





# Workshop On E911 Phase II Location

## Verizon Wireless

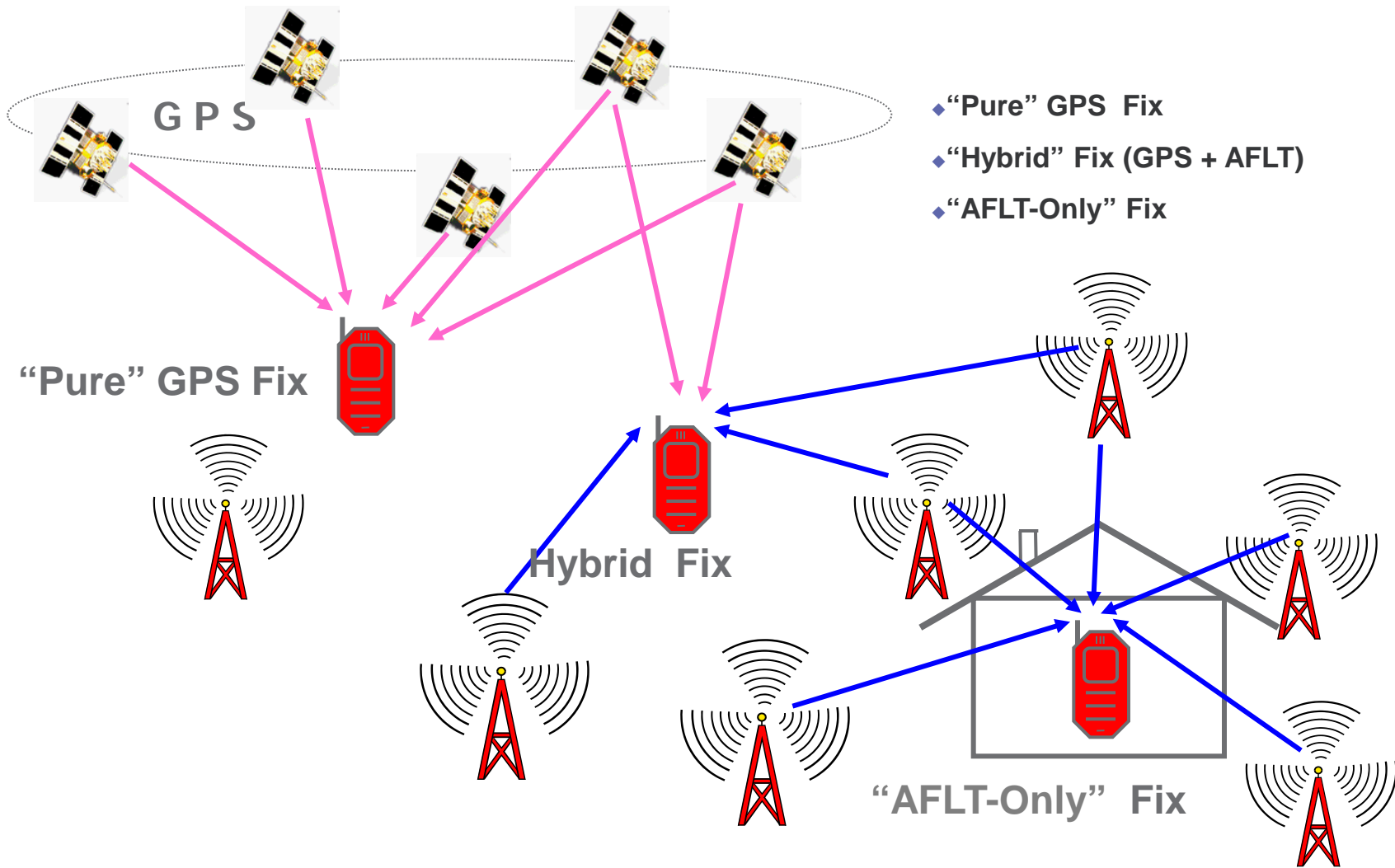
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# Verizon Wireless E911 Phase II Location

- Verizon Wireless uses A-GPS for E911 Phase II Location:
  - When 911 is dialed, Positioning Determining Equipment (PDE) provides GPS assistance data to the device.
  - Device reports back the number & position of GPS satellites to PDE:
    - 4+ satellites visible to device  PDE makes GPS calculation
    - < 4 satellites  PDE asks device for RF measurements from visible cell sites
      - PDE supplements satellite data with cell RF measurements, or
      - If no satellites visible, PDE calculates cell-based location
- Potential “Phase II” fixes (PSAP must be Phase II capable):
  - GPS only – most accurate, and overwhelming majority of all Phase II fixes
  - Hybrid (GPS & AFLT)
  - AFLT (Advanced Forward Link Trilateration) – similar to UTDOA performance for GSM
- “Phase I” type fixes are provided in very challenged locations:
  - Urban canyons causing signal delay & multipath
  - Dense Forestation
  - Inside structures with lots of concrete, steel & tinted glass

# E911 “Phase II” PDE Fix Types





# Accuracy and Performance Monitoring

- For empirical outdoor accuracy test data, VZW uses mobile test devices.
  - Test devices perform two functions (continuously throughout each year):
    - Collects ground truth every one second using its own GPS antenna
    - Places periodic test calls with embedded CDMA chipset
  - Ground truth is matched up with individual test calls to measure accuracy.
  - Based on drive testing conducted in representative topologies.
  - Accuracy is compiled for each deployed Phase II county at FCC thresholds using 90% statistical confidence.
- VZW reviews weekly key performance metrics on live 911 call data to ensure for call routing and accuracy purposes that:
  - PDE's base station almanac (BSA) is accurate and complete,
  - MSC routing translations are accurate, &
  - Other network elements in call and data flow are performing as required.



# Accuracy and Performance Monitoring

- VZW works with Qualcomm to continually improve existing technology:
  - Improvements have been made in chipset GPS & RF signal detection.
  - Improvements have been made in feedback loops for BSA data & PDE settings.
- VZW's focus on improvement of its existing technology has resulted in:
  - Increased network-wide "Phase II" fix percentage to 92% of attempts, overwhelming majority of those are GPS
  - Over 99% of "Phase II" fixes are calculated within 25 seconds
  - Over 65% of "Phase II" fix are within 13 seconds
- VZW continually evaluates new location vendors against existing solution:
  - SME Network team meets & reviews presentations/data of new solutions
  - Set up VZW test bed in 2010 to test new technologies both outdoor & indoor
  - Participated with our existing technology vendor in CSRIC indoor test bed, CSRIC IV will provide objective performance data for willing vendors
  - Improvements in A-GPS will be employed for Voice over LTE (GLONASS, O-TDOA)