

Agenda Item: 14.1
Source: Rapporteur (M. Schopp, Siemens)
Title: Iur Flow Control for FACH and DSCH traffic
Document for: Discussion

1 Introduction

At TSG-RAN-WG3#6 an ad hoc meeting on Iur Flow Control took place and an according study item was created. This report summarises the discussions to date.

2 Ad hoc Meeting

The following report from the ad hoc meeting was distributed on the mail reflector:

Report from the ad hoc meeting on flow control over Iur

During the ad hoc meeting on flow control over Iur (Nicolas [Alcatel], Michael [Siemens], Jean-Marie [Nortel Networks], Björn [Ericsson], Massimo [Italtel], et al.), three proposals for the handling of FACH traffic were discussed:

1. No explicit flow control, only overload indication on RNSAP (per MAC-c, with affected priority). [Siemens]
2. Credit-based flow control per UE. [Ericsson]
3. Credit-based flow control per group of UEs (e.g. for all UEs from one RNC on one MAC-c). [Alcatel]

Proposal 3 was withdrawn by Alcatel, because Nicolas believed that if a UE changes groups, some data may be lost in the SRNC (in an implementation which avoids credit distribution within the SRNC).

Proposal 1 has the advantage, that maximum utilisation of the FACH can be achieved and that no additional signalling is required when there is no congestion. However, it was not clear, how the system returns from congested state to normal operation. It was feared that messages which were stored in the SRNCs during congestion may flood MAC-c when the end of congestion is signalled.

Proposal 2 has the advantage that a proper designed credit-mechanism can avoid loss in the DRNC and that the behaviour of the SRNC could possibly be defined in a straight-forward manner (request credits when you need them - send PDUs when you receive/have credits, however details are still FFS). It was feared that this mechanism introduces initial delay, a large amount of signalling, and may limit transmission while resources on the FACH are available. It was however mentioned by Jean-Marie that full usage of the FACH spectral resources was more important than to avoid initial delay since services on the FACH are best effort services. Nicolas, however wanted low initial delay for rt-services.

Proposal 2 was described by Björn in more detail: Each MAC-d should register as a user with MAC-c. MAC-c would then give credits to the registered users on a regular basis (polling). When the MAC-d has no more data to send it unsubscribes with MAC-c and returns to an initial state (e.g. with some initial credits as discussed in the next section). This way the amount of signalling depends on the amount of active users.

It was discussed that each MAC-d could keep a limited amount of credits while no PDUs await transmission. This could probably avoid initial delay, however losses in the DRNC might occur, especially if there is a large number of MAC-d which keep such initial credits. Jean-Marie proposed to introduce some kind of slow-start together with the use of initial credits. This slow start only works if it is co-ordinated by the MAC-c thus requiring a credit based mechanism. It could be combined with proposal 2 (FFS).

Furthermore, piggy-backing of credits was discussed. If credits can only be piggy-backed onto data frames which go to the according MAC-d, some companies had the opinion, that this procedure becomes too complex and would need additional control frames anyway. Therefore control frames or credits with an MAC-d identifier might be more appropriate. (FFS).

It was discussed that some kind of rt-traffic might be sent according to proposal 1, (whereas nrt-traffic might be sent according to proposal 2). No conclusion was reached. (FFS).

The discussion will go on the mail reflector and all companies are - of course - invited to provide contributions for FACH and DSCH traffic on Iur.

Several open issues remain (examples):

- * What are the QoS requirements for FACH (and DSCH) traffic?
- * How well do we need to define the behaviour of SRNC (and/or DRNC)?
- * Is the traffic over Iur significant compared to RNC-internal traffic?

3 Contribution on the mail relector

Fabio Longoni summarised the Nokia position on the mail reflector:

1) FACH is used only for best effort traffic, thus we don't need necessarily to avoid any frame lost (and retransmitted) in Iur, especially if complicate mechanisms are introduced for this: what is the rationale of having such a complicate mechanism as the proposal n. 2 for best effort data, considering also that in any case there are frames lost in air interface and RLC retransmission?

2) The congestion based flow control that we propose is mainly based on a MACc-MACd interaction (via FP). Optionally also a MACc-RRC indication can be used (via the current RNSAP load indication procedure).

2a) MACc-MACd interaction: *upon reception of a MACd PDU* (and only in this case), MACc in congested state answers with a 'load control frame' to the sending MACd entity (different level of congestion can be indicated). MACc also sends a load control frame to MACd indicating the termination of the congestion state.

2b) MACc-RRC interaction. A MACc in congested state informs the RRC entity in DRNC, that may send a RNSAP load information message to the SRNC (or to RNC2 in general). The trigger for this is left to O&M or internal RNC settings. This has the advantage to prevent a SRNC to switch the UE into CCH state in the congested cell (this is not prevented by any credit based mechanism, that is active only when the UE is already in CCH state).

Few lines also about the MACd-MACsh interaction: it can be based on the same mechanism, with the only difference that (in case the DSCH shall guarantee QoS), there is an admission control mechanism in DRNC at RL setup/reconfiguration. Once the UE is admitted in the MACsh, then it has guaranteed the requested minimum bit rate/maximum delay.

4 Conclusion

A fruitful discussion during the ad hoc meeting took place. It was clear, that each proposed solution has potential advantages and drawbacks. The evaluation of the different proposals is controversial; partly, because the requirements put on the solution are not agreed; partly, because good modelling and simulation/analysis would be needed to identify the actual behaviour of the different mechanisms.

It is expected, that the discussion will continue during meeting #7 and that some additional contributions might help to advance the discussion.