Managing Multi-site, Multi-Technology Connectivity

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CEO, Square Mile Systems, AssetGen
My Objectives

Help you understand techniques and practices that make managing connectivity easier across multiple locations

– Universities
– Hospitals
– Commercial & Finance
– Government offices
– Transportation (Airports, Ports, Railways)
– Pharmaceuticals, Chemical & Industrial Plants
– Military sites
Personal Background

Personal Experience

- Network Troubleshooting
- Cabling and Network Installations
- Managed Services Voice/Data

Skills
- Awareness
- Communication

Naming
- Labelling
- Change Process

Industry Groups and Frameworks

Baselining
- Toolsets
- Visio automation

- ITIL
- COBIT
- Baseline, Manage, Deploy and Sustain
- Bicsi
- ANSI: American National Standards Institute
- TIA: Telecommunications Industry Association
Why Manage Connectivity?

• Increase in project costs and delays
  – Reverse engineering with workshops, site surveys, etc
  – Overloading of key engineers / individuals

• Increased risks
  – The “human factor” (guess, assume, worry, forget, etc.)
  – Huge security holes

• Transformation activities are costly
  – Upgrading networks, consolidation, cloud migration

Physical connectivity data highlights the current understanding of inventory and dependency.
An easy target for auditors!
Overview

- Understand the Problem(s)
- Standards can help – or hinder
- New technology challenges
- Organisational challenges
- Labelling – not the same as naming
- Case Study(s)
A Starting Point?

1. Is every device in data center / equipment rooms and how it is connected currently documented in a common system that supports connectivity for both planning and operations needs?
   - data, power, video, voice, building management, CCTV

2. Are change updates to inventory and connectivity data duplicated in spreadsheets, diagrams and databases in a consistent way?
   - When devices are added / changed / removed
   - With changes in backbone cabling or patching

3. Can you create detailed work packages for connectivity changes for internal or external engineers, without visiting site beforehand, or being there during changes?

4. Does current connectivity documentation for data centers and shared equipment rooms use consistent naming conventions across all locations, devices and connections?
Infrastructure responds to change so there are limits to what you can manage.
How Do We Cope?

• Adopt industry best practices – where they exist
  – Ensure clarity on roles and practices

• Make the complexity easier to manage
  • Clear naming, labelling and documentation
  • Reduce the number of data sets needed for governance and control
Case Study One

Two data centers (co-lo)
- approx 400 racks
- 36200 fiber/copper connections
- 5800 patches
- 600 servers

“*I’m just overloaded and can’t get others to understand*

4 spreadsheets – inventory + connectivity per DC
(*>1.8 million cells*) + >6000 other spreadsheets

Maintained by a data center manager – no onsite staff
Requesting a Connection -1

This is the initial spreadsheet used to capture connectivity requests

<table>
<thead>
<tr>
<th>Device</th>
<th>Port</th>
<th>Connection</th>
<th>Port</th>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW-BHAM-09</td>
<td>23</td>
<td>To be filled in by DC team</td>
<td>NIC 1</td>
<td>UK_BIRM_BLADE-03</td>
</tr>
</tbody>
</table>

Device 1

SW-BHAM-09

Port 23

Connection

CAT6A Copper

Device 2

UK_BIRM_BLADE-03

Port NIC 1
### Requesting a Connection -2

**Device**

<table>
<thead>
<tr>
<th>Port</th>
<th>SW-BHAM-09</th>
</tr>
</thead>
</table>

**Port**

| 23 | CONNECTION |

**Connection**

- **CAT6A Copper**

**Device**

<table>
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<tr>
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<th>UK_BIRM_BLADE-03</th>
</tr>
</thead>
</table>

**Port**

| NIC 1 |

---

<table>
<thead>
<tr>
<th>Device</th>
<th>Port Type</th>
<th>Speed</th>
<th>VLAN</th>
<th>Colour</th>
<th>Cable Label</th>
<th>Connection type</th>
<th>Length</th>
<th>Port Type</th>
<th>Speed</th>
<th>VLAN</th>
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</tbody>
</table>

**Device**

<table>
<thead>
<tr>
<th>Room</th>
<th>Rack</th>
<th>Position</th>
<th>Make</th>
<th>Model</th>
<th>Asset Number</th>
<th>IP Address</th>
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**Port Type**

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<th>Speed</th>
<th>VLAN</th>
</tr>
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</table>

---

The spreadsheet just went from 4 to 30 columns wide!
Naming & Labelling

Figure 5.2 Sample name labels

- Label 1 - Server Connection
  - Line 1: com00-5/fe0
  - Line 2: A0015-02-03

- Label 2 - Patch Panel Connection
  - Line 1: A0015-02-03
  - Line 2: com00-5/fe0
Ports and Connections

Equipment – use the physical label?

- 1 or 01 or 001?
- 2/1 2\1 2/01 SL2/1 Port 2/1 Gig 2/1 Fe2/1 Slot 2/09
- Mgmt MGT Con Console ILO Net Mgmt
- NIC 1 Eth A Net 0 hba0 bge1 12F1 primary

Cable Labels

1) port 2) local devices 3) end devices
4) full path 5) cable unique id 6) path unique ID
And – Which Cabling Topology?

Could involve 1 to 5 patches
Multi-path Options

Network Racks

Server Racks

RACK N01
Zone A

RACK N02
Zone B

RACK N03
Zone C

RACK N04
Zone D

RACK A01

RACK A02

01-06 07-12 13-18 19-24

01-06 07-12 13-18 19-24

01-06 07-12 13-18 19-24

01-06 07-12 13-18 19-24
Very Multi-path – Modular Panels

One unit = 48 modules @ 6 LC ports per module = 288 ports
One rack @ 6 Units = 288 modules = 1728 ports
## Increase The Spreadsheet Size – Add Control

<table>
<thead>
<tr>
<th>Device</th>
<th>Port</th>
<th>Patch</th>
<th>PPA Port</th>
<th>Patch Panel A</th>
<th>Back to Back</th>
<th>Patch Panel B</th>
<th>PPB Port</th>
<th>Patch</th>
<th>Port</th>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>23</td>
<td>05</td>
<td>AA</td>
<td></td>
<td>AC</td>
<td>05</td>
<td>NIC 1</td>
<td></td>
<td></td>
<td>SW-BHAM-01</td>
</tr>
</tbody>
</table>

- Room
- Rack
- Position
- Make
- Model
- Asset Number
- IP Address

The spreadsheet data has now grown to up to 60 columns wide!
And Cabling Extends Beyond The DC!
Define Active Device Naming

Device Name
1) Logical Name  US-SW-DC02-03P
2) Type of device / location  Cisco 6509 DC02-B03-U2
3) Asset Number  Asset HW0078732

Device component – Switch Card
US-SW-DC02-03P Card3
Cisco 6509 DC02-B03-U2.Slot03
Asset HW0078737

Device component – Blade Server
UX-NY0445-PROD
HP BL685C BLNY05-DC02-B03-U2.Slot03
Asset HW0078143
### Define Infrastructure Naming

#### Patch Panel
- AB
- B03-AB
- B03-5
- **US-NY-DC05-H1-B03-5**
- PP B03-AB-U5
- PP B03-AB-U5 to H07-AC-U2
- PP B03-AB-U5 to H07-AC-U2/H06-AG-U9
- PPC B03-AB-U5 to H07-AC-U2: Ports 01 to 24

#### Port Selection
- AB-A Ports 1-6
- H07-AC-B Ports 7-12
- PCI AB-A Ports 1-6 to H07-AC-B Port 7-12
- AC-03B Ports 1-6
- PFI B03-AB-03B Ports 1-6 to H07-AC-12A Ports 1-6

#### 24 Port Copper Patch Panel
- 6 Copper RJ45 Ports
- 6 Fiber LC Ports

#### 288 Port Fibre Panel
- 288 Port Fibre Panel
And To Manage The Request

Data Center Change Request

New Equipment?

Y

N

New Infrastructure?

Y

N

New Infrastructure Build

Design

Allocate location

Create Work Order

Install & Test

New Infrastructure

Connectivity

Equipment Positioning

Design Connection Path(s)

Allocate Resources

Allocate PP ports

Patch & Test Path

Patch to Equipment

Assess Space/Power Connectivity

Allocate location

Create Work Order

Install

Test

Installed And Working

Defining change process and team Interfaces
Infrastructure Data Issues

1. Names and labelling of devices, ports, patch panels are often inconsistent. Keep them as simple as possible.
   - Use external standards if helpful – TIA606B, TIA942
   - As equipment vendors use various names for ports, decide on your standard
   - Labels and administration identifiers may be different!

   PP NYC-DC1-RM302-B03-AB-U5    Short code/label PP-AB-U5

2. Working practices will dictate when an update is carried out
   - Request, design, issue design docs, make change, complete
   - A spreadsheet will be locked by one user, so look at a database option

3. But you will need other views / perspective to manage connectivity
   - Capacity reporting, device views, diagrams
Case Study Two - Airport

Scope
- 350 Buildings - growing to over 400
- Data cabling - inside and outside connectivity
- Power - equipment rooms / data centers
- Devices - anything with data connection

Step 1
- Assess / define standard for naming / schematics

Step 2
- Consolidate data and audit where needed

Step 3
- Define process and educate on systems and processes
In Hindsight

1. **Maybe a spreadsheet wasn’t the best way to start**
   - It gives structure, but isn’t best suited to complex multi-site connectivity
   - Loading a database is 4 spreadsheets – 1) buildings 2) racks 3) devices 4) connections

2. **You have to manage inventory and maintain it before you can manage connectivity!**
   - Inaccuracies in data / naming are often present in other systems
   - Without resolving naming issues, audits / data capture may be wasted

3. **Managing connectivity has to cope with the real world**
   - Complex device build – switches, servers, cabling distribution, pre-terminated cassettes, MPO, blown fibre, diverse paths, etc.
Many 1,000s of documents are created by projects, operations and risk processes.

<table>
<thead>
<tr>
<th>Commercial</th>
<th>Physical</th>
<th>Logical</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership</td>
<td>Room 🌟</td>
<td>LAN 🌟</td>
<td>System</td>
</tr>
<tr>
<td>Support</td>
<td>Rack 🌟</td>
<td>SAN 🌟</td>
<td>Service</td>
</tr>
<tr>
<td>Software</td>
<td>Cabling 🌟</td>
<td>Virtual Machines</td>
<td>Applications</td>
</tr>
<tr>
<td>Security</td>
<td>Power 🌟</td>
<td>OS</td>
<td>User Data</td>
</tr>
<tr>
<td>Contracts</td>
<td>Hardware Build 🌟</td>
<td>Remote Mgt 🌟</td>
<td>DR Plan</td>
</tr>
<tr>
<td>Licences</td>
<td>Backup</td>
<td>Environment</td>
<td>Change Impact</td>
</tr>
</tbody>
</table>

One Server, Multiple Mappings and Diagrams
The Bigger Picture – Think Forward

- Physical locations
- Hardware inventory
- Physical connectivity
- Logical connectivity
- Rack capacity
- Port capacity
- Asset lists
- Project plans
- Work orders
- Alternate paths / SPOF
- Monitoring toolsets
A More Strategic Approach

Physical Changes
- Location and position
- Resource reservation for projects
- Physical connectivity
- Audits and manual data gathering
- Impacts and dependencies
- Adds, moves and changes

Trusted sources
- Discovery systems
- Monitoring tools
- Service desk CMDB
- Spreadsheets – risk, contracts
- Recovery plans
- Project handover

Infrastructure Database(s) & Reporting

Typical Outputs
- Capacity management – space, power, connectivity
- Change impact analysis – impact, risk, auditing
- Inventory extracts
- Custom reporting
- Physical plans
- Floor and rack diagrams
- Topology diagrams
- Networks, power, storage
- System & Architecture Maps
- ITIL services, applications
In Summary - When?

1. Multi-site, multi-technology connectivity management often requires simplification and consistency to be made easy. The normal end goals are speed of change (often reducing cost) and increased control.

2. If you document data connectivity of everything that has a data connection, you might as well document power in the same way for data center and power management.

3. If you don’t manage connectivity, expect frustration and unpredictable project delivery. Be wary of auditors as connectivity shows up internal process gaps. Once control is lost it can be very expensive and time consuming to regain it – a connectivity audit!

4. Think about the use of specialist tools, rather than Excel or a self developed database.
<table>
<thead>
<tr>
<th>Website</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.bicsi.org">www.bicsi.org</a></td>
<td>ANSI/BICSI-002</td>
</tr>
<tr>
<td><a href="http://www.squaremilesystems.com">www.squaremilesystems.com</a></td>
<td>Free SMS Visio utilities</td>
</tr>
<tr>
<td></td>
<td>Webinars/videos</td>
</tr>
<tr>
<td><a href="http://www.assetgen.com">www.assetgen.com</a></td>
<td>Evaluation software</td>
</tr>
<tr>
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