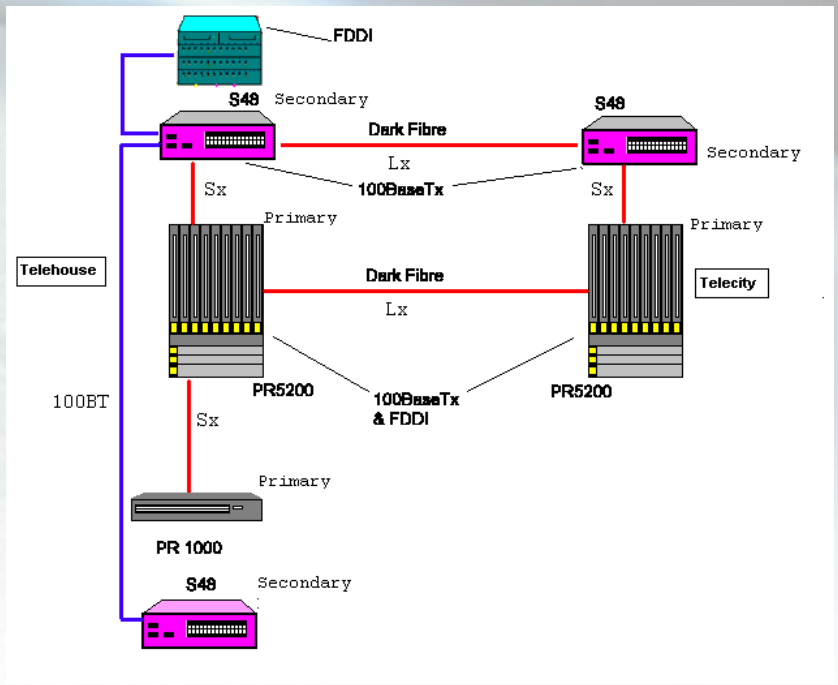
# Passive DWDM Experiences

Mike Hughes
mike@linx.net

# A long time ago, not so far away…

- There was an Internet Exchange
  - It added a new site 4 km away
  - So it leased some dark fibre
  - Ran 1000BaseLX (Gig-E) over it




LINX Circa 1998

# LINX Dark Fibre Deployment

- Over the years, additional locations were added – more dark fibre
- Until 10G was shipped multiple strands of fibre were added between locations
  - DWDM very expensive back in early 2000s
- When 10G shipped, that ran over the same G652 fibre that 1G used
- 10G then trunked across multiple fibres

# Changes in Dark Fibre market

- London “Fibre glut” from early 2000’s overbuild is slowly being consumed
  - Was very competitively priced previously
  - Pricing is now increasing again
- Business rates now payable on each lit strand of fibre
- MRC for in-building cross-connects
- All the above work in DWDM’s favour

# Changes in Equipment

- Fixed optics replaced by pluggables
  - Ability to easily change optic type
  - Both in IP/Ethernet gear and DWDM kit
- Availability of DWDM pluggables
- Decreasing price of DWDM pluggables
- Support for “wide” LAG bundles in network gear

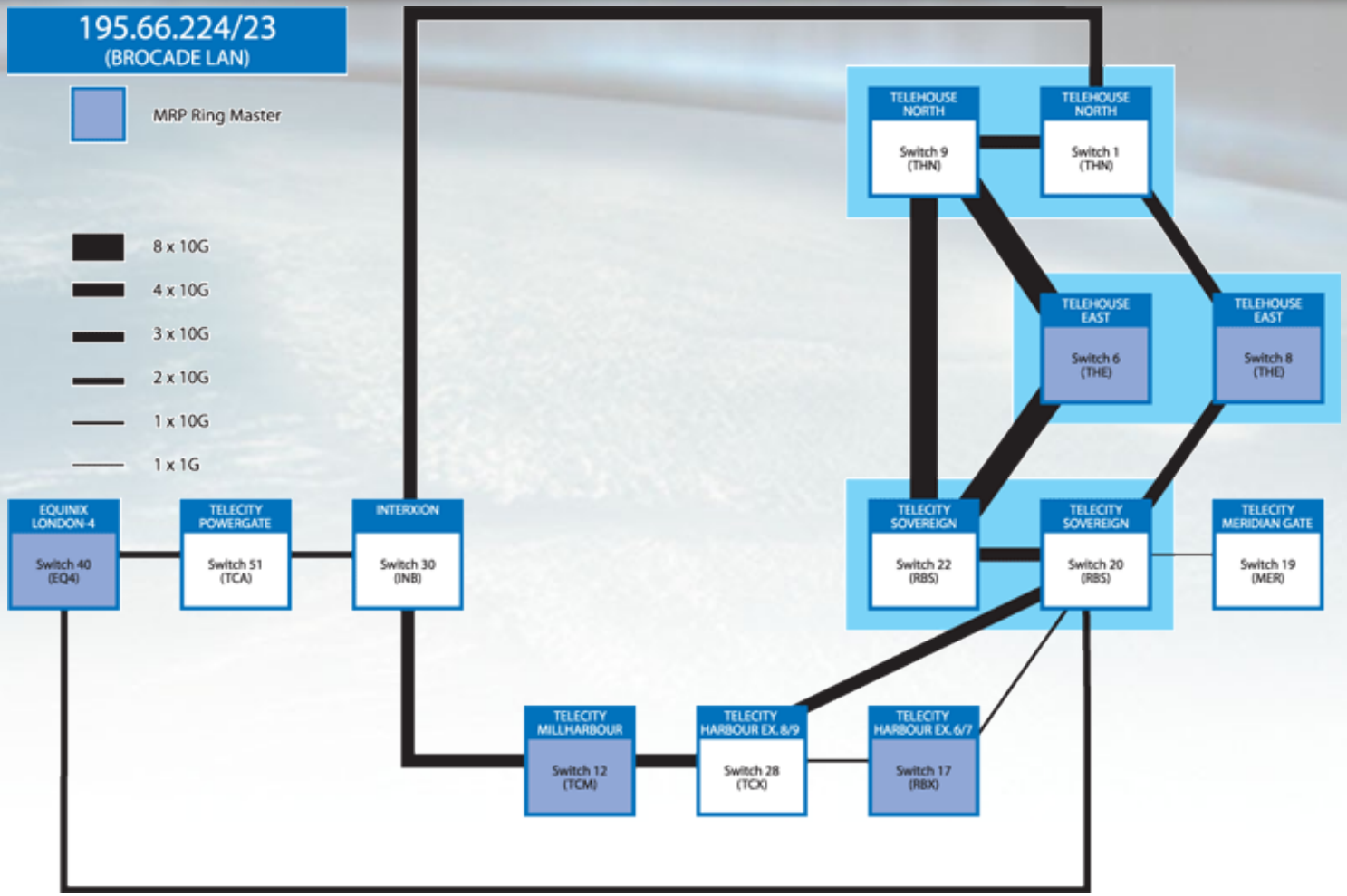
# What is Passive DWDM

- "Passive" refers to the mux/demux element
- It is an unpowered, pure optical mux
- Transponder-free
  - No "grey light" to DWDM conversion
  - DWDM grid optics straight in the Ethernet or IP interface
- Saving on the cost of an additional piece of powered equipment

# LINX DWDM Deployments

- Initially “poor mans” WDM
  - 1310nm/1550nm split
  - Solved a specific problem
  - Used readily available optics (LX/LR)
- Moved to ITU grid DWDM
  - 8 channel muxes, 10G 40km DWDM XFPs
  - Small number of spans
- Increasing density
  - 16 channel muxes, longer reach optics

# Current LINX Platform Example






LINX

# Scale of LINX Deployment

- 12 spans currently deployed
- About 100 DWDM XFPs in place
- Usually 8x10G on a single fibre today
- Scale up to 32 lambdas on a fibre easily
- Generally speaking, it's "just worked"
  - Setup should be done carefully
  - Fibre should be clean, in good condition
- Longest span is 68km

# Equipment Used at LINX

- Passive OADMs – Cube Optics
  - Made in EU
  - 8 channel
  - 8 channel, expandable
  - 16 channel, expandable
- 10G XFPs
  - 40km and 80km (ZRD) reaches
  - OEM – not expensive and vendor qualified
  - Mostly from Finisar or LuminentOIC

# Rough Equipment Prices

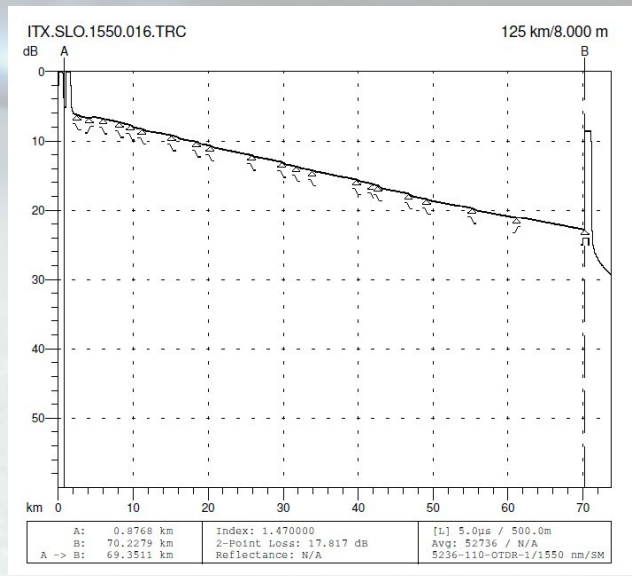
- Passive muxes
  - Approx £1500 to £2000 per unit
  - Dependant on number of wavelengths
- XFP DWDM Optics
  - 40km ITU Grid XFPs: approx £1200 ea.
  - 80km ZRD XFPs: approx £1800-2000 ea.
  - These are from the optical OEMs
  - “Vendor qualified” versions of the exact same optic can be up to 10x the above!

# Gotchas – Optic Locking

- Vendor optic locking (see UKNOF 9)
  - Vendor qualified optics – expensive!
  - OEM may not work at all, or
  - Digital Diagnostics won't work
    - Loss of optical power readings
- "Nag" messages in the logs
  - "Unsupported optic in slot x/y"

# Gotchas – Fibre Cleanliness

- Perfect fibre could be affected by dirty patches
  - DWDM is sensitive
- Invest in proper tools
  - Cletops
- Proper testers
  - OTDR, Light Meter





# Other Gotchas

- DWDM optics are made in small runs
  - Some channels are more widely available than others
  - Can have long lead times (e.g. 3-4 months)
  - Especially in “exotic” types such as X2
- SFP+ is growing in popularity
  - Lower power MSA (1-1.5W per interface)
  - Cannot drive 40km/80km optics
  - Unlikely to be able to drive DWDM optics

# Other Common Suppliers

- Quite a few other suppliers
  - GHIP systems seem common
  - Fiberdyne or Packetlight OADMs
  - Various pluggable transceiver companies
    - Avago, Opnext, Picolight, etc.
    - It's whether they will sell to you in small volume
  - System vendors
    - Most ship "vendor badged" pluggables, though they are usually sourced from a standard OEM

# Summing Up

- Cuts out a piece of active equipment
  - Chassis, transponders, yet another vendor, support contracts, etc.
- Should “just work” with existing gear
- Easily expandable with planning
  - i.e. Quickly light up a spare wavelength
- Should save you some money
  - May need to invest in fibre hygiene kit

# Questions?