

How does 9-1-1 work?

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9-1-1 Acronyms

- **PSAP = Public Safety Answering Point**
 - *This is the 9-1-1 Center also called Emergency Call Center or ECC*
- **ANi = Automatic Number Identification**
 - *Looks up your phone number*
- **ALi = Automatic Location Information**
 - *Looks up your location*
- **LEC = Local Exchange Carrier**
 - Your legacy wireline phone company. The old phone on mounted on the wall.
- **WSP = Wireless Service Provider**
 - Your cellular phone provider
- **MSAG = Master Street Address Guide**
 - A database of street names and house number ranges within a community

9-1-1 Acronyms

- **ESiNet** = Emergency Services Internet
 - The iP network, equipment, and services that make up NextGen 9-1-1
- **LIS** = Location Information Services
 - *This tracks location or addresses of devices when calling 9-1-1*
- **ESRP** = Emergency Service Routing Proxy
 - *Looks up location information and determines which PSAP to route the call*
- **ECRF** = Emergency Core Routing Function
 - *Database of mapping information and service boundaries*

There are literally thousands of acronyms for emergency services

9-1-1 a quick overview

- Public dials 9-1-1.
- Their telephone company or device provider provides the 9-1-1 network your location and telephone number.
- The 9-1-1 provider assembles the call information and routes your call to the Public Safety Answering Point (PSAP) over dedicated 9-1-1 circuits and network.
- PSAP answers your call; rebids if necessary to get updated location information throughout the incident.
- Dispatch occurs.
- Help arrives!



How does 9-1-1 work – The Old Way!

- Legacy 9-1-1 is a circuit based switched telephone network. It uses dedicated circuits between telephone switches to deliver calls to the correct 9-1-1 Center.
- Calls flow through a regional 9-1-1 Selective Router and are delivered to the appropriate *Local Exchange Carrier* (LEC), that is responsible for phone service to the county seat. The calls are then delivered the last mile to the PSAP where the call is answered.
- 56K data circuits are used for *Automatic Number Identification*, *Automatic Location Information* (Ani/Al) to dip phone number and address information from the data base (DB).
- Originally 9-1-1 was address based but adapted to location based for wireless calls.
- The most important information to a 9-1-1 center is location!
- “*What is the location of this emergency?*” is typically first question you will be asked.

How does 9-1-1 work – Wireless Phases

- 9-1-1 wireless was overlaid over the legacy 9-1-1 system.
- 9-1-1 wireless service was implemented in phases
- *Phase 0* - This is the basic 9-1-1 process. Wireless calls are sent to a PSAP. Service providers must direct a call to a PSAP even if the caller is not a subscriber to their service. Based on the cell tower location
- *Phase I* - The Federal Communications Commission's (FCC's) rule requires that a phone number be displayed with each wireless 9-1-1 call, allowing the PSAP operator to call back if there is a disconnection. This is sector based on the direction the antennas are pointing that received the call
- *Phase II* - The final phase requires carriers to place GPS receivers in phones to deliver more specific latitude and longitude location information. Location information must be accurate within 164 to 984 feet (50-300 meters).

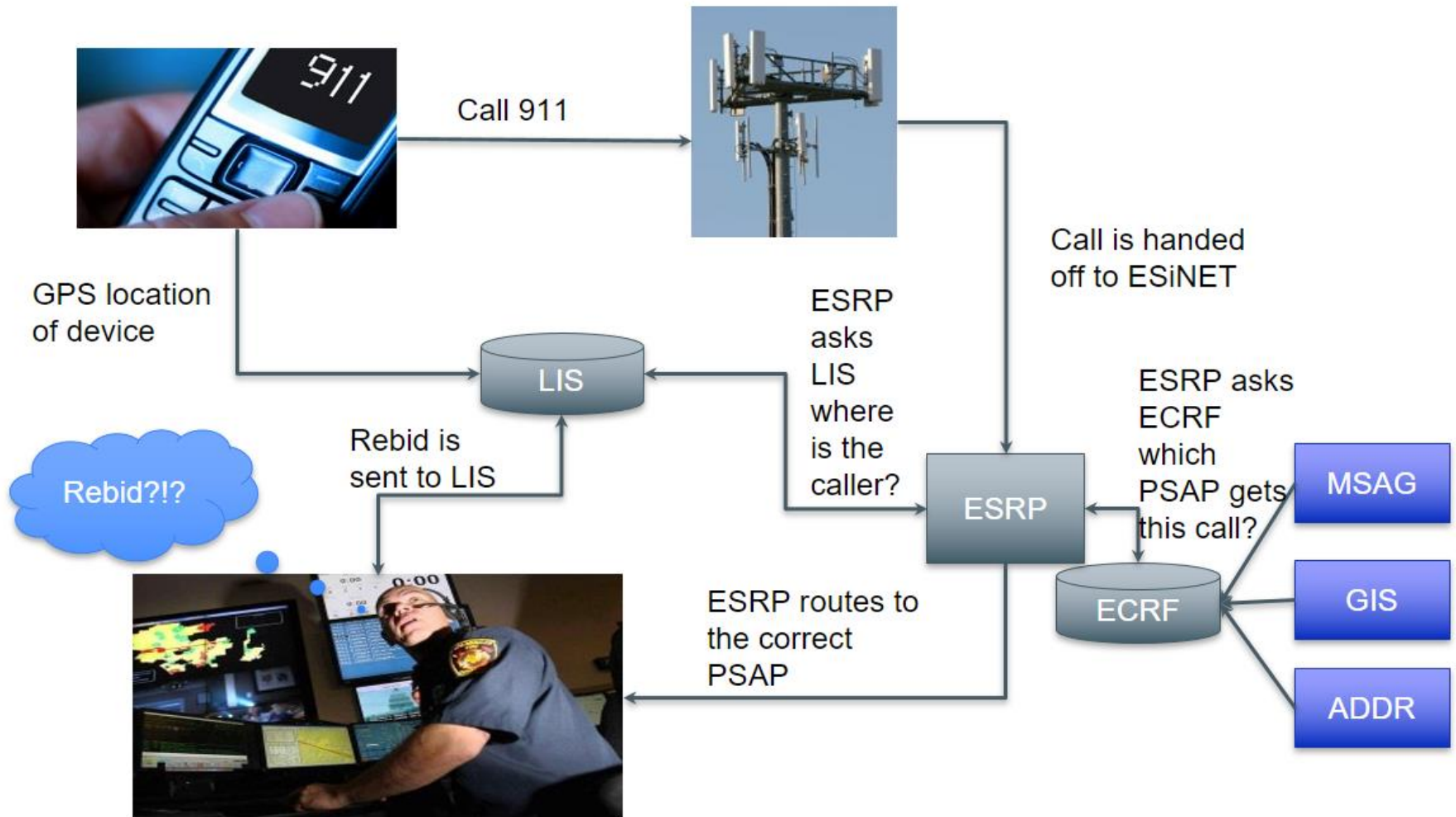
How does 9-1-1 work – The New Way. “The” Ohio ESiNET - NG9-1-1

- The State of Ohio has been proposing an Emergency Services Internet for over 10 years. It is now under construction and expected to be certified by December 31, 2024.
- The next generation system is location based over ip networks.
- The Ohio ESiNet will aggregate interconnection among a wide range of networks, such as wireless, legacy wireline, Voice Over iP, and the internet.
- The State ESiNet will operate out of two data centers, one in Columbus and one in Cleveland. Each PSAP will be responsible for providing their connections to the ESiNet. Calls will come into the data centers and be routed to the PSAP Customer Premise Equipment (CPE) to the Dispatcher. Some PSAPs will connect their workstations directly to the State with them acting as a 9-1-1 cloud to the smaller PSAPs.

How does 9-1-1 work – The New Way. “The” Ohio ESiNET - NG9-1-1

- The “Net” part of the Ohio ESiNet will be based on Ohio Academic Resources Network (OARNET). OARNET will provide all connectivity between the two data centers and to “meet points” where PSAPs will have their last mile fiber provider connect to the OARNET nodes.
- Video/photo capabilities will be implemented as standards are adopted and implemented.
- Many third-party services have built around this limitation and developed their own applications to fill the current multi-media void.

9-1-1 NextGen call routing



9-1-1 is ringing!

- A 9-1-1 call aggregator will collect all 9-1-1 calls from the various phone companies and deliver them to the ESiNet over several of the OARNET Nodes across the State.
- The State will process the call at one of the two data centers, determine the correct PSAP the call should be sent to, and route the call to the PSAP.
- The PSAP answers the call and pulls the phone number and location information into their Computer Aided Dispatch (CAD) system.
- The CAD system uses a Geographic Information System (GIS) map to determine who gets sent to the emergency.
- The CAD system uses map layers, one each for Police, Fire, EMS, Water, Electricity, Gas, etc.

9-1-1 is ringing! *Continued*

- Once the call for service has been assigned a “call type” *such as* structure fire, auto accident, etc. CAD drills down in the layers to find what agencies to recommend be sent to the incident based on location and a “run card” (a dynamic response plan) created by the police and fire.
- The “run card” says for this type of incident, say an automobile accident, send an engine, a medic, and a police unit. For a structure fire it may say send three engines, two ladder trucks, a medic, and two police units.

FCC - No Single Points of Failure

- Each year, anyone that processes and transports 9-1-1 calls are required to register and verify with the FCC they have no single points of failure, redundant power supplies and reporting systems to notify PSAPs when they know of a 9-1-1 outage.
- Using a single provider for your network connectivity is a single point of failure. In Ohio, the single core transport will be via OARNet. (Ohio Academic Resources Network).
- The legacy 9-1-1 network was regional and was very expensive to build circuits between central offices. As a result, circuits were limited and easily filled with heavy calling. NG9-1-1 is more national as LECs can consolidate efforts between states over diverse internet protocol networks. It is much easier and less expensive to roll over to other circuits to mitigate circuit busies or outages.
- Warren County asks our providers to certify our circuits are diverse and redundant each September after the FCC due date for their certification.

Other 9-1-1 details – Cyber Security, the 9-1-1 VENDORS PERSPECTIVE

- They are a closed network so they cannot be affected.
- They have no Endpoint Detection and Response (EDR) on answering positions because EDR could make the workstation unstable and drop a 9-1-1 call.
- They don't have EDR on servers because they don't need it.
- Windows updates may break their applications.
- If you ask them about cyber security, you the get the deer in headlights look.
- All they can tell you is it costs extra but they can't tell you what it does, is, or how it works.

Other 9-1-1 details – Cyber Security, How are the vendors vulnerable?

- By connecting to the internet, cell networks, and foreign networks the 9-1-1 system will be opened up to new threats it never had to deal with before.
- Most vendors have many PSAPs connected to them. Once free in the network the bad actors could take down hundreds of PSAPs simultaneously.
- Configurations of workstations are generally copied from workstation to workstation using the machines as the only copies. They are not typically backed up off site.
- Server configurations are similarly kept on the local servers with no off-site backups.
- They use VPNs to access the systems for remote support.

Other 9-1-1 details – Why you should worry!

- More than likely your 9-1-1 network is tied directly into your Computer Aided Dispatch (CAD) system.
- Quite likely 9-1-1 is tied to your administrative phone lines and are on the local area network (LAN) for dial tone so they can call extensions in their local government, be it the Sheriffs Office, City, Village, Township, or County and most likely, it is a Voice over Internet Protocol (VOIP) system.
- Chances are, your CAD system is also tied into your Law and Fire Records Management System (FRMS) and depending on how you print and fax, your office network as well.



Summary – 911

- 9-1-1 is just a 3-digit number to reach emergency services over dedicated circuits.
- A 9-1-1 call brings with it the calling number and caller location.
- The number and location is pulled automatically into the Computer Aided Dispatch System to find who and what type of help to send.
- The reliability in the network and the tools in place to expedite first responders arriving quickly often means the difference between a good or bad outcome.
- Everyone that calls is likely having the worst day in their life.
- The Dispatchers have to hear things no one should ever have to endure.
- By adding computers and IP networks over dedicated appliances, security and redundancy are more important than ever!
- Consider Microwave for circuit diversity.

Summary – 911 Cyber Security & Redundancy

- Don't be afraid to ask your Local Telephone Provider for information on 911 Diversity! Make them show you how your circuits are routed.
- Ask your 911 equipment vendor how they protect the system from a cyber attack. Do they have EDR? How often do they patch?
- Did you buy enough equipment so when they do patch your not down during the updates? If you "cheaped out" they may have to take you down to patch.
- Make sure you have firewalls between all your systems. Ask your vendor for a network diagram.
- Are all of your 911 workstations on the same network switch? What if it fails? What if it needs patched?
- Test your redundant equipment and circuits. Work with your vendor to develop a test plan so no single point goes without routine testing.
- Ask your vendor who is liable if the system gets hacked and someone dies? They become a lot more invested in cyber when you ask the hard questions!
- Do you have more than one power source? Is the system split between them?



Thank you!

Questions?

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