“Avoiding High Density Spaghetti”
- Managing High Density Modular Cabling Systems

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Is Managing Cabling Boring?

• It is not seen as important as delivering projects
• It is difficult
  – Lots of spreadsheets
  – Very detailed and prone to error
  – Too many people involved in changes
• Inconsistencies and technologies make it complex
• Very costly to sort out once control is lost
• Not a career path for most (or all) IT specialists
Personal Background

Personal Experience

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

Industry Groups and Frameworks

- ITIL
- COBIT
- ANSI
- Bicsi
- BCS
- AFCEA

Process Skills
- Methods
- Communication

Naming
- Labelling
- Change Process

Baselining
- Toolset Development
- Visio automation
It’s An Industry Challenge
But... We have to... Because...

- Every cabling change costs time and money
- Impossible to manage changes centrally
  - Every project MADC could need a site survey
  - Creation of build documents is very time consuming
  - Interface with internal/external teams for delivery
- Disruption is still caused by physical layer changes
- Use resources effectively
  - people, switch ports, fibre
- Infrastructure can’t be secured, or attacks managed
Managing Connectivity

- We've had copper and fibre for many years
- Port densities are increasing
- One mistake with power, cabling, software – bigger impact!
- New technologies and options MTP, pre-terminated, OCP
- Planning – Build – Change – Decommissioning evolves
- How to do it well and stay ahead?
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
  • Use pre-terminated (and reuse) cabling more to minimise testing
High Density Fibre – Multiple Port Types

- LC connectors
- SC Connector
- FC Connector
- ST Connector
- MT-RJ connector

- Key-Up
- MPO (Male) - Pins
- MPO (Female) - No Pins

- 12 Fiber MPO/MTP
- 24 Fiber MPO/MTP

- Fiber 1
- 12-fiber MPO/Female Connector SM(MM) (Round Type)
- 12-fiber Round Cable LSZH
- Fanout Kit with Metal Tube
- 2.0mm Colored Tube
- 12x LC SM(MM) 2.0 Connector

- L Meter (-0/+10 cm)
- 30cm~2M

- Type-A Cables
- Type-B Cables
- Type-C Cables
ODF Presentation
High Density - Presentation
And The End Equipment
It makes sense to present services in patch panels with high density cabling
When We Go Modular

Easy to add, move, re-use modules and connections

Not so easy to document, manage capacity and comprehend

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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</thead>
<tbody>
<tr>
<td><strong>SAN 1 Ports 0-23</strong></td>
<td><strong>SAN 2 Ports 0-23</strong></td>
<td><strong>DATA 1 Ports 3/1 to 3/24</strong></td>
<td><strong>DATA 2 Ports 3/1 to 3/24</strong></td>
</tr>
<tr>
<td>Cab A01 A</td>
<td>Cab A01 B</td>
<td>Cab A02 A</td>
<td>Cab A02 B</td>
</tr>
<tr>
<td>Cab A02 A</td>
<td>Cab A02 B</td>
<td>Cab A07 A</td>
<td>Cab A07 B</td>
</tr>
</tbody>
</table>
Change In Data Requirements

- Easy to add, move, re-use modules and connections
- Not so easy to document, manage capacity and comprehend
Hmmm.. Naming.. Modules

1. Slot name
   - A01
2. Rack/Panel and Slot name
   - A03 U39.A01
3. Room/Rack/Panel and Slot name
   - DC1-A03 U39.A01
4. Type/Room/Rack/Panel and Slot name
   - PFI-DC1-A03 U39.A01
5. Destination far end and Slot
   - DC1-03-10 U39.C01
Hmmm.. Naming.. Modules

• **Active Equipment** - Easy
  – Use logical name      SWNZ66_F301
  – Cards could be       SWNZ66_F301.slot04

• **Cabling Modules** – Often uses location identifiers
  Option A  Where it is       A05-U05.03A
  Option B  Where it goes     A07-U07.07A
  Option C  Both of the above A05-U05.03A to A07-U07.07A
  Option D The end service   SWNZ66_F301.slot04:Ports 07>12

  Plus module attributes – make, model, port type, orientation
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

Patch cable labels

1) port  2) local devices  3) end devices
4) full path  5) cable unique id  6) path unique ID

With dense panels, how big can the label be, what size of font can still be read?
Multi-path Options

Network Racks

Server Racks
Design The Infrastructure Naming

**Patch Panel**
- AB
- B03-AB
- B03-5
- **FM NY-DC05-H1-B03/C10**
- PP B03-AB-U5
- PP B03-AB-U5 to H07-AC-U2
- PPF 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:06
- PFI B03-AB-03B:09 to H07-AC-12A:03
High Density Connectivity - Challenges

1. Designing for flexibility and control – rightsizing
2. Planning
   – Requires common inventory of cabling and hardware components
   – Local environment awareness - distance and paths
   – Planning documents – time to complete
3. Build and operate
   – Locations and cable lengths
   – Naming and labelling
   – Verification and fault finding – wiggle, twist, pull, hope, deny, run
   – Decommissioning
4. Getting a baseline for better change workflow
   – It costs a lot to do to repeat site surveys and multiple audits
In Some Environments

• Engineers called in at all hours to help troubleshoot
• Changes made in racks without coordination
  – No labeling, wrong patch lengths, bad cable routing
  – Equipment installed wrong way round for cooling
  – Cabling spaghetti
• Surveys done for all changes + written build docs
• Projects delayed with managers often escalating
• Extra contract staff taken on to cope with workload
• Quarterly audits to gather capacity data
## Moving Forward

### Infrastructure Planning Team

- **Space, Power Connectivity**

### WHY

- Cost reduction
- Shorten project delivery timescales
- Support operational troubleshooting
- Flexible use of 3rd parties for local build
- Ensure controls are applied globally - consistently

### HOW

- Defined roles and interfaces
- Standardised naming conventions
- Baseline audit and resolve non-conformities
- Moved from spreadsheets to a database
- Evolving with new technologies
How Do We Change?

Change Requestors
- Projects
- Servers
- Networks
- Security
- Service desk

Request Form
Outline Design

Infrastructure Planning
Assess
Allocate

Infrastructure Database
Interrogate
Update

Project Documents

Local 3rd Contractors
It’s Not Difficult – Really!

Infrastructure Planning Team

Kansas City DR / Test

St Louis Missouri DC

New York US HQ

Space, Power Connectivity

Brussels

Sydney

Sao Paulo

Beijing

London

Melbourne

Buenos Aries

Seoul

Amsterdam

Singapore

Costa Rica

Auckland

+78 other locations
To Avoid “High Density Spaghetti”

1. Connectivity management needs good planning and install processes that are simple and quick
   - Get the benefits of flexible, modular systems and be in control
   - Ensure cable lengths and management bars are appropriate
   - Verification checks on implementation and labelling
   - Requires records maintenance

2. One day you will have to establish a baseline inventory and maintain it before you can manage connectivity capacity
   - Without specifying and resolving naming issues,
   - Audits / data capture / resilience / capacity checks may not be maintained

3. Connectivity options still continue to develop
   - Complex device build – switches, servers, cabling distribution, pre-terminated cassettes, MPO, blown fibre, diverse paths, base-8, etc.

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