**3GPP TSG-RAN2 Meeting #113-e R2-2102075**

**e-Meeting, 25 Jan - 05 Feb, 2021**

**Source: email discussion Rapporteur (ZTE Corporation)**

**Title: Offline 509 on SDT control plane and CBs**

**Agenda item:** **8.6.3**

**Document for:** **Discussion and Decision**

# Introduction

This document is the report of the following email discussion:

* [AT113-e][509][SData] Control Plane and CBs (ZTE)

**Scope:**

1. Further discussion on pending proposals (and those marked for CB) for email discussion R2-2101162

Tdoc summary and identification of possible proposals to agree/discuss for these topics

2. Discussion on Handling of non-SDT

When non-SDT bearers are resumed

- when SDT is initiated

- only upon RRC resume by UE

What to do when non-SDT arrive and DRBs are suspended

- trigger legacy RRC resume procedure

- introduce a MAC indication to indicate non-SDT arrival

2. Whether we use RRC Resume or new RRC message/indication of SDT?

3. How to handle RRC release for subsequent data – sending a release before SDT phase or RRCRelease at the end of the SDT phase.

**Intended outcome:**

* + - Agreeable proposals

**Deadline for providing comments:**

* + - Companies comments/inputs – Feb. 1st 17:00 UTC
    - Proposals by rapporteur – Feb. 2nd

# Discussion

## RRCResume or new message with SDT indication

The following agreement was reached at RAN2#112e:

|  |
| --- |
| As a baseline, the RACH resource i.e. (RO+preamble combination) is different between SDT and non-SDT  - If ROs for SDT and non SDT are different, preamble partitioning between SDT and non SDT is not needed.  - If ROs for SDT and non SDT are same, preamble partitioning is needed |

Based on the above agreement, the network will know about the SDT cause after receiving msg1. This also means that the CCCH message would be the same for both SDT and non-SDT.

However some companies have said that supporting other options may be disussed further. Specifically, the following were mentioned in the tdocs:

* Option 1: Some companies said that we could just stick with this agreed baseline:
  + This option means that already at MSG1 level the network will know the SDT cause (and hence no new CCCH message or cause is needed further down the protocol)
  + E.g: (R2-2100141, P4)
* Option 2: Other companies mentioned that we could also allow common RACH pool in addition but with a new cause:
  + Then, this requires either a new cause in the CCCH message (R2-2100367, P2), (R2-2101369, P1) or it requires a new CCCH message to identify the SDT cause
* Option 3: Whilst there are also proposals that the CCCH message could remain the same even if we support common pool
  + E.g: (R2-2100367, P1), (R2-2101204, P2)
  + the assumption is that either the MSG3/MSGA grant size will accommodate BSR (which will indicate the SDT cause) when common resource pool is used or that a new logical channel ID is used for the CCCH message

The advantage of option 1 (i.e. the current baseline) is that the CCCH message will be common regardless of whether or not SDT or non-SDT is selected down the line (e.g. in MAC – see the discussion in section 2.4), but requires that the network can provide the resource separation (i.e. preamble + PO combination is different).

Option 3 also has similar advantages as option 1, but this comes with the requirement that the MSG3/MSGA payload size needs to accommodate at least the BSR (i.e. this has implications on coverage) – but this has no restriction on the network to provide separate preamble+PO resource pool as per option 1 or a new LCID for CCCH is needed.

Option 2 on the otherhand might require new cause in the CCCH message and will require additional complexity and interaction between RRC and MAC in case switching/fallback to non-SDT happens in MAC. Further, the available space in the CCCH message is quite limited and reusing the code points or adding bits in this message seems to come with additional complexity/cost.

Based on the above, it seems the current baseline could be sufficient perhaps?

|  |  |  |
| --- | --- | --- |
| Q1: Do companies agree that option 1 is sufficient? | | |
| Company | Y/N | Comments (if answer is No then please explain why other options are essential) |
| Nokia, Nokia Shanghai Bell | No | We don’t agree with rapporteur’s understanding that the CCCH message would be the same for both SDT and non-SDT, this has not been agreed.  We don’t agree with rapporteur’s consideration of complexity for Option 2 and it does neither require any cause in the CCCH message.  With subsequent SDT agreed, common RACH pool would seem beneficial to allow NW not to always configure SDT specific RACH resources – this would increase the possibilities to use the whole feature.  Furthermore, we don’t fully understand why Msg1 indication means same CCCH message for SDT and non-SDT. |
| OPPO | Y | Option1 can be taken as baseline. |
| ZTE | Y | We think option 1 is sufficient.  For the option 2, we think this option implies different CCCH message (or different content of CCCH message) will be used to distinguish SDT and Non-SDT. Considering the size of CCCH message is sensitive for coverage and the codepoints in CCCH is quite precious which should be reserved for future use case, we want to keep the CCCH message the same for both SDT and Non-SDT, thus the option 2 is not preferable to us.  Option 3 is acceptable if the contents of CCCH can be kept the same as the CCCH for normal RRCResumeReq (i.e. either different LCID is used or BSR is included). Considering extra complexity will be required, we prefer not to have this. However, we can live with this if the majority of companies also want to support option 3. |

## Timing of the RRCRelease message

There are two possible options for the RRCRelease message:

* Option 1: RRCRelease message to be sent at the end of the subsequent data transfer:
  + E.g: (R2-2100366, P4); (R2-2101161, P4); (R2-2100283, P2)
* Option 2: RRCRelease message in the beginning before the subsequent data transfer:
  + E.g: (R2-2100139, P11)

In general, it seems option 1 is supported by the majority of companies.

R2-2100139 mentions that the RRCRelease like message may be needed upfront for network authentication.

However, even if an RRC message is sent (by the genuine network) up front, there is no guarantee that the subsequent messages on the user plane are also from an authentic network (the only way to guarantee this would be to have DRB IP, which of course can be configured for SDT if needed). So, it seems sending an RRC message by itself is not really necessary. Of course we can send an LS to SA3 to confirm the overall procedure with them from security perspective.

Based on the above, it seems option 1 is okay:

|  |  |  |
| --- | --- | --- |
| Q2: Do companies agree that option 1 (i.e. RRCRelease at the end of the SDT phase including subsequent data transfer) can be assumed as the baseline from RAN2 perspective? | | |
| Company | Y/N | Comments (if answer is No then please explain why option 2 is essential) |
| Nokia, Nokia Shanghai Bell | Y, but | We agree to send RRCRelease at the end of the procedure but we don’t understand what “i.e. RRCRelease at the end of the SDT phase including subsequent data transfer” means.  Rapporteur Clarification:  Option 1 means that RRCRelease is at the end of the overall procedure. i.e. if there is subsequent data, then first this subsequent data phase is finished and than the network sends RRCRelease (and the UE will go back to INACTIVE/IDLE upon receiving the RRCRelease).  Option 2: Requires the network to send an integrity protected message in DL (e.g. RRCRelease) first and then after this RRC message is sent, then DL DRB data is sent (e.g. for the subsequent data transmission). It seems the assumption of the proponents is that with this option there will be a timer started after this RRCRelease message during which subsequent data transmission can happen etc (but this is not clear). I guess the main issue to discuss is whether we need RRCRelease (or some RRC message) in DL before any subsequent data transmission phase (and this is option 2). Hope that clarifies.  Anyway, the answer above seems clear to me. |
| OPPO | Y | As we have agreed, UE shall execute a set of actions such as suspending DRBs upon the reception of RRCRelease, after which data transmission in RRC\_INACTIVE is not supported any more. Therefore, the subsequent transmissions shall be performed before RRCRelease. Note that the subsequent transmissions aim to cover the data that has ready in the buffer. However, to support subsequent tranmssion before RRCRelease, we also have a concern on gNB verification issue, our option is to consult with SA3. |
| ZTE | Y | We think option 1 works, and the RRC release can be sent separately after the transmission of last DRB packet (i.e. the RRC release has not to be sent together with the last data packet). We support sending an LS to SA3 informing about the overall framework of our agreements. |

## Handling non-SDT data

As noted in

The question is how to handle the data for non-SDT DRBs and this was already well discussed during the email discussion prior to the meeting and the following options have been identified:

* Option 1: Trigger a new MAC CE upon data arrival for non-SDT DRB
  + R2-2101160, R2-2100365, R2-2100294, R2-2100282, R2-2100146
* Option 2: Trigger a new RRCResume procedure
  + R2-2101221, R2-2101203, R2-2101176, R2-2101750
* Option 3: Leave to UE implementation
  + R2-2100139, R2-2101370

It would be good to narrow down the options first so that we can focus the online discussion on fewer options.

In general, we don’t leave the BSR triggering or initiation of connection resume at the lower layers to UE implementation. So, the view of the rapporteur is that option 3 is not really ideal.

|  |  |  |
| --- | --- | --- |
| Q3: Can we exclude option 3? - i.e. we will at least specify the behaviour for data arrival for non-SDT DRBs one way or the other | | |
| Company | Y/N | Comments (if answer is No then please explain) |
| Nokia, Nokia Shanghai Bell | Y | Since the UE cannot determine how long the SDT procedure lasts, Option 3 is really not an option. |
| OPPO | Y |  |
| ZTE | Y | It would be preferable to specify this. |

Assuming the majority view to be that we aim to specify this, we need to further disucss how options 1 and 2 work.

With option 1, a new MAC trigger is needed to indicate the data arrival for non-SDT DRBs

* This trigger needs to be defined for both when there is MCG path and there is no MCG path for the bearer

For option 2, it seems there are few issues to clarify further:

* Will NAS actually trigger a new resume when a resume procedure is ongoing? (it is unclear whether this happens, because today whilst a RRCResume procedure is happening, we don’t trigger a new RRCResume procedure even if data for some other DRBs arrive whilst the resume is ongoing)
* What resume cause will be used? – will we use a new resume cause or will NAS provide another resume cause again (seems this doesn’t happen according today?)
* How does the security work (i.e. the contents of RRCResumeRequest – specifically the security token seems to be repeated if we have to repeat the RRCResumeRequest?)

For now, to facilitate the online discussion companies are encouraged to provide views on the above and also any other considerations that could be useful for making a decision.

|  |  |  |
| --- | --- | --- |
| Q4: Between options 1 and 2, which option do you prefer and why? | | |
| Company | Option 1/2 | Please explain how each option will work (especially please provide your views on the open issues mentioned for options above and add anything that is unclear for each option in the comments) |
| Nokia, Nokia Shanghai Bell | Option 2 | MAC solution would require NW to configure non-SDT DRBs to different LCG from SDT DRBs – this restricts NW implementation which is not OK.  We don’t see reasoning for introducing new resume cause for this case. |
| OPPO | Option1 | We have not discuss whether to resume those non-SDT DRBs upon SDT is initiated. Our view on this issue is that non-SDT DRBs are not resumed until the reception of RRCResume as legacy since non-SDT DRBs can not be transmitted in SDT procedure. We prefer not to mix the data transmission procedure in different RRC state together.  With this assumption, we prefer to introduce a new MAC CE to inform the network of the non-SDT data arrival duing an ongoing SDT. The MAC CE can be generated by the indicated of higer layer, i.e. RRC. Since AS (i.e. RRC) is capble to determine which DRBs the coming data belong to even before the data is delivered down. Therefore, it is feasible for AS to generate a MAC CE as an indication when non-SDT data is arriving. We think no matter whether there is MCG path bearer, same indication can be used since the intention of this MAC CE is to convey UE’s requirement of going back to RRC\_CONNECTED. That means no need to distinguish those DRBs not allowed to perform SDT, i.e. whether it is a DRB with MCG path. |
| ZTE | Option 1 | Option 1 is preferred. We think the option 1 refer to a new MAC CE other than BSR, since BSR can not work for the Non-SDT DRB without MCG path. Hence, this doesn’t require the NW to configure non-SDT DRBs to different LCG from SDT DRBs. So, even if non-SDT and SDT DRBs are mapped to the same LCG, then the new non-SDT DRBs are kept suspended and a new MAC indication is triggered (instead of the BSR) upon arrival of data for these non-SDT DRBs.  For option 2, our understanding is that today the UE doesn’t trigger a new Resume during an ongoing resume procedure but this can be checked with CT1 if needed.  Repeating the security token is not preferable either and hence option 2 seems to be more complex than option 1 |

## Overall procedure for SDT type selection

The discussion for overall SDT procedure happened in the email discussion prior to the meeting and a set of proposals were made in R2-2101162.

During the online discussion we have the following tentative set of agreements and comebacks:

**Agreements**

1 For RA-SDT, up to two preamble groups (corresponding to two different payload sizes for MSGA/MSG3) may be configured by the network

*2 [CB]* UE performs carrier selection as per legacy procedure and then the UE determines whether SDT can be initiated.

*3 [CB]* Upon initiating SDT, after the carrier selection, if valid CG-SDT resource exists, then CG-SDT is chosen, otherwise UE proceeds to RA-SDT procedure.

*4* If RACH procedure is initiated for SDT (i.e. RA-SDT initiated), the UE first performs RACH type selection as specified in MAC (i.e. Rel-16). FFS whether threshold is SDT specific or not

Although some discussion on this happened as part of the email discussion, during the initial online discussion, it seems some further detail on the overall procedure would help with the agreement. Based on this, the following clarifications are added to the overall procedure:

|  |
| --- |
| **Possible agreements**  1FFS:RSRP threshold to select between SDT and non-SDT RA procedure. FFS whether this threshold is CG/RA-SDT specific.  2    [CB]For SDT, UE performs UL carrier selection (i.e. if SUL is configured in the cell, UL carrier selected based on RSRP threshold as in legacy – FFS whether the RSRP threshold for carrier selection is common or specific to SDT)  3 [CB] If CG-SDT resources are configured on the selected UL carrier and are valid, then CG-SDT is chosen. Otherwise,   * If 2 step RA-SDT is configured on the UL carrier and criteria to select 2 step RA SDT is met, then 2 step RA-SDT is chosen * else If 4 step RA-SDT is configured on the UL carrier and criteria to select 4 step RA SDT is met, then 4 step RA-SDT is chosen * else UE does not perform SDT (i.e. perform legacy resume procedure) * If both 2 step RA-SDT and 4 step RA-SDT are configured on the UL carrier, RA type selection is performed based on RSRP threshold as in legacy.   -           FFS whether RSRP threshold for RA type selection is common or different for SDT and non SDT. |

|  |  |  |
| --- | --- | --- |
| Q5: Can we take the above overall procedure as the baseline? | | |
| Company | Y/N | Please clarify which aspects need modification if any and how |
| Nokia, Nokia Shanghai Bell | Y, but | However, references to legacy should be removed as they seem to create quite some confusion.  For first possible agreement, the term “RA” should be removed from the first sentence. The second FFS in the first one is also confusing, could be formulated: FFS whether RSRP threshold to select between SDT and non-SDT procedure is used for CG-SDT, RA-SDT, or both and whether the RSRP threshold is the same for CG-SDT and RA-SDT.  For the second one, the FFS reads oddly, could formulate: FFS whether the RSRP threshold for carrier selection is specific to SDT or common between SDT and non-SDT.  For third, better to talk about 2/4-step RA-STD **resources** being configured on the UL carrier. |
| OPPO | N | In our opinon, whether SDT and non-SDT selection is performed in the first step depends on whether the RSRP threshold for selection can be configured per carrier. Considering that where SDT is allowed would be smaller than the largest coverage of each carrier, the RSRP threshold can be configured separately. Furthermores, the RSRP threshold to perform CG-SDT and RA-SDT can be different. If separate RSRP threshold is configured, we think it can be taken as one of the CG-SDT validity conditions.  We suggest the procedure to be as follows:  When SDT is initiated by upper layer, selections in MAC includes:   * 1. Selection between NUL/SUL. The RSRP threshold use the same one as legacy.   2. If CG-SDT resources are configured on the selected UL carrier and are valid, then CG-SDT is chosen   3. Else if selection RSRP threshold between RA-SDT and non-SDT is met,   - If both 2 step RA-SDT and 4 step RA-SDT are configured on the UL carrier, RA type selection is performed based on RSRP threshold as in legacy.  - else if only 2 step RA-SDT is configured on the UL carrier and criteria to select 2 step RA SDT is met, then 2 step RA-SDT is chosen  - else 4 step RA-SDT is chosen   * 1. Else, UE does not perform SDT (i.e. perform legacy resume procedure) |
| ZTE | Y | In general the above can be the baseline  If the RSRP threshold is agreed for the overall SDT vs non-SDT selection, then it is possible to set this threshold in such way that once this selection is made SDT can be selected (e.g. by setting this threshold as min{4-step RA SDT threshold in SUL, 4-step RA SDT threshold in NUL}) – but even in this case, the above framework will work (i.e. the final “else UE does not perform SDT” will not happen but can still be implemented like that in the procedure). |

# References

1. R2-2100139 Discussion on User Plane Aspect of Small Data Transmission vivo
2. R2-2100140 Duscussion on RRC-Controlled Small Data Transmission vivo
3. R2-2100141 Supporting Small Data Transmission via RA Procedure vivo
4. R2-2100142 Supporting Small Data Transmission via CG Configuration vivo
5. R2-2100145 Details of Configured Grant based Small Data Transmission Samsung Electronics Co., Ltd
6. R2-2100146 User Plane Common Aspects of RACH and CG based SDT Samsung Electronics Co., Ltd
7. R2-2100147 Control Plane Common Aspects of RACH and CG based SDT Samsung Electronics Co., Ltd
8. R2-2100148 Details of RACH bsaed Small Data Transmission Samsung Electronics Co., Ltd
9. R2-2100282 Discussion on SDT UP issues OPPO
10. R2-2100283 Discussion on SDT CP issues OPPO
11. R2-2100284 Discussion on RACH based SDT OPPO
12. R2-2100285 Discussion on CG based SDT OPPO
13. R2-2100294 User plane common aspects of SDT CATT
14. R2-2100295 Considerations on control plane common aspects CATT
15. R2-2100296 Considerations on transition into RRC\_CONNECTED during subsequent SDT CATT
16. R2-2100297 Analysis on CG-based SDT CATT
17. R2-2100365 Common User plane aspects for SDT Intel Corporation
18. R2-2100366 Common Control plane aspects for SDT Intel Corporation
19. R2-2100367 Fallback, RACH resource partitioning and identification of SDT access Intel Corporation
20. R2-2100368 Handling of configured grant for SDT Intel Corporation
21. R2-2100413 Fallback issue for 2-step RA based small data transmission SHARP Corporation
22. R2-2100419 Identified issue in [Post111-e][926]: CA and PDCP CA duplication Fujitsu
23. R2-2100420 Open issue in [Post112-e][550][STD]: PDCCH monitoring Fujitsu
24. R2-2100668 Discussion on the general aspects for small data transmission Spreadtrum Communications
25. R2-2100669 Discussion on small data transmission for RACH-based scheme Spreadtrum Communications
26. R2-2100749 Handling of new arriving data during SDT NEC
27. R2-2100764 Some open issues of SDT procedure Potevio Company Limited
28. R2-2100775 Discussion on beam operations for small data enhancements Google Inc.
29. R2-2100777 Discussion on CG-based small data transmission Google Inc.
30. R2-2100782 Separate BWP for Small Data Transmission LG Electronics
31. R2-2100784 CG Resource validity and MAC PDU rebuilding on SDT LG Electronics
32. R2-2100817 T319-like timer for the SDT procedure PANASONIC R&D Center Germany
33. R2-2100826 Discussion on how to handle cell reselection for the case of SDT ITRI
34. R2-2100906 Discussion on subsequent SDT in NR, and timer handling Sony
35. R2-2100907 Discussion on context fetch and anchor relocation Sony
36. R2-2100908 Details of RA-based schemes for SDT in NR Sony
37. R2-2100909 Details of CG-based scheme for SDT in NR Sony
38. R2-2100930 Report from email discussion [POST112-e][550][SDT] Further details of CG aspects Lenovo, Motorola Mobility
39. R2-2101111 Consideration on CG based small data transmission Lenovo, Motorola Mobility
40. R2-2101112 Consideration on CP issues for small data transmission Lenovo, Motorola Mobility
41. R2-2101136 The UP common issues for small data transmissions Lenovo, Motorola Mobility
42. R2-2101137 Analysis on open issues of RA based SDT Lenovo, Motorola Mobility
43. R2-2101138 Consideration on CG based small data transmission Lenovo, Motorola Mobility
44. R2-2101145 Handling of non-SDT DRB MediaTek Inc.
45. R2-2101146 Subsequent Transmission of Small data in INACTIVE MediaTek Inc.
46. R2-2101147 Aspects specific to CG based schemes Nokia, Nokia Shanghai Bell
47. R2-2101151 RRC-less SDT over CG MediaTek Inc.
48. R2-2101158 Configured grant based small data transmission ZTE Corporation, Sanechips
49. R2-2101159 Consideration on RACH based small data transmission ZTE Corporation, Sanechips
50. R2-2101160 User plane common aspects of SDT ZTE Corporation, Sanechips
51. R2-2101161 Control plane common aspects of SDT ZTE Corporation, Sanechips
52. R2-2101162 Email discussion summary #551: Common aspects between CG and RACH ZTE Corporation, Sanechips
53. R2-2101174 RACH configuration for SDT Ericsson
54. R2-2101175 Details of CG based SDT Ericsson
55. R2-2101176 Common aspects for SDT Ericsson
56. R2-2101177 CP aspects for SDT Ericsson
57. R2-2101183 User plane common aspects for SDT Huawei, HiSilicon
58. R2-2101184 Control plane common aspects for SDT Huawei, HiSilicon
59. R2-2101203 User Plane common aspects Nokia, Nokia Shanghai Bell
60. R2-2101204 Details on RACH specific schemes Nokia, Nokia Shanghai Bell
61. R2-2101213 Small data transmission with CG-based scheme Huawei, HiSilicon
62. R2-2101214 Small data transmission with RA-based scheme Huawei, HiSilicon
63. R2-2101221 Remaining issues on user plane aspects of NR small data transmission Qualcomm Incorporated
64. R2-2101223 Remaining issues on control plane aspects of NR small data transmission Qualcomm Incorporated
65. R2-2101231 Discussion on RACH based NR small data transmission Qualcomm Incorporated
66. R2-2101233 Discussion on CG based NR small data transmission Qualcomm Incorporated
67. R2-2101311 SDT control plane aspects Nokia, Nokia Shanghai Bell
68. R2-2101368 Subsequent data transmission for SDT Apple
69. R2-2101369 Control plane aspects on SDT procedure Apple
70. R2-2101370 Non-SDB handling during the SDT procedure Apple
71. R2-2101371 CG based SDT procedure Apple
72. R2-2101407 RRC-less SDT NEC Telecom MODUS Ltd.
73. R2-2101466 CG resource release for SDT ETRI
74. R2-2101505 RACH-based SDT precedure InterDigital
75. R2-2101506 CG-based SDT selection and configuration InterDigital
76. R2-2101507 Subsequent small data transmission InterDigital
77. R2-2101513 Subsequent data transmission and indication for non-SDT DRBs LG Electronics Inc.
78. R2-2101578 Small data transmission failure timer InterDigital, Asia Pacific Telecom, Ericsson, ETRI, FGI, Sharp, Sony
79. R2-2101619 SDT type selection and switch procedure CMCC
80. R2-2101620 Remaining issues on RACH based scheme CMCC
81. R2-2101621 Anchor relocation and context fetch CMCC
82. R2-2101622 Consideration on CG resource configuration CMCC
83. R2-2101674 Collision between SDT and RACH Beijing Xiaomi Mobile Software
84. R2-2101675 Discussion on the RRC-less SDT Beijing Xiaomi Mobile Software
85. R2-2101676 Retransmission issue not included in the CG email discussion Beijing Xiaomi Mobile Software
86. R2-2101750 Handling non-SDT data arrival during subsequent SDT ASUSTeK
87. R2-2101751 Discussion on RO configuration between SDT and legacy RA ASUSTeK
88. R2-2101752 Beam selection for CG-SDT ASUSTeK
89. R2-2101753 Discussion on RNTI for CG-based SDT ASUSTeK
90. R2-2101835 Discussion on CG-SDT configuration Asia Pacific Telecom, FGI
91. R2-2101837 Beam operation for CG-SDT Asia Pacific Telecom, FGI
92. R2-2101867 Handling of the subsequent data ITL
93. R2-2101947 New timer for SDT failure detection LG Electronics Inc.
94. R2-2102230 Handling of non-SDT DRB MediaTek,

# Annex (contact details for email discussions)

|  |  |  |
| --- | --- | --- |
| Company | Contact name | Contact email |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |