Network Entry and Neighborhood Discovery

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Wei Zou, Jimin Liu	Voice:	+86 21 58541240
Alcatel, Research & Innovation	Fax:	+86 21 50554550
388#, Ningqiao Road, Shanghai, P. R. C.	E-mail:	wei.zou@alcatel-sbell.com.cn

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Purpose:

.   Propose network entry and neighborhood discovery schemes for IEEE802.16j

Outline

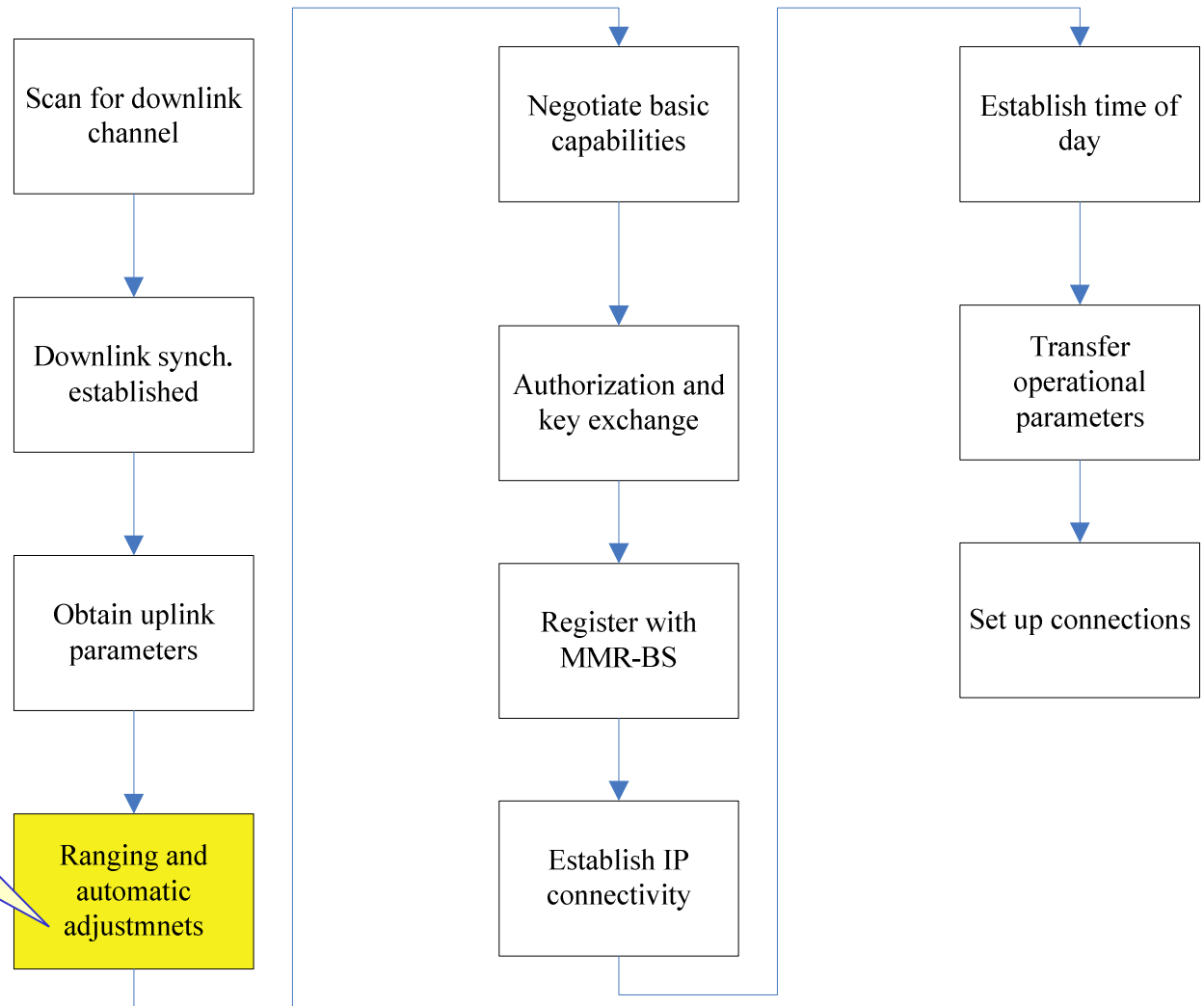- MS / RS network entry and initialization
- Neighborhood Discovery
- Summary

Network Entry and Initialization

- MS entry and initialization process with RS involvement
  - BS performs access station selection and assignment in MS initialization

- RS entry and initialization process
  - Same to that of a MS, except that
    - RS identification by CDMA code or messages
    - Neighborhood discovery

MS / RS Network Entry and Initialization

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┌─────────────────────┐        ┌─────────────────────┐        ┌─────────────────────┐
│  Scan for downlink  │        │   Negotiate basic   │        │  Establish time of  │
│       channel       │        │     capabilities    │        │         day         │
└─────────────────────┘        └─────────────────────┘        └─────────────────────┘
           │                              │                              │
           ▼                              ▼                              ▼
┌─────────────────────┐        ┌─────────────────────┐        ┌─────────────────────┐
│   Downlink synch.   │        │  Authorization and  │        │      Transfer       │
│     established      │        │     key exchange    │        │     operational     │
│                     │        │                     │        │     parameters      │
└─────────────────────┘        └─────────────────────┘        └─────────────────────┘
           │                              │                              │
           ▼                              ▼                              ▼
┌─────────────────────┐        ┌─────────────────────┐        ┌─────────────────────┐
│    Obtain uplink    │        │    Register with    │        │ Set up connections  │
│     parameters      │        │       MMR-BS        │        │                     │
└─────────────────────┘        └─────────────────────┘        └─────────────────────┘
           │                              │
           ▼                              ▼
┌─────────────────────┐        ┌─────────────────────┐
│   Ranging and       │        │    Establish IP     │
│    automatic        │        │    connectivity     │
│   adjustmnets       │        │                     │
└─────────────────────┘        └─────────────────────┘
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Perform access station selection to achieve an optimal path for each specified MS / RS

Access Station Selection via Ranging

BS make a comparison and
determination of RS selection

| BS | DL | UL | |

BS measurement   Quality measurement report and
ranging signal forwarded by RS

| RS | DL | UL | |

RS measure the
ranging signal quality

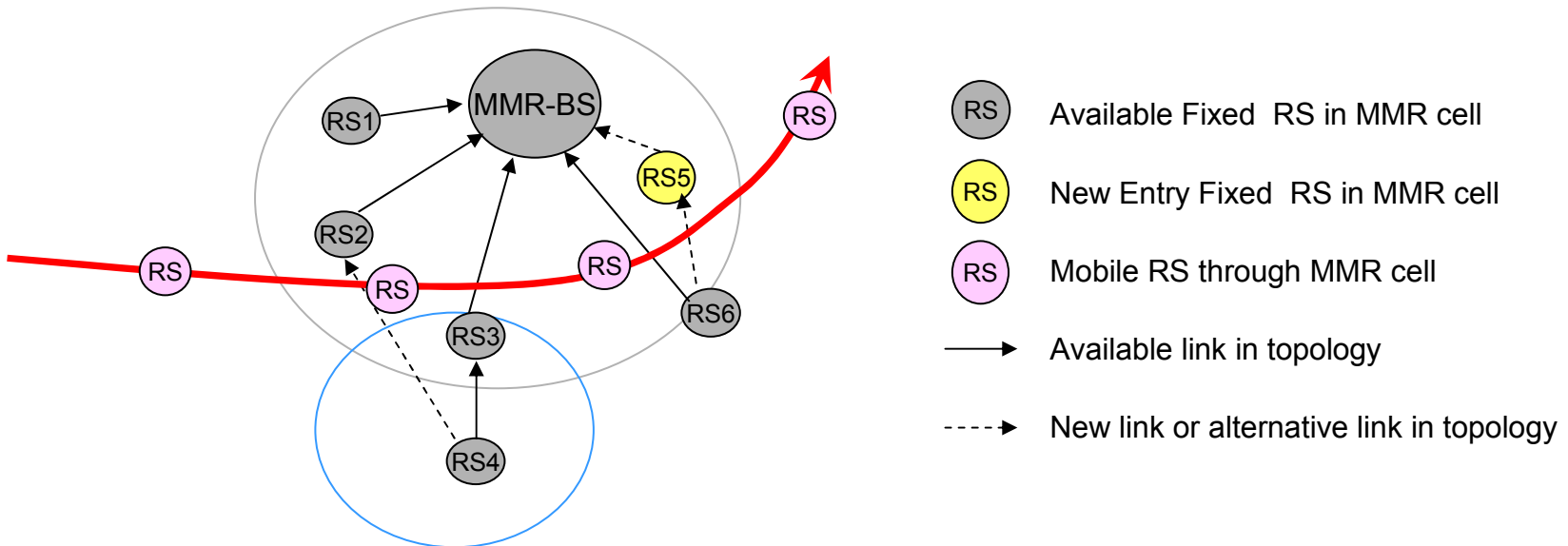| MS | DL | UL | |
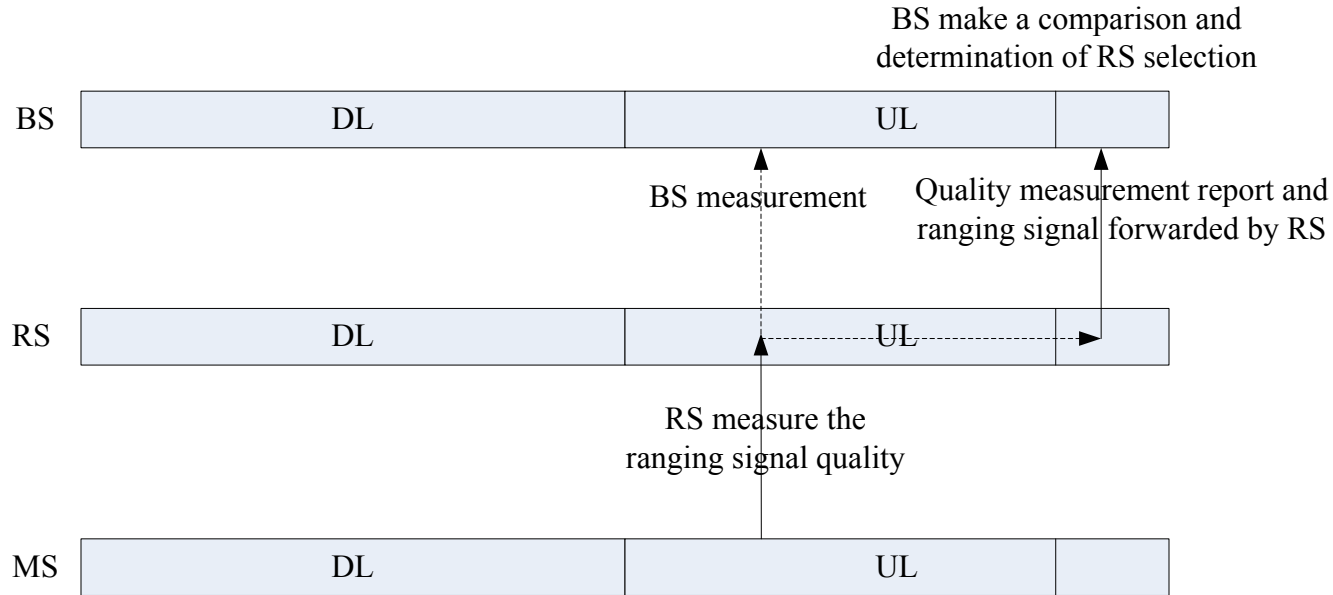
- One ranging sub-channel allocated by BS
- RS monitor ranging requests
  - Measure the ranging signal quality
  - Forward ranging signal and measurement reports to BS
- BS performs access station selection for MS
  - Based on whole path evaluation instead of the access link only
  - Make a decision of access station to achieve the optimal relay path
- RNG-RSP for MS adjustment

Neighborhood Discovery

- Efficient radio resource allocation requires that MMR-BS has the knowledge of each RS and its neighborhood
- Topology change due to
  - New RS entry, mobile RS handover, RS exit , propagation environment change, and etc

RS — Available Fixed RS in MMR cell

RS — New Entry Fixed RS in MMR cell

RS — Mobile RS through MMR cell

→ Available link in topology

----► New link or alternative link in topology

Neighborhood Discovery Procedure

- ## Neighborhood table setup at new RS entry
  - BS create a neighborhood table for each new RS at its network entry

- ## RS neighborhood discovery
  - Measurement
    - RS measures signals from other RSs periodically or requested by MMR-BS
  - Link report
    - If the signal quality (e.g CINR/RSSI) is greater than a threshold, RS report to MMR-BS the existence of a neighbor and link qualities.
  - Table update
    - MMR-BS will process the received reports and update the neighbor stations of each RS and corresponding link qualities.

Summary

- Network entry and initialization with RS involvement
  - Access station selection through ranging signal measurement
  - Decision based on the whole path evaluation
  - RS and MS have the same entry procedure
- Neighborhood discovery
  - Neighborhood table maintained in BS to describe the link qualities between stations.