Some Considerations on Mobile Multi-hop Relay Based System

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None

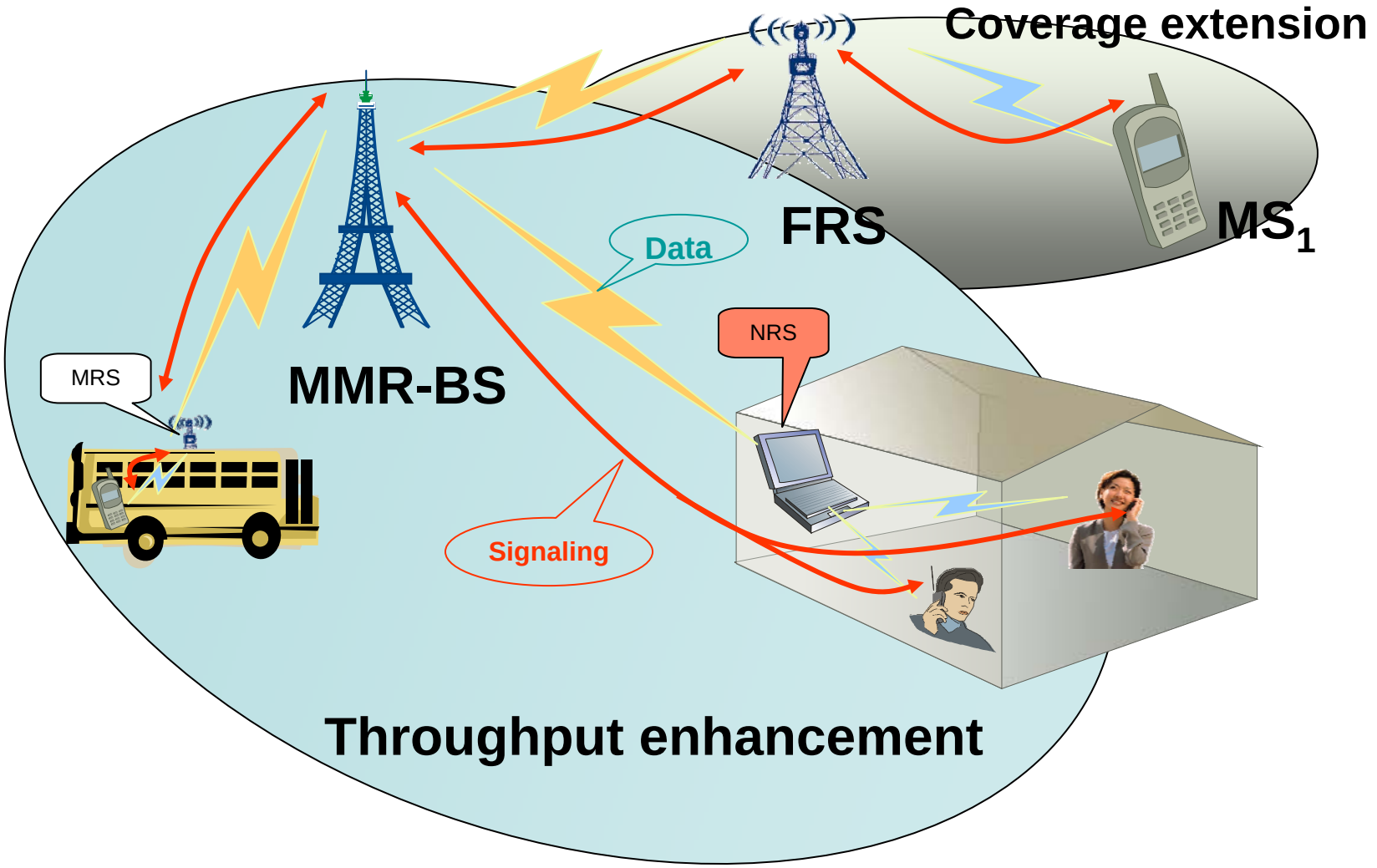
Purpose:

The purpose of this document is to give some recommendations on mobile multi-hop relay .

Outline

- Scenarios
- Considerations on hop number
- Possible relay station types and usage scenarios
- Frame structure analysis
- Conclusion

Scenarios


Coverage extension
FRS
MS1
Data
NRS
MRS
MMR-BS
Signaling
Throughput enhancement

Considerations on hop number

- More than two hops
  - Possibly used to extend cell coverage
  - System complexity increases with the number of hops
    - Packet routing
    - System crash recovery
    - Signaling overhead
  - Latency increases linearly with the number of hops
- Two hops
  - Protocols can be optimized for two hops such as
    - ARQ/HARQ
    - Cooperative relaying

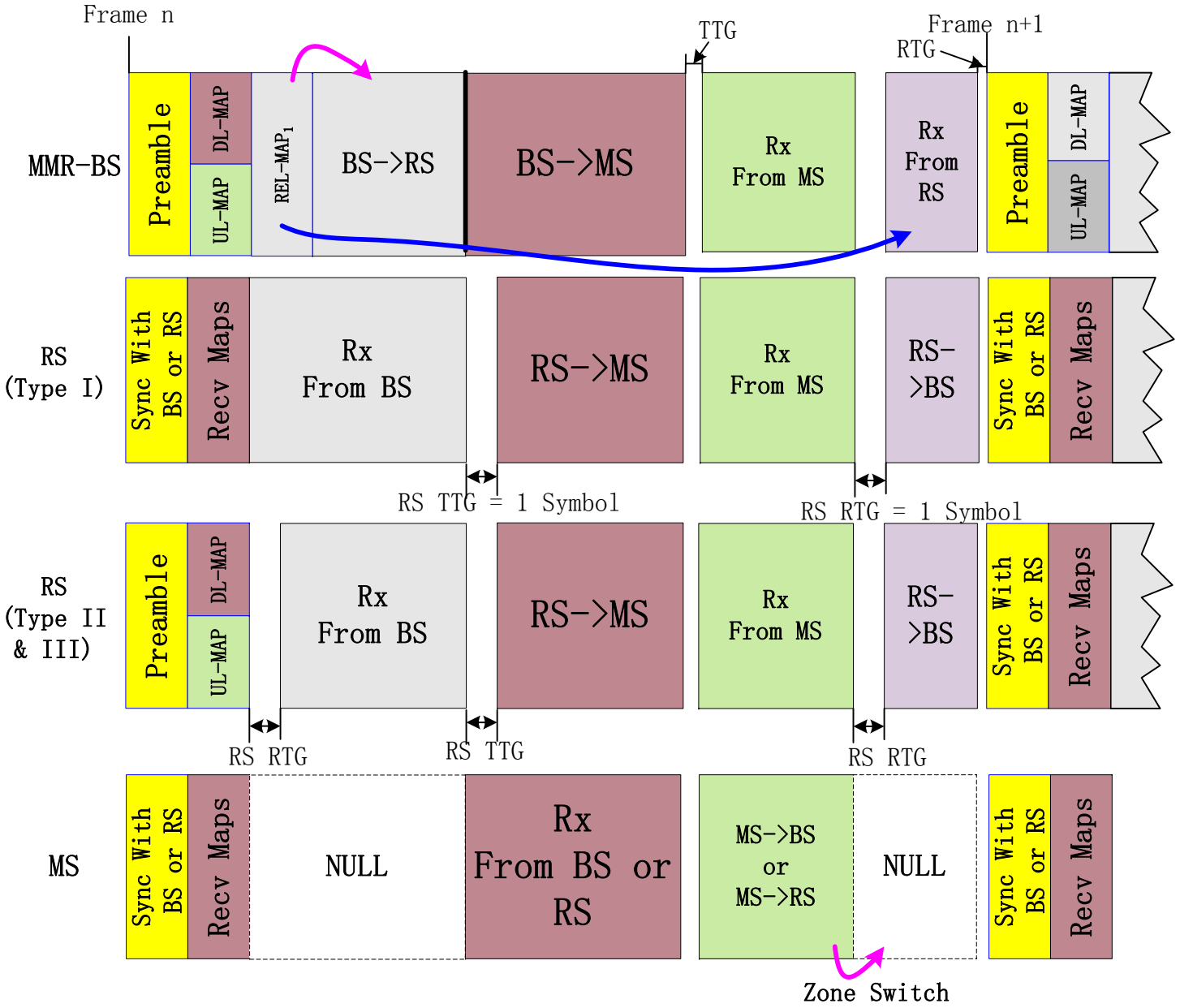
Possible relay station types and usage scenarios

- Possible relay station types
  - RS does **not transmit frame header** (Type I)
  - RS transmits the **same frame header** with BS (Type II)
  - RS transmits **different frame header** with BS (Type III)
- Duplex modes of different RS types
  - Type I：TDD
  - Type II：TDD
  - Type III：TDD and HFDD (HFDD mode is suitable for mobile RS installed on the moving vehicle to avoid frequent handover of MSs)
- Throughput enhancement
  - Type I ～ Type III
- Coverage extension
  - Type II & Type III

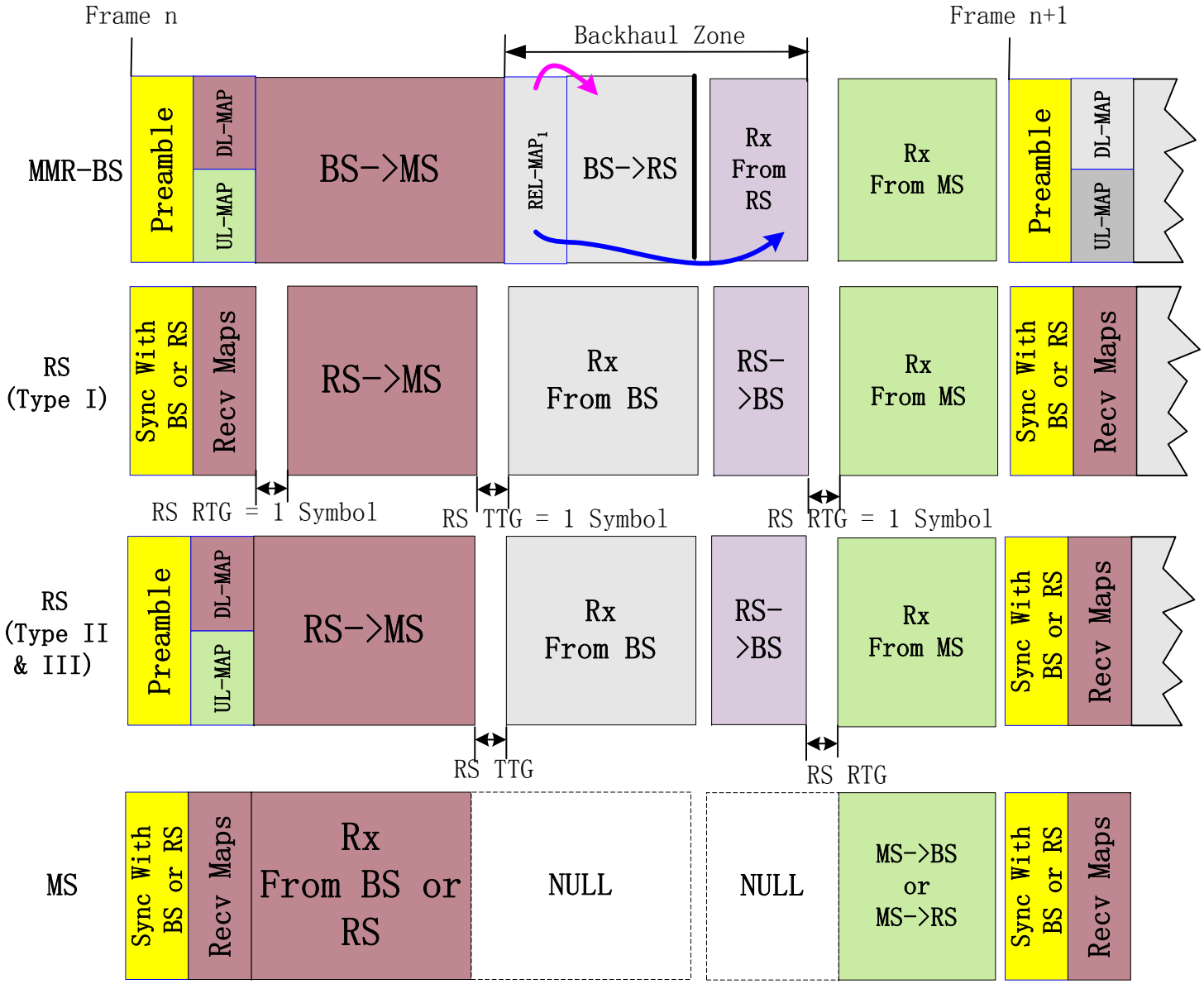
Frame structure analysis

- A unified frame structure should be used by MMR-BS which supports all of the aforementioned RS types at the same time
- RS transceiver status transition times should be minimized, since one OFDM symbol is wasted per transition in the DL/UL sub-frame
- Pilot collision should be avoid between different RSs
- Conventional .16/.16e MS compatibility should always be kept in mind

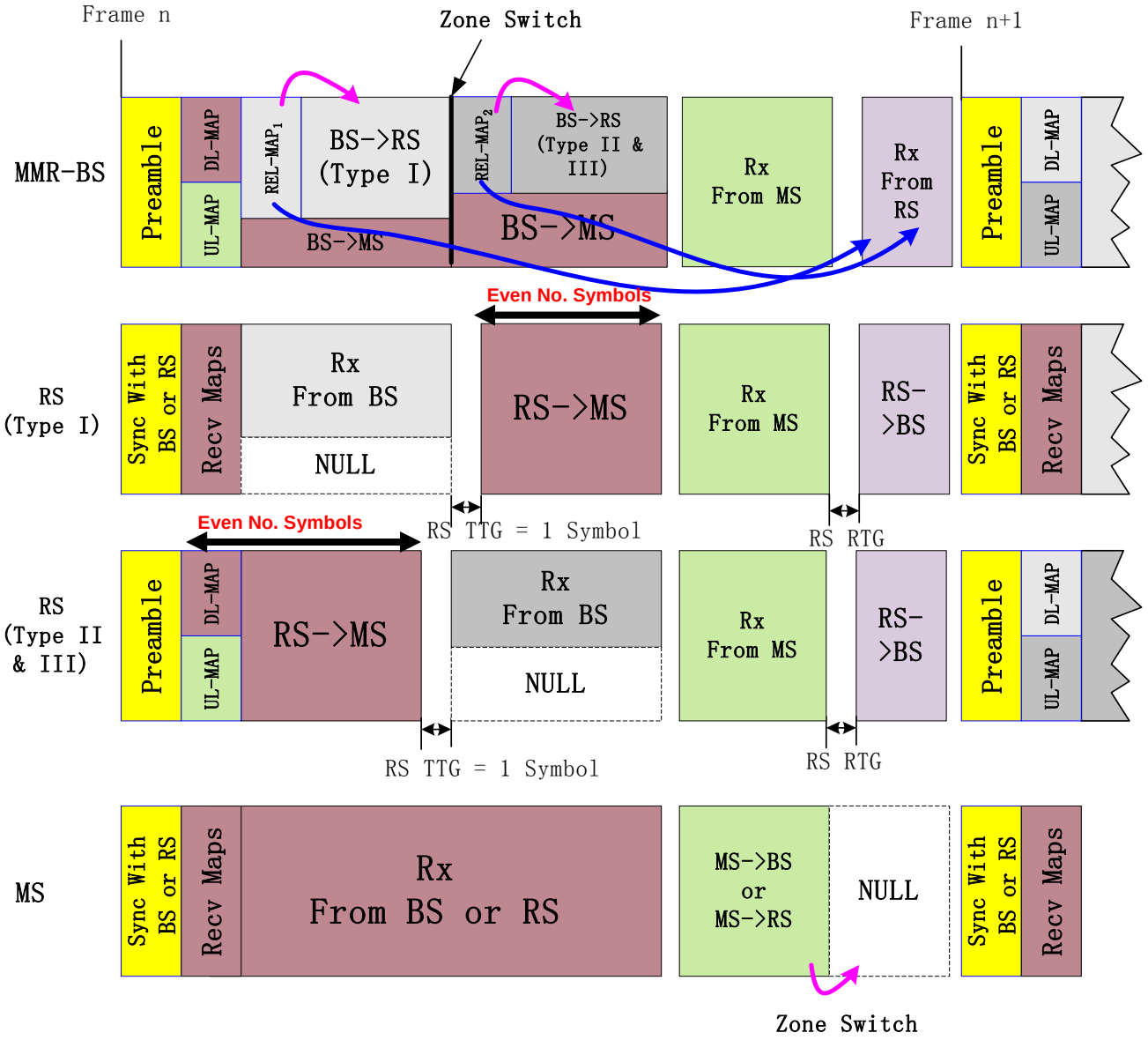
Frame structure 1



Frame structure 2



Frame structure 3



Frame structure analysis

- Frame structure 1
  - Suitable for type I RS
  - Not good for type II and III RS
- Frame structure 2
  - Suitable for type II and III RS
  - Not good for type I RS
- Frame structure 3
  - A combination of frame structure of 1 and 2
  - Optimized for all types of RS
  - RS type II or III and type I can be cascaded to support multi-hop relaying

Conclusions

- Several types of relay stations with different capabilities should be supported in the same site
- Complexity and latency increase with the number of hops
- Protocols can be optimized for two-hops