Measurements for LBS in Idle Mode

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IEEE C802.16maint-08/278r1

Purpose:

Review and discuss in support for the adoption of the proposal contained in C80216maint-08/278r1 into IEEE 802.16e Rev 2.

Obtaining measurements from MS in idle mode

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Motivation

- The current mechanisms in 802.16e for measurement requests and reporting using MOB_SCN-REQ/RSP/REP messages were designed for handoff so they are only allowed when the MS is not in idle mode.
- With the increase of Location Based Services, for example, measurement requests/reports will be more frequent and the MS would not necessarily need to exit idle mode
  - For a tracking-type application, for example, a location/position update may be needed without requiring the application to exchanged data with the MS.
  - Also, for radio resource management, MS location/position update while in idle mode may be useful.
- It is wasteful for the MS to reenter the network for measurement requests/reports and then enter idle mode immediately afterward.
- It is beneficial that the capability is available for the MS to stay in idle mode for measurement requests/reports in a similar way as for the Location Update procedure.

Obtaining measurements from MS in idle mode

Description of the proposal

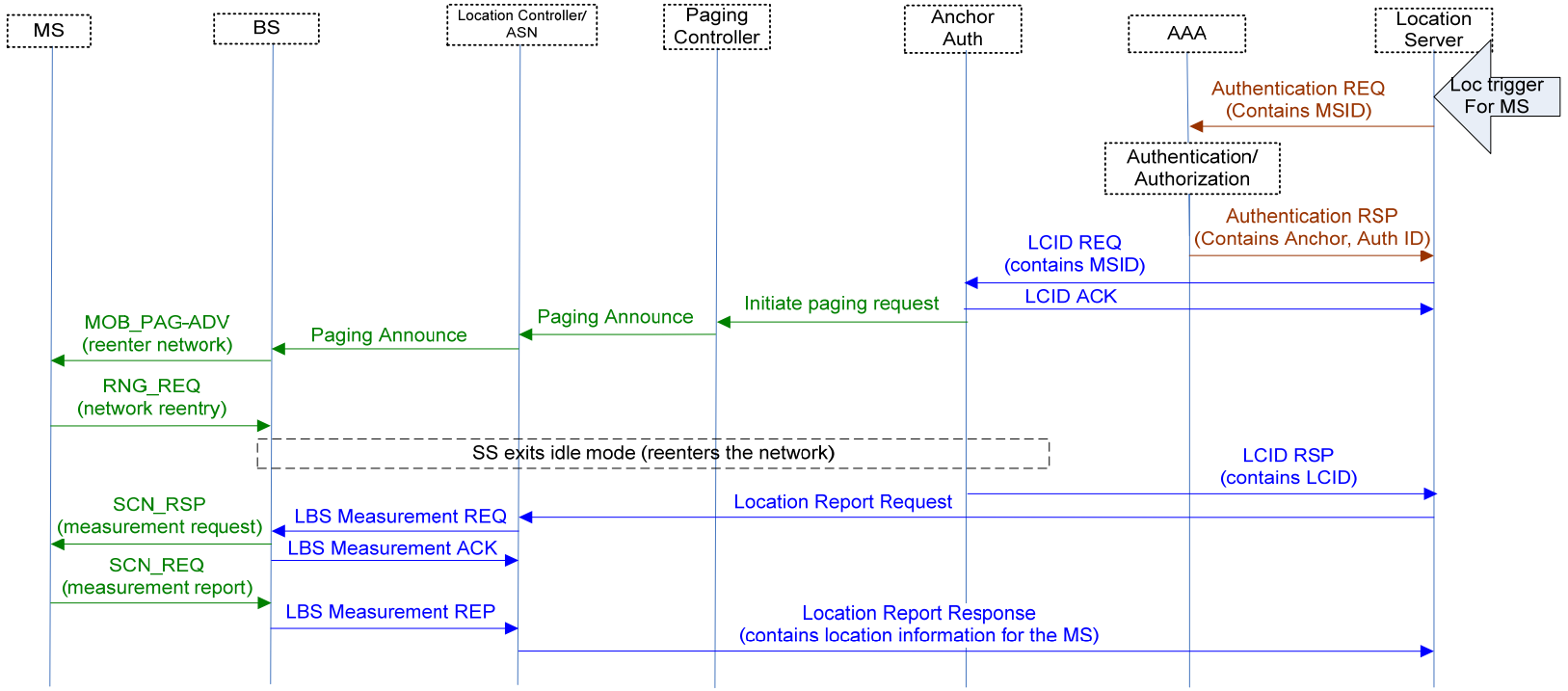
- This proposal provides support for measurement requests/reports without requiring an MS in idle mode to perform a full network entry.
  - The already existing mechanisms used to allow an MS to perform Location Update without fully reentering the network are leveraged.
  - A measurement request is initiated in the access network by first paging an MS with a Location Update indication in order for the network to locate the serving Location Controller (LC) for the MS.
  - When the BS sends a RNG_RSP message with a Location Update success status, parameters may be included that request the MS to perform measurements and report the results.
  - The MS reports measurement results using the RNG_REQ message.
  - The measurement parameters included in RNG_RSP and RNG_REQ are based on the parameters in the MOB_SCN-RSP and MOB_SCN-REP messages.
- NWG LBS protocols and architecture
  - Currently, NWG is developing the protocols and architecture for Location Based Services.
  - Since measurement requests/reports are not allowed in idle mode, the NWG LBS document states that the MS must exit idle mode before performing measurements.
  - This presentation provides several use cases illustrating how a new capability in 802.16e for idle mode measurement requests/reports can be used in the NWG LBS framework.

Obtaining measurements from MS in idle mode

NWG LBS procedure

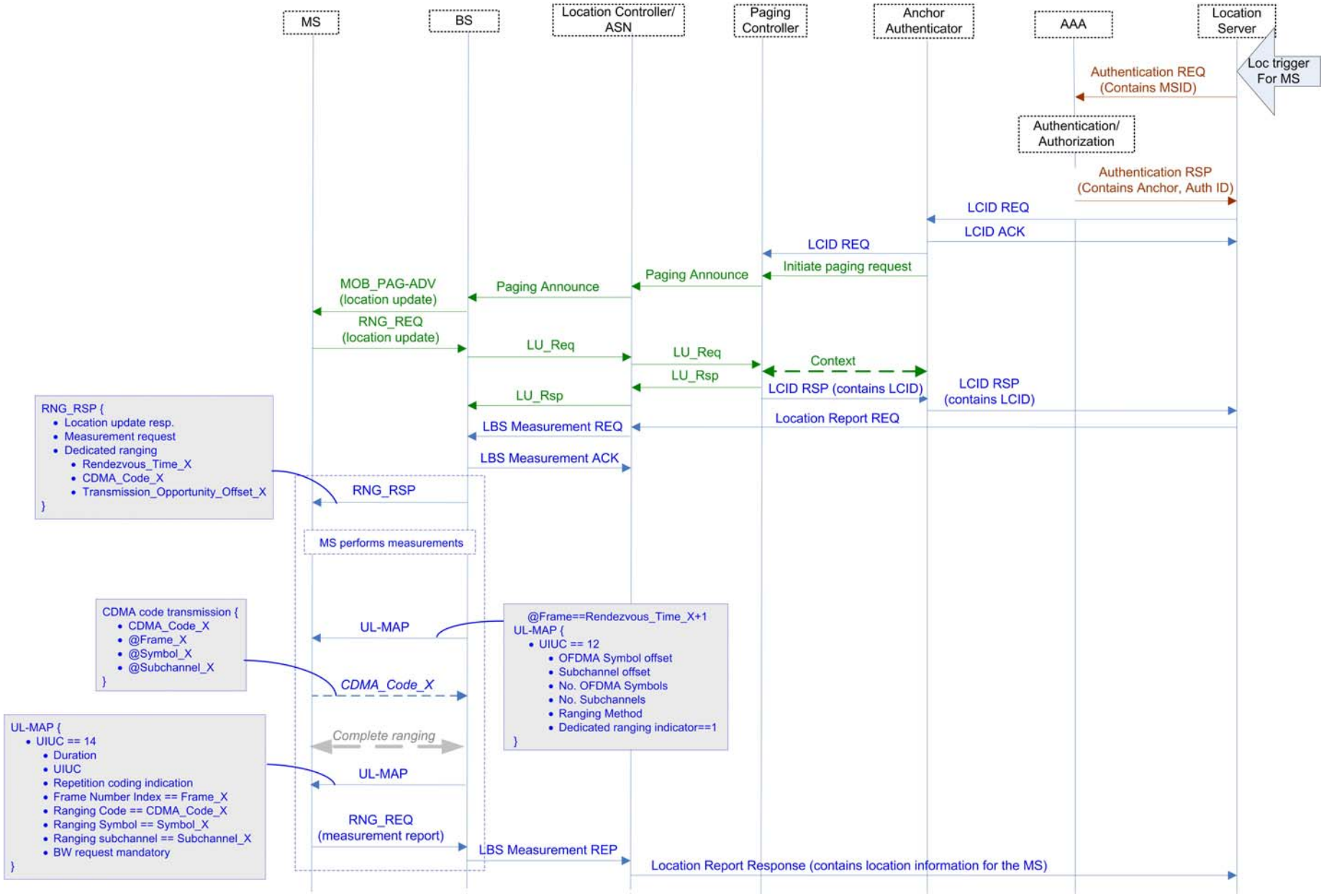
- LS gets the Anchor Auth ID for the MS from AAA
- Alternatively, the AAA-server could directly forward the location request to Authenticator who forwards it to the LC
- LS requests the LCID of the MS from the Anchor Auth
- Anchor Auth responds back to the LS with an ACK indicating that the MS is in idle mode
- Anchor Auth initiates paging of the MS with the PC

- MS is paged and exits idle mode
- Anchor Auth updates the LS with the LCID
- LS requests location report from LC
- LC requests LBS measurements for MS from BS
- BS sends MOB_SCN-RSP with measurement request
- MS performs measurements and reports results in MOB_SCN-REP
- BS sends report to LC
- LC calculates position and sends to LS



Obtaining measurements from MS in idle mode

LS and LC direct communication



Obtaining measurements from MS in idle mode

LS and LC direct communication

- Anchor Authenticator requests LCID from PC
- PC pages MS
- MS initiates location update, PC receives LCID, PC forwards LCID to Anchor Auth.
- PC continues location update
- Anchor Auth forwards LCID to LS
- LS requests location report from LC

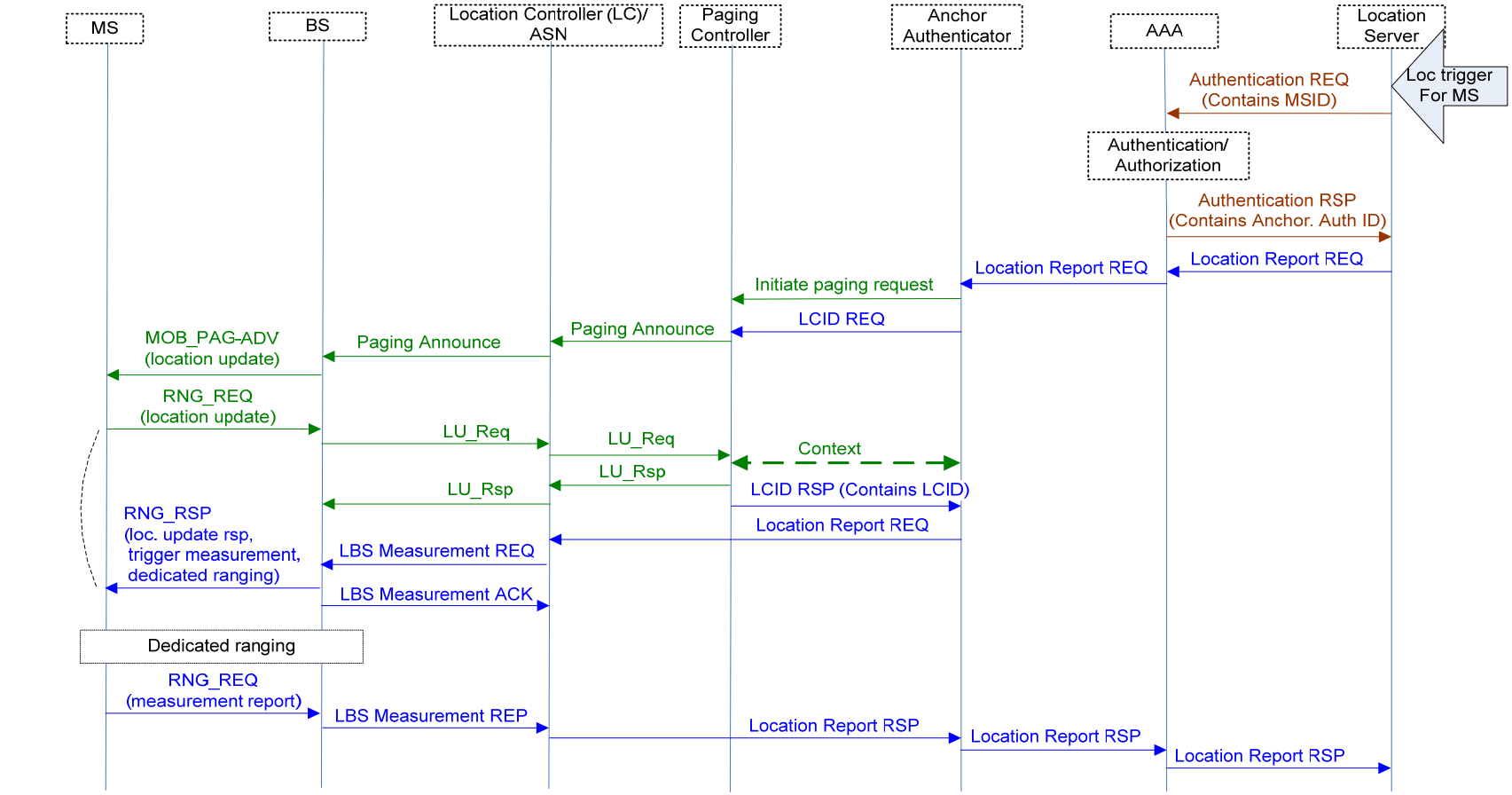
- BS receives LU_Rsp from ASN but waits for LBS Measurement REQ before sending RNG_RSP based on parameter in Paging Announce
- LC requests LBS measurements for MS from BS
- BS sends RNG_RSP with location update status and measurement request, and includes dedicated ranging code, Rendezvous Time, and Transmission Opportunity for MS to use to report measurements
- MS performs measurements
- At the frame indicated by the Rendezvous time, BS sends UL-MAP with dedicating ranging region
- MS transmits dedicated CDMA code in the ranging region based on the Transmission Opportunity and then completes ranging
- BS correlates CDMA code to the MS
- BS sends UL-MAP with CDMA Allocation IE including MS's dedicated CDMA code and the transmission frame number, symbol, and subchannel with allocation size based on the measurement request size
- MS sends RNG_REQ with measurement report
- BS sends measurement report to LC
- LC calculates position and sends to LS

Obtaining measurements from MS in idle mode

LS and LC communicate with help of AAA Session-Anchor Auth sends Meas. REQ

- LS sends location report request to AAA, AAA sends it to Anchor Auth
- Anchor Auth requests LCID from PC and PC pages MS
- MS initiates location update, PC receives LCID, PC forwards LCID to Anchor Auth.
- PC continues location update
- Anchor Auth requests location report from LC
- BS receives LU_Rsp from ASN

- BS waits for LBS Measurement REQ before sending RNG_RSP based on parameter in Paging Announce
- LC requests LBS measurements for MS from BS
- BS sends RNG_RSP with location update status, measurement request, and dedicated ranging info.
- MS performs measurements and reports results in RNG_REQ using dedicated ranging,
- BS sends report to LC
- LC calculates position and sends to Anchor Auth, Anchor Auth sends it to AAA, AAA sends to LS



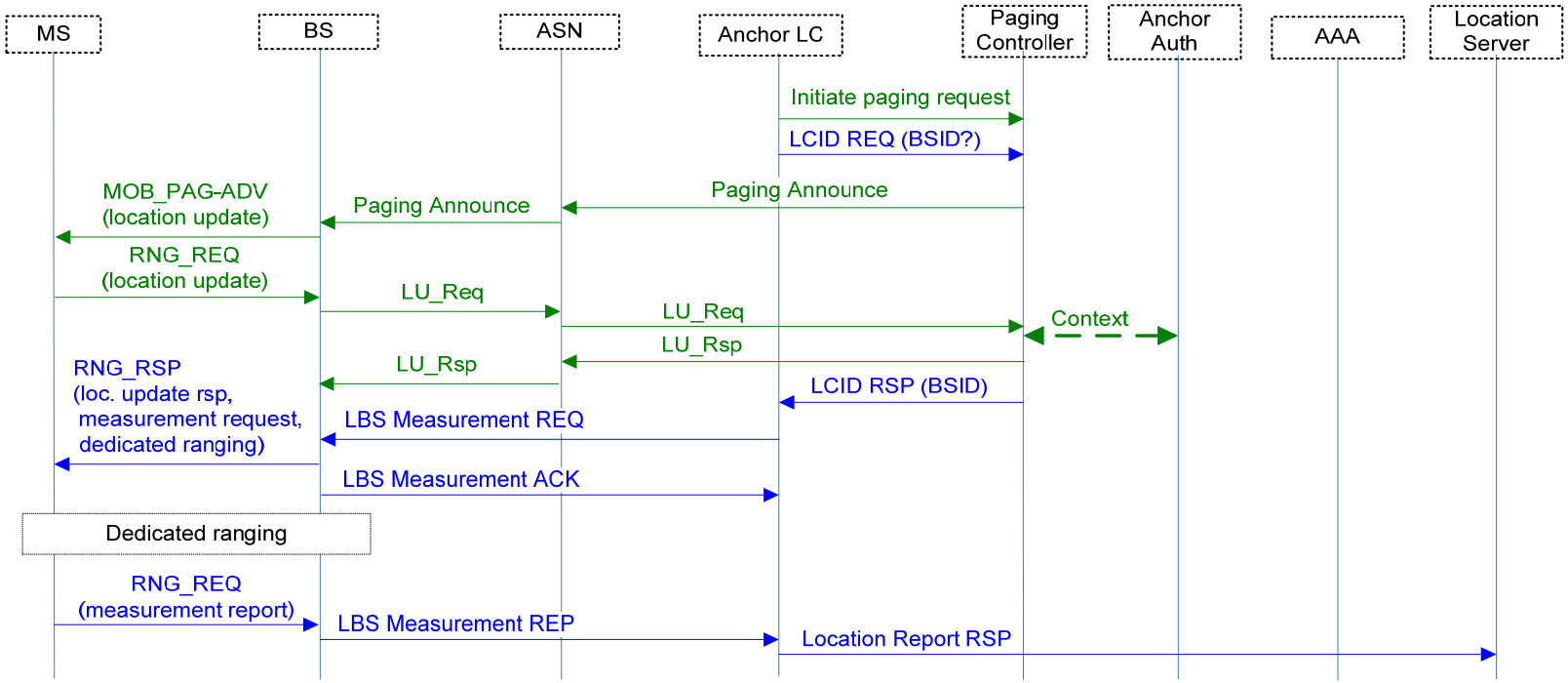
Obtaining measurements from MS in idle mode

Ongoing periodic measurement with Anchor LC

- **Anchor LC initiates measurement**

- LS has previously requested a periodic measurement
- MS has moved out of the original serving area
- Associated LC manages periodic measurement as an Anchor LC
- Anchor LC initiates paging request to obtain MS's BSID
- PC pages MS
- MS initiates location update, PC receives BSID and forwards it to Anchor LC
- PC continues location update

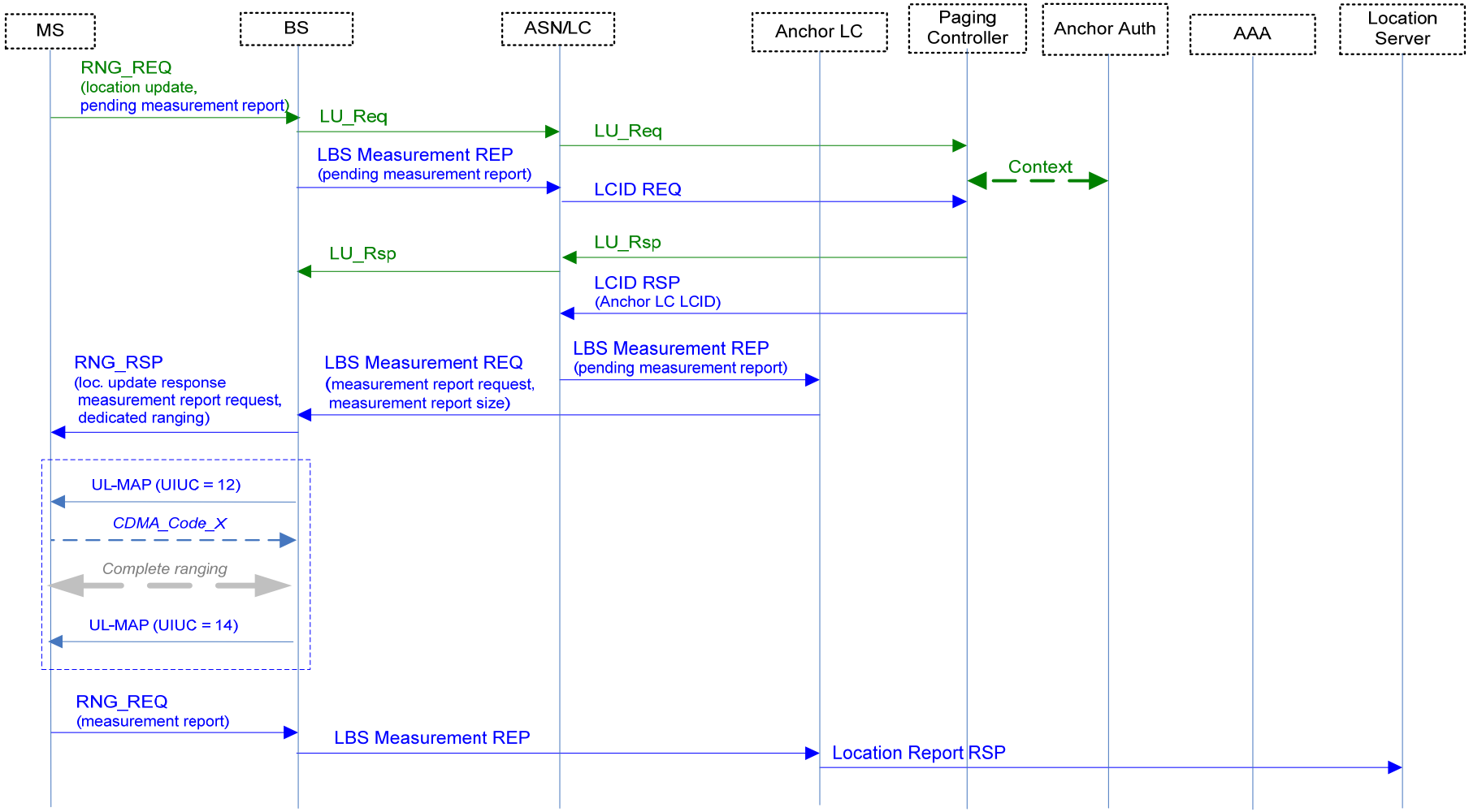
- BS receives LU_Rsp from ASN but waits for LBS Measurement REQ before sending RNG_RSP based on parameter in Paging Announce
- Anchor LC requests LBS measurements for MS from BS
- BS sends RNG_RSP with location update status, measurement request, and dedicated ranging info.
- MS performs measurements and reports results in RNG_REQ, BS sends report to Anchor LC
- Anchor LC calculates position and sends to LS



Obtaining measurements from MS in idle mode

Ongoing periodic measurement with Anchor LC

- **MS initiates measurement**



Obtaining measurements from MS in idle mode

Ongoing periodic measurement with Anchor LC: MS initiates measurement

- LS has previously requested a periodic measurement
- MS has moved out of the original serving area
- LC associated with original serving area serves as Anchor LC
- For this scenario, MS manages periodic measurement
- To report periodic measurement data:

- MS sends **RNG_REQ** with
  - *pending measurement report* indication
  - *location update indication* to initiate location update
- BS sends **LBS Measurement REP** to ASN/LC with
  - *pending measurement report* indication
- ASN/LC does not have context for this MS
- ASN/LC sends **LCID REQ** to PC to obtain Anchor LC LCID for this MS
- PC sends **LCID RSP** with
  - *Anchor LC LCID*
- ASN/LC sends **LBS Measurement REP** message to Anchor LC with
  - *pending measurement report*
- Anchor LC sends **LBS Measurement REQ** with
  - *pending measurement report* to request pending report
  - *measurement report size* to assist the BS with bandwidth allocation for the MS's measurement report

- BS sends **RNG_RSP** to MS with
  - *location update response*
  - *measurement report request*
  - *dedicated ranging parameters*
- BS sends **UL_MAP** with
  - dedicated ranging allocation for MS
- MS sends CDMA code provided in RNG_RSP using allocation provided in UL_MAP
- MS completes ranging
- BS sends **UL_MAP** with
  - allocation for RNG_REQ including measurement report using report size information received from Anchor LC
- MS sends **RNG_REQ** including measurement report
- BS sends **LBS Measurement REP** to Anchor LC with measurement report information
- Anchor LC calculates position and sends **Location Report RSP** to LS

Obtaining measurements from MS in idle mode

Ongoing periodic measurement with Anchor LC

❑ Context transfer and LCID update

- LS has previously requested a periodic measurement
- MS has moved out of the original serving area
- Associated LC serves as Anchor LC
- Location update is performed and relocation of Anchor PC is to be done
- The current Anchor PC provides the current Anchor LC with the LCID of the target (new) Anchor LC
- The current Anchor LC sends the MS's location context to the target Anchor LC
- The target Anchor LC sends an unsolicited LCID update to the LS, which LS may use to terminate periodic measurement