

Comparing Commercial Broadband Data Performance

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Presented by:

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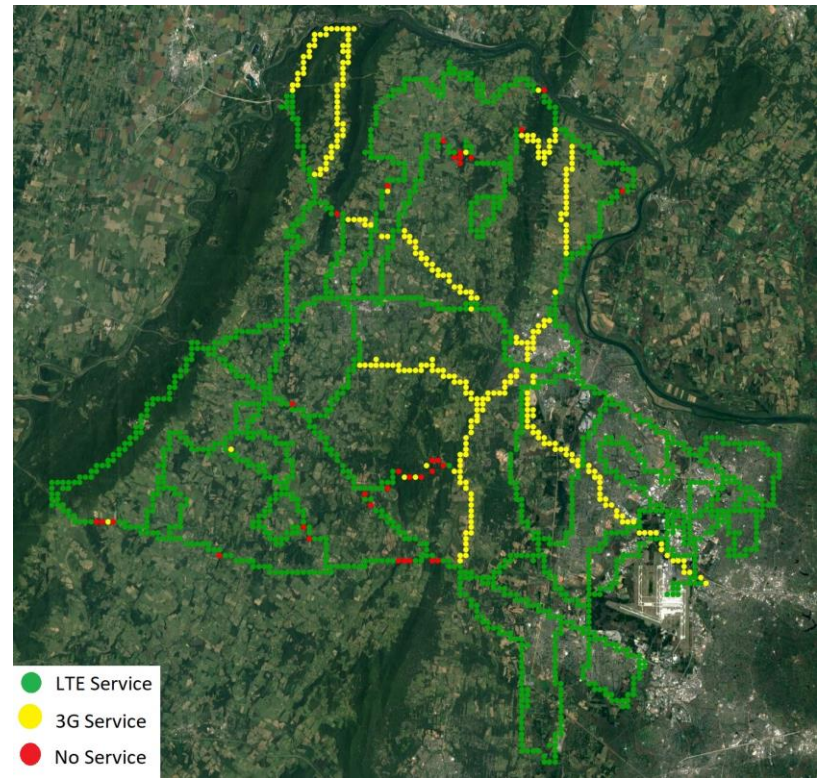
TELEVATE

Multiple Performance Dimensions

- Goal is reliable communication, where, when, and how we work
- Dimensions:
 - Signal
 - Interference
 - Capacity/Congestion
 - Resources
 - Technology (LTE or 3G)
 - Others

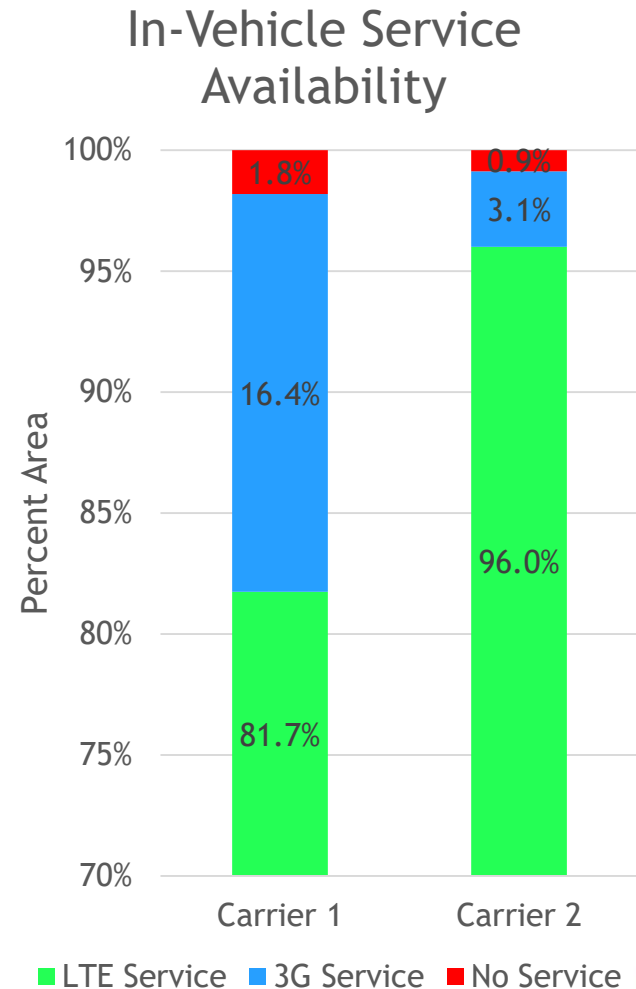
Test Scenario

- Suburban U.S. county, >500 square miles
- Two distinct areas:
 - Suburban
 - Rural
- Test Configuration:
 - Two carriers, std. accounts
 - Two Samsung S7s
 - Professional data collection tools
 - In-Vehicle
 - Same server, script, etc. configuration
 - Tested over weekend in February 2018
 - Automated repeating tests (10s each)
 - 20+ hours of testing

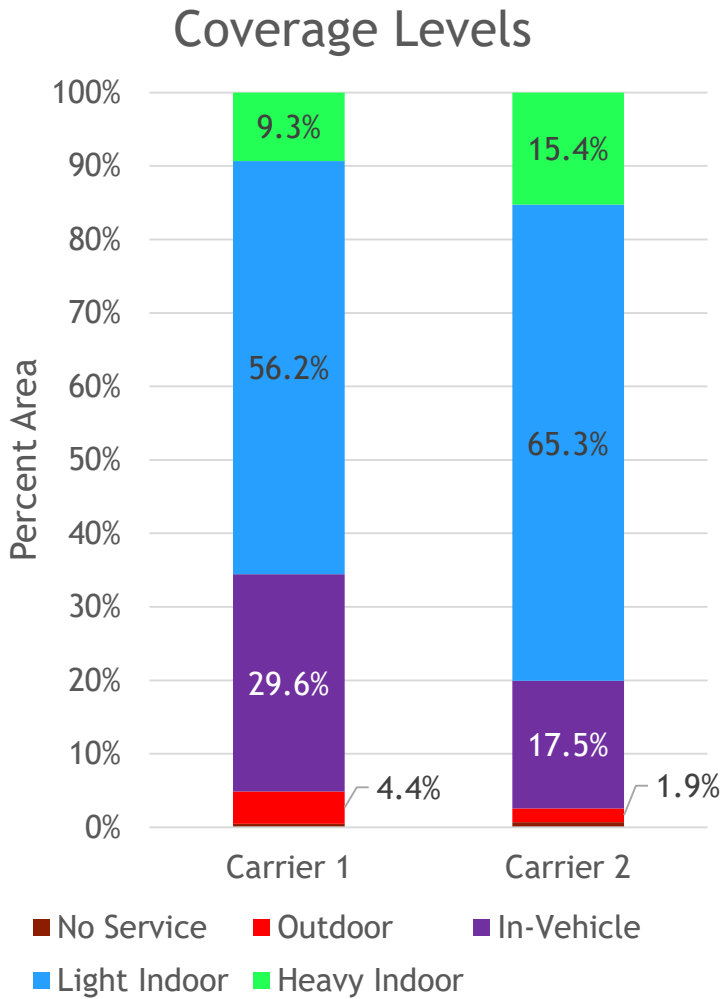


The Basics - Service Availability

- Carrier 2 had substantially more LTE coverage and the area with no service was half the size
- 3G service may come with reduced performance
 - Priority
 - Latency (delay)
 - Throughput



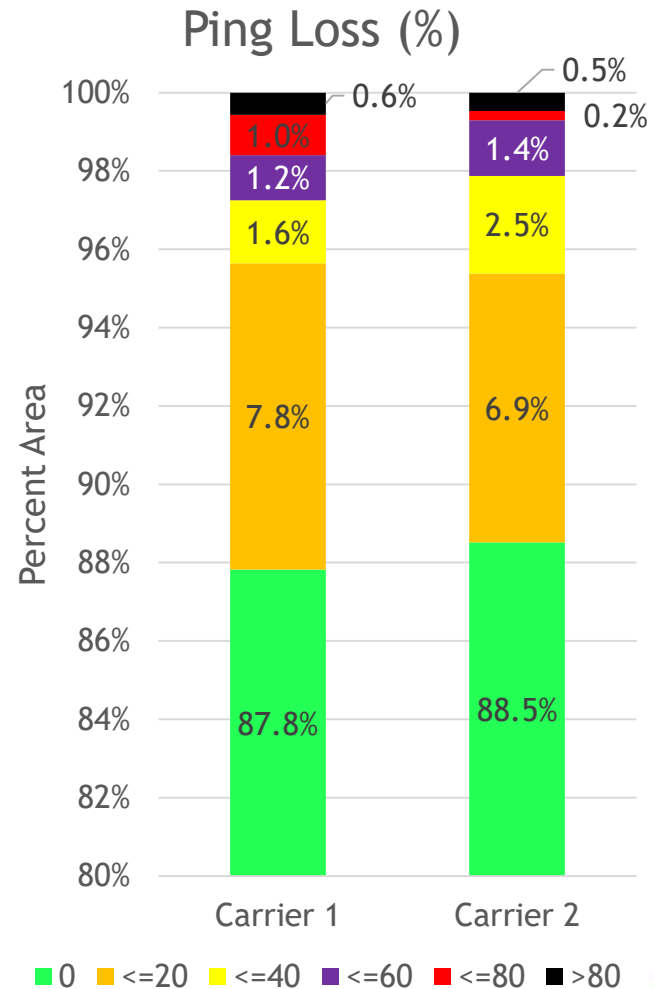
LTE Coverage Levels



- Graph shows areas where both had LTE service
- Imputed coverage based on in-vehicle data collection
- Carrier 2's stronger signal likely results in more indoor coverage
- Carrier 2 had 3% more "in-vehicle" area

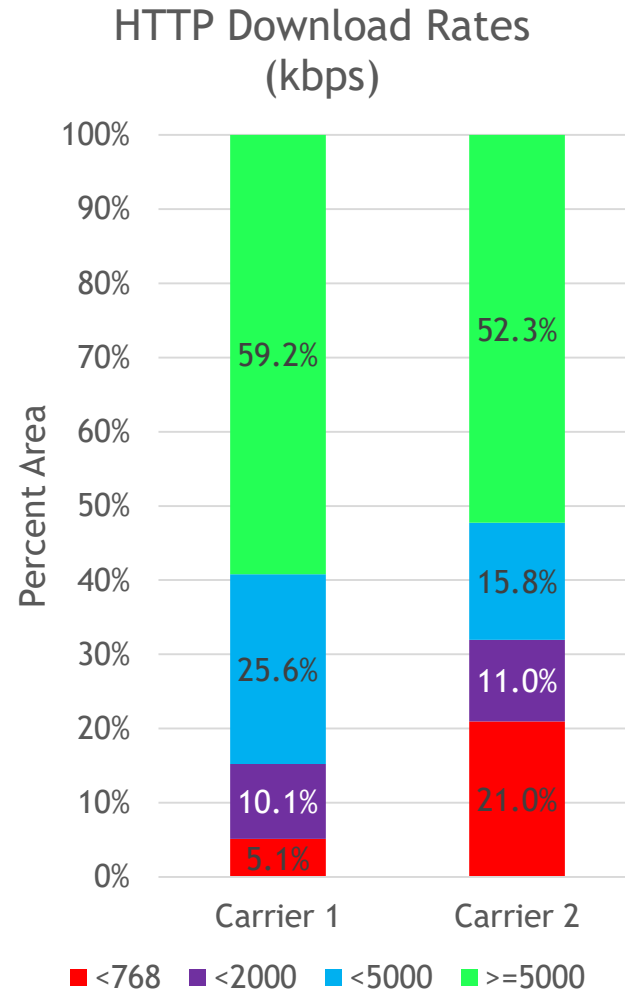
Ping Loss Test

- Ping tests “reachability” when service is available
- Comparable performance between carriers
- Service is very reliable < 90% of the time, and unreliable ~ 2% of the time
- Differentiates “available service” from “usable service”



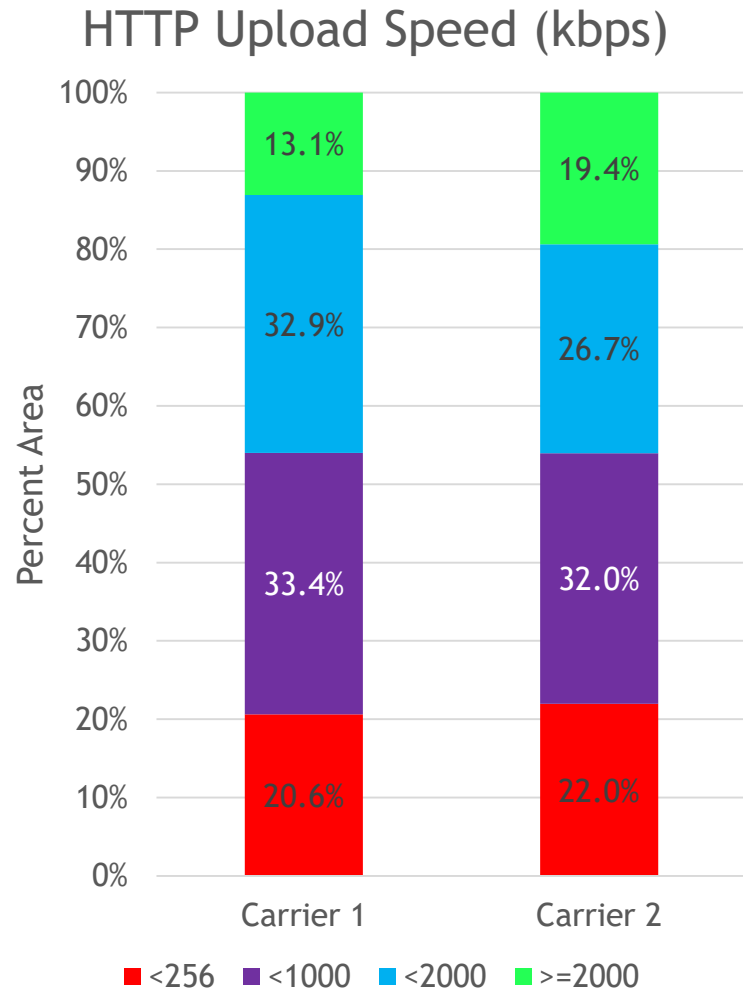
HTTP Download Test Results

- Tests take as many resources as network will offer
- Despite substantial advantage in signal levels and LTE service, Carrier 1 outperformed Carrier 2
- Less than broadband (<768 kbps)
 - Carrier 2 - 21% of all tests
 - Carrier 1- 5% of all tests
- Higher-end speed (>2000 kbps)
 - Carrier 1 - 85%
 - Carrier 2 - 68%
- Carrier 1 signal levels and 3G areas did not result in poorer performance



Reminder: Accounts did not have priority access

HTTP Upload Test Results



- Upload tests are more comparable between carriers
- Carrier 2 provides more high speed connections
- Carrier 1 provides slightly more “broadband” (256 kbps) reliability

Explaining Performance Difference

- Why doesn't Carrier 2 perform better?
- It's not interference...
 - Carrier 2's average interference level better by 2 dB
- Unlikely it's "congestion"
 - Data collected on weekend
 - Ping delay profiles comparable
 - Carrier 2 has 50% more LTE spectrum allocated in suburban area
- Resource allocation:
 - Carrier 2 has higher peak rates (41.9 Mbps versus 34.0 Mbps)

However....

- Carrier 1 allocates 55% more network resources on average
- Carrier 1 allocates over 100% more resources at lower signal levels on average

Summary

- Your results may vary - depends on location, time, use of priority services
- The network you “need” depends on the specifics. What is more important?
In this case:
 - Carrier 1 - More reliable “broadband” service
 - Carrier 2 - More usable service area including more indoor service area
- Passive measurements are not enough - testing is required