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D6-3.1

UE SDMB specification for Release 1

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Abstract:

This SDMB software specifications document describes the UE procedures to establish and maintain an SDMB connection over FACH, which is downlink only. Also, SDMB channel configuration mainlines are given.

Keyword list: Maestro, UE, SDMB, Release 1, FACH, Downlink

EXECUTIVE SUMMARY

This document contains deliverable **D6-3.1** of the IST Integrated Project MAESTRO – Mobile Applications & sErvices based on Satellite and Terrestrial inteRwOrking (IST Integrated Project n° 507023).

MAESTRO project aims at studying technical implementations of innovative mobile satellite systems concepts targeting close integration & interworking with 3G and Beyond 3G mobile terrestrial networks.

MAESTRO aims at specifying & validating the most critical services, features, and functions of satellite system architectures, achieving the highest possible degree of integration with terrestrial infrastructures. It aims not only at assessing the satellite systems' technical and economical feasibility, but also at highlighting their competitive assets on the way they complement terrestrial solutions.

This is the third of 8 tasks in Work Package 6 – "Architecture". The WP defines the functions and interfaces of SDMB all sub-systems namely user equipment, intermediate module repeater, space segment, hub and service centre.

The deliverable D6.3 – UE SDMB specification for Release 1 - describes the features required to be set or changed with respect to the existing 3GPP procedures, from a UE standpoint. Indeed, for the MAESTRO Release 1 test bed, a commercial 3G Motorola handset is the starting point, to which changes will be brought, taking into account the scenarios to be demonstrated on the test bed, and the procedures to be changed accordingly. There is also a strong interdependence with other work packages, namely WP3 for the MAESTRO Release1 test bed.

The task is led by MSPS and is actively supported by ASP and ERCOM as MAESTRO partners.

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1 INTRODUCTION

1.1 Background

The deliverable D6-3.1 – « UE SDMB specification for Release 1 » - is one of the deliverable of the task 6.3 « *User Equipment Specification»*

The task is led by MSPS.

This document includes the specifications of the Release1 UE and the list of SDMB features that will be validated through the first MAESTRO test-bed release.

The overall summary is the following one:

1. Introduction
2. Terms, Definitions, Abbreviated terms and Symbols
3. 3GPP to SDMB Release1 UE Specifications
4. Test Bed R1 Requirements
5. References

Chapter 3 describes the SDMB system from a UE point of view, the changes with respect to the 3GPP system, and derives the required changes to the UE implementation to reach an SDMB implementation.

Chapter 4 details an SDMB UE and trade-offs used to achieve an SDMB capable UE starting from a 3GPP-compliant one, as required for the test bed.

1.2 Fields of application

This document is applicable to the design of the first MAESTRO test-bed release. It is not applicable to the UE to be depicted in the scope of the SDMB commercial system. Indeed such an UE would be based on MBMS standard as described in D3.1- “SDMB Access Layer Definition” document.

2 TERMS, DEFINITIONS, ABBREVIATED TERMS AND SYMBOLS

2.1 Terminology and definitions

BM-SC	Means the BM-SC as defined for MBMS and including specific SDMB features
Cell	Means the Terrestrial mobile network cell
Content	File or data stream transmitted by the SDMB system and possibly (for the Download service) completed by terrestrial retransmissions
Download service	A service that delivers some multimedia content with loose time constraints. The service is best map on 3GPP defined background traffic class capability.
End User	The End user owns the terminal, subscribes to the MNO & Mobile Portal services
Groupcast service	A service offered to end-user allowing to send in a cost efficient way the same content to a group of users. This may include streaming or download.
Mobile IP datacast service	A push service that delivers a set of Multimedia content to several recipients. The service includes information, which allows the user equipment to process the content according to the end-user's rights and terminal capabilities. The access to the service may be restricted to a certain group of users which may have to pay a fee. It includes streaming, download as well as groupcast services.
Relevant content	A multimedia content which is expected to interest the end user with respect to its user preference profile.
Service area	Refers to the area where the SDMB services are available. Basically it is defined taking into account a set of satellite spots providing the European coverage.
Spot area	Corresponds to the areas covered by a satellite spot beam. There is not necessarily a service continuity between two spot areas. We assume that the same data is datacast in a spot area and it differs from the data datacast in other spot areas.
Streaming service	A service that delivers some multimedia content with real time constraints. It may refers to TV or radio type of services. Such service is manually activated by the end-user. Content are played as soon as received by the end-user terminal. The service is best map on 3GPP defined streaming traffic class capability.
Terrestrial mobile network	The terrestrial mobile network(s) on which the SDMB system relies.
UE	The UMTS/GSM User equipment modified to include SDMB features.
User preference profile	The description of the SDMB-content related user preferences in the UE.

2.2 Abbreviations

2G / 3G	2nd / 3rd Generation
3GPP	3rd Generation Partnership Project
AC	Admission Control
ACK	ACKnowledged
AM	Acknowledged Mode
APN	Access Point Name
ARQ	Automatic Repeat reQuest
B/M	Broadcast/Multicast
BCCH	Broadcast Control Channel (logical control channel)
BCH	Broadcast Channel (transport channel)
BE	Best Effort
BER	Bit Error Ratio
BLER	Block Error Ratio
BMC	Broadcast/Multicast Control
BM-SC	Broadcast Multicast Service Center in MBMS
BO	Buffer Occupancy
BS	Base Station
CAC	Call Admission Control
CB	Cell Broadcast
CBS	Cell Broadcast Service
CCCH	Common Control Channel
CCTrCH	Coded Composite Transport CHannel
CDMA	Code Division Multiple Access
CN	Core Network
C-PHY	Primitives for the control of the configuration of the physical layer
CPICH	Common Pilot CHannel
CRC	Cyclic Redundancy Check
CRLC	Control RLC
CRNTI	Control RNTI
CTCH	Common Traffic Channel
CTCH-BS	Common Traffic Channel Block Set
DCCH	Dedicated Control Channel (logical channel)
DCH	Dedicated Channel (transport channel)
DL	Downlink
DRX	Discontinuous Reception
DSCH	Downlink Shared Channel
DTCH	Dedicated Transport Channel
Eb/No	Energy per Bit over Noise power density ratio
Ec/No	Energy per chip over Noise power density ratio
ESA	European Space Agency
ETSI	European Telecommunications Standards Institute
FACH	Forward Access Channel
FDD	Frequency Division Duplex (UMTS mode)

FEC	Forward Error Correction
FES	Fixed Earth Station
FIFO	First In First Out
FL	Forward Link
FSM	Finite State Machine
GEO	Geo-stationary Earth Orbit
GGSN	Gateway GPRS Support Node
GoS	Grade of Service
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
GSN	GPRS Support Node
GW	Gateway
HC	Handover Control
HFN	Hyper Frame Number
HLR	Home Location Register
ID	Identity
IE	Information Element
IETF	Internet Engineering Task Force
IMR	Intermediate Module Repeater
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
Kbps	Kilo bits per second
L1	Layer 1
L2	Layer 2
L3	Layer 3
LC	Load Control
LI	Length Indicator
LLr	Linked List of addresses of packets to be re-emitted
MAC	Medium Access Control
MAC-b	Medium Access Control broadcast
MAC-c	Medium Access Control common
MAC-d	Medium Access Control dedicated
MAC-sh	Medium Access Control shared
MBMS	Multimedia Broadcast Multicast Services
Mbps	Mega bits per second
Mcps	Mega chips per second
MCCH	MBMS point-to-multipoint Control CHannel
MICH	MBMS notification Indicator CHannel
MLP	MAC Logical channel Priority
MS	Mobile Station
MT	Mobile Terminal

MTCH	MBMS point-to-multipoint Traffic CHannel
MUI	Message Unit Identifier
NAS	Non Access Stratum
NBAP	Node B Application Protocol
NI	Notification Indicator
NRT	Non Real Time
OVSF	Orthogonal Variable Spreading Factor
PC	Power Control
P-CCPCH	Primary Common Control Physical Channel
PCH	Paging CHannel
P-CPICH	Primary Common PIlot CHannel
PDCP	Packet Data Convergence Protocol
PDP	Packet Data Protocol
PDU	Packet Data Unit
PHY	PHYsical layer
PI	Page Indicator
PICH	Paging Indicator Channel
PLMN	Public Land Mobile Network
PN	Pseudo Noise
PS	Packet Switched
PS	Packet Scheduler
PSC	Primary Synchronization Code
p-t-p	Point-to-Point
p-t-m	Point-to-Multipoint
QoS	Quality of Service
RAB	Radio Access Bearer
RAN	Radio Access Network
RANAP	RAN Application Part
RB	Radio Bearer
RBAM	Radio Bearer Allocation and Mapping
Req.	Request
RL	Return Link
RLC	Radio Link Control
RM	Resource Management
RNC	Radio Network Controller
RNTI	Radio Network Temporary Identity
RRC	Radio Resource Control
RRM	Radio Resource Management
RT	Real Time
Rx	Receive
SAP	Service Access Point
Sat	Satellite
SATIN	SATellite UMTS IP-based Network

SCCP	Signalling Connection Control Part
S-CCPCH	Secondary Common Control CHannel
SCH	Synchronisation CHannel
SDU	Service Data Unit
SF	Spreading Factor
SFN	System Frame Number
SGSN	Serving GPRS Support Node
SI	Status Indicator
SIB	System Information Block
SNI	Secondary Notification Indicator
S-UMTS	Satellite UMTS
SW-CDMA	Satellite Wideband CDMA
T	Terrestrial
TB	Transport Block
TBS	Transport Block Set
TCTF	Transport Channel Type Field
TE	Terminal Equipment
TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
TFCS	Transport Format Combination Set
TFI	Transport Format Indicator
TFS	Transport Format Set
TM	Transparent Mode
TMGI	Temporary Multicast Group Identifier
TMSI	Temporary Mobile Subscriber Identity
TPC	Transmit Power Control
TrCH	Transport Channel
TSTP	Time Stamp
TTI	Transmission Time Interval
T-UMTS	Terrestrial UMTS
TV	Virtual spacing Time
Tx	Transmit
UDP	User Datagram Protocol
UE	User Equipment
UM	Unacknowledged Mode
UMTS	Universal Mobile Telecommunications System
U-plane	User plane
U-RNTI	UTRAN RNTI
UTRA	UMTS Terrestrial Radio Access (ETSI)
UTRA	Universal Terrestrial Radio Access (3GPP)
UTRAN	UMTS Terrestrial Radio Access Network
WCDMA	Wideband CDMA
WFQ	Weighted Fair Queuing

3 3GPP TO SDMB RELEASE1 UE SPECIFICATIONS

For Test Bed release 1, UE SDMB specifications are an “add-on” over a 3GPP release 99 UE. To perform an SDMB download, some 3GPP features will be inhibited, and others will be slightly modified, as described in section 5.

Internal modifications will be brought to the UE in such a way that for Test Bed release 1, the UE will not be fully 3GPP compliant anymore.

3.1 External Interface requirements

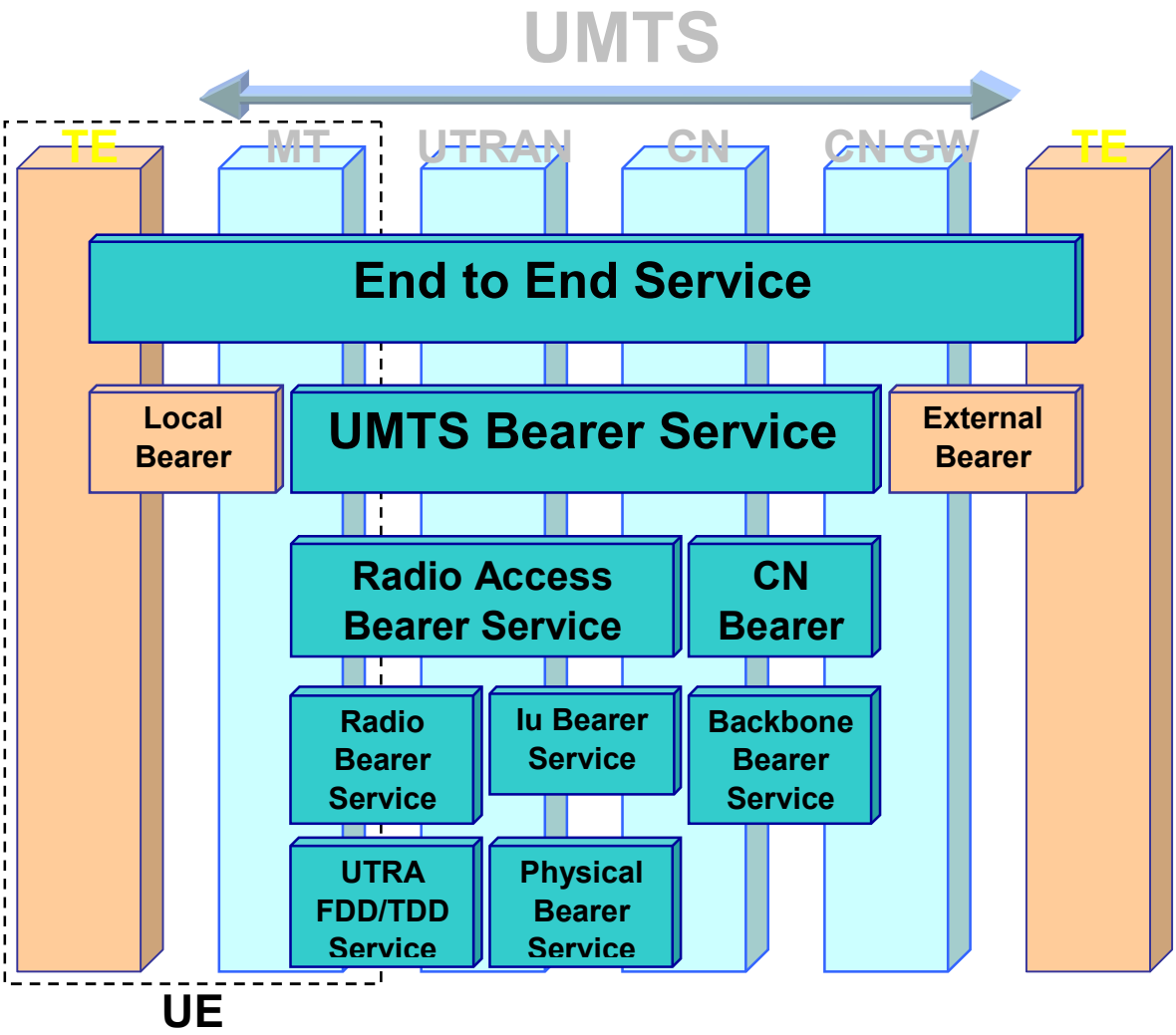

Figure 1 UMTS Reference Architecture

Figure 1 above describes the UMTS reference architecture. Details of equipment involved in the UE are detailed below. This document addresses the impacts brought to this architecture in the scope of the MAESTRO Release1 test bed im-

plementation. More specifically, the document will describe the Uu Interface impacts, i.e. impacts brought to the interface between the UE and UTRAN, as it is associated to the UE specifications.

3.1.1 UE decomposition

Figure 1 shows the UE can be split into a Mobile Terminal and a Terminal Equipment.

In the MAESTRO test bed R1, the starting system is a 3GPP compliant Mobile Terminal which will be modified so as to be able to receive broadcast data on an SDMB cell. This data will be a streaming multimedia file. It therefore needs a client able to read and play the streaming flow received by the handset from the SDMB cell. In test bed R1, the client will be hosted outside the Mobile Terminal, on a PC.

The Terminal Equipment is a PC, hosting several applications for streaming and testing purposes. Regarding streaming, an MSPS proprietary application allows the PC to use the MT as a modem to retrieve the user data flow. The streaming client is an open source application based on the Java Media Framework.

Regarding testing, the design document REF provides a detailed description of the application used on the PC to trace the Handset behaviour on the Uu interface.

In SDMB release 1 Test Bed, a 3GPP compliant USIM will be used without modification.

3.1.2 Uu Interface modifications

In the MAESTRO test bed R1, the starting system is a 3GPP compliant Mobile Terminal. On the MT side, the Uu interface will be modified in order to receive data broadcast on an SDMB cell. Use of only the downlink path of the UTRAN will be made. The serving cell shall provide the required channels for the Mobile to camp and perform attach. These channels are listed on figure 3.

Subsequently, the Mobile will be able to decode the primary common control channel (P-CCPCH) which carries the System Information Block (SIB) embedded into the broadcast control channel (BCCH). The SIB information will allow decoding data transmitted over the forward access channel (FACH). The following channel mapping is the 3GPP channel mapping that is specified in **[AD5].**

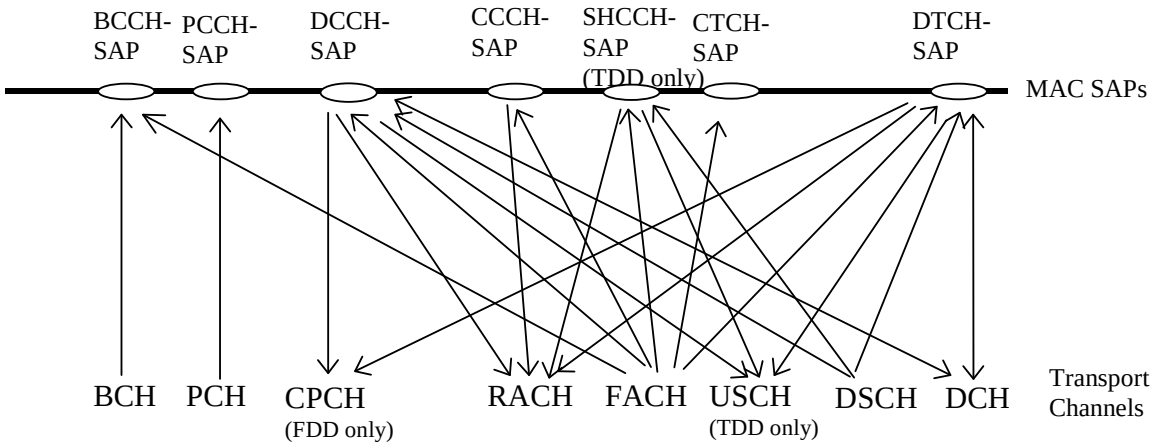

Figure 2 Logical channels mapped onto transport channels, UE side

However, for the SDMB R1 test bed, most of these channels will not be used because:

- SDMB traffic and signalling is downlink-only in nature, meaning that all 3GPP uplink channels are not relevant
- SDMB traffic is broadcast, meaning that all 3GPP dedicated downlink channels will not be used.

Instead, the following channel mapping has been proposed as optimal for the SDMB broadcast. The figure does not give the exact mapping in terms of the multiplexing options (i.e. number of FACHs that are to be mapped on the S-CCPCH) but gives the indication of the logical channels, transport channels and physical channel involved in the MAESTRO Release1. It is to be noted however that in release 1 we plan only to use a single FACH mapped into a single S-CCPCH. Some other multiplexing options will be studied in the scope of MAESTRO release 2 test bed.

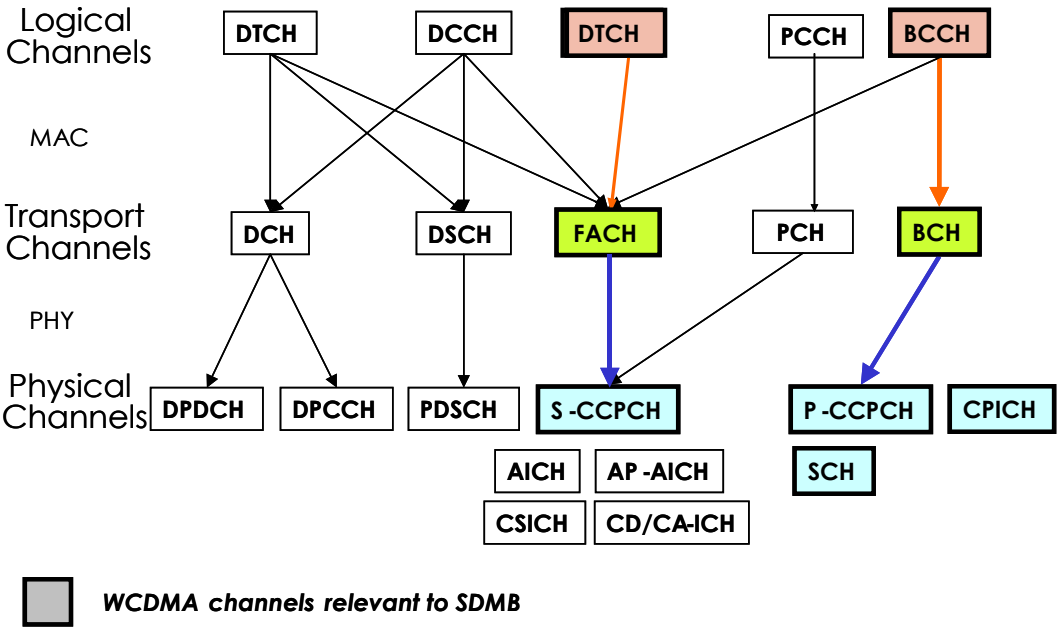

Figure 3 UMTS channels and relevance to SDMB test bed R1

Data transfer on the RLC UM SAP will thus transit via the DTCH on the FACH which is then mapped on the S-CCPCH on the physical layer to be sent on the air.

Once the UE is attached, all signalling will be sent on the BCCH via SIB. The main modification brought into the Uu interface will be the introduction of a series of SIB fields that will be needed to configure the UE via an indexed method described in section 4.

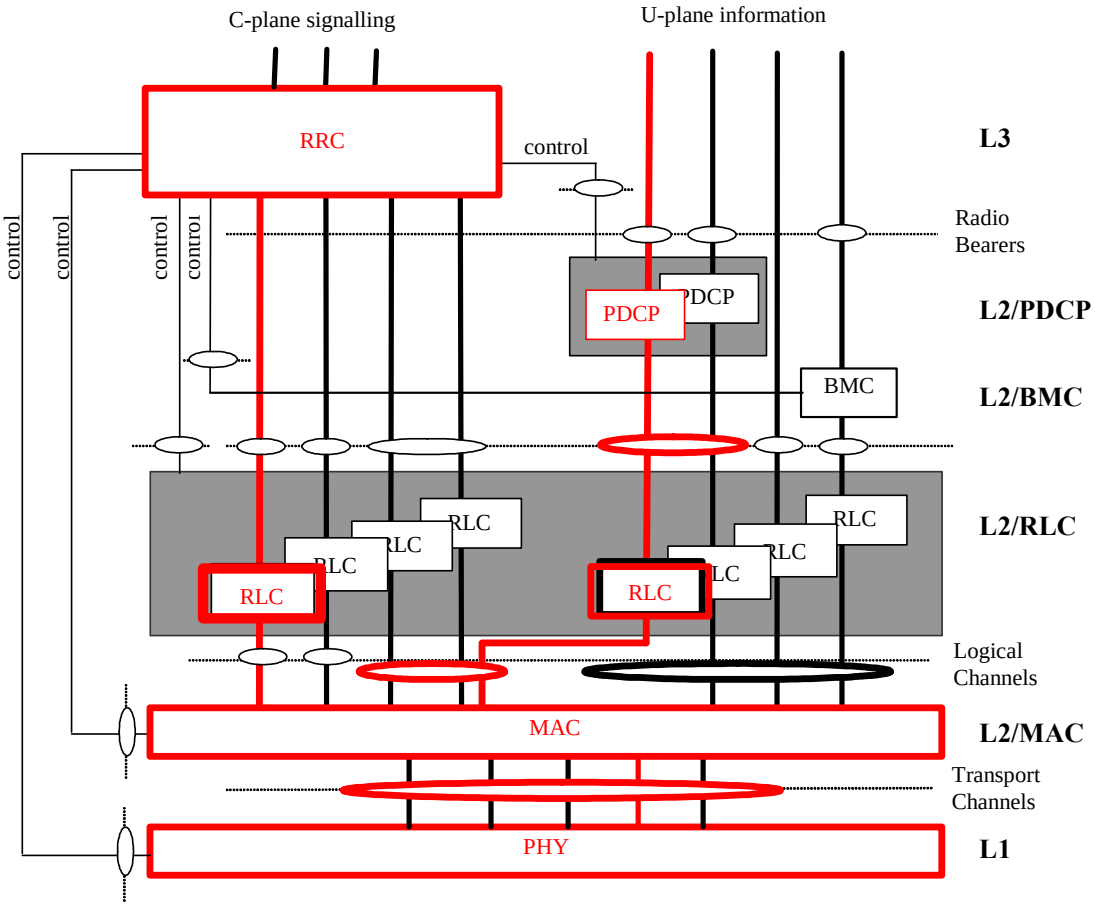

Figure 4 Radio Interface protocol architecture

The above figure describes the 3GPP existing protocol architecture in the UE, and highlights in red the layers and interfaces to modify to achieve MAESTRO SDMB Release1 requirements. Note that Service Access Points are marked by circles.

As SDMB for test bed release 1 aims at doing a downlink packet transfer, the user plane will be impacted as well as the control plane. Our approach is to reuse as much as possible the existing 3GPP procedures from a UE standpoint. The main SDMB limitation is the lack of uplink return channel; hence, internal agents added to existing 3GPP modules in the UE will simulate both the generation of uplink messages and the reception of downlink messages such as RRC connection setup. Thus, the absence of a return link will be transparent to the UE, behaving as if a usual 3GPP procedure was ongoing.

The 3GPP layers that are impacted by the changes to 3GPP due to SDMB release 1 requirements are therefore:

- On both user and control plane: Physical Layer, MAC. The channel mapping of FACH on DTCH mentioned above is not described in the specs, although it is not explicitly prohibited
- On the user plane: RLC needs no modification as per 3GPP. RLC will run in transparent mode for signalling and unacknowledged mode for the data transfer. Above RLC, PDCP needs no special modification.
- On the control plane: RRC hosts the major changes. As no specific module has been defined for SDMB release 1, it is planned to modify RRC in order to stub the RRC Connection Setup, the Radio Bearer Setup and PDP Context Activation. The configuration of L1/MAC and MM will follow as per 3GPP. Details and scenarios are given in section 5.

All the interfaces between these layers remain 3GPP compliant. Only procedures changes are introduced.

3.2 Operational requirements

3.2.1 Transition between existing and new system

The detailed trade-off between the existing (3GPP) system and SDMB as required for Release1 has been detailed in **D03-1_UNIS_MAESTRO_v2.7, "SDMB Access Layer definition"**

Scenario	*Existing System*	*New System (Release1)*
Cell selection and Camping	*Power Scan* *Selection of best cells* *PLMN scan*	*Identical to existing system*
Attach	*Location Update/Routing Area Update triggered by MM layer. Response from the network expected*	*Fake attach: MM message not sent. UE RRC to send reply to MM, including the TMSI value.*
RRC Connection Establishment	*RRC Connection Request primitive sent to UTRAN on RACH. RRC Connection Setup message sent on FACH to be able to configure the RLC,MAC and Layer1 sub-layers of the access layer in the UE.*	*SDMB RAN does not support RRC connection.* *Fake RRC Connection procedure: UE RRC sends an RRC CONNECTION SETUP message to itself, including hard-coded values necessary for configuring*

		the access layer. RRC enters the CELL FACH state after reception of this message.
Pipe establishment	*After receiving a Radio Bearer Setup message from the UTRAN, the UE RRC sends a CPDCP_CONFIG_REQ message to the UE PDCP layer.*	*The same CPDCP_CONFIG_REQ message will be sent to the PDCP layer using hard-coded values stored in the UE.*
Data transfer	*Data is brought to application through the User Plane. The Service Class has triggered an Access Layer Configuration for streaming.*	*Data is brought to the application hosted by a PC through the Mobile. The Access Layer Configuration is not determined by the application. A pointer to a static configuration hosted by the Handset is sent out through System Information.*

Table 1 Existing system and Release1 system trade-offs

3.2.2 Operations preparation

3.2.2.1 Development system

The development system to be used for the UE of the Release1 test bed is the Motorola in-house configuration management system as used for the development of the commercial version of Motorola handsets.

3.2.2.2 Associated validation system

The validation system to be used for the UE of the Release1 test bed is the Motorola in-house systems.

3.2.2.3 Associated maintenance system

Same as in 3.2.2.1

3.2.3 Operability

3.2.3.1 General requirements for operability

Reference **MAE-D6-1-C-REQ-52**

The UE shall be able to combine coherently several identical signals due to multi-path effects and/or terrestrial repetition.

*

3.2.3.2 Ergonomics – human factors

- Operation and maintenance of the Terminal Equipment – the PC – for this test bed will require the presence of MSPS people in the MAESTRO team.
- Once the phone is powered up when connected via cable to the PC, the necessary tools for data logging will run automatically.
- An application running on a PC (TE) will be in charge of collecting and processing data received from the Mobile (MT) being used as a modem. Once the application is started, no human interaction is required.

3.2.3.3 Observability and Monitoring

As stated in D6-1-1 – “SDMB system technical requirements document”, the UE shall be able:

- To keep track of the incoming data rate (**MAE-D6-1-T-REQ-043**)
- To monitor the BER, BLER and the received mean power (**MAE-D6-1-T-REQ-018**)
- To monitor the Packet error rate (**MAE-D6-1-T-REQ-054**)

3.2.4 Operation scenarios

The scenarios to be studied will be defined in **D06-2-1b - “MAESTRO Release 1 Test Bed Design Document”**

3.3 Functional requirements

3.3.1 Specification of the product states

The starting point is a commercial version of a 3GPP-compliant Motorola handset that is adapted to be operational in the scope of the MAESTRO Release1 test bed. The state of the handset after these modifications (wrt 3GPP compliance) will not be verified, and it is therefore assumed that the handset will not be 3GPP compliant.

3.4 Performance requirements

Reference **MAE-D6-1-C-REQ-103**

The physical layer shall be able to provide a BLER less than or equal to 1% w.r.t. transmission impairments. This will be further analyzed for next releases in WP2.

This does not take into account SDMB signal reception interruption due to paging and measurements of adjacent cells, as well as interruptions due to cellular calls, phone off, etc.

*

3.5 Capacity requirements

In the scope of release 1, it is expected from the terminal to support the decoding of a single FACH mapped into a single S-CCPCH. The maximum user data rate supported at the FACH level that includes the relevant UDP/IP/RLC/MAC headers is 384kbps.

3.6 Security Requirements

N/A

3.7 Regulations requirements

FFS: It seems that WP8 addresses these issues. Is it applicable here and what is the input from WP8?

3.8 RAMS requirements

N/A

3.9 Environment requirements

N/A

3.10 Design and Development requirements

3.10.1 Architecture

The only constraint on the software architecture is that we are deriving the UE SDMB stack for Release1 from the current 3G Motorola proprietary stack architecture.

3.10.2 Interfaces

Interfaces are defined internally and are Motorola Proprietary.

The UE-SDMB RAN interface is the UMTS WCDMA air interface, the UE only receiving SIB, and other signalling and data transfer channels as defined in **D03-1_UNIS_MAESTRO_v2.7, “SDMB Access Layer definition”.**

3.10.3 Reusability

The UE hardware is completely reusable throughout the different MAESTRO releases excluding the commercial release.

3.10.4 S/W technologies and processes

The MAESTRO MSPS team will apply fully mature software development process that have been proven and validated in the MSPS Toulouse site. In-house configuration management policies will be used.

3.10.5 Particular instructions for materials and procedures

N/A

3.10.6 Robustness

UE hardware and software have successfully passed 3GPP tests.

3.10.7 Efficiency margins

N/A

3.10.8 Expansion capability - Potential for additional services

The initial UE is dual-mode capable, meaning that it supports both GSM/GPRS and UMTS services. Support for additional services is not applicable to MAESTRO.

3.10.9 Portability

N/A

3.10.10 Mechanical design

N/A

3.10.11 Electrical design

N/A

3.10.12 Thermal design

N/A

3.10.13 Production

N/A

3.11 Integrated Logistic Support requirements

3.11.1 Test and trouble-shooting support equipment

MSPS MAESTRO team will use in-house testing equipment and validation.

3.11.2 Deployment configuration requirements

The MSPS proprietary logging software hosted on the PC connected to the Mobile on the test bed will be monitored by trained MSPS team members.

3.11.3 Databases

N/A

3.11.4 Packaging, handling, storage and transport

N/A

3.11.5 Identification and labelling

N/A

4 TEST BED R1 REQUIREMENTS

This chapter is intended to provide the test bed presentation with the overall test bed system presentation in the first part, with an emphasis on the UE specifications in the final part. In this section, we propose to detail the trade-offs implied in the SDMB Release 1 requirements versus 3GPP implementation, and then to describe the *ad hoc* solutions that have been adopted by the different WP6 partners as necessary for the practical realisation of the Release1 test bed. As a reminder from the MAESTRO technical annex the requirements for the SDMB Release1 as depicted in the D6.3.1 are given below:

- Establishing an S-DMB connection over FACH (establishment downlink only)
- Pre-determined SDMB channel configuration (release 1)
- Maintaining the S-DMB connection over FACH (release 1)
- Reporting essential physical parameters such as BER and BLER through SDMB specific test menu (release 1)

4.1 Applicability of the Commercial Product requirements to the Test Bed R1

There is no commercial product requirement as defined **D06-2-1b - "MAESTRO Release 1 Test Bed Design Document"** covered by the Release1 test bed. The aim of the test bed is to prove the SDMB concept via the validation of:

- downlink-only UE setup
- a maximum physical channel (SCCPCH) bit-rate of 1920 kbps/SF4
- using FACH as transport channel.

In test bed R1, no UMTS idle mode procedures as specified in the commercial version of SDMB will be taken into consideration. The initial UE UMTS stack will be converted to an 'SDMB Release1' stack.

The aim of the Release1 test bed is therefore to demonstrate the feasibility of performing a download on the FACH without the return link, and validating the BLER and BER values.

4.2 Test Bed R1 Trials overall requirements

The Release1 test bed will be setup to test and validate the concept of performing an SDMB broadcast, namely in terms of data rates and configuration of the access layer. The test bed should also provide valuable input regarding to the ongoing definition of SDMB. From the UE standpoint, the data rates and absence of return link imply that for the Release1 test bed, changes with respect to the 3GPP-

compliance will have to be foreseen. The Release1 UE will therefore implement these changes, and the procedures are described in this section.

The following system description has been derived from D06-2-1b - "MAESTRO Release 1 Test Bed Design Document". It represents the committed test bed architecture for MAESTRO Release 1:

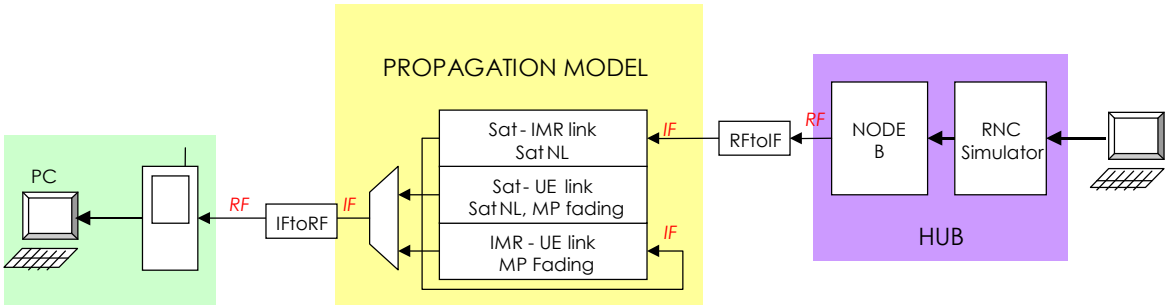

Figure 5 – Lab propagation test bed

The only information that the UE receives from the SDMB RAN will be broadcast in the form of System Information Blocks (SIB). In 3GPP implementation, SIB are sent on the BCCH. On reception of the SIB, the UE obtains relevant information about the channels that it will have to configure in the cell for example to initiate a dedicated channel circuit-switched or packet-switched connection. As such, information about the uplink channel (RACH) on which to send an RRC_CONNECTION_REQUEST message is detailed in the SIB, as well as the downlink channel (FACH) for the RRC_CONNECTION_SETUP reply from the network. Likewise, information about the physical channels is known. Throughout this section, it is important to bear in mind the fact that no uplink transmission is valid in the Release1 test bed, in order to understand the trade-offs that are being proposed. The RNC also provides a set of channels that are necessary for the UE to perform its cell selection, camping, synchronisation and BCCH decoding.

This section is organised in the chronological order of procedures that are undertaken from the UE standpoint, and gives a picture of the tradeoffs that have been used for Release 1 purposes.

4.2.1 Cell selection and Camping

- Description: At power up, the UE shall use the physical channels provided by RNC simulator necessary for the UE to camp: SCH, CPICH, P-CCPCH. Using these channels, the UE will perform the classical (3GPP) power scan on the usual 3GPP frequencies, synchronise and read information about the PLMN of the RNC simulator (BCCH). This phase is similar to the 3GPP procedure.

At this point, the UE is considered to be ”camped” on the serving cell.

4.2.2 Attach

- Description: The next step that is normally undertaken is location update or routing area update triggered by the MM layer in the UE.
- SDMB Release1 trade-off: this procedure will be bypassed in the following manner:
    - o MM sends a Location Update/ Routing Area Update message to the UE RRC layer.
    - o RRC then sends a reply message to MM (without establishing the RRC connection as specified in 3GPP), **giving the appropriate value to GMM for the P-TMSI** as it would have been assigned by UTRAN.

At this point, the UE is considered as registered in the UTRAN.

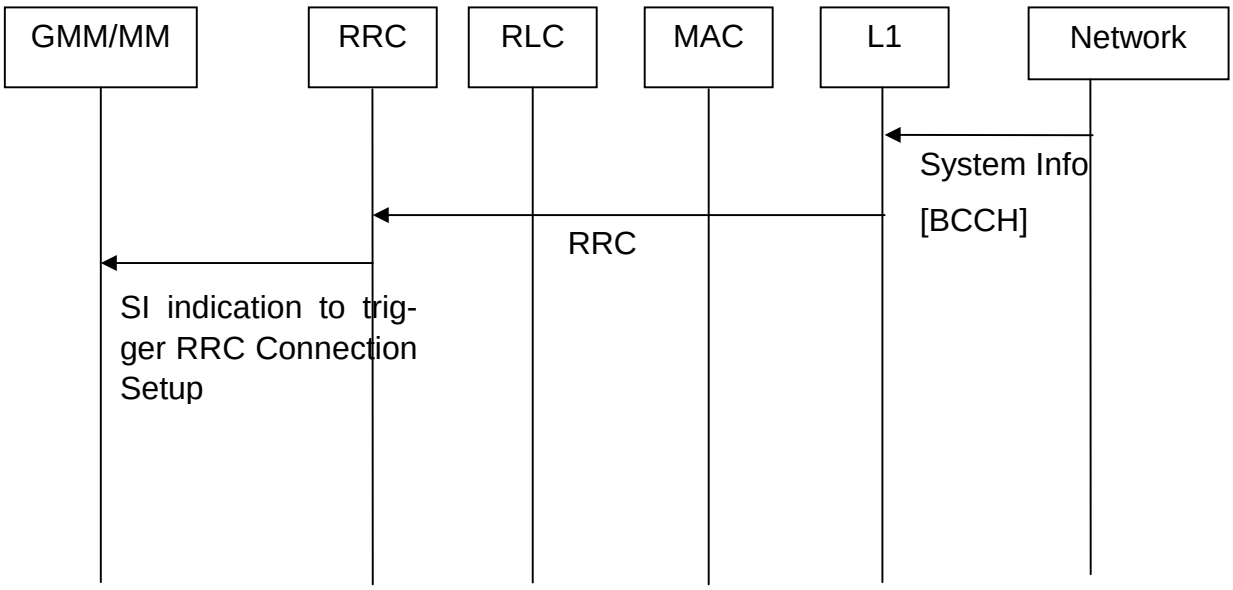

Figure 6 Fake RRC connection initiation

4.2.3 RRC Connection Establishment

- o Description: The next step in the 3GPP procedure is for the UE to enter a state in which it can be paged in case of incoming calls, or initiate a PS or CS connection with the network.

  SDMB Release1 trade-off: In both cases, the UE has to setup an RRC connection establishment. However, this implies uplink signalling on the RACH. This is not possible with SDMB. The proposal for the Release1 test bed is to bypass this procedure as well, by performing a fake RRC connection establishment using only System Information read on the BCCH to configure the UE SDMB stack. After reading the necessary SIB, the UE RRC layer will receive a message as if it has received the RRC_CONNECTION_SETUP message from UTRAN, and then configure

its L1/MAC and RLC layers. This is indeed a realistic rationale, as the same FACH on which the UMTS stack is configured to read the RRC_CONNECTION_SETUP message is to be used for the subsequent data transfer for the test bed. However, given that the information that is set in the 3GPP SIB is only used for signalling purposes instead of data transfer, sufficient information corresponding to the Radio Bearer Setup should be known to the UE. For Release1, some of these values will be hard-coded, and accessed via an index sent in the SIB. Details about the fields impacted are detailed in 4.3.

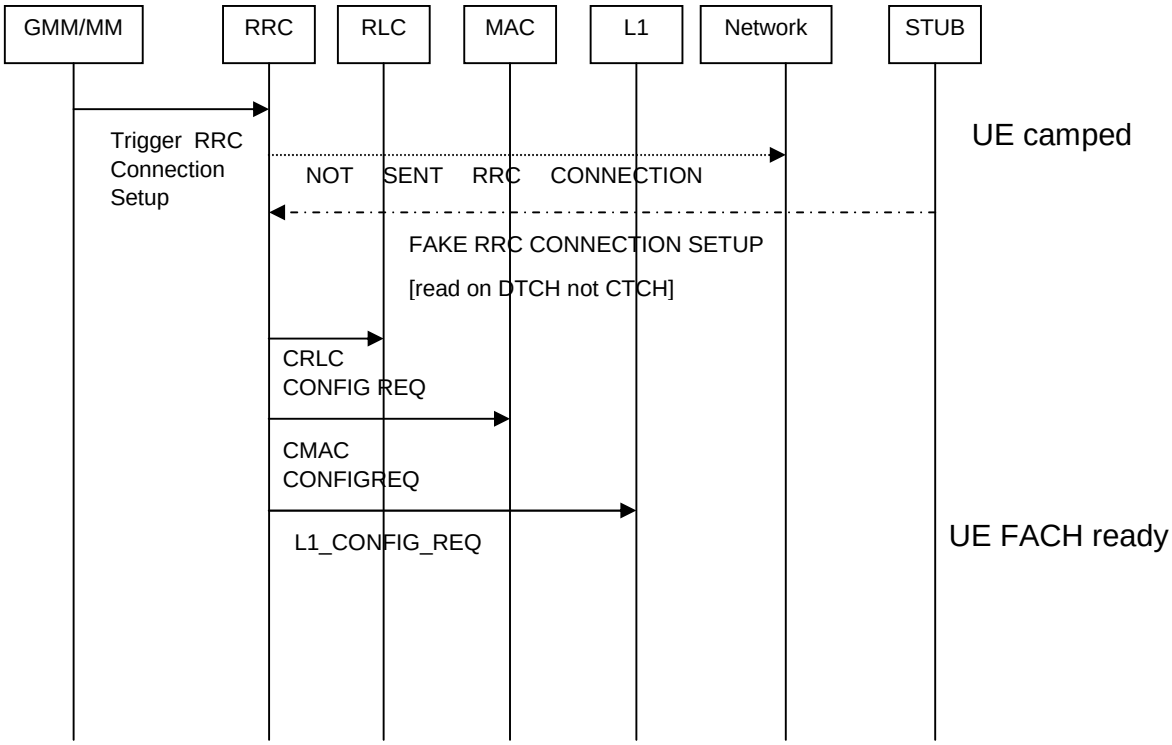

Figure 7 Fake RRC connection termination and access layer configuration

4.2.4 Pipe establishment

- Description: Now that the RRC connection establishment is “set up”, the UE is in the proper state to perform data transfer. However, the NAS layers (namely SM, IP, UDP) still need to be configured properly to perform end-to-end data transfer.

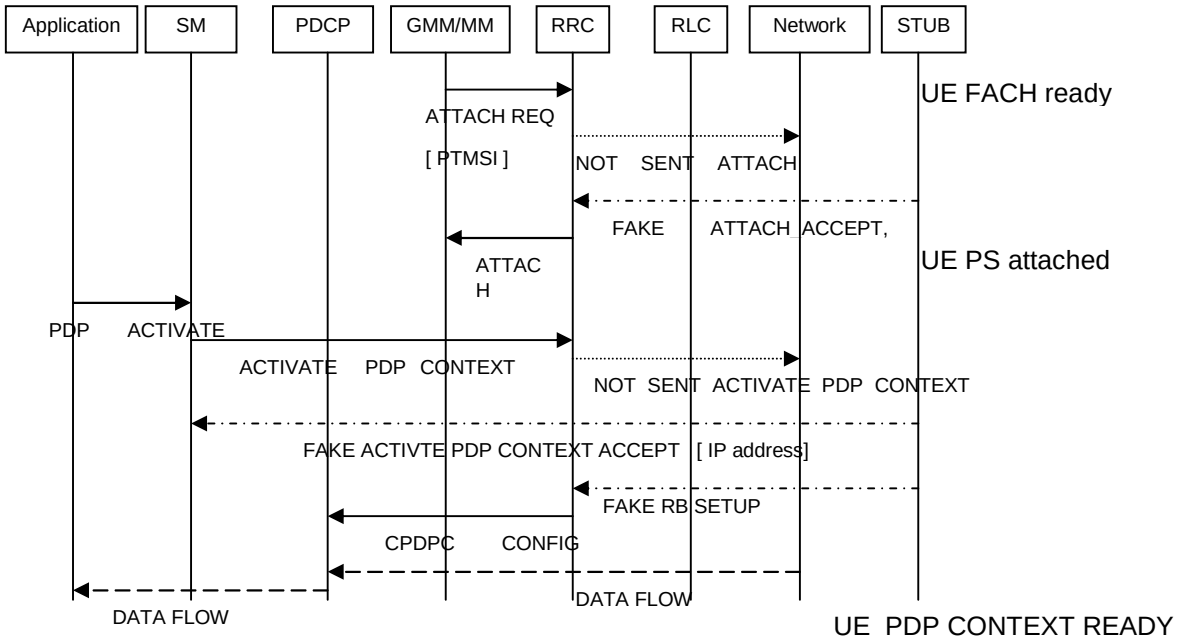

Figure 8 PDP context activation procedure for Release1

- SDMB Release1 trade-off:
  - 3GPP procedure: SM sends a PDP CONTEXT ACTIVATE REQUEST message to its peer entity, and receives a PDP CONTEXT ACTIVATE ACCEPT in the positive case. Meanwhile, the UTRA RRC sends a RADIO BEARER SETUP to configure all layers up to PDCP for data transfer on the appropriate RAB/RB mapping.
  - Release 1 procedure: Hard code some of the values that are to be used for PDP context activation in the UE, and then RRC configures L1, MAC, RLC and PDCP layers, using broadcast System Information.

4.2.5 Data transfer

- Description: All of the protocol layers are correctly configured to perform the data transfer. The data transfer flow is detailed in the following steps:
  - The physical layer of the UE decodes the SCCPCH and performs the demultiplexing on the FACH,
  - MAC receives its PDUs on the FACH and routes the RLC blocks on the DTCH,
  - RLC performs reassembly of the received segments and sends them to the PDCP layer.

- PDCP decompresses the received PDUs (if applicable) and forwards the relevant data to the upper layers.
- Data Packets received by the MT from PDCP will be transferred on the PC through an MSPS proprietary interface over USB and played on the fly on the PC by a streaming client.
- *Data transfer end*: once the data transfer is completed, the UE will reset on reception of a special SIB value broadcast by the Network.
- *File Download*: Moreover the consortium needs to define a mechanism to determine which parts of the content to download have been received by the UE / sent by the Network in order to stop the download when appropriate.

4.3 Test Bed R1 specific requirements

Per scenario Release1 Requirement:

- Cell selection and camping: Release1 requirement: The PLMN value listed in the MIB **must** be a Preferred PLMN for the UE USIM.
- Attach: RRC has to calculate the UE TMSI value and provide it to the MM sublayer.
- RRC Connection Procedure: The System Information Blocks **must** be properly set for the FACH download. Only one S-CCPCH will be used to carry only one FACH. Current UE capabilities (cf. [2]) state that a DL384k class mobile needs to handle only one SCCPCH/DPCH at a time. The response should also indicate in the Information Element in the RRC State Indicator field to the RRC layer that it should enter the CELL_FACH state as required for release1.

Other specific requirements for the R1 test bed involve essentially the insertion of a certain number of fields in the SIB that are depicted in the following tables per type of message expected from the UTRAN:

4.3.1 RRC Connection Setup

In release 1 scenario, RRC Connection Request will not be sent out by the UE. The RRC Connection Setup message parameters requested to configure the phone internal layers will be stubbed.

MP stands for Mandatory Present, MD for Mandatory Default and OP for Optional as per 3GPP TS 25.331.

Message Name	From	To	Description
RRC Connection Setup	RRC UTRAN	RRC UE	

Fields not used in SIB	1. Initial UE identity	MP	Hard Coded
	2. RRC transaction identifier	MP	Hard Coded
	3. Activation time	MP	Hard Coded
	4. New U-RNTI	MP	Hard Coded
	5. New C-RNTI	OP	Hard Coded
	6. RRC State Indicator	MP	Hard Coded
	7. UTRAN DRX cycle length coefficient	MP	Not Used but Hard Coded default value
	8. Signalling RB information to setup list	MP	Index to Hard Coded “configuration set”
	9. >Signalling RB information to setup	MP	Index to Hard Coded “configuration set”
	10. UL Transport channel information common for all transport channels	OP	Not Applicable
	11. Added or Reconfigured TrCH information list (UL)	MP	Not needed when in CELL_FACH according to 25.331, but value needed => Hard Coded
	12. >Added or Reconfigured UL TrCH information	MP	Not Applicable
	13. DL Transport channel information common for all transport channels	OP	Index to Hard Coded “configuration set”
	14. Added or Reconfigured TrCH information list (DL)	MP	Not needed when in CELL_FACH according to 25.331, but value needed => Hard Coded
	15. >Added or Reconfigured DL TrCH information	MP	Not needed when in CELL_FACH according to 25.331, but value needed => Hard Coded

	16. Frequency info	OP	Not Applicable for Release 1 / FFS
	17. Maximum allowed UL TX power	MD	Not Applicable
	18. Uplink DPCH info	OP	Not Applicable
	19. CPCH SET Info	OP	Not Applicable
	20. Downlink information common for all radio links	OP	FFS (a priori non)
	21. Downlink information per radio link list	OP	Not Applicable
	22. >Downlink information for each radio link	MP	Not Applicable
Fields read from SIB:	23. Capability update requirement (SIB 13)	MD	Not Applicable in release 1

Table 2 RRC Connection Setup SIB fields

4.3.2 Attach Accept

Stages:

- Fake Attach Accept: stub attach accept in order for the UE to enter the PS attach state.
- Attach Accept is a NAS message (transparent to RRC, embedded in a downlink direct transfer RRC message), indicating UE is attached to PS core domain. The information encoded in this message is too high level to be broadcast in System Information and will therefore be hard-coded. At a MM level.

4.3.3 Activate PDP Context Accept

Stages:

- Fake Activate PDP Context
- Activate PDP Context Accept is a NAS message (transparent to RRC, embedded in a downlink direct transfer RRC message), indicating UE ready at a high level for data transfer. The information encoded in this message is

too high level to be broadcast in System Information and will therefore be hard-coded. At a MM level.

4.3.4 Radio Bearer Setup Complete

Stages:

- Fake Radio Bearer Setup Complete: This message is sent by UTRAN to the UE to establish new radio bearer(s).

Message Name	From	TO	Description	
RADIO BEARER SETUP	RRC (UTRAN)	RRC (UE)		
Fields not used in SIB:	1. RRC transaction identifier		MP	
	2. Integrity check info		OP	
	3. Integrity protection mode info		OP	The UTRAN should not include this IE unless it is performing an SRNS relocation
	4. Ciphering mode info		OP	The UTRAN should not include this IE unless it is performing an SRNS relocation and a change in ciphering algorithm
	5. Activation time		MD	
	6. New U-RNTI		OP	
	7. New C-RNTI		OP	
	8. New DSCH-RNTI		OP	
	9. RRC State Indicator		MD	

	10. UTRAN DRX cycle length coefficient	OP	
	11. CN Information info	OP	
	12. URA identity	OP	
	13. Signalling RB information to setup list	OP	
	14. >Signalling RB information to setup	MP	
	15. RAB information to setup list	OP	
	16. >RAB information for setup	MP	
	17. RB information to be affected list	OP	
	18. >RB information to be affected	MP	
	19. Downlink counter synchronisation info	OP	
	20. >RB with PDCP information list	OP	This IE is needed for each RB having PDCP in the case of lossless SRNS relocation
	21. >>RB with PDCP information	MP	
	22. UL Transport channel information common for all transport channels	OP	
	23. Deleted TrCH information list	OP	
	24. >Deleted UL TrCH information	MP	

	25. Added or Reconfigured TrCH information list	OP	
	26. >Added or Reconfigured UL TrCH information	MP	
	27. >>CPCH set ID	OP	
	28. >>Added or Reconfigured TrCH information for DRAC list	OP	
	29. >>>DRAC static information	MP	Dynamic Ressource Allocation Control
	30. DL Transport channel information common for all transport channels	OP	
	31. Deleted TrCH information list	OP	
	32. >Deleted DL TrCH information	MP	
	33. Added or Reconfigured TrCH information list	OP	
	34. >Added or Reconfigured DL TrCH information	MP	
	35. Frequency info	OP	
	36. Maximum allowed UL TX power	MD	
	37. >Uplink DPCH info	OP	
	38. >CPCH SET Info	OP	Not Applicable for Release 1

	39. >>Downlink PDSCH information	MP> >OP	

Table 3 Radio Bearer Setup SIB fields

5 REFERENCES

5.1 Applicable documents

[AD1] MAESTRO Annex I - “Description of Work”- Technical Annex

[AD2] EU MAESTRO Deliverable D6-1, “SDMB system technical requirements Document (for R1)”, version 3.1, February 2004

[AD3] D06-2-1a.ASP.MAESTRO.v2.1, “SDMB system Design Document for release 1”

[AD4] D06-2-1b.ASP.MAESTRO.v2.1, “MAESTRO Release 1 Test Bed Design Document”

[AD5] D03-1_UNIS_MAESTRO_v2.7, “SDMB Access Layer definition”

5.2 Applicable norms and standards

[AN1] TS25.306 v3.7.0, Sect. 5.2.2, UE Radio Access capabilities (Release 1999)

[AN2] 3GPP TS 25.301, “Radio Interface Protocol Architecture”