Case Study of Building a National Broadcast Network using IP

John Ellerton – Head of Media Futures, Media and Broadcast, BT

Ross Kemp – Head of Connectivity Architecture, BBC

BT is the major provider of telecommunications networks and services in the UK. It is now an established global communications company serving customers in more than 170 countries.

Its global **media & broadcast** division has underpinned the global television industry for more than 60 years, today helping 600 customers distribute and broadcast content around the globe.

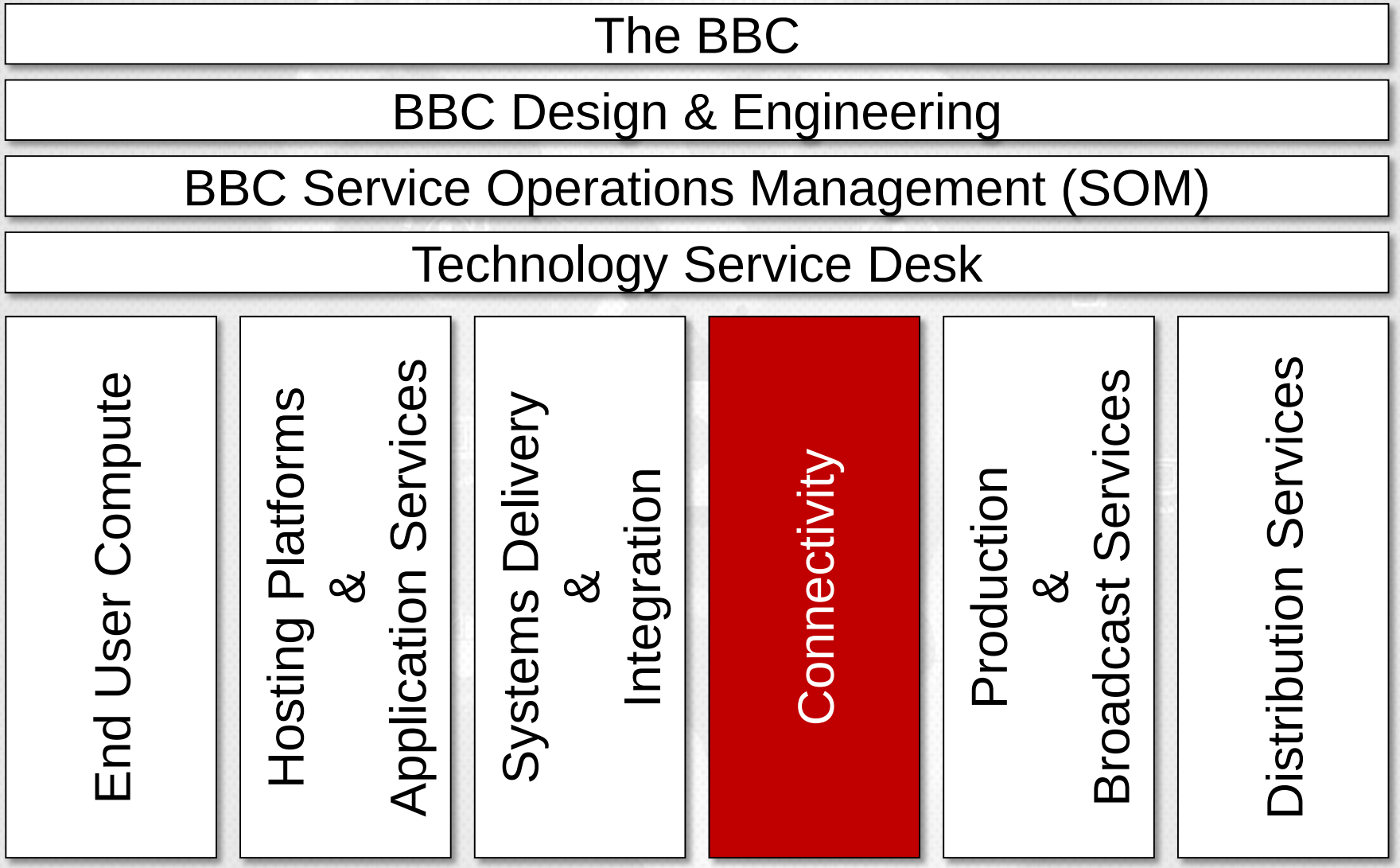
John Ellerton is Head of Media Futures. An alumni of Salford University in the UK and École Centrale de Lyon in France, he has since gained over 20 years' experience creating specialist network and workflow solutions for broadcasters and media companies worldwide.

The BBC is the world's leading public service broadcaster. Its mission is to enrich people's lives with programmes that inform, educate and entertain.

Ross Kemp is an experienced broadcast engineer and programme lead with a professional background in engineering. He is specialist in delivering strategic wide area connectivity ranging from international contribution and distribution to large corporate wide area networks for broadcast, telephony and enterprise IT.

Ross also has much experience delivering broadcast infrastructure overseas, ranging from international bureaux and transmitting stations. With a price premium on bandwidth, Ross has a developed a keen interest making best use of available capacity.

BBC Aurora - Towers



Circuit numbers

Lines

- **2,293** Direct Exchange Lines
- **2,350** ISDN 2
- **137** ISDN 30
- **851** ADSL
- **3** SIP Trunks (although one is very large!)

Core Network

- **2,917** Video & Audio circuits
- **782** Data circuits

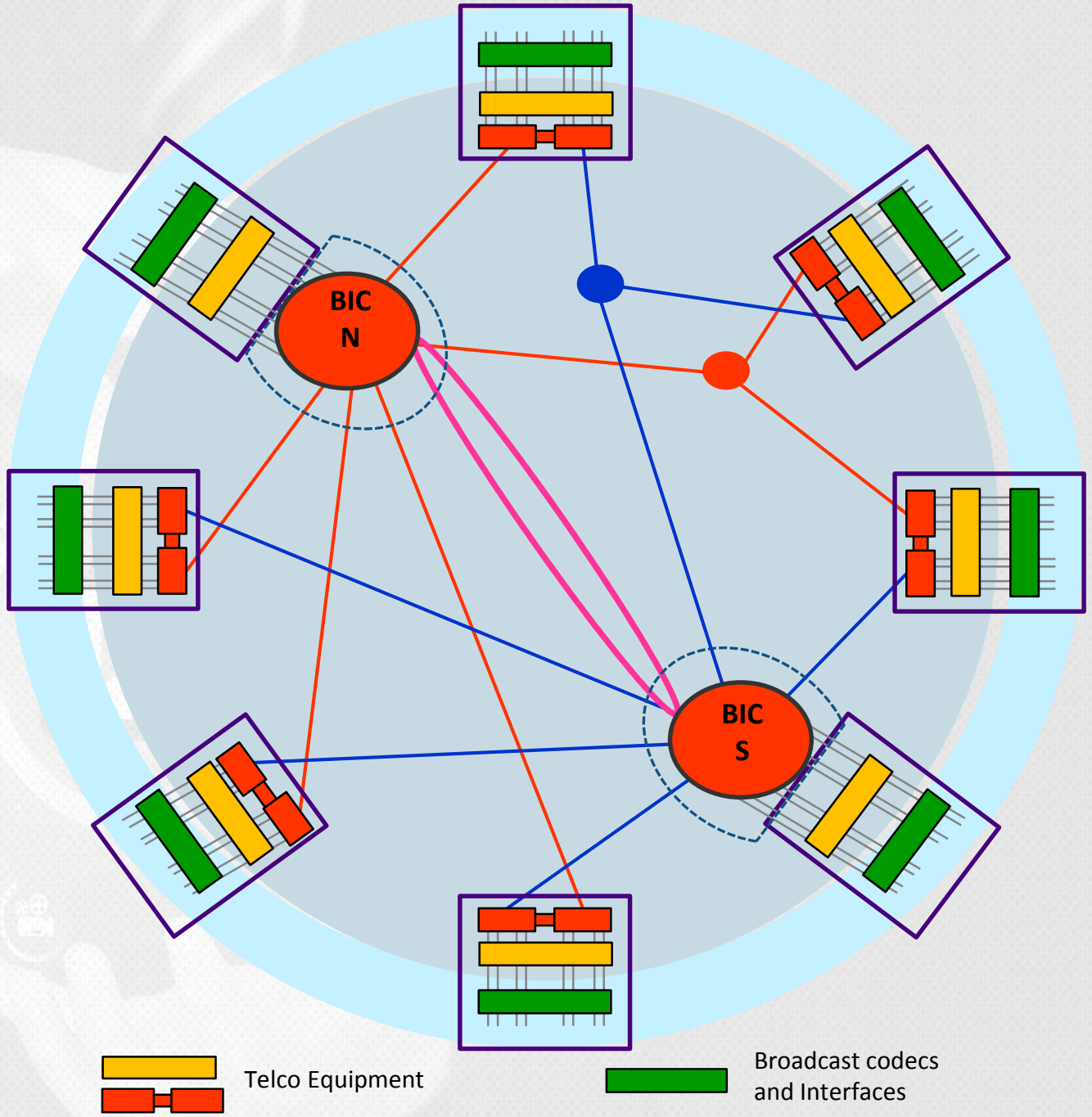
Other

- **114** dark fibres, international circuits, etc.

This requires a pan-UK network with circa 4.7Tb/s of capacity

Key Requirements

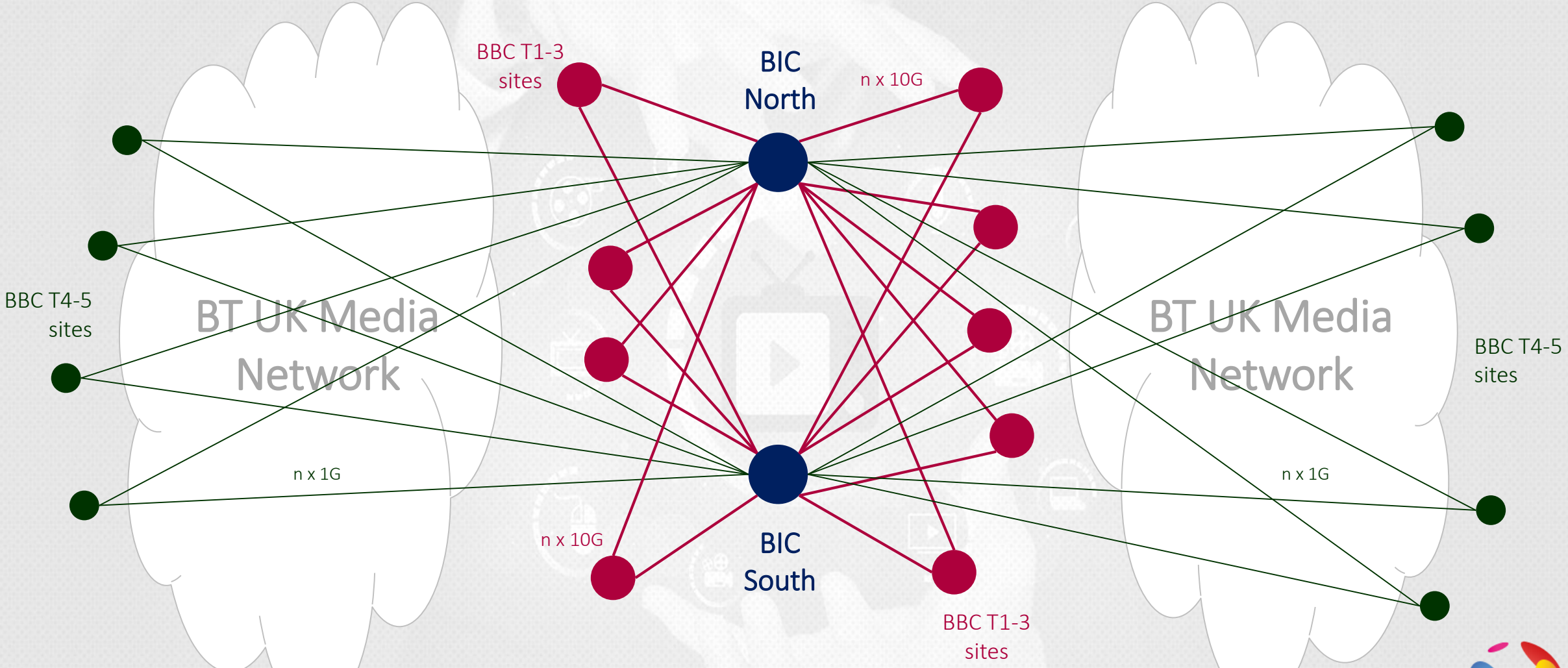
- Remove complex and obsolete technology
- Move the interchange points from Telco premises to BBC sites
- Unified management of video & audio interfaces
- Prepare for end-to-end IP working



Core network: Circuits and content

- **Video (HD and SD):** SDI and ASI
- **Audio:** Analogue and AES
- **Talkback:** Analogue
- **Legacy:** E1, STM-1
- **Data:** 10G, 1G, 100M and 10M Ethernet

Introducing “Hermes”: The new BBC network



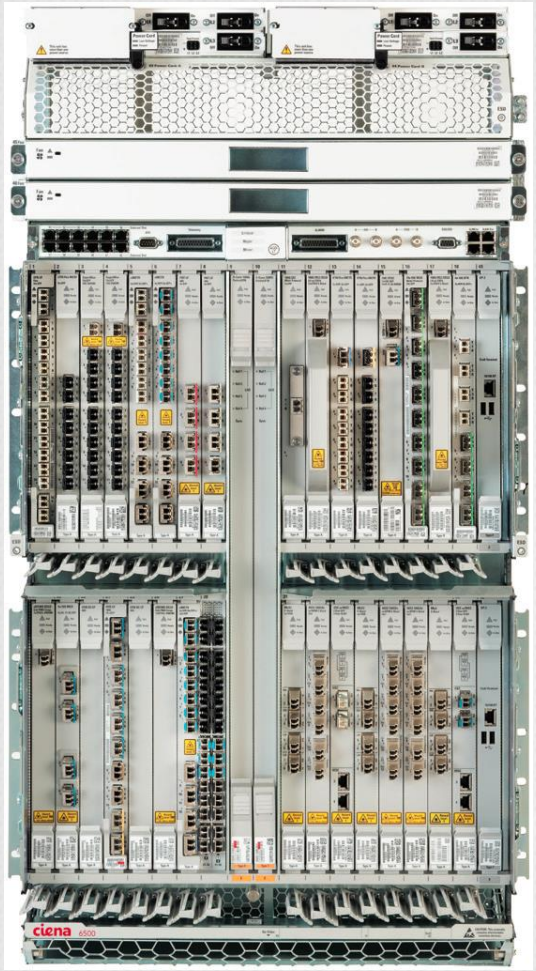
BIC = Broadcast Infrastructure Centre

Design Philosophy

- **Truly end-to-end IP network, without compromises**
  - Absolutely everything is IP encapsulated, including SDH, E1, speech, etc
  - Video services are switched in the IP domain
  - ‘Software Defined Network’ using Nevion Video IPath
  - Multi-terabit capacity Ethernet switches in cores
- **Core based on 100G and 40G wavelengths**
  - Uncompressed video, audio wherever possible
  - 88 wavelengths per fibre, ROADM switched
- **Uses the UKMN to reach radio station sites**
  - Proven high-stability MPLS network designed for broadcast

Test Rig

Hardware



Ciena 6500 – Optical core

Cisco Nexus 9508 – Core Switches

Cisco Nexus 3172 – Edge Switches

Adva FSP150 – Network Interface Devices

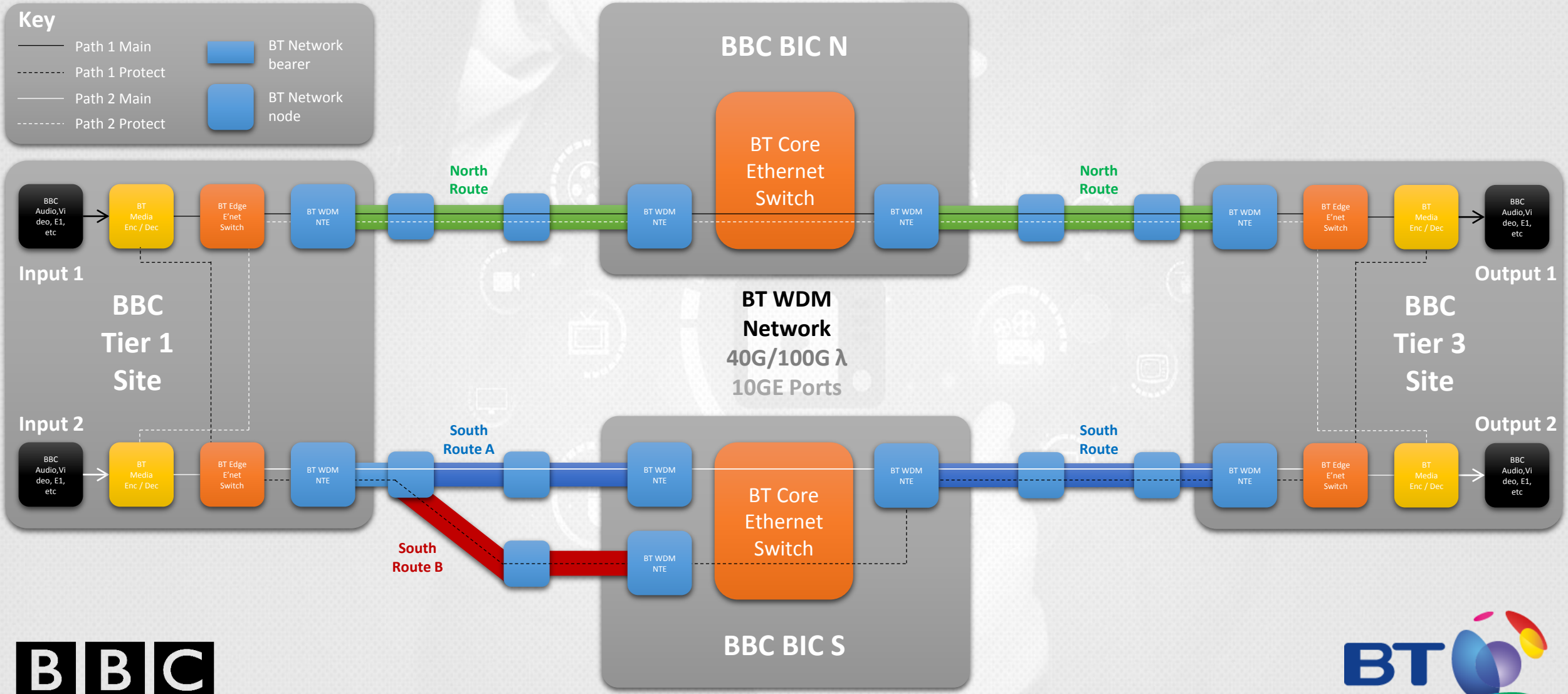
Nevion VS902 and VS906 –
Video, Audio, E1 services

Software

- **Nevion Video IPath** sets up and manages all media and data services on the core network
- The BBC uses **BNCS** to send video switch commands to BT's Video IPath system
- **Skyline DataMiner** is used for alarm monitoring across all services
- **BMC Remedy** is used for Incident Management

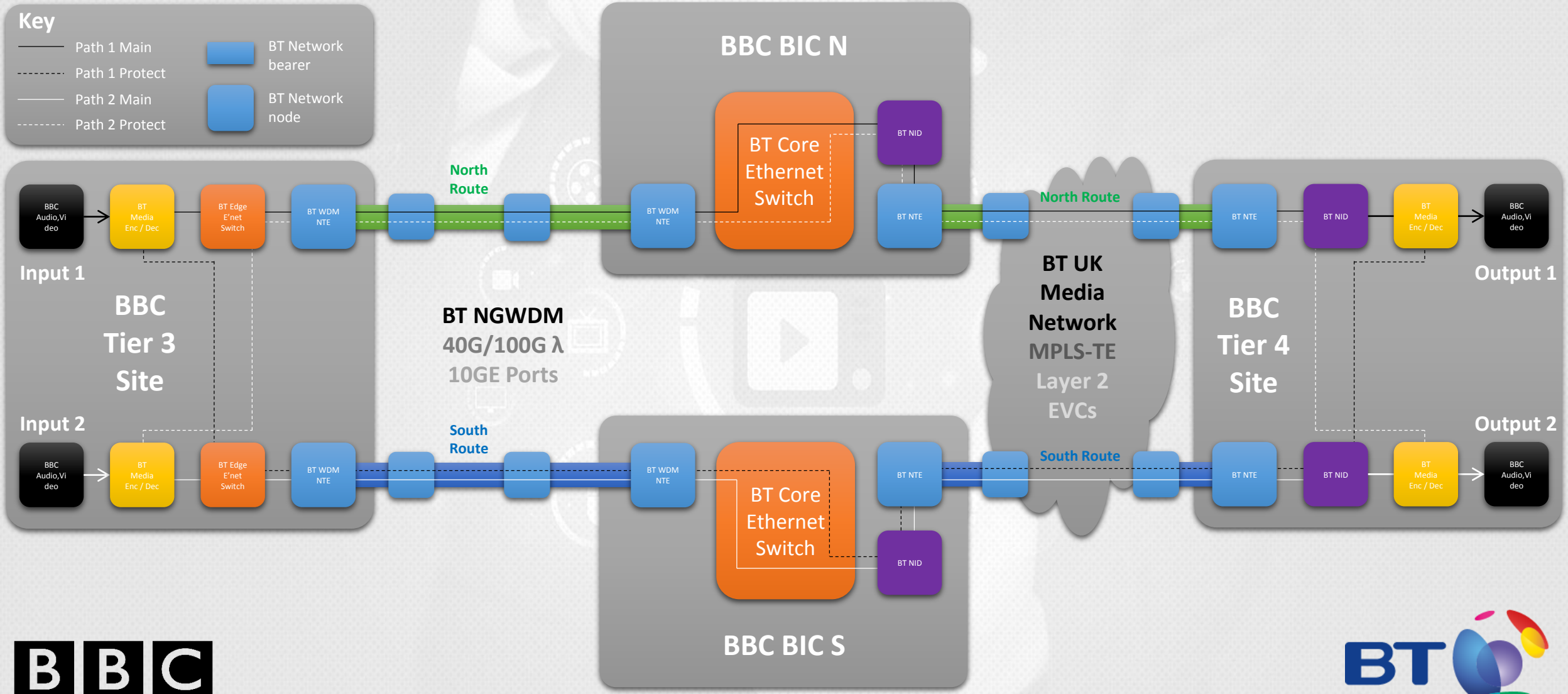
Media Service Design

Example: Tier 1 to tier 3



Media Service Design

Example: Tier 3 to tier 4



Migration: Site Builds

May — June — July — August

BICs
BIC North
BIC South

Tier 1-3 Priority
Belfast Broadcasting House
Birmingham Mailbox
Cardiff Broadcasting House
CCM North
CCM South
Glasgow Pacific Quay
London Broadcasting House
Manchester MediaCity Salford

Tier 1-3
Bristol Broadcasting House
Brookmans Park
Cambridge Broadcasting House
Caversham Radio Berkshire
Edinburgh
Elstree
Hull Radio Humberside
Leeds Quarry Hill
London 4 Millbank
London Broadcast Centre
London Redbus Sovereign House
London Western House
Newcastle
Norwich Forum
Nottingham London Road
Oxford Road Oxford
Playout A
Plymouth
Southampton
Telehouse Docklands
Tunbridge Wells
Watford Data Centre
Playout B

Tier 4-5	
Aberdeen	Leicester Radio Leicester
Aberystwyth	Lerwick
Bangor	Lincoln Radio Lincolnshire
Barrow Radio Furness	Liverpool Radio Merseyside
Blackburn Radio Lancashire	Londonderry Radio Foyle
Brighton Southern Counties Radio	Middlesbrough BBC Radio Tees
Carlisle Radio Cumbria	Milton Keynes Willen Studio
Carmarthen	Northampton Radio Northampton
Chelmsford Radio Essex	Peterborough Studio
Derby Radio Derby	Portree
Dorchester Local Radio	Portsmouth
Dumbarton	Radio Coventry & Warwickshire
Dumfries Studio R Solway	Selkirk Radio Tweed
Dundee	Sheffield Radio Sheffield
Dunstable	Shrewsbury Radio Shropshire
Edinburgh Holyrood	Stirling
Enniskillen Belmore St	Stoke Radio Stoke
Glasgow City Halls	Stornaway
Gloucester Radio Gloucestershire	Swansea Studio
Grimsby Studio	Swindon Radio Wiltshire
Guernsey R Guernsey St Sampson	Taunton Somerset Sound
Guildford Local Radio Surrey	Truro Radio Cornwall
Hereford	Wolverhampton Studio
Inverness	Worcester
Ipswich Radio Suffolk	R Hereford & Worcester
Jersey Radio Jersey	Wrexham Studio
Kirkwall	York Radio York

BBC

BT

Collaboration and testing

Ready for the future

- More ad-hoc switching
- UHD content
- IP handoffs
- SMPTE ST-2110
- AMWA NMOS

For more information

john.ellerton@bt.com
ross.kemp@bbc.co.uk

www.mediaandbroadcast.bt.com