

Automatically Providing Location Information for Routing 911 Calls Using Fixed Broadband Networks

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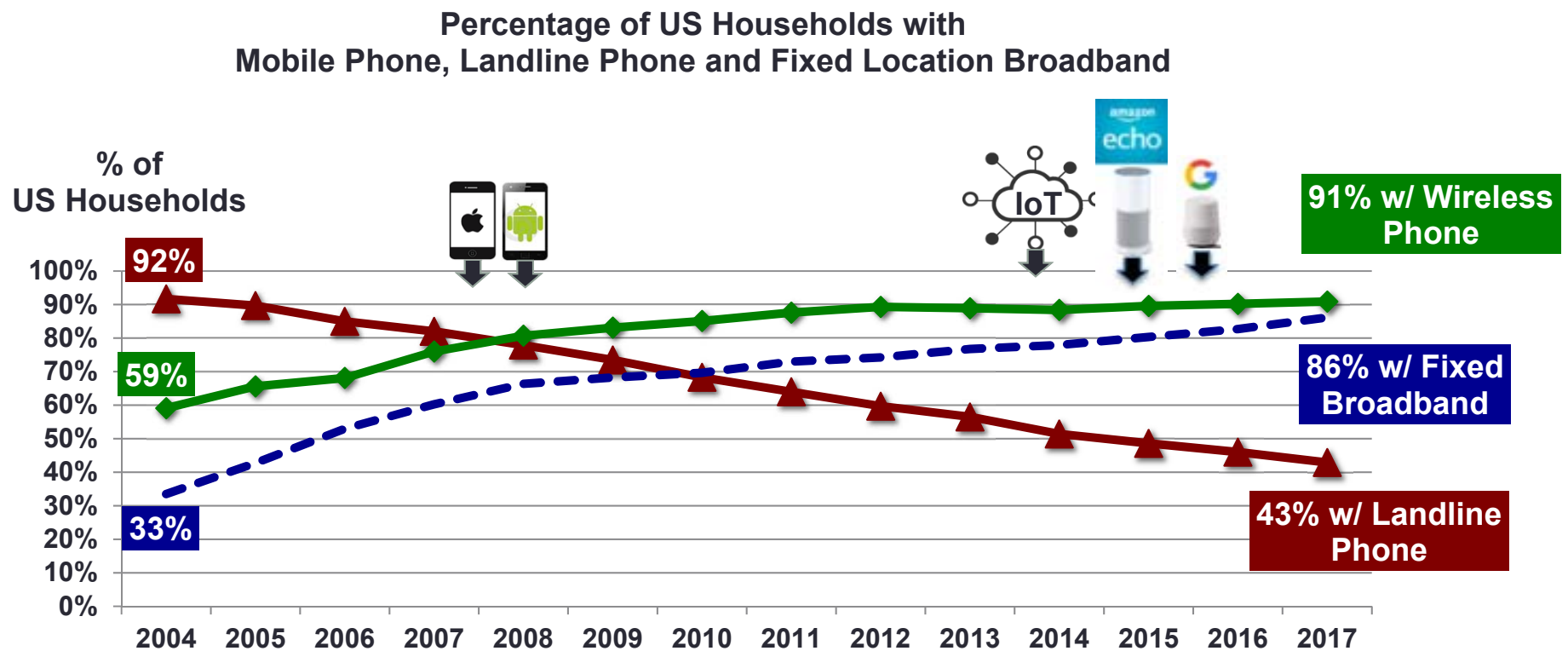
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Fixed Broadband Enhanced 911 Solution Summary

- 43% US households (HHs) with no landline phone.
- >72 million households (≈187 million people) with no access to “address-specific” E911.
- 108.7 million HHs (86%) fixed-location broadband Internet connections – an available, but unutilized network for 911.
- Such fixed-location broadband connections can provide civic “address-specific” locations for 911 call routing and emergency dispatch purposes.
- Expand existing 911 communications network and *Accessibility* access by **50%** by adding a third, secure communications pathway for location, routing and multimedia communications between end users and 911 authorities.
- Supports mobile (CMRS) and non-CMRS 911 call location and routing.
- Adds a new 911 funding source and cost-recovery model for service providers.

Households with Landline Phone is Less Than 50% and Declining

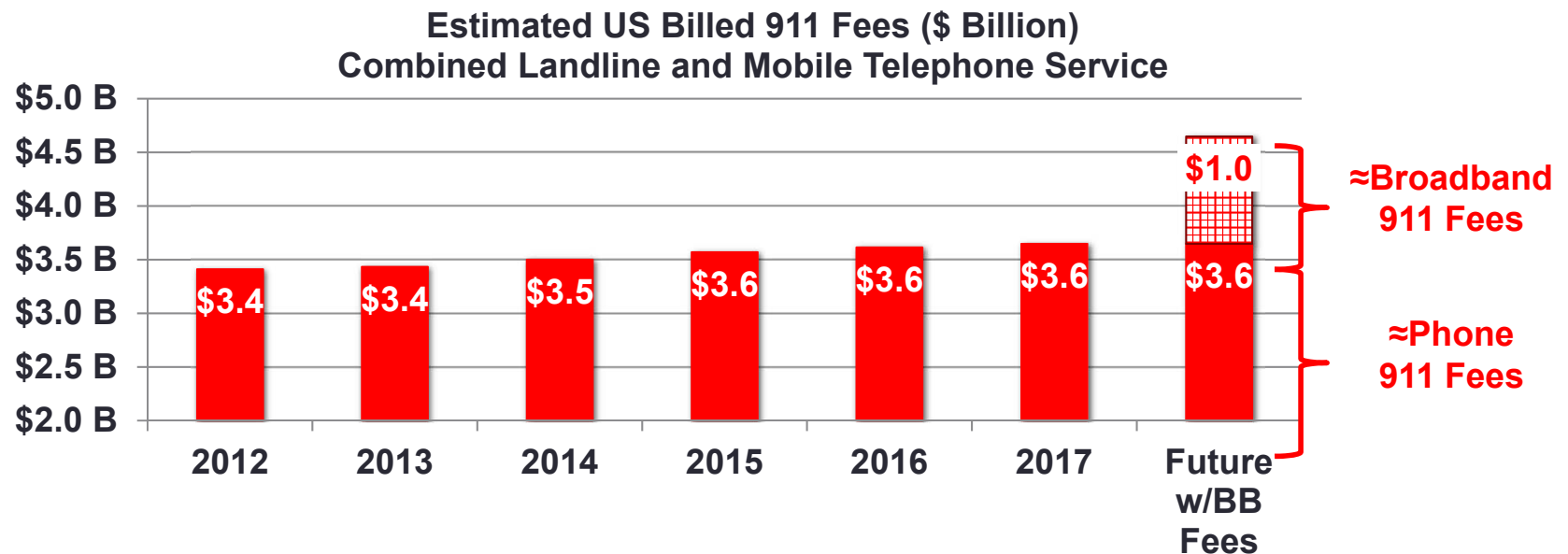
≈187 million people in 72 million HHs are without access to “address-specific” E911 as of December, 2017



Source: Phone Households: June 2018 National Institute of Health Annual Wireless-Only Survey. Fixed Broadband Households: The Organisation for Economic Co-operation and Development (OECD) – Q2,2018

Economic Impacts

- **\$3.6B billed annual 911 fees with nominal annual growth** in combined mobile and landline phone billed 911 fees.¹ Mature mobile phone market is barely making up for the loss of 911 fees from landline phone disconnects.
- **~ \$1B (28%)** per year in additional 911 funding potential by assessing 911 fees on 108.7 million fixed location broadband subscriptions.* To justify the fee, these connections must be utilized for 911.
 - 911 fees assessed on broadband service is permitted under federal law (The Internet Tax Freedom Act - 2004 Amendment - Public Law No: 108-435). 911 fees are assessed at the state level.
 - Such fees were suggested in a FCC Task Force on Optimal PSAP Architecture (TFOPA) Report dated January 29, 2016.

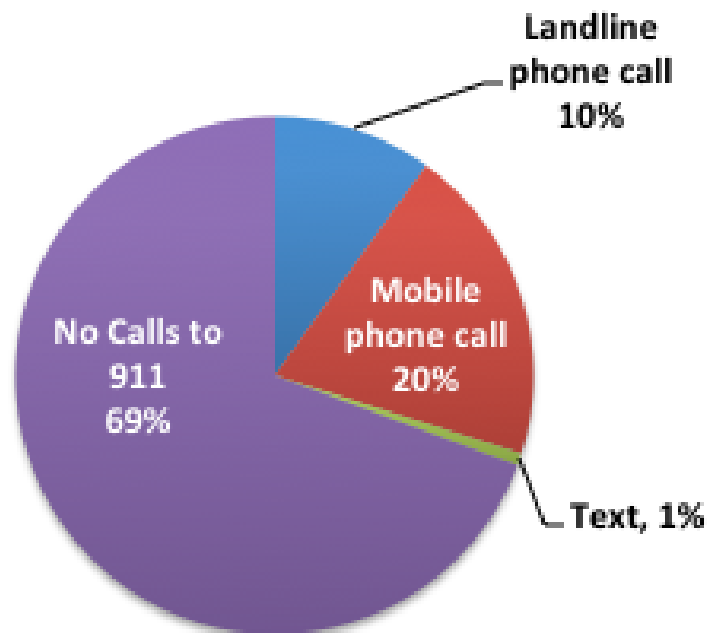


¹ Estimated billed 911 fees are based on total US mobile and landline phone subscriptions x average \$0.75/mo. 911 fee.

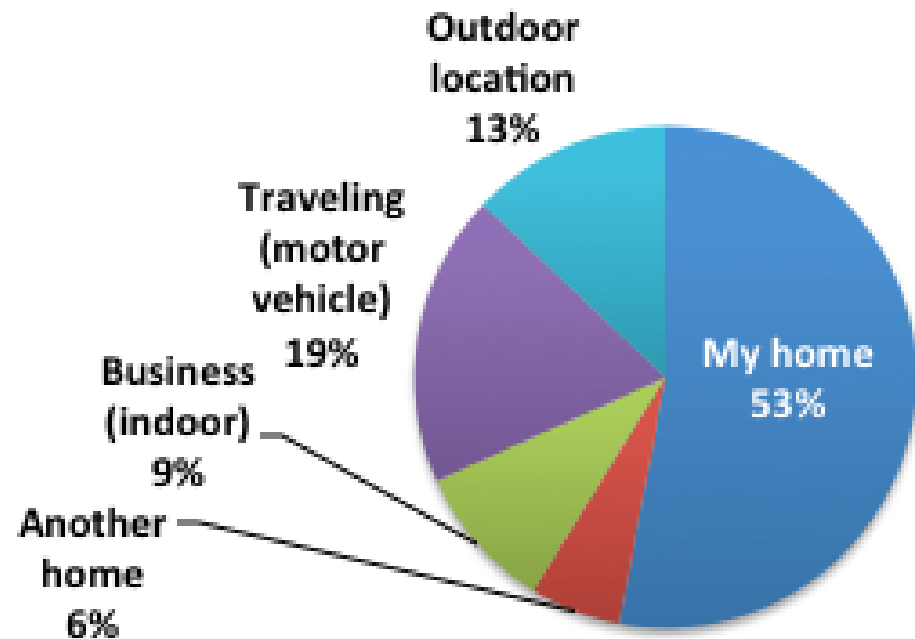
Precision Broadband 911 Market Research Study – July, 2018 ²

31% of respondents called 911 in the last two years, of which two-thirds were from mobile phones. Nearly 60% of the calls were from a residence.

Percent of respondents calling or texting 911 in last 2 years



Where was the 911 call made?

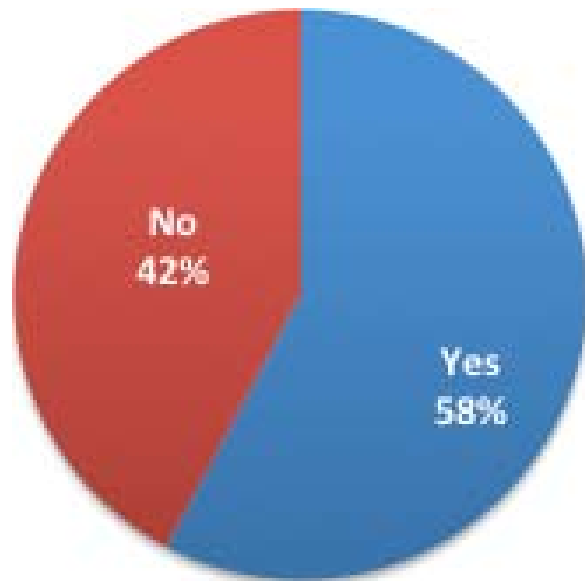


² Source: 911 Market Study conducted by Precision Broadband LLC July 2, 2018. [Hereinafter PBB Market Study 2018]. Survey Monkey online survey of 252 person panel representing the general US census. This survey was a repeat of the same study of 258 respondents in October, 2017. Results for each survey were similar.

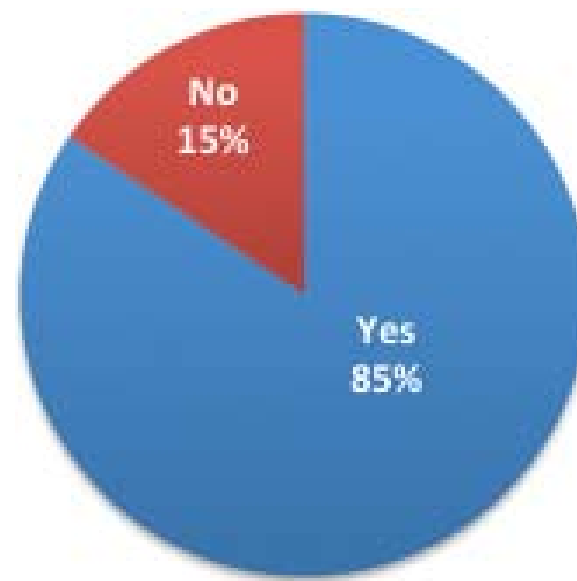
Precision Broadband 911 Market Research Study – July, 2018 ³

Overall, in just 58% of the 911 calls, the caller was under the impression that the 911 operator automatically knew their location when they called. When the call was made by a landline phone, 68% reported that 911 knew their location, while only 53% of those that used a smart phone responded that 911 knew their location.

According to the caller, did the 911 operator know the caller's location when they called?



According to the caller, did the caller know where he was or was able to communicate the location?

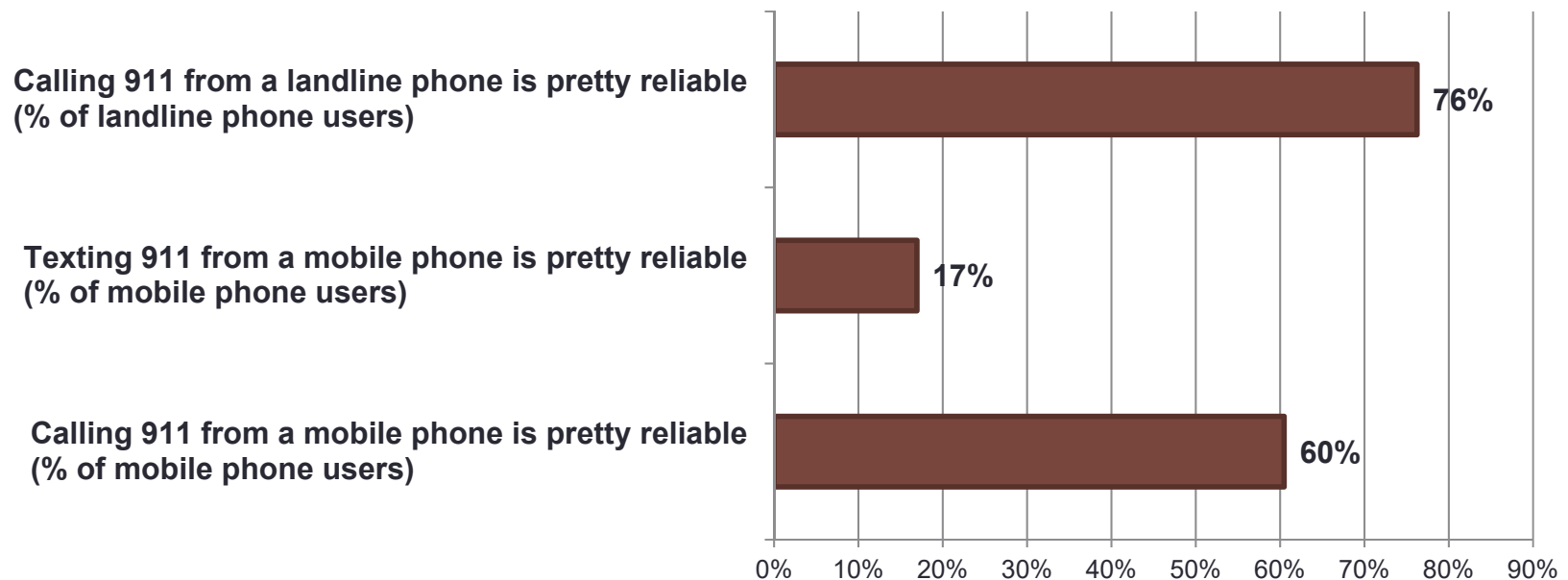


³ Source: PBB Market Study 2018.

Precision Broadband 911 Market Research Study – July, 2018 ⁴

Overall, there is not a high confidence among all survey respondents (especially mobile phone users) that 911 will be able to automatically locate them.

Respondents' perceptions of 911 emergency services being able to accurately and quickly locate them based on method of communication



⁴ Source: PBB Market Study 2018.

FCC E911 Requirements for Nationwide Mobile Carriers x/y (GPS) Location Coordinates or “Dispatchable” Location⁵

Horizontal Location Accuracy

Percent of 911 calls within 50 meters

- 2017 – **40%**
- 2018 – **50%**
- 2020 – **70%**
- 2021 – **80%**

Vertical Location Accuracy

- 2021 – Top 25 market areas
 - 2023 – Top 50 market areas
-
- CTI, NENA & APCO have been collaborating on a new supplemental location system called the National Emergency Address Database (NEAD) to meet the FCC regulations
 - The NEAD is a database of WiFi and Bluetooth beacon MAC addresses and corresponding locations. User Equipment /Smartphones (UE) are queried for MAC address of connected and pre-registered NEAD WiFi access points and Bluetooth beacons.

⁵ In The Matter of Wireless E911 Location Accuracy Requirements. PS Docket No. 07-114 February 3, 2015

Wireless Location and Routing is Not the Only Issue

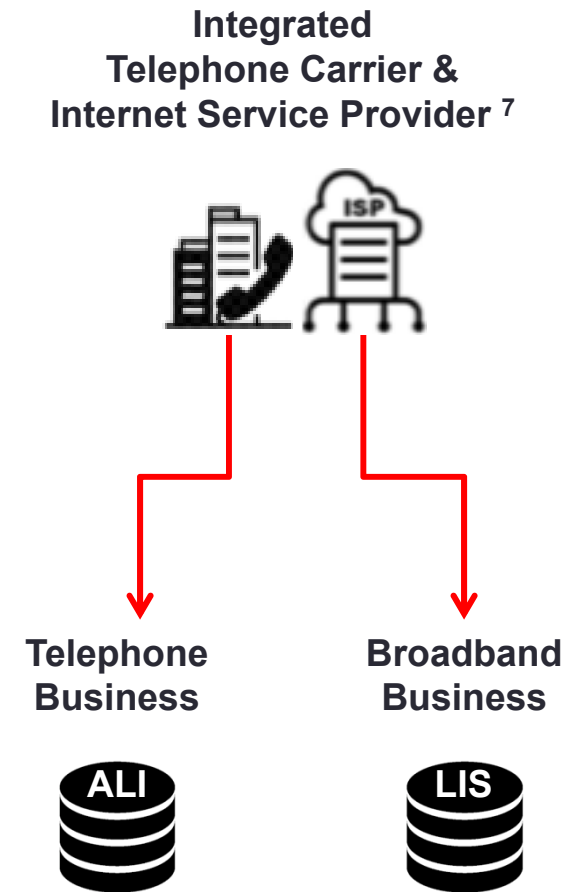
- *Adding the broadband network for 911 mitigates vulnerabilities in the wireless networks.*

Mobile Carrier 911 Communications Impacted by Outages

- 2017 - AT&T Wireless experienced two 911 outages in 2017. The March 8th outage resulted in failed 911 calls from 12,600 unique users. The May 1st outage resulted in 2,600 failed 911 calls. Fined \$5.25 million by the F.C.C.
- August 4, 2014 – T-Mobile experienced two nationwide outages during which time many of the mobile carrier's then 50 million subscribers were unable to reach first responders. Fined \$17.5 million by the F.C.C.
- April 14, 2014 - Verizon outage affecting 750,000 customers in California. Fined \$3.4 million by the F.C.C.
- March – September, 2014 – Sprint hearing-impaired customers who used the Internet Protocol Captioned Telephone Service (IP CTS) were unable to make calls to 911. Fined \$1.2 million by the F.C.C.

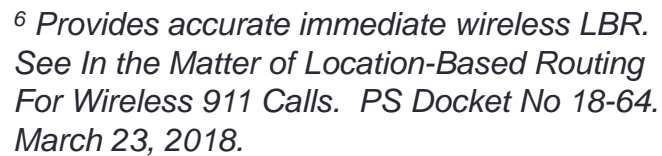
Fixed Broadband 911 Location Source - Standards-Based Location Information Server

1. **Populated by ISP** (not user) at time of service provisioning. Replicates the ALI provisioning on the phone carrier side of the business.
2. ISPs utilize same location data and order processing for broadband as is done for telephone.

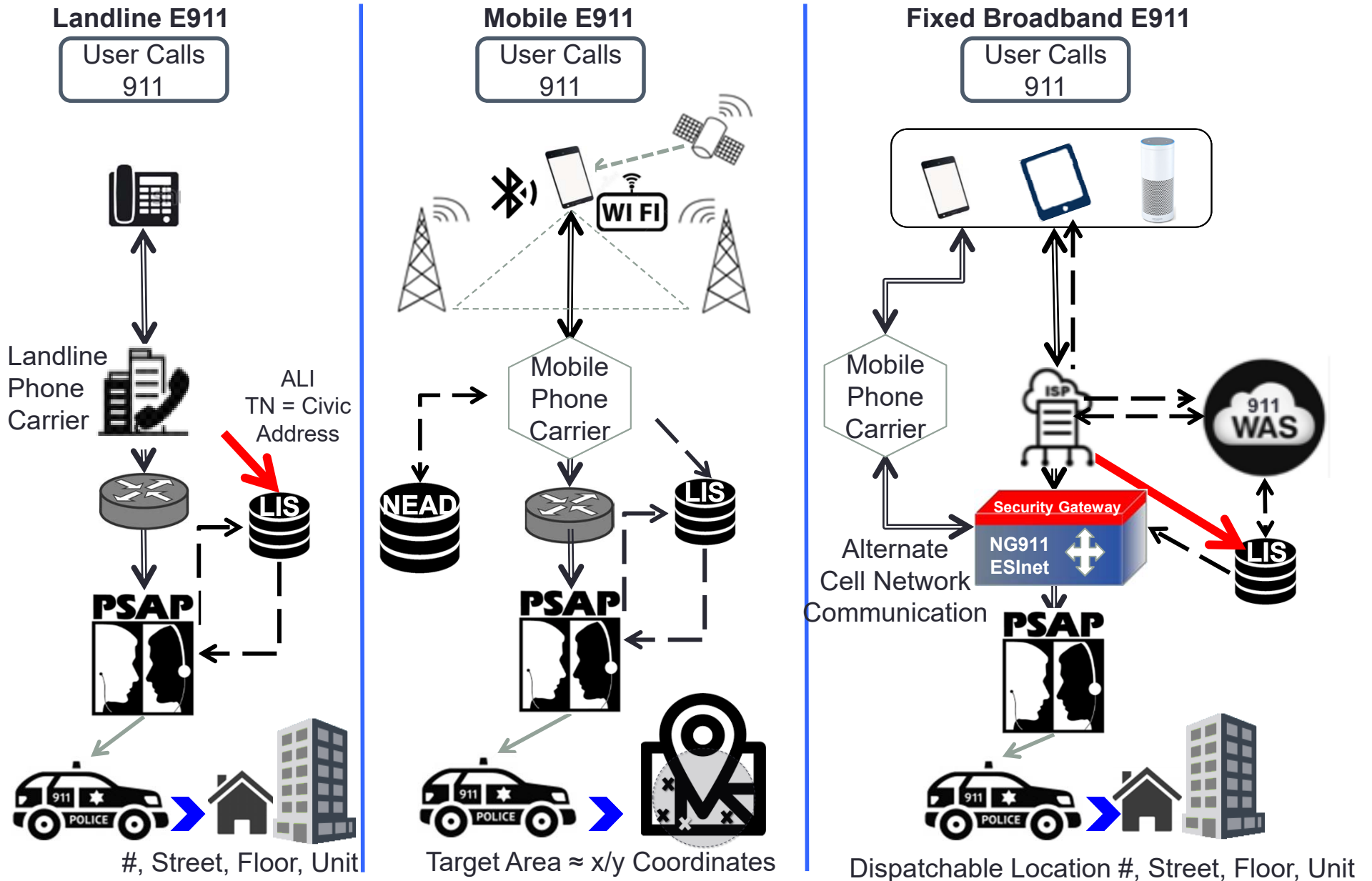


⁷ Integrated Telephone Carriers and ISPs include AT&T, Verizon, CenturyLink, Frontier, Fairpoint, Comcast, Charter, Cox, CableOne, WOW, Altice, Mediacom and thousands of small rural, municipal, electric, community and private facilities-based providers.

Provisional Patent Application 62/663,556



Fixed Broadband Enables a Third Network for 911 Location and Communications



Fixed Broadband Location Added Value

Hybridized Device-Based LIS



- ◆ Target location algorithmically estimated.
- ◆ Horizontal position today.
- ◆ Indoor and outdoor. Mobile.
- ◆ Multiple, **fragmented** sources and formats. Varied, competing devices, service providers and technologies.
- ◆ Multiple device sensors required. Location services must be active long enough to compute estimated target area.

Fixed Broadband ISP LIS



- ◆ Dispatchable civic location provided from fixed database
- ◆ Horizontal & vertical civic address position
- ◆ Indoor. Fixed location. Predominantly residential (108.7 million HHs).
- ◆ **Common**, single format and source.
- ◆ No device sensors required. Enables lower cost devices, including non-CMRS devices.

Fixed Broadband Location Added Value

Optimal Future State Hybridized Device-Based LIS + Fixed Broadband ISP LIS



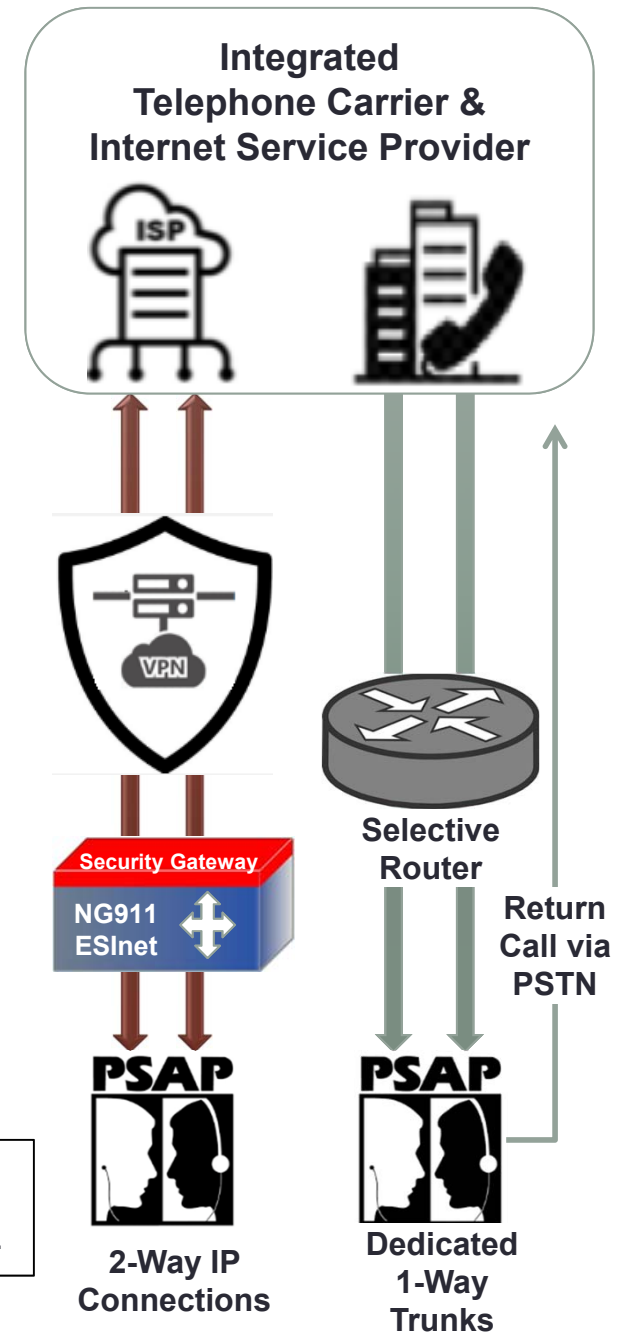
1. Communications network chooses best location data point from various sources available to the device at the time of the call for routing the call to the location-serving PSAP.
2. PSAP systems prioritize best dispatchable location from various location systems available at the time of the call.

Dedicated Secure Connectivity

For Location & Routing Only, or Location, Routing and Media

1. Similar to the dedicated redundant 911 trunks between the carrier's telephone network and the 911 network, there would be dedicated VPNs between the ISP's managed network and the ESInet.
2. ***No 911 traffic traverses the public Internet***
3. ISPs can prioritize bandwidth for 911 services and ensure Quality of Service.
4. The same dedicated VPNs between the ESInet and ISPs can be used for:
 - User-initiated 911 calls to the PSAP
 - Return calls from the PSAP to the user-device.
 - Emergency alerts sent from local authorities to end-users
5. Same 2-way connectivity is available for Geographically Targeted Wireless Emergency Alerts.⁸

⁸ In the Matter of Improving Wireless Emergency Alerts and Community-Initiated Alerting PS Docket No.15-91 and Amendments to Part 11 of the Commission's Rules Regarding the Emergency Alert System PS Docket No. 15-94. January 31, 2018



ISP Responsibilities and Incentives

- Light touch, minimal impacts

- Responsibilities:
 - Populate the LIS with customer Gateway Device ID and Service Addresses (same as they do today for the ALI using OSS/BSS for telephone service).
 - Implement a secure service to accept real-time requests from the 911 Application Server to associate the IP addresses with customer Gateway IDs.
 - Implement bandwidth prioritization/QoS for designated 911 traffic and dedicated VPN connectivity to ESInets in the ISP service areas.
- Incentives:
 - Funds could be made available out of new 911 broadband fees so ISPs can recover their costs for compliance. There is precedence for ISPs to be reimbursed for such services. They are allowed to seek reimbursement from law enforcement today for CALEA support.⁹

The Broadband 911 System Leverages existing deployed user devices and existing installed ISP systems without incurring any additional costs for:

- *Customer location databases, networks and provisioning systems.*
- *Network architectures, distribution plant, and deployed customer premise equipment (modems, connections).*
- *Customer billing.*

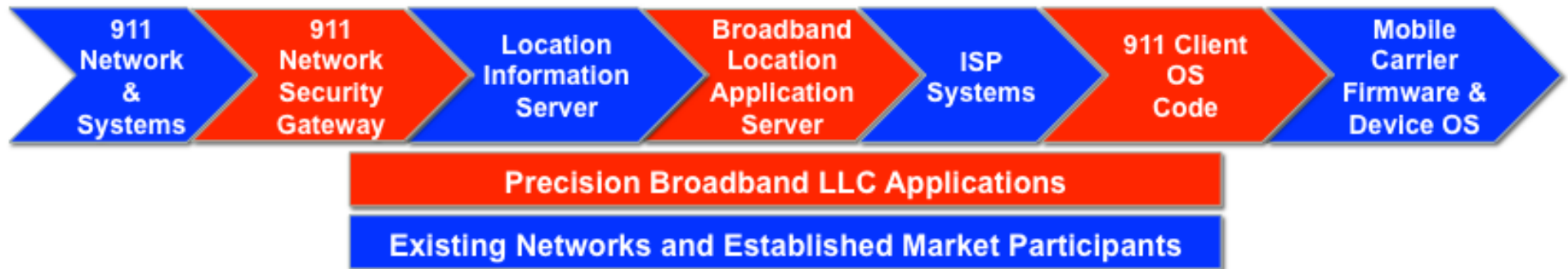
Furthermore, implementing these systems would not result in any ISP customer service disruptions.

⁹ Communications Assistance for Law Enforcement Act. Title 18 U.S. Code § 2706.

Precision Broadband Fixed Broadband Additions to 911 Systems

- Not changing existing systems or standards

Provisional Patent Application 62/663,556¹⁰



¹⁰ Proprietary techniques implemented at interface points via application programming interfaces to existing standards-based systems. PBB's system complies with existing standards, including NENA i3 NG911 standards. **Requires minimal, if any, changes to ISP, wireless or PSAP systems.**

Consumer Devices & Applications

There are many devices already available for communications in the home that could be used to contact 911, Below are a few concepts where the Precision Broadband 911 OS client code could be installed.



Tablet
WiFi App



Google
Home*



Amazon
Echo*



Internet of Things
Home Security



Programmable
Amazon Dash
Button



Smart Phone
WiFi App



Medical Alert
Pendant-
Personal Emergency
Response System (P.E.R.S.)



WiFi Baby
Monitor



Accessibility
Services

*** Both Amazon Echo and Google Home support outbound calling today – but not for 911**

Precision Broadband 911 Market Research Study – July, 2018 ¹⁰

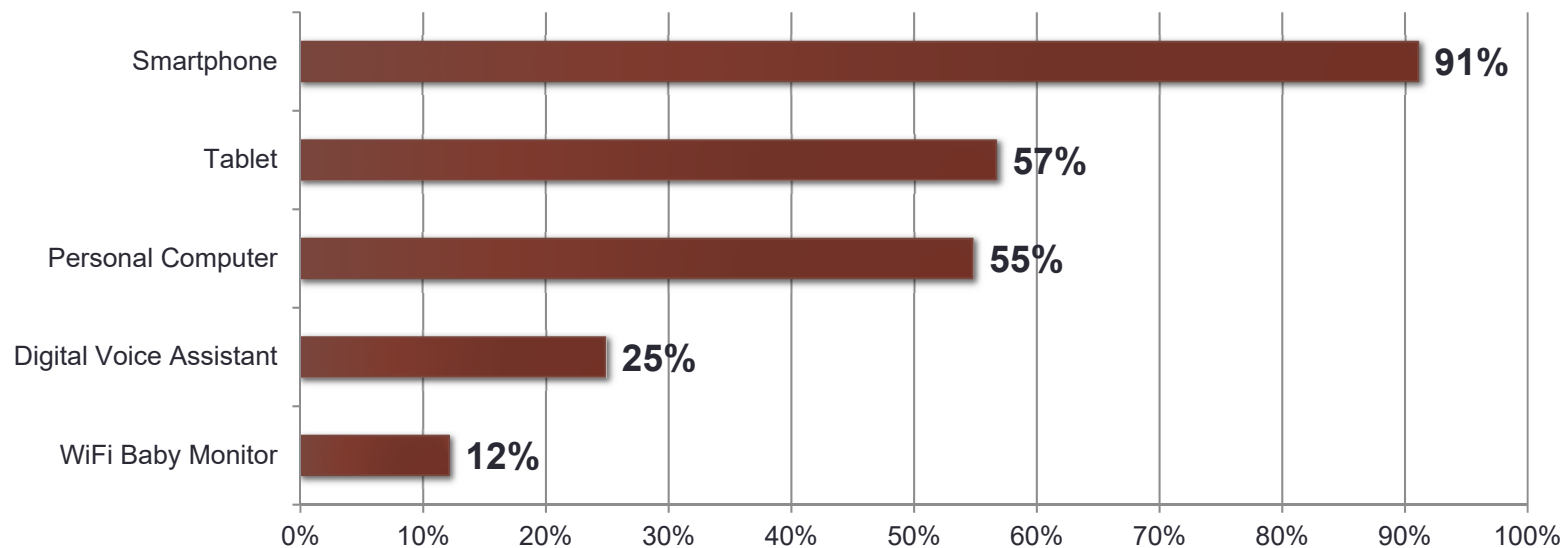
- Responses to questions regarding 911 access via home broadband Internet

% of all respondents interested in using broadband service to contact 911 **62%**

- % of those respondents that would use more than one device **68%**

- % of those respondents willing to pay additional broadband 911 fee of \$50-\$1.00 per month **59%**

Percentage of respondents Interested in contacting 911 using one or more devices connected to the home broadband service



¹¹ Source: PBB Market Study 2018.

Conclusion – The Case for Fixed Location Broadband E911

- Landline-phone E911 equivalent accuracy and timeliness for:
 - Immediate, accurate PSAP location-based routing for indoor initiated 911 calls (PS Docket No. 18-64).
 - Horizontal and vertical dispatchable location (PS Docket No. 07-114).
 - Can be utilized for Targeted Wireless Alerts (PS Docket Nos. 15-91 and 15-94).
 - Can be utilized for CALEA support (47 U.S. Code §§ 1001-1010).
- Immediately available and scalable.
 - Leverages existing standards and installed ESInet, PSAP, and ISP technologies.
 - Leverages existing deployed consumer devices. No new hardware required for consumers to purchase or new apps to install on existing devices.
- Supplements existing legacy and planned NG911 systems and device-based hybridized location systems.
- Enables low-cost 911 support for various accessibility and new consumer devices (i.e., Amazon Echo, Google Home, IoT).
- Adds third access network for 911, increasing reliability.
- Adds a new funding source (\$1B annually) for 911 and other public safety needs.

Recommended Next Steps for the Commission

- We invite the Commission to see a live demonstration of PBB's fixed-broadband 911 location system.
- We ask that the Commission seriously consider using whatever authority it possesses to persuade all facilities-based broadband providers to utilize their networks to support 911 location and routing services as a matter of public safety. This would be consistent with these companies' public safety responsibilities as ISPs and telephone carriers under CALEA and as cable TV providers with respect to supporting the Emergency Alert System.
- We ask that the Commission include fixed broadband provided location services with respect to device and operating system provider recommendations along with other solutions offered by other market participants.
- We ask that the Commission give serious consideration to supporting a 911 fee assessed monthly on broadband services.

Appendix

Principals



Precision Broadband LLC was founded in 2016 with the purpose of improving public safety by addressing today's technology challenges with 911 communications and caller location identification. Precision Broadband is developing a lightweight, ISP and mobile carrier-friendly system that leverages facilities-based broadband networks to provide the same horizontal and vertical "address-specific" location accuracy for 911 calls as landline telephone.

Charley Simon is the founder of Precision Broadband. He is a seasoned telecommunications executive and entrepreneur whose deep experience encompasses all aspects of the business and technologies related to the Precision Broadband systems. From 2003 to 2016, Charley directed new business and product development for the telephone businesses and numerous broadband services at two major cable TV, phone and Internet service providers - Mediacom Communications and Bright House Networks. At these companies, Charley played a lead role in establishing a new CLEC and bringing new voice, video and data products to market including landline telephone, community WiFi networks, MVNO wireless services, mobile applications and home security & management (Internet-of-Things). Prior to 2003, Charley founded two companies, one engaged in cable television programming and the other, a value-added reseller of e-commerce, VPN and cybersecurity applications serving Fortune 500 enterprises. Additionally, he led the turnaround of a niche healthcare cable TV and IT company and was CFO of two start-up cable television companies in Staten Island, NY and Newark, NJ.

INdigital



Indigital is a leading 911 system service provider. INdigital was formed in 1995 by a group of independent telephone companies to develop and provide new technology in several segments of the industry. In 2004, INdigital was selected by the Indiana Wireless 911 Advisory Board to build a new 911 network for Indiana. These emerging technologies are now known as NG911. The company has expanded its service area by building private, high availability IP-based public safety networks throughout the United States. INdigital's ESInets have evolved to meet industry standards, and provide local 911 authorities and other emergency system service providers innovative platforms for emergency service processing and delivery.

James Kinney is the Chief Innovation Officer of INdigital. James is an expert in legacy and Next Generation 911 telecommunications equipment, products and services, including all PSTN functional elements and related protocols. James possesses a vast knowledge of current and emerging IP, public safety (911), and wireless technologies, (e.g. SDR, CMRS and WiFi). As Chief Innovation Officer at INdigital, James is the Senior Design Engineer for INdigital's NG911/telecom/VoIP platforms, software and products, and heads the R&D team working on Advanced Location NG911 innovations including artificial intelligence integration and real-time communications.

April Heinze, ENP/CMCP, is the Industry Affairs Specialist of INdigital. April has 24 years of PSAP experience. She is an active member of several State and National 911 organizations. April currently serves as the Senate Appointee to Michigan's State 911 Committee and is the Vice-Chair. She is the chair of the Emerging Technologies Subcommittee and a member of the Legislative Action Subcommittee. April is a member of the Development Steering Committee for NENA and is a Co-Chair of the PSAP Operations Committee. She was a member of the FCC Taskforce on Optimal PSAP Architecture and is a member of the CTIA work group focusing on PSAP implementation of the rules for Wireless Location Accuracy.