

Advanced Network Management: Intelligent Correlation and Performance Management

**Gloria Canales – Network Services
Management Manger**

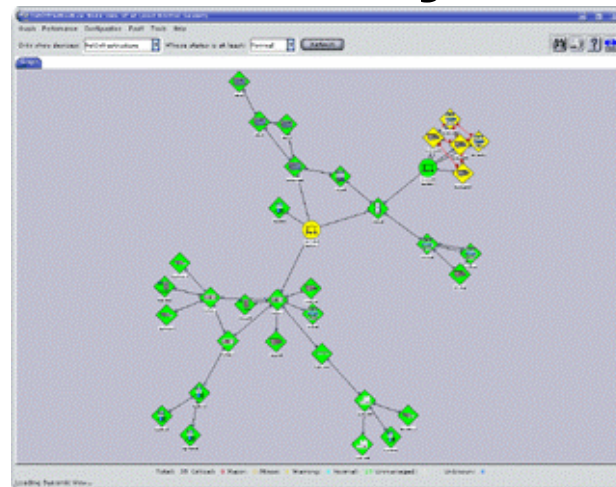
**Dan Roggenbuch – Technical
Marketing**

Hewlett-Packard



Keeping Networks Healthy

**Resolve
Problems
Quickly**

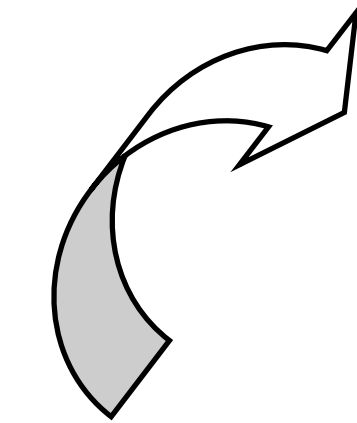


**Spot
Developing
Bottlenecks**

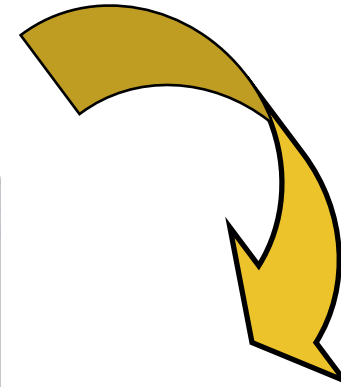
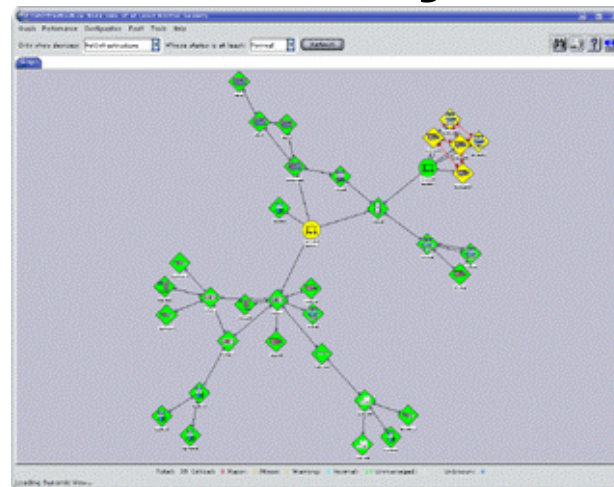
**Prevent
Reoccurrence**

Keeping Networks Healthy

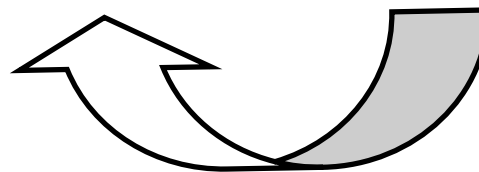
**Resolve
Problems
Quickly**



**Spot
Developing
Bottlenecks**



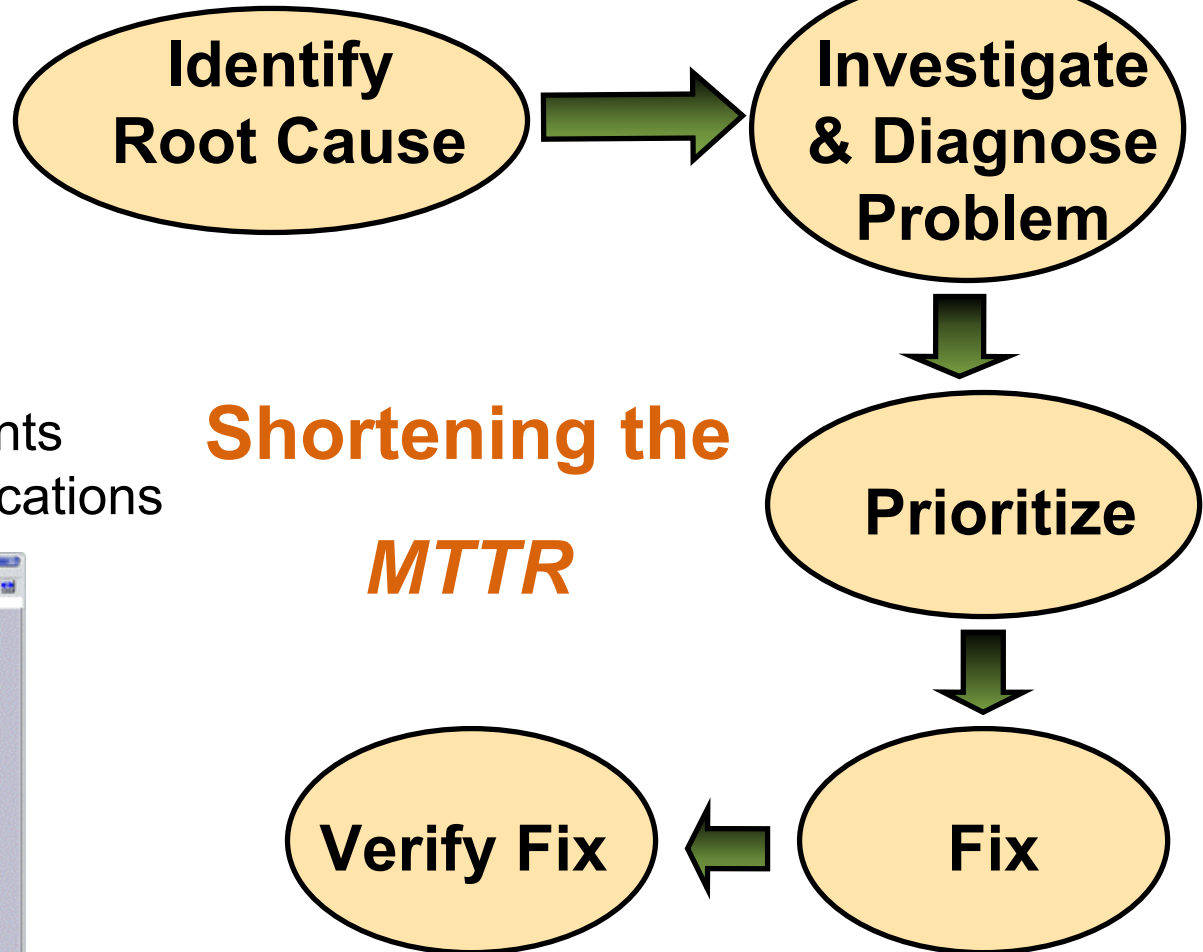
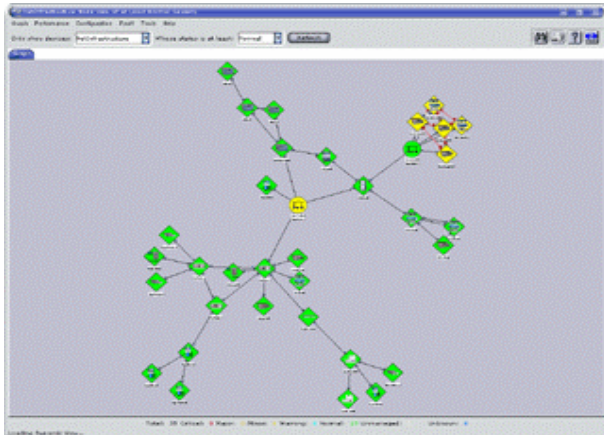
**Prevent
Reoccurrence**



Problem Resolution Process

EVENTS

- Traps from network elements
- Management system notifications



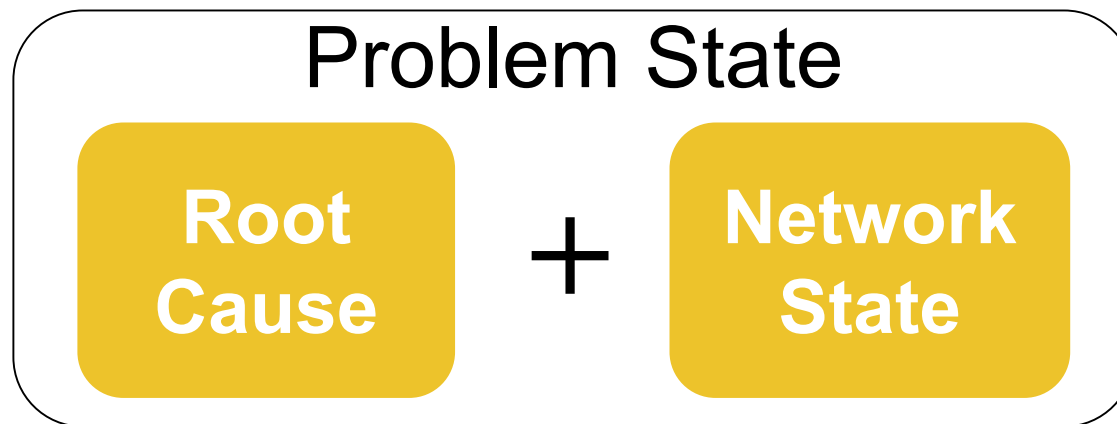
The Challenges

- **Too many events**
 - 1000s per day in a large network
 - Symptomatic events
- **Network Complexity**

• HSRP	Meshed Topologies
• VLANs	Frame Relay
• OSPF	MPLS
- **Events don't tell the whole story**
 - Must know network STATE after a failure

Problem State

- The diagnostic process must determine:



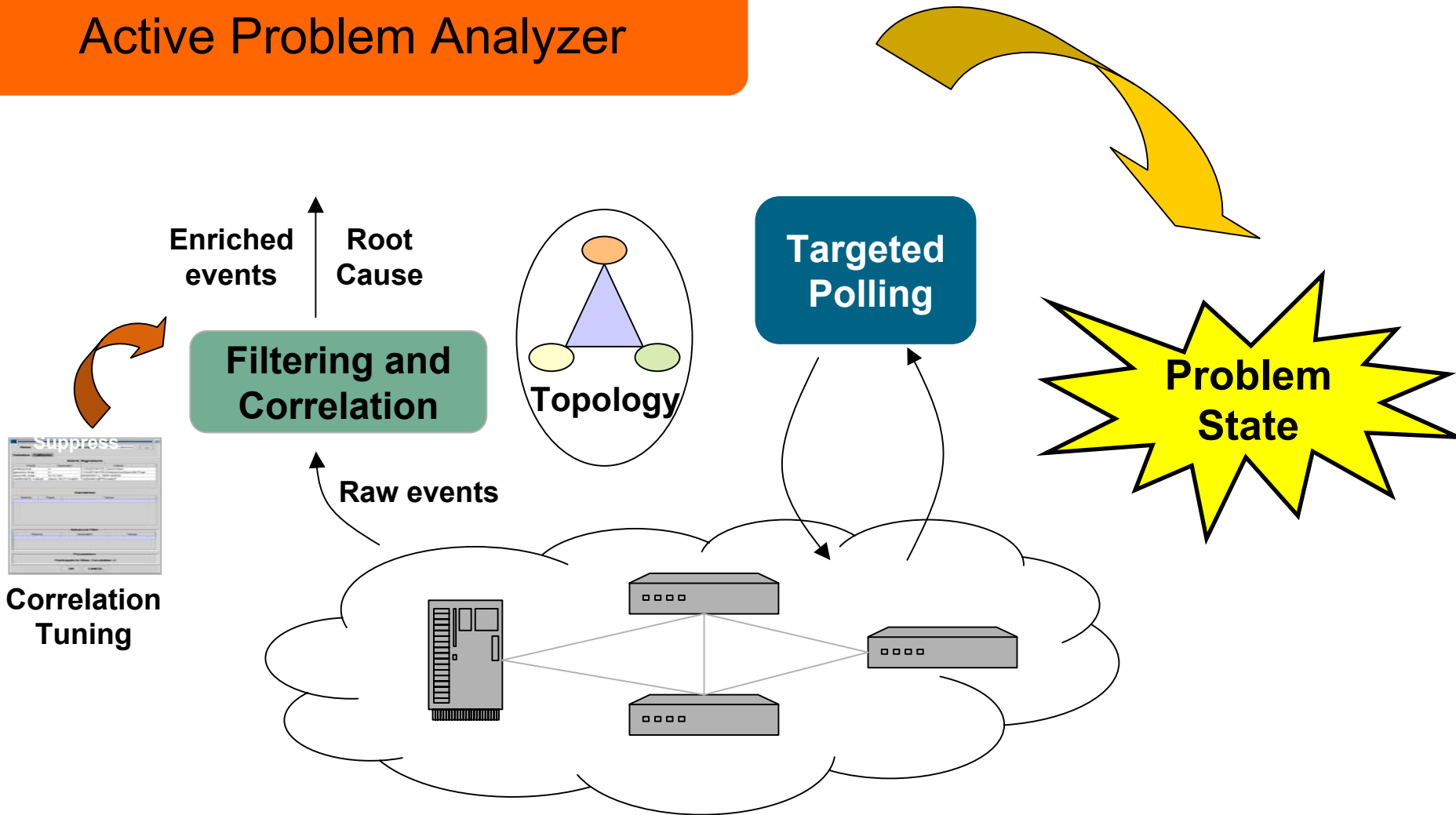
The key to preventing follow-on outages.

A Management System Should

1. Analyze the event stream to determine the most likely root cause
2. Perform active analysis and polling to confirm the root cause and determine the *state* of the network following the failure.
3. Provide the views and tools needed for further investigation.
4. Help assess services and customers impacted.
5. Link easily to other tools to correct problems.

Intelligent Diagnostics for Networks

Active Problem Analyzer



Filtering and Correlation

- Filters out unimportant events
- Eliminates duplicates
- Understands event relationships
- Determines most likely root cause
- Provides more meaningful messages



chk	Cor	Severity	Date/Time	Source	Message
<input type="checkbox"/>		Critical	Wed Mar 13 13:19:19	ntelnt04	Primary DNS INTERRUPTED Critical
<input type="checkbox"/>		Major	Wed Mar 13 13:19:20	ntcatn02	WebService INTERRUPTED Major
<input checked="" type="checkbox"/>	*	Warning	Wed Mar 13 13:19:20	ntelnt01	Node down
<input checked="" type="checkbox"/>	*	Warning	Wed Mar 13 13:19:26	ntelnt04	Node down
<input checked="" type="checkbox"/>	*	Warning	Wed Mar 13 13:19:20	15.6.96.8	Network status major (almost critical)
<input checked="" type="checkbox"/>	*	Warning	Wed Mar 13 13:19:29	15.6.96.24	Network status major (almost critical)
<input type="checkbox"/>	*	Normal	Wed Mar 13 13:19:50	ntcatn02	Node up
<input type="checkbox"/>	*	Normal	Wed Mar 13 13:19:50	ntelnt04	Node up
<input type="checkbox"/>	*	Normal	Wed Mar 13 13:19:50	ntelnt01	Node up
<input checked="" type="checkbox"/>	*	Warning	Wed Mar 13 13:19:29	c4k2loop.fc.hp.com	Node status - marginal
<input type="checkbox"/>	*	Normal	Wed Mar 13 13:19:51	c4k2loop.fc.hp.com	Node up
<input type="checkbox"/>	*	Warning	Wed Mar 13 13:19:52	ntelnt01	Node down
<input type="checkbox"/>	*	Warning	Wed Mar 13 13:19:52	ntelnt04	Node down
<input type="checkbox"/>	*	Warning	Wed Mar 13 13:19:53	15.6.96.8	Network status major (almost critical)
<input type="checkbox"/>	*	Warning	Wed Mar 13 13:19:53	15.6.96.24	Network status major (almost critical)

320 Alarms - Critical:14 Major:66 Minor:58 Warning:61 Normal:121 (39 acknowledged)

**** Topology Smart ****

Built-in Correlators

- Adjacent Node Failure
- Frame Relay Correlator
- Hot Standby Router Protocol
- Intermittent Interface
- Chassis Enclosure
- Event Noise Reduction
 - See next slide



Event Noise Reduction

- Event classifier
- Pair-wise events
- Node interface
- Multiple reboot
- De-duplication
- Physical address mismatch
- Authentication failure
- Connector down
- (Advanced Edition only)
- Scheduled maintenance

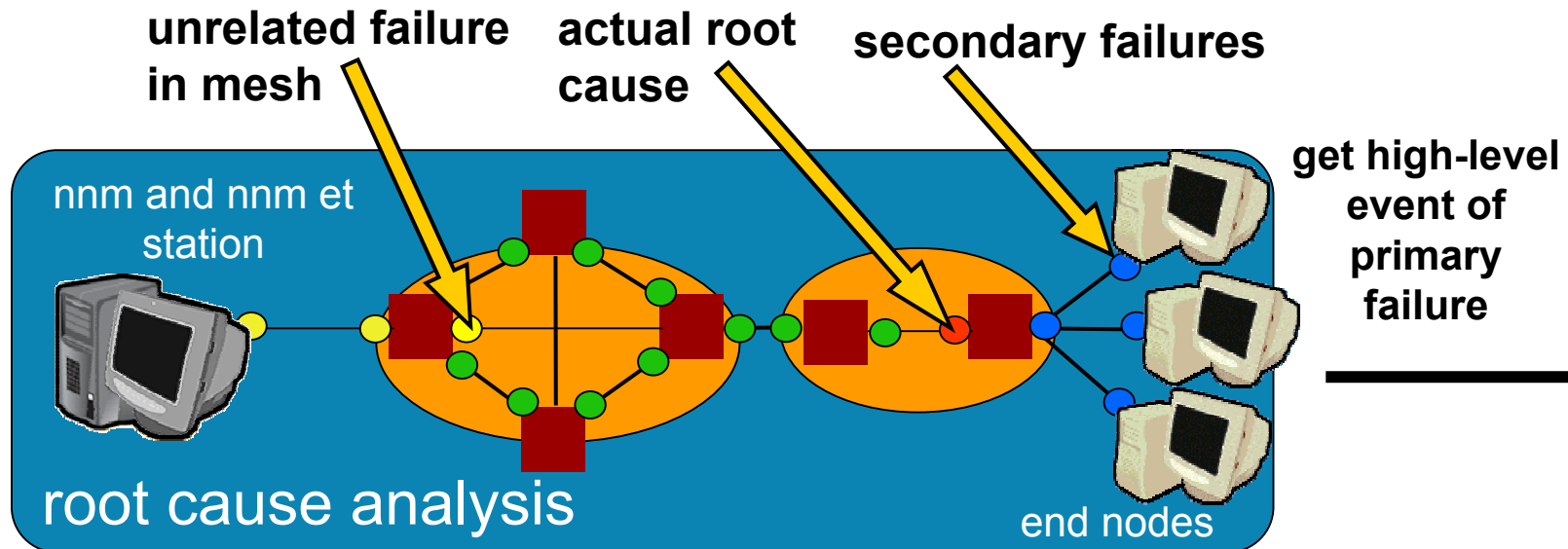


Topology Smart

- Based on accurate layer 2 and layer 3 path analysis (including meshed networks)
- example: NNM AE understands the mesh, therefore knows precisely why the end nodes are down

Ack	Cor	Severity	Date/Time	Source	Message
		Critical	Wed Mar 13 13:19:19	ntclnt04	Primary DNS INTERRUPTED Critical
		Major	Wed Mar 13 13:19:20	ntccatn02	WebService INTERRUPTED Major
✓	*	Warning	Wed Mar 13 13:19:20	ntclnt01	Node down
✓	*	Warning	Wed Mar 13 13:19:28	ntclnt04	Node down
✓	*	Warning	Wed Mar 13 13:19:20	15.6.96.0	Network status major (almost critical)
✓	*	Warning	Wed Mar 13 13:19:29	15.6.96.24	Network status major (almost critical)
✓	*	Normal	Wed Mar 13 13:19:50	ntccatn02	Node up
✓	*	Normal	Wed Mar 13 13:19:50	ntclnt04	Node up
✓	*	Normal	Wed Mar 13 13:19:50	ntclnt01	Node up
✓	*	Warning	Wed Mar 13 13:19:19	c4k2loop.fc.hp.com	Node status - MARGINAL
✓	*	Normal	Wed Mar 13 13:19:51	c4k2loop.fc.hp.com	Node up
✓	*	Warning	Wed Mar 13 13:19:52	ntclnt01	Node down
✓	*	Warning	Wed Mar 13 13:19:52	ntclnt04	Node down
✓	*	Warning	Wed Mar 13 13:19:53	15.6.96.0	Network status major (almost critical)
✓	*	Warning	Wed Mar 13 13:19:53	15.6.96.24	Network status major (almost critical)

320 Alarms - Critical:14 Major:66 Minor:58 Warning:61 Normal:121 (39 acknowledged)



Frame Relay Correlation

Frame Relay



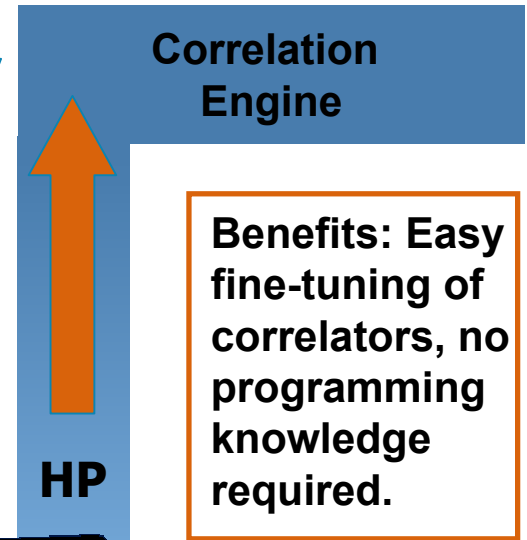
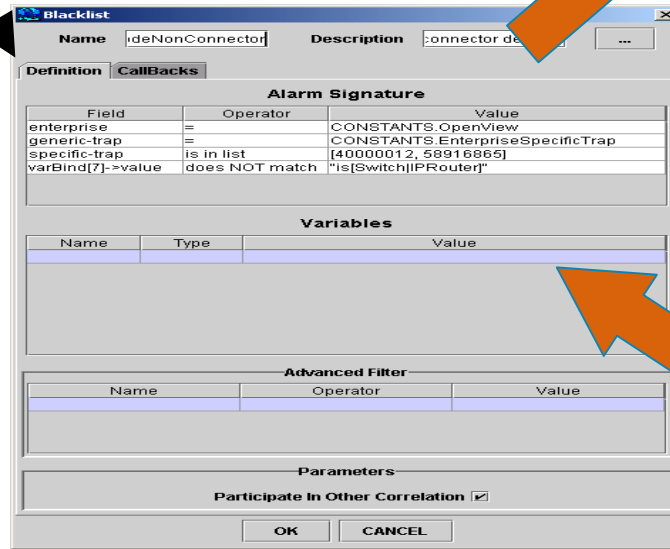
- Detects and reports problems with virtual connections
- Distinguishes between failures within the provider network and failures within the local network

Correlation Composer

Immediate customer value...with a custom fit



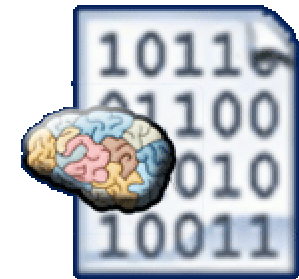
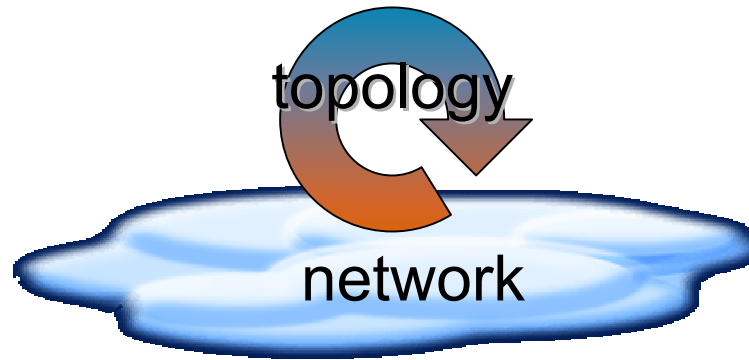
Customer can fine-tune out of the box correlator



Correlation Composer GUI

Active Problem Analyzer Starts the diagnostic process

Built-in Scenario Intelligence



Targeted Polling

- Situation aware
- Uses accurate and complete topology
- Collects additional information

State determination

- Situation aware
- Determines Problem State
- HSRP (requires NNM SPI for advanced routing)
- Adjacent node failures

For example: Cisco HSRP

Root cause HSRP events

Ack	Cor	Severity	Date/Time	Source	Message
		Critical	Wed Mar 13 13:19:19	stcint04	Primary HSRP Router down
		Warning	Wed Mar 13 13:19:20	stccats02	WebServer DOWN Major
		Warning	Wed Mar 13 13:19:20	stcint01	Node down
		Warning	Wed Mar 13 13:19:20	stcint04	Node down
		Warning	Wed Mar 13 13:19:20	15.6.96.0	Network status major (almost critical)
		Warning	Wed Mar 13 13:19:20	15.6.96.24	Network status major (almost critical)
		Normal	Wed Mar 13 13:19:50	stccats02	Node up
		Normal	Wed Mar 13 13:19:50	stcint04	Node up
		Normal	Wed Mar 13 13:19:50	stcint01	Node up
		Warning	Wed Mar 13 13:19:51	c4k2loop.fc.hp.com	Node status - marginal
		Normal	Wed Mar 13 13:19:51	c4k2loop.fc.hp.com	Node up
		Warning	Wed Mar 13 13:19:52	stcint01	Node down
		Warning	Wed Mar 13 13:19:52	stcint04	Node down
		Warning	Wed Mar 13 13:19:53	15.6.96.0	Network status major (almost critical)
		Warning	Wed Mar 13 13:19:53	15.6.96.24	Network status major (almost critical)

“Warning: HSRP Router down. Standby now active...”

Benefits:

- intelligent messages to operator
- understand the state of your service

contextual launch of detail view

- Is it ok/critical?
- What’s the risk of future failure?

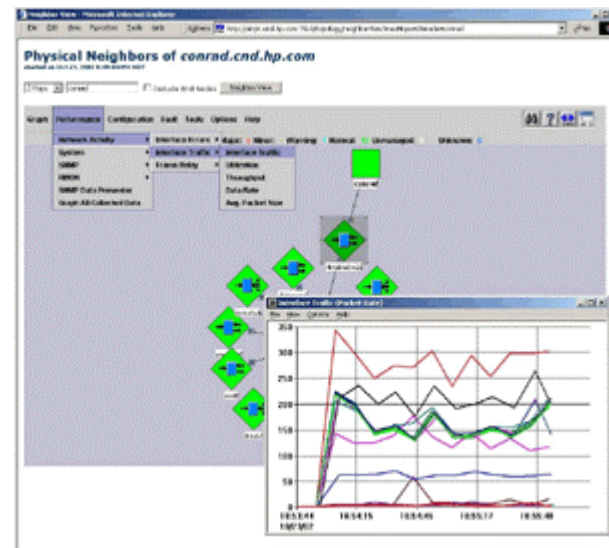
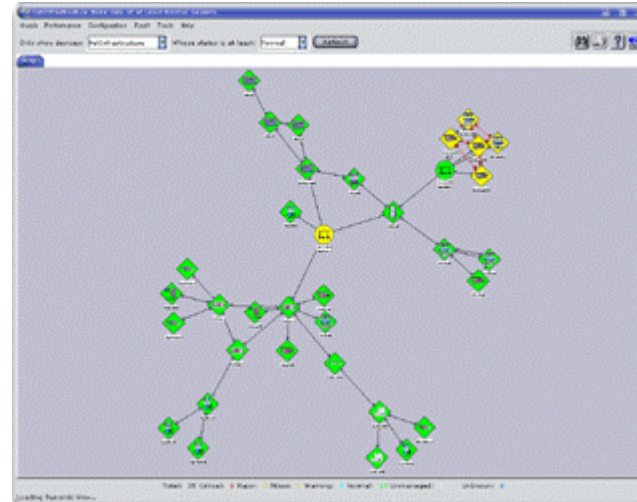
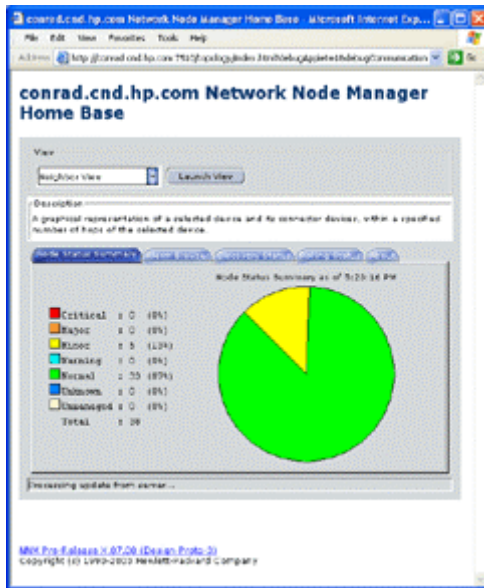
balance.cnd.hp.com HSRP Group Detail View
started on Sep 4, 2002 1:21:09 PM PDT

Routers in Group 1.0.0.3

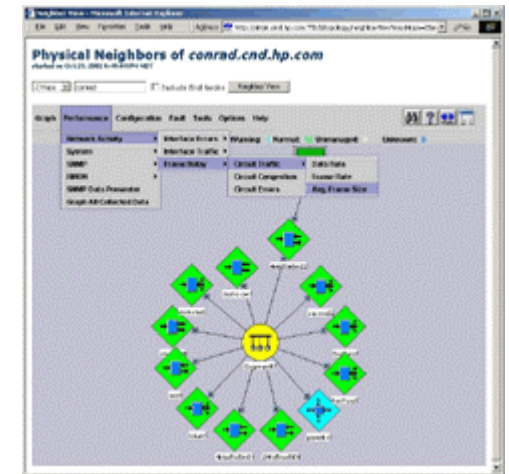
Router	IP Interface	Interface Status	HSRP State	Priority	Group Membership	Tracked Interface	Tracked Interface Status
hsrprouter1.cnd.hp.com	1.0.0.1	Normal	Active	110	1.0.0.3, 1.0.0.4	None	N/A
hsrprouter2.cnd.hp.com	1.0.0.2	Normal	Standby	90	1.0.0.3, 1.0.0.4	Serial 0	Critical
						Serial 1	Critical

State of HSRP Group

Views – get to the heart of your problem fast



**Benefits: Fast
troubleshooting**



Support the diagnosis process

balance.cnd.hp.com HSRP Group Detail View

Routers in Group 1.0.0.3

Router	IP	Interface	Interface Status	HSRP State	Priority	Group Membership	Tracked Interface	Tracked Interface Status
hrsprouer1.cnd.hp.com	1.0.0.1		Normal	Active	110	1.0.0.3, 1.0.0.4	None	N/A
hrsprouer2.cnd.hp.com	1.0.0.2		Normal	Standby	90	1.0.0.3, 1.0.0.4	Serial 0	Critical
							Serial 1	Critical

launch a view from Problem State display

Physical Neighbors of cisco3.cnd.hp.com

All Alarms Browser

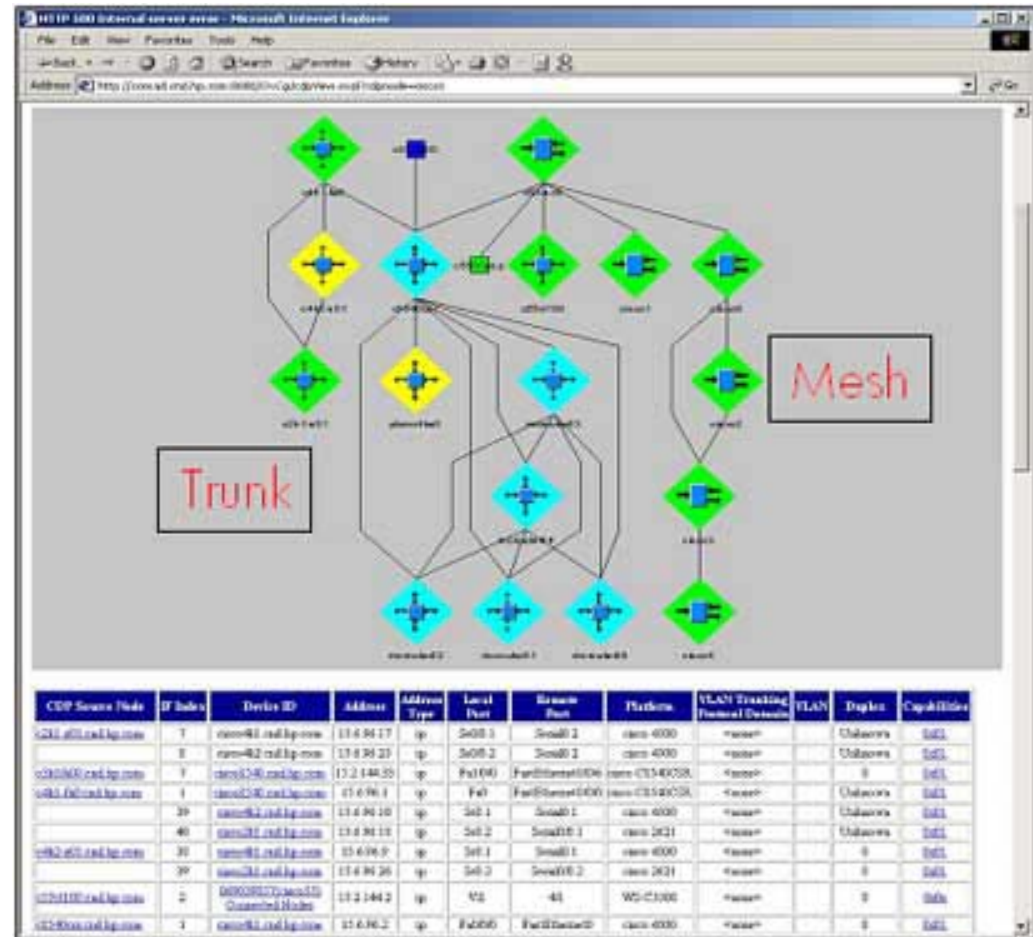
ack	Cor	Severity	Date/Time	Source	Message
		Critical	Wed Mar 13 13:19:19	ntelnt04	Primary DNS INTERRUPTED Critical
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✓	*	Normal	Wed Mar 13 13:19:50	ntelnt04	Node up
✓	*	Normal	Wed Mar 13 13:19:50	ntelnt01	Node up
✓	*	Warning	Wed Mar 13 13:19:19	c4k2loop.zc.hp.com	Node status - marginal
✓	*	Normal	Wed Mar 13 13:19:51	c4k2loop.zc.hp.com	Node up
✓	*	Warning	Wed Mar 13 13:19:52	ntelnt01	Node down
✓	*	Warning	Wed Mar 13 13:19:52	ntelnt04	Node down
✓	*	Warning	Wed Mar 13 13:19:53	15.6.96.0	Network status major (almost critical)
✓	*	Warning	Wed Mar 13 13:19:53	15.6.96.24	Network status major (almost critical)

320 Alarms - Critical:14 Major:66 Minor:50 Warning:61 Normal:121 (39 acknowledged)

launch a view from event browser

Neighbor View

- heterogeneous L2 view
- meshed networks
- trunked networks



HSRP View

- HSRP groups
- router interfaces
- group states (active/standby)

HSRP View - Microsoft Internet Explorer
Address: http://conrad.cnd.hp.com:7510/topology/hsrpView

All HSRP Groups
started on Oct 23, 2002 6:43:19 PM MDT

Graph Performance Configuration Fault Tools Help

Total: 2 Critical: 0 Major: 0 Minor: 0 Warning: 0 Normal: 2 Unmanaged: 0 Unknown: 0

15.2.132.1

HSRP View - Microsoft Internet Explorer
Address: http://conrad.cnd.hp.com:7510/topology/hsrpView?groupObjIDStr=1644d390-e5dd-71dc

HSRP Group Detail

Router and Interface Information for Group 10.97.255.1

Router	IP Interface	Interface Status
c2k3fa00.cnd.hp.com	10.97.255.3	Normal
c4k3-e0.cnd.hp.com	10.97.255.4	Normal

Refresh the browser for latest information.

HSRP View - Microsoft Internet Explorer
Address: http://conrad.cnd.hp.com:7510/topology/hsrpView?groupObjIDStr=1644d390-e5dd-71dc

HSRP Node Detail

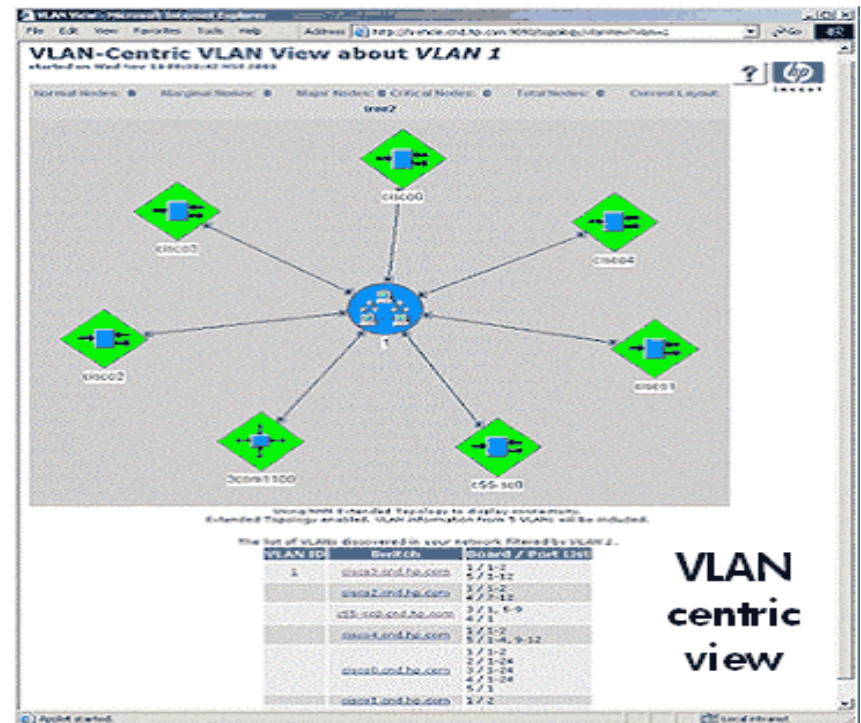
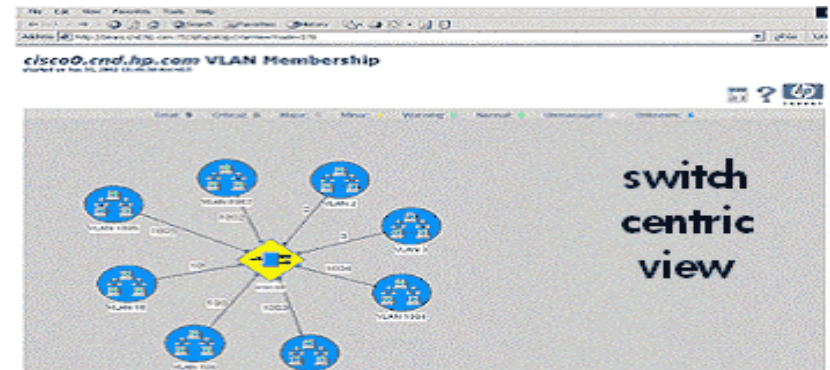
Interface and Group Information for Router c2k3fa00.cnd.hp.com

IP Interface	Interface Status	Group Membership
15.2.132.3	Normal	15.2.132.1
10.97.255.3	Normal	10.97.255.1

Refresh the browser for latest information.

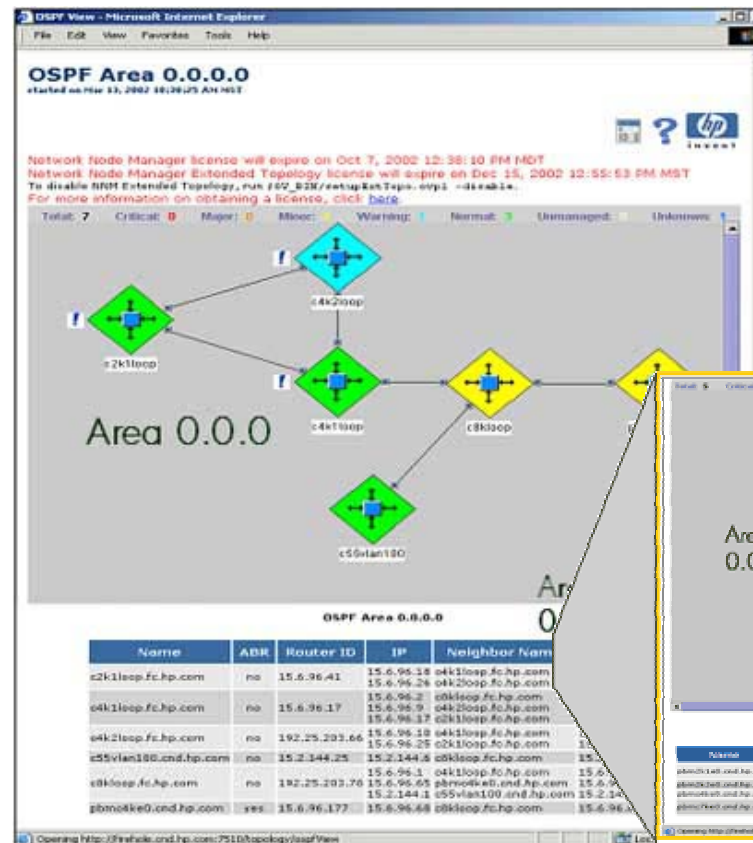
VLAN View

- table of all VLANs
 - which switches, interfaces, and ports participate in which VLAN
- know which VLANs are affected when problem on a switch
- troubleshoot a VLAN problem by seeing which switches participate in VLAN

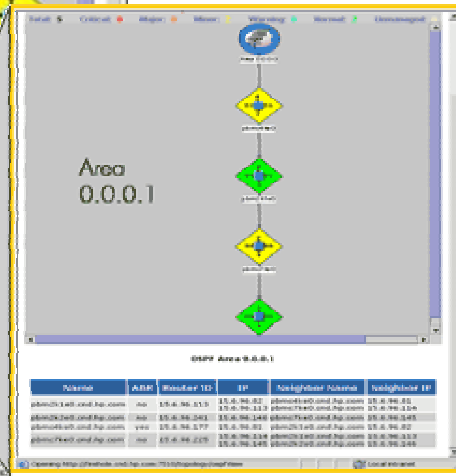


OSPF View

- graphical representation of an OSPF area
- table of routers, filtered by area, with router ID, IP addresses, and neighbors
- figure illustrates a pop-up of node details (status, uptime, description, etc.)



Area 0.0.1



Path Views

Problem Diagnosis - DP 6

Trek Type: **NetPath**

Endpoints:
 Probe: magma.cnd.hp.com
 Target: ntcInt01.cnd.hp.com

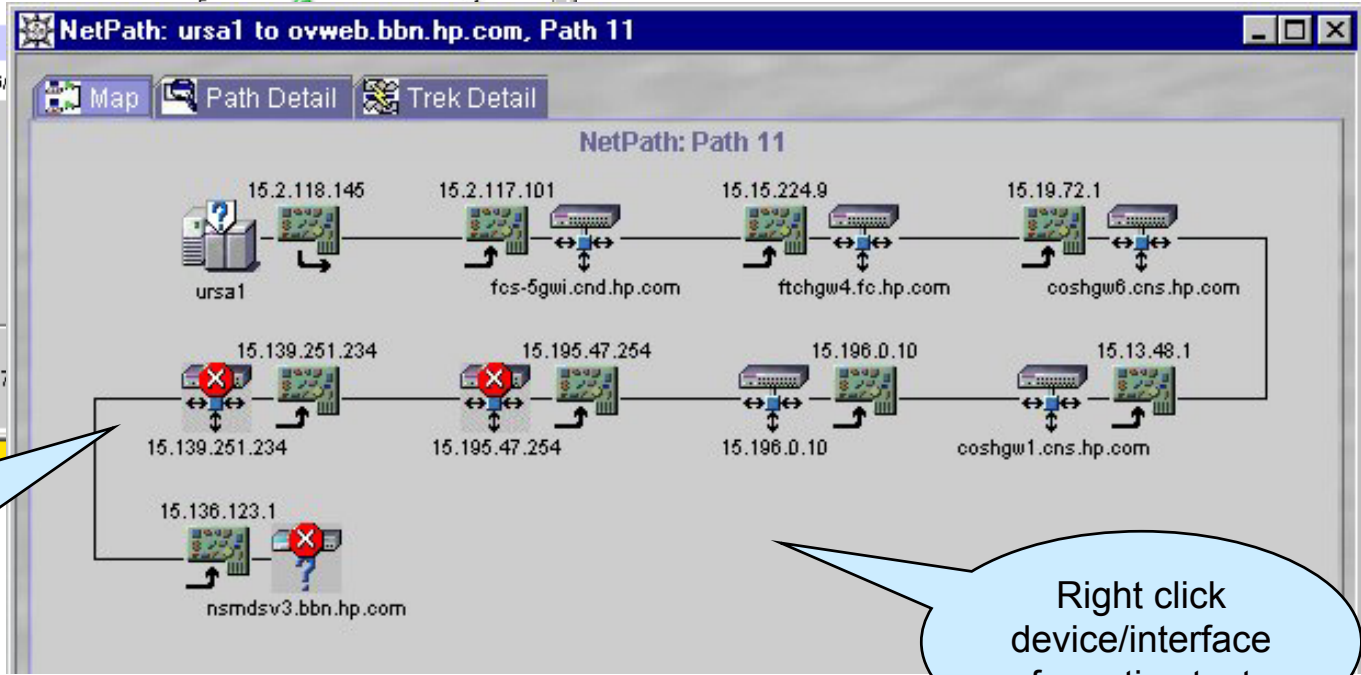
GO CANCEL

Trek Type Description
 Path detected by NetPath probe source

Double click a path

% Utilized	Path ID	Last Used	Hops	Present Status	Matching Path
-	Current	2/16/01 8:23 AM			
100.0	1	2/16/01 8:22 AM			
0.0	2	not used since 2/16/01			

Display current path and all paths between endpoints



Drill-down on one path

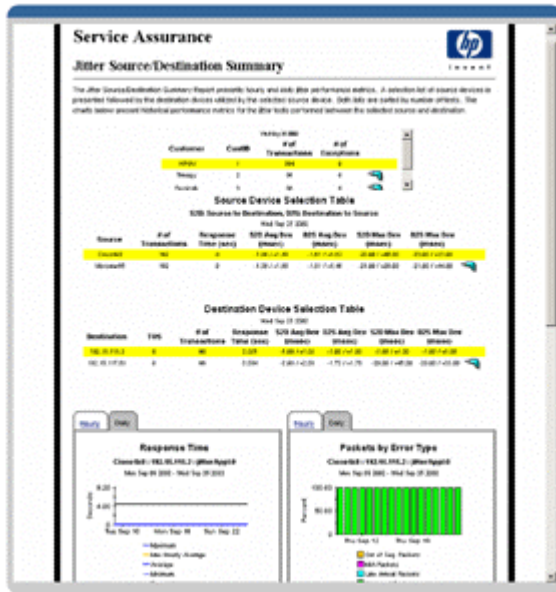
Right click device/interface for active test menu

Path Analysis

Integrated fault & performance

Advanced Edition

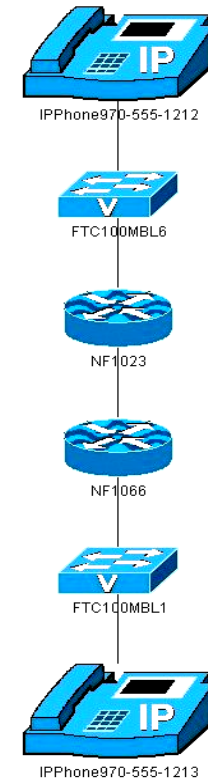
Performance Insight for Networks



Views shows layer 2 for more complete path analysis

- OVPI:
- Improved Ease-of-Use
 - Base-lining
 - IP QoS
 - Cisco CAR
 - IPF

Problem Diagnosis



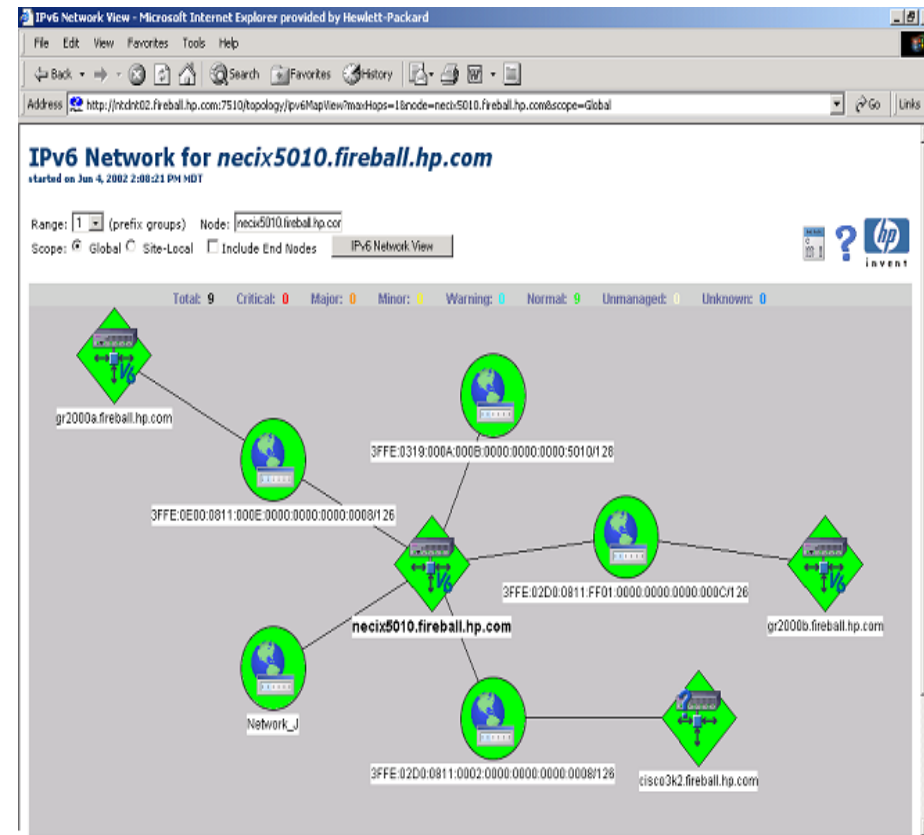
probe

probe

Benefits: Isolating performance problems in complex networks.

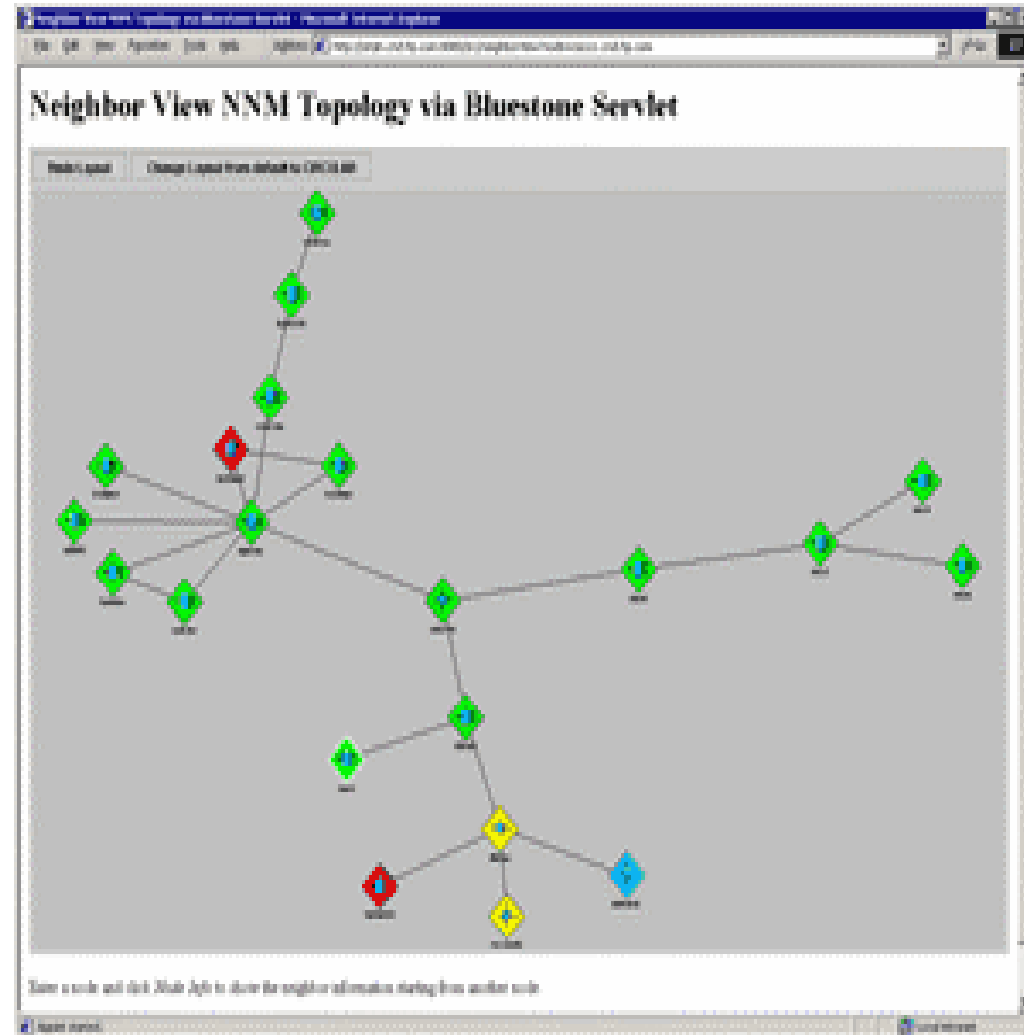
IPV6 View

- IPv6 devices discovered and polled (via ICMPv6 ping)
- IPv6 dynamic view shows layer 3 connectivity
- Hitachi, NEC, Juniper, & Cisco equipment supported
- Only dual-stacked (IPV4 & IPV6) routers supported



Dynamic Views

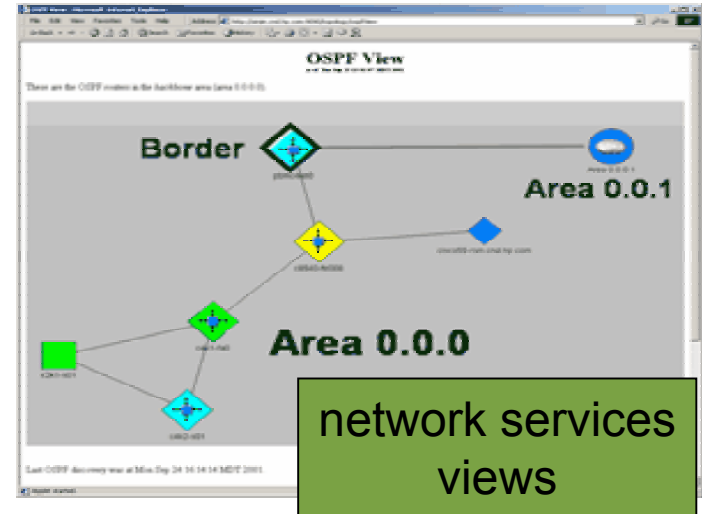
- Need a custom view?
- Create dynamic views as needed
- Based on
 - Device types
 - Device attributes



Prioritize the Problem

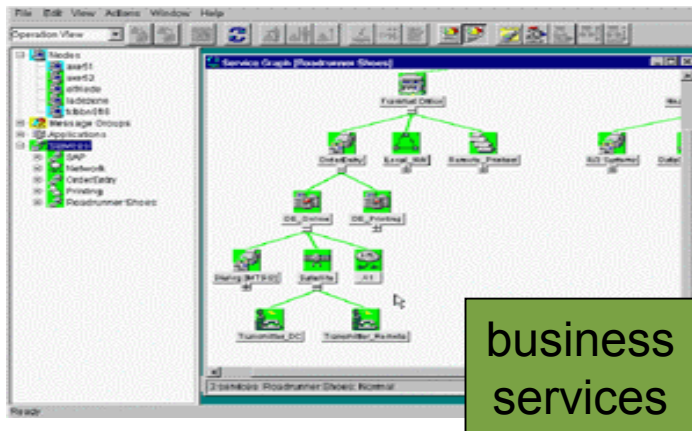
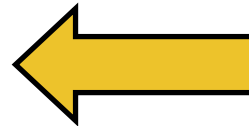
Operator understands network impact

- what's the health of network service:
(VLAN, OSPF, HSRP)
- redundant networks paths still working?
- trunks, meshes, OSPF areas, HSRP standby routers...



Operator understands business impact

- what systems & applications depend on these network paths
- what business services and customers are affected?

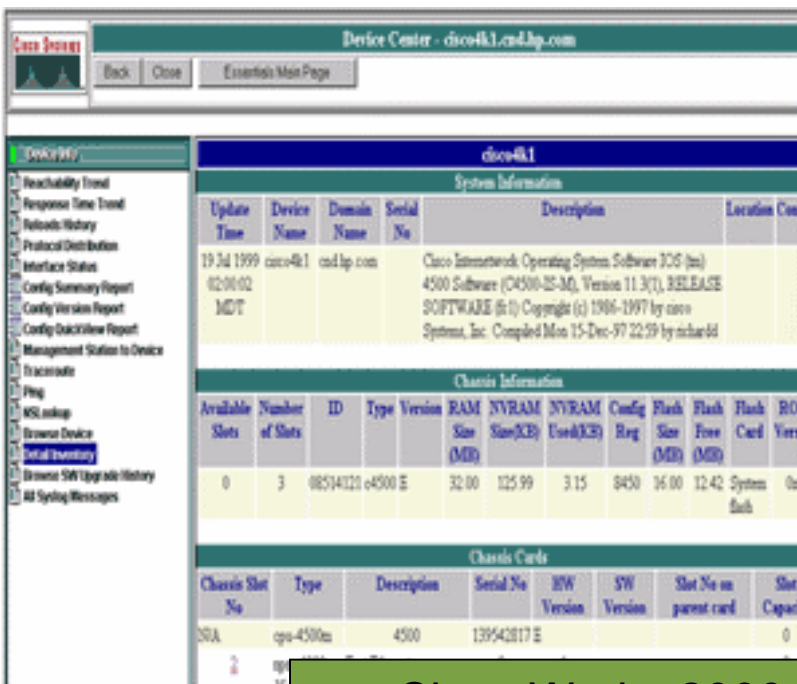


hp OpenView service navigator

Take Action

fix and verify

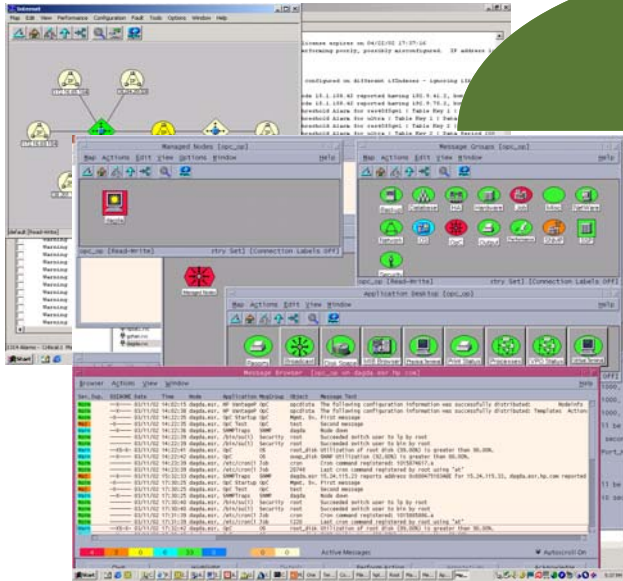
- launch device **element manager** for further investigation & corrective actions
- NNM & HP OpenView Operations **automated actions**
- Service Desk for **fix control & documentation**
- **check** NNM views – configuration changes happened?
 - missing PC added to VLAN?
 - new router added to OSPF area 0?



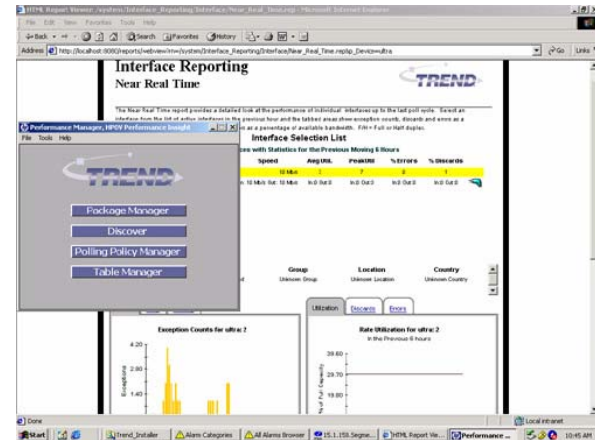
Cisco Works 2000 integration shipped w/nnm

Integration with NNM OVPI Integration

node list synchronization



threshold traps



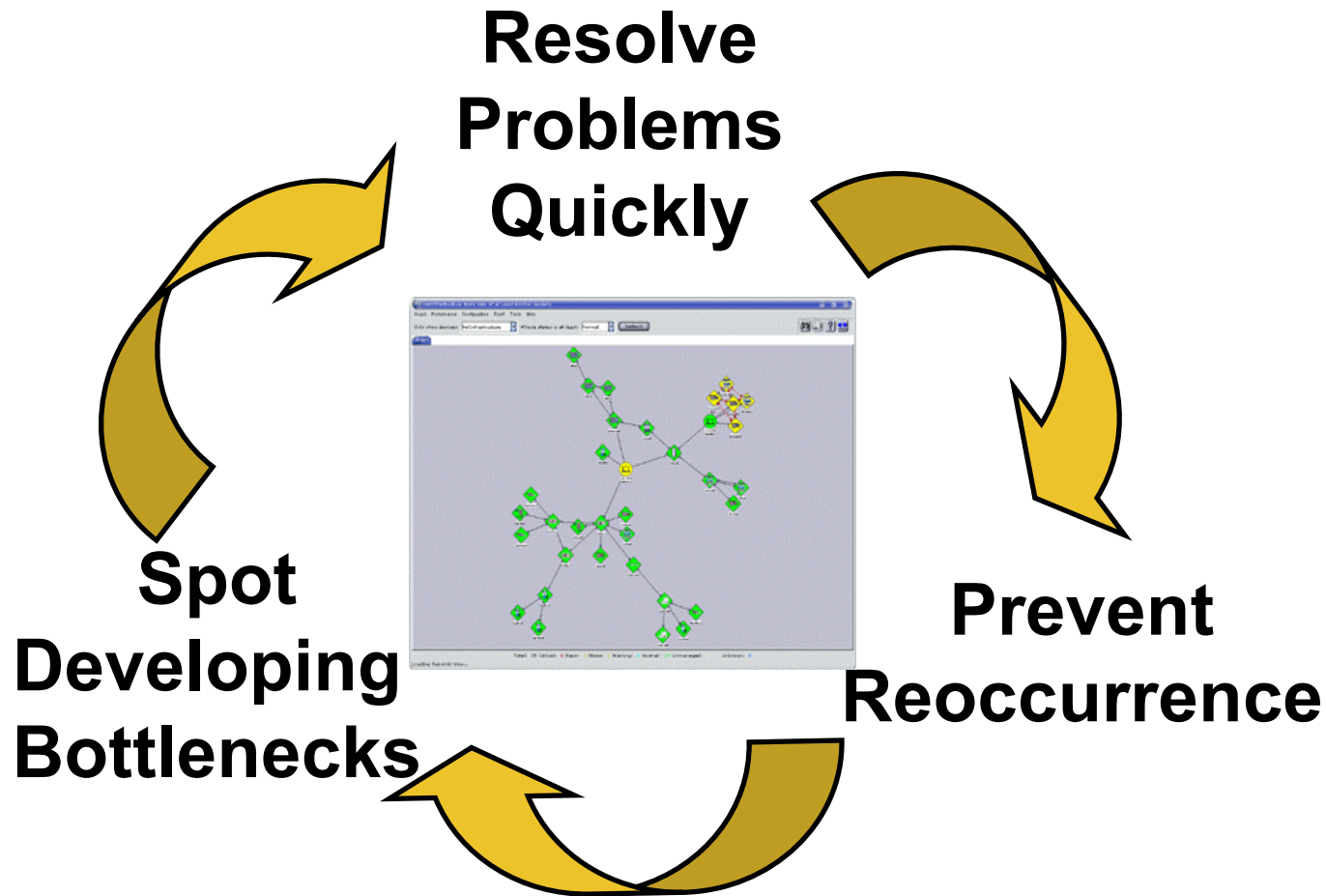
HP OpenView NNM/
HP OpenView Operations

HP OpenView PI



context based PI
report launching

Keeping Networks Healthy





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