



International CAT iq Developers Conference - 2010

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Unified CAT-iq API

Bridging IP Services to CAT iq

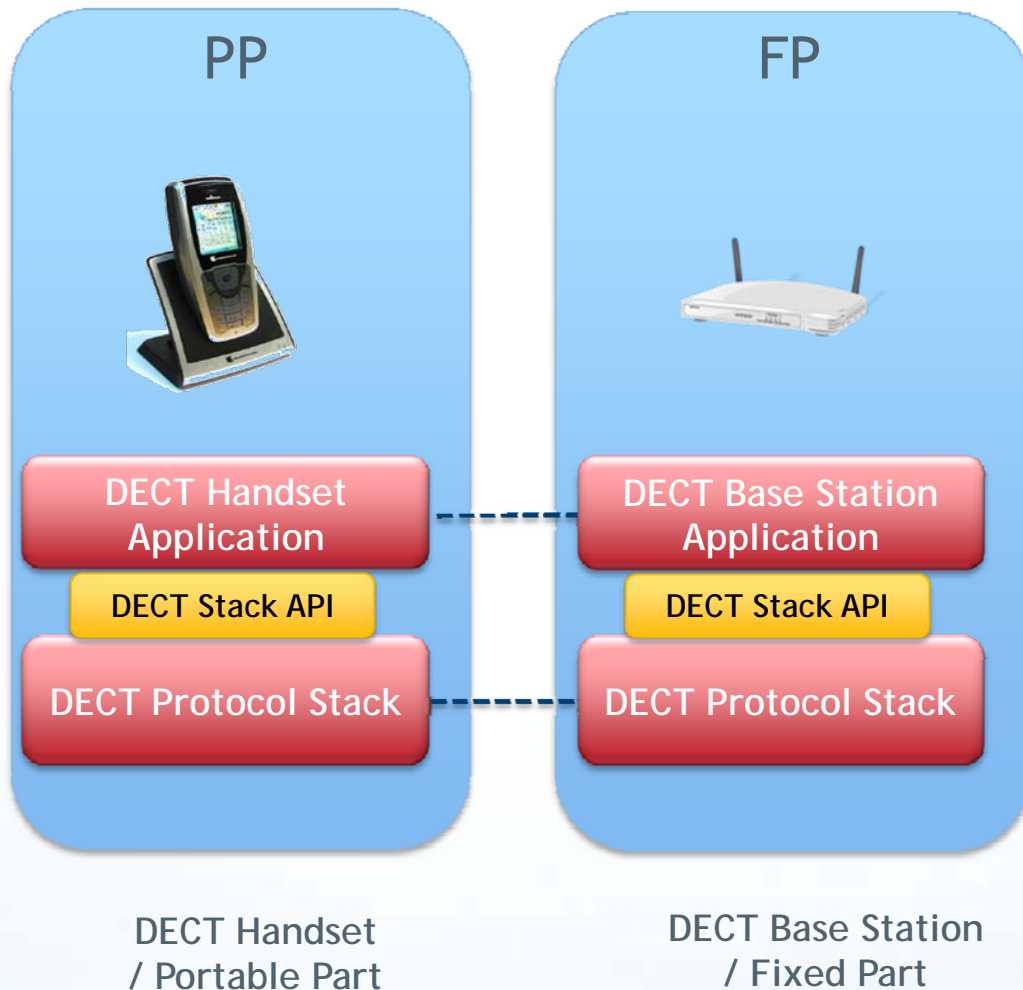
CAT iq within a Digital Home

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DECT Architecture- Introduction



DECT Protocol Stack

- Implements the protocol layers of the DECT
- DECT follows the ISO protocol layering - consists of Network, Data link, MAC and Physical Layers

DECT Base Station Application

- Implements the DECT Base Station functionality
- Call management, Media management, PP Registration

DECT Handset Application

- Implements the Call Handling, Media Handling, UI, Peripheral management of the DECT Handset

DECT Stack API

- Interface to the DECT Protocol Stack

DECT Stack API - Traditional Approach & Short comings

DECT Application

DECT Stack
API

Network

Data Link

MAC

Physical

Protocol Layers

Access to
Protocol as
opposed to
access to
Services

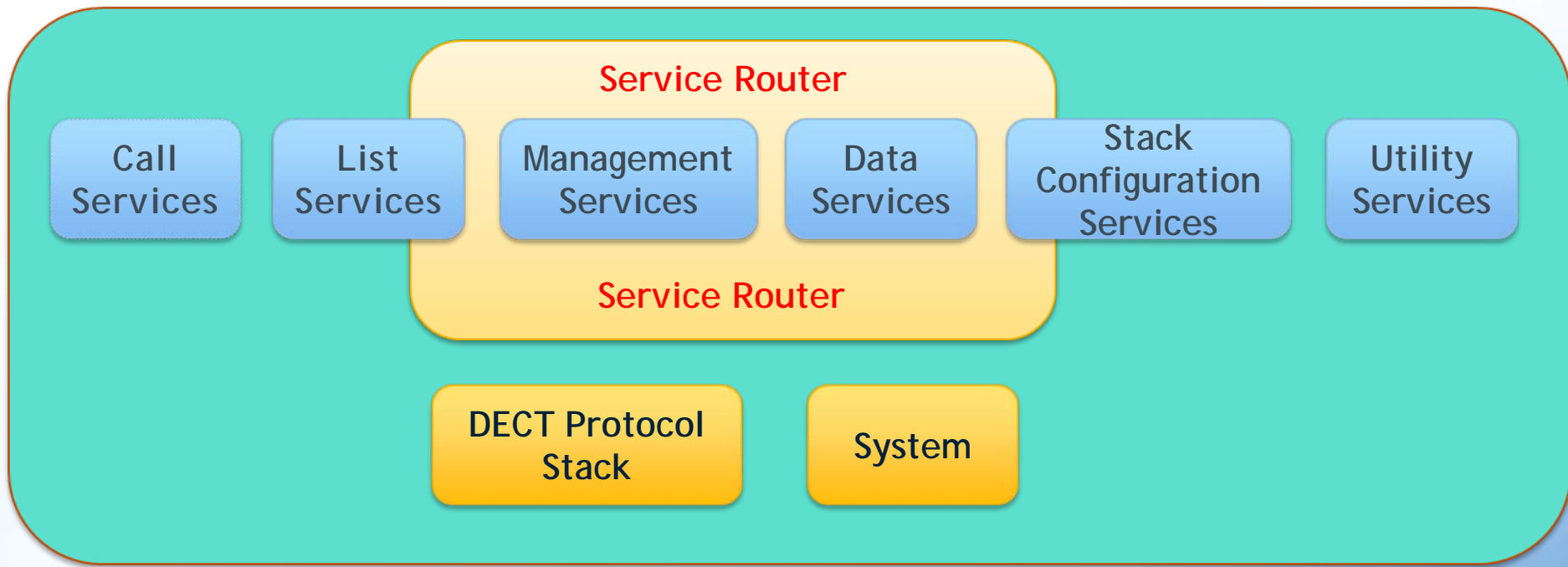
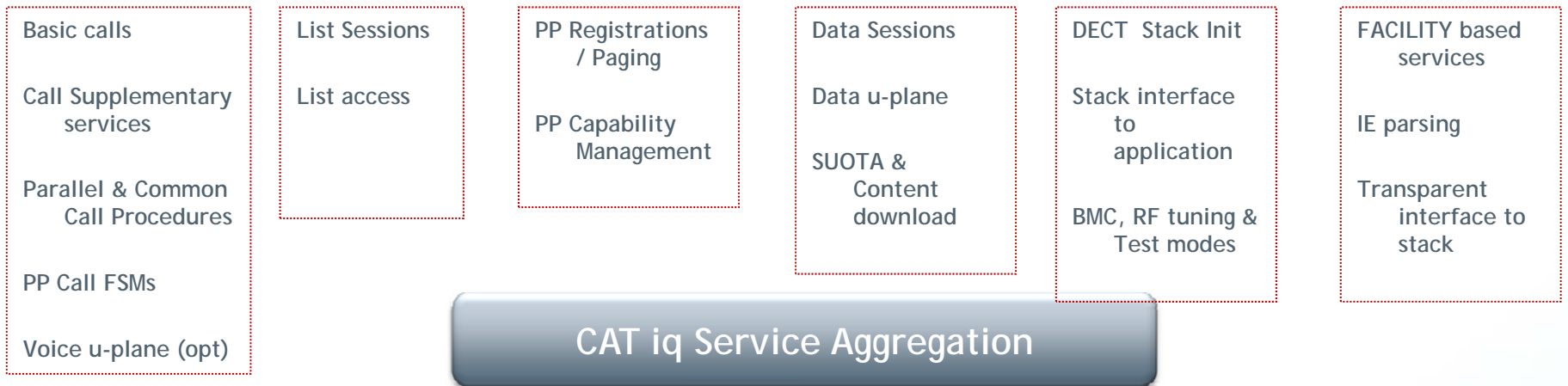
- Γ Interface to the protocol layers of the DECT Protocol Stack
 - Γ Directly based on DECT Protocol Primitives
 - E.g FP_IN_CC_SETUP, FP_IN_MAC_XXXX
- Suitable for GAP based applications
- Limited requirements at call control level

What is lacking ?

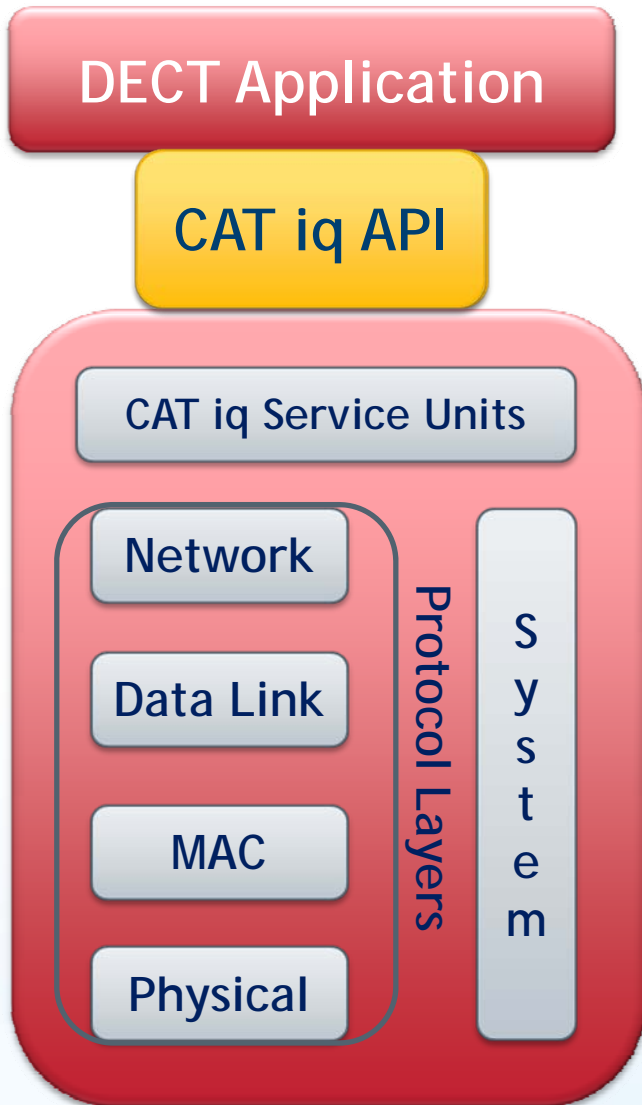
- Γ No Service Level Intelligence
 - To manage service requirements of CAT iq
 - E.g Call Supplementary services, List Access, Data channel
- Γ App. Developer needs deep DECT Protocol knowledge
 - DECT Protocol primitives and call flows for CAT iq services
 - Message construction, IE's encoding/decoding
- Γ Increased development & QA efforts
 - Service logic has to be implemented for each CAT iq vendor
 - Increased protocol compliance and IOP efforts

Consequence -
Increased Time to Market

CAT iq services that require a re-think



CAT iq Service Aggregation - The way forward



- Γ Introduction of a CAT iq Service Aggregation layer between the Application and DECT Protocol Stack
 - Consists of Service Units
 - Consists of service routing
 - Includes system management services too
 - Test interfaces

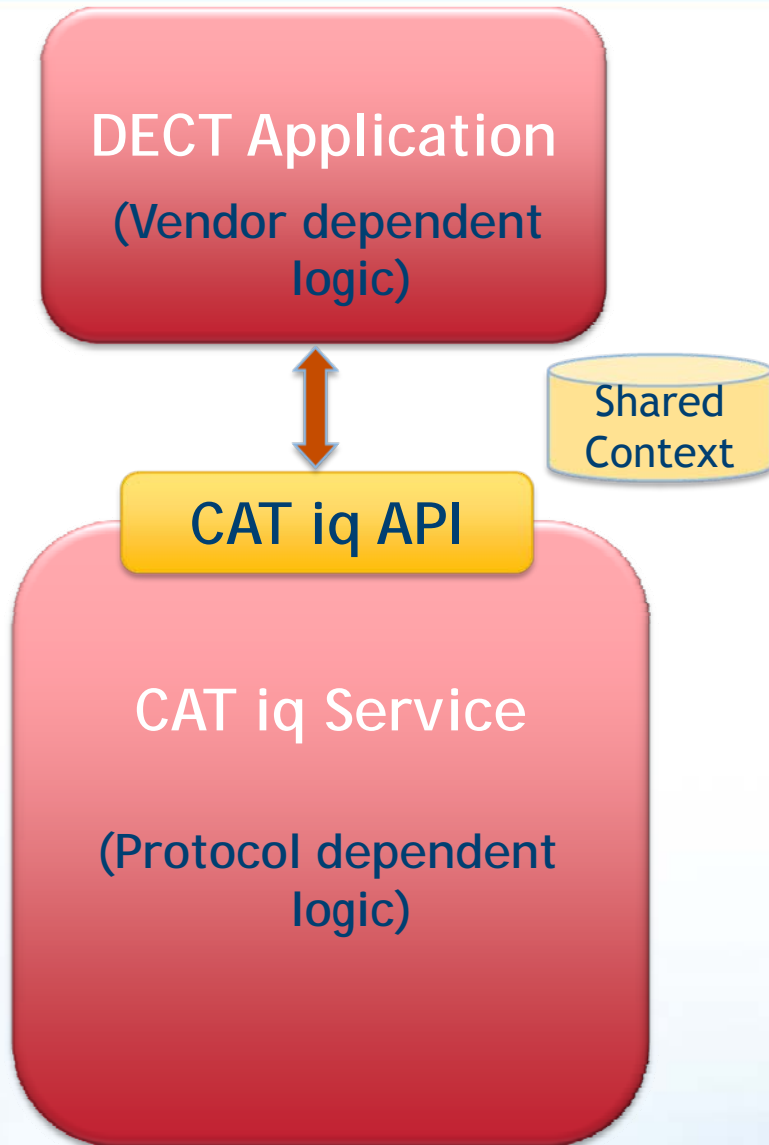
- Γ Flexibility to bring in new service units as CAT iq moves forward
 - E.g SMS

- Γ Service aggregation layer implements the CAT iq API

CAT iq API = Service Aggregation + Interface

- Interface to services as opposed to protocol
- Reduction in dev. & QA efforts
- Savings in Time to Market !!!

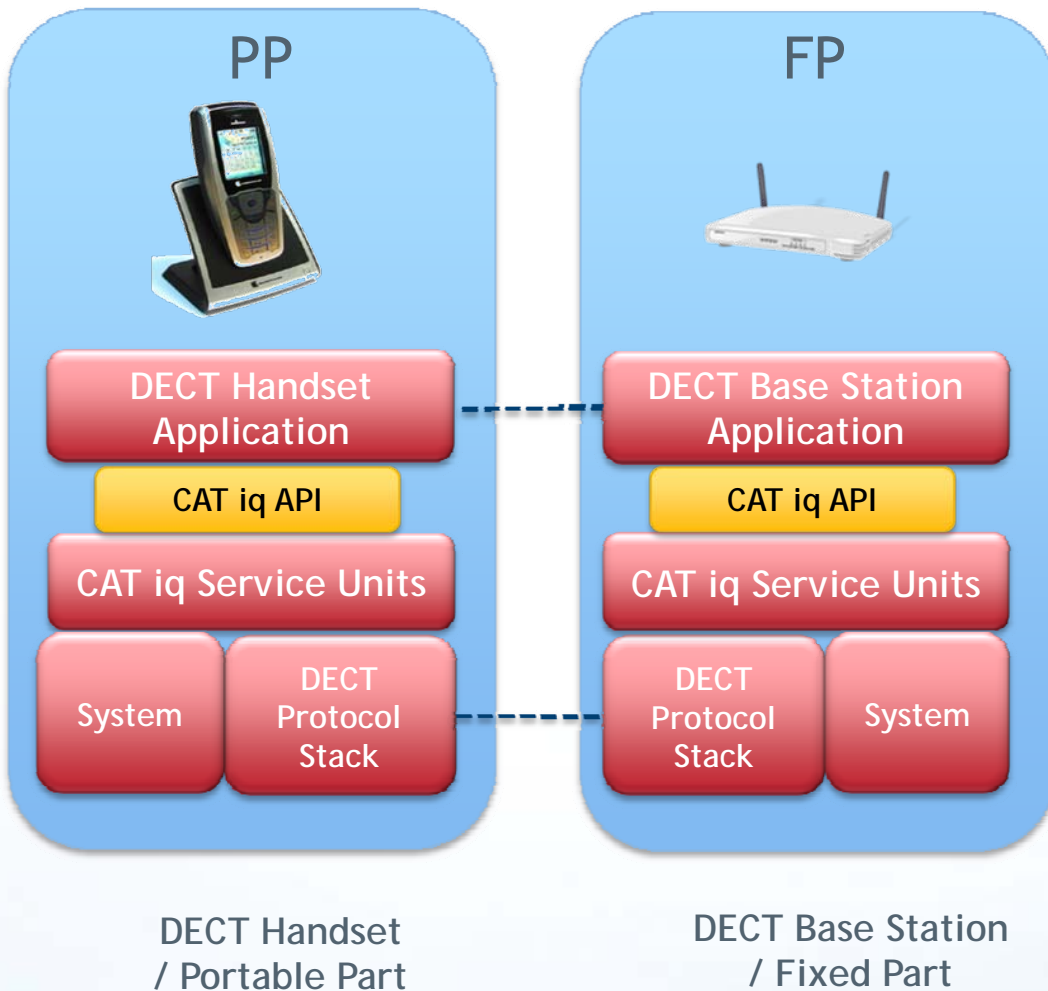
CAT iq API - Service Distribution with Application



Γ The Thumb rules:

- Where it is defined and fixed within the protocol, should be a part of the CAT iq API.
- Where is it flexible and a behaviour can be vendor dependent, should be a part of the Application.
- The CAT iq API and the Application may share context related data which can be exchanged in the invocation routines.

CAT iq API - Design Goals



- Γ Common layering for FP and PP software
- Γ Functional or messaging interface to the application software
 - Functional interface - Typically for FP, where memory and CPU are relatively relaxing
 - Message interface - Typically for PP, where memory and CPU are a premium
- Γ Thread safety
- Γ OS independent
- Γ Programming Language

Unified CAT iq API - Summary

- ┌ DECT is evolving and CAT iq is bringing new services and applications

- ┌ Current DECT Stack API is not designed to manage the new requirements
 - Only provides access to the protocol !!
 - Unified CAT iq API provides access to services !!!

- ┌ Unified CAT iq API will help to bridge the requirements gap and accelerate CAT iq deployments
 - Reduction of complexity in development of CAT iq products and faster deployments

- ┌ In order for DECT and CAT iq to compete effectively against other technologies, the DECT forum should consider setting up a development community to define and standardize the CAT iq API (as early as CAT iq 3.0 !!)

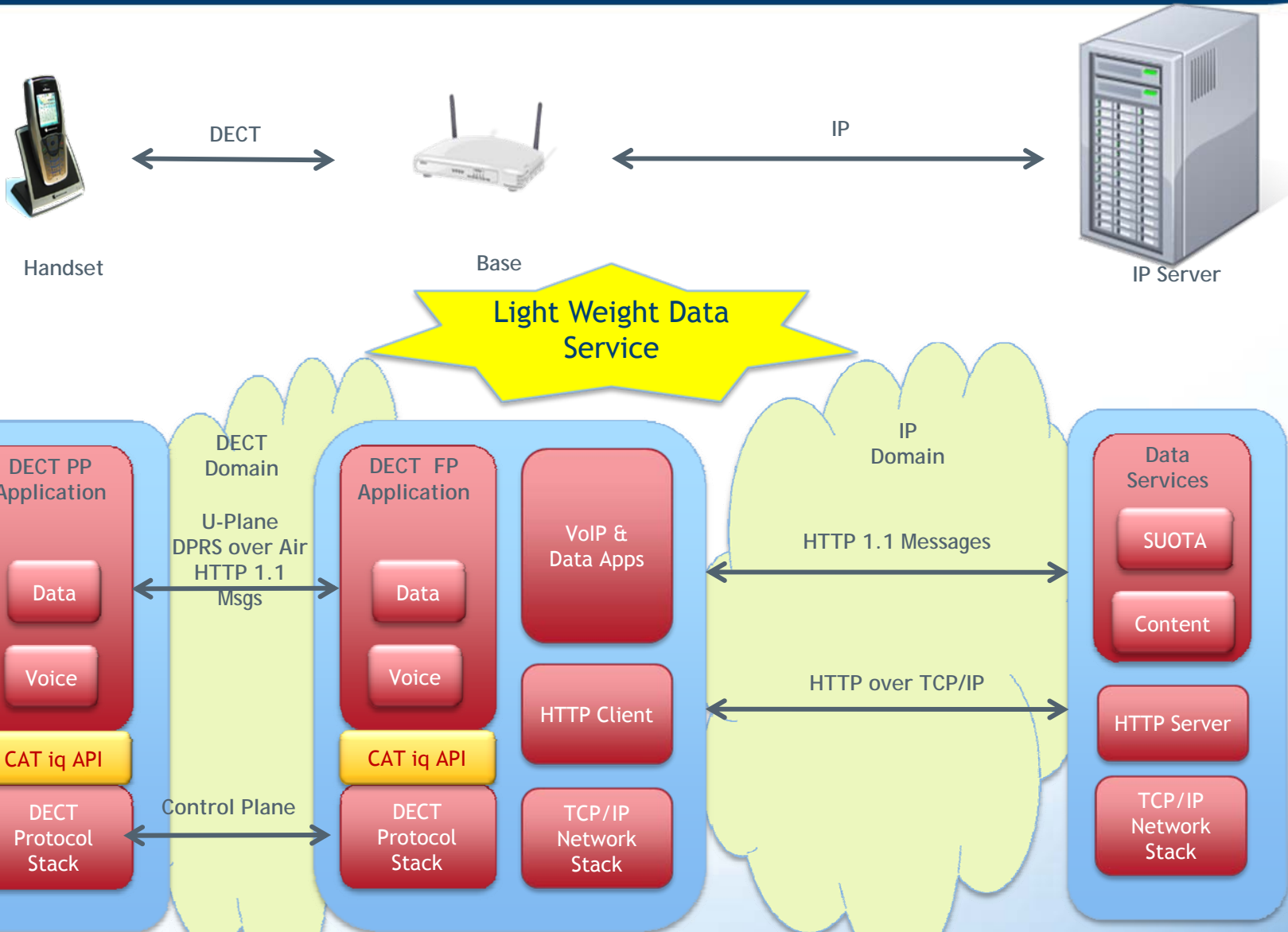
- ┌ Lantiq has successfully implemented a similar CAT iq API (catering till CAT iq 3.0) on its Base Station and Handset designs

Unified CAT-iq API

Bridging IP Services to CAT iq

CAT iq within a Digital Home

IP services and CAT iq - Emerging Application Scenarios



Light Weight Data Service

Γ Light Weight at the PP

- No TCP/IP Stack running - Reuse of the network interface (WAN/LAN) at the base
- Basic HTTP 1.1 Parsing
- C-Plane handling through normal signaling procedures
- U-Plane handling through DPRS

Γ Light Weight at the FP

- HTTP Connection setup and termination
- Forwarding HTTP Data to DECT and vice versa transparently

IP services - Characteristics

Γ IP based services

- CAT iq 3.0
 - Light weight data service, involving SUOTA and binary content downloads - *Reference ETSI TS 102 527-4 V1.1.1 (2009-10)*
 - DPRS Class 4, symmetric, Single bearer, data rate 51.2 Kbps
- New Services under CAT iq umbrella
 - Music Streaming, RSS feeds, Emails, Internet radio, etc

Γ Characteristics of IP based services

Service Examples	Characteristics
SUOTA	Handset software images ranging from 500 KB to 1.5 MB
Content Download	Ring tones, Wall papers, icons, etc ranging from 50 KB to 1.5 MB
Music Streaming / Internet radio	MP3 coded music @ a minimum of 128 Kbps
RSS feeds, Emails	Feeds and page links within feeds running into few 100s of KB

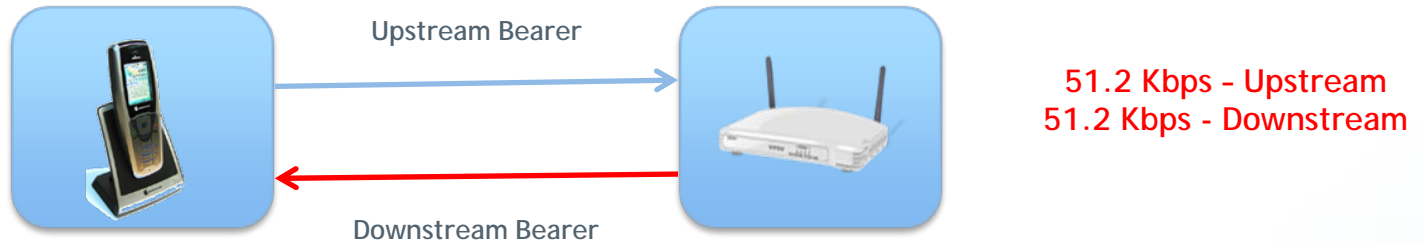
Conclusion - LW data service (@ 51.2 Kbps) unable to cater to the needs of new services.

How can data rates / bandwidth for services be increased ?

Connection Types basics - Symmetric and Asymmetric

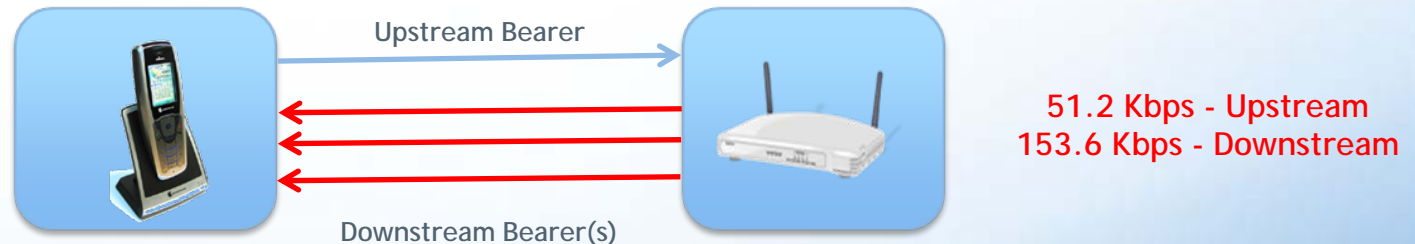
Symmetric Connection

No. of Upstream Bearers (1) = No. of Downstream Bearers (1)



Asymmetric Connection

No. of Upstream Bearers (1) \neq No. of Downstream Bearers (3)



Total number of bearers within a connection remains even always.

Concept of grouping multiple bearers under a single connection to maximize the data rate/bandwidth within the connection.

Γ Protocol Background

- DPRS Class 2 - *Ref: ETSI EN 301 649 V2.1.1 (2010-02)*
 - Full DPRS capabilities, including complete C-plane with call control and mobility management
 - Provides all capabilities of the packet service of public cellular networks (i.e. GPRS).
 - Supports multi bearer and asymmetric connections

Γ Role of different protocol layers

- DPRS defines the handling for the DLC and MAC layers under ME class 2
- The boundaries on the number of bearers to be used in a connection are provided at connection setup. MAC layer dynamically allocates/de-allocates bearers within the boundary.

Γ What is not defined yet

- Application Layer framework for multi bearer asymmetric connections
 - Connection Setup
 - Decision on the number of bearers (limits) for a connection
 - Connection maintenance, error handling, etc

Channel Bundling - Application Layer considerations

Γ Factors influencing Application Layer Framework:

Factors	Details
Number of PPs registered	<ul style="list-style-type: none">• Prevent bearer starvation. Ensure bearer availability for voice calls.
Maximum bearer allocation for a connection	<ul style="list-style-type: none">• Careful consideration on the upper limit for the number of bearers to be allocated within a connection.
Application type	<ul style="list-style-type: none">• Use the type of application to determine the number of bearers to be allocated.<ul style="list-style-type: none">• A SUOTA (that happens once in a while) can be still managed with a single bearer, but 2 bearers are a minimum for music streaming.
Bearer allocation at SETUP or Service Change	<ul style="list-style-type: none">• Upfront max reservation on number of bearers at SETUP• or Dynamic reservation through service change procedure
Downstream vs Upstream traffic	<ul style="list-style-type: none">• Decide on number of bearers for upstream and downstream based on expected application traffic flow.• Asymmetric or Symmetric• More bearers upstream or downstream

Bridging IP Services to CAT iq - Summary

- Γ Emerging IP Services are bringing value to the CAT iq Handset.
- Γ Light weight data service cannot cater to all the bridged IP services, under the scope of CAT iq
- Γ Channel Bundling => Looking beyond the light weight data service
- Γ Application Layer framework for channel bundling applications needs to be defined fast !!
- Γ Explore alternatives for bandwidth increase
 - New Modulation schemes, e.g QAM64 which provides data rates upto 5.5 Mbps

Unified CAT-iq API

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CAT iq within a Digital Home

DLNA - An Introduction

Γ DLNA - Digital Living Network Architecture

Γ Industry consortium of

- 250+ companies
- Consumer Electronics
- Computing Industry
- Mobile Devices
- Content Distributers



Γ Goal : Establish an ecosystem of compatible products for networked media devices

Γ Develops standards-based specifications - “DLNA Guidelines”.

DLNA - Device Classes

Γ Device class - A certifiable unit

- Implementation of a device class for a DLNA Certification

Category: Home Networked Devices (HND)

Digital Media Server (DMS)

Digital Media Player (DMP)

Digital Media Renderer (DMR)

Digital Media Controller (DMC)

Digital Media Printer (DMP_r)

Category: Mobile Handheld Devices (MHD)

Mobile Digital Media Server (M-DMS)

Mobile Digital Media Player (M-DMP)

Mobile Digital Media Controller (M-DMC)

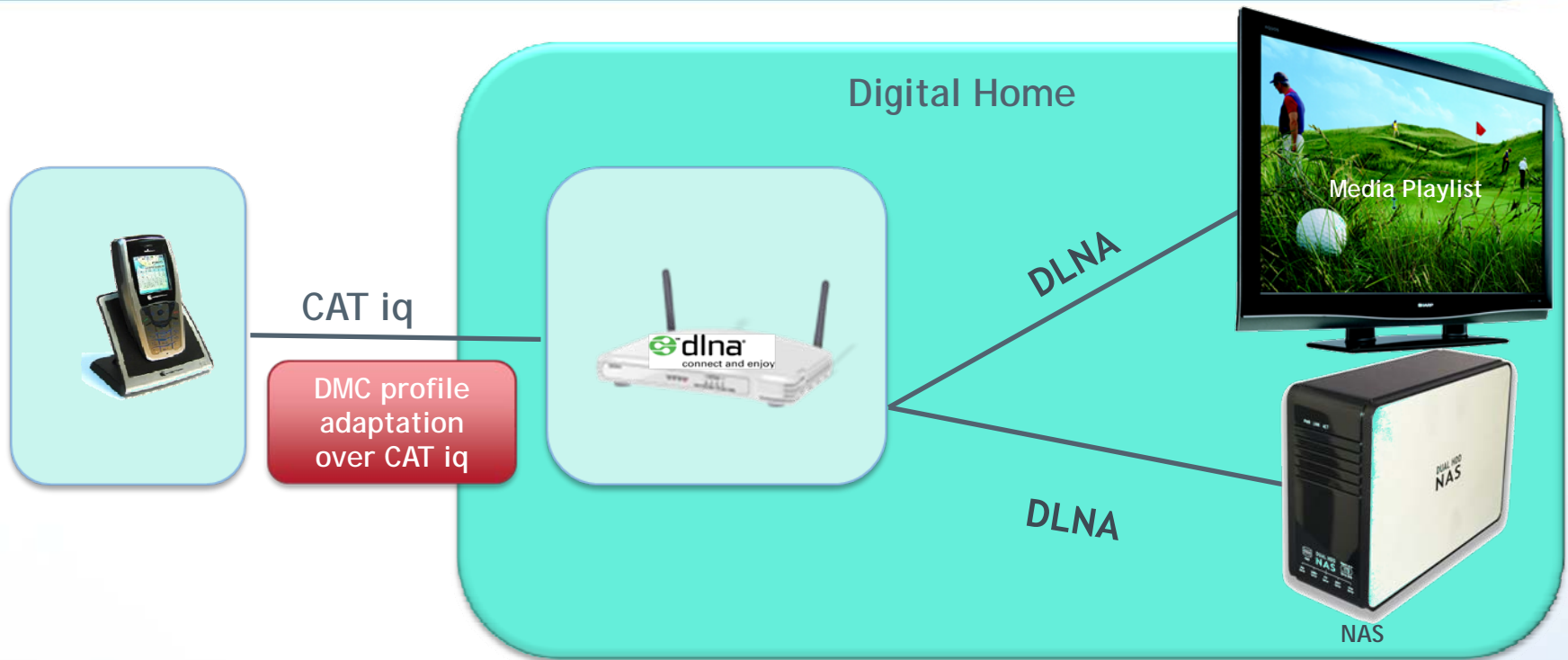
Mobile Digital Media Uploader (M-DMU)

Mobile Digital Media Downloader (M-DMD)

Γ M-DMC and M-DMP devices classes are interesting for CAT iq

- M-DMC Use Case - Remote Control
- M-DMP Use Case - Music Player / Picture Viewer

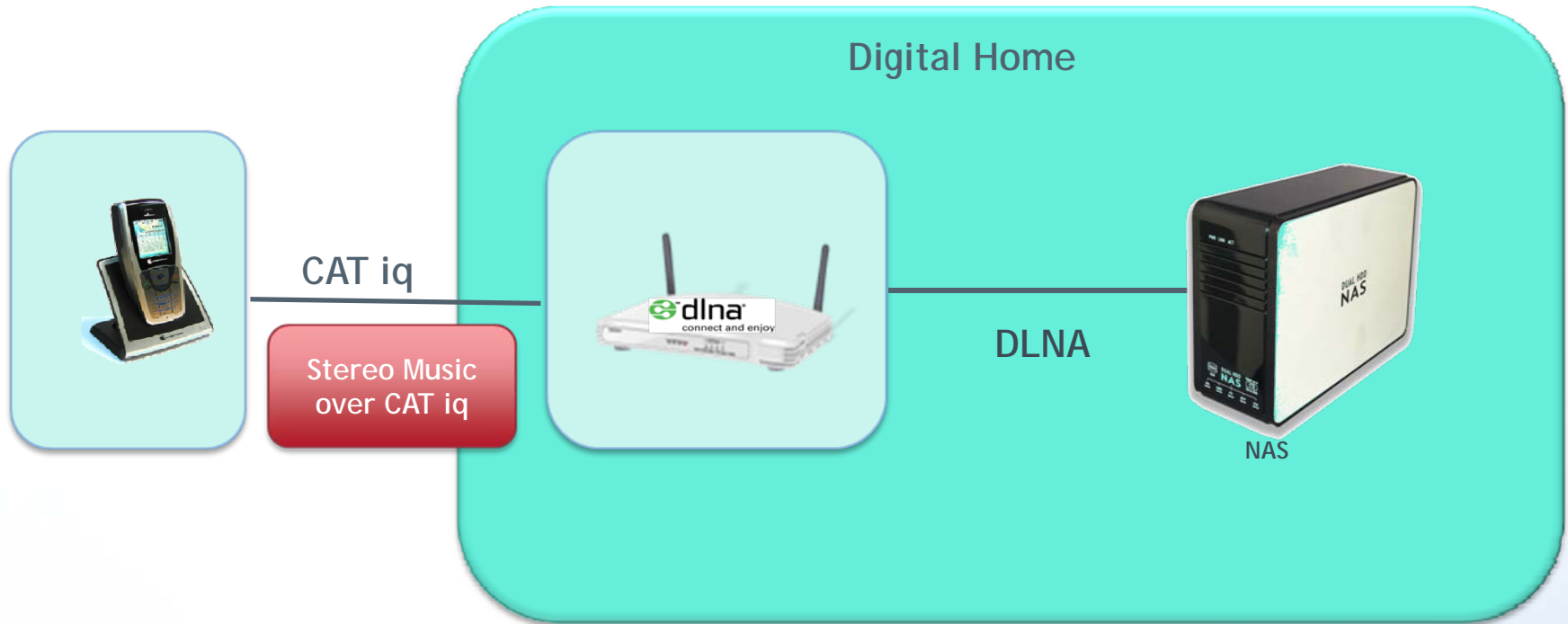
Digital Media Controller - Remote Control Use Case



- Γ Select Media Source - NAS Source
- Γ Select Display Source - Television
- Γ View Media Playlist in the Display
- Γ Select Media Player - Television
- Γ Select Media file to be played

CAT iq Handset replaces IR Remote(s) at home

Digital Media Player- Music Streaming Use Case



- Γ Select Media Source - NAS Source
- Γ Select Media Player - Self (CAT iq Handset)
- Γ View Media Playlist in the Display
- Γ Select Media file to be played

DECT Handset plays the role of a Media Player

CAT iq within a Digital Home - Summary

- Γ CAT iq/DECT has to find a role of significance within a Digital Home

- Γ A CAT iq handset can replace an Infra Red Remote within a Digital Home
 - It is mobile, easy to carry
 - There could be more than one at home (in different rooms)

- Γ A CAT iq handset can also function as a voice media player and image viewer
 - Select set of voice codecs
 - Select set of Image files

- Γ Alternate ideas - Can DECT fit in as a transport protocol within DLNA ?

Thank You

Questions ?

Backup

CAT iq API - Service Distribution with Application

- Γ The Thumb rule for service distribution between the CAT iq API and the application:
 - Where it is defined and fixed within the protocol, should be a part of the CAT iq API.
 - Where is it flexible and a behaviour can be vendor dependent, should be a part of the Application.
- Γ Call Service - Use Case Example with CAT iq 2.0 at the Fixed Part

Action	Performed at	Reason
Line Management	Application	Lines are logical abstractions to the network interfaces of a GW. The lines are not used by DECT terminals alone. Other terminal interfaces like FXS, ISDN also use the lines.
Call Initiation / Termination	Application	Call Source, destination and routing information is within the Application.
Call Finite State Machine	Application	Application has information on the terminal (DECT, FXS, ISDN, etc) capabilities, system limits and facilitates call/media management.
Call Id Generation	CAT iq API	Call Id generation is an essential part of the protocol.
Call handling messages	CAT iq API	For e.g the CAT iq API knows that a Setup Ack needs to follow a SETUP request and can initiate it on its own.

CAT iq API - Sample API at Fixed Part (FP)

Service Unit	API	Description	Important Parameters
Call	Call Initiate	Function - Initiates a call between FP & PP Callback - Initiates a call between PP & FP	IN PP Reference, IN Call Parameters, OUT Call Handle
	Call Release	Function - Releases a call between FP & PP Callback - Releases a call between PP & FP	IN Call Handle, IN Call Parameters, IN Reason
	Info Received	Function - Send CC_INFO to PP Callback - Receive CC_INFO from PP	IN Call Handle, IN Call Parameters
	Service Change	Function - Service change from FP Callback - Service change from PP	IN Call Handle, IN Call Parameters, IN Codec
List	Session Start	Callback - List Session start request from PP	IN PP reference, IN Command, OUT Response
	Session End	Callback - List Session end request from PP Function - List session end request from FP	IN Session Identifier
	Send Data Packet	Function - Send Data Packet from FP	IN Session Identifier, IN Data Buffer, IN Size of the Data Buffer
	Receive Data Packet	Callback - Receive Data Packet from PP	IN Session Identifier, IN Data Buffer, IN Size of the Data Buffer
	Entry operations	Callback(s) - Request Delete / Edit / Read / Save / Search from PP Function(s) - Confirm Delete / Edit / Read / Save / Search from FP	IN Command, OUT Response IN Response

FP - Fixed Part
PP - Portable Part

IP Services & SUOTA - A case study

Γ Image download and upgrade timing sample illustration - Image size 1 MB

Action	Approximate Timing
Transfer of 12 KB @ 62 bytes every 10 ms	2 seconds
Transfer of 1 MB [85 times transfer of 12 KB]	170 seconds
Protocol overheads to obtain 12 KB from IP servers (100 ms for each 12 KB)	8.5 seconds
Other system overheads (retransmissions, admissible system delays)*	20 seconds
Handset upgrade (flash programming, reboot, etc)*	120 seconds
Total	322.5 seconds => 5.5 minutes

* Vendor specific delays

Γ Image download takes a bigger share of the total upgrade time (approx 3 minutes).

Γ Channel Bundling - 3 downstream bearers and 1 upstream bearer

- Download time is reduced to 1/3rd => 56.6 seconds

Γ The savings are more pronounced for updates to PP's with large image sizes.

Note : Minor changes in the SUOTA signaling flow expected to gather size information on the images.

