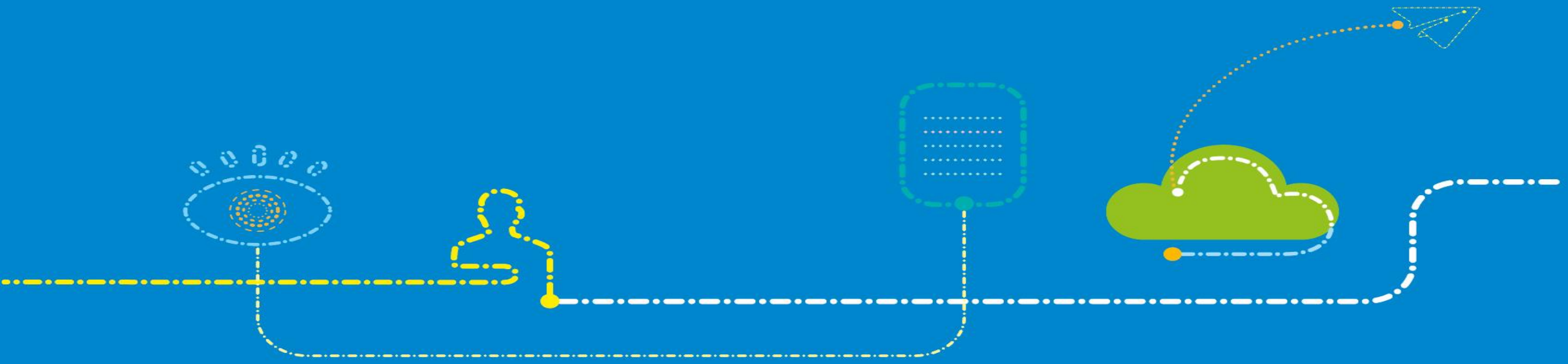
3GPP TSG RAN Rel-19 workshop
Taipei, June 15-16, 2023

RWS-230284

ZTE中兴

Source： ZTE, Sanechips
Agenda: 5

Views on Rel-19 NR positioning



Motivation

Higher accuracy

Uu positioning:

- UWB positioning (>= 500MHz) provides sub-meter accuracy of positioning which attracts a lot of attention in the market. However, currently UWB technology is not included in either LPP or NRPPa spec.

SL positioning:

- During Rel-18 SI phase, most contributions show that target requirement Set B (sub-meter accuracy) can **NOT** be achieved.
- Only ITS band and licensed spectrum in FR1 are supported in Re-18 SL positioning

Power saving

Uu positioning:

- Rel-18 LPHAP evaluates performance and specifies solutions for use case 6 (6 months - 1 year battery life), only a part of contributions show that battery life requirement can be achieved with potential enhancement for LPHAP device A.
- Longer battery life requirements (e.g. use case 5 with 18 month battery life) with limited capacity is desirable.

© ZTE Corporation. All rights reserved

Content

High priority

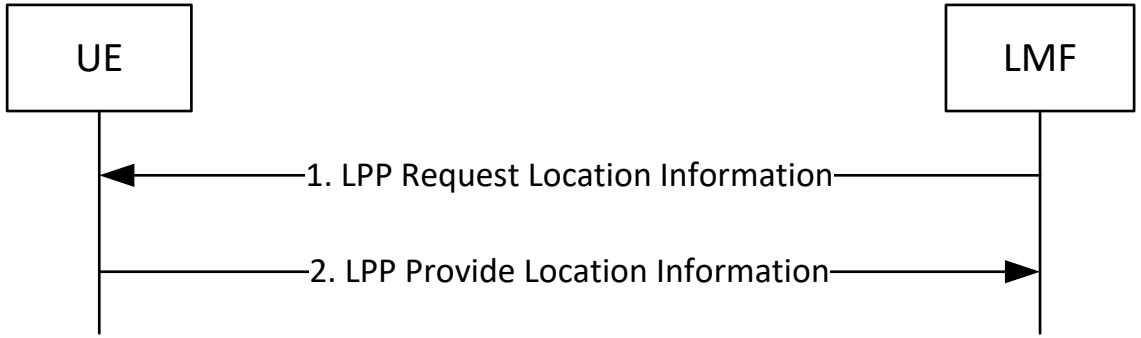
- UWB based positioning [RAN2, RAN3]
- Uu positioning enhancement
  - LPHAP enhancement [RAN2, RAN1]
    - Relaxed positioning, e.g. for UEs in the cell center/with low mobility
  - Uu positioning in Unlicensed bands
  - Rel-18 leftovers:
    - PRS/SRS BW aggregation in PPW,
    - Carrier phase based positioning in PPW
- SL positioning enhancement [RAN1, RAN2]
  - SL positioning in FR2
    - Support SL-AoD positioning method
    - Support beam indication/QCL
  - SL positioning in Unlicensed bands
  - Rel-18 leftovers:
    - IUC
    - Partial sensing

UWB Positioning

© ZTE All rights reserved

Background - Current LPP in NR (1)

- **UWB based positioning is NOT supported in current NR specifications**
- **While Bluetooth-based positioning** and WLAN-based positioning are supported
  - In the Bluetooth positioning method, **the UE position is estimated with the knowledge of geographical coordinate of reference Bluetooth beacons**. This is accomplished by collecting a certain amount of **measurements from UE's Bluetooth receiver**, and applying a location determination algorithm using databases of the estimated position's references points



Information may be from the UE to the LMF

Information	UEAssisted	Standalone
Bluetooth Location Information		
MAC Address	Yes	No
Received Signal Strength (RSSI)	Yes	No
Time Stamp	Yes	No
Measurement characteristics	Yes	No
UE Location Information		
UE position estimate with uncertainty shape	No	Yes
Position Time Stamp	No	Yes
Location Source (method(s) used to compute location)	No	Yes

© ZTE Corporation. All rights reserved

Background - Current LPP in NR (2)

- Bluetooth based positioning was introduced in **Rel-13** inherited from LTE.

TS 37.355

6.5.7.2 Bluetooth Location Information Elements

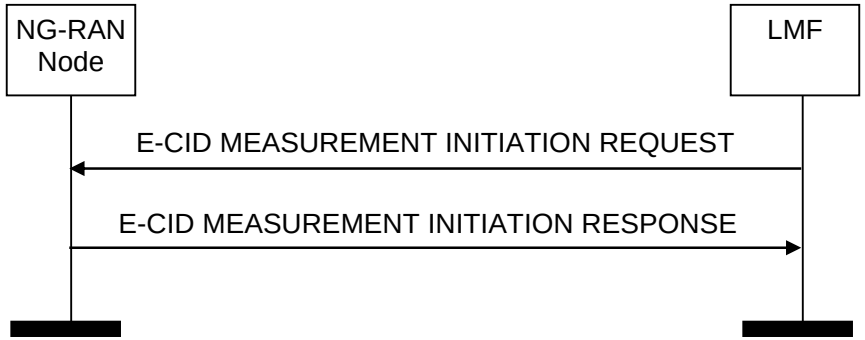
– *BT-MeasurementInformation*

```
-- ASN1START

BT-MeasurementInformation-r13 ::= SEQUENCE {
    measurementReferenceTime-r13        UTCTime                     OPTIONAL,
    bt-MeasurementList-r13              BT-MeasurementList-r13      OPTIONAL,
    ...
}

BT-MeasurementList-r13 ::= SEQUENCE (SIZE(1..maxBT-Beacon-r13)) OF BT-MeasurementElement-r13


BT-MeasurementElement-r13 ::= SEQUENCE {
    btAddr-r13                      BIT STRING (SIZE (48)),
    rssi-r13                        INTEGER (-128..127)             OPTIONAL,
    ...
}

-- ASN1STOP
```


© ZTE Corporation. All rights reserved

Background - Current NRPPa

- **UWB based positioning and Bluetooth-based positioning is NOT supported in current NRPPa procedure**
- While WLAN-based positioning is included in ECID method



Direction: NG-RAN node → LMF.

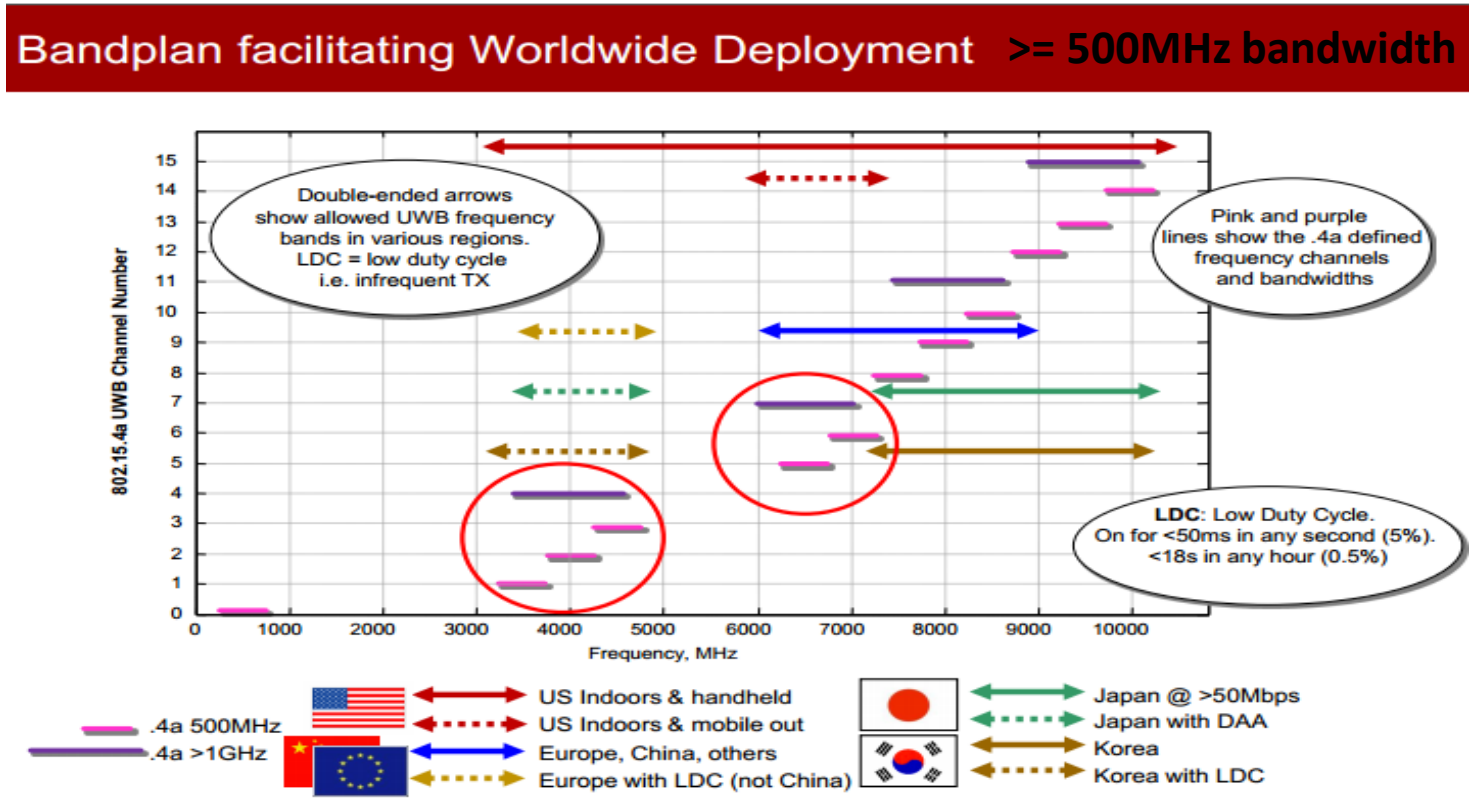
IE/Group Name	Presence	Range	IE type and reference
Message Type	M		9.2.3
NRPPa Transaction ID	M		9.2.4
LMF UE Measurement ID	M		INTEGER (1..15,…, 16..256)
RAN UE Measurement ID	M		INTEGER (1..15,…, 16..256)
E-CID Measurement Result	O		9.2.5
Criticality Diagnostics	O		9.2.2
Cell Portion ID	O		9.2.12
Other-RAT Measurement Result	O		9.2.13
WLAN Measurement Result	**O**		**9.2.14**

>WLAN Measurement Result Item	
>>WLAN RSSI	M
>>SSID	O
>>BSSID	M
>>HESSID	O
>>Operating Class	O
>>Country Code	O
>>WLAN Channel List	
>>>WLAN Channel List Item	
>>>>WLAN Channel	M
>>WLAN Band	O

© ZTE Corporation. All rights reserved

Background - UWB based positioning

- IEEE802.15.4/4z protocols defines UWB technique, where IEEE802.15.4z was distributed in 2020.
- Integraton of 5G gNB and UWB anchor have been specified in CCSA.

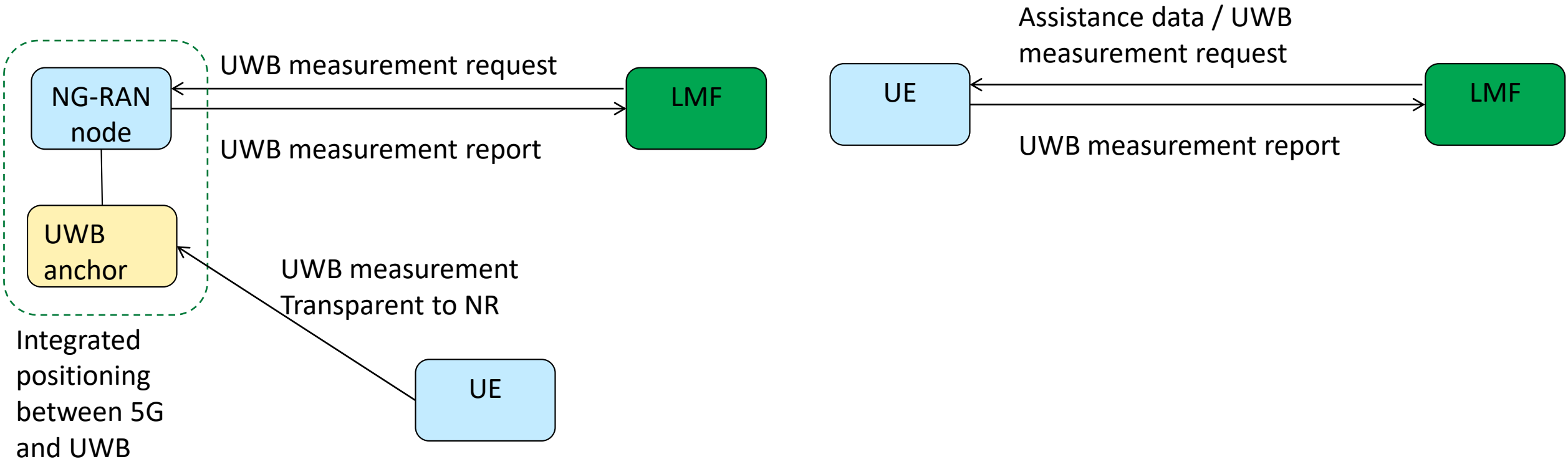


- Very Large bandwidth
- Support TDOA, RTT, AOA methods
- **Nowadays, UWB is deployed more and more in the market**

© ZTE Corporation. All rights reserved

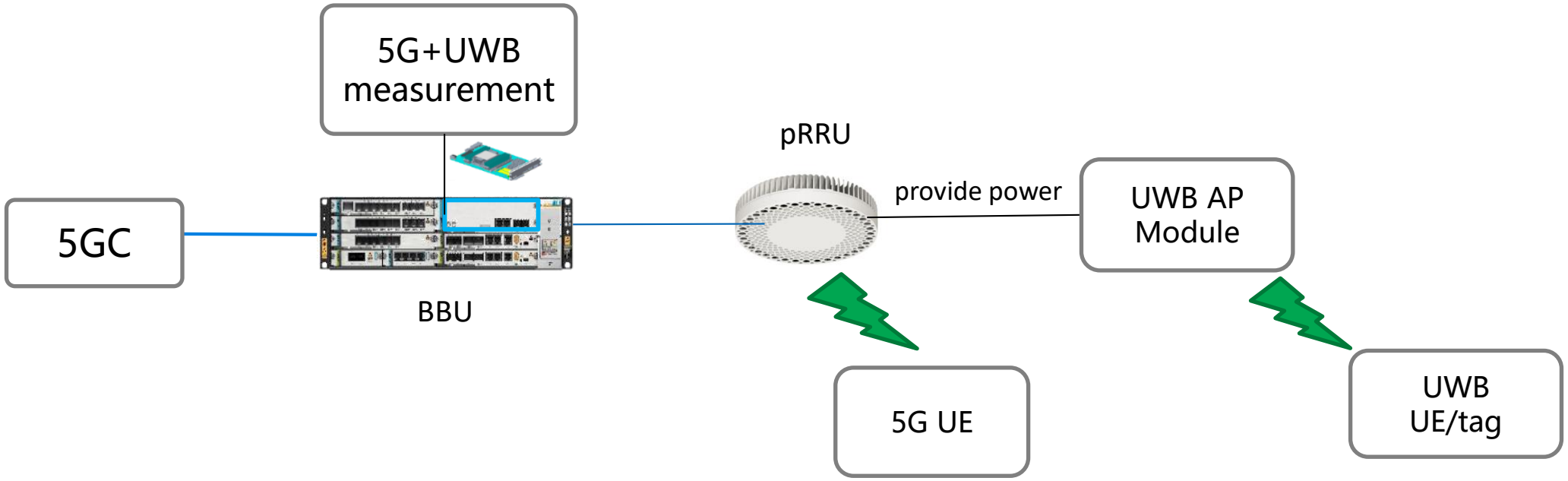
Proposal for UWB

- Introduce UWB-based positioning in LPP, NRPPa, SLPP in Rel-19



© ZTE Corporation. All rights reserved

ZTE product plan



© ZTE All rights reserved

Uu positioning enhancement

© ZTE All rights reserved

LPHAP Enhancement - background

Related background:

- Relaxed RRM measurement: UE can receive and measure SSB from the serving cell and neighbor cell in RRC_INACTIVE or RRC_IDLE state for RRM (radio resource management) measurement. If some conditions are satisfied, UE can perform relaxed RRM measurement via reducing SSB measurement.

TS 38.304	**Relaxed RRM measurement**
5.2.4.9	Relaxed measurement
5.2.4.9.0	Relaxed measurement rules
5.2.4.9.1	Relaxed measurement criterion for UE with low mobility
5.2.4.9.2	Relaxed measurement criterion for UE not at cell edge
5.2.4.9.3	Relaxed measurement criterion for a stationary RedCap UE
5.2.4.9.4	Relaxed measurement criterion for a stationary RedCap UE not at cell edge

© ZTE All rights reserved

LPHAP Enhancement - relaxed positioning

Use case:

- Current positioning behavior: Currently UE has to wake up to receive every PRS indicated by LMF in RRC_INACTIVE or RRC_IDLE state (and/or sends SRS as configured by gNB) to remain high positioning accuracy, which will cause large ramp-up/ramp-down power consumption.
- For LPHAP UE: It is likely that the LPHAP UE has low mobility state, or the LPHAP UE is always within the cell center (e.g., in a factory area with small movement). Since the UE can be assumed as rarely changing its location, the UE does not need to measure the DL-PRS(or transmit SRS) frequently under such conditions in order to achieve power saving.

Benefit:

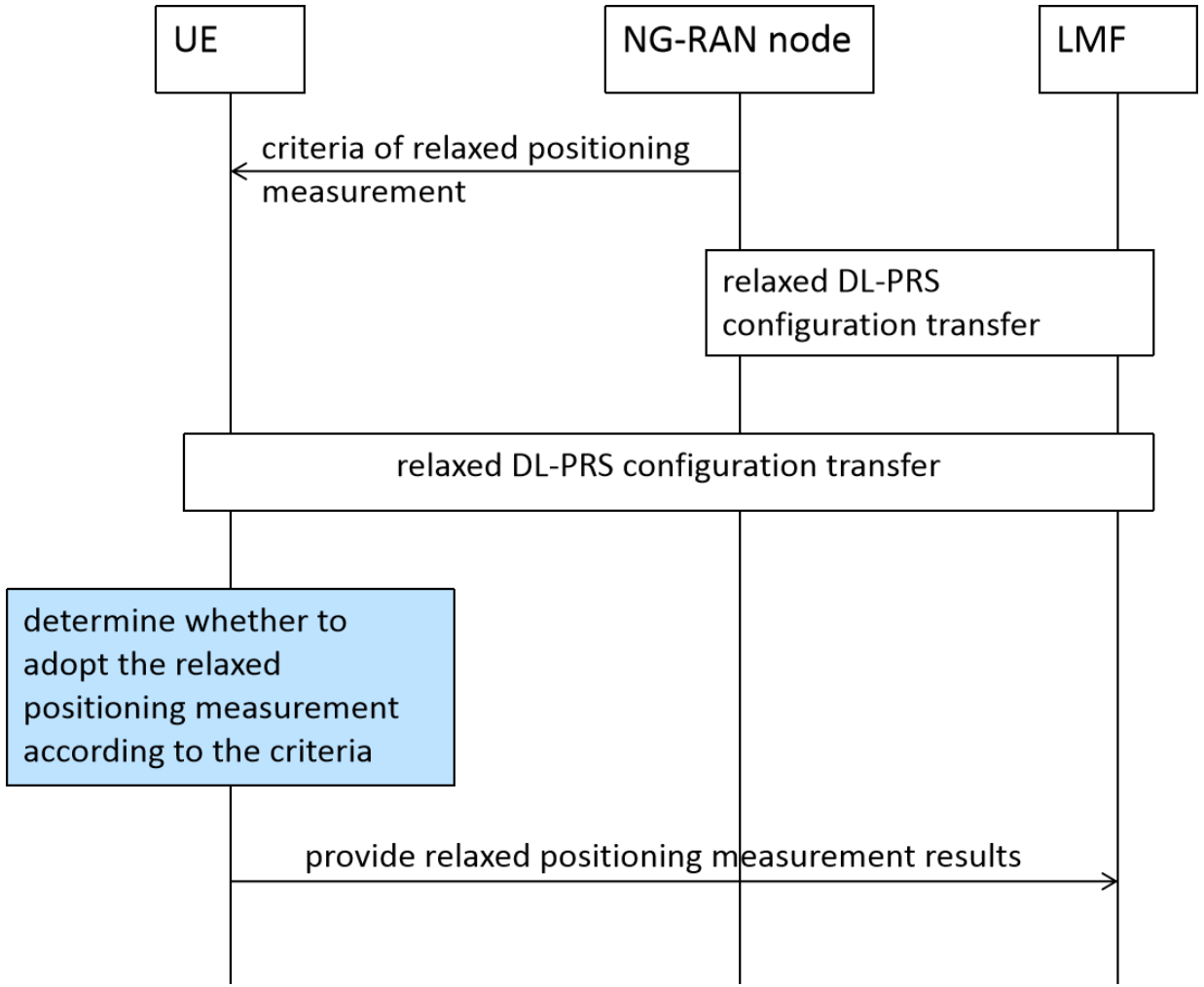
- Reduce power consumption while maintaining high accuracy positioning, especially in RRC_INACTIVE and RRC_IDLE state. i.e., **adaptive power saving for LPHAP UE**.

© ZTE All rights reserved

LPHAP Enhancement - relaxed positioning

Proposal:

- Support LPHAP UE to perform relaxed positioning under certain conditions
  - DL: Relaxed DL-PRS measurement
  - UL: Relaxed positioning SRS transmission (optional)
  - Conditions: Reusing criterions configured for RRM relax measurement in SIB2 including low mobility criterion, not at cell edge criterion, stationary UE, etc.



Example procedure of relaxed DL-PRS measurement

© ZTE All rights reserved

SL positioning enhancement

© ZTE All rights reserved

SL Positioning enhancement

Rel-18 SL positioning

- Methods: RTT, SL-AoA, SL-TDOA
- Support for SL PRS in FR1 spectrum
- Licensed band
- Resource allocation
  - Scheme 1
  - Scheme 2: Only full sensing and random resource selection
- Others: Inter-UE coordination (IUC)

Rel-19 SL positioning

- **Methods: SL-AoD**
- **Support SL-PRS in FR2 spectrum**
- Unlicensed band
- Resource allocation scheme 2: partial sensing
- Potentially: IUC

© ZTE All rights reserved

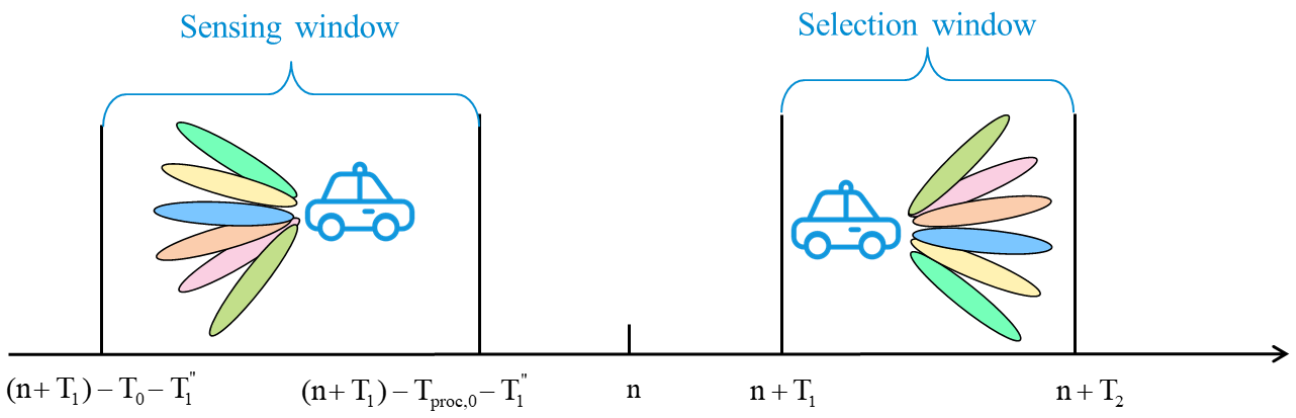
Proposal for SL positioning

SL-U positioning

- Specify channel access mechanism for SL positioning, use the mechanism defined in Rel-18 SL communication (e.g. LBT, COT sharing) as a starting point.

SL positioning in FR2

- Resource allocation shall consider time-frequency-spatial SL-PRS resources
  - » Introduce SL-PRS resource set which consists of multiple SL-PRS resources where each has an associated spatial transmission filter
  - » Scheme 1 resource allocation: Beam information of SL-PRS is provided by gNB to UE, LMF can be involved.
  - » Scheme 2 resource allocation: with regards to sensing based resource allocation, the spatial information shall be specified. Specifically, **the sensing beam is associated with the transmission beam in corresponding selection window**.
- Introduce SL-AoD method for SL positioning



© ZTE All rights reserved

Thank you

5G 先锋