



# Ensuring a good QoE for mobile broadband customers on LTE networks

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# Consider ...MBB -> Smart Phone -> Apps

The average smart-phone  
has 26 downloaded app's,

...

An LTE device can run 24  
simultaneous sessions,

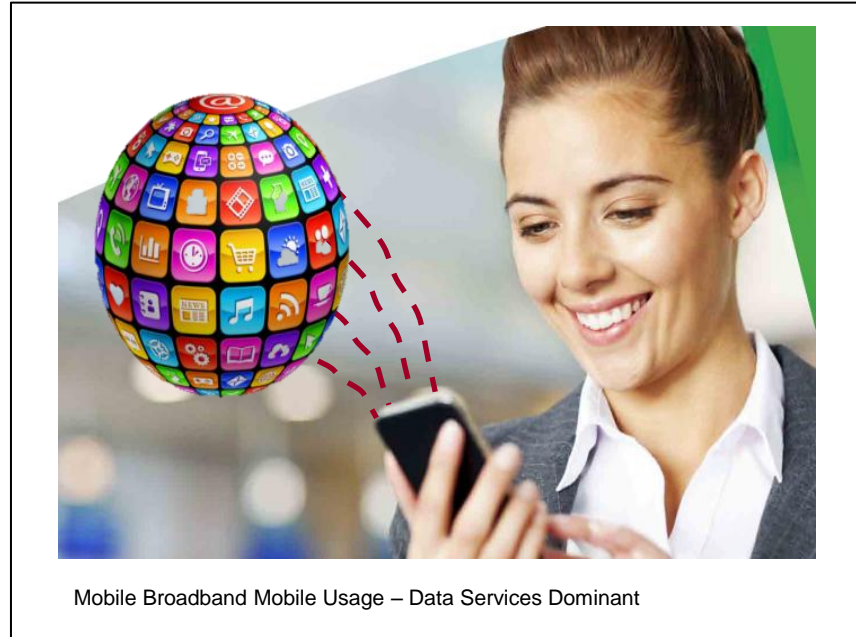
...

LTE generates > 10x more  
signaling traffic than 3G,

...

Individual data sessions  
can typically last hours  
(e.g. watching a video),

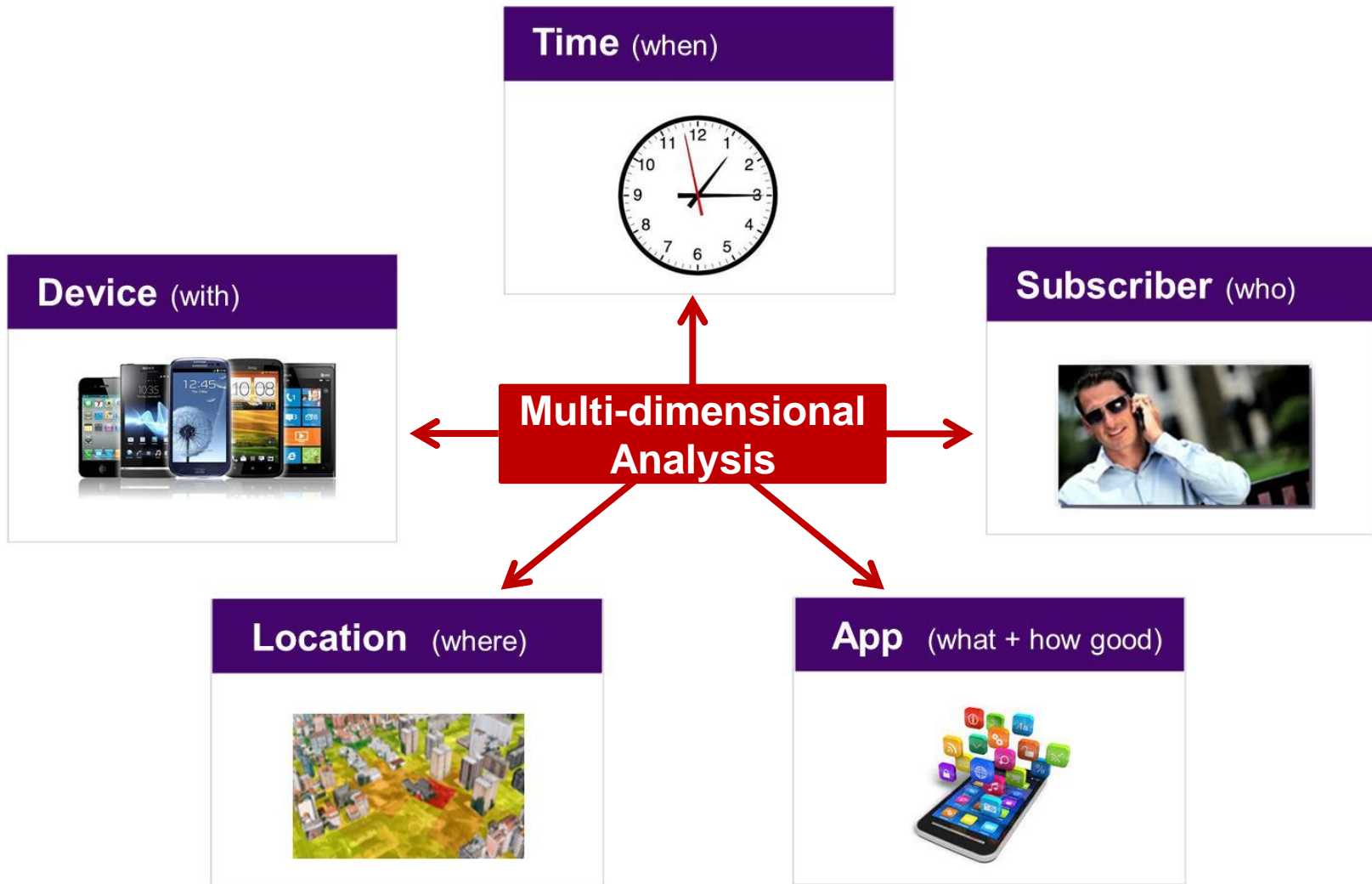
...



Mobile Broadband Mobile Usage – Data Services Dominant

**Do you really believe that assurance workflows and tools designed for voice-dominated 2/3G networks can deliver a good QoE for LTE mobile BB customers ...**

# QoE Requirements



# Dimension - Where

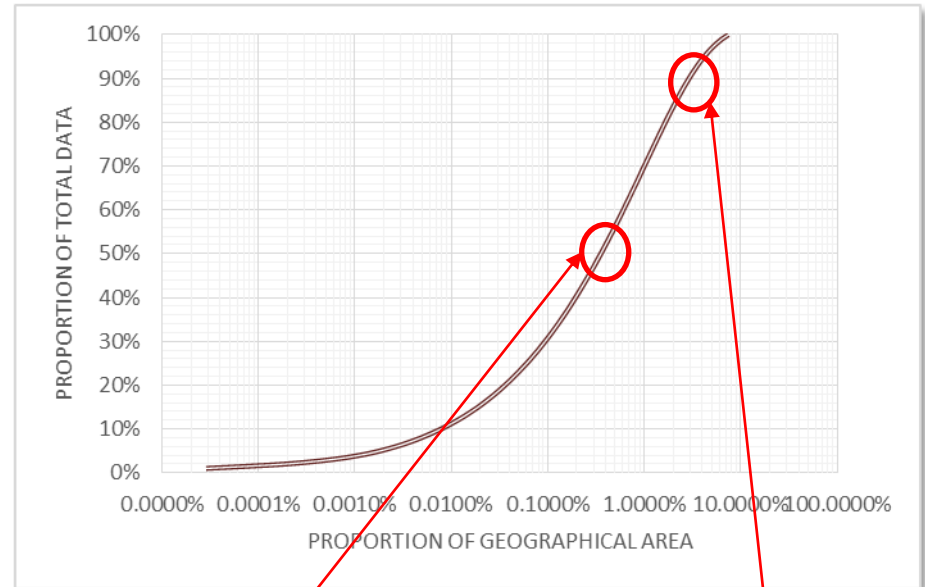


- Ability to capture, geo-locate and store details on all calls and data sessions
- Need geo-location resolution down to 50m x 50m “tiles”  
- cell site resolution is not enough for most analytics
- Need scalability of at least 30B events per day

Determine exactly “where” all subscribers are all the time

## Data consumption by proportion of area

(Data from Viavi 2015 Study)



50% of the data is consumed in less than 0.35% of area

90% of the data is consumed in less than 5% of area

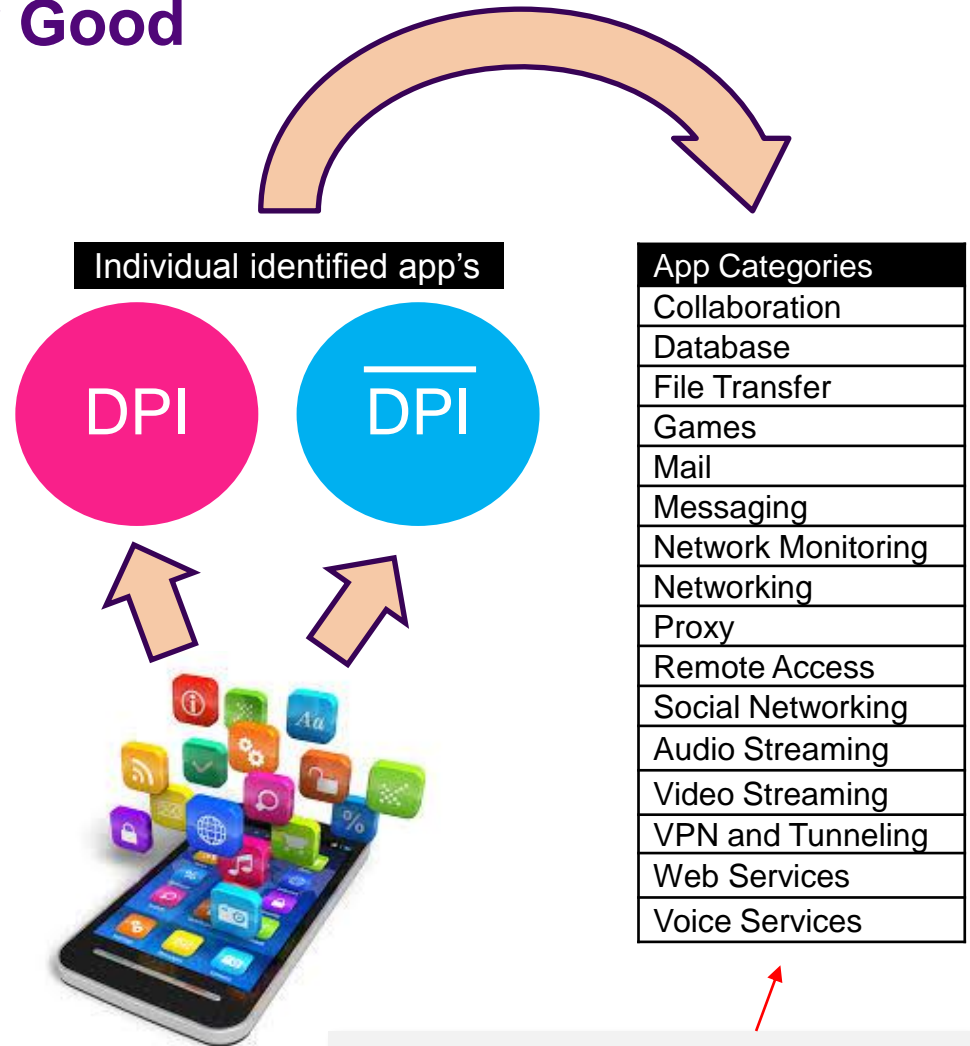


# Dimension – What + How Good



- Need to identify at least 1200 different app's, targeting app identification in > 90% of data sessions
- Need DPI plus an alternative process that complies with data privacy, works with encryption
- Need to be able to determine QoE scores by app categories

Determine exactly “what” app and “how (good)” the QoE



# Key Enablers To Delivering Good Mobile BB QoE over LTE

End-to-end network visibility

App identification and QoE

Dimensional analysis of QoE

# Viavi LTE Network End-2-End Performance Visibility

## Rubix/TrueSite

Reduce time and cost on indoor testing & optimization with ultra-portable cloud enabled solution



## ariesoGEO

Boost network performance and enrich user experience, enabling customer-centric self-organizing networks



## EtherAssure

Address the entire Ethernet service life cycle – monitor & segment performance in real-time



## xSIGHT

Delivering cost effective assurance of customer QoE in real-time with multi-dimensional analysis

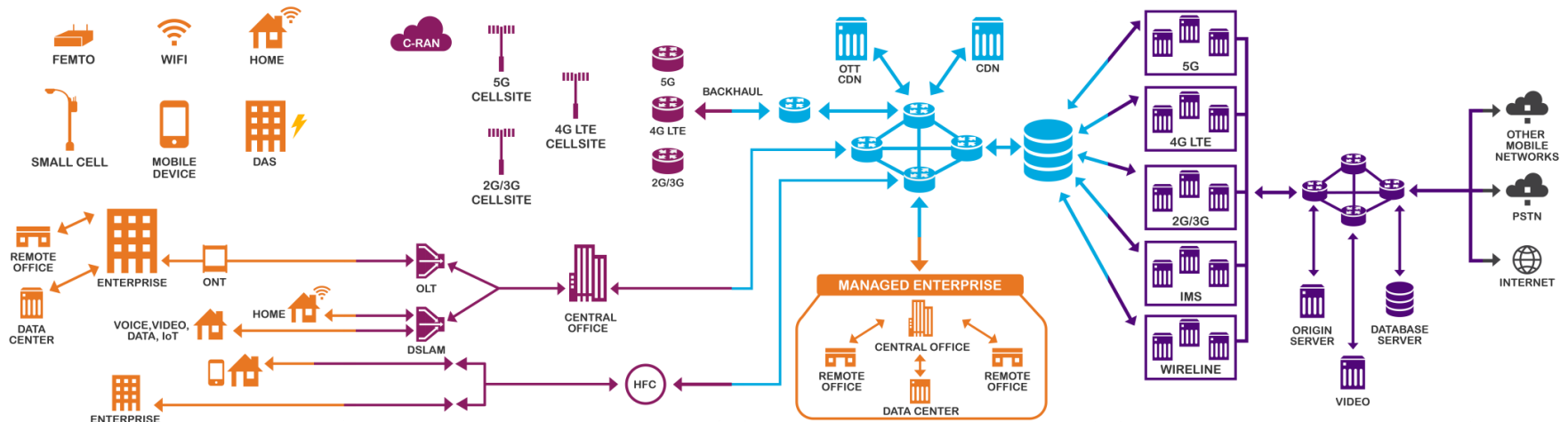


### Devices | Premises

### RAN | Access

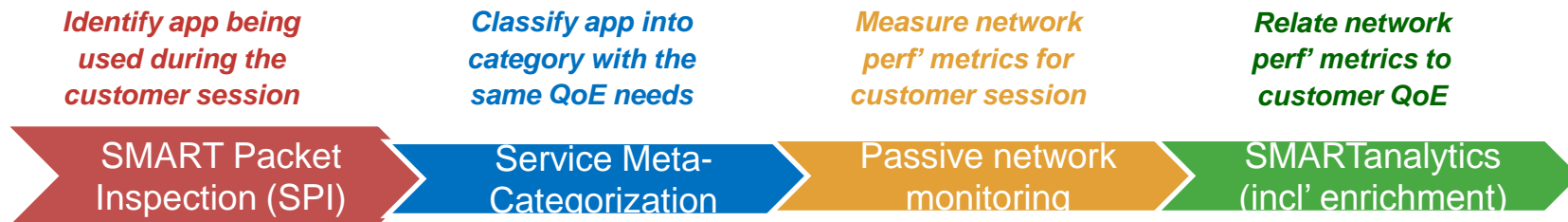
### Backhaul | Metro

### Packet | IP Core



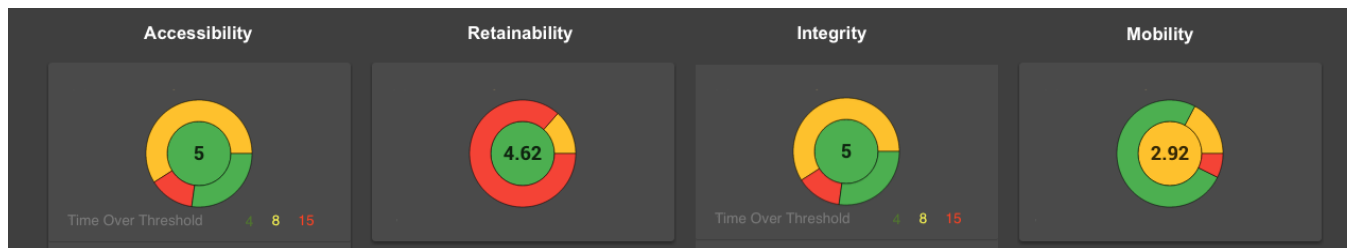
# Viavi Application Specific QoE Measurement

- Viavi patented process for app-specific QoE scoring



- Viavi sub-divides QoE into 4 categories and combines for an overall QoE score

- Accessibility – Ability to access service session. (CP-based)
- Retainability – Ability to maintain an accessed service session, eg. avoid drops. (CP-based)
- Integrity – Quality while service session in use. (UP-based)
- Mobility – Ability to handover service session between cells, networks, etc. (CP-based)

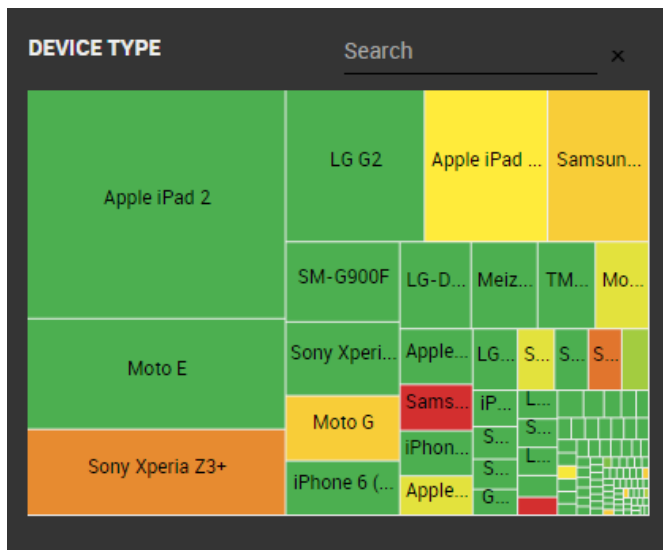


- Viavi normalizes QoE scores across different identified user applications

- QoE scores are normalized to between 1 (poor) and 5 (good).
- Solution configurable in terms of KPIs included in each score and weighting applied to each KPI.



# Viavi Multi-Dimensional Analysis of (LTE) QoE - Examples



## Normalized App QoE By Device Type

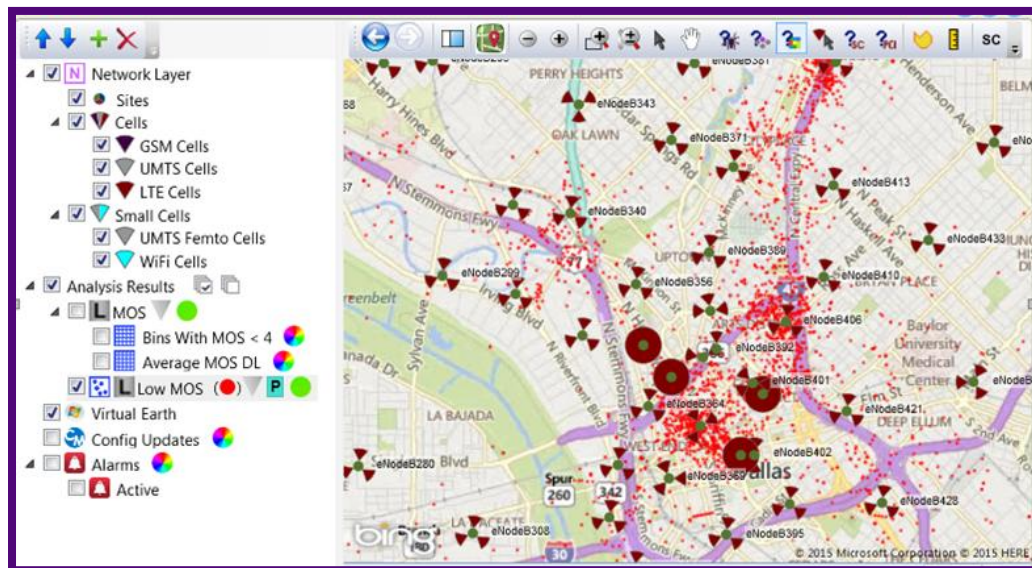
- Diagram shows measured QoE analyzed by device type
- Tile color indicates average QoE for that device type
- Tile size indicates session volume used for QoE score

Analysis is excellent for identifying issues affecting only a single dimension and for prioritizing detected QoE issues (based on impact severity and the impacted session volume)

## VoLTE Voice Quality By Location

- Red dots highlight those locations where VoLTE (MOS) voice quality is below a user-defined threshold score (in this case a score of 4)

Analysis is an example of combining RAN location intelligence with app-specific QoE measurement to identify “hot spots” of poor VoLTE QoE



# Blending together “Who + What + Where + How (good)”?



**Location Intelligence**  
Arceso  
A JDSU Mobility Solution



**xSIGHT™** Mobile Assurance

- Network-wide RAN health / activity / congestion
  - e.g. By sub-Cell, subscriber
- By Subscriber (**IMSI**)
  - Sessions
  - Bearer type + QCI info
    - E.g. Voice/Data/VoLTE
  - Handset (IMEI)
  - **Geo Location**
  - RF Throughput (Mb/s)
  - Failure Causes

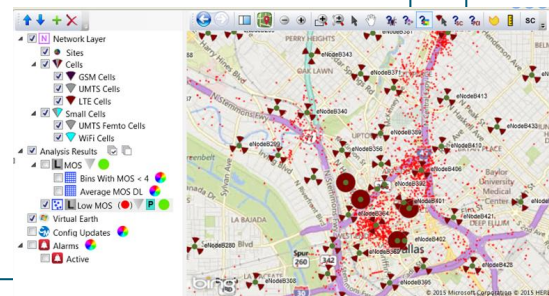
- Network-wide Core health / activity / congestion
    - e.g. by eNodeB, MME, App
  - By Subscriber (**IMSI**)
    - Sessions
    - Bearer type + QCI info
      - E.g. Voice/Data/VoLTE
    - Handset (IMEI)
    - **App**
      - e.g. VoLTE, HTTP, EMAIL
      - **URI (web-page e.g. Facebook)**
      - **User Agent (e.g. Chrome)**
- Quality of Experience

**WHO?**

**WHERE?**

**WHAT?**

**HOW (good)?**



# Summary

End-to-end network visibility

- Making it easy to localize issues across network & dimensions

App identification and QoE

- Accurately measuring app specific QoE

Dimensional analysis of QoE

- Detecting QoE issues impacting 1 dimension

- Accurately prioritizing detected QoE issues

**The ability to measure true user app experience and relate this to network performance, and key dimensions (e.g. location,app,device), is a must for delivering excellent mobile broadband QoE**

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