LTE Backhaul Considerations
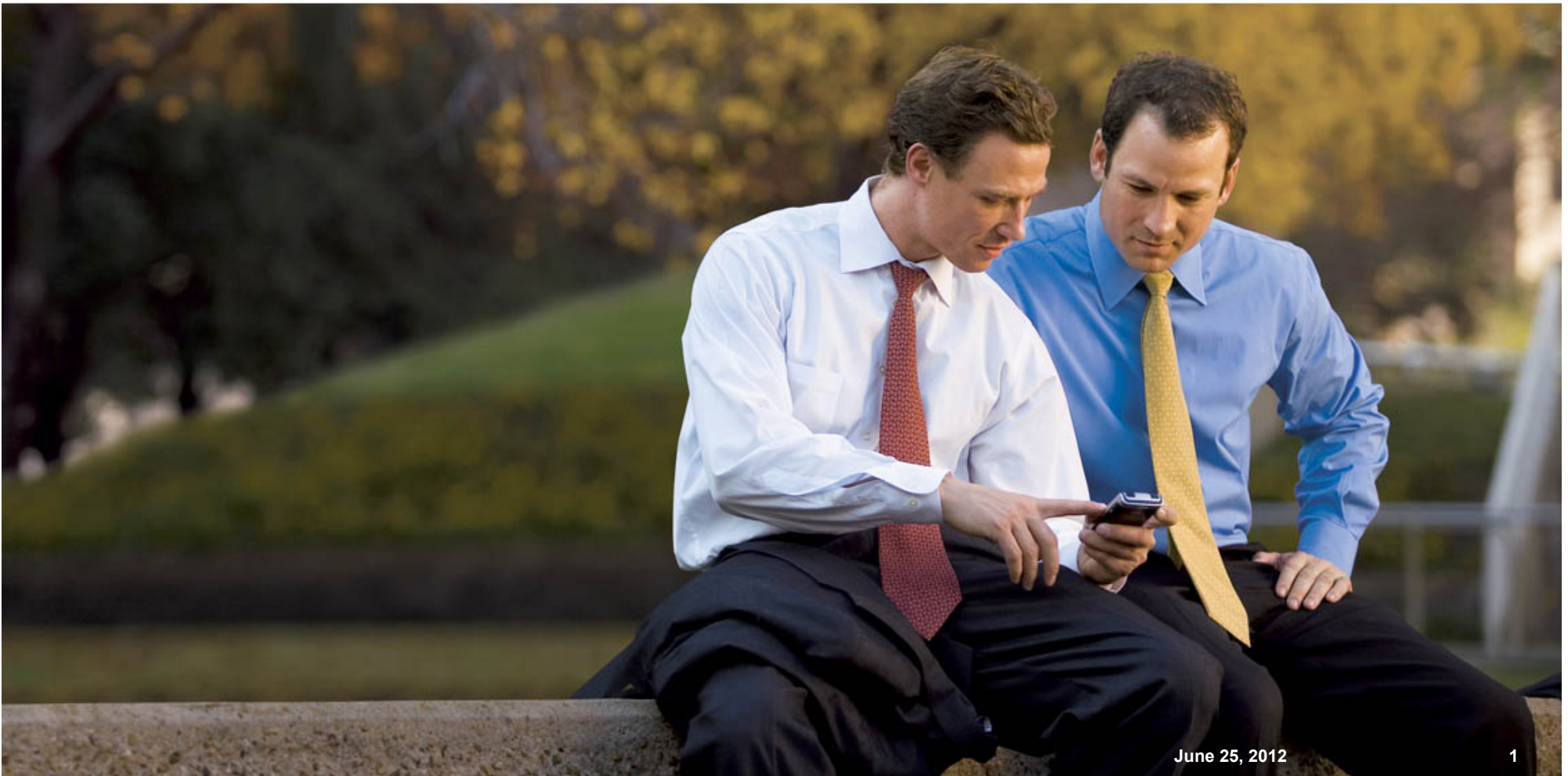
AGENDA

✓ LTE Requirements and Backhaul Considerations

✓ Backhaul Framework and Architecture

✓ How to Manage the Network Evolution

LTE Business model challenge imperatives:
Key Success Factors for Profitability

Market: Sustainable user base

- Targeted services
- QoE
- Consistent service delivery and enforcement

Network : Control costs and provide QoS

- Traffic management
- Scalable transport
- Equipment modularity and flexibility (any transport, topology and connectivity)

Traffic Monetization: New Revenue

Backhaul Considerations

- ✓ Technical
  - ✓ Specific LTE requirements
- ✓ Ecosystem
  - ✓ Business profitability
  - ✓ Consider current services
  - ✓ Current network
  - ✓ Dynamics of mobile broadband

It is not just about technical features

LTE and IP RAN Backhaul Requirements (1/2)

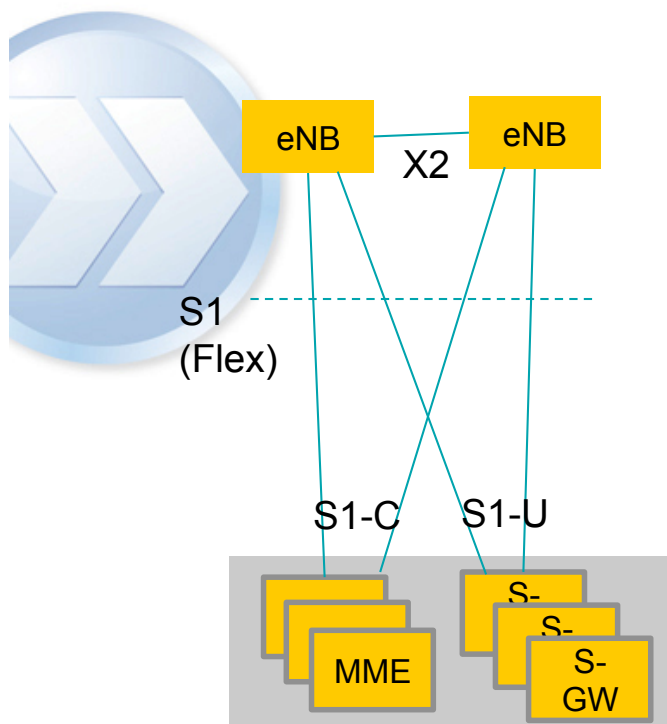|	
Synchronization	• Frequency Synchronization for IP RAN and LTE • Phase and Time of Day (TOD) required for LTE-TDD and LTE Advanced
Connectivity	• From point to point to any to any (X2 and S1 Flex interface)
Quality of Experience with QCIs	• Support for QoS aware backhaul where QCIs can be mapped with required granularity to transport network QoS classes
OAM	• Network availability data with Ethernet OAM and MPLS OAM
Small cell deployments	• Ability top support small cells to increase user experience and coverage • Ubiquitous and Flexible backhaul
Security	• IPsec • Authentications
Support multiple mobile generations	• LTE and 3G – IP VPNs, VPLS and Ethernet PWEs • 2G and 3G support with TDM, ATM, FR PWEs
Seamless Evolution	• Flexible platform and tools to properly manage the continuous changes in the service and network

LTE and IP RAN Backhaul Requirements (1/2)

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New Connectivity Requirements in LTE

eNB — X2 — eNB

S1
(Flex)

S1-C   S1-U

MME

S-
S-
S-GW

IF	Small network	Large deployment
X2	Limited use	Important
S1-Flex	Limited use	Important

- LTE specific interfaces in RAN
  - X2 for interconnecitivity between eNBs
  - S1 for eNB connectivity to MME and GWs

- S1-flex
  - Ability to multihome an eNB to a pool of MMEs and SGWs
  - One terminal assigned to one MME and GW at a time based on the load and availability

- S1-flex benefits
  - Networking redundancy – no single point of failure
  - Load sharing in core network
  - Enabler for multi-operator RAN sharing

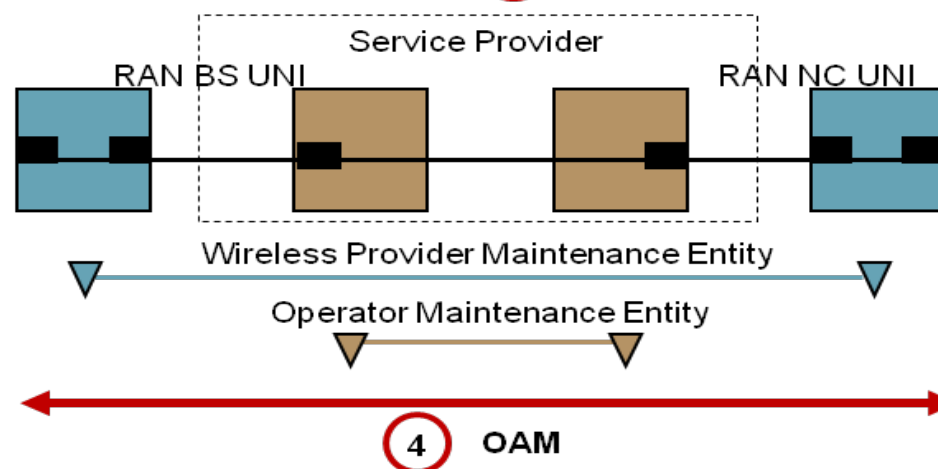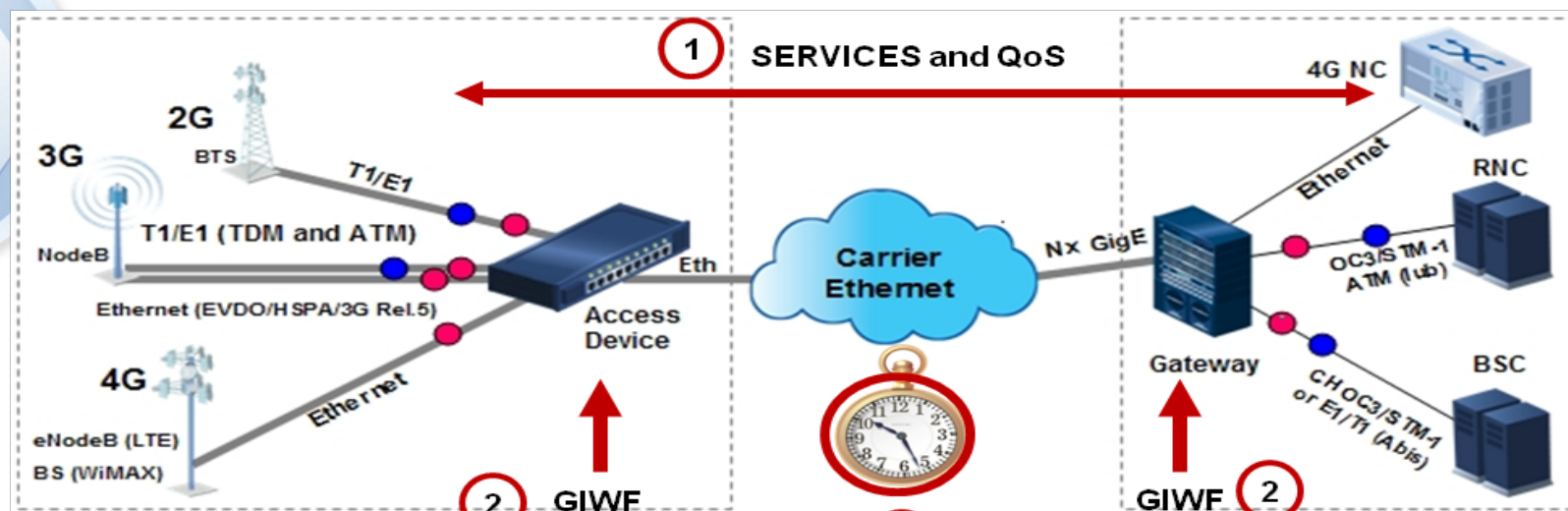*Backhaul must not restrict the connectivity and future evolution*

Seamless Evolution

Technology: What to Deploy
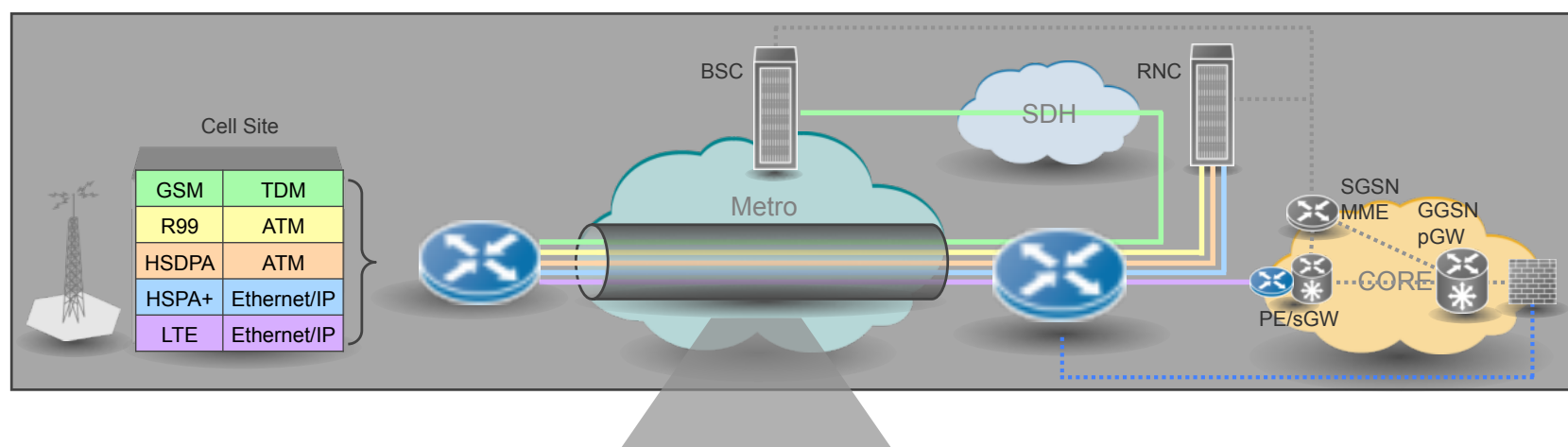
Evolution: How to Deploy

MEF 22: Backhaul Framework
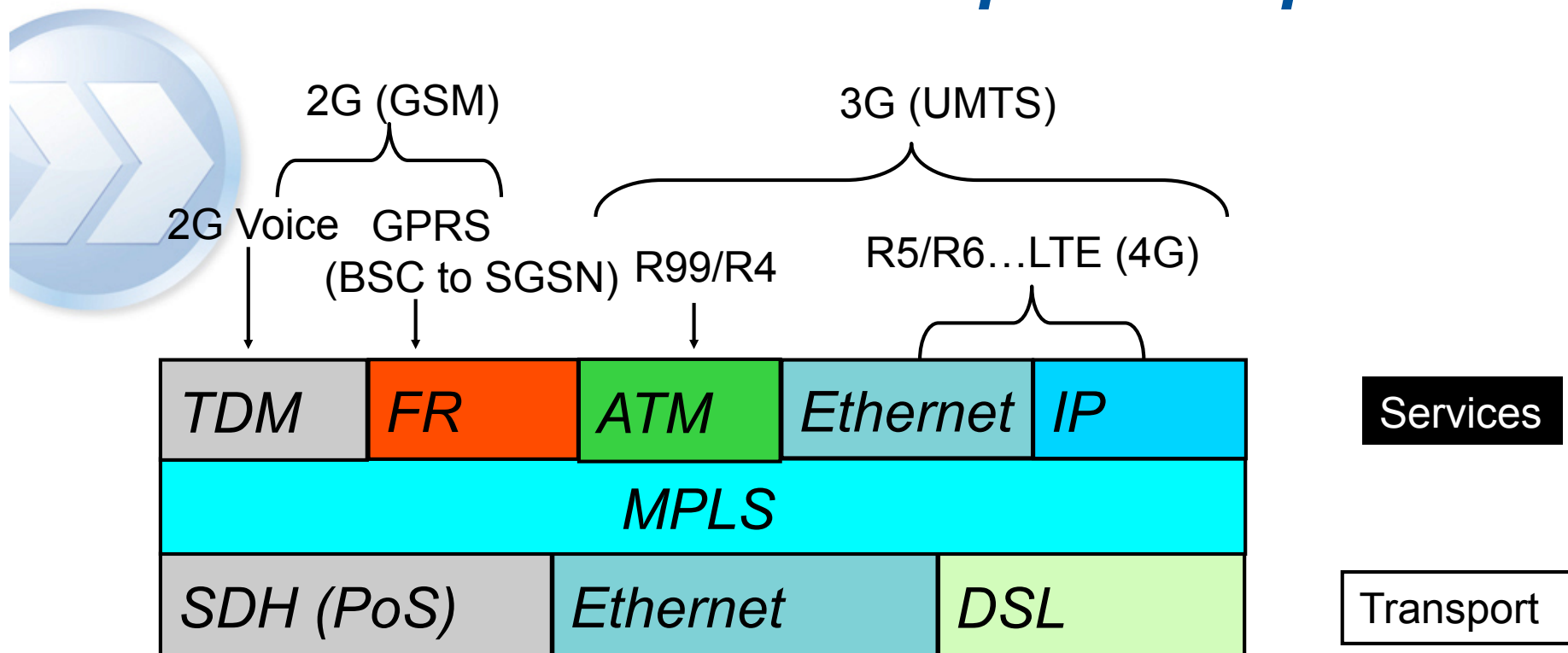
The Solution: Backhaul Architecture

- ✓ Specific LTE requirements
  - ✓ QoS, OAM, Synch
- ✓ Service Convergence
  - ✓ 2G, 3G, LTE, FMC
- ✓ From point to point to any to any connectivity

- ✓ Granular QoS and traffic control
- ✓ Flexible topology
  - ✓ Simple adaptation to changes
  - ✓ IP/MPLS
- ✓ L3 vs L2: IP VPNs recommended
- ✓ Other considerations
  - ✓ Hierarchical MPLS

Cell Site

GSM	TDM
R99	ATM
HSDPA	ATM
HSPA+	Ethernet/IP
LTE	Ethernet/IP

BSC

RNC

SDH

Metro

SGSN
MME

GGSN
pGW

CORE

PE/sGW

Flat Architecture over Any Topology

Strategic Approach:
IP/MPLS for Service / Transport Independence

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2G (GSM)   3G (UMTS)

2G Voice   GPRS
            (BSC to SGSN)   R99/R4   R5/R6...LTE (4G)

TDM	FR	ATM	Ethernet	IP	**Services**

MPLS

SDH (PoS)	Ethernet	DSL	Transport

Lower the Cost by using <u>one</u> technology, <u>one</u> provisioning approach

> Enable Services over lowest cost Transport

> Future proof the network

> Fast, accurate service delivery capability is enhanced by using a single provisioning approach

Broadband Forum TR221: MEF 22 Compliance

June 25, 2012
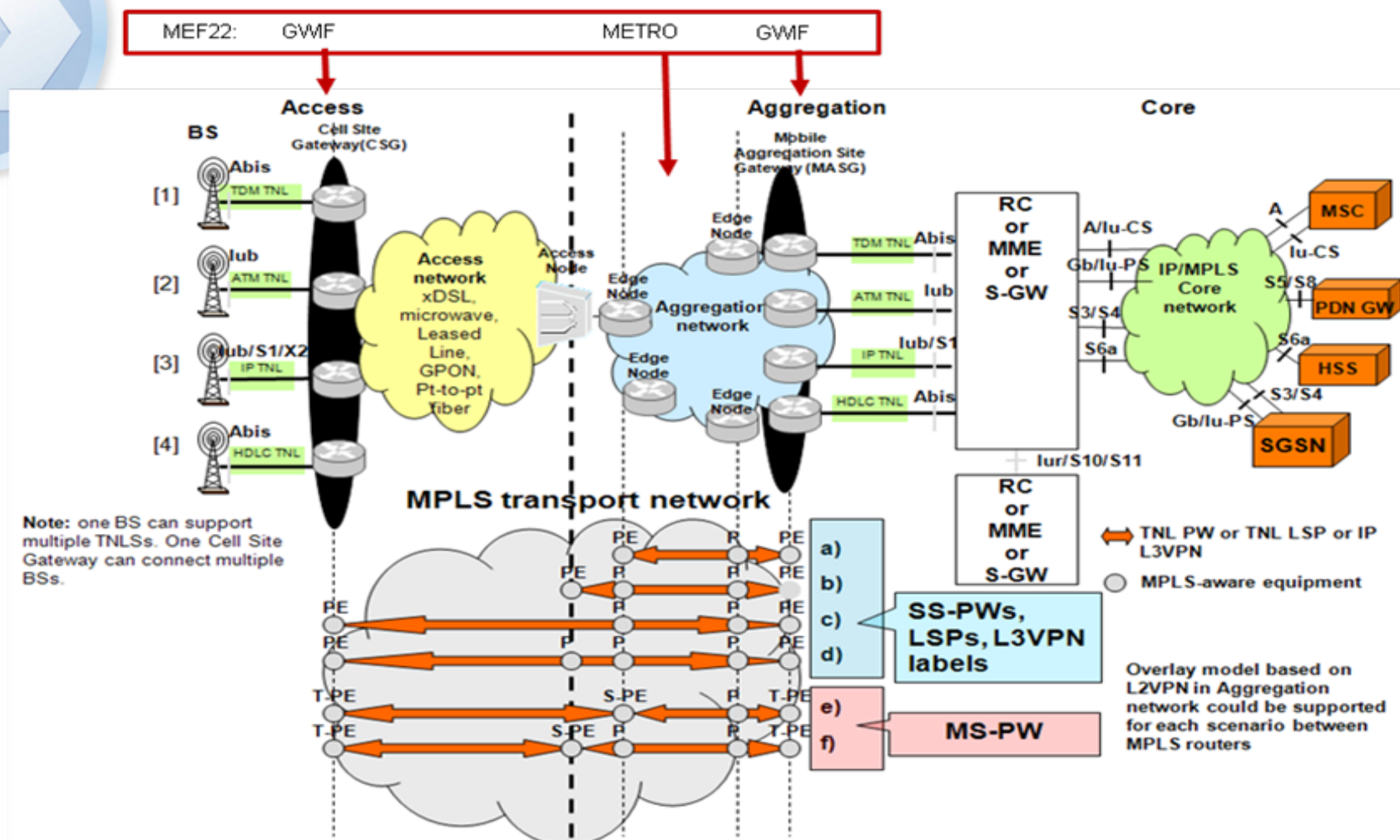
Seamless Evolution

Technology: What to Deploy

Evolution: How to Deploy

Seamless Evolution – What it Means?

Gradual network modernization and growth

- New elements and technologies roll-out at customer 's own pace
- First and next generation elements play smoothly together

Planning tools to anticipate changes and flexibility to implement them

- Maximum utilization of existing assets
- Close and consistent end to end QoS control

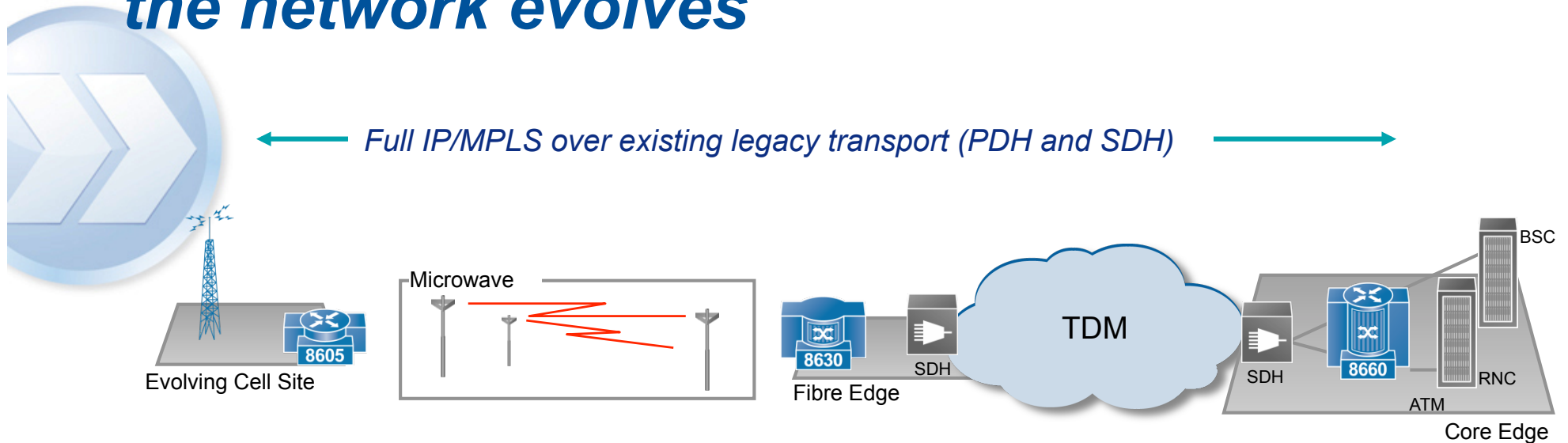**Automated upgrade/change tools to minimize service disruption and opex**

- Easy new technology upgrade for customers
- Fast and error-free service reconfiguration

Full manageability

- Constant and full control of the network and services

Leverage existing Network Assets, Simplified Changes, QoS Control And Low Risk Evolution of the Network towards LTE

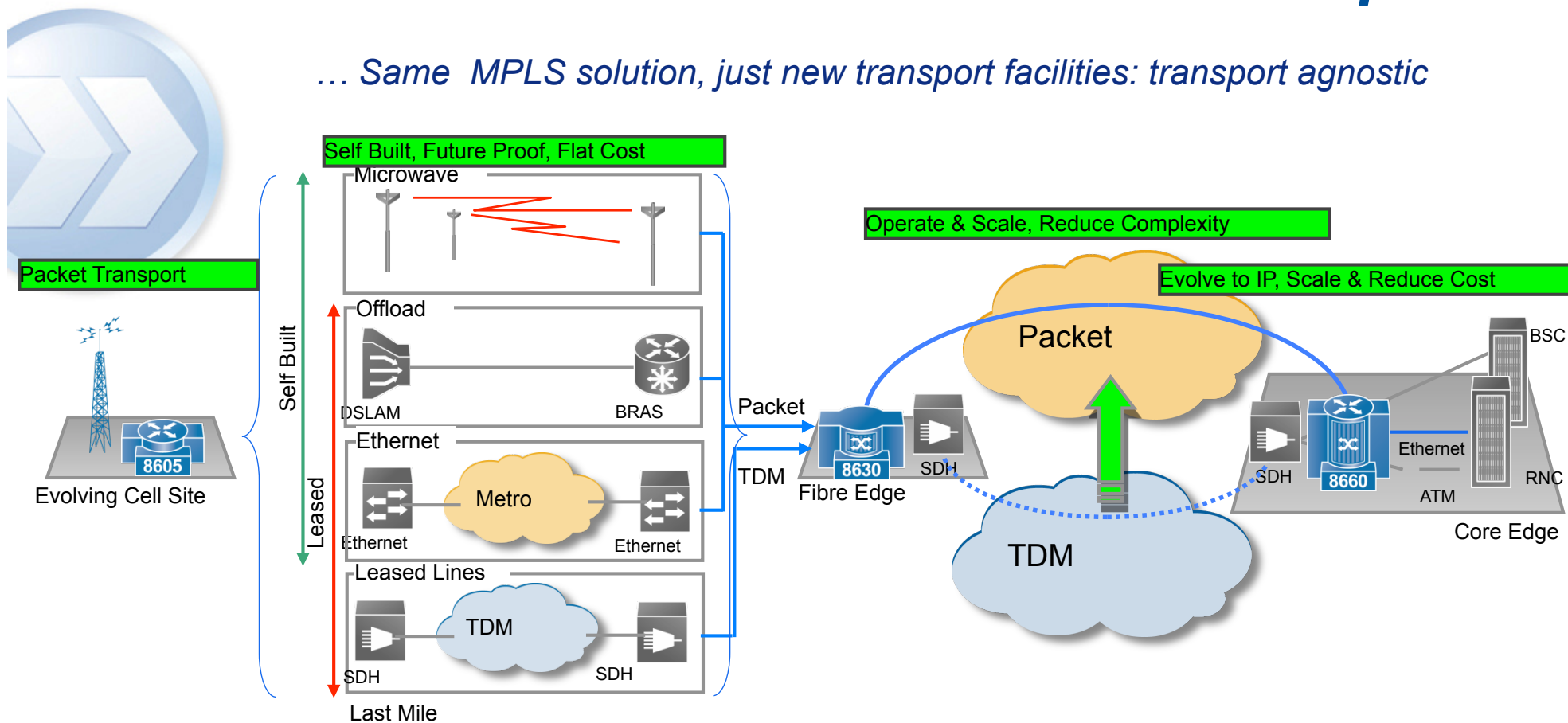# *Multiple Transport Service independency as the network evolves*

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Full IP/MPLS over existing legacy transport (PDH and SDH)

Microwave

8605

Evolving Cell Site

8630

Fibre Edge

SDH

TDM

SDH

8660

BSC

RNC

ATM

Core Edge

Uniform end to end planning, design, provisioning and management

*The required functionalities, flexibility and tools
for a successful journey from TDM to Packet*

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IP RAN Evolution: TDM to Packet Transport

… Same MPLS solution, just new transport facilities: transport agnostic

Self Built, Future Proof, Flat Cost

Microwave

Operate & Scale, Reduce Complexity

Packet Transport

Evolve to IP, Scale & Reduce Cost

Offload

Packet

DSLAM   BRAS

Packet

Ethernet

8630   SDH

SDH   8660

Metro   Fibre Edge   Core Edge

Ethernet   Ethernet

TDM

Leased Lines

TDM

SDH   SDH

Last Mile

Evolving Cell Site   8605

Self Built   Leased

BSC

RNC

ATM

Ethernet

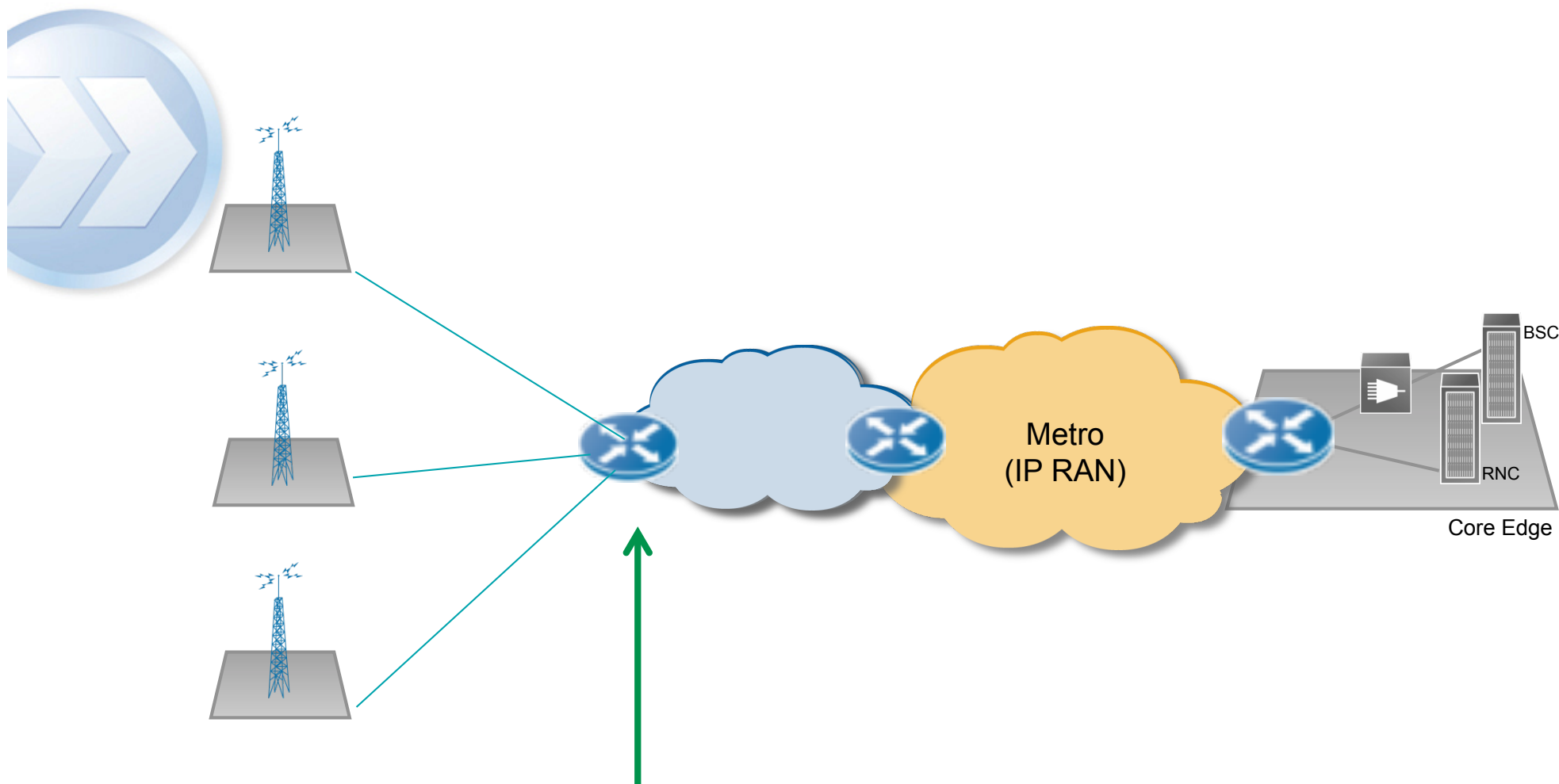No need to reconfigure services: simplifies network evolution

The required functionalities, flexibility and tools
for a successful journey from TDM to Packet

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# Seamless Evolution: Flexible Topology Changes (1/3)

tellabs®

SDH (Microwave)

Metro (IP RAN)

BSC

RNC

Core Edge
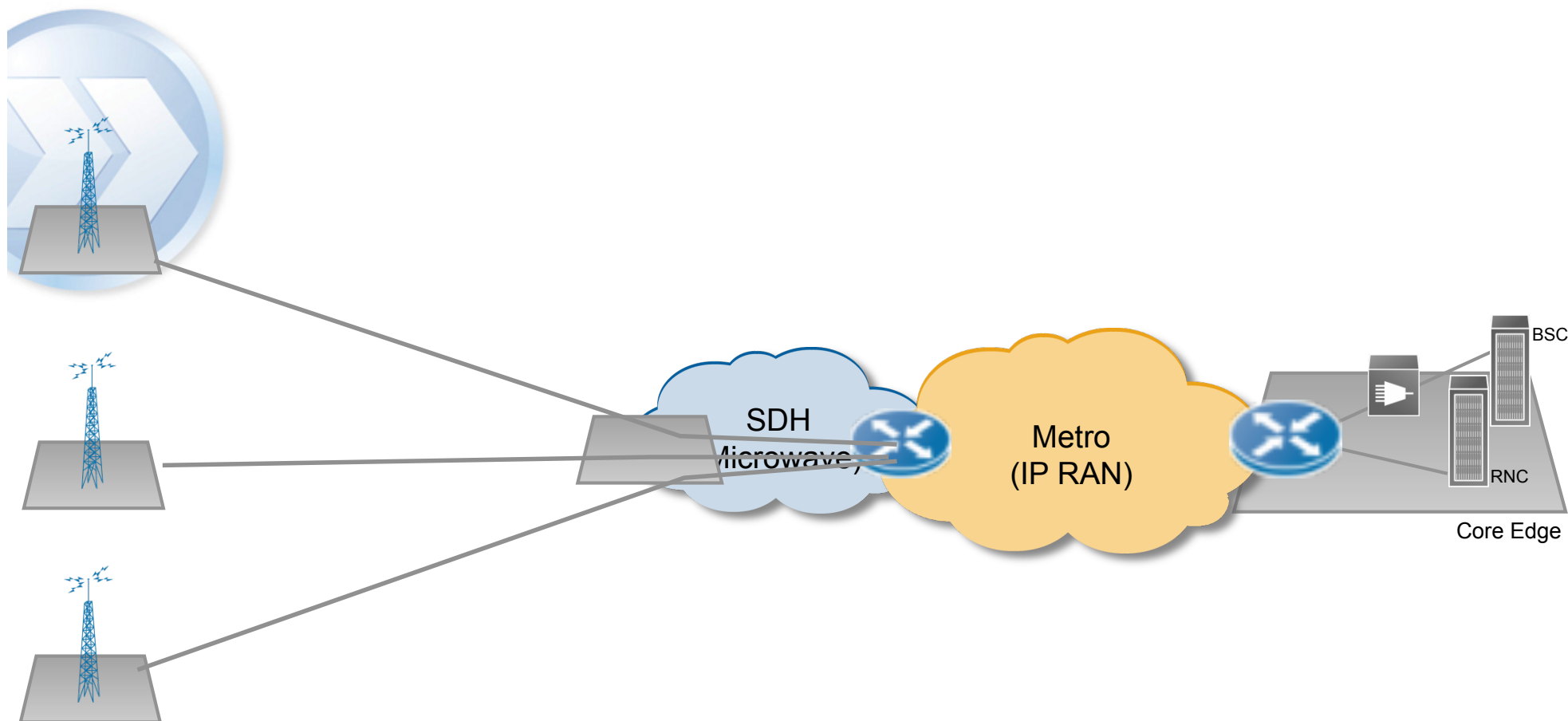
Combine packet and TDM transport

June 25, 2012

Seamless Evolution: Flexible Topology Changes (2/3)

Metro (IP RAN)

BSC

RNC

Core Edge

Further optimize traffic by aggregating closer to the access

Seamless Evolution: Flexible Topology Changes (3/3)

Metro
(IP RAN)

BSC

RNC

Core Edge
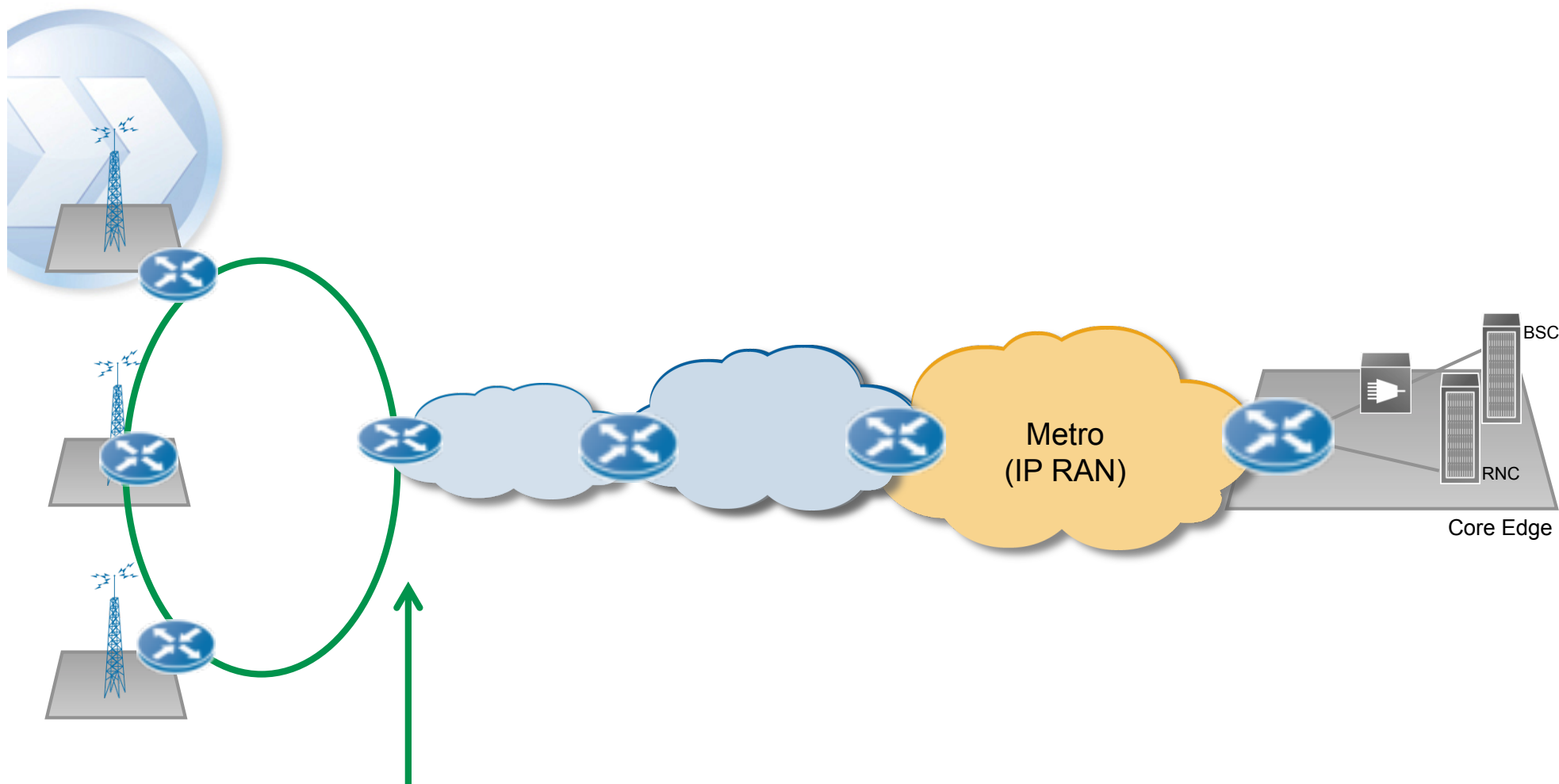
New aggregation sites and collector rings for increased number of cell sites
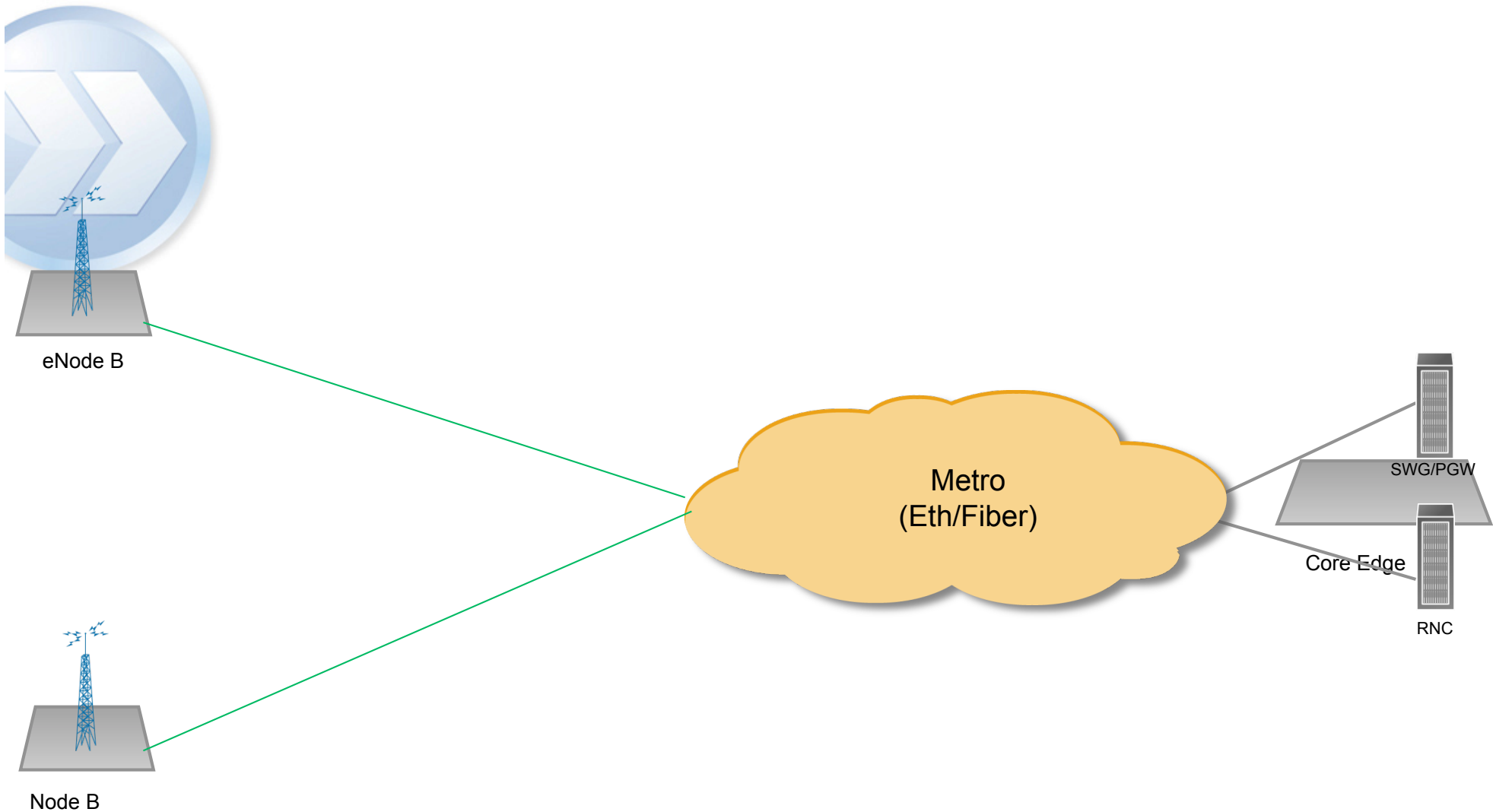
June 25, 2012

Convergence: What Does it Mean ?

✓ Transport

  ✓ An optical layer (i.e ROADM) that provides a common transport to different service networks

✓ Services

  ✓ A common network to provide services to a given market

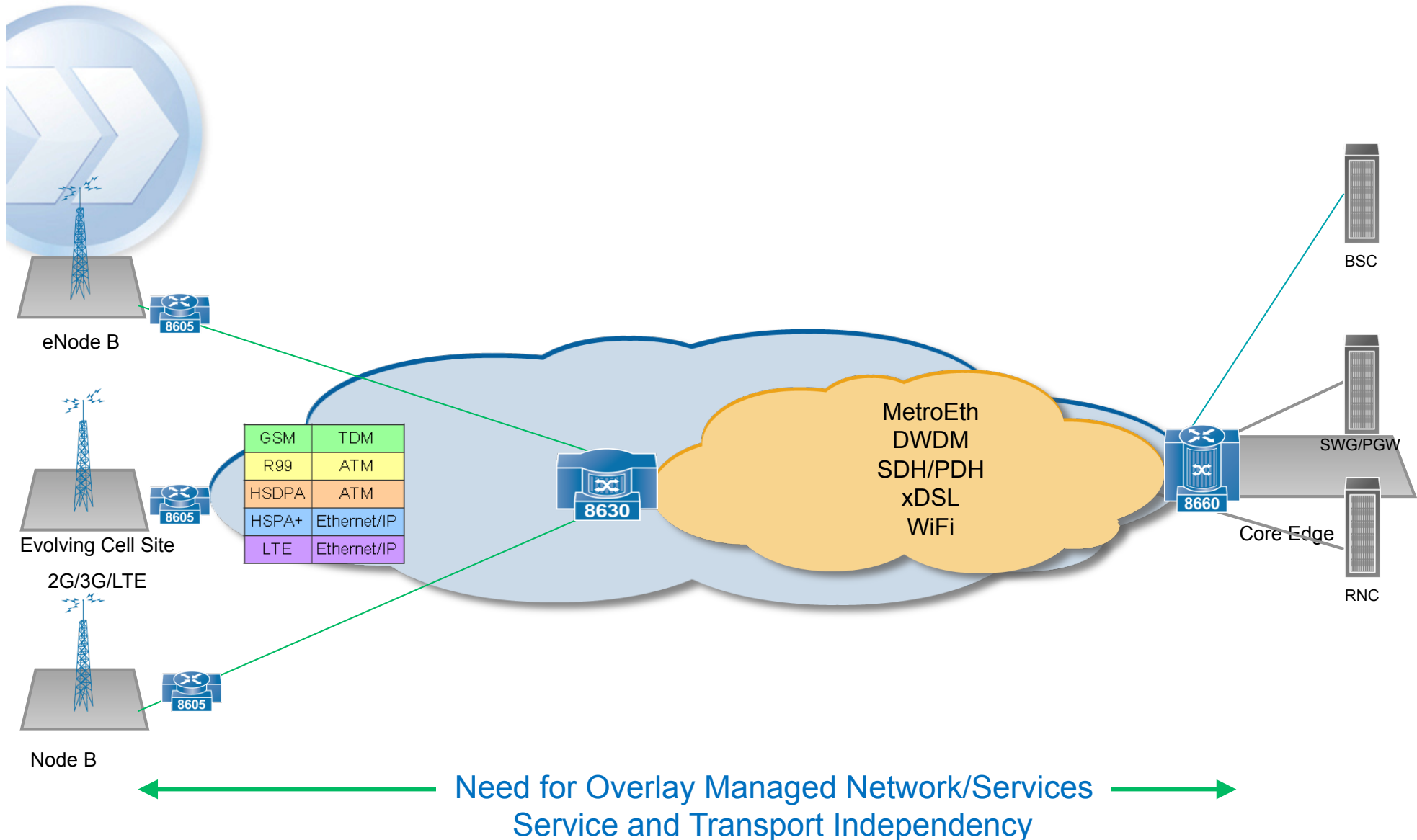 ✓ Example: backhaul for mobile services

Managed Backhaul
FMC and The Evolving Mobile Network (1/2)

eNode B

Metro
(Eth/Fiber)

SWG/PGW

Core Edge

RNC

Node B

Can the cell sites be served directly by the "fixed" MetroEthernet ?

Managed Backhaul
FMC and The Evolving Mobile Network (2/2)

GSM	TDM
R99	ATM
HSDPA	ATM
HSPA+	Ethernet/IP
LTE	Ethernet/IP

eNode B

Evolving Cell Site

2G/3G/LTE

Node B

8605

8630

MetroEth
DWDM
SDH/PDH
xDSL
WiFi

8660

BSC

SWG/PGW

Core Edge

RNC

Need for Overlay Managed Network/Services
Service and Transport Independency

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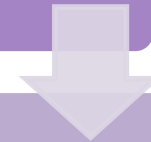# Managed Backhaul: Why Service and Transport Independency ?

Better Leverage of existing infrastructure for service/network evolution

Operational and bussiness efficiency

Improved service and network reliability

Better cost points for services and transport

Summary

Summary

- ✓ The backhaul plays an important role in the business
  - ✓ Cost: optimize and control costs
  - ✓ Network evolution: flexible and simple
  - ✓ Quality of experience

- ✓ The right solution goes beyond technical requirements
  - ✓ Non disruptive: Adaptability to changes
  - ✓ Deployment model
  - ✓ Management tools

Seamless Evolution

Next Steps

Visit www.tellabs.com for best practices on migrating to LTE:

- ✓ Download white papers

- ✓ Watch videos

- ✓ Read customer success stories

- ✓ Read blog posts

Send your questions to ask@tellabs.com