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1 Introduction

This contribution proposes a grouping of the system information elements listed in TS 25.331[1] into system information blocks. New information elements related to e.g. the scheduling of system information on BCCH (ref [2]) and the configuration of the page indicator channel (PICH) and acquisition indication channel (AICH) have been added to the system information blocks.

The system information blocks are specified in accordance with the output of the e-mail discussion for tabular format description [3]. However, the new system information elements proposed by the RRC parameter e-mail discussion have not been considered yet.

2 Discussion

The system information elements are broadcast in system information blocks. A system information block groups together system information elements with the same nature. Different system information blocks may have different characterisitics, e.g. regarding their repetition rate and the requirements on UEs to update the system information blocks.

The following criteria have been used to group the system information elements:

- Area scope (cell/PLMN)
- Modification frequency (IEs modified frequently/IEs modified seldom)
- UE mode (idle mode/connected mode)

The *area scope* referes to the area where the system information block is valid. This is either the cell where the information is broadcast or the PLMN if the information is valid in more than one cell.

The *modification frequency* indicates how often the system information elements in the block are updated. Information elements which are updated frequently should not be grouped together with system information elements which are updated very seldom.

System information blocks which are updated frequently contains an expiration time which specifies how long time the values in the system information block are valid before they must be re-read by the UE. These system information blocks are often updated periodically as a result of e.g. interference or traffic measurements. System information blocks which are updated more seldom contains a value tag related to the values of the information elements in the block. When any of the information elements are updated, the value tag of the block is changed to indicate that the UE need to acquire new information. Each system information block contains either a value tag or an expiration time.

The *UE mode* indicates in which UE mode(s) the system information block will be used.

Each system information element shall only exist in one system information block unless different values of the information element could be used for e.g. idle mode and connected mode. In that case the system information elements specifying the values to use in connected mode shall be optional and only transmitted when needed. If these information elements are not sent, the connected mode UE shall use the values specified for idle mode.

3 Specification of System information Blocks

3.1 Master Information Block

The master information block contains references to a number of system information blocks in a cell, including scheduling information for those system information blocks. The master information block is scheduled with a fixed pre-defined repetition rate.

Area scope: cell

UE state: idle mode and connected mode

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Value tag	M			
CN information elements				
PLMN Identity	M			
Other information elements				
References to other system information blocks		1 to <maxSysInfoBlockcount>		
System information block type	M			
Value tag	C - Blocktype			
Scheduling information	M			

Condition	Explanation
Blocktype	The presence of this IE depends on the definition of the system information block type.

Range Bound	Explanation
MaxSysInfoBlockcount	Maximum number of references to other system information blocks.

3.2 System Information Block type 1

The system information block type 1 contains NAS system information to be used by UEs in idle mode.

Area scope: PLMN

UE state: idle mode

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Value tag	M			
CN information elements				
CN information		1 to <maxCNdomains>		Send CN information for each CN domain. Information must be included for at least one core network domain type.
CN domain identity	M			
NAS system information	M			

Range Bound	Explanation
MaxCNdomains	Maximum number of CN domains

3.3 System Information Block type 2

The system information block type 2 contains the URA identity and information for periodic cell and URA update.

Area scope: PLMN

UE state: connected mode

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Value tag	M			
UTRAN mobility information elements				
URA identity	M	1 to <maxURAcount>		
Information for periodic cell and URA update	M			

Range Bound	Explanation
MaxURAcount	Maximum number of URA's in a cell

3.4 System Information Block type 3

The system information block type 3 contains parameters for cell selection and re-selection to be used in the cell. The block may also contain references to other system information blocks.

Area scope: cell

UE state: idle mode (and connected mode)

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Value tag	M			
UTRAN mobility information elements				
Cell identity	M			The necessity and usage of cell identity is FFS.
Cell selection and re-selection info	M			
Other information elements				
References to other system information blocks	O	1 to <maxSysInfoBlockcount>		
Block type	M			
Value tag	C - Blocktype			
Scheduling information	M			

Condition	Explanation
Blocktype	The presence of this IE depends on the definition of the system information block type.

Range Bound	Explanation
MaxSysInfoBlockcount	Maximum number of references to other system information blocks.

3.5 System Information Block type 4

The system information block type 4 contains parameters for cell selection and re-selection to be used in connected mode. The block is optional and shall only be transmitted if different cell selection and re-selection parameters are used in idle- and connected mode. The block may also contain references to other system information blocks.

Area scope: cell

UE state: connected mode

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Value tag	M			
UTRAN mobility information elements				
Cell identity	M			The necessity and usage of cell identity is FFS.
Cell selection and re-selection info	M			
Other information elements				
References to other system information blocks	O	1 to <maxSysInfoBlockcount>		
System information block type	M			
Value tag	C - Blocktype			
Scheduling information	M			

Condition	Explanation
Blocktype	The presence of this IE depends on the definition of the system information block type.

Range Bound	Explanation
MaxSysInfoBlockcount	Maximum number of references to other system information blocks.

3.6 System Information Block type 5

The system information block type 5 contains parameters for the configuration of the common physical channels in the cell. The block may also contain references to other system information blocks.

Area scope: cell

UE state: idle mode (and connected mode)

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Value tag	M			
PhyCH information elements				
RACH information		1 to <maxRACHcount>		
PRACH info	M			
AICH info	M			
Frequency info	O			
FACH information		1 to <maxFACHcount>		
Secondary CCPCH info	M			
Frequency info	O			
PCH information		1 to <maxPCHcount>		
Secondary CCPCH info	M			
PICH info	M			
Frequency info	O			
Other information elements				
References to other system information blocks	O	1 to <maxSysInfoBlockcount>		
System information block type	M			
Value tag	C - Blocktype			
Scheduling information	M			

Condition	Explanation
Blocktype	The presence of this IE depends on the definition of the system information block type.

Range Bound	Explanation
MaxRACHcount	Maximum number of RACH's
MaxFACHcount	Maximum number of FACH's mapped onto secondary CCPCH's
MaxPCHcount	Maximum number of PCH's mapped onto secondary CCPCH's
MaxSysInfoBlockcount	Maximum number of references to other system information blocks.

3.7 System Information Block type 6

The system information block type 6 contains parameters for the configuration of the common physical channels to be used in connected mode. The block is optional and shall only be transmitted when different configurations are used in idle- and connected mode. The block may also contain references to other system information blocks.

Area scope: cell

UE state: connected mode

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Value tag	M			
PhyCH information elements				
RACH information	O	1 to <maxRACHcount>		
PRACH info	M			
AICH info	M			
Frequency info	O			
FACH information	O	1 to <maxFACHcount>		
Secondary CCPCH info	M			
PCH information	O	1 to <maxPCHcount>		
Secondary CCPCH info	M			
PICH info	M			
Frequency info	O			
Other information elements				
References to other system information blocks	O	1 to <maxSysInfoBlockcount>		
System information block type	M			
Value tag	C - Blocktype			
Scheduling information	M			

Condition	Explanation
Blocktype	The presence of this IE depends on the definition of the system information block type.

Range Bound	Explanation
MaxRACHcount	Maximum number of RACH's
MaxFACHcount	Maximum number of FACH's mapped onto secondary CCPCH's
MaxPCHcount	Maximum number of PCH's mapped onto secondary CCPCH's
MaxSysInfoBlockcount	Maximum number of references to other system information blocks.

3.8 System Information Block type 7

The system information block type 7 contains the uplink access control parameters and the PRACH power control information to be used in the cell. The values of the included information elements will be updated periodically and the expiration time specifies how long time the values are valid.

Area scope: cell

UE state: idle mode (and connected mode)

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Expiration time	M			
UE information				
Uplink access control info	M			
PhyCH information elements				
PRACH power control information	M			

3.9 System Information Block type 8

The system information block type 8 contains the uplink access control parameters and the PRACH power control information to be used in connected mode. The block is optional and shall only be transmitted when different values are used in idle- and connected mode. The values of the included information element will be updated periodically and the expiration time specifies how long time the values are valid.

Area scope: cell

UE state: connected mode

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Expiration time	M			
UE information				
Uplink access control info	O			
PhyCH information elements				
PRACH power control information	O			

3.10 System Information Block type 9

The system information block type 9 contains information to be used by UEs having their DCH controlled by a DRAC procedure. The values of the included information elements will be updated periodically and the expiration time specifies how long time the values are valid.

Area scope: cell

UE state: connected mode

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Expiration time	M			
UE information				
DRAC information		0 to <maxDRACclasses>		DRAC information is sent for each class of terminal
Transmission probability	M			
Maximum bit rate	M			

Range Bound	Explanation
MaxDRACclasses	Maximum number of UE classes which would require different DRAC parameters

3.11 System Information Block type 10

The system information block type 10 contains measurement control information to be used in idle mode. The values may also be used in connected mode if the corresponding information elements are not transmitted in system information block type 11. The block may also contain references to other system information blocks.

Area scope: cell

UE state: idle mode (and connected mode)

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Value tag	M			
Measurement information elements				
Intra-frequency measurement information		0 to <maxIntrafreqcount>		
Measurement Identity Number	M			Note 1
Intra-frequency cell info	M	0 to <max MeasObjCount>		
Intra-frequency measurement quantity	M			
Inter-frequency measurement information		0 to <maxInterfreqcount>		
Measurement Identity Number	M			Note 1
Inter-frequency cell info	M	0 to <max MeasObjCount>		
Inter-frequency measurement quantity	M			
Inter-system measurement information		0 to <maxInterSyscount>		
Measurement Identity Number	M			Note 1
Inter-system cell info	M	0 to <max MeasObjCount>		
Inter-system measurement quantity	M			
Other information elements				
References to other system information blocks	O	0 to <maxSysInfoBlockcount>		
System information block type	M			
Value tag	C - Blocktype			
Scheduling information	M			

Condition	Explanation
Blocktype	The presence of this IE depends on the definition of the system information block type.

Range Bound	Explanation
MaxIntraFreqCount	Maximum number of intra frequency measurement control
MaxInterFreqCount	Maximum number of inter frequency measurement control
MaxInterSysCount	Maximum number of inter system measurement control
MaxMeasObjCount	Maximum number of Measurement Objects
MaxSysInfoBlockcount	Maximum number of references to other system information blocks.

Note 1: The necessity and usage of the Measurement identity number in this system information block is FFS.

[Editor's note: How to use the measurement control information broadcast on the BCCH needs to be further analysed.]

3.12 System Information Block type 11

The system information block type 11 contains measurement control information to be used in connected mode. Some of the information elements in the block are optional and shall only be transmitted if different values are used in idle- and connected mode.

Area scope: cell

UE state: connected mode

RLC_SAP: TM or UM

Logical channel: BCCH

Direction: UTRAN -> UE

Information Element	Presence	Range	IE type and reference	Semantics description
Message Type	M			
Value tag	M			
Measurement information elements				
Intra-frequency measurement information		0 to <maxIntrafreqcount>		
Measurement Identity Number	M			Note 1
Intra-frequency cell info	O	1 to <maxMeasObjCount>		
Intra-frequency measurement quantity	O			
Intra-frequency measurement reporting criteria	M			
Intra-frequency reporting quantity for RACH reporting	C - RACHrep			
Inter-frequency measurement information		0 to <maxInterfreqcount>		
Measurement Identity Number	M			Note 1
Inter-frequency cell info	O	1 to <maxMeasObjCount>		
Inter-frequency measurement quantity	O			
Inter-frequency measurement reporting criteria	M			
Inter-system measurement information		0 to <maxInterSyscount>		
Measurement Identity Number	M			Note 1
Inter-system cell info	O	1 to <maxMeasObjCount>		
Inter-system measurement quantity	O			
Inter-system measurement reporting criteria	M			
Other information elements				
References to other system information blocks	O	1 to <maxSysInfoBlockcount>		
System information block type	M			
Value tag	C - Blocktype			
Scheduling information	M			

Condition	Explanation
RACH-rep	This information element is only included if RACH reporting is indicated in the reporting criteria
Blocktype	The presence of this IE depends on the definition of the system information block type.

Range Bound	Explanation
MaxIntraFreqCount	Maximum number of intra frequency measurement control
MaxInterFreqCount	Maximum number of inter frequency measurement control
MaxInterSysCount	Maximum number of inter system measurement control
MaxMeasObjCount	Maximum number of Measurement Objects
MaxSysInfoBlockcount	Maximum number of references to other system information blocks.

Note 1: The necessity and usage of the Measurement identity number in this system information block is FFS.

[Editor's note: How to use the measurement control information broadcast on the BCCH needs to be further analysed.]

4 Specification of new system information elements

4.1 Physical CH Information Elements

4.2 AICH info

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
Channelization code	M			
DL scrambling code	C-DLscode			

Condition	Explanation
DLscode	This information element is only included if different from DL scrambling code of Primary CCPCH.

4.2.1 PICH info

Information Element/Group name	Presence	Range	IE type and reference	Semantics description
Channelization code	M			
Number of page indicators per frame (N)	M			
DL scrambling code	C-DLscode			

Condition	Explanation
DLscode	This information element is only included if different from DL scrambling code of Primary CCPCH.

4.3 Other Information Elements

4.3.1 System information block type

The system information block type identifies a specific system information block.

4.3.2 Value tag

The value tag is related to the values of the system information elements in a system information block. When any of the information elements are modified, the value tag of the system information block is changed to indicate that the UE must acquire new information.

4.3.3 Expiration time

The expiration time specifies how long time the values of the information elements included in a system information block are valid.

4.3.4 Scheduling information

Information Element/Group name	**Presence**	**Range**	**IE type and reference**	**Semantics description**
Broadcast channel	M			
SIB_REP	M			The repetition period for the system information block
SIB_POS	M			The position (phase) within the repetition period.

5 Proposal

We propose to replace the text in section 10.1.6 of TS 25.331[1] with the specification of the system information blocks described in chapter 3 in this document.

Further we propose to add the new information elements specified in chapter 4 into section 10.2.6 (Physical CH Information Elements) and section 10.2.8 (Other Information Elements) in TS 25.331[1].

6 References

[1] TS 25.331 v1.2.0, RRC Protocol Specification

[2] TSGR2#6(99)810, Scheduling of system information

[3] Second DRAFT Report of the email discussion group – Enhanced RRC message and IE tabular descriptions