



Network Management in Mobile Networks:



Pavel Dvorak
CSE Mobile Solutions
Service Provider Sales Emerging Markets

Agenda

- Cisco Active Network Abstraction (ANA) Overview and Update
- ANA 3.x Overview
- ANA 4.0 Overview
- ANA Evolution – Releases & Roadmap
- Cisco IP Solution Center(ISC) Overview And Update
- ISC MPLS VPN Provisioning
- ISC Evolution – Releases & Roadmap
- Cisco Assurance Management Solution (AMS)



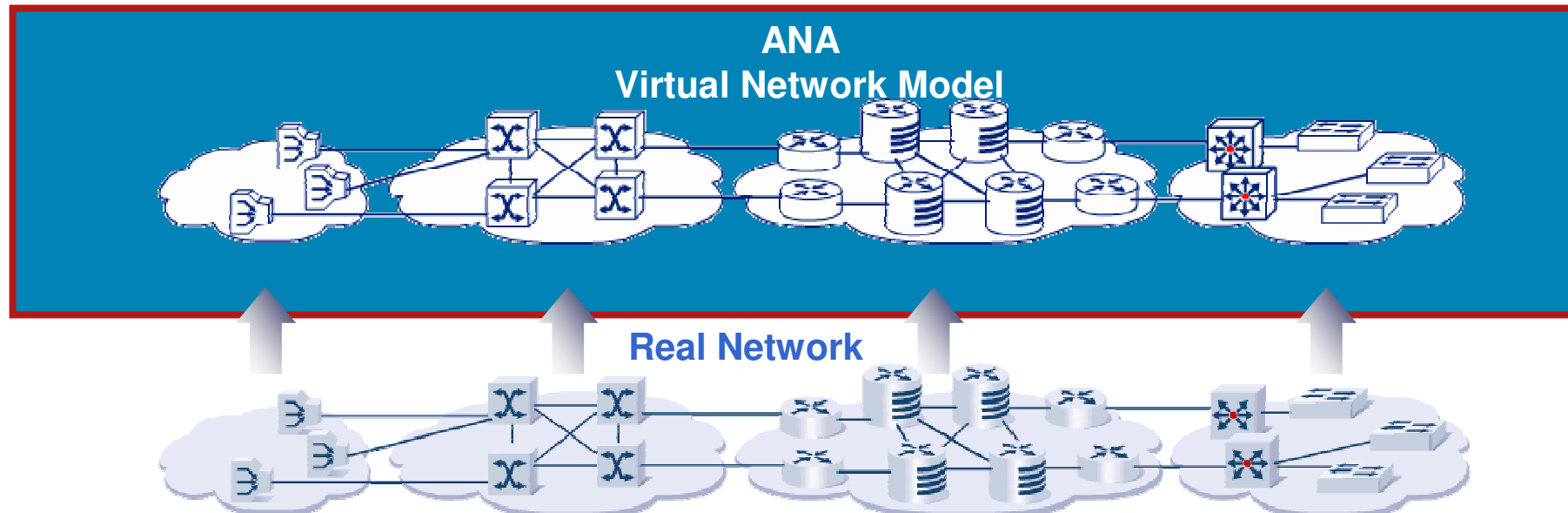
Cisco Active Network Abstraction (ANA) Overview and Update



Cisco Active Network Abstraction (ANA)

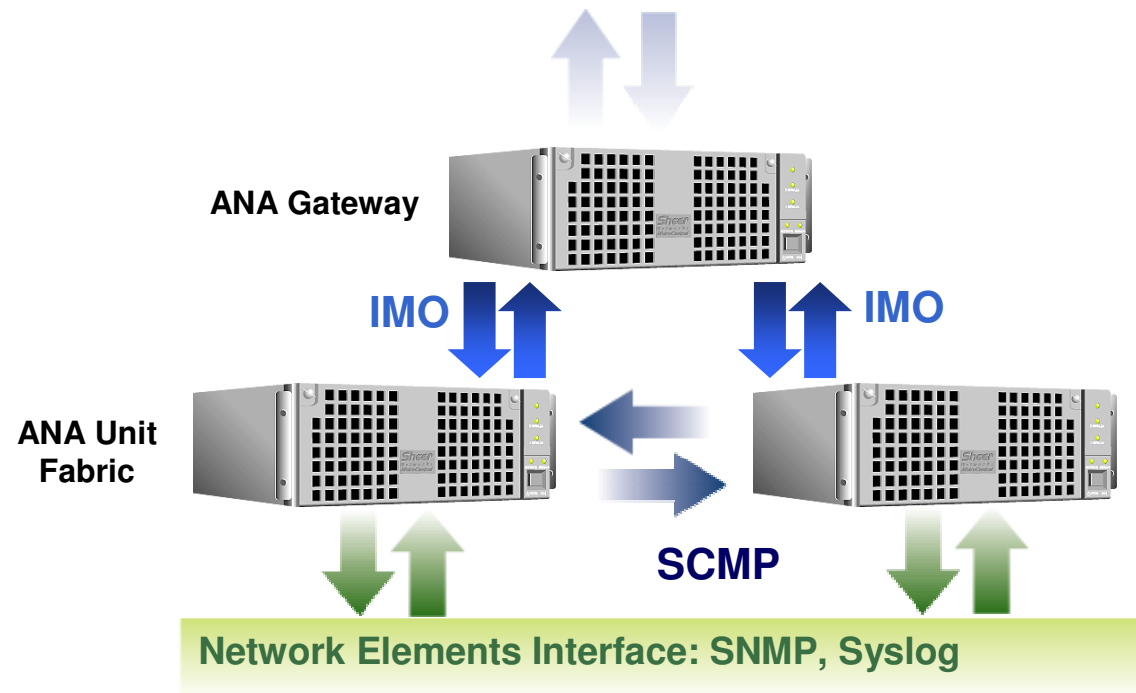
The Principle

- Cisco's ANA creates and maintains an abstract virtual model of any given network:
 - Virtual Network Elements (NE)
 - Virtual links
 - Virtual Services



Cisco ANA Architecture and Interfaces

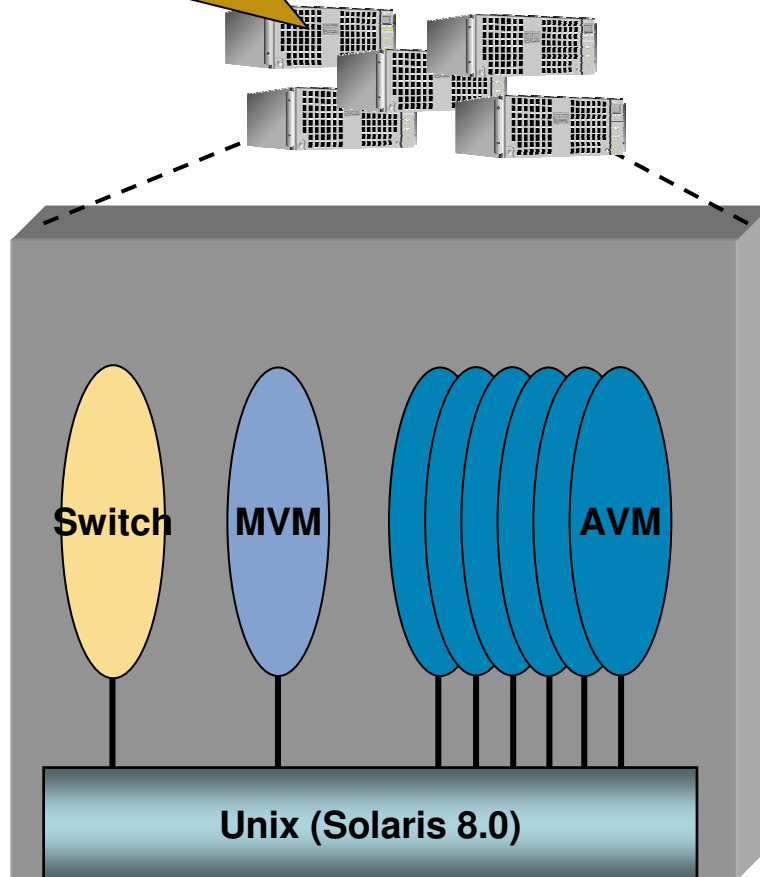
GUI Clients (Network Vision, Event Vision, Config Builder)
OSS/BSS North Bound Interfaces: SNMP, CORBA, BQL/XML, WSDM
Element Inventory, Network Topology, Connectivity Services



Cisco ANA Servers

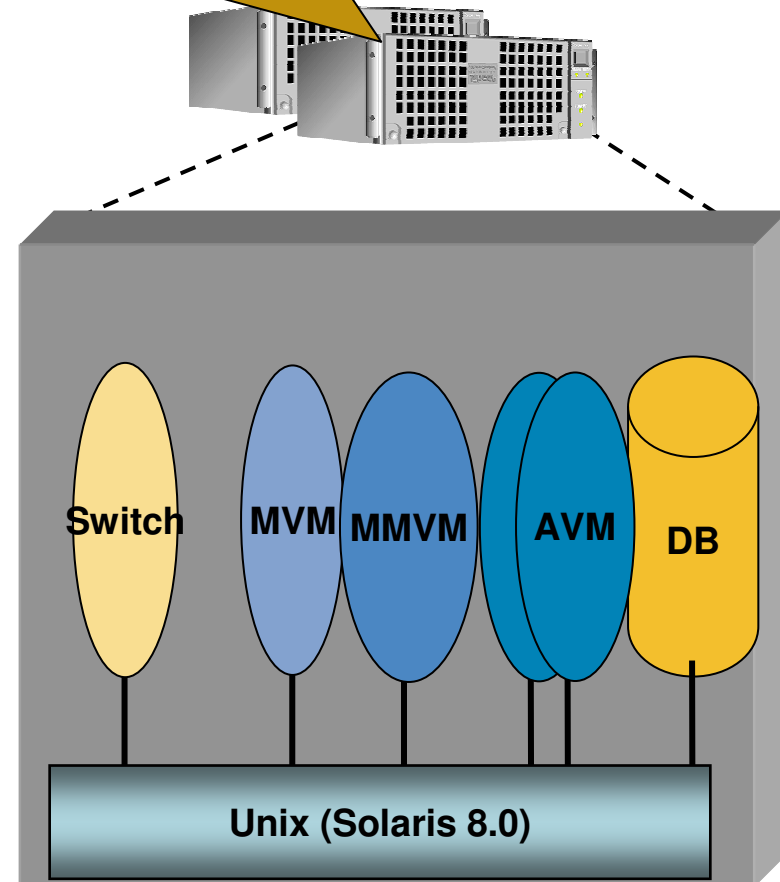
ANA Unit

- Maintains NE and Topology Info



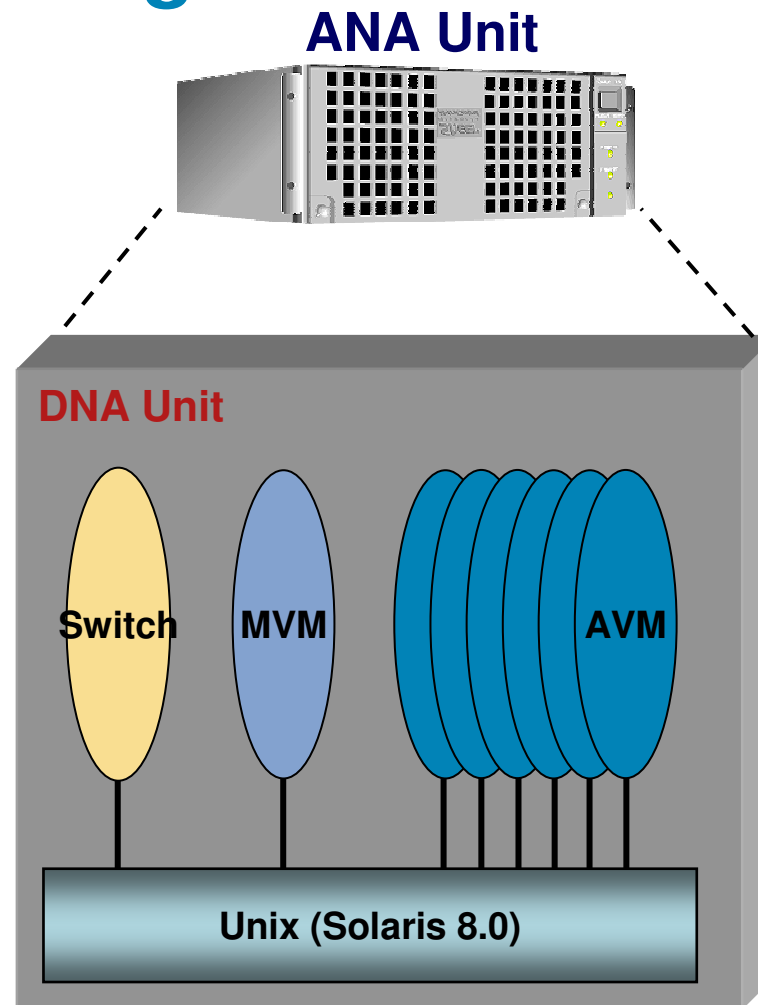
ANA Gateway

- Integration platform and Oracle DB repository
- Handles GUI Maps and business information

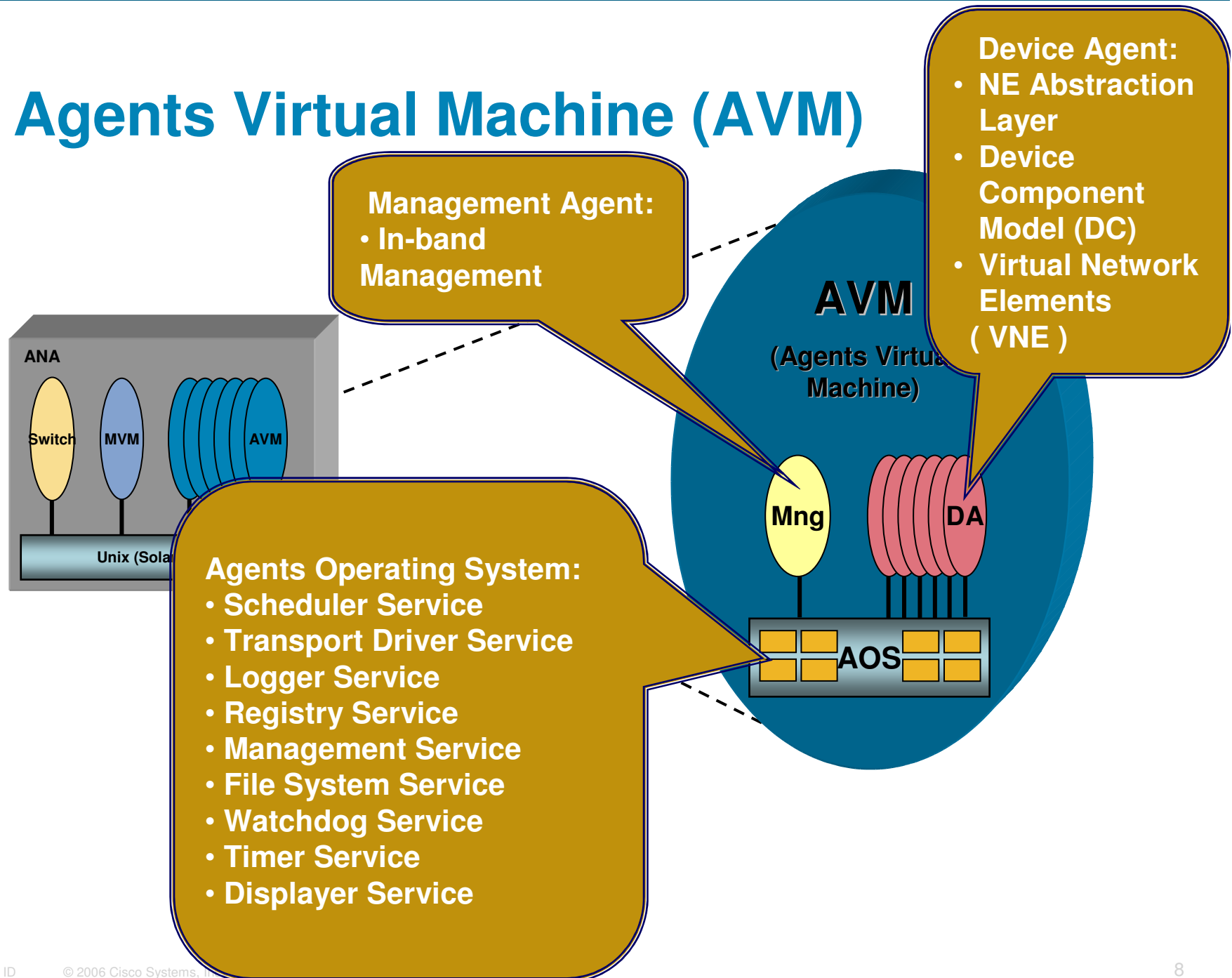


Cisco ANA Unit Block Diagram

- Modular, scalable, high-performance, distributed network-knowledge engine
 - Responsible for assurance, fulfillment, and transaction processing
 - Main DNA Unit processes:
 - AVM – Agent Virtual Machine (VM)
 - MVM – Management VM
 - Switch – Transport Uplink Switch
- AVM types:**
- ANA System AVMs**
 - IP Core Network**
 - MPLS VPN**
 - Access Network**

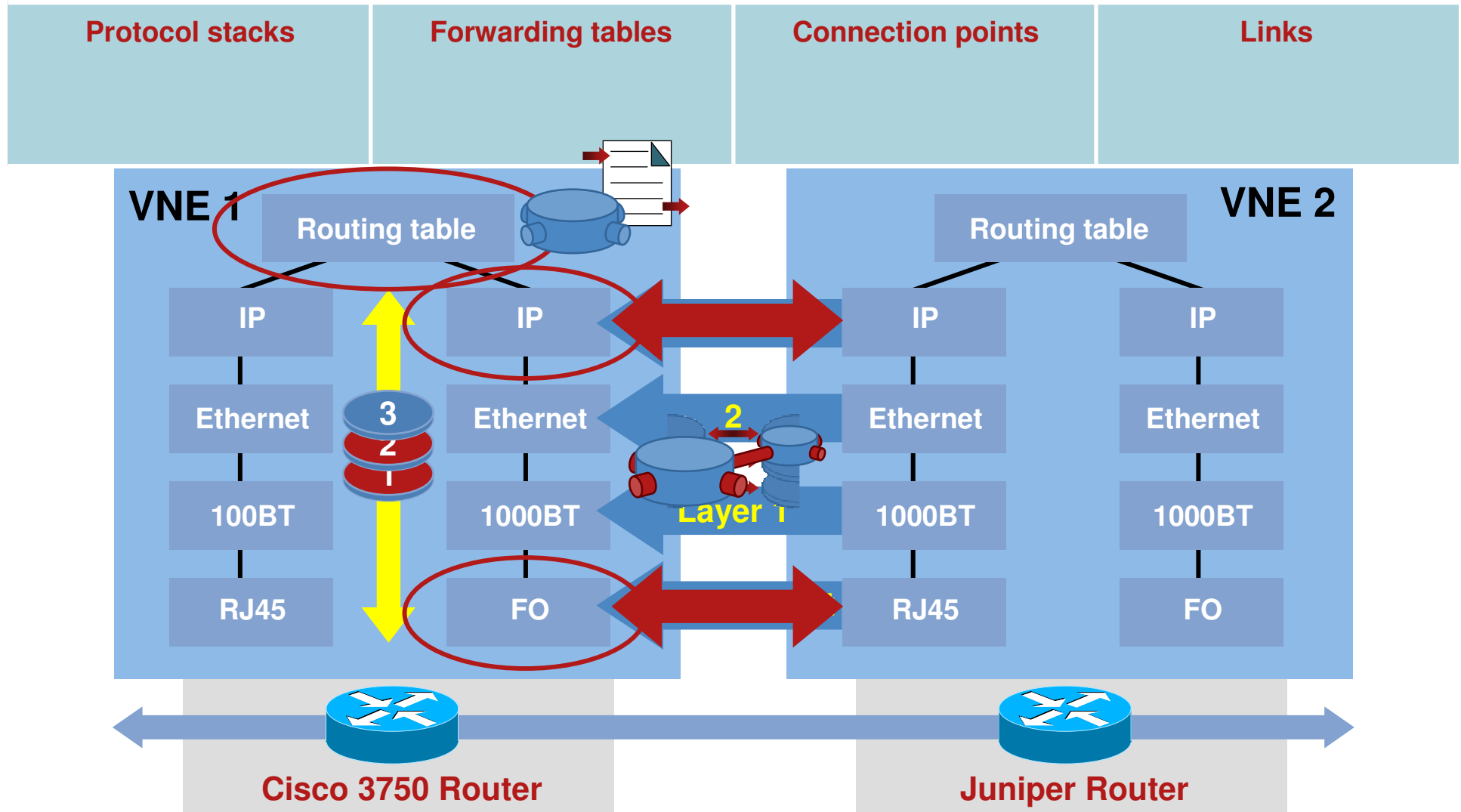


Agents Virtual Machine (AVM)



The Device Component (DC) Model

Building VNEs from Atomic Components



ANA 3.x Overview



Network Vision GUI: Network Maps Device Topology Discovery

The screenshot displays the Network Vision GUI interface. On the left, a tree view lists various network locations such as 'China_Town_02', 'Down_Town[3M]', and 'Soho_08'. The main area shows a 'Map View' of the network topology, with nodes representing devices and lines representing connections. A 'Table View' tab is also visible. At the bottom, an 'Alarm Viewer' table displays a list of network alarms.

Alarm ID	Severity	Alarm	Root Cause	Message	Affected	Time	Ack
284	Major	Link Down	222.26.40.1<->222.26.8...		347	8/26/02 - 10:48	
400	Normal	Link Over Utilized	222.26.30.1<->222.26.3...		288	8/26/02 - 11:04	
692	Normal	Port Over Utilized	222.26.30.20#9.1		273	8/26/02 - 11:55	
6E7	Major	Link Down	???.26.???.1<->???.26.??		???	8/26/02 - 12:38	

- 1 Topological view of the network Devices and connectivity
- 2 Aggregation hierarchy of Sub-networks
- 3 Device hierarchy tree
- 4 Context-sensitive alarm viewer

Network Vision GUI: Service Maps IP/VPN Topology Discovery

- Present logical views of network services

Service entities

Connections and dependencies

Service paths

①

VPNs and components list

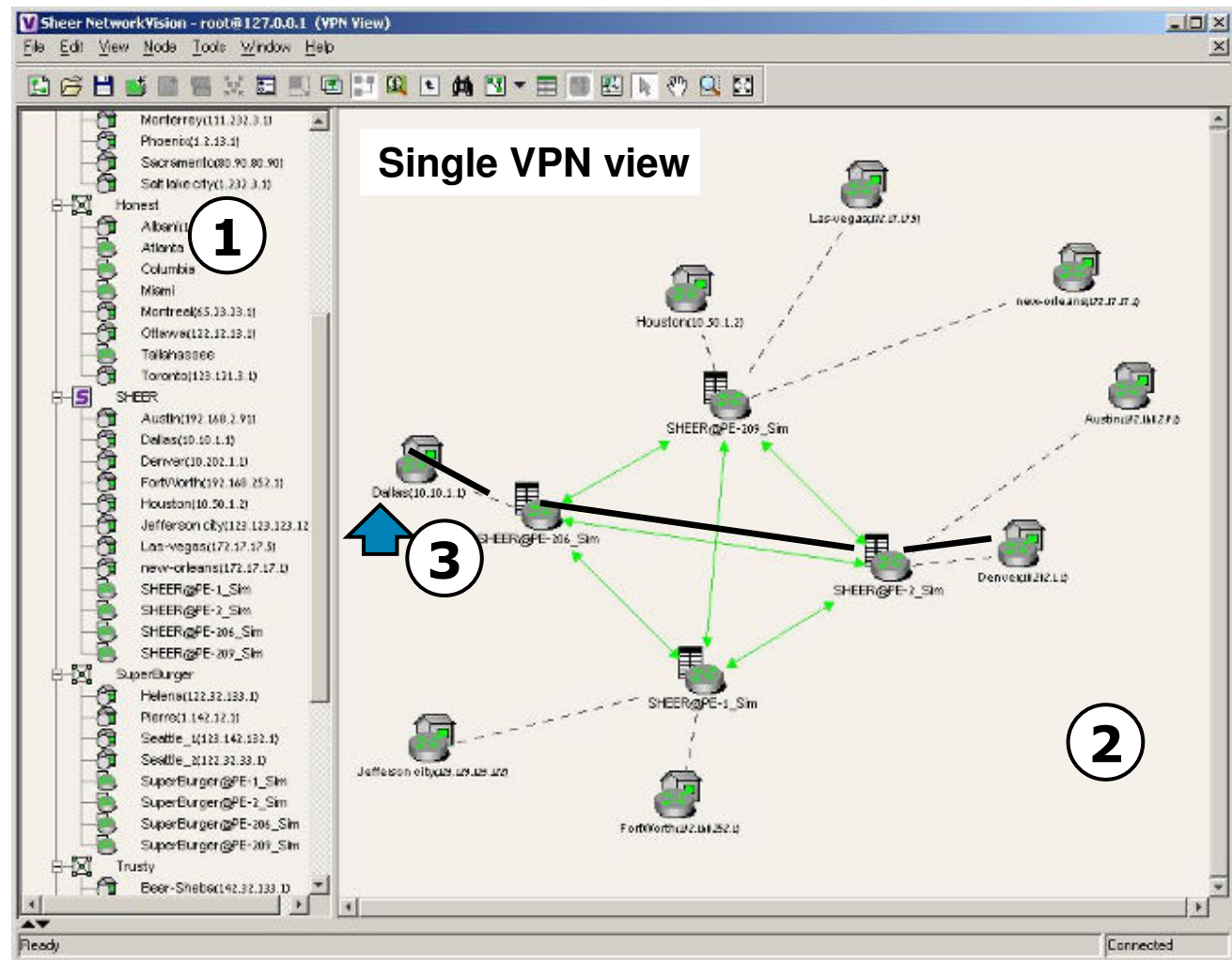
②

VPN layer view complete with

- CEs
- PEs
- Their respective relationships

③

Physical point-to-point connection available through PathTracer



Network Vison GUI: PathTracer End-to-end Service View

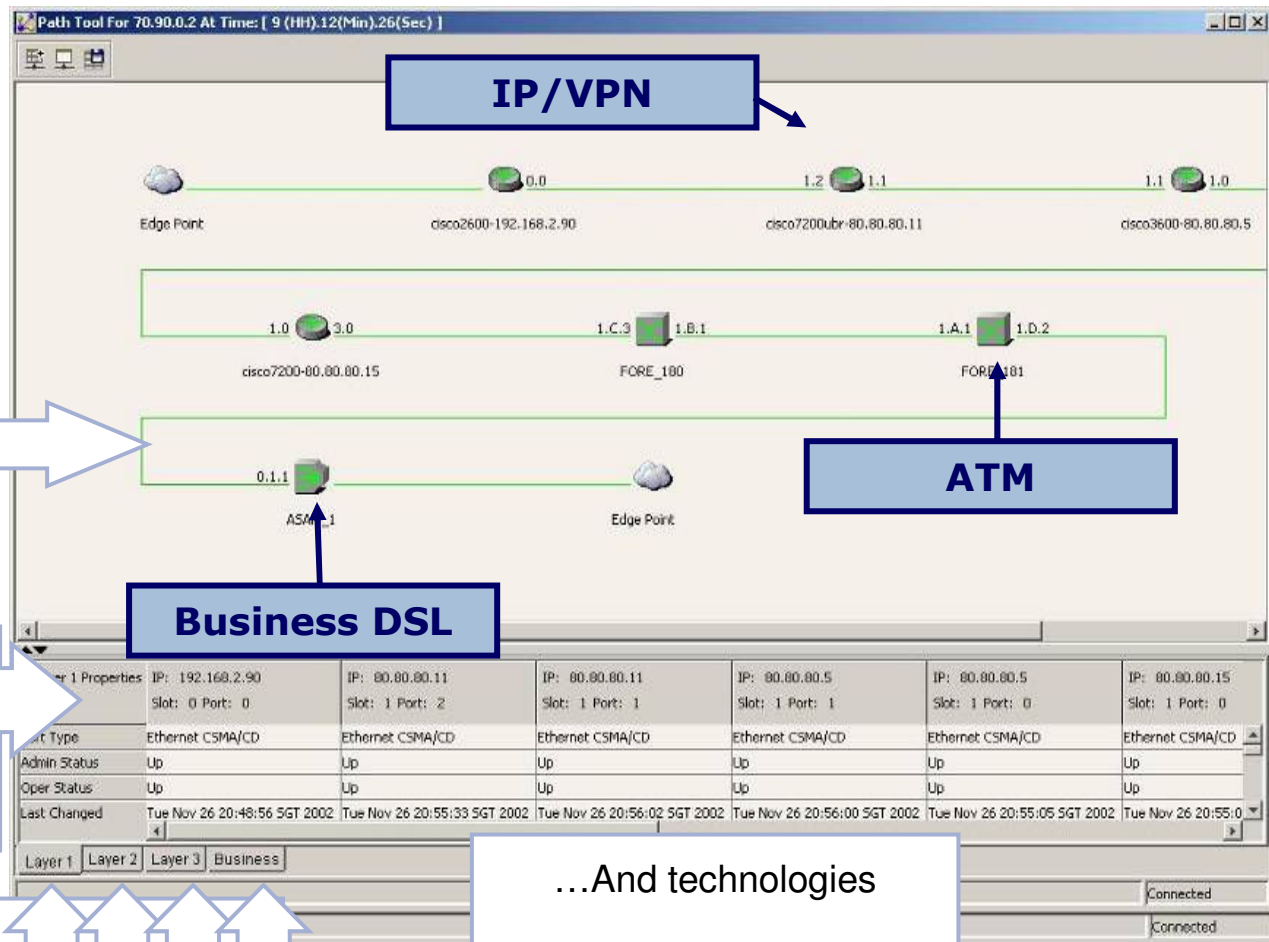
- Real-time path tracing across technologies and network layers

Subscriber to ISP
Point-to-point lines
VPN site-to-site

All the nodes across the path

- ...with relevant properties
- Physical and logical configuration
 - Traffic counters
 - Configuration consistency

Through all layers
1, 2, 3, Business...



Topology Auto-Discovery

- Continuous, real-time discovery of physical & logical connectivity
- Discovery via Signature Analysis algorithm: compiling and matching unique interface signatures, based on information such as:
 - MIB connectivity advertisements (e.g. CDP, PNNI)
 - Network attributes (e.g. Subnet, MAC & ARP analysis)
 - Reachability (e.g. VRF Route-Target compatibility)
 - Traffic signatures (patented)

Topology Auto-Discovery (cont.)

- Network View and VPN View (Discovery)

The screenshot displays the Sheer NetworkVision software interface, which is used for network topology auto-discovery. The interface is split into two main views: Network View and VPN View.

Network View (Left Panel): This panel shows a hierarchical tree of network elements. The top-level view is 'MPLS Network View', which includes a list of nodes such as Albany-PE, Asam, Austin-PE, CE-1 through CE-6, Dallas-PE, Florida-P, Fore1, Fore2, Huston-PE, NewYork-P, NYC-PE, RedBackSMS1800, SmartEdge800, SW-1, SW-2, Tampa-PE, and Texas-P. Below this list, there are buttons for 'Network View' and 'VPN View', and a 'Ready' status indicator.

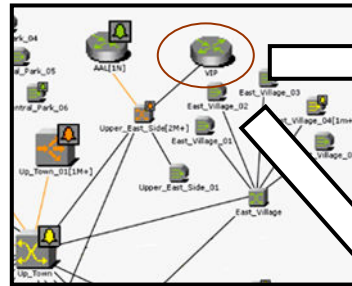
VPN View (Right Panel): This panel shows a detailed network topology diagram. The diagram consists of numerous nodes (represented by icons) connected by a dense network of green lines, indicating discovered connections. The nodes are labeled with various identifiers, including 'vpn_Elysium_71100@re1-NNAMDEL', 'vpn_Elysium_71100@NRABVIA1', 'at-1/2/1.150(172.28.17.25)', 'macrolan_provision', 'vpn_Cerberus_17000', 'vpn_PROBANDOMAS_123401', 'VPNIP_VRF_CLIENTE_IDCLTE', 'vpn_DC_1_60301', 'vpn_macrolan_701', 'VPNIP_VRF_PRUEBA_SAS_15', 'vpn_CISCO_PRUEBA_99701', 'vpn_TDE_ING_SERV_21500', 'TAREA', 'vpn_Santas_01', 'vpn_MARS_555', 'vpn_GestionEDCs_10', 'Serial2 0.3(172.28.0.1)', 'vpn_GestionEDCs_10@NRABV12', 'vpn_GestionEDCs_10@NRAMRRO1', 'Serial5/1/0.3(172.28.0.5)', 'vpn_PRO2_66601', 'vpn_AMERICA_0008', 'vpn_PRO_88801', 'vpn_EUROPA_701', 'vpn_EUROPA_701@NRABVIA1', 'vpn_teldan_0077', 'vpn1 [1N]', 'vpn_shapfrcia_575700', 'vpn_bancoA_1234', 'vpn_PRO1_77701', 'vpn_GestionEDCsVPN_13', 'vpn_3499999999M_4702', 'vpn_EUROPA_0007', and 'vpn_VDN224_224'. The diagram is connected to a 'Ready' status indicator at the bottom left and a 'Connected' status indicator at the bottom right.

Device Drill-Down Physical and logical inventory

Zoom into any selected device, to view its inventory (continuously discovered in near-real-time)

- **Physical inventory:**

- Chassis
- Shelves
- Cards
- Ports & parameters
- More...



Logical inventory

- **Logical inventory:**

- Circuit tables
- Traffic profiles
- Routing tables
- VRFs
- Label-switching tables
- IP pools
- More...

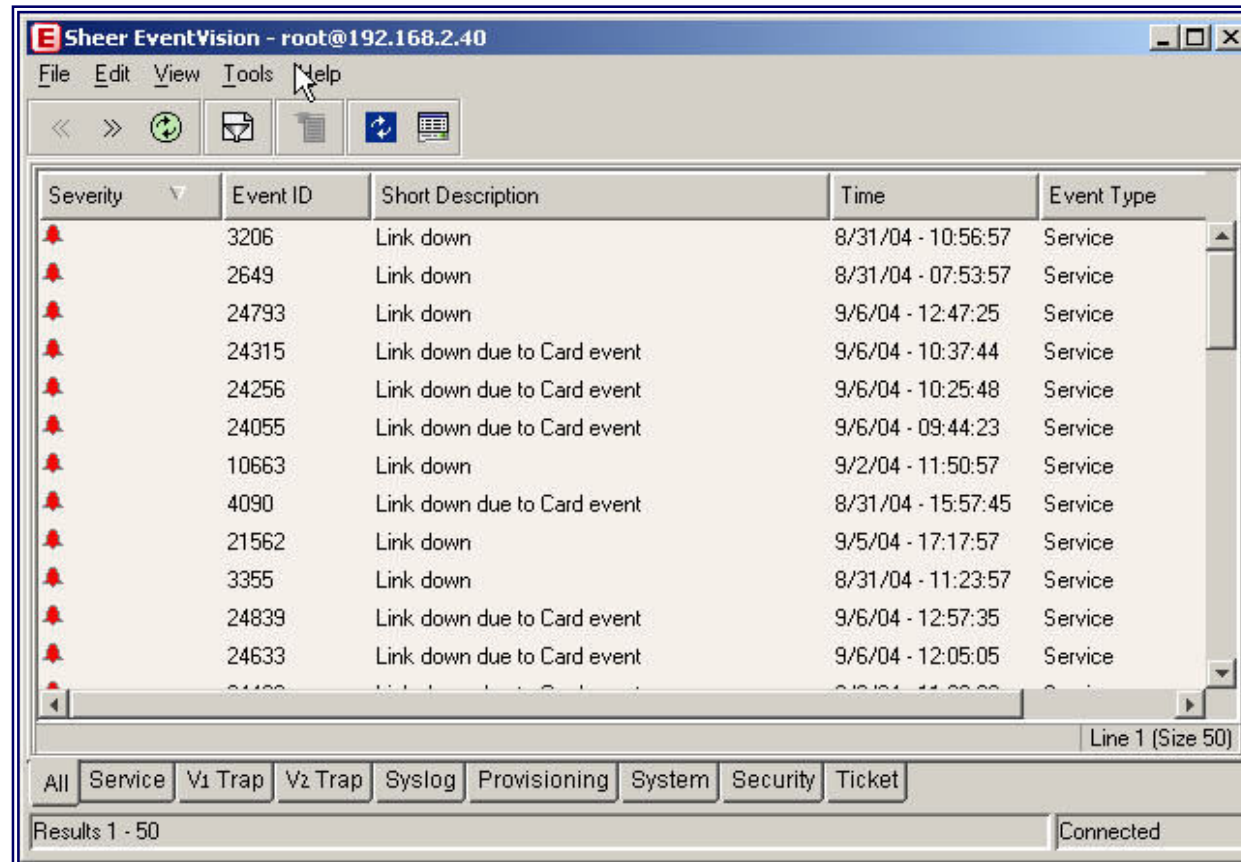
Incoming Label	Action	Outgoing Label	Out Interface	IP Destination
524309	Swap	27	11.1	80.80.80.11
524308	Swap	20	11.1	10.1.7.0
524307	Swap	17	11.1	10.1.3.0
524306	Swap	32	11.1	192.168.1.0
524305	Swap	31	11.1	80.80.80.25
524304	Swap	30	11.1	80.80.80.22
524303	Swap	29	11.1	80.80.80.15
524302	Swap	28	11.1	80.80.80.13
524301	Swap	26	11.1	80.80.80.5
524300	Swap	25	11.1	80.80.80.4
524299	Swap	24	11.1	80.80.80.3
524298	Swap	23	11.1	10.1.10.0
524297	Swap	22	11.1	10.1.5.0
524296	Swap	21	11.1	10.1.2.0
524295	Swap	19	11.1	10.1.1.0
524294	Swap	18	11.1	10.1.4.0
524293	Swap	16	11.1	10.1.8.0
524292	Pop	3	11.1	80.80.80.21
524291	Pop	3	11.1	10.1.6.0

- **Network-to-business mapping**

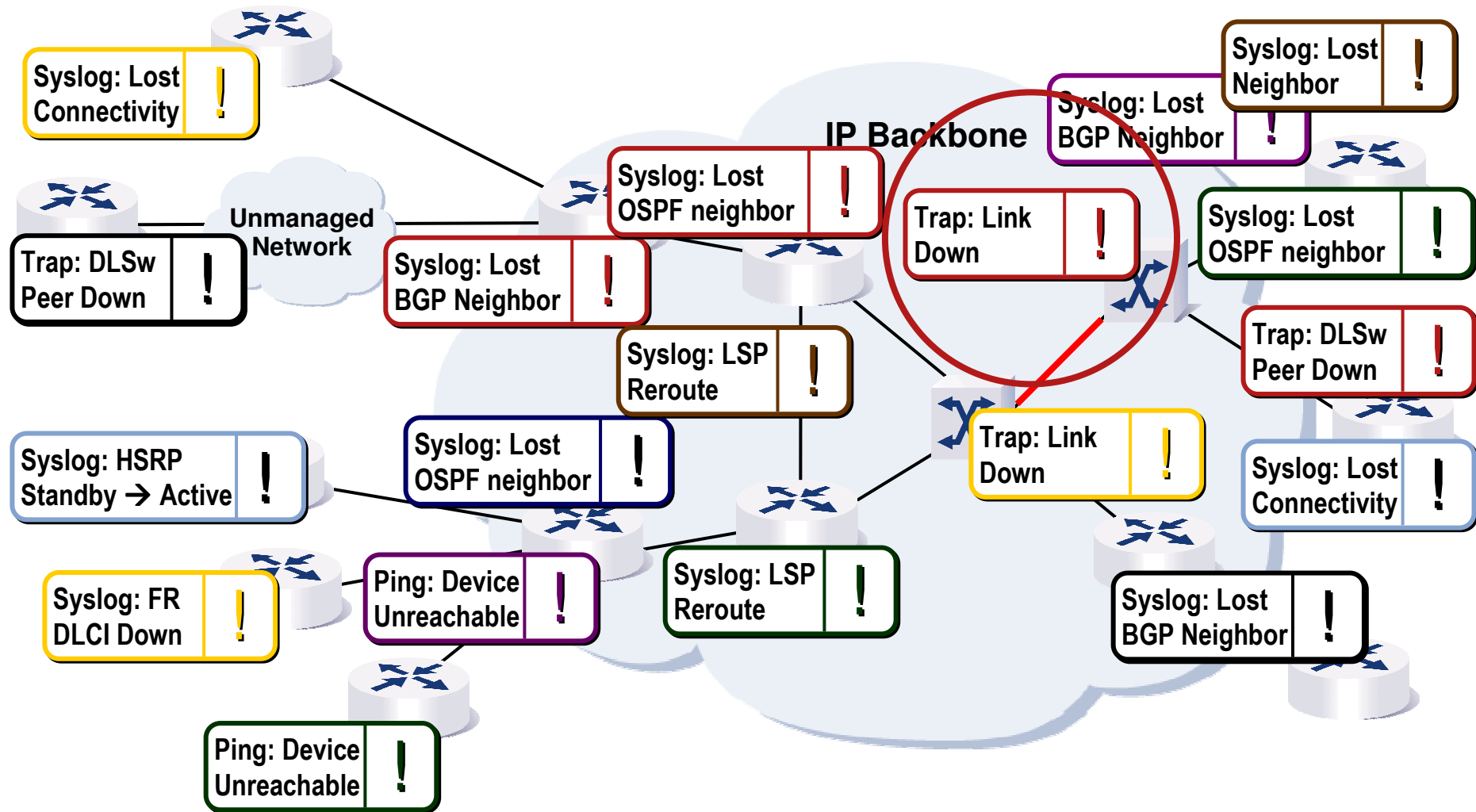
- Supports user-defined Business Objects
- containers for network resources

EventVision GUI

- ANA EventVision is a tool, which serves as a browser for viewing all current and past events database.



Fault management : Complexity of relations between Events

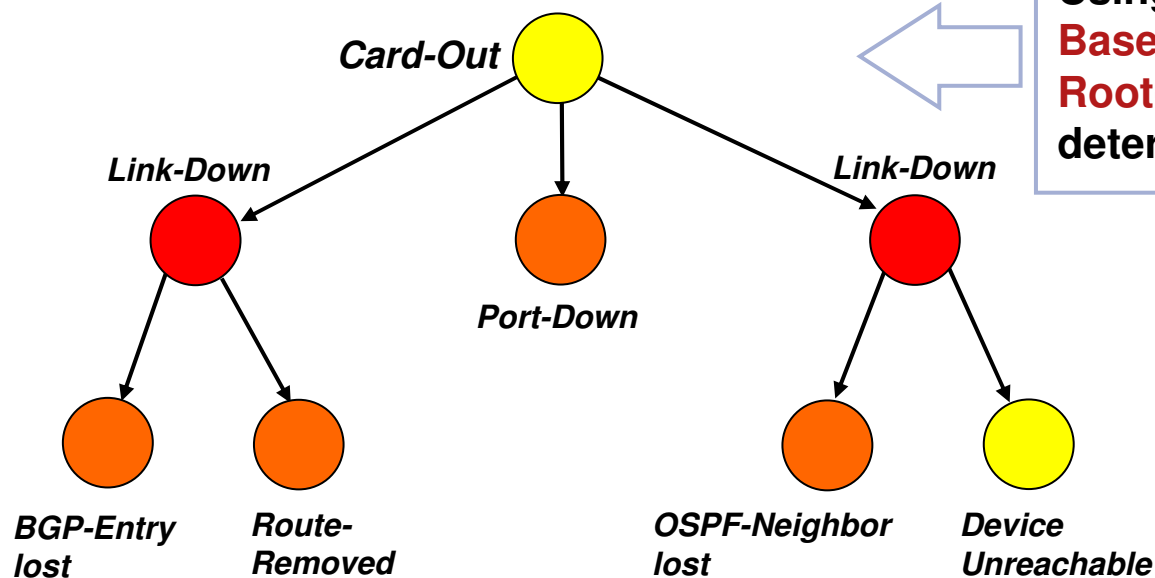


ANA-based Fault Analysis

- ANA works with virtual network as a reference model
- Reduces trouble-ticket flooding
 - Can correlate hundreds of alarms to a single root-cause ticket
 - Can handle multiple concurrent root causes
- No rules to write
 - Correlation logic is automatically determined by Network relationships (physical & logical)
 - True multi-layer, multi-domain correlation

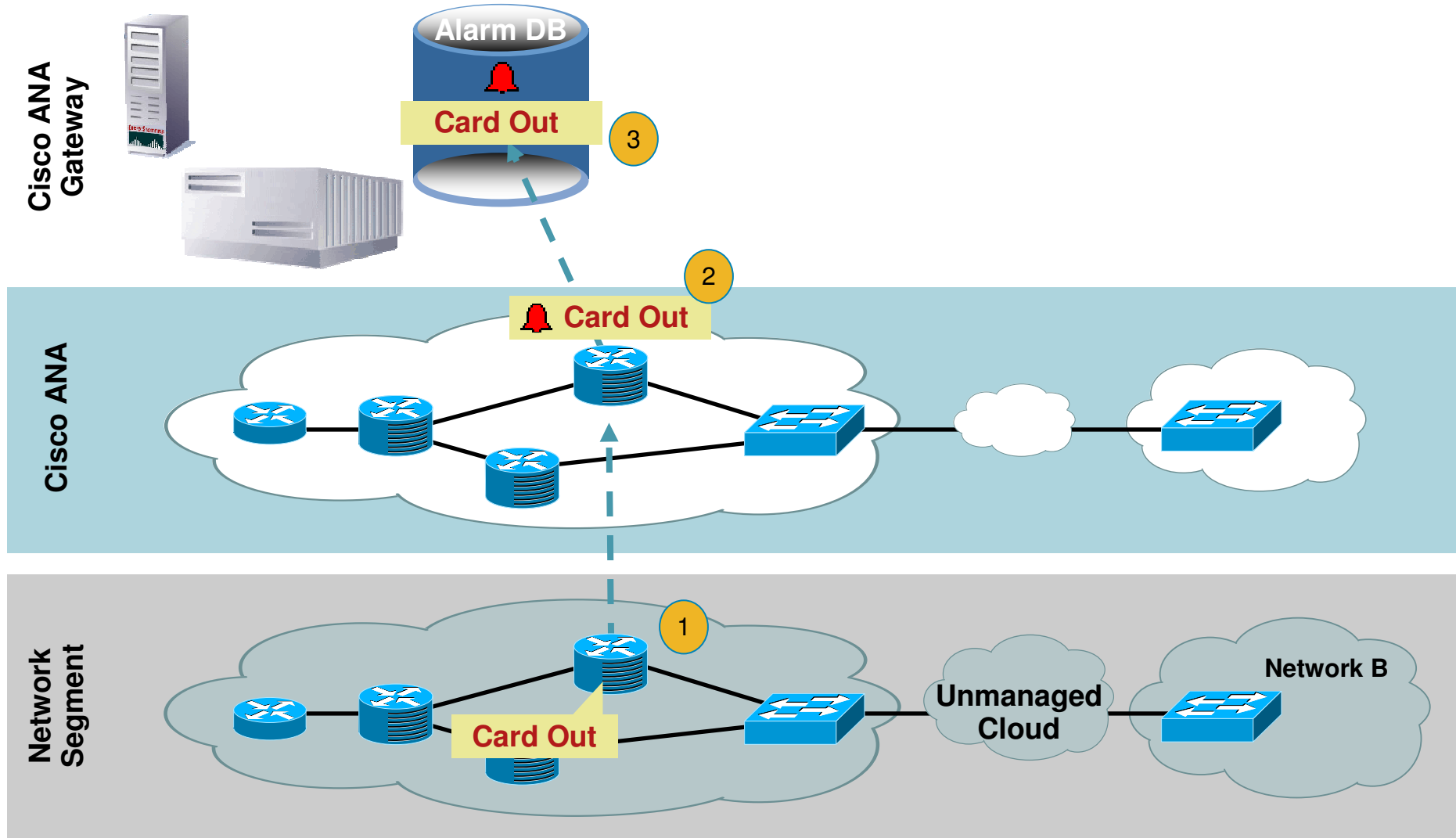
Topology-based Alarm Correlation and Root-Cause Analysis

- Cisco ANA identifies the **relationship between root-cause alarms and consequent alarms**
- Dynamically building a **multi-level alarm correlation tree**
- The Alarm Viewer displays only the topmost root alarm, and enables drill-down for the full hierarchy of consequent alarms

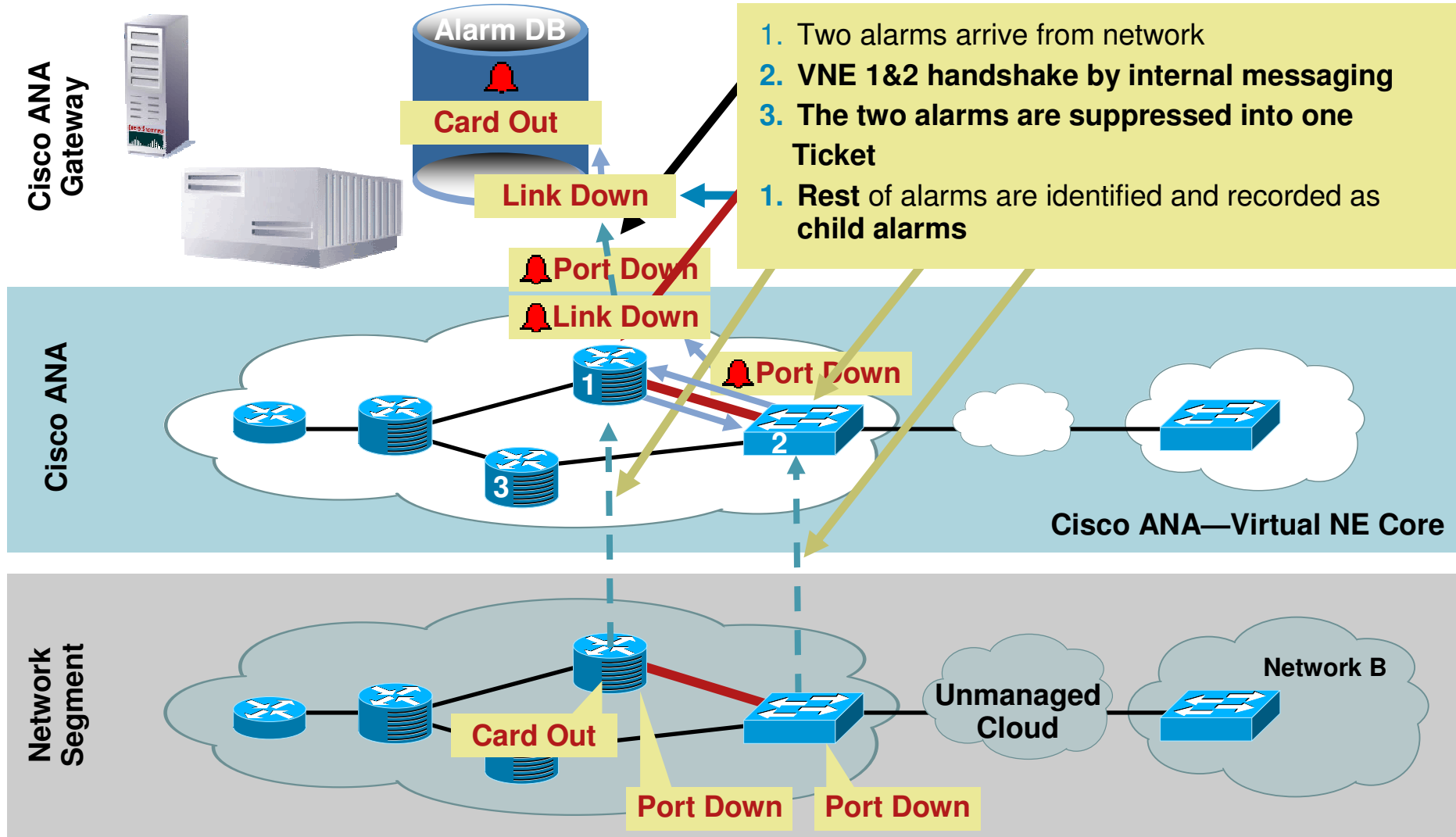


Using Cisco ANA's topology-based alarm correlation and Root-Cause Analysis we can determine the source.

Topology-based Alarm Correlation and Root-Cause Analysis



Topology-based Alarm Correlation and Root-Cause Analysis



NOC friendly Cisco Fault Management

The screenshot displays the NetworkVision interface with several key components highlighted by numbered callouts:

- 1**: Network health at a glance - The main network map showing various devices and their connections.
- 2**: Device hierarchy with status propagation - The left-hand tree view showing a hierarchical structure of network devices.
- 3**: Main alarm Viewer: only topmost root alarms - The bottom section of the interface showing a table of active alarms.
- 4**: Alarm drill-down window. Multiple consequent (child) alarms - A pop-up window titled 'Properties of Ticket 1373' showing a detailed list of related events.

ID	Severity	Alarm	Affected	Source	Time	Latest Modification Time	Ack	Count	Remove Alarm	Message
Alar...	Critical	Link Down	9	80.80.80.5<-...	28/1/03 - ...	28/1/03 - 01:04	Not Ack...	12	false	Affected SNC ...

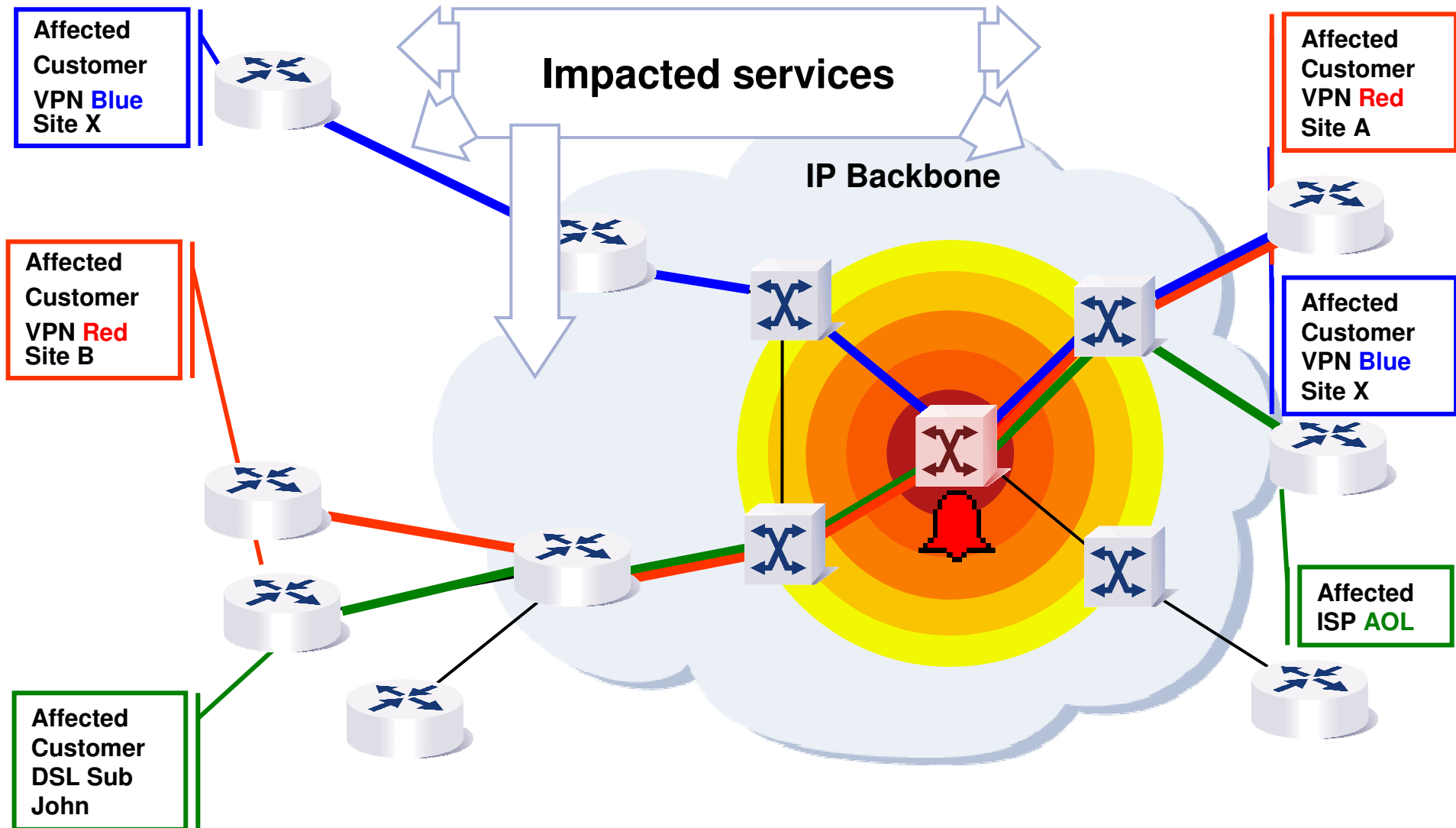
1
Network health at a glance

2
Device hierarchy with status propagation

3
Main alarm Viewer: only topmost root alarms

4
Alarm drill-down window. Multiple consequent (child) alarms

Impact Analysis (Affected Services)



Impact Analysis (Affected Services)

12809 - Ticket Properties

Refresh Acknowledge Clear

Source:

Find:

Location	Key	Name	Type	IP Address
PE-206_Sim VRF ACME IP:Ethernet0/3.125		Monterrey		111.232.3.1
PE-2_Sim VRF SHEER IP:Ethernet0/1		Denver		10.202.1.1
PE-2_Sim VRF ACME IP:Ethernet0/3.125		Salt lake city		1.232.3.1
PE-206_Sim VRF Accounting IP:ATM1/0.9298		San Francisco		192.154.6.1
PE-2_Sim VRF Trusty IP:Ethernet0/3.3512		Jerusalem		142.32.33.1
PE-209_Sim VRF Accounting IP:FastEthernet0/0.777		Boise		192.154.12.1
PE-206_Sim VRF ACME IP:Ethernet0/0.124		Los Angeles		1.2.132.1

Line 3 (Size 27)

Destination:

Find:

Location	Key	Name	Type	IP Address
PE-206_Sim VRF ACME IP:Ethernet0/...		Monterrey		111.232.3.1
PE-206_Sim VRF ACME IP:Ethernet0/...		Phoenix		1.2.13.1
PE-206_Sim VRF ACME IP:Ethernet0/...		Los Angeles		1.2.132.1
PE-209_Sim VRF ACME IP:FastEthern...		Baton Ro...		134.2.142.1
PE-206_Sim VRF ACME IP:ATM1/0.90...		Sacramento		80.90.80.90
PE-209_Sim VRF ACME IP:FastEthern...		Jackson		16.25.13.1

Line 1 (Size 6)

General History Affected Parties Correlation Notes

Ready Connected

ANA 4.0 Overview



ANA 4.0 New Features

- **Single Client GUI**
- **Network Auto Discovery Module**
- **NE Configuration Archive**
- **Command Builder Enhancements**
- **Inventory reporting**
- **Network Element Image management**
- **SNMP NBI Trap Forwarding**
- **WSDM NB API**

ANA 4.0 Single Client Administration, Monitoring, Troubleshooting, and Inventory.

The screenshot displays the Cisco ANA 4.0 Single Client interface. The window title is "Cisco Active Network Abstraction (Connected to: idm-v440-1 User: Administrator)". The interface is divided into several sections:

- Application Title Bar:** Displays the application name and connection details.
- Menu Bar:** Includes File, Edit, Administration, Report, Configuration, Tools, Window, and Help.
- Global Tool Bar:** Contains icons for file operations and application functions.
- Perspective Selector:** Allows switching between Administration, Inventory, Troubleshooting, and Monitoring views.
- Navigation Tabs:** Shows active tabs for "sjcn-sys7301-92 [1M]" and "sjcn-sys7609-84".
- Navigation Area:** A tree view showing network elements categorized by State (MAINTENANCE, MANAGED, UNMANAGED, UNSUPPORTED) and specific device IDs.
- System Information:** A detailed view for the selected device (sjcn-sys7301-92), including:
 - System Name:** sjcn-sys7301-92
 - Vendor:** CISCO
 - CPU Usage:** Cisco 7301 Router
 - Software Version:** 12.2(18)S6
 - Communication State:** Device Reachable
 - Element Name:** sjcn-sys7301-92
 - IP Address:** 172.20.124.92
 - Up Since:** 24 Jul 2007 07:11:30 PDT
 - Category:** Router
 - Sending Alarms:** true
 - Investigation State:** Shutting down
 - Played Role:**
- System Description:** Cisco Internetwork Operating System Software, IOS (tm) 7301 Software (C7301-3S-M), Version 12.2(18)S6, RELEASE SOFTWARE (fc2).
- Contact:** ana-systest@cisco.com bldg N, San Jose, CA 95134
- Location:** SystemTestNetwork

- Anchor Selector View Area:** A tree view showing network elements like Bridging Entry, DataCollection, EtherChannel, EthernetFlowPoints, IP Address Pools, etc.
- Anchor Sub Tabs:** Shows tabs for "Summary" and "EthFlowPoint:FastEthernet1/0".
- Common Supporting View Toolbar:** Includes a filter input field and "Go" and "Clear Filter" buttons.
- Common Supporting View Tabs:** Shows tabs for "Properties" and "Active Tickets".
- Common Supporting View Area:** A table displaying active tickets:

Ticket ID	Severity	Short Description	Location	Time
7977	Major	Device unreachable	sjcn-sys7301-92	15 Aug 2007 16:48:40 PDT
- Status Bar:** Shows system resources like "23M of 508M" and "1 Items".

ANA 4.0 Monitoring Example

The screenshot displays the Cisco Active Network Abstraction (ANA) 4.0 Monitoring interface. The window title is "Cisco Active Network Abstraction (Connected to: idm-v440-1 User: Administrator)". The interface includes a menu bar (File, Edit, Administration, Report, Topology, Tools, Window, Help) and a toolbar with icons for Troubleshooting, Administration, Inventory, and Monitoring. The main area shows a network topology with nodes: sjcn-sys2851-61, newTag, sjcn-sys7609-84, and sjcn-sys7301-92 [3M]. Green lines indicate connections between sjcn-sys2851-61 and newTag, and between newTag and sjcn-sys7301-92 [3M].

On the left, the "Objects" pane shows a tree view under "Network Domain" with sub-items: domain3, alka, jashyu, and domain2. Below it, the "Overview" pane shows a tree view for "domain3 [3M]" with sub-items: newTag, sjcn-sys2851-61, sjcn-sys7301-92 [3M], and sjcn-sys7609-84.

At the bottom, the "Active Tickets" pane is active, showing a table of tickets. The table has columns for Ticket ID, Severity, Short Description, Location, and Time. There are 3 items displayed.

Ticket ID	Severity	Short Description	Location	Time
3054	Major	Card out	sjcn-sys7301-92#100.3	30 Aug 2007
3055	Major	Card out	sjcn-sys7301-92#100.4	30 Aug 2007
3042	Major	Card out	sjcn-sys7301-92#100	30 Aug 2007

ANA 4.0 Troubleshooting Example

The screenshot displays the Cisco Active Network Abstraction (ANA) 4.0 interface. The window title is "Cisco Active Network Abstraction (Connected to: idm-v440-1 User: Administrator)". The interface includes a menu bar (File, Edit, Report, Tools, Window, Help) and a toolbar with icons for Troubleshooting, Administration, Inventory, and Monitoring. A left-hand navigation pane shows "Event Types" with a tree view including Tickets, Audit, Provisioning, Security, Service, Syslog, System, V1 Traps, and V2 Traps. The main area shows a "Tickets" tab for "Ticket-3054". A dashboard at the top right indicates 0 Critical, 3 Major, and 0 Minor tickets. Below this is a filter input field with "Go" and "Clear Filter" buttons. A table lists tickets with columns for Ticket ID, Severity, Short Description, Location, and Time. Ticket 3054 is highlighted in grey and shows a Major severity "Card out" event. The table also shows several "Cleared" events (Severity: Cleared) with descriptions like "Port up" and "Device reachable".

Ticket ID	Severity	Short Description	Location	Time
7483	Cleared	Port up	sjcn-sys7609-83#1.9:TenGigabitEt...	04 Sep 200
7372	Cleared	Device reachable	sjcn-sys2851-61	03 Sep 200
6623	Cleared	Port up	sjcn-sys7609-83#1.9:TenGigabitEt...	31 Aug 200
6438	Cleared	Port up	sjcn-sys7609-83#2:GigabitEthere...	31 Aug 200
6440	Cleared	Device reachable	sjcn-sys7301-92	31 Aug 200
6437	Cleared	Port up	sjcn-sys7609-84#1.13:GigabitEthe...	31 Aug 200
6402	Cleared	Port up	sjcn-sys7609-83#1.9:TenGigabitEt...	31 Aug 200
6091	Cleared	Port up	sjcn-sys7609-83#1.9:TenGigabitEt...	30 Aug 200
4942	Cleared	Port up	sjcn-sys7609-83#2:GigabitEthere...	30 Aug 200
3054	Major	Card out	sjcn-sys7301-92#100.3	30 Aug 200
3055	Major	Card out	sjcn-sys7301-92#100.4	30 Aug 200
3042	Major	Card out	sjcn-sys7301-92#100	30 Aug 200

ANA 4.0 Inventory Example

The screenshot displays the Cisco Active Network Abstraction (ANA) 4.0 interface. The main window shows the system information for a specific device, **sjcn-sys7301-92**. The interface includes a menu bar (File, Edit, Administration, Report, Configuration, Tools, Window, Help), a toolbar, and several panes. The left pane shows a tree view of network elements under 'State' and 'MANAGED'. The bottom-left pane shows a physical/logical view of the device's chassis and modules. The main right pane displays the following details:

System Information

- System Name:** sjcn-sys7301-92
- Vendor:** CISCO
- CPU Usage:** 0%
- Element Type:** Cisco 7301 Router
- Software Version:** 12.2(28)SB
- Communication State:** Device Reachable
- Element Name:** sjcn-sys7301-92
- IP Address:** 172.20.124.92
- Up Since:** 31 Aug 2007 11:36:21 PDT
- Category:** Router
- Sending Alarms:** true
- Investigation State:** Normal
- Played Role:**

System Description

System Description: Cisco Internetwork Operating System Software
IOS (tm) 7301 Software (C7301-JS-M), Version 12.3(13), RELEASE SOFTWARE (fc2)
Technical Support: <http://www.cisco.com/techsupport>
Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Thu 10-Feb-05 01:37

Contact: ana-systest@cisco.com bldg N, San Jose, CA 95134
Location: SystemTestNetwork

Active Tickets

Ticket ID	Severity	Short Description	Location	Time
3054	Major	Card out	sjcn-sys7301-92#100.3	30 Aug 2007
3055	Major	Card out	sjcn-sys7301-92#100.4	30 Aug 2007
3042	Major	Card out	sjcn-sys7301-92#100	30 Aug 2007

The interface also shows a status bar at the bottom indicating 53M of 508M memory usage and 3 items in the active tickets list.

Network Auto Discovery Module

- Discovers devices in the customer network
- Requires input of default credentials and user preferred discovery methods and limits
- Supports multiple user configurable discovery methods including:
 - CDP
 - ILMI
 - ELMI
 - Routing Table Discovery
 - BGP
 - OSPF
 - HSRP
 - Ping Sweep (Range of addresses or starting address)
 - Cluster
- Output provided in ANA seedfile format – for input into the ANA system

NE Configuration Archive

- Stores user configurable number of configuration files of network elements in an archive
- Provides GUI for
 - Setting up configuration archive parameters
 - Automatic archive on configuration change notification
 - Number of archives per NE to store
 - Viewing summary of versions per NE
 - Configuration files details (full configuration or via configlets)
 - Comparison of configuration files
 - Out of Sync Summary Reports
 - Restoration of configuration file version to the NE
 - Search facility that provides ability to search archived files for specific criterion

Command Builder Enhancements

- Ability to create and apply activation **scripts across multiple NEs at the same time**
- Ability to **schedule application of the activation scripts**

Inventory Reporting

- Provides an “Inventory Summary Report” containing physical inventory and a subset of logical inventory information for a user selected set of network elements
- Reports can be scheduled or generated on demand
- Exportable in PDF, CSV (XLS), HTML and XML formats

ANA 4.0 Inventory Report Example

Cisco Active Network Abstraction (Connected to: idm-v440-1 User: Administrator)

File Edit Administration Report Topology Tools Window Help

Objects Task Search Report Browser Test ABC x

Stop Refresh Print Save

Inventory Summary Report

Generated on Thu Aug 30 16:38:39 PDT 2007

Summary	
Created By	root
Report Generation Time	Thu Aug 30 16:38:39 PDT 2007
Devices without inventory	
Total number of devices	1

Module			
Number Of Ports	Software Version	Product Version	Serial Number
4	N/A	1.0	35431095
2	N/A	V03	FOC11011PEB

Flash File			
Flash Partition Index	Flash File Index	Checksum	Size
0	0	0x0	0

Module Port Interface			
Type	Interface Index	Speed	Last Channeled

Summary

21M of 508M

Network Element Image Management

- ANA 4.0 (IOS and IOS XR)
- **Image Distribution**
 - Scheduled or On Demand image update to one or more NE with ability to:
 - Specify order and method (sequential or parallel)
 - Stop on Failure
 - Activate image immediately or Schedule activate for later
 - Do not activate image
- **Image Repository Management**
 - Download image from Cisco.com to local ANA repository
 - Add, remove and browse images in the repository
 - Edit and update image attributes in the repository
- **Image Analysis**
 - Choose an image from the repository and verify its compatibility against a set of devices.

SNMP NBI Trap Forwarding

- Provides ability to configure ANA to forward all events in the system to be forwarded as SNMP traps to designated northbound system(s)

WSDM NB API

(Web Services Distributed Management)

- Supports the ability of a northbound system to:
 - Retrieve physical and logical inventory information including topology link information
 - Retrieve alarm/event information
 - Subscribe to change notifications for inventory and alarm/event data
 - Execute template activation scripts and workflows

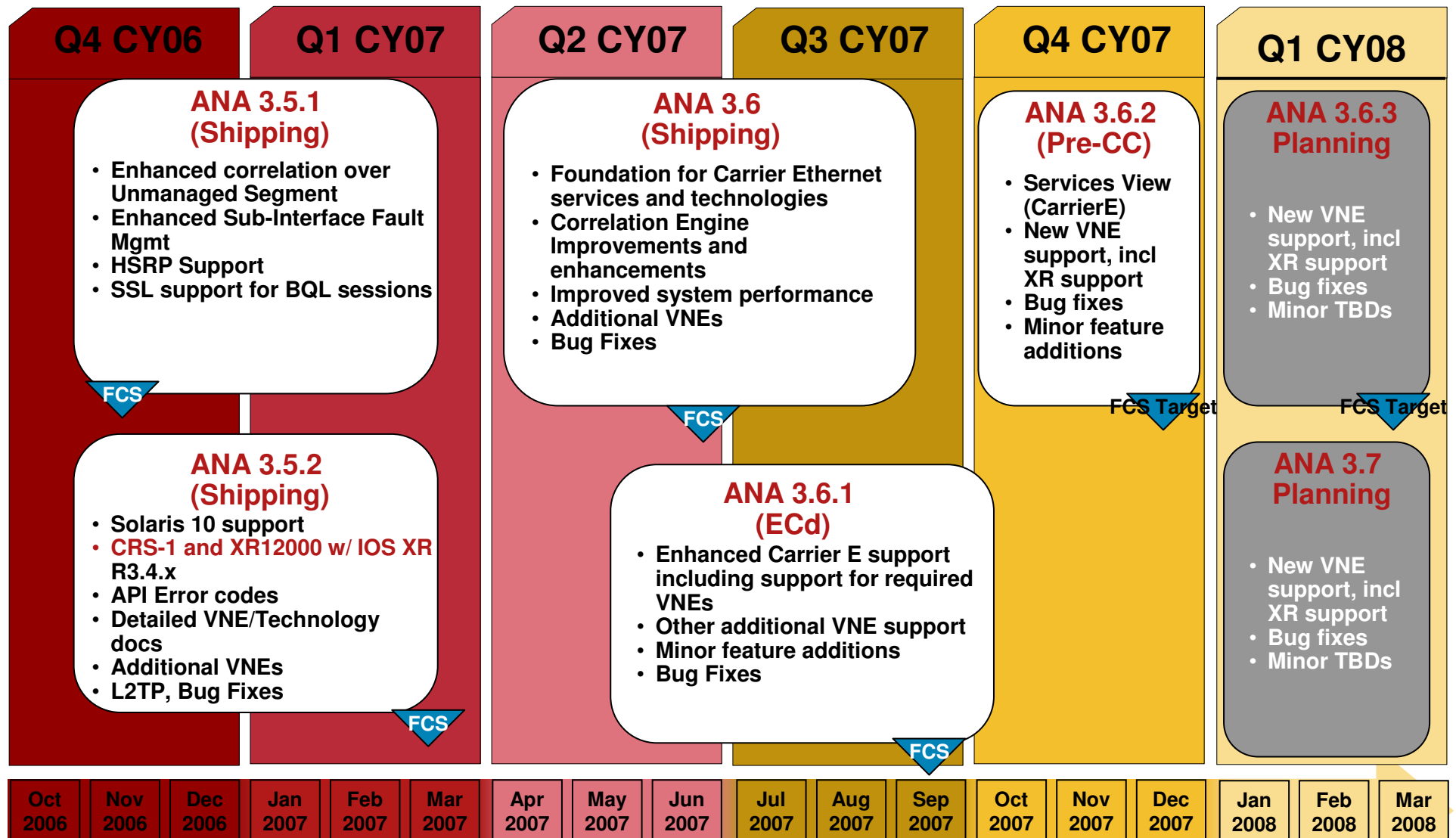


Cisco Active Network Abstraction

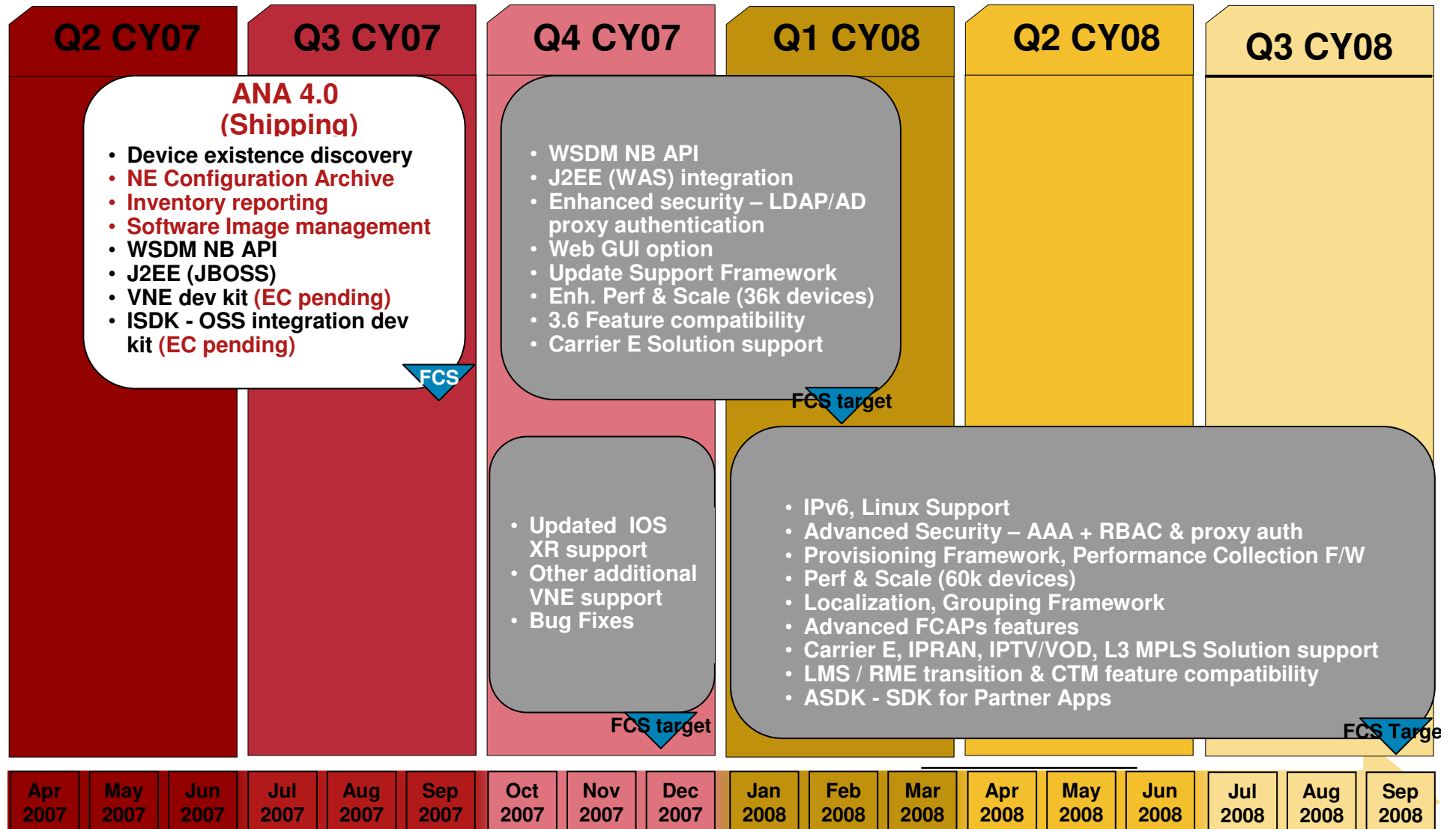
Evolution – Releases &
Roadmap



Cisco ANA 3.x Roadmap



Cisco ANA 4.x Roadmap





Cisco IP Solution Center (ISC) Overview And Update



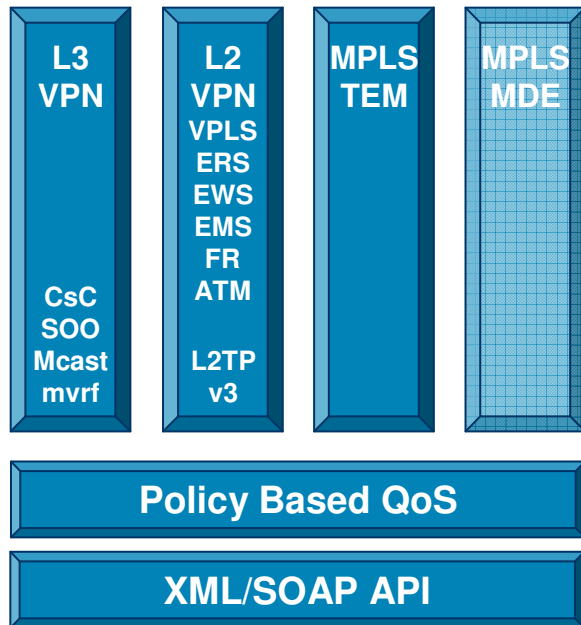
Mobile Core Networks

Key Provisioning Requirements

- Robust MPLS L3 and L2 VPN provisioning
 - Automatic, carrier-class provisioning
 - Reduce Provisioning Failures due to error-prone manual procedures
- Traffic Engineering for provisioning and protection management
 - Superior node and link protection for delay-sensitive core traffic (e.g. signalling and voice)
- Fast recovery and restoration
 - Sub-50ms recovery with managed FRR back-up for mission-critical traffic
- Fast diagnosis and repair of MPLS VPN services
 - Industry-leading MPLS OAM Diagnostic tool.

Cisco ISC 4.1 Overview

IP Solutions Center Service Modules



- IP Solutions Center is a Family of Management Applications for Planning, Provisioning, and Troubleshooting MPLS and Metro Ethernet networks.

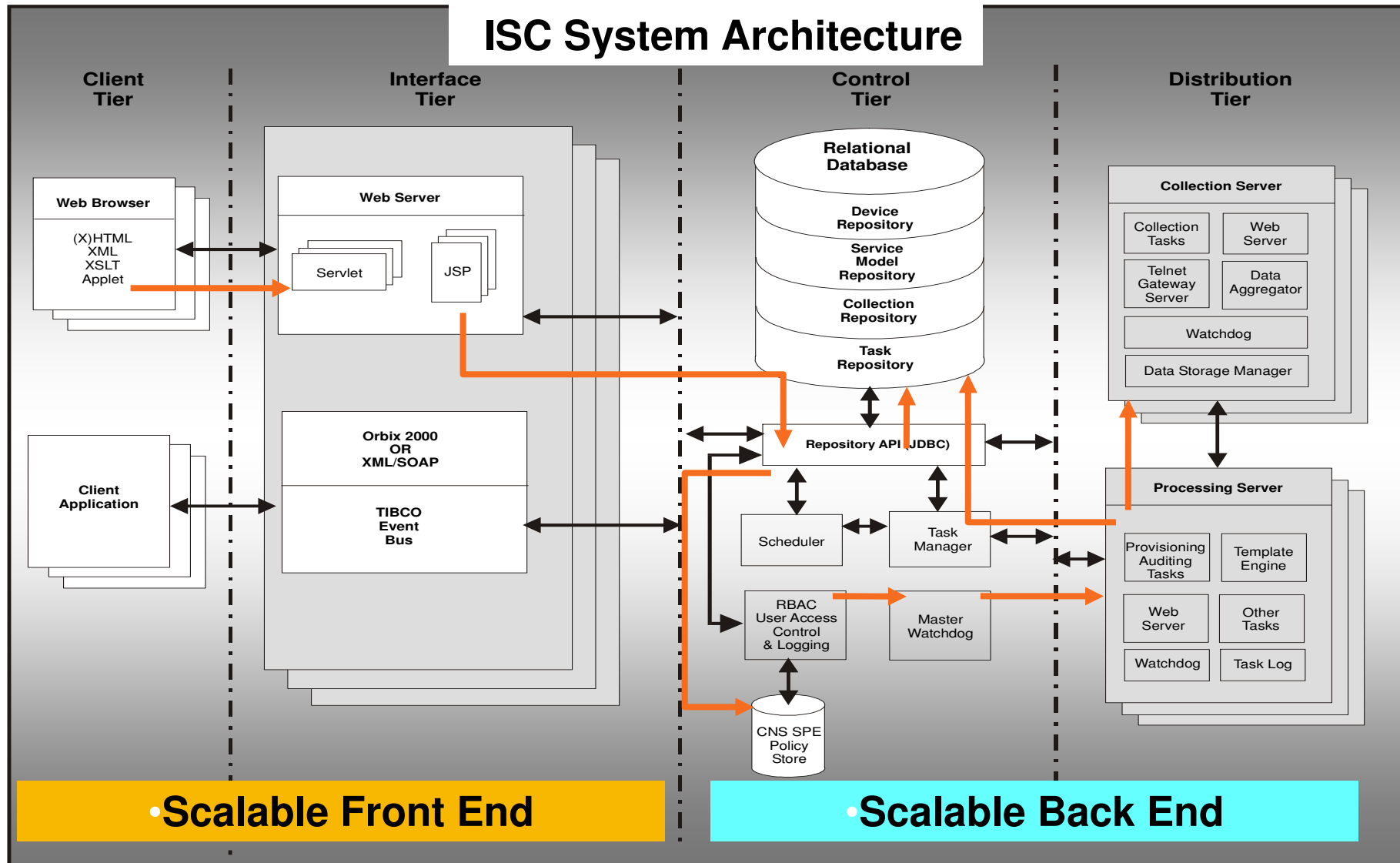
ISC:MPLS simplifies, integrates and automates the management of IP VPN and QoS.

ISC:L2VPN and ISC:Metro Ethernet simplify, integrate and automate the management of IP VPN, Metro Ethernet, ATM, FR, and QoS.

ISC:TEM leverages MPLS TE to enable network convergence and offers advanced MPLS-TE management functionality, including network optimization and bandwidth protection.

ISC:MDE MPLS Diagnostic Expert improves Service availability and MTTR through advanced Diagnostics MPLS Core, Aggregation and Access networks.

System Architecture



GUI - Top Level Organization

- Scalable distributed/redundant architecture
- Centralized system resource management
- **Network/Service auto-discovery and inventory mgmt**
- **Topology tool with Physical and Service maps**
- Resource/User partitioning
- Web GUI
- Monitoring
- Scheduling
- Role based Access Control
- User audit trail
- Open XML API interface



GUI – Service Inventory and Service Requests

- Three kinds Of Users:
 - Service Operator
 - Network Operator
 - Administrator
- Service Operator Creates Services by Service requests
- Network Operator Designs Service
- Administrator Manages The System
- Service Operator Will See Only the Service Inventory Tab.
- All Works Need To Be Done by Service Operators Are Listed In This Tab's Table Of Content.

Service Requests - Microsoft Internet Explorer provided by Cisco Systems, Inc.

Address: http://isc-mpls-demo1:8030/isc/service_filter.do

Home | Shortcuts | Account | Index | Help | About | Logout

User: admin

IP Solution Center

Service Inventory | Service Design | Monitoring | Diagnostics | Administration

Inventory and Connection Manager | Discovery | Device Console

You Are Here: Service Inventory > Inventory and Connection Manager > Service Requests

Customer: None

Selection

- Service Requests
- Traffic Engineering Management
- Inventory Manager
- Topology Tool
- Devices
- Device Groups
- Customers
 - Customer Sites
 - CPE Devices
- Providers
 - Provider Regions
 - PE Devices
 - Access Domains
- Resource Pools
- CE Routing Communities
- VPNs
- AAA Servers
- Named Physical Circuits
 - NPC Rings

Service Requests

Show Services with Job ID matching * of Type All Find

Showing 1 - 2 of 2 records

#	Job ID	State	Type	Operation Type	Creator	Customer Name	Policy Name	Last Modified	Description
1.	47	DEPLOYED	TE Protection	MODIFY	admin			11/16/05 8:00 PM	
2.	53	DEPLOYED	TE Tunnel	MODIFY	admin			11/14/05 1:10 PM	

Rows per page: 20 Go to page: 1 of 1

Auto Refresh:

Create Details Status Edit Deploy Decommission Purge

MPLS VPN

L2VPN

VPLS

QoS

IPsec

IPsec RA

Firewall

NAT

TE

Local intranet

MPLS Management Problems Addressed

- **Provisioning**

 - Complexity of MPLS VPN Service activation

 - Accuracy of configuration

 - Partitioning of provisioning tasks

 - Role Base Access Control

- **Verification**

 - Verification of configuration

 - Customer VPN routing verification

- **Troubleshooting**

 - Automation of root cause analysis

 - Complex configuration and core verification

MPLS VPN Provisioning Features

- Resource Management

Manage AS, Regions, IP address pools, RD/RT Pools, VLAN pools, Provider administrative domains.

- Design and Assign Policies

CERC (CE Routing Communities)

Hub-n-spoke, full mesh, partial mesh VPN

Pre-provisioning checks for design validity

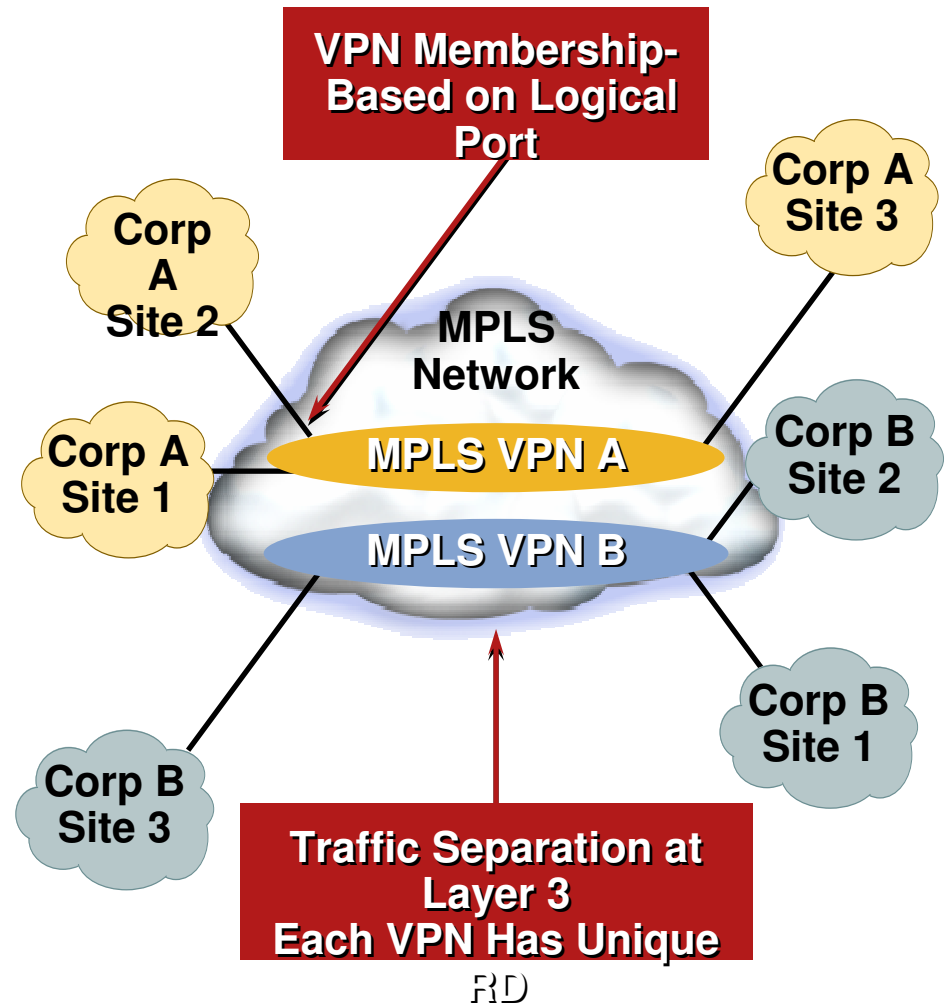
Profile based design of services

Routing protocol configuration for attachment circuits – RIP, OSPF, static, EIGRP, ISIS

- Post Provisioning Verification

Smart Configuration and Routing audits; VRF Pings to validate VPN configuration.

On demand Audits for configuration troubleshooting



MPLS VPN Verification and Diagnostic Features

▪ Configuration verification

Accurate verification of service activation configuration

▪ Post Provisioning Verification

Smart Configuration and Routing audits, VRF Pings to validate VPN configuration.

On demand Audits for configuration troubleshooting

▪ Diagnostic support (MPLS Diagnostics Expert)

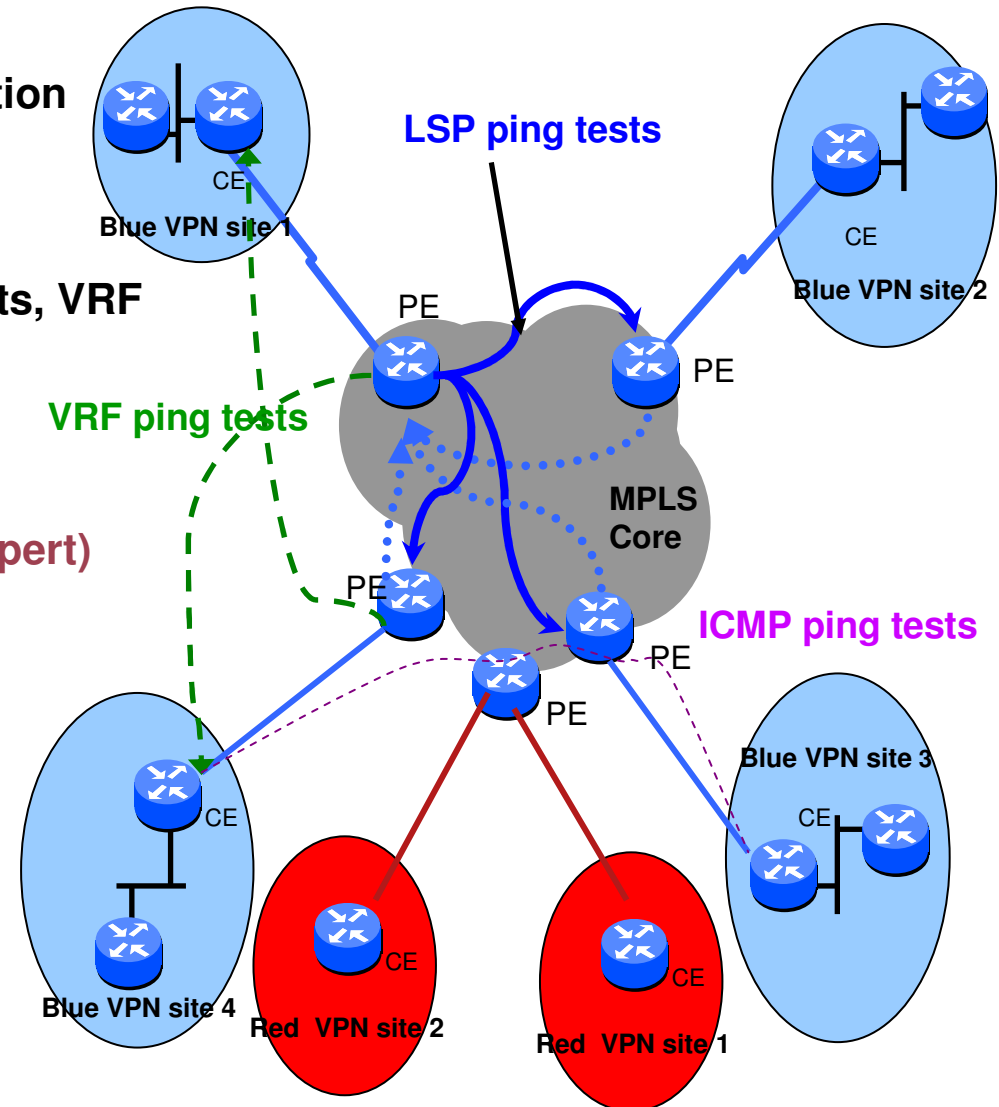
New ISC Module – supports:

Drill down to root cause

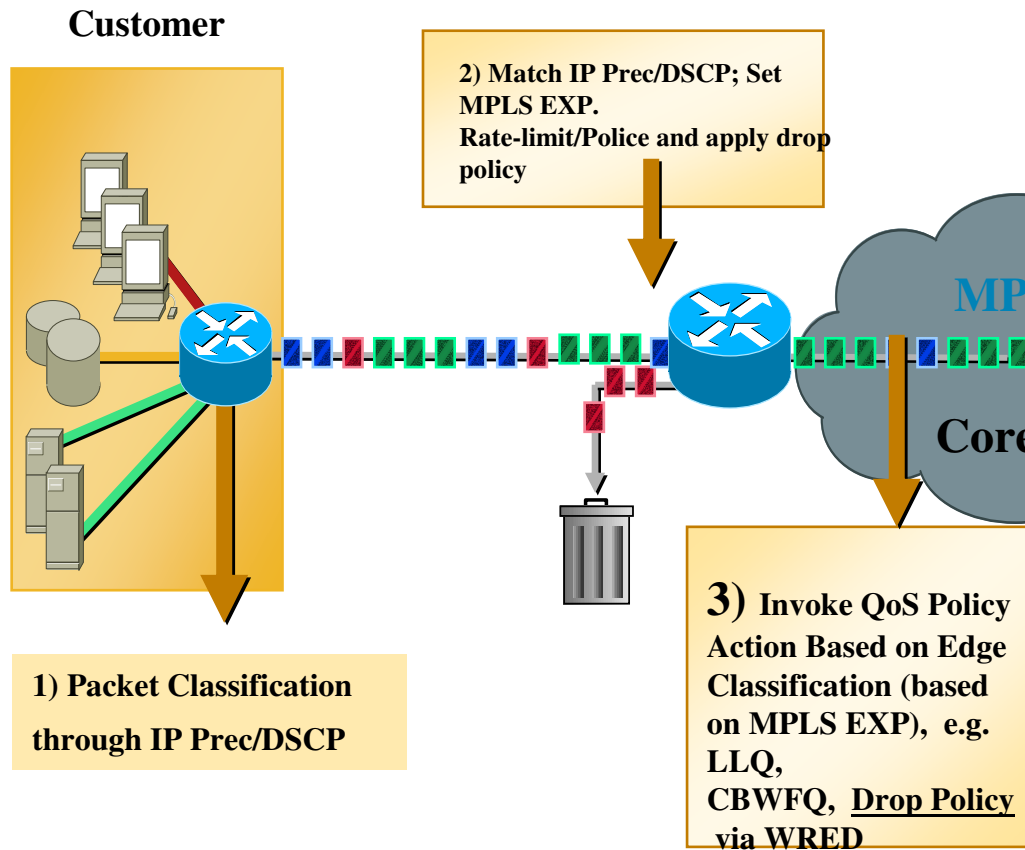
Control/data plane analysis

Summarised and detailed views

VRF Ping, LSP Ping, LSP trace,



QoS Provisioning Features until ISC 4.x



• Traffic Classification

- Protocol ID, Src/Dest Addr., Src/Dest Ports, Port Ranges, DSCP, IP Prec, L2 CoS

• Marking

- DSCP between 0 & 63
- IP Precedence between 0 & 7
- MPLS Exp between 0 & 7 (when core has MPLS network)

Rate-limiting

- Class-based Single/Dual Rate Policer (MQC) and CAR (non-MQC)

• Shaping

- CB-shaping (MQC), Interface-based GTS (non-MQC)
- FRTS in the context of Frame-Relay
- ATM Shaper (vbr-rt, vbr-nrt, abr, cbr ubr)

• Congestion Management

- CBWFQ (for Data) + PQ (for voice)
- WFQ (for Data) + PQ (for voice)

• Congestion Avoidance

- WRED with DSCP & IP Precedence

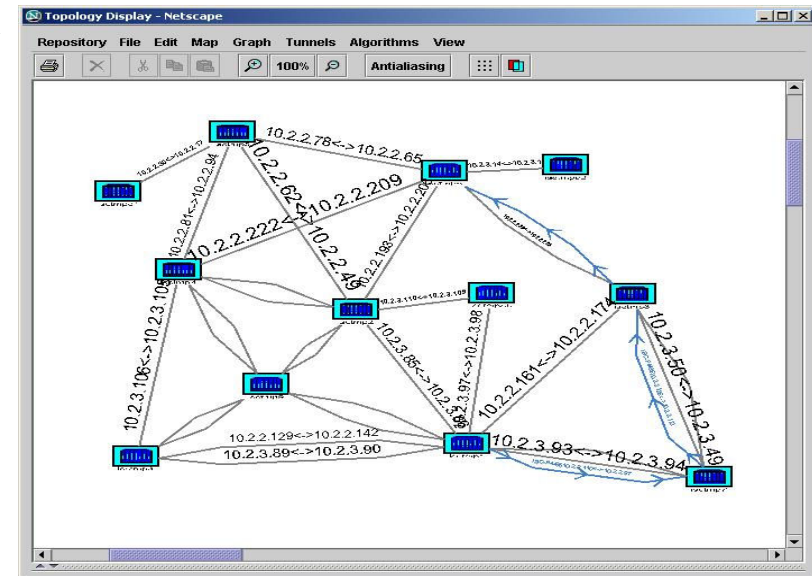
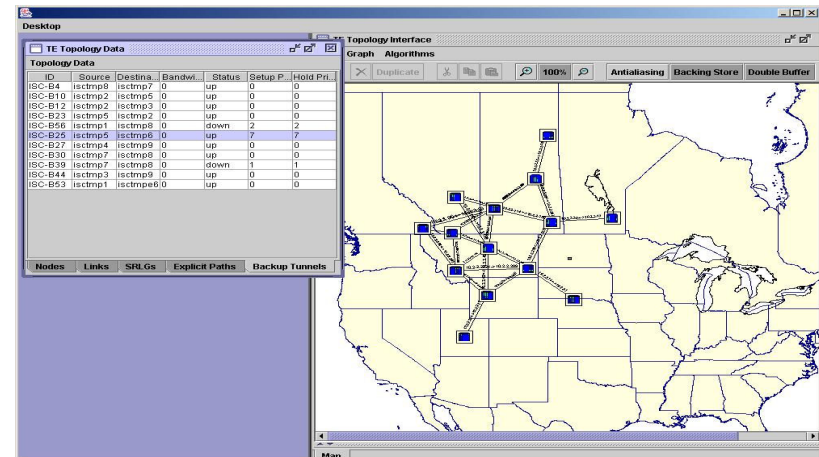
• Link Efficiency

- LFI over MLPPP
- LFI over Frame-Relay, cRTP

ISC MPLS TE

MPLS TE Planning & Configuration

- **Discovery and Audit**
 - MPLS TE topology, validation of placed tunnels
- **Bandwidth Protection**
 - Compute placement of Fast Reroute backup tunnels to protect critical network elements
 - Protect bandwidth against link, node, or SRLG (Shared Risk Link Group) failures
- **Optimal DS-TE primary tunnel routing**
 - Compute and place new primary tunnel demands
- **Provisioning**
 - Primary DS-TE tunnels, FRR for bandwidth protection and resiliency



ISC MPLS Diagnostics Expert

Automated Diagnosis of Problems in an MPLS Network

- **Edge: > 30 Unique Scenarios ... including**
 - Config issues e.g. Route Target Mismatches between Ingress/Egress PE**
 - Interface not associated with VRF; VRF route limit exceeded**
 - Inconsistencies – e.g. Route installed into BGP table but not VRF**
 - Mismatches between FIB/LFIB; Routes not distributed into MP-BGP**
- **Core: > 30 Unique Scenarios ... including**
 - Config issues – “finger trouble” e.g. CEF/VPNv4 Address family disabled**
 - Label allocation/installation issues; RP/LC inconsistencies**
 - LSP Blackholes; Packets too big for Interface MTU**
- **Access Circuits: > 40 Unique Scenarios ... including**
 - Config issues - Interface admin down, Line protocol down**
 - CE/PE connectivity – including automated execution of ATM & FR OAM**
 - Packets being dropped in switched (ATM/FR) circuit**

Intelligent IOS MPLS Instrumentation & Cisco MPLS Diagnostics Expert

Reactive Test Configuration



Local Site

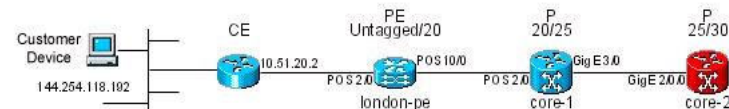
PE Hostname *	cl-7206-2	Select
PE Access Circuit Interface *	POS3/0	
CE Access Circuit Interface IP Address *	7.1.1.2	

Type in simple details
e.g. Customer Edge IP
addresses ... and
press "OK" to start

Simple GUI telling you where problem is, what is underlying root cause ... and recommended action ... 100+ potential failure scenarios checked automatically – repeatable process

Reactive Test Results

VPN Connectivity Test Result



View: Test Details Test Log

Summary: No VPN connectivity within VPN1 on london-pe to 10.52.21.2
Possible Cause(s): LSP broken, No LFIB entry on core-2 for prefix 144.254.117.190
Recommended Action:

1. Clear IP route for prefix 144.254.117.190
2. Check LDP session
3. Check LP/RC inconsistency on each previous hop
4. Check for duplicate loopbacks in path

WARNING: Clearing route may be service affecting operation

Advanced Re-test Cancel

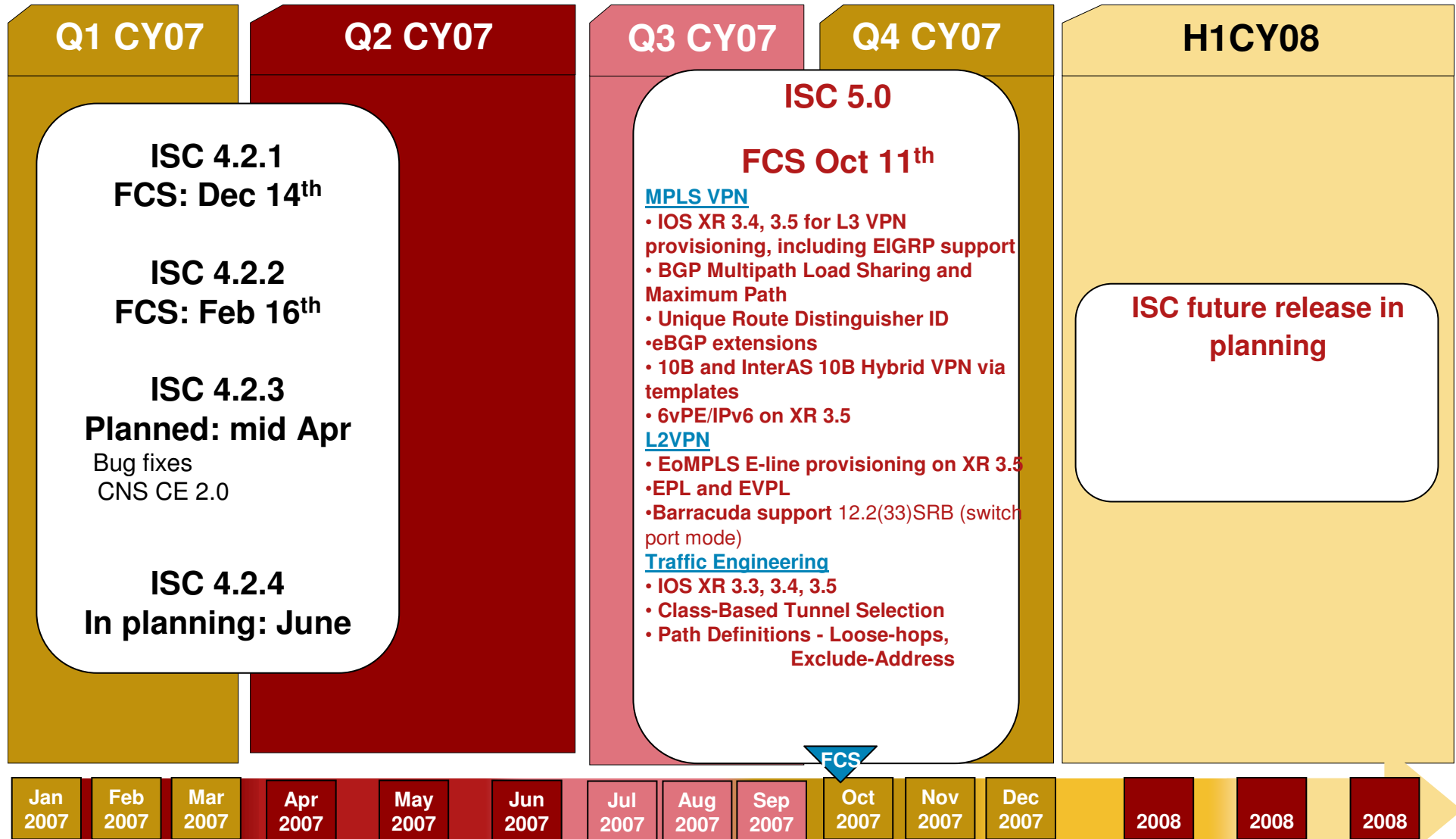


Cisco IP Solutions Center

Evolution – Releases &
Roadmap



ISC Provisioning and TEM Application Roadmap



CRS & XR Management Package

- Device Management for CRS and XR12K; opportunity for extension to edge & aggregation
- Joint program by NMTG, CRS and CA Advanced Services
- Worldwide availability for 'any customer buying CRS, XR12K Hardware' – not limited to top SPs
- Cisco build a new Virtual Network Element (VNE) for the CRS-1 and XR12000 to run on ANA 3.5.2
- Initial support will be for IOS XR R3.4.x with the commitment to upgrade the VNE as new versions of IOS XR are released

CRS & XR Management Package

- VNE for CRS-1 and XR12000
 - IOS XR R3.4.x
 - Logical & Physical Inventory
 - Fault collection and Display
- Solaris 10 Support
- NB Mediation Layer for WSDM compatibility with ANA 4.0

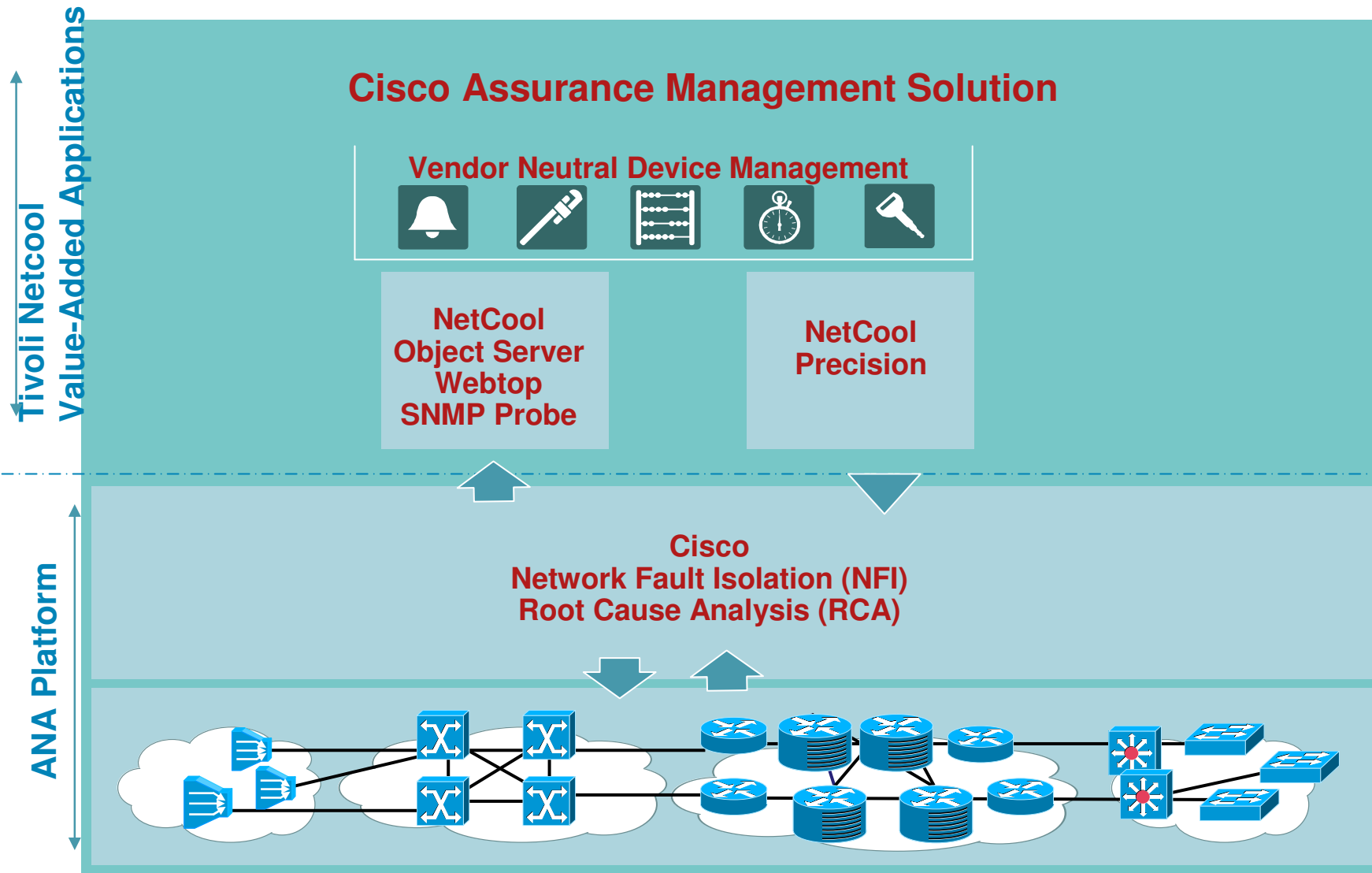


Cisco “Assurance Management Solution” Overview



Cisco Assurance Management Solution (AMS)

Bundle of IBM Tivoli/Netcool with Cisco ANA



Assurance Management Solution - MoM

NetCool/Omnibus Desktop Event View

Netcool/OMNIBus Event List : Filter="Cisco ANA Events", View="Cisco ANA Detailed View"

File Edit View Alerts Tools Help

Cisco ANA Events Cisco ANA Detailed View Top [OFF]

Agent	Node	Summary - Long Description	Alert Group	Alarm ID	ANA Severit	NA Si
Cisco ANA	80.80.80.63	Port Down due to Oper Status down	Cisco 7204	n5Major0Port down0{[ManagedElement(Ke	5	Major
Cisco ANA	80.80.80.65	IP Interface ATM1/3.101 (10.10.10.1) changed status	Cisco 12410		5	Major
Cisco ANA	80.80.80.68	Port Down due to Oper Status down	Cisco 7600	5Major0Port down0{[ManagedElement(Ke	5	Major
Cisco ANA	80.80.80.65	IP Interface ATM1/3.100 (172.16.0.1) changed status	Cisco 12410	6.0.1) changed status to down5Major0Inte	5	Major
Cisco ANA	80.80.80.65	IP Interface ATM1/3.300 (172.16.1.1) changed status	Cisco 12410	6.1.1) changed status to down5Major0Inte	5	Major
Cisco ANA	80.80.80.65	IP Interface ATM1/3 (10.120.1.2) changed status to d	Cisco 12410		5	Major
Cisco ANA	80.80.80.65	IP Interface ATM1/3.500 (172.16.2.1) changed status	Cisco 12410	6.2.1) changed status to down5Major0Inte	5	Major
Cisco ANA	80.80.80.65	mpls te tunnel down due to operational status change	Cisco 12410	ational status change5Major0MPLS-TE tun	5	Major
Cisco ANA	80.80.80.65	Affected Services Report	Cisco 12410	MPLS-TE tunnel down1{[ManagedElement	5	Major
Cisco ANA	80.80.80.68	Port Down due to Oper Status down	Cisco 7600	5Major0Port down0{[ManagedElement(Ke	5	Major
Cisco ANA	80.80.80.65	All ip interfaces are down on port OC3/Stm1: 1.3	Cisco 12410	ort OC3/Stm1: 1.35Major0All ip interfaces d	5	Major
Cisco ANA	80.80.80.65	IP Interface Tunnel0 (80.80.80.65) changed status to	Cisco 12410	65) changed status to down5Major0Interfa	5	Major
Cisco ANA	80.80.80.65	mpls te tunnel down due to operational status change	Cisco 12410	ational status change5Major0MPLS-TE tun	5	Major
Cisco ANA	80.80.80.65	Affected Services Report	Cisco 12410	MPLS-TE tunnel down1{[ManagedElement	5	Major
Cisco ANA	80.80.80.68	Unreachable IP address is 80.80.80.68	Cisco 7600		5	Major
Cisco ANA	80.80.80.65	Unreachable IP address is 80.80.80.65	Cisco 12410		5	Major
Cisco ANA	80.80.80.65	IP Interface ATM1/3.101 (10.10.10.1) changed status	Cisco 12410		5	Major
Cisco ANA	80.80.80.65	IP Interface ATM1/3.100 (172.16.0.1) changed status	Cisco 12410	6.0.1) changed status to down5Major0Inte	5	Major
Cisco ANA	80.80.80.65	IP Interface ATM1/3.300 (172.16.1.1) changed status	Cisco 12410	6.1.1) changed status to down5Major0Inte	5	Major
Cisco ANA	80.80.80.65	IP Interface ATM1/3 (10.120.1.2) changed status to d	Cisco 12410		5	Major
Cisco ANA	80.80.80.65	IP Interface ATM1/3.500 (172.16.2.1) changed status	Cisco 12410	6.2.1) changed status to down5Major0Inte	5	Major
Cisco ANA	80.80.80.65	All ip interfaces are down on port OC3/Stm1: 1.3	Cisco 12410	ort OC3/Stm1: 1.35Major0All ip interfaces d	5	Major
Cisco ANA	80.80.80.65	IP Interface Tunnel0 (80.80.80.65) changed status to	Cisco 12410	65) changed status to down5Major0Interfa	5	Major

0 0 3 307 55 0 All Events

365 row(s) matched. 04/23/07 08:48:51 AM root NCOMS[PRI]

start Directory 08:52 23/04/2007

Assurance Management Solution - MoM

Netcool Omnibus – Webtop Event View

Micromuse Netcool - Mozilla Firefox


File Edit View History Bookmarks Tools Help

http://172.23.241.10:8080/

Getting Started Latest Headlines http://www.mb.com/...

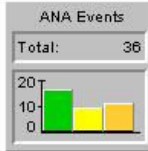
NETCOOL Suite™ logged in as: Netcool Administrator | Netcool ANA Integration **Logout**

MapView
Netcool-ANA-Integration



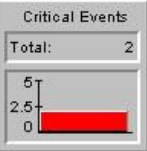
ANA Events

Total: 36



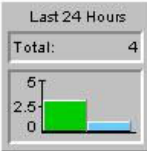
Critical Events

Total: 2




Last 24 Hours

Total: 4



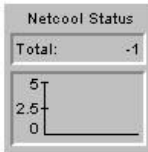
All Events

Total: 150



Netcool Status

Total: -1



Netcool Events

http://172.23.241.10:8080/webtop/ANA_Events/

File Edit View Alerts Tools Help

Agent	Node	Alert Group	Summary	ANA Severity Desc
Cisco ANA	10.56.23.12	Cisco 7204	Port down - Port Down due to Admin Status down	Major
Cisco ANA	10.56.23.12	Cisco 7204	Device unreachable due to port event - Unreachable IP address is 10.56.23.12	Major
Cisco ANA	10.56.23.12	Cisco 7204	Device unreachable due to port event - Unreachable IP address is 10.56.23.12	Major
Cisco ANA	10.56.23.12	Cisco 7204	Interface status down - IP Interface Ethernet2/2 (10.110.1.1) changed status to...	Major
Cisco ANA	10.56.23.12	Cisco 7204	Device unreachable - Unreachable IP address is 10.56.23.12	Major

Done

Cisco AMS Roadmap

