Impact of LTE/VoLTE network architecture on QoS/QoE measurements

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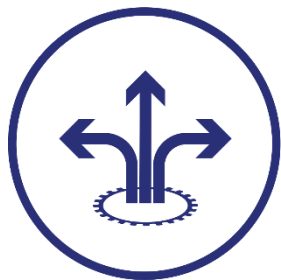
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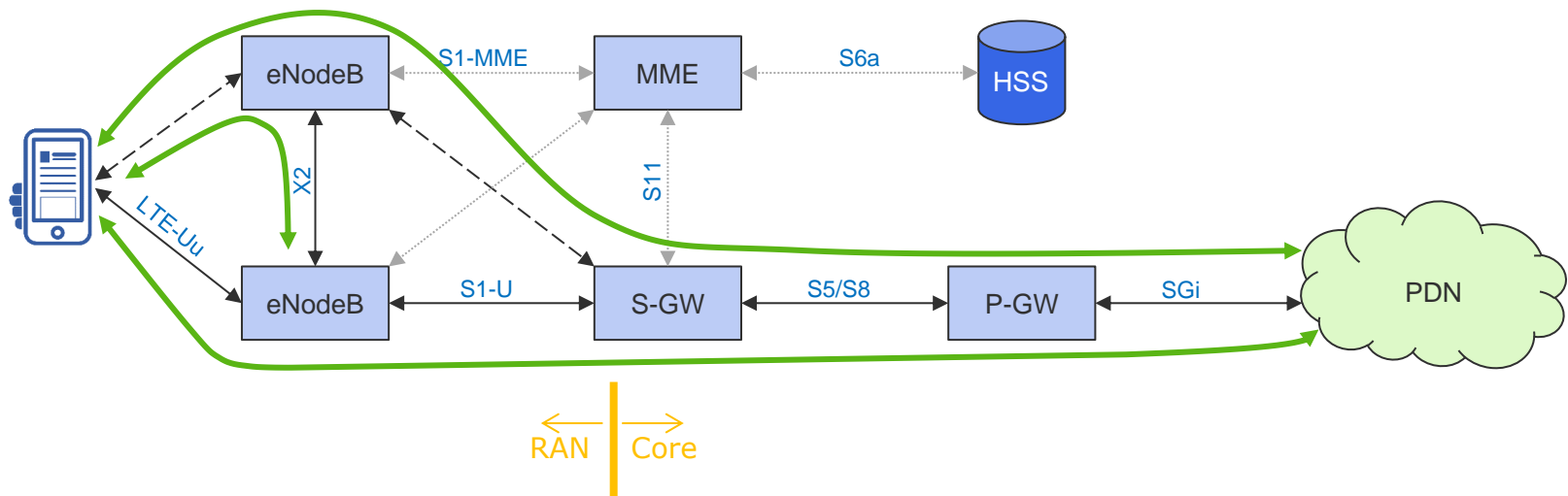
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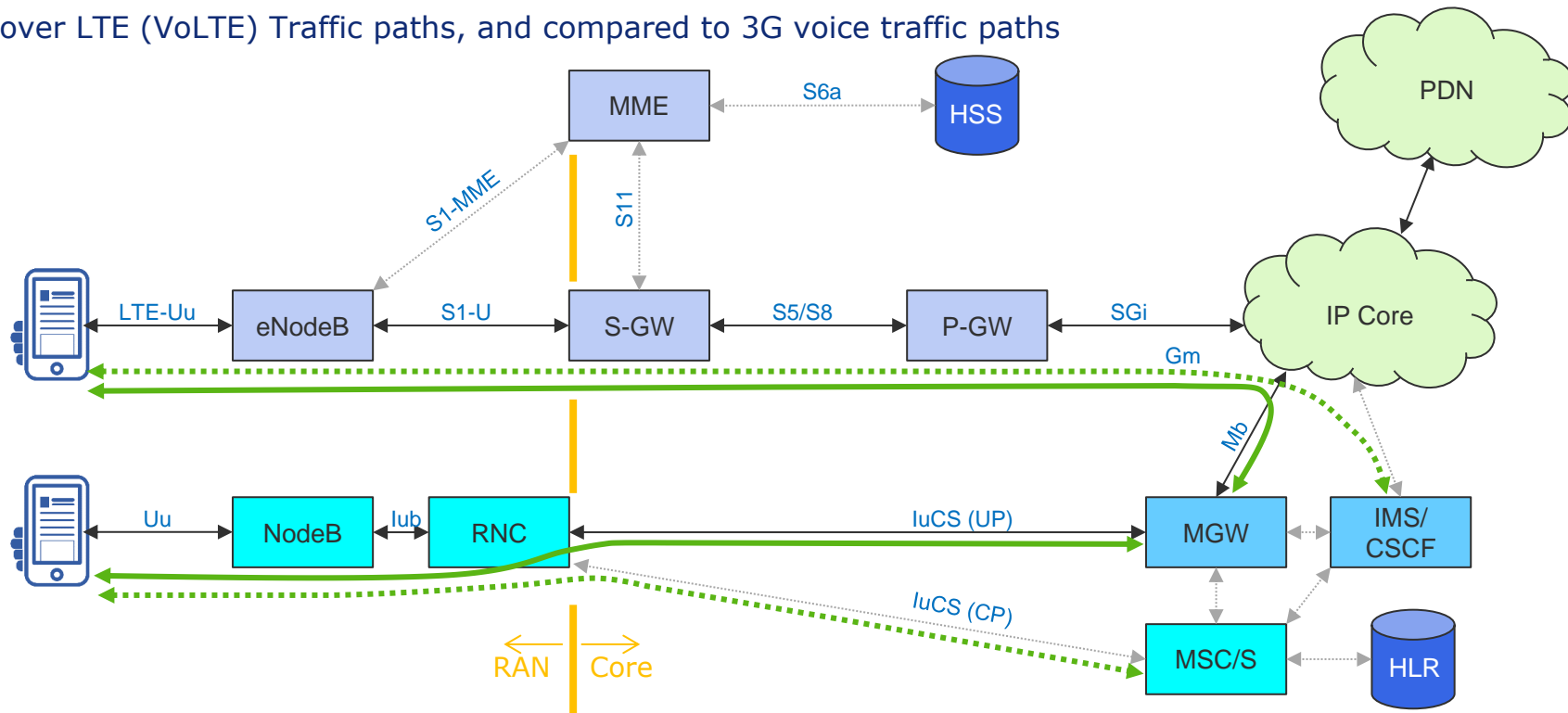
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LTE Architecture and Traffic Path

Nodes, Interfaces and User plane traffic paths for LTE

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VoLTE Architecture and Traffic Path

Voice over LTE (VoLTE) Traffic paths, and compared to 3G voice traffic paths

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Key Differences: voice service

- Key differences between VoLTE and legacy voice for the *end user*:
  - Some possible differences in call setup time and voice quality depending on codec usage
  - Very little else

- Key differences between VoLTE and legacy voice for the *network*:
  - Legacy voice has its dedicated path for signalling and user planes
  - VoLTE shares its user and signalling paths with packet switched traffic (ie. Large volume of Internet traffic)
  - VoLTE signalling is carried inside a data user plane!

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Implications

- Measurement of standard "best effort" data services quality in LTE network is similar to that of legacy 2G/3G networks

- For many operators, Voice over LTE is the first and possibly most important service that requires full implementation of QoS on bearer level, IP and lower levels

  - Consistent traffic marking and treatment required, details outside scope of this presentation

- Measurement and Monitoring of voice service quality in LTE is much more important than in legacy network, and can be more difficult

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Quality of Experience measurements

- Quality of Experience (QoE) measurements should always be completed as surveys and the results are dependant on perceptions and expectations

- Hence the measurement of QoE over LTE networks is the same as other networks

- In practice, expectations of quality would likely have a big impact on QoE results: What is the impact of using LTE network instead of 2G/3G networks on:

  - Data services
    - File Transfer
    - Social Media
    - Web Browsing
    - Audio/Video Streaming
  - Voice services
    - VoLTE
    - CSFB
  - In short: How (and how much) have the services improved in the LTE network?

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Quality of Service measurements

- Quality of Service (QoS) measurements of typical Over The Top (OTT) internet services are described in Omnitele's Session 6 presentation "*Network Performance vs. App Testing; Findings and Considerations*"

- QoS measurements of VoLTE can be done either in the handset or the network, each with its advantages and disadvantages. There are known solutions to carry out such QoS measurements already on the market

- For VoLTE QoS measurements made on the handset, the concepts used are similar/same as legacy voice QoS measurements – each handset/terminal measures the relevant KPIs and *incoming* stream quality

- VoLTE QoS measurements made on the network are done somewhat differently to legacy voice due to the different architecture, but still allows:

  – QoS measurements to be made on a large number of users

  – Streams in both directions to be measured

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VoLTE interfaces for QoS measurements

Key interfaces for QoS measurements for network based capture probe measurements. Actual interfaces will depend on desired KPIs, network design and tool capability.

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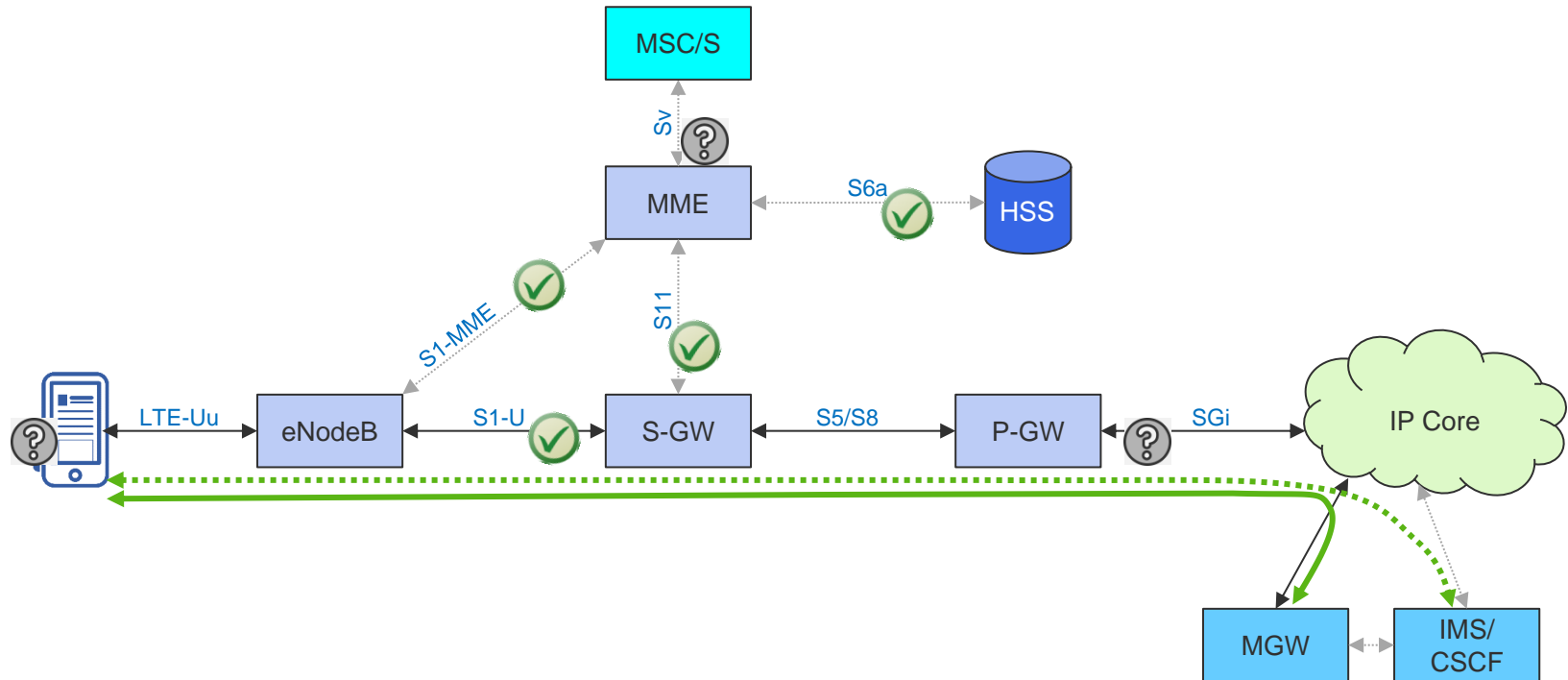
VoLTE QoS related KPIs

- KPIs/KQIs associated with VoLTE QoS are typical to voice services:
    - Voice Quality (eg. POLQA algorithms, for wideband or narrowband codecs)
    - Call success rate
    - Call setup success rate
    - Call drop rate
    - Call setup time

- Other KPIs relevant to VoLTE are:
    - SRVCC (Single Radio Voice Call Continuity) handover success rate
    - SRVCC handover voice interruption time
    - RTP packet loss
    - RTP jitter
    - IMS KPIs (e.g. Initial Registration Success Rate)
    - EPC KPIs (e.g. Bearer Establishment Success Rate)

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QoS measurement issues

Key issues faced in LTE QoS measurements (some not specific to LTE/VoLTE):

- Deciding where to measure and how to measure
  (defined by what the measurements are targeted to do)

- Real network is not just LTE, but also 3G and 2G
  (take into account legacy network & architecture)

- Sheer volume of traffic
  (effective filtering required)

- Relatively low amount of VoLTE traffic
  (effective filtering required)

- Correlating the QoS results to ensure the final results
  provide an accurate representation of the actual network
  performance

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Summary and Conclusion

- *QoE for LTE and VoLTE* would be measured in same way as for legacy networks

- *QoS for LTE best-effort* data services would be measured in similar way as legacy mobile data services

- *QoS for VoLTE* service should be carefully measured, in particular to take into account the difference in network architecture compared to legacy voice/circuit-switched network.

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thank you for your attention!

Questions?

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We answer

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