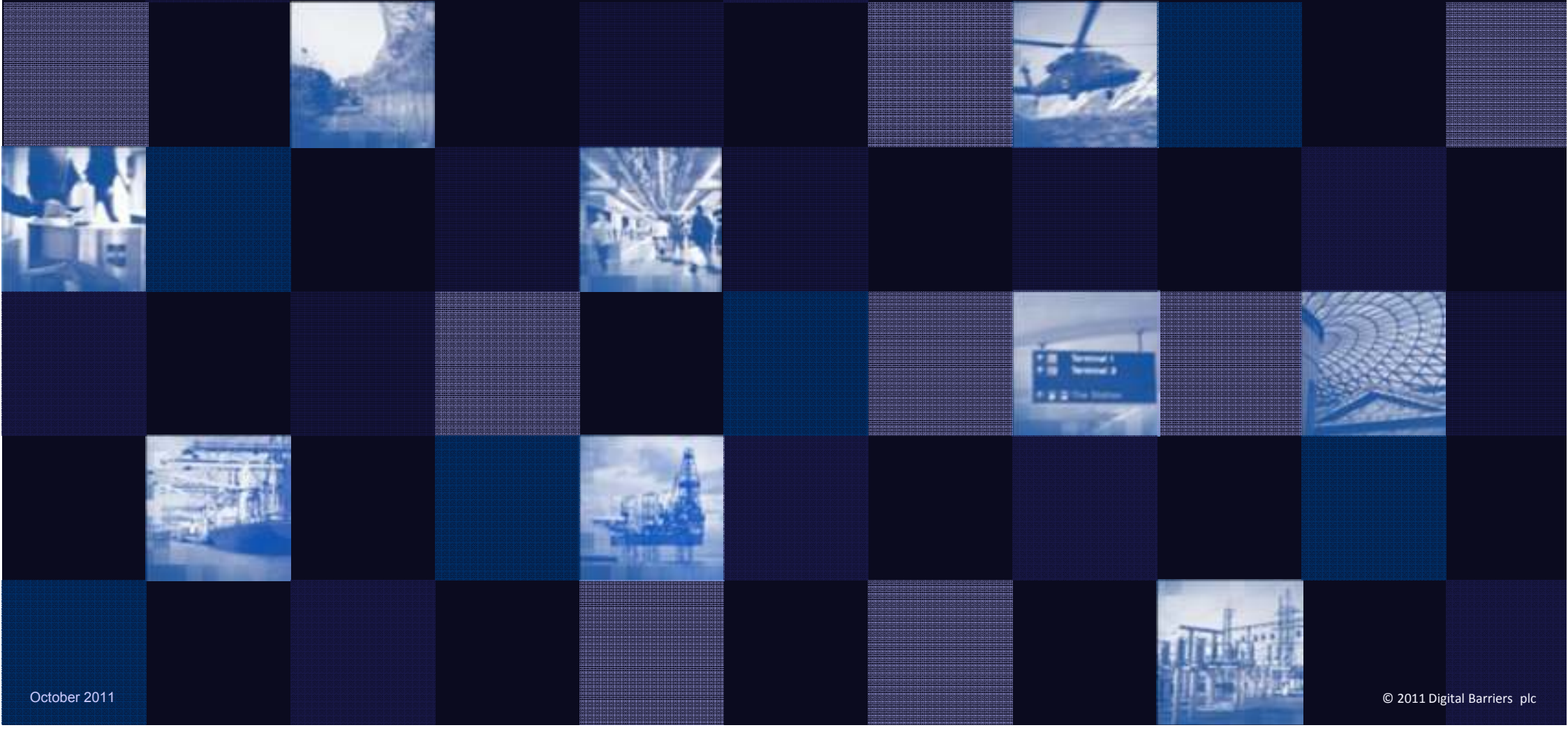
VIDEO OVER IP - CONVERGENCE AND PICTURE QUALITY

Considerations for high capacity video networks

Video Solutions from Digital Barriers



October 2011

Video over IP – convergence and picture quality

- Who are we?
- Video formats and the pros and cons
- Effects of low bandwidth – example videos
- Fibre based analogue and hybrid networks example
- Ethernet IP network example
- Points to consider for large scale video deployments

COE – our provenance…

- 20+ years in design and manufacture of real time fibre optic and Ethernet CCTV products and systems
- Technologies employed include:
  - WDM/CWDM/DWDM optics techniques
  - Analogue, hybrid and IP networking deployed through the use of FM, digital encoding and compression techniques
- Highly resilient approach to network and operations
  - London Congestion charge fibre ring – multiplexed FM video with DWDM optics
  - SMRT, Singapore – Hybrid 6,000+ camera network
  - Manchester Airport – 1,000+ channels of compressed IP video delivery
- Open systems approach compliant with international network and surveillance systems standards

A quick technology comparison…

CCTV: Analogue video <> Un-compressed digital <> compressed IP based video

ANALOGUE VIDEO

- High quality non-digitised real-time stream
- Ultra-low latency
- Efficient use of bandwidth (~6Mhz/channel)
- Limited network compatibility: non-IP, proprietary format
- Sterilises the fibre

UN-COMPRESSED DIGITAL

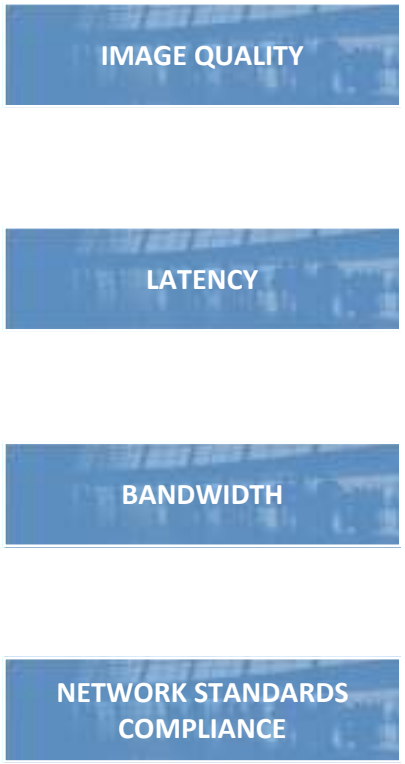
- High quality real-time stream
- Ultra-low latency
- High bandwidth (>100Mb/s/channel)
- Low channel count per fibre (limited by switch technology)
- Proprietary format (10 bit encoding or higher)
- Sterilises the fibre

IP COMPRESSED VIDEO

- Low-Medium-high quality compressed stream
- Latency sensitive
- Efficient use of bandwidth
- High channel count per fibre (limited by switch technology)
- Standards based format (MPEG)
- Multiple services may be used

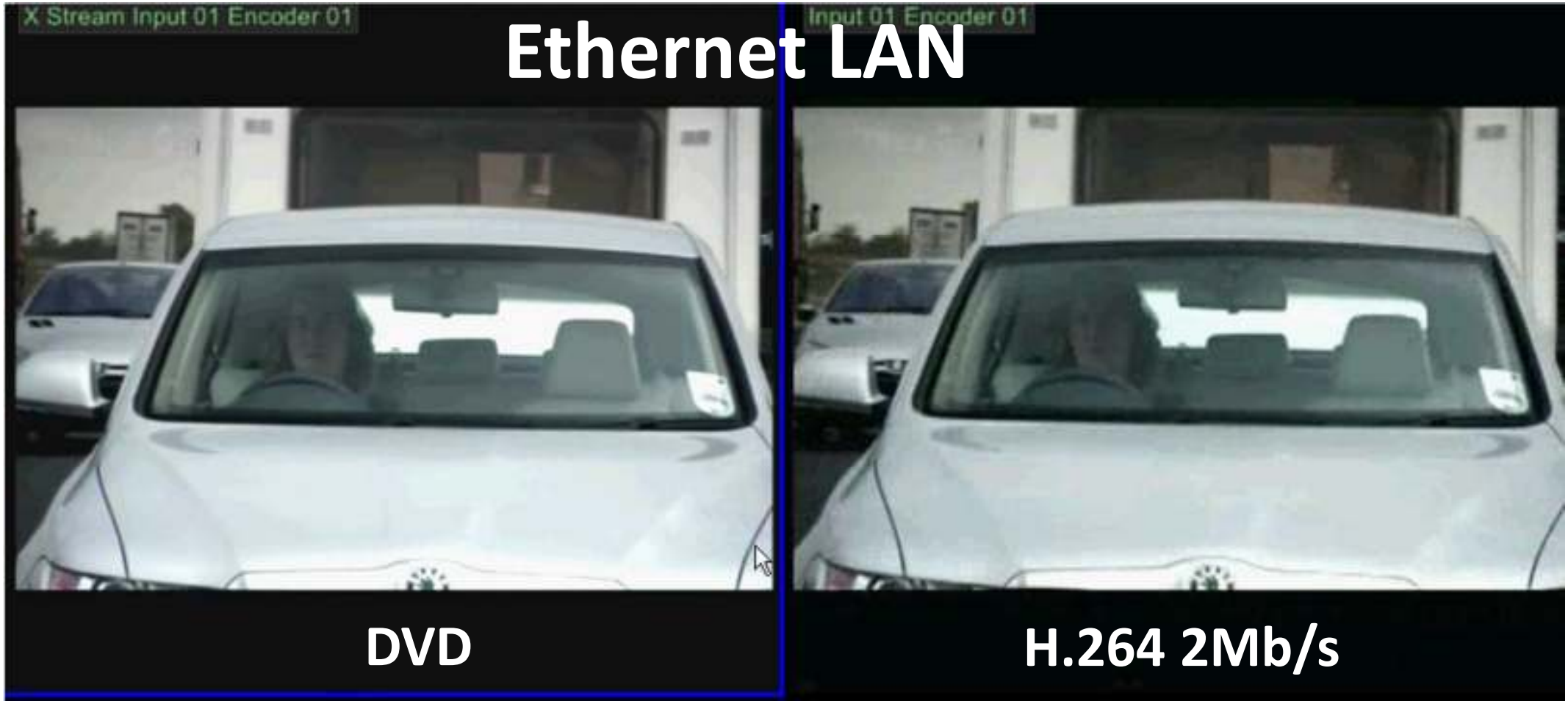
Key points for consideration…

- Video is an always on, non-recoverable high bandwidth low latency signal type
- Any IP based compressed video network will introduce additional latency to the video image
- Video is bandwidth hungry and requires careful network planning
- Wireless networks impose additional constraints on the network performance
- Standards are important for “open systems” and compliance is required



GSM Mobile network

H.264 64Kb/s **Proprietary 64Kb/s**



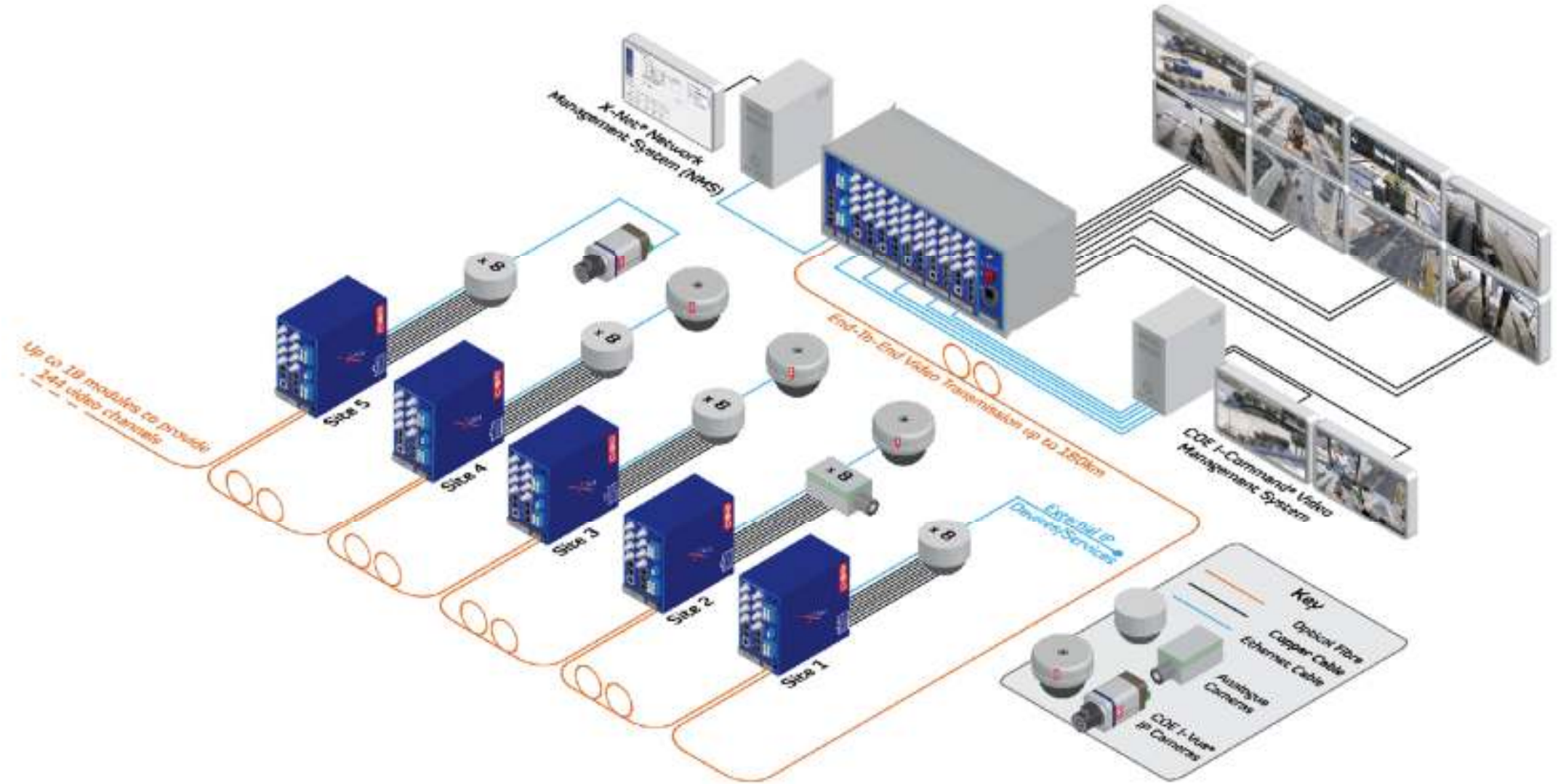
Video Network designs #1

Adopting optical multiplexing

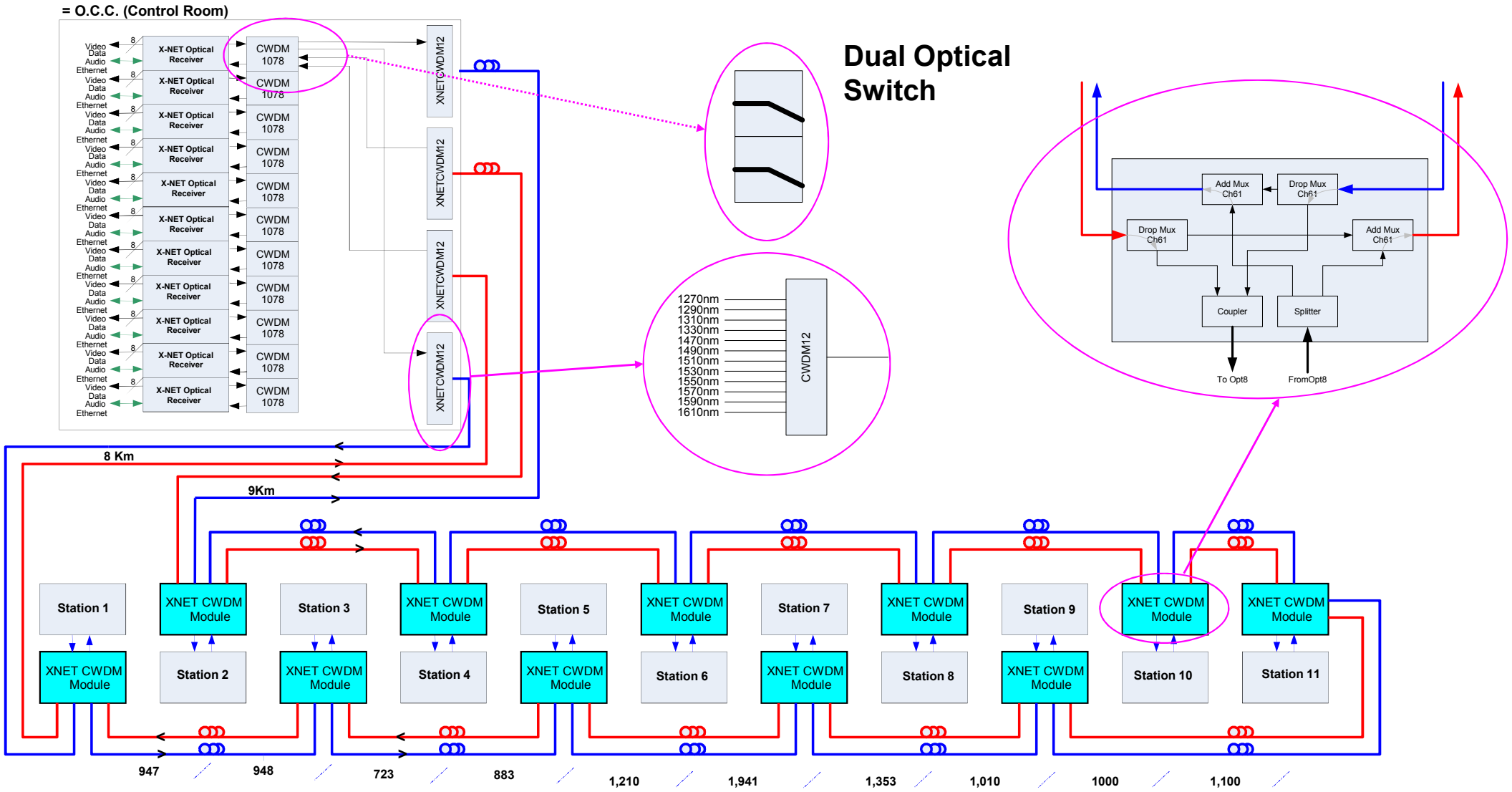
Course and Dense Wavelength Division Multiplexing

Passive network designs

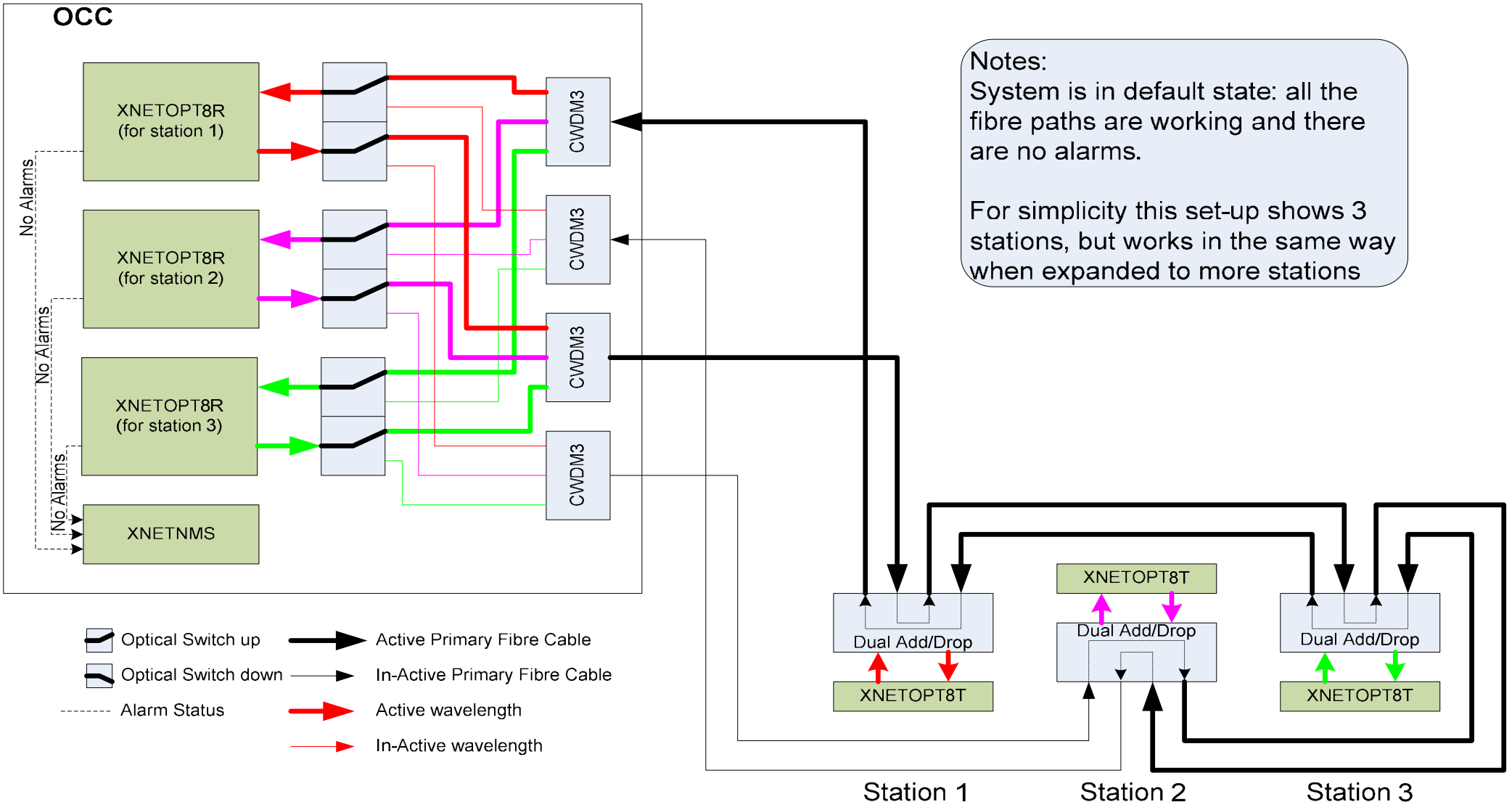
Optical multiplexing – linear network



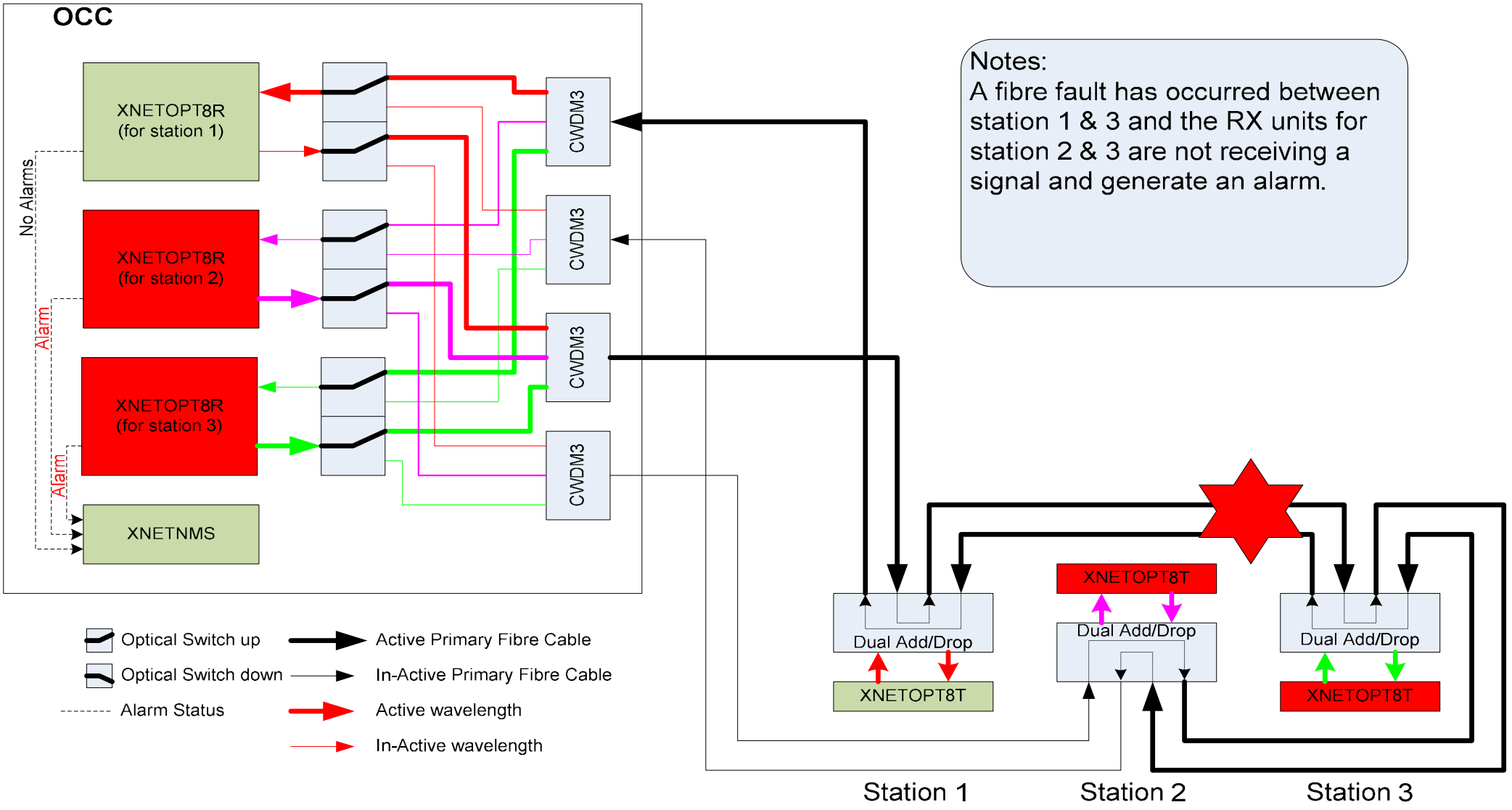
Network topologies…CWDM/DWDM for passive networks



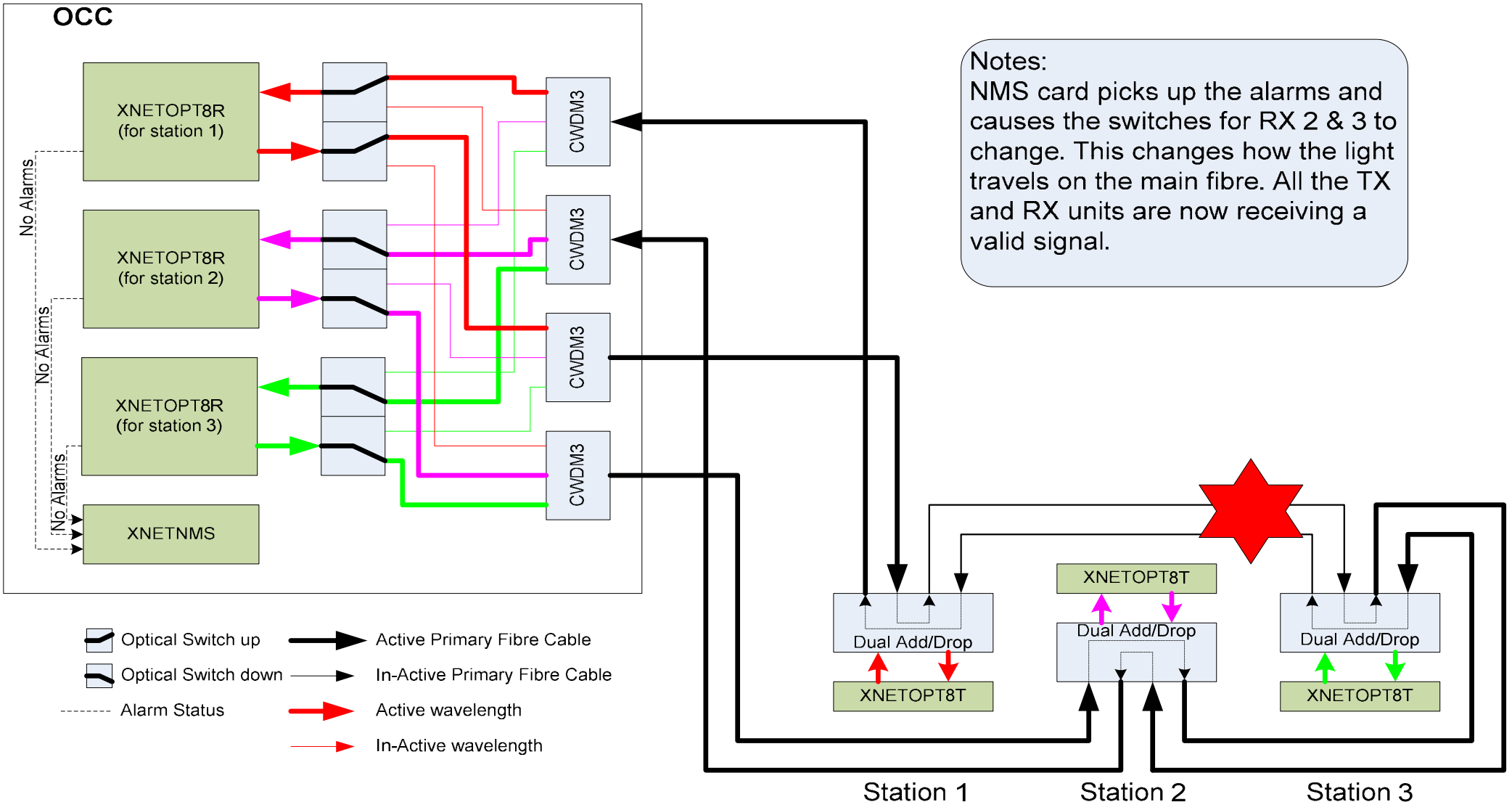
Optical network default set-up



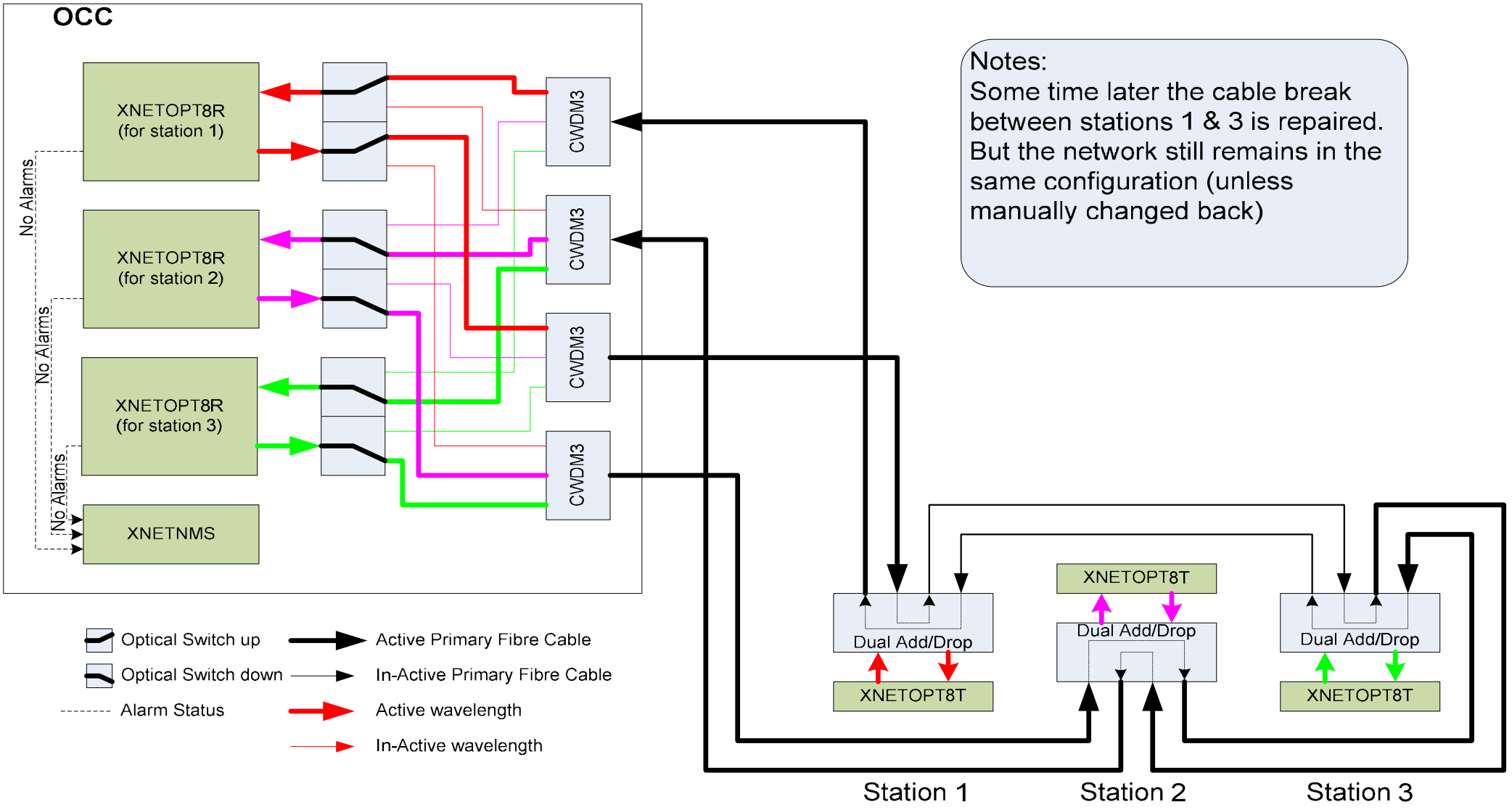
Fibre cable fault occurs



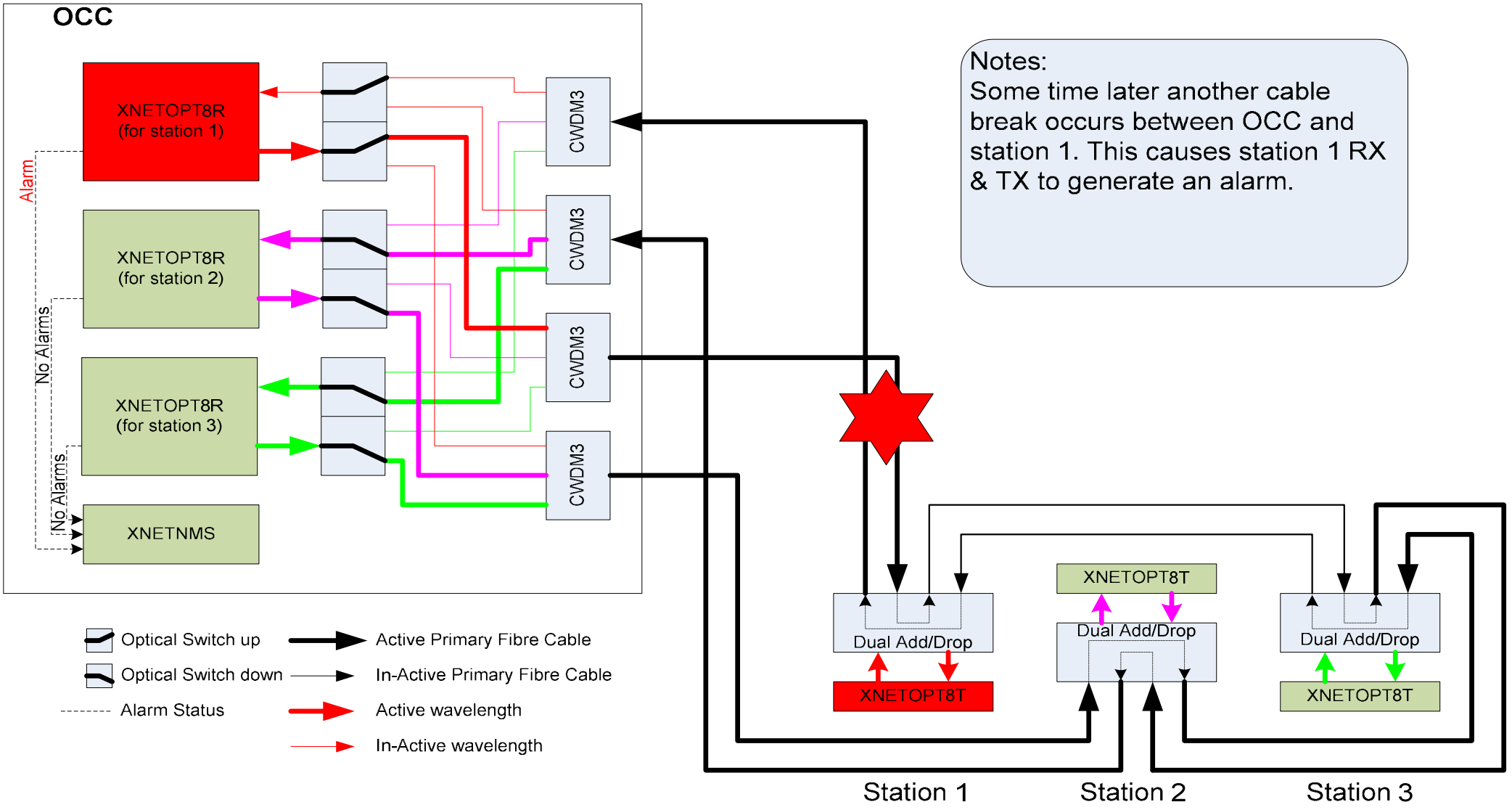
Optical switch change over



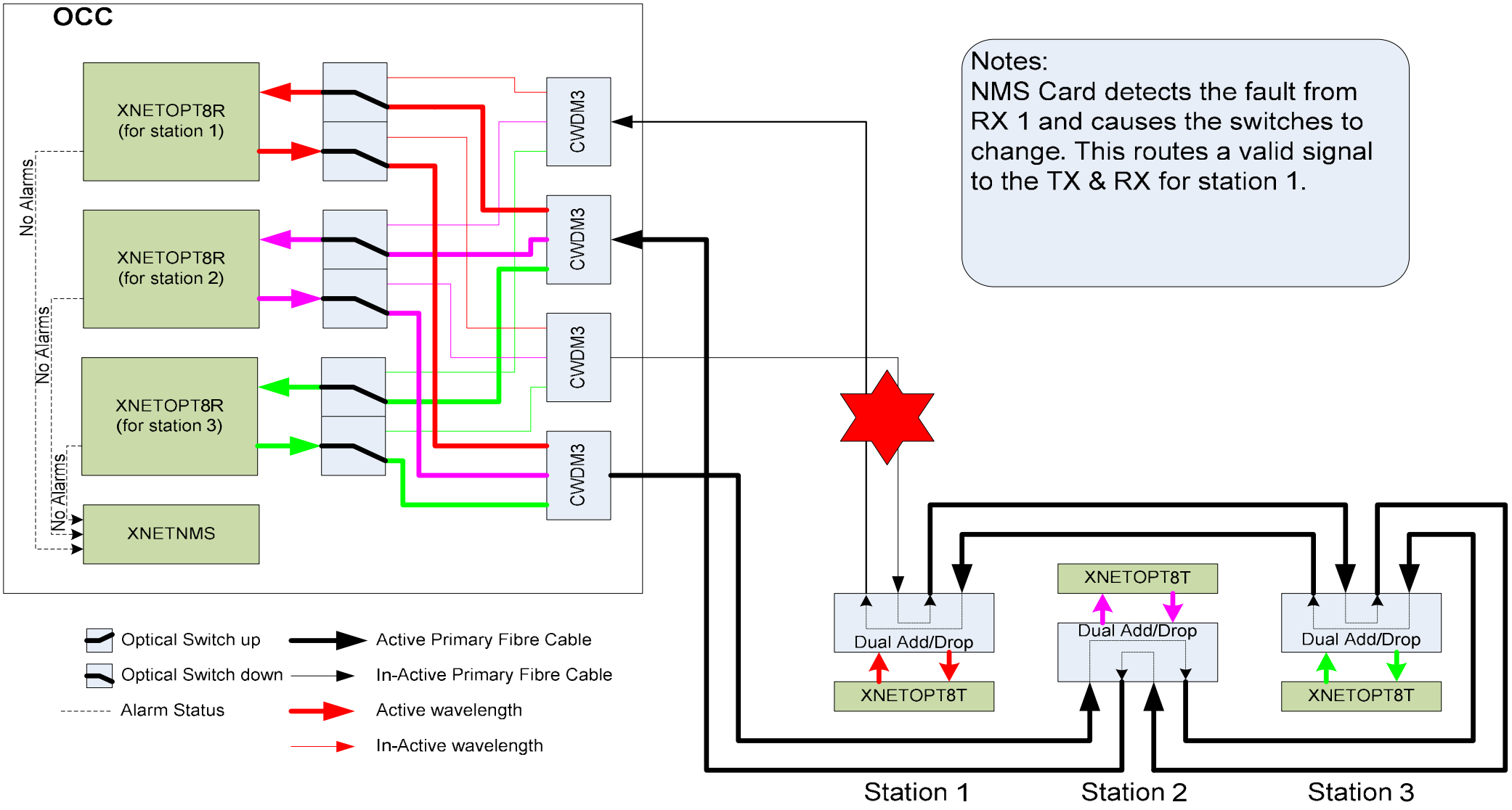
Optical switch change over



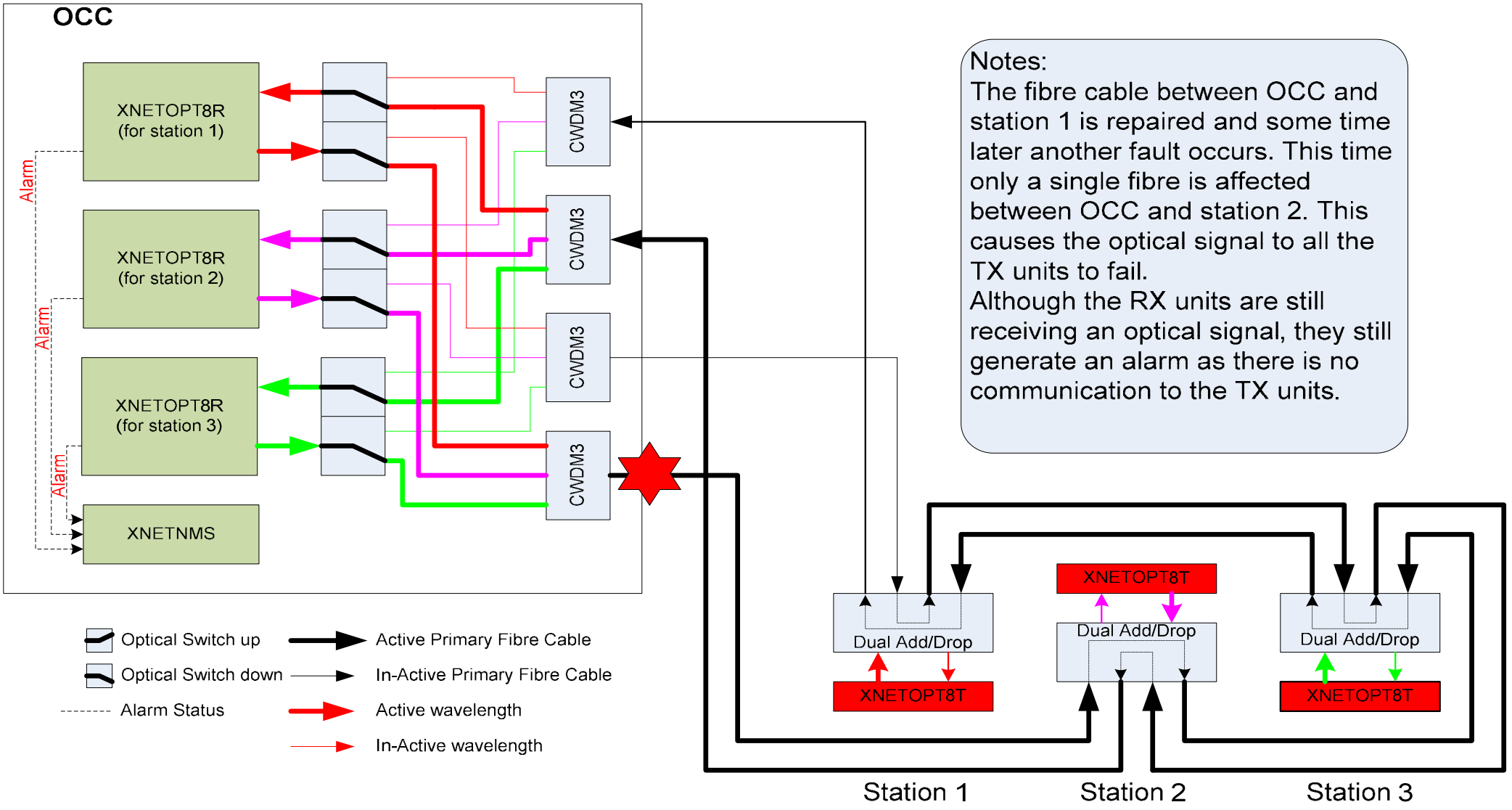
2nd Cable Fault occurs



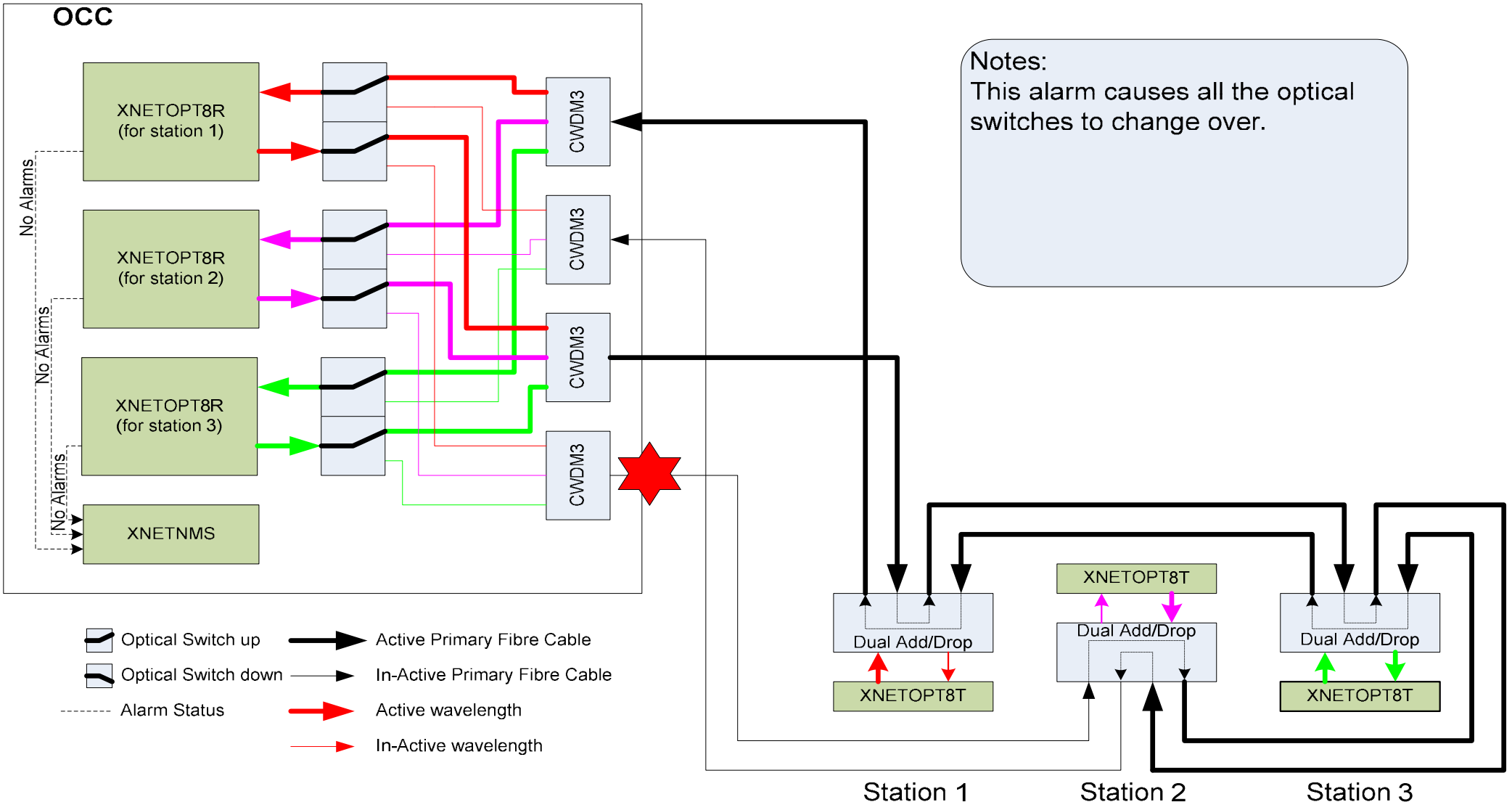
Optical switch change state



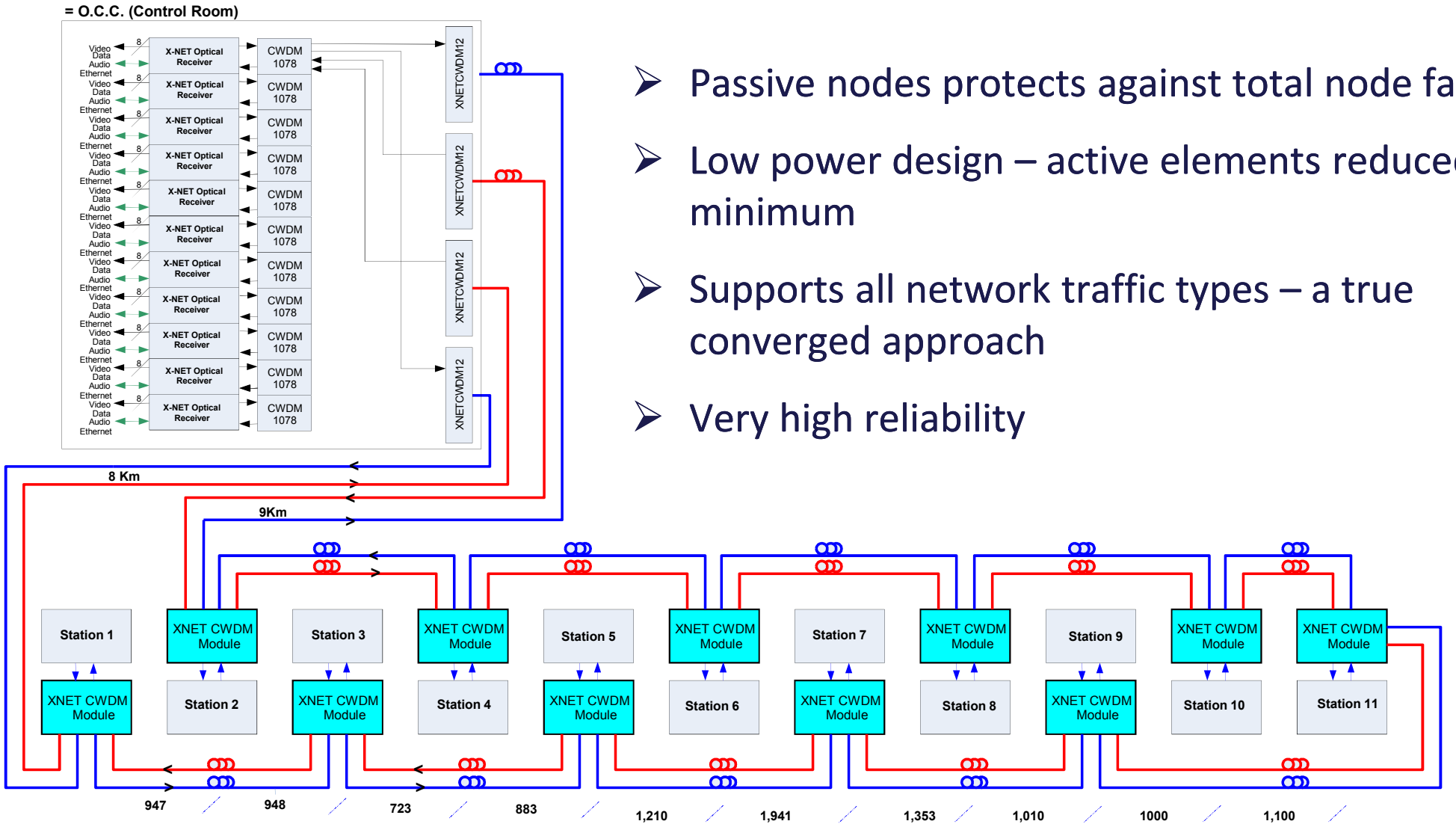
3rd Fibre Fault



All optical switches change state



Key advantages of this design approach……



- Passive nodes protects against total node failure
- Low power design – active elements reduced to a minimum
- Supports all network traffic types – a true converged approach
- Very high reliability

Efficient use of the fibre space…

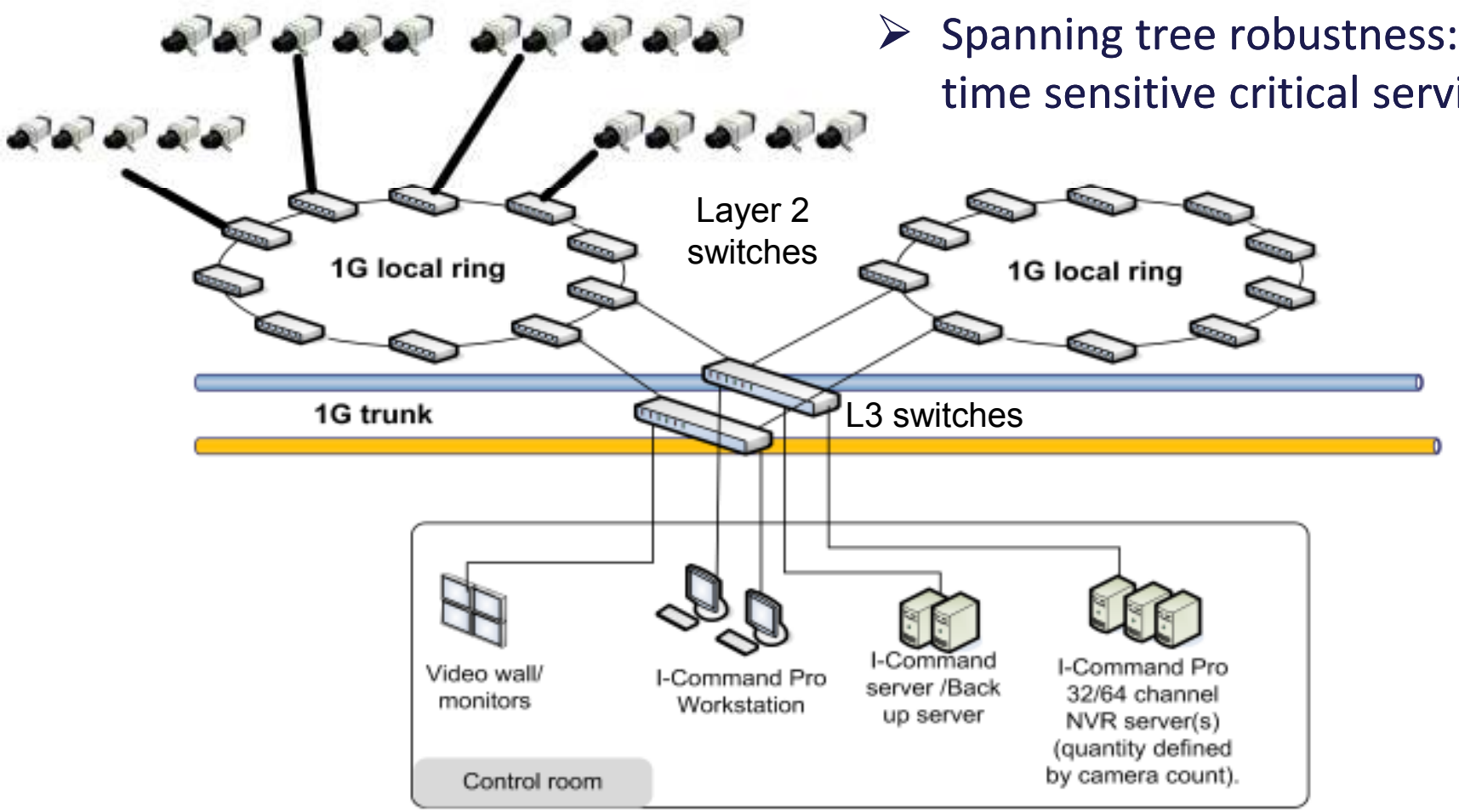
- Ready for convergence: Used for analogue/digital signals types in any format
- Carries real-time and non real-time signals
- Highly resilient: multiple path routing with passive nodes
- Highly flexible: signal agnostic allowing the move from analogue -> hybrid -> digital at your pace and cost
- Passive nodes mean:
  - Zero power use
  - Zero EMC, intrinsically safe
  - Ultra low failure rates
- Lower technology threshold for maintenance engineers (non Ethernet based passive network)

Video Network designs #2

Ethernet networks

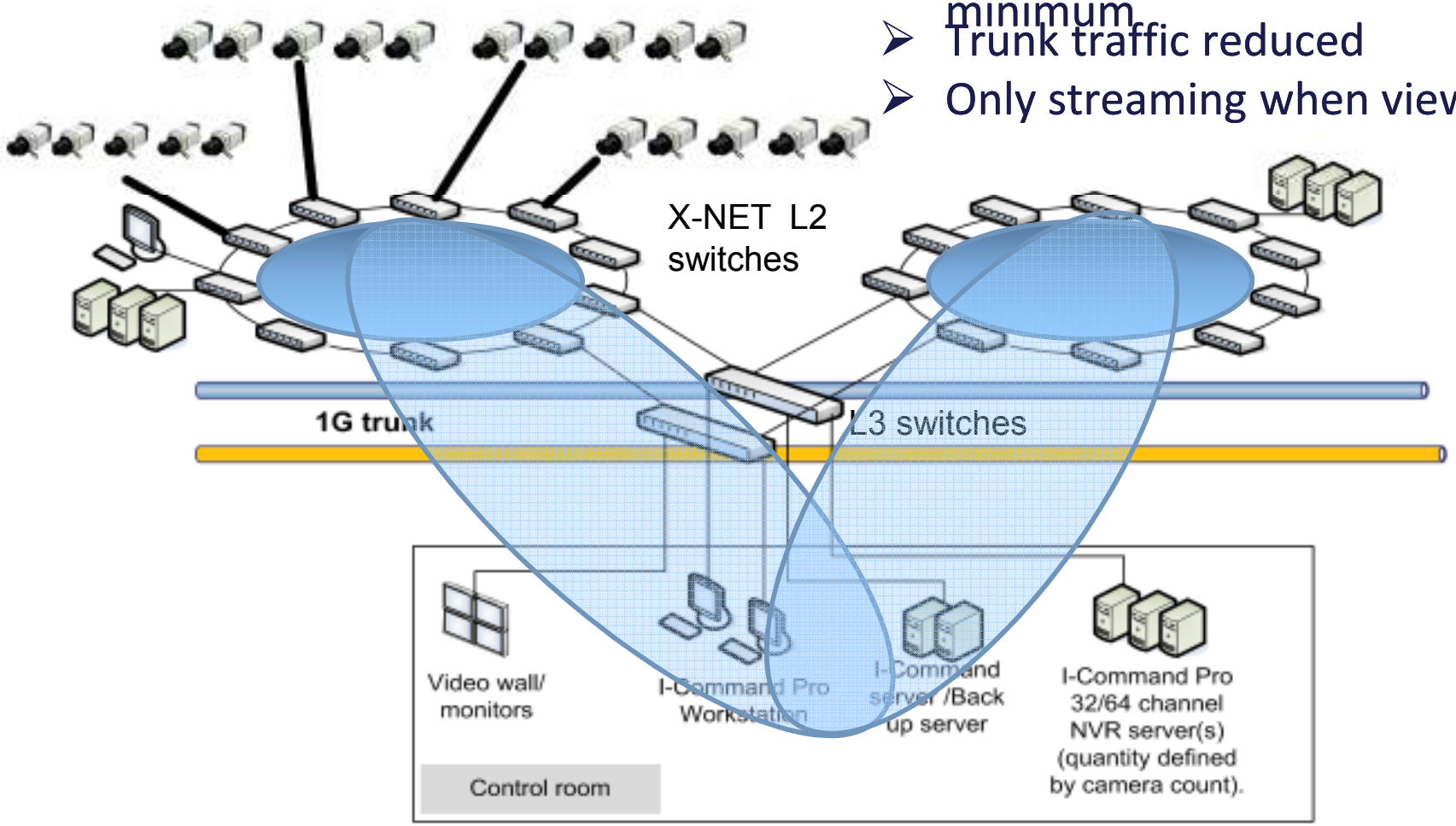
High capacity large scale IP video WAN example …

- Routing/redundant path management
- Spanning tree robustness: voice/video are time sensitive critical services



High capacity large scale IP video WAN example – improved design…

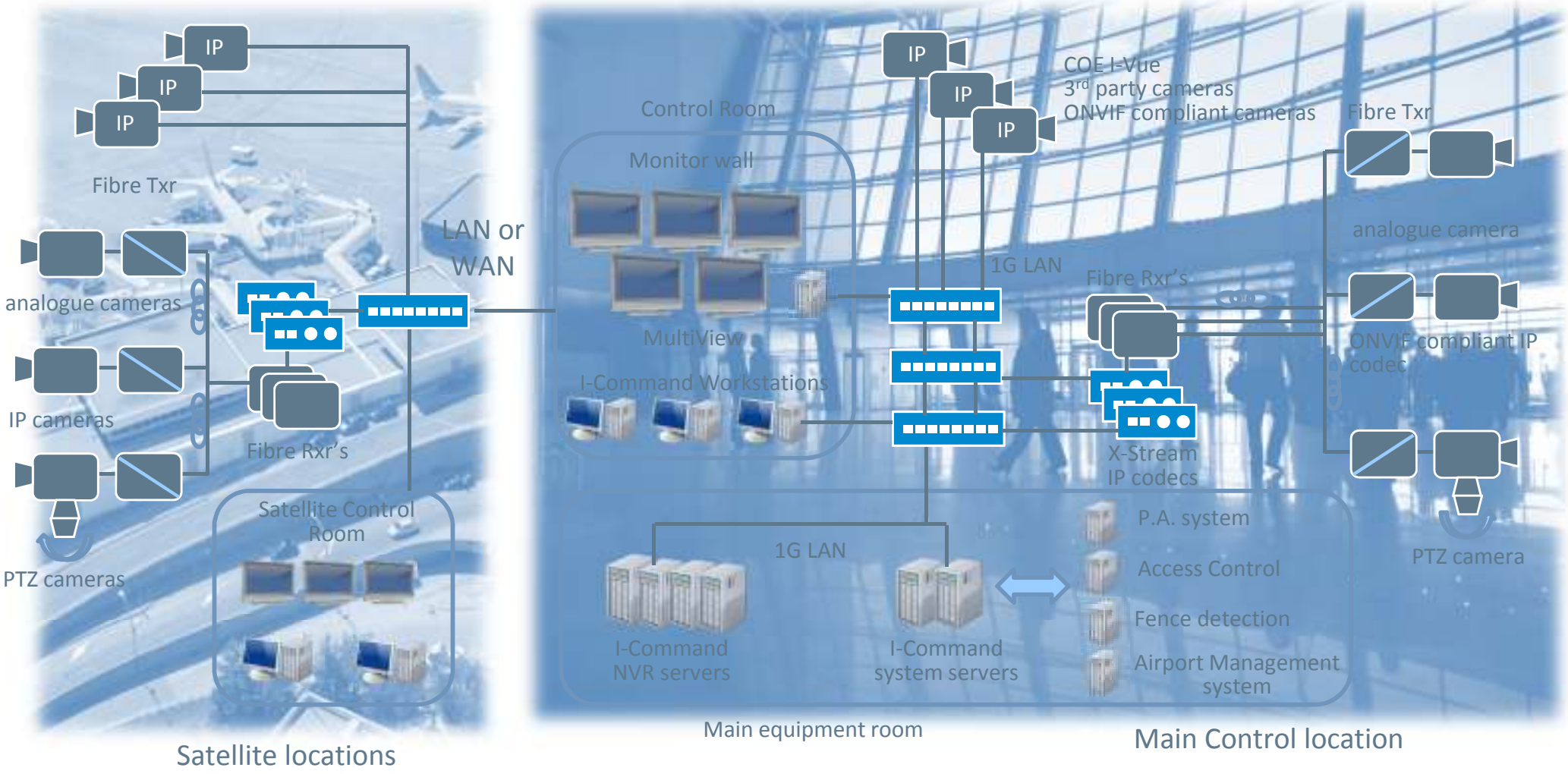
- Video on demand traffic is kept to a local ring minimum
- Trunk traffic reduced
- Only streaming when viewed or archived



Points to consider

- Switch and router core backbone bandwidth and capabilities – video is an always on stream!
- The use of v-lans – segregation of traffic types
- Wireless networks and the pitfalls
- Use of unicast and multicast – wireless n/w may only support unicast
- Convergence of signal types onto the IP network: different demands and management required:
  - Video: Conferencing, surveillance, broadcasts (YouTube/training etc.),
  - Audio: Conferencing, surveillance, VoIP
  - Data: email, transactions and archiving

Flexible expandable Video management system for multiple control locations and a host of surveillance devices…



The drive for convergence is placing stresses on networks…

- Mix of legacy and new technology and applications
- Existing infrastructure constraints – fibre and/or copper
- High bandwidth low latency applications such as video and voice
- Reliability in the network through redundancy

Requirements can be met through…..

- Careful design and expansion contingencies being taken into account
- Use of cost effective efficient optical multiplexing techniques
- Managing client expectations

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Thank you for listening

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