# Next Generation 911 – –

A lifeline service based on the Internet - Are we ready for this?

# Distinguished Experts Panel

**Chair: Carol Davids, Illinois Institute of Technology**

**Panelists**

- **Stephen Ashurkoff, General Dynamics**
- **Trey Forgety, National Emergency Numbers Association**
- **Barbara Kemp, Assure911**
- **Henning Schulzrinne, Columbia University; FCC**

# Focus on the Access Network Provider

- Policy and regulatory
- Standards
- Early Adopter
- Current challenges: Examples include mobile location, indoor location, text

# Problem Statement

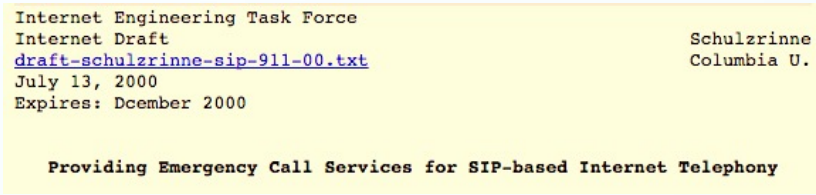
- Emergency Services are traditionally accessed using telecommunications systems.
- As these telecommunications systems move to IP networks, the Web and to smart mobile devices, people expect to reach emergency services using all the expanded modes of communications these new methods afford, texting and sending real-time video to the emergency call center.

# Problem Statement

- These centers and the networks that support them need technical standards, government policy, new networks and operations to meet the new demands.  The National Emergency Numbers Association has adopted a set of standards and best practices to be used by emergency service providers.
- Building and securing the networks that will support NG911 services and creating the operations to make these services reliable requires expertise in many fields.
- This panel of experts will discuss the architectures, security, operations, and policies that are being developed to meet this need.

# Policy and Regulatory: Environmental challenges

- Used to be simple: ILEC delivers calls to PSAP
- NG911 dates back 15 years
- "Overtaken by events":
  - ILECs getting out of (TDM) voice business
  - very little SP innovation in voice
  - slow deployment of VoLTE
  - consumer behavior: voice → text-based
  - application behavior: standards-based → proprietary (apps, web interfaces)



Internet Engineering Task Force
Internet Draft — Schulzrinne
draft-schulzrinne-sip-911-00.txt — Columbia U.
July 13, 2000
Expires: December 2000

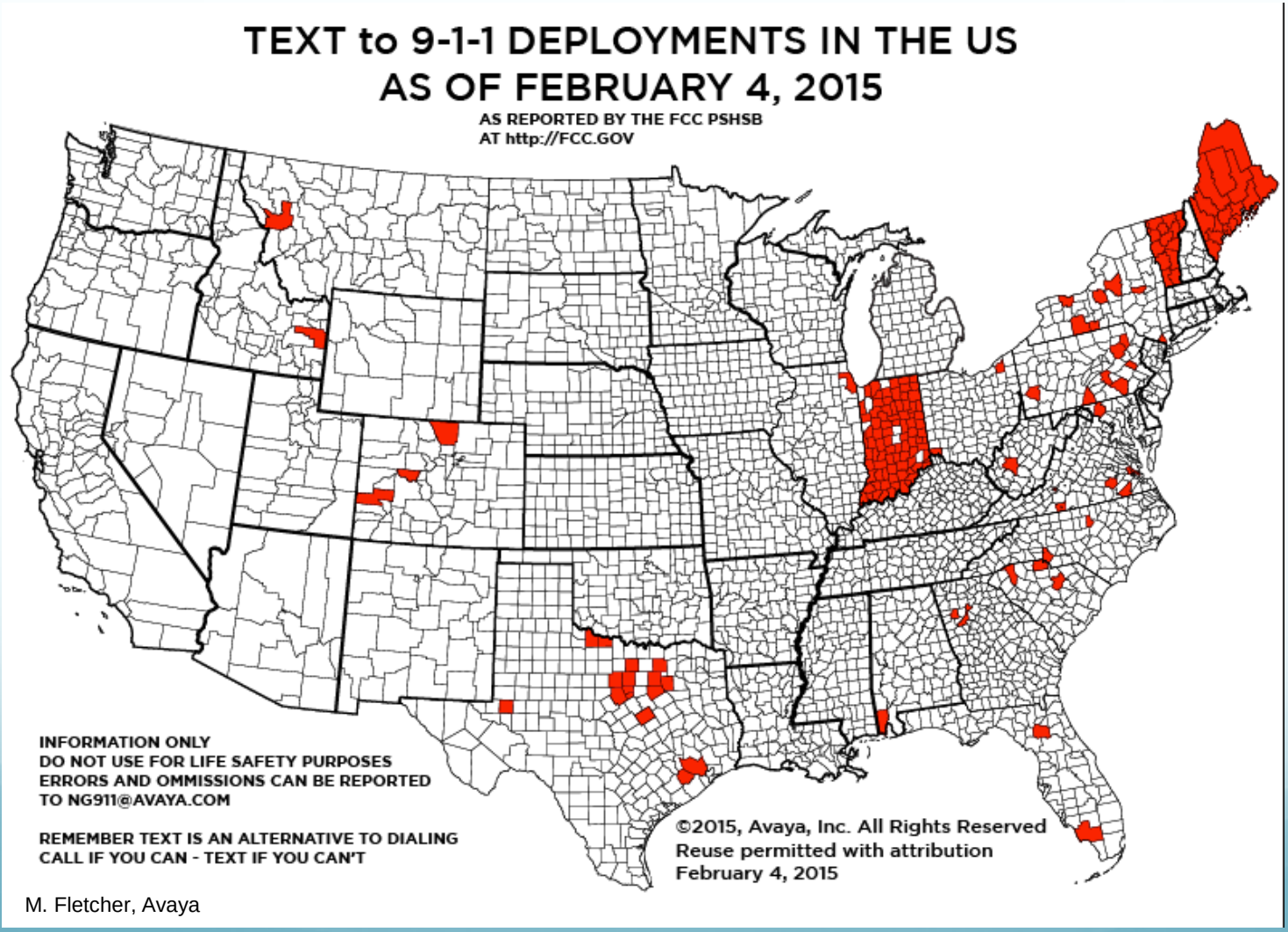
**Providing Emergency Call Services for SIP-based Internet Telephony**

NENA began the process of redesigning the 9-1-1 service system in 2000, with discussion among the Technical Committee leaders about future 9-1-1 needs and concepts to support them. In 2001, the NENA Board President and 1st VP inquired about whether the Technical Committee would pursue this effort as a NENA organizational goal. The following sequence is a general history of this effort.

2001 Technical Committee leaders conceptualize the NENA Future Path Plan

Forever 20 years away: will we ever have a working nuclear fusion reactor?

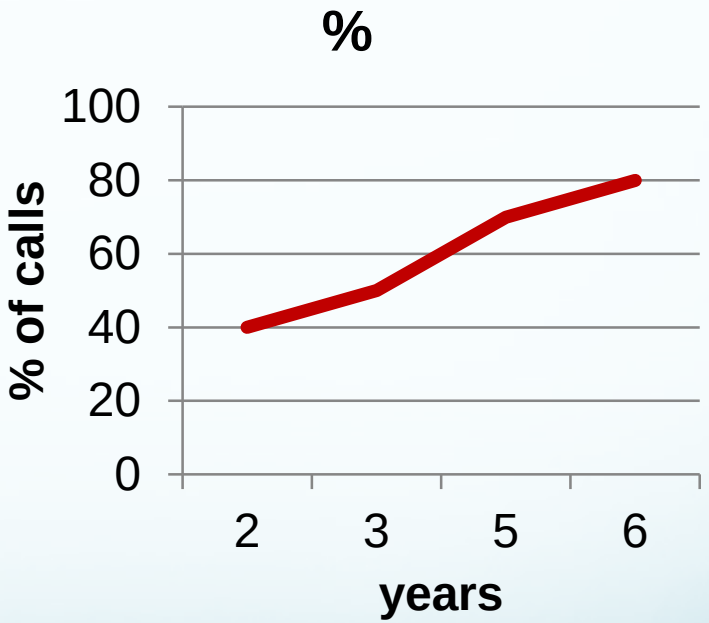
# Text-to-911




M. Fletcher, Avaya

# Policy: Caller location

- Builds on long history of FCC location accuracy requirements
  - implicitly outdoor: 50m (67%)/150m (80%-90%) circles (1996), with geographic exclusions
- dispatchable location or x/y within 50 m
  - ~70% calls are wireless
  - unknown % indoor
  - residential indoor may allow GPS
- z axis:
  - 3 years: uncompensated barometric
  - 6 years: 80% of top 25 CMAs
- open issues:
  - nomadic iVoIP
  - separation of location & call delivery

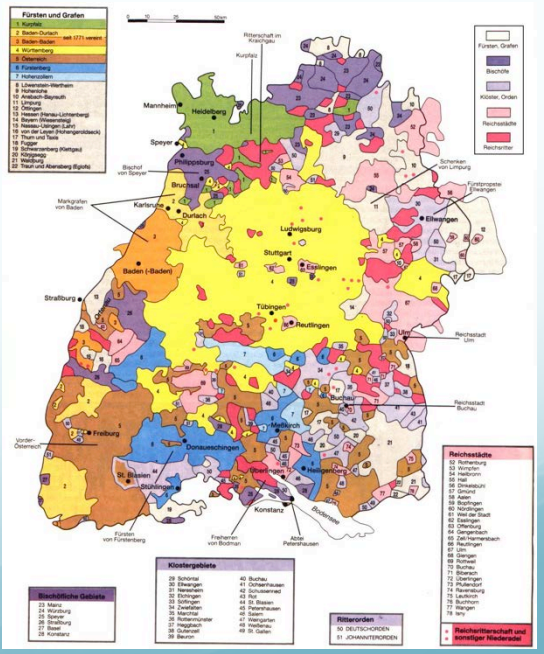


# Alternative network models

- Current deployment model
  - network islands with SBC moats
  - one county, one network, one server rack, one purpose, one decade

Suomenlinna

- Similar to early academic Internet → Internet2
  - initially custom, then re-use dark fiber
  - membership model?

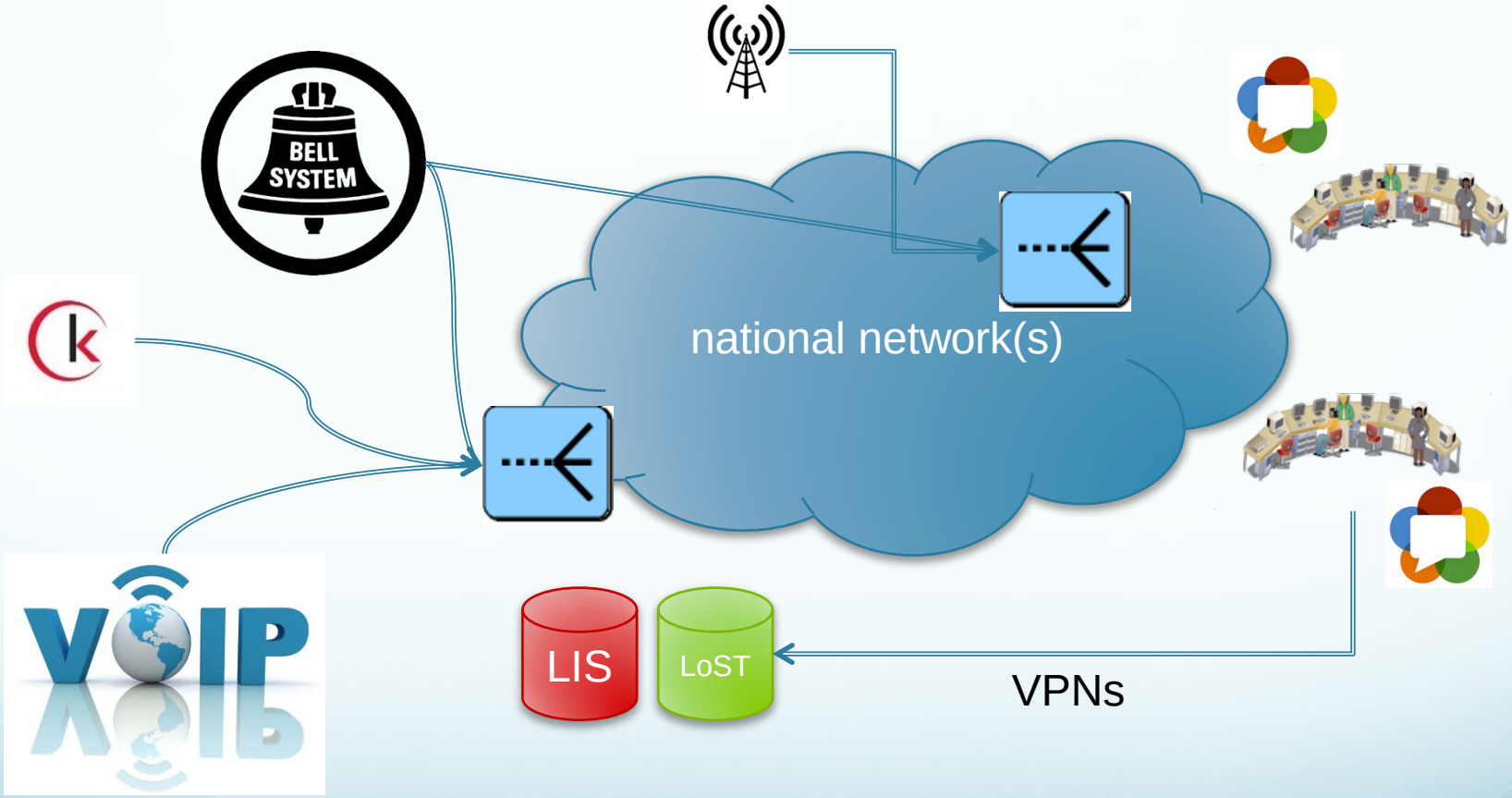


# Alternative network models

old model: one 99.999% network
new model: 7 99% networks → 99.9999999999999% (in theory…)

4x

# Alternative network models




major network interconnect points:
SEA, LAX, SJC, DEN, CHI, BOS, DC, NYC

# Specifications and Standards

NENA Standards Work

- i3 – v.2 near-final
  v.3 Candidate ANS
- NGSEC – Aligned to NIST Cybersecurity Framework
- Next-Gen Transition Planning Committee (Open)
- dev.nena.org

# Specifications and Standards

Early Adoption

- State-Wide
  - Vermont – Unified, Hosted
  - Alabama – Federated
- Regional
  - Counties of Southern Illinois

# Specifications and Standards

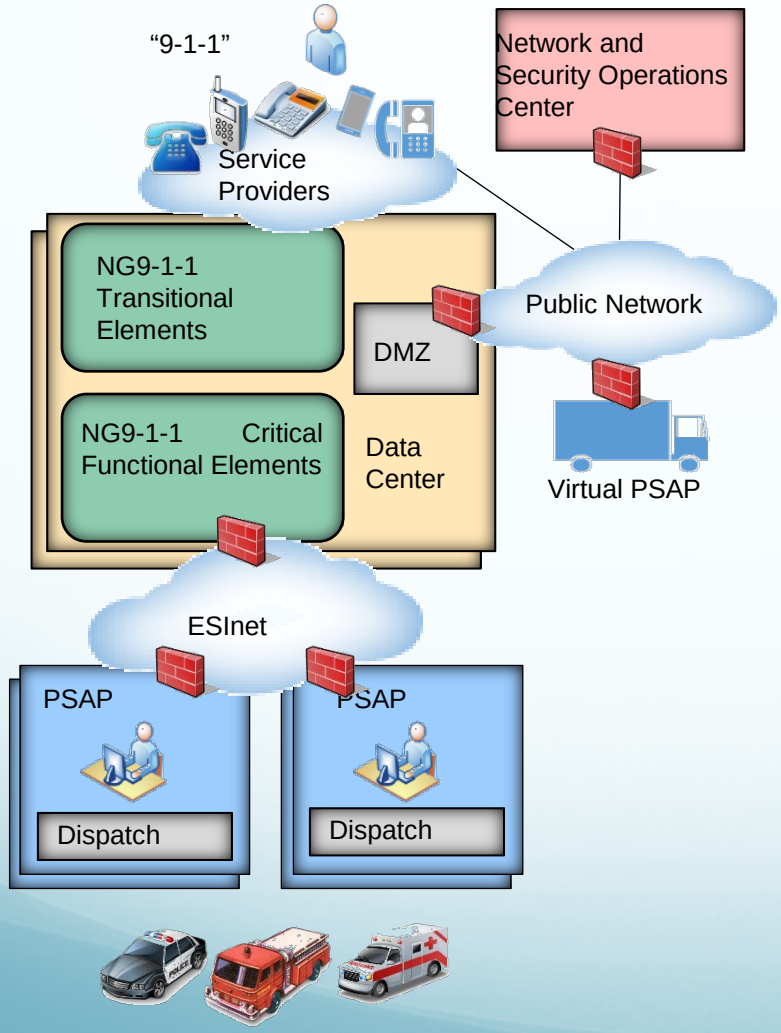
**Start Now! (or Regret it Later)**

ANPs and OSPs *must* start thinking about 3 major transition elements:

- Service Discoverability for Early-Adopter OSPs
- Location Information Servers
- Media encoding at IX points

- www.nena.org/standards

# NG9-1-1 & Access Providers: Dual Perspective




<u>NG9-1-1 Design Objectives</u>

- Efficiency through economies of scale
- Interoperability through industry standards
- Ability to Introduce new technology & services
- Improved survivability and resiliency

<u>Originating Service Provider Responsibilities</u>

- Routing of multi-media 911 traffic
- Prioritization of multi-media 911 traffic
- Authoritative location information with "call"
- Authoritative location information maintenance

# Challenges - Counties of Southern Illinois NG9-1-1 Project – 2009 to 2015

- Design and Engineering
  - –ESInet, and Functional Elements – Eliminate Single Points of Failure
  - –Diversity, Reliability, Resiliency

- Carrier Access Negotiations
  - –Direct and Indirect Carrier Access Options
  - –Signaling , Selective Routers and Transfers “the good the bad and the ugly”

- Illinois Commerce Commission Applications
  - –Rules, Lessons Learned and Measurements

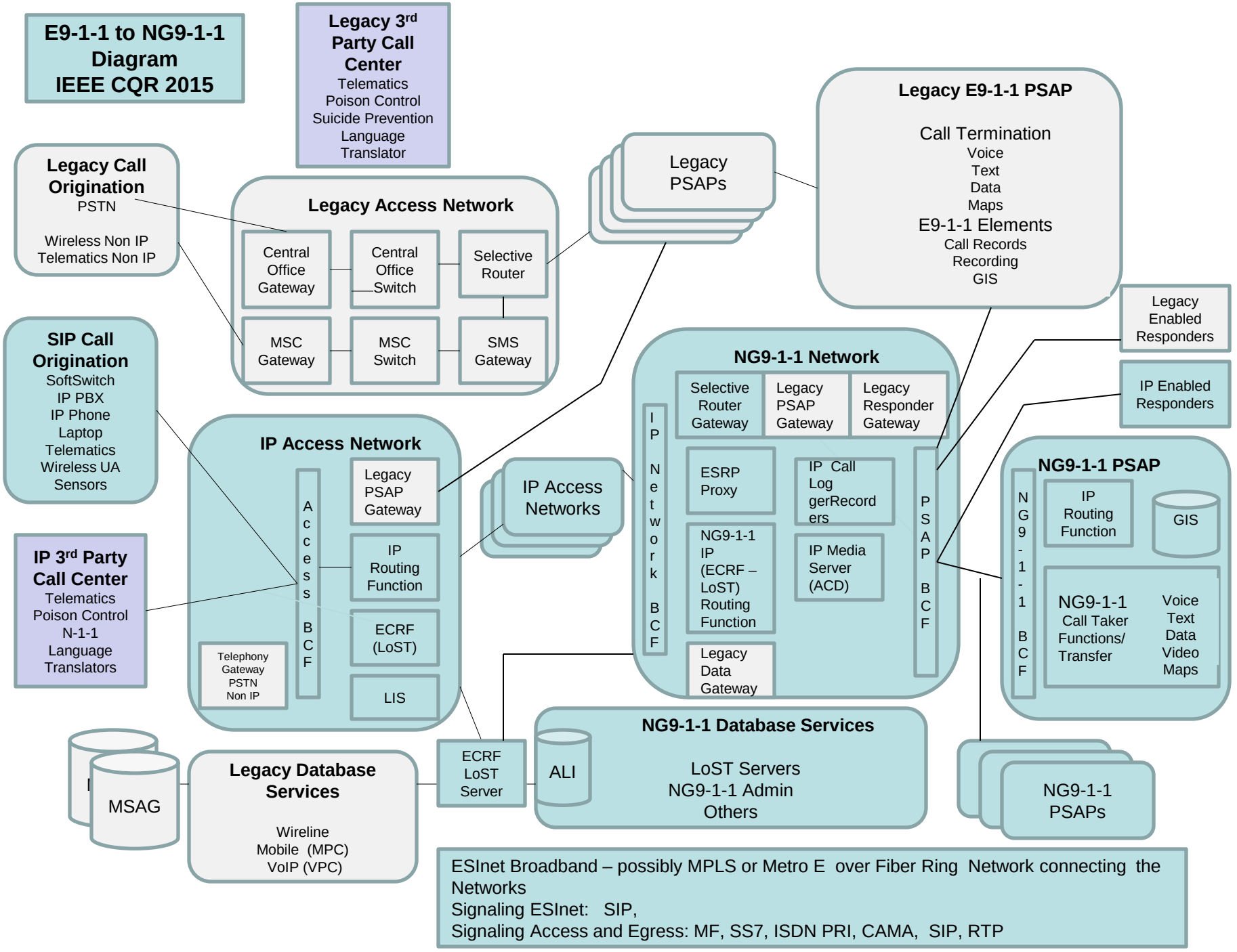
- Network Testing
  - –IIT RTCL – ICE and Network Testing followed by Field Testing
  - –Pre Cutover Border Control Functional Testing – Load and Overload

- End-to-End Testing
  - –Tools – Wireshark, Protocol Analyses
  - –Detailed Test Plans – Diagrams, Test Numbers, Cooperation, LERG, Database Readiness

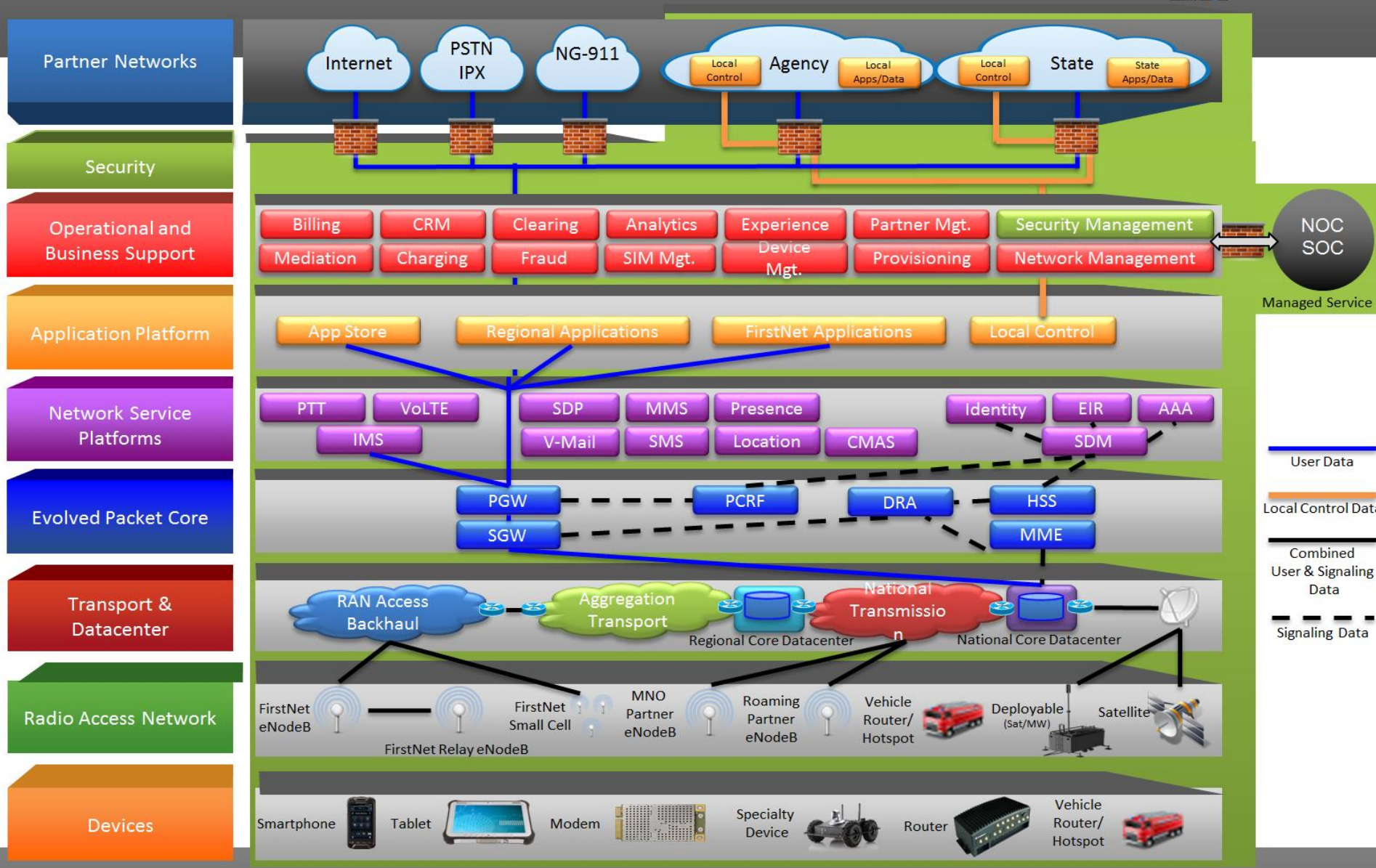
- Cutover
  - –Some things are harder than others – Wireless and VoIP Testing and Cutovers
  - –Database issues – Testing and Default Routing

- Operations Surveillance and Alerting
  - –Real Time Alerts – Database, PSAP, Network, Routers, Access, Transport, ESInet, FEs, Routers ,MIS

# Reference Slides


E9-1-1 to NG9-1-1 Diagram
IEEE CQR 2015
Legacy 3rd Party Call Center
Telematics
Poison Control
Suicide Prevention
Language Translator
Legacy Call Origination
PSTN
Wireless Non IP
Telematics Non IP
Legacy Access Network
Central Office Gateway
Central Office Switch
Selective Router
MSC Gateway
MSC Switch
SMS Gateway
Legacy PSAPs
Legacy E9-1-1 PSAP
Call Termination
Voice
Text
Data
Maps
E9-1-1 Elements
Call Records
Recording
GIS
SIP Call Origination
SoftSwitch
IP PBX
IP Phone
Laptop
Telematics
Wireless UA
Sensors
NG9-1-1 Network
Selective Router Gateway
Legacy PSAP Gateway
Legacy Responder Gateway
IP Network BCF
ESRP Proxy
IP Call LogerRecorders
NG9-1-1 IP (ECRF – LoST) Routing Function
IP Media Server (ACD)
Legacy Data Gateway
PSAP BCF
Legacy Enabled Responders
IP Enabled Responders
IP Access Network
Access BCF
Legacy PSAP Gateway
IP Routing Function
ECRF (LoST)
LIS
Telephony Gateway PSTN Non IP
IP Access Networks
NG9-1-1 PSAP
NG9-1-1 BCF
IP Routing Function
GIS
NG9-1-1 Call Taker Functions/ Transfer
Voice
Text
Data
Video
Maps
IP 3rd Party Call Center
Telematics
Poison Control
N-1-1
Language Translators
MSAG
Legacy Database Services
Wireline
Mobile (MPC)
VoIP (VPC)
ECRF LoST Server
ALI
NG9-1-1 Database Services
LoST Servers
NG9-1-1 Admin
Others
NG9-1-1 PSAPs
ESInet Broadband – possibly MPLS or Metro E over Fiber Ring Network connecting the Networks
Signaling ESInet: SIP,
Signaling Access and Egress: MF, SS7, ISDN PRI, CAMA, SIP, RTP

# FirstNet Network Architecture

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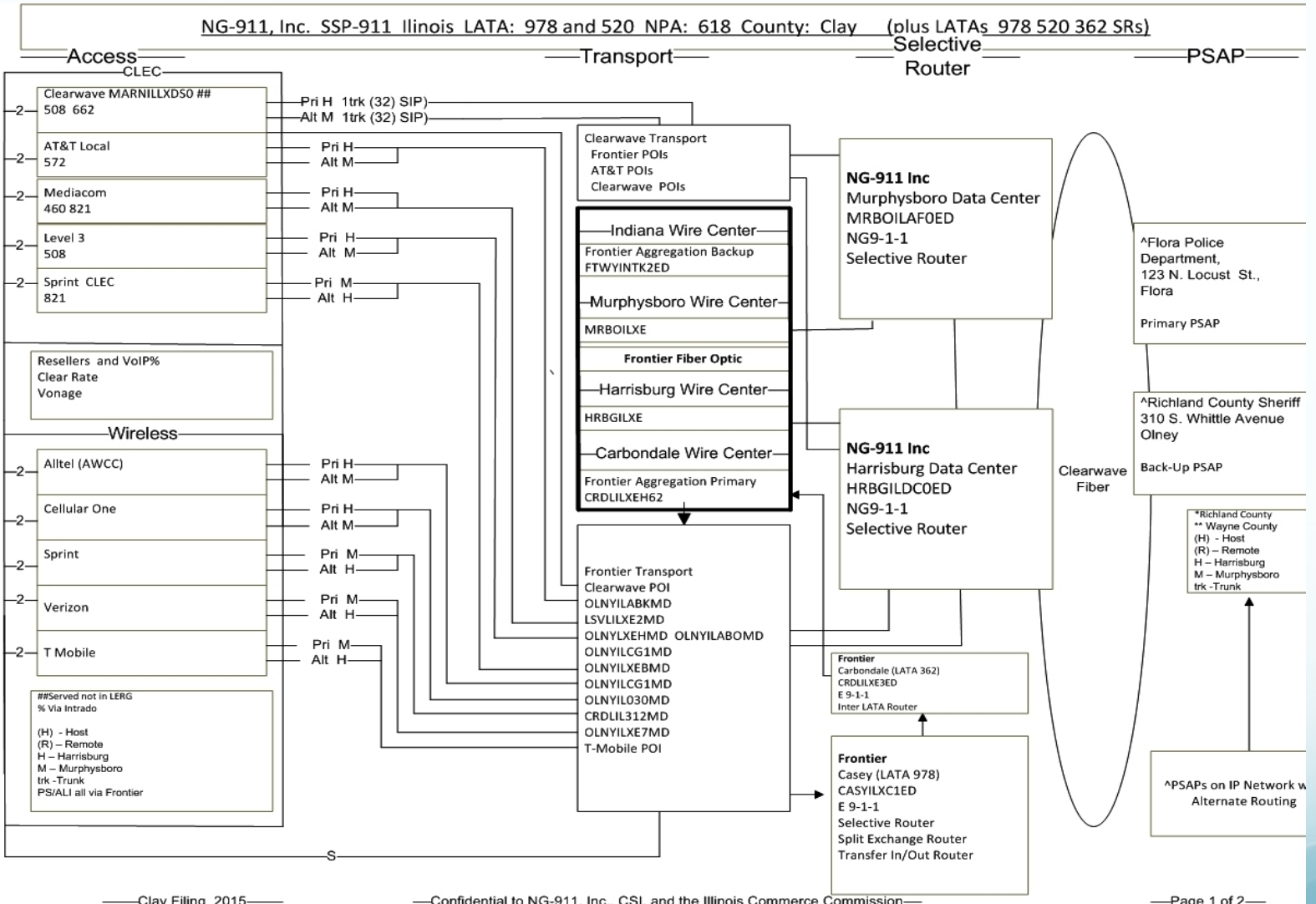
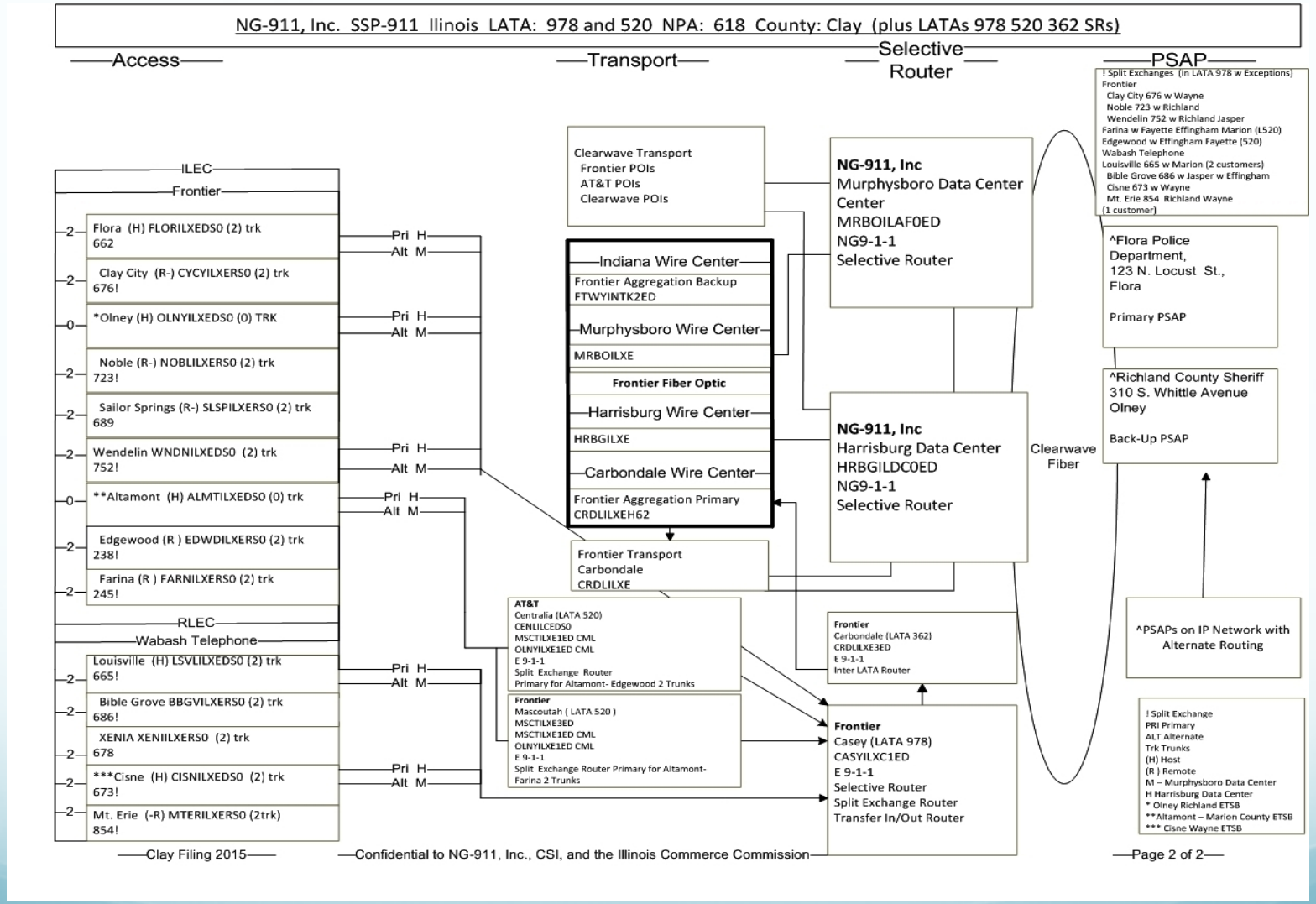
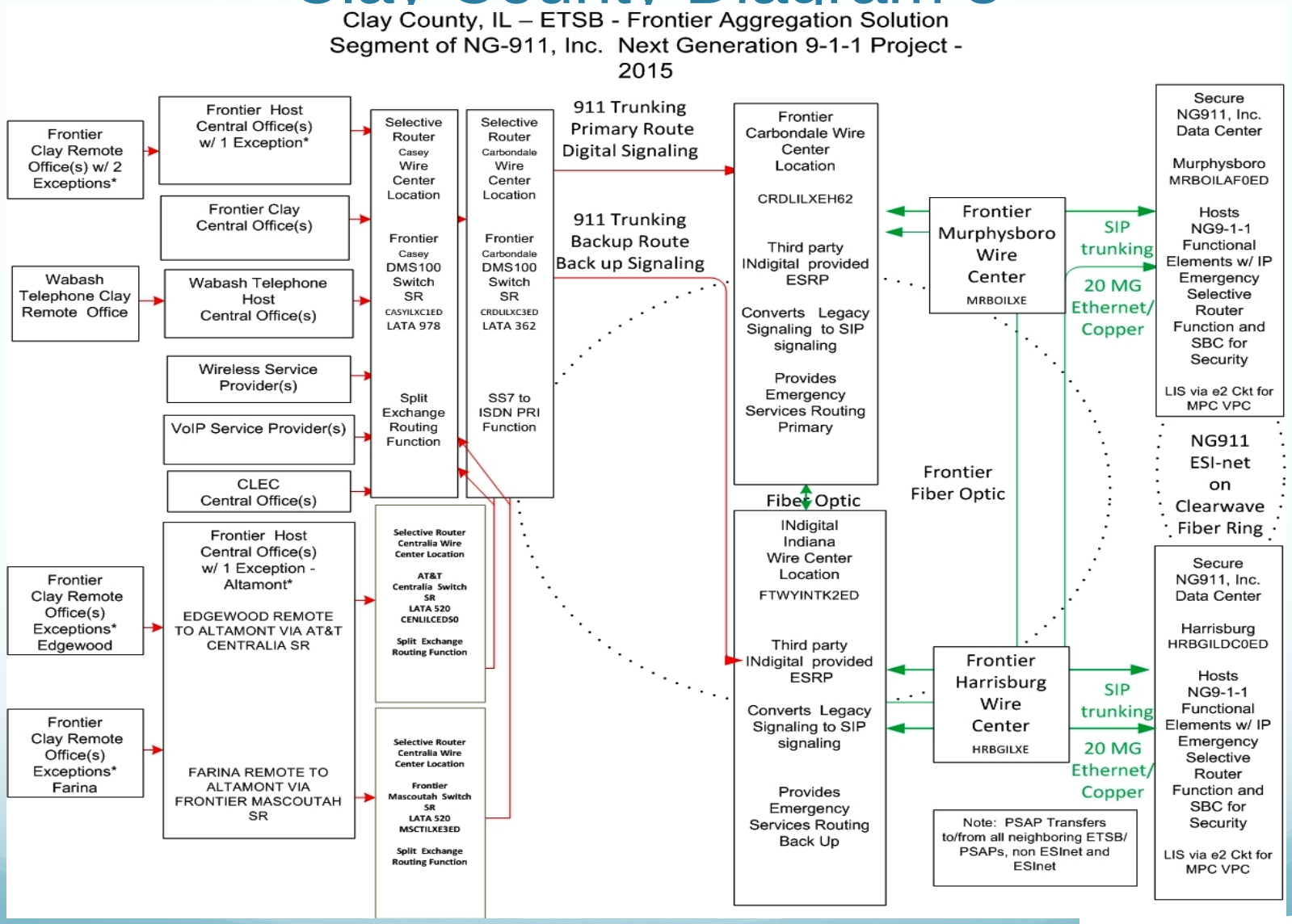
# Clay County Diagram 1



# Clay County Diagram 2



# Clay County Diagram 3

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