

End user perspective on 400Gb/s Ethernet

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Agenda

- Introduction
- AMS-IX network
 - 100GE take up
 - Future projections

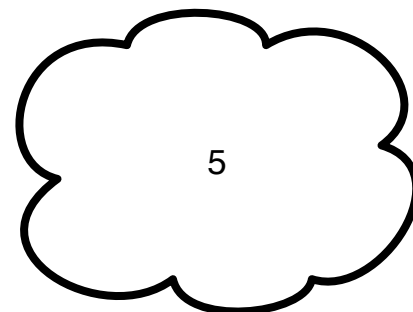
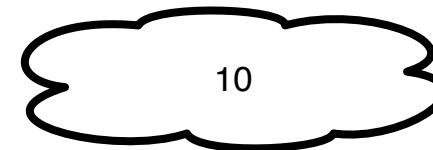
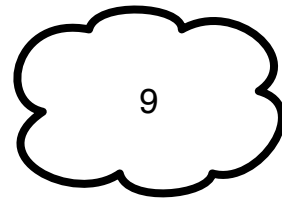
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- Requirements for 400Gb/s Ethernet
- Fibre type and view on parallel fibre
 - Lengths
 - Link aggregation
 - Costs compared to existing technologies

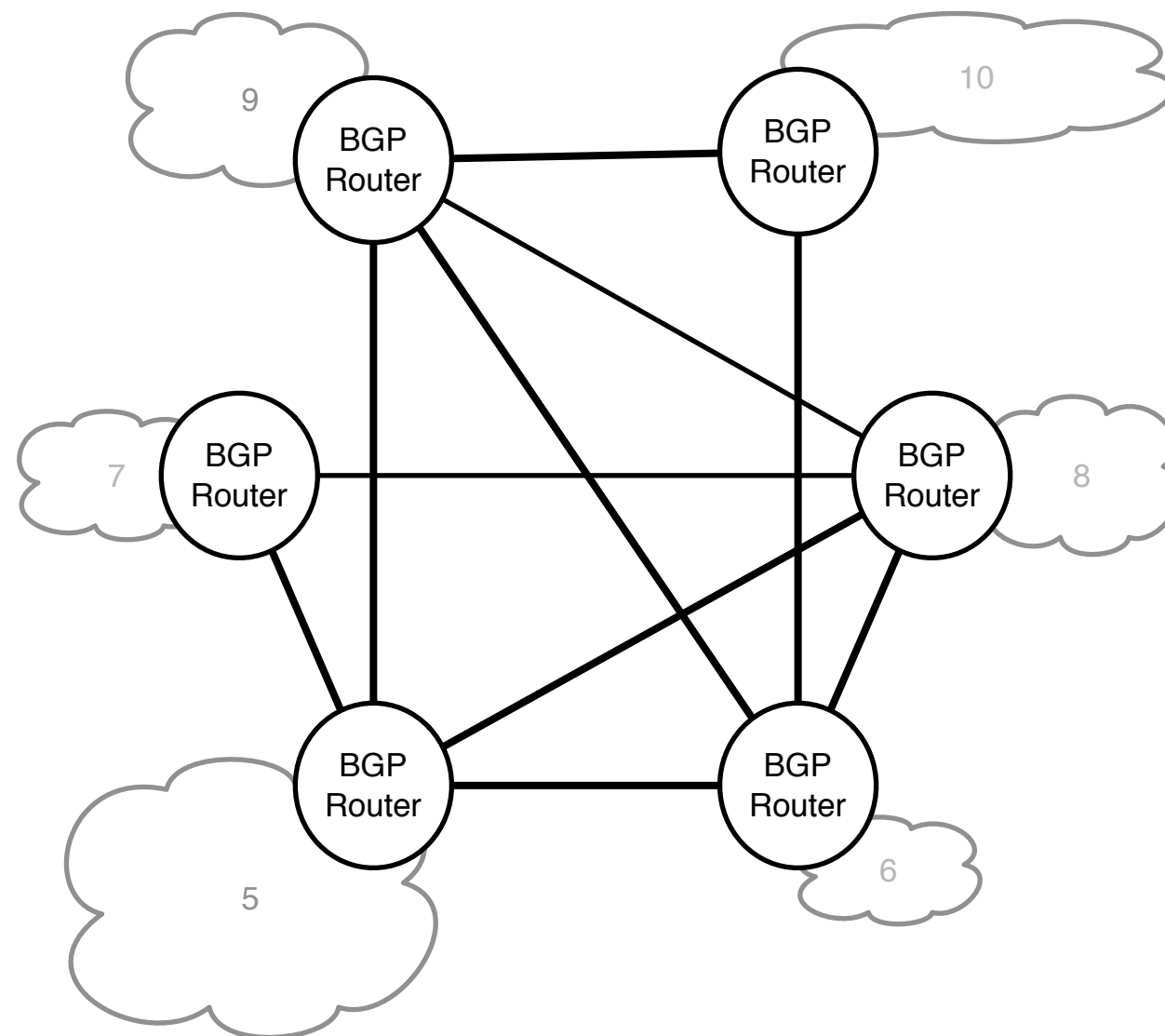
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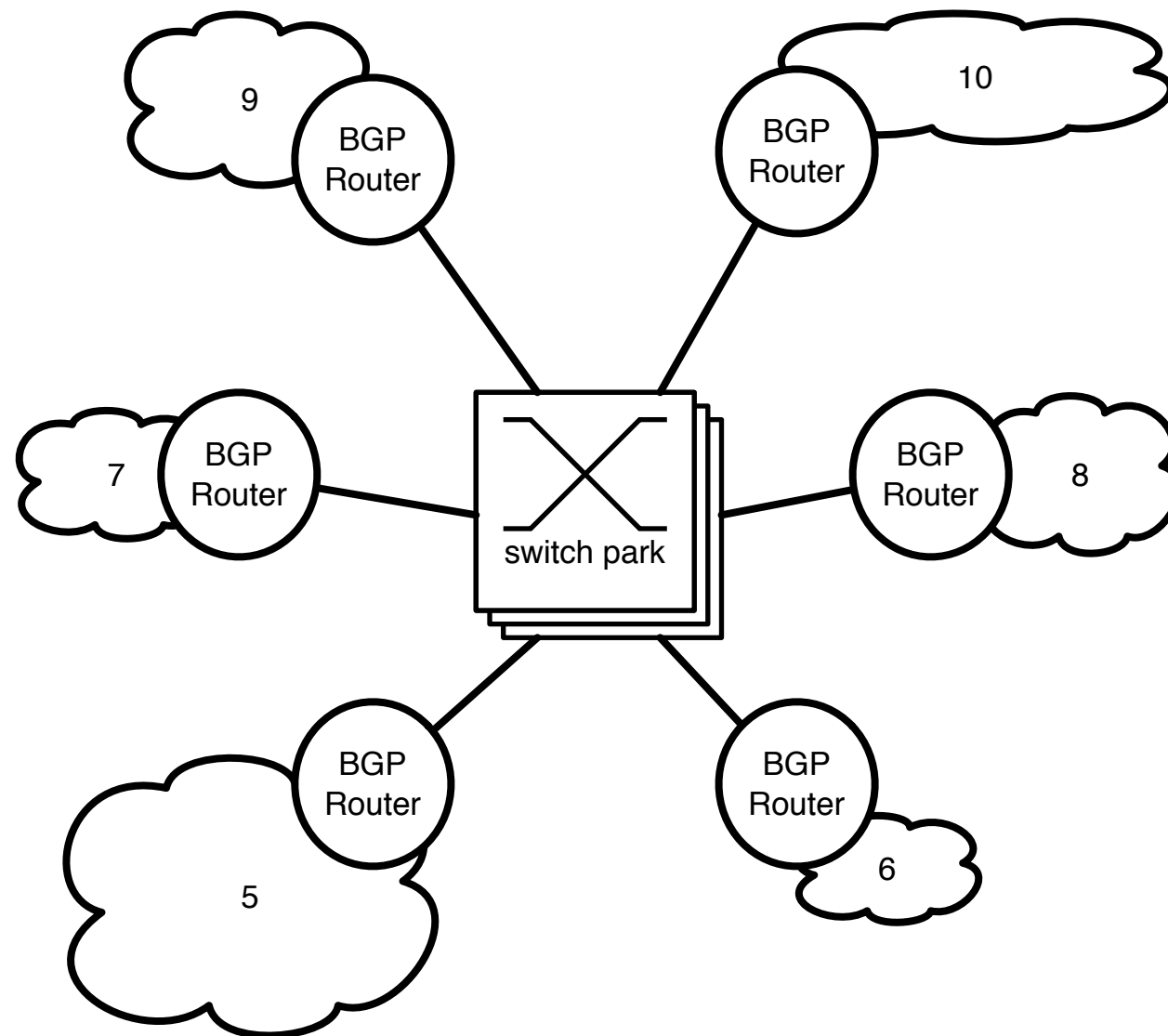
Introduction



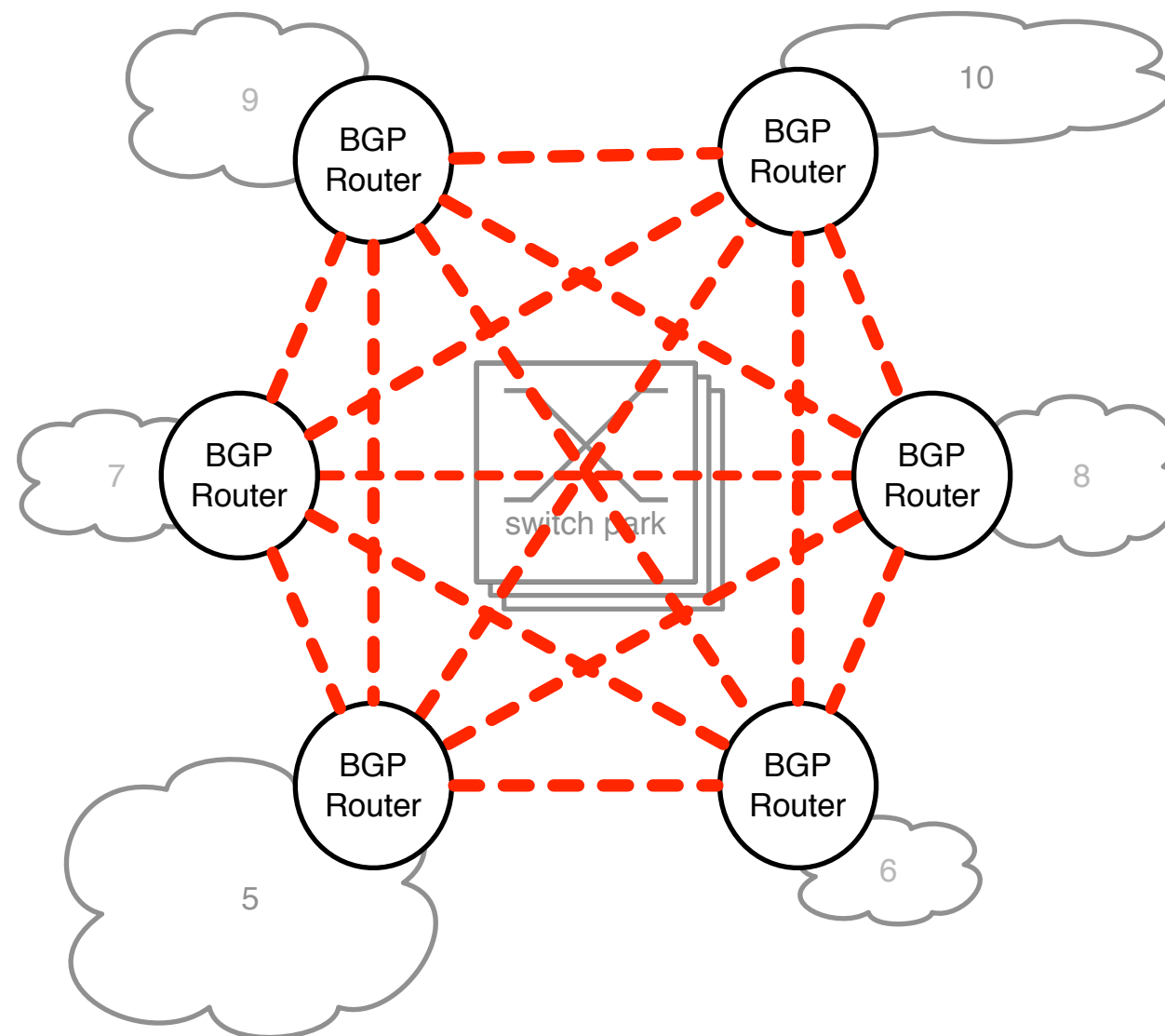
Introduction



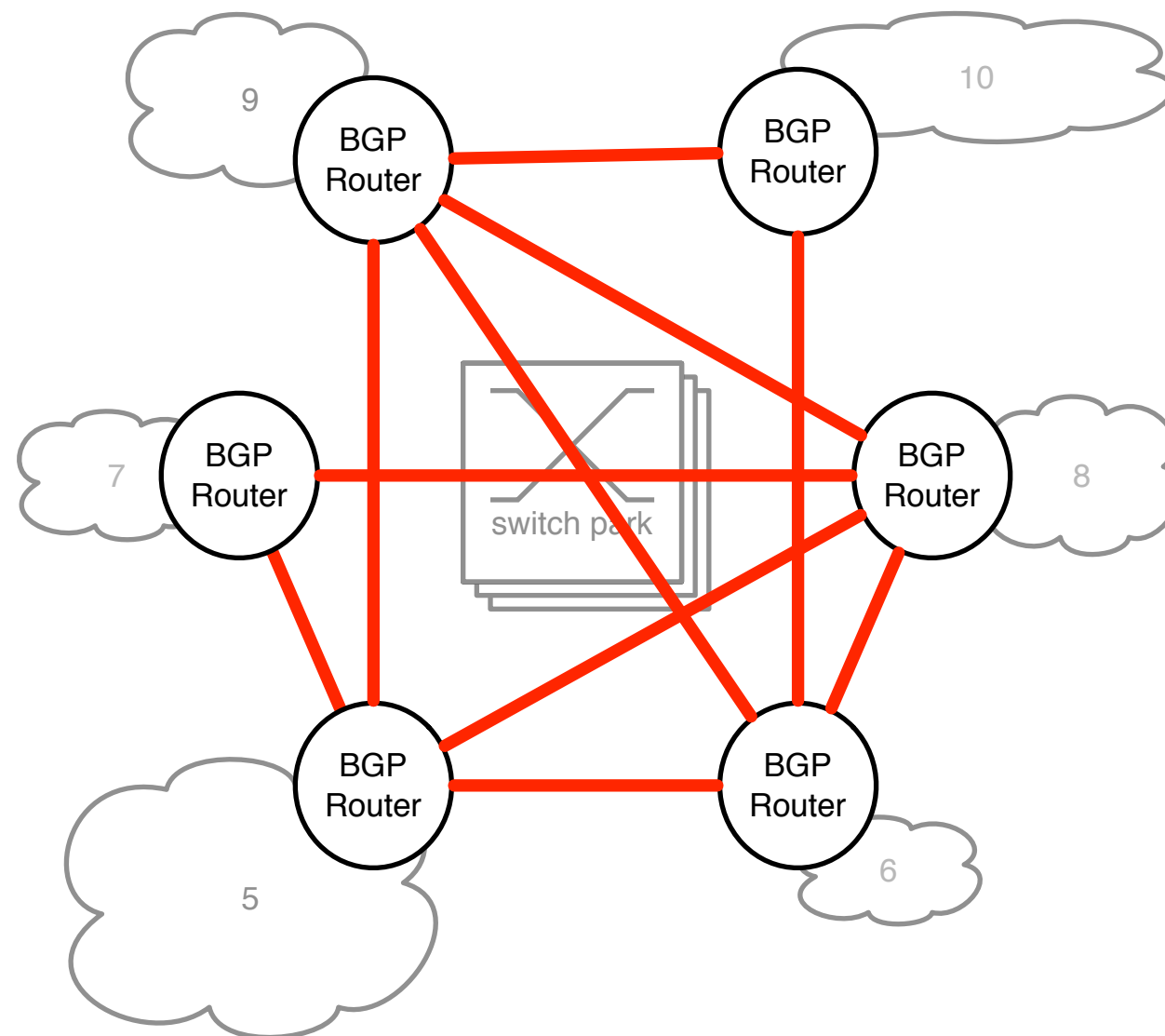
Introduction



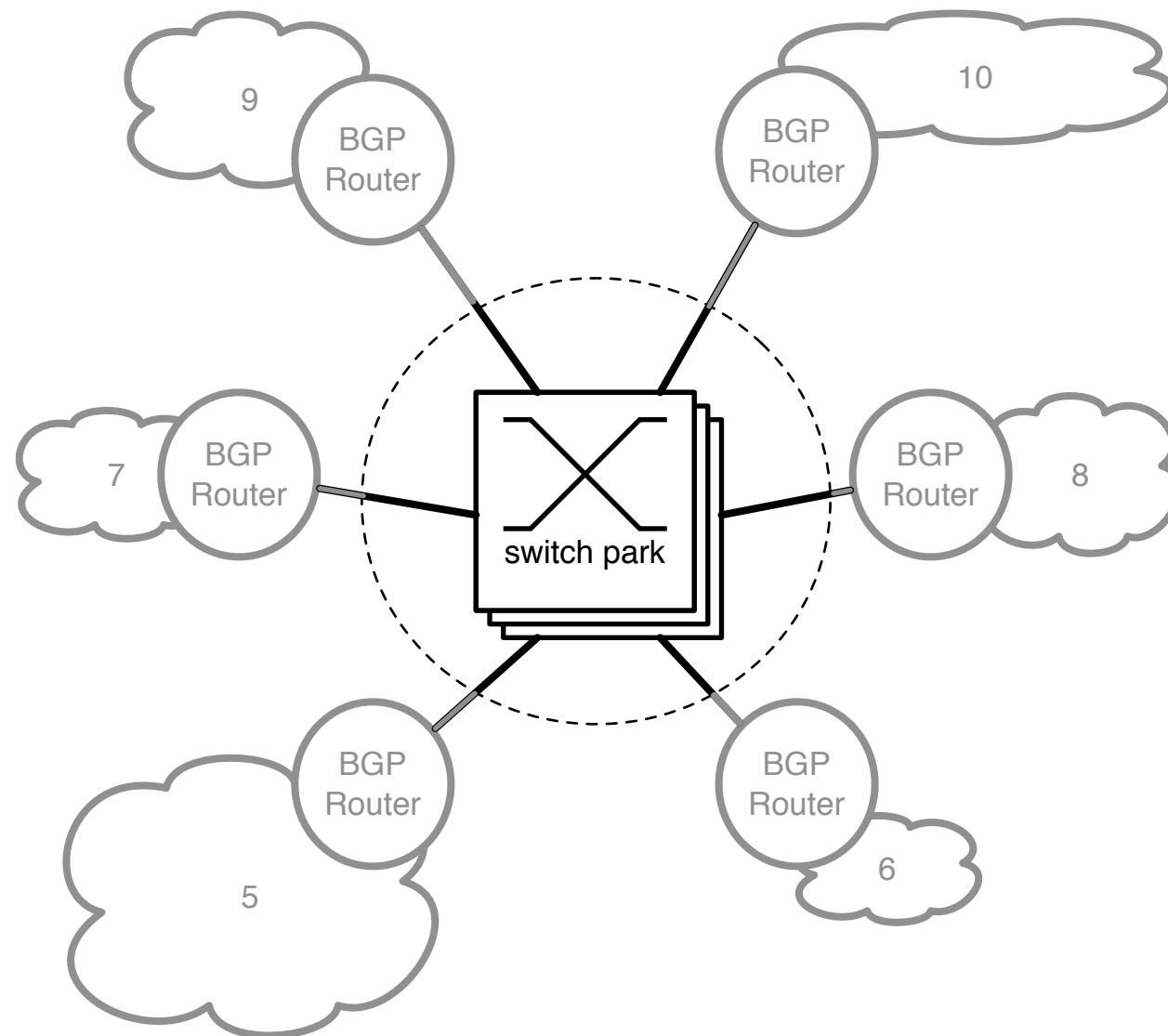
Introduction



Introduction



Introduction



Agenda

- Introduction
- **AMS-IX network**
 - 100GE take up
 - Future projections

```

Stockholm      CERN
!              !
!512            !512
!              !
!      !-----!
!      !      IDNX      !
!      !-!-----!-!
!              !      !
!              !448  !32
!              !IP    !CLNP
!              !      !
!-----!-----!-----!----!   64
!      (ibr-router)      ----- RedIRIS
!              !
!      Amsterdam.      ----- Leuven
!      ebone.net      !   64      !-----! (UCD)
!              ----- PTT Telecom ----- IXI (ULB)
!-----!-----!              !-----! (YUNAC)
!
=====!=====!=====!===== ibr-lan
!              !
!-----!-----!      !-----!-----!
!Amsterdam1.!      !Amsterdam. !
!router.      !      !nl.eu.net !
!surfnet.nl !      !      !
!-----!-----!      !-----!-----!
!              !
SURFnet      EUnet

```

TBD - network topology

TBD - volume growth

TBD - year over year growth

TBD - port growth

TBD - future port growth

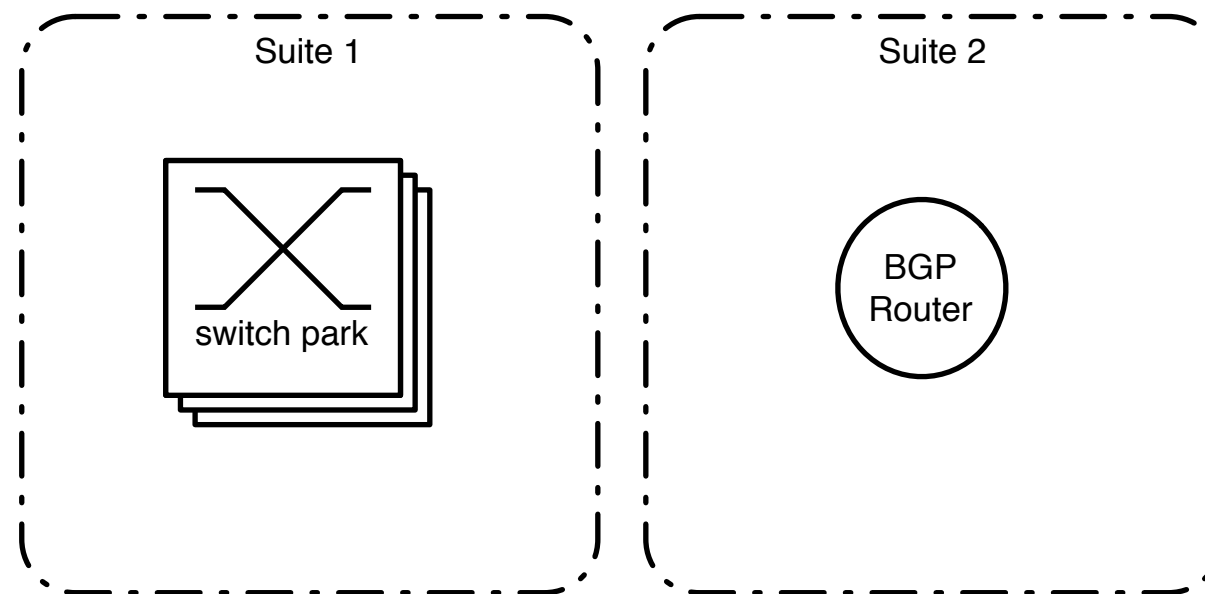
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 - Fibre type and view on parallel fibre
 - Link aggregation
 - Costs compared to existing technology

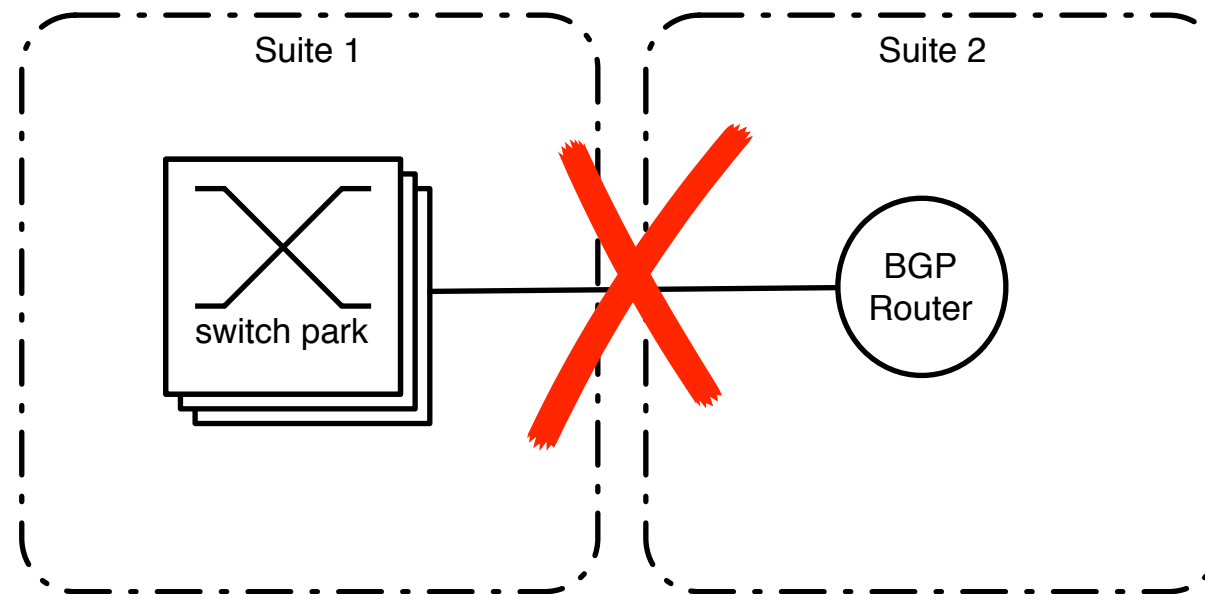
Cabling

- Single mode fibre
 - Don't bother about multi mode
- Fibre lengths
 - Up to 40km, direct or with low costs amplifiers or transmission equipment

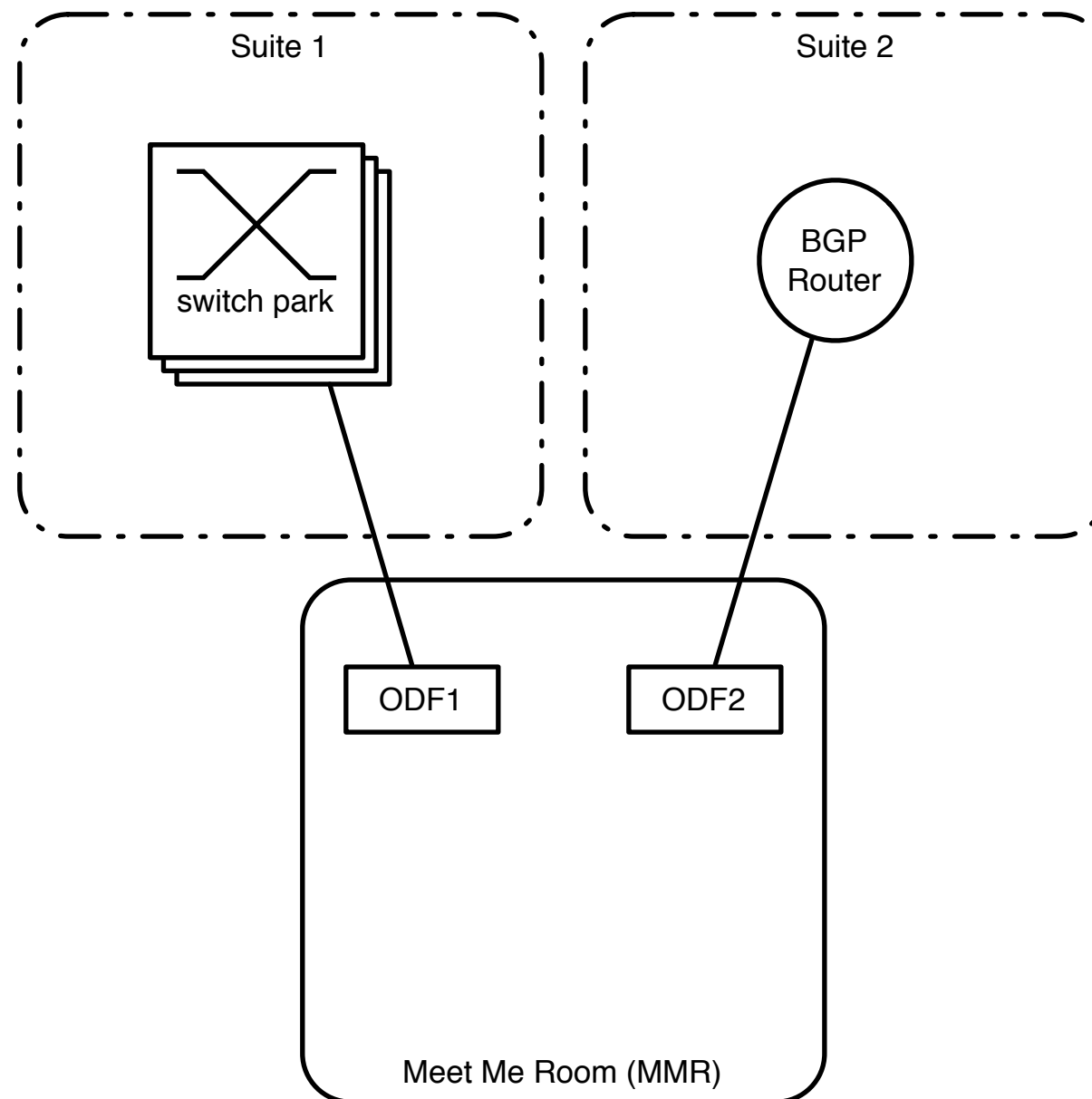
Cabling



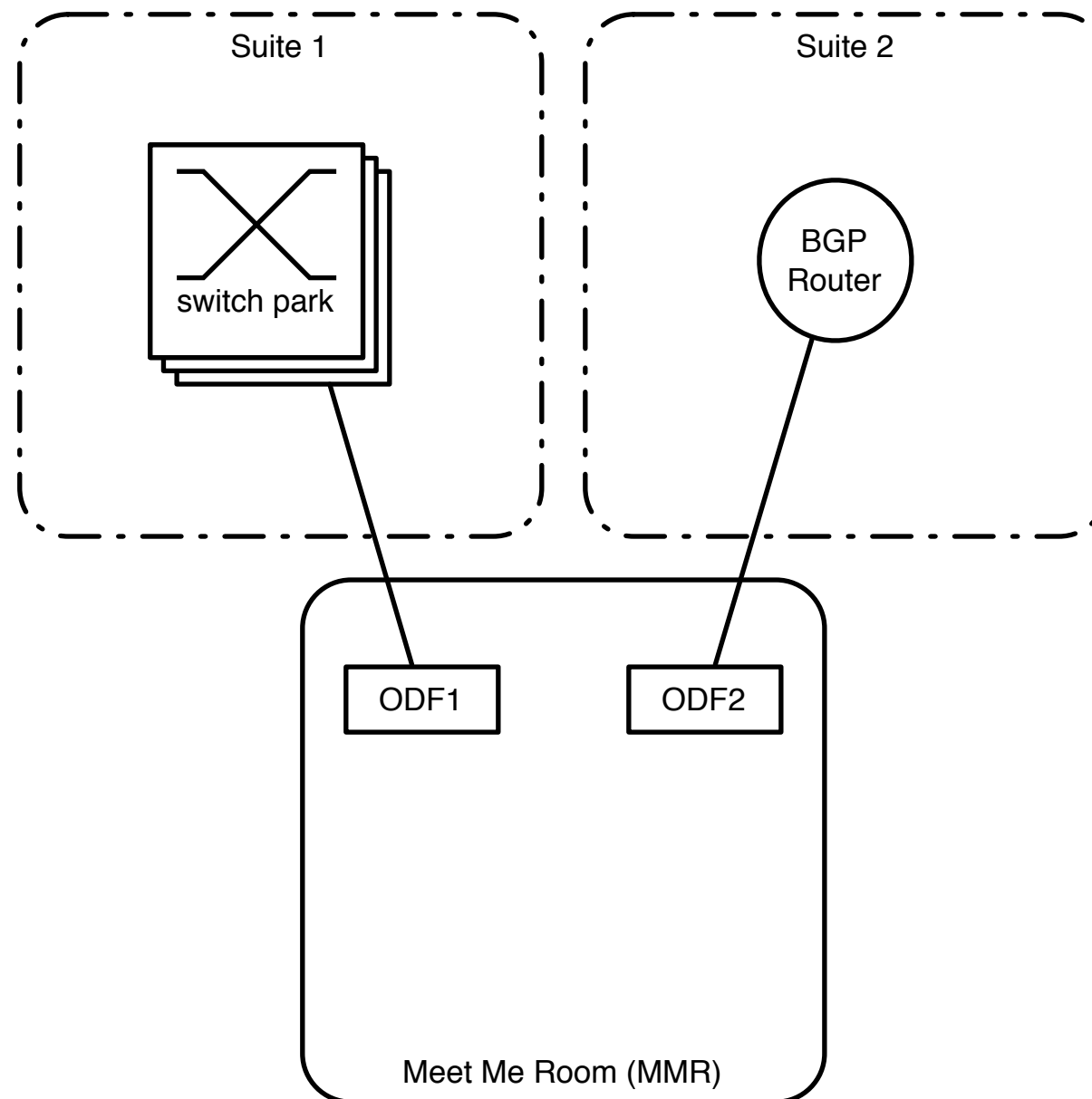
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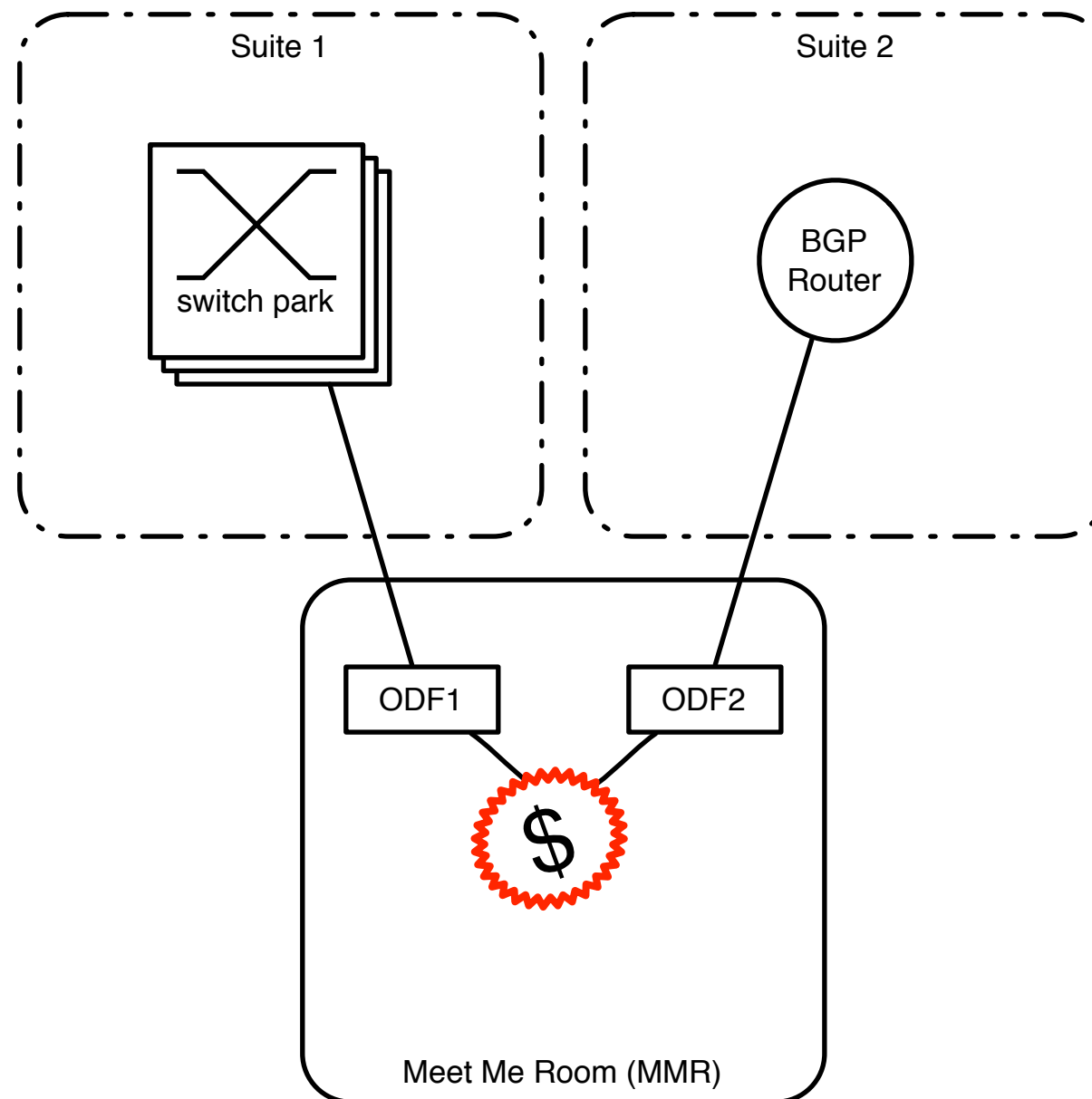
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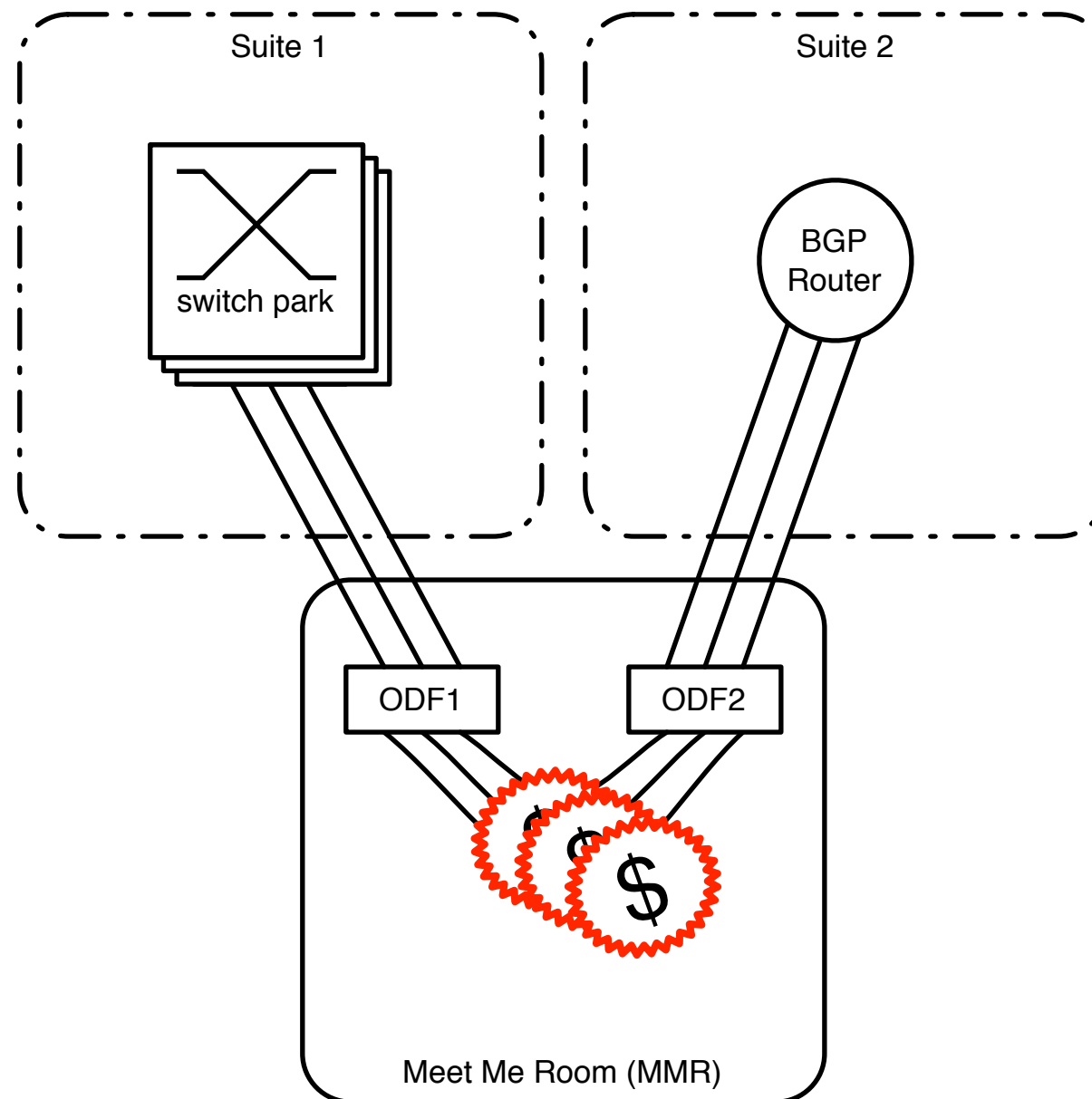
Cabling



Cabling



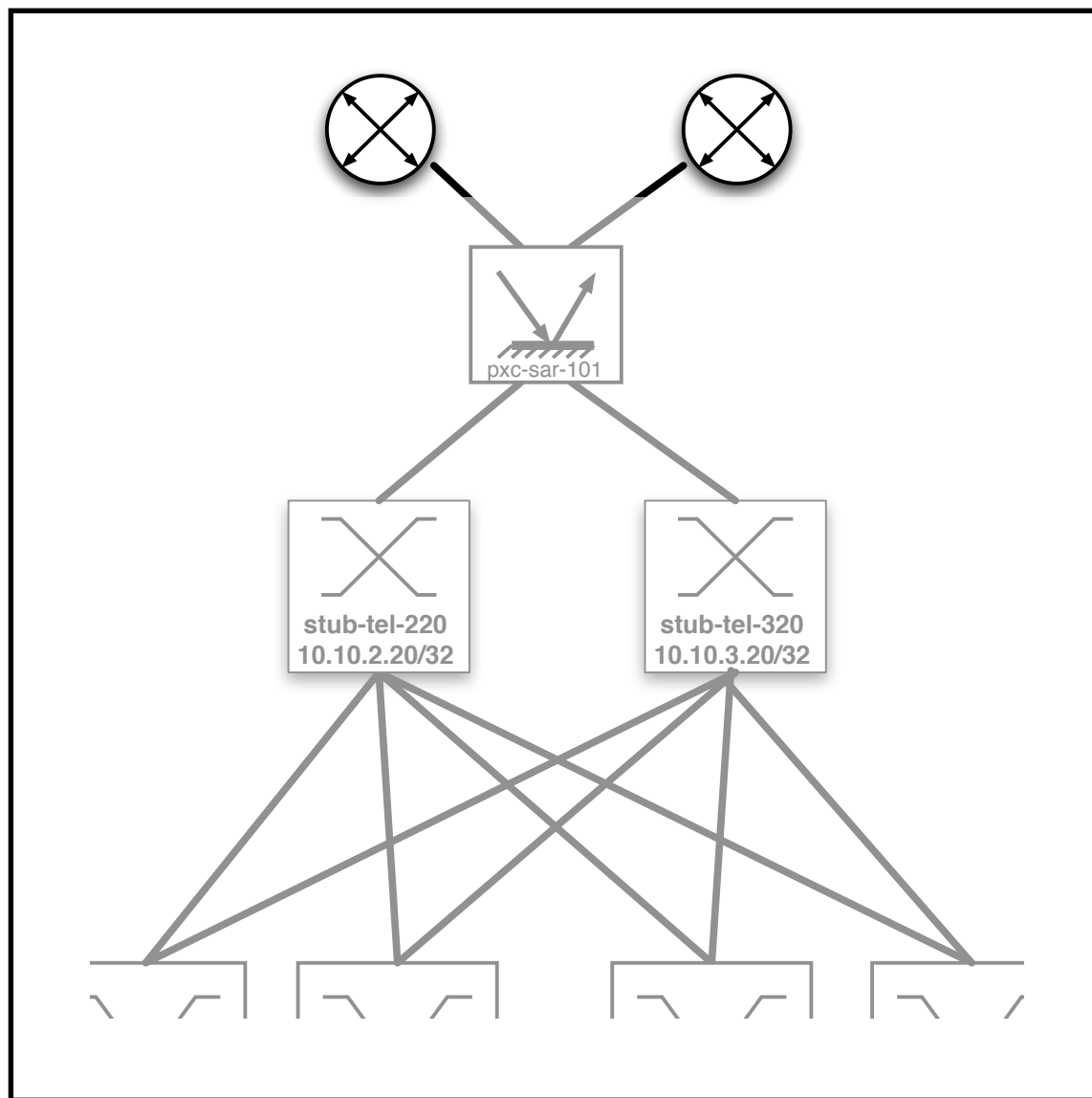
Cabling



Meet Me Room

- Very high density ODFs
 - > 2000 simplex fibers in 47U
- Fusion spliced to infrastructure cabling
 - One MTP/MPO connector will take one standard splice box of 12 splices

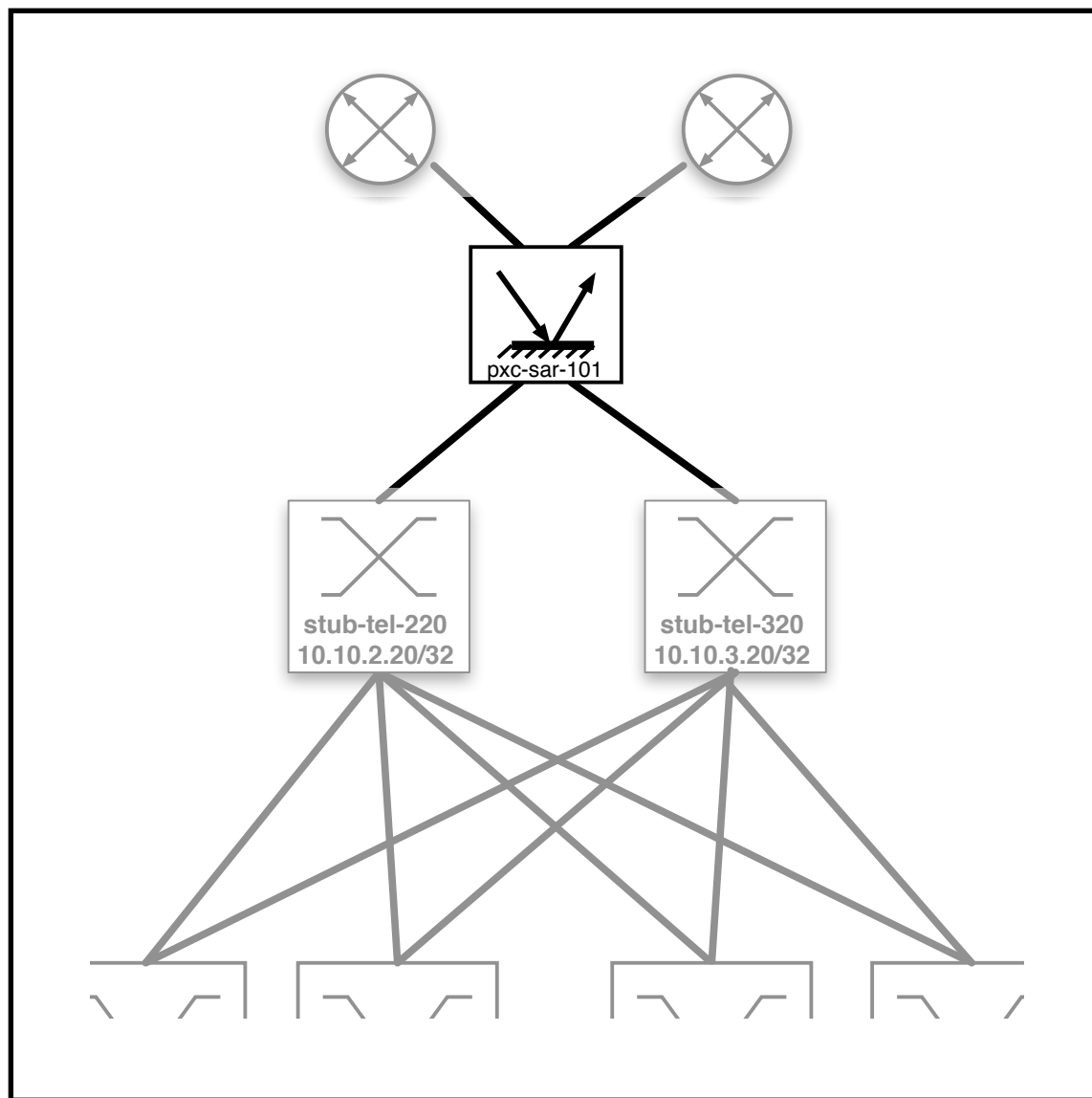
Layer 1 switching



- Border routers of members

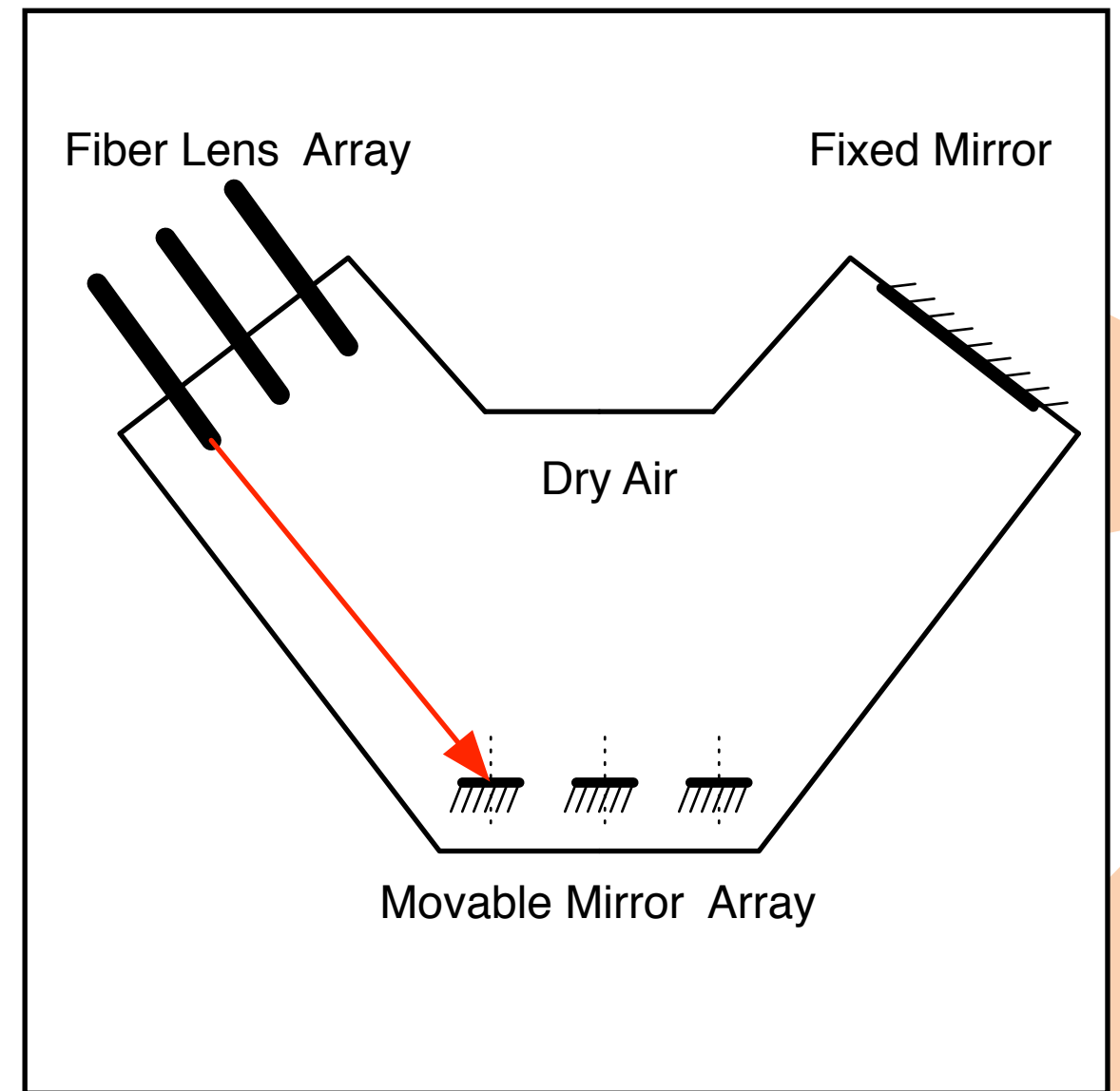
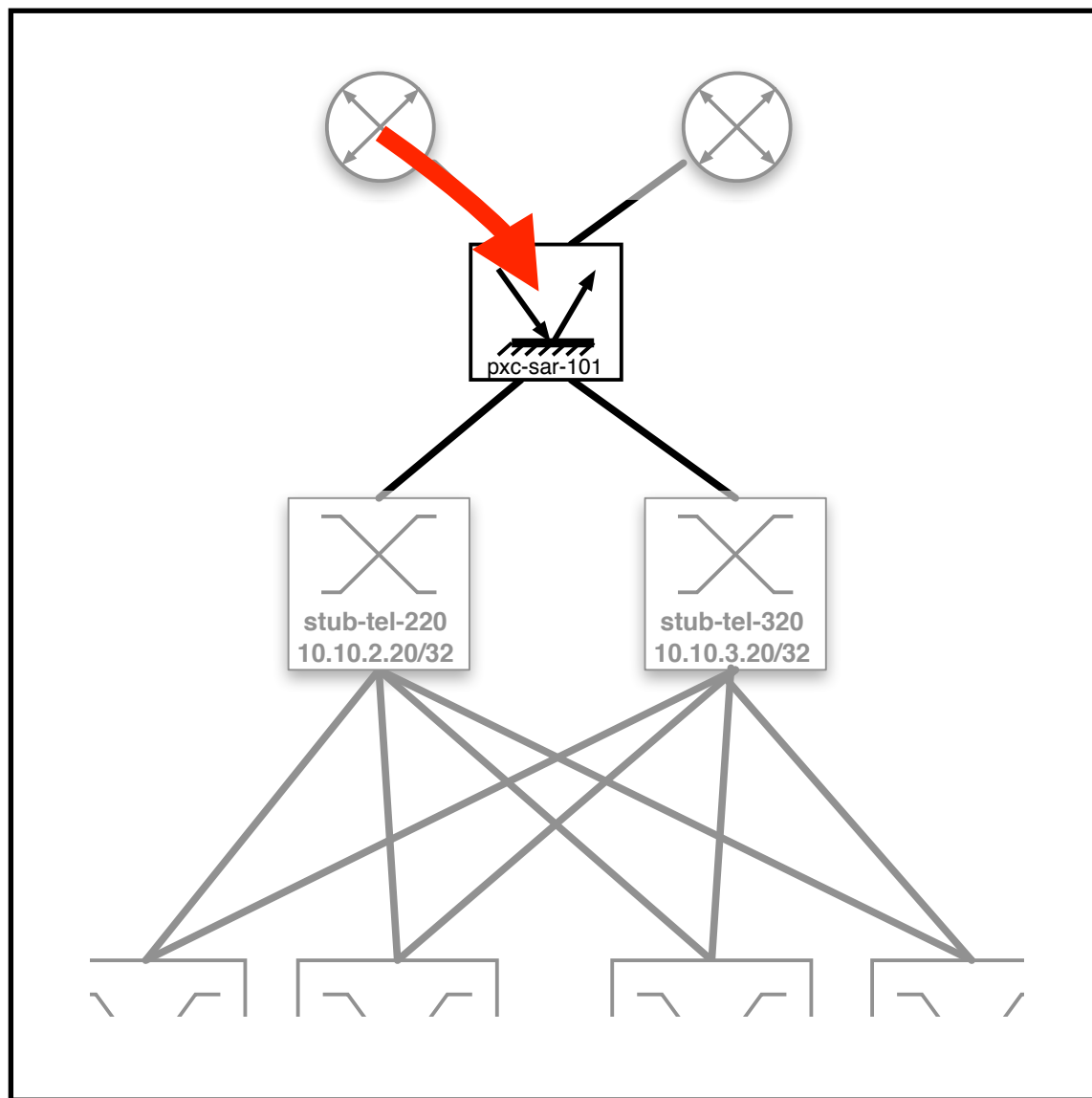


Layer I switching

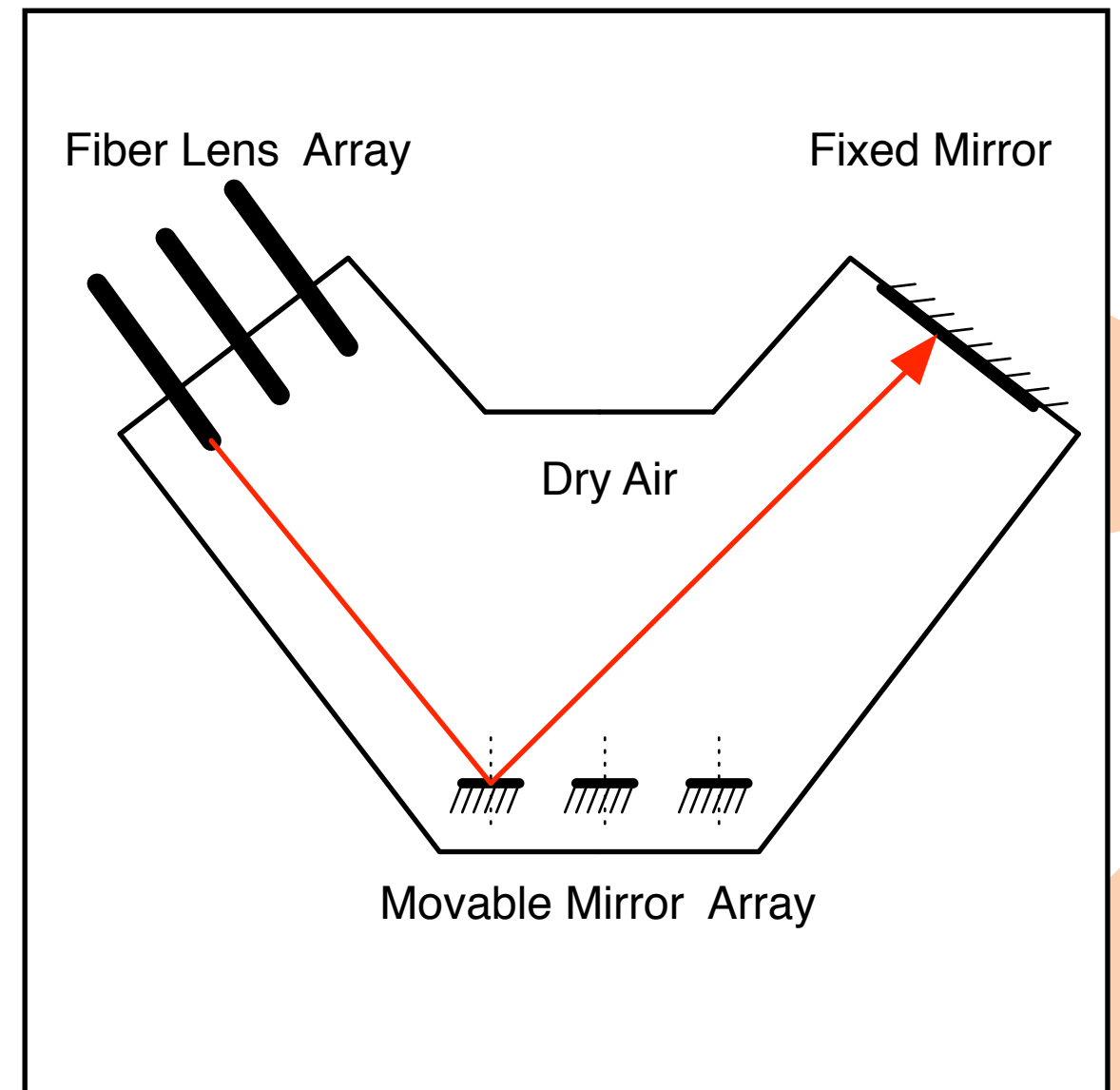
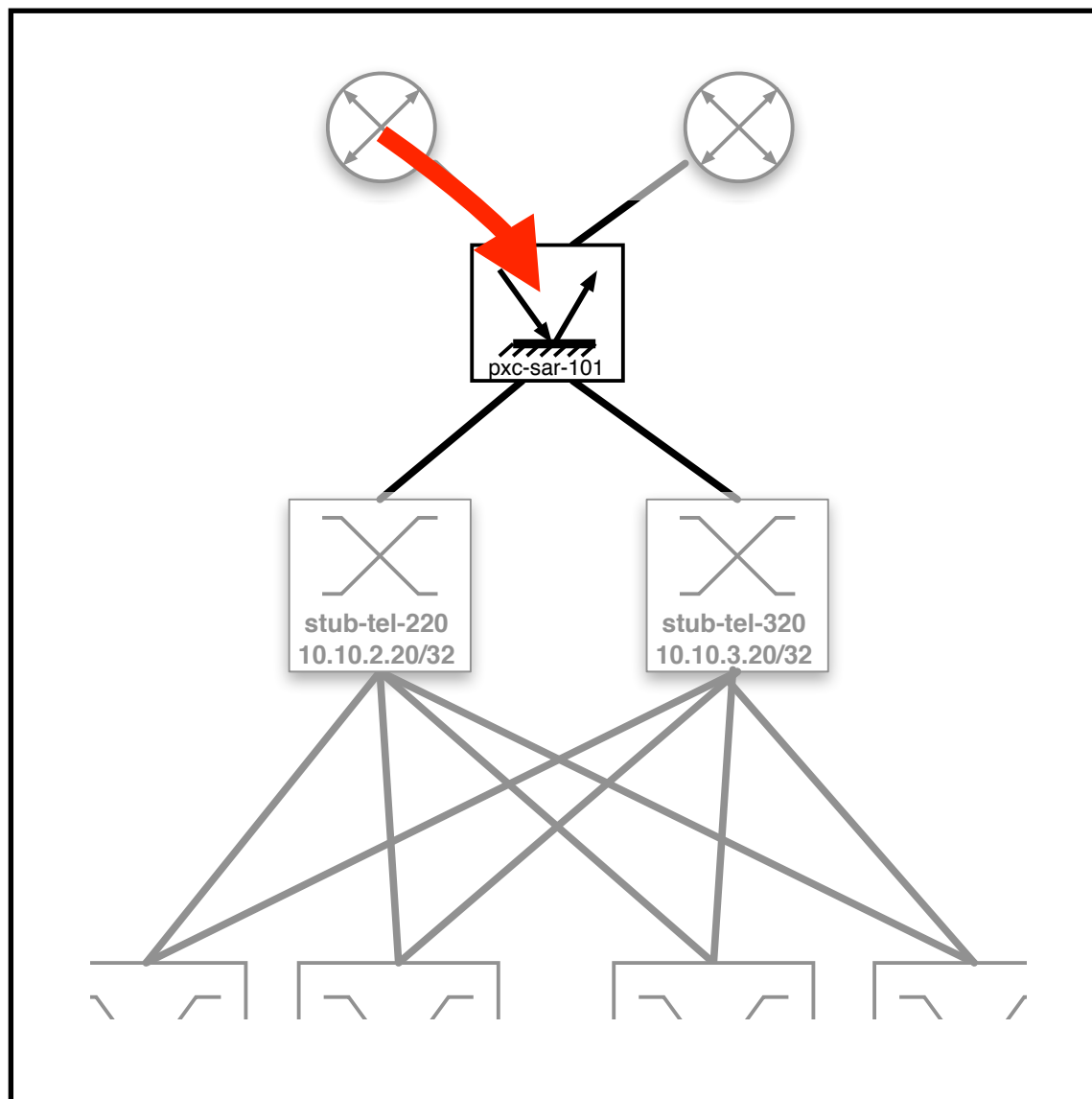


- Border routers of members
- Photonic Cross Connect (PXC)
 - Layer I
 - Low energy consumption
 - Reliable

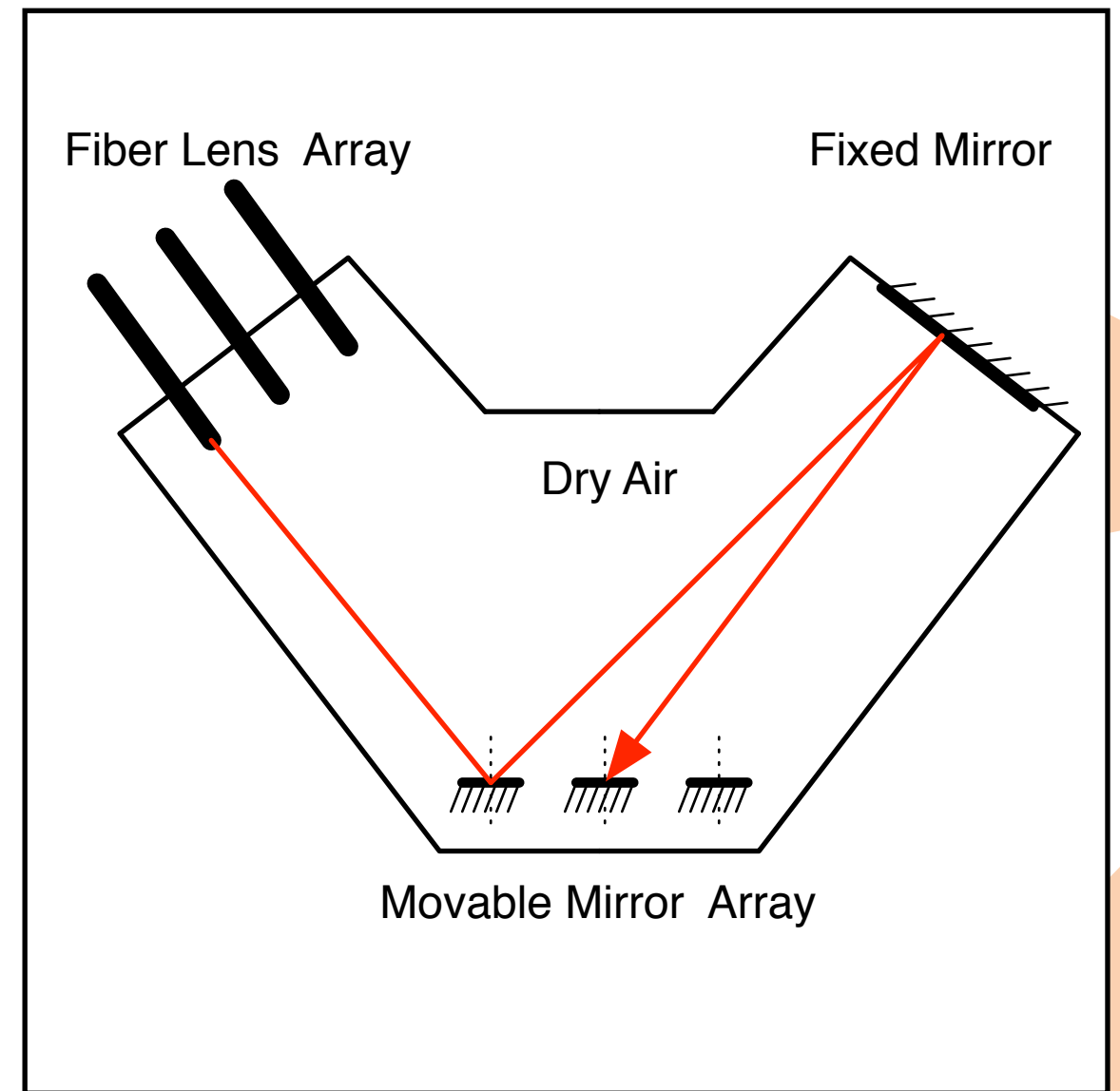
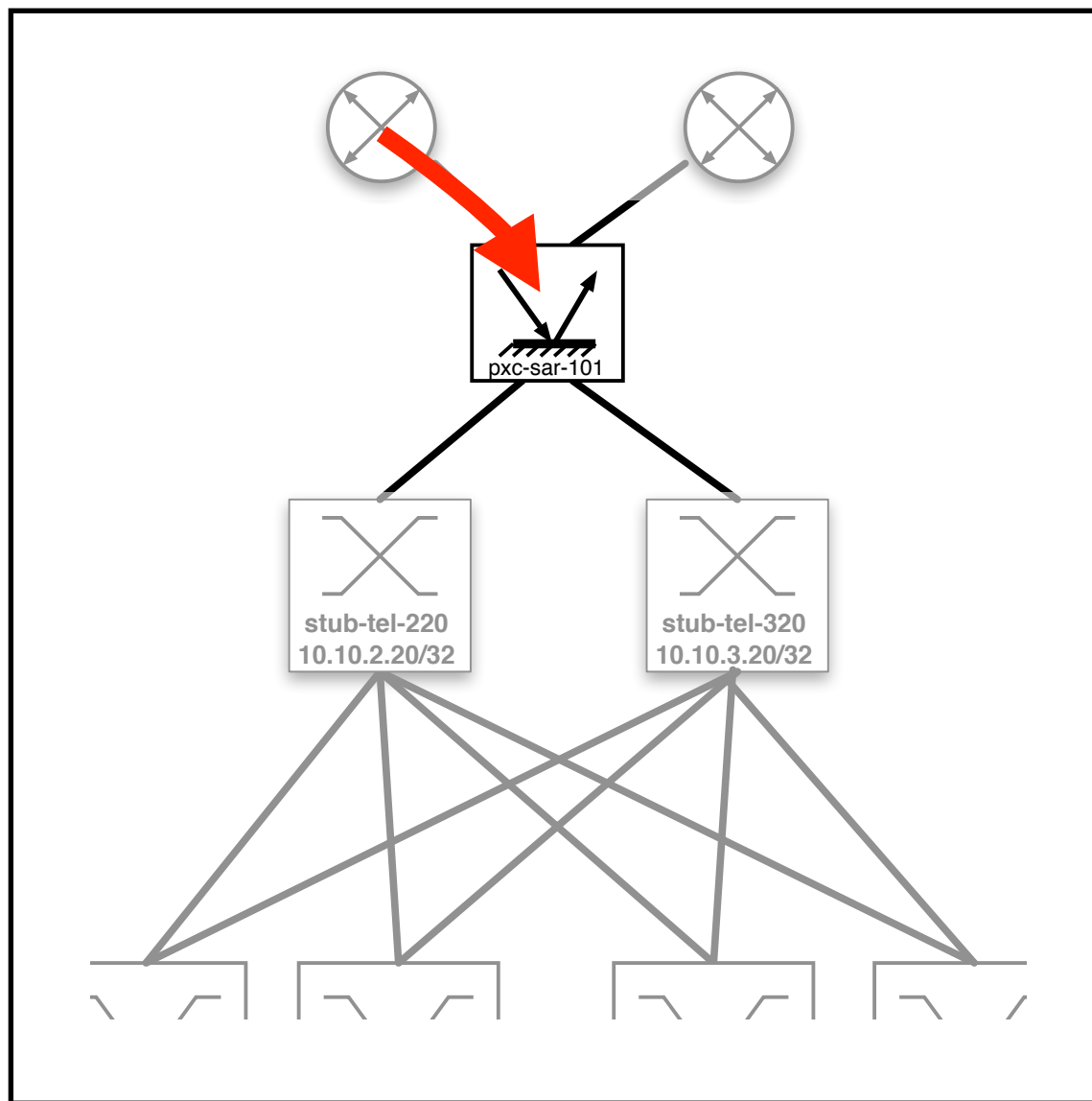
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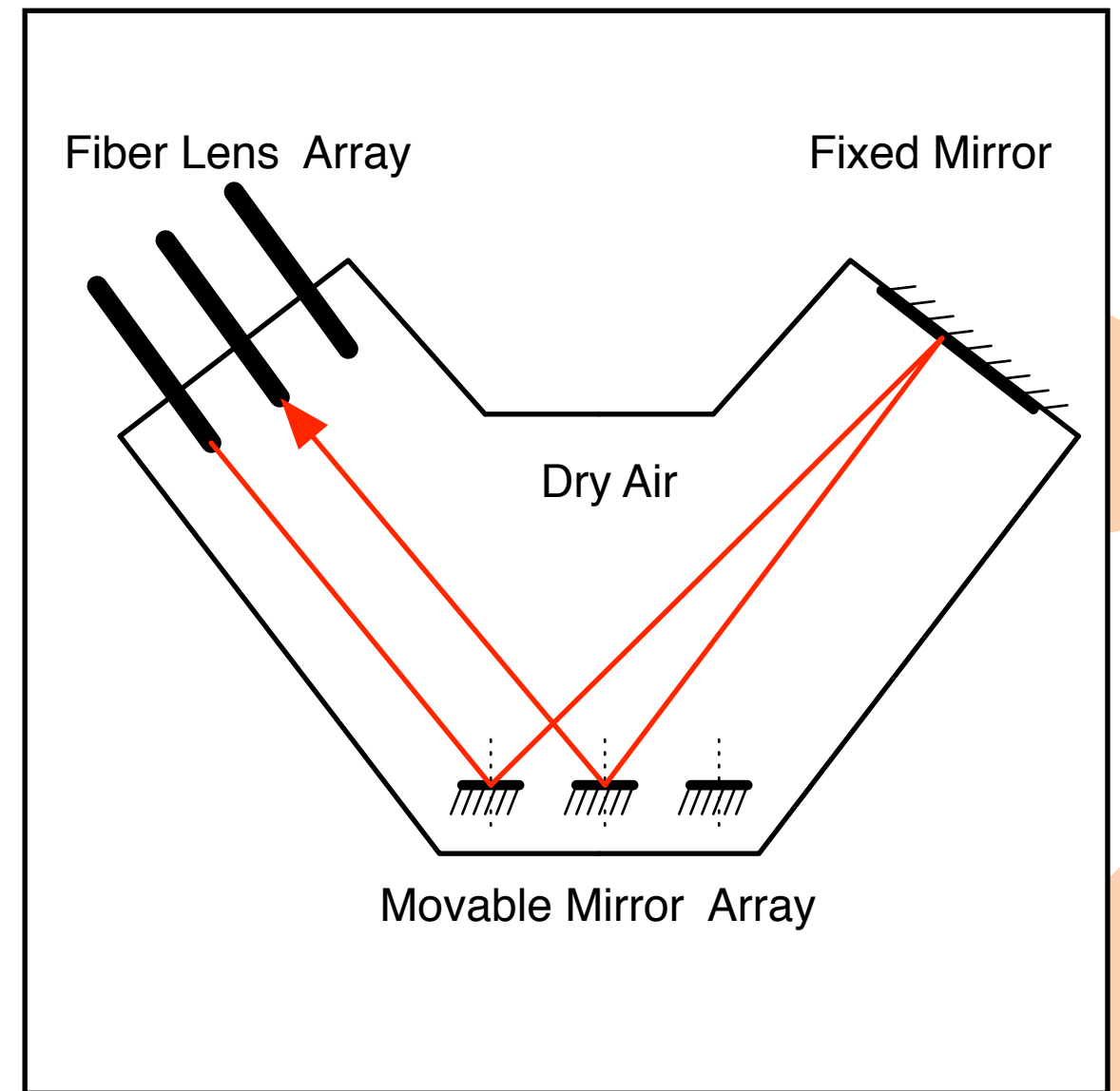
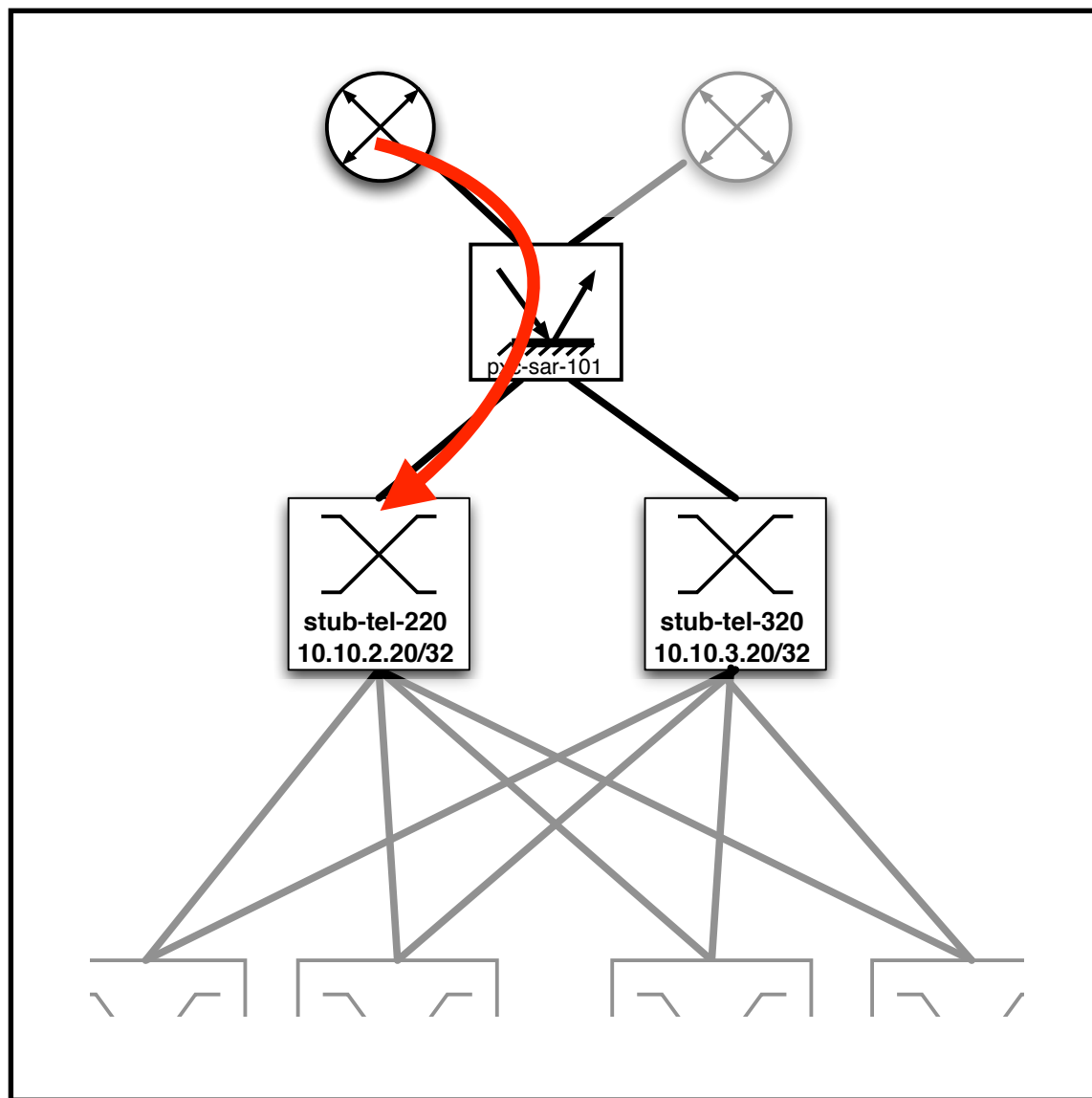
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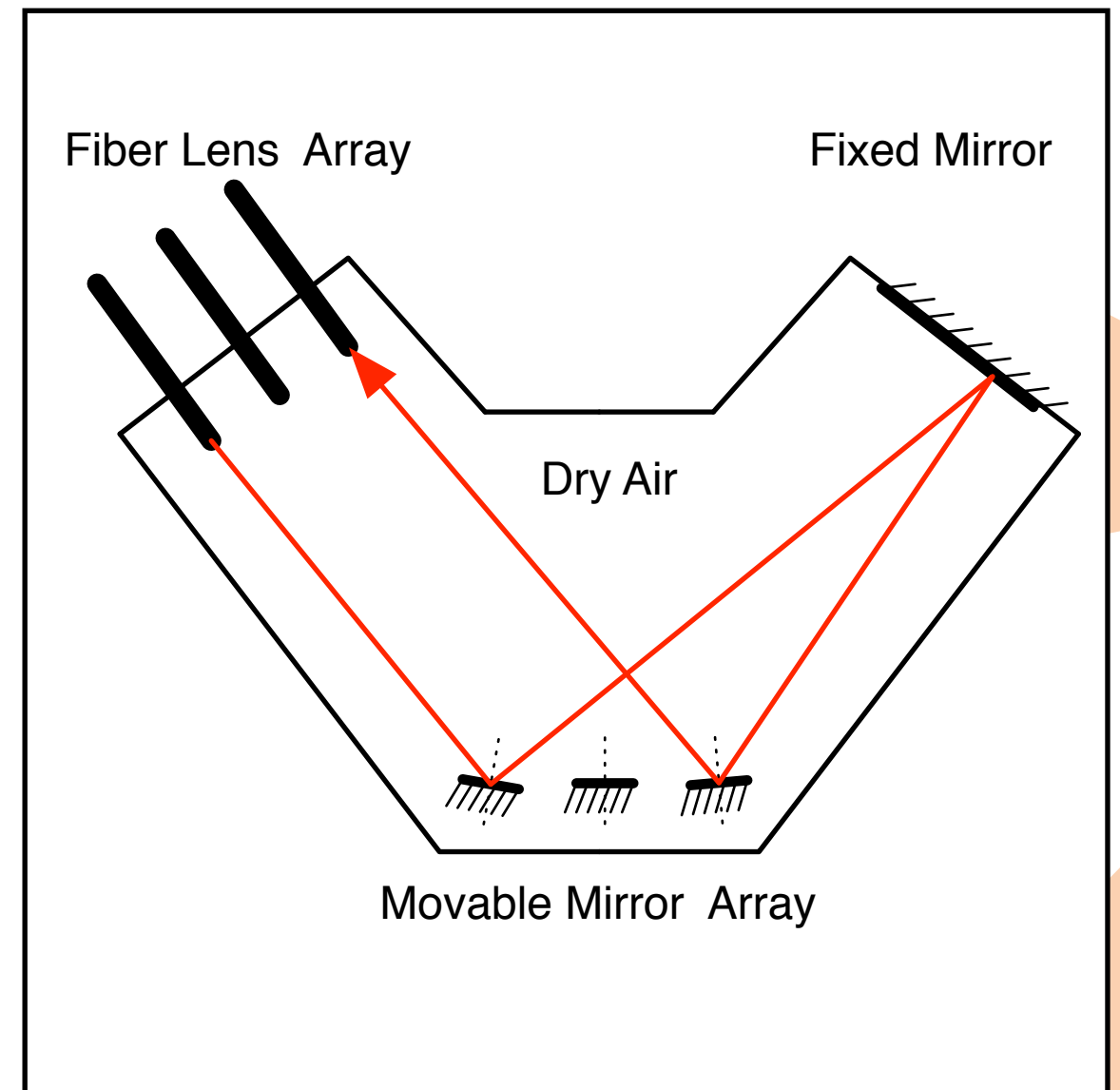
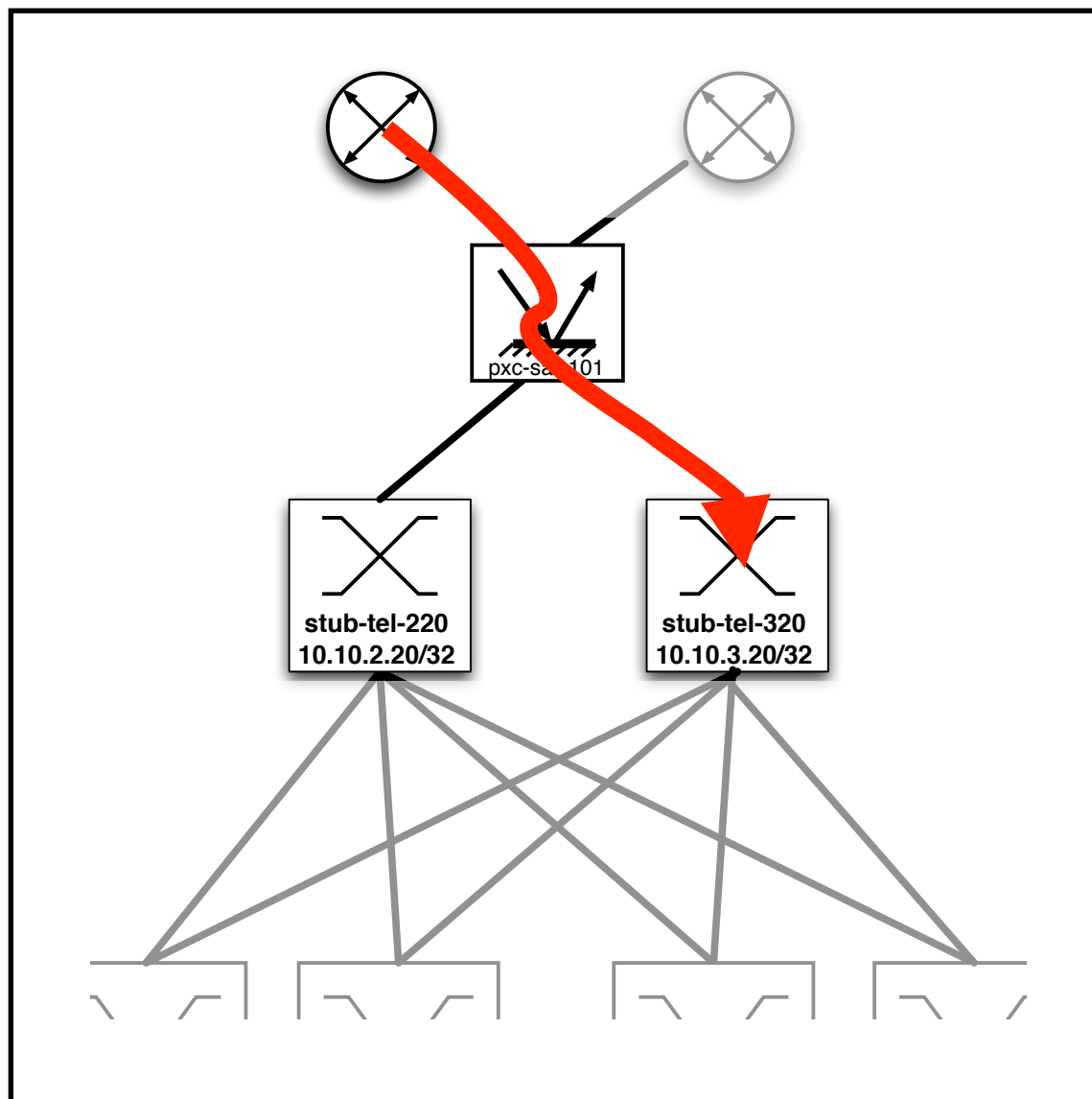
Layer I switching



Layer 1 switching



Layer 1 switching



Cabling

- Parallel fibre
 - Increased interconnection costs
 - Recurring costs!
 - Possibly port density issues in the MMR
 - Large number of “layer one” ports
 - Equipment density problems

Cabling

- Please design for duplex, single mode fibre
 - This fits the existing infrastructure and business practices
- Parallel fibre has a lot of practical problems
- Operational costs of parallel fibre will definitely be higher than duplex fibre

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Link aggregation

- Link aggregation is a hard requirement
- We already have aggregated 100Gb/s links
 - Two 2x100Gbit/s customer links
 - Two more on the way
 - Ten 2x100Gbit/s backbone links
- We expect 4x100Gb/s links in 2015

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Costs

- Financial costs
 - $\leq 2.5 \times 100\text{Gb/s}$
- Port density
 - One 400Gb/s port should not replace more than two 100Gb/s ports

End