Industrial Technology Research Institute
Computer & Communications Research Laboratories
Wireless Communication Department

Modification for enabling the RS operations

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Tzu-Ming Lin, Chun-Chieh Tseng, and Wern-Ho Sheen
ITRI, Computer & Communications Research Labs
195 Sec. 4, Chung Hsing Rd.
Chutung, Hsinchu, Taiwan 310, R.O.C.

Voice: +886-3-591-6020
Fax: +886-3-582-9733
E-mail: tmlin@itri.org.tw

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Tzu-Ming Lin, Wern-Ho Sheen

ITRI Computer & Communications Research Labs,
Taiwan, R.O.C.

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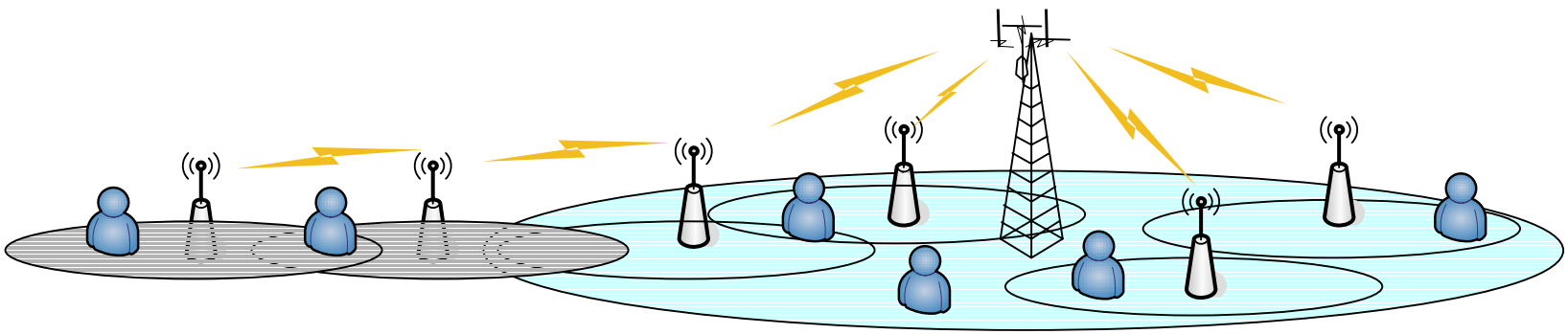
Purpose and scenario

- Propose the modifications in the MMR scenario to enable the RS operations



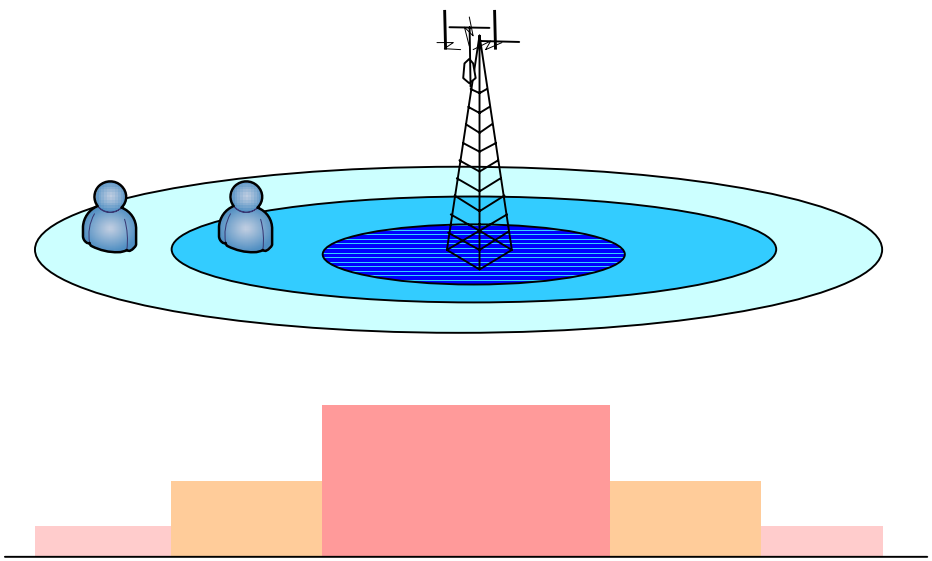
Multi-hop Relay

two-hop Relay

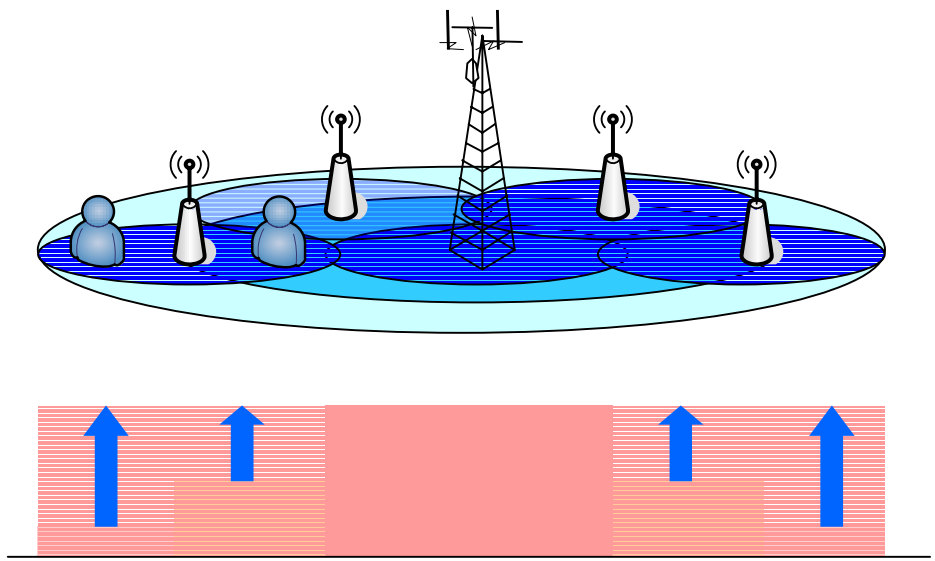
Ref: C80216mmr-005_005r2

Motivation

- Throughput enhancement (from SS' perspective)
  - MMR can improve the throughput within the coverage of BS
  - Modification for RS operations are needed

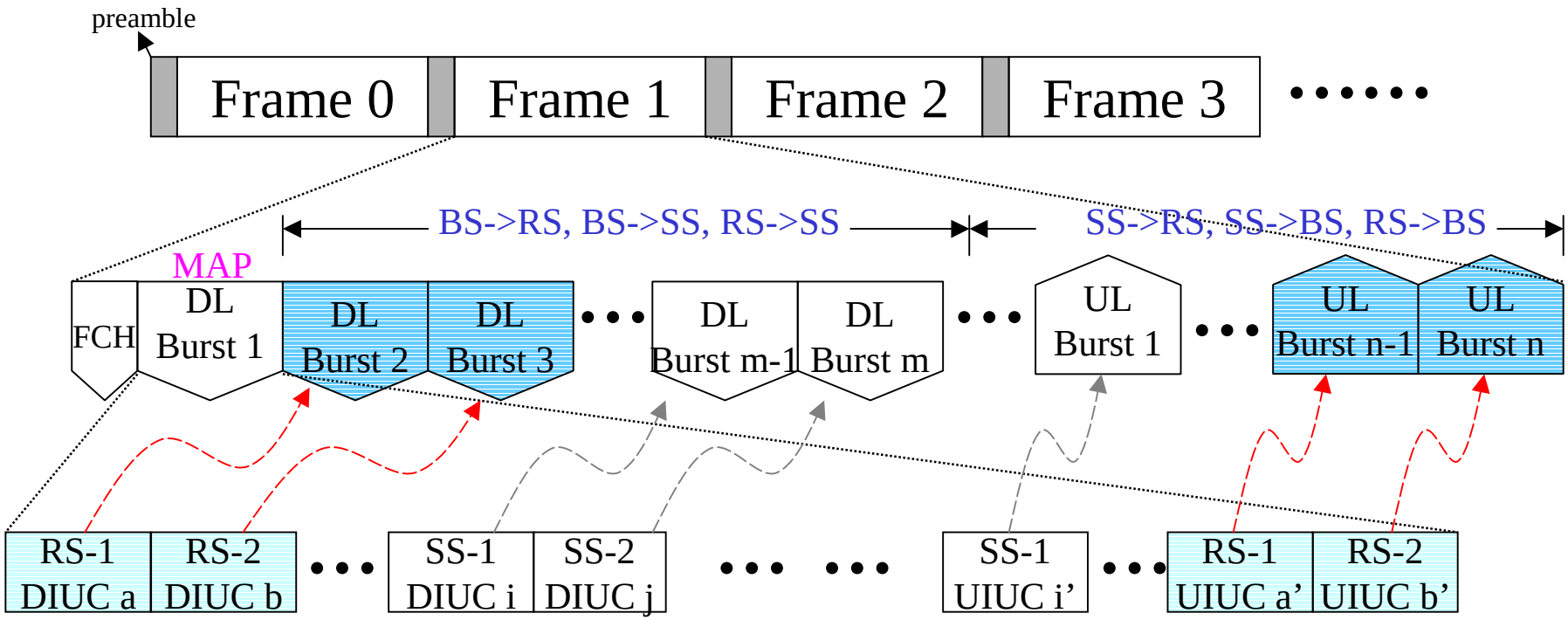


Traditional PMP



PMP + MMR

Frame structure



- Downlink subframe is separated to BS->RS, BS->SS, and RS->SS
- Uplink subframe is separated to SS->RS, SS->BS, RS->BS
- RS identification is needed for burst transmission and management
  - BS treats RS as specific SS, and using RS CID for identification

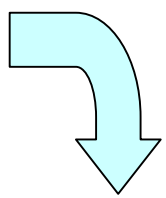
Modified CID field (ref. 16-2004/16e)

Table 345—CIDs

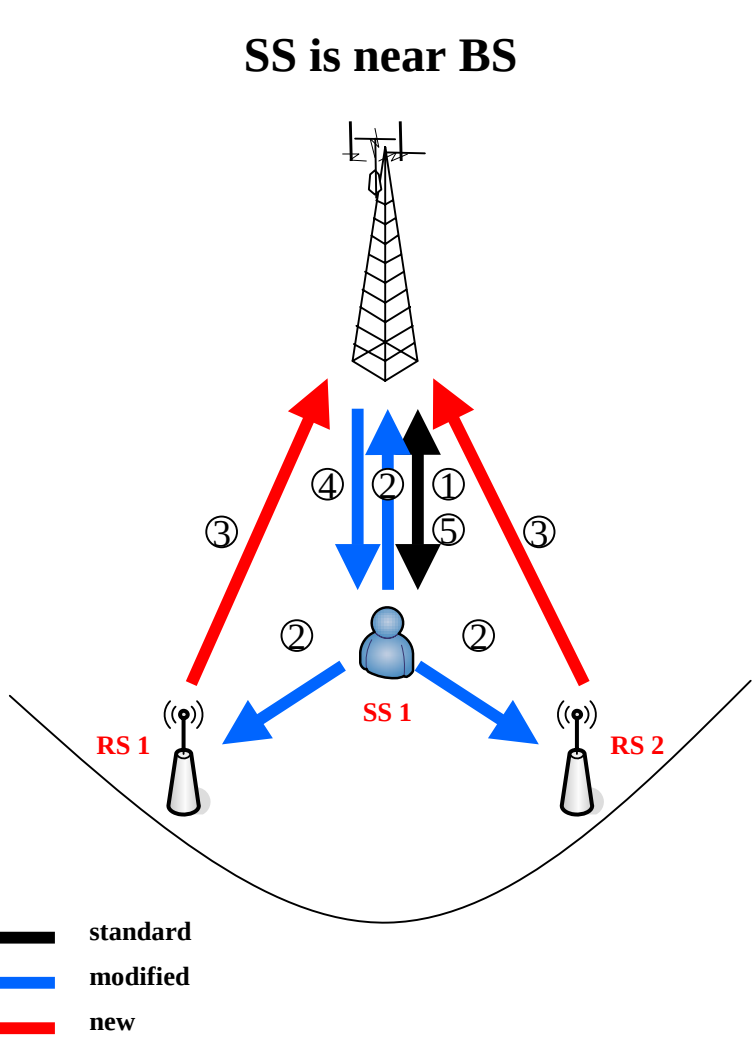
CID	Value	Description
Initial ranging	0x0000	Used by SS and BS during initial ranging process.
Basic CID	0x0001– *m*	The same value is assigned to both the DL and UL connection.
Primary management	*m*+1 – 2*m*	The same value is assigned to both the DL and UL connection.
Transport CIDs and secondary Mgt CIDs	3m ~~2m~~+1–0xFEFE	For the secondary management connection, the same value is assigned to both the DL and UL connection.
AAS initial ranging CID	0xFEFF	A BS supporting AAS shall use this CID when allocating a Initial Ranging period for AAS devices.
Multicast polling CIDs	0xFF00–0xFFFD	An SS may be included in one or more multicast polling groups for the purposes of obtaining bandwidth via polling. These connections have no associated service flow.
Padding CID	0xFFFE	Used for transmission of padding information by SS and BS.
Broadcast CID	0xFFFF	Used for broadcast information that is transmitted on a downlink to all SS.
RS CID	**2m+1 – 3m**	**For RS connection, the same value is assigned to both the DL and UL connection**

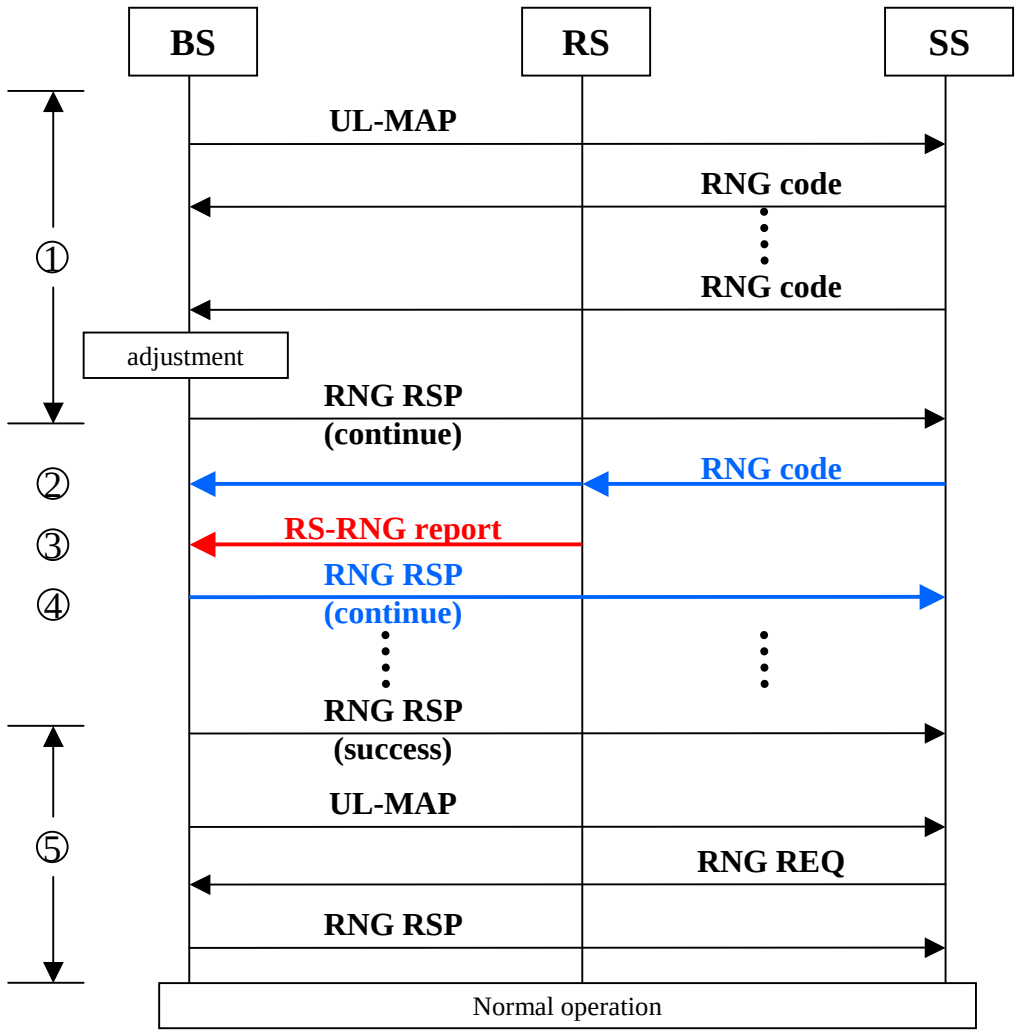
Synchronization

- Criteria
  - Ranging process is administrated by BS
    - Security / Performance / Complexity issues
  - BS treats RS as a specific “SS”
    - Compatibility
  - RS may/may not be transparent for SS
    - Impact of SS
- RS to BS
  - Legacy SS synchronization process
- SS to RS/BS
  - BS control the ranging process and advise the suitable parameters to SS by the help of the information from RS



Initial Ranging – near case





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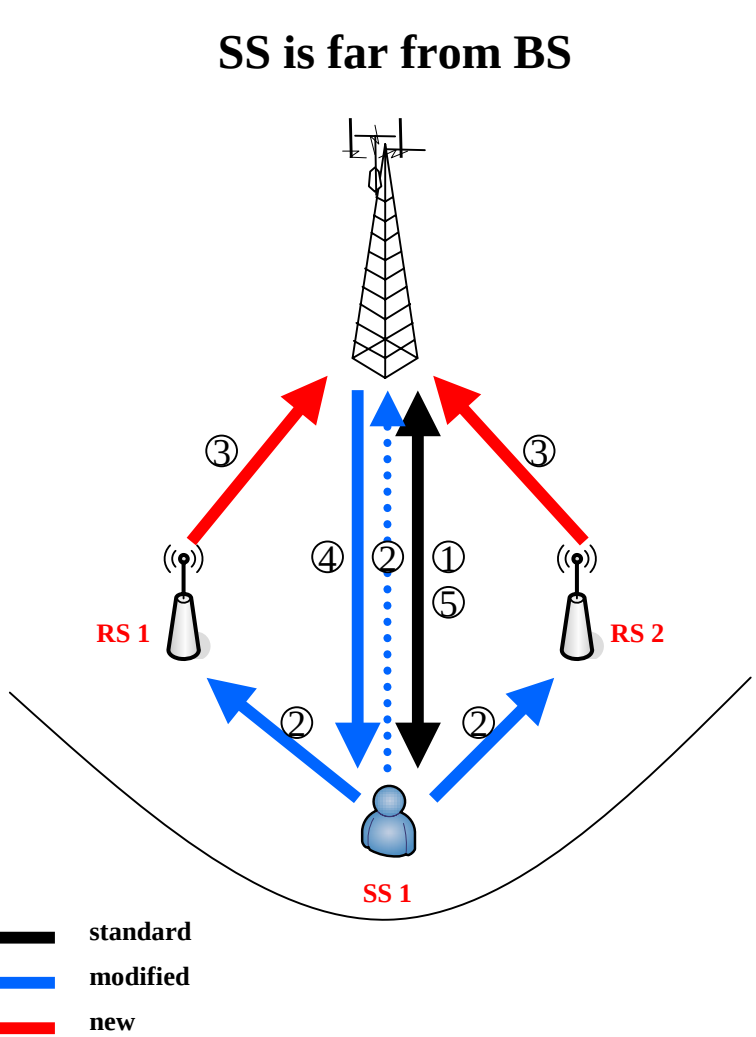
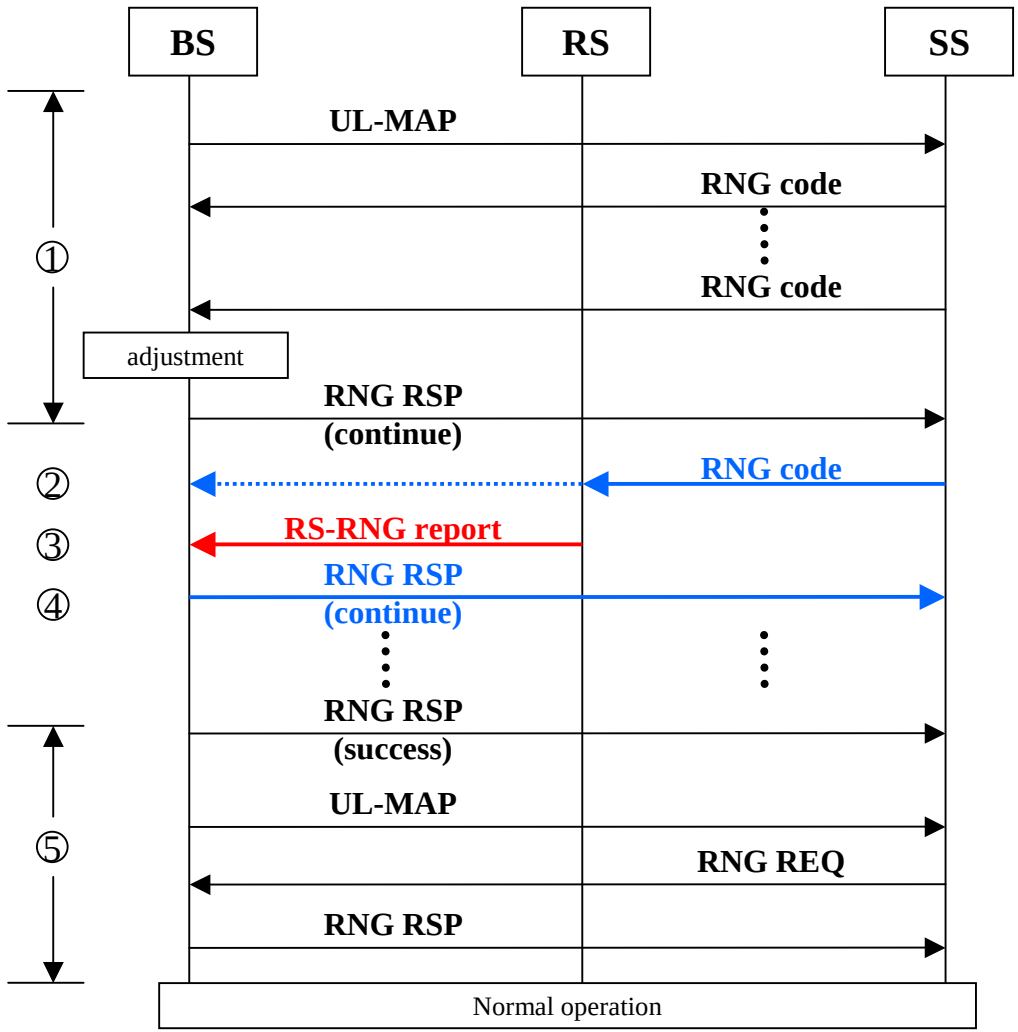
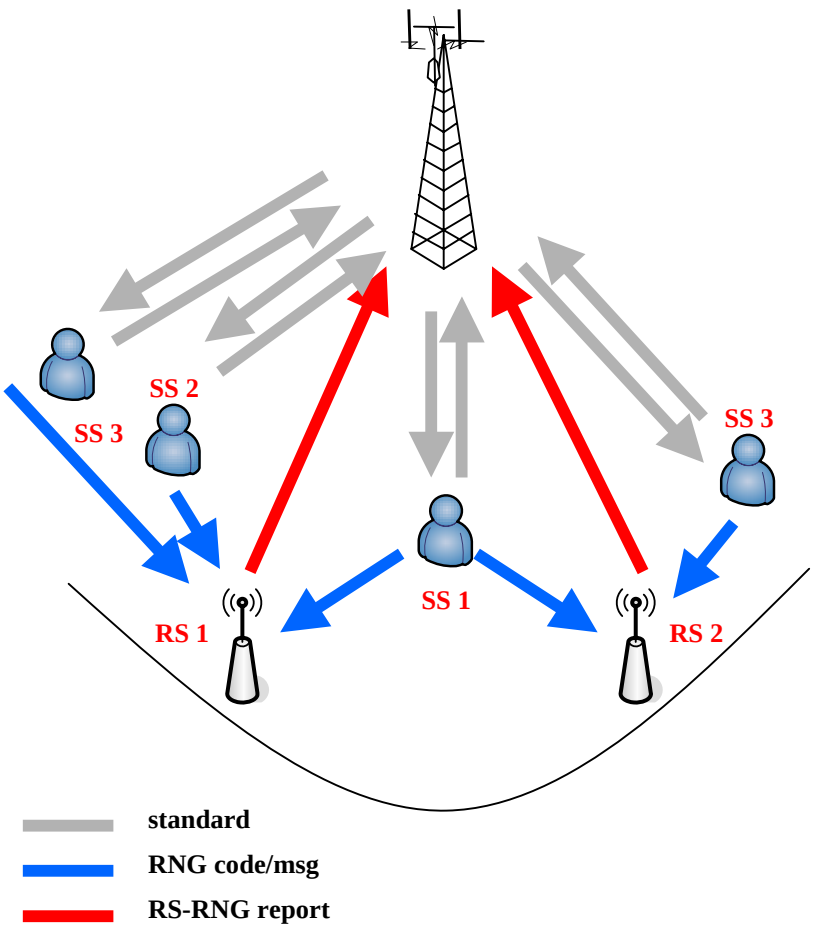
Initial Ranging – far case





Initial Ranging – multi SSs



- RS collects the ranging info. within its coverage and reports to BS
  - Sending RS0RNG report periodically
- BS administrates overall ranging processes of SSs
  - Select the suitable RS for further operations
  - Adjust parameters between SS and RS/BS

RS-RNG report

- Operation
  - Report the signal and info. of ranging SSs
- Benefits
  - BS can arrange the RS to SSs based on the info. for data relay
  - Assist adjusting the parameters between BS/RS/SS
- Issues
  - The SS must send first RNG code to BS directly
    - If not, it is the case of coverage extension case
      - Black hole problem is also in this case
    - All ranging process should be administrated by BS
      - BS can omit the first RNG code sent by RS

Summary

- RS is expected to enhance the throughput and coverage extension in MMR scenario
  - Modifications for RS operation are needed
- This contribution proposes modifications to enable the RS operations compatible with 802.16 standard
  - RS identification
  - Synchronization process
- RS acts as a SS can
  - Low cost RS (almost the same with SS)
  - Increase the compatibility (limit modification of standard)

References

- IEEE C80216mmr-05/005r2, Fang-Ching Ren, Chang-Lung Hsiao, Yu-Ching Hsu, and Wern-Ho Sheen, A Recommendation on PMP Mode Compatible Frame Structure