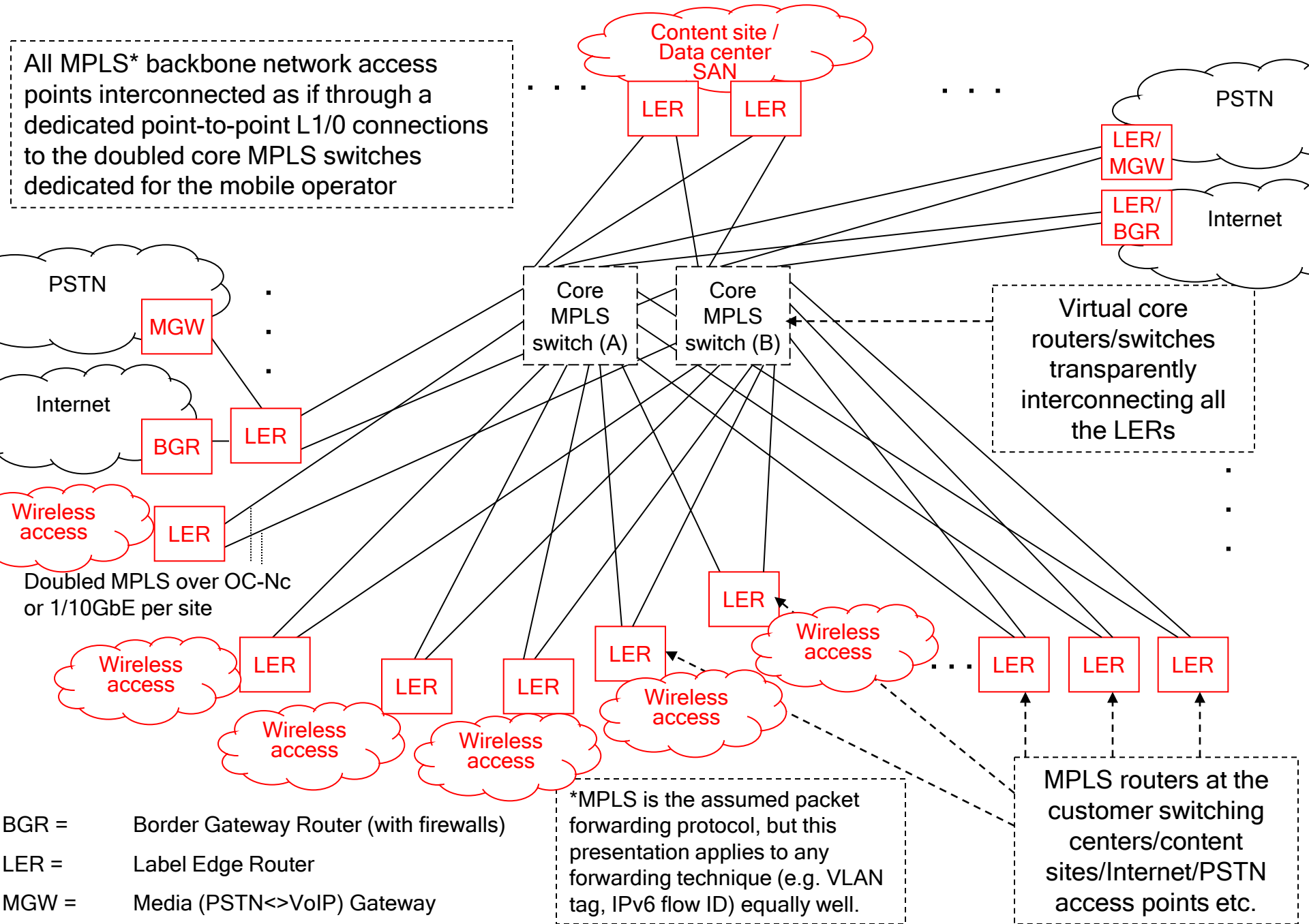
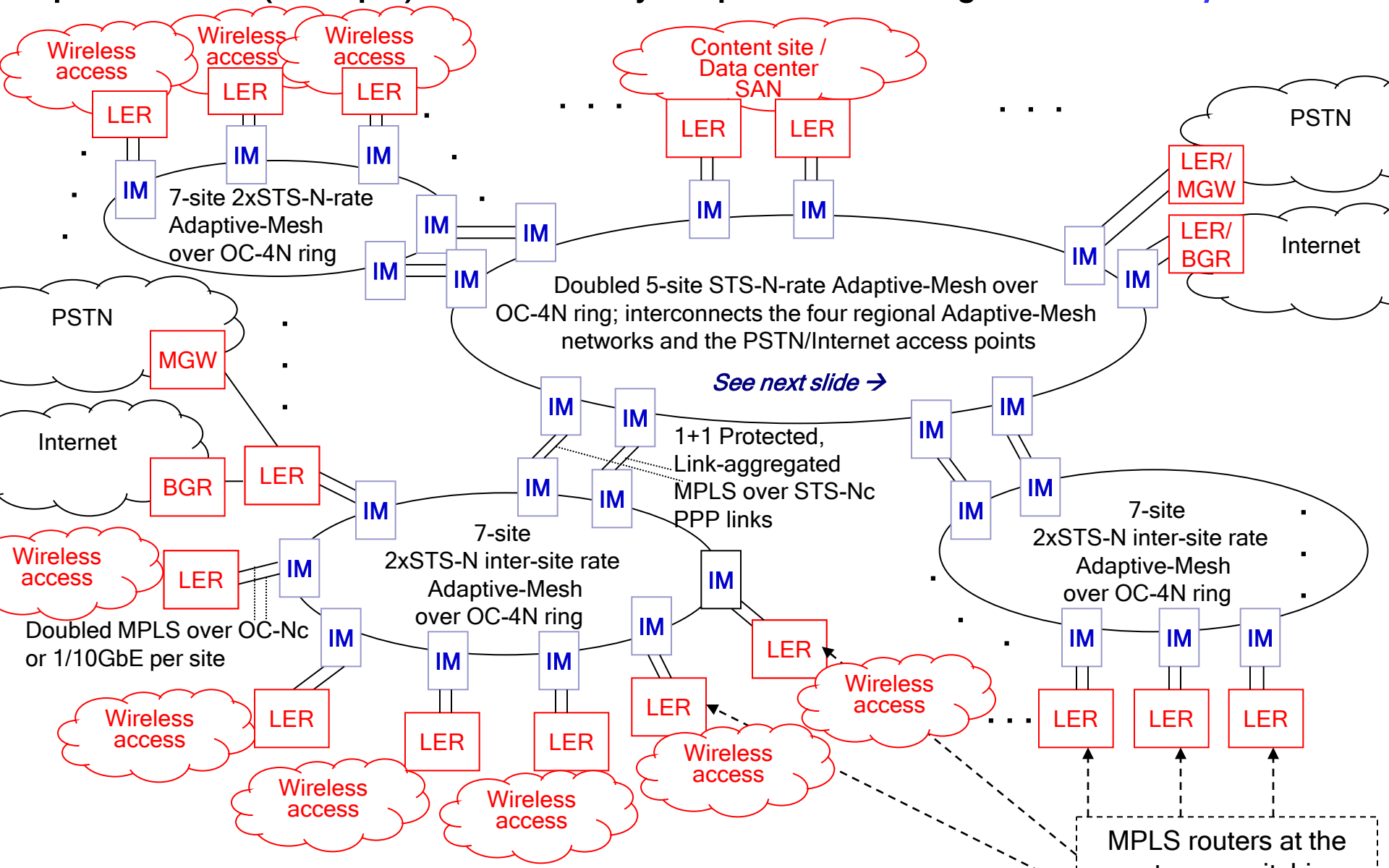
Adaptive-Mesh for Mobile Core Networks

Edge-controlled multi-service core network
by Optimum Communications Services, Inc.

Context - Connectivity Requirements for Core Network



Implementation (example) of Connectivity Requirements Using *OCS' ITN Adaptive-Mesh*

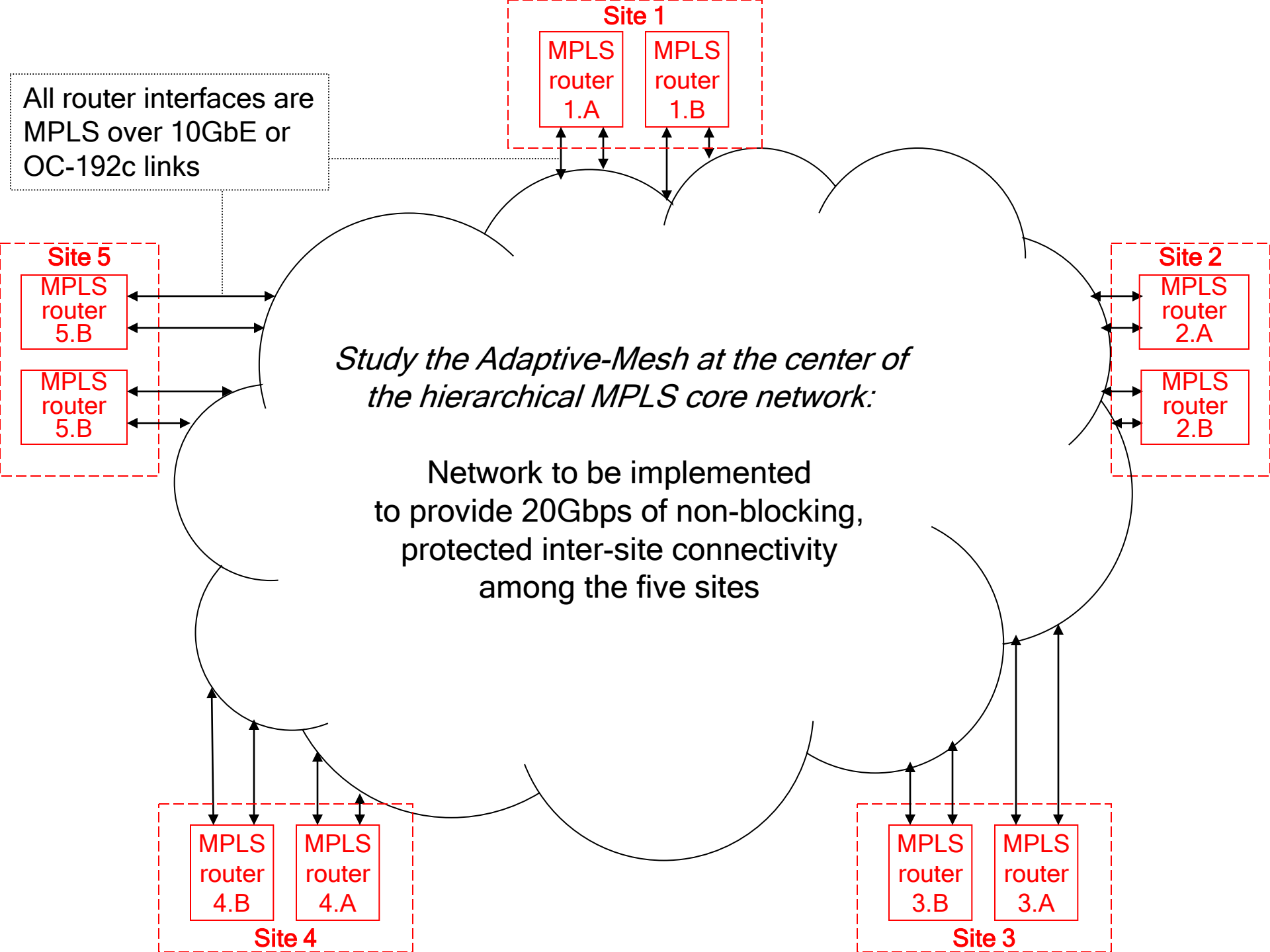


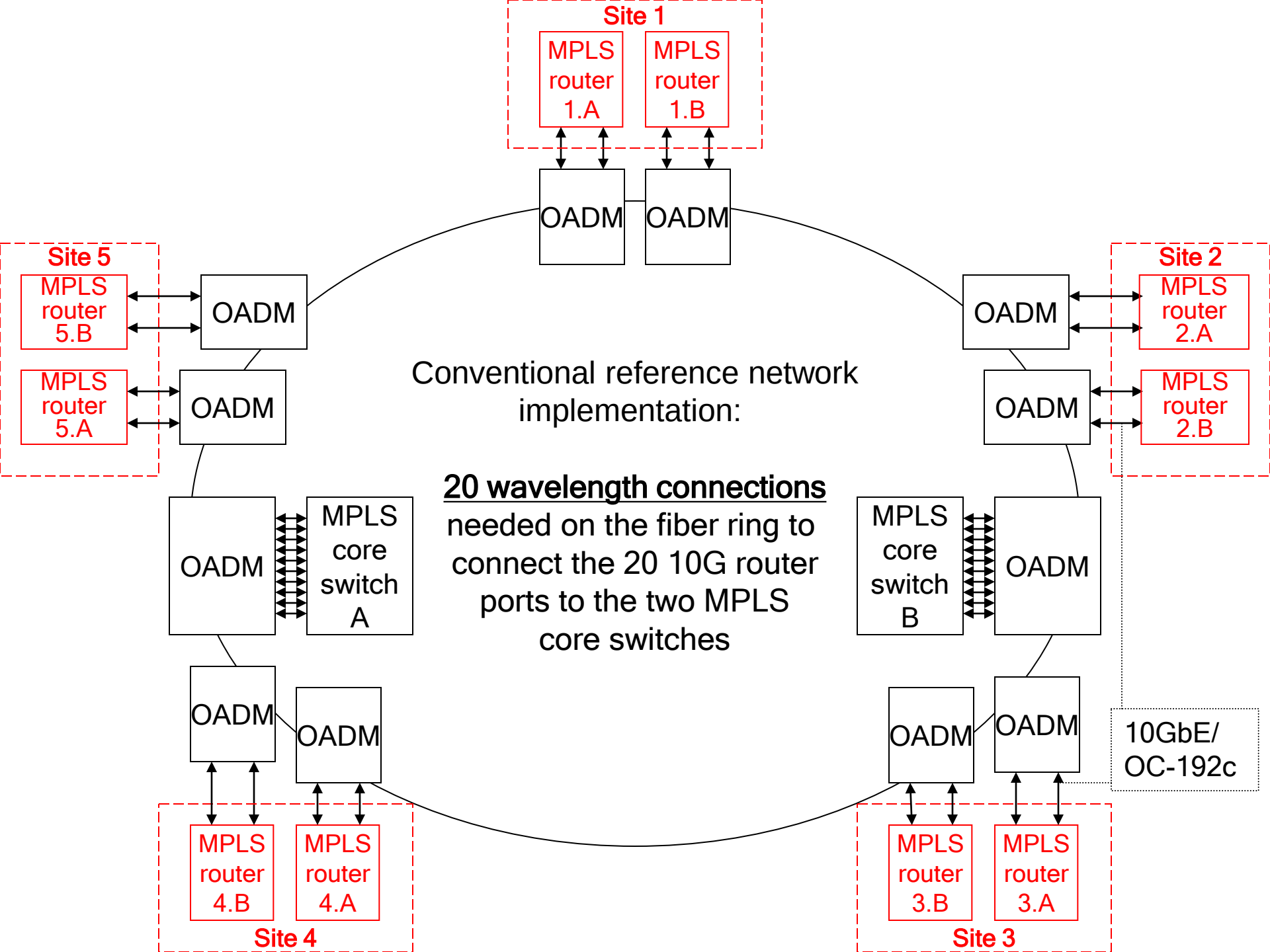
BGR = Border Gateway Router (with firewalls)

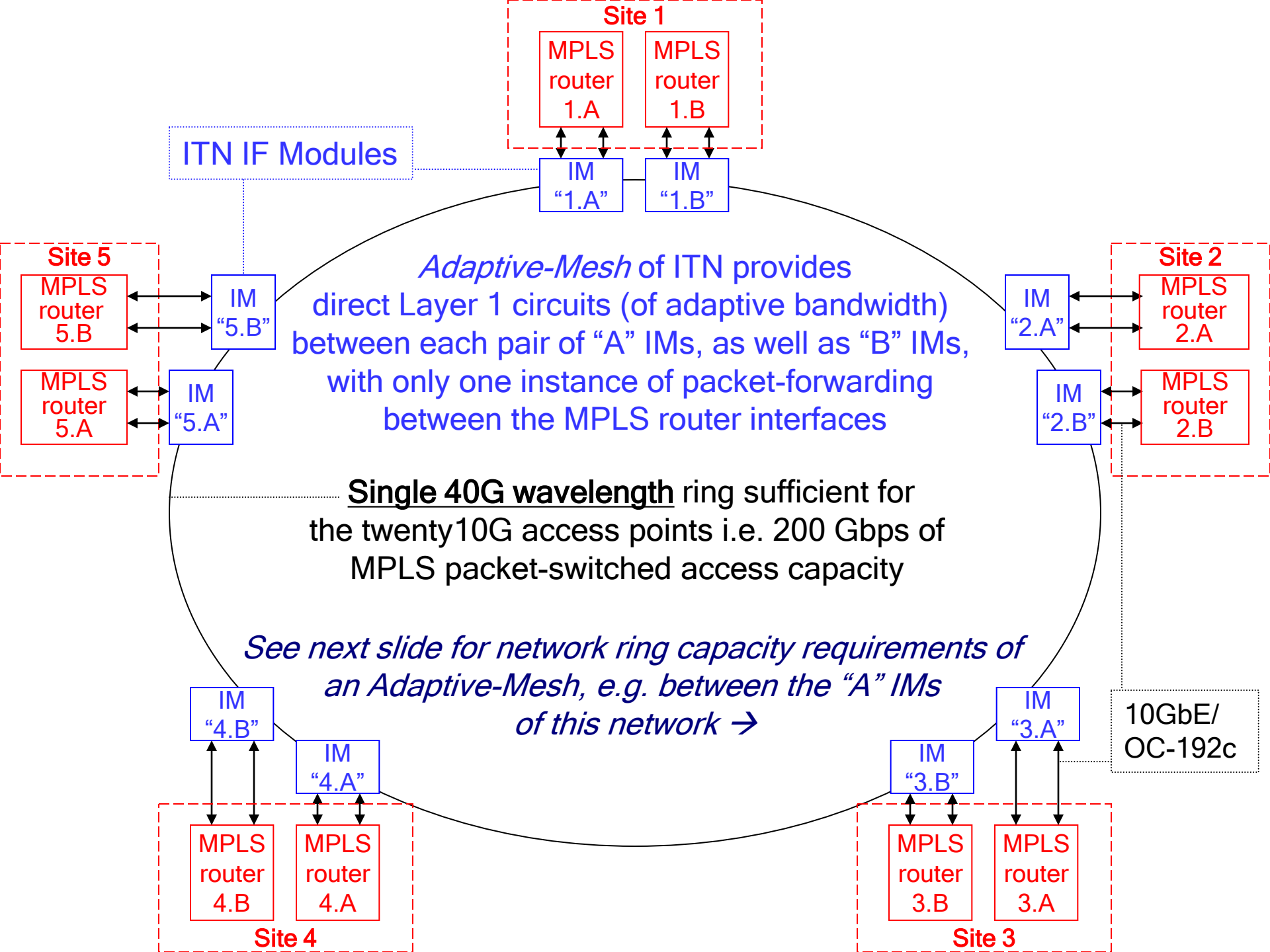
LER = Label Edge Router

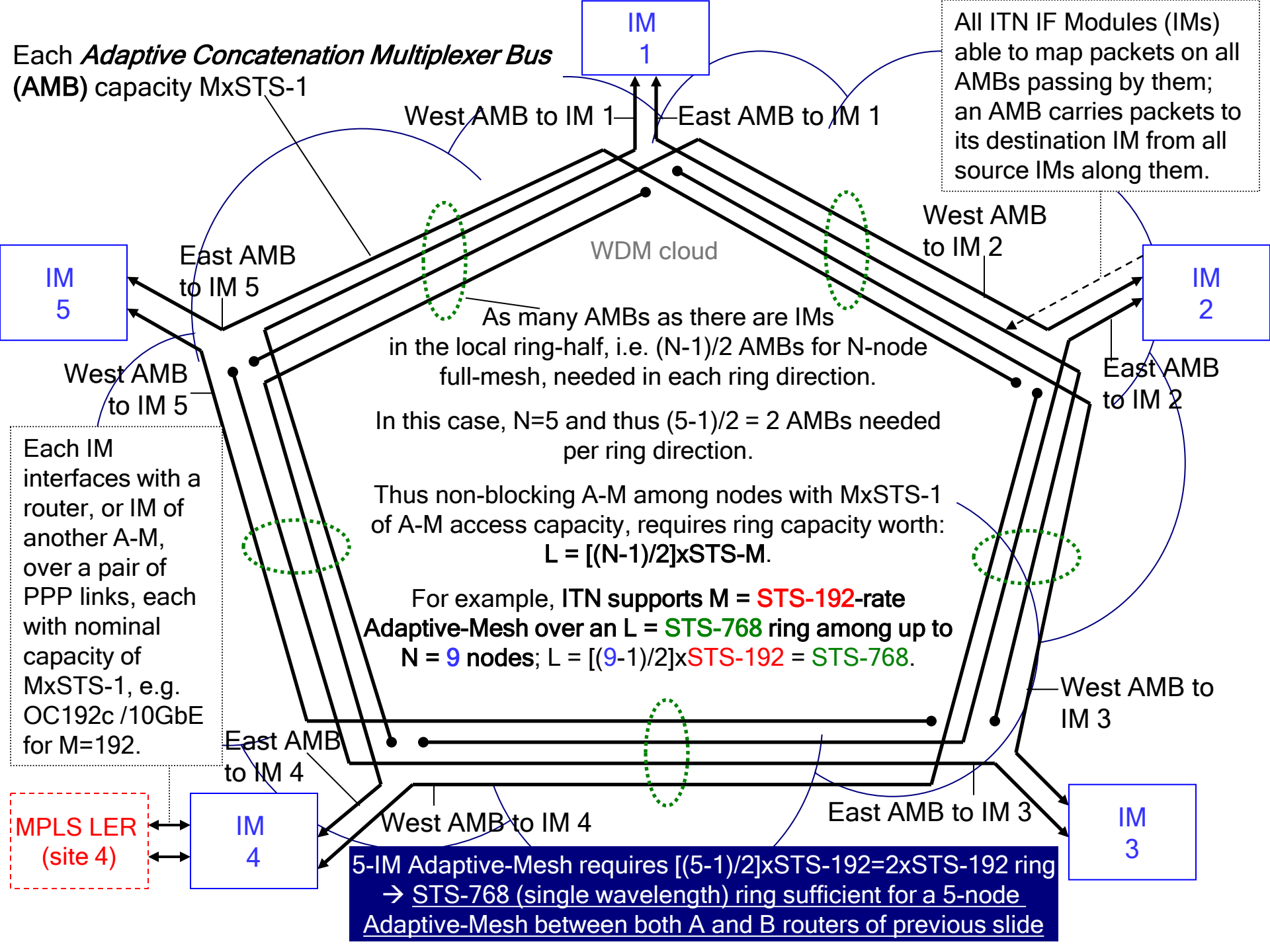
MGW = Media (PSTN<>VoIP) Gateway

IM = OCS' Intelligent Transport Network™ IF module


All router interfaces are MPLS over 10GbE or OC-192c links
Site 1
MPLS router 1.A
MPLS router 1.B
Site 5
MPLS router 5.B
MPLS router 5.B
Site 2
MPLS router 2.A
MPLS router 2.B
Study the Adaptive-Mesh at the center of the hierarchical MPLS core network:
Network to be implemented to provide 20Gbps of non-blocking, protected inter-site connectivity among the five sites
MPLS router 4.B
MPLS router 4.A
Site 4
MPLS router 3.B
MPLS router 3.A
Site 3


Site 1
MPLS router 1.A
MPLS router 1.B
OADM
OADM
Site 5
MPLS router 5.B
MPLS router 5.A
OADM
OADM
Site 2
MPLS router 2.A
MPLS router 2.B
OADM
OADM
Conventional reference network implementation:
20 wavelength connections needed on the fiber ring to connect the 20 10G router ports to the two MPLS core switches
OADM
MPLS core switch A
MPLS core switch B
OADM
OADM
OADM
OADM
OADM
10GbE/ OC-192c
MPLS router 4.B
MPLS router 4.A
Site 4
MPLS router 3.B
MPLS router 3.A
Site 3


Site 1
MPLS router 1.A
MPLS router 1.B
ITN IF Modules
IM "1.A"
IM "1.B"
Site 5
MPLS router 5.B
MPLS router 5.A
IM "5.B"
IM "5.A"
Site 2
MPLS router 2.A
MPLS router 2.B
IM "2.A"
IM "2.B"
Adaptive-Mesh of ITN provides
direct Layer 1 circuits (of adaptive bandwidth)
between each pair of "A" IMs, as well as "B" IMs,
with only one instance of packet-forwarding
between the MPLS router interfaces
Single 40G wavelength ring sufficient for
the twenty10G access points i.e. 200 Gbps of
MPLS packet-switched access capacity
See next slide for network ring capacity requirements of
an Adaptive-Mesh, e.g. between the "A" IMs
of this network →
IM "4.B"
IM "4.A"
IM "3.A"
IM "3.B"
10GbE/
OC-192c
MPLS router 4.B
MPLS router 4.A
Site 4
MPLS router 3.B
MPLS router 3.A
Site 3


Each *Adaptive Concatenation Multiplexer Bus* **(AMB)** capacity MxSTS-1
IM 1
West AMB to IM 1
East AMB to IM 1
All ITN IF Modules (IMs) able to map packets on all AMBs passing by them; an AMB carries packets to its destination IM from all source IMs along them.
West AMB to IM 2
IM 2
East AMB to IM 2
IM 5
East AMB to IM 5
WDM cloud
West AMB to IM 5
As many AMBs as there are IMs in the local ring-half, i.e. (N-1)/2 AMBs for N-node full-mesh, needed in each ring direction.
In this case, N=5 and thus (5-1)/2 = 2 AMBs needed per ring direction.
Thus non-blocking A-M among nodes with MxSTS-1 of A-M access capacity, requires ring capacity worth: **L = [(N-1)/2]xSTS-M**.
For example, **ITN supports M = STS-192-rate Adaptive-Mesh over an L = STS-768 ring among up to N = 9 nodes**; L = [(9-1)/2]xSTS-192 = STS-768.
Each IM interfaces with a router, or IM of another A-M, over a pair of PPP links, each with nominal capacity of MxSTS-1, e.g. OC192c /10GbE for M=192.
West AMB to IM 3
East AMB to IM 4
East AMB to IM 3
MPLS LER (site 4)
IM 4
West AMB to IM 4
IM 3
5-IM Adaptive-Mesh requires [(5-1)/2]xSTS-192=2xSTS-192 ring
→ STS-768 (single wavelength) ring sufficient for a 5-node Adaptive-Mesh between both A and B routers of previous slide

Adaptive-Mesh for Mobile Core

Summary:

1) Customer controllable, transparent packet-switched network service
2) Up to 20X architectural network cost-efficiency gain
3) Efficient multi-service integration

OCS' Adaptive-Mesh Service:
Customer's private packet-switching backbone -- just without the need for the customer to spend capital on deploying or operating their backbone network

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