Alaska Land Mobile Radio

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I. What Is ALMR?

ALMR: a 24/7/365 communications system, providing: Public Safety Radio Communications In Alaska

- Daily Operations, DPS, DOT, Municipalities, Others
- Interoperable emergency use across multiple users and organizations
- Secure, cost-effective communications
- Compliance with FCC and other requirements, such as
  - Narrowbanding
  - Statute, security
  - Multi-frequency waiver
- Lowest cost among alternatives to meet day-to-day needs
I. What Is ALMR?
I. What Is ALMR?

ALMR IS:
- VHF (very high frequency 30mhz – 300mhz)
- Line of sight, efficient over long distances

ALMR IS NOT:
- Broadband – which describes “internet or data”
- 700mhz (but “talks” to 700mhz)
  - higher energy radio frequency
  - useful in urban environments
  - better building penetration.
  - UHF 700mhz range is less than ALMR VHF
- Limited to special proprietary radios
II. Why Is ALMR Important?

Day-to-Day Operations:
- Soldotna Public Safety Communications Center
- Fairbanks North Star Borough

Interoperable:
- “Why Can’t We Talk” article (Government Technology Sept. 2011)
- Division of Homeland Security and Emergency Mgmt.
- Preparedness: can talk to many users over wide area

We own/share it now
### III. Who Uses ALMR?

<table>
<thead>
<tr>
<th>USERS</th>
<th>SUBSCRIBER UNITS (SUs)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of Alaska</td>
<td>4,682</td>
</tr>
<tr>
<td>Department of Defense (DOD)</td>
<td>6,354</td>
</tr>
<tr>
<td>Federal Non-DOD</td>
<td>606</td>
</tr>
<tr>
<td>Municipalities and NGOs</td>
<td>4,893</td>
</tr>
</tbody>
</table>

**Total SUs** 16,535

* Subscriber Units (SUs) include Handsets and Vehicle-mounted Sets
IV. Alternatives?

Cell Phones
- No incident command capability, one-to-one only
- Oversaturation risk proven

Radio Systems
- Large capital re-investment
- Unnecessary duplication, complexity
- Loss of frequencies
- Loss of interoperability

Satellite
- Need more than one – several
- High initial cost, relative high risk
V. Challenges

- System refresh overdue
- ALMR 90% along road system
- Balance in SE Alaska (not shown)
- 80% of state population
- SATS transport deferred maintenance
- Predictable shared costs
- Training
ALMR 2012

Questions?

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Appendices

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II. Appendix B: ALMR Operations & Maintenance
III. Appendix C: ALMR Governance
IV. Appendix D: ALMR Timeline
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State of Alaska Telecommunications System

- 300+ transmission & repeater towers, shelters
- 26,235 2-way radios (including 16,535 ALMR SUs)
- SOA Wide Area Network
  - Data
  - Voice
  - Others
1976 – SATS initiated
State Telecommunications initiated in response to DPS need for reliable 2-way radio for troopers.

1982 – Microwave links for TV
Funding appropriated for video microwave links to transmit television to Kenai Peninsula, Girdwood and other communities.

1986 – State Highways linked
Large portion of state highway system (Sterling, Parks, Glenn, Richardson) have 2-way sites interlinked with microwave.

1987 – Satellite T1 Carrier System
A satellite T1 carrier system established between ANC and JNU and State telephone switches in JNU, FBX, ANC linked. SATS network begins to serve as the primary pipeline for the Wide Area Network (WAN) along the road system, in Southeast Alaska and in areas where fiber is not available.

1989 – Project 25
The project provided a unified digital standard for interoperability between public safety and military organizations using advances in digital spectrum and provided backwards compatibility to older analog systems.

1989 – Valdez Oil Spill
With Valdez Oil Spill, a number of 2-way radio sites interlinked with microwave were developed in Prince William Sound, South Kenai Peninsula, and areas affected by oil spill. These sites now used by all state agencies for oil spill contingencies, primarily for 2-way radio dispatch centers.

1996 – DoD Co-Locate Request
SATS begins five year process of taking public comment on a Project 25 system that would meet the needs of municipal and state public safety entities that would also be interoperable with federal and military agencies in Alaska.

2001 – 9/11 Attack
The Trade Center attacks required massive multi-agency response. Wire-line and wireless public telecommunications are first to fail. Public safety communications were not interoperable. As a result, federal funding is provided to deploy P25 systems throughout the U.S.

2002 – ALMR System Begins
The DoD installs a Master Site at Ft. Wainwright and the State builds a Master Site at the Tudor Road office in Anchorage.

2011 – SATS
Today SATS is used primarily as a backhaul to support the State of Alaska WAN, for Public Safety two-way communications, data-processing links, state telephone networks links, paging, and SCADA telemetry.
B: ALMR Operations & Maintenance

- Costs
- Managing Operations & Maintenance
B: ALMR Operations & Maintenance

- Pay for what you own (infrastructure maintenance)
  - State owns 90%
- Shared services = Shared cost (Operations Management Office / Systems Management Office)
- Must be simple and fair
  - May include some portion of the infrastructure cost
B: ALMR Operations & Maintenance

- Systems Management Office, $1,705,500, 30%
- Operations Mgmt Office, $482,000, 9%
- Infrastructure Maintenance $3,473,000, 61%

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C: ALMR Governance

**ALMR Executive Council Members:**
- State of Alaska - DPS Commissioner Joseph Masters
- Department of Defense - Col. George Hays, ALCOM J6
- Federal Agencies Non-DOD – Darrin Jones, FBI

**ALMR Executive Council Associate Members:**
- Alaska Municipal League – Chief Jeff Tucker, NorthStar Fire Dept.

**ALMR User Council:**
- State of Alaska – 3 members, Major Matt Leveque, DPS, Chairman
- Department of Defense – 3 members
- Federal Agencies Non-DOD – 3 members
- Alaska Municipal League – 3 members
D: ALMR Timeline

Key Dates:

- 1996 – FCC Narrowband rules
- 1997 – Study and P25 Design Consensus
- 1998 – Federal and State cooperative build
- 2001 – MOU signed
- 2007 – Cooperative Agreement signed
- Initial Build completed 2008; enter OPs phase
- Includes Anchorage Muni-built sites to connect to 700Mhz system
- DOD Equipment Divestiture – January 2012
Radio Signal Propagation (Coverage)

High Frequency (HF) – 3 MHz to 30 MHz
- Long range communications used by military, government and amateur radio operators (HAMS)
- Reliability of signal propagation varies depending on frequency, time of day, transmitter power and atmospheric conditions
- Not generally reliable in close proximity or indoors

Very High Frequency (VHF) – 30 MHz to 300 MHz
- Used by public safety, government, military and business for local/regional land mobile communications
- Generally limited to lower power transmissions and line-of-sight coverage; spotty in-building coverage; generally more useful in rural applications
Radio Signal Propagation (Coverage), cont’d

Ultra High Frequency (UHF) – 300 MHz to 3000 MHz

- Used by first responders in urban settings; better in-building coverage compared to VHF

UHF (700, 800, 1900 MHz) –

- 700 and low 800 used by first responders in high density urban settings; better in-building coverage compared to lower frequencies
- High 800 and 1900 are used for cell phones

NOTE: As frequency increases, coverage distance decreases and coverage inside buildings gets better.
E: ALMR Technologies

VHF in Alaska

- “Air Band”: 109 – 136 MHz
- “Marine Band”: 151 – 158 MHz
- “Public Safety”: 140 – 159 MHz

- All are “VHF” radios.
- In most Villages, “VHF” are marine band radios
General Coverage Rules Outdoors:

- Lower the frequency + higher transmitter power = greater communication distance
- Conversely, increased transmission frequency = transmitter power is less important + range decreases
- As transmission frequency increases, cost of equipment tends to increase.
- As the mode of usage (i.e., trunking, cellular) expands, the cost of infrastructure equipment increases.

General Coverage Rules Indoors:

- Higher frequencies penetrate buildings better than lower frequencies.
- Metallic-coated windows attenuate most frequencies.
- Walls and doors attenuate signals but not as much as metallic windows do.
- In-building coverage can display hot and cold spots: 800 MHz and higher begins to behave somewhat like light indoors.
E. ALMR Technologies

Frequency Band Characteristics
Affecting Radio Communications

- **30 MHz**: Good In-building Coverage
- **150 MHz**: Line of Sight
- **200 MHz**: Increasing blockage of signal by terrain, foliage, metallic coated windows & “urban canyon effects”
- **800 MHz**: Equipment Cost

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Radio Usage in ALMR

SIMPLEX – A single frequency used to talk radio to radio.

Each radio transmits and receives on the same frequency
Push to talk – release to listen.
Limited to line of sight communications
If you can see it, you can talk to it.
Line of sight is limited by antenna height
How tall are you?
Want to increase distance?
Find a high spot.
“Repeater talk around”: simplex on the lower frequency of a repeater channel.
Radio Repeater Usage

HALF DUPLEX – Separate frequencies are used for transmitting and receiving;
The pair is usually referred to as a repeater channel
Repeater: received F1, transmits F2

“Push to talk; Release to listen"
Trunked Radio

- All radios listen to control channel when not busy
- Tactical 1 pushes PTT; controller assigns voice channel A after verifying user ID and privileges
- All Tactical units hear Tactical 1; Patrol units continue to monitor control channel
- Tactical 2 pushes PTT to respond to Tactical 1; controller assigns voice channel D after verifications

Half Duplex Operation

Controller

1. Tactical Talk Group
2. Patrol Talk Group

E: ALMR Technologies