NNM 8i
Let’s Get Down to Brass Tacks, How Much For the Ape?

Presented by Mike Peckar, Fognet Consulting
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Las Vegas, Nevada
Session Topics

• NNM 8i product roadmap and positioning
• Requirements
• Migration Considerations
• Product Architecture with details on:
  • Spiral Discovery
  • Network State Polling
  • Event Pipeline and Incidents
  • Causal Engine
  • Continuous Spiral Discovery
  • Performance SPI Features
  • Databases
• Assorted tips and tricks from the field
• MIMIC SNMP Simulator – NNM 8i migration tool
• Backup Slides
NNM 8i:

- Level 3 topology view
NNM 8i History

• NNMi 8.00 released 11/22/2007
  – Support for Windows and HP-UX only
  – NNMi 8.0 provided to existing NNM SE/AE customers on support free of charge
  – Entitlement for parallel deployment alongside NNM 7.x

• NNMi 8.01 released 2/13/2008
  – Support for Solaris, Linux added
  – NNM iSPI for Performance Support
  – Many feature enhancements over 8.00 (see relNotes)
Requirements

- **Windows**
  - Windows Server 2003 Enterprise x64 w/ SP2 or R2
  - Intel or AMD - Itanium Processor Family (IPF) **not** supported
  - Windows 32-bit operating systems **not** supported
  - Microsoft SNMP

- **HP-UX**
  - HP-UX 11iv3 (11.23) IPF
  - Mozilla Firefox 2.0.0.4 or later
  - Embedded database (postgres) or remote Oracle 10.0.2.0
  - Prerequisite OS & JAVA patches

- **Solaris**
  - 2.10 SPARC, intel architecture not supported

- **Linux**
  - RedHat Enterprise Server AS 4.0 or ES 4.0
  - 64-bit libstdc++ library dependencies

- **All**
  - Embedded database (postgres) local or remote Oracle 10.2.0.x
  - Client browsers: IE 7.0.5730.11+ OR Mozilla Firefox 2.0.0.11+ (IE 6, Safari no good)
NNM 8i vs 7.x

• NNM V1 through 7.x is OSI Level 3-centric
• NNM 8i is OSI Level 2-centric
• 8i is supported only on 64-bit hardware and OS
• Gone in 8i:
  – ipmap, ovw map, topology & object dbs
  – netmon and APA (7.x APA ≠ 8i APA)
  – All xnm* apps (mib browser, etc)
  – snmpCollect and reporting database
  – ECS-based event correlation (composer, manager)
• Retained in 8i:
  – Extended topology
    • Not all views available in 8.00, however
  – ovspmd
  – pmd (and ov_event subsystem)
    • Allows events to be forwarded to/from legacy nnn
NNM 8i vs 7.x

- 8i features to come?
  - Container and other ET views
  - Configuration entry points (causal engine, etc)
  - Distributed Poller, Syslog feature
  - Command line fault analysis tools (rnetstat, netcheck, natping…)
  - SNMP MIB Browser - MIMIC simulated agent MIB Browser:
6/7 – 8i Migration paths

• No upgrade direct migrations supported in 8.00
• HP recommends separate install/side by side evaluation
• HP plans to support 7.x at least through 2008
• Expect additional point versions of 7.x in ‘08
• “Migration tools to come”
  – Discovery options
  – SNMP configuration
  – SNMP events
  – Network polling
  – Device/Interface filters
  – Tools to migrate from 6.x/7.x
Architecture

• Elements
  – Web UI
  – RDBMS - embedded=postgres or oracle
  – J2EE Application Server (jboss)
    • Web Services
    • Classifier
    • Notification Bus
    • Event Pipeline
    • Causal Engine
    • Network State Poller
    • Continuous Spiral Discovery
    • Communication Protocol Support (SNMP, ICMP)
Architecture

• More details
  – SOA (service-oriented architecture) based integration interface
  – Classifier provides for automatic containerization and grouping (extended topology manager)
  – Notification bus ensures accurate and real-time updates
  – Event Pipeline provides high performance event correlation
  – Causal Engine provides advanced deterministic RCA
  – Network state poller with aggressive polling intervals
  – Continuous spiral discovery delivers hyper-accurate topology in dynamic environments
8i Architecture

- Events
- Topology and inventory
- Polls

- Spiral discovery
- Causal engine
- Network State poller
- Event pipeline
- Managed environment
- nnmtrapd
- NNM 6/7 events
- Classifier (ET)
- RDBMS topology inventory events performance

Notification Bus
7.X Architecture
For comparison
Architecture

• Continuous Spiral Discovery
  – Topology aware
  – Staged discovery
  – Proprietary MIB’s modeled
  – Level 2 and 3, Vlan, VPM, MPLS aware

• Network State Polling
  – Collects and correlates fault and performance data
  – Monitoring policies based on categorizations
  – Highly threaded and optimized (getbulk)

• Causal Engine
  – Topology and inventory aware
  – Actively re-polls to get tunnel-down and more global state data
  – Determines overall status and clears problems
Architecture

• Event Pipeline
  – Comprised of plug and play independent functions (stages):
    • Incident Receiver: Takes input from Causal Engine
    • Type Enforcement: Populates config’d incident, trap or event fields
    • Resolver: Checks topology for source node
    • Store Bulk: Logs incident to DB
    • Notification: Passes incidents to bus to inform NNM processes
    • Pairwise: Performs configured pairwise correlations
    • Rate: Performs configured rate count correlations
    • De-dup: Performs configured dedup correlations
    • Relate: Cancels incidents correlated by the Causal Engine
    • Actions: Performs configured actions
  – Event Pipeline receives events and supplies state to the Causal Engine
Architecture

• Causal Engine
  – Causality relationships/scenarios
    • Causality graphs define common network problems
    • Defined in a language file
    • Causality is heavily dependent on SysObjectID
  – Incident Reports
    • Outputs Incident Description; health of object; likely causes
  – Configuration Interface
    • Unexposed in 8.00 and 8.01
Architecture

- Causal Engine
  - Hypothetical Causality Graph

epd: excessive packet drop
cf: connection failure
dts: drop in TCP segment count
cr: congestion
su: server underutilization
sl: Ethernet segment load
ev1, ..., evn: various symptom events
Communication Configuration

– SNMP/ICMP Timeouts and retries
  • 1st retry is 100% of timeout, 2nd thru nth is 150% of previous value
  • If V2 & V1 supported, pollers will try V2 then V1
  • V1: 10 Sec + 4 retries = 2.2 min
  • V2: 10 Sec + 4 retries = 4.4 min

– Example:
  • 1st poll: NNM waits 100% (10 seconds)
  • 1st retry: NNM waits 150% of 10 seconds (15 seconds)
  • 2nd retry: NNM waits 150% of 15 seconds (22.5 seconds)
  • 3rd retry: NNM waits 150% of 22.5 seconds (33.75 seconds)
  • 4th retry: NNM waits 150% of 33.75 seconds (50.625 seconds)
  • 50.625 + 33.75 + 22.5 + 15 + 10 = 131.875 (2.2 min)
Communication Configuration

– Network Regions (Regions tab)
  • Specify Comm. Config for a subset of devices
  • By IP Address ranges (required)
  • Optionally specify SNMP Community strings
  • Optionally specify host name wildcards

– Specific Nodes (Specifics tab)
  • Specify Target Hostname and Preferred SNMP Address
Communication Configuration

- `nnmcommload.ovpl`
  - Reads NNM communication config data for nodes
    - `-proto SNMP|ICMP` – `host <hostname>`
  - Writes config data from a file
    - `-file <filename>`
    - File contains Target, Community String, Preferred Address
      <hostname>,,,
      <hostname>,<READ-ONLY string>,
      <hostname>,,<node address>
      <hostname>,<READ-ONLY string>, <node address>
Discovery

• Discovery Policies
  – Discover Everything
    • Set an autodiscovery rule as follows:
      – Ordering 500 (HP recommendation);
        » Higher numbers = higher precedence wrt other rules
      – Enable auto-discovery; enable discover any SNMP device
      – Enable discovery any Non-SNMP device
      – Create at least one IP Address Range
      – Do not add OID ranges; Add at least one discovery seed
  – Limit auto discovery
    • Set rules that use SNMP OID’s
    • Set rules that use limited IP address ranges
    • Set rules that disable auto-discovery for certain IP ranges
      – Equivalent of netmon.noDiscover
  – Do not use auto discovery
    • Do not set any auto-discovery rules (default)
Discovery

• General notes
  – Configure Communication Configuration
    • SNMP community not set to public by default
    • Verify using `nnmsnmpwalk -c <string> >node>`
  – Re-Discovery interval 24 hrs by default
    • Adjust via Control Group – rediscovery Interval
    • Minimum is 1 hour
  – Seeding
    • At least one seed is required
    • Optionally use `nnmloadseeds.ovpl` to externally load from a file
  – Name Resolution – 3-level hierarchy
    • Choose among these choices:
      – Short Name DNS (1st default)
      – FQDN
      – Short SNMP sysName (2nd default)
      – Full SNMP sysName
      – IP Address (3rd default)
  • `$DataDir/shared/nnm/conf/hostNoLookup.conf` – stops reverse lookups for hosts
  • `$DataDir/shared/nnm/conf/ipNoLookup.conf` - stops fwd lookups for IP addresses
Discovery

- Subnet connection rules allow NNM to connect interfaces on devices which do not run Layer 2 Discovery protocols, such as CDP.

- **WPA**: Widest Prefix Allowed

```
<table>
<thead>
<tr>
<th>Maximum Prefix</th>
<th>Valid Maximum Prefix Value</th>
<th>Number of Usable IPv4 Addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>14 (16-2=14)*</td>
<td>14</td>
</tr>
<tr>
<td>29</td>
<td>6 (8-2=6)*</td>
<td>6</td>
</tr>
<tr>
<td>30</td>
<td>2 (4-2=2)*</td>
<td>2</td>
</tr>
<tr>
<td>31</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
```
Discovery

• Verify/validate discovery
  – Global discovery status:
    • Help – About Network Node Manager
  – Node discovery status
    • Discovery state in node form: 3 values:
      – Newly Created (discovered, but polling not complete)
      – Discovery Completed
      – Re-discovery In Process (discovery actively polling node)
  – Seed discovery status
    • Discovery status column in discovery seeds tab
  – View results
    • View IP Addresses view or Nodes View
    • View Layer 2 Neighbors from Nodes view
  – Force a configuration poll
    • Can be done from GUI or using nmmconfigpoll.ovpl
Discovery

• Configuration Poll

Configuration Poll of 45.2.0.1
Connecting to server for configuration poll.
09:07:37  **** Starting configuration poll of node 45.2.0.1 ****
09:07:38  Supports SNMP V2C
09:07:38  Get NodeInfo. Found entries:1
09:07:38  Get MigratableAddresses retrieved no data because this device does not support a way of collecting data.
09:07:38  Get Addresses. Found entries:24
09:07:38  Get AddressesIFType. Found entries:23
09:07:43  0 IP Addresses created, 0 IP Addresses deleted
09:07:43  0 IP Addresses changed, 23 IP Addresses unchanged 1 IP Addresses skipped
09:07:58  Supports SNMP V2C
09:07:58  Get Interfaces. Found entries:123
09:07:58  Created 0 new Interfaces deleted 0 interfaces, 123 interfaces unchanged
09:07:58  BasicNodeAnalyzer has Completed
09:07:58  ArpCacheAnalyzer is working on node: MIMIC_sim1
09:07:58  XdpAnalyzer is working on node: MIMIC_sim1
09:07:58  Get XDP. Found entries:6
09:07:58  XdpAnalyzer has Completed
09:07:59  Get ArpCache. Found entries:101
09:07:59  SubnetAnalyzer has Completed
09:07:59  ArpCacheAnalyzer has Completed
09:07:59  **** End of configuration poll for node 45.2.0.1 ****
Discovery

• Discovery trace (MIMIC)
  – Note GetBulk calls
Discovery

• Discovery trace (MIMIC)
  – Agent-specific SNMP gets via ovet_daExtSw
State/Status Polling

• Modules
  – State Poller determines State
    • Pings IPv4 addresses
    • Checks each SNMP agent for responsiveness
    • Checks ifAdminStatus and ifOperStatus
    • Extendible to monitor unconnected interfaces (default=off)
    • States: Responding; Not Responding; Unset; Not Polled
  – Causal Engine determines Status
    • Inputs from State Poller, Discovery and incidents
    • Condition Listener – collect symptoms
    • Hypothesis Engine – Analysis to determine relationships
    • Blackboard – updates status and posts incidents
State/Status Polling

- *Status* is reflected in topology, not *State*
State/Status Polling

<table>
<thead>
<tr>
<th>Color</th>
<th>Meaning</th>
<th>Color</th>
<th>Meaning</th>
<th>Color</th>
<th>Meaning</th>
<th>Color</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unknown</td>
<td></td>
<td></td>
<td></td>
<td>Disabled or Unset</td>
<td></td>
<td>Unmanaged*</td>
</tr>
<tr>
<td></td>
<td>Normal</td>
<td></td>
<td>Major</td>
<td></td>
<td>No Status</td>
<td></td>
<td>Restricted*</td>
</tr>
<tr>
<td></td>
<td>Warning</td>
<td></td>
<td>Critical</td>
<td></td>
<td>Informational</td>
<td></td>
<td>Testing*</td>
</tr>
</tbody>
</table>

- **Status**

<table>
<thead>
<tr>
<th>Color</th>
<th>Meaning</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unknown</td>
<td>Indicates one of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The node has just been added to the NNM database and the Causal Engine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>has not yet calculated its health status.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The node is unreachable and cannot be polled.</td>
</tr>
<tr>
<td></td>
<td>Disabled or</td>
<td>Indicates the object has an administrative status of &quot;disabled&quot; or &quot;unset&quot;</td>
</tr>
<tr>
<td></td>
<td>Unset</td>
<td>This status prevents the device from being polled. As a result, the node</td>
</tr>
<tr>
<td></td>
<td></td>
<td>appears on maps, but is not monitored. When Spiral Discovery detects a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>change in administrative status, monitoring resumes. Administrative status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>is the current value stored in MIB II ifAdminStatus.</td>
</tr>
<tr>
<td></td>
<td>No Status</td>
<td>Indicates that NNM’s current configuration excludes this device from</td>
</tr>
<tr>
<td></td>
<td></td>
<td>monitoring so the Status is not calculated because the device is set to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unmanaged/Out Of Service.</td>
</tr>
<tr>
<td></td>
<td>Informational</td>
<td>Indicates the object has an administrative status of &quot;unmanaged&quot;.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Administrative status is the current value stored in MIB II ifAdminStatus.</td>
</tr>
<tr>
<td></td>
<td>Unmanaged*</td>
<td>Indicates the object has an administrative status of &quot;unmanaged&quot;.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Administrative status is the current value stored in MIB II ifAdminStatus.</td>
</tr>
<tr>
<td></td>
<td>Restricted*</td>
<td>Indicates the object has an administrative status of &quot;restricted&quot;.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Administrative status is the current value stored in MIB II ifAdminStatus.</td>
</tr>
<tr>
<td></td>
<td>Testing*</td>
<td>Indicates the object has an administrative status of &quot;testing&quot;.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Administrative status is the current value stored in MIB II ifAdminStatus.</td>
</tr>
</tbody>
</table>
# State/Status Polling

**Management Events - Status**

<table>
<thead>
<tr>
<th>Incident Configuration Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AddressNotResponding</td>
<td>Address is not responding to ICMP</td>
</tr>
<tr>
<td>ConnectionDown</td>
<td>Both (or all) ends of a connection not responding to SNMP</td>
</tr>
<tr>
<td>ConnectionPartiallyUnresponsive</td>
<td>Connection partially unresponsive. undiscovered device down</td>
</tr>
<tr>
<td>ImportantNodeorConnectionDown</td>
<td>Node not responding to ICMP or SNMP. Also: only one neighbor is down so NNM can’t determine if node or connection is down.</td>
</tr>
<tr>
<td>ImportantNodeUnmanageable</td>
<td>Node not responding to SNMP.</td>
</tr>
<tr>
<td>InterfaceDisabled</td>
<td>Interface explicitly disabled.</td>
</tr>
<tr>
<td>InterfaceDown</td>
<td>Interface is not responding to SNMP/ICMP polls.</td>
</tr>
<tr>
<td>ModifiedConnectionDown</td>
<td>Connection disconnected and/or moved and is not responding to SNMP.</td>
</tr>
<tr>
<td>NodeDown</td>
<td>NNM’s APA has determined the node is down based on:</td>
</tr>
<tr>
<td></td>
<td>100% of the addresses assigned to this node are unreachable</td>
</tr>
<tr>
<td></td>
<td>The SNMP agent installed on this machine is not responding</td>
</tr>
<tr>
<td></td>
<td>At least 2 neighbors have problems with connectivity to node</td>
</tr>
<tr>
<td>NodeOrConnectionDown</td>
<td>Not responding to ICMP or SNMP. Also: only one neighbor is down</td>
</tr>
<tr>
<td>NonSNMPNodeUnresponsive</td>
<td>Node down, or undiscovered device between node and NNM is down.</td>
</tr>
<tr>
<td>WANEdgeRouterUnresponsive</td>
<td>Router down, or undiscovered device between router and NNM down.</td>
</tr>
<tr>
<td>RateCorrelation</td>
<td>Template to measure number of incoming incidents within period.</td>
</tr>
<tr>
<td>DuplicateCorrelation</td>
<td>Template to configure deduplication attributes</td>
</tr>
</tbody>
</table>
## State/Status Polling

### Management Events – Performance and other

<table>
<thead>
<tr>
<th>Incident Configuration Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InterfacePerformanceCritical</td>
<td>Interface performance has reached a Critical severity.</td>
</tr>
<tr>
<td>InterfacePerformanceWarning</td>
<td>Interface performance has reached a Warning severity.</td>
</tr>
<tr>
<td>InterfaceInputDiscardRateHigh</td>
<td>Indicates a high input discard rate percentage.</td>
</tr>
<tr>
<td>InterfaceInputErrorRateHigh</td>
<td>Indicates a high input error rate percentage.</td>
</tr>
<tr>
<td>InterfaceInputUtilizationHigh</td>
<td>Indicates a high input utilization percentage.</td>
</tr>
<tr>
<td>InterfaceInputUtilizationLow</td>
<td>Indicates a low input utilization percentage.</td>
</tr>
<tr>
<td>InterfaceOutputDiscardRateHigh</td>
<td>Indicates a high output discard rate percentage.</td>
</tr>
<tr>
<td>InterfaceOutputErrorRateHigh</td>
<td>Indicates a high output error rate percentage.</td>
</tr>
<tr>
<td>InterfaceOutputUtilizationHigh</td>
<td>Indicates a high output utilization percentage.</td>
</tr>
<tr>
<td>InterfaceOutputUtilizationLow</td>
<td>Indicates a low output utilization percentage.</td>
</tr>
<tr>
<td>LicenseExpired</td>
<td>NNM license has reached expiration.</td>
</tr>
<tr>
<td>LicenseMismatch</td>
<td>License capacity doesn’t match Perf SPI license capacity.</td>
</tr>
<tr>
<td>LicenseNodeCountExceeded</td>
<td># of discovered nodes exceeds the licensed managed node count.</td>
</tr>
</tbody>
</table>
State/Status Polling

• Set default monitoring rules attributes:
  – Interval, Enable ICMP, Enable SNMP
  – Poll unconnected interfaces (disabled by default)
  – Poll Interfaces hosting IP Addresses
    • Enabled by default for “Routers” node group
    • Any unconnected interface that addresses associated with it
    • Any unconnected If with ifAdminStatus and ifOperStatus set
  – (PerfSPI): Enable performance monitoring
  – Performance polling interval

• Set Interface and Node monitoring rules
  – Same set of attributes above
  – Added attributes for Node|Interface Group & Ordering
  – Ordering precedence: Interface – Node – Default

• Ad-hoc status poll from command line:
  – nnmstatuspoll.ovpl –node <name|IP> -t <sec> -v
Monitoring Configuration

• Interface Group Configuration
  – Column Headings:
    • Or: Order
    • EIPAFP: Enable ICMP Ping Addr Fault Polling
    • ESAaIFP: Enable SNMP Agent & Interface Fault Polling
    • PUI: Poll Unconnected Interfaces
    • PIHIA: Poll Interfaces Hosting IP Addresses
    • ESIPP: Enable SNMP Interface Performance Polling
  – Default monitoring configuration settings:

![Interface Settings](image-url)
Monitoring Configuration

• Node Group Configuration
  – Column headings:
    • Or: Order
    • EIPAFP: Enable ICMP Ping Addr Fault Polling
    • ESAaIFP: Enable SNMP Agent & Interface Fault Polling
    • PUI: Poll Unconnected Interfaces
    • PIHIA: Poll Interfaces Hosting IP Addresses
    • ESIPP: Enable SNMP Interface Performance Polling
  – Default monitoring configuration settings:
Filters

- **Old Old filters (nnm 7.x and Earlier):**
  - `$OV_CONF/C/filters` file
- **Old filters (NNM 7.x only):**
  - `$OV_CONF/nnmet/topology/filter/TopoFilters.xml`
  - `$OV_CONF/nnmet/paConfig.xml`
- **New filters**
  - In DB – configured only through GUI
  - Defaults: Management stations; Node groups; Interface Groups

### View Filter Possibilities

<table>
<thead>
<tr>
<th>Filter</th>
<th>View: Object Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>NNM 6.x/7.x Management Stations</td>
<td>Incident</td>
</tr>
<tr>
<td><em>View NNM 6.x and 7.x Management Stations</em></td>
<td>X</td>
</tr>
<tr>
<td>Node Groups</td>
<td></td>
</tr>
<tr>
<td><em>Node Group Filters</em></td>
<td></td>
</tr>
<tr>
<td>Interface Groups</td>
<td></td>
</tr>
<tr>
<td><em>Interface Group Filters</em></td>
<td></td>
</tr>
</tbody>
</table>
Filters

- Filter Config:

- Device profiles:
Filters

- Device Profiles
  - OID dependent
  - Force Device to: Router; Switch; Switch & router; End Node;
  - Interface reindexing Type:
    - Choose which attribute indicates change:
      - ifIndex; ifName; ifDescr; ifAlias; ifName & ifDescr
Incidents

- Incident sources
  - Causal Engine
    - Origin = Management Software
  - NNM events
    - Forwarded from NNM 6.x and 7.x
  - SNMP Traps
Incidents

- Incident Form
  - Severity; Priority; Lifecycle; Assigned To; Source Node/Object; Category; Family; Origin
  - Correlation; Message; Notes; Name; Dup Count; RCA Active; Corr Notes; 5 time stamps
  - View ALL Incidents: Select Custom View; ALL filter
Incidents

• **Severity**
  - Normal, Warning, Minor, Major, Critical

• **Lifecycle States:**
  - Registered, In-progress, Completed, Closed

• **Priority States:**
  - None (5), Low (4), Medium (3), High (2), Top (1)

• **Category:**
  - Accounting*, App Status, Config, Fault, Perf, Security, Status

• **Family:**
  - Addr, Agg Port, Board, Connection, Corr, HSRP, IF, Node, OSPF

• **Origin:**
  - Mgmt Software, Manual, Remote, SNMP, Syslog

• **Correlation Nature:**
  - Root, Secondary, Symptom (trap), Stream (dedup, rate or pairwise)

* = not used by NNM
## Incidents

- **Management Events**
  - Faults
  - Performance

### Management Events

<table>
<thead>
<tr>
<th>Event</th>
<th>Status</th>
<th>Severity</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplicate Correlation</td>
<td>✔</td>
<td>Warning</td>
<td>Correlation</td>
</tr>
<tr>
<td>Interface Input Discard Rate High</td>
<td>-</td>
<td>Critical</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Input Error Rate High</td>
<td>-</td>
<td>Critical</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Input Utilization High</td>
<td>-</td>
<td>Critical</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Input Utilization Low</td>
<td>-</td>
<td>Minor</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Input Utilization None</td>
<td>-</td>
<td>Minor</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Output Discard Rate High</td>
<td>-</td>
<td>Critical</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Output Error Rate High</td>
<td>-</td>
<td>Critical</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Output Utilization High</td>
<td>-</td>
<td>Critical</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Output Utilization Low</td>
<td>-</td>
<td>Minor</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Output Utilization None</td>
<td>-</td>
<td>Minor</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Performance Critical</td>
<td>✔</td>
<td>Critical</td>
<td>Interface</td>
</tr>
<tr>
<td>Interface Performance Warning</td>
<td>✔</td>
<td>Warning</td>
<td>Interface</td>
</tr>
<tr>
<td>Rate Correlation</td>
<td>✔</td>
<td>Warning</td>
<td>Correlation</td>
</tr>
</tbody>
</table>

- **Address Not Responding**
- **Connection Down**
- **Connection Partially Unresponsive**
- **Modified Connection Down**
- **Important Node Or Connection Down**
- **Important Node Unmanageable**
- **Interface Disabled**
- **Interface Down**
- **Node Down**
- **Node Or Connection Down**
- **Non SNMP Node Unresponsive**
## Incidents

### Management Events - faults

<table>
<thead>
<tr>
<th>Name</th>
<th>En</th>
<th>Severity</th>
<th>Ca</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>AddressNotResponding</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Address</td>
</tr>
<tr>
<td>ConnectionDown</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Connection</td>
</tr>
<tr>
<td>ConnectionPartiallyUnresponsive</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Connection</td>
</tr>
<tr>
<td>ModifiedConnectionDown</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Connection</td>
</tr>
<tr>
<td>ImportantNodeOrConnectionDown</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Node</td>
</tr>
<tr>
<td>ImportantNodeUnmanageable</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Node</td>
</tr>
<tr>
<td>InterfaceDisabled</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Interface</td>
</tr>
<tr>
<td>InterfaceDown</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Interface</td>
</tr>
<tr>
<td>NodeDown</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Node</td>
</tr>
<tr>
<td>NodeOrConnectionDown</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Node</td>
</tr>
<tr>
<td>NonSNMPNodeUnresponsive</td>
<td>✓</td>
<td>✗ Critical</td>
<td></td>
<td>Node</td>
</tr>
</tbody>
</table>

- Address fails ICMP
- Both ends fail SNMP
- Undiscovered device in connection down
- Connection fails SNMP or was moved
- Fails ICMP & SNMP & 1 neighbor down
- Fails SNMP
- ifAdmin status = disabled
- Fails SNMP and/or ICMP
- All Ifs & Mgmt Addr down & >1 neighbors
- All Ifs & Mgmt down & only 1 neighbor
- Node down or undiscovered device down
Incidents

- **Example: LinkDown**

  - Source: SNMP Trap, Category: Fault; Family: Interface
  - Severity: Critical; Lifecycle: Registered; Correlation Nature: Symptom
Incidents

- Example:
  - Node Down

- Details:
Incidents

• `nnmincidentcfg.ovpl`
  – Equivalent of `xnmevents` – `load` (trap macros from MIB)
  – `nnmincidentcfg.ovpl -loadTraps "C:\Cisco Mibs\CISCO-VTP-MIB.my"

• `nnmloadmib`
  – Equivalent of `xnmloadlib` (Load MIBs for all SNMP apps)

• `nnmconfigexport --e incident`
  – Backup/export incident configuration to xml schema

• `nnmincidentcfg.ovpl`
  – Equivalent of `xnmevents` – `load` (trap macros from MIB)

• `nnmdumpevents`
  – dump contents of event db (equivalent of `ovdumpevents`)
    usage: [-f <filename>] [-t] [-l <minutes>][-c | -s <streamName>]
    [-d <database pathName>]


Incidents

• nnmtrapd
  – Equivalent to ovtrapd in previous versions
  – -W -b 2000 -r 30 suppresses subsequent traps if more than 2000 are received within 30s

• nnmtrapd.conf
  – Block traps from sources via ip range or OID

• pmd
Performance SPI
Performance SPI

**Perf SPI**
- Fixed collection – network only
- Limited report changes
- Retention 9 weeks only
- Specialized cube storage
- 1 min polling – can enhance PI’s collection
- Feeds PI – *integration in 1.0*

**PI**
- Customizable collection – cross domain
- Full report authoring
- Long retention
- Full data warehouse
- 5 min polling (for now)
- Can consolidate multiple Perf SPIs
Performance SPI

• Report Types
  – Dashboard
  – Headline
  – Monthly Heat Chart
  – Calendar
  – Top Ten
  – Most Changed
  – Data Explorer
Performance SPI

Top 5 Node Vendors by Volume (Last Day)

<table>
<thead>
<tr>
<th>Node Vendor</th>
<th>Volume (Packets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme (28 / 130)</td>
<td>16471709</td>
</tr>
<tr>
<td>Cisco (3 / 8)</td>
<td>2524563</td>
</tr>
<tr>
<td>Intel (3 / 4)</td>
<td>2409465</td>
</tr>
<tr>
<td>Farallon Computing (2 / 4)</td>
<td>65753</td>
</tr>
<tr>
<td>Alcatel-Lucent (2 / 14)</td>
<td>0</td>
</tr>
</tbody>
</table>

30-Day Volume (by Vendor)

Top 5 Nodes by Utilization Exceptions (Last Day)

<table>
<thead>
<tr>
<th>Node</th>
<th>Utilization Exceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIMIC Sim agent 22</td>
<td>0</td>
</tr>
<tr>
<td>MIMIC Sim agent 25</td>
<td>0</td>
</tr>
<tr>
<td>MIMIC Sim agent 20</td>
<td>0</td>
</tr>
<tr>
<td>MIMIC Sim agent 31</td>
<td>0</td>
</tr>
<tr>
<td>MIMIC Sim agent 35</td>
<td>0</td>
</tr>
</tbody>
</table>

30-Day Utilization (All Interfaces)

Top 5 Nodes by Discard Exceptions (Last Day)

<table>
<thead>
<tr>
<th>Node</th>
<th>Discard Exceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIMIC Sim agent 22</td>
<td>0</td>
</tr>
</tbody>
</table>

30-Day Discard Rate (All Interfaces)
Performance SPI

• Report Types
Web Interface

• Primary URL: https://server_name/nnm
• Ports used:
  – jboss.http.port=80
  – jboss.http.port=8004
  – jboss.jnp.port=1099
  – jboss.https.port=443
  – jboss.rmi.port=1098
  – jboss.jrmp.port=4444
  – jboss.pooled.port=4445
  – jboss.socket.port=4446
  – jboss.bisocket.port=4457
  – jboss.ws.port=8083
  – jboss.ejb3.port=3873
• Port Configuration:
  – $OV_DATA_DIR/shared/nnm/conf/nnm.ports.properties
Web Interface

- **JBoss Troubleshooting**
  - Footprint/heap size - Config files:
    - `%INSTALLED_DIR%\shared\nnm\conf\ovjboss` `Ovjboss.jvm/properties` (2GB XP Pro):

      ```
      # JVM Memory parameters
      # -Xms: Initial Java Heap Size
      # -Xmx: Maximum Java Heap Size
      # -Xms25m
      -Xmx1024m

      # Permanent Generation JVM heap parameters - default to a fixed size of 128 MB
      # -XX:PermSize=56m
      -XX:MaxPermSize=100m
      ```

  - Logfiles: `\log\nnm\jbossServer.log`, `ovjboss.log`
Web Interface

- **JBoss Memory footprint:**
  - Shown: 32 Bit, XP Pro, 2GB
    - 32 nodes, 2000 interfaces (sim)
  - Win 2003 Ent x64 SP2
    - 926 managed nodes (sim)
  - ovjboss takes 1.2G memory

<table>
<thead>
<tr>
<th>Image Name</th>
<th>PID</th>
<th>User Name</th>
<th>CPU</th>
<th>Mem Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>nmcbmgr.exe</td>
<td>2088</td>
<td>SYSTEM</td>
<td>0</td>
<td>5,280 K</td>
</tr>
<tr>
<td>nmccmd.exe</td>
<td>4220</td>
<td>SYSTEM</td>
<td>0</td>
<td>4,223 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>228</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,795 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>648</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,772 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>748</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,792 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>856</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,832 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>1112</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,920 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>1764</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,780 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>1960</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,788 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>2124</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,792 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>2224</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,796 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>2340</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,788 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>2616</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,772 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>2776</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,680 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>2892</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,808 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>3012</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,820 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>3144</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,812 K</td>
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<tr>
<td>ovjAgent.exe</td>
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<td>SYSTEM</td>
<td>0</td>
<td>7,804 K</td>
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<tr>
<td>ovjAgent.exe</td>
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<td>SYSTEM</td>
<td>0</td>
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<td>ovjAgent.exe</td>
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<td>ovjAgent.exe</td>
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<td>SYSTEM</td>
<td>0</td>
<td>7,800 K</td>
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<td>4068</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,828 K</td>
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<td>4092</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,808 K</td>
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<td>ovjAgent.exe</td>
<td>5936</td>
<td>SYSTEM</td>
<td>0</td>
<td>8,112 K</td>
</tr>
<tr>
<td>ovjAgent.exe</td>
<td>6128</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,804 K</td>
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<tr>
<td>ovjAgent.exe</td>
<td>6140</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,804 K</td>
</tr>
<tr>
<td>ovjBridge.exe</td>
<td>4872</td>
<td>SYSTEM</td>
<td>0</td>
<td>6,252 K</td>
</tr>
<tr>
<td>ovj_dhsnpex...</td>
<td>5164</td>
<td>SYSTEM</td>
<td>0</td>
<td>41,740 K</td>
</tr>
<tr>
<td>ovj_discoA.exe</td>
<td>5004</td>
<td>SYSTEM</td>
<td>0</td>
<td>13,536 K</td>
</tr>
<tr>
<td>ovj_discoC.exe</td>
<td>5176</td>
<td>SYSTEM</td>
<td>0</td>
<td>12,372 K</td>
</tr>
<tr>
<td>ovj_helpserv....</td>
<td>4992</td>
<td>SYSTEM</td>
<td>0</td>
<td>7,996 K</td>
</tr>
<tr>
<td>ovjboss.exe</td>
<td>2208</td>
<td>SYSTEM</td>
<td>01</td>
<td>385,724 K</td>
</tr>
<tr>
<td>ovsmqd.exe</td>
<td>860</td>
<td>SYSTEM</td>
<td>0</td>
<td>4,755 K</td>
</tr>
<tr>
<td>pmc.exe</td>
<td>3476</td>
<td>SYSTEM</td>
<td>0</td>
<td>6,132 K</td>
</tr>
<tr>
<td>postgres.exe</td>
<td>2656</td>
<td>nmsdbmgr</td>
<td>00</td>
<td>8,788 K</td>
</tr>
<tr>
<td>postgres.exe</td>
<td>3208</td>
<td>nmsdbmgr</td>
<td>00</td>
<td>2,172 K</td>
</tr>
<tr>
<td>postgres.exe</td>
<td>3764</td>
<td>nmsdbmgr</td>
<td>00</td>
<td>5,148 K</td>
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<td>nmsdbmgr</td>
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<td>5360</td>
<td>nmsdbmgr</td>
<td>00</td>
<td>5,084 K</td>
</tr>
<tr>
<td>postgres.exe</td>
<td>5400</td>
<td>nmsdbmgr</td>
<td>00</td>
<td>3,375 K</td>
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<td>postgres.exe</td>
<td>7476</td>
<td>nmsdbmgr</td>
<td>00</td>
<td>5,668 K</td>
</tr>
<tr>
<td>postgres.exe</td>
<td>9884</td>
<td>nmsdbmgr</td>
<td>00</td>
<td>3,840 K</td>
</tr>
</tbody>
</table>
Troubleshooting

• Process Log files
  – %INSTALL_DIR%\Data\Log
  • nmsdbmgr.log, ovjboss.log, ovspmd.log, etc

jvmArgs[25]: -XX:+HeapDumpOnCtrlBreak
jvmArgs[26]: -XX:+HeapDumpOnOutOfMemoryError
jvmArgs[27]: -XX:HeapDumpPath=nmm.hprof
jvmArgs[28]: -Dsun.rmi.dgc.client.gcInterval=3600000
jvmArgs[29]: -Dsun.rmi.dgc.server.gcInterval=3600000
jvmArgs[30]: -Dpython.verbose=error
jvmArgs[31]: -Djboss.http.port=80
jvmArgs[32]: -Djboss.jnp.port=1099
jvmArgs[33]: -Djboss.https.port=443
jvmArgs[34]: -Djboss.rmi.port=1098
jvmArgs[35]: -Djboss.jrmp.port=4444
jvmArgs[36]: -Djboss.pooled.port=4445
jvmArgs[37]: -Djboss.socket.port=4446
jvmArgs[38]: -Djboss.bisocket.port=4457
jvmArgs[39]: -Djboss.ws.port=8083
jvmArgs[40]: -Djboss.ejb3.port=3873
appArgs[0]: -c
appArgs[1]: nms
appArgs[2]: -b
appArgs[3]: 0.0.0.0
/DE/COMMON/util_libs/src/ovutil/ExecJava.cpp:355 Can't create Java Virtual Machine: JNI_CreateJavaVM() returned -4
Troubleshooting

• Windows ovpl output to a file:
  Use complete path to perl and program to work around this:
  C:\Program Files\HP OpenView\support>"%NnmInstallDir%\nonOV\perl\a\bin\perl.exe"
  "%NnmInstallDir%\support\dumpstatepollerjmx.ovpl" -all >a.txt

• nnmprintcounts.ovpl (support dir)
  – Equivalent of legacy ovtopodump -L

• nnmmbcapture.ovpl (support\mibcapture dir)
  – Captures agents responses to SNMP OID’s in oids.txt file for nodes in hosts.txt file

•
MIMIC SNMP Simulator

- 20,000 SNMP agents in one workstation
- Easy to compare / migrate from NNM 7 to NNM 8i
- SNMPv1, v2 and v3, RMON 2, IPv6
- Cisco/IOS, TL1, IPMI, TFTP, DHCP, ToD, Telnet, SSH
- Network recording tools
- Platforms – Windows, Solaris and Linux
  - 32 and 64 bit support
- Languages – Java, Tcl/Tk, Perl, C++
MIMIC Simulator

- Control/populate SNMP agent data
- Discover/model existing agents
Summary

• Features/functionality - will trickle in over time
• Migration - we’ll miss you ovw
• Performance SPI - vast improvements but its an add-on
• Scalability/Distribution – mostly good news
• SOA – let’s all get on the Service Bus
• jboss – popular, good DB citizen, open, but footprint?
• MIMIC Simulator – a big help in migration

• Thanks for attending!

www.fognet.com
www.gambitcomm.com
Backup Slides
NNM 8i Licensing

NNM v7.x

Product Licensing
• Advanced Edition + Standard Edition
• 250, 1000, 5000, Unlimited Node Packs (by monitored device)
• SPIs: varies (lump sum, phone packs)

Example
• 1 each NNM AE 1000 Node Pack LTU
• 1 each NNM AE 250 Node Pack LTU

NNMi

Core Product Licensing
• NNMi (today), NNMiadv (future)
• 50 node pack with quantity breaks (by discovered device)
• Unlimited license (7.x update and CSL only)
• i SPIs: 50 node packs

Example
• 25 each NNMi 50 Node Pack LTU
Backup Slides:

• Directories on Windows:
  – Base:
    • C:\Program Files\HP OpenView\n    • C:\Program Files (x86)\HP Openview\n  – Online Documentation Web URL:
    • Program Files/HP OpenView/nonOV/jboss/nms/server/nms/tmp/deplo/util51831nnMDocs_en-exp.war/index.html

• 32 Bit Installation:
  – Touch %TEMP%\bypass64check
  – Consider C:\Program Files\HP OpenView\contrib\source\pthreads.zip