A Collaborative Crowdsourced User-Carrier-App Ecosystem to Enable Next Generation Wireless Research

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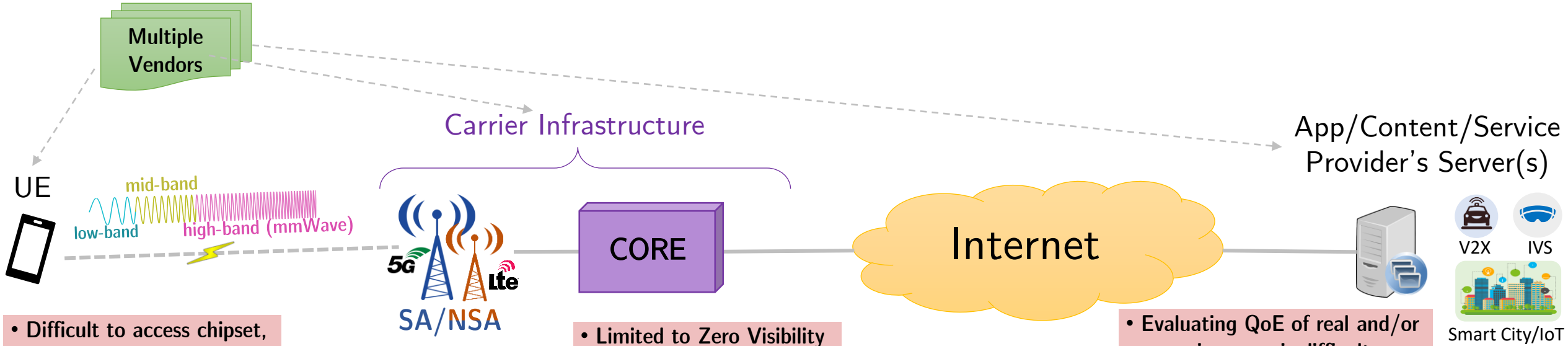
Challenges Conducting Measurement Studies using Commercial 5G Services

Closedness of a Diverse 5G Ecosystem



- Difficult to access chipset, radio and other logs
- Limited OS/API support
- Non-removable Battery

- Limited to Zero Visibility to Carrier's Infrastructure
- Traffic Policies & Config.

- Evaluating QoE of real and/or emerging apps is difficult.
- Vital to understand app/service characteristics

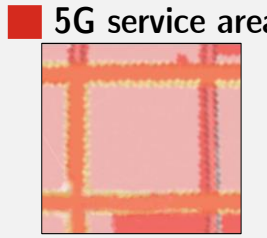
Handling Missing/Inaccessible Information

Data Quality Concerns

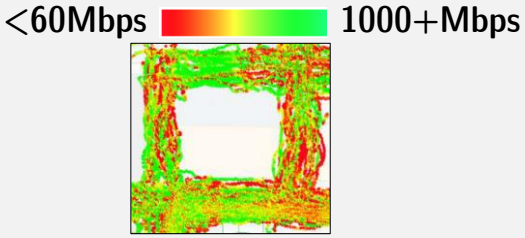
Evaluating 5G & 5G Apps

Major 5G carriers in the US advertise 5G as "its all perfect", but there is a long road ahead...

e.g. for mmWave 5G, providing a coverage map is challenging [2, 3].



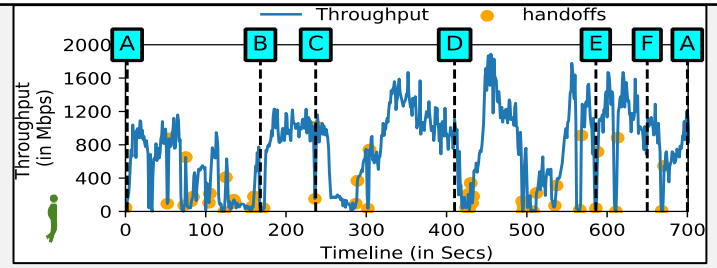
5G Coverage
(by carrier)



5G Throughput Map
(data driven)

Industry will not be capable to timely find all the bottlenecks and (potentially novel) issues.

e.g. especially from the upper-layer view



frequent and wild fluctuations in throughput might confuse existing transport layer or video ABR mechanisms [1].

Can existing mechanisms be tweaked or is there a need for "novel" mechanisms to address the issues?

e.g. use UE-side contextual info to predict mmWave 5G throughput [3] that can help build 5G-aware apps.

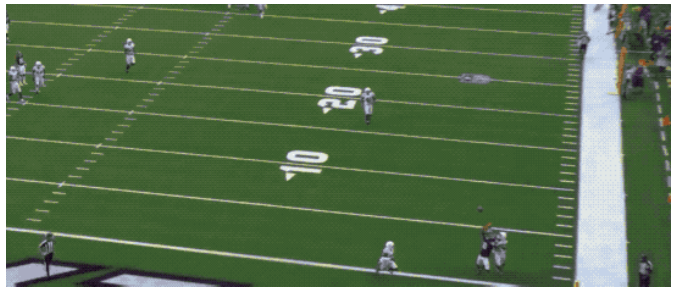
5G is expected to support a programmable core, provide edge-support (MECs) to apps, network slicing, etc.

Commercial 5G still in its infancy... a challenging journey ahead...

Summary

AR/VR Services

Source: Intel True View



(Live) Volumetric Content Delivery

In a rapidly evolving space, research in the industry is driven by business goals and other interests.

With NSF's support, academia (with industry's cooperation) can take a more holistic approach in designing (cross-layer and cross-stakeholder) systems.

Academia can help identify issues industry may be unaware of, propose new mechanisms/solutions and provide value to industry.

We propose the need to have a collaborative crowdsourced User-Carrier-App ecosystem to reap the benefits offered by 5G and further enable research of 5G and beyond.

[1] Narayanan, A, *et. al.* A First Look at Commercial 5G Performance on Smartphones. *(WWW '20)*
[2] Narayanan, A, *et. al.* 5G Tracker – A Crowdsourced Platform to Enable Research Using Commercial 5G Services. *(SIGCOMM '20 Demos and Posters)*
[3] Narayanan, A, *et. al.* Lumos5G: Mapping and Predicting Commercial mmWave 5G Throughput. *(IMC '20)*

Thank you