TR-069 and TR-104 Overview

For SIP Forum UA Config Group Meeting
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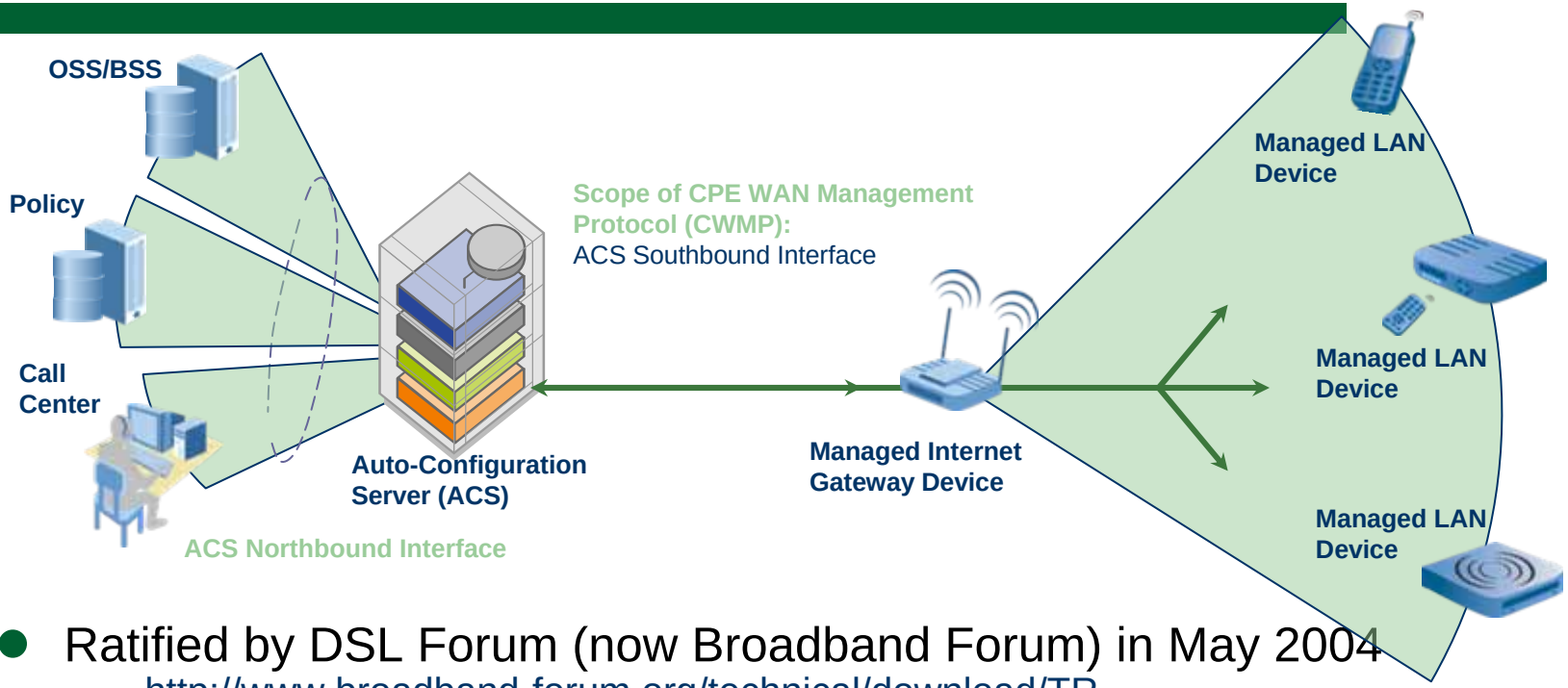
William Lupton, 2Wire
(with thanks to Heather Kirksey, Alcatel-Lucent)

TR-069 Architectural Framework

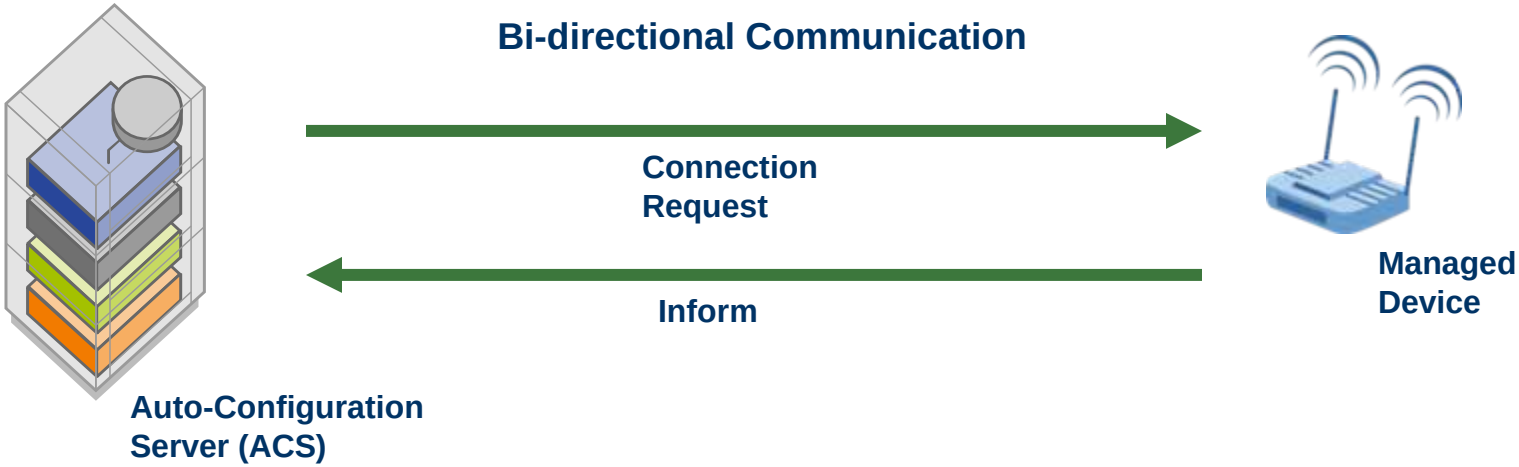


- Ratified by DSL Forum (now Broadband Forum) in May 2004
  - http://www.broadband-forum.org/technical/download/TR-069Amendment2.pdf
  - Amendment 1 ratified in December 2006
  - Amendment 2 ratified in December 2007
- Management Functions
  - Auto Configuration
  - Service Provisioning
  - Firmware Management
  - Diagnostics
  - Fault and Performance Monitoring

TR-069 Terminology

ACS	Auto-Configuration Server. This is a component in the broadband network responsible for auto-configuration of the CPE for advanced services.
CPE	Customer Premise Equipment. A DSL B-NT is one form of broadband CPE.
B-NT	Broadband Network Termination or in the context of TR-069, a broadband access CPE device capable of being managed by an ACS.
Internet Gateway Device	A CPE device that is either a B-NT or a broadband router.
NBI	Northbound Interface
NBS	Northbound System (e.g OSS)
OSS	Operations Support Systems
Parameter	A name-value pair representing a manageable CPE parameter made accessible to an ACS for reading and/or writing.
RPC	Remote procedure call
Session	A contiguous sequence of transactions between a CPE and an ACS.

TR-069: CWMP Protocol



ACS Discovery

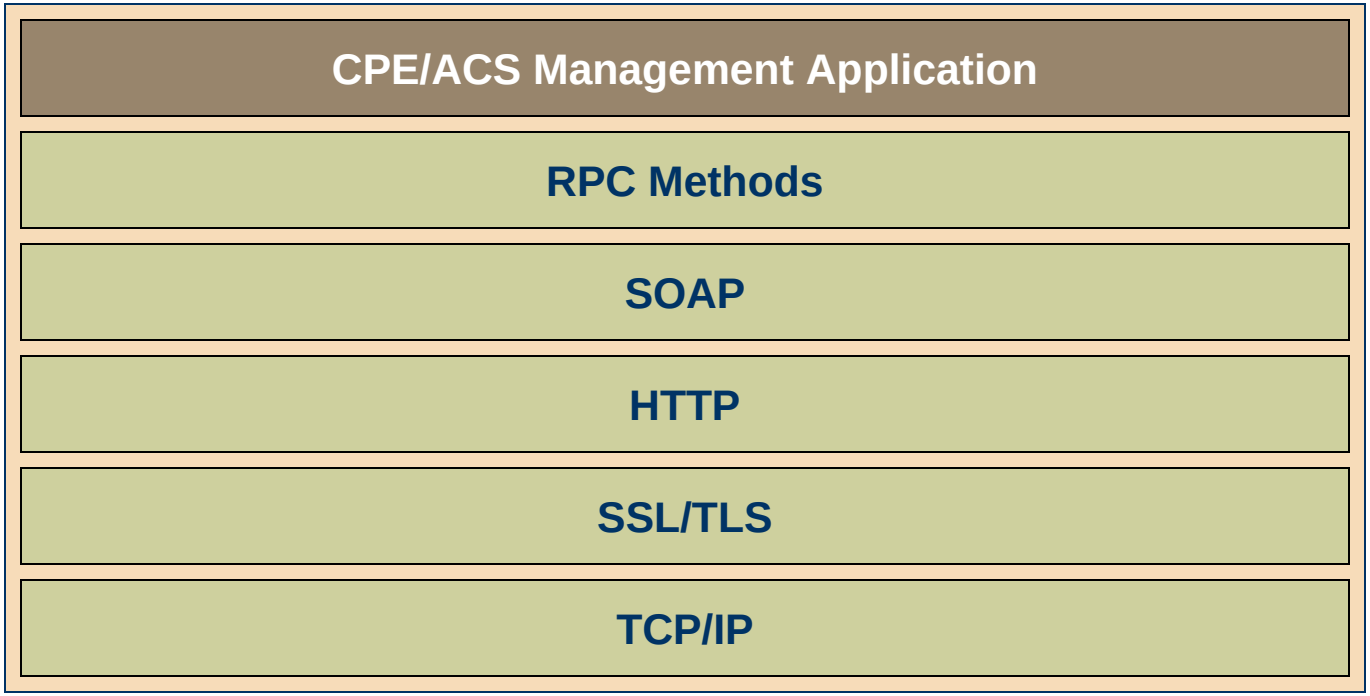
CWMP Connection Initiation

- Bootstrap – first connect to network
- Requested by ACS – Scheduled or immediately
- Asynchronous Notifications
  - > Active – as soon as value changes
  - > Passive – report value next inform

Device Control

- Get, Set Parameter Values and Attributes
- Add, Delete Objects
- Reboot, Reset to Factory Defaults
- Initiate Firmware Download
- Initiate diagnostic tests

TR-069 CWMP Protocol Stack



- Built on web protocols (no dependence on access technology)
  - Standards-based
  - Built-in security
  - Reduces implementation burden
- Active interoperability program
- Management applications are an area for innovation

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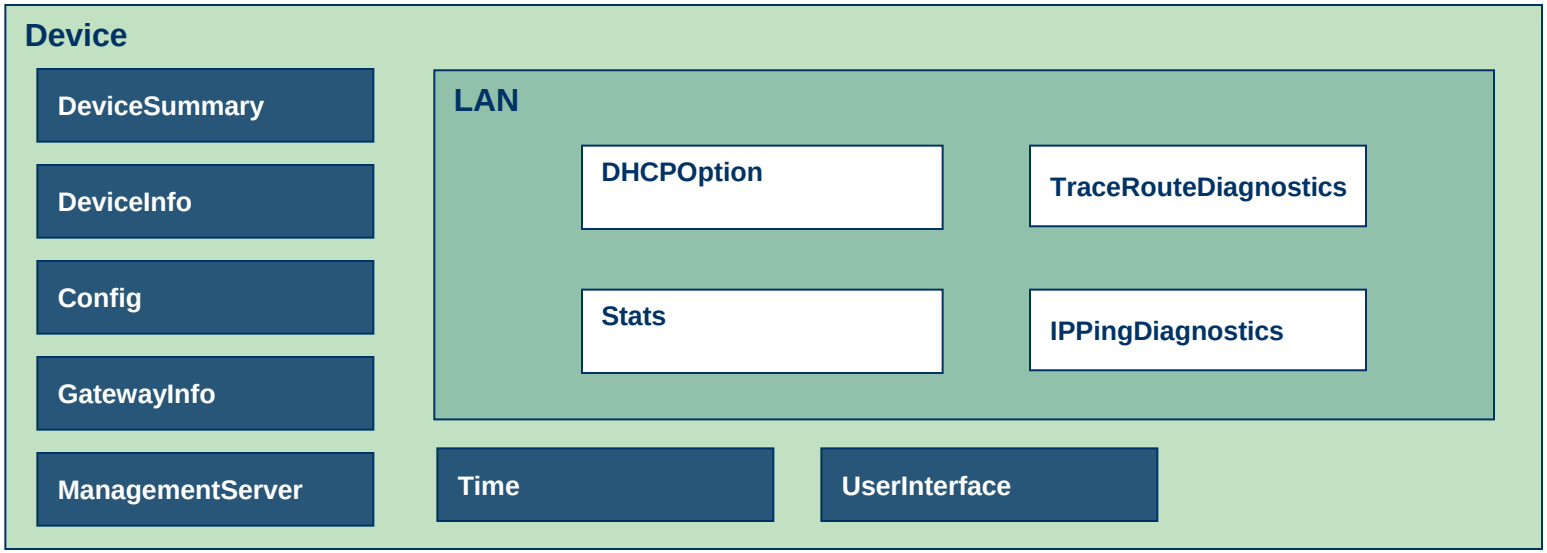
TR-106 Device



- **TR-106 Defines general template for data model definition**
  - Rules for embedding service objects
    - > TR-106 Root Device + TR-104 Voice Service object = Standalone ATA gateway
    - > TR-098 IGD + TR-104 Voice Service object = Gateway with embedded ATA
    - > TR-106 + TR-135 Video Service object + TR-140 Storage Service object = Standalone STB with embedded storage (PVR)
    - > Embedded devices and services could be proxy devices (opaque to ACS)
  - Rules for deprecation and obsolescence
  - Rules for profiles
- **Additionally defines common objects for LAN devices**

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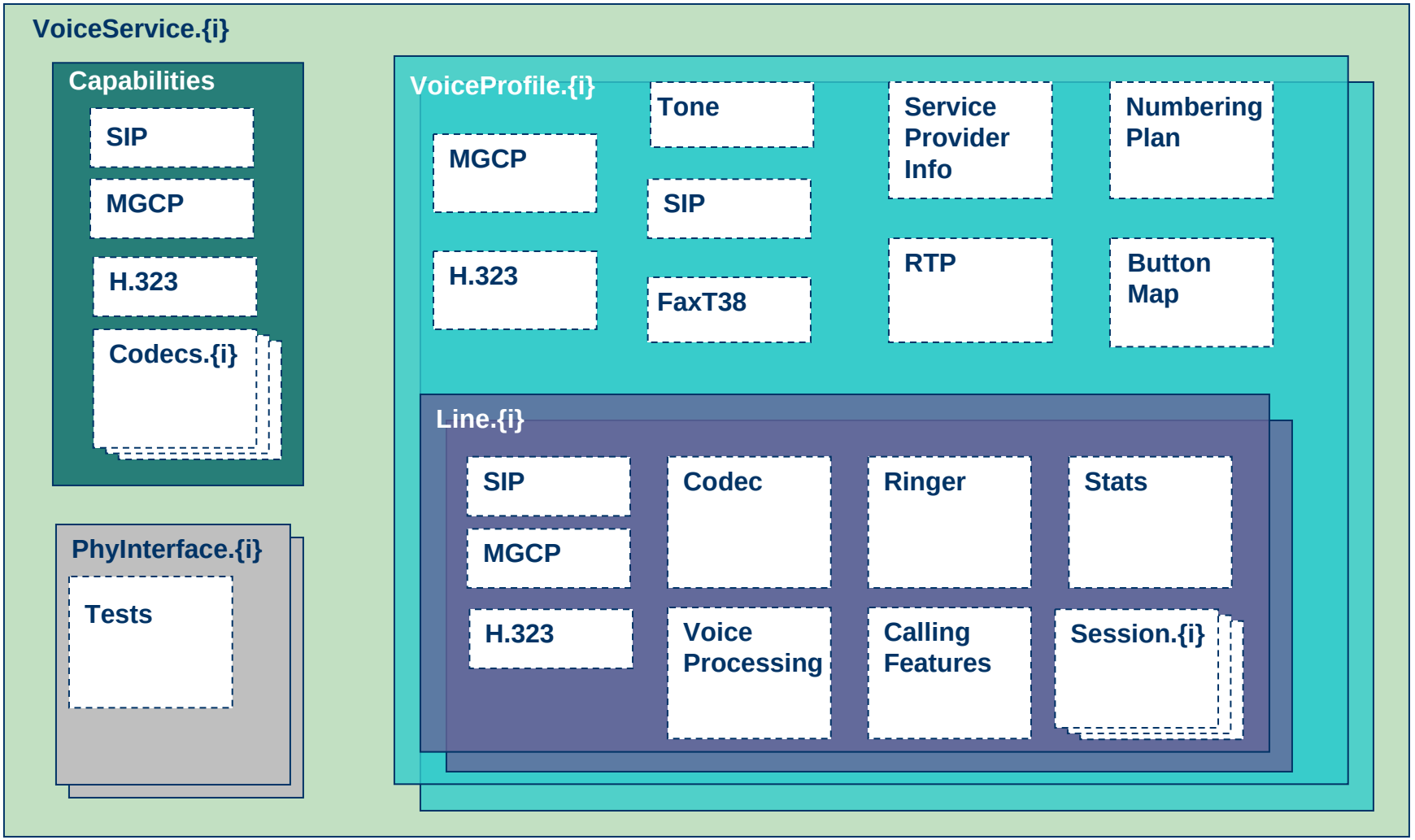
TR-104 VoIP Provisioning Data Model

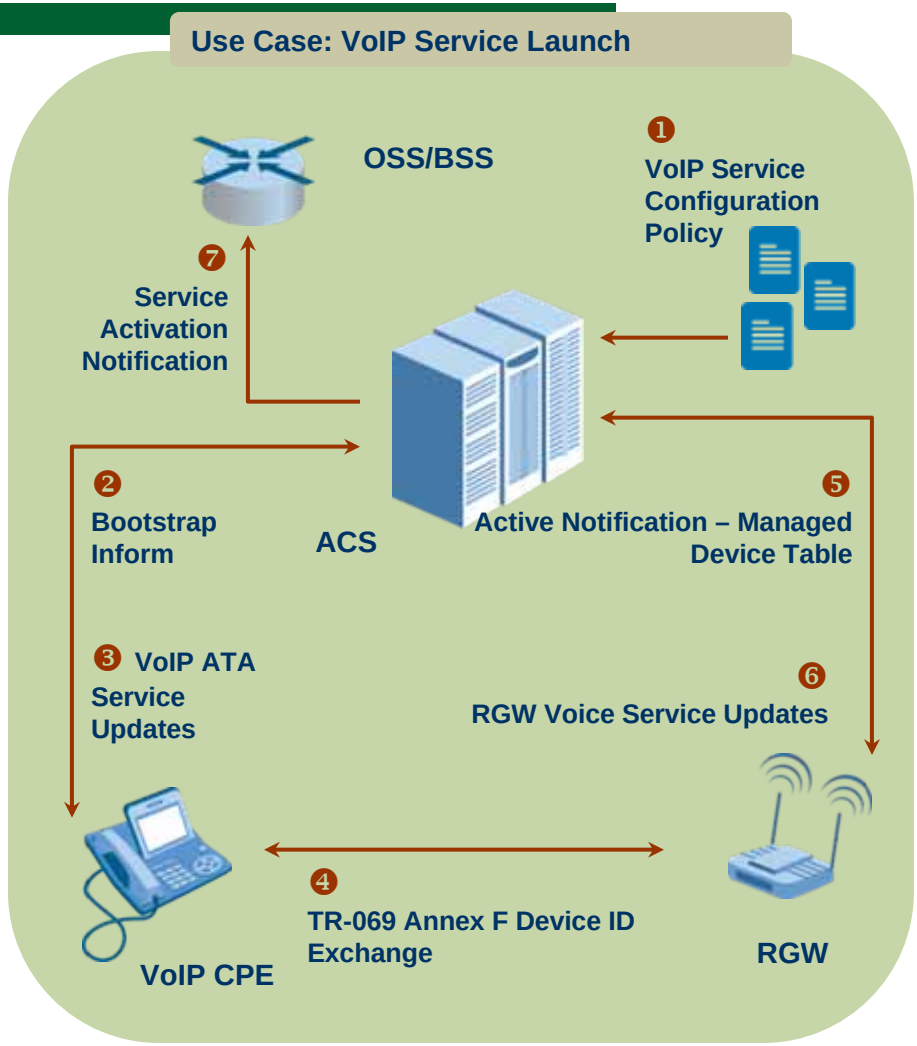


TR-104 Example SIP Parameters

- SIP Capabilities
  - Role (*UA, B2BUA, OutboundProxy)*
  - Extensions
  - Transports
  - URI schemes
  - Event subscription
  - Response map
  - TLS (authentication, encryption, key exchange)
- SIP UA configurable parameters
  - Proxy server, registrar server, user agent, outbound proxy (address, port, transport)
  - Organization, registration period, timers
  - Inbound authentication
  - Outbound QoS settings, event subscriptions, response maps

VoIP Service Provisioning

- Service Activation
  - SP creates VoIP service profile in ACS DB
  - When ATA initiates Bootstrap session, ACS matches device ID to profile and configures device
  - RGW sends Notification of addition to Managed Device table
    - Notification enabled previously
  - ACS correlates RGW to VoIP policy and ATA, optimizes device for VoIP traffic
  - ACS can send billing or other event to back-end systems
- Benefits
  - ACS able to remotely configure new and existing devices without subscriber interaction
    - Configuration of multiple devices involved in delivering VoIP service
  - Reduced costs, increased customer satisfaction, improved time to market



TR-069 Benefits

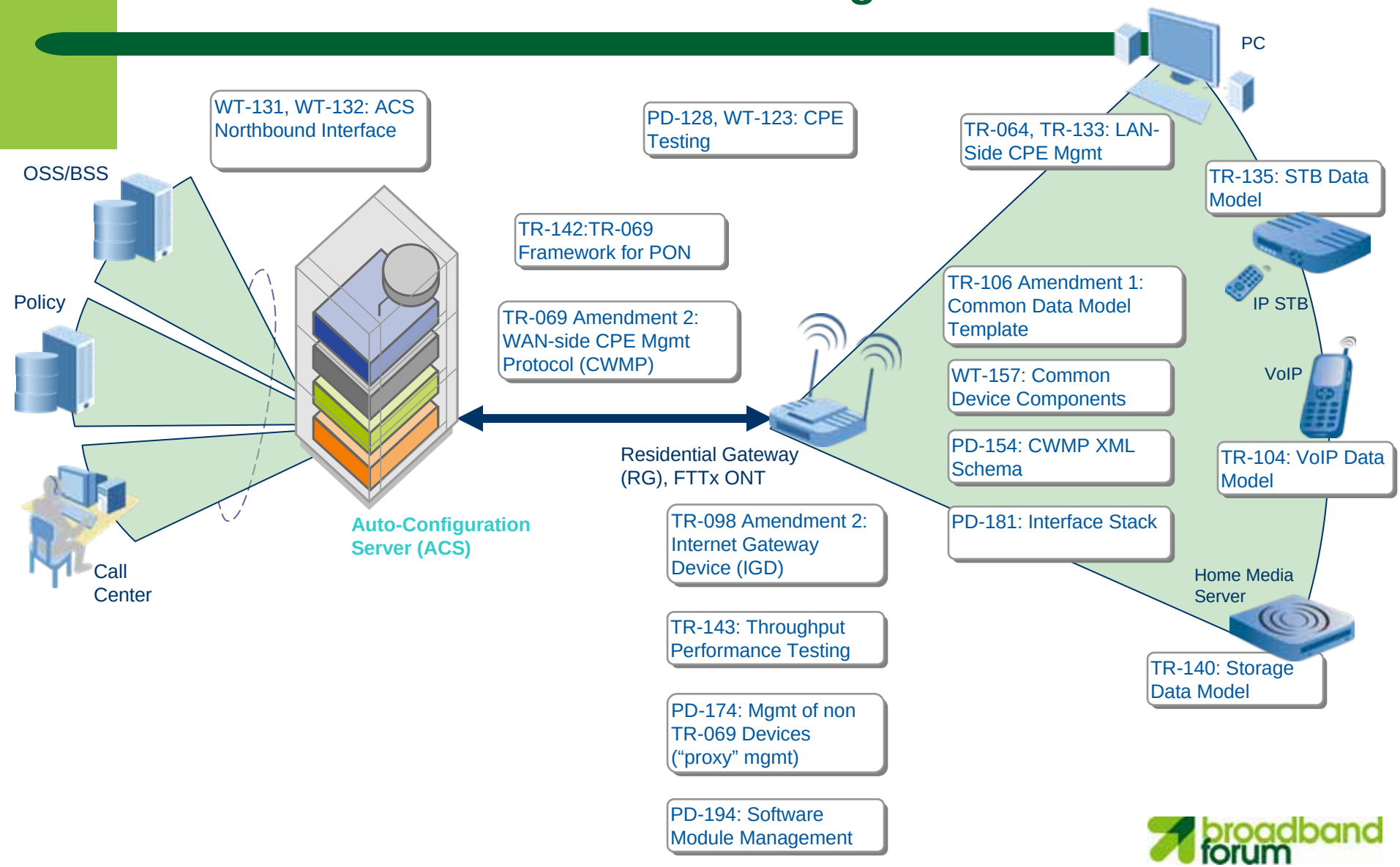
- Profitable and seamless service deployment
  - Reduce costs
  - Enable services
  - Improve customer experience
- Higher layer protocol – network (and device) agnostic
- Robust functionality
  - Granular device and service control
  - Flexible, policy-based management
- Well-defined extensibility mechanisms
  - New devices and services
  - Vendor differentiation
- Standard web technologies
  - Scalable
  - Secure
  - Widespread
- Applicable to full range of devices on home network
  - Annexes F (device/gateway association) and G (NAT traversal)

Thank You

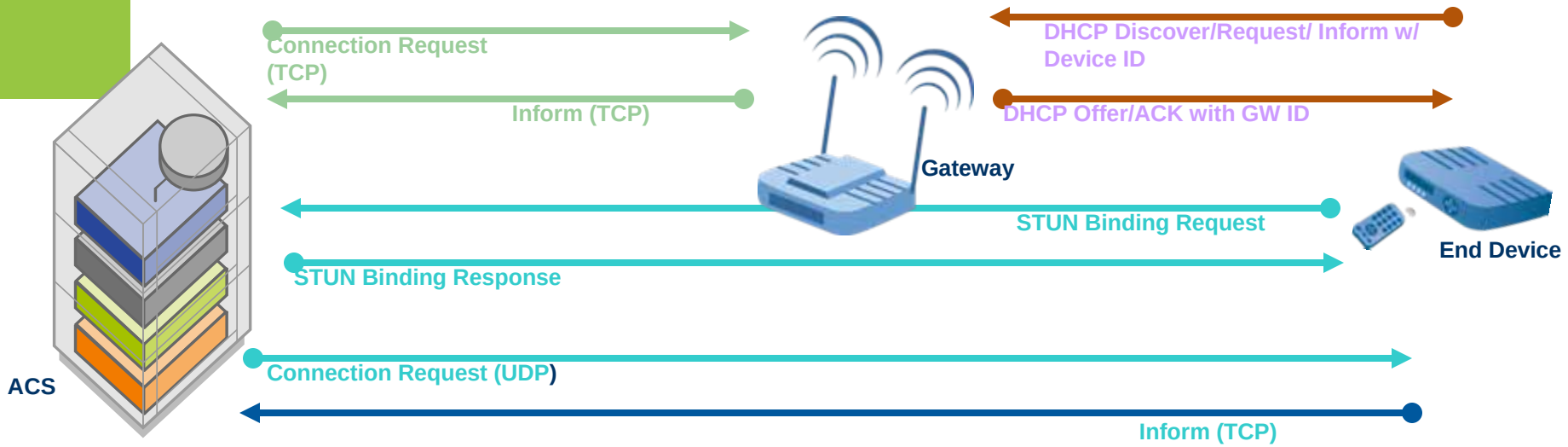
Any Questions?

Backup Materials

Broadband Home Remote Management Framework



Applying CWMP to Home Network



Annex F – Device/Gateway Association

- End Device and Gateway exchange DeviceID via DHCP
  - > Independent of device address assignment
- Populate relevant objects in data model
  - > ManagedDevices table in GW
  - > GatewayInfo object in end device
  - > ACS can perform optional cross-check

STUN – Simple Traversal of UDP through NATs (RFC 3489)

Annex G – NAT traversal for ConnectionRequest

- ACS enables STUN client on device
- Device creates STUN binding with STUN server
  - CPE uses STUN protocol to determine NAT type and public address and communicates to STUN server
  - Uses STUN to maintain UDP binding through NAT gateway
- ACS sends UDP ConnectionRequest to address communicated to STUN server
- CPE responds w/ TCP Inform

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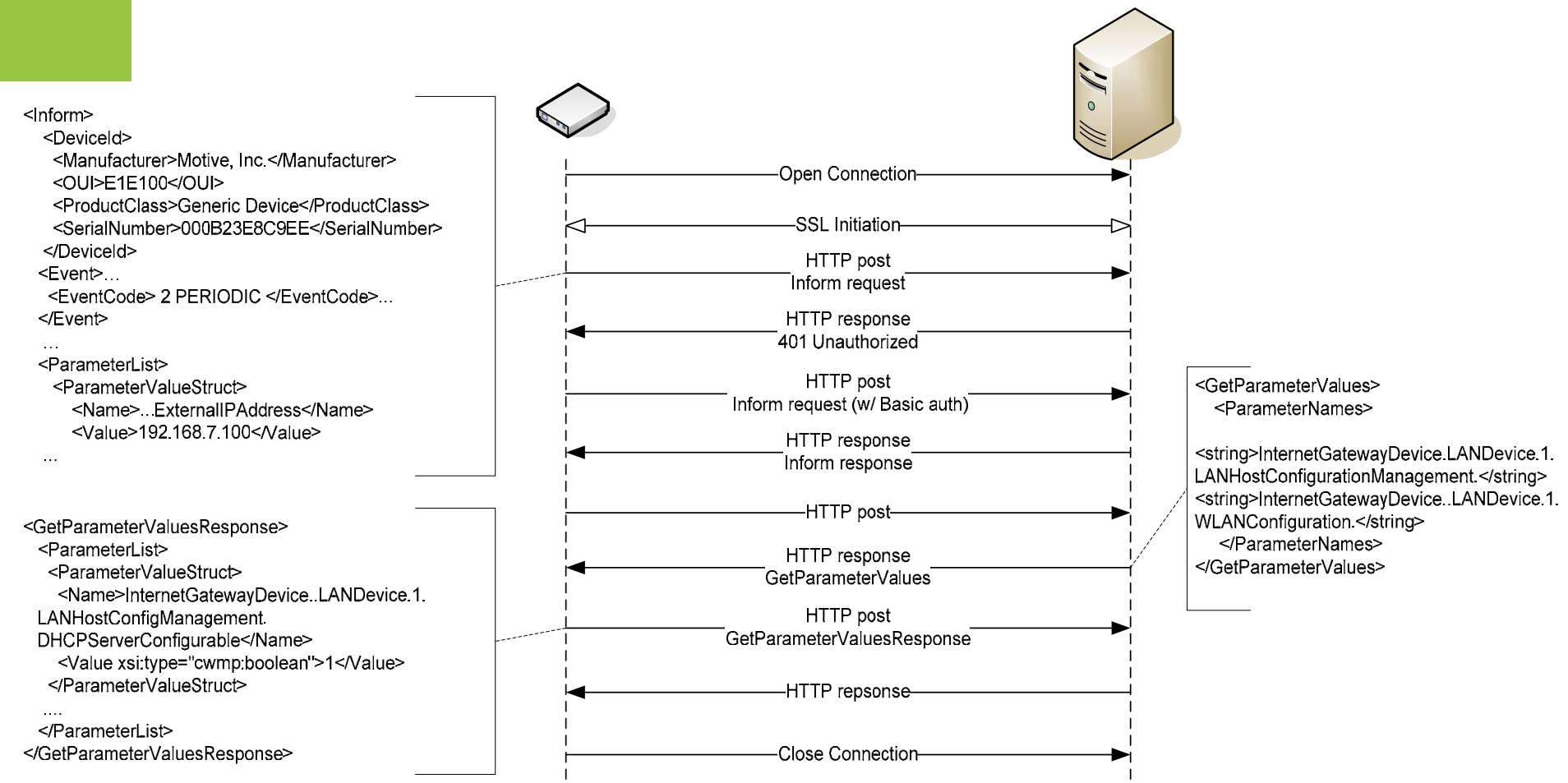
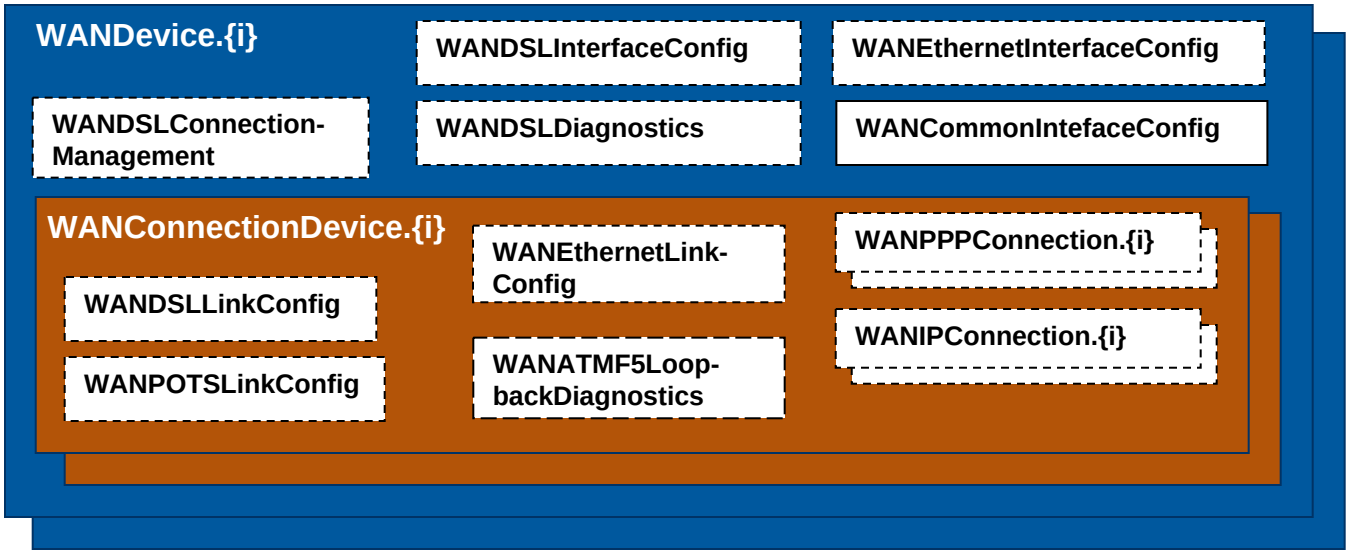
Example TR-069 Session (MaxEnvelopes=1)

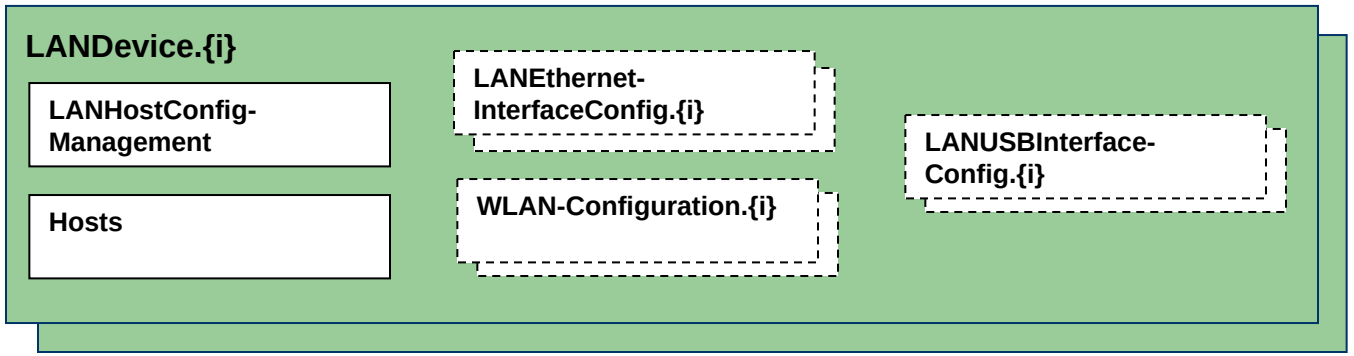


TR-098: InternetGatewayDevice Data Model

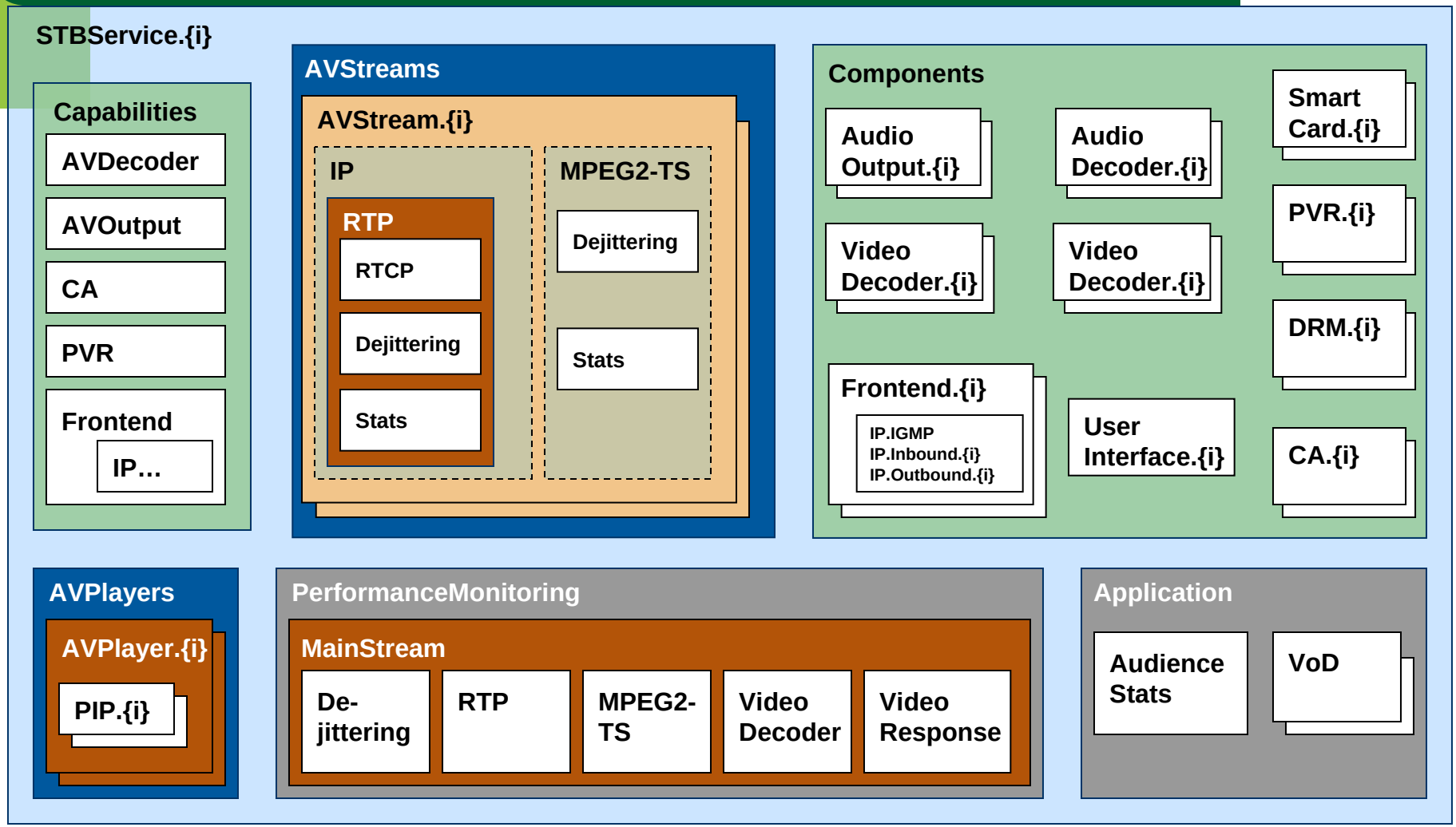
InternetGatewayDevice

- Layer3Forwarding
- DeviceInfo
- DeviceConfig
- LANConfigSecurity
- ManagementServer
- Time
- UserInterface
- IPPingDiagnostics
- Layer2Bridging
- QueueManagement

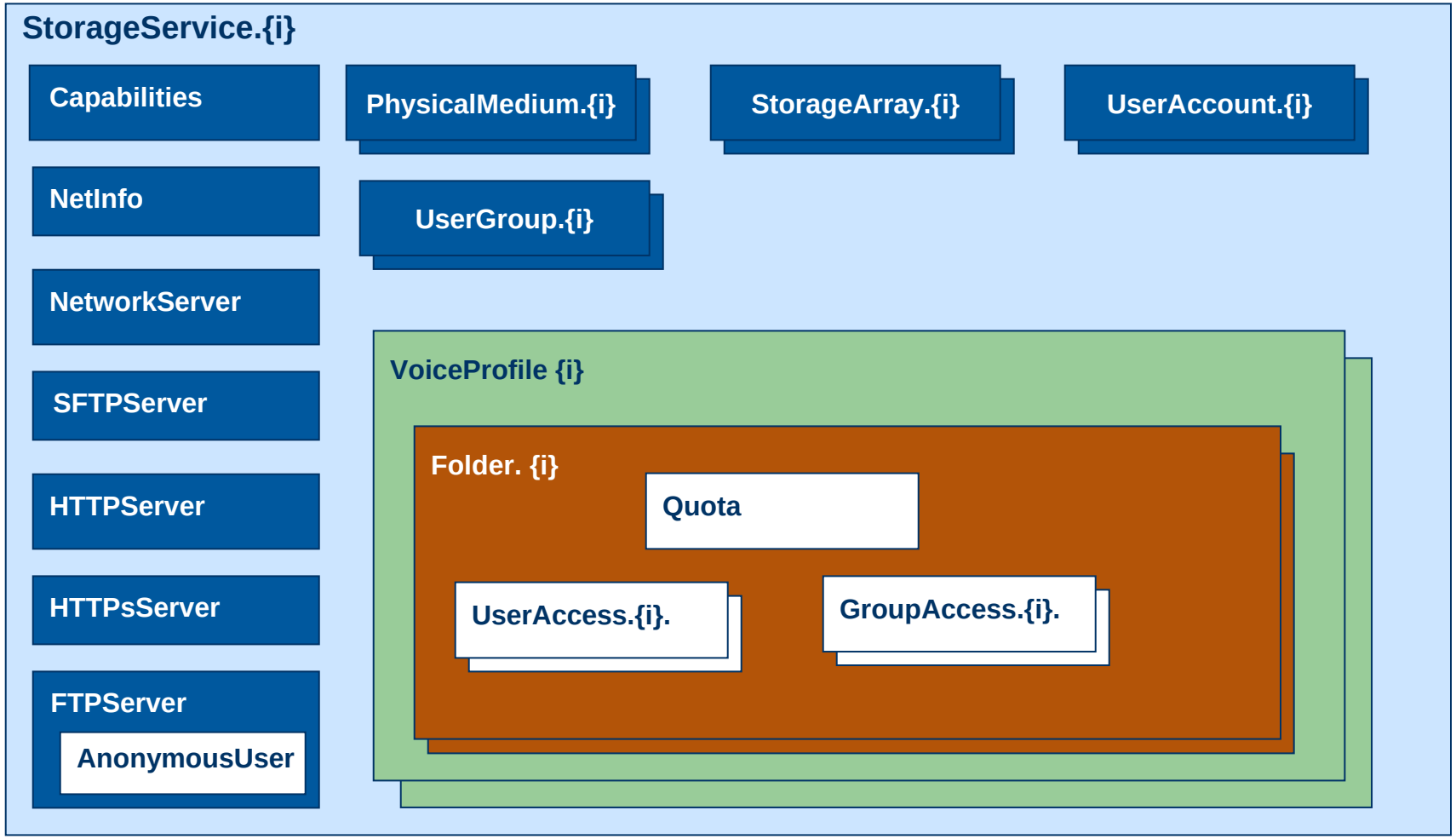




TR-135: STB Data Model

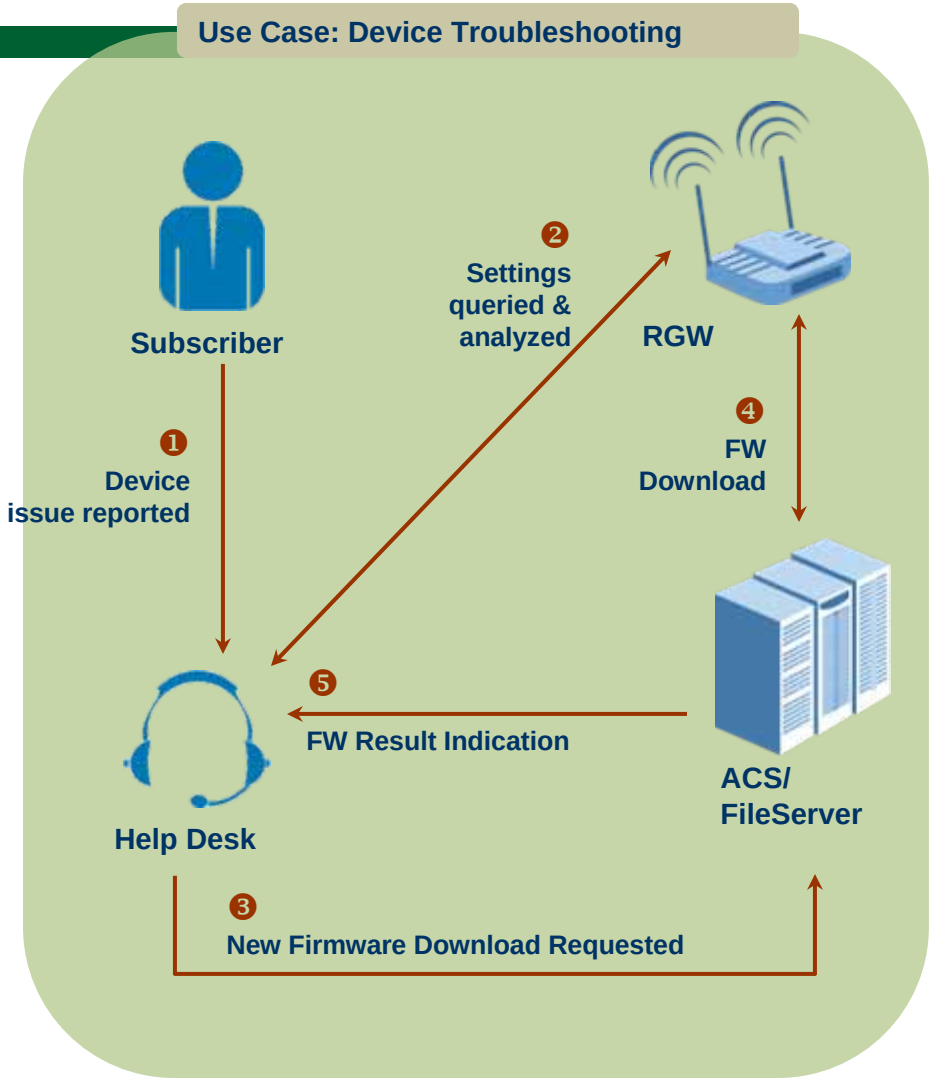


TR-140: Storage Data Model



Service Support

- Features
  - Subscriber calls Service Provider call center to report device problem
  - Through the ACS, CSR can query device settings
    - CSR notes that firmware out of date, contains known bug
    - Requests ACS to initiate file download/upgrade
  - RGW reports to ACS when download complete; ACS indicates results to Help Desk
    - ACS could also change configuration settings as appropriate
    - Firmware upgrades could also be managed proactively
- Benefits
  - Reduces call center escalation costs
  - Reduces AHT, increases FCR
  - Streamlines CSR processes
  - Reduces RMA, equipment upgrade costs
  - Enables new device capabilities



Service Monitoring

- Performance Monitoring
  - Service Provider enables monitoring for subset of STBs
  - Determines which statistics to collect and report interval
  - Adjust device configuration as appropriate
    - IGMP
    - QoS
    - May also require adjustment to other network/IPTV delivery systems
- Benefits
  - Service provider control over statistics collected
    - Focus on key metrics, amount of data, reporting traffic
  - Proactive discovery of service issues
  - More intelligent network planning and ongoing adjustment