

Agenda item: 10.4.1.6.4
Source: ITRI
Title: Discussion on the granularity of SI change notification
Document for: Discussion and Decision

1. Introduction

RAN2#97 meeting reached the following agreements on minimum SI [1]:

Agreements

1: Broadcasting some kind of index/identifier in minimum SI to enable the UE to avoid re-acquisition of already stored SI-block(s)/SI message(s). The index/identifier and associated system information can be applicable in more than one cell. System information valid in one cell may be valid also in other cells.

In RAN2#98 meeting agreements on on-demand/other SI include [2]:

Agreements

There will be at least a value tag and area ID

- value tag is associated to each SIB
- value tag can be valid in only one cell or when combined with an area ID to be valid in more than one cell.

The following agreements are made during RAN1 201706AH meeting [3]:

- Following contents are carried in NR-MIB
 - (Part of) SFN: [7 - 10] bits
 - At least 80 ms granularity
 - FFS: indication within 80 ms
 - [H-SFN: 10 bits]
 - RAN1 will ask RAN2
 - Timing information within radio frame: [0 - 7] bits
 - E.g., SS block time index: [0 - 6] bits
 - E.g., half radio frame timing: [0 - 1] bit
 - RMSI scheduling information: [x] bits
 - CORESET(s) information: [x] bits
 - Simplified information of CORESET(s) compared to CORESET(s) information for UE-specific configuration is considered
 - E.g., Time/frequency resource configuration of CORESET(s)
 - [Numerology of RMSI: [0 - 2] bits]
 - [Information regarding frequency resources for PDSCH scheduling: [x] bits]

This contribution discuss on the notification of SI change.

2. Discussion

NR UEs could use stored SI if the SI is valid. UE could determine the validity of stored SIBs other than SIB1 by checking the associated value tags in the scheduling information transmitted from gNB. Based on RAN agreement that there is no value tag/area relate info in MIB [4], UE needs to check the content of SIB1 to determine the validity of SIB1.

Upon system information change, the change could be notified from gNB to UE (e.g., by paging message). It is possible for gNB to provide finer granularity such as SIB-specific or SI message-specific SI change notification. Also it is possible for gNB to provide the latest value tag associated with the updated SIB.

The scenarios of SIB1 change and SIBs other than SIB1 change are used for discussion on whether finer granularity SI change notification is beneficial.

- Scenario 1: change of SIB1

If the SI change notification is SIB-specific, UE can identify the change of SIB1 upon the notification. The UE acquires the latest SIB1 from gNB according to the SIB1 scheduling information carried in MIB and update the stored SIB1 to the latest one. The UE may check the scheduling information carried in the latest SIB1 for the validity of the other stored SIBs. If the scheduling information is different from the stored scheduling information, the UE can identify the changed SIBs and acquire the updated SIBs accordingly.

If the notification is not SIB-specific, UE couldn't identify which part of SI is changed. The UE should acquire the latest SIB1 from gNB and check the scheduling information for the validity of the other stored SIBs. If the value tag/area information associated a SIB is different from the stored one, UE then identifies the changed SIB(s) and acquires the latest SIBs from gNB accordingly.

When it is SIB1 change, UEs need not to distinguish the notification was triggered by scheduling information change or triggered by the content of SIB1 change.

Observation 1: UE needs to re-acquire SIB1 upon receiving SI change notification.

Observation 1a: When the SI change notification is triggered by SIB1 change, UEs need not to distinguish the notification is triggered by scheduling information change or triggered by the content of SIB1 change.

- Scenario 2: change of SIBs other than SIB1

In case of SIB-specific SI change notification, UE can identify the change of a specific SIB upon the notification. The UE may use the stored scheduling information to monitor the scheduled SI window of the concerned SIB. The UE may receive multiple SI change notification in a modification period and acquire the updated SIB in the next modification period (Figure 1).

If cross modification period SI change notification is supported, UE may need value tag associated with the concerned SIB to determine whether or not to re-acquire the update SIB in the next modification period.

Observation 2: If cross-modification-period SI change notification is supported, including value tag associated with the concerned SIB may help UE to determine whether or not to re-acquire the update SIB in the next modification period.

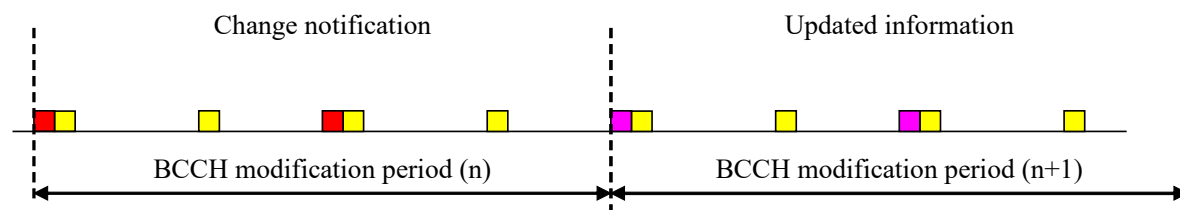


Figure 1. Change of system Information

- If the associated value tag is included in the notification, the UE could autonomously update stored scheduling information to the latest value tag after successfully acquired the changed SIB. However, it is a concern for UE to update the stored SIB1 autonomously without verifying the actual scheduling information in the latest SIB1 provided by gNB.
- If the associated value tag is not included in the notification, the UE needs to acquire the latest SIB1 to update the value tag of the concerned SIB and to update the stored scheduling information to the latest one.

If the notification is not SIB-specific, the UE should acquire the latest SIB1 from gNB and check the scheduling information for the validity of the other stored SIBs. If the value tag/area information associated with a SIB is different from the stored one, UE then identifies the changed SIB(s) and acquires the latest SIBs from gNB accordingly.

Observation 3: UE is able to re-acquire only the SIBs which are updated.

Observation 3a: Including value tag in the SI change notification could help UE autonomously update the latest value tag of the concerned SIB in the stored scheduling information. However, that UE autonomous could be a concern.

Observation 3b: Upon SI change notification, UE needs to update the stored SIB1 irrespective of SIB-specific SI change notification or not.

Based on the discussions and the observations, neither SIB/SI message-specific SI change notification nor value tag associated with the concerned SIB/SI message benefits UE in SIB re-acquiring. It is proposed that RAN2 not to provide SIB-specific SI change notification.

Proposal 1: It is proposed that RAN2 not to provide SIB/SI message-specific SI change notification.

Proposal 2: It is proposed that RAN2 not to include value tag in the SI change notification.

3. Conclusion

In this contribution we investigate the UE procedure of SIB re-acquirement and provide the following observations:

Observation 1: UE needs to re-acquire SIB1 upon receiving SI change notification.

Observation 1a: When the SI change notification is triggered by SIB1 change, UEs need not to distinguish the notification is triggered by scheduling information change or triggered by the content of SIB1 change.

Observation 2: If cross-modification-period SI change notification is supported, including value tag associated with the concerned SIB may help UE to determine whether or not to re-acquire the update SIB in the next modification period.

Observation 3: UE is able to re-acquire only the SIBs which are updated.

Observation 3a: Including value tag in the SI change notification could help UE autonomously update the latest value tag of the concerned SIB in the stored scheduling information. However, that UE autonomous could be a concern.

Observation 3b: Upon SI change notification, UE needs to update the stored SIB1 irrespective of SIB-specific SI change notification or not.

Based on the observations, our conclusions for RAN2 to discuss and agree are proposed as below:

Proposal 1: It is proposed that RAN2 not to provide SIB-specific SI change notification.

Proposal 2: It is proposed that RAN2 not to include value tag in the SI change notification.

References

- [1] R2-1702451, Report of 3GPP TSG RAN WG2 meeting #97.
- [2] R2-1707601, Report of 3GPP TSG RAN2#98 meeting, Hangzhou, China.
- [3] R1-171712032, Final Report of 3GPP TSG RAN WG1 #AH_NR2 v1.0.0.
- [4] R2-1707602, Report of 3GPP TSG RAN WG2 NR AdHoc#2 meeting, Qingdao, China.