Managing Multi-Site,
Multi Technology Connectivity

SQUARE MILE SYSTEMS

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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.
<u>An easy target for auditors!</u>

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?

Information Requirements Force Technical Change
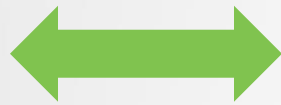
Information and Data

Applications

Virtual

Hardware

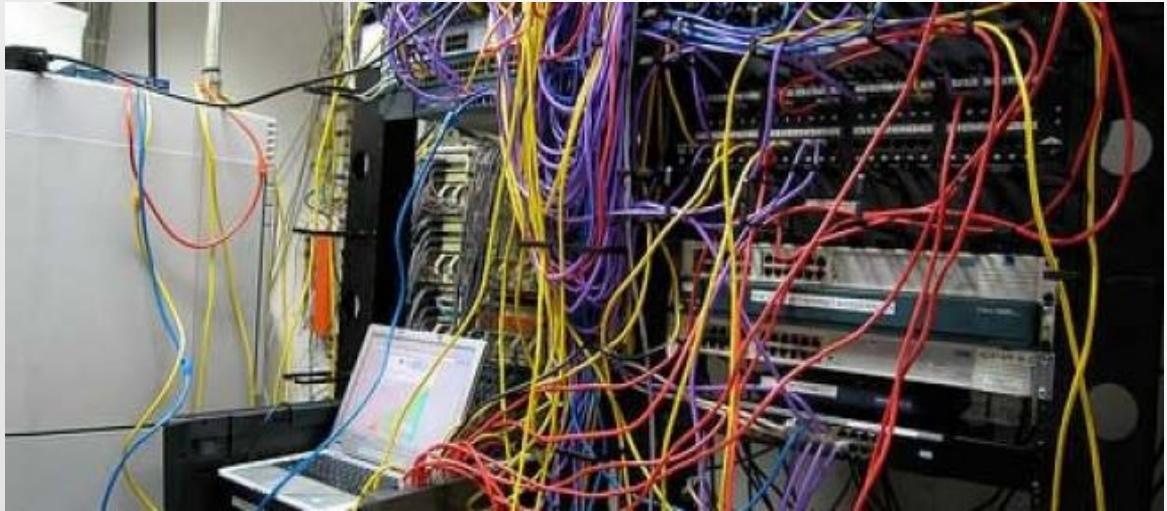**Physical Infrastructure**

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 operational processes are not the weakest link
    - 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
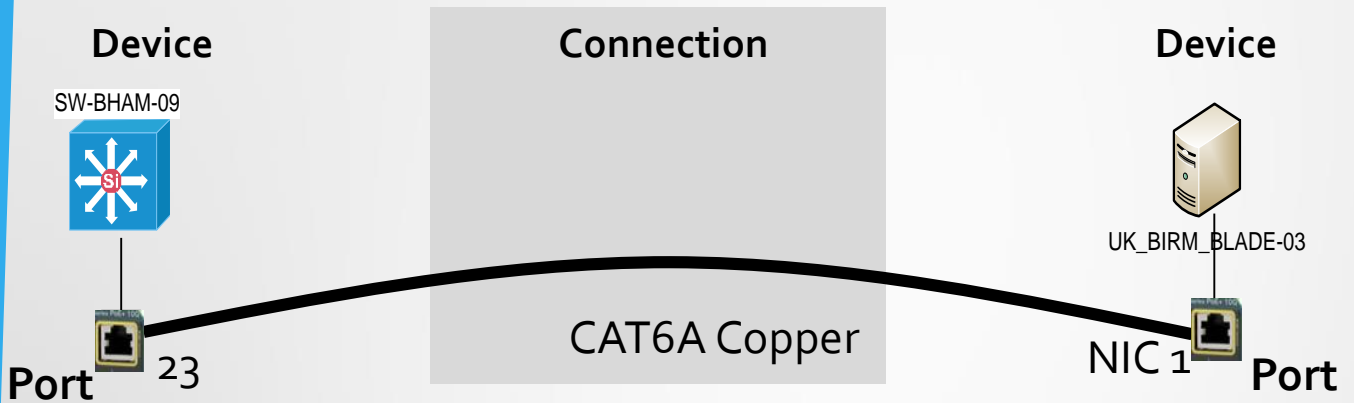- 36200 fiber/copper connections
- 5800 patches
- 600 servers

"I'm just overloaded and can't get others to understand

4 spreadsheets – inventory + connectivity per DC

(>1.8 million cells) + >6000 other spreadsheets

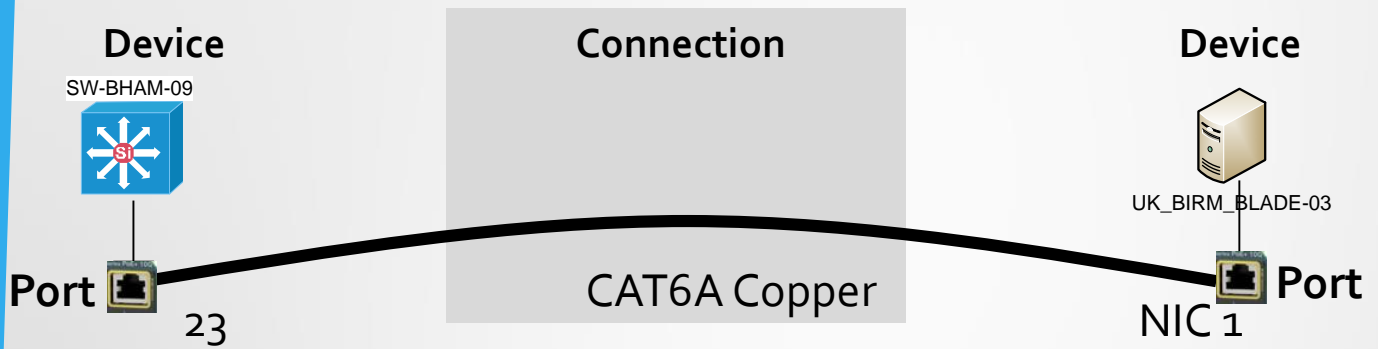Maintained by a data center manager – no onsite staff

Requesting a Connection -1

Device	Connection	Device

SW-BHAM-09

Device

Connection

CAT6A Copper

Device

UK_BIRM_BLADE-03

Port 23

NIC 1 **Port**

Device 1	Port	Connection	Port	Device 2
SW-BHAM-09	23	To be filled in by DC team	NIC 1	UK_BIRM_BLADE-03

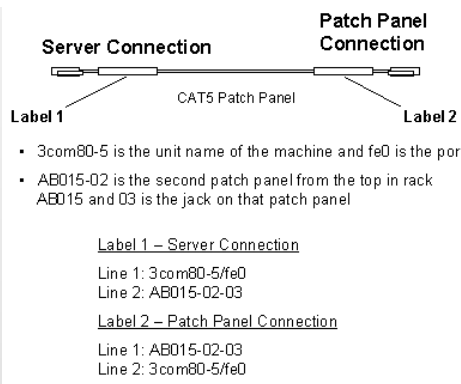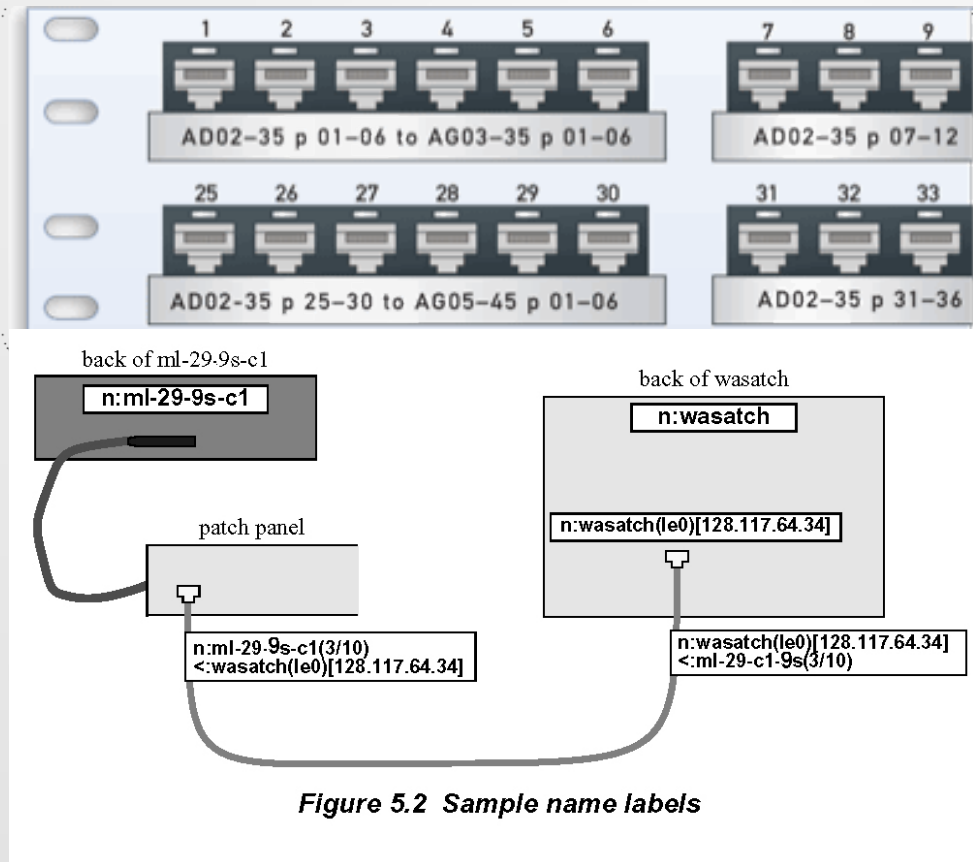**This is the initial spreadsheet used to capture connectivity requests**

Requesting a Connection -2

Device					
Device	**Connection**		**Device**		

SW-BHAM-09

Port 23

Connection

CAT6A Copper

UK_BIRM_BLADE-03

Port NIC 1

Device 1	Port	Connection	Port	Device 2
SW-BHAM-09	23	To be filled in by DC team	NIC 1	UK_BIRM_BLADE-03
Room Rack Position Make Model Asset Number IP Address	Port Type Speed VLAN	Colour Cable Label Connection type Length	Port Type Speed VLAN	Room Rack Position Make Model Asset Number IP Address

The spreadsheet just went from 4 to 30 columns wide!

Naming & Labelling


Figure 5.2 Sample name labels

- 3com80-5 is the unit name of the machine and fe0 is the port
- AB015-02 is the second patch panel from the top in rack AB015 and 03 is the jack on that patch panel

Label 1 – Server Connection

Line 1: 3com80-5/fe0
Line 2: AB015-02-03

Label 2 – Patch Panel Connection

Line 1: AB015-02-03
Line 2: 3com80-5/fe0

Ports and Connections

Equipment – use the physical label?

Port name

- 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

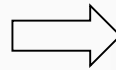- NIC 1 Eth A Net 0 hba0 bge1 12F1 primary

Cable Labels

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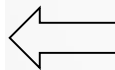
4) full path   5) cable unique id   6) path unique ID
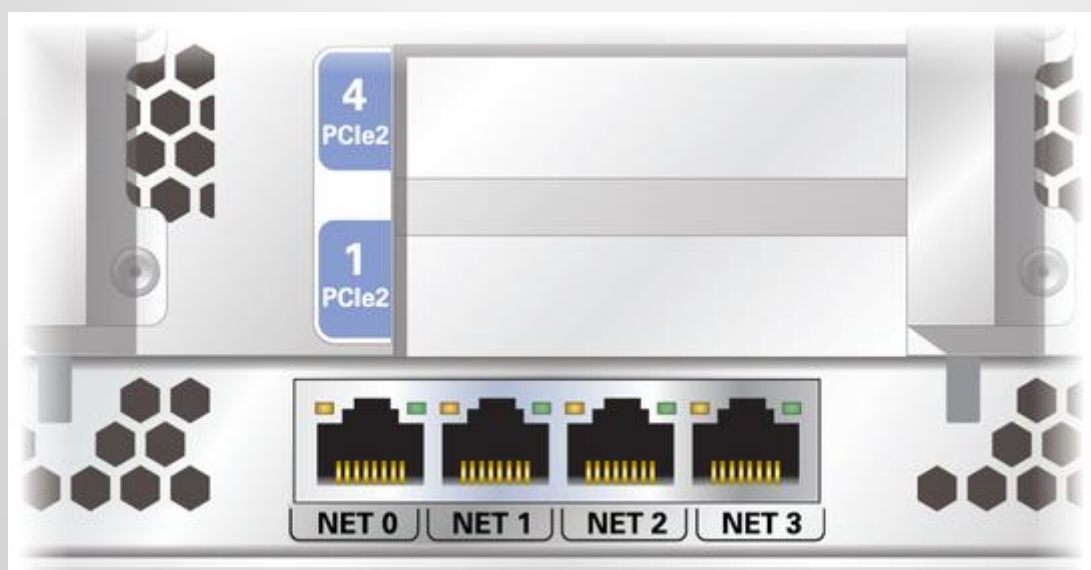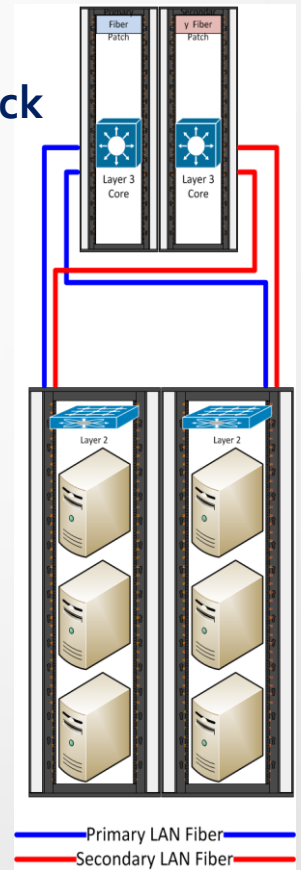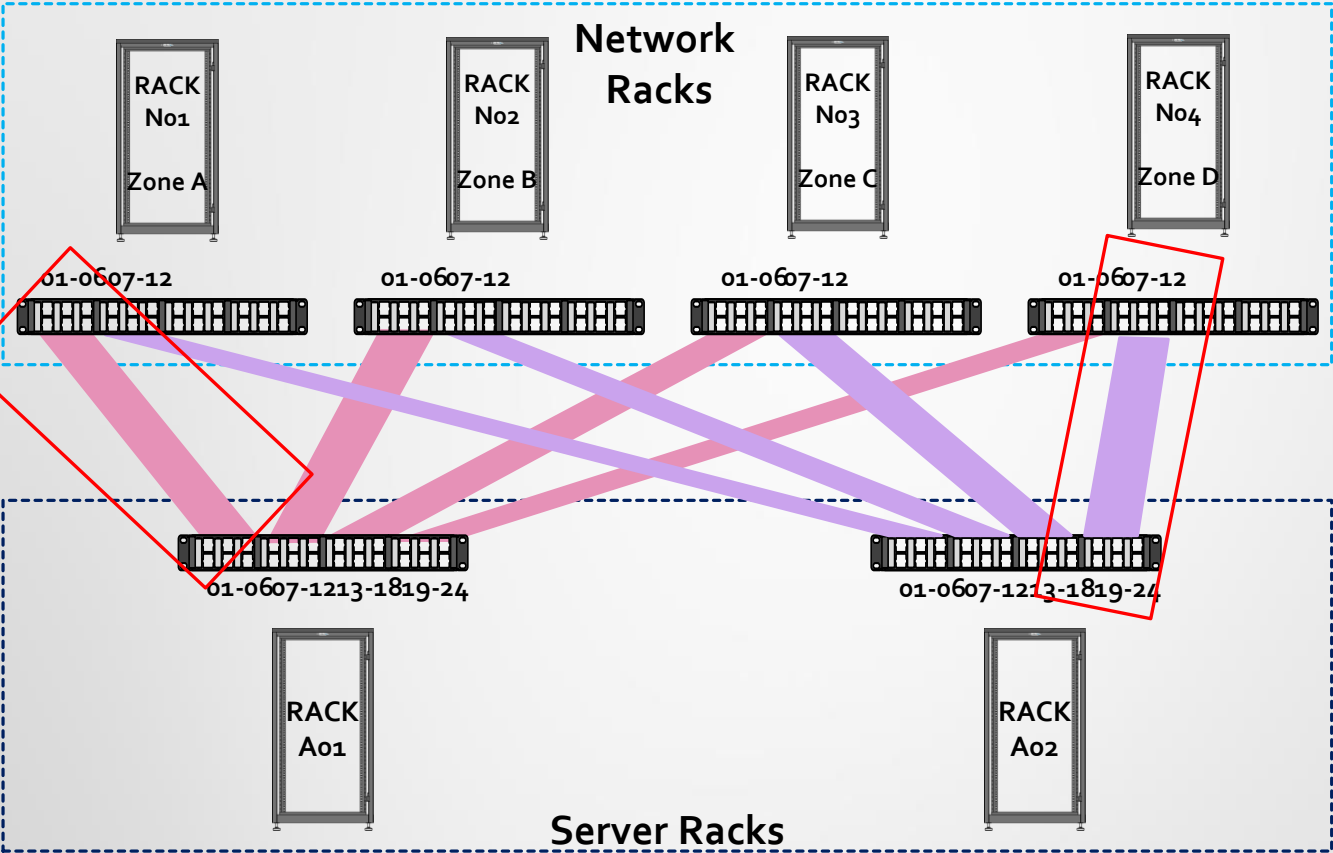
And – Which Cabling Topology?
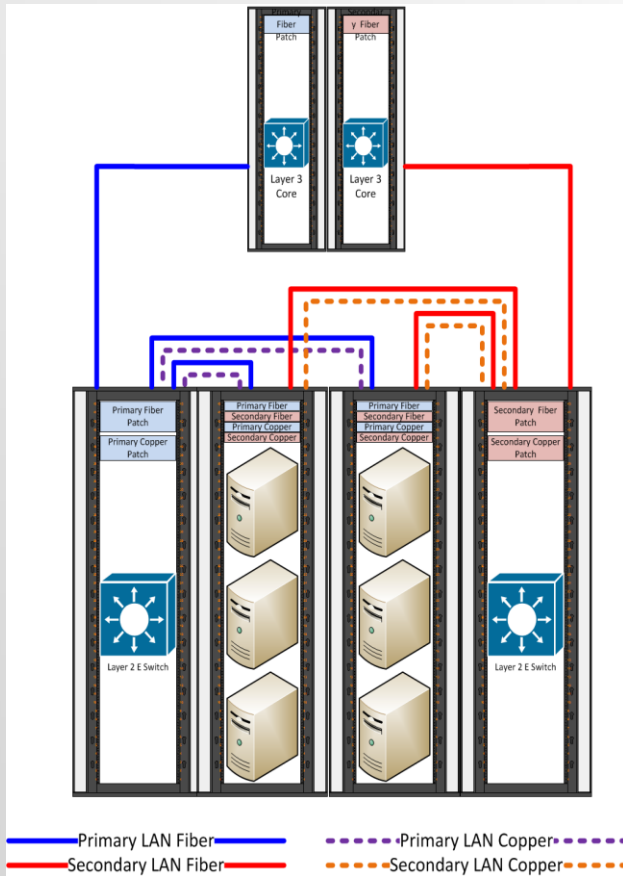
Top Of Rack

End Of Row

Could involve 1 to 5 patches

Multi-path Options

Very Multi-path – Modular Panels

One unit = 48 modules @ 6 LC ports per module = 288 ports

One rack @ 6 Units = 288 modules = 1728 ports

Very Multi-path – Modular Panels

Device	Port	Patch	PPA Port	Patch Panel A	Back to Back	Patch Panel B	PPB Port	Patch	Port	Device
UK_BIRM_UX01										SW-BHAM-01
A	23		05	AA		AC	05		NIC 1	B
Room Rack Position Make Model Asset Number IP Address	Speed VLAN	Cable Label Type Length	Speed	Rack Position Make Model	Length	Room Rack Position Make Model	Speed	Colour Cable Label Type Length	Port Type Speed VLAN	Room Rack Position Make Model Asset Number IP Address

Contact
Purpose
Request date
Request Number
Project Code / Ref

Work number
Path reference
Scheduled date
Installed status
Path length

The spreadsheet data has now grown to up to 60 columns wide!

And Cabling Extends Beyond The DC
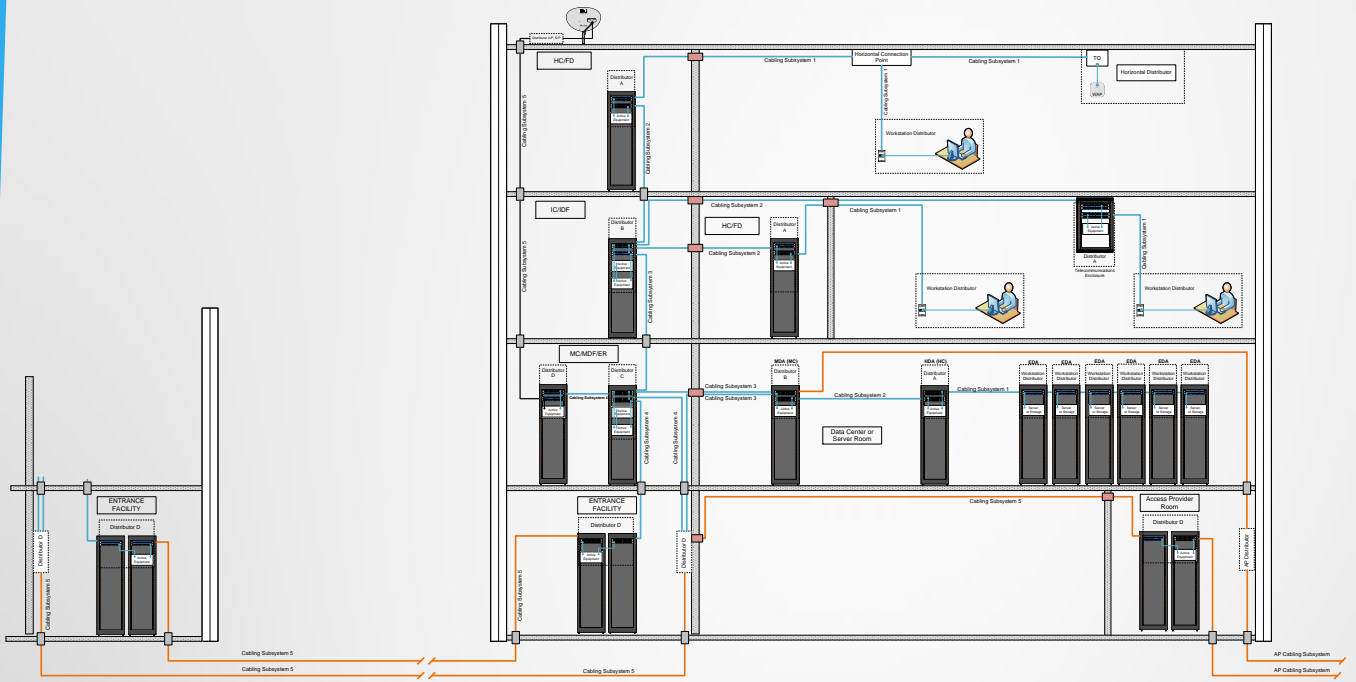
Define Active Device Naming

Device Name

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

SW-BHAM-CORE1.Card1
SW-BHAM-CORE1.Card3
SW-BHAM-CORE1.Card4
SW-BHAM-CORE1.Card5
SW-BHAM-CORE1.Card9
SW-BHAM-CORE1

SW-BHAM-CORE1.Card3
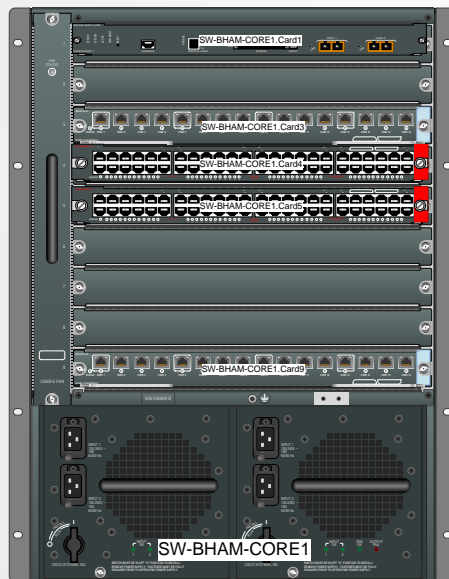
Device component – Switch Card
US-SW-DC02-03P Card3
Cisco 6509 DC02-B03-U2.Slot03
Asset HW0078737
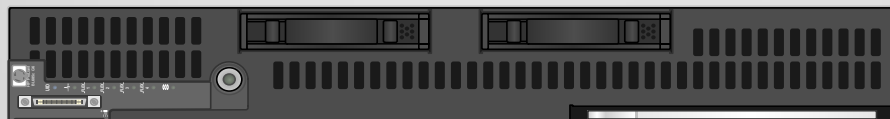
Device component – Blade Server
UX-NY0445-PROD
HP BL685C BLNY05-DC02-B03-U2.Slot03
Asset HW0078143

Define Infrastructure Naming

24 Port Copper Patch Panel

288 Port Fibre Panel
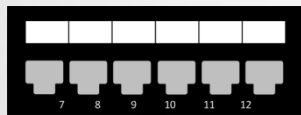
6 Copper RJ45 Ports
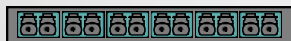
6 Fiber LC Ports

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

Equipment Positioning

Data Center Change Request

New Equipment ?

And To Manage The Request

Y

N

New Infrastructure ?

N

Y

Equipment Placement

Assess Space /Power Connectivity

Allocate location

Create Work Order

Install

New Infrastructure Build

Design

Allocate location

Create Work Order

Install & Test

New Infrastructure

Design Connection Path(s)

Allocate PP ports

Allocate Resources

Patch & Test Path

Patch to Equipment

Connectivity

Test

Installed And Working

Defining change process and team Interfaces

Define Infrastructure Naming

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 centres

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!**
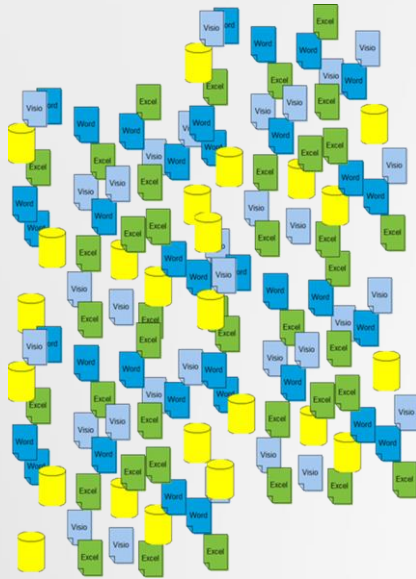
   - Inaccuracies in data / naming are often present in other systems
   - Without resolving naming issues, audits/ data capture may be wasted

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.

Understand - Before You Start

Many 1,000s of documents are created by projects, operations and risk processes

Lists/Database ➡️ **Pictures**

| Commercial	Physical	Logical	Business
Ownership	Room	LAN	System
Support	Rack	SAN	Service
Software	Cabling	Virtual Machines	Applications
Security	Power	OS	User Data
Contracts	Hardware Build	Remote Mgmt	DR Plan
Licences	Backup	Environment	Change Impact

UK_BIRM_UX01

**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
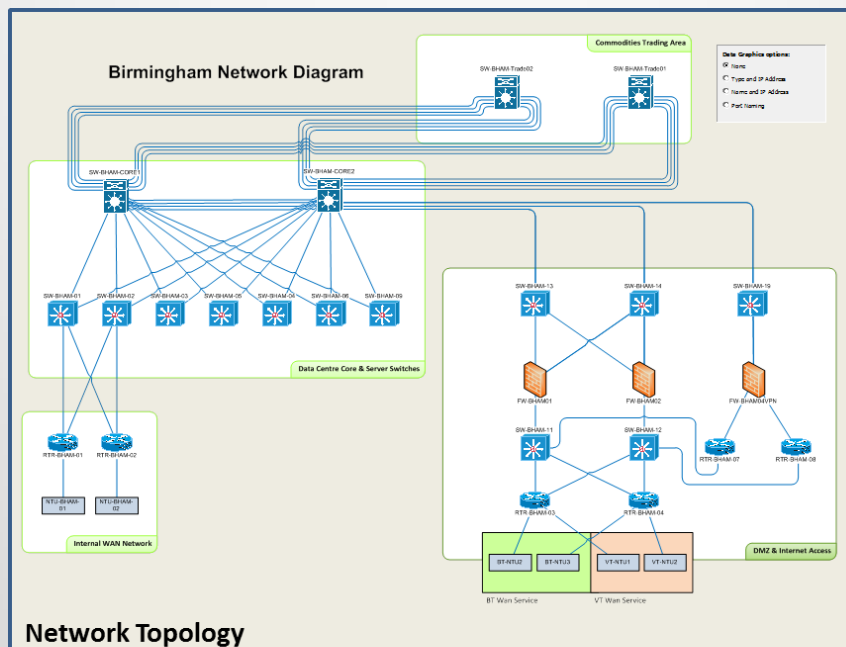
Network Topology
Computer Room Layout
Rack Positions
Architecture Network Overview
Application Architectures
Cabling Backbone and Distribution
Virtual LANs/SAN/
Data Flows
Process Flows

The More Strategic Approach

Physical Changes
Location and Position
Resource Reservation For Projects
Physical Connectivity
Audits & Manual Data Gathering
Impacts & Dependencies
Adds, Moves & Changes

Trusted Sources
Discovery Systems
Monitoring Tools
Service Desk CMDB
Spreadsheets – Risk, Contracts
Recovery Plans
Project Handover

References

Updates

Updates

Infrastructure Database(s) & Reporting

Outputs

Typical Outputs
Capacity Management – Space, Power, Connectivity
Change Impact Analysis – Impact, Risk, Auditing

Excel   **Inventory Extracts**
Custom Reporting

Visio   **Physical Plans**
Floor and Rack Diagrams

Visio   **Topology Diagrams**
Networks, Power, Storage

Visio   **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.

Additional Materials +

www.tiaonline.org   ANSI/TIA568C, ANSI/TIA606B, ANSI/TIA942

www.bicsi.org   ANSI/BICSI-002

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Free SMS Visio utilities - Downloads and videos

Webinars/videos - Visio automation, documenting cabling

AssetGen

www.assetgen.com

Evaluation software - Free "DCIM/CMS" evaluation version

Webinars - Data centre practices, Visio integration