

SCTE CABLE-TEC
EXPO'13
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UPDATE ON CARRIER WI-FI

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ARRIS

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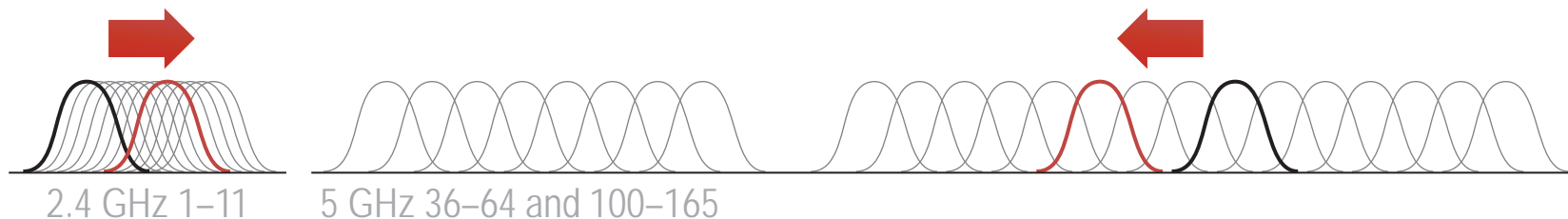
Agenda

- ▶ Carrier-class Wi-Fi
 1. Hotspot 2.0
 2. 802.11ac
 3. Antenna technology
 4. Fast handoff technology
 5. Convergence of Wi-Fi & small cells
- ▶ Carrier-class Wi-Fi backhaul: HFC Network Evolution
- ▶ Questions



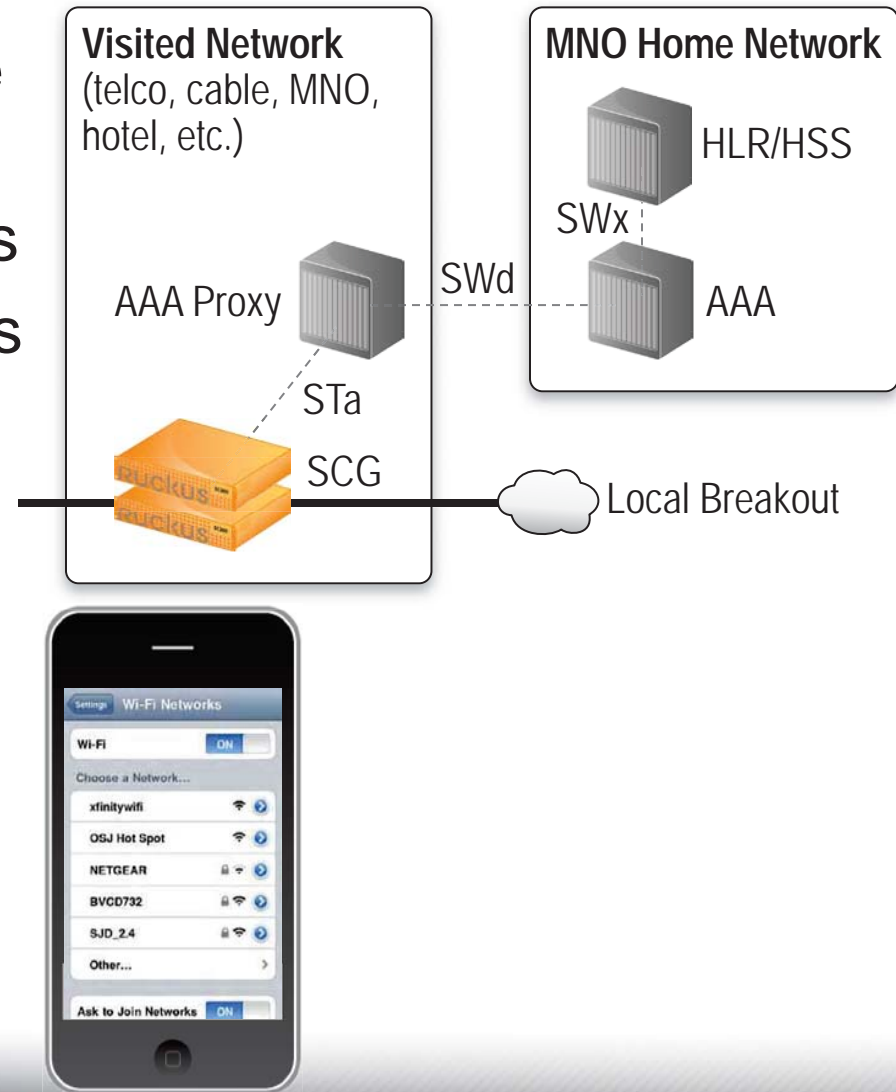
Carrier Wi-Fi

- ▶ Upwards of 600 MHz of spectrum
- ▶ Neutral-hosting
- ▶ Worldwide spectrum harmonization
- ▶ Broadly deployed in networks and devices SON capabilities
- ▶ Advanced antenna technologies
- ▶ New capabilities emerging like HS2.0, ANDSF, 802.11ac, SaMOG, etc.



Hotspot 2.0: the future of Wi-Fi

- ▶ Makes Wi-Fi as easy to use and secure as cellular
- ▶ ...including non-SIM devices
- ▶ User is automatically always best connected
- ▶ Hotspot 2.0 enables seamless Wi-Fi roaming:
 - Automatic network discovery and authentication
 - Airlink security
 - Online signup for non-SIM plus operator policy
 - Ruckus is a major driving force in Hotspot 2.0



Industry Organizations



802.11u

Rated in 2011

Defines how to
“interwork” with
external
networks

Creates a
framework for
APs to advertise
external services

HOTSPOT 2.0

- HS 2.0 is the name of the program and technology
- Passpoint is the certification name for APs and clients

NEXT GEN HOTSPOT

- NGH trials throughout 2012
- Tests backend infrastructure integration, particularly for authentication and roaming

WBA Joint TF

- Existing program for cross-MSO roaming (CableWiFi)
- Harmonizing framework with WBA to support cross-industry roaming

RELEASE SCHEDULE

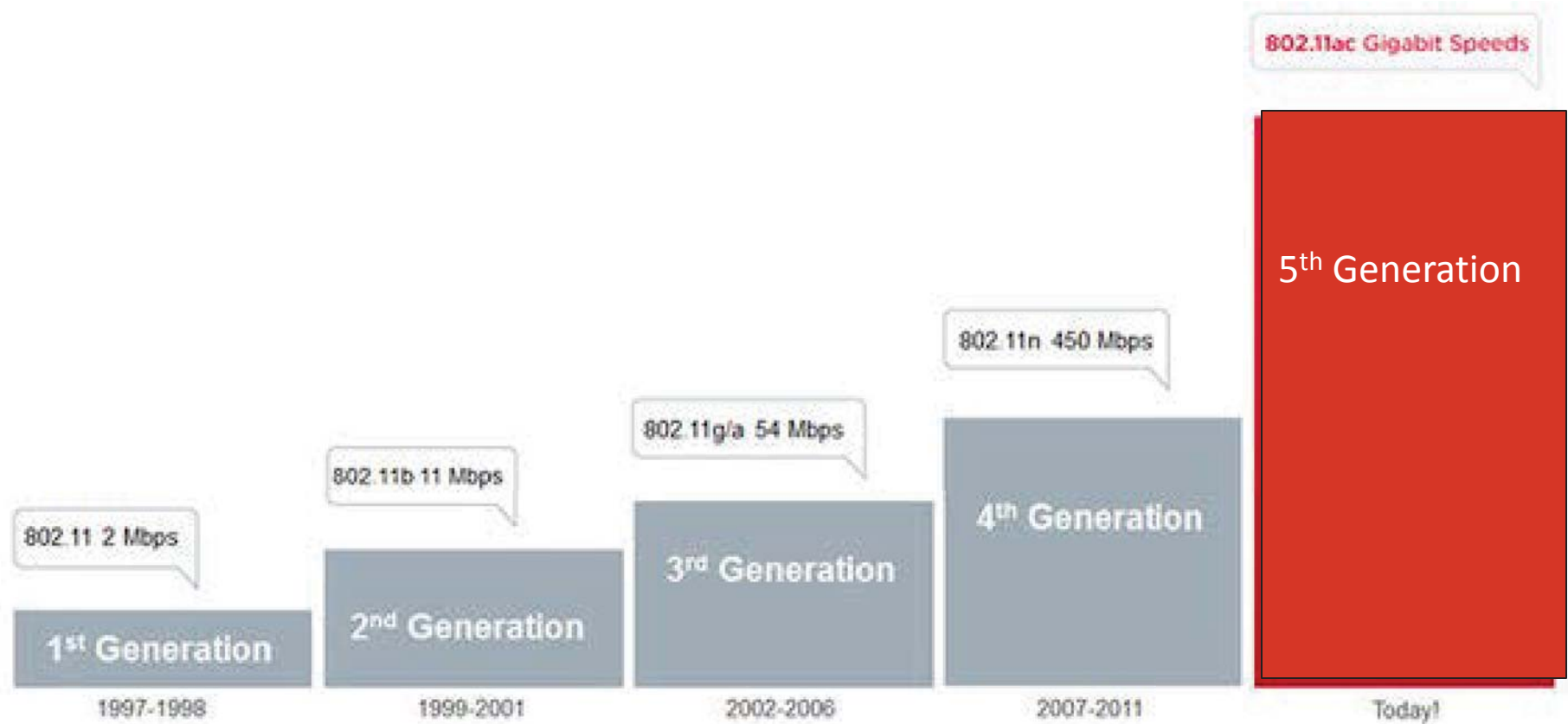
- **Release 1:** Network Selection and Security (launched June 2012)
- **Release 2:** Credential and Policy Provisioning (planned launch 2H13)
- **Release 3:** In development

For more on Hotspot 2.0

- ▶ Dave Stephenson, Senior Principal Engineer at Ruckus Wireless talk about the impact of Hotspot 2.0
- ▶ <http://www.ruckuswireless.com>



Faster Wi-Fi with 802.11ac



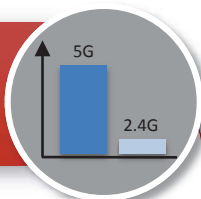
An Overview

Specs



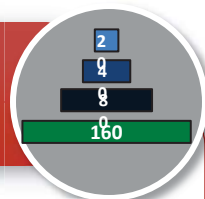
- Breaks “gigabit” barrier

5 GHz Only



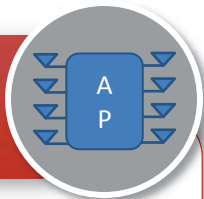
- Encourages 5G adoption
- Focuses on capacity-rich, low-interference spectrum
- Benefits entire Wi-Fi ecosystem

80/160 MHz channels



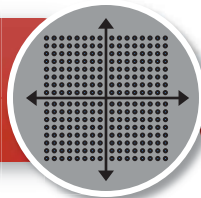
- Very wide channels
- Primary reason for 11ac's very high data rates

Up to 8 spatial streams



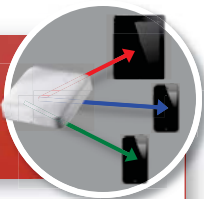
- N-fold efficiency improvement
- Increases radio complexity, power draw, and cost
- Requires client-side support
- Not possible today

256-QAM



- More efficient modulation
- 33% data rate gains
- Very short ranges only
- Requires 11ac clients

Multi-user MIMO

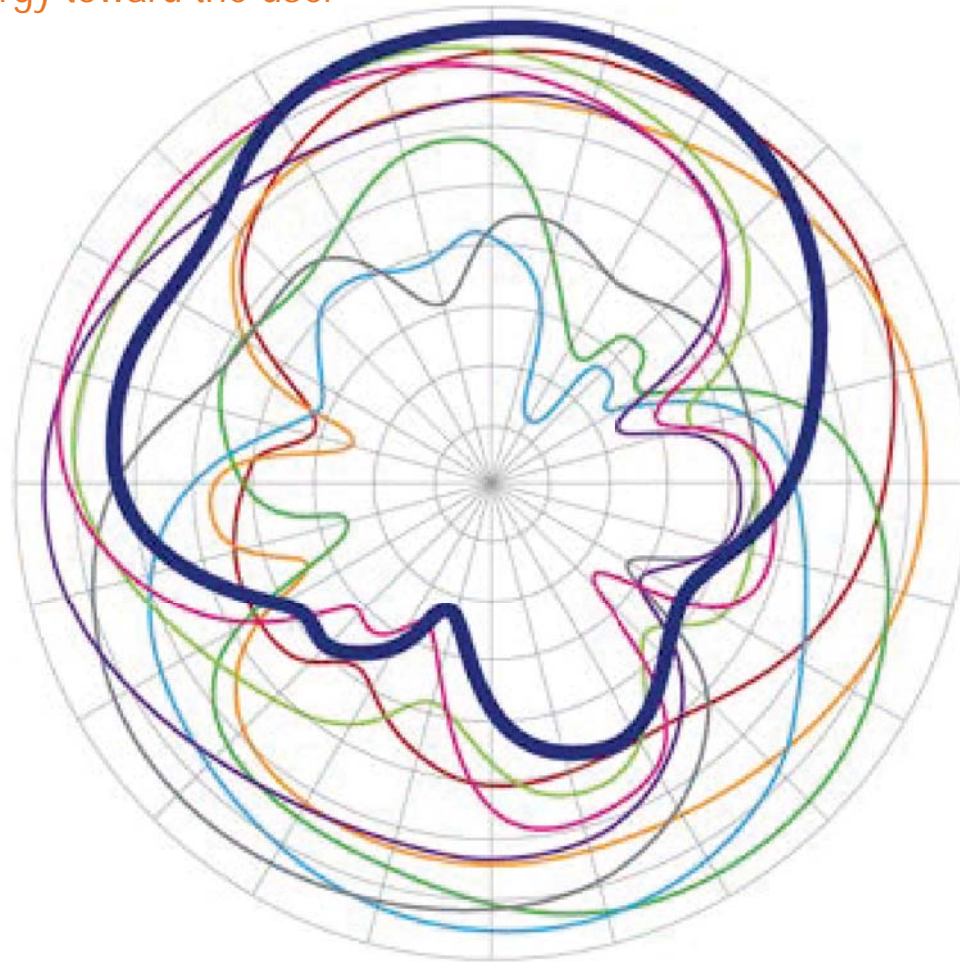


- Simultaneous downlink Tx to single-stream clients
- Multiplies network capacity
- Key differentiator from 802.11n

Adaptive Antennas

Steering RF energy toward the user

Up to 6 dB of gain



Up to 15 dB of interference mitigation



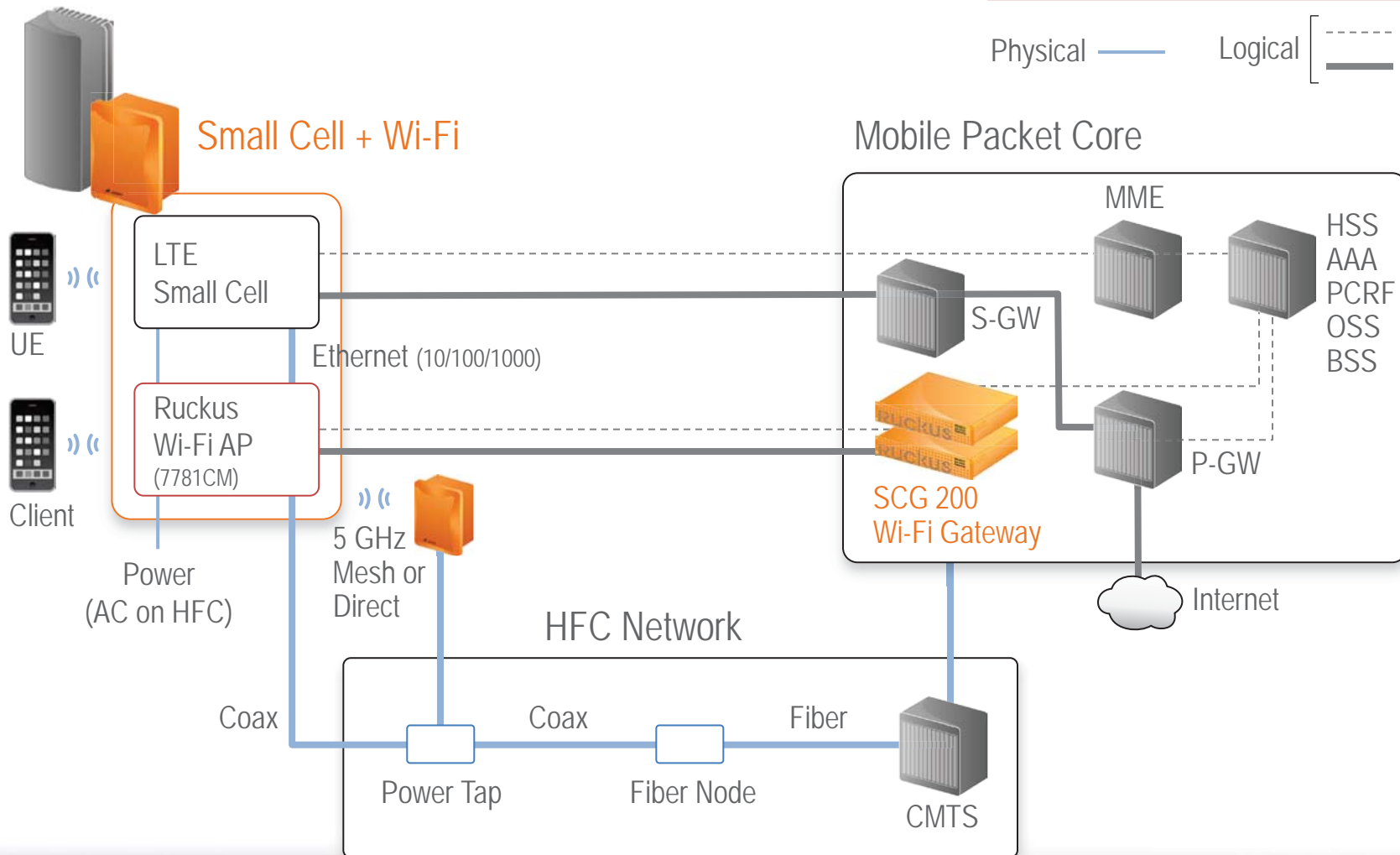
Fast handoff and load balancing

- ▶ Seamless Wi-Fi handoffs:
 - Fast, secure, scalable Wi-Fi handoffs via 802.11r
 - Wi-Fi load balancing via 802.11k
- ▶ Cellular to Wi-Fi handoffs:
 - User directed today
 - HS2.0 and ANDSF policy-directed in future
 - Seamless handoffs with session persistence in future



Small-Cell backhaul over HFC

Connections Legend



The timing of small cells

- ▶ LTE small cells will emerge in late 2014 and into 2015
- ▶ Will most likely be deployed outdoors
- ▶ Will most likely be deployed with Wi-Fi
- ▶ Site acquisition will continue to be a major challenge
- ▶ Will most likely be deployed on the macro cell carrier
- ▶ Will help increase network capacity
- ▶ There will be a roll for MSOs



Summary

- ▶ The Carrier Wi-Fi story keeps getting stronger
- ▶ A host of new technologies are set to emerge
- ▶ The timing couldn't be better as demand just keeps increasing for data services
- ▶ Ruckus will continue its strong focus on the carrier Wi-Fi market



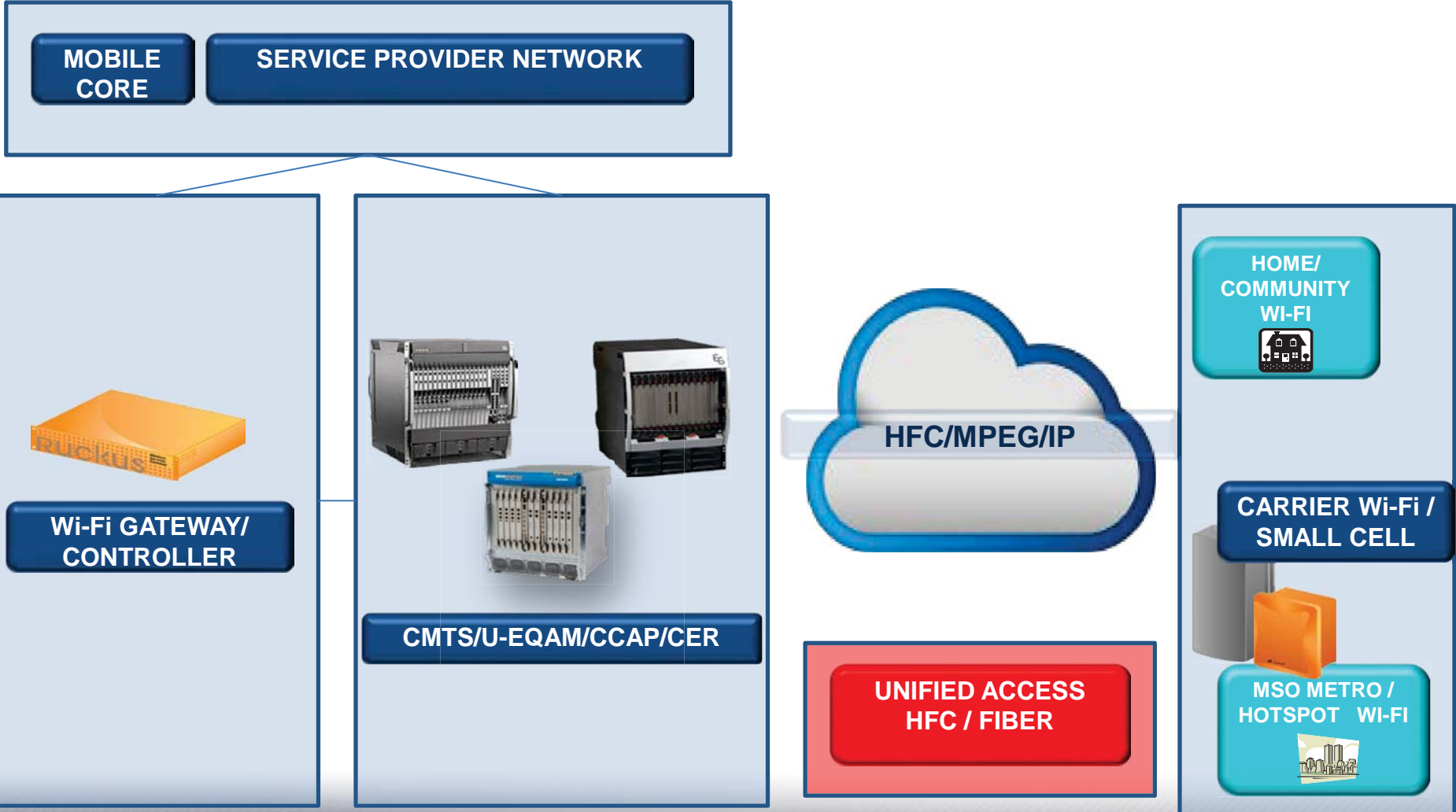
Next Gen HFC Networks

Update on backhaul and headend systems

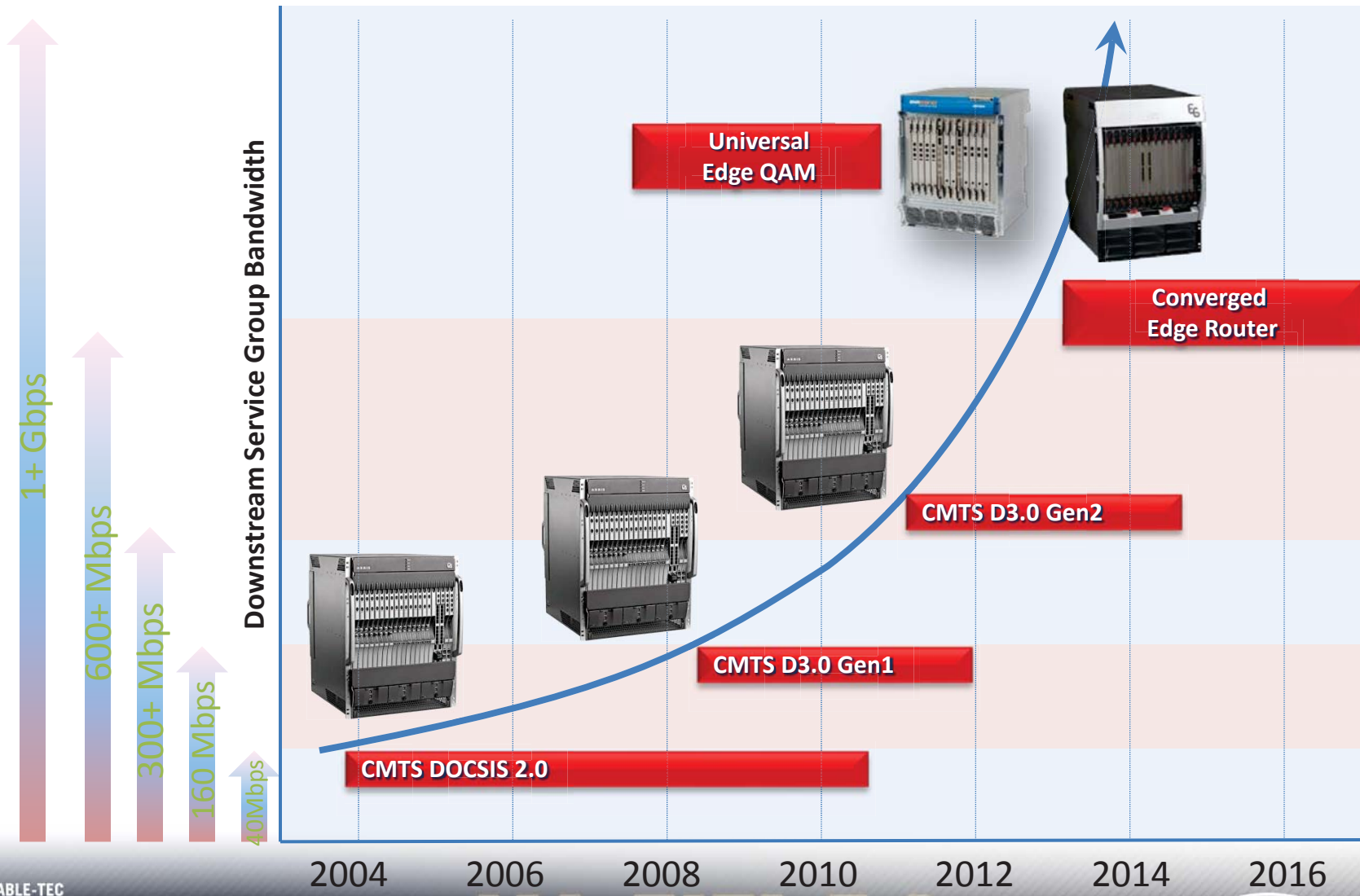
- ▶ Evolutionary strategy: towards IP networks and virtualized services
 - CCAP and Converged Edge Routers
 - Multi-screen Video Platforms



CCAP and Converged Edge Routers



CMTS Edge Router Evolution

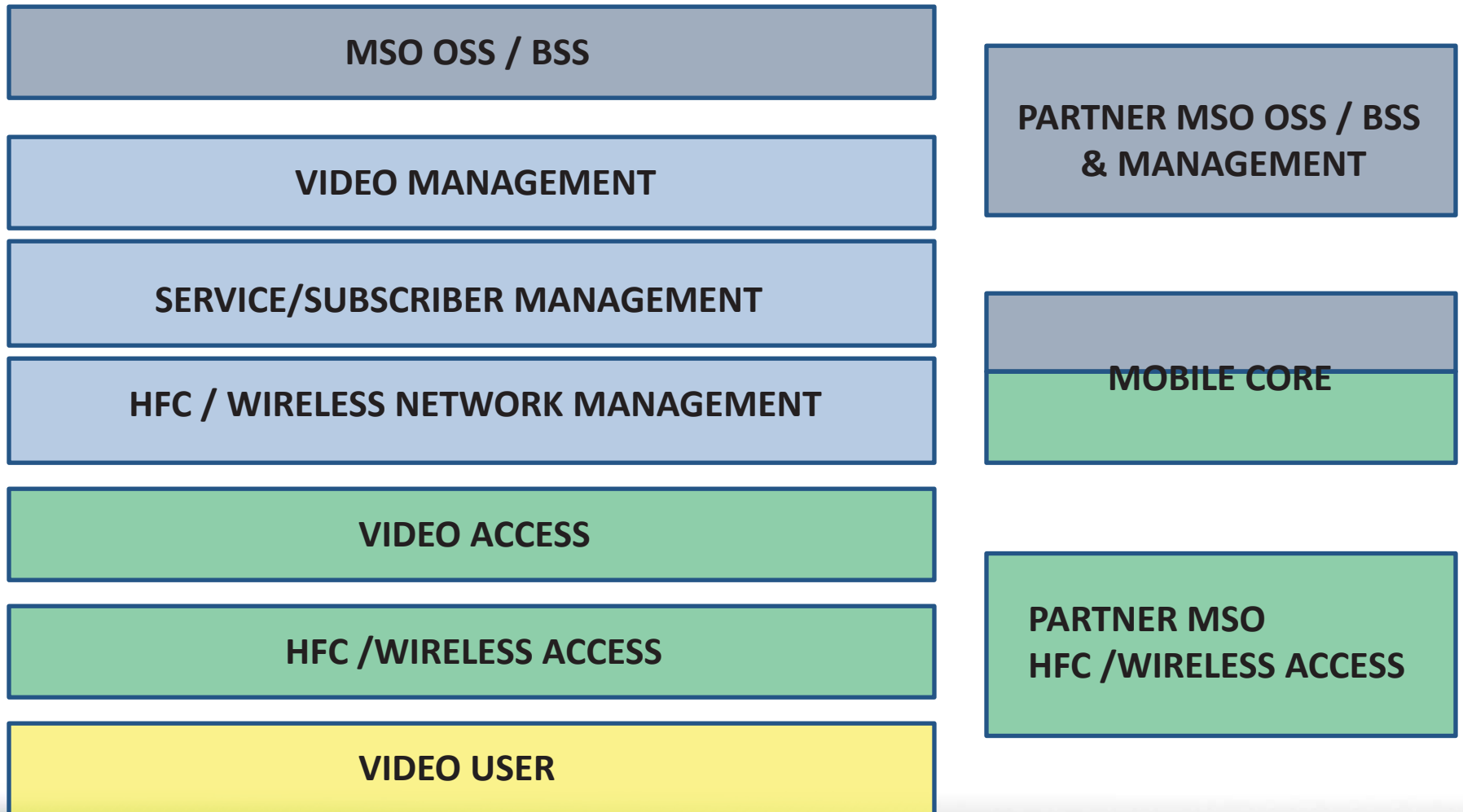


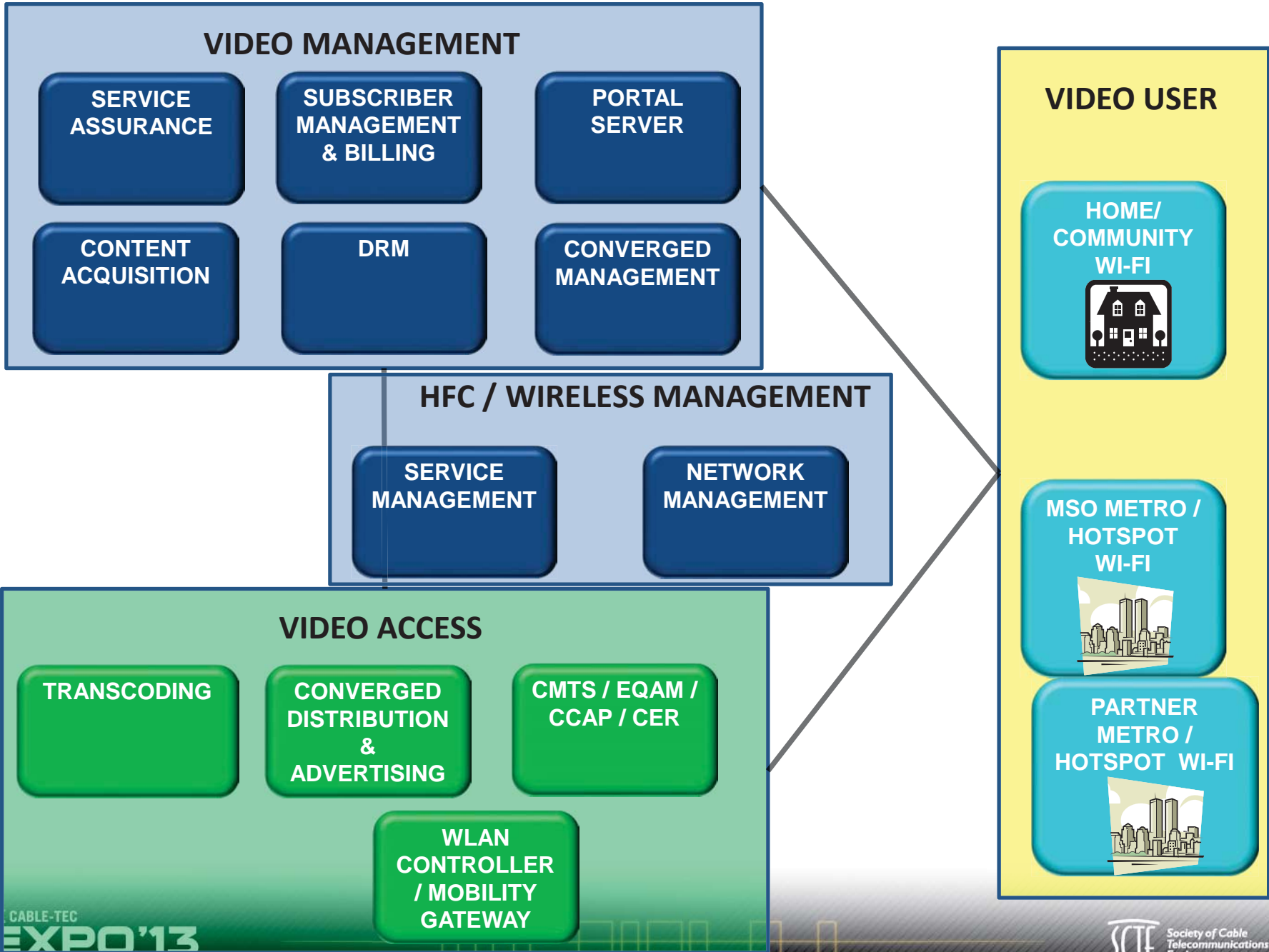
CER Evolution and Carrier Wi-Fi

- ▶ Unified Services and Resource Management
 - More integrated Wi-Fi traffic and management
- ▶ Higher bandwidth with more cost efficiency
 - Suitable for new high bw APs and carrier grade Wi-Fi services
- ▶ Transport-agnostic network architecture
 - APs with coax/fiber backhaul connected to the same platform
- ▶ Configuration and Management Simplifications
 - Simplified Wi-Fi deployment and integration with backhaul
- ▶ IP Routing
 - Towards IP communications with more provider services available over Wi-Fi



Next Gen Video Services over Cable Wi-Fi Networks





Video over Cable Wi-Fi

- ▶ User authentication and content protection
 - Seamless access to both networks (roaming, handoff) and services
 - Authentication of APs and wireless users
 - Secure wireless traffic and content protection, DRM...
- ▶ Access to content
 - Device agnostic, seamless, secure (at home and visited networks)
- ▶ Carrier Video Quality of Experience
 - Different channel and usage characteristics: interference mitigation and congestion control
 - End-to-end QoS provisioning
 - Network-based ABR assisted with client-based ABR



Video over Cable Wi-Fi

- ▶ Integrated policy and charging functionality
 - Usage/time based (at home and visited networks)
- ▶ Business intelligence and user behavior analytics
 - Both wireless and video data
 - Correlation based on user, device, content, location, time
 - Personal and location based aggregate behavior
 - Advertising and location based services



Conclusion

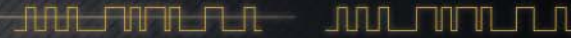
▶ Carrier Wi-Fi Technologies

- The Carrier Wi-Fi story keeps getting stronger
- A host of new technologies are set to emerge

▶ Backhaul Solutions:

- Evolutionary strategy by leveraging and updating existing technology
 - Wi-Fi Access Networks and Interworking
 - Converged Edge Routers and Multi-screen Services
- Hybrid Systems with corresponding APIs





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