TSG-RAN Working Group 3 meeting #7*TSGR3#7(99)C14*
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Agenda Item: 14.3, 13.1

Source: Ericsson

Title: Flow control for FACH data streams o/Iur

Document for: Approval

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1. Introduction

This document proposes a flow control scheme for FACH common channel data streams over Iur.

2. Discussion

2.1 General

The proposal is based on a TCP-like slow start flow control scheme. The main principles are:

- Flow control is done per UE and priority class.
- The number of priority classes needed for FACH data streams over Iur is FFS and need to be standardised.

It seems reasonable that the services (RABs) which may use FACH are limited to services belonging to the interactive class (see [4]). The traffic priority parameter for interactive class services could be used as a basis for defining the FACH priority classes. There may also be a need to prioritise between RLC control information if transmitted on different logical channels.

- A user may simultaneously have multiple FACH data streams with different priorities.
- A user is granted an initial (minimum) window size per common transport channel priority by the DRNC at common transport channel establishment in the DRNC (RNSAP Common Transport Channel Request/-Response).
- The window size is controlled (increased/decreased/unchanged) by the DRNC using UL FACH control frames.
- When a user sends its last FACH data frame (i.e. buffer empty) the window size shall be decreased to the initial (minimum) window size.
- The FACH FP does not provide any retransmission mechanisms or any other reliability mechanisms.

2.2 Description

The sequence below illustrates an example of u-plane signalling for FACH data streams o/Iur.

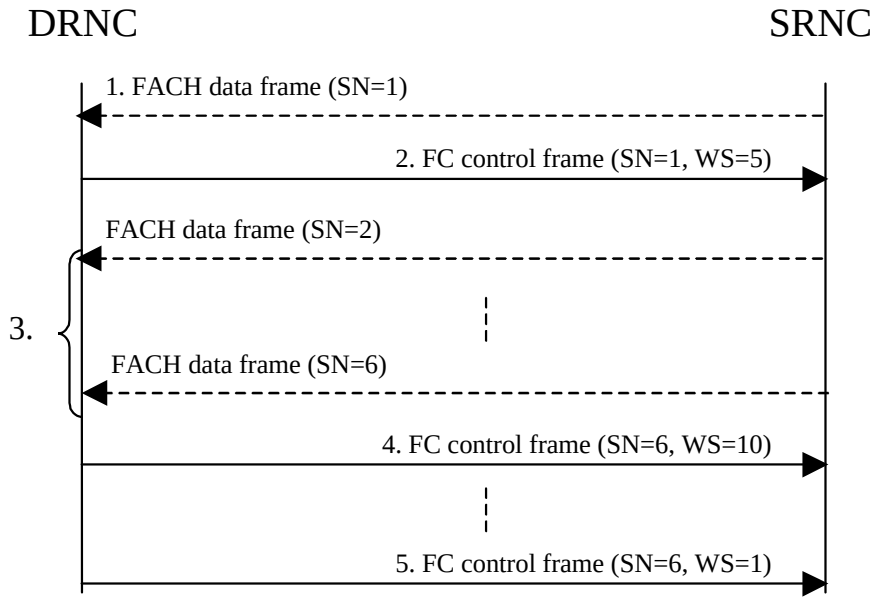

Figure 2-1. Example of u-plane signalling for FACH data streams o/Iur.

1. The user (MAC-d) sends its first FACH data frame. The user was granted an initial (minimum) window size by the DRNC at common transport channel establishment in the DRNC (RNSAP Common Transport Channel Request/-Response). In this example the initial window size = 1.

2. The DRNC (MAC-c) acknowledges the FACH data frame with a Flow Control control frame. The Flow Control control frame also includes a new window size = 5.

3. The user transmits the maximum number of FACH data frames according to the new window size received from the DRNC.

4. The DRNC acknowledges the last data frame (SN = 6) and increases the window size (WS = 10).

5. No data frames are received from the SRNC (time supervision in DRNC), so the DRNC sends a Flow Control control frame with window size = initial window size. Observe that the initial window size for subsequent ‘sessions‘ does not have to be the same as the initial window size granted to the user at common transport channel establishment.

In case of e.g. congestion the DRNC can send a Flow Control control frame with window size = 0. It is up to MAC-d to take appropriate actions. It could e.g. wait for a new Flow Control control frame with window size > 0 indicating that it can resume transmission, or perform channel switching. Any non-acknowledged data frames should be considered discarded by the DRNC.

3. FACH FP

3.1 FACH data frame structure

	Information element	Description
Header	Frame Type	FACH data frame
	DRNTI	Used to identify the UE context in the DRNC
	FACH Indicator	Indicates if the data in the payload should be sent on the FACH coupled to the RACH (i.e. the payload contains the Cell Update Confirm message), or if it can be sent on a different FACH decided by the DRNC (subsequent user data).
	~~Priority Indicator~~	~~Priority indicator corresponding to logical channel type. Used by the CRNC to place the payload in the correct transmit buffer.~~
	Common Transport Channel Priority Indicator	Indicates the priority of the FACH data frame. Used by the DRNC when scheduling FACH traffic.
	Frame Sequence Number	Used for sequential numbering of FACH data frames.
	Length	Length of the data field
Payload	Data	Contains the data to be sent on the radio interface.
Tail	Data Frame Checksum	See ref. [4] TS 25.427

3.2 FACH control frames

Flow Control: This control frame is used by the DRNC to acknowledge transmission of FACH data frames and control the user data flow.
The table below shows the payload structure when the control frame is used for the above mentioned purpose. This control information is sent in the UL only.

NAME	Flow Control	
Parameters	SRNTI	
	Common Transport Channel Priority Indicator	Indicates the priority of the acknowledged FACH data frame(s). A user may simultaneously have multiple FACH data streams with different priorities. The Common Transport Channel Priority Indicator correlates the acknowledgement to the correct FACH data stream.
	Sequence Number	Sequence number of acknowledged FACH data frame.
	Window Size	Indicates the maximum number of FACH data frames that may be transmitted without an acknowledgement. The window size can be set to 0.

4. RNSAP

4.1 Message contents

COMMON TRANSPORT CHANNEL REQUEST

[Editor's note:

This message has no content described due to lack of contributions. Contributions are invited.]

Information element	Reference	Type
Message type		M
Transaction ID		M
D-RNTI		M
Cell Id		M
Transport Bearer Request Indicator		M

COMMON TRANSPORT CHANNEL RESPONSE

[Editor's note:

This message has no content described due to lack of contributions. Contributions are invited.]

Information element	Reference	Type
Message type		M
Transaction ID		M
Common Transport Channel Info		
Common Transport Channel Priority Indicator		M
Common Transport Channel Initial Window Size		M
Common Transport Channel Max. Frame Size?	Note1	M
Transport layer address		O
Binding Identity		O
DL Channelisation Code		O

[Note1: Does the size of the FACH (and RACH) data frames need to be standardised? What is the relationship between the FACH transport block size (constant within one transmission time interval; WG2 decision) and the FACH data frame size? If there is no relationship and the FACH data frame size does not need to be changed during the lifetime of a UE context in the DRNC then the size could be given in the COMMON TRANSPORT CHANNEL RESPONSE message. The assumption is that the FACH data frame size is decided by the DRNC (MAC-c) and given to the MAC-d at configuration of MAC-d/setup of the common transport channel context in the DRNC.

4.2 IE functional definition and contents

9.2.x Transport Bearer Request Indicator

Indicates whether an Iur transport bearer needs to be established for carrying the FACH data stream(s), or whether an existing transport bearer will be used.

9.2.x Common Transport Channel Priority Indicator

Indicates the priority of the FACH data frame. Used by the DRNC when scheduling FACH traffic.

9.2.x Common Transport Channel Initial Window Size

Indicates the initial number of FACH data frames that may be transmitted before an acknowledgement is received from the DRNC.

9.2.x Common Transport Channel Max. Frame Size

Indicates the maximum allowed FACH data frame size. *[See Note1].*

5. Proposal

- Replace the basic principles in ch. 8 of 25.420 with the principles in ch. 2.1.
- Update the FACH data frame structure in 25.425 according to ch. 3.1.
- Include the contents of ch. 3.2 'FACH control frame structure' in ch. 5.2.1 of 25.425.
- Update the message contents of Common Transport Channel Request/-Response in 25.423 according to chapter 4.1.
- Include the new IEs of chapter 4.2 in chapter 9.2 of 25.423.

6. References

[1] 25.423 v.1.2.2, UTRAN Iur Interface RNSAP Signalling

[2] 25.420 v.0.1.5, UTRAN Iur Interface: General Aspects and Principles

[3] 25.425 v.0.2.1, UTRAN Iur Interface User Plane Protocols for Common Transport Channel Data Streams

[4] 23.907 v.1.4.0, QoS Concept and Architecture