Ba...	Jan 21, 2...
OV_NodeIf	Mar 28, 2...
OV_Poller	Jan 21, 2...
OV_PollerPlus	Jan 21, 2...

Enabled	Name	Type	
☑	OV_Link_Intermittent	Rate	!!!
☑	OV_Conn_IntermittentStatus	Rate	!!!
☑	OV_Addr_IntermittentStatus	Rate	!!!
☑	OV_Interface_IntermittentStatus	Rate	!!!
☑	OV_Node_IntermittentStatus	Rate	!!!

ConnectorDown correlation behavior

- General behavior:
  - NNM’s “first” built-in correlation, introduced in NNM V6.0
  - Circuit embeds interface-related events under node-related events
  - Circuit reads path data encoded in varbinds to distinguish primary/secondary
  - Circuit embeds secondary failures under primary failures (*netmon*-only)
  - Important Node filter defines list of nodes considered primary (*netmon*)
    - *genannosrvr* feeds important node filter data to ECS

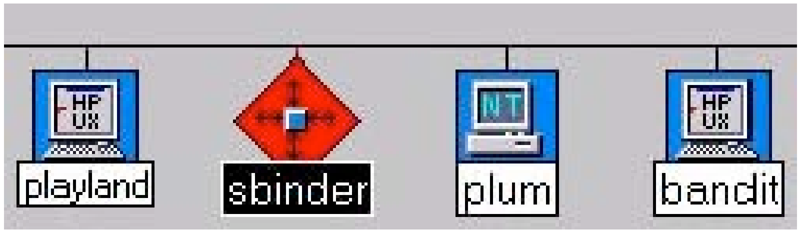
- *netmon*-based status:
  - *netmon* builds path data in memory on startup to determine primary/secondary
  - Topology status set to “unknown” for subsequent secondary failures
  - Scheduled polls to “downstream” secondary interfaces doubled

- *ovet_poll*-based status:
  - APA failure analysis done on adjacent nodes to correlate connector state
  - *ovet_pathengine* passes primary/secondary path analysis data to *netmon*
  - By default, ET never passes secondary device status to topology/alarm browser

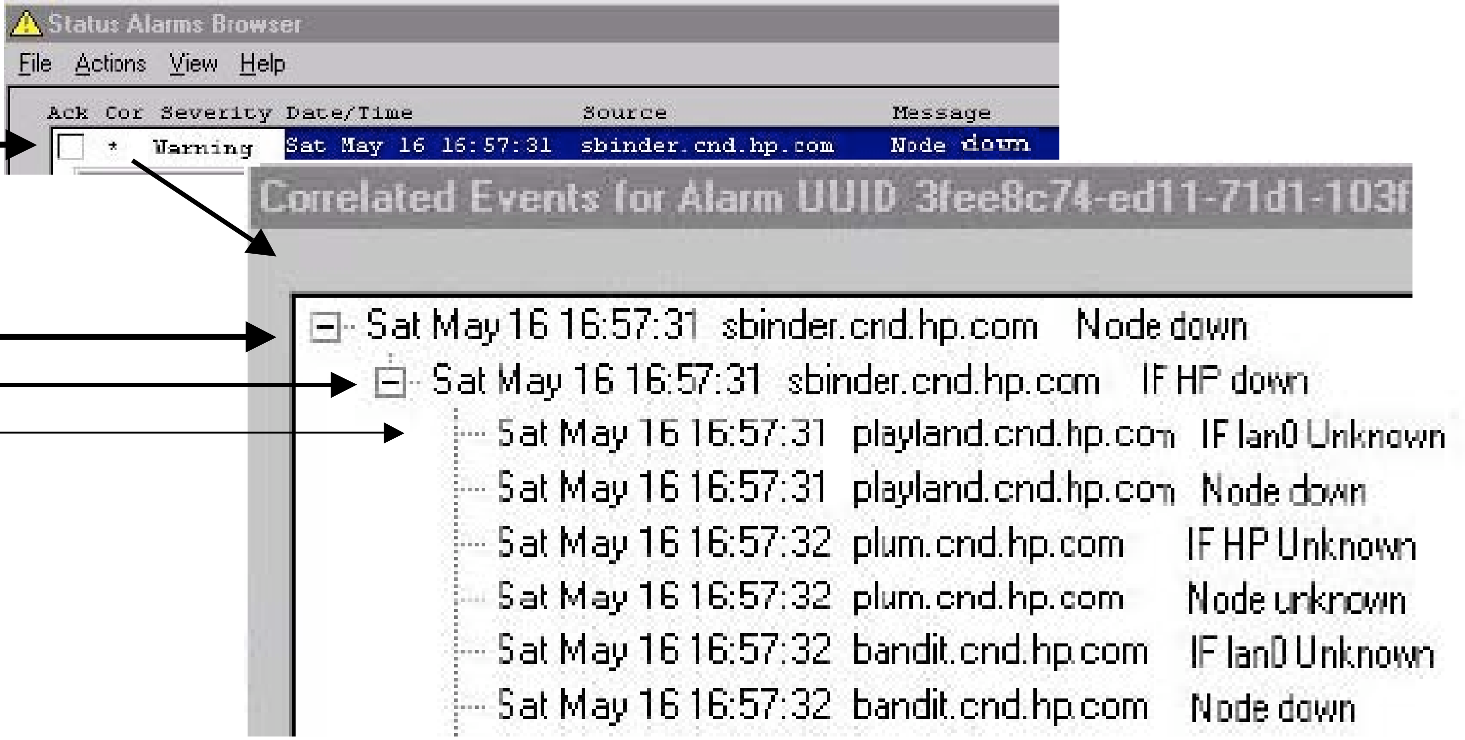
ConnectorDown correlation configuration

- Status Alarms:
  - Interface events embedded into node events for *netmon*-based status
  - Interface/Address/Connection/Node events embedded for APA-based status
  - Secondary alarms from “downstream” nodes embedded (*netmon*)
- Topology Status:
  - Primary Interfaces updated immediately
  - Secondary failures set to selected failure status when polled
    - Down, Unknown (default), Unchanged (*netmon* via xnmpolling)
    - Off, ET, Critical, Unknown (APA via the following StatusBridge settings:
      - PrimaryStatusOnly (false); SecondaryFailureStatus (ET); CorrelateSecondaryFailures (true)
  - Connector Node topology status other than Up/Down held 4 minutes
- Configuration:
  - Correlation Manager
  - Network Polling Configuration (set secondary failure polling options)
- Scope: Most if not all netmon and APA-based status events

APA/*netmon* ConnectorDown correlation differences



- ConnectorDown with *netmon* polling:
  - Note “triple” layers of embedding
    - Primary Parent Event – Node Down
    - Primary Child Event -- Interface Down
    - Secondary Grandchild Event – Secondary Node/IF down or unknown

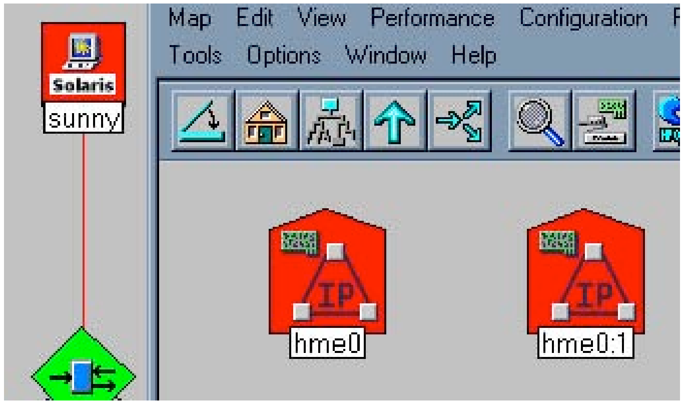


```
Ack Cor Severity Date/Time            Source               Message
□    *  Warning  Sat May 16 16:57:31  sbinder.cnd.hp.com   Node down
```

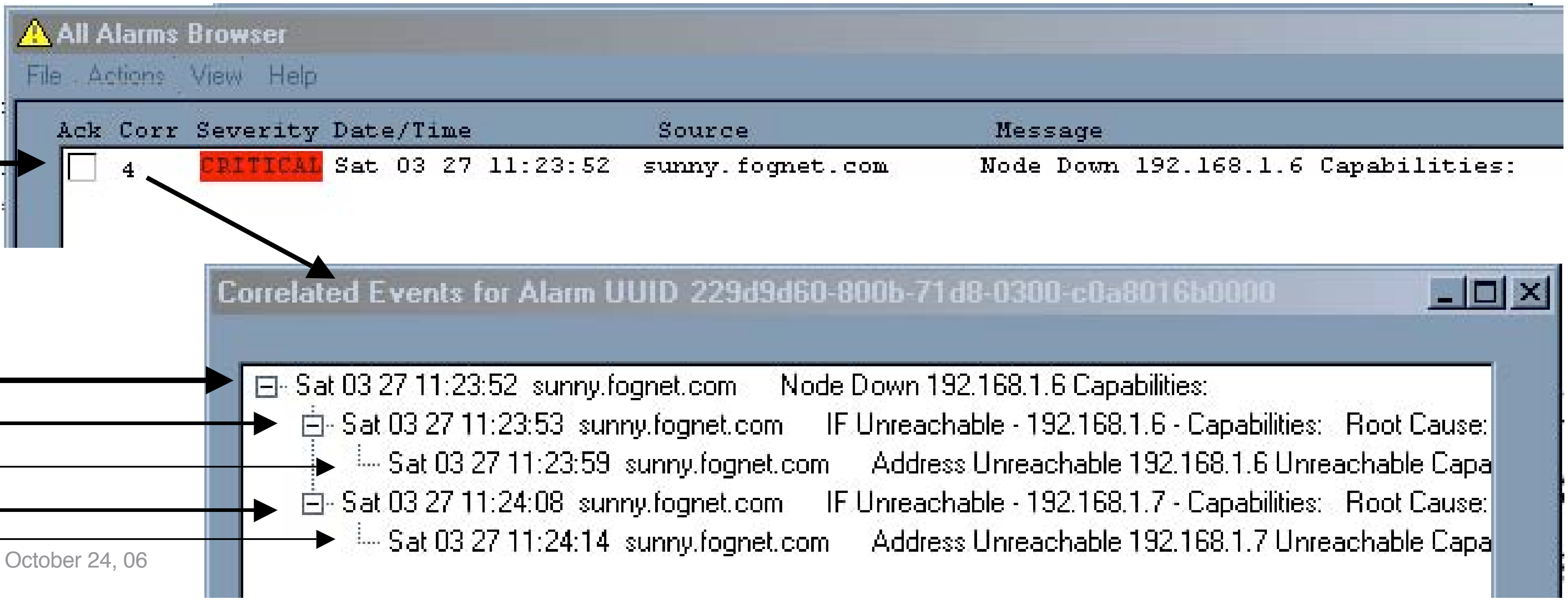
Correlated Events for Alarm UUID 3fee8c74-ed11-71d1-103f

```
⊟ Sat May 16 16:57:31  sbinder.cnd.hp.com   Node down
  ⊟ Sat May 16 16:57:31  sbinder.cnd.hp.com   IF HP down
      Sat May 16 16:57:31  playland.cnd.hp.com  IF lan0 Unknown
      Sat May 16 16:57:31  playland.cnd.hp.com  Node down
      Sat May 16 16:57:32  plum.cnd.hp.com      IF HP Unknown
      Sat May 16 16:57:32  plum.cnd.hp.com      Node unknown
      Sat May 16 16:57:32  bandit.cnd.hp.com    IF lan0 Unknown
      Sat May 16 16:57:32  bandit.cnd.hp.com    Node down
```

APA/*netmon* ConnectorDown correlation differences


Solaris
sunny
Map Edit View Performance Configuration
Tools Options Window Help
IP
hme0
IP
hme0:1

- ConnectorDown with APA polling:
  - Note "triple" layers of embedding
    - Primary Parent Event – APA Node Down
    - Primary Child Events -- Interface unreachable
    - Secondary Grandchild Events – Address unreachable
  - Secondary failures never indicated by default


All Alarms Browser
File Actions View Help
Correlated Events for Alarm UUID 229d9d60-800b-71d8-0300-c0a8016b0000

```
Ack Corr Severity Date/Time            Source               Message
□    4   CRITICAL Sat 03 27 11:23:52   sunny.fognet.com     Node Down 192.168.1.6 Capabilities:
```

```
⊟ Sat 03 27 11:23:52 sunny.fognet.com   Node Down 192.168.1.6 Capabilities:
   ⊟ Sat 03 27 11:23:53 sunny.fognet.com   IF Unreachable - 192.168.1.6 - Capabilities:  Root Cause:
      └ Sat 03 27 11:23:59 sunny.fognet.com   Address Unreachable 192.168.1.6 Unreachable Capa
   ⊟ Sat 03 27 11:24:08 sunny.fognet.com   IF Unreachable - 192.168.1.7 - Capabilities:  Root Cause:
      └ Sat 03 27 11:24:14 sunny.fognet.com   Address Unreachable 192.168.1.7 Unreachable Capa
```

NodeIf correlation behavior

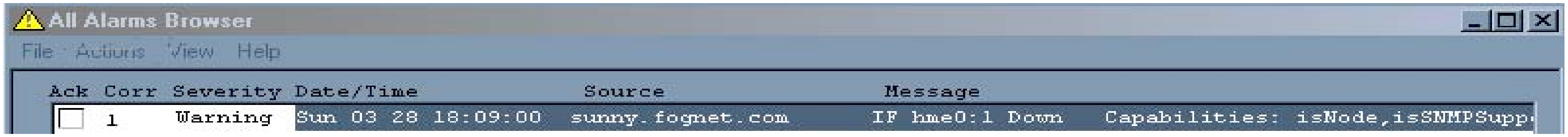
- Behavior:
  - AKA "Router/Switch Health" – affects *netmon* status only - example next slide
  - Supplements ConnectorDown - major re-work of *netmon* status alarms V6.31
  - Takes advantage of V6.31 *netmon* dynamic polls to connector interfaces
  - NodeIf correlates *netmon*-based status of interfaces on the same device
  - Suppresses interface status alarms from non-connector devices (e.g. systems)
  - Suppresses interface alarms from unconnected ports
- Status Alarms:
  - Simple device: send interface events immediately, suppress node events
  - Node alarms for simple devices *not* suppressed when using APA
  - Connector: hold interface event from alarm browser until either:
    - Major node status event occurs (all if's down, all up, all unknown), or
    - PairedTimeWindow (10 Minutes).
- Topology Status:
  - Interface & Node status released immediately
- Configuration:
  - Correlation Composer, OV_NodeIf namespace
  - netmon.lrf: –k scheduleChassisIfsImmediate=false

NodeIf correlation behavior – example

- Example 1: NNM V7.x, *netmon*-based status, NodeIf on (default)
  - Node Down never seen for simple devices – only Interface level events

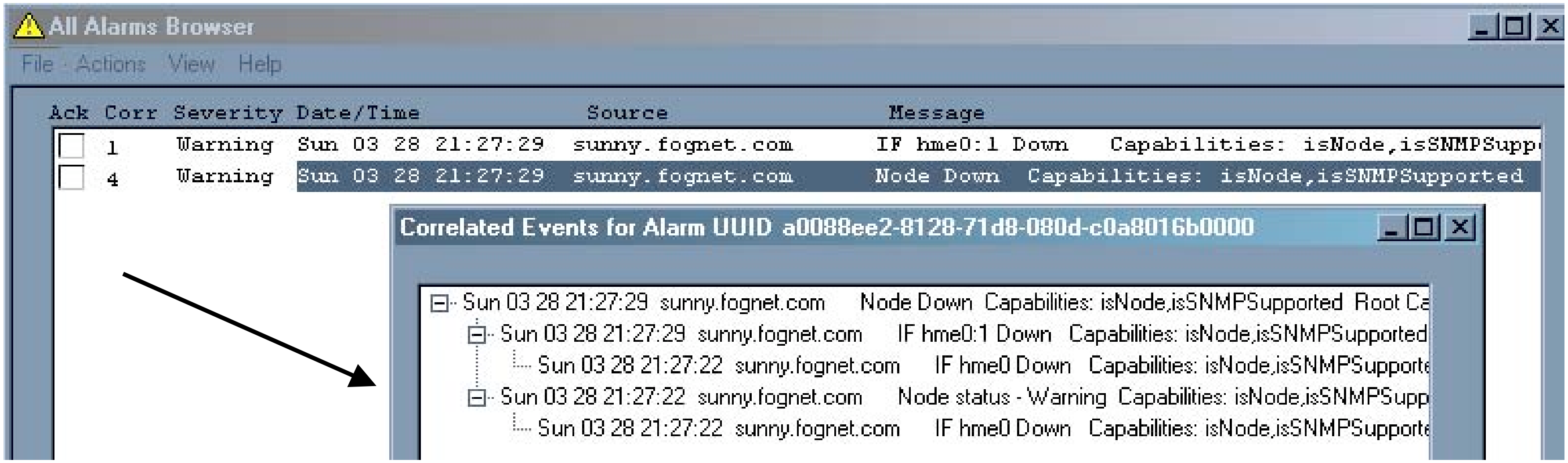
- Example 2: : NNM V7.x, *netmon*-based status, NodeIf disabled
  - Node event and embedded ConnectorDown correlations deleted for simple device
  - For connector, IF events combined into single IF event (or node event if all down)
  - Same behavior for NNM V6.31, V6.41, V7.0

1



```
Ack Corr Severity Date/Time             Source              Message
□   1    Warning  Sun 03 28 18:09:00    sunny.fognet.com    IF hme0:1 Down    Capabilities: isNode,isSNMPSupp
```

2



```
Ack Corr Severity Date/Time             Source              Message
□   1    Warning  Sun 03 28 21:27:29    sunny.fognet.com    IF hme0:1 Down    Capabilities: isNode,isSNMPSupp
□   4    Warning  Sun 03 28 21:27:29    sunny.fognet.com    Node Down   Capabilities: isNode,isSNMPSupported
```

Correlated Events for Alarm UUID a0088ee2-8128-71d8-080d-c0a8016b0000

```
⊟ Sun 03 28 21:27:29 sunny.fognet.com   Node Down Capabilities: isNode,isSNMPSupported Root Ca
  ⊟ Sun 03 28 21:27:29 sunny.fognet.com   IF hme0:1 Down  Capabilities: isNode,isSNMPSupported
      Sun 03 28 21:27:22 sunny.fognet.com   IF hme0 Down  Capabilities: isNode,isSNMPSupporte
  ⊟ Sun 03 28 21:27:22 sunny.fognet.com   Node status - Warning  Capabilities: isNode,isSNMPSupp
      Sun 03 28 21:27:22 sunny.fognet.com   IF hme0 Down  Capabilities: isNode,isSNMPSupporte
```

ECS Logging and Troubleshooting

- Logging All Incoming ECS Events
  - To turn on logging ecsmgr –log_events input on
  - To turn off logging: ecsmgr –log_events input off
  - To change log size: ecsmgr –max_log_size event <Kbytes>
  - Log file name is *ecsin.evt0*, is a rolling log, is 512k by default and is located in:
    - UNIX: $OV_LOG/ecs/1/ecsin.evt0 and $OV_LOG/ecs/1/ecsin.evt1
    - Windows:<install_dir>\log\ecs\1\ecsin.evt0 and ecsin.evt1
- Logging Output and Correlated Events
  - ecsmgr –log_events stream on
  - ecsmgr –log_events stream off
    - ecsmgr –max_log_size event <Kbytes>
  - Log file is default_xxx.evt0, is a rolling log, 512K by default, and is located in:
    - UNIX: $OV_LOG/ecs/1/default_sout.evt0 & default_sout.evt1
    - Windows:<install_dir>\log\ecs\1\default_sout.evt0 & default_sout.evt1
- Logging discarded or suppressed events:
  - UNIX: $OV_LOG/ecs/1/default_sdis.evt0 & default_sdis.evt1
  - Windows:<install_dir>\log\ecs\1\default_sdis.evt0 & default_sdis.evt1

ECS Tracing and Simulation

- Simulate events for testing ECS logic
  - *ecsevgen* and *ecsevout* in $OV_CONTRIB/ECS can be used to replay logs for testing the effects of ECS circuit changes. For more info, see TroubleshootingEventCorrelation.txt in that directory.

- ECS Support tools
  - $OV_SUPPORT/processEvents – Summarizes output of ovdumpevents (UNIX Only)
  - $OV_SUPPORT/processCorrEvents – Summarizes output of correlation log (UNIX Only)
  - $OV_SUPPORT/ECSTracing.ovpl – Front-end to pmdmgr & ecsmgr tracing/logging commands

- ECS Tracing
  - ECS tracing can be extremely verbose, but certain development activities can't be sufficiently troubleshot with logging. To enable full ECS tracing:
    - ecsmgr -i 1 -trace 65536
    - pmdmgr -SECSS\;T0xffffffff
  - The traces are then written to $OV_LOG /pmd.trc0.

The End