

Agenda Item: 7.8

Source: Ericsson

Title: **Merge proposal of L1 primitives in ETSI and ARIB documentation**

Document for: Decision

1 Introduction

At the previous TSG-RAN WG2 meeting in Helsinki the documentation from the different standardisation bodies participating in 3GPP were successfully merged into a common set of documents (the S2.XX series). However, the merge could not be fully completed. Since the ARIB L1 documentation including the primitives was not available to everyone, the set of L1 primitives could not be merged. In this contribution a merge of the L1 primitives, taking into account those that have been specified in ARB, is presented.

2 Discussion

[1] In the following sub-sections we discuss each primitive one-by-one. The ARIB primitives from ARIB, Volume 3; Specifications of Air-Interface for 3G Mobile System, Ver. 1.0, January 14, 1999 have been copied into the Appendix of this contribution for reference.

2.1 Naming convention

ARIB have denoted primitives to MAC and RRC as PHY- and RPHY-primitives respectively. ETSI have used the naming PH- and MPH-primitives (same as in GSM). In our view the ARIB naming corresponds better to the protocol architecture adopted. The 'R' in RPHY would correspond to RRC in the same way as 'M' corresponds to RR-management in GSM. Throughout this paper we refer to the ARIB naming as the preferred naming. Please note that if another naming is preferred (e.g. PH- and MPH-) all names of the proposed merged set of primitives could easily be changed correspondingly.

2.2 PHY-primitives (PH-primitives)

2.2.1 PH-CONNECT

This one does not exist in ARIB. To our understanding this primitive would only be useful for the DSCH solution with MAC signalling (DSCH control channel). In that case the UE MAC would activate the DSCH part of its physical layer when it has received an indication to do so on the DSCH control channel. For other channels it would be RRC that activates the physical layer. We think that the primitive should remain, but with a clarification included that it is intended for the DSCH MAC solution only. The name should be changed to PHY-CONNECT

2.2.2 PH-DISCONNECT

The same applies as for the previous one. The name should be changed to PHY-DISCONNECT

2.2.3 PH-DATA

This one exists in ETSI and ARIB, with some differences in included parameters. We think that the ARIB parameter CRC (CRC check result) should be added to the S2.02 list of parameters, but only for the indication primitive. Note also that CRC check result

shall be per transport block, not transport block set. The ARIB parameter MU corresponds to Transport block set and is therefore already covered. The name should be changed to PHY-DATA.

2.2.4 PH-STATUS

In S2.02 this is only an indication primitive. ARIB also include request and confirm. Indication could perhaps be useful, e.g. for enabling MAC to take temporary actions at certain events (e.g. max transmission power has been reached). However, it is unclear to us what would be the purpose of request and confirm primitives offered to MAC. In our opinion corresponding primitives should instead be offered to RRC (corresponding RPHY-primitives already exist). Therefore we would like to keep the primitive as it is in S2.02, except for that the name should be changed to PHY-STATUS. Parameters to be included should be FFS for now.

2.2.5 PHY-ERROR Indication

This one is in ARIB only. We don't see a need for this. Instead there should in our opinion be (and there is already) a corresponding RPHY-primitive to RRC.

2.3 RPHY-primitives (MPH-primitives)

2.3.1 PHY-DCH-Connect

This one only exists in ARIB. We think it should be included in S2.02 since the configuration of the transport channels to be used by PHY and MAC are not covered by the MPH-Setup. MPH-Setup is used to setup a certain RL, not to configure a TrCH between MAC and PHY. This primitive would be used for setting up and configuring a TrCH, and also to modify an existing TrCH. However, the current naming is a bit misleading. We propose to change the name to RPHY-TrCH-Config.

2.3.2 PHY-DCH-Disconnect

Same applies for this primitive as for PHY-DCH-Connect.

2.3.3 PHY-RL-Connect (ARIB) and MPH-Setup (ETSI)

Similar in both ETSI and ARIB, i.e it is used for setting up a new RL including physical channels. We think that a clearer name would be RPHY-RL-Setup.

2.3.4 PHY-RL-Disconnect (ARIB) and MPH-Release (ETSI)

Similar in both ETSI and ARIB. The name should be changed to RPHY-RL-Release.

2.3.5 MPH-Modify

This one only exists in ETSI. We see a possible need for this primitive, when modifying an RL. The name should be changed to RPHY-RL-Modify.

2.3.6 PHY-Error (ARIB) MPH-Error (ETSI)

Similar in both ETSI and ARIB. The name should be changed to RPHY-Error.

2.3.7 PHY-Status

This exists both in ETSI and ARIB, although in ETSI "sub primitives" has been used (MPH-Sync, MPH-out-of sync and MPH-Measurement). The ETSI way is easier to understand when primitives are used in examples. We suggest to rename these primitives to RPHY-Sync, RPHY-Out-of-sync and RPHY-Measurement.

3 Text proposal

In the following three pages a text proposal for inclusion in S2.02 is given, using revision marks for changes compared to the current version.

10. Primitives of the physical layer

~~Editor's note: The following list of primitives, as well as the corresponding parameters, has been taken from ETSI UMTS YY.02 v1.2.0. A review is needed to compare the section with the corresponding sections of the ARIB physical layer specification.~~

The Physical layer interacts with other entities as illustrated in figure 2.1. The interactions with the MAC layer and the RRC layer are shown in terms of primitives where the primitives represent the logical exchange of information and control between the physical layer and higher layers. They do not specify or constrain implementations. For the physical layer two sets of primitives are defined:

* **Primitives between layer 1 and 2:**

PHY - Generic name - Type: Parameters.

* **Primitives between layer 1 and the RRC entity:**

MRPHY - Generic name - Type: Parameters.

10.1 Generic names of primitives between layers 1 and 2

Editor's note : the following list of primitives contains the first part of the generic primitives between the physical layer and upper layers. It is not complete yet. Further primitives will be incorporated when the modelling of the physical layer is further refined. In particular, most of the parameters to the primitives are FFS.

10.1.1 PHY-CONNECT

Note: This primitive is FFS. It could potentially be used by MAC for activating reception of the physical channel that carries DSCH if MAC signalling is used for DSCH resource allocation, i.e. in the case of MAC signalling on a DSCH control channel (c.f. Case B in S2.01). Will there be additional use for it in the TDD mode?

The PHY-CONNECT primitives are used to request activation of the physical layer connection or to confirm that the physical layer connection has been activated.

Primitives: request, confirm.

Request parameters:

- FFS

Confirm parameters:

- FFS

10.1.2 PHY-DISCONNECT

Note: This primitive is FFS. It could potentially be used by MAC for de-activating reception of the physical channel that carries DSCH if MAC signalling is used for DSCH resource allocation, i.e. in the case of MAC signalling on a DSCH control channel (c.f. Case B in S2.01). Will there be additional use for it in the TDD mode?

The PHY-DISCONNECT primitives are used to request deactivation of the physical layer connection or to indicate that the physical layer connection has been deactivated.

Primitives: request, indication (FFS)

Request parameters:

- FFS

Indication Parameters

- FFS

10.1.3 PHY-DATA

The PHY-DATA primitives are used to request and indicate SDUs used for Layer 2 peer to peer communications passed to and from the physical layer. One PHY-DATA primitive is submitted every Transmission Time Interval for each Transport Channel.

Primitives: request, indication.

Parameters:

- TFI
- Type of slotted mode (e.g. no slotting, slotting of beginning/middle/end of frame)
- Transport Block Set
- CRC check result (indication only)
- FFS

10.1.4 PHY-STATUS

The PHY-STATUS primitive can be used by the layer 1 to notify higher layers of an event which has occurred.

Primitives: indication

Parameters

- Event value
 1. Maximum transmission power has been reached

10.2 Generic names of primitives between layers 1 and 3

~~3.4.4~~ 10.2.1 STATUS PRIMITIVES

MRPHY-Sync

This primitive is used for L1 to indicate to RRC that synchronisation of a certain physical channel has been done in the receiver.

Primitives:

MRPHY-Sync-IND

Parameters:

FFS

MRPHY-Out-of-Sync

Primitive sent from L1 to RRC indicating that synchronisation of a previously configured connection has been lost in the receiver.

Primitives:

MRPHY-Out-of-Sync-IND

Parameters:

FFS

MRPHY-Measurement

The Request primitive is used for RRC to configure L1 measurements. The Indication primitive is used to report the measurement result from L1 to RRC.

Primitives:

MRPHY-Measurement-REQ

MRPHY-Measurement-IND

[Note: The need for a **MRPHY-Measurement CNF** is FFS.]

Parameters:

Transmission quality parameters

FFS

10.2.2 MRPHY-ERROR

The MRPHY-ERROR primitive is used to indicate to the managementRRC entity that an error has occurred as a result of a physical layer fault.

Primitives: indication

Indication Parameters

- Error Code

10.2.3 CONTROL PRIMITIVES

RPHY-TrCH-Config

This primitive is used for setting up and configuring a transport channel, and also to modify an existing transport channel.

Primitives:

RPHY-TrCH-Config-REQ

RPHY-TrCH-Config-CNF

Parameters:

FFS

RPHY-TrCH-Release

This primitive is used for releasing a transport channel.

Primitives:

RPHY-TrCH-Release-REQ

RPHY-TrCH-Release-CNF

Parameters:

FFS

MRPHY-RL-Setup

The Request primitive is sent from RRC to L1 for establishment of a Radio link to a certain UE. The Confirm primitive is returned from L1 to RRC when the Radio link is established. In case L1 is unable to execute the request, this is indicated in the confirm primitive.

Primitives:

MRPHY-RL-Setup-REQ

MRPHY-RL-Setup-CNF

Parameters:

Physical channel description

MRPHY-RL-Release

The Request primitive is sent from RRC to L1 for release of a Radio link to a certain UE. The Confirm primitive is returned from L1 to RRC when the radio link is released.

Primitives:

MRPHY-RL-Release-REQ

MRPHY-RL-Release-CNF

Parameters:

FFS

MRPHY-RL-Modify

The Request primitive is sent from RRC to L1 for modification of a Radio link to a certain UE. The Confirm primitive is returned from L1 to RRC when the radio link is modified. In case L1 is unable to execute the request, this is indicated in the confirm primitive.

Primitives:

MRPHY-RL-Modify-REQ

MRPHY-RL-Modify-CNF

Parameters:

Physical channel description

5 Conclusion

A merge of the different sets of L1 primitives listed in S2.02 (taken from ETSI document YY.02) and the corresponding primitives listed in the ARIB L1 specification have been discussed. It is proposed that the text about primitives of the physical layer in S2.02 is changed according to the text proposal presented in this contribution.

6 References

[1] ARIB, Volume 3; Specifications of Air-Interface for 3G Mobile System, Ver. 1.0, January 14, 1999

Appendix: ARIB L1 primitives

The following text has been copied from the ARIB L1 specification ARIB, Volume 3; Specifications of Air-Interface for 3G Mobile System, Ver. 1.0, January 14, 1999.

Elements for layer-to layer communication

Primitives between PHY and MAC

Primitives represent, in an abstract way, the logical exchange of information and control between the PHY and MAC sub-layers. They do not specify or constrain implementations or imply any particular exposed interface.

Primitives

The primitives between PHY and MAC are shown in Table 2.2-1. It is used for peer-to-peer communication between MAC entities.

Table 2.2-1. Primitives between MAC sub-layer and Physical layer

Generic Name	Type				Parameters
	Request	Indication	Response	Confirm	
PHY-DATA	X	X			CHI, MU, CRC
PHY-STATUS	X	X		X	[FFS]
PHY-ERROR		X			[FFS]

PHY-DATA Request/Indication

- PHY-DATA.Request primitive defines the transfer of data from the MAC sub-layer to the physical layer.
- PHY-DATA.Indication primitive defines the transfer of data from the physical layer.

PHY-STATUS Request/Indication/Confirm

- PHY-STATUS.Request is used by the MAC to request status of the physical layer.
- PHY-STATUS.Indication is used by the physical layer to indicate its status.
- PHY-STATUS.Confirm is used by the physical layer to confirm its status associated with a previous PHY-STATUS.Request.
- These primitives should include a status primitive in the MS indicating. This information should flow from physical layer to layer 3, enabling RRC to conduct proper action. For example, if MS transmitter is transmitting at full power, this status information is reported by those primitives to RRC in order to restrict the transmission rate so that the quality can be maintained or release the radio bearer if this is not possible.

PHY-ERROR Indication

- PHY-ERROR.Indication is used by physical layer to indicate that an error has occurred.

Parameters

- a) CHI
Channel Indication which identifies the transport channel.
- b) Message Unit (MU)
It contains the information to be transmitted or received by the physical layer.
- c) CRC
CRC check result of MU

Primitives between PHY and RRC

Primitives

The primitives between PHY and RRC are shown in Table 2.2-2.

Table 2.2-2 Primitives between PHY and RRC

Generic Name	Type				Parameters
	Request	Indication	Response	Confirm	
RPHY-DCH-CONNECT	X			X	[FFS]
RPHY-DCH-DISCONNECT	X	X		X	[FFS]
RPHY-RL-CONNECT	X			X	[FFS]
RPHY-RL-DISCONNECT	X	X		X	[FFS]
RPHY-STATUS	X	X		X	[FFS]
RPHY-ERROR		X			[FFS]

PHY-DCH-CONNECT Request/Confirm

- PHY-DCH-CONNECT.Request is used by the RRC either to create a new DCH or to modify an existing one at L1. It also activates connection of the DCH to certain RL(s) at specified time.
- PHY-DCH-CONNECT.Confirm is used by the physical layer to confirm creation or modification of the DCH and activation of the DCH connection.

PHY-DCH-DISCONNECT Request/Indication/Confirm

- PHY-DCH-DISCONNECT.Request is used by the RRC to disconnect and clear a DCH.
- PHY-DCH-DISCONNECT.Indication is used by the physical layer to indicate disconnection of the DCH.
- PHY-DCH-DISCONNECT.Confirm is used by the physical layer to confirm the disconnection of the DCH.

PHY-RL(*)-CONNECT Request/Confirm

- PHY-RL-CONNECT.Request is used by the RRC to set radio link parameters at L1.
- PHY-RL-CONNECT.Confirm is used by the physical layer to confirm the changes.

[() Assumed definition for "RL" (radio link) : A Radio Link is a bi-directional connection between a terminal and a base station sector. Each RL is comprised of all the channels that are associated with the same physical layer control channel (DPCCH).]*

PHY-RL-DISCONNECT Request/Indication/Confirm

- PHY-RL-DISCONNECT.Request is used by the RRC to request disconnection of a radio link.
- PHY-RL-DISCONNECT.Indication is used by the physical layer to indicate disconnection of the radio link.
- PHY-RL-DISCONNECT.Confirm is used by the physical layer to confirm the disconnection of the RL.

PHY-STATUS Request/Indication/Confirm

- PHY-STATUS.Request is used by the RRC to request status of the physical layer.
- PHY-STATUS.Indication is used by the physical layer to indicate its status.
- PHY-STATUS.Confirm is used by the physical layer to confirm its status associated with a previous PHY-STATUS.Request.
- These primitives should include a status primitive in the MS indicating. This information should flow from physical layer to layer 3, enabling RRC to conduct proper action. For example, if MS transmitter is transmitting at full power, this status information is reported by those primitives to RRC in order to restrict the transmission rate so that the quality can be maintained or release the radio bearer if this is not possible.

PHY-ERROR Indication

- PHY-ERROR.Indication is used by physical layer to indicate that an error has occurred.

Parameter

FFS