

# Switch Fabric Applications and Software Solutions

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# Agenda

- ATCA Chassis
- Application
- Switch Fabrics
- Software
- Wireless role
- Software
- Conclusion

# ATCA Goals

## Benefits

- Enables use of standardized components for chassis equipment
- High Reliability
- Lowers cost of development
- Lowers operational costs for equipment manufacturers
- Opens up the supply-base for COTS vendor competition

## ATCA Chassis



# ATCA applications

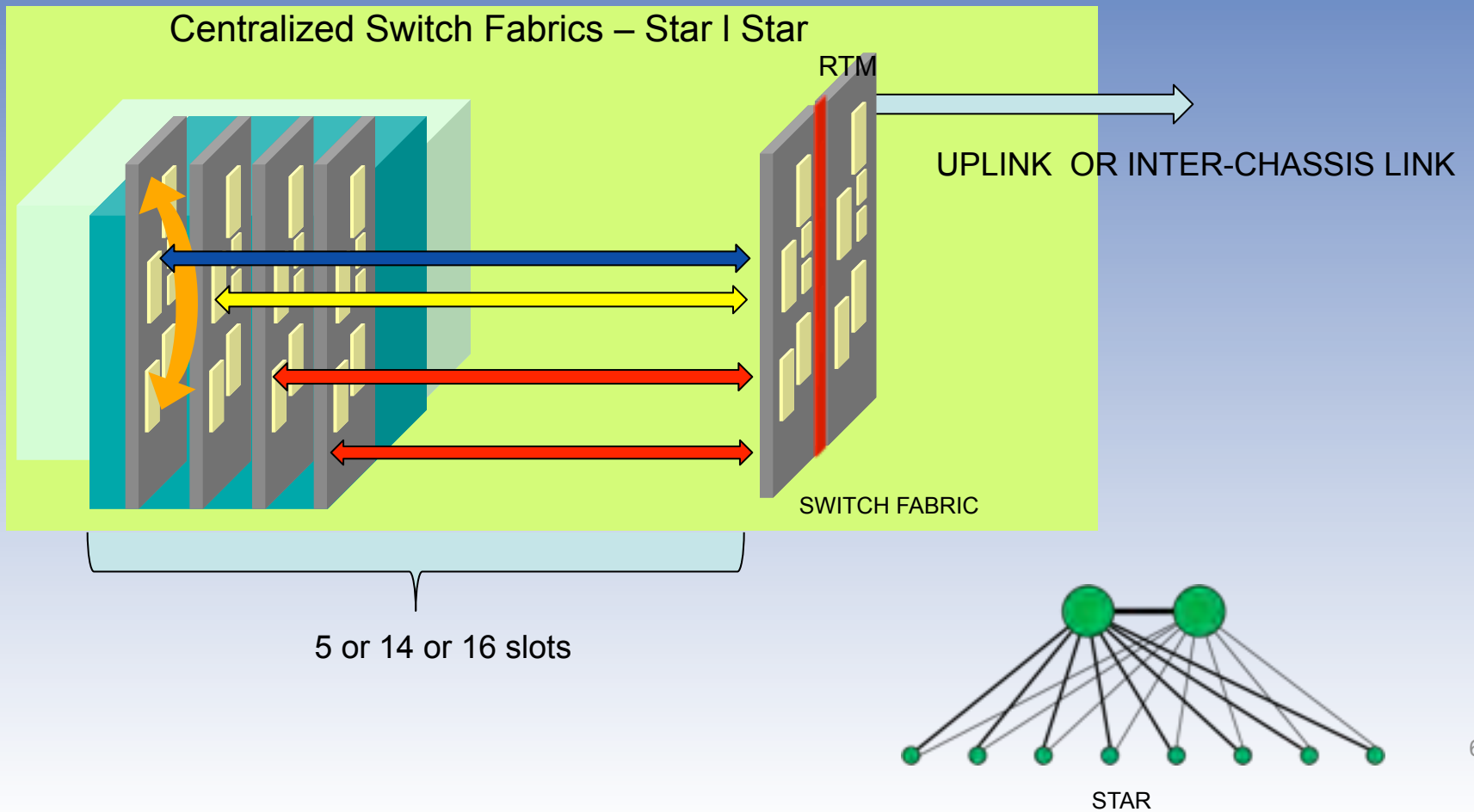
- Telecommunications
  - MSPPs
  - ACCESS
  - MEDIA GATEWAYS
  - SSGNs
  - IP Media Servers

# Role of Switch Fabrics

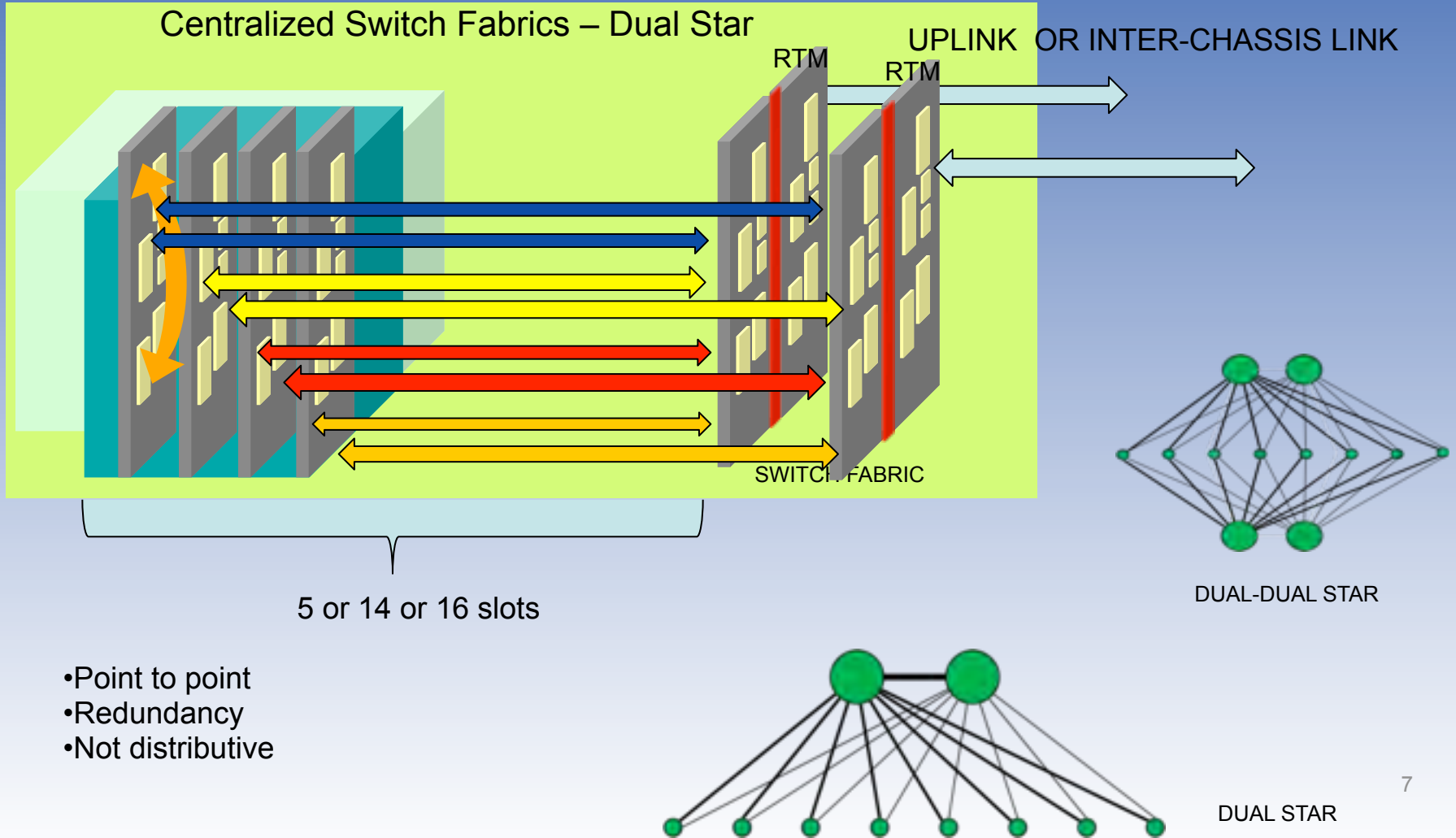
## Providing

- Cross-connects between line card
  - Dual star
  - Dual-dual star
  - Mesh
- High Availability
  - Redundant Cards
    - Stateful switchover
    - Data check-pointing
    - Fault management
    - 50 ms recovery
- Uplink connectivity
  - Inter-chassis
  - WAN

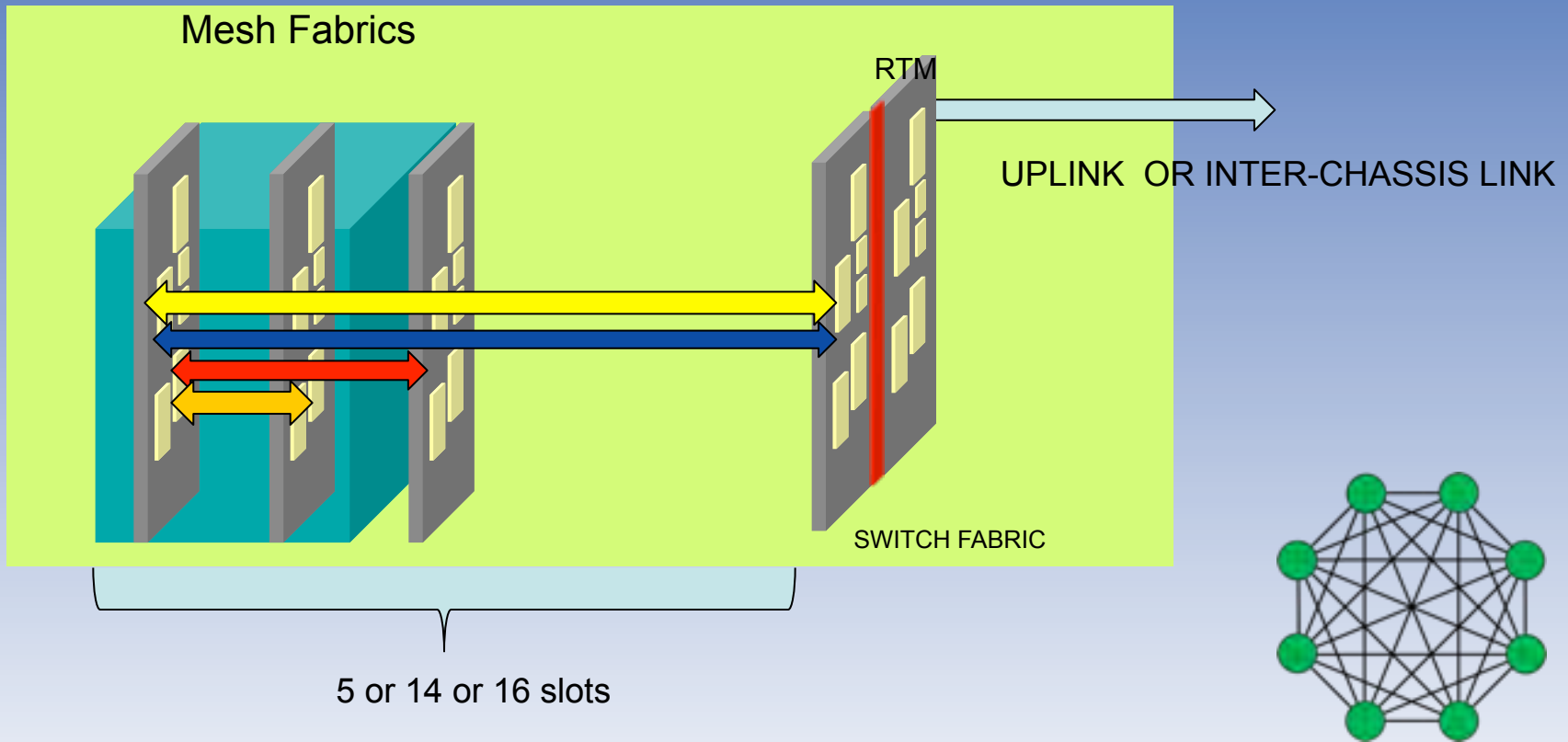
# ATCA Switch Fabrics - Star



# ATCA Switch Fabrics – Dual Star



# ATCA Switch Fabrics - Mesh



- Any to any
- Built-in redundancy
- Higher capacity switching and processor

**MESH**

# Basic Blade Applications

- Multi-CPU processor blades
- Multi-function blades
  - Carrier Blades with AMCs
    - Multiprocessor
    - Multi Network processing
- Multi-core processing blades
- Media Server blades
- Aggregation Blades

# Software Functionality

- Data-plane
  - Traffic Management
  - Forwarding
  - Security
  - Other Network processing
- Control & Management plane
  - Configuration
  - VLAN registration
  - Spanning tree Setup

## Blades

- Network processing
  - Routing
  - Security
- Network Management
- Traffic Management

# Networking Protocols

- Layer 2
  - Link Aggregation  
LACP
  - VLAN , VLAN Q-in-Q
  - QOS
- Carrier Ethernet
  - PBB-TE
  - PBB
  - 802.1ag (CFM)
- Layer 3
  - BGP
  - RIP
  - IS-IS
  - OSPF
- MPLS
  - Routing
  - RSVP-TE
  - Resiliency
  - OAM

## Worldwide User Growth

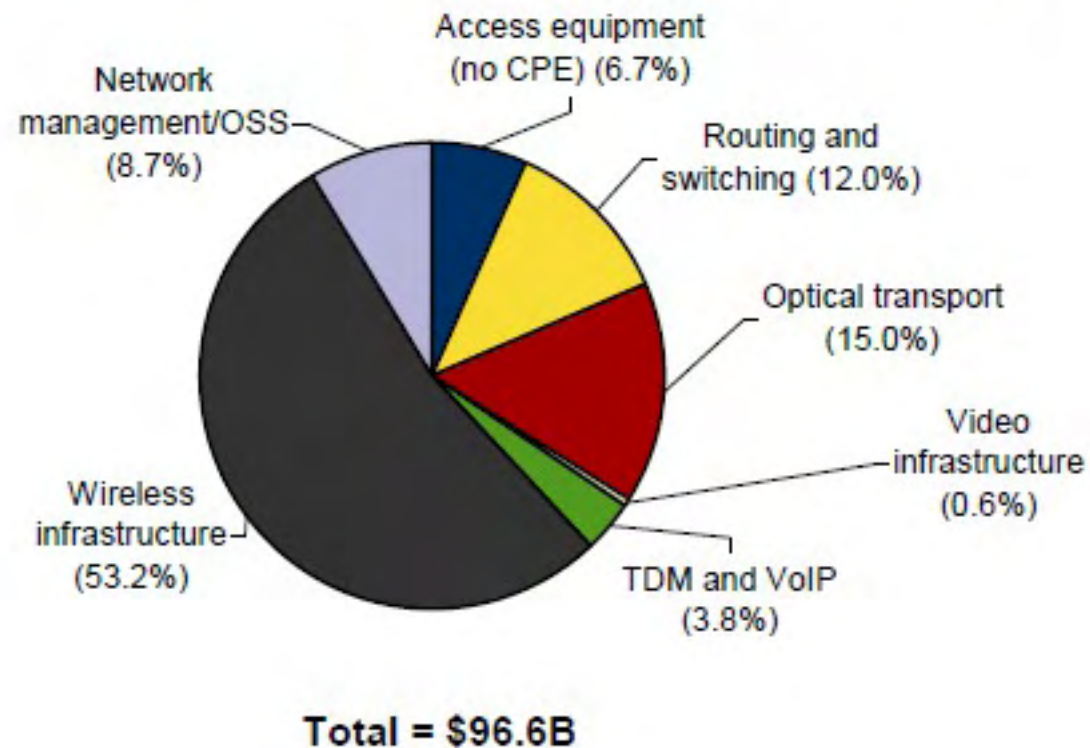
- Total world population 2009: 6,789,627,419
- Internet users in 2000: 360,985,492
- Internet users in 2009: 1,663,770,408
- Penetration worldwide: 24.5%
- 2000-2009 growth: 360.9%
- Exploding bandwidth needs, driven by mobile-wireless services
- What about revenue?

## Growth Expectation for Mobile Backhaul

- IDC predicts over 3 million base stations and over 1.8 million cell sites by 2012
  - growth of 24.3% and 10.7% respectively from 2008
- Almost 50% connected to fiber through Carrier Ethernet
- IDC also expects most WiMAX and Long Term Evolution (LTE) base stations to be connected to fiber by 2012
  - Non-line-of-sight (NLOS) microwave and fixed WiMAX will provide up to 300 mbps backhaul where fiber is not available

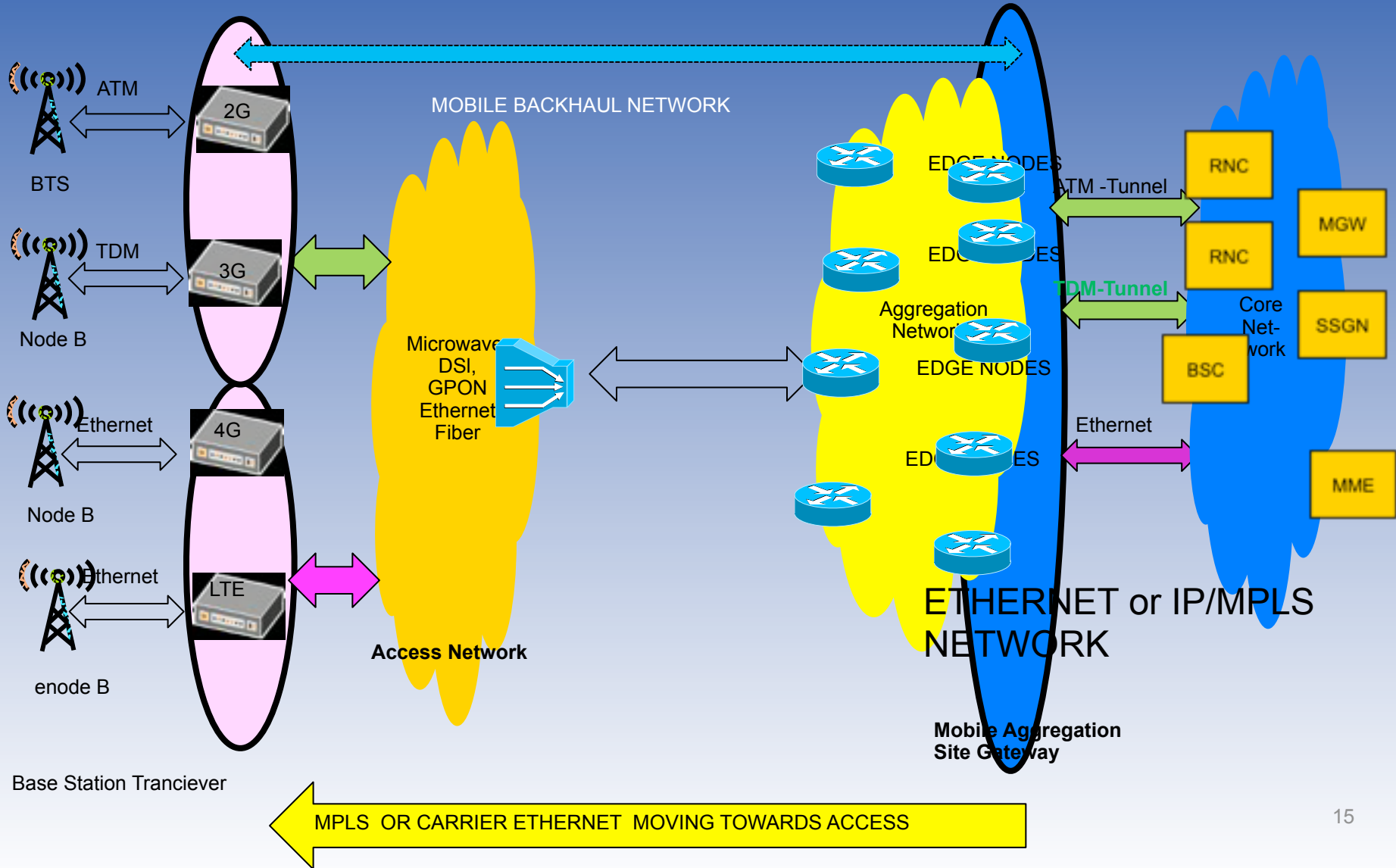
# Telecom Growth by Segment

Worldwide Telecom Equipment Revenue Share by Segment, 2009

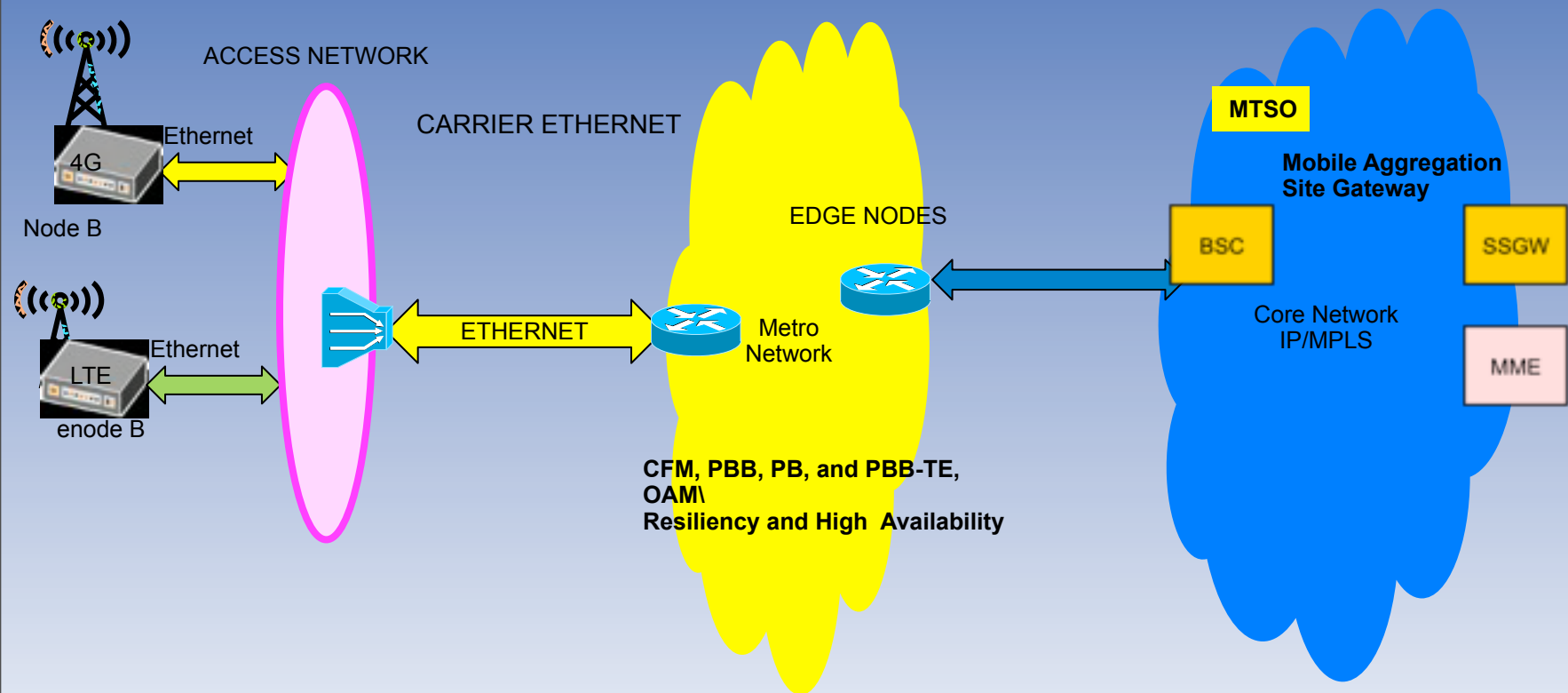


Source: IDC, 2009

# Mobile Backhaul Evolution



# Mobile Backhaul Evolution – All IP



# Carrier Grade Ethernet Support for MBH

- Carrier Grade efforts
  - High Availability and OAM
    - High Availability with OPENSAT support
    - Ethernet OAM
      - 802.1ag Connectivity Fault Management
      - 802.Qaw Management of Data Driven and Data Dependent Faults
      - ITU Y.1731 OAM Functions and Mechanisms for Ethernets
      - 802.1Qbf – PBB-TE Segment protection
      - 802.1Qay – PBB-TE (Protection)
    - Ethernet linear and ring protection mechanisms (ITU-T 8031/8032)
      - Providing the same 99.9999% reliability as legacy networks

# Carrier Grade Ethernet Support for MBH

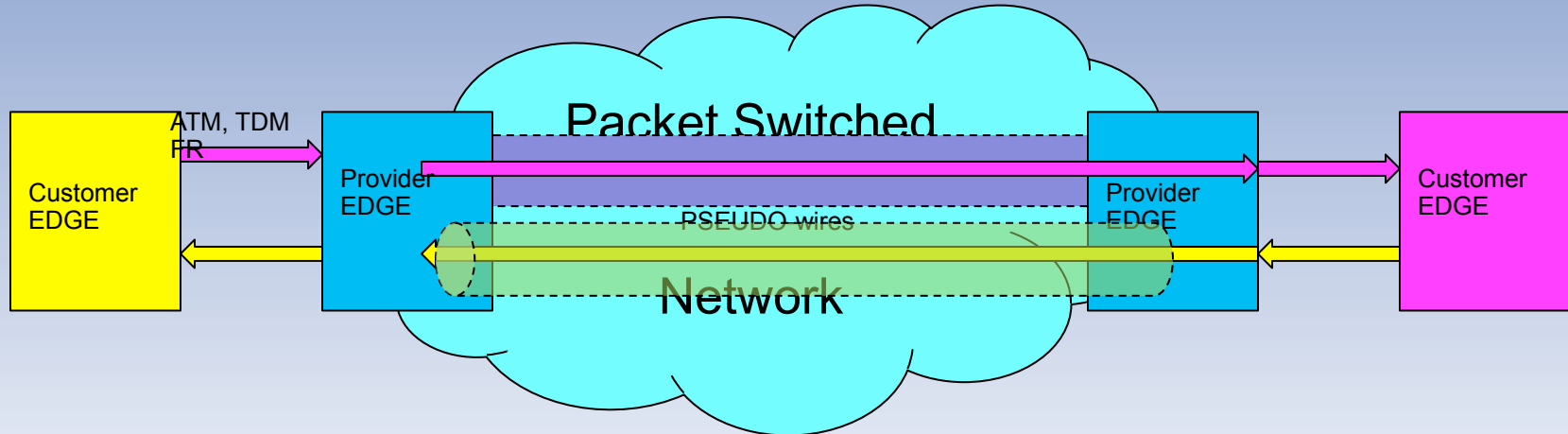
- Carrier Grade efforts
  - Provider Bridging
    - 802.1ad - Provider Bridging
    - 802.1ah– Provider backbone bridging
    - 802.1Qay – PBB-TE (Also protection and OAM)
  - Inter-op and Certification

# IP/MPLS Support for MBH

- IP/MPLS Networks
  - MPLS OAM
  - MPLS Resiliency
  - Connectivity
  - Legacy Support
  - Timing support

# IP/MPLS for MBH

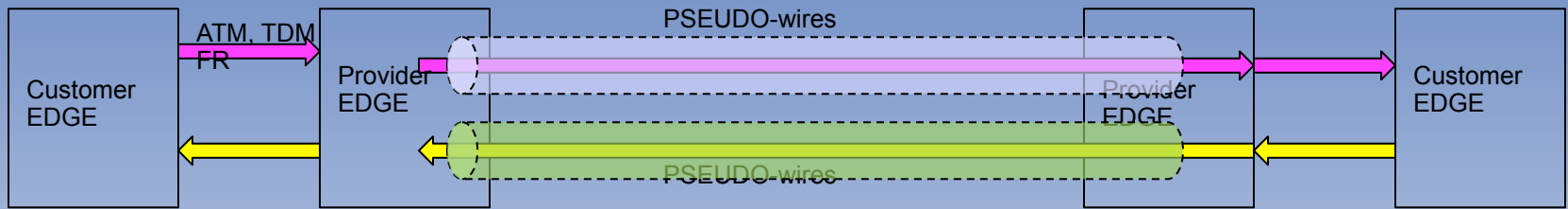
- MPLS OAM
  - MPLS-TP expands the limited capabilities of MPLS for OAM
  - Ping/trace-route
- MPLS resiliency
  - Fast reroute
  - VCCV (Virtual Circuit Connectivity Verification)
    - Enable connectivity checks for PWs



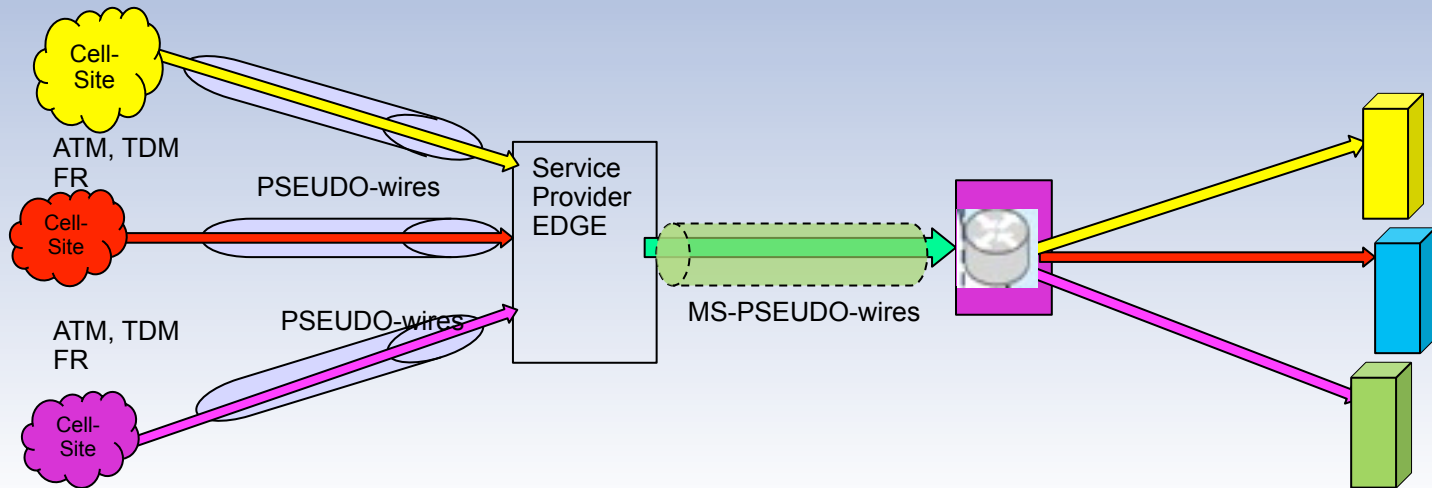
- Connectivity - Inherent to MPLS
  - MPLS-centric COE? (MPLS-TP)

# IP/MPLS for MBH

- Legacy Support
  - Pseudo Wires

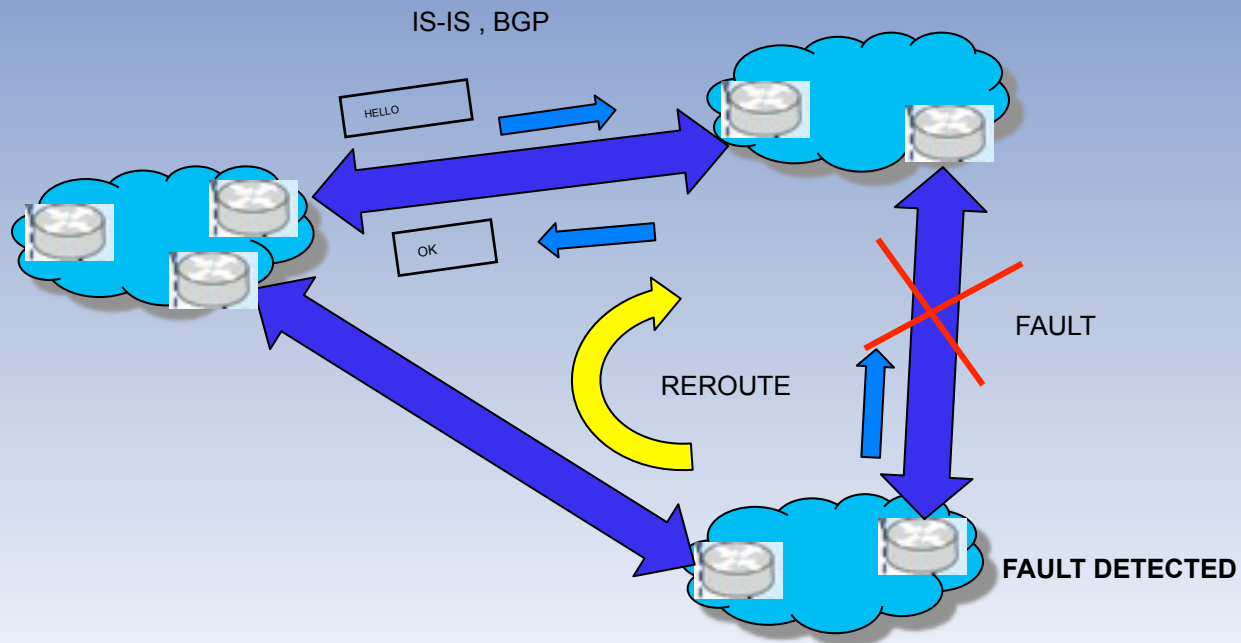


- Multi-Segmented pseudo-wires



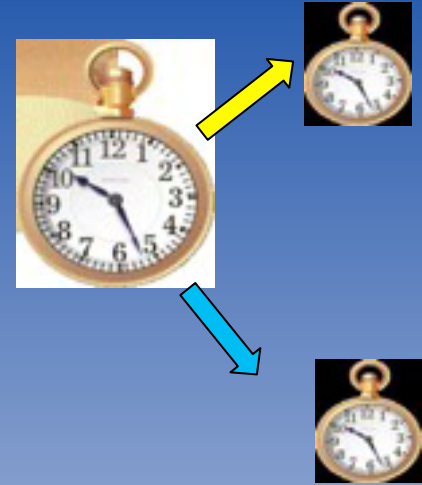
# IP/MPLS support for MBH

- BFD Bidirectional Forwarding Detection

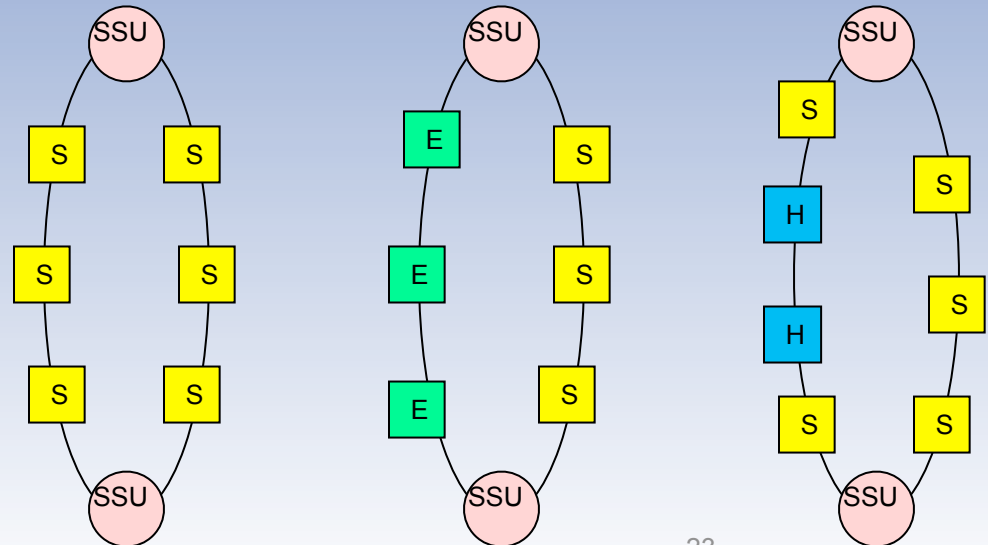


## Timing Synchronization

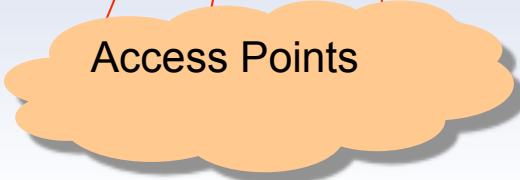
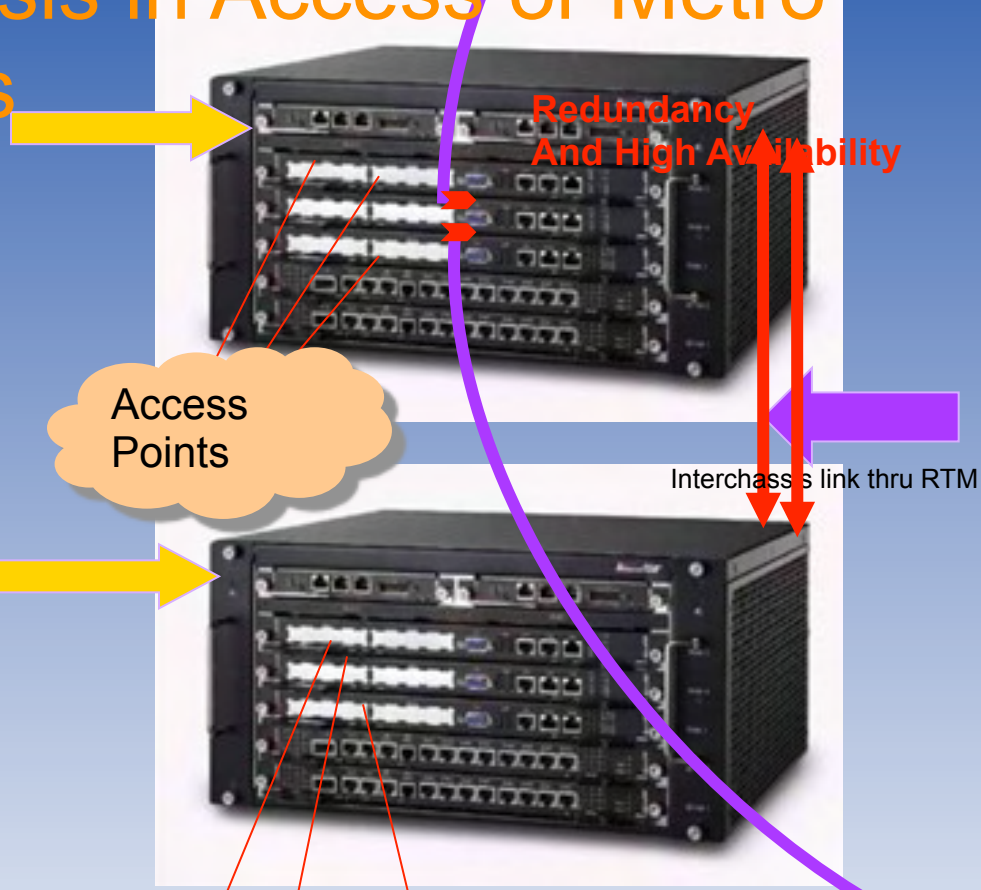
- ATCA standards require clock source in all types of cards
- Synchronous Ethernet
  - ITU-T 8261/8262
- Adaptive Clocking (depends heavily on packet arrival time)
- IEEE 1588
- Hybrid - out-of-band TDM?



S = Sonet  
E = Synch E  
H = Hybrid

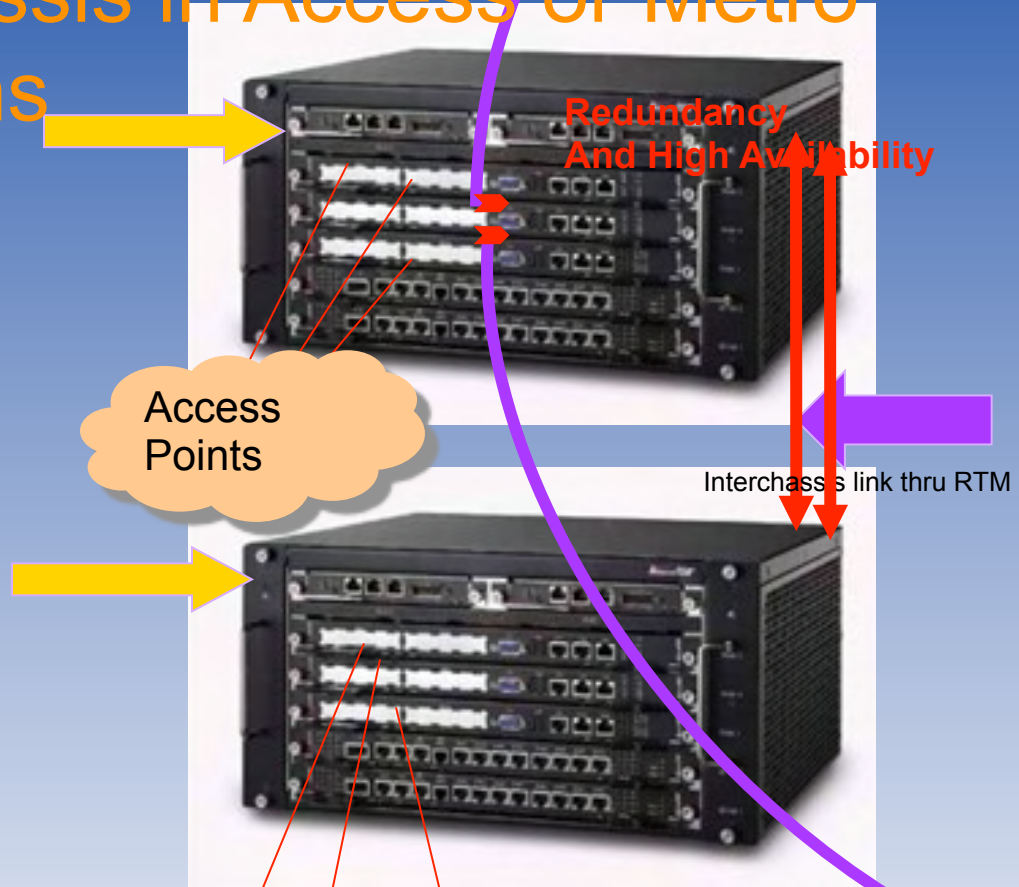


# ATCA Chassis in Access or Metro Applications



# ATCA Chassis in Access or Metro Applications

IP Infusion Switching with full L2, L3, QoS MPLS, VPLS, High Availability and CM support



Network Ring

## Future requirements for networks

- Automated provisioning and servicing, key to the end-to-end management of next generation carrier and access networks
- Self-healing networks
- Middleware requirements for next generation carrier equipment
  - High Availability
  - High Performance
    - Multi-threaded and distributed functionality
    - Support for multi-core and 64-bit architectures
  - Advanced Manageability

## What does IP Infusion do?

- IP infusion is a provider of intelligent software solutions for Next Generation Networks equipment.
- Our portfolio includes protocol stacks for Next Generation Technologies - Carrier Ethernet, Virtual Private Services, Multicast, MPLS, BFD, VCCV, PW, MS-PW and High Availability support for OPENSAN
- Implements well tested Carrier Ethernet stacks
  - And coming soon next generation MPLS and Carrier Ethernet functionality
  - Assured quality through extensive testing at three worldwide labs in USA, China and India

## Summary

- Bandwidth demand, costs, required bandwidth granularities for services, provisioning and OAM are driving providers to upgrade their networks to NGNs
- Wireless backhaul networks will get the much needed upgrade. Carrier Ethernet is essential to the transformation to Next Generation Networks
- Reliability, interoperability and testing - Cost, resource and Time challenge
  - Can be reduced by sharing through IOT and certification facility
  - Standardization of Chassis

Thank You !

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