



Converged Packet-Optical Solutions - The Control Plane

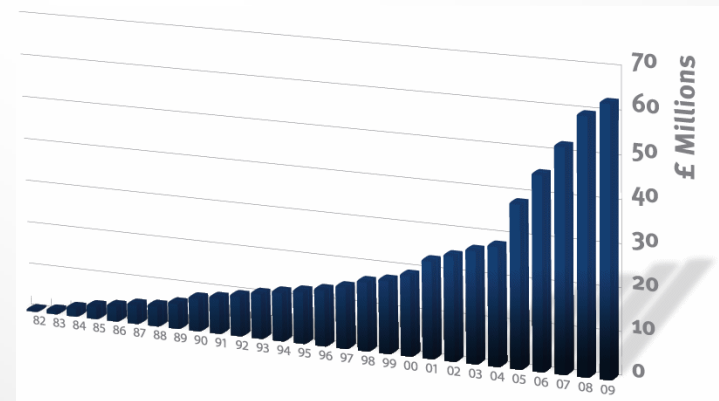
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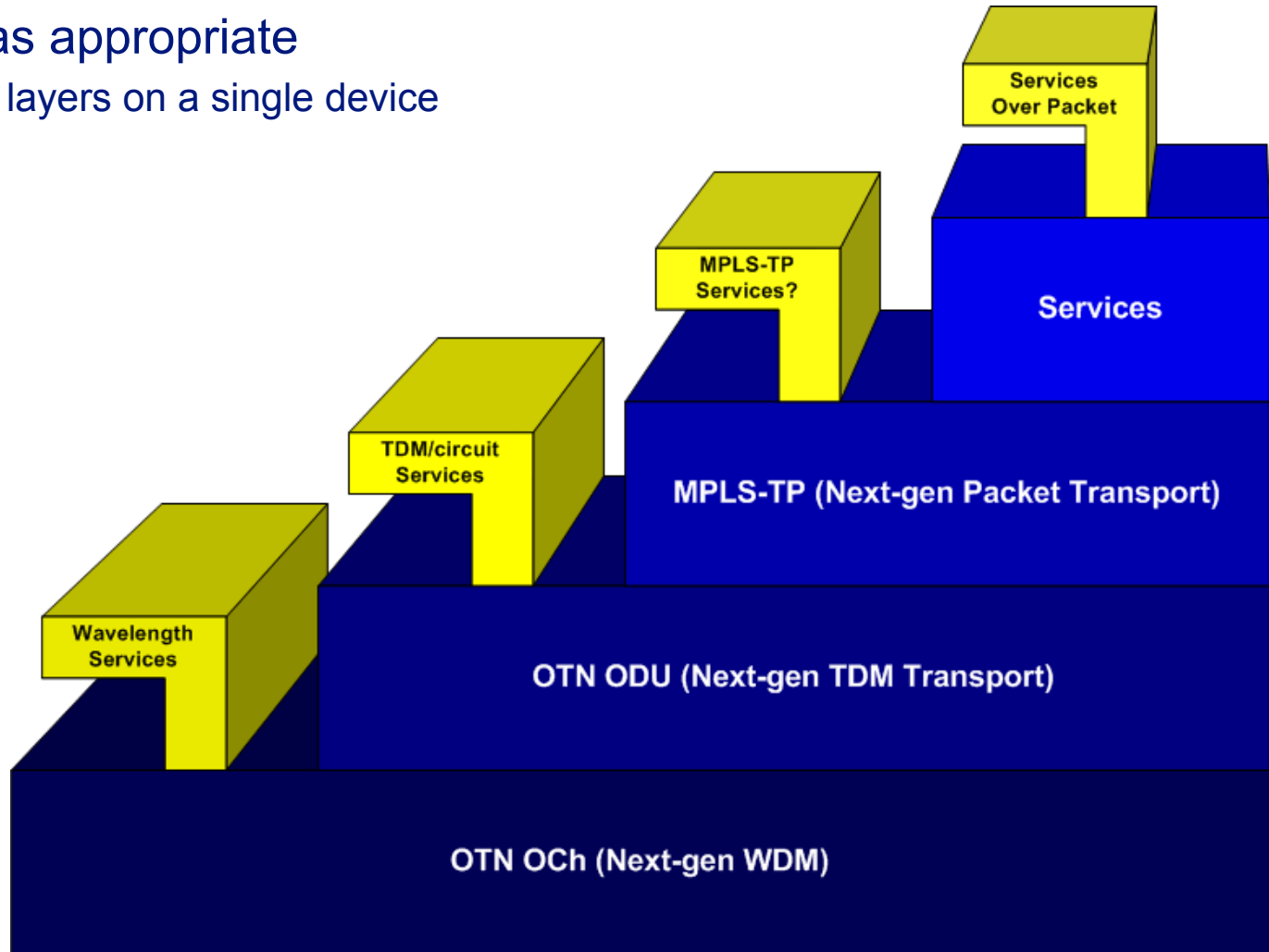
- Previously Data Connection Ltd. (DCL)
- Network Protocol source code since 1983
- All tier 1 OEMs are customers
- Carrier Systems products since 2003



Next Generation Network Layers

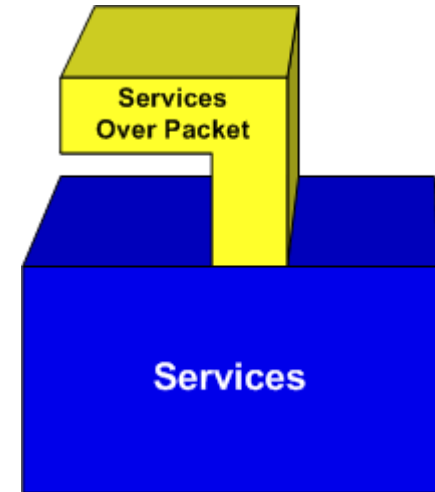
Use layers as appropriate

- Subset of layers on a single device



Services

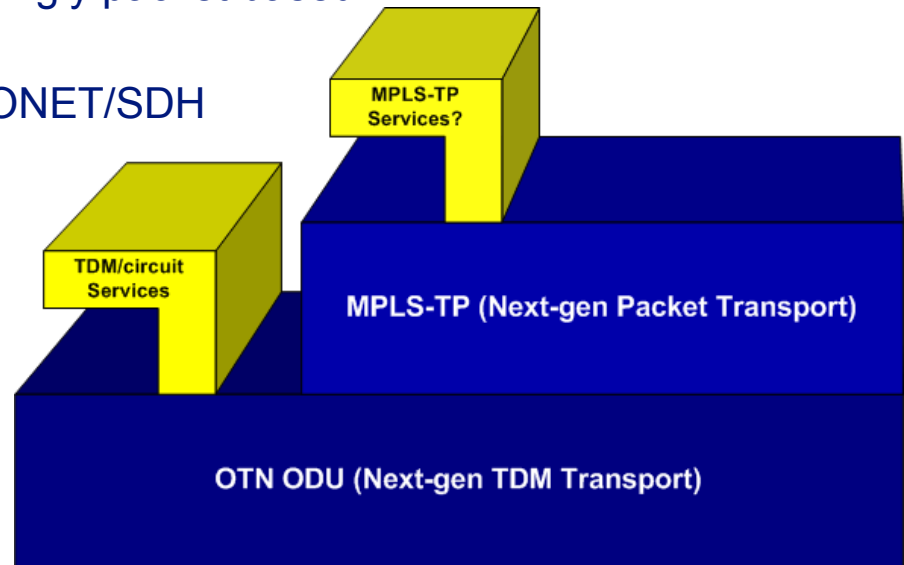
- Wide range
- Pseudowire service
 - Static or LDP provisioning
 - Can carry PDH for GSM or ATM for 3G backhaul
- L2 VPN aka VPLS service
 - Service provider looks like a L2 switch
 - Privacy between users / VLANs
 - Carrier Ethernet
 - Supports MEF E-LINE, E-TREE and E-LAN
 - Built using pseudowires
- L3 IPv4 or IPv6 service (delivered over Ethernet)
 - Unicast (RIP, OSPF, BGP, IS-IS)
 - Multicast (PIM-SM)
 - Private VPNs (BGP / MPLS)
- IPTV
 - Several technologies / protocols can be used



All use an IP / MPLS control plane

Transport

- Provides the QoS
- MPLS-TP – next-gen packet transport
 - Better fit as services become increasingly packet based
 - Hardware cheaper than TDM
 - Extended OAM capabilities match SONET/SDH
 - Meshed networks
 - mesh protection / restoration
 - The future – standardization is near
- OTN ODU – next-gen TDM
 - Huge TDM installed base
 - Many TDM services (T1, E1)
 - OTN efficiently carries a mix of
 - Legacy TDM services
 - Next-gen packet services
 - Ring topologies



Both use a GMPLS control plane
or static provisioning

WDM

- Massive capacity
- Long-haul
- Traditionally static provisioning
- GMPLS control plane
 - Signaling well defined (RFC 4328)
 - Full routing solution is work in progress (IETF WSON)
 - Wavelength assignment (for devices with switching restrictions)
 - Optical impairments (an issue for long-haul)

Mostly static provisioning today
GMPLS use increasing



Conclusions

Layers provide power, scale and legacy services / devices

Control plane provides smart and dynamic operation

One control plane for all layers

- IP, MPLS, MPLS-TP, GMPLS
- Static provisioning option
- Available today

Thank you

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