



Location using Pattern Matching of Wireless Network Measurements




Opportunistic RF Localization for Next Generation Wireless Devices
 June 17, 2008

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Company Overview

- **Who we are**
 - Global leader in providing high-accuracy, software-based, location systems to the wireless carrier market
- **Technology**
 - Software-only solution enables carriers to deploy location technology using existing handsets and radio network infrastructure
 - 40 patents granted or pending around underlying location technology and applications
 - Technology is backed by strong internal R&D team and research relationships with Stanford University, University of California Berkeley, Georgia Tech, McMaster University and Polytechnic University
- **Customers**
 - Since 2003, 16 U.S. wireless carriers in 21 networks have deployed Polaris products to meet E911 Phase II requirements
 - Deployed industry's first, high-accuracy, location-based Network Optimization product using offline bulk processing



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Polaris Wireless Price/Performance Leader for Wireless Location

Wireless Location Signatures (WLS)

- Signatures based on standard radio network measurements (signal strengths, signal-to-interference ratios, time delays, Cell-IDs, etc.)
- Pattern match against an RF prediction database to estimate location

- Software-only approach – No radio hardware network overlay, no handset changeout

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Polaris Wireless Price/Performance Leader for Wireless Location

WLS Accuracy: Blind Trial by Mobile Operator in New York City

WLS Accuracy:
<50m, 74% cases
<100m, 91% cases
<150m, 99% cases
<200m, 100% cases
100% Yield

Polaris won blind competitive trial against four other companies with best accuracy, including mix of outdoor and indoor test points where A-GPS failed.

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WLS Accuracy: Blind Trial by Mobile Operator in Toronto



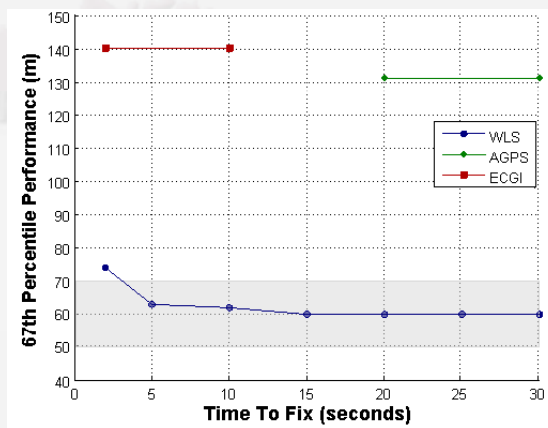
WLS Accuracy:
 <50m, 69% cases
 <100m, 90% cases
 <150m, 96% cases
 <300m, 100% cases
 100% Yield

Polaris won blind competitive trial with best accuracy performance "by a dramatic margin"

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Urban Indoor Example




- Indoor test points in urban area
- Shaded area is the desired accuracy
- A-GPS performance marked in **Green**
- ECGI (Enhanced Cell Global Identity) marked in **Red**
- WLS performance indicated in **Blue** for different time-to-fix with 100% location yield

WLS Meets Performance Objective with Time-to-Fix of 5 Seconds





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Pondering Performance

- Performance dimensions
 - Accuracy, latency, coverage, reliability
 - Compatibility across handset devices & operating systems
 - Conformance to relevant standards
 - Cost and time to deploy
- Application categories
 - ↑ Safety of life
 - Emergency call, personal security, first responder
 - Mission critical
 - Enterprise, surveillance, network monitoring & optimization
 - Consumer
 - Location-based services (navigation, POI, friend finder)



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Emergency Call Example

- **New FCC directions for E911 (NPRM, R&O)**
 - Meet accuracy requirements at the **PSAP service area level**
 - **Deferred enforcement** – benchmarks and timelines
 - **Single location accuracy standard** – remove dual standard
 - **Location technologies** – pros/cons, hybrid technologies
 - **Accuracy standard** – more stringent, vertical dimension
 - **Compliance timeframes and testing** – indoor, testing changes
 - **Compliance schedules** – maintenance testing every 2 years
 - **Accuracy data distribution** – carriers to provide data to PSAPs
- **Why not leverage these emergency call assets for other safety of life, mission critical and consumer applications too?**

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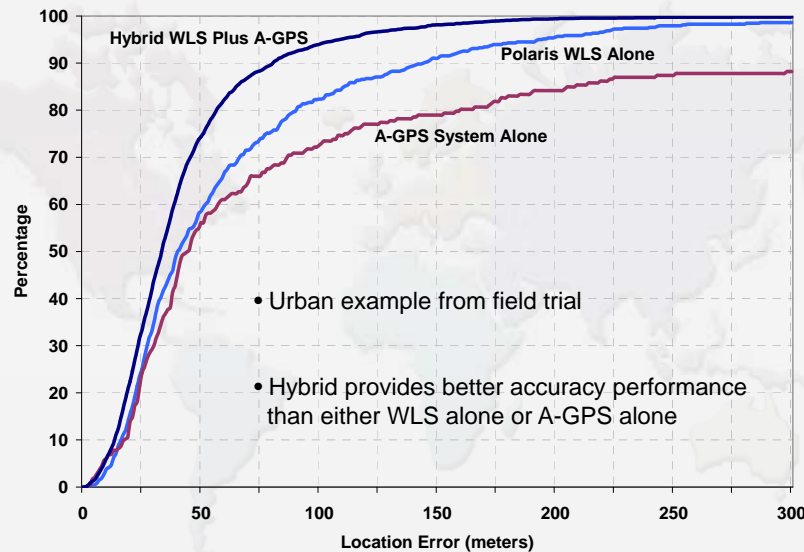
Hypothetical Hybrid

- **Everyone's definition of hybrid is different**
- **Question is which hybrid achieves best combination of performance, cost and time-to-market?**
 - **Flavors based on cellular networks**
 - WLS, UTDOA, EOTD, OTDOA, AFLT, etc.
 - **Other networks**
 - WiFi, Bluetooth, UWB, proprietary, etc.
 - **Broadcast systems**
 - TV, FM, Mobile TV, etc.
- **Answer may depend on the specific applications and target markets to be addressed**

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Hybrid Improvement



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