Video Ready Mobile Networks

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Agenda

- Market Recap
- Video in Mobile Transport
- Optimized Video
- Monetizing Video

Market Recap

Mobile Internet Market

More Mobile Devices

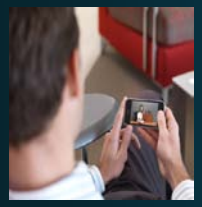
> 5.6B devices
> 1.5B M2M Nodes

Faster Mobile Data

10-fold Speed Increase

2,600%
Increase in Mobile Data Traffic from 2010–2015*

Enhanced Computing



Mobile Outgrows Fixed 3.3X

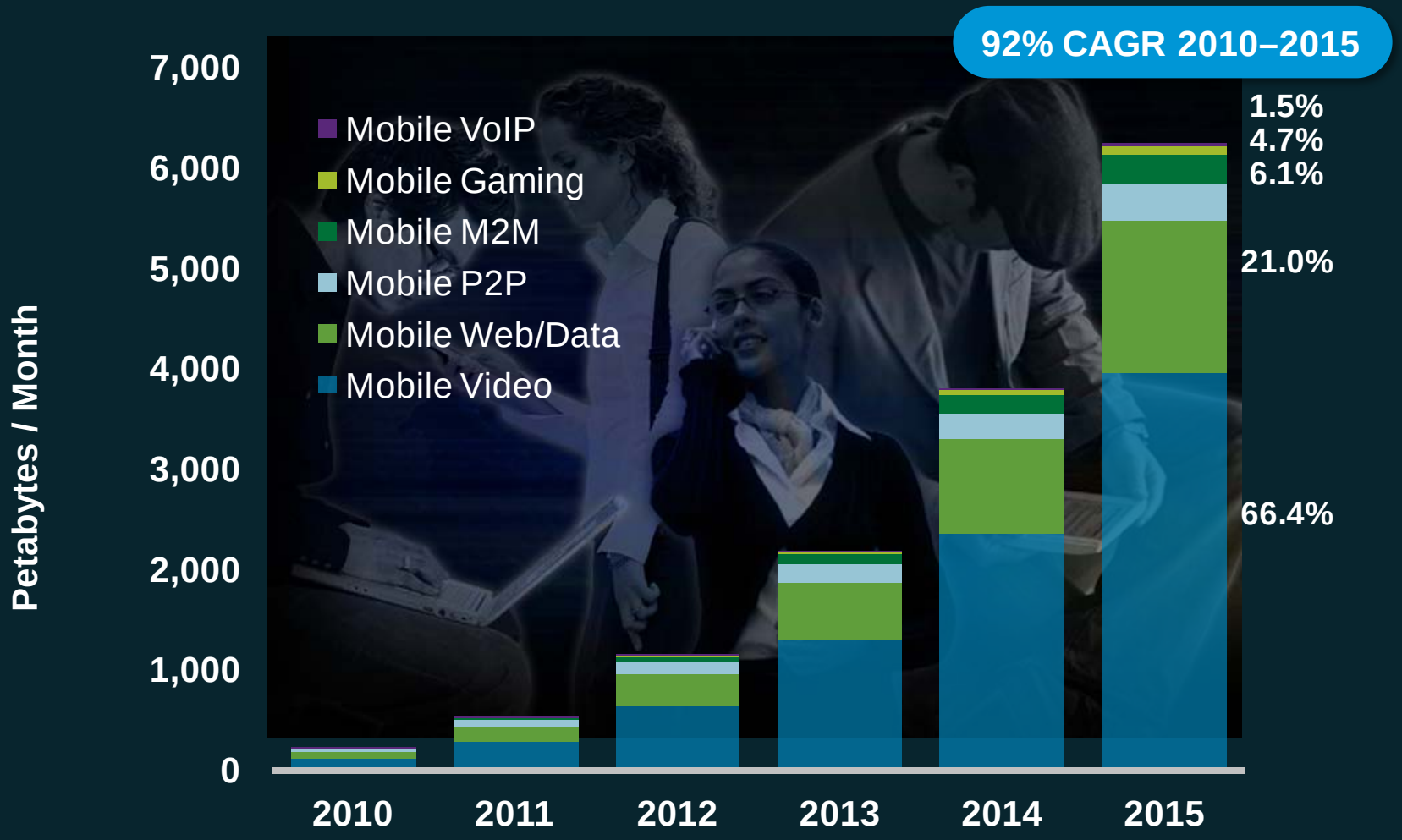
More Rich Media & Content

Video grows to 66% of mobile data

* Source: Cisco Visual Networking Index (VNI) Global Mobile Data Forecast, 2010–2015

Global Mobile Data Traffic Growth / Applications

Video to reach more than 50 percent of mobile data traffic by 2011



* Source: Cisco Visual Networking Index (VNI) Global Mobile Data Forecast, 2010–2015

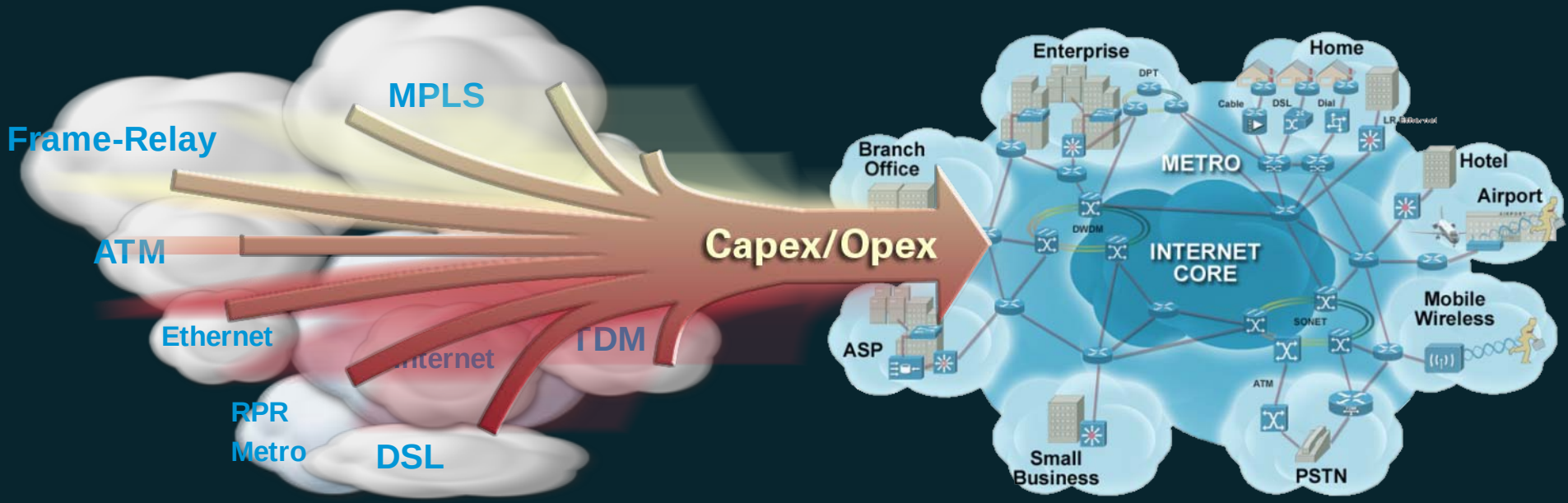
Challenge of Shifting Environment

Video in Mobile Transport

3GPP All IP Trend

Multiple Interworked Networks

Converged Core

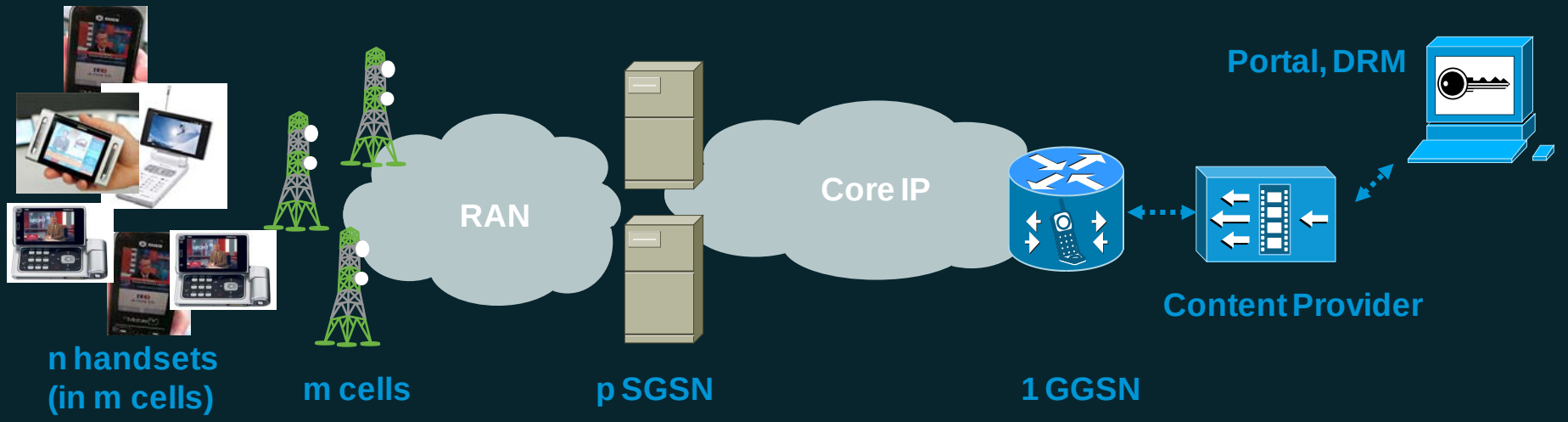


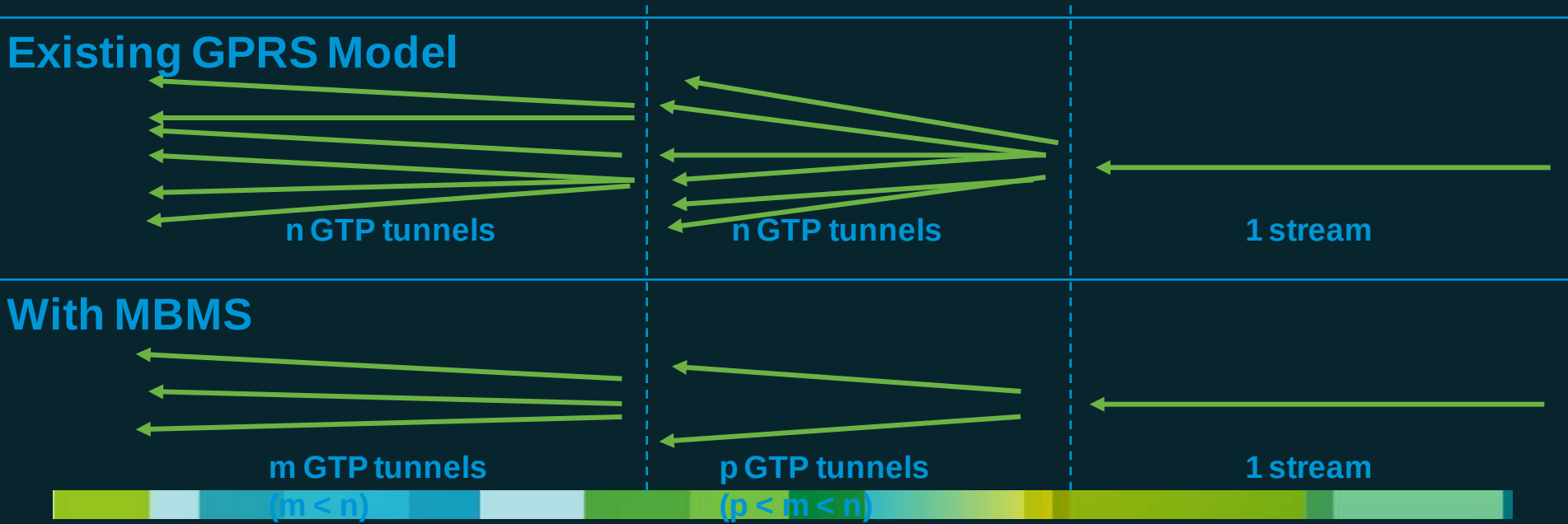
- Often connection oriented
- End-to-end provisioning
- Scalability issues
- Capex intensive
- Less Opex efficient

- Mostly connectionless
- IP/MPLS aware end-to-end
- Reduced provision replication
- Highly scalable
- More Capex and OPEX efficient

Multicast Requirement

3G Release 6 : MBMS

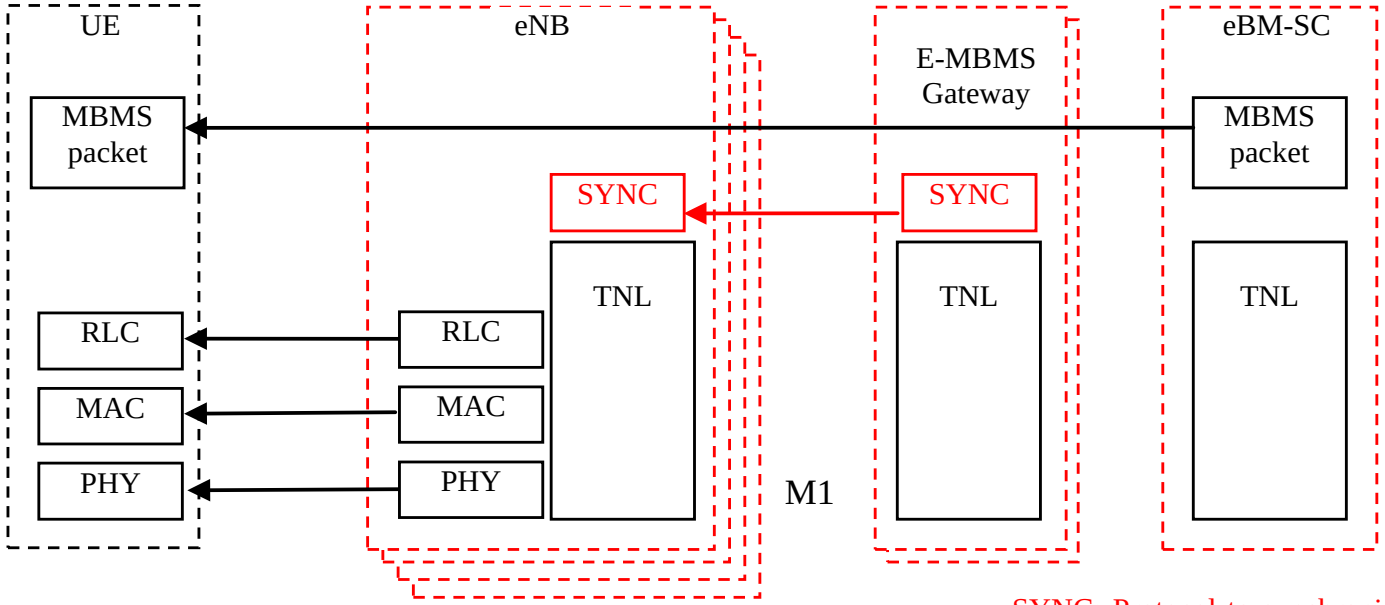




Multicast Requirement

E-MBMS

- MBSFN is for delivering services like Mobile TV using LTE
- Transmission happens from a time-synchronized set of eNBs using the same resource block
- Over-the-air combining improve the Signal-to-Interference plus Noise-Ratio (SINR)

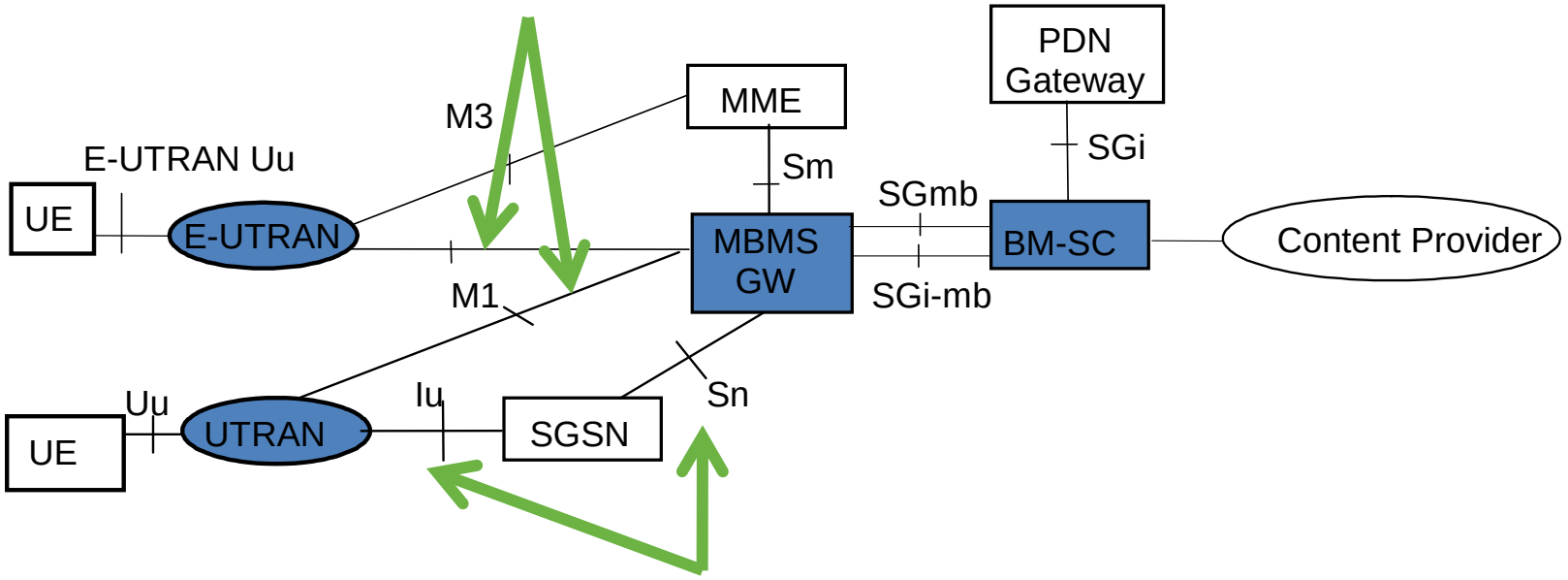


SYNC: Protocol to synchronise data used to generate a certain radio frame

Multicast Requirement

MBMS with EPS with E-UTRAN and UTRAN

IP Mulicast distribution (SSM)

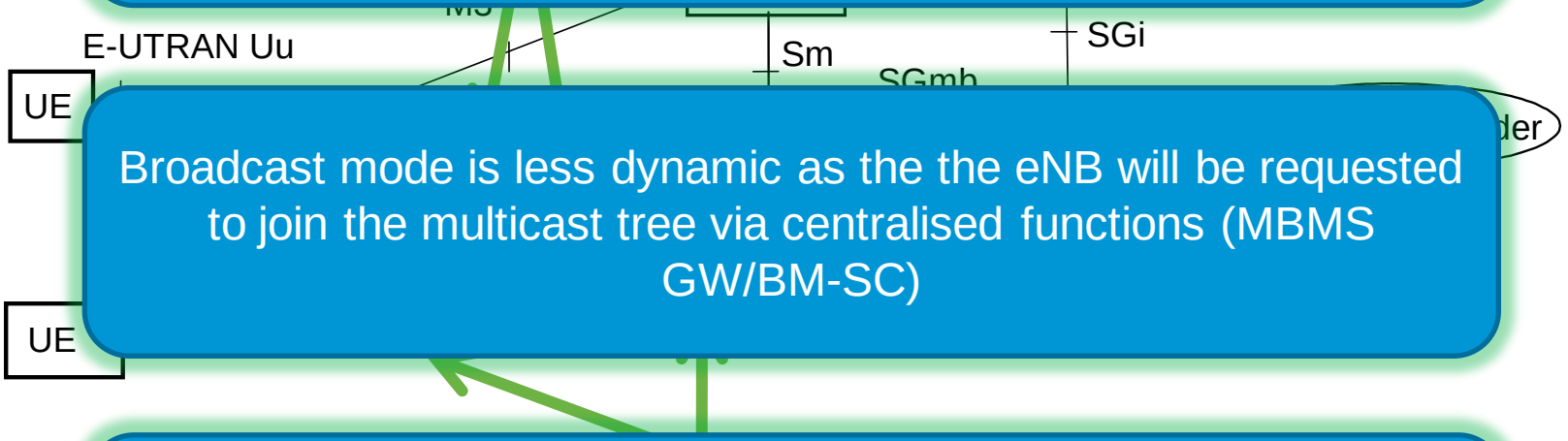


GTP-U Unicast distribution
(for RNC not supporting Multicast)

Multicast Requirement

MBMS with EPS with E-UTRAN and UTRAN

Multicast mode will result in an IGMP from the UE that will result in the eNB dynamically joining the multicast tree when necessary

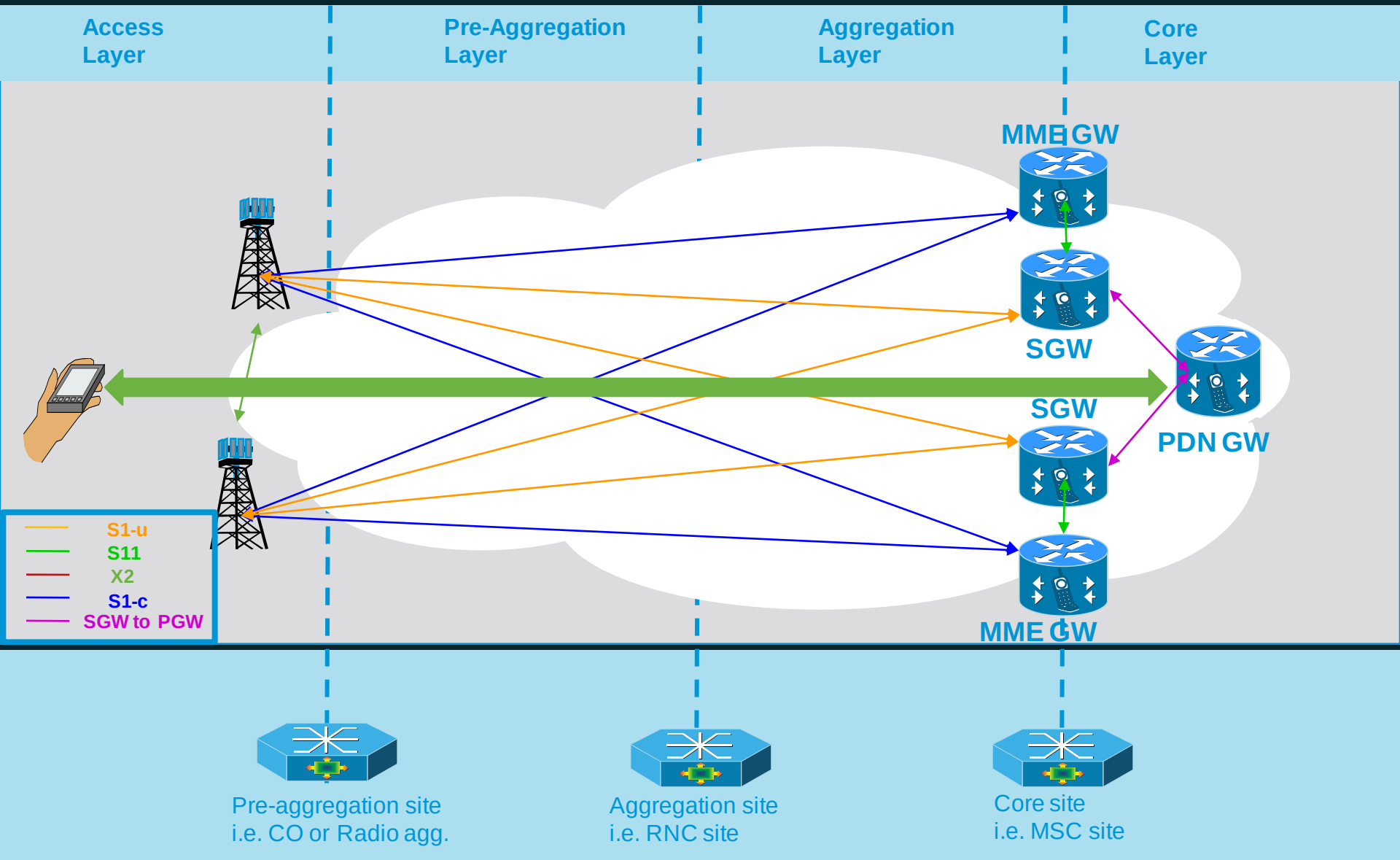


Broadcast mode is less dynamic as the the eNB will be requested to join the multicast tree via centralised functions (MBMS GW/BM-SC)

This functionality mandates the support of Multicast (more specifically Source Specific Multicast) in the RAN backhaul

QoS implementation

Extract from “3GPP TS 23.401 V8.3.0 (2008-09)”

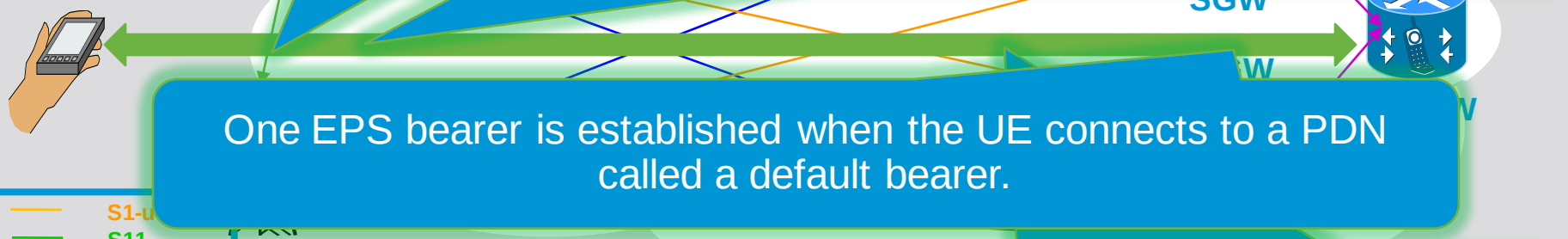


QoS implementation

Extract from “3GPP TS 23.401 V8.3.0 (2008-09)”

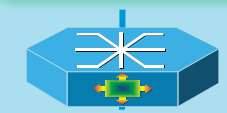
EPS bearer uniquely identifies traffic flows that receive a common QoS treatment between a UE and a PDN GW

An EPS bearer is the level of granularity for bearer level QoS control in the EPC/E-UTRAN



One EPS bearer is established when the UE connects to a PDN called a default bearer.

Any additional EPS bearer that is established to the same PDN is referred to as a dedicated bearer.



Pre-aggregation site
i.e. CO or Radio agg.

Aggregation site
i.e. RNC site

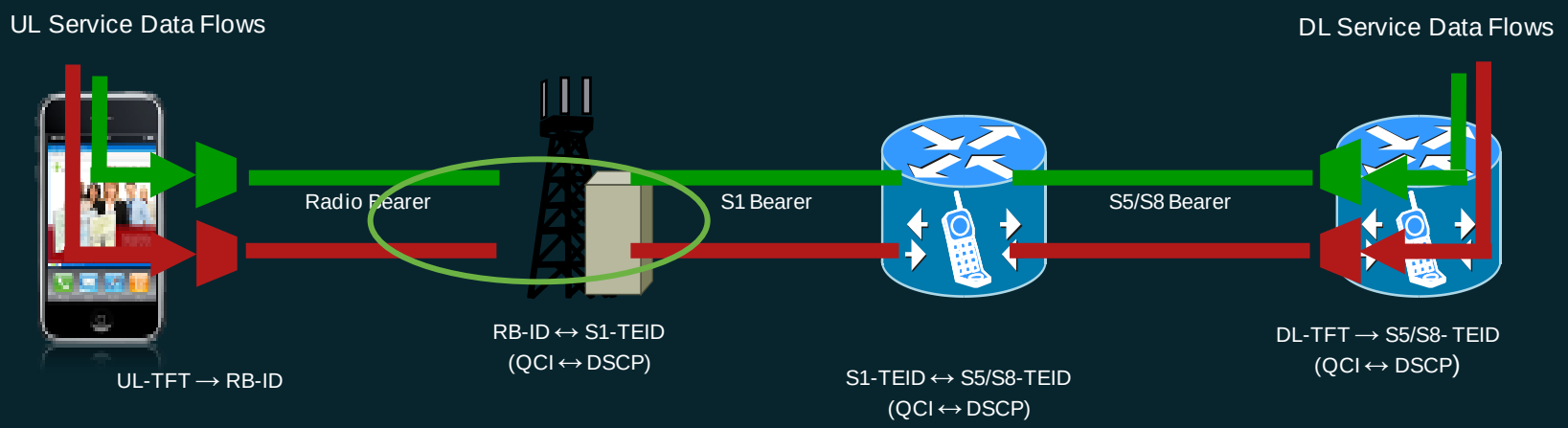
Core site
i.e. MSC site

QoS implementation

QoS Profile parameters

EPS bearer QoS profile includes the parameters:

- GBR - bit rate that can be expected to be provided by a GBR bearer
- MBR - limits the bit rate to be expected to be provided by a GBR bearer
- ARP - whether a bearer establishment/mod. request can be accepted
- QCI - A QCI is a scalar that controls bearer level packet forwarding. The current specifications have defined 9 QCI values (*3GPP TS 23.203)*



QoS implementation

QoS Profile parameters

The LTE Standards doesn't make allowances for contention in the underlying transport infrastructure

The underlying backhaul technology will be contented and may be involve adaptive techniques i.e. AMR

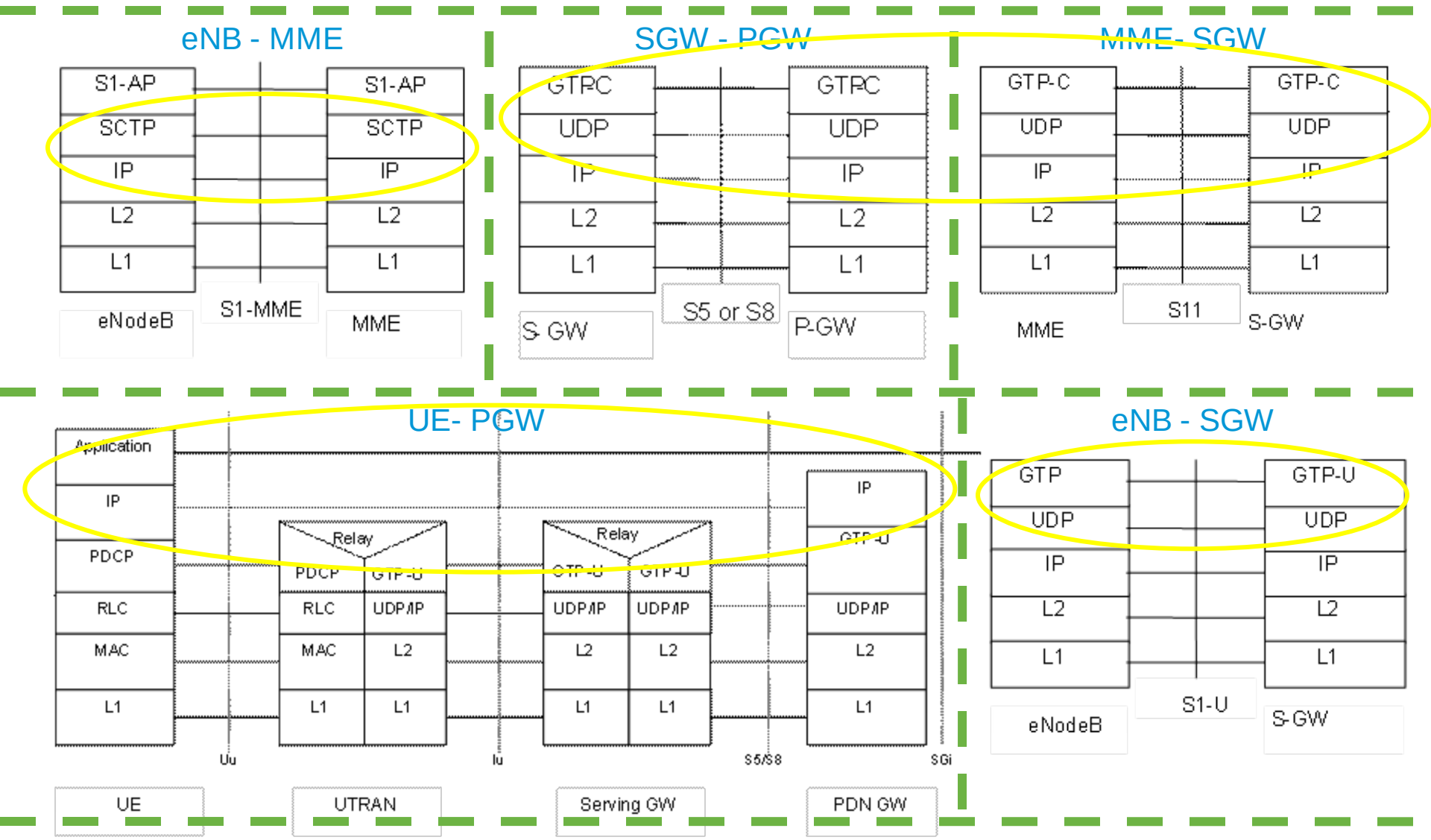
Traffic Prioritisation and Dual priority/Low Latency queues should be supported for 3GPP compliance

Hierarchical multi-layer QoS profiles to be supported for multiple bearers with GBR & MBR parameters

Issues with mapping of QCI Parameters (9 values) in L2 environments with insufficient 802.1p bits

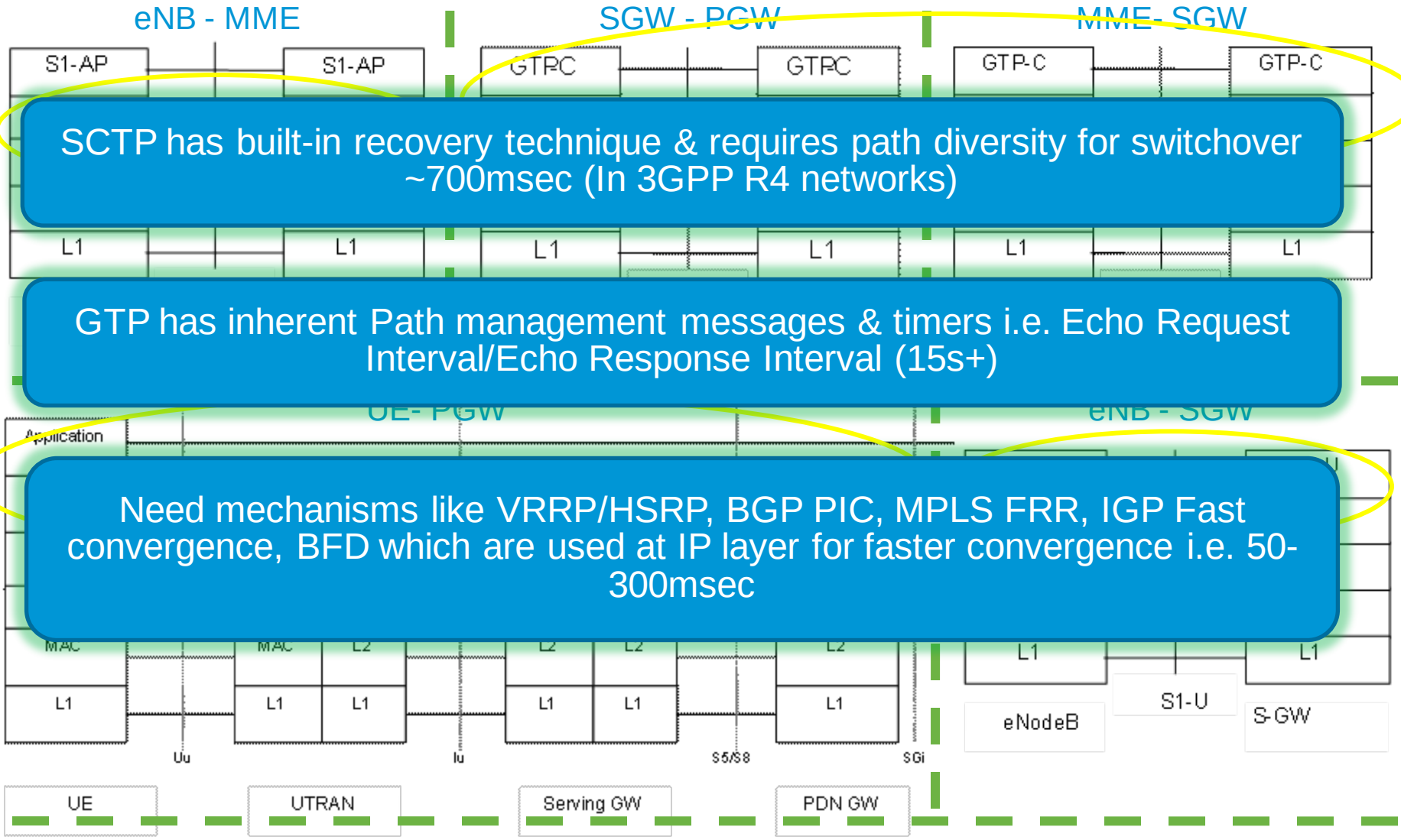
Network Fast Convergence

Control & Data Plane Protocol Stacks



Network Fast Convergence

Control & Data Plane Protocol Stacks



SCTP has built-in recovery technique & requires path diversity for switchover ~700msec (In 3GPP R4 networks)

GTP has inherent Path management messages & timers i.e. Echo Request Interval/Echo Response Interval (15s+)

Need mechanisms like VRRP/HSRP, BGP PIC, MPLS FRR, IGP Fast convergence, BFD which are used at IP layer for faster convergence i.e. 50-300msec

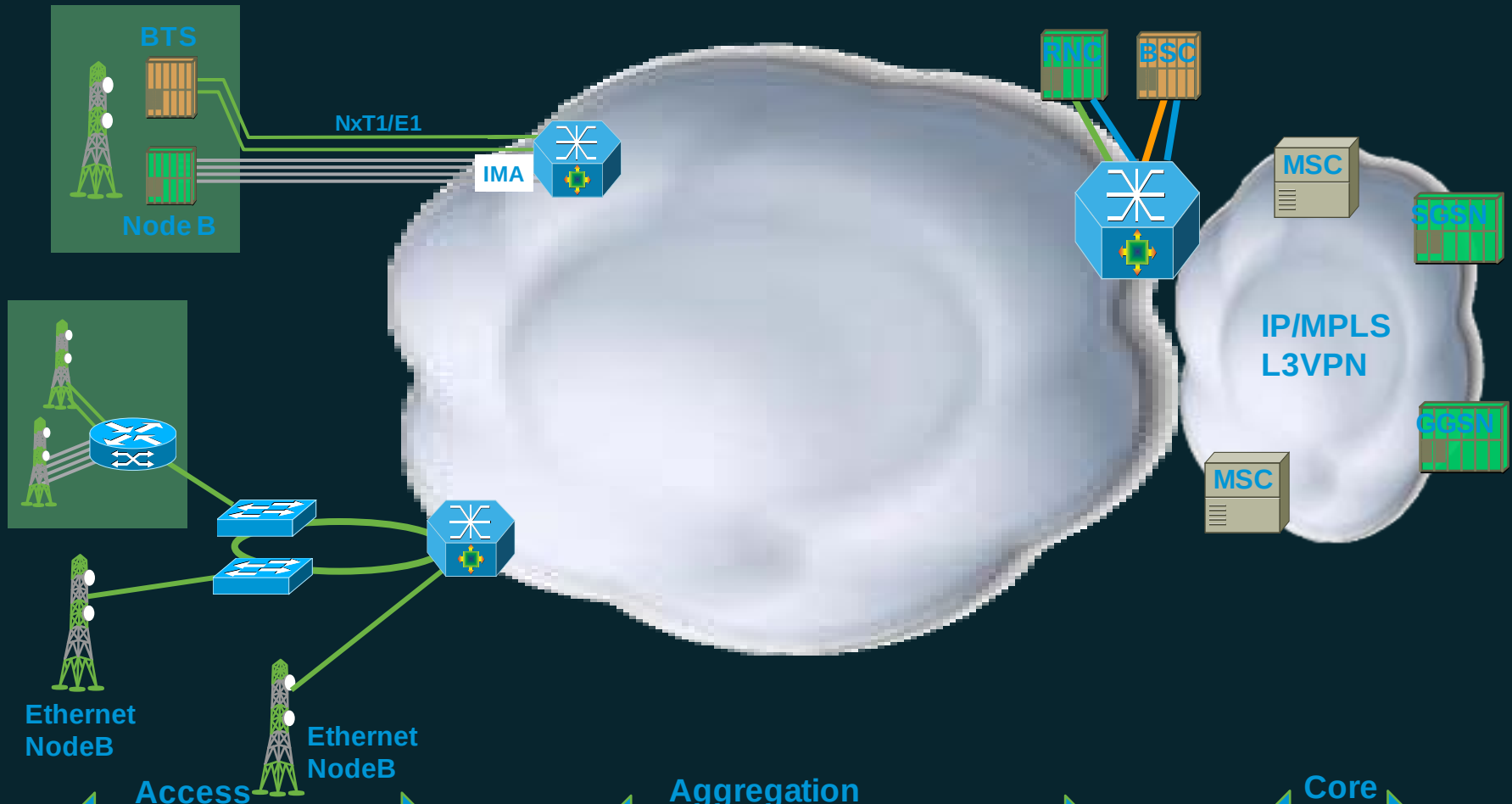
Network Fast Convergence

Tight SLAs for CE/MPLS Infrastructure

- **Service Recovery = Protection (super-fast) and Restoration (fast)**
- **IP/MPLS fast convergence baseline has improved dramatically**
  - IGP Fast Convergence (FC) broke the barrier of <200msec restoration time
  - Powerful and simple baseline tool for all L2 and L3 services, covering multiple failures
  - Combined with BGP PIC* ensures fast convergence for IP/IPVPN service edge
  - **It is simple – a built-in property of the IP/MPLS network**
- **Protection with IP Fast ReRoute (FRR)**
  - Tool to improve on IGP FC for some topologies (e.g. Two-plane designs)
  - Provides local protection with <50msec recovery
- **Protection with MPLS TE FRR**
  - Local Link and Node Protection for deterministic <50msec recovery
  - Seamless service restoration (make-before-break)
  - Applies to all transit MPLS link and node failures

*** BGP PIC – BGP Prefix Independent Convergence**

Mobile Transport Hierarchy



Access

Last-mile
Small aggregation sites
Mostly Microwave transport
Limited traffic volumes
No redundancies or ring

Aggregation

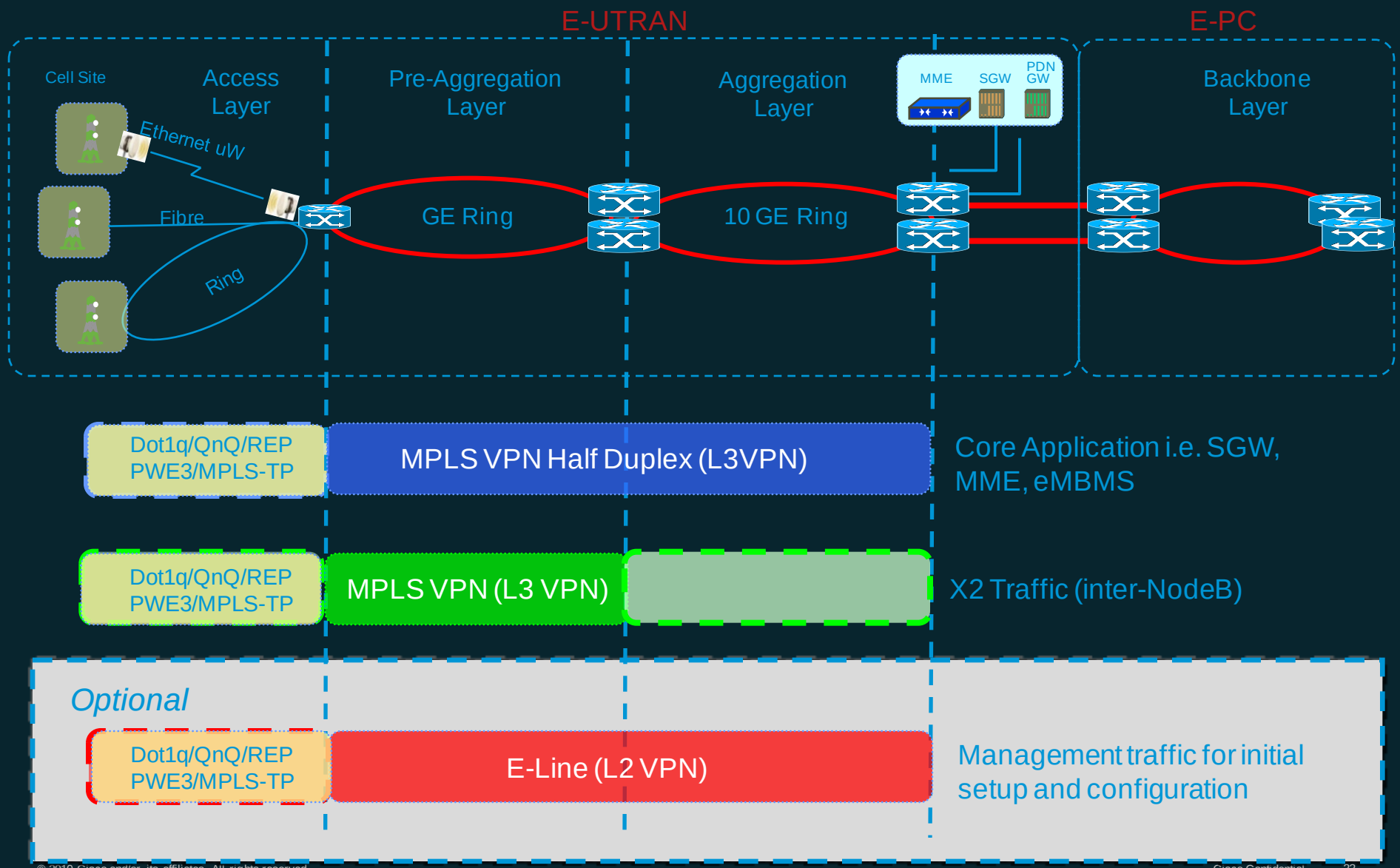
Higher capacities
Redundancies
Partially meshed interconnections
Different transport technologies
Often includes wireline services

Core

Aggregation Technologies

	IP/MPLS	PBB-TE (802.1ah, 802.1Qay)	MPLS-TP	T-MPLS
Multiservice	Yes (including L3VPN, ATM, TDM)	Ethernet L2 only	L2 only	L2 only
Switching capacity	High	High	High	High
Interoperability	Yes	Limited	Limited	No
Transport	Any	Ethernet Only	Any	Any
Any-to-Any	Yes	No	No	No
Multicast	Yes	No	No	No
Core Interop	Native	L2 to L3 handover needed in Core	L2 to L3 handover needed in Core	No
Service distribution	L3VPN,GGSN SAE/PDN	No	No	No
Maturity	Mature	Early adoption	Early adoption	No standard

Preferred LTE Deployment Option



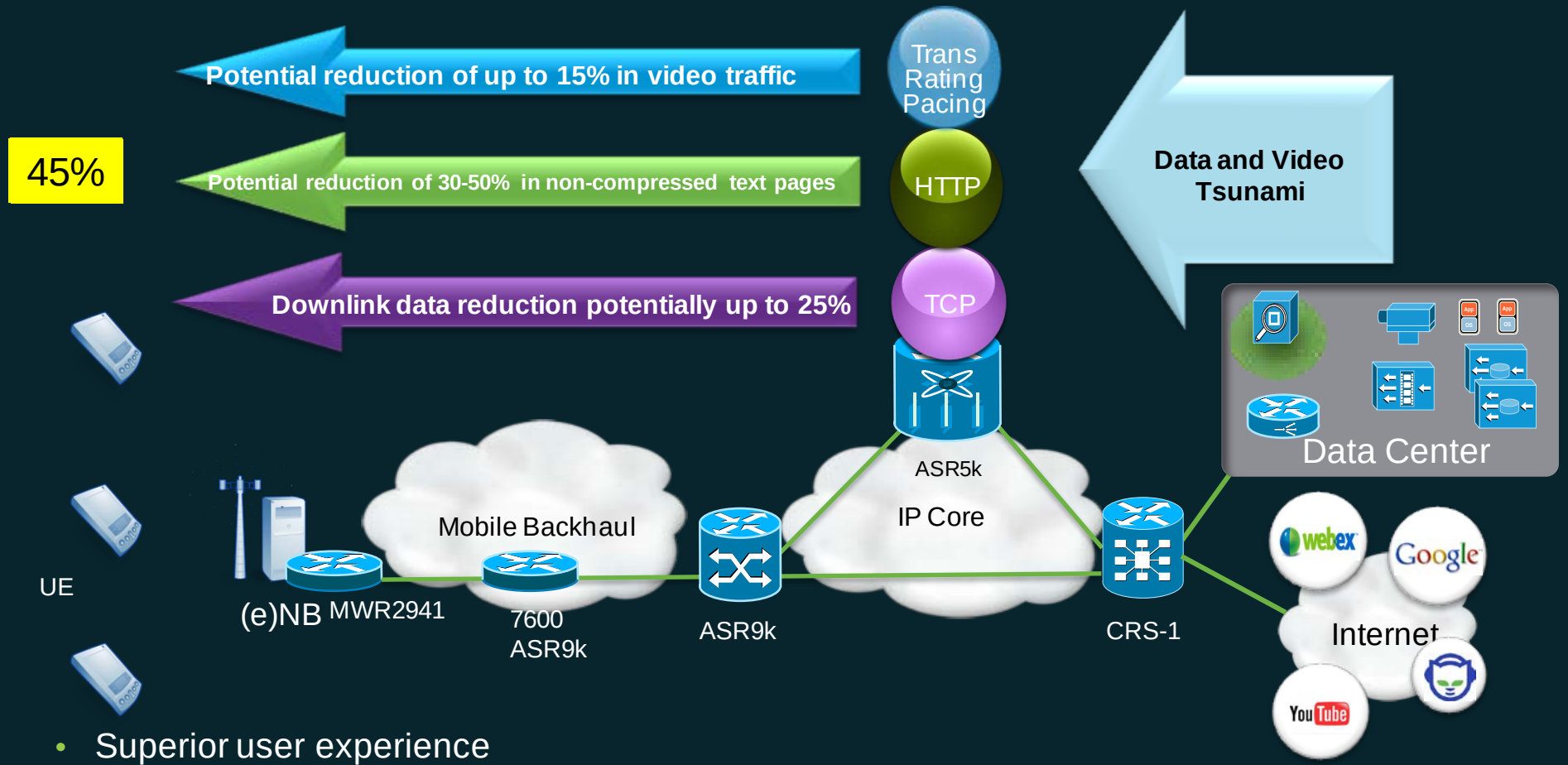
Optimized Video

Video Optimization

- Video will make significant share of mobile traffic
- Video can be optimize without loosing the information value
- Optimization for better user experience
  - Video adapted to the network quality
  - Right size for the screen
  - Less packet-loss through localization of content
  - Service independence of access
- Optimization for CAPEX/OPEX reduction
  - Up to 45% less traffic
  - Up to 30% less RAN costs
  - Reduced churn rate

Traffic Packet Optimization

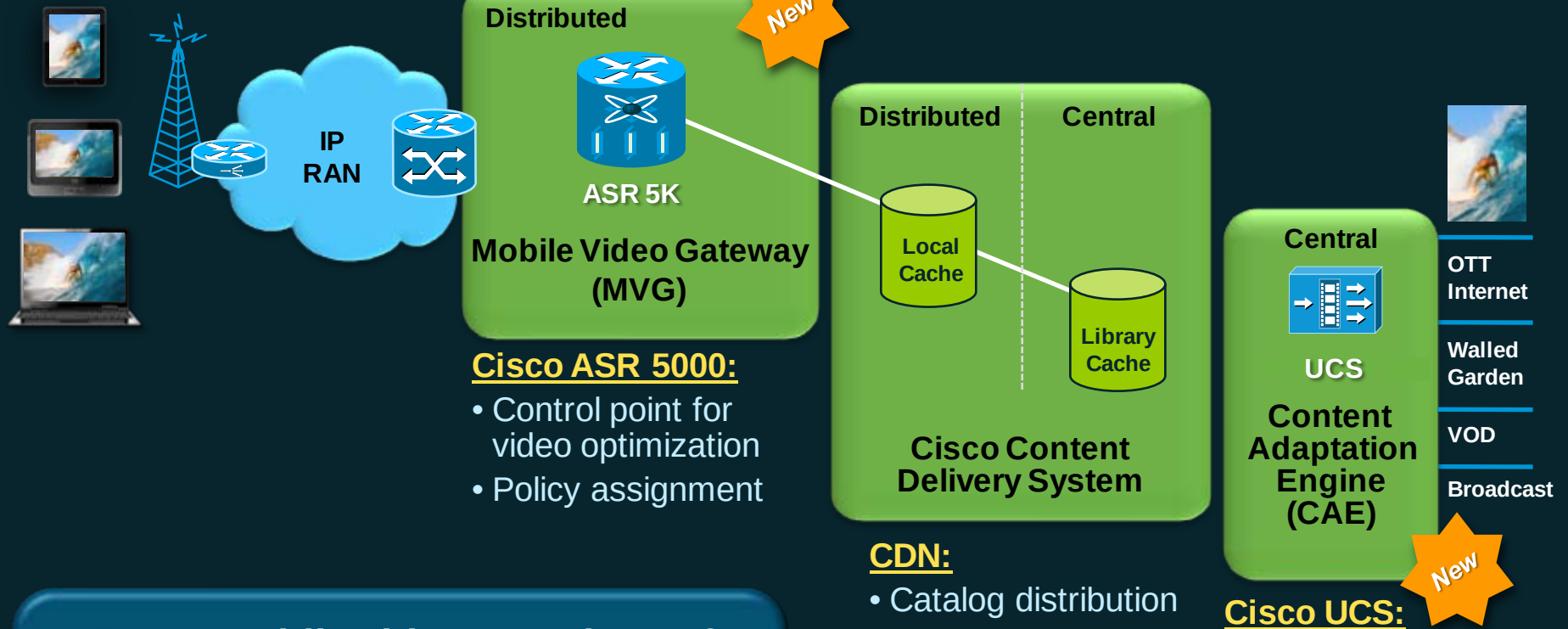
TCP, HTTP, Transrating, Pacing



- Superior user experience
- Superior mobile bandwidth utilization
- Solutions for both data and video
- In-line capabilities reduce Opex and additional 30-40% over external solutions

Cisco Mobile Videoscape Solution

Better video experience at lower cost



Cisco ASR 5000:

- Control point for video optimization
- Policy assignment

CDN:

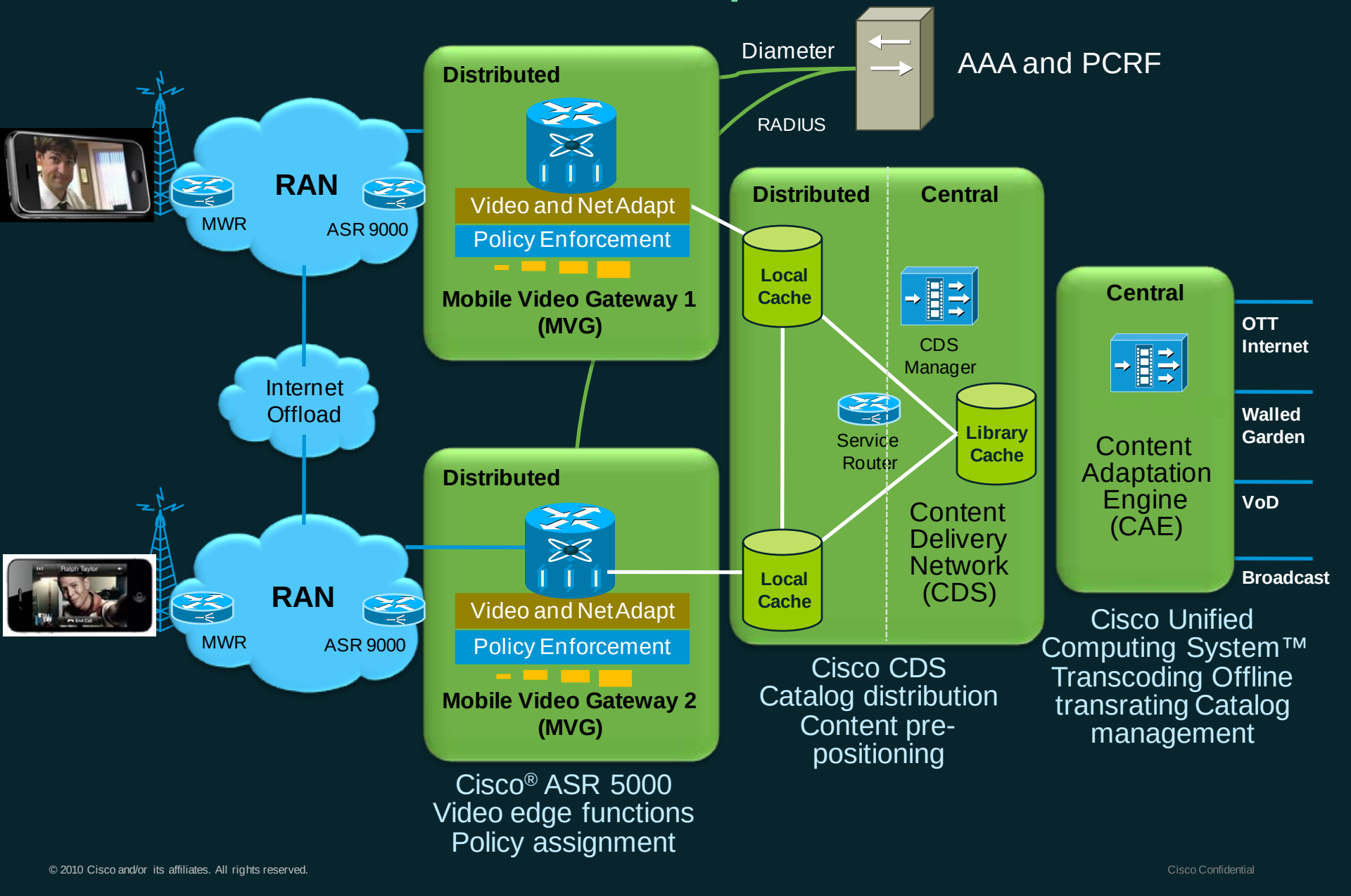
- Catalog distribution
- Content pre-positioning

Cisco UCS:

- Transcoding offline
- Transrating
- Catalog management

- **Better mobile video experience for end users**
- **Less cost and more revenues for operators**

Cisco Mobile Videoscape Solution



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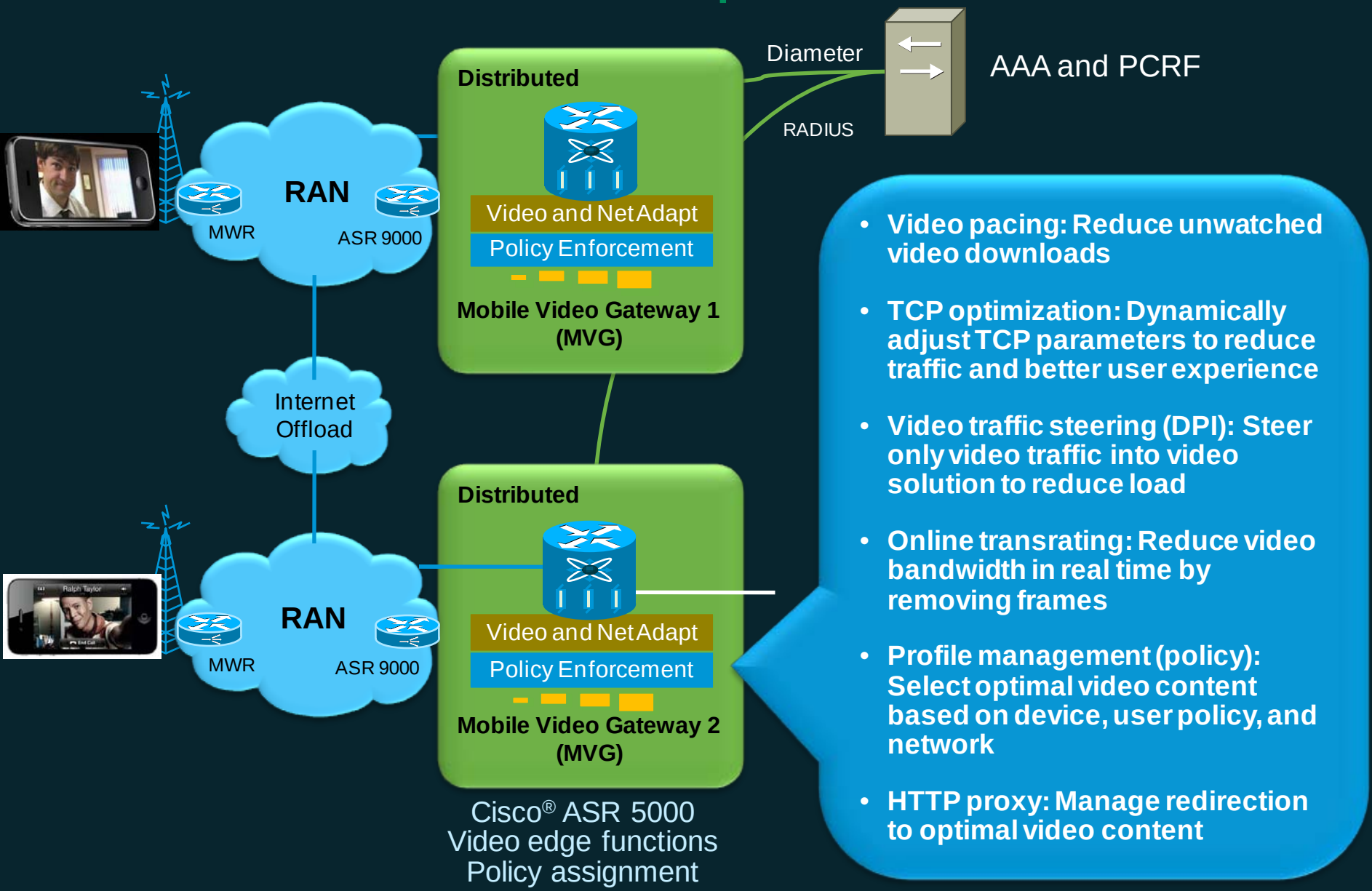

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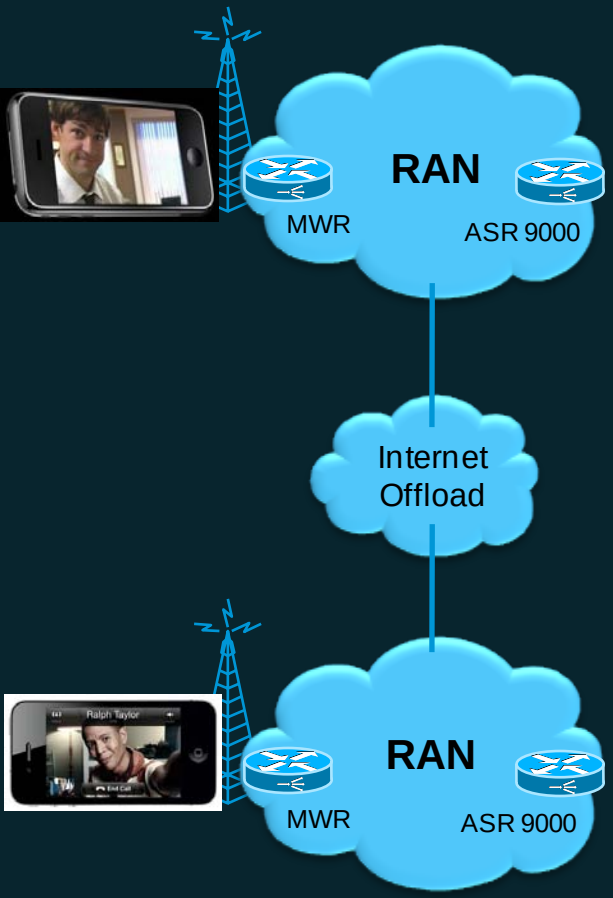
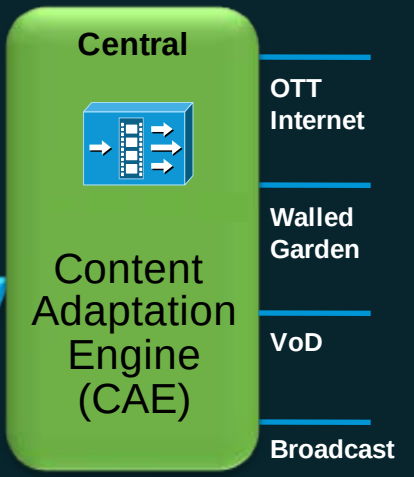


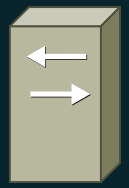
- **Bulk transcoding: Transforms video codec to optimize for device**
- **Bulk transrating: Reduces video bandwidth in background by decoding and reencoding**
- **Transwrapping: Transforms video file type to optimize for device**
- **Catalog management: Delivers optimal versions of video based on device, user policy, and network**
- **Video streaming preparation: Segments content for adaptive bit rate streaming**



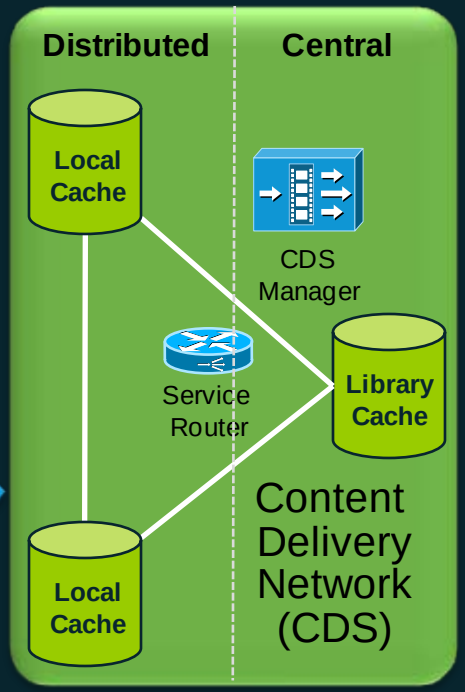
Cisco Unified Computing System™ Transcoding Offline transrating Catalog management

Cisco Mobile Videoscape Solution

- **Central caching: Stores transcoded content to prevent retranscoding**
- **Distributed caching: Moves transcoded content closer to user**
- **Catalog distribution: Delivers optimal versions of video based on device, user policy, and network**
- **Content pre-positioning: Moves transcoded content to optimal location**
- **Video streaming: Supports adaptive bit rate streaming**

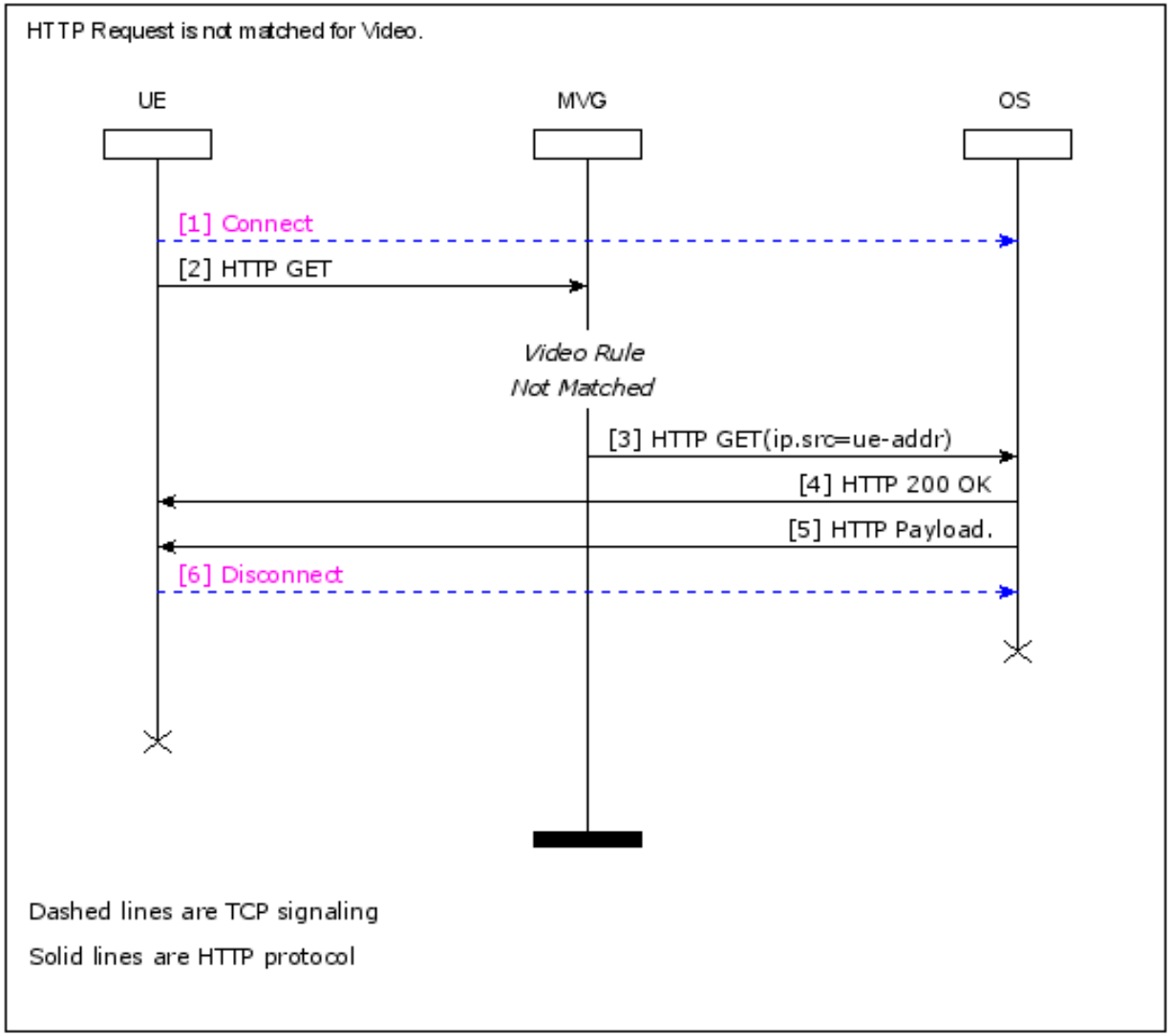


AAA and PCRF

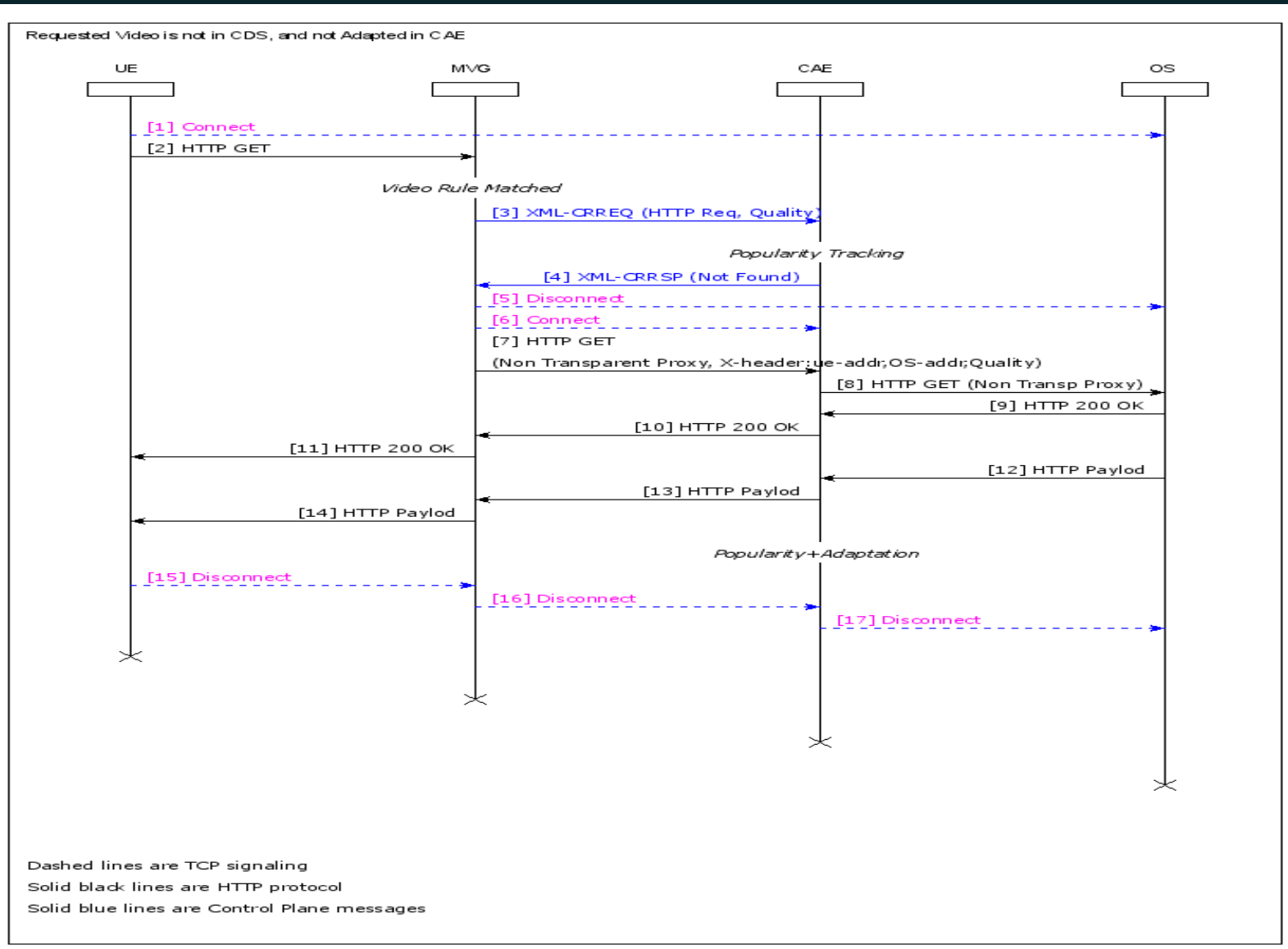


Cisco CDS
Catalog distribution
Content pre-positioning

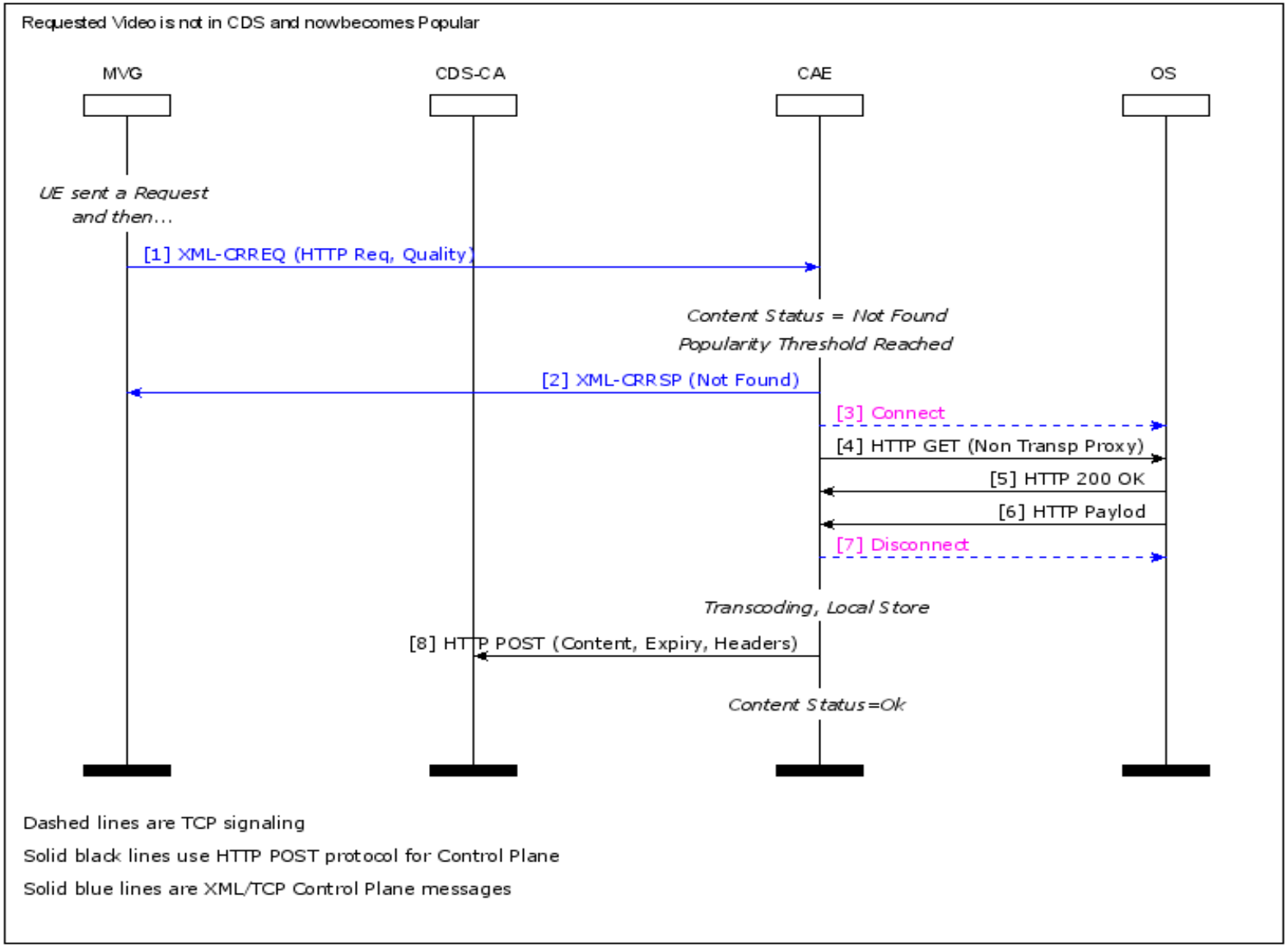
Mobile non video content



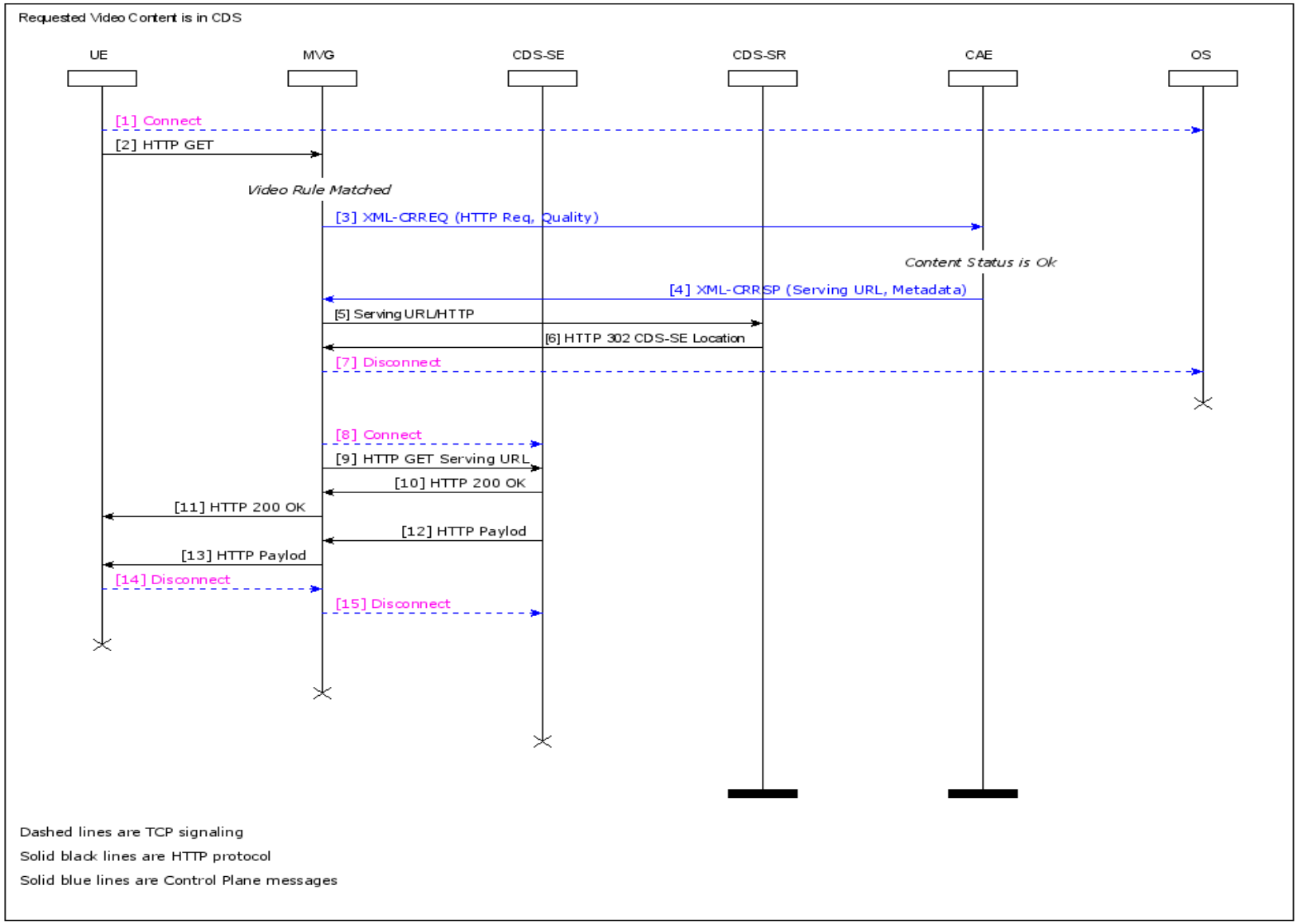
Mobile Video Content Not Available in CDS/CAE



Mobile Video CAE Offline Trans-rating/coding



Mobile Video Content Available in CDS



Mobile Videoscape Business Analysis

New

Mobile Videoscape

Optimized mobile video experience

Potential Cost Savings Up To $800M

Enable New Services e.g., $250M Premium HD

- Reduces RAN costs up to 30%
- Up to $1B ROI over 5 Years
- Based on 17M subscriber network

Monetizing Video

Turbo Boost

Gain New Revenues with Bandwidth on Demand

Control

What's the Opportunity?

- Upgrade QoS on-demand when accessing specific applications

How Will This Impact My Business?

- New revenues from users upgrading QoS on demand
- Higher uptake of upgrades when "in service"
- Expose chargeable API for OTT apps

Why Cisco?

- Integrated Charging, Application Detection & Control, Traffic Optimization, and Policy Enforcement lowers OpEx and accelerates Time-to-Market

Upgrade quality for $1.99?

Quality upgraded

Premium Mobile Video

New Customers and Revenues from Internet Video

Collaborate

What's the Opportunity?

- Offer high quality streaming internet video content to gain new subscribers and revenues
- Bundle with top data tier plan and forge content partnerships

How Will This Impact My Business?

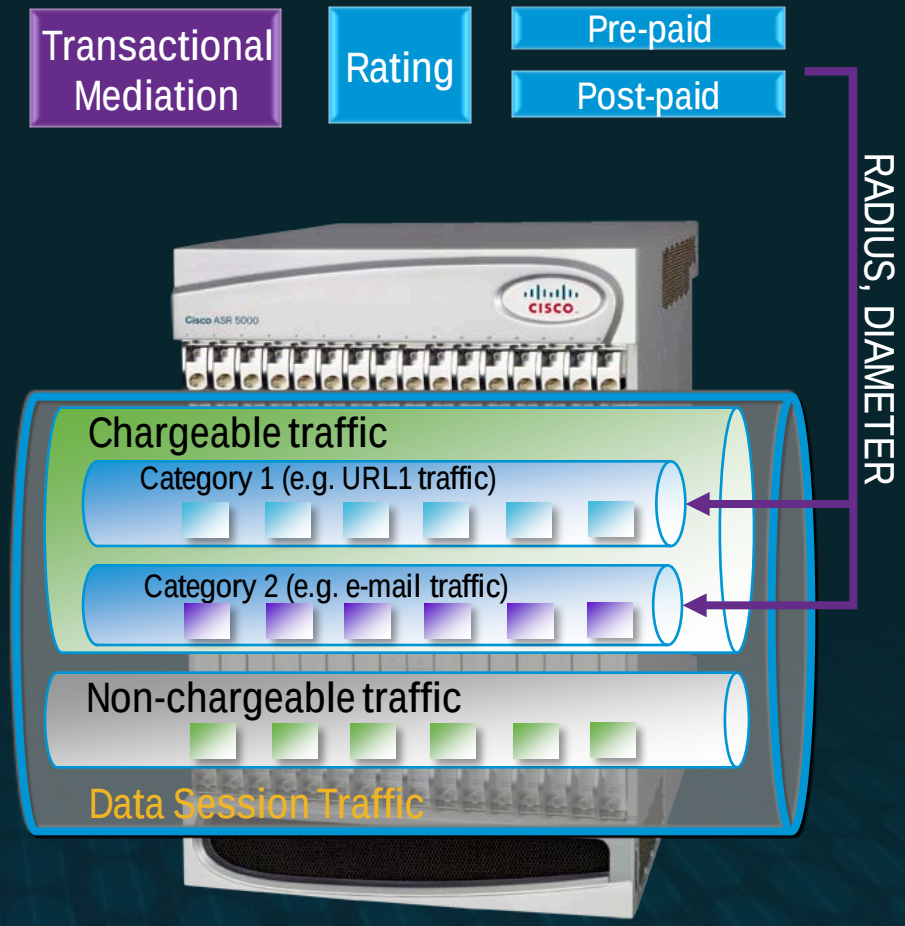
- New video services revenues
- Upsell higher priced Speed Tiers
- Expose chargeable API for OTT

Why Cisco?

- Integrated Charging, Application Detection and Control, Traffic Optimization, and Policy Enforcement lowers OpEx and accelerates Time-to-Market
- Cisco Mobile Videoscape solution

Application Charging and Policing

- Deep packet inspection
  - Layer 4
  - Layer 7
- Charging per application
  - Volume
  - Time
  - Event
- Policy enforcement per application
  - Throughput limitation
  - QoS enforcement
  - Redirect
  - Content Blocking
- Inline services



Release 7 PCC Architecture

- Database of user services
- Updated by provisioning systems or applications

- Application function
- May request special policies for particular streams dynamicaly

- Central decision point for user policies
- Collects information from AAA, SPR, Applications or PCEF
- Reacts to external events
- Can Push policies to PCEF

- Connects to IN system for balance of pre-paid services
- Translates monetary information to traffic volumes, time or events

- Policy and Charging Enforcement point
- Applies policies activated by PCRF
- Predefined policies or dynamic policies
- Traffic metering for
  - Online charging
  - Offline charging
  - Fair use services
- Deep packet inspection for application recognition

- Receives the CDRs for post-paid
- May include service level information

Conclusion

Summary

- Video as a challenge
  - Network load increases (LTE allows for higher capacities)
  - Multicast services
  - SLAs (Packet loss, failover times etc.)
- Video as an opportunity
  - Any-screen services
  - Monetization models (Turbo Button, High Quality Video etc.)
- Network must have specific capabilities to address the Video traffic efficiently (Multicast, QoS, Optimization, Policy Control etc.)

Thank you.