

The Dramatic Comeback of HF in the US



NVIS Communications LLC

Basic Principles

- Fallback and Baseline Fallback
- HF (High Frequency) Radio
- NVIS (Near Vertical Incident Skywave)

(May be review for some of you)

Basic Principles

Fallback and Baseline Fallback

Preferred travel mode



Resiliency in your preferred mode



Fallback to other modes



- Your preferred mode may be complex and require infrastructure
- You need Fallback modes for when your preferred mode is not available
- Your **Baseline Fallback** mode is your most basic *prepared* mode

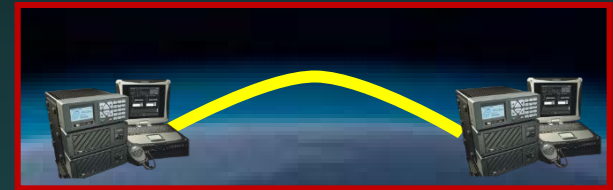
Basic Principles

Baseline Fallback Modes for Radio Communications

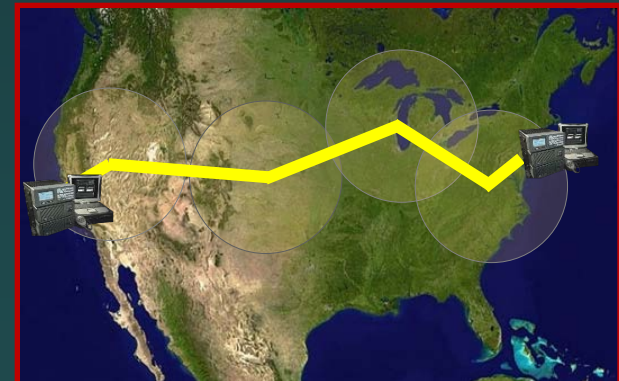
Local: VHF/UHF Direct



Regional: HF-NVIS Direct



Nationwide: Multi-site Linking



Basic Principles

HF (High Frequency) in the Radio Spectrum

We are now moving back *down* in frequency to HF for automated, reliable, baseline fallback

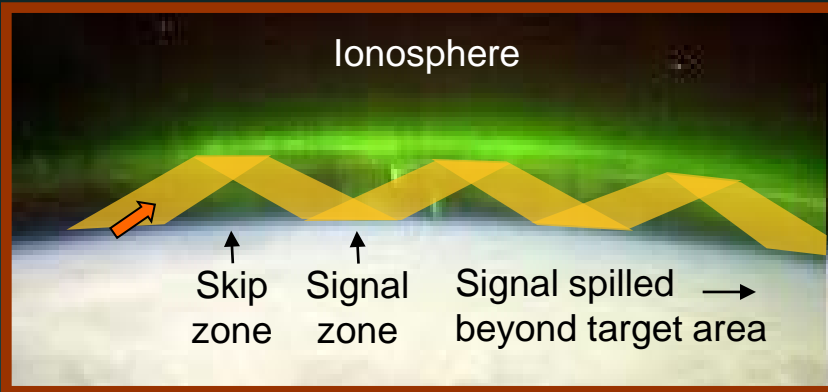


MF	HF	VHF	UHF	SHF
Medium Frequency	High Frequency	Very High Frequency	Ultra High Frequency	Super High Frequency
.3 MHz 1000 m	3 MHz 100 m	30 MHz 10 m	300 MHz 1 m	3 GHz .1 m
				30 GHz .01 m

Basic Principles

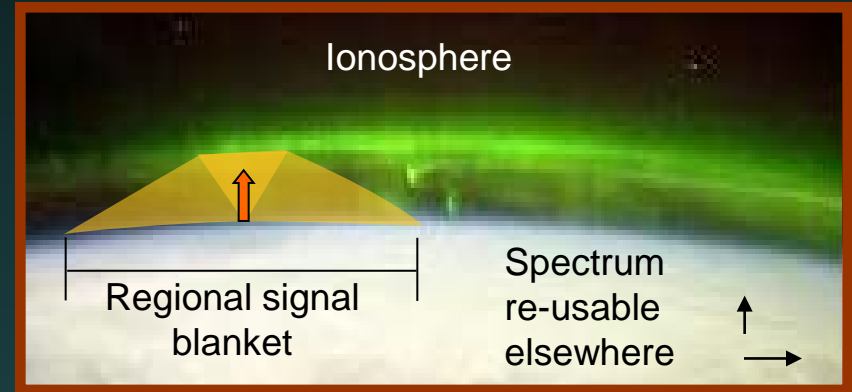
NVIS (Near Vertical Incident Skywave) Sending the signal straight up

Long Distance HF



vs.

HF-NVIS



- Signal toward the horizon
- High power, often 1KW+
- Antennas must be elevated
- May or may not work
- Has dead “skip” zones
- Spills beyond intended area
- Makes spectrum re-use difficult

- Signal straight up
- Low power, 125W is plenty
- Antennas stay near the ground
- Always works
- Blankets entire region
- Stays in the regional area
- Re-assign spectrum elsewhere

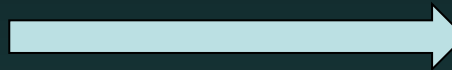
Modern Systems

- Comparing the past to today
- Automatic connection
- Multiple data modes
- Gateways to the outside
- Easy to use
- Linkable in a network

The Past vs. Today



The Past



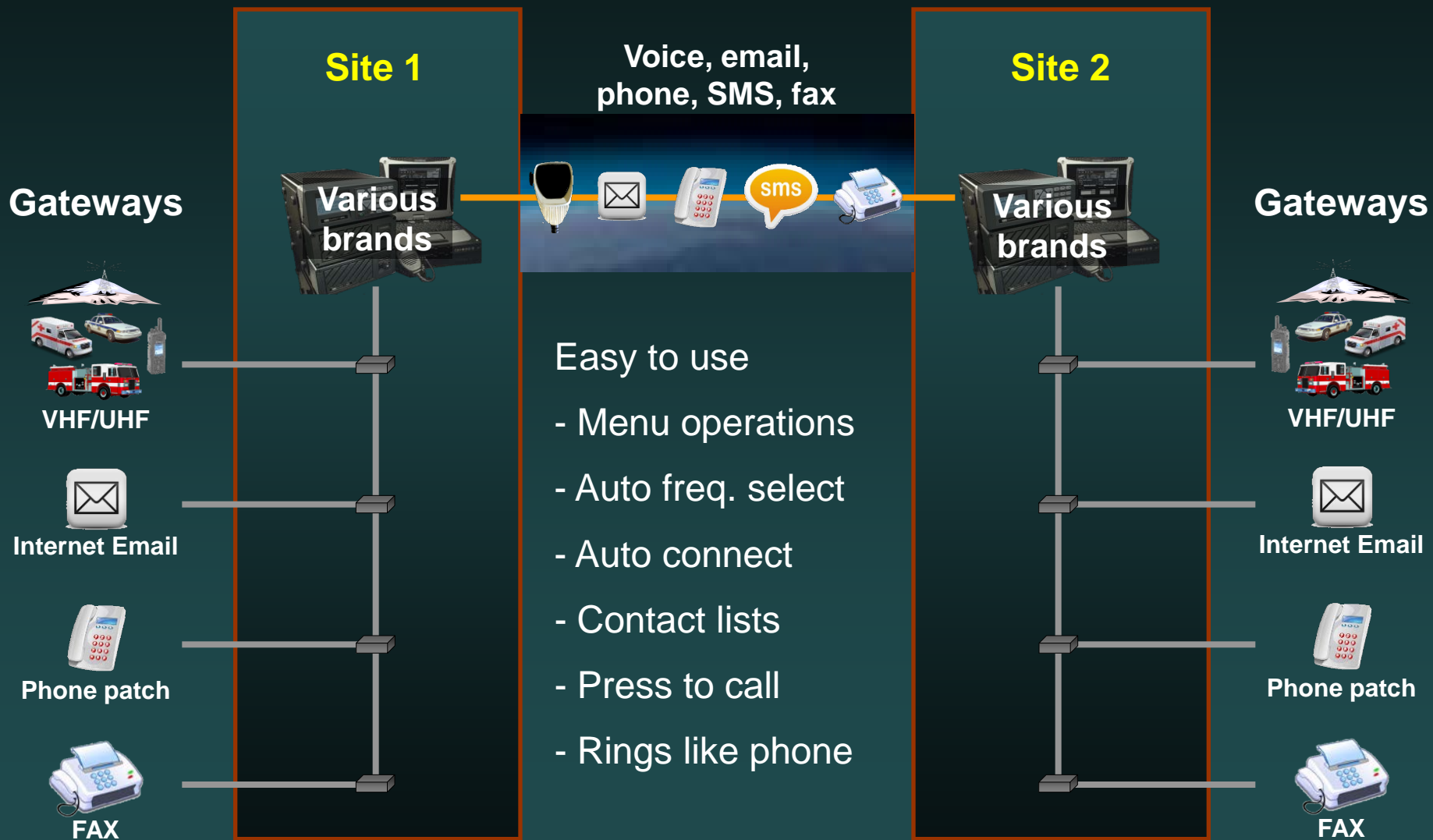
Today

- Large, heavy equipment
- Marketed for the military
- Few vendors, very expensive
- Complicated operation
- Specially trained operators
- Limited features
- Not recognized for fallback
- Not on the public safety radar
- Not on the critical industry radar

- Smaller lightweight equipment
- Marketed for govt., public safety
- Competing vendors, much lower prices
- Simpler, menu operation
- Your regular operational staff
- Many voice/data features
- The new Baseline Fallback
- Public safety lining up to get it
- Critical industries buying systems

Modern Systems

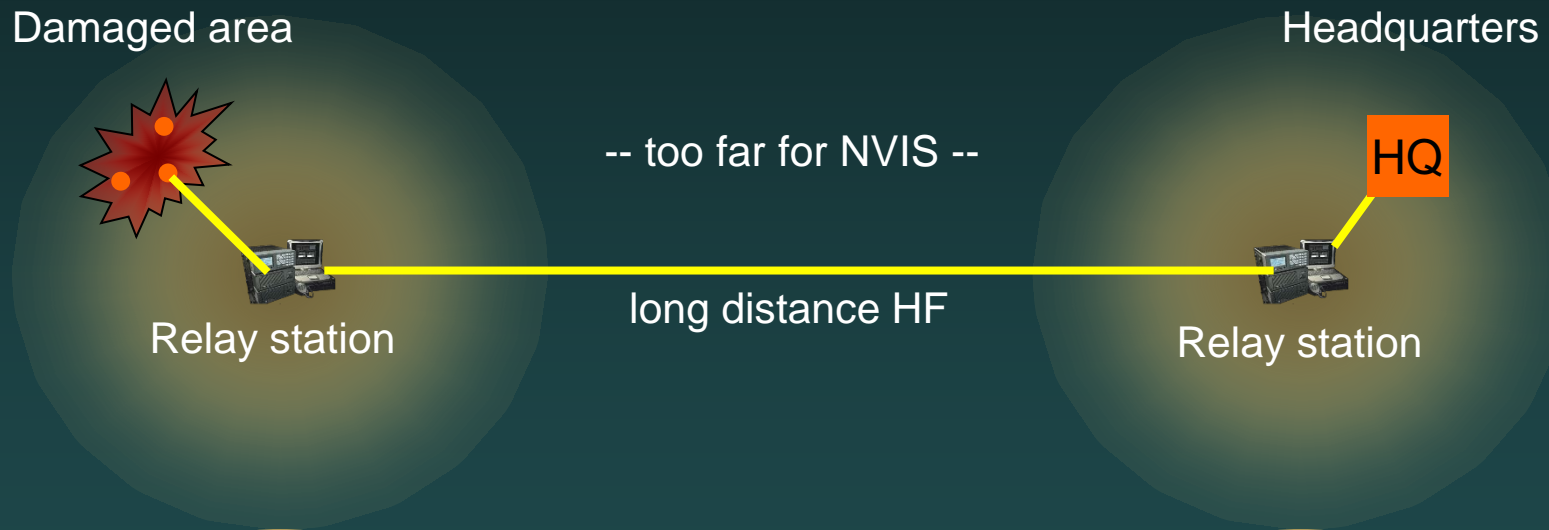
Modes, gateways, ease of use



Modern Systems

Multi-site relay systems

Using HF relay stations to extend beyond NVIS distance.



This can be extended to multiple hops.

Case Studies

- Airport System
- Electric Power Grid
- National Guard
- Large Law Agency

Case Studies

A statewide, regional airport system



Major/regional airports are depended upon by business, government, and millions of people



Subject to weather threats ranging from tropical storms to ice storms



Requires 24/7 communications throughout the state

- Installed HF-NVIS base stations with data features at airports.
- Have mobile and portable radios if needed
- Used so far in two real situations:
 - 1. A tropical storm affected the state. The airports established regular check-ins using HF-NVIS. Fortunately no airport damage, The HF-NVIS network performed as expected.
 - 2. An ice storm affected several airports. One airport experienced a power failure. HF-NVIS was used to notify administration and the other airports.

Case Studies

A major, multi-state electric power grid



Power stations
over a wide
geographic area



Hundreds of
distribution
stations



Thousands
of miles of
power lines



Crews in remote areas
with no communications
infrastructure



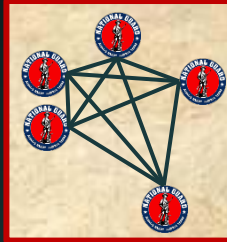
Millions of
customers over
several states

- Critical need for protection from all risks to the grid - natural or intentional
- **Immediate** fallback communications required
 - They can't "wait" for the power to come back on, they have to **make** it come back on.
- Need reliable **primary** communications for mobile crews in remote areas
- Building an HF-NVIS network with email, inbound/outbound telephone interconnects, secure mode when needed, and data capability for line status reports

A State National Guard



An Army and Air Guard component distributed across a geographically large state



Communications among all their sites and also to the National Guard Command Center in VA



Communications with other federal, state, and local organizations

- They are replacing their old HF voice-only gear with modern voice/data/telephone interconnect ALE systems
- They intend to use standard power (125W) with NVIS antennas for operations within the state
- They want to use high power (500W) with beam antennas for communications with agencies across the nation.
- They are installing modern, high/low power switchable radios with switchable antenna systems
- They are also acquiring mobile and man-pack systems

Case Studies

A large law enforcement agency



Huge geographical area, some parts are heavily populated, other parts are empty desert



Populated areas have communications, desolate areas may have none.



Have to operate anywhere in the county with or without infrastructure



- They need reliable fallback communications if primary systems fail.
- They also need reliable primary communications when operating in areas away from communications infrastructure
- They need direct links to state OES and to other federal, state, and local agencies
- They are building an HF-NVIS base/mobile network with voice, data, inbound/outbound telephone interconnects, and VHF/UHF interconnects

HF-NVIS across the nation

