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RAN WG2 779/99

Source: InterDigital

Title: TDD Specific Parameters for the RRC Messages

Document For: Decision

Introduction:

This document proposes definitions of additional RRC parameters and Information Elements (IE) that are unique to TDD mode. Restructuring where the TDD time slot parameter is maintained is also suggested.

Since the mandatory or optional parameter type for TDD is not always the same for FDD, the following change request identifies TDD and FDD in separate columns.

Discussion:

1. Time Slot Identification in TDD Mode:

Currently time slots are identified in the Uplink Time Slot Info and Downlink Time Slot Info IE's, which are independent of the physical channel IE's that include the channelization code. In TDD a physical channels time slot is associated with it's chanelization code. To maintain this information in common IE's, the following changes are proposed:

- a) Remove *Uplink Time Slot Info* and *Uplink Time Slot Info* IEs from the following messages:
 - i. HANDOVER COMMAND
 - ii. RRC CONNECTION SETUP
 - iii. PHYSICAL CHANNEL RECONFIGURATION
 - iv. RADIO ACCESS BEARER RECONFIGURATION
 - v. RADIO ACCESS BEARER RELEASE
 - vi. RADIO ACCESS BEARER SETUP
 - vii. TRANSPORT CHANNEL RECONFIGURATION
- b) Add *Time Slot* parameter for the following physical channel IEs:
 - i. Secondary CCPCH Info
 - ii. PRACH Info
 - iii. Uplink DPCH Info
 - iv. Downlink DPCH Info
- c) Remove the following note from the above mentioned messages:

"Note 1: It is assumed that the DL timeslot configuration is the same for all radio links, whether or not macro-diversity is supported for TDD"

This assumption is no longer necessary since the time slot is specified for each physical channel.

This also corrects the System Information Message, which did not indicate time slot information for the secondary CCPCH channel.

2. Channelization Code parameter for the PRACH Info IE:

In TDD it is necessary to specify the *Channelization Code* for each *PRACH channel*. Therefore it is proposed to add this parameter to the PRACH Info IE (RRC Protocol Specification section 10.2.6.4 PRACH info).

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3. Spreading Factor parameter for DPCH channels:

Every dedicated channel in TDD may have a different Spreading Factor (SF), particularly if they resided in different time slots. Therefore, it is proposed to add the SF parameter to the *Uplink DPCH info* and the *Downlink DPCH info* IEs (RRC Protocol Specification sections 10.2.6.6 Uplink DPCH info, and 10.2.6.8 Downlink DPCH info).

4. <u>System Information identification of cell sync case and neighbor cell information</u>: It is proposed to add the following IEs to the System Information message:

a) Sync Info:

This IE provides the necessary information to establish frame synchronization.

There are three synchronization cases in TDD:

- Case 1: One PSCH (Physical Synch Channel) every 10ms DL frame BCH in the same time slot as PSCH
- Case 2: Two PSCH channels every 10ms DL frame BCH in the same time slots as PSCH
- Case 3: Two PSCH channels every 10ms DL frame BCH location is found by a pointer (3 extra bits that are used for that purpose)

The first PSCH time slot is always indicated by the value k. The second PSCH time slot (for case 2, and 3) can be found in k+8.

After the PSCH channel is found, the BCH channel can be determined. Since the value k (the PSCH time slot) is not given, the beginning of the frame can not be determined.

Therefore, it is proposed to include the value k as a parameter "PSCH Time Slot (k)" of the Sync Info IE to the System Information message.

b) Neighboring cells Sync info:

This IE provides information about the neighboring cells sync and broadcast channels. This information is required to avoid going through the time consuming cell search algorithm for each of the neighboring cell. The following parameters should be defined.

i. Cell Parameter

This parameter serves as an index to a Look-Up-Table that provides the following information:

- DL Scrambling code
- <u>Toffset</u>: The amount of chips the primary synchronization code (Cp) is offset from the start of the timeslot.
- Midamble code
- Cs pattern: Pattern of 8 secondary synchronization codes (Cs)
- ii. Sync time slot (k can take the values 0 14)
- iii. Sync case (1,2, or 3)
- iv. BCH (CCPCH) pointing bits (only for sync case 3)

<u>Proposed Changes to the RRC Protocol Specification (25.331) for</u> removal of UL&DLTime Slot IE's:

10.1 Radio Resource Control messages

10.1.1 RRC Connection Mobility Messages

10.1.1.5 HANDOVER COMMAND

<Functional description of this message to be included here>

RLC-SAP: t.b.d.

Logical channel: DCCH Direction: UTRAN \rightarrow UE

Information element category	Information elements	REFERENCE	TYPE (TDD)	TYPE (FDD)	NOTE	
	Message Type		M	М		
Phy CH information	Frequency info		M	M		
elements	UL DPCH power control info		M	М		
	UL DPCH info		M	М		Uplink radio resources
	UL timeslot info			0		100001000
	Primary CCPCH info		M	М	For each radio	Downlink radio
	DL DPCH info		M	М	IIIIK. NOTET	resources
	DL timeslot info			0	Note 2	-
	SSDT indicator		<u>O</u>	0		

Note1: The possibility to request the establishment of several radio links simultaneously with this message is FFS.

Note 2: It is assumed that the DL timeslot configuration is the same for all radio links, whether or not macro-diversity is supported for TDD.

10.1.4.7 RRC CONNECTION SETUP

This message is used by the network to accept the establishment of an RRC connection for an UE, including assignment of signalling link information, transport channel information and optionally physical channel information.

RLC-SAP: t.b.d.

Logical channel: CCCH Direction: UTRAN → UE

Information element category	Information elements	REFERENCE		TYPE (FDD)	NOTE	
	Message Type		M	М		
UE information elements	Initial UE identity		M	M	FFS whether co or MAC.	onveyed on RRC
	S-RNTI		M	M		
	SRNC identity		M	M		
	C-RNTI		<u>O</u>	0	Only if assigned transport chann	
	Activation time		0	0		
RAB	RAB identity		M	M	Indicates the si	gnalling link
information elements	Signalling link type		M	M		
	RAB multiplexing info		<u>M</u>	M	For the signalling	ng link
TrCH information	TFCS		<u>O</u>	0	Uplink TFCS	
elements	TFCS		<u>O</u>	0	Downlink TFCS)
	TFC subset		<u>O</u>	0		
	Transport channel identity TFS		<u>M</u>	M M	For each new transport channel	Uplink transport channels
	Transport channel identity		M	M	For each new	Downlink
	TFS		M	M	transport channel	transport channels
PhyCH	Frequency info		0	0		
information elements						
elements	Uplink DPCH power control info		<u>O</u>	0		
	Uplink DPCH info		<u>O</u>	0	Maximum one	Uplink radio
	PRACH info		<u>O</u>	0	of these	resources
	Uplink timeslot info			0		
	Primary CCPCH info		<u>O</u>	0	For each radio	Downlink radio
	Downlink DPCH info		0	0	link	resources
	Secondary CCPCH info		<u>O</u>	0		_
	Downlink timeslot info			0	Note 1	
	SSDT indicator		<u>O</u>	0	Necessity is FF	S
	Gated Transmission Control info		<u>O</u>	0	FFS	

Note 1: It is assumed that the DL timeslot configuration is the same for all radio links, whether or not macro-diversity is supported for TDD.

10.1.5.1 PHYSICAL CHANNEL RECONFIGURATION

This message is used by UTRAN to assign, replace or release a set of physical channels used by a UE.

RLC-SAP: t.b.d.

Information element category	Information elements	REFERENCE	TYPE (TDD)	TYPE (FDD)	NOTE	
	Message Type		M	М		
UE Information	Activation time		0	0		
elements	C-RNTI		0	Ö	Only RACH/F	FACH
UTRAN mobility Information elements	URA update indicator		<u>O</u>	0	when present	hall be used, and t, it instructs the JRA updating
PhyCH	Uplink DPCH power control info		<u>O</u>	0		
information elements	Frequency info		<u>O</u>	0		
	Uplink DPCH info PRACH info		<u>O</u> <u>O</u>	0	Maximum one of these	Uplink radio resources
	Uplink time slot info			0		
	Primary CCPCH info Downlink DPCH info		0	0	For each radio link	Downlink radio resources
	Secondary CCPCH info		0	0	For FACH	
	Secondary CCPCH info		<u>O</u>	0	For PCH	
	Downlink timeslot info			0	Note 1	1
	SSDT indicator		<u>O</u>	0	Necessity is F	FFS
	Gated Transmission Control info		<u>O</u>	0	FFS	

10.1.5.3 RADIO ACCESS BEARER RECONFIGURATION

This message is sent from UTRAN to reconfigure parameters related to a change of QoS. This procedure can also change the multiplexing of MAC, reconfigure transport channels and physical channels.

RLC-SAP: t.b.d.

Information element category	Information elements	REFERENCE		TYPE (FDD)	NOTE	
	Message Type		M	М		
UE Information			<u>O</u>	0	0 1 5 1 0 1 1/5 1	~
elements	C-RNTI				Only RACH/FAG	CH
RAB	RAB identity		M	M		For each RAB
information	RLC info		O	0	FFS	affected by this
elements	RAB multiplexing info		M	M		message
TrCH	TFCS		0	0	for uplink DCHs	i
information						
elements	TFCS		<u>O</u>	0	for downlink DC	Hs
	TEC auboot		0	0	for DCHa in unli	nle
	TFC subset		<u>O</u>	0	for DCHs in upli	nk
	Transport channel identity		<u>O</u>	0	For each removed transport channel	Uplink transport channels
	Transport channel identity		0	0	For each	
					reconfigured or added	
	TFS		<u>O</u>	О	transport channel	
	Dynamic Control		<u>O</u>	0	For each	
	Transmission time validity		0	0	reconfigured or	
	Time duration before retry		0	0	added	
	Silent period duration before release		0	0	transport channel	
					controlled by DRAC	
	Transport channel identity		0	0	For each	Downlink
	Transport channel identity		<u>O</u>	O	removed transport channel	transport channels
	Tranpsort channel identity		0	0	For each	
	TFS		<u>O</u>	0	reconfigured or added transport	
					channel	
DhyCH	Haliak DBCH naves control info		0	0		
PhyCH nformation	Uplink DPCH power control info		<u> </u>	0		
elements	Frequency info		0	0		
	1 2					
	Uplink DPCH info		<u>O</u>	0	Maximum one of these	Uplink radio resources
	PRACH info		<u>O</u>	0		
	Uplink timeslot info			0		
	Primary CCPCH info		NΙΛ	0	For each radio	Downlink radio
	-		NA O		link	resources
	Downlink DPCH info Secondary CCPCH info		<u>0</u>	0		. 55531000
	Downlink timeslet info			0	Note 1	1
	DOWNING UNICOUCHINO		1	9	I VOTO	l .
	SSDT indicator		<u>O</u>	0	Necessity is FF	S
	Gated Transmission Control info		0	0	FFS	

10.1.5.5 RADIO ACCESS BEARER RELEASE

<Functional description of this message to be included here>

RLC-SAP: t.b.d.

Information element category	Information elements	REFERENCE		TYPE (FDD)	NOTE	
	Message Type		<u>M</u>	М		
	Activation time		<u>0</u>	0	0 1 54011/54	S
elements	C-RNTI		<u>O</u>	0	Only RACH/FAC	ЭН
RAB information	RAB identity		M	М	For each release	ed RAB
elements	RAB identity		<u>O</u>	0	For each other f	RAB affected by
	RAB multiplexing info		<u>O</u>	0		
ГгСН	TFCS		0	0	for uplink DCHs	
nformation						
elements	TFCS		0	0	for downlink DC	Hs
	TFC subset		<u>O</u>	0	for DCHs in upli	nk
	Transport channel identity		<u>O</u>		For each removed transport channel	Uplink transport channels
	Transport channel identity		0	0	For each	
	TFS		<u>O</u>		reconfigured or added (FFS) transport channel	
	Dynamic Control		0	0	For each	
	Transmission time validity		0	0	reconfigured or	
	Time duration before retry		0	0	added (FFS)	
	Silent period duration before release		<u>O</u>		transport channel, controlled by DRAC	
	Transport channel identity		<u>O</u>		For each removed transport channel	Downlink transport channels
	Transport channel identity		<u>O</u>	0	For each	
	TFS		<u>O</u>		reconfigured or added transport channel	
21 011	LL II L BBOLL					
PhyCH nformation	Uplink DPCH power control info		<u>O</u>	0		
elements	Frequency info		<u>O</u>	0		
	Uplink DPCH info		0	0	Maximum one	Uplink radio
			0	0	of these	resources
	PRACH info				†	resources
	PRACH info Uplink timeslot info			0		
	Uplink timeslot info				For each radio	Downlink radio
	Uplink timeslot info Primary CCPCH info		0	0		Downlink radio
	Uplink timeslot info Primary CCPCH info Downlink DPCH info		0	0 0	For each radio link	Downlink radio resources
	Uplink timeslot info Primary CCPCH info			0		

10.1.5.7 RADIO ACCESS BEARER SETUP

<Functional description of this message to be included here>
RLC-SAP: t.b.d.
Logical channel: DCCH
Direction: UTRAN \rightarrow UE

Information element category	Information elements	REFERENCE	TYPE (TDD)	TYPE (FDD)	NOTE	
	Message Type		M	М		
CN information elements	NAS binding info		M	M	Transparent nor stratum info e.g.	access bearer identity.
	Activation time		<u>O</u>	0	0 1 0 4 0 1 / 5 4	S
elements	C-RNTI		<u>O</u>	0	Only RACH/FAC	JH
RAB	RAB identity		M	M	For the new RA	В
nformation	RLC info		M	M		
elements	RAB multiplexing info		M	М		
	RAB identity		<u>O</u>	0	For each other f	RAB affected by
	RAB multiplexing info		<u>O</u>	0	this message	
	TF00			0	(II I BOIL	
rCH nformation	TFCS		<u>O</u>	0	for uplink DCHs	
elements	TFCS		0	0	for downlink DC	Hs
	11 00				IOI GOWIIIIK DC	1 10
	TFC subset		0	0	for DCHs in upli	nk
	Transport channel identity		<u>O</u>	0	For each removed transport channel	Uplink transport channels
	Transport channel identity		0	0	For each	
	TFS		0	0	reconfigured or	
			<u></u>	J	added transport channel	
	Dynamic Control		0	0	For each	
	Transmission time validity		0	0	reconfigured or	
	Time duration before retry		0	0	added	
	Silent period duration before release		<u>O</u>	0	transport channel, controlled by DRAC	
	Transport channel identity		0	0	For each	Downlink
	,		<u>U</u>	O	removed (FFS) transport channel	transport channels
	Transport channel identity		0	0	For each	
	TFS		<u>O</u>	0	reconfigured or added transport channel	
PhyCH	Uplink DPCH power control info		0	0		
nych nformation	Opinik DPOH power control into		<u> </u>	0		
elements	Frequency info		0	0		
	Uplink DPCH info		0	0	Maximum one	Uplink radio
	PRACH info		0	0	of these	resources
	Uplink timeslot info			θ		
	D: OODOU: (_		n
	Primary CCPCH info		0	0	For each radio	Downlink radio
	Downlink DPCH info		0	0	link	resources
	Secondary CCPCH info Downlink timeslot info		<u>O</u>	0	Note 1	
	II II WITHING THE SCIOT INTO	1	1	0	Note 1	
	DOWNINK UNICOIOUNIO					
	SSDT indicator		0	0	Necessity is FFS	<u> </u>

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10.1.5.9 TRANSPORT CHANNEL RECONFIGURATION

This message is used by UTRAN to configure the transport channel of a UE. This also includes a possible reconfiguration of physical channels. The message can also be used to assign a TFC subset and reconfigure physical channel.

RLC-SAP: t.b.d.

Information element category	Information elements	REFERENCE		TYPE (FDD)	NOTE	
	Message Type		M	М		
	3 71					
UE Information	Activation time		0	0		
elements	C-RNTI		0	0	Only RACH/FAG	CH
	Control-only-state-timer		0	Ō	FFS	
1	common ormy oracle armon		Ť			
TrCH	TFCS		0	0	for uplink DCHs	
information					ioi apiiiik Borio	,
elements	TFCS		0	0	for downlink DC	'He
olollioliko	11 03			<u> </u>	lor downlink DC	1113
	TFC subset		0	0	for DCHs in upli	ink
İ	TFC Subset		<u>U</u>	U	IOI DONS III upii	IIIK
1	Transport shown at identity				Cor cook	Linkale
I	Transport channel identity		0	0	For each	Uplink
	TFS		<u>O</u>	0	reconfigured	transport channels
					transport	channels
	Dunamia Cantral				channel For each	-
I	Dynamic Control		<u>O</u>	0	reconfigured	
1	Transmission time validity		0	0	transport	
	Time duration before retry		<u>0</u>	0	channel,	
	Silent period duration before release		<u>O</u>	0	controlled by	
					DRAC	
					DRAC	
	Transport channel identity		0	0	For oach	Downlink
	Transport channel identity TFS		<u>0</u>	0	For each reconfigured	Downlink transport
	115		<u>O</u>	U	transport	channels
					channel	Chameis
					onanno	
PhyCH	Uplink DPCH power control info		0	0		
information	Opinik Di Ori power control illio			0		
elements	Frequency info		0	0		
Olomonio	riequency into		<u>U</u>	0		
	Unlink DPCH info		0	0	Maximum one	Uplink radio
	Uplink DPCH info PRACH info		0	0	of these	resources
			<u>U</u>		or triese	resources
	Uplink timeslot info			0		
	D: OODOU: (D 11 11
	Primary CCPCH info		<u>0</u>	0	-	Downlink radio
	Downlink DPCH info		0		link	resources
	Secondary CCPCH info		<u>O</u>	0]
	Downlink timeslot info			0	Note 1	
	SSDT indicator		<u>O</u>	0	Necessity is FF	S
	Gated Transmission Control info		<u>O</u>	0	FFS	

Note 1: It is assumed that the DL timeslot configuration is the same for all radio links, whether or not macro-diversity is supported for TDD.

<u>Proposed Changes to the RRC Protocol Specification (25.331) for additional TDD specific IE's and parmeters:</u>

10.1.6 System Information Messages 10.1.6.1 SYSTEM INFORMATION

<Functional description of this message to be included here>

RLC-SAP: t.b.d.

Logical channel: BCCH or DCCH or CCCH

Direction: UTRAN → UE

NOTE: The division of the system information into messages is FFS.

Information element category	Information elements	REFERENCE	TYPE (TDD)	TYPE (FDD)	NOTE	
outogo. y	Message Type		М	М		
	I Woodage Type		101	101		
CN information	PLMN Identity		M	М		
elements	CN domain identity		M	M		For each Core
0.0	NAS system information		<u>M</u>	M		Network Domain.
						Information must be included for at least one core network domain type.
UTRAN	URA identity		M	М		For each URA
mobility information elements	Information for periodic cell and URA update		M	M		Note: not for each URA any more
	Cell identity		<u>M</u>	M	The necessity and usage of cell identity is FFS.	
	Cell selection and re-selection info		<u>M</u>	М		
UE information	Uplink access control info		<u>M</u>	М		
elements	Transmission probability		<u>O</u>	0	For all UE	For each class
eiements	Maximum bit rate		0	0	having DCH	of UE Note2
DI OLI	Francisco info				Far and DACI	1
PhyCH	Frequency info PRACH info		<u>О</u> М	O M	For each RACI	٦
information	PRACH IIIIO		IVI	IVI		
elements	Cell Sync Info		M		Identification of synchronisation	
	Neighbouring Cell Info		<u>M</u>		Neighbouring 1 synchronisation channel inform	n and broadcast
	Frequency info		0	0	For each FACH	on secondary
	Secondary CCPCH info		<u>M</u>	M	CCPCH	. cri coochaary
	Frequency info		0	0	For each PCH	on secondary
	Secondary CCPCH info		<u>M</u>	M	CCPCH	on occorridary
	PRACH power control info		<u>M</u>	М		

Measurement	Measurement Identity Number	<u>M</u>	М	Note 1	For each Intra-
Information elements					frequency
	Intra-frequency cell info	<u>M</u>	М	For each measurement object	measurement control
	Intra-frequency measurement quantity	<u>M</u>	М		
	Intra-frequency measurement reporting criteria	<u>M</u>	М		
	Measurement Identity Number	<u>M</u>	М	Note 1	For each Inter- frequency measurement control
	Inter-frequency cell info	M	М	For each measurement object	
	Inter-frequency measurement quantity	<u>M</u>	М		
	Inter-frequency measurement reporting criteria	<u>M</u>	М		
	Measurement Identity Number	<u>M</u>	М	Note 1	For each Inter- system
	Inter-system cell info	<u>M</u>	М	For each measurement object	measurement control
	Inter-system measurement quantity	<u>M</u>	М		
	Inter-system measurement reporting criteria	<u>M</u>	М		

Note 1: The necessity and usage of Measurement identity number in this message is FFS.

Note 2: The split of parameters into several System Information message X is FFS.

10.2.6 Physical CH Information elements

10.2.6.3 Secondary CCPCH info

Parameters	REFERENCE			NOTE
		(TDD)	<u>(FDD)</u>	
DL scrambling code		N/A	0	Only needed if different from DL scrambling code of Primary CCPCH
Channelization code		<u>M</u>	М	
Time Slot		<u>M</u>	N/A	

10.2.6.4 PRACH info

Parameters	REFERENCE	TYPE	TYPE	NOTE
		(TDD)	(FDD)	
Access slot		N/A	М	For each allowed access slot for the preambles
Preamble spreading code		<u>N/A</u>	М	For each code to use for spreading of the preamble. There is also a one to one mapping from preamble code to what scrambling code to use for the message part.
Preamble signature		N/A	М	For each allowed preamble signature.
Spreading factor		N/A	M	For each rate or SF that are allowed to use on the data part (I-branch) in the message part of the random access
Time Slot		<u>M</u>	N/A	For each RACH in TDD mode
Channelization Code		<u>M</u>]

10.2.6.6 Uplink DPCH info

Parameters	REFERENCE	TYPE		NOTE	
		(TDD)	(FDD)		
UL scrambling code		<u>M</u>	M	What short or long uplink scrambling code a certain labould use	JE
DPCCH channelization code		N/A	M	SF of the channelization code for control part. [necessity of this parameter is FFS.]	_
DPDCH channelization code		M	M	SF of the channelization code for data part	
Time Slot		M	N/A	Time slots to be used in the UL for TDD	
Spreading Factor(SF)		M		SF to be used in the DL for TDD mode	

10.2.6.8 Downlink DPCH info

Parameters	REFERENCE	TYPE (TDD)	TYPE (FDD)	NOTE	
DL scrambling code		O	0	Only needed if differen scrambling code of Prir CCPCH	
DL channelization code		M	М	Channelization codes to be used in the downlink for DPCH	For each DPCH
Time Slot		M	N/A	Time slots to be used in the DL for TDD	
Spreading Factor (SF)		<u>M</u>		SF to be used in the DL for TDD	

10.2.6.9 Uplink timeslot info (TDD only)

Parameters Parameters	REFERENCE	TYPE	NOTE	
Slot number		M	Timeslot to be	For each slot
			used in uplink	
			(TDD only)	

10.2.6.10 Downlink timeslot info (TDD only)

Parameters Parameters Parameters	REFERENCE	TYPE	NOTE	
Slot number		M	Timeslot to be	For each slot
			used in	
			downlink (TDD	
			only)	

10.2.6.10 Neighboring Cell Sync Info (TDD only)

<u>Parameters</u>	REFERENCE	TYPE	NOTE
Cell Parameters id		M	For the cell parameter table
Sync Time Slot		M	The value K
Sync Case		M	Case 1, 2, or 3