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What You Make Possible
Administration and monitoring of the Cisco Data Center with Cisco DCNM

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Agenda

• DCNM Solution overview
• Best Practices for deploying DCNM and discovering the Data Center components
• DC LAN and SAN Topology views and overlays
• Host and VM inventory, path and statistics
• DCNM clustering and federation
• Conclusion and takeaways
DCNM Solution Overview
Data Center Network Management evolution and convergence

- **Data Center Network Manager**: Manages all LAN Nexus switches.
- **Prime Data Center Network Manager Web Client**
- **Data Center Network Manager for LAN**
- **Data Center Network Manager for SAN**

Continues to bring new innovative features to DC Management on Nexus and MDS series switches.
Components of a DCNM solution

- **DCNM server(s)**
  - DCNM APIs
  - Files
  - Database server (PostgreSQL or Oracle)
  - AAA/AD servers
  - File server(s)
  - FTP
  - NX-OS images
  - Config. rollbacks

**DCNM-LAN Java Client**
- Unified Web Client
- DCNM-LAN Java Client
- DCNM-SAN Java Client
- SAN Device Manager

**Data Center (MDS, NEXUS, UCS and servers/VMs)**
- SNMP
- SSH/CLI
- SNMP SSH/Netconf/XML
- SSH/CLI

**SAN Device Manager**
- SNMP

**Database server**
- JDBC
- SFTP, TFTP, FTP
- Radius, TACACS+, LDAP

**File server(s)**
- FTP
- SFTP, TFTP, FTP
- Radius, TACACS+, LDAP

**AAA/AD servers**
- NMX-OS images
- Config. rollbacks

**HTTP with Flash**
- Java RMI
- SNMP

**SNMP**
- SSH/CLI
- SSH/Netconf/XML

**DCNM API**
- Java RMI
- SNMP
DCNM-LAN Java Client

Comprehensive LAN inventory, topology and configuration

- Detailed inventory and configuration management
- Supports all Nexus switches and technologies (FEX, VDC, vPC, Port Channel, FabricPath, OTV, …)
- LAN topology views
- L2 and security
- Wizards and template-based configuration
- Configuration archive and image management
- On-demand performance monitoring and thresholds
- Events
DCNM-SAN Java client

Comprehensive Fabric management

- SAN Fabric Management (FC, FCoE, FICON, iSCSI, FCIP, ..)
- VSAN and Zoning management
- Wizard-based configuration (VSAN, IVR, FCoE, PortChannel, iSCSI, FCIP, NPV)
- Topology views and path display
- Configuration archive and image management
- Troubleshooting tools
- Events and performance
DCNM-SAN Device manager

Single device view and configuration

- Representation of the physical switch
- Monitors performance statistics in real time
- Configure all features except Zoning
- Single and multiple ports configuration
DCNM unified web client

Unified dashboard console: LAN and SAN inventory, health and performance

- Unified discovery
- Dashboard views: summary, switches, hosts, storage enclosures
- Topology and path analytics
- Device groups and scoping
- Inventory and performance views: switches, modules, links, ports, …
- Configuration archive and restore
- SAN inventory, health and performance reports
Best Practices for deploying DCNM and discovering the Data Center components
Pre-requisites and best practices

- **General**: check version compatibility between DCNM and devices (especially Nexus)
- **Devices** (MDS, Nexus and UCS)
  - Use the device management port (otherwise CDP neighboring information cannot be used by DCNM)
  - Devices and DCNM clocks are synchronized, and use a standard timezone (i.e. CET)
  - Use the same, non-default and dedicated device credentials for discovery
- **Connectivity**
  - from DCNM to the devices: IP/SNMP/SSH
  - from devices to DCNM: syslog and SNMP traps
- **DCNM server**
  - MAC address is static
  - Prefer an external Oracle DB for large and critical deployments
- **DCNM Java clients**: Recommended to use the officially supported JRE version (1.6.0.31)
Discovering the Data Center

DCNM Data Sources: SAN Fabric, LAN and VMware

- Data Source discovery is done from a single place
SAN Discovery

Similar to Fabric Manager

- Per Fabric discovery
- Uses SNMP (V2c or V3) and SSH
- Per-VSAN discovery
- DCNM discovers the entire Fabric
- DCNM-SAN modifies the switch configuration: adds the DCNM-SAN server IP address as trap destination
- Synchronisation:
  - DCNM-SAN relies on traps sent by the switch
  - Incremental per-fabric resynch every 300 seconds
  - Full rediscovery every 5 hours
- Best Practice: check that traps are received by DCNM

Unified Web Client

SAN Java Client
LAN discovery – step 1

Shallow discovery: SNMP-based

• Step 1 is SNMP-based:
  – V1 or V3
  – Explicit SNMP timeout

• Result of CDP neighbors scan is listed and mapped

• Credentials are tested

• Each device is flagged as manageable, unknow user/password, timeout or already managed

• You can revert back and increase the SNMP timeout

• Select the Nexus, UCS and Cat 6k that you want to add in DCNM

• Click on Add to complete the SNMP discovery
LAN discovery – step 2

Deep discovery: Netconf/XML-based

• Deep discovery is no longer automatic.
• Must be explicitly requested by editing the discovery task.
• May take time … check progress in both web or Java clients.
• Synchronisation: DCNM polls system log and accounting log, every 60 seconds + upon config change.
### VMWare discovery

Gives DCNM detailed host/VM visibility

<table>
<thead>
<tr>
<th>Server</th>
<th>Managed</th>
<th>Status</th>
<th>User</th>
<th>Last Updated Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>102.158.40.100</td>
<td>true</td>
<td>OK</td>
<td>Administrator</td>
<td>Wed Jan 02 09:10:35 CET 2013</td>
</tr>
</tbody>
</table>

- Add a VMware Vcenter or an ESX server
- Read-only credentials
- DCNM retrieves hosts/VMs inventory, connectivity and statistical data
- Synchronization: DCNM polls every 5 mins
DC LAN and SAN Topology views
Physical view and overlays (DCNM-LAN Java client)

Physical view of the DataCenter LAN
Physical view and overlays

Overlay the Port Channel and vPC, physical or logical
Physical view and overlays

Display VLANs and STP

- Map toolbox for troubleshooting VLAN and FP
Physical view and overlays

FabricPath topology and graphs

- FP topology graphs
- FP connectivity graphs
Physical view and overlays

Nexus virtualization objects

- Nexus 7000 Virtual Device Context (VDC)

- Nexus 1000V Virtual Service Module (VSM) and Virtual Ethernet Module (VEM)
Fabric and VSAN physical view

Dynamic and contextual FC topology

- Per Fabric or VSAN
- VSAN and zone resources highlight
- Protocol-specific link display
- Per link attributes display
Unified web client

LAN and SAN physical topology views, with performance data

- Topology views animated with performance data: link load, CPU, memory
Host and VM inventory, path and statistics
Which host/VM information is available to DCNM?

DCNM discovers all the hosts/VMs connected to the LAN and SAN networks (Nexus and MDS) from the following sources, when available:

- Fabric database (« show fcns database details »)
- LAN (Nexus):
  - LLDP entries: the command « show lldp neighbors details » provides MAC, VLAN, connectivity
  - MAC address table: the command « show MAC address-table » and « show IP arp » provides MAC, IP, VLAN, connectivity and aging
- VMWare Vcenter provides MAC, WWN, IP, hostname, adapters, Host-VM relationship, and statistics
- No DNS resolution
LAN host discovery and tracking

Comprehensive LAN inventory of all hosts/VMs

• Must be explicitly enabled
• Default polling cycle 180 mins
• Uses Nexus MAC and ARP tables
• Requires VMware datasource for hostname mapping
• Track host active/inactive status
• Filtering and searching
• Inactive hosts can be manually deleted
LAN host/VM access topology

Host enclosure dashboard includes LAN hosts/VMs

- Search by Name, IP or MAC
- Host contextual topology is displayed
Host <-> Storage path

Host to Storage paths (shortest or all)

- Host or Storage specific view
- Select host / storage enclosure or host / storage port
- Select “show path”: Shorter path or multiple path view
Unified web client: Host dashboard

Server details, path and statistics

- Search server by name, WWN and alias
- Server details
- Server to storage(s) path
- Server traffic statistics
- Server port events
Unified web client: Host dashboard

VM centric view per ESX server

- ESX server details
- VM details (up to datastore LUN and storage port)
- VM to storage path view
- VM statistics (CPU, latency, disk IO) and events
- VM details requires VMWare data source discovered
DCNM scalability and High-availability

Local and remote
Overview

• Before DCNM 5.2, each product had a separate technology for H/A and scalability

• DCNM: « server clustering »:
  • Shared external database and data repository
  • Requires multicast between nodes
  • Requires all servers on same subnet (local H/A)
  • Distributed load-balancing
  • automatic failover

• Fabric Manager: « server federation »:
  • Shared external database
  • Suitable for remote H/A
  • Explicit assignment of a Fabric to a server;
  • manual failover

• In DCNM 5.2.2 and 6.1.1, each technology remains unchanged in the converged DCNM
Clustering/Federation enhancements in DCNM 6.1.2

- Oracle RAC support
- DCNM supports both local and remote deployments:
  - DCNM LAN clustering no longer requires multicast transport. Uses TCPing instead.
  - Manual load balancing between DCNM servers
  - Automatic failover between DCNM servers
DCNM Cluster/Federation installation

- Prerequisites:
  - External DB (Oracle preferred)
  - External shared file system (for Nexus configuration archives)
  - Nodes NTP synch’ed
- Prepare the DB server, create the database and user, allow remote access
- Install primary DCNM server (remember the Partition ID)
- On the secondary server installation:
  - select « add server to federation »
  - Specify the same Partition ID
DCNM cluster/federation monitoring

LAN Java Client

Unified Web Client
# Manual load balancing

Moving LAN or SAN ownership to another server

## Load Balancing Table

<table>
<thead>
<tr>
<th>Domain Server</th>
<th>Name</th>
<th>Seed Switch</th>
<th>Status</th>
<th>SNAPSHOT/SYNCH</th>
<th>User/Group</th>
<th>Auth/Privacy</th>
<th>Included VSN List</th>
<th>Excluded VSN List</th>
<th>Licensed</th>
<th>Last Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>172.22.29.14</td>
<td>Fabric_002</td>
<td>172.23.162.65</td>
<td>managed</td>
<td>true</td>
<td>admin</td>
<td>NOS</td>
<td></td>
<td></td>
<td>true</td>
<td>2012-12-16 12:33:00</td>
</tr>
<tr>
<td>172.22.29.14</td>
<td>Fabric_172-231</td>
<td>10.101.40.29</td>
<td>managed</td>
<td>false</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>true</td>
<td>2012-12-16 12:33:00</td>
</tr>
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<td>2012-12-16 12:33:00</td>
</tr>
</tbody>
</table>

## LAN Tasks Table

<table>
<thead>
<tr>
<th>Domain Server</th>
<th>Name</th>
<th>Managed</th>
<th>Discovery Status</th>
<th>Last Updated Time</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>172.22.29.14</td>
<td>task_seed_10.16.64.161</td>
<td>true</td>
<td>...</td>
<td>2012-12-05 13:23:38:744</td>
<td>admin</td>
</tr>
<tr>
<td>172.22.29.14</td>
<td>task_seed_10.16.64.161</td>
<td>true</td>
<td>...</td>
<td>2012-12-05 13:23:38:744</td>
<td>admin</td>
</tr>
<tr>
<td>172.22.29.14</td>
<td>task_seed_172.22.21.103</td>
<td>true</td>
<td>...</td>
<td>2012-12-05 13:23:38:744</td>
<td>admin</td>
</tr>
<tr>
<td>172.22.29.14</td>
<td>task_seed_172.22.21.103</td>
<td>true</td>
<td>...</td>
<td>2012-12-05 13:23:38:744</td>
<td>admin</td>
</tr>
</tbody>
</table>

**Unified Web Client**
DCNM server automatic failover (local and remote)

- Automatic failover must be enabled explicitly.
- In case of failure of a DCNM server, the Fabric and LAN devices ownership (and monitoring tasks) is automatically moved to another server of the same location after calculating server load.
- Location field is editable.
Conclusion
Key takeways …

- DCNM integrates and unifies the LAN and SAN management in the DC
- DCNM simplifies daily admin tasks
- DCNM manages the Nexus and MDS virtualization features
- DCNM has many more features than the ones shown today ….

- [http://www.cisco.com/go/dcnm](http://www.cisco.com/go/dcnm)
- How-to videos:
  -> Presentations
Recommended Reading for BRKNMS-2695

Not Yet Published
Due: March 2013

**NX-OS and Cisco Nexus Switching**
Next-Generation Data Center Architectures
Second Edition
Kevin Garbin, CCIE® No. 11577
Ron Fuster, CCIE® No. 5801
David Jannes, CCIE® No. 5952

**Storage Networking Fundamentals**
An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems
Marc Fuxley

**Network Management Fundamentals**
A guide to understanding how network management technology really works
Alexander Clemen, Ph.D.
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