# 802.16e Handoff ad-hoc report

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Itzik Kitroser

Runcom

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# 802.16e
# Handoff ad-hoc Report

Itzik Kitroser

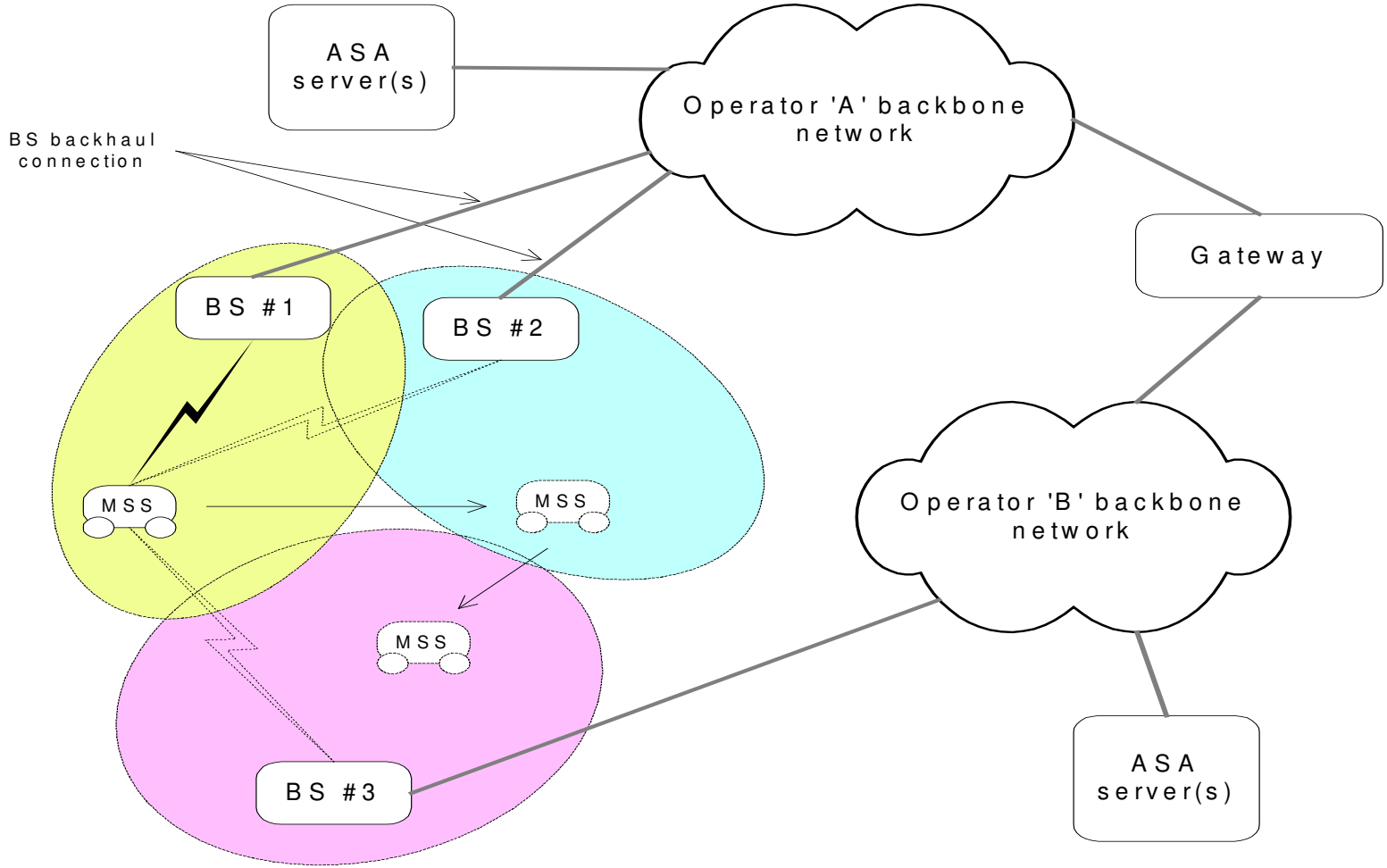
Handoff ad-hoc chair

Runcom

# Entities

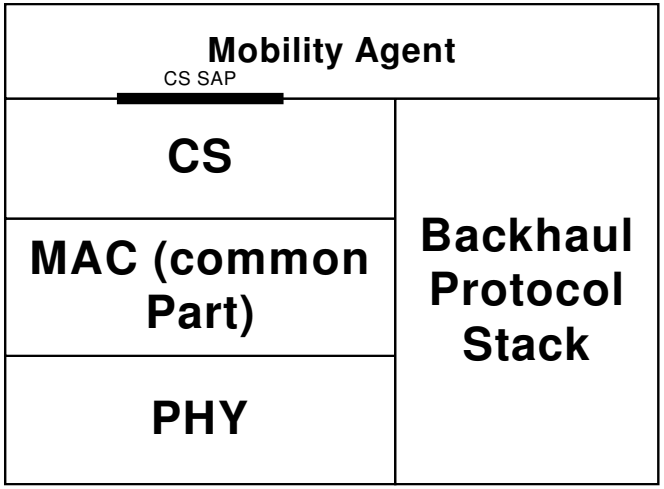
- **MSS** - Mobile Subscriber Station, contains MAC (CS), PHY layers
- **BS** - Base Station Sector, a single MAC entity covers a single air interface instance
- **ASA Server(s)** - Authentication and Service Authorization Server servicing the whole operator's network. These may be implemented as a centralized or distributed entity
- **Serving BS** - BS with which the MSS has recently performed registration at initial network-entry or during an HO
- **Target BS** - The BS that a MSS intends to be registered with at the end of a HO

# Network reference model



# BS and MSS protocol stack

- MSS protocol stack
  - No difference here compared to IEEE 802.16a standard
- BS protocol stack



# Network topology advertisement

- A BS **shall** broadcast information about the network topology using the NBR-ADV MAC message
  - Information about the PHY settings of the neighbor BS
    - Frequency channel
    - DCD information
    - UCD information
- MSS **may** decode this message to find out information about the parameters of neighbor BS
- Each MSS would thus be able to synchronize quickly with neighbor BS.

# MSS scanning of neighbor BS

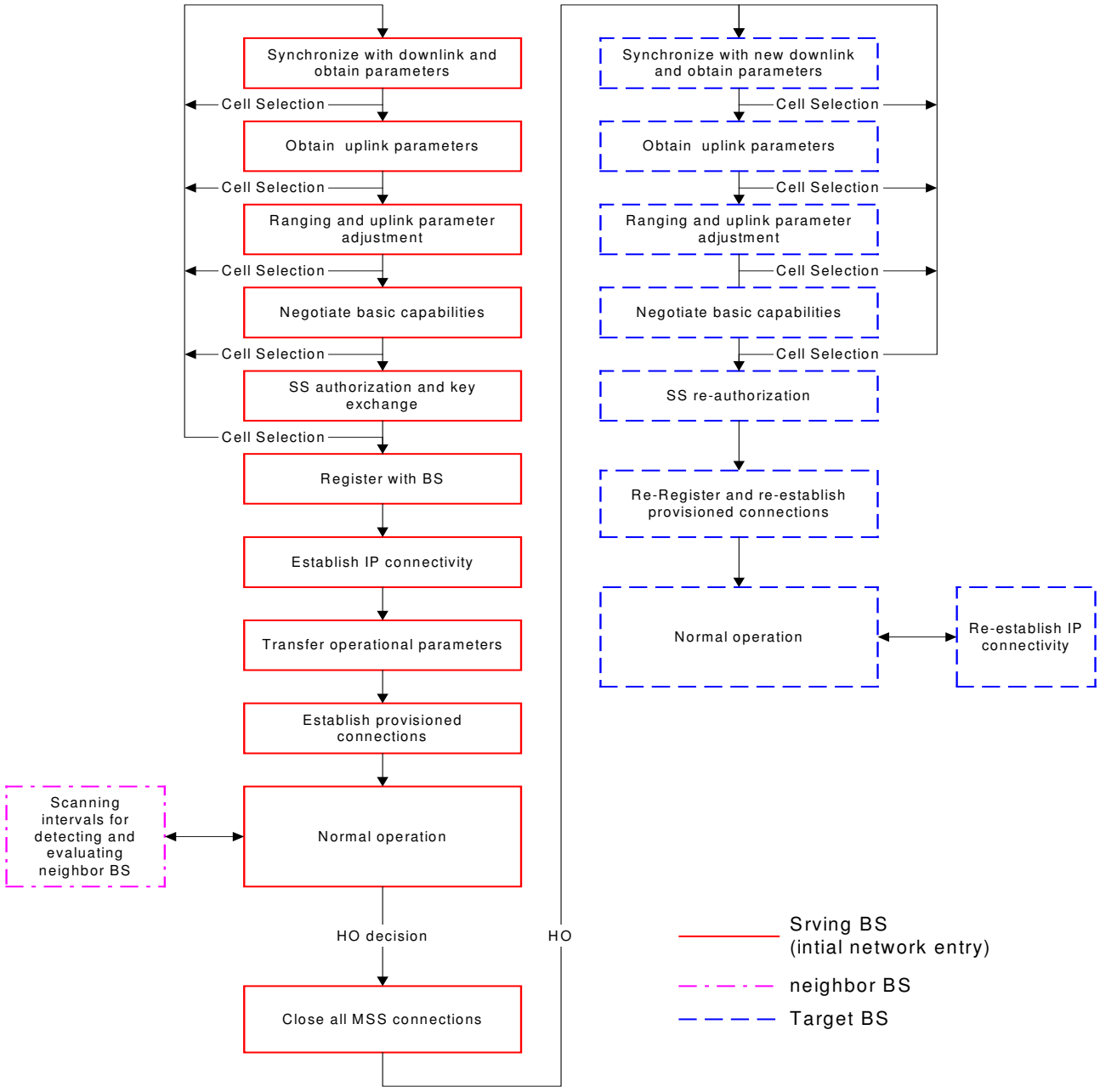
- A BS may allocate time intervals to MSS for the purpose of seeking and monitoring neighbor BS - **scanning interval**
- A MSS may request an allocation of a scanning interval using the SCN-REQ MAC message
  - The MSS indicates the duration of time it requires for the scan
- BS responds with placement of a Scanning_IE in the DL-MAP
  - The Scanning_IE either grants the requesting MSS a scanning interval that is at least as long as requested by that MSS, or deny the request
  - The BS may also place unsolicited Scanning_IE
- Passive scanning
  - A MSS shall use the allocated interval to seek neighbor BS
  - When neighbor BS are identified, estimate the connection quality

# MSS scanning of neighbor BS – Cont'

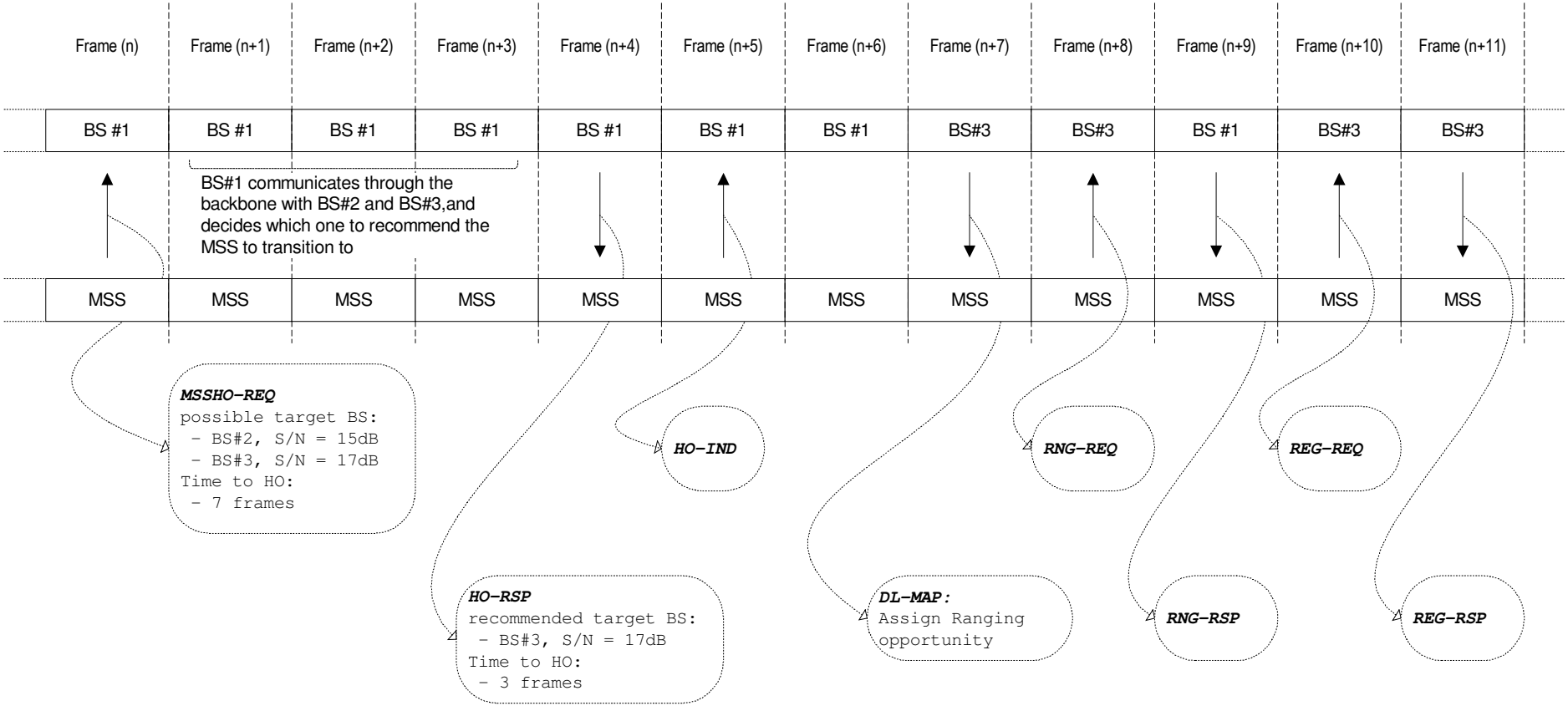
- Active scanning
  - A MSS shall use the allocated interval to seek neighbor BS
  - When neighbor BS are identified, estimate the connection quality
  - A MSS may use the interval for UL ranging as well to in a procedure is called **association**.
- When associating with a neighbor BS, two additional stages are performed
  - **association-initial-ranging**
  - **association-pre-registration**
- Association-initial-ranging is performed by transmitting a RNG-REQ MAC message
- Information on Association is reported to the Serving BS

# HO Process

- The HO process belongs to the break-before-make type
  - Make-before-break can still be implemented
- HO process consists of the following stages,
  - HO initiation
    - The decision to start the process is taken
  - Termination of service with the serving BS
    - All connections belonging to the MSS are terminated
    - The context associated with connections is discarded (i.e. information in queues, ARQ state-machine, counters, timers, etc.)
  - Network re-entry in target BS
    - The MSS re-enters the network using a fast network entry procedure
    - After network re-entry, connection belonging to the MSS are re-established based on the availability of resources in the target BS


Synchronize with downlink and obtain parameters
Cell Selection
Obtain uplink parameters
Cell Selection
Ranging and uplink parameter adjustment
Cell Selection
Negotiate basic capabilities
Cell Selection
SS authorization and key exchange
Cell Selection
Register with BS
Establish IP connectivity
Transfer operational parameters
Establish provisioned connections
Scanning intervals for detecting and evaluating neighbor BS
Normal operation
HO decision
Close all MSS connections
HO
Synchronize with new downlink and obtain parameters
Cell Selection
Obtain uplink parameters
Cell Selection
Ranging and uplink parameter adjustment
Cell Selection
Negotiate basic capabilities
Cell Selection
SS re-authorization
Re-Register and re-establish provisioned connections
Normal operation
Re-establish IP connectivity
Srving BS (intial network entry)
neighbor BS
Target BS

# Example of Handoff Process



# Call for Contributions

- Handoff control
  - Which entity can decide about the HO process, where to go, when actually perform the HO
  - Can BS enforce HO to MSS?
  - How HO controlled if MSS did not perform scanning
- Packet CS to be supported in mobile scenario
  - Group agreed on IP (IPv4 and IPv6)
  - Other options?
- Primitives for communication between CS and MA
  - Parameters should be defined

# Call for Contributions – cont'

- Soft and Hard HO
- Make before Break HO
- Performance requirements for HO procedures
  - Requirements for HO latencies
  - Bottle necks in current spec and solutions (e.g. UDC/DCD intervals sizes)
  - Basic PHY capabilities  for mobile case (predefined values can eliminate negotiations stage)
  - Parameters and thresholds for scanning mode (passive and active)

# Call for Contributions – cont'

- Security Issues
  - Security context transferring between Serving and Target BS
  - Pre-Authentication procedures
- BS QoS rating for HO criteria
  - How to calculate the BS Rating (or QoS) field
- Modifications to Ranging procedures during HO stage
- Setup and negotiations for HO
- Model for coexistence of fixed and mobile SS on same air interface
- Table of Operator parameters for HO
  - Force MSS to perform HO