



Device Receiver Ecosystem

3/12/2012



Carrier Ecosystem of Specifications and Requirements

How are Requirements /Specifications for receivers derived:



- Business opportunity
- Business needs
- Standards
- Regulatory obligations
- Global trends
- Innovation
- Compliance

Realities of sourcing and delivering receivers for devices:

- Products are built for Global markets
- Radio chip makers are limited
- Receiver improvements are challenging due to cost
- Multiple vendors are needed to keep eco-system healthy
- The customer experience is determined by device, network and conditions
- Carrier is held accountable for the product performance by consumer

Device Radio Complexity

GPS Radio

- Determining location
 - Emergency
 - Family Where
 - Mapping

Cellular Radio

- Voice to/from Tower
- Data to/from Tower

Devices examples with receivers:

- Mobile Phones
- Mobile Tablets
- Data sticks
- Mobile Routers
- Embedded radios in Laptops or other machine to machine



NFC Radio

- Payment

Wifi Radio

- Carrying data
 - Music
 - Video
 - Web browsing
 - Email
- Voice

Bluetooth Radio

- Headset
- Speakers

- All radios can be active in a mobile device simultaneously.
- We rely on standards for performance and inter-operability



Device Eco-system Complexity

Suppliers to build a device

- Core Cellular Radio chipset suppliers
- Secondary Radio suppliers (GPS,wifi, Bluetooth, NFC)
- Application processor supplier
- Software operating system supplier
- Carrier specific software and or hardware
- **Manufacturer /OEM builds the phone to specifications**
- 3rd party software suppliers
- **Carrier or Retailer sells to consumer**



- A carrier specifies hundreds and upto several thousand technical requirements for each device
- Foundational requirements cover radios to insure
 - Public safety
 - Regulatory conformance
 - Standards conformance
 - Business conformance
 - Consumer Experience



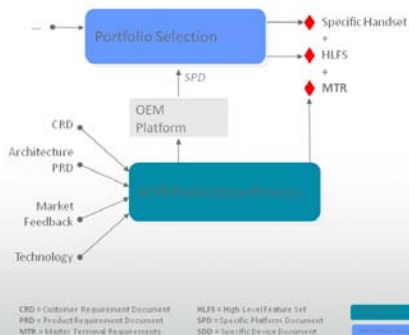
Carrier Specification and Requirements

Product Experience is managed through a formal process of requirements management and compliance.

Compliance is managed through steps of testing and validation in collaboration with

- CTIA/PTCRB Certifications
- FCC Certifications
- Manufacturer testing
- Carrier quality validation

Handset Requirements Process Overview



CRD = Customer Requirement Document
 PRD = Product Requirement Document
 MTR = Mobile Technical Requirements

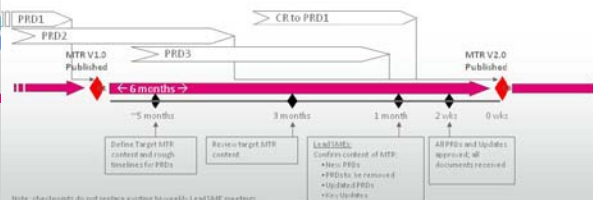
HLFs = High Level Feature List
 SPD = Specific Platform Document
 MTR = Specific Device Environment

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MTR Publication Process

6-Month cycles:

- PRD updates published in next scheduled MTR release
- Regular checkpoints between MTR Coordinator and Lead SMEs
- Amended Release(s) possible for Urgent Updates (see appendix for details)



Note: checkpoints do not replace existing bi-weekly Lead SME meetings

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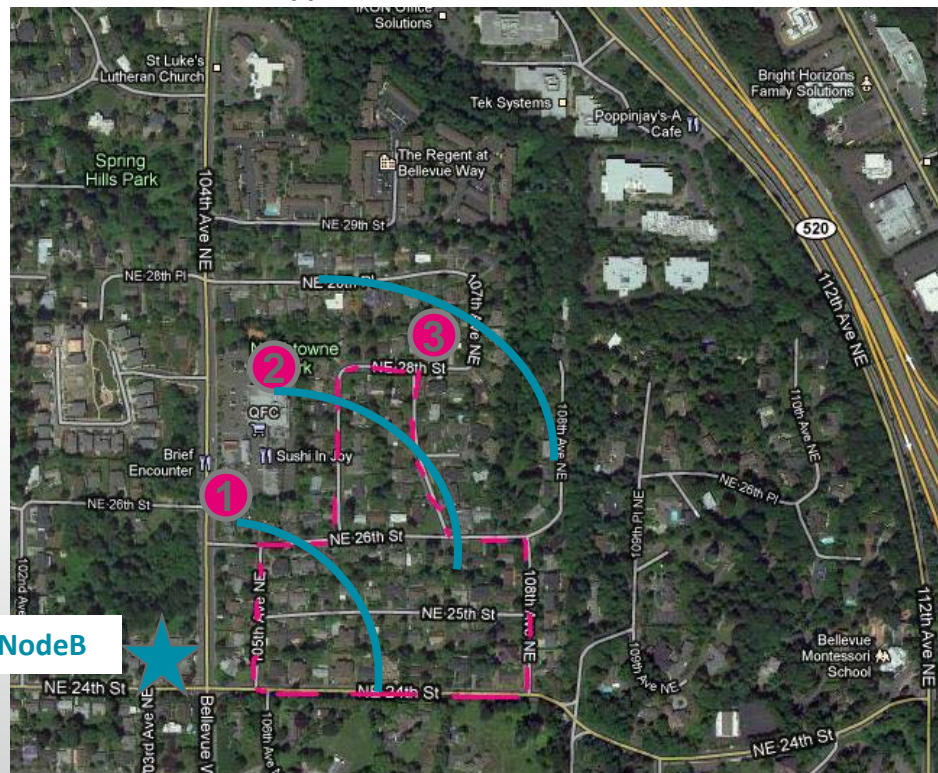
Field Tests Augment Lab Certifications

Example - Receiver Gains Stationary Test Results

The largest throughput gain from Type3 and Type3i are experienced toward the cell edge in poor coverage conditions.

Advanced Receivers give consumers a better experience at edge of cell

Typical Drive test area



Summary of Stationary Test Results

	①	②	③
	Excellent Coverage	Good Coverage	Poor Coverage
RSCP (dBm)	-60	-80	-100
Type2 (Mbps)	10.7	8.3	2
Type3 (Mbps)	12	8.9	3.4
Type3i (Mbps)	13	9.2	4
Type3 Gain over Type2	12%	7%	70%
Type 3i Gain over Type2	21%	11%	100%

Using a better receiver – doubles the throughput for a consumer in this situation

Thank you

