Good morning! My name is Curt Bartholomew and I serve in the FCC's Public Safety and Homeland Security Bureau as its new Senior Emergency Manager.

I would like to thank the Dayton Hamvention organizers and volunteers for setting up this forum.

You may have attended the other FCC forum yesterday with Bill Cross and Laura Smith regarding enforcement of the FCC rules. My role at the FCC involves Public Safety, Homeland Security, and Emergency Management. While we do assist the Enforcement Bureau when asked, those activities are not our primary focus.

I am very pleased to be here and happy to have this chance to discuss with you the serious side of Amateur Radio – *Emergency Communications* – and our role in it, as Amateur Radio Operators.

I chose the title of this presentation because some folks have expressed concern by asking whether or not we are still needed. This presentation hopes to clearly answer that question and much more. Do we have a utility problem? Do we have a perception problem? Will a rulemaking help? Will enforcement solve all our challenges? These are some of the questions that are in need of an action plan. Recent positive publicity has given us a window of opportunity – we should seize it and capitalize on it.

I'm sure you are asking yourself: "Who is this guy? And why did I skip the other forums, vendors, and other activities to come here?" And you're right to ask that question.

During the past decade, I have served in senior emergency management positions at the Department of Homeland Security's Office of Intelligence and at FEMA HQ's National Security Division. I also served as an expert on Continuity of Operations and Continuity of Government.

In 2002, I researched and authored the 50-page FEMA Emergency Communications Accreditation Program for Amateur Radio training, whose funding was removed in 2004 to pay for a cost overrun in another program.

In the nineties, I deployed several times as a supervisory federal police officer supporting FEMA disaster relief deployments, spent a year as a Radio Shack store manager, and retired from the US Army in 1993 as a decorated combat veteran and senior intelligence officer.

First licensed in 1970, I have served as a volunteer examiner since 1984 for both W5YI and the ARRL, and as a MARS operator in Germany while serving as a Company Commander.

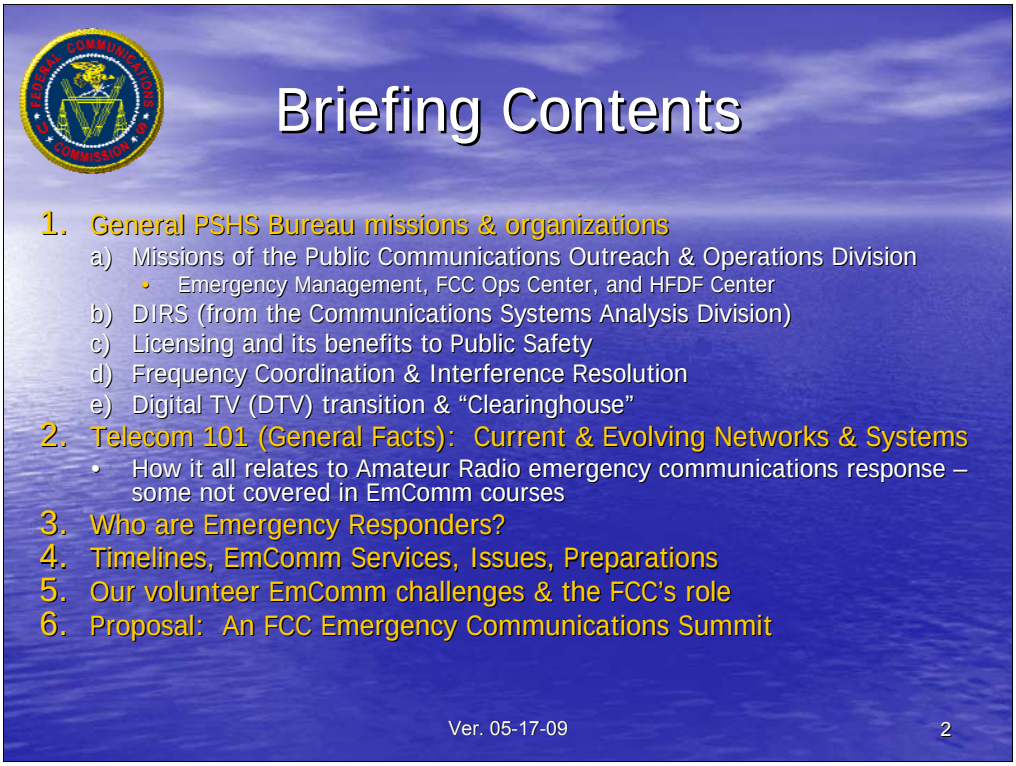
I recently served in the ARES service as Assistant Section Manager for Northern Virginia and Virginia District 4 Emergency Coordinator.

During the past 4 years I have served as the EC and RO of my county's EmComm team consisting of 52 members.

Last summer, I activated and deployed our EmComm Team in support of the aftermath of a Tornado that hit just a few miles from my house. On May 8th last year, in a matter of minutes, over 100 houses were damaged and 30 were destroyed. Thank goodness we had our Skywarn net up and running and we were able to deploy to support the American Red Cross shelter and the county emergency manager.

Please hold your questions until the end of the slide presentation, because we have many slides to get thru, and I hoping you might forget your question by then. Just kidding. If you're anything like me, you'll need to write your questions down so you don't forget them.

First, for you history buffs, I'm going to show you how the Morse Code <u>really</u> got started (Next Slide).



[Cartoon Deleted] We have several DTV information sheets and forms.

I also brought a few handouts and promotional items specifically for this Dayton presentation for those of you who succeed in surviving this death-by-PowerPoint challenge.

We have an acronym brochure.

We have a "Bart's Basics" brochure.

I have just a few FCC stickers in 3, 5, and 7 inch sizes. [[hold up for the audience to see.]]

We have 2 different bookmarks.

And finally, we have a couple of hundred engraved carabiners that were made just in time for Dayton. It's one of the few promotional items I found that were both useful and affordable, so I paid for them myself.

To answer your question as to why you came here, here is what we would like to cover in this hour.

Although I tried to cut it down, there is a lot of information in this presentation

We are going to talk about the following 5 topics in the order as shown on the slide.

First, the obligatory organization chart and where my new Division fits into Emergency Response.

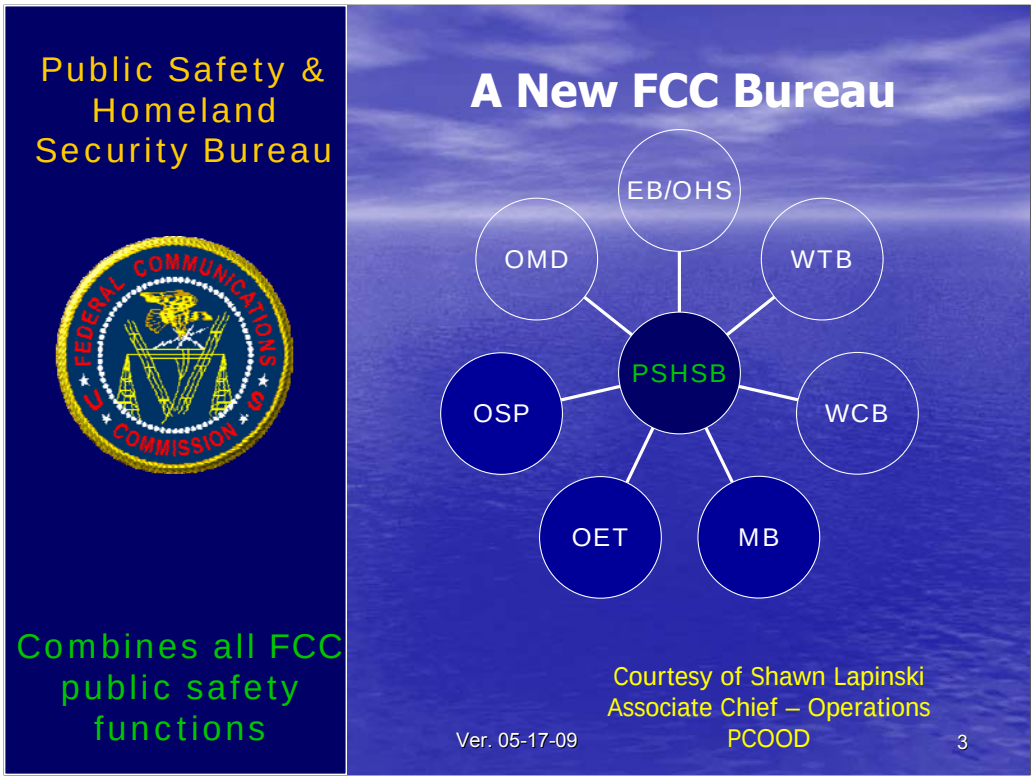
Then we will discuss our missions that are related to disaster and emergency response as they relate to communications outages.

Then, to help us visualize the bigger picture, we will take your thru a quick series of Telecommunications Technology 101 information regarding the various current and future communications networks and systems and where some of their vulnerable points are that become inoperative or are overloaded during emergencies and disasters.

Finally, we will talk a little about timelines, served agencies, the various EmComm services, guidance, issues, preparation for significant events, and, most importantly, what <u>you</u> see as what the Commission's role should be regarding EmComm .

There's quite a bit of acronym soup here, so I have a handout with the acronyms in this briefing in case you need to check them.

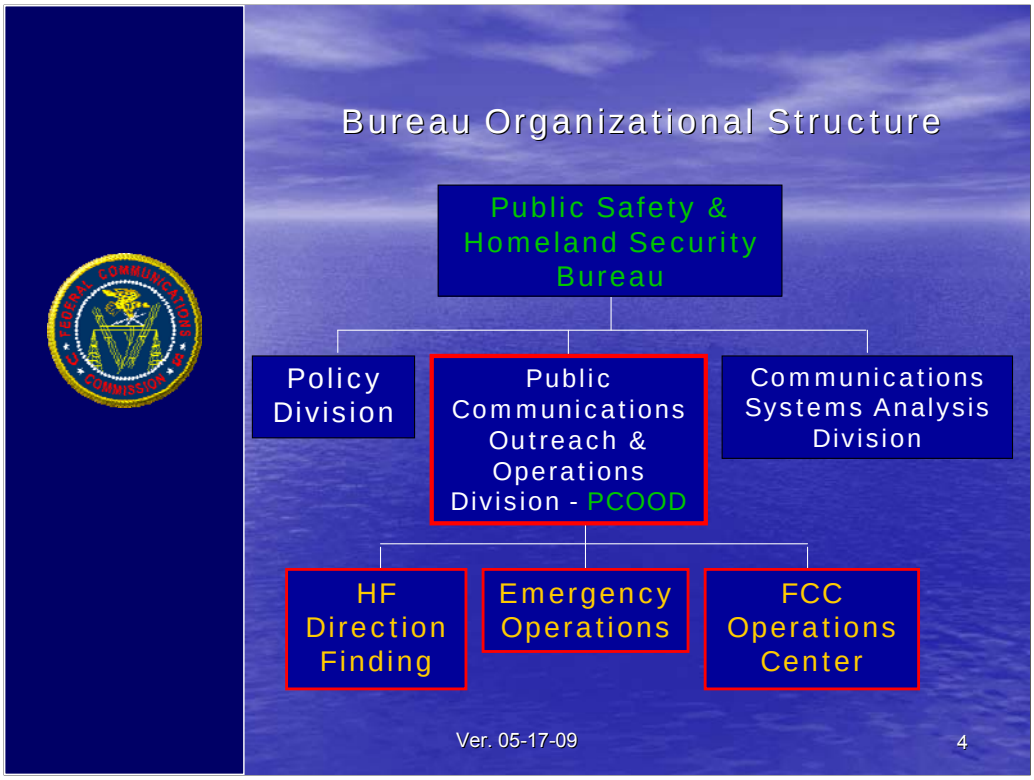
>>JOKE<< Juggler & Highway Patrol traffic stop



The creation of the Public Safety and Homeland Security Bureau advanced Congress's mandate in Section 1 of the Communications Act that the Commission … promote the "safety of life and property" through the use of communications services.

Creation of this new Bureau facilitates an essential Commission role … to ensure a robust and reliable public safety communications system and effective communications during and after emergencies.

In creating the new Bureau, the Commission combined the public safety-related functions of the Enforcement, Wireless, Wireline, and Media Bureaus, and the Offices of Managing Director, Strategic Plans & Policy, and Engineering & Technology, into a single Bureau dedicated to the promotion of reliable communications for public safety and disaster management.



The Bureau consists of three divisions: the Policy Division; the Public Communications Outreach & Operations Division; and the Communications Systems Analysis Division.

Some folks have been wondering – since when has the FCC been calling its licensees during emergencies and disasters?

Local governments do not usually welcome any calls from federal agencies; but in this case, we really are trying to help them.

It started 2 years ago after the formation of the Public Communications Outreach & Operations Division or PCOOD – we are affectionately internally known as the PCOODers. We are a Division of the Public Safety and Homeland Security Bureau, itself also new.

Because the FCC Bureau and Division I work in are just two years old, many of you may be unaware of their existence or what they do.

The Public Communications Outreach & Operations Division (PCOOD) manages and leads the FCC's All Hazards emergency preparedness and response activities.

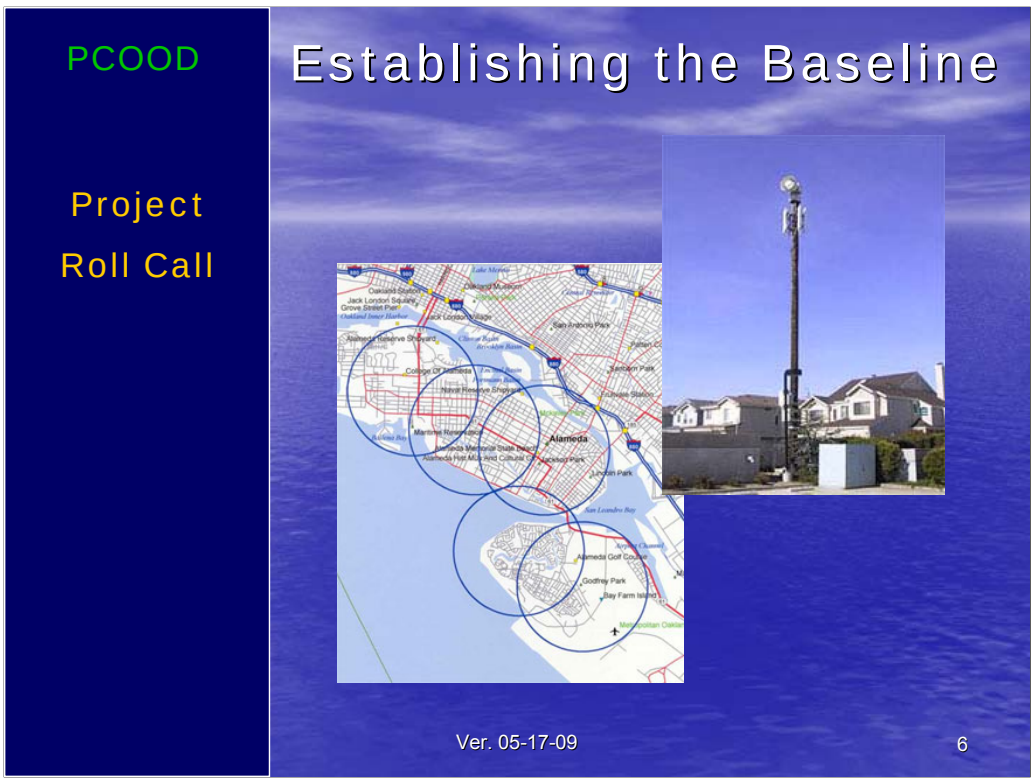
PCOOD operates both the FCC's High Frequency Direction Finding Center (HFDFC) and the FCC Operations Center (FCC-OC), a 24x7 operations watch and reporting center.

PCOOD staff members are subject matter experts in a variety of technical disciplines and deploy to the field to provide assistance to FEMA, state, local, and tribal governments and the public safety community with disaster response and recovery of communications.

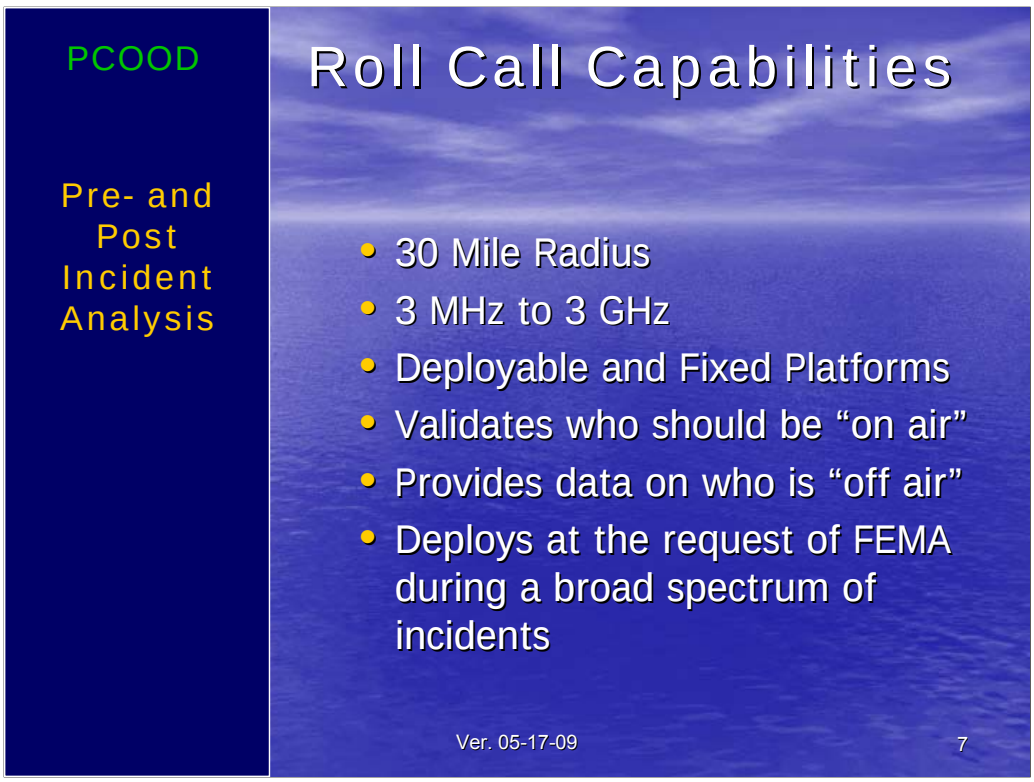
PCOOD provides leadership and support for interagency working groups and intergovernmental coordination, and guides FCC COOP, COG, and Pandemic planning.

Staff members also work with industry and state representatives on the development of state plans for implementation of the Emergency Alert System.

The Bureau's key priorities are: (1) Public Safety; (2) Outreach; (3) Critical Infrastructure; (4) Emergency Preparedness; (5) Emergency Response; and (6) Continuity of Operations/Continuity of Government.



First we establish a baseline, using Project Roll Call, which uses a special type of spectrum analyzer.



Here are some of the Systems Status that we check for during an emergency or disaster:

PSAP

Status of transmission links – bearer channel and ANI/ALI.

Projected restoration time (if applicable)

Wireline

Status of infrastructure to remote electronics level.

Customers affected

Hicap facilities affected, including number of TSP circuits carried.

Blocked calls

Wireless

Status of infrastructure to county level.

Coverage maps.

Broadcast

Status of broadcasting facilities.

CATV

Status of system at head-end level, including powering.

Customers affected

Satellite

Status of earth stations

Give an example of how it is used prior to and during a large emergency or disaster.

PCOOD

Public Safety, Broadcast, and Health Care Licensees

Outreach

- Cross Bureau Involvement
  - Television
  - Cable
  - Radio
- PSHSB Outreach
  - First Responders
  - Hospitals/Trauma Center
- AM/HF Surveillance
  - HFDFC
- Pre Incident
- Post Incident

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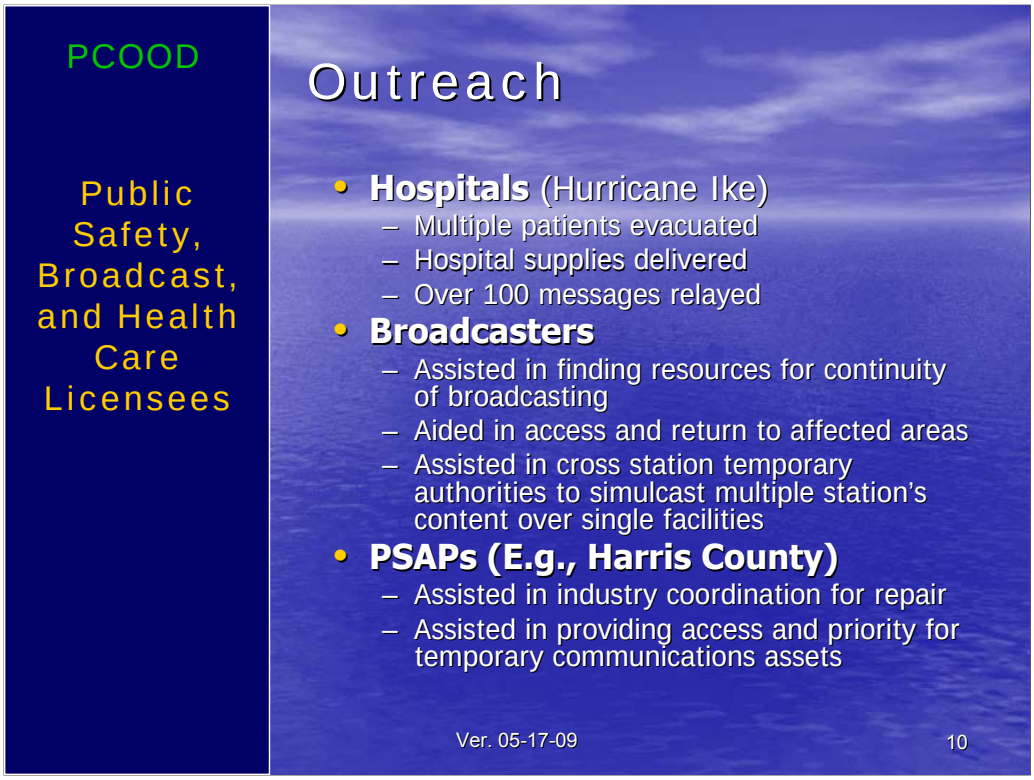


Whether addressing the communications needs of hospitals, ensuring reliability of communications in the event of a pandemic, or encouraging partnerships with state, local, and tribal governments on issues of public safety, the Commission has shown a strong commitment to the promotion of public safety.

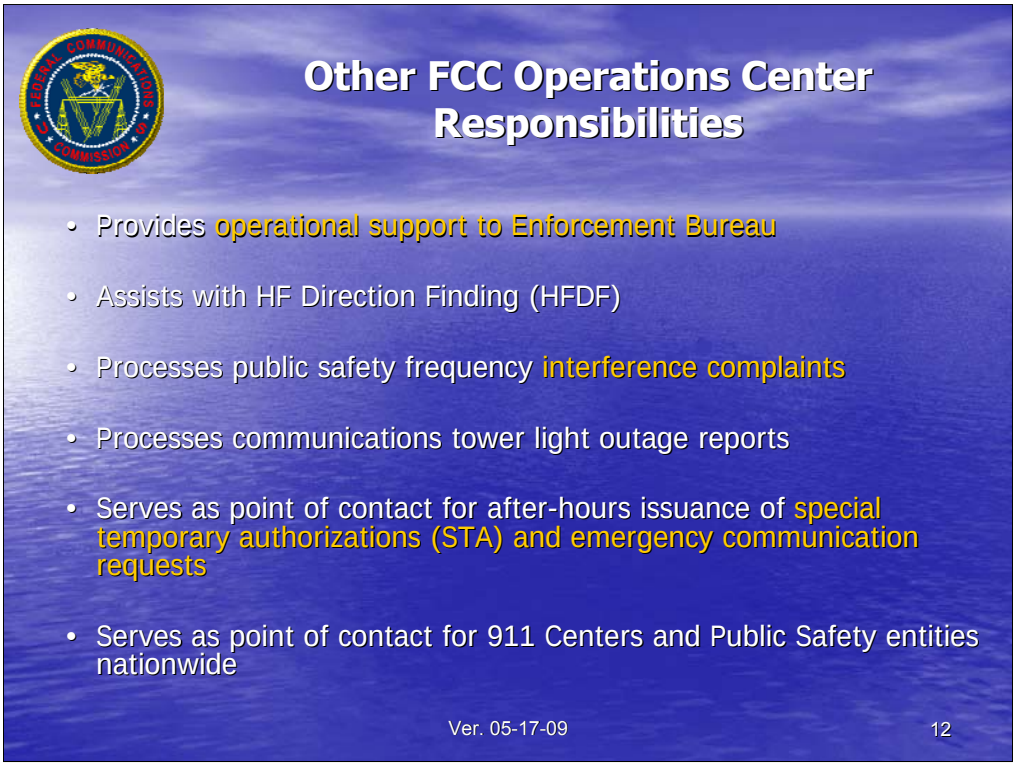
That strong commitment is reflected in the depth and breadth of experience and expertise within the new bureau.

On behalf of the staff of the Public Safety and Homeland Security Bureau, we look forward to working with you and all stakeholders on these important public safety issues.

The Federal Communications Commission's

Operations Center (FCCOC):

- Provides 24-hour situational awareness, information gathering, and interpretation from internal and external agencies, media and licensee reporting.
- Provides expert analysis, assessments and trending for all crisis scenarios that may have Public Safety, National Security, or Emergency Preparedness implications.
- Operates and maintains all required systems in accordance with NCS Directive 3-10, "Minimum Requirements for Continuity Communications Capabilities," July 25, 2007 and NCS Manual 3-10-1, "Guidance for Implementing NCS Directive 3-10," February 26, 2008.
- Serves as the focal point and single point of contact for all secure systems and communications for the commission.

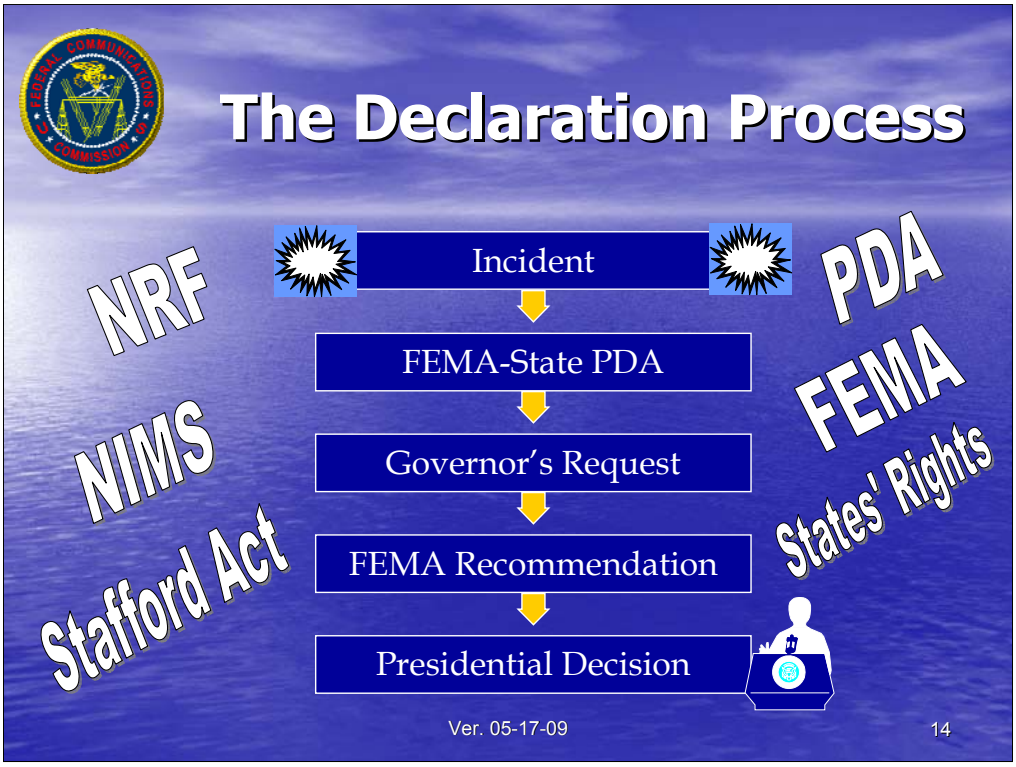


Okay, that was a mouthful. Now what does all this mean to you and where does Amateur Radio EmComm fit in within our Division?

When there is a local emergency involving lost communications for a significant population and period of time, we call the state and local emergency management offices (when we can) to determine the extent of the outages, what we can do to help them get the outages fixed, what we can do to establish a dialogue between the local governments and the licensed communications service providers, and anything else we can do to help coordinate some immediate relief and recovery in coordination with the National Communications System and Office of Emergency Communications at the Department of Homeland Security, the National Technical Information Agency, FEMA, and other agencies. The local requests could include the need for more generator sets, generator fuel, site security for repair crews, Cell [Towers] on Light Trucks (COLTs), Cell [Towers] on Wheels (COWs), Special Temporary Authorizations (STAs), etc.

We will also ask if the local government is receiving any communications support from the local or adjacent town's **Amateur Radio operators** through the RACES, ARES, or other EmComm service programs. In the short time I have been with the FCC, I have already heard some interesting local stories that tell us that the local governments usually call Amateur Radio operators almost immediately when they are suddenly without any electrical power or means of communication, such as the Kentucky example I will mention after we get thru a few more slides.

Some of the missions of the HF DF center are sensitive and will therefore not be discussed in this forum.



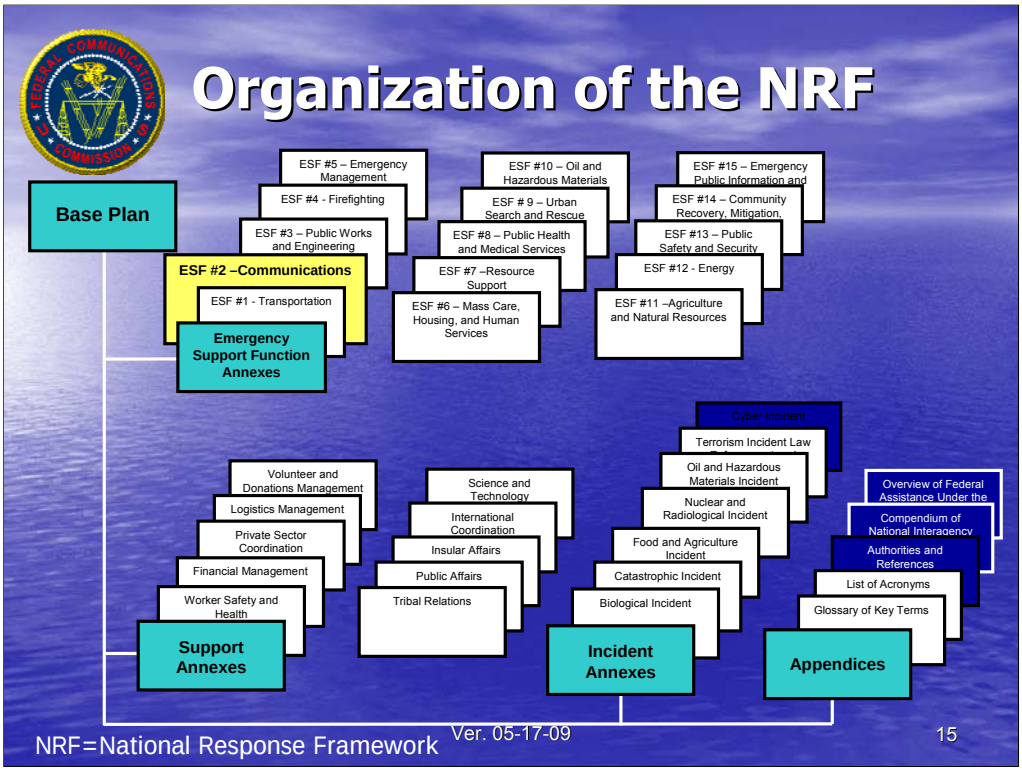
When an incident occurs somewhere in the US, the law and States' Rights prevent the federal government from immediately responding with aide.

A **Presidential Declaration** is needed first.

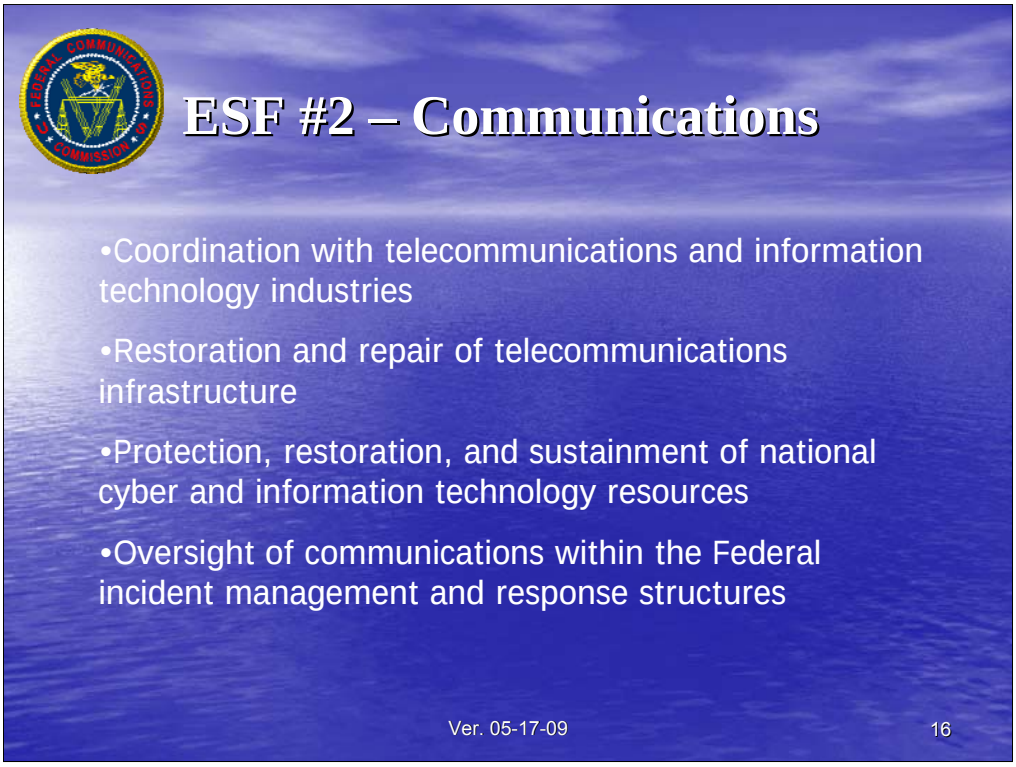
This slide depicts the process, which can take anywhere from a day to several days.

PDA=Preliminary Damage Assessment
==========
[BACKUP]

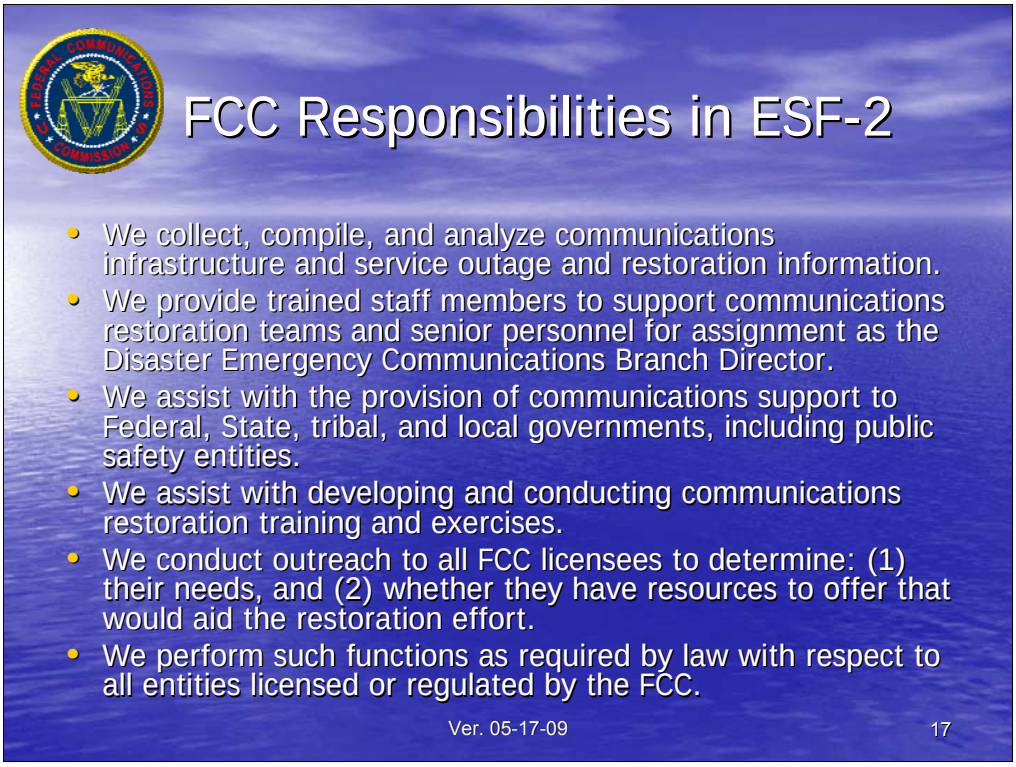
The Preliminary Damage Assessment (PDA) is a joint assessment used to determine the magnitude and impact of an event's damage. A FEMA/State team will usually visit local applicants and view their damage first-hand to assess the scope of damage and estimate repair costs. The State uses the results of the PDA to determine if the situation is beyond the combined capabilities of the State and local resources and to verify the need for supplemental Federal assistance. The PDA also identifies any unmet needs that may require immediate attention.



Here, in yellow, is where the FCC fits in the National Response Framework, under Emergency Support Function 2.



Under the Emergency Support Function 2 of the National Response Framework (NRF/ESF-2), the FCC "provides spectrum management and frequency allocation for the entities it regulates."



So, what are the FCC's specific duties in ESF-2?

Disaster Information Reporting System

Public Safety & Homeland Security Bureau –
Communications Systems Analysis Division

Courtesy of

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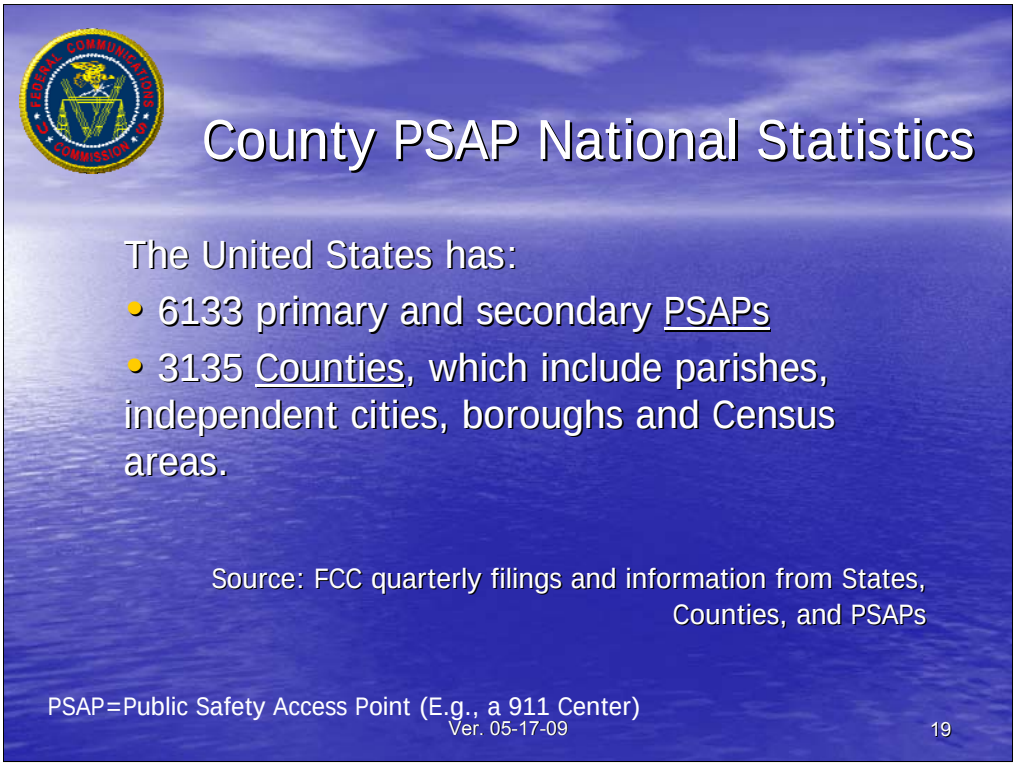

As you can see, we have a lot of counties in the U.S., and even more Public Safety Access Points, which are usually local 911 Centers.

DIRS Outline

- **Background**
  - Why we developed the Disaster Information Reporting System (DIRS)
  - Roles of National Communications Systems (NCS) and the FCC in Disaster Recovery
  - Process Flows
  - Information in DIRS
- **Sample Data Output**
  - Tables
  - Charts
  - Maps

Hurricane Katrina Process

- Carriers reported some equipment failures in Network Outage Reporting System (NORS)
  - Information incomplete
  - Information inconsistent across carriers
- Needed information daily on the status of equipment
- Numerous phone calls to find out information
- Some Information transmitted via e-mails and manually summarized
- Whole process was labor-intensive
- Carriers contacted by numerous agencies and people in the FCC

Why the Disaster Information Reporting System (DIRS) Was Developed

We Need:

- Information on Network Status
- Daily updates
- An automated process
- Consistent data
- The “right” single points-of-contact

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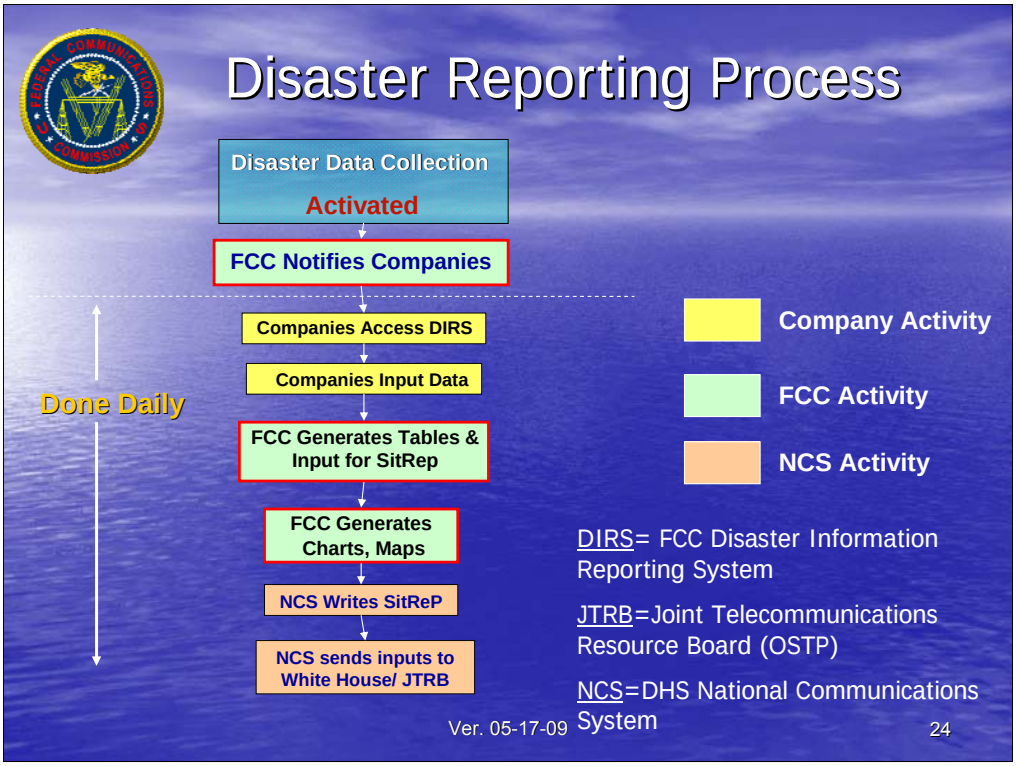
Disaster Recovery & Reporting

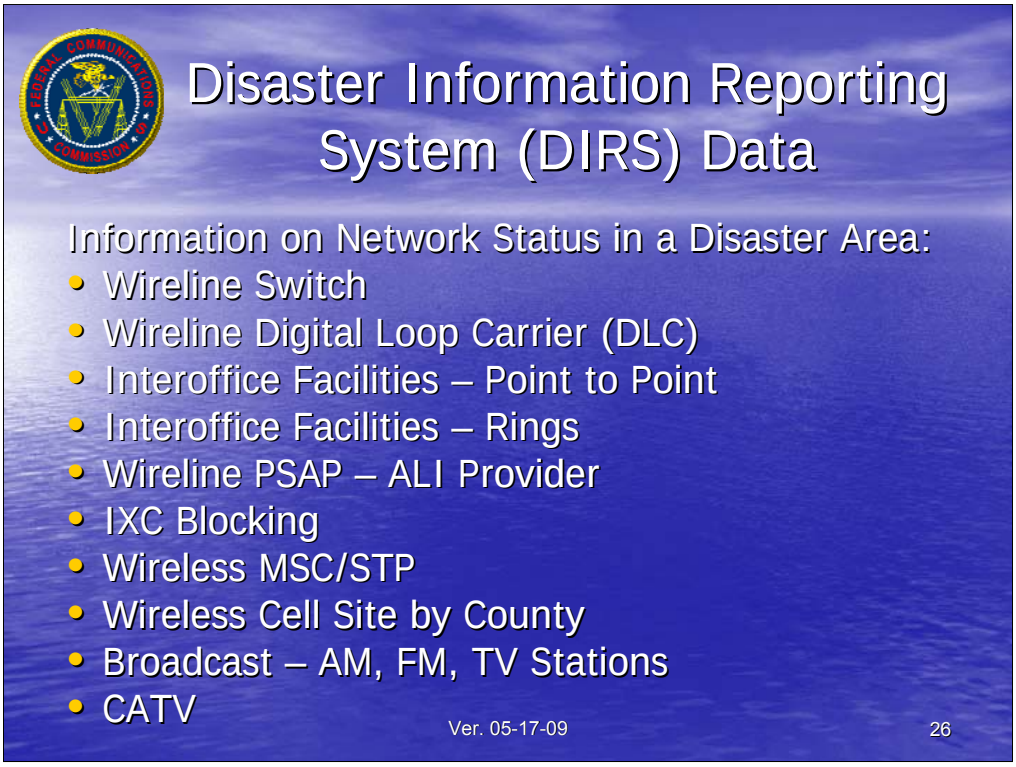
- **National Communications System:**
  - Overall Coordination: Coordinates the planning for and provision of national security and emergency preparedness communications for the Federal government during disasters and emergencies.
- **Federal Communications Commission (FCC):**
  - Situation Awareness Data Collection: Collects network status and restoration information from companies through the Disaster Information Reporting System (DIRS).



During this process, the FCC notifies companies, generates tables, provides Situation Report input, and generates charts and maps.

What Information Does/Will DIRS Have?

- Contact Information (name, phone, etc.)
- Network Status in a Disaster Area



Here is the data we record in the Disaster Information Reporting System.

Next, we'll provide some graphical output examples.

==========

ALI = Automatic Location Identification (database) [returns location information to the PSAP]

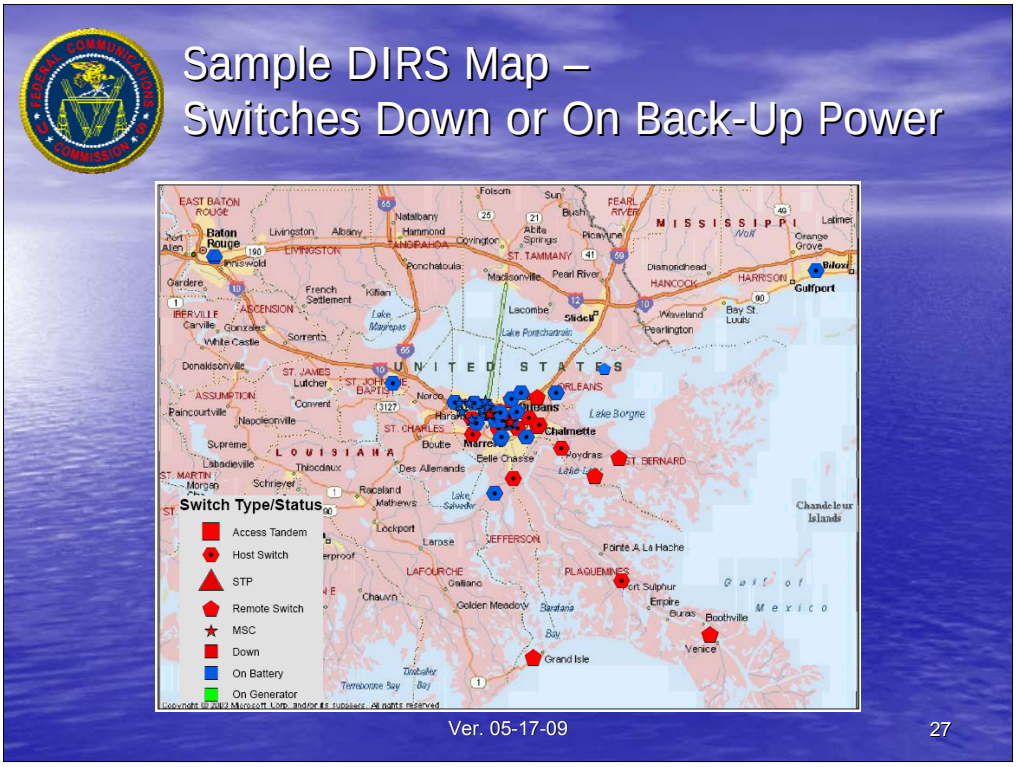
IXC = An **Interexchange Carrier** (IXC) is a U.S. legal and regulatory term for a telecommunications company, commonly called a **long-distance telephone company**, such as MCI (before its absorption by Verizon), Sprint

(before it spun off its IXC services in 2006) and the former AT&T (before its merger with SBC in 2005) in the United States. It is defined as any carrier that provides inter-LATA communication, where a LATA is a local access and transport area.

Wireless MSC/STP = Wireless Mobile Switching Center/Signal Transfer Point

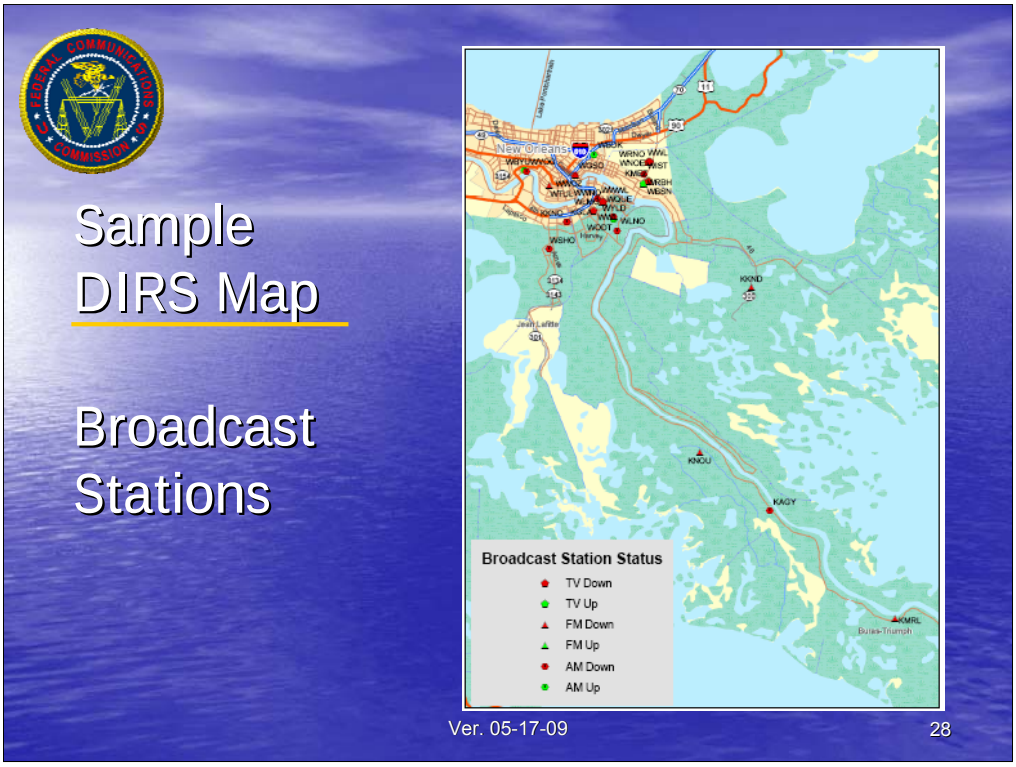
MSC is the primary service delivery node for GSM, responsible for handling voice calls and SMS as well as other services (such as conference calls, FAX and circuit switched data).

GSM (Global System for Mobile communications) is the most popular standard for mobile phones in the world.

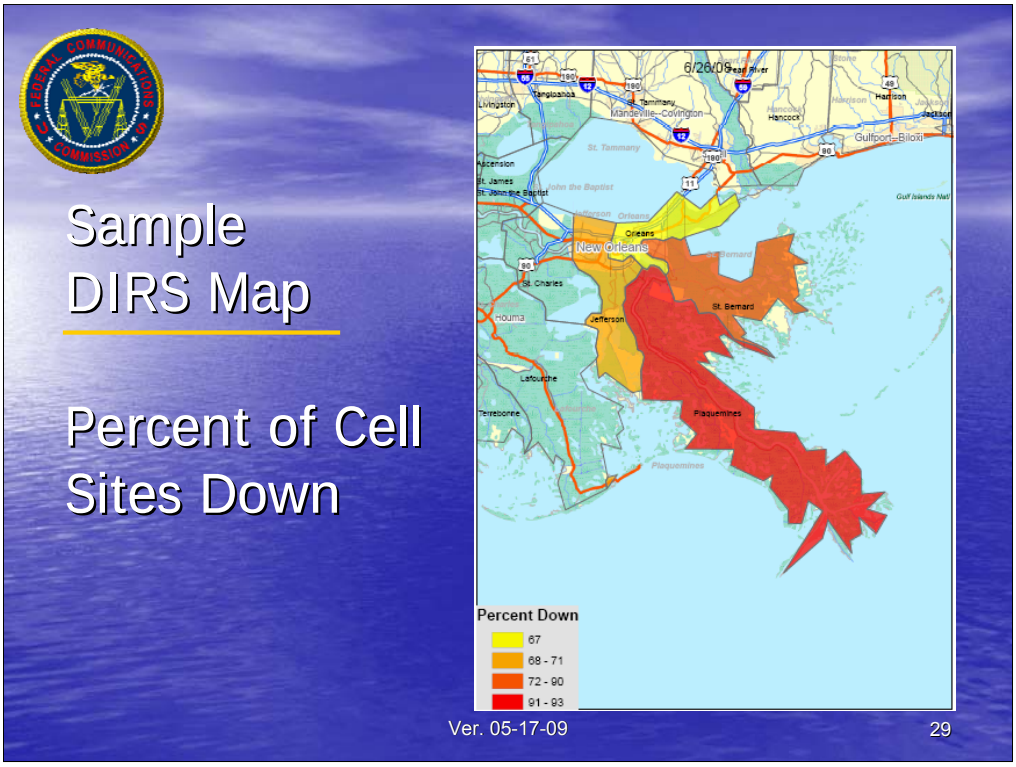


Here's an example of a DIRS map.

This map shows switches that are down or on back-up power.



Here's another example of a DIRS map – this one shows all the broadcast stations in a selected area.

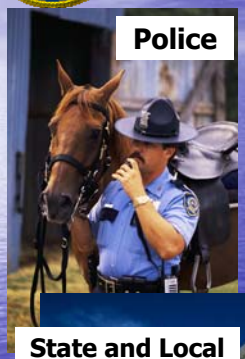


This example shows how many cell sites are down in an area.

Next, we will talk about licensing and its benefits to Public Safety.

Then we will identify who the Public Safety Licensees are.

Traditional Public Safety Licensees



Other Public Safety Licensees under rule section 90.20

- Forestry-Conservation activities
- Rescue Organizations
- Organizations that engage in medical services
- Hospitals that offer services beyond 24 hrs
- Physicians
- Schools of Medicine
- Persons with disabilities
- Veterinarians
- Disaster Relief Organizations
- School Buses
- Beach Patrols
- Persons or organizations maintaining establishments in isolated areas

Benefits of Licensing

- Protect frequency from potential co-channel and adjacent channel interference
- Interoperability
- Coordinate with Federal government
- Coordinate frequency in accordance with agreements with Canada and Mexico
- Mandate new technology such as 700 MHz and narrowbanding below 512 MHz.

Now we will briefly talk about frequency coordination and interference resolution.

Public Safety Frequency Coordinators

APCO **IMSA** **FCCA** **AASHTO**

- **Association of Public Safety Communications Officials, Inc.**
- **International Municipal Signal Association**
- **Forestry Conservation Communications Association**
- **American Association of State Highway and Transportation Officials**

All Four Coordinators are members of the Land Mobile Communications Council (LMCC)

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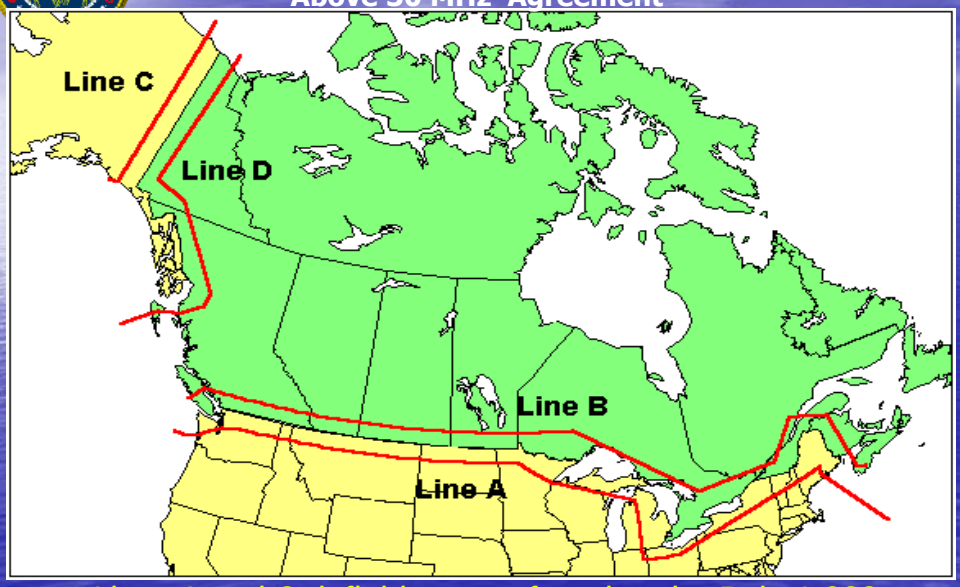
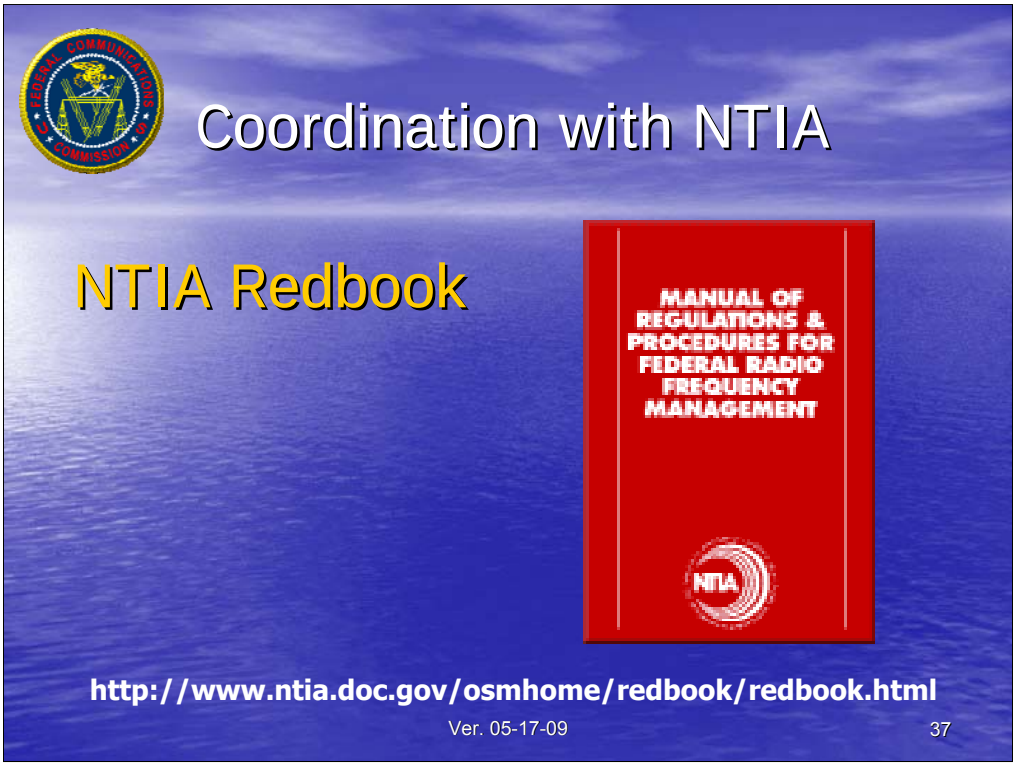
Coordination with Canada

Above 30 MHz Agreement



Lines A and C definitions are found under Rule 1.928.



We coordinate with the National Technical Information Agency.

The NTIA Redbook's real name is the Manual of Regulations & Procedures for Federal Radio Frequency Management.

You can find the manual online at the link on the slide.

Some Federal Frequencies that FCC Public Safety coordinates with NTIA

- 173.075 MHz – Stolen Vehicle Recovery (Lojack)
- Hydrological Frequencies Rule 90.265
- Wireless Microphone Frequencies Rule 90.265
- Federal Interoperable Frequencies
- 4.9 GHz Band for air-to-ground operation

Interference Resolution

Most Common Types of Interference:

- Bad Frequency Coordination
  - Adjacent Channel
  - Co-Channel
- "They are on my channel"
  - All channels below 470 MHz are shared except if granted exclusivity under Rule 90.187
- Unlicensed Operation
  - Operating on expired license and frequency coordinator didn't protect their frequency

This is the goal of evolving systems –- a 9-1-1 system that is accessible from any device, anywhere and anytime.

Current Systems

- Existing emergency communication systems are resilient
- Commercial systems not resilient in face of large scale disasters
- Information Systems supporting emergency response often not interoperable
- A single national backup system not feasible in near term (cost)
- Discrete backup solutions are feasible
- There is increasing Regional and State planning which enhances effectiveness of discrete solutions
- Evolution of both commercial technology and perspective of public safety should create opportunity for interoperable backup communication system

Source: 2008 FCC Study

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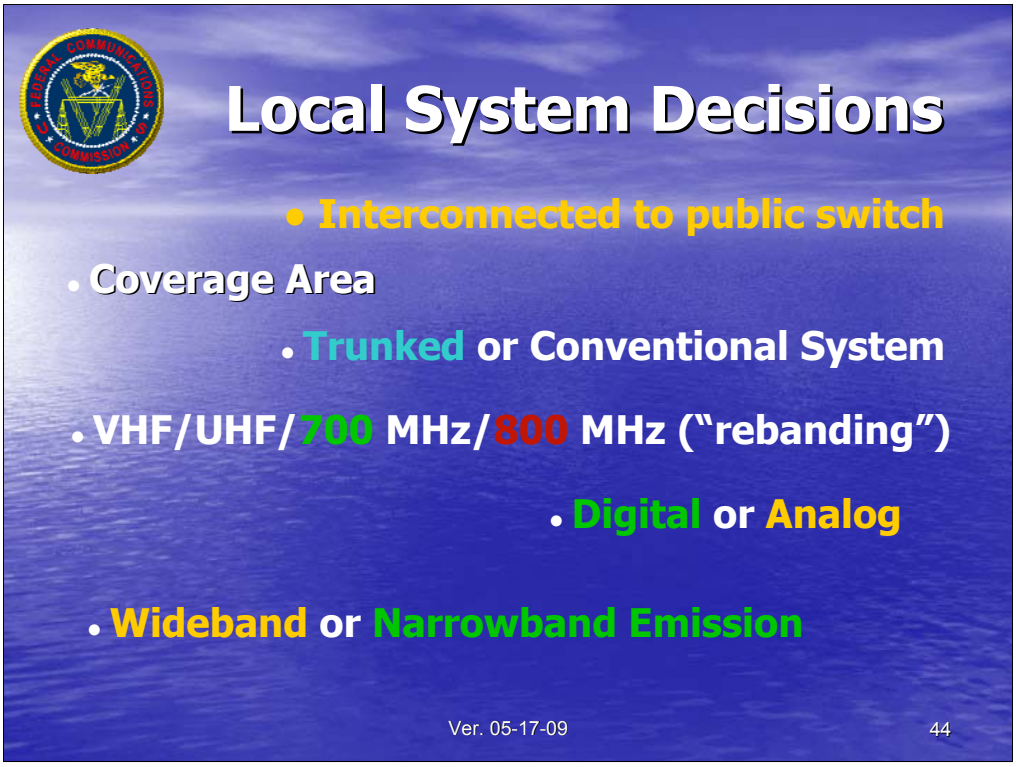
This info came from a 2008 FCC Study.

Within the hierarchy depicted on this slide, you will find that the Amateur Radio Service support is normally centrally coordinated at the State and local EOCs.

Here, the Amateur Radio Service support is considered a Public Safety Enterprise Group.



State and local public safety entities have to determine network design and day-to-day operation based on local factors such as geography, population distribution, public safety capacity needs, existing commercial network deployment, and, of course, cost.

Many Public Safety networks use Internet protocol (IP)-based solutions and consistent technical standards to help them interoperate.

This slide depicts the main technical decision elements considered by local governments when planning their communications systems.

Speaking of decisions, we have a few of our own to make when we respond to help our local governments.

Is your Go-Kit ready?

Do you have a portable HF NVIS antenna?

Will you be using packet radio to support the Red Cross?

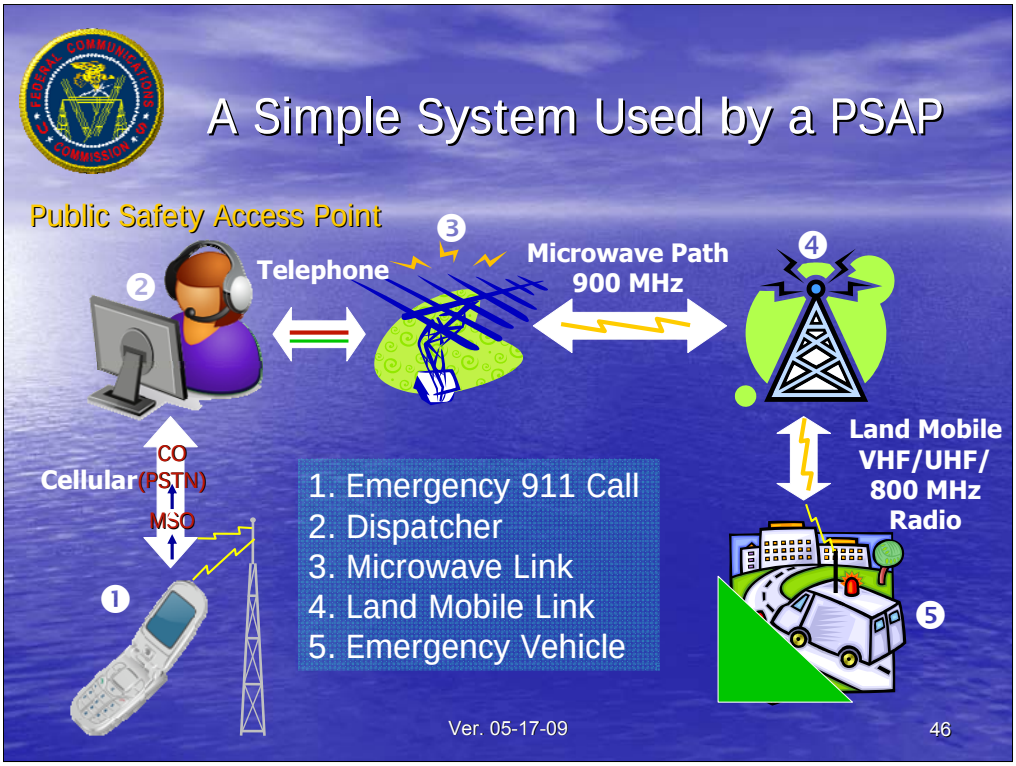
Are you proficient in message and traffic handling?

Are your spare batteries charged?

Do your repeaters have backup power?

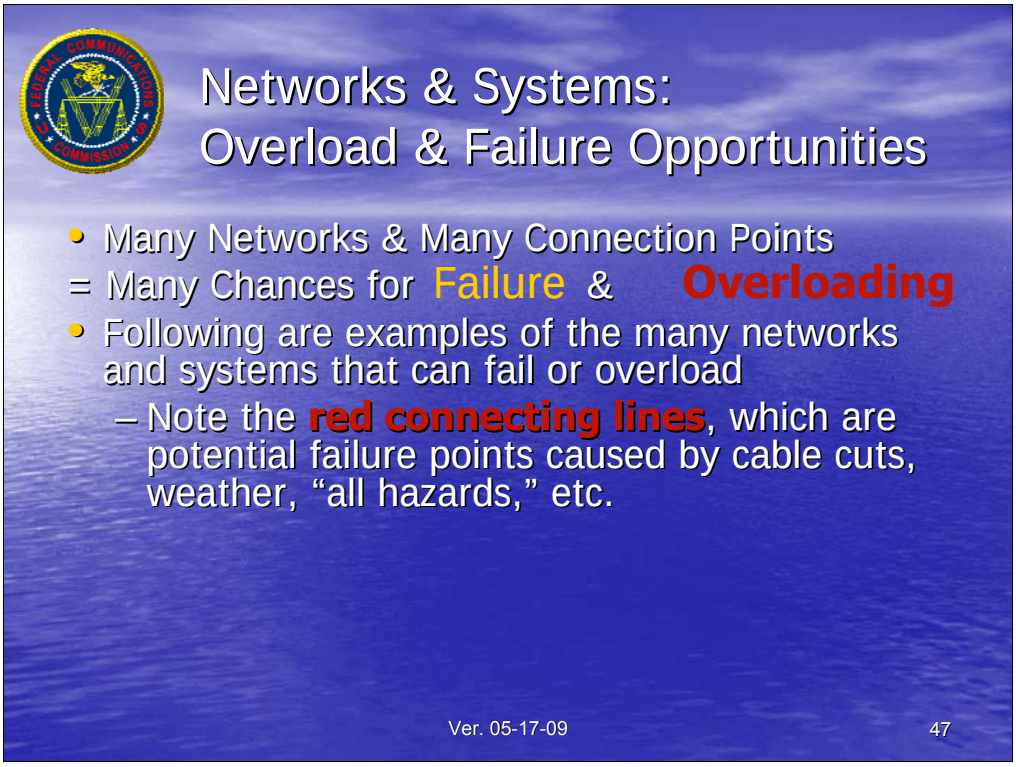
What modes will you be using?

And the list goes on…



Here, you can follow the signal as it goes from the cell phone, thru the Mobile Switch Office, to the Central Office and into the Public Switch Telephone Network, to the 911 Operator.

Then the dispatch signal travels to the First Responder via a microwave path to a repeater which sends the signal to the First Responder's Land Mobile Radio on VHF, UHF, or on 800 MHz.



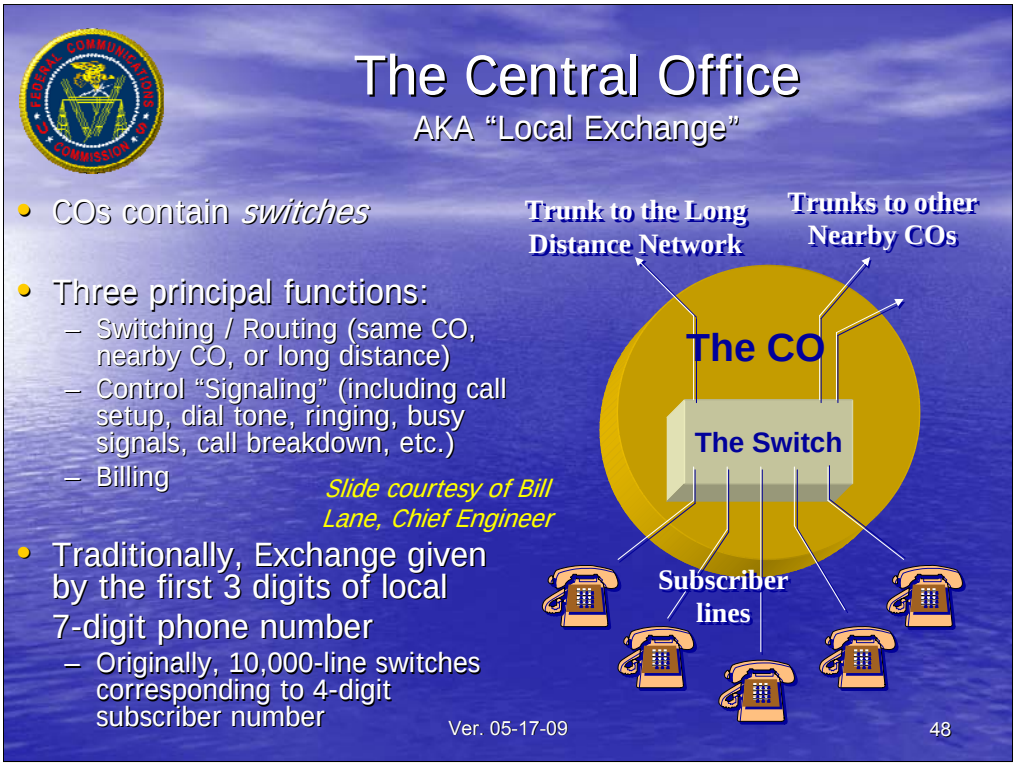
The more you know about your customer and potential customers, the more you will be able to understand their needs and to even advise them when asked.

The next few slides could be considered as a very abbreviated version of Telecommunications Technology 101.

We don't have much time, so we can't spend much time on each slide – it's just an overview to put into perspective the number and types of telecommunications systems that could be resident in your area, and generally where they could be disabled, disconnected, overloaded, or rendered inoperable.

So, I will run thru the next several slides quickly just to give you a big picture of all the system elements and networks that can fail.

The lines colored in red that connect the networks and systems together are particularly vulnerable.

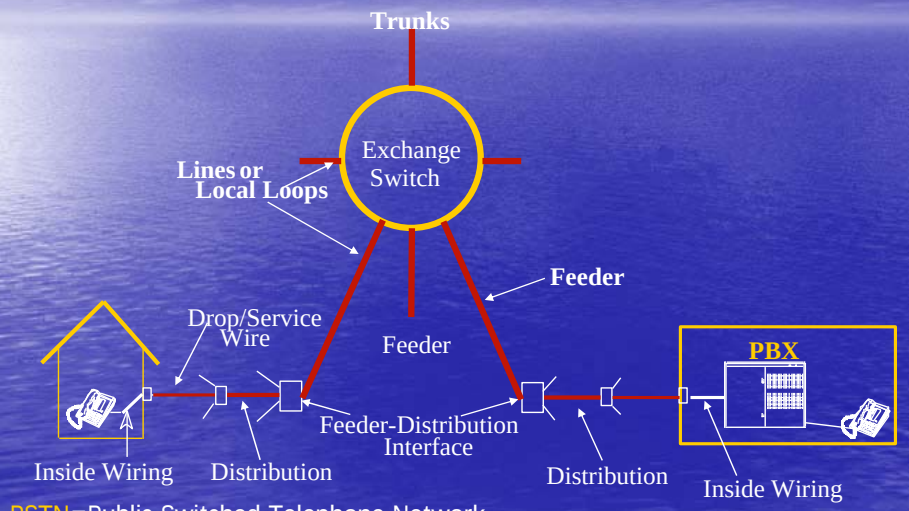


But first, a few definitions.

The Central Office was once called the Dial Central Office, and before that, it was called a switchboard.

The Traditional PSTN

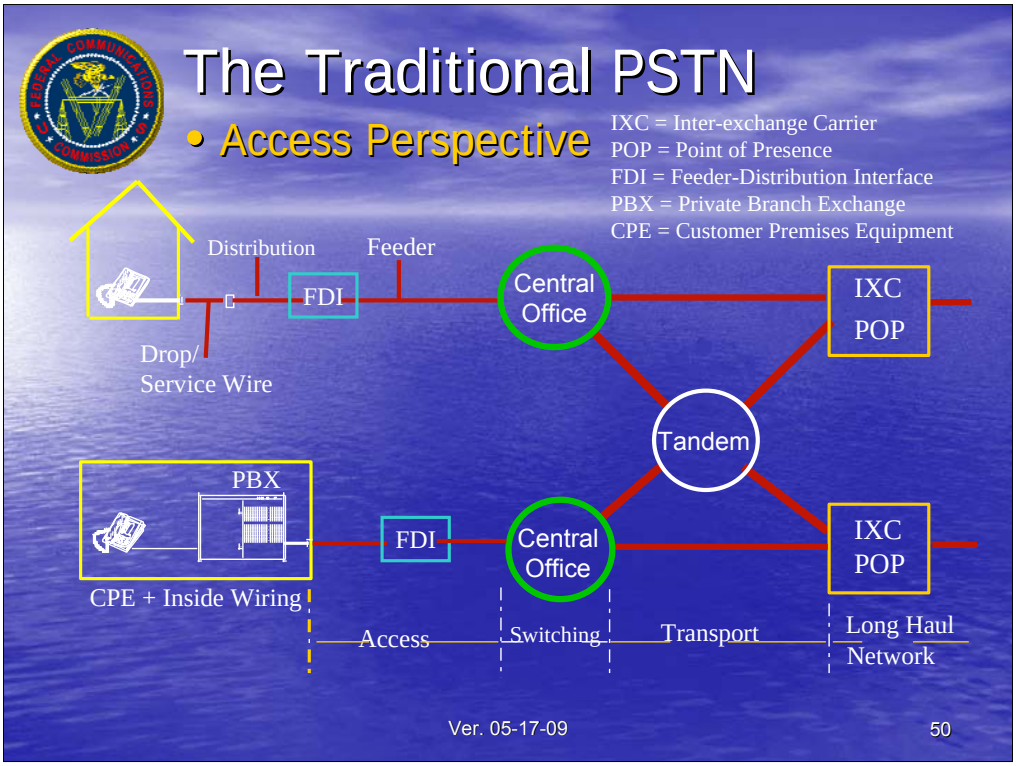
- The Local Exchange Network



PSTN=Public Switched Telephone Network

Ver. 05-17-09

PBX = Private Branch Exchange



IXC = Inter-exchange Carrier

POP = Point of Presence

FDI = Feeder-Distribution Interface

PBX = Private Branch Exchange

CPE = Customer Premises Equipment

Tandem Switch

A telephone central office switch that links telco end offices together and does not connect to the customer directly. Also called a "Class 4 switch" or "TDM switch," a tandem switch is a computer that is specialized for TDM-based, circuit-switched telephone calls. Tandem switches are typically from Lucent and Nortel Networks.

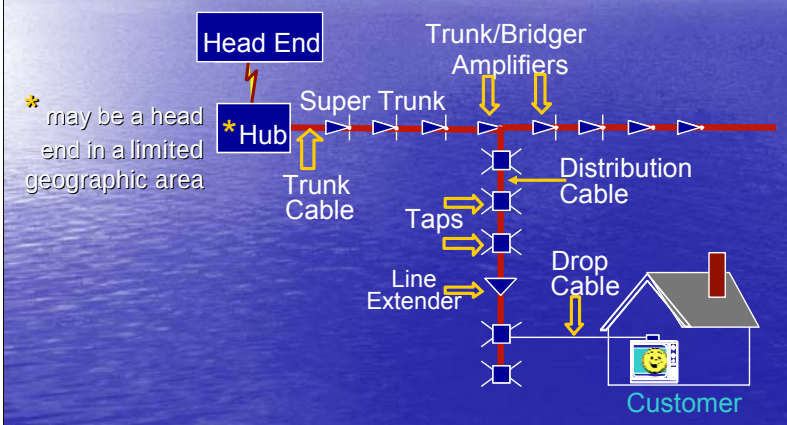
In the past, most of the call recording and billing was handled by tandem switches, also called "toll/tandem switches." Subsequently, such services were taken over by end office switches.

Sector and Access Tandems

A sector tandem switch connects end offices for intraLATA traffic, while an access tandem switch provides the connection between end offices and the POPs for interexchange carriers (IXCs).

In the past, Class 4 tandem switches dealt only with high-speed, four-wire T1, T3 and OC-3 connections in contrast to two-wire local lines on Class 5

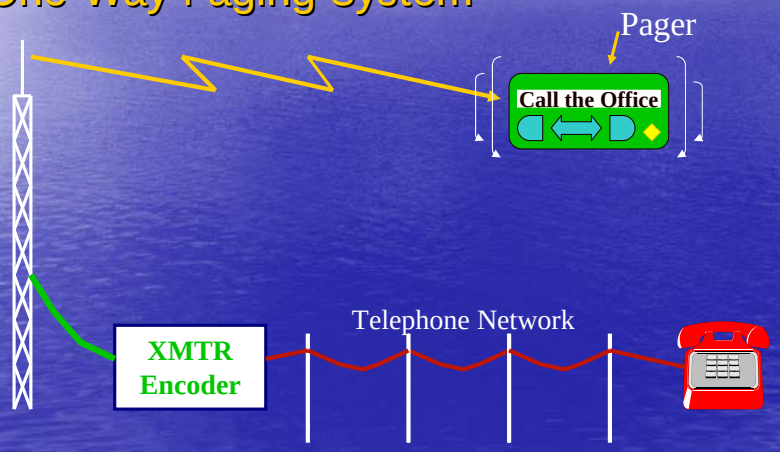
Traditional Cable Television Network



* may be a head end in a limited geographic area

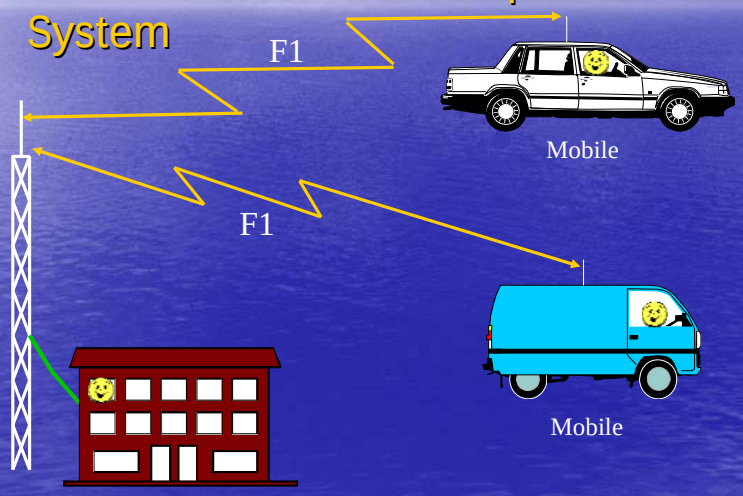
Traditional Wireless Networks

- One-Way Paging System



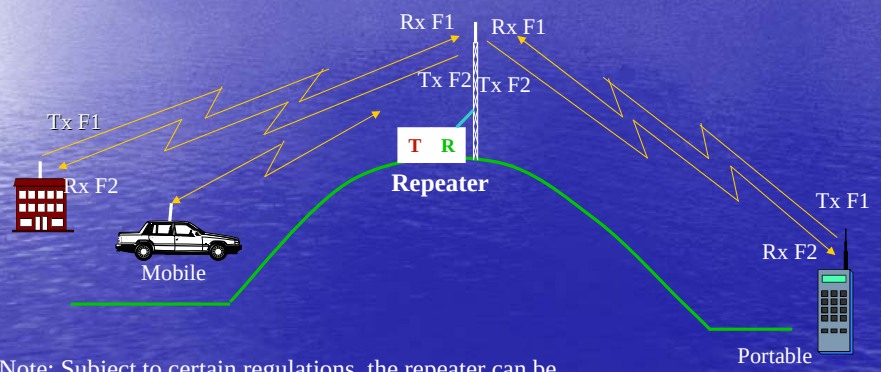
Traditional Wireless Networks

- Conventional Private Dispatch System



Traditional Wireless Networks

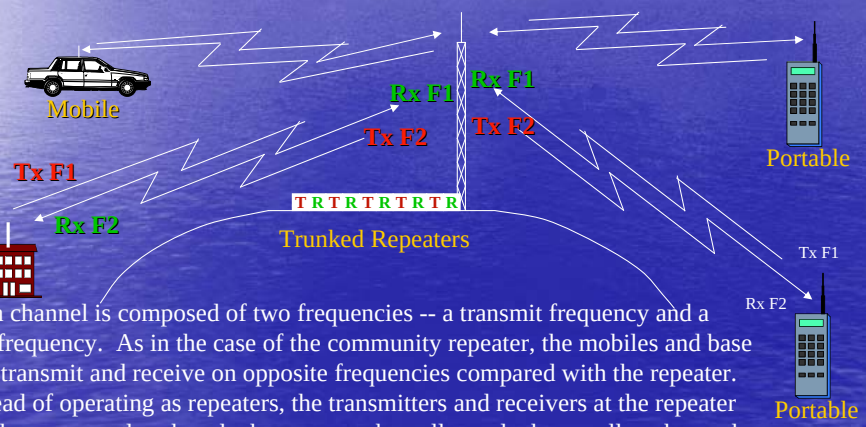
- Community Repeater System



Note: Subject to certain regulations, the repeater can be connected to the public switched telephone network in order for all the mobile units to place and receive telephone calls.

Traditional Wireless Networks

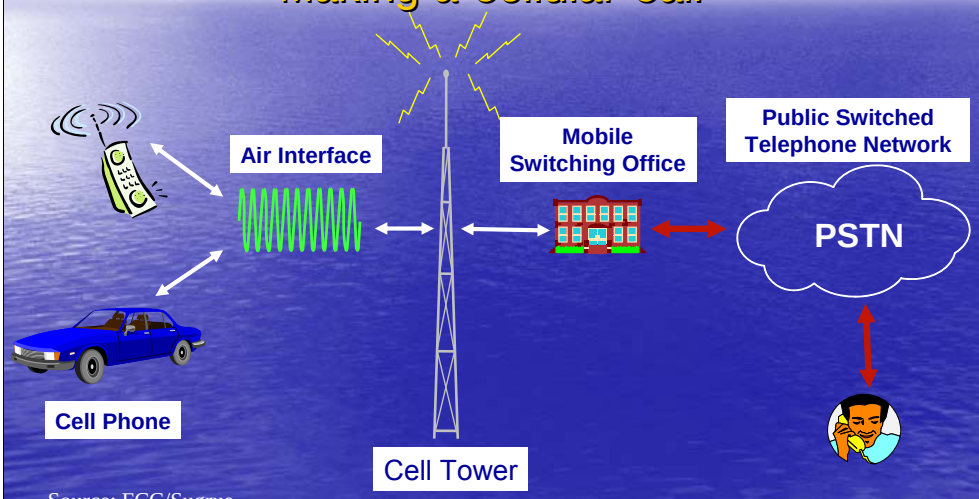
- Trunked Multichannel System



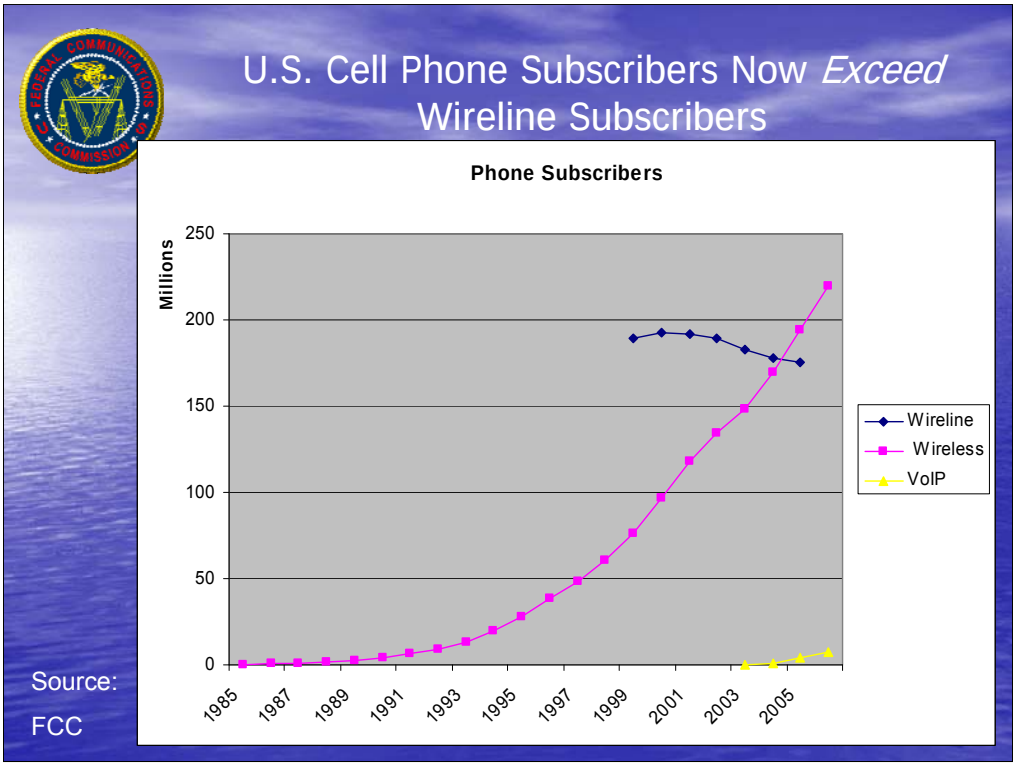
Notes:
(1) Each channel is composed of two frequencies -- a transmit frequency and a receive frequency. As in the case of the community repeater, the mobiles and base stations transmit and receive on opposite frequencies compared with the repeater.
(2) Instead of operating as repeaters, the transmitters and receivers at the repeater site can be connected to the telephone network to allow telephone calls to be made and received. Early (pre-cellular) mobile telephone systems operated in this manner.

Wide Area Networks

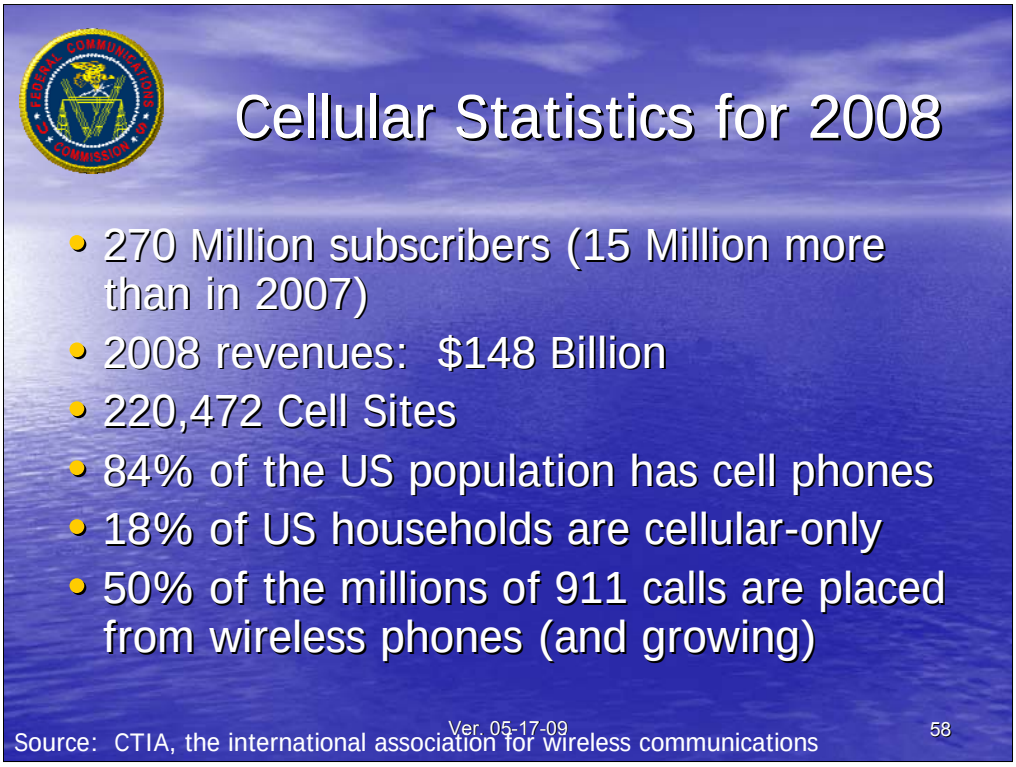
- Making a Cellular Call



Source: FCC/Sugrue



Starting in 2004, cell phone subscribers have exceeded landline subscribers.



As a nation, we are becoming increasingly dependent upon cell phones.

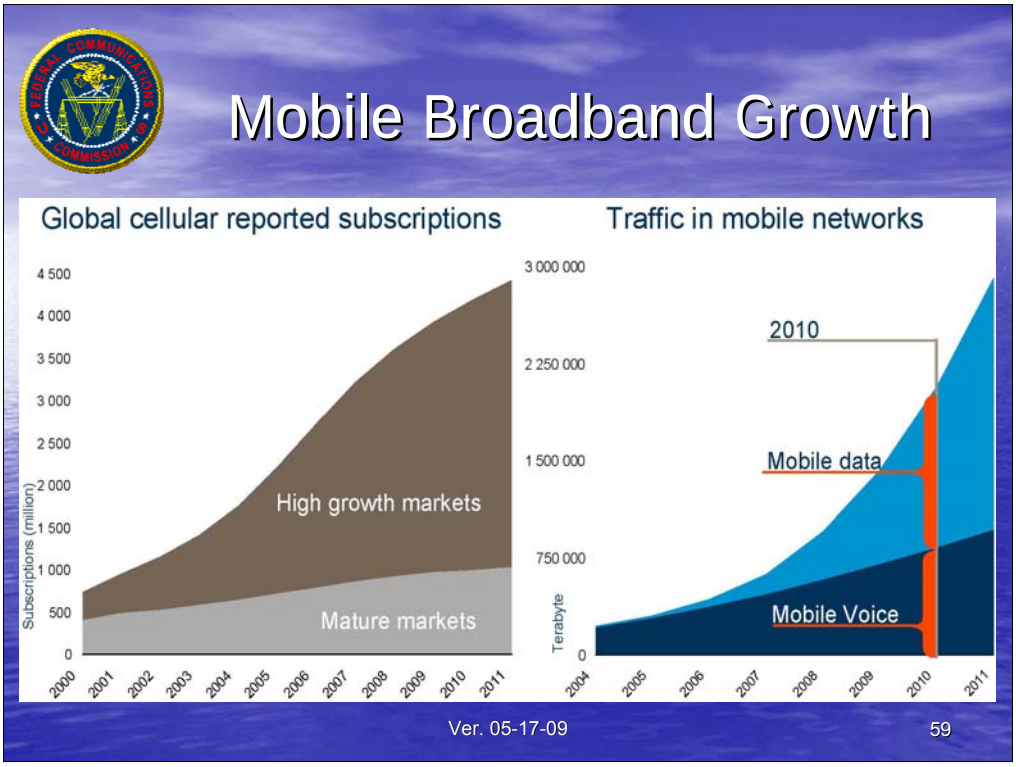
What do you think the effect is when cell towers get overloaded or break down?

Can you see why the cellular providers are clamoring for more spectrum?

According to CTIA, the international association for wireless communications, as of the end of last year, carriers had more than 270 million subscribers - an increase of 15 million from 2007. CTIA also said that providers saw annual revenues reach $148 billion last year.

There are over 220,472 cell sites. 84% of US population has cell phones. 18% of US households are cellular-only.

50 per cent of the millions of 911 calls received by Public Safety are placed from wireless phones, and that percentage is growing. (Source: *Dayton Daily News*, DaytonDailyNews.com, March 28, 2009, Jim DeBrosse, Staff Writer)



Cellular companies have been clamoring for more spectrum during the past few years as the number of cell phone subscribers has skyrocketed.

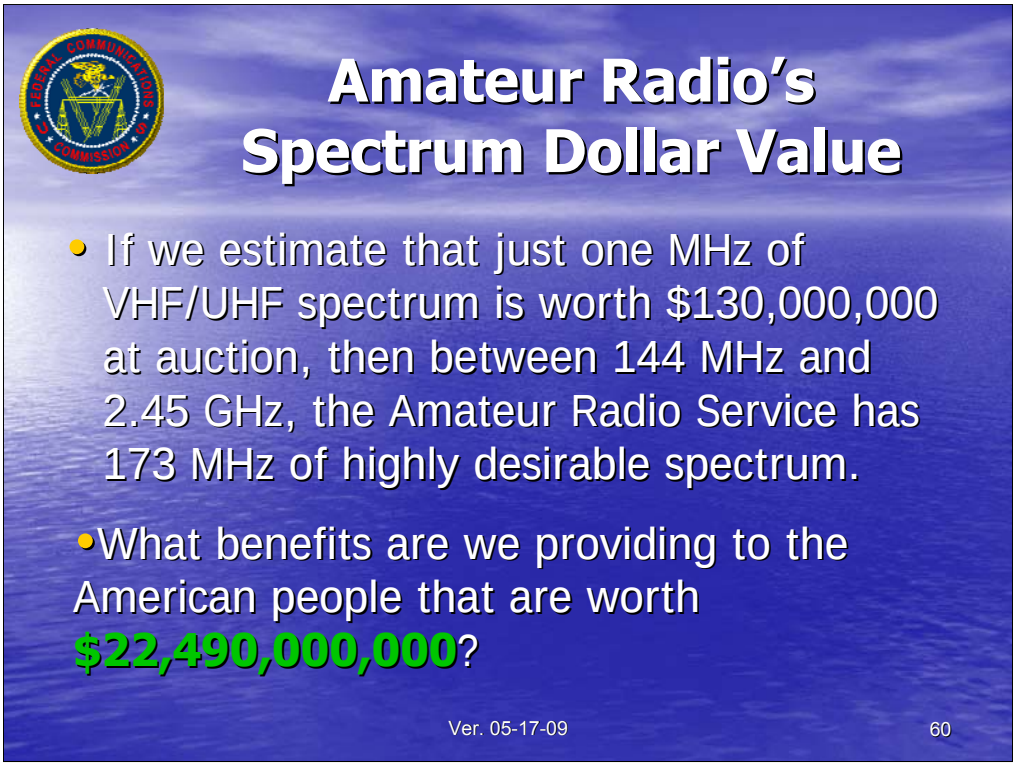
They are looking everywhere for it.

Guess what's included in "everywhere?"

You guessed it. The Amateur Radio spectrum.

Here, you see that there are about 3 ½ Billion cell phone subscribers worldwide, going to 4 ½ Billion in just 2 more years.

Add to that figure the high mobile data growth, which has doubled in the past 2 years, and you can see why they want more spectrum.



Let's take a look at our very valuable Amateur Radio spectrum.

Are we making the most use of our prime radio real estate?

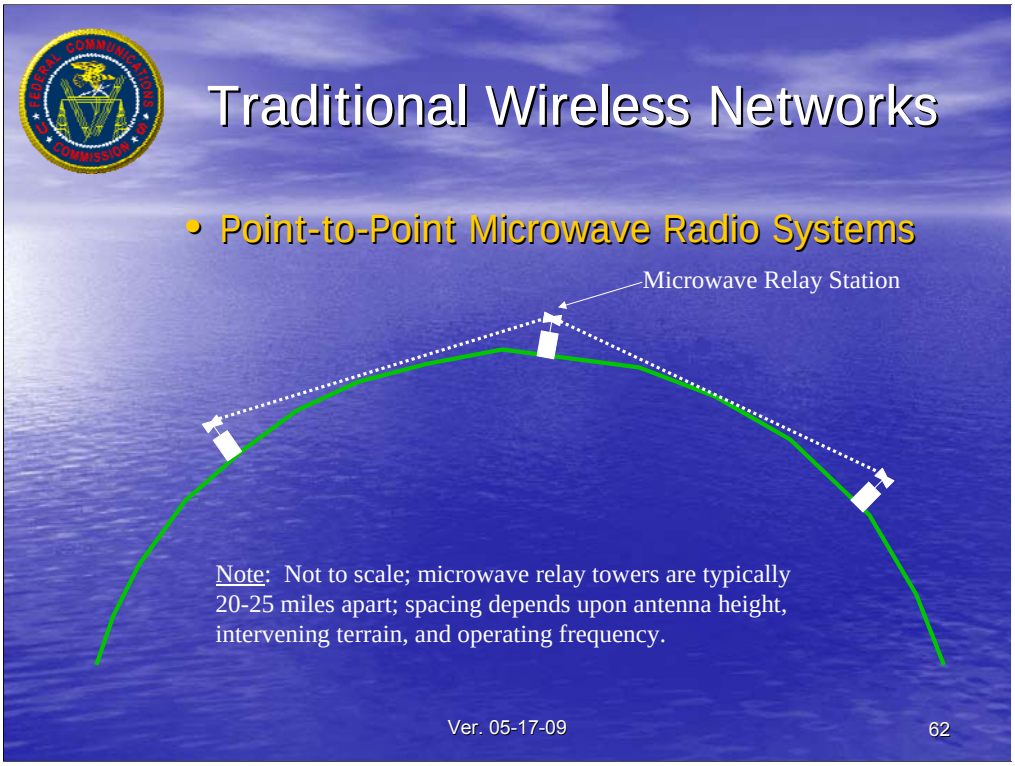
I realize the last 2 slides imply that we may lose this spectrum someday.

The point I am making here is that we need to continue to be good guardians of our free spectrum.

And we must continue to show that we still deserve it.

What is the <u>best</u> way to show that?

The best way to show that is thru our public service and emergency communications.



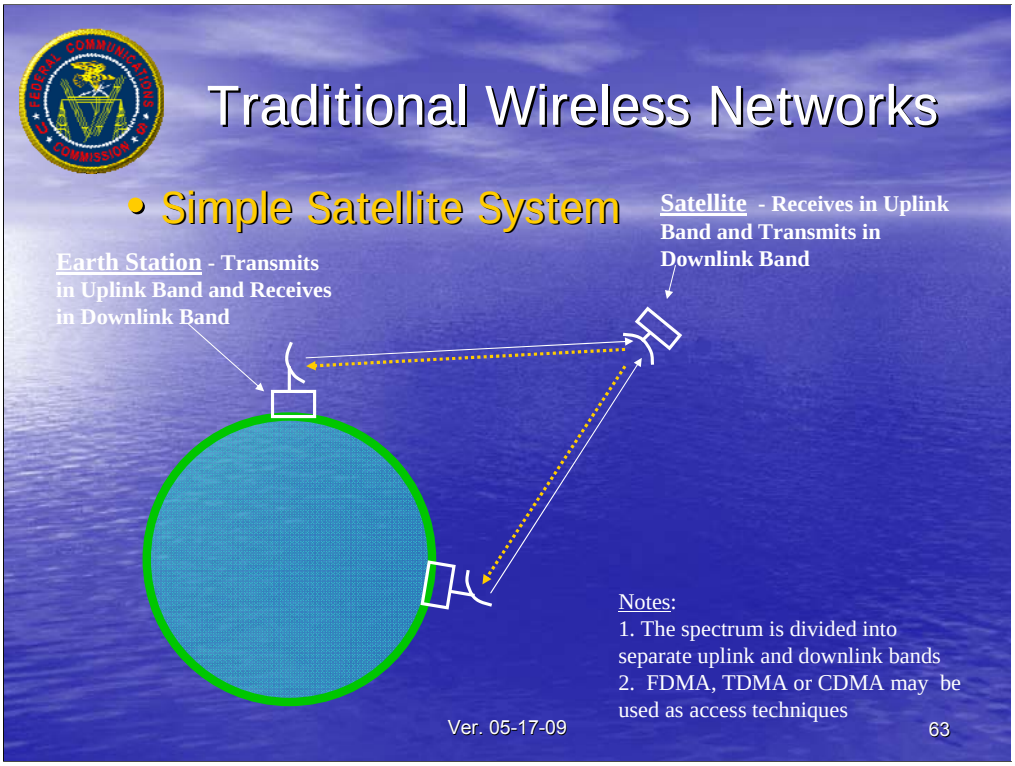
Okay, back to the basic telecommunications technologies that are out there.

Here's another traditional wireless network – the point-to-point microwave radio systems.

Please note that this diagram is not to scale.

Microwave relay towers are typically 20-25 miles apart.

Spacing depends upon antenna height, intervening terrain, and operating frequency.



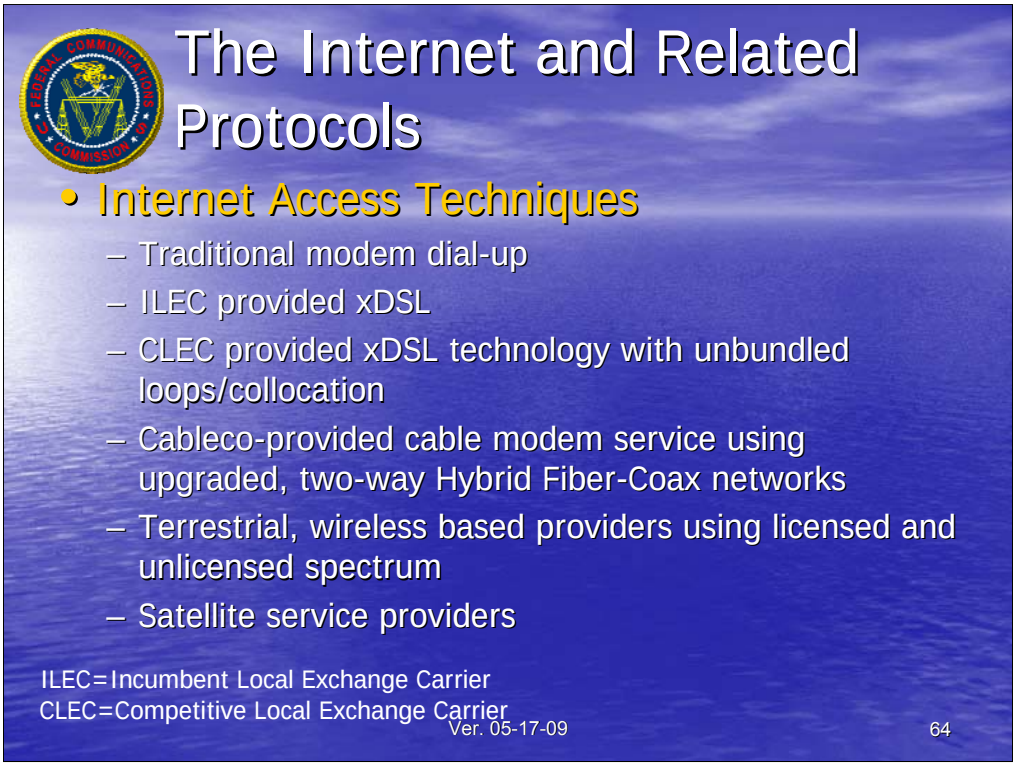
1. The spectrum is divided into separate uplink and downlink bands

2. FDMA, TDMA or CDMA may be used as access techniques.

FDMA = Frequency Division Multiple Access

TDMA = Time Division Multiple Access

CDMA = Code Division Multiple Access

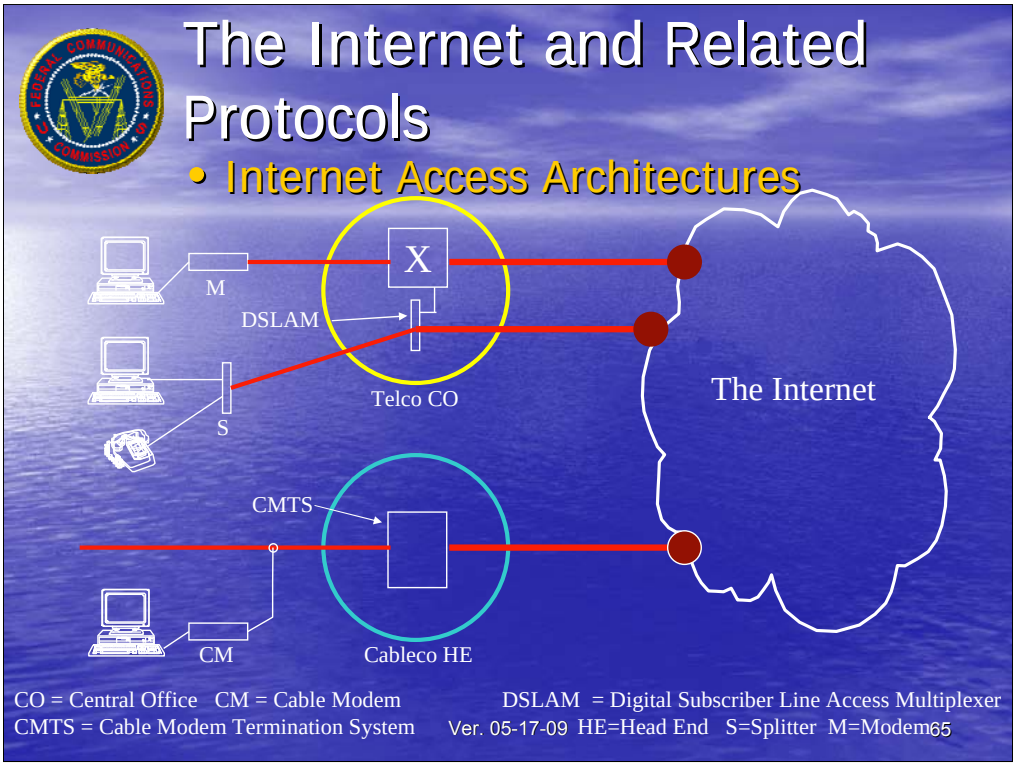


Here are some internet access techniques:

1. Modem dial-up
2. DSL from local exchange carriers
3. Cable modem service
4. Wireless-based providers
5. Satellite service providers

ILEC=Incumbent Local Exchange Carrier

CLEC=Competitive Local Exchange Carrier



CO = Central Office

CM = Cable Modem CMTS = Cable Modem Termination System

HE = Head End

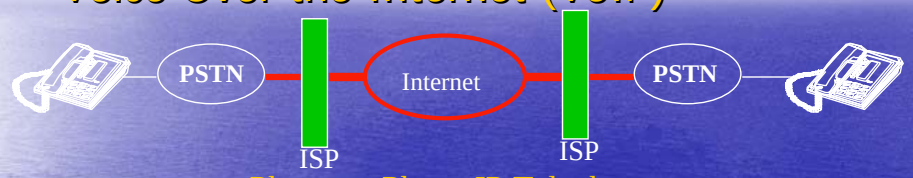
S = Splitter

M = Modem

DSLAM = Digital Subscriber Line Access Multiplexer

The Internet and Related Protocols

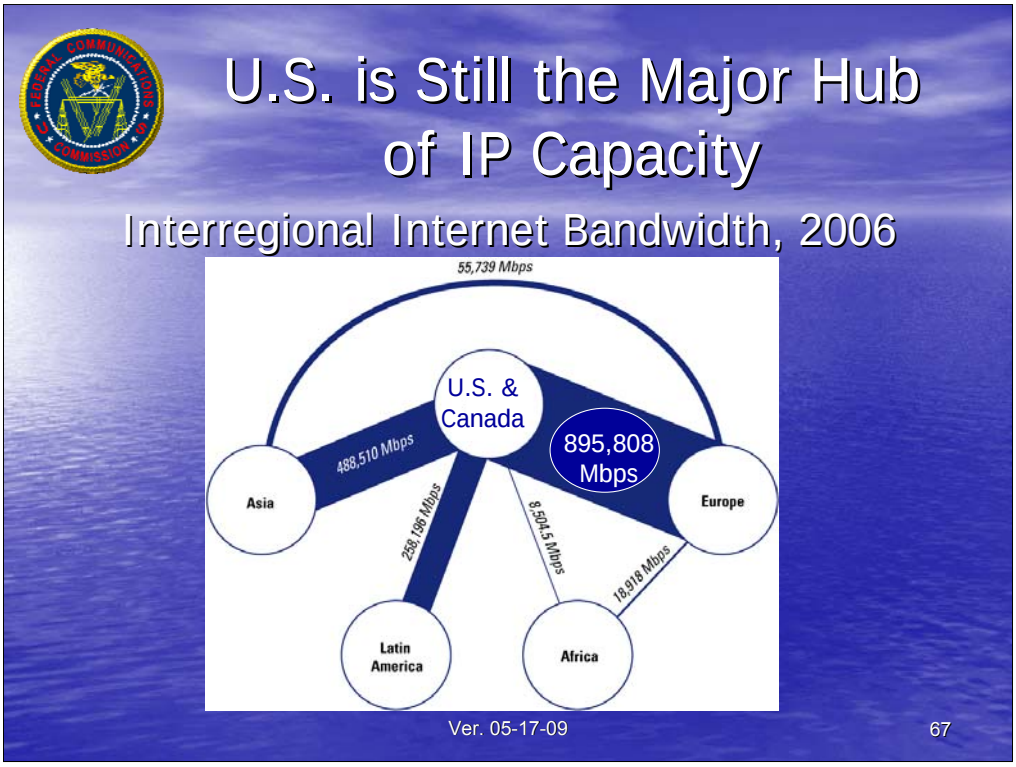
- Voice Over the Internet (VoIP)



Phone-to-Phone IP Telephony

Computer-to-Computer IP Telephony

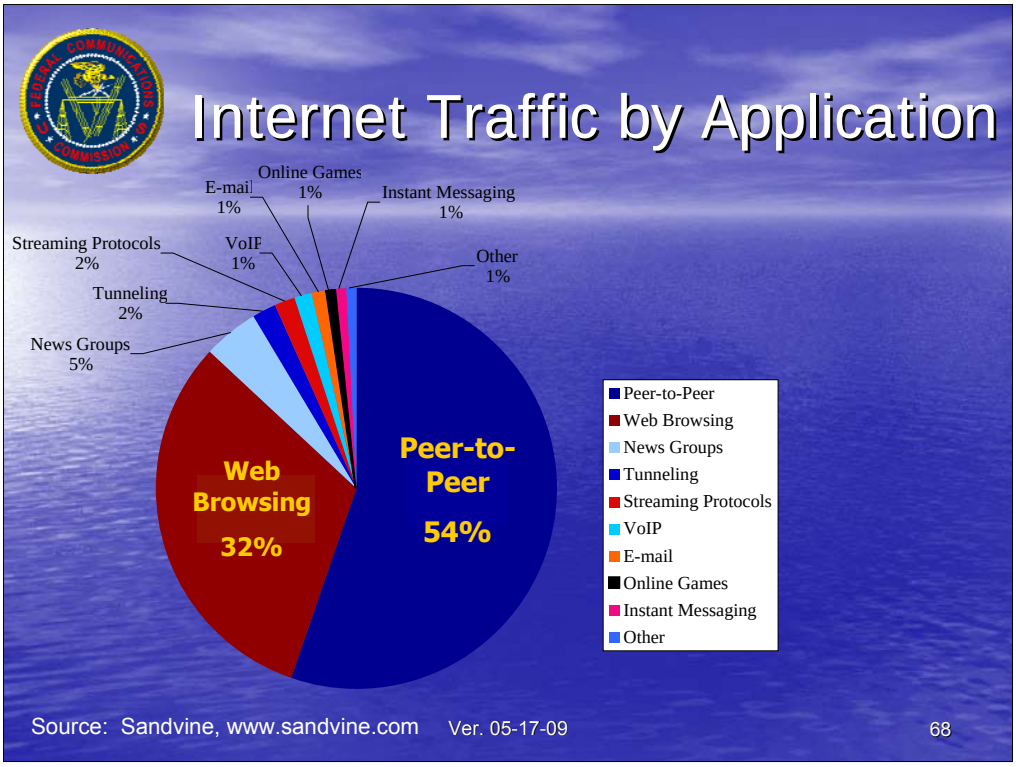
PSTN=Public Switched Telephone Network



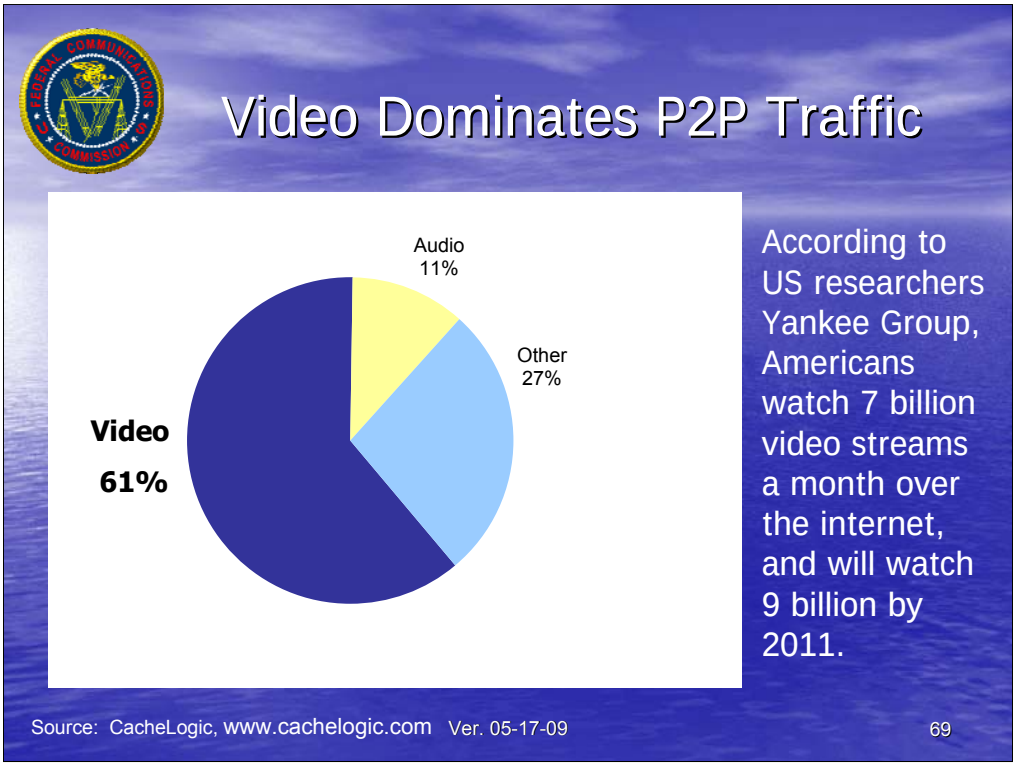
The thickness of the connecting lines indicates the size of the pipe to each continent.

You may not be able to read the numbers on this slide.

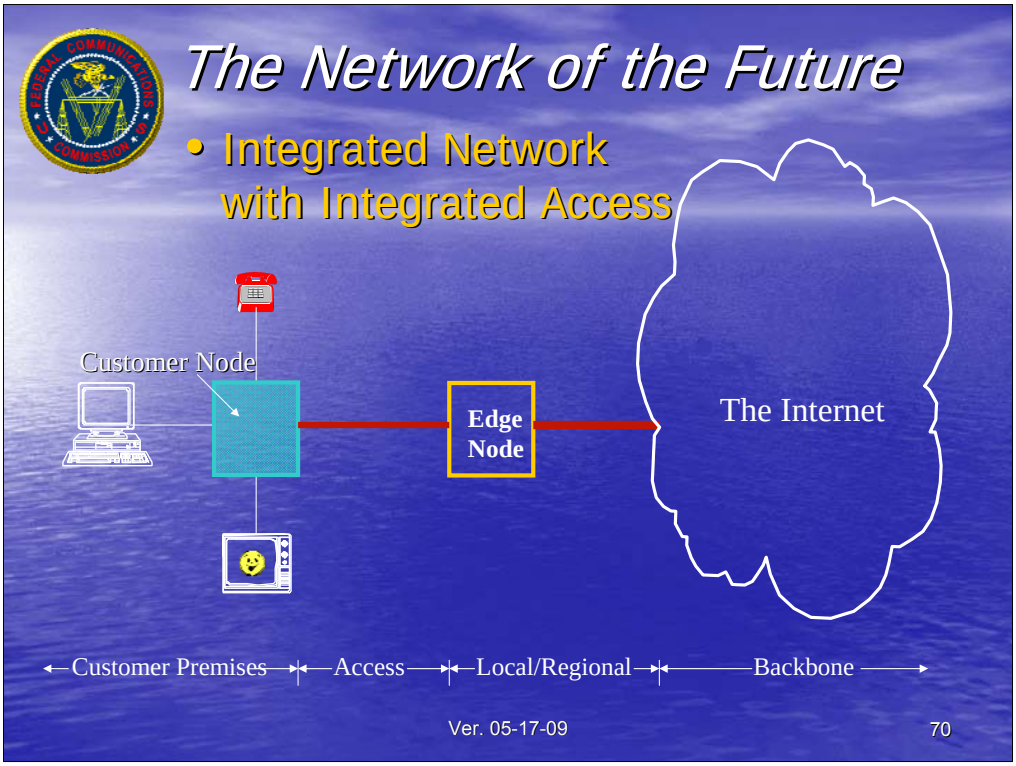
It shows that the US is still the Major Hub of Internet Protocol Capacity



This slide shows that P2P takes up half of all internet traffic, web browsing 1/3, news groups 5%, email 1%, text messaging 1%, VoIP 1%, and gaming 1%.



According to US researchers Yankee Group, Americans watch 7 billion video streams a month over the internet, and will watch 9 billion by 2011.



The goal of future networks is to have a customer node that integrates all devices that use, or can use, the internet.

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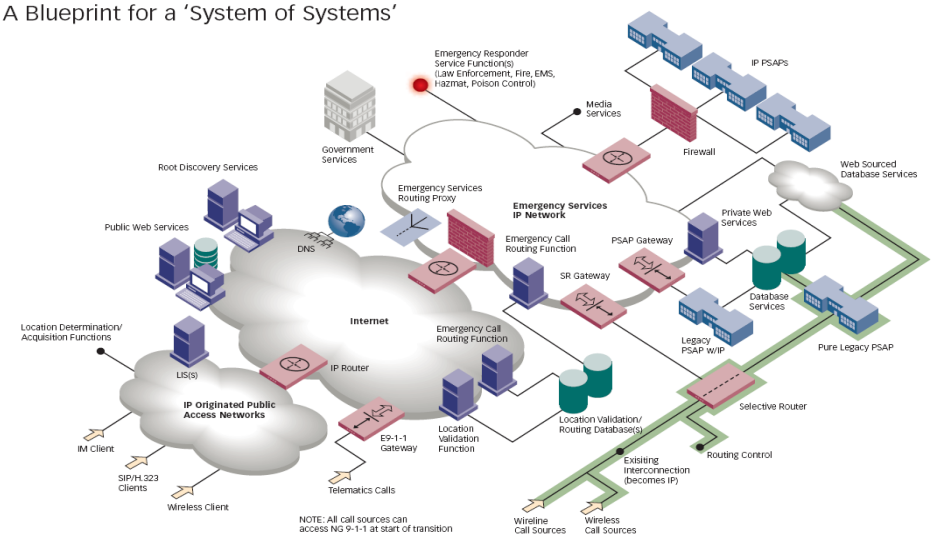
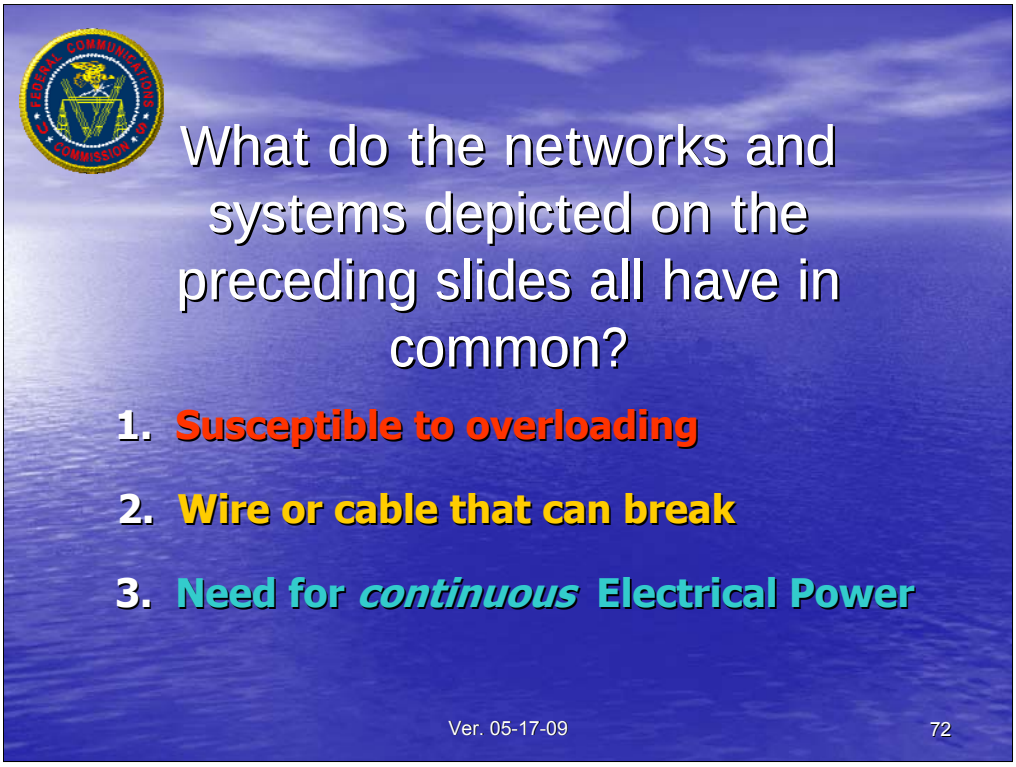
Edge Node: controls the distribution of network routing information

Systems becoming more complex

The Future of 9-1-1 and Emergency Communications

A Blueprint for a 'System of Systems'





1. **They are all susceptible to overload**

2. **Wire or cable that can break**

3. **Need for continuous Electrical Power**

Who Are Emergency Responders?

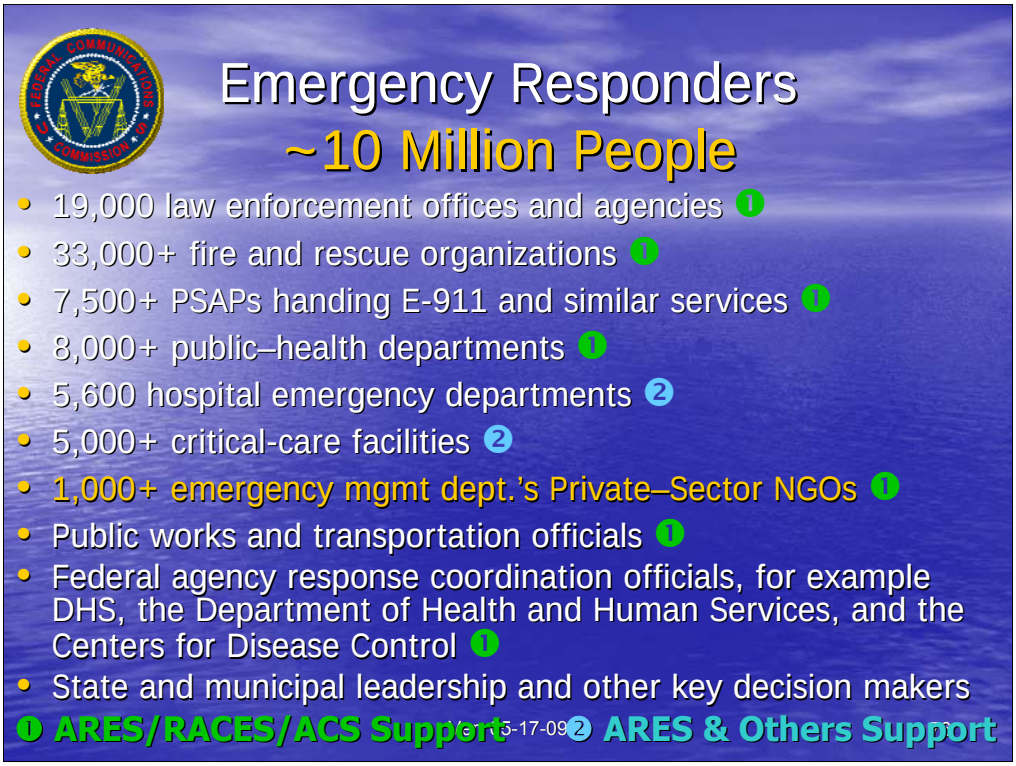
"Emergency response providers include Federal, State, and local government emergency public safety, law enforcement, emergency response, emergency medical, and related personnel, agencies, and authorities."[1]

...then who are First Responders?

1. Homeland Security Act of 2002

First responders include police, fire, and EMS.

Emergency Responders include First Responders.

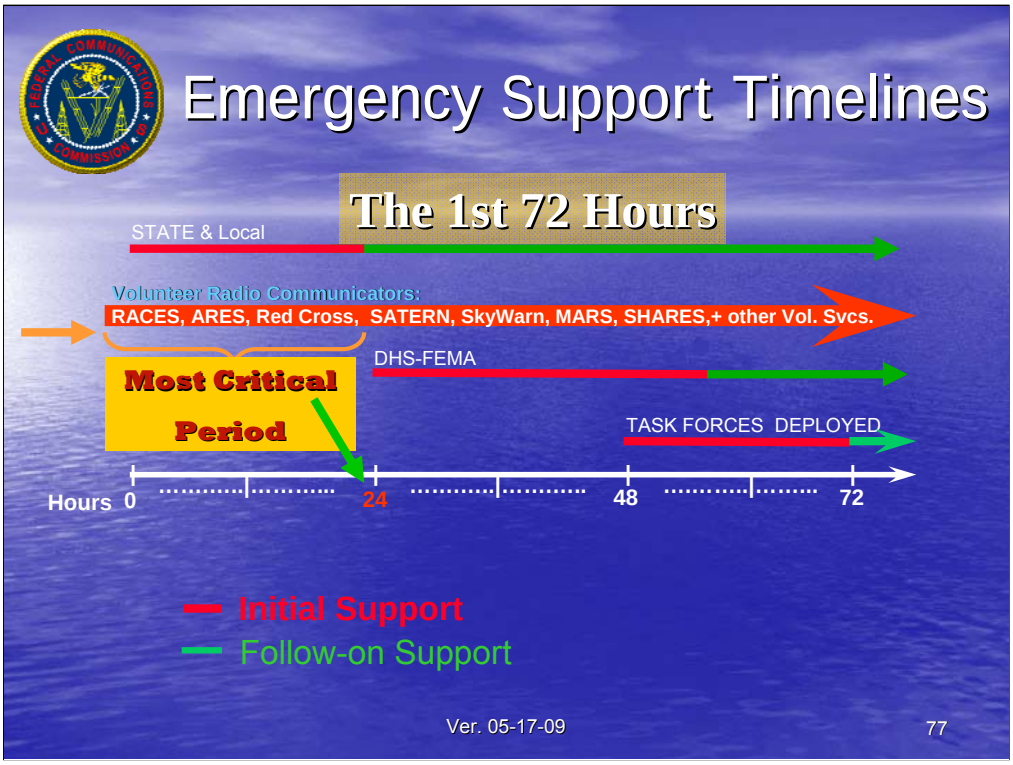


•As you can see, we have a lot of potential customers.

•RACES volunteers are normally associated with Emergency Management departments, EOCs, and other government-to-government communications.

•Emergency medical facilities are usually supported by ARES, ACS, and specialty groups such as hospital EmComm groups. Their function there is to back up the communications that are critical to patient care. A good example is **HDSCS** in Orange County, California. HDSCS stands for **Hospital Disaster Support Communications System**.

•When responding as hams, you could say that we are emergency responders who support other emergency responders.



We know that all wireless infrastructures are vulnerable to power outages caused by weather events, overloading, criminal activity, and accidents.

But how many of these communications infrastructures have redundant capabilities and backup power that lasts longer than 24 hours?

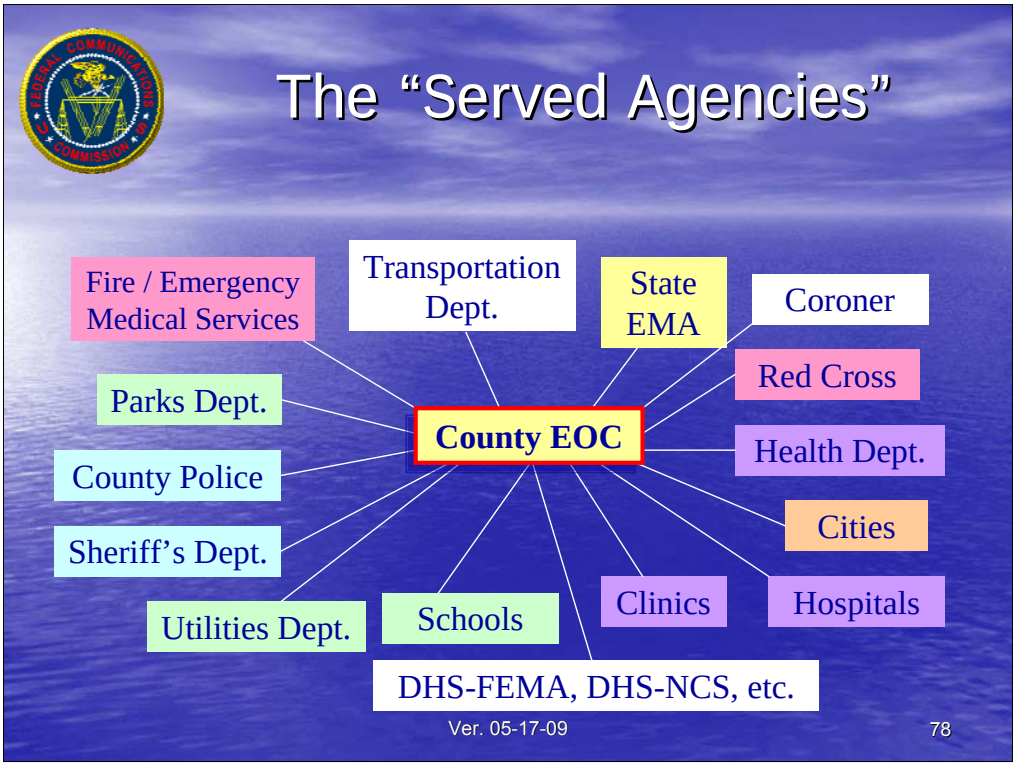
In my experience, very few.

In some cases, cell networks from several counties are routed through just <u>one</u> Mobile Telephone Switching Office (MTSO), and many cell networks depend on the local Central Offices (which can handle 10,000 or more phone lines) to route their calls.

About 10,000 of the 670,000 licensed Amateur Radio Operators are prepared and ready to immediately support EmComm and traffic exchange operations.

Many others can also help with a minimum amount of preparation.

As shown on this slide, the first few hours of any emergency are usually the most critical in terms of Amateur Radio Service support.



These are most of our customers at the local level.

Health & Welfare Messaging

- As you know, one of our key functions throughout our response to an event is our provision of 'Health and Welfare' messaging.

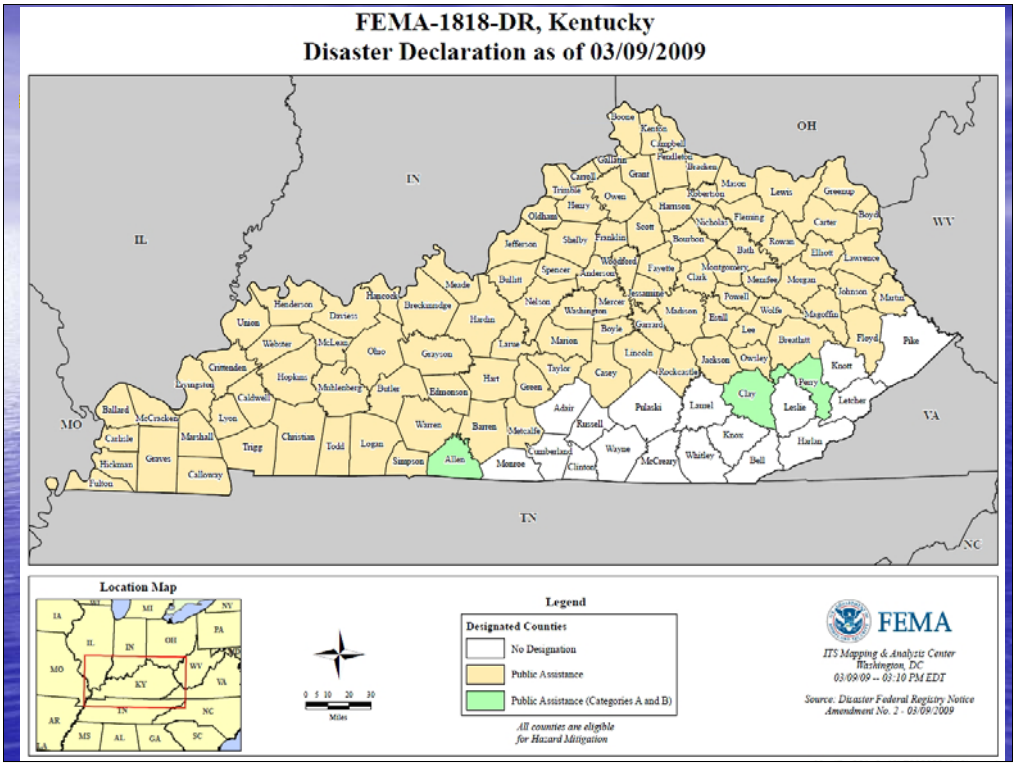
- "In all disasters, our ability to communicate with our social network underlies everything else we may do to survive. My experience providing mental-health services at disaster sites and hospital emergency centers convinced me that I needed to get a ham radio license."

  —Wayne Rosenfeld, Norwhich, CT

These are photos taken by Amateur Radio operators responding to Hurricane Katrina.

In one photo, two operators are seeking gas for their generator sets.

Another photo shows the tents, antennas, and trailers used by the operators at one of the “Camp Katrina” sites.



According to FEMA, most of Kentucky's counties needed public assistance.

My division called every affected county's emergency management office to ask their status and what we could do to help them.

Ice knocked out communications

According to Jack Brammer of the Kentucky Herald-Leader on 3/10/09, “The Kentucky ice storm was the most catastrophic natural disaster to hit Kentucky since the New Madrid earthquake of 1811...”

"In much of the state we lost the means to communicate," Adjutant General Edward W. Tonini said on 9 March to members of a House legislative committee in a presentation about the state's response to the January storm, which knocked out power to more than 770,000 customers and is blamed for at least 36 deaths.

General Tonini said the hardest-hit areas of Western Kentucky lost all means of communications.

He said, "In many cases, the total extent of our emergency eyes and ears were a couple of satellite radios and a few **ham radio operators** operating on batteries."

The poor communication also delayed the notification of some National Guard members, whom Gov. Steve Beshear activated, General Tonini said.

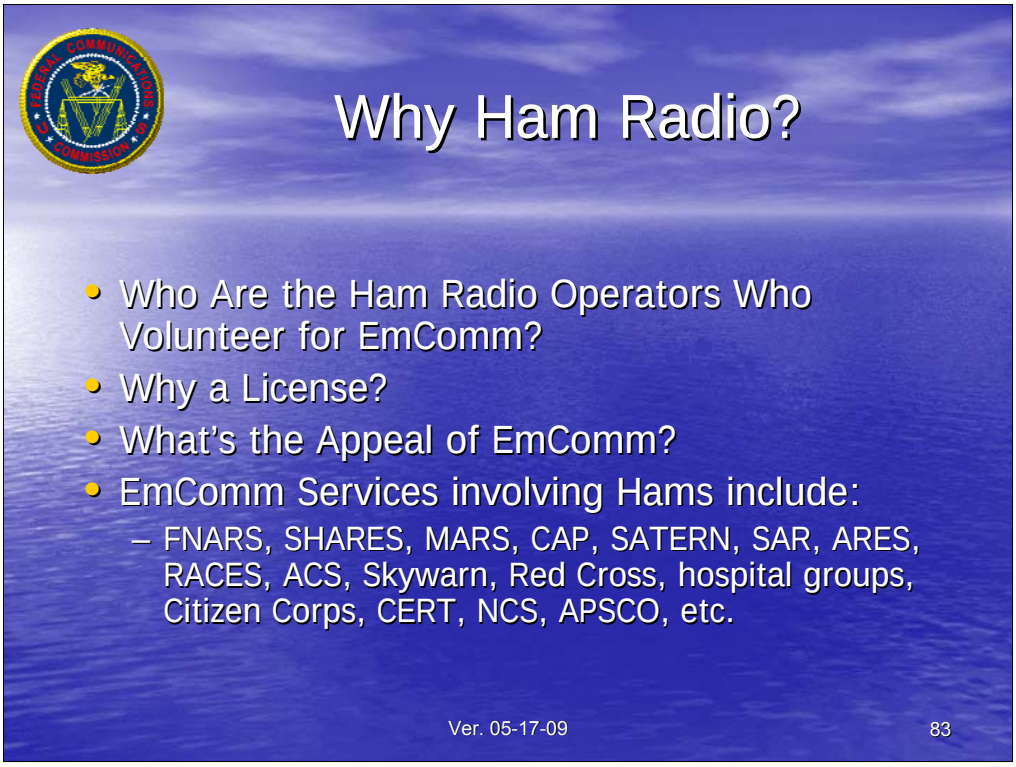
If anyone thinks trained Amateur Radio Operators are no longer needed for communications emergencies, outages, or disasters, he just needs to listen to what county emergency managers tell our FCC operations staff when we call them during their communications outages.

As most of you already know, during the first few hours of most communications emergencies throughout the U.S., Amateur Radio Operators are usually the first communicators to respond to the aid of local governments and Volunteer Organizations Active in Disasters (VOADs), like the American Red Cross.

You show up with your own radios, generators, batteries, antennas, tables, chairs, necessities, and food supplies at a time when many of your neighbors are bugging out.

During the Kentucky ice storms of February this year, one county Emergency Manager who I called told me that he was initially unable to talk to his State EOC to inform the State of his county’s situation and needs. The sheriff finally sent a deputy with a 4-wheel drive vehicle and a chain saw to cut through the road debris and blocking tree limbs to pickup his primary Amateur Radio Operator, who promptly made contact with both the State EOC and an adjacent county via HF using an NVIS antenna.

Most counties and cities cannot afford or justify expensive redundant backup communications systems. This fact makes your free service increasingly valuable to your hometown government. The FCC appreciates that many of you are using your FCC licenses to serve in communications emergencies and disasters. It is Amateur Radio’s highest calling.



As I have pointed out thru examples, the Amateur Radio Service, in addition to being a fun hobby, is also a very important local, regional, and national emergency communications system and asset.

When cell phones, regular phones, the internet and other networks and systems are down or overloaded, ham radio can still get the message through.

Ham radio is a key communications service that has saved lives and property when regular communication systems failed.

Many lives are saved when skilled ham radio hobbyists serve as emergency communicators to render aid during emergencies, tornados, and earthquakes both here and abroad. On September 11th, 2001, many ham radio operators, including several hams and a mobile repeater from my county, helped relay key information for the Pentagon and New York City authorities. After hurricanes Katrina, Wilma, and Rita struck communications infrastructures, volunteer ham radio communicators provided vital communications that often involved life-and-death situations.

Who are the Hams who volunteer for EmComm?

There are 10,000 to 40,000 Amateur Radio operators who come from all walks of life, ages, and income levels. Increasingly, we are seeing that the bulk of volunteers, like me, are bordering on being senior citizens. We hope they will continue to maintain their good health so that they will be able to handle the physical part of EmComm, which includes lugging heavy gel cell batteries, generator sets, coolers, and sometimes even boat anchors, to a site where they are needed.

All EmComm operators have in common a basic knowledge of today's wireless technologies, regulations, and operating principles, even if they memorized all the answers to the tests. I'm glad no one laughed, because if you look at what is contained in the license requirements for a Technician license, you will see that this basic knowledge is somewhat demonstrated by passing an examination for a Federal Communications Commission (FCC) license to operate on the Amateur Radio frequencies. But you all know that the real learning occurs AFTER the license exam is passed.

Why a License?

The bulk of licensees eventually translate into a pool of self-trained technicians able to provide backup emergency communications. We at the FCC acknowledge the ability of Amateur Radio licensees to not only advance radio communication and technical skills, but also to enhance international goodwill.

What's the Appeal of EmComm?

Some EmComm operators are attracted by the ability to help their own community communicate at a time when they are struggling to contact the adjacent county or the State EOC.

Others who build and experiment with electronics are able to translate those skills into providing troubleshooting help at their local agencies. Because hams are at the cutting edge of many technologies, many also avail their other skill sets to help their local governments and organizations during times of emergencies.

Many skilled EmComm operators also have a Morse Code key next to their modern transceiver. Many of them can copy the code faster than most folks can type, using a tiny amount of bandwidth, and just enough low power to punch thru QRM and QRN.

==========

APSCO: Associated Public Safety Communications Officers FNARS: FEMA National Radio System

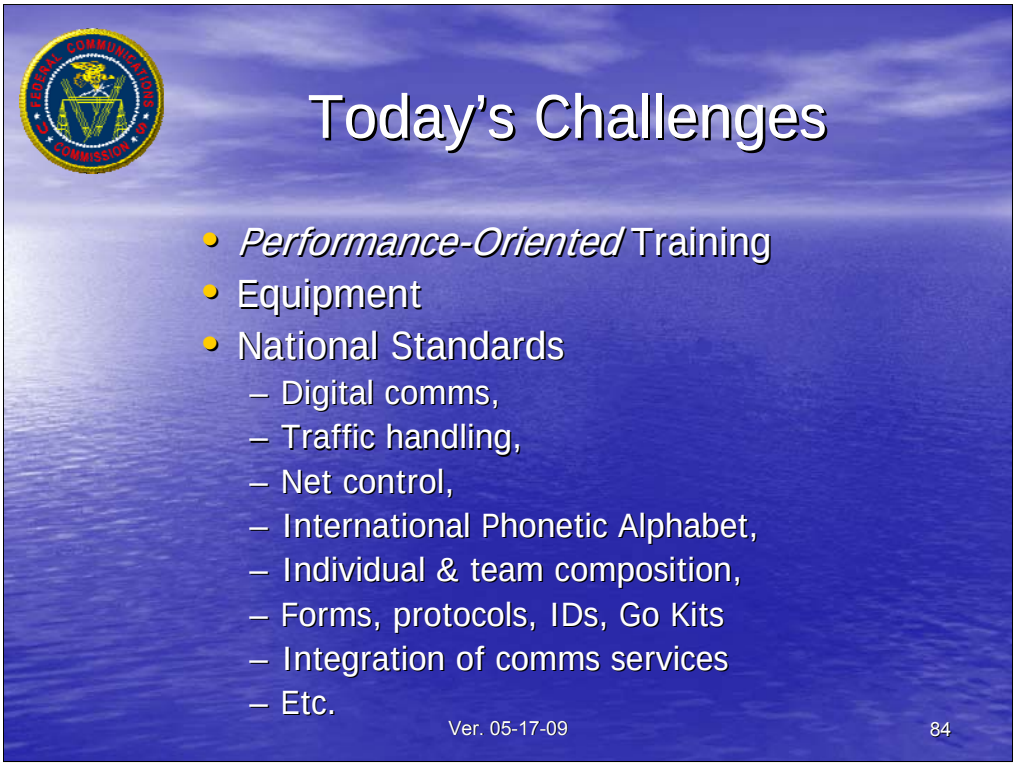
ARES: Amateur Radio Emergency Service RACES: Radio Amateur Civil Emergency Service

CAP: Civil Air Patrol SAR: Search & Rescue

CERT: Community Emergency Response Team / DHS-FEMA Citizen Corps

MARS: Military Affiliate Radio System SATERN: Salvation Army Team Emergency Radio Network

NCS: National Communications System SHARES: Shared Resources / NCS



While it is incumbent upon each volunteer emergency communicator to obtain all the necessary specialized training needed to be an effective emergency communicator when called upon, up until now, there has been no single regional or national source where certified ***performance-oriented*** training can be obtained.

Today, licensed volunteer communicators are usually not required to show their ability to setup and skillfully operate communications equipment to a standard for emergency communications.

We don't have a national standard for digital communications – this is needed because agencies such as the American Red Cross need us to use a transmission mode that offers some accuracy and at least a modicum of security for their patient lists and other data known as Personally Identifiable Information, or PII. While we are waiting for consensus on this issue, packet radio still seems to be the most common digital mode used for this purpose. Unfortunately, even packet radio, which is about 2 decades old, has few practitioners available for EmComm.

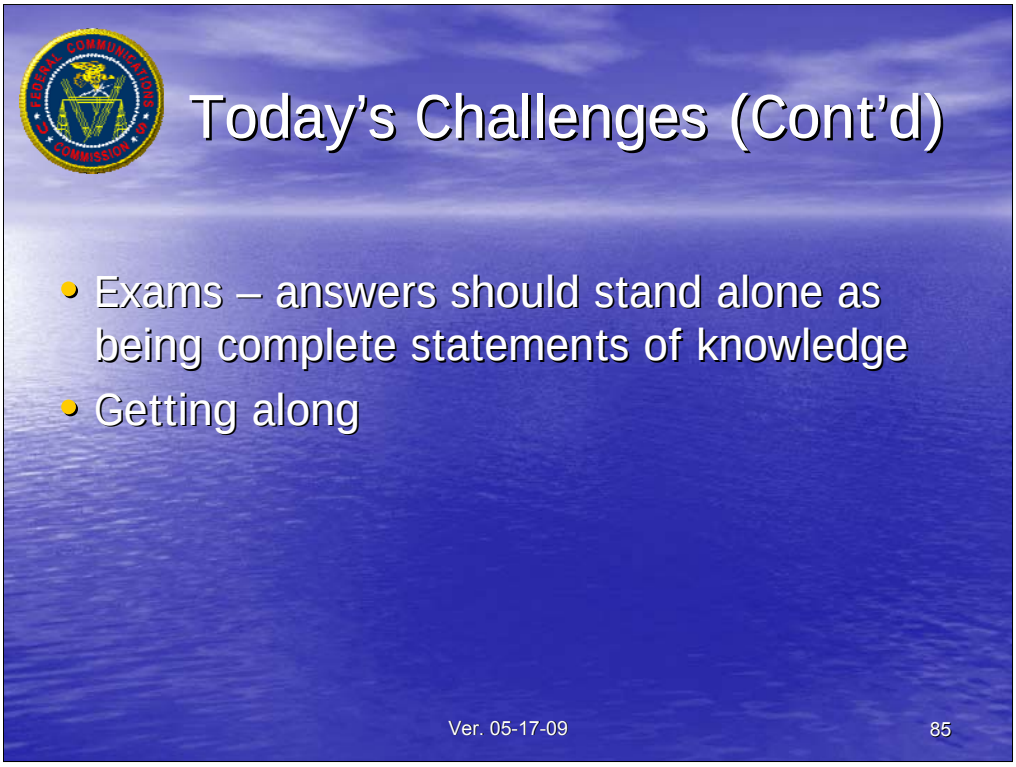
What I am saying here is that as an EmComm service, we do not have enough trained members. Part of this reason is due to the fact that we do not have any national standards for EmComm. No federal agency has stepped forward to help fill this void and we cannot expect the ARRL to do everything for us.

The volunteer EmComm mission demands development of standards for emergency communications skills needed by volunteer responders to:

1. Help every town prepare to respond to emergencies and disasters
2. Minimize effects of disasters and emergencies through better communications preparedness

We need standards that:

1. Comply with the National Incident Management System (NIMS)
2. Establish Response Standards
3. Mesh with the Incident Command System
4. Ease Mutual Aid initiatives
5. Provide a basis for credentialing
6. Provide seamless Communications Interoperability



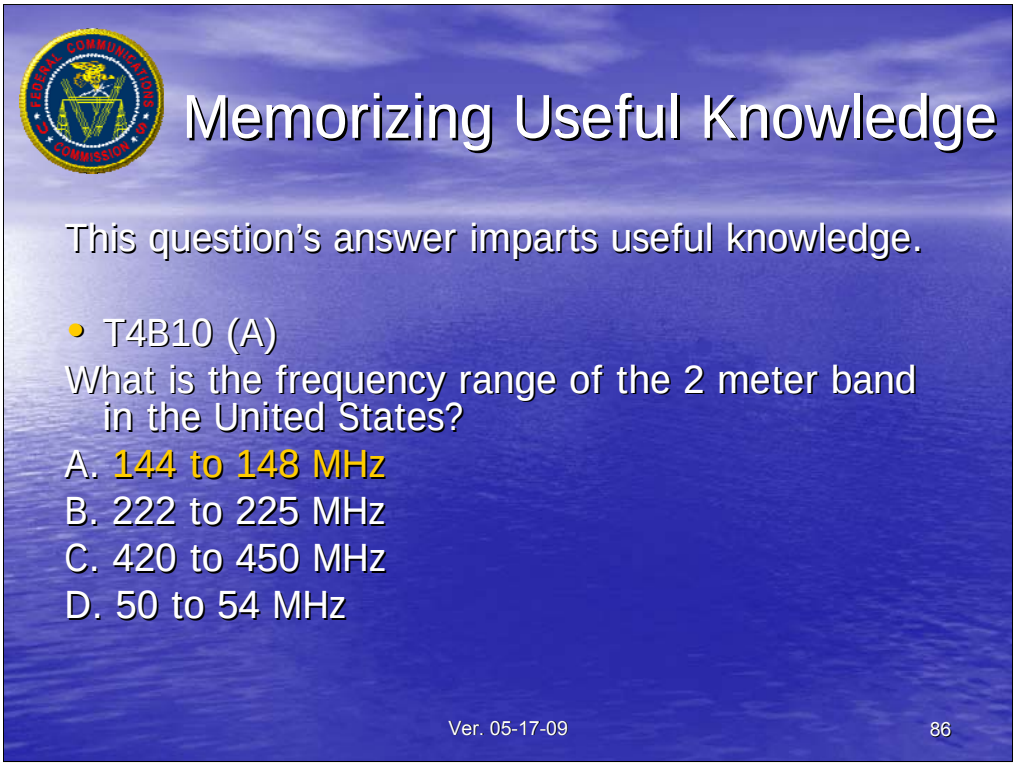
The National Conference of 14 Volunteer Examiner Coordinators (NCVEC) has done a great job with coming up with examination questions on a volunteer basis. However, it is up to us to help them write suitable questions.

I have been proctoring examinations since 1984. In my experience, the vast majority of candidates only memorize the question pool ANSWERS. Since there is no way to stop candidates from memorizing the answers, why not rewrite the same questions but changing their answers so that each answer is a complete statement of the knowledge desired from the question?

My recommendation is to write each correct answer in a way that memorizing it will result in memorizing the element of knowledge desired by the question itself. Some questions already follow this protocol, most do not. Examples on the next slides.

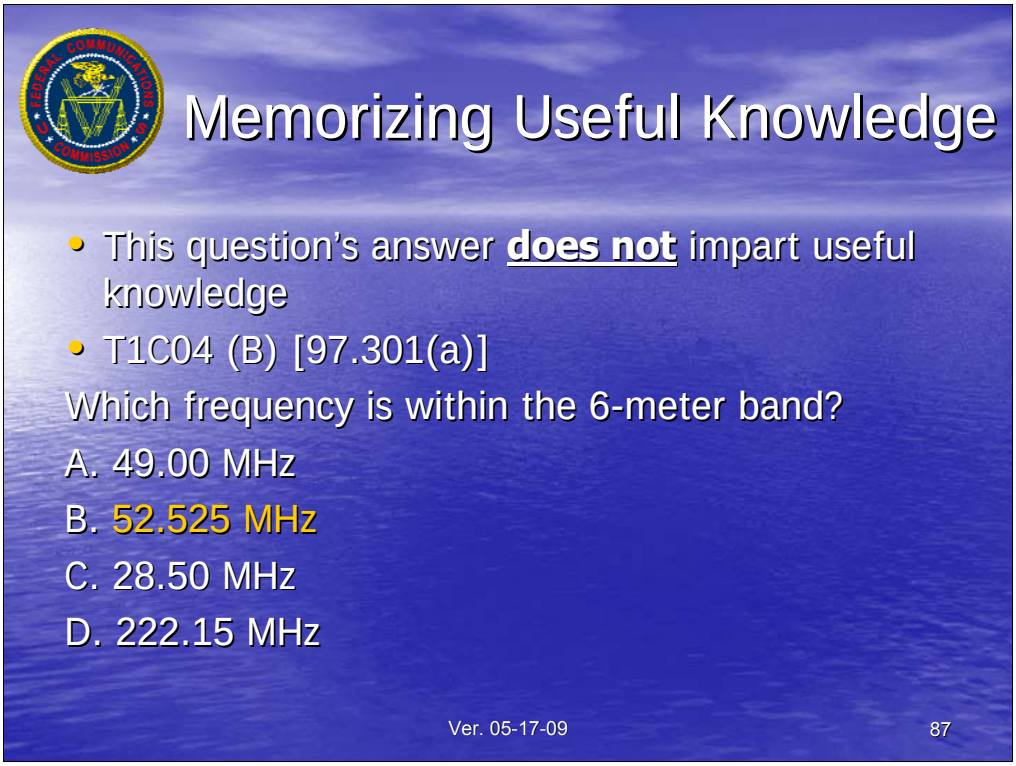
I added "getting along" on this slide because when I served as an Assistant Section Manager and District Emergency Coordinator, most of my time was spent dealing with personality conflicts that should have been resolved in grade school. Maybe we need to encourage some clinical psychologists to join our ranks.

Life is too short; let's get along with each other.



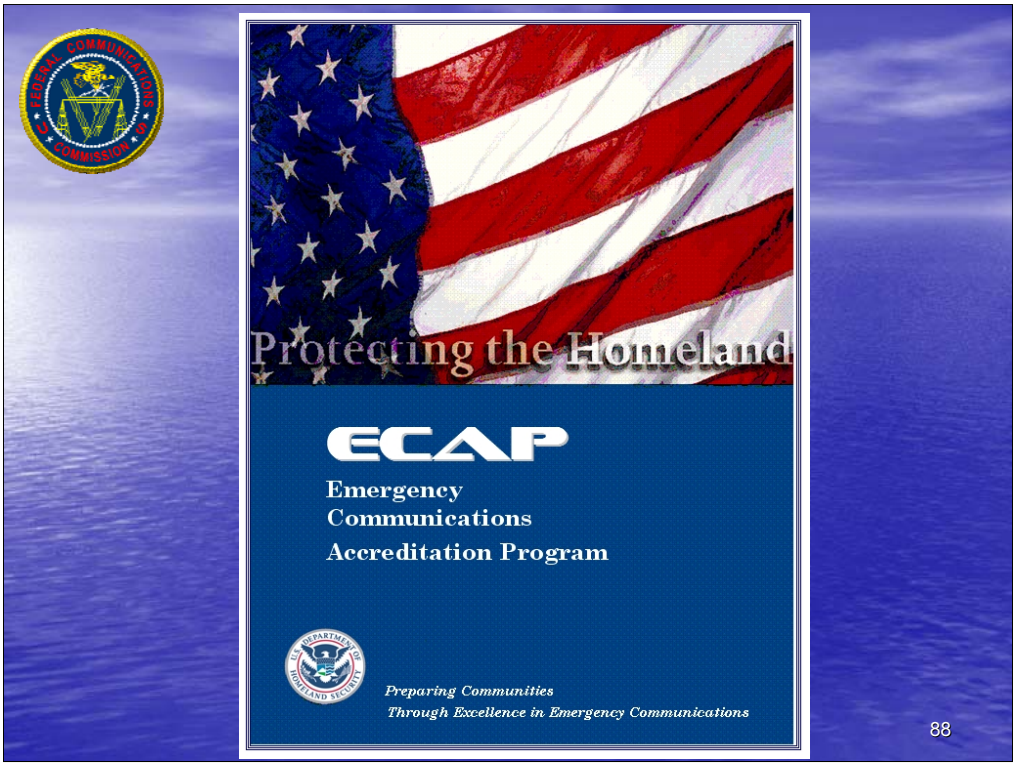
Here, the memorizer has memorized the 2 meter band authorization.

That knowledge is useful to know.



Why?

Memorizing 52.525 MHz is not an element of useful knowledge in and of itself.

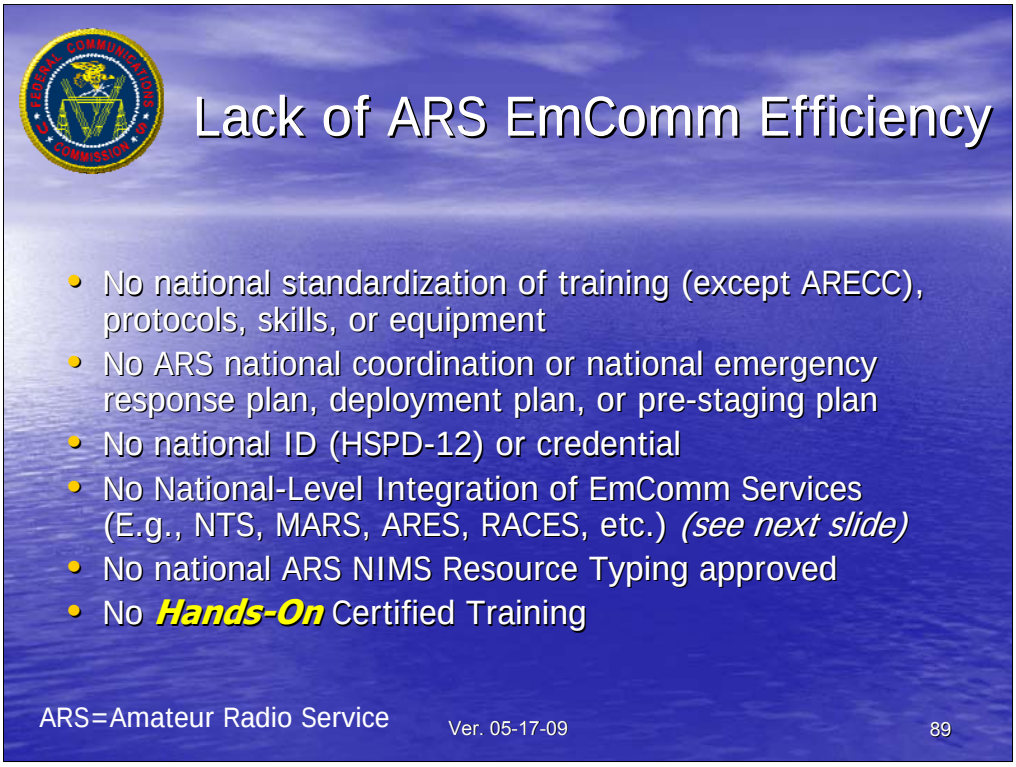


Regarding standards, here's a little bit of history not widely known.

Since 2003, with the retirement of Paul Reid, the FEMA frequency manager, and the departure of Ross Merlin, there has been no federal RACES program management at FEMA or the FCC.

In 2004, when I was a FEMA employee, and after 3 years of coordination, I proposed a FEMA training program primarily for Amateur Radio Operators that was approved and funded initially at $330,000.

Unfortunately, a cost overrun on an unrelated classified software program in the same office, caused the program, dubbed the Emergency Communications Accreditation Program, or ECAP, to be cancelled for lack of funding.

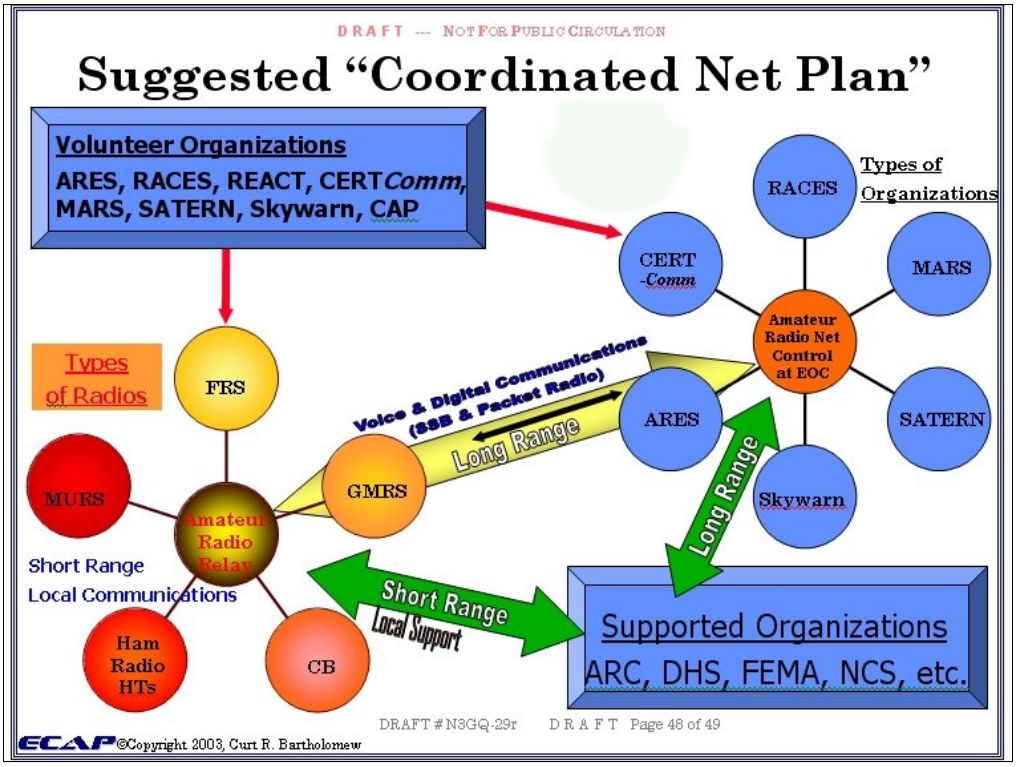


These are areas that could improve our interoperability, efficiency, and usefulness to our served agencies.

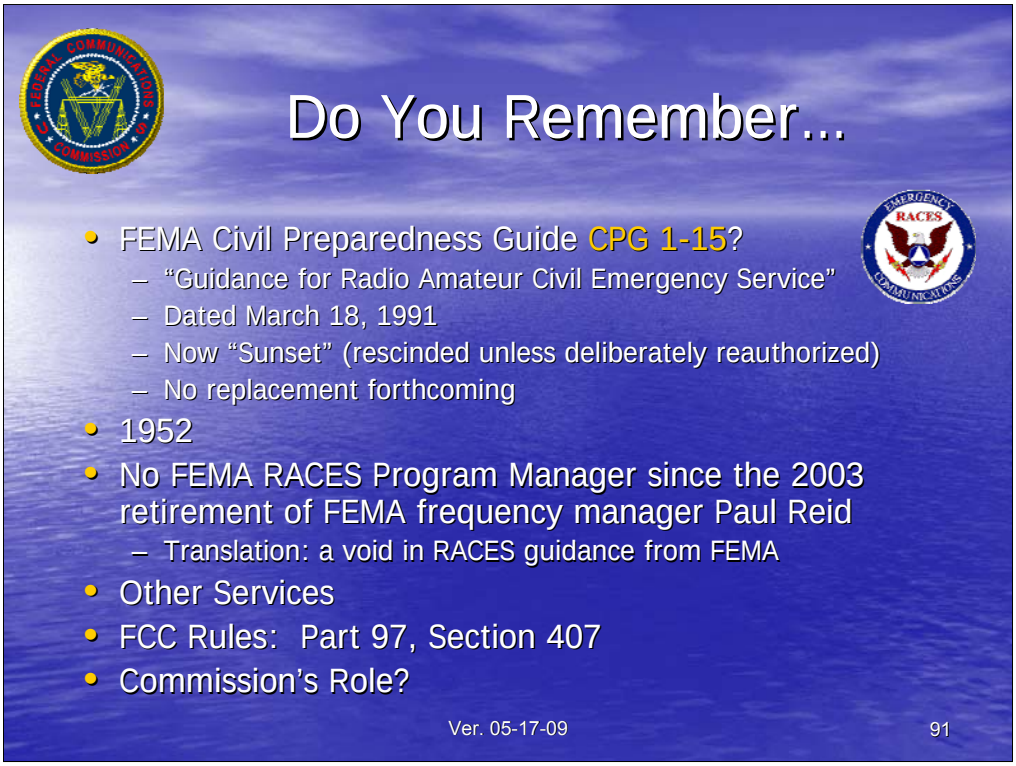
If you have ever listened to an emergency net, you will quickly come to the conclusion that we need more training in message handling, net control, and the use of the International Phonetic Alphabet, to name just three items.

I have brought with me a few copies of a brochure I made up a few years ago that I call “Bart’s Basics.” Please take one, if you like, to use as a reminder.

Can the FCC fix all of these challenges? Maybe not. But ignoring them won’t make them go away, either.



This is a pictorial example of how we could coordinate nets among the EmComm services, from my 2003 ECAP plan.



Several states experience challenges from EmComm volunteer services that insist on competing with one another.

In some, there are ARES, RACES, & ACS challenges.

The situation we have now started in 1952 with the formation of RACES in the post-war era.

Remember that RACES is a service, not an organization. However, local governments can form their own local RACES organizations. This is why RACES organizations are different everywhere – there's no national standard for them and no national program manager. RACES is available to local and state governments for government to government communications. With the exception of a few rules in Part 97, RACES is not controlled or directed by the federal government at the state or local levels. Sometimes, federal employees forget the existence of States' Rights and try to pass rules to force states to comply. There are no such rules that require States to use the RACES service or any other EmComm service.

ARES, SATERN, Skywarn, and other programs are all both services and organizations.

Skywarn is a service of the NWS.

What are we going to do about this situation?

Here's my suggestion:

All local Emergency Managers should reach out to include all available EmComm services in their EmComm plans and should use their services in their exercises.

What are the advantages of each service?

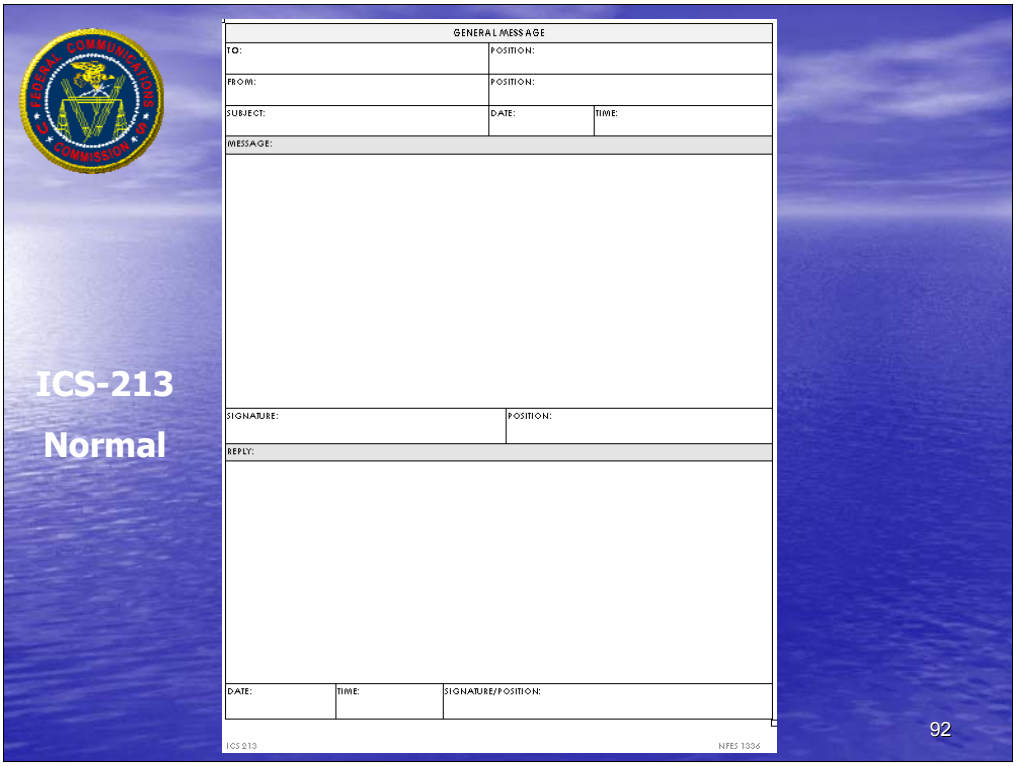
The RACES service gives EMs direct control over their assigned and registered AROs.

RACES is also a federally supported service. This fact makes it easier for some local jurisdictions to justify requests and grants for equipment, antennas, and working space for their EmComm teams who support the local government.

On the other hand, ARES, SATERN, Red Cross, and other VOADs that use EmComm volunteers provide the EM much more flexibility in coordinating and deploying volunteer EmComm assets. There's no one-hour-per-week training limitation and you aren't limited to government-to-government communications.

The jurisdictions that have combined the ARES and RACES programs seem to be the most successful in the nation. Those jurisdictions that shut out any one program are less successful.

And finally, what do you feel is the Commission's role in EmComm?



Does this form look familiar?

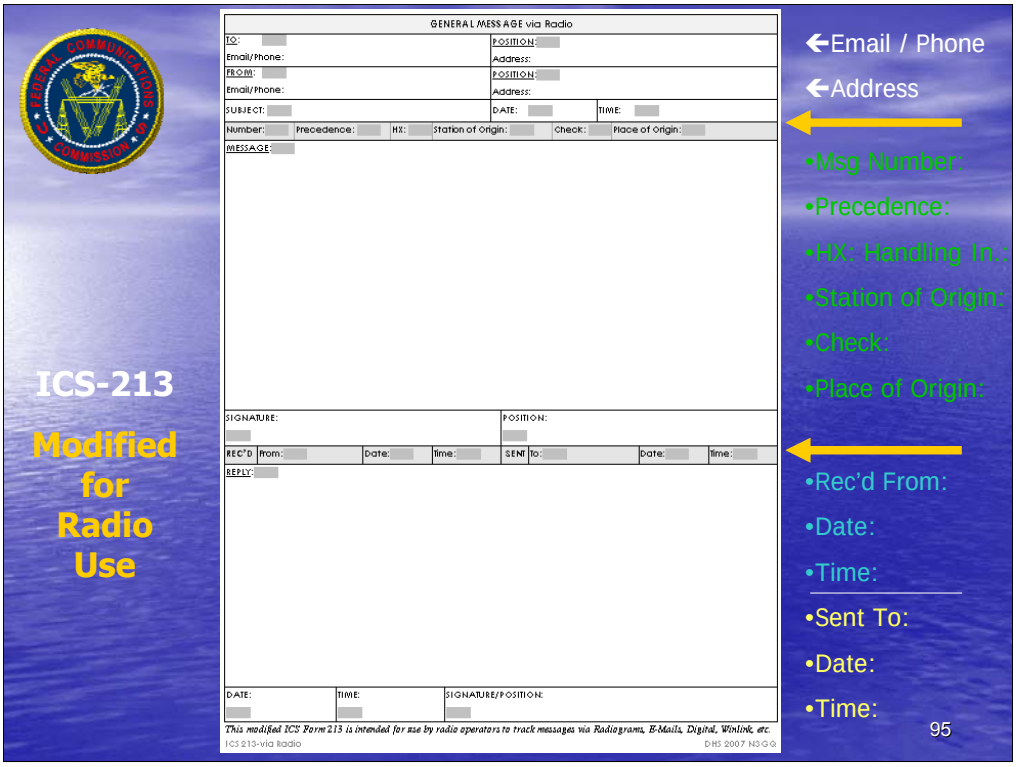
ICS Form 213

- ICS-213 is an inter-office memo neither designed nor meant for over-the-air use
- Recommendation:
  - Use a radio form like the radiogram instead
  - Or add a couple of lines to ICS-213 to capture the radio data needed, such as the draft shown on the next slide *for interim use*

Current ICS-213

GENERAL MESSAGE		
TO:	POSITION:	
FROM:	POSITION:	
SUBJECT:	DATE:	TIME:
MESSAGE:		
SIGNATURE:	POSITION:	
REPLY:		
DATE:	TIME:	SIGNATURE/POSITION:

ICS 213 NFES 1336



In this draft radio form, there is no lost space with the added data elements.

The data elements were added into the blank space occupied by the word "Message."

This modified form doesn't have the underlined spaces to help you count the words for the word "check," but it is a step in the right direction.

THE AMERICAN RADIO RELAY LEAGUE

RADIOGRAM

VIA AMATEUR RADIO

NUMBER	PRECEDENCE	HX	STATION OF ORIGIN	CHECK	PLACE OF ORIGIN	TIME FILED	DATE

TO

TELEPHONE NUMBER

THIS RADIO MESSAGE WAS RECEIVED AT

AMATEUR STATION _____ PHONE _____

NAME _____

STREET ADDRESS _____

CITY, STATE, ZIP _____

FROM REC'D	DATE	TIME	TO SENT	DATE	TIME

THIS MESSAGE WAS HANDLED FREE OF CHARGE BY A LICENSED AMATEUR RADIO OPERATOR, WHOSE ADDRESS IS SHOWN IN THE BOX AT RIGHT ABOVE. AS SUCH MESSAGES ARE HANDLED SOLELY FOR THE PLEASURE OF OPERATING, NO COMPENSATION CAN BE ACCEPTED BY A "HAM" OPERATOR. A RETURN MESSAGE MAY BE FILED WITH THE "HAM" DELIVERING THIS MESSAGE TO YOU. FURTHER INFORMATION ON AMATEUR RADIO MAY BE OBTAINED FROM ARRL HEADQUARTERS, 225 MAIN STREET, NEWINGTON, CT 06111

THE AMERICAN RADIO RELAY LEAGUE, INC. IS THE NATIONAL MEMBERSHIP SOCIETY OF LICENSED RADIO AMATEURS AND THE PUBLISHER OF QST MAGAZINE. ONE OF ITS FUNCTIONS IS PROMOTION OF PUBLIC SERVICE COMMUNICATION AMONG AMATEUR OPERATORS. TO THAT END, THE LEAGUE HAS ORGANIZED THE NATIONAL TRAFFIC SYSTEM FOR DAILY NATIONWIDE MESSAGE HANDLING.

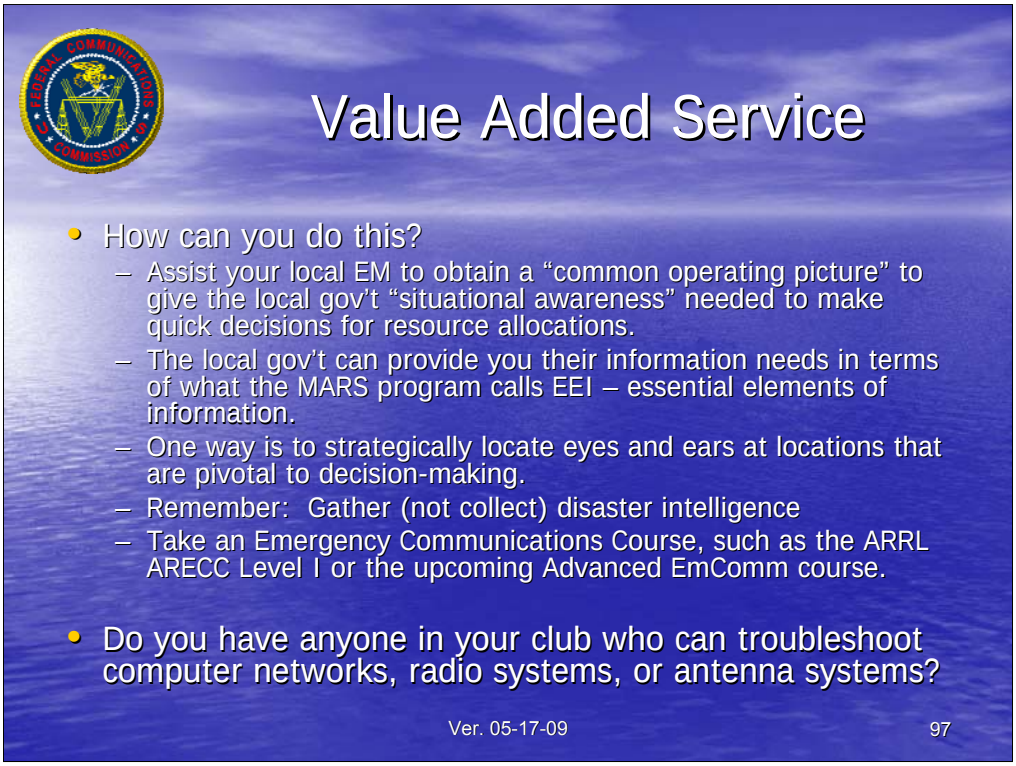
PRINTED IN USA

THE AMERICAN RADIO RELAY LEAGUE

RADIOGRAM

VIA AMATEUR RADIO

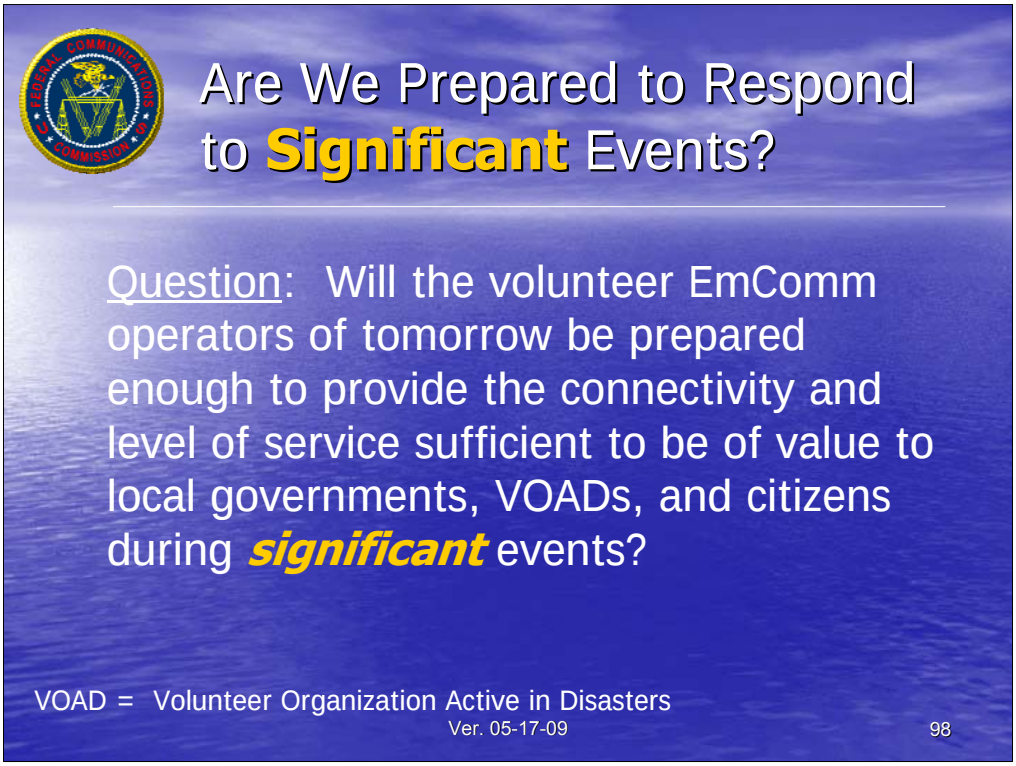
Ver. 05-17-09



You can relieve other agencies, such as law enforcement, fire, and rescue, of some duties that you may be qualified or trained to do for them.

Be careful about using the term "disaster intelligence" that has been floating around. If you use this term, remember that you can only "gather" intelligence, you cannot collect intelligence. Per presidential Executive Order 12333, and other rules of the executive branch, only certain members of the US government's Intelligence Community are allowed to "collect" intelligence. It's splitting hairs, but it has legal issues associated with it. As an example, the CIA can collect intelligence, but the DHS Office of Intelligence & Analysis can only gather and analyze intelligence.

While we are waiting for "the big one," perhaps we could look at offering our local emergency managers some additional skill sets available from our EmComm team and local ham club. These skill sets could include those related skills that are useful in an emergency, such as the ability to troubleshoot their computer networks, radio systems, or antenna systems. You might be surprised to discover the professional talent and sophisticated test equipment that is resident in your ham club. There aren't many emergency managers who would turn down free professional assistance.

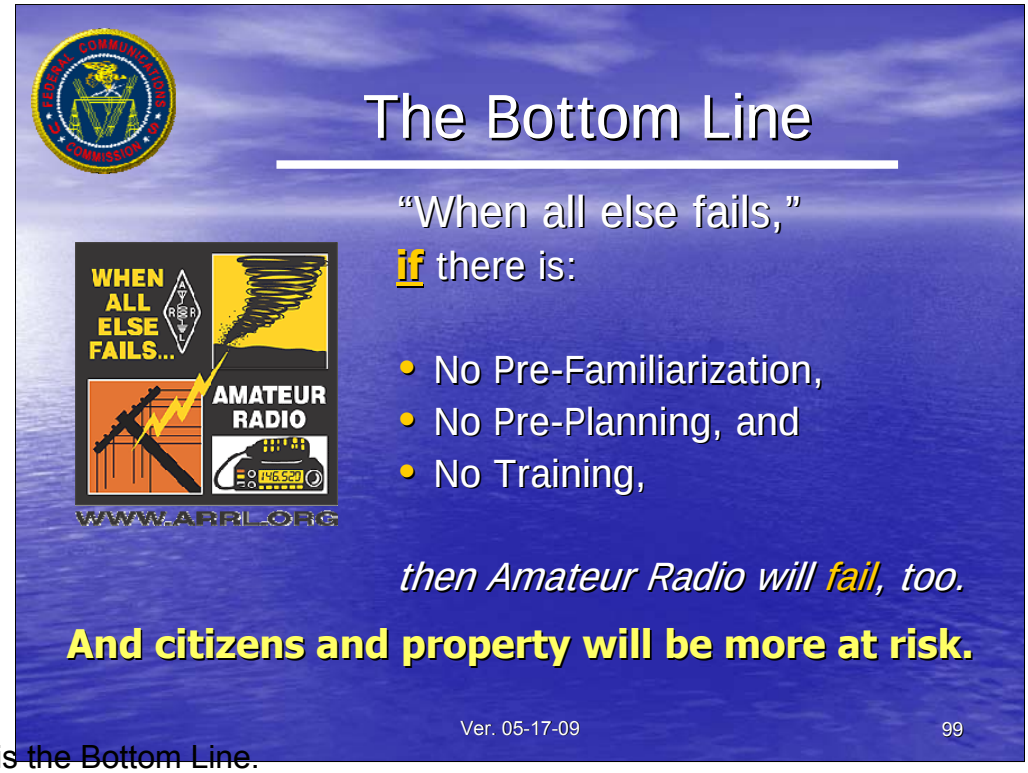


((add logos for ARES, RACES, SATERN, Skywarn, Red Cross, etc.))

So the challenge we face is **not** a question of whether or not Amateur Radio Operators are still needed, but rather ***if Amateur Radio Operators will be prepared enough*** to provide the connectivity and level of service **sufficient** to be of value to local governments, VOADs, and citizens during ***significant*** events. This is a topic that needs to be routinely and thoroughly discussed among ourselves and with our served agencies. We need to place the word "major" in front of any type of emergency and ask ourselves how prepared we are to respond to any of them: a major earthquake; a major tornado; a major hurricane; a major disaster; a major criminal act; or a major terrorist attack. How often has a major weather or other major event hit your area? Once every 5 years, 12 years?

Small emergencies help prepare us for larger ones. The ubiquitous and generally resilient nature of modern wireless communications networks increasingly affords us fewer opportunities to train because the smaller emergencies are repaired relatively quickly – perhaps within hours – and in many cases, circuits are routed around the problem area.

Although there is a ubiquitous deployment of wireless communications devices, Amateur Radio Operators are still needed to assist with emergency and disaster communications. Blackberries and cell phones are normally the first systems to become unusable in most significant emergencies. As you know, although CB, FRS, MURS, and GMRS radios are easily available, they have an extremely short range and there is very little organization or infrastructure to use them as versatile and dependable communications systems. We must acknowledge, however, that the increased cell phone infrastructure, and its generally good resilience, has lessened the need for Amateur Radio Operators for small emergencies in modern times. Some of you will recall when Amateur Radio Operators were the only folks who could get a phone line while mobile or away from a landline phone. Our repeater "auto-patch" capability was a lifesaver in those days – and it still is in parts of every community without ubiquitous cell phone coverage. We had a car accident ham radio rescue in my own county 2 years ago; in an area without cell phone coverage. One ham relayed information to the 911 Center while another ham relayed an EMT's life-saving instructions to the on-scene ham radio operator via the county 2-meter repeater.



This is the Bottom Line.

If we are telling our served agencies that we are ready, ***then we should be.***

As a nation, we tend to forget events and become complacent.

For example, we haven't had another 9/11 for 8 years, so some folks feel it won't happen again.

We haven't had another tornado or hurricane recently, so some folks feel they won't get another one either.

The more time passes without an incident, the more complacent we become.

As a senior intelligence officer for the past few decades, I can assure you that there are many nasty individuals who spend all their time planning and training for our demise. We catch many of them and we monitor most of the rest of them, but it is nearly impossible to catch them all.

Don't worry about what others think – they may not be the self-professed experts they think they are. Every club has at least one.

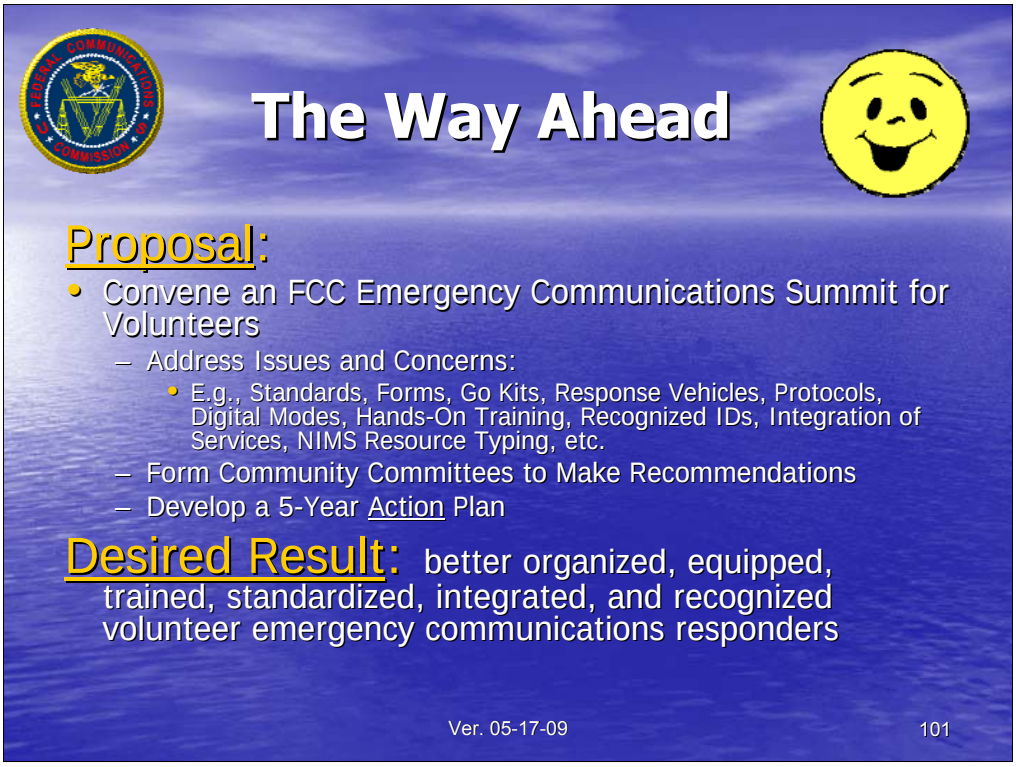
Do you feel lucky?

You may have seen this poster before.

It says that “good luck” is often with the man who **does not** include it in his plans.”

Note the cell phone display shows “1 Call Missed” – indicating that this bomb’s electronics for the firing mechanism were hooked up incorrectly,
which makes the person holding the bomb device very lucky indeed.

So what’s our next step? Here’s what I propose:



Okay,

We've talked about the new PSHS Bureau, how it is organized and what it does.

We've outlined Current & Evolving Telecommunications Networks & Systems that can lose power, fail, or become overloaded.

We defined that we are Emergency Responders, not first responders.

We talked about other services we can provide our served agencies.

Now we need to identify our most pressing volunteer EmComm challenges & what role the FCC can play to help us continue to move forward with our current momentum.

I propose we convene a summit later this year to discuss the formation of a 5-year action plan to address the concerns of the Amateur Radio emergency response community that it feels need national attention.

We have walked the walk and talked some of the talk.

Let's move forward with some more talk followed by action so that we can compose the song that we need to sing.

We're playing a new ballgame in a new era.

We have the support of many agencies and groups.

The road ahead is not yet clear, but we are coming out of the fog.

Let's move forward together in a shared vision.

Working as a team, we can combine our skills and resources to handle the job before us to take care of our families, our neighbors, and our great nation.

It isn't enough to be prepared.

We have to be <u>ready</u>!

Everyone knows that assembling a Go Kit for an emergency communications deployment is not cheap. Extra batteries, food, connectors, cables, antennas, a mobile rig, a packet TNC, and the list goes on. Our hobby is not cheap and deploying with a full radio station takes time, effort, money, and dedication.

Unemployment has doubled in many areas of the country. You could have put any extra money you had in the bank, under a mattress, or to pay down bills. Instead, you put your own needs aside and spent the money to prepare to help your neighbors for the next emergency and disaster.

You work hard to serve your community and you ask for nothing in return. You rarely receive any recognition.

When the lights go out, the cell phones die, and the Internet connection is gone, you fire up your rigs and rush in to help your local governments link up with their State operations centers. Then you help your neighbors let their loved ones know they need help or that they are OK.

The FCC heartily applauds all the patriotic ham radio operators who, in spite of our poor economy and their personal circumstances, have reached deep into their pockets to buy the items needed to stock their Go Kits to be ready at a moment's notice.

You are the silent EmComm patriots of America.

The FCC salutes you!

Thank You!

- Thank you for listening!
- Without you, I would be talking to myself

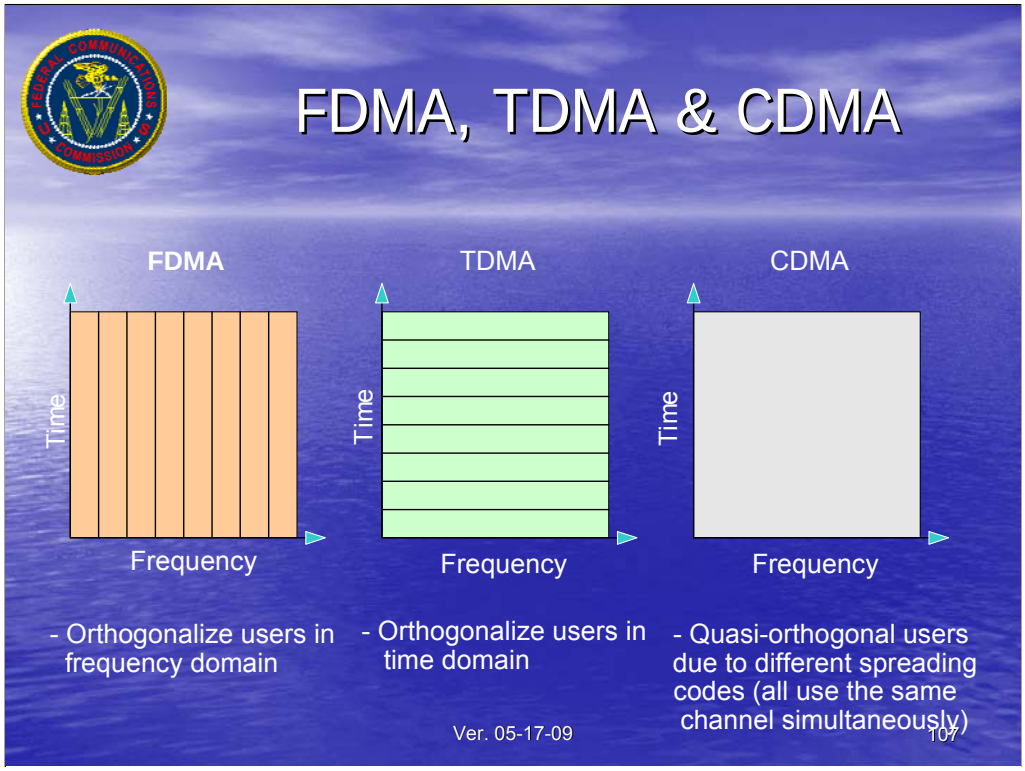
Questions?

Prepared: "properly organized or equipped"
Ready: "completely prepared or in fit condition for immediate action or use"

<u>Possible Questions</u>:

1. RACES: Why do we still have it?
2. Guidance on preparations:
    a. Take ARRL AREC Courses, see the Orange County Hosp. web site; etc.
3. Credentials for responders
    a. HSPD-12 – FRAC-- First Responder Authentication Credential

Backup Slides Follow



• Code Division Multiple Access (**CDMA**) has been known for a long time, and used in military communications, but has only recently found widespread use in commercial systems with the introduction of IS-95.

•In general, CDMA achieves quasi-orthogonal multiple access via low cross-correlation spreading sequence, so that multiple users can share the same channel with little interference.

• In some situations (forward link) it is possible to achieve orthogonal CDMA via orthogonal spreading sequences (e.g. Walsh sequences) in which case, in the absence of multipath, the performance and spectral efficiency of CDMA is equivalent to that of FDMA/TDMA.

• Multipath propagation destroys the orthogonality in orthogonal CDMA in that interference from other paths is present.

•In a **TDMA** cellular radiotelephone system, each radio channel is divided into a series of time slots, each of which contains a burst of information from a data source, e.g., a digital computer. During each time slot in a GSM-type system for example, 114 bits are transmitted, of which the major portion is information to be transmitted, including bits due to error correction coding, and the remaining portion is used for guard times and overhead signaling for purposes such as synchronization.

•In a **GSM**-type system for example, a frame comprises eight time slots. The number of different users that can simultaneously share the radio channel is related to the number of time slots in each TDMA frame. In general, the maximum number of users is the number of slots in each frame, but it is possible that one user may be assigned more than one slot in each frame. The successive time slots assigned to the same user, which may or may not be consecutive time slots on the radio carrier, can be considered a logical channel assigned to the user.