Source: **OPPO**

Title: **Discussion on SI Request Prohibit Timer**

Agenda Item: **10.4.1.6.6**

Document for: **Discussion and decision**

1 Introduction

For On-demand SI request, there are some agreements in previous meetings. During previous e-mail discussion, the issue of upper layer actions upon Random Access problem was discussed but not concluded. We have one contribution to discuss this issue[]. Moreover, one option which seems to have majority support mentioned the SI prohibit timer as follows:

 Alternative 2: Depends on the SI/ SIBs being requested. If these are not the essential SIBs (according to NR RRC) then UE refrains from retrying until a certain time. The prohibit timer, if any, might be specified or be configurable etc. In case of essential SIBs (if not all essential SIBs are 'regularly' broadcasted), the UE shall treat the cell as barred.

In this paper, we discuss the SI prohibit timer for MSG1 and MSG3 based SI request especially for RRC Idle/inactive UEs.

2 Necessity of SI Prohibit Timer

For MSG1-based SI request, RAN2 has agreed that in MSG2 there will be acknowledge.   If RAR is missing and lower layer indicates the Random Access problem, we think that UE should not send SI request endlessly. Instead, UE should try to read SIB1 to check if the request SI has been available. And, because of the SI period, UE should wait for the latest SIB1.   If the request SI is still not available, then UE can try to send SI request.   If after certain time of retrying, SI can still not be acquired, then UE can decide whether the cell is barred depends on whether this SI is essential or not. If UE initiate MSG1-based SI request without any control, there will be heavy load to RACH.

Observation 1   For MSG1-based SI request for RRC_Idle and RRC_Connected UEs, if Random Access problem is indicated, if UE send SI request before it make clear if the request SI has been available due to the request by other UEs, there can be heavy load to RACH.

For MSG3-based SI request, if MSG3 triggers a random access and random access problem is indicated to RRC layer, it also unreasonable if the MSG3 triggers a random access again.   In such case, UE should also check if SIB1 has been updated and the request SI has become available.

Observation 2   For MSG3-based SI request for RRC_Idle and RRC_Connected UEs, if Random Access problem is indicated, if UE send SI request before it make clear if the request SI has been available due to the request by other UEs, there can be heavy load to RACH.

For RRC-based SI request, usually we think the gNB can send a RRC message, otherwise, there might be radio link failure if RRC connection is broken.   Similarly, we that that after one SI request, UE should not send another one to gNB before it check the latest SIB1 to know if the request SIB has been available.

Observation 3   For RRC-based SI request for RRC_Connected UEs, after UE send one SI request to gNB, it should not send another one before check the latest SIB1 to know if the request SIB has been available, otherwise, there can be frequent SI request which is unnecessary.

Based on the above observations, we think that RAN2 need to introduce SI request prohibit timer in order to avoid the UE to generate frequent SI request.

Proposal 1   RAN2 to agree that SI prohibit timer is introduced for MSG1, MSG3 and dedicated RRC signalling to suppress UE to generate frequent SI request signalling.

3 How SI Prohibit Timer Works?

Regarding to how SI prohibit timer works, we think there are tow issues.   The first issue to be solved is which layer should maintain the timer.   The second issue is the conditions and triggered event of the timer.

● **Which layer maintains the timer?**

Regarding to which layer maintains the timer, there can be two options.   Option 1 is MAC layer and Option 2 is RRC layer.   Basically, we think that RRC layer is more proper because RRC is aware of the SI request for three SI request approaches.   For MSG1 based SI request, RRC layer need to provide the associated preamble and/or PRACH resource.   For MSG3 and RRC based SI request, RRC layer is charge of SI request generation.   Meanwhile, we also think it is better to minimize MAC impacts since we RAN2 agreed to reuse RACH procedure as much as possible.   Thus we propose:

Proposal 2   RAN2 to agree that SI prohibit timer is maintained in RRC layer.

● **Conditions and action upon expiration**

For the introduced SI prohibit timer, we think RRC need to configure the SI prohibit timer.   And, the timer is started when SI request is initiated.   Regarding to the stop condition, we think there can be at least two conditions.   The first condition is that UE get the acknowledgement of the SI request.   The second condition is that UE read the SIB1 and knows the requested SI has been available e.g. due to the request from other UEs.   When Timer expires, SI request can be triggered UE still need the SI on the concern cell.

Proposal 3   The SI prohibit timer is configured by RRC.

Proposal 4   The SI prohibit timer is started when SI request is initiated and stopped when the request SI has been available or the SI request has been acknowledged.

Proposal 5   When the timer expires, SI request can be triggered UE still need the SI on the concern cell.

The following table summarize proposal 4 and proposal 5.

Timer	Start	Stop	At expiry
Txxx	Transmission of SI request by RRC signalling or trigger MAC to perform Random Access for SI request	Reception of SI request acknowledgement; The requested SI has been available in latest SIB1	Trigger another SI request if the SI is still needed in the concern cell

4 Conclusion

In this contribution, we discuss prohibit timer for On-Demand SI request and we have the following observations and proposals.

Observation 1   For MSG1-based SI request for RRC_Idle and RRC_Connected UEs, if Random Access problem is indicated, if UE send SI request before it make clear whether the request SI has been available due to the request by other UEs, there can be heavy load to RACH.

Observation 2   For MSG3-based SI request for RRC_Idle and RRC_Connected UEs, if Random Access problem is indicated, if UE send SI request before it make clear whether the request SI has been available due to the request by other UEs, there can be heavy load to RACH.

Observation 3   For RRC-based SI request for RRC_Connected UEs, after UE send one SI request to gNB, it should not send another one before check the latest SIB1 to know if the request SIB has been available, otherwise, there can be frequent SI request which is unnecessary.

Proposal 1   RAN2 to agree that SI prohibit timer is introduced for MSG1, MSG3 and dedicated RRC signalling to suppress UE to generate frequent SI request signalling.

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Proposal 4   The SI prohibit timer is started when SI request is initiated and stopped when the request SI has been available or the SI request has been acknowledged.

Proposal 5   **When the timer expires, SI request can be triggered UE still need the SI on the concern cell.**

5 References

[1] R2-1801780   Clarifications on Upper Layer Actions Upon RACH Problem for SI Request   OPPO