STATE OF ALASKA TELECOMMUNICATIONS SYSTEM (SATS) ANALYSIS

SPRING 2014

An analysis of the State of Alaska's microwave backbone and public safety telecommunication resources.

PEAK SIGNALS Telecommunications

World Wide Technology, Inc.

TABLE OF CONTENTS

PRESENTED BY

World Wide Technology, Inc.

Anchorage, Alaska

PREPARED FOR

State of Alaska Department of Administration

PREPARED BY

Peak Signals in collaboration with

World Wide Technology, Inc.

WORK ORDER

02-3035

Acknowledgements:

World Wide Technology, Inc. is an IT systems integrator and has extensive involvement and familiarity with the SOA's IT network as well as the SATS communications system. WWT does not have a vested interest in the determinations of the SATS communication system and has verified sufficient neutrality in the selection of Peak Signals, LLC as the subcontractor performing the analysis at hand.

In September of 2013, WWT was contracted to conduct stakeholder interviews and gather data necessary for this study. This project was identified as Phase I and was concluded in November, 2013. All financial data has been verified and updated as needed.

Peak Signals, LLC has been in business since 2009 and provides telecommunications system consulting, integration and support services. They specialize in the conversion of legacy systems along with the required infrastructure.

Peak Signals' business model is focused primarily on supporting federal and state agencies, with relatively little focus on private sector customers. Their principals have worked with a variety of federal agencies including the U.S. Navy Space and Naval Warfare (SPAWAR) and NavSEA laboratories, the U.S. Air Force Research Laboratory (AFRL), the National Security Agency (NSA), the National Geospatial Intelligence Agency (NGA), the Defense Information Systems Agency (DISA), the National Aeronautics and Space Administration (NASA) along with most branches of the Department of Defense (DoD). In 2013, less than 15% of their revenue was derived from non-federal projects.

TABLE OF CONTENTS

Contents

SATS: AN ANALYSIS

I. State of Alaska Telecommunications System (SATS)

A. OVERVIEW

The State of Alaska's Telecommunications System (SATS) is an aggregation of approximately 159 telecommunication sites linked together through a variety of different transport methods (although primarily via terrestrial microwave) and covering the majority of the state's road system. The physical transport layers, the electrical, optical, mechanical and functional interfaces carrying the signal include:

- Terrestrial microwave;
- Fiber optic cabling;
- Copper wire; and
- 2-way radio.

SATS may be viewed as a "Network-of-Networks" as it encapsulates so many different services. It is owned by the State and managed by ETS (Enterprise Technology Services). It has evolved over a span of 50 years from a basic 2-way radio system into the backbone of the state's Wide Area Network (WAN) and Public Safety communications system.

If one also includes Conventional 2-Way sites into the count, SATS is comprised of over 300 sites and 26,235 radios, including 16,408 Alaska Land Mobile Radio (ALMR) units at the end of 2012[1]. In fact, ALMR has grown significantly over the last six years, as shown in the table below.

Year	Agencies on ALMR	Subscriber Units	Voice Calls
2008	76	12,915	9,008,350
2009	98	13,544	9,860,720
2010	106	14,446	9,833,178
2011	110	15,030	10,451,463
2012	116	16,408	11,508,239
2013	119	18,988	12,778,142

All figures are at end of calendar year

The system complexity is significant since SATS is comprised of over twelve thousand separate pieces of communications equipment, many of which are owned by allied state and federal

[1] **State of Alaska, Department of Administration, Enterprise Technology Services.** *Alaska Land Mobile Radio.* s.l. : Alaska State Legilsature Presentation, 2012. p. 12.

agencies. ETS manages over 2,200 Federal Communications Commission *(FCC)* licenses with most being associated to this system[2]

Also dependent on the microwave backbone provided by SATS is the ALMR system. The State of Alaska, the Department of Defense, other federal agencies in Alaska, and local municipalities joined together in a consortium effort to design, build, and now operate as well as maintain, a fully interoperable wireless communications system in Alaska. The primary objective of ALMR is to provide a reliable and secure, cost-effective emergency communications system for all emergency responders and DOT in Alaska, especially for multi-agency responses to emergencies and critical situations.

The SATS Name

The acronym SATS is the term often used instead of the longer phrase State of Alaska Telecommunications System. The term State of Alaska Telecommunications System was created as a title for a book of spread sheets used to allocate costs for services provided by the telecommunications services division of the Department of Administration. The SATS book was created in 1990 to determine costs of providing services and to establish rates for these services. Each spreadsheet in the SATS book described what cost percentage of a telecommunications site was used for the services provided by or at that site.

For a site to be included in the SATS book and have a spreadsheet for allocating costs, the site needed to provide services for more than one cost center in ETS. To provide multiple services at a site, the site needed an interconnectivity capability back to other sites. This interconnectivity was microwave radio, fiber optic systems or copper cable. As a result, a site that used microwave radio for interconnectivity and provided services to more than one cost center was therefore considered a SATS site and was included in the SATS book.

In the past, the SATS was the core set of telecommunications sites forming the fundamental infrastructure that provided telecommunications services for the executive branch of the State of Alaska. The majority of the sites and equipment is now owned and operated by the Alaska Department of Administration, Enterprise Technology Services Division. Other government and utility organizations own and operate portions of the system and have partnered with ETS to more cost effectively provide services.

Definition methodology

One of the problems for SATS is the confusion surrounding the multitude of perceived definitions. Historically, what constitutes a SATS site depended on the presence of either a tower, a dedicated communications shelter or possibly the existence of a power source. These several criteria have led to inconsistent conclusions as to what the exact number of sites there are in this system. For clarity's sake, we will attempt to define some fundamental descriptions of the system and its

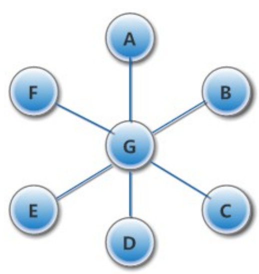
[2] **Federal Communication Commission.** ULS Online. *Universal Liscensing System.* [Online] 2014. http://wireless.fcc.gov/uls/index.htm?job=home.

components. Without these clear definitions, the majority of the information provided is as meaningless as it is open to individual interpretation. For the purposes of this analysis, a site is defined in terms of network topology.

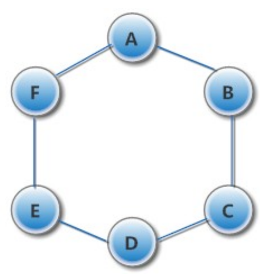
Network topology is the arrangement of the various components of a computer or communications network. In this parlance, a node is a connection point, either a redistribution point or an endpoint for data transmissions. In general, a node has a programmed or engineered capability to recognize and process or forward transmissions to other nodes. A link is one of several types of information transmission paths between these nodes.

Star topology is one of the most common communication network topologies, consisting of a central hub, to which all other nodes are connected. This central node provides a common connection point for all nodes through a hub. In star topology every node is connected to a central node. The central node is the server and the peripherals are the clients. This means that the central node is the bottleneck for all data transmission.

Ring topology is a network in which each node connects to exactly two other nodes, forming a single continuous pathway for signals through each node, creating a ring. Data travels from node to node, with each node along the way handling every packet. The advantages are that it performs better than star topologies under heavy network load as it does not require a central node to manage the connectivity between nodes.



Star topology



Ring topology

Because a ring topology provides only one pathway between any two nodes, ring networks may be disrupted by the failure of a single link. A node failure or cable break might isolate every node attached to the ring.

For these reasons, the SATS microwave backbone implements ring-protected topologies wherever feasible, allowing data packets to be switched to an alternate route if one of the protected nodes fails.

Under these criteria of network topology definitions, a SATS microwave facility is defined to be a site if it is either a terminal or intermediary node within the overall linked network.

Defining Terminology

As these terms can be ambiguous, when the following terminology or acronyms are used in this report, refer to the definitions given below:

SATS – the State of Alaska Telecommunications System microwave network

SATS site – a microwave site, either a terminal or intermediary node on the network

Terminal node – the end-point of a microwave link where bandwidth is being provided for distribution

Intermediary node – a midpoint support for links to the terminal nodes

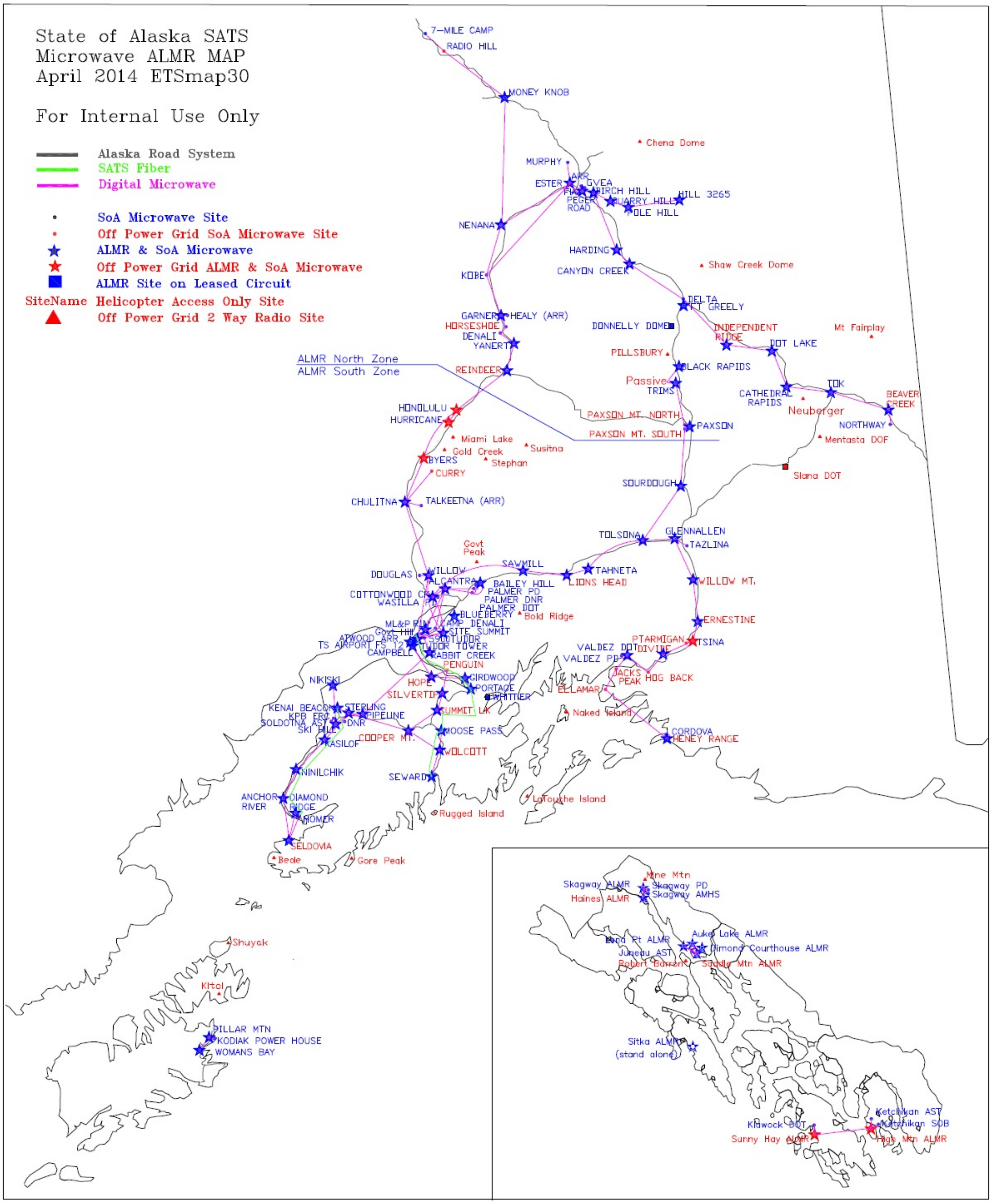
- Active intermediary node – traffic/service may be dropped, powered site
  - *Active repeater* – receives the signal and retransmits, boosting power and/or changing direction
- Passive intermediary node – no traffic/service dropped, no power required
  - *Passive repeater*[3] –
    - *Passive or plane reflector* – billboard style
      (Penguin Peak, Trims Passive, Hogback Mountain)
    - *Back-to-back antenna passive* – two antennas connected together
      (Paxson Moutain North/South)

2-Way site – A site having a conventional repeater (Daniels type)

ALMR Site – A Site having a trunking repeater (Motorola Quantar type)

[3] Passive Repeater Engineering, Manual No. 161A, 1984 Edition, Microflect Co, Inc. (Valmont) Salem, OR

State of Alaska Microwave Backbone



B. SERVICES PROVIDED

SATS has evolved technologically, providing a wide range of services beyond the original phone and data network traffic. These include:

- Trunked 2-Way Radio (ALMR)
- Data traffic - Wide Area Network (WAN)
- Conventional 2-Way Radio (non-ALMR)
- Voice traffic - telephones
- Seismic Equipment and Data Transport
- SCADA Equipment and Data – Southeast Alaska Power Agency / Four Dam Pool support
- Differential GPS Equipment and Data
- Video Conferencing
- Highway Emergency Call-boxes
- FAA Weather Cameras
- Department of Transportation Weather Information Service (DOT RWIS)
- Railway signaling support [is this the correct phrasing or is it included above?]

C. CUSTOMER BASE

The user base is comprised of a large number of state, federal and municipal agencies as well as a few critical utilities.

SATS also supplies circuits and support to a variety of Alaskan municipal fire, police and health and safety agencies, as well as SCADA and ALMR support and coverage for critical power infrastructure, such as dams and power plants. A comprehensive list of the user base is given below:

Federal Agencies

- United States Military:
  - U.S. Army Black Rapids Training Center
  - U.S. Army Corps of Engineers
  - U.S. Army Ft. Greely
  - U.S. Army Ft. Wainwright
  - Clear Air Station
  - USAF Eielson AFB
  - Joint Base Elmendorf Richardson
  - USMC Detachment, MP Company D, 4th LE detachment
  - NOAA - National Oceanic and Atmospheric Administration
  - Bureau of Alcohol Tobacco and Firearms
  - Bureau of Land Management

- Drug Enforcement Agency
- Federal Aviation Authority
- Department of Homeland Security, Immigration and Customs Enforcement
- Federal Bureau of Investigation
- Internal Revenue Service Criminal Investigation
- National Park Service
- National Oceanic and Atmospheric Administration enforcement
- National Protection and Programs Directorate, Federal Protective Services
- Transportation Security Administration
- U.S. Attorney's Office, District of Alaska
- U.S. Fish and Wildlife
- U.S. Forest Service, Law enforcement
- U.S. Marshals
- West Coast &Alaska Tsunami Warning Center

- **State Agencies**
  - Department of Commerce, Community & Economic Development
    - Alaska Railroad Corporation
  - Department of Corrections
  - Department of Environmental Conservation
  - Department of Health and Social Services
  - Department of Military &Veterans Affairs
    - Alaska Air National Guard
    - Army National Guard
    - Division of Emergency Services
    - Division of Homeland Security and Emergency Management
  - Department of Natural Resources
    - Division of Forestry
    - Division of Parks and Outdoor Recreation
  - Department of Public Safety
    - Alaska State Troopers
    - Fish and Wildlife Protection
    - State Fire Marshal's Office
  - Department of Transportation &Public Facilities
    - Statewide Maintenance &Operations
  - University of Alaska, Fairbanks
  - State Seismology Laboratory

Municipal Agencies

- Police Departments
- Fire Departments
- Health & Safety Officers

Utilities

- Electric Power Plants
- Alaska Energy Authority

D. HISTORY

Many find the SATS system very difficult to initially understand due to the multiple layers of complexity. In order to better understand the structure of the SATS, it may be useful to take a brief look at how it has evolved over the years into its existing structure.

In the 1950s, prior to statehood, the Territorial Bureau of Roads (now known as the Department of Transportation & Public Facilities) had, then as now, a need for its road crews to communicate with each other. The solution at the time was primitive at best with communication dependent upon the use of a few two-way radios.

The State of California decided to upgrade its existing radio system in the 1960s and offered the old equipment to the State of Alaska. These older radio repeaters operated on Low-Band frequencies, which the FCC granted licenses for the State of Alaska to use.

While recycling California's Low-Band equipment made good economic sense, it also unintentionally enforced the habit of DOT utilizing this type equipment for the next several decades.

During the pipeline days, in the 1970s, the workers wanted to have access to television during their off time. In Anchorage, the local television station Channel 11 would produce video tapes and send them out to the camps for delayed viewing. As time went by, the workers wanted to watch these taped shows in more private settings around the camp, such as their own rooms or trailers. The solution was to retransmit the video on small and local low-powered transmitters known as mini-TV. One of the problems was that each of these "mini-TV" transmitters required a unique FCC license in order to comply with federal law. The Governor's Office of Telecommunications had to hire several Washington, DC-based lawyers to manage these license applications.

Concurrent to the pipeline crew’s demands for television, rural villages also voiced their needs. During the 1970s a local Dillingham politician ran for office on the platform that, if elected, he would bring television to the community. He was elected. The Dillingham community received a television broadcast that was retransmitted from a military Armed Forces Radio and Television Service (AFRTS) feed through King Salmon. Shortly thereafter, the Governor's Office of Telecommunications was receiving an increased amount of requests for rural television.

On July 1, 1981, per Executive Order #50, the responsibility of the Division of Communications (DivCom) was assigned to the Department of Administration. At the time, the Department of Transportation was supporting 2-way radio for public safety and the Governor's Office of Telecommunications was handling everything else that was telecom-related. To a large extent, the catalyst for this move was the political and administrative demands for providing television throughout rural Alaska.

While the initial 1971 network consisted of only a handful of microwave facilities to support 2-way radio coverage for the State Troopers and emergency vehicles, data circuits were later added to provide services between Fairbanks and Anchorage at the request of the University of Alaska. This service was subsequently expanded to address the University's intrastate voice requirements. Data circuits were added throughout the 1980s as additional services were needed.

On March 24, 1989, the Exxon Valdez oil spill occurred in Prince William Sound. The State telecommunications staff was able to respond almost immediately to support the disaster response efforts deployed by the State. Throughout the summer of 1989, the SATS microwave network was rapidly expanded to cover emergency communication needs over the Sound. Barges carrying concrete trucks and heavy lift helicopters were used to build out this network from Valdez down to Kodiak in a single summer. This quick expansion was necessary to follow the flow of oil down to Kodiak. This is another example of the State's ability to provide rapid response during a critical emergency. Connecting the microwave system from Anchorage to Valdez and on up the Richardson Highway to Fairbanks provided the foundation of the substantial infrastructure to support State telecommunications.

Over the years, several natural disasters have mandated the need to enhance the network to support emergency services. These disasters have ranged from forest fires, such as the 1996 Miller's Reach fire, to avalanches and significant rockslides that have periodically damaged fiber optic cables connecting Anchorage and Fairbanks.

In 1996, the State of Alaska and the Department of Defense (DoD) in Alaska had been operating on antiquated radio equipment when the FCC announced its narrowbanding mandate, which required that all licensees using 25 kHz radio systems migrate to the narrowband 12.5 kHz channels by January 1, 2013. Both organizations needed to completely replace their respective radio systems at a very high cost.

After several studies and design meetings, it was determined that it was in the best interest of both parties to pursue a cooperative build-out of a new system. The DoD brought the bulk of the funding to the project starting around 2005, while the State had a pre-existing microwave network (SATS) in place that already covered the majority of the road system in Alaska.

In December 2001, the State of Alaska entered into a contract with Alaska Communications Systems, Inc. (ACS) for voice and data communication services. The contract was known as the Telecommunications Partnering Agreement (TPA) and was valued at $100 million. Part of this agreement was the transfer of daily operations and maintenance of the SATS system. Unfortunately, the partnership with ACS was terminated in September 2003 due to its ineffectiveness. The impacts of the failure of outsourcing critical services are further discussed in Section III.

In 2007 the Alaska Land Mobile Radio (ALMR) project finally started to show progress. The build-out of the ALMR project (2007-2008) saw major capital improvements made on the SATS system. New towers, shelters, microwaves, power systems and other equipment were installed, all of which significantly improved the reliability of the system. At the end of the build-out, it was determined that approximately $195 million dollars had been spent on the new radio system with over 72% of these costs having been federally funded.

Due to funding challenges for ongoing maintenance, the DoD transferred ownership of 13 ALMR sites to the State of Alaska on July 1, 2011. The following year on July 1, 2012, the ownership of another 28 ALMR sites were transferred to the State. The State of Alaska now owns 88% of the total ALMR equipment.

E. ALASKA STATUTES

The duties of the Department of Administration are defined in the Alaska Statutes (specifically Chapter 44.21 Article 01). Listed under these departmental duties is the responsibility for telecommunications for the State of Alaska.

Sec. 44.21.320. Telecommunications operations.

(a)(1) plan, design, construct, manage, and operate all telecommunications systems owned or leased by state agencies;

(a)(2) manage…telephone-related services of state agencies;

(a)(3) be responsible… for telecommunications systems and design for state agencies;

Within the department, the Enterprise Technology Services division has been delegated to manage statewide telecommunications.[4]

[4] **Alaska Statutes 2013**, Chapter 44.21, Article 01 Department Functions

II. Current Model

A. ORGANIZATION

The three principal components of system are SATS Microwave Backbone, ALMR and Conventional 2-Way Radio. The genesis, oversight and current status of SATS was discussed in the previous section.

SATS Microwave
Since the end of the TPA outsourcing experience, ETS has had difficulty managing the SATS system. The average tenure of the SATS manager has been less than three years. This may have something to do with the average tenure of an ETS director being less than two years. Although we have not identified the turnover associated with the technical staff (Engineers and Technicians), it too is substantial. This lack of continuity is disruptive as the learning curve is fairly significant.

The SATS system is currently managed in-house primarily out of the State-owned Tudor Road facility in Anchorage. From this location, the network operations and management are performed across the State. The majority of the small staff (21 of 25) works out of the Tudor Road facility.

The SATS staffing structure consists of three main groups which include Engineering, the Electronics Maintenance Technicians and Administrative Support. Each group plays different roles in the day-to-day operations of this large network. While the Enterprise Technology Services Administrative Support is not part of the SATS organization, 25% of its function is allocated to SATS to support departmental needs as travel, procurement and billing. It should also be noted that the Anchorage Data Center Operations, co-located at Tudor Road, has been assisting SATS for the past 18 months with operations such as shipping/receiving, asset inventory maintenance and control as well as some project management. Starting in FY15, 25% of their allocation will be to SATS.

The duties of the three different groups are:

- Engineering
  - Projects
    - Internal and Customer-Sponsored capital projects
    - Special / Emergency projects
  - Maintenance & Operations
    - Support for ALMR
    - Conventional 2-way support
    - Microwave support
    - Circuits / MPLS
    - Procurement Support
    - Customer Services
  - Administrative

        - FCC licensing
        - Land leasing
        - CAD / Documentation
        - Strategic planning / Network design
        - Procurement support
- Radio Shop – Technicians
    - Maintenance & Operations
        - Alarm monitoring
        - Preventive Maintenance Inspections, Remediation and Support
        - Tower Climbing
        - Equipment Installation/Upgrading/De-commissioning
        - Power System Maintenance
- Administrative support
    - Accounting (AR/AP)
    - Travel
    - Procurement
    - Data / Project Management
    - Project Planning at the Portfolio Level
    - Management of Telecommunications Agreements, Permit, Leases and Renewals

Current Organization of the "SATS" Group

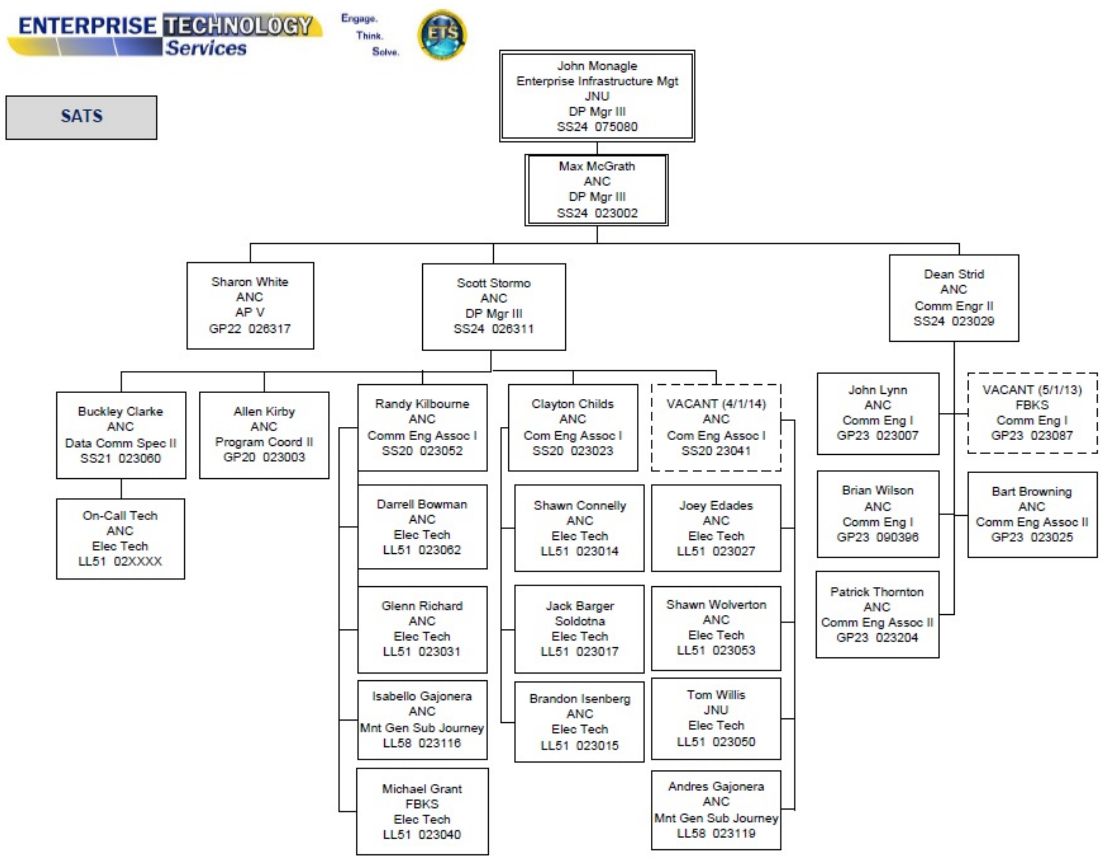


Figure 1. SATS Group Organization Chart.

Conventional 2-Way
Historically, the telecommunications shop at Tudor Road has always deployed and maintained conventional 2-way radios as necessary. This need for support services still exists and will continue to ensure rapid response for emergency situations.

Conventional 2-way radio systems are not trunked. Conventional systems can be simplex (base to mobile) or repeated (where the signal from a low power/low elevation mobile or portable radio is automatically rebroadcast usually with higher power and/or higher elevation). A repeater system extends the line of sight operating range of communications beyond that achievable directly between users on the ground. Conventional radio repeater systems can be either analog or digital.

A conventional radio repeater system typically consists of one or more channels, each made up of a pair of frequencies (input and output) and a user selects the frequencies being used by changing channels on his or her radio.

Conventional radio repeater systems are inefficient when used by a large number of users because such systems only offer a single talk path through the repeater. Users must stand by until the system is idle to initiate a conversation. However, they are easy to configure in an emergency situation and are used for temporary radio coverage during fire season, or major projects in a coverage limited zone. For this reason, conventional 2-way remains an important component of the SATS services, with approximately 15% of the man hours being devoted to these services with one contractor dedicated full-time to fulfilling customer 2-way requests.

ALMR
In 2002, ALMR was implemented with the DoD installation of a Master Site at Ft. Wainwright and the State a Master Site at the Tudor Road office in Anchorage. The system grew significantly over the next decade.

In 2011, a study was conducted to determine the operational and economic impact having the State of Alaska accept the equipment of a planned U.S. Army Alaska (USARAK) equipment divestiture. An assessment of recent advances in technology was made to determine if feasible alternatives to ALMR exist. The conclusions of the study supported the State of Alaska's accepting a significant increase in equipment ownership and O&M responsibility from USARAK.[5]

As of July 2012, the State of Alaska owns 88% of the ALMR infrastructure. Since its inception, the model for maintenance and operations of ALMR infrastructure has been managed by a third-party contractor.

---

[5] **ALMR Feasibility Study**, State of Alaska October 2011
http://doa.alaska.gov/ets/almr/ALMR_FeasibilityStudy+Survey%20Results_Final_WWT_OCT-2011_Web.pdf

The support, oversight and maintenance of ALMR infrastructure are managed by two groups, ALMR's System Management Office (SMO) and ALMR's Operations and Management Office, (OMO)[6].

The SMO is responsible for the day-to-day "nuts and bolts" operation of ALMR. Its duties include the Wide Area System Management, the asset management, as well as system/network maintenance and support. The SMO also provides 24/7/365 helpdesk support and emergency maintenance. Other duties of the SMO include Radio Frequency Spectrum Management, DIACAP certification and Security and Information Assurance.

The day-to-day oversight and administration functions of ALMR are assigned to the ALMR Operations and Management Office, (OMO). While the mechanical activities are outsourced, the OMO retains oversight of the following functions:

- Administrative oversight of the SMO;
- Ensure the availability of the System 24/7; and
- Serve as the point of contact between the User Council and the SMO.

In order to accomplish this, the OMO develops all system policies, plans, procedures, and protocols. It also audits and reports on SMO compliance with service level agreement.

The OMO is also responsible for the training of member organizations, as well as liaising with other states as well as Canada for cross-border inter-operability.

B. BUDGET

Funding Levels

As this system has grown, its operating budget has remained static at approximately $3.5 million annually. The only way that ETS has been able to provide some consistency in the SATS maintenance is through its reliance on capital project funding.

When looking at the valuation of the SATS network, excluding ALMR, it is around $205 million based on industry benchmarks. The methodology by which this valuation is determined is discussed in detail later in Section IV, under the heading "Valuation Methodology" on page 22.

Most industries, including the telecommunications industry, set aside an annual maintenance budget of around five percent (5%) of the system value. Based upon this standard, a reasonable budget for annual maintenance on this system would be approximately $10 million a year excluding ALMR budget requirements. This is for maintenance only.

Breakdown

---

[6] **State of Alaska Department of Administration, Enterprise Technology Services.** ALMR 101. *Alaska. GOV Department of Administration-Enterprise Technology Services-ALMR.* [Online] JANUARY 25, 2012. http://doa.alaska.gov/ets/almr/ALMR%20January%2025%202012%20Presentation.pdf.

SATS: AN ANALYSIS

The O&M funding levels for SATS, ALMR and the overall budget for ETS are given in Table 1, below for Fiscal Years 2011 through 2014. Over this period, funding for SATS and ETS has remained somewhat consistent while the O&M budget for ALMR has more than doubled.

STATE FUNDING LEVELS

ENTITY	FY 2011	FY2012	FY 2013	FY2014
SATS	5,558.3	5,659.3	5,731.6	5,777.6
ALMR	1,300.0	1150.0	2650.0	3450.0
ALMR – Political Subdivisions (State funded)	n/a	n/a	n/a	500.0
ETS	$39,557.6	40,285.6	40,633.5	40,085.6

Table 1. State funding levels for ETS and SATS and ALMR components

A breakdown of the actual FY2013 budget for SATS is given in Table 2 and Figure 1 below.

DESCRIPTION	FY 2013 BUDGET (ACTUALS) $K
PERSONAL SERVICES	2,722.6
TRAVEL	91.9
CONTRACTUAL	1,219.3
COMMODITIES	175.7
CAPITAL OUTLAY	28.3
TOTAL	$4,237.8

Table 2. SATS FY 2013 Operating Budget Actuals

These numbers are shown graphically in Figure 2. A key takeaway is that the amount of state resources committed to new telecomm equipment and O&M comprised only 1% of SATS FY2013 expenditures, with the bulk of the resources being devoted to support infrastructure. Combining ALMR and SATS into one cost center and sharing more resources would allow for a savings in the cases where expenditures overlap.

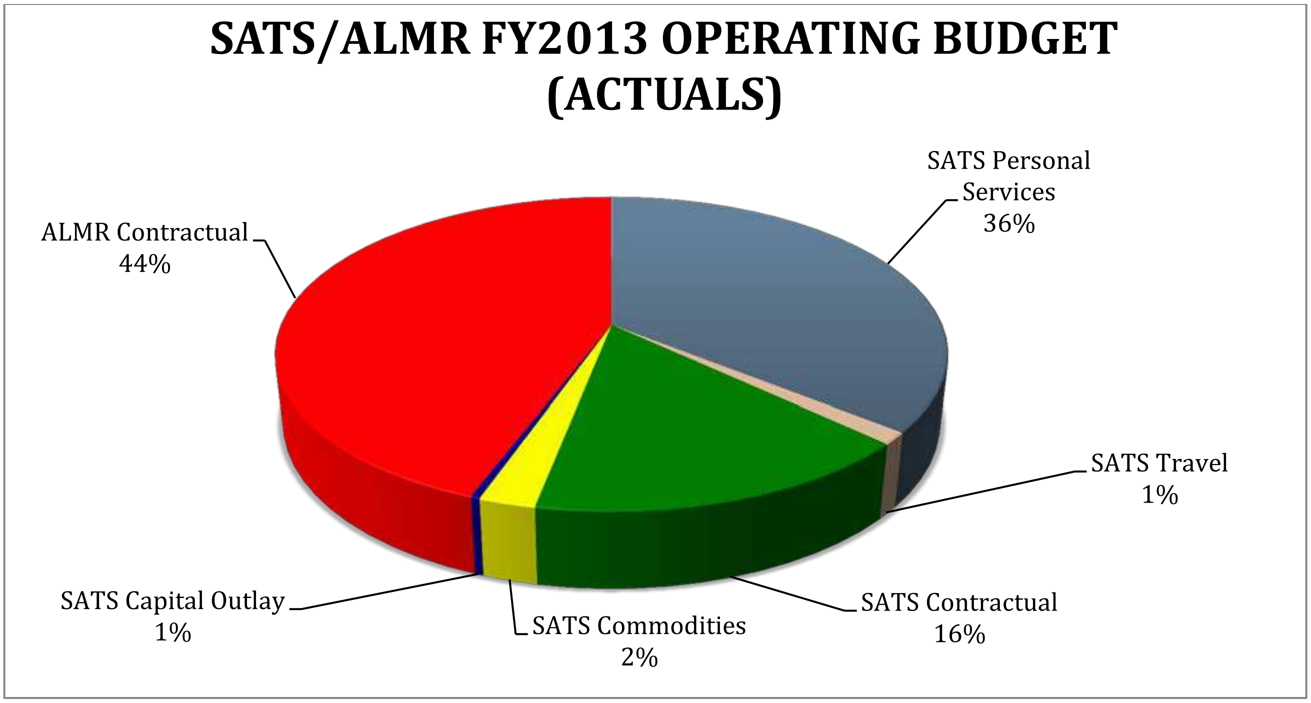


Figure 2. The amount of state resources committed to new telecomm equipment and O&M comprised only 1% of SATS FY2013 expenditures

C. VALUATION

In order to determine valuation, examples of other states public safety communication networks are given below (For specifics and references, see Appendix A):

State	Number of Sites	Service Centers	Cost of trunked Component ($M)
Alaska	159	4	$205M*
Michigan	244	7	$230M
Virginia	121	7	$329M
Colorado	222	13	$155M
California	260	47	$500M
Oregon	142	6	$317M
Totals	**1,148**	**84**	**$1,736M**

Table 3. Similar Public Safety Communications networks in other States

These budget numbers appear to average approximately 13.5 sites/ service center and $1.515M per site.

* See "Valuation Methodology", Page 22, Section IV for an explanation of this valuation.

III. Alternative Models

A. PRIVATIZATION

Privatization as it is applied to a network of this scale would involve the transfer of all or partial assets to a for-profit entity and the State would buy back the services.

At first glance, privatization might be envisioned as selling the entire system to a telecommunications company. Any services that the State might require could then just be purchased back from the telecommunications company.

A partial privatization might involve selling off one or more select sites. Obviously, certain communication sites are much more appealing than others due to their locations and potential coverage areas.

While researching for this report, not one example could be found of a State government that had successfully privatized its public safety communications system. Privatization might appear attractive at first glance, but there are a number of factors that complicate matters and even prohibit a site's use for commercial applications.

B. OUTSOURCING

Outsourcing would involve having specific job functions and responsibilities performed by a third-party as opposed to performing them in-house.

There are several potential scenarios associated with outsourcing the operation and management, administration or both. The strengths and weaknesses of these options are discussed in the following sections.

Another potential option might be for the State to retain ownership, yet outsource the maintenance and operations of the system. This approach had been attempted in the past and unfortunately failed.

SATS – Prior Outsourcing Experiences (TPA)

In December 2001, the State of Alaska entered into a contract with Alaska Communications Systems (ACS)[7] for voice and data communications services. This contract was for an initial duration of 5 years at a cost of $100 million. Along with a migration to Voice-over-Internet-Protocol (VoIP) phone system, the outsourcing of the SATS system was a major cost component of this contract.

---

[7] **Alaska Communications System.** Alaska Communications Systems Awarded State of Alaska Telecommunications Contract. *ACS Investor Relations.* [Online] December 10, 2001. [Cited: 2 28, 2014.] http://investors.alsk.com/releasedetail.cfm?ReleaseID=66951.

ACS agreed to take over the operations and management of the State-owned microwave network and offer employment to a few of the State employees whose jobs were being outsourced. After many challenges, in September 2003 it was determined that the termination of the telecommunications contract was in the best interest of each party.[8] The control of all the State-related capital equipment was turned back over to the State[9].

Prior to the ACS contract, staff at multiple locations managed the system across the State. The centralized management was based out of the Tudor Road facility while several other outposts handled needs in their specific regions. Small maintenance shops existed in Glennallen, Fairbanks, Juneau, Dillingham and Soldotna. This regional approach allowed for a reduction in response time to meet the needs of the customer base.

During the outsourced contract period, ACS had performed a minimum level of maintenance on the SATS system to assist in controlling costs. An additional study was performed by GCI in August 2004 depicting multiple discrepancies and indicators of neglect. Based on GCI's findings, they declined to take over the SATS network maintenance contract from ACS instead providing a Time and Materials contract to assist the State when necessary.

When the contract was terminated, ETS was left with many challenges. The number of staff had been severely reduced, the sites had been neglected for a few years and the budget had been reduced. Hiring to rebuild a team became problematic as the necessary skills needed to manage this system where in high demand by the private sector making it very difficult to find qualified candidates.

ALMR Impact on SATS Microwave Infrastructure

Concurrent with all of the State's telecommunications contractual issues with ACS, the ALMR project was gaining traction. Looking back, SATS was the primary reason for the Department of Defense (DoD) partnership with the State of Alaska and the Alaska Land Mobile Radio system. Both DoD and the State of Alaska had aging radio systems that were at end-of-life. DoD's budget was too limited to build out a large scale microwave network needed to support the new trunked radio system, although the ALMR component had a significant amount of funding.

The current operations and maintenance of the ALMR system is outsourced to a third-party contractor. The model of management for the ALMR system was predominately driven by the DoD during ALMR's inception; and, as it was bringing 90% of the new money to the table, DoD drove many of the decisions.

---

[8] **Alaska Communication Systems.** ACS and State of Alaska to Proceed with Disentanglement From Contract. *ACS Investor Relations.* [Online] September 15, 2003. [Cited: 2 28, 2014.] http://investors.alsk.com/releasedetail.cfm?ReleaseID=118072.

[9] **ComputerWorld.** Alaska Kills $100M Voice and Data Contract. *www.computerworld.com.* [Online] September 22, 2003. [Cited: 2 28, 2014.] http://www.computerworld.com/s/article/85183/Alaska_Kills_100M_Voice_and_Data_Contract.

The State of Alaska already had a large microwave network in place, namely the SATS system, which covered the majority of the road system. By sharing resources, a state-of-the art Land Mobile Radio system could be put into place in Alaska.

The Department of Defense had already obtained its funding and was not pleased with the State's lack of funding and attention to the project. The DoD representatives gave then Governor Murkowski an ultimatum to either act or dissolve the partnership. Since DoD was covering approximately 90% of the costs associated with the new radio system build-out and the current system in place was over thirty years old, it was determined to be in the best interest of the State to fully engage. This partnership also necessitated the FCC waiver for sharing the frequency band.

One of the challenges for the State to support ALMR was the additional requirement for remediation of discrepancies found on the SATS system. Capital funding was obtained from the Legislature however staffing was an issue due to an approximate 75% staff reduction that had previously taken place implementing the ACS contract.

Conventional 2-way
Another potential cost driver would be the residual necessity to support the multiple agencies requiring space and power outside of just broadband. A typical Alaskan example of this might be either conventional 2-way radio support for a fire season or seismographic equipment for earthquake monitoring and forecasting. Both of these services are of great use to public safety but would likely generate little revenue for a third-party administrator or private owner and thus would tend to get lower priority for support and maintenance.

ALMR
The Operation and Maintenance (O&M) of ALMR is currently outsourced. Further outsourcing would complicate the relationship and responsibilities of the third-party administrator that would be in charge of the O&M of the overall SATS organization.

C. HYBRID SOLUTIONS

One scenario could be the possible sale of a few sites that are very attractive to a commercial entity. It is very likely that the overall costs will increase due to the dilution of the economy of scale gained through your O&M efforts. Additional costs will likely be incurred with the ongoing need to lease circuits. Another potential cost driver would be the residual necessity to support the multiple agencies requiring space and power outside of just broadband. An example of this might be either conventional 2-way radio support for a fire season or seismographic equipment for earthquake monitoring and forecasting.

IV. Analysis

A. VALUE PROPOSITION

Maintenance budgets
Although there are many similarities with the overall functionality of large-scale Public Safety communication systems, each are unique. As described earlier in the history of SATS, these systems and their associated service requirements have evolved over time to meet specific needs. This may explain the lack of industry standards in determining baseline O&M cost models as each system is very different.

Under the current organizational and fiscal model for the SATS system, there appears to be a significant budget shortfall. Without the five year deferred maintenance funding for infrastructure repair the current ability to provide service would be substantially diminished. It is recommended that further analysis be performed to determine the adequate Operations and Management funding level in the future.

With the recent transfer of ALMR equipment ownership of 41 sites, the State is currently in a position to revisit the O&M model originally driven by the Department of Defense. Historically the DoD representatives had significant concerns with the State's management of these assets. Now that the State has ownership of approximately (88%) of the ALMR system, along with a larger on-going financial responsibility, it may be prudent to re-evaluate the O&M model.

A more integrated approach into the daily ETS operations might provide some cost savings. Regardless of whether or not these three systems and/or cost centers (ALMR, SATS, 2-way) are combined, the choice of internal versus external operations and management needs to be addressed.

For internal operations and management, a greater investment needs to be made in the hiring, training and retention of qualified staff. The rapid changes in technology mandate higher skills then historically have been necessary.

Another issue is the majority of the center of mass based at the Anchorage facility. Based on the geographic dispersion of these critical sites, expansion of facilities in key areas (such as Fairbanks, Soldotna and Juneau) should be made to provide adequate service and responsiveness.

Valuation Methodology
The issue of establishing a valuation methodology for the State of Alaska Telecommunications System (SATS microwave) is challenging as we attempt to capture all of the associated costs and allocate them to a specific user base of the different services. In a very simplistic process - the system itself is made up of approximately 159 sites. They have been categorized into four tiers based on their physical locations which are:

	SITE	CATEGORIZATION
CATEGORY	**SITE TYPE**	**DESCRIPTION**
A	Urban Site	Within City limits of major towns
B	Rural Site	On the Road System outside of major towns
C	High Site	Mountain top sites, with no road access
D	Extreme Site	Mountain top sites, difficult to reach with helicopter

Table 4. Table of Site Categories

This categorization allows for the allocation of maintenance and operations costs, as they are known today. The Alaska Land Mobile Radio (ALMR) project has infused the State's infrastructure with federal dollars to pay for radio equipment. Effective July 1, 2006, ETS resumed the responsibility for the ALMR project and is now charged also with creating a rate methodology for ALMR users.

The following charts indicate the total costs associated with these sites by category:

MICROWAVE NETWORKVALUATION						
CATEGORY	SITE TYPE	MICROWAVE SITE COUNT	MARKET COMPRABLE	DISCOUNT FACTOR	VALUATION (Per Site)	VALUATION (Per Category)
A	Urban Site	52	$1.0M	20%	$ 800 K	$41.60M
B	Rural Site	58	$1.4M	20%	$ 1.12M	$64.96M
C	High Site	37	$2.3M	20%	$1.84M	$68.08M
D	Extreme Site	12	$3.2M	20%	$2.56M	$30.72M
		159 sites			**TOTAL**	**$205.36 M**

Table 5. Estimated cost of site build-out by category. Discount factor is based on cost of in-house vs. contractor installation.

The market comparable numbers depicted in the above chart are reflective approximations of recent (2013) contract awards in Alaska. A categorized list of all of the State of Alaska SATS and ALMR sites is provided in Appendix C.

Day 2 support or maintenance and operations require that ETS complete site support visits to the SATS sites. A conservative estimate using industry standard PMI visits of twice a year show a significant cost of approximately $3.7 million just to perform the annual site support. These numbers are based upon the following table:

PREVENTIVE MAINTENANCE INSPECTIONS (PMI)				
		(2 trips / year)		Total
CATEGORY	PMI Rates	PMI Costs ($K)	Site Count	PMI Costs
A	1.5%	$12.0K	52	$ 624.0K
B	2.0%	$22.4K	58	$1,299.2K
C	2.5%	$46.0K	37	$1,702.0K
D	3.0%	$76.8K	12	$ 921.6K
			159	**$4,546.8K**

Table 6. PMI Cost estimates based on site category.

Keeping a simplistic thought process – by determining the percentage of use by services of the SATS environment, it is then possible to determine what rate base is applicable for the services.

B. RISK FACTORS

There are many different variables when analyzing the operational risks associated with a system of this scale. While tradeoffs can be made, these risk factors should be viewed on the aggregate in allowing for a prudent decision.

Specialized Skill Sets
The SATS microwave backbone, ALMR, and 2-Way are already combined through technological dependencies. For the most part, operationally these three categories have always been viewed separately even though it would be both difficult and expensive to segregate their functions. This is to a large part, due to the fact that each of the components requires differing skill sets dependent on extensive training, or education.

This has become even more apparent with the advent of the newer technologies associated with both the ALMR system and the SATS microwave. With the increasing level of complexity, the necessary skill sets needed to successfully operate and maintain this equipment has significantly increased. This added level of complexity and necessary knowledge level impacts all of the following aspects of the complete communications system:

- Oversight / Operations
- Monitoring
- Troubleshooting / Maintenance
- Design / Strategic growth
- Contract management

As the SATS microwave system and ALMR both introduce revolutionary new technology through equipment and software upgrades, advanced skills are needed for basic day-to-day operations. The skills necessary to operate each of the three system components are listed below.

SATS Microwave Specializations
The SATS microwave network uses the MPLS protocol creating virtual circuits based on packet-switching technology.

In packet switching (an example of this would be email), data is divided into a series of packets, each with its assigned own header or address. These packets and headers are sent separately via the most convenient circuit path (or virtual circuit) and being able to use all of the physical circuits' bandwidth. When the packets arrive at their destination, the message is reconstructed according to the information in the individual packet's headers.

These "virtual" circuits have the benefit of maximizing the bandwidth through a much more efficient approach. Through the use of a Quality of Service (QoS) model, policies for allocating traffic may be managed to give the highest service to an ALMR transmission as an example.

The reason for pointing out these differences goes back to the discussion about advanced skillsets. While the underlying technology of both ALMR and the SATS systems are similar in some ways, a broad range of technical knowledge is necessary to fully understand each system.

Conventional Two-way Specializations
The conventional two-way applications used by the State require yet another knowledge base. The applications supported by this group are typically non-trunking repeater configurations to support temporary emergency response communication and operations where ALMR is not available.

While conventional two-way is a small subset of SATS budget, it does fulfill critical needs and requires a unique skill set in addition to those required for the SATS microwave backbone or ALMR.

ALMR Specializations
The digital trunking radio system of ALMR is based around the P25 standard that uses circuit-switched technology. The majority of data networks these days (including the Internet) use packet-switched technology.

ALMR uses the P25 standard that accomplishes the digital trunking by using circuit switching technology.

Circuit Switching (example: analog phone call, using the same basic switching technology as invented in 1878)

- Source establishes a connection (of a set size) to the destination
- Source sends the data
- Source ends the connection when complete, terminating the circuit

The circuit being setup is used by ALMR as a dedicated channel to communicate with another user. While this technique is not very efficient as the voice or data traffic may require only a portion of the circuit that it is holding in use; the trade-off is a more secure connection.

Retention of liability

The State of Alaska will not be able to outsource the liability associated with Public Safety communications. This means that the State will be obligated to commit substantial resources to provide oversight to manage this liability. If the purchaser is to take over this system, the purchaser should provide enough liability coverage to shelter the state; adding significantly to the cost of acquisition. Furthermore, even if these resources are divested by the State of Alaska, the State will almost certainly have to allocate resources to insure that changes to statutory and/or case law (which directly or potentially impact public safety communications) do not increase the State's exposure.

Equipment ownership

Through the evolution of different partnerships, the State does not own all of the capital equipment associated with this infrastructure. Several SATS sites contain co-located Alaska Railroad equipment, and State traffic is carried over Alaska Railroad (AKRR) equipment in instances that the main Anchorage to Fairbanks SATS circuit is saturated or has failed. Divesting SATS resources would necessarily remove this important fail-over path.

A further complication is that the Department of Defense owns 12% of the ALMR equipment and is dependent upon the SATS microwave backbone.

Security

There are a few other concerns that would need to be addressed. As more agencies become dependent upon SATS, security concerns increase. These concerns are related to the physical security of the sites and equipment, the data security of the traffic being carried, and the personnel who have access. These challenges exist under current control and would be a major issue by introducing a third party.

Prioritization

Public safety communications must take precedence over any form of commercial traffic. It is relatively easy for a system to be overloaded due to excess cell traffic during a major event. A dedicated public safety network insures against overloading due to unnecessary excess traffic. Also, there is a greater need for responsiveness on a network for which Public Safety is dependent upon.

Each carrier has their unique standards in place to help control costs. These might include limiting the use of specific brands and models of equipment to in-house standards. By doing so, they can potentially lower costs by matching inventory and maintenance procedures. It has been noted in the past that if a SATS site is not up to a predetermined standard by a carrier, the improvement and maintenance costs will be significantly higher in order to mitigate potential risk.

Costs
There already exists a significant value for the State of Alaska based on the gains through the economy of scale on this system. If an attractive service, such as the broadband microwave was privatized the infrastructure needs and costs associated would not diminish. On a site-specific basis, the majority of these sites are in remote areas with low population. The potential customer base is not there to financially justify the increased costs associated with the liability and mandated response time. Furthermore, continuous improvements to the SATS sites are driven by the agency requirements. Internally the agencies are the customer of the services being provided. The technology improvements may not be in line with the upgrade cycle of a private entity.

Land Lease Agreements
A further stumbling block is that the majority of land leases associated with SATS prohibits the use of sites for commercial activity. Permission of use at these sites has been granted specifically for Public Safety.

Partnerships with Outside Agencies
The SATS organization has established and maintains multiple agreements such as MOUs and MOAs between the State and different agencies. For the most part, each of these agreements has different criteria defining performance, ownership and responsibilities. Limitations are present which dictate the operational parameters for this system

C. RECOMMENDATIONS

We have identified three primary models for the operations, management and ownership of the SATS microwave network. The current model, now in operation consists of full State ownership and management. A privatization model would involve the transfer of ownership and operations to a private entity. The last model would be outsourcing the operations and management yet retaining State ownership.

Privatization
There are multiple challenges associated with the privatization of the SATS microwave network. While most of these challenges can be addressed and mitigated, a few such as the issue of liability are static. The divestment of this system, either partially or in its entirety is surrounded with complexity. Our analysis leads us to believe that privatization of any portion of this system will come at a higher cost than would be incurred if the State retains ownership.

Retention of liability
The most important obstacle surrounding the privatization issue is the fact that even if the critical infrastructure is sold to the private sector, the State of Alaska will not be exempt from providing adequate public safety communications. The retention of liability diminishes any potential economic gain from selling off the assets. Any benefit through a divestment would be

negated by the loss of control yet you would still carry the full responsibility of providing the necessary services. Without argument, the role of Public Safety is one of the fundamental responsibilities of government and one of the current administration's top five priorities.

Economics

Looking at the valuation of the SATS microwave network, at approximately $205M, a possible sale is appealing. There are several problems associated with selling off either a portion or the entire network (i.e. – all of the sites). Several decades of collaboration and agreements have clouded who actually owns what with this system. An extensive and accurate inventory would be needed along with more granularity in the valuation process.

Ownership

Land ownership issues also come into play. The vast majority of the land leases hold clauses prohibiting any commercial activity as they have been granted for public safety usage only. These restrictions obviously reduce the level of attractiveness to a private carrier.

Usage

Another issue revolves around the different types of usage of each site. Selling off even an individual site based on the microwave network does not necessarily remove the need for that site to support other services and would increase the complexity of future operations and maintenance. The majority of these sites support many different services exclusive of the SATS microwave network.

Conformity

Then there is the issue surrounding the current state of the individual sites. We are making the assumption that the predominate private carriers (such as AT&T, ACS, GCI, possibly Verizon, etc.) would be interested in an acquisition. It is expected that the valuation will be considerably reduced due to the lack of conformity to individual carrier's proprietary standards. This was certainly the case historically with both ACS and GCI contracts and each carrier that was recently interviewed both mentioned the predication on existing conditions.

Outsourcing

When looking into the possibility of outsourcing there are several different approaches, which might be applied effectively. The lack of success for the Telecommunications Partnering Agreement (TPA) in 2001 can be attributed to unclear definitions of scope and responsibilities.

Task/Function based

One scenario for outsourcing a portion of the system would be to breakdown all of the different tasks and functions associated with providing services and determine which ones might be better outsourced. Some tasks may be performed more cost competitively by an outside entity as opposed to attempting everything in-house.

Currently, this task-based form of outsourcing is being used periodically on a site or project specific basis. The possible expansion of this approach would reduce travel fatigue on staff and can be done cost effectively. Several contractual vehicles are in place to help facilitate task outsourcing such as the World Wide Technology, Inc. (WWT) and General Communications Inc. (GCI) telecommunications contracts.

Geographically based

Due to the significant territory that this network spans, a geographic approach to outsourcing might make sense. Decisions to support specific sites base upon distance from the primary State facilities may be a way to gain efficiencies and effectiveness. There are many instances where Anchorage-based employees must incur significant travel costs and have limited effectiveness due to weather conditions upon their arrival. With recent travel restrictions, it becomes an even greater balancing act to manage travel versus overtime costs.

Historically, the State tried to avoid unnecessary expenses associated with travel by using local State-owned and operated radio shops. After the Telecommunications Partnering Agreement (TPA) was disbanded, the additional regional State facilities were never reopened.

Technology based

Another aspect of outsourcing is to look at specific technological needs and the appropriate skillsets required supporting those needs. An example of this is the ALMR system. The ALMR system is completely outsourced, with the Operations and Maintenance along with most technical aspects. This approach limits the State from making prudent technical decisions associated with ALMR.

An example of technology-based outsourcing would also be the MPLS based circuit management. A project is currently underway to enhance the management of the MPLS environment on the SATS microwave network. This circuit management project is making investments in the Alcatel Lucent Service Portal and CPAM technologies. This will provide visibility of the system through the use of automation of the existing circuit environment down to the customer level. These tools will provide more granularity allowing for a more accurate valuation of the services being provided. A similar manual analysis was done in 2012 which circuits that supported ALMR were given a commercial value totaling just over $3.8 million annually. Based on the 2012 costs to operate SATS and portion attributable to ALMR, the cost to the state is $944K.

ALMR would have to pay for hosting services if SATS were outsourced. A 2012 analysis showed the value of hosting ALMR equipment would be $1.5M annually. Furthermore, this new technology is a divergence from how circuits have been managed historically and requires a much different set of skills and oversight. A new approach is needed to effectively manage this newer technology.

Unfortunately, when needed services are not being provided adequately, agencies look for other solutions. There are many costly examples of State agencies managing their own telecommunications systems and even dedicated sites, without any input from the Department of Administration. These activities clearly go against the intent of the statutes. Through these disparate systems (DOT RWIS, DNR 2-Way, etc.) eliminate any potential gain from economies of scale and also prevent collaboration.

SATS: AN ANALYSIS

The utilization of any type outsourcing must be clearly defined and well managed in order to succeed. Due to the significant size of this system, it is imperative that performance metrics and accountability are applied on an ongoing basis.

Summary

The SATS microwave network is viewed as critical infrastructure for the State of Alaska. While there are several different approaches to the management and operations of this system, it is necessary for the State to retain some level of control.

Major Issues associated with SATS Operations and Ownership

Key Issue	In-House	Out-Sourced	Privatization
Liability Exposure	2	3	5
Economics/Costs *	2	3	4
Ownership/Partnership Complexity	2	3	5
Service Response level **	3	2	3
Future growth/Expansion Difficulty ***	3	2	4

Low Impact 1 —— 5 High Impact

* Costs would be predicated based on the expected level of indemnification, complexity of the partnership and expected service response level. All of these costs would be passed back to the State as part of the monthly service fees.

** Current service level agreements mandate specific response times. The ability to deploy staff from multiple locations is a benefit although also a cost driver.

*** The loss of internal technical capabilities and institutional knowledge would complicate implementation of expansion projects both internally and with any third party owner of the infrastructure.

The current in-house model is dependent upon internal staffing for maintenance and operations. As the technology changes greater demands will be placed on the staff. A hybrid approach is now in place where outside contractors are being used to assist when needed.

An outsourced model may be effective if lessons learned from the past are followed. The requirements and performance metrics must be clearly defined.

With a privatization model, the effort to spinoff even a portion of this system will be significant and costly. There are so many different variables involved with segregating services and equipment.

SATS: AN ANALYSIS

The issues identified above should be taken into consideration when making a decision about the future direction of the SATS microwave network. There are a substantial amount of services dependent upon the stable operations of this system. With the evolution and growth over several decades, the cost to replace this system would be very significant and not without impact to critical services.

Appendix A. Other States' Comparable Public Safety Trunking Radio Systems

Regarding the other state's FY13 Support and Maintenance Figures, it is unclear if these figures include personnel costs and travel or just include services, commodities and capital costs. The FY 2013 SATS O&M budget at $5.7M includes Personnel, Travel, Services, Commodities and Capital.

Michigan Public Safety System

- 244 Tower sites[10]
- 62,200 Radios[7]
- $230M System[7]
- 7 Regional Service Shops[7]
- Co-location for Public Safety Only[7]
- FY 2013 Support and Maintenance $2.5M[11]

Virginia Statewide Agencies Radio System (STARS)

- 121 Sites[12]
- 7500 Radios[13]
- $329M System [9]
- 7 Regional Service Centers[9]
- Supports 21 state agencies, Municipal and Federal Public Safety Entities [9]
- FY 2013 Support and Maintenance $3.5M[14]

---

[10] **Michigan Public Safety System.** About the Michigan Public Safety System. *Michigan. GOV.* [Online] 2014. http://www.michigan.gov/mpscs/0,4640,7-184-58837---,00.html#.

[11] **Michigan Department of Technology Management and Budget.** MICHIGAN'S PUBLIC SAFETY COMMUNICATIONS SYSTEM REVENUE COLLECTION. [Online] 2013. http://www.michigan.gov/documents/dtmb/MPSCS_revenue_report_093013_437348_7.pdf.

[12] **Virginia State Police.** Virginia Statewide Agencies Radio System. *Virginia State Police.* [Online] 2013. http://www.vsp.state.va.us/stars.shtm.

[13] **Heney, Alan.** Virginia Signs With Motorola. *The Capitol Hill Monitor.* [Online] November 2014. http://henney.com/chm/1104/CHM1104.pdf.

[14] **Flaherty, Col. Michael.** Report to the Governor, House Appropriation Committee and Senate Finance Committee for the Commonwealth of Virginia on the Statewide Agencies Radio System. *Commonwealth Of Virginia State Legislature.* [Online] October 1, 2013. http://leg2.state.va.us/dls/h&sdocs.nsf/By+Year/RD2172013/$file/RD217.pdf.

Colorado Statewide Digital Trunked Radio System (DTRS)

- 222 Active Sites[15]
- 4 Zone Controllers[12]
- 52,000 Radios[16]
- $120M Initial Cost 1996 (Not counting in-situ microwave backbone)[17]
- $43M System Upgrade on FY2009 to existing CWIN system[18]
- 13 Regional Service Shops [12]
- 31 Technicians [12]
- FY 2013 Maintenance and Upgrade $3.7M[19]

---

[15] **Colorado Office of Information Technology.** The Story of the Colorado Statewide Digital Trunked Radio System (DTRS). *Public Safety Communications Network.* [Online] 2013. http://www.colorado.gov/cs/Satellite/OIT-ServicesApps/CBON/1251575060697.

[16] **Kirstin D. Russell, Secretary of Technology and CIO.** The State of Colorado Legislature. *The Colorado Statewide Digital Trunked Radio System: An Overview.* [Online] 2013. http://www.leg.state.co.us/CLICS/CLICS2013A/commsumm.nsf/b4a3962433b52fa787256e5f00670a71/ea573f415b90b58b87257b1e004e93b3/$FILE/130226%20AttachC.pdf.

[17] **National Telecommunications and Information Agency.** Sharing Trunked Public Safety Radio Systems Among Federal, State, and Local Organizations. *www.ntia.doc.gov.* [Online] 2000. http://www.ntia.doc.gov/legacy/osmhome/reports/slye_rpt/appendix.html.

[18] **Kim Coleman, DTR Project Manager, Office of Information Technology.** www.colorado.gov. *Digital Trunked Radio System Upgrade and Colorado Wireless Interoperability Network, Lessons Learned.* [Online] 2011. http://www.colorado.gov/cs/Satellite?blobcol=urldata&blobheadername1=Content-Disposition&blobheadername2=Content-Type&blobheadervalue1=inline%3B+filename%3D%22Digital+Trunked+Radio+Project.pdf%22&blobheadervalue2=application%2Fpdf&blobkey=id&blobtable=Mun.

[19] **Colorado State Web Portal.** State budget office submits amended spending request to JBC. *www.colorado.gov.* [Online] 2013. http://www.colorado.gov/cs/Satellite/GovHickenlooper/CBON/1251638962764.

California Public Safety Microwave Network (CAPSNET)

- 300 Microwave paths[20]
- 260 Active Sites, 1300 Circuits[21]
- $500M upgrade to existing CAPSNET system[22]
- 11 Regional geographical segments[18]
- 47 Service shops[18]
- 350 Employees[18]
- FY 2013 O&M Budget $67M [18]
- Co-location for public safety only (equipment vault separated)[18]
- Redundant Network Operations Center (NOC), to provide emergency back-up.[17]

Oregon State Radio Project

- 142 Sites[23]
- 122 Microwave Paths [21]
- 1728 Radios[24]
- 6 Regional Dispatch Centers [21]
- $317.9M System (Through build-out completion 2015) [20]
- FY 2013 O&M Budget rolled into build-out costs

---

[20] **California Office of Emergency Services (Public Safety Communications Office).** Public Safety Communications Services. *02-23-2012_PSCO_Virtual_Tour_Ver_1.ppt.* [Online] 2012. www.caloes.ca.gov/.../Publications/.../02-23-2012_PSCO_Virtual_Tour_Ver_1.ppt.

[21] **California Office of Emergency Services.** Public Safety Services. *California Office of Emergency Services.* [Online] 2013. http://www.caloes.ca.gov/PSC/Pages/Services/Public%20Safety/Public%20Safety%20Services.aspx.

[22] **McKenna, Correy.** California Sets Strategic Direction for Upgraded Microwave Network. *Emergency Management.* [Online] April 15, 2011. http://www.emergencymgmt.com/safety/California-Upgraded-Microwave-Network-041511.html.

[23] **Oregon Department of Transportation: State Radio Project.** *October 2013 Monthly Report.* [Online] 2013. http://www.oregon.gov/ODOT/HWY/StateRadioProject/docs/MPR/2013.10_MPR.Full.Report.pdf.

[24] **Oregon State Radio Project.** WWW.Oregon.Gov. *State Radio Project.* [Online] 2011. www.oregon.gov/ODOT/HWY/StateRadioProject/docs/SRP_FAQs.pdf.

Appendix B. ALMR Specific Site Information

Site Name	ALMR	Microwave	DoD/ALMR Ownership
Alcantra	✓	✓	
Anchor River	✓	✓	
Atwood Building	✓	✓	
Auke Lake	✓	✓	
Bailey Hill	✓	✓	
Beaver Creek	✓	✓	
Birch Hill	✓	✓	✓
Black Rapids	✓	✓	✓
Blueberry Hill	✓	✓	
Byers Creek	✓	✓	
Canyon Creek	✓	✓	
Cathedral Rapids	✓	✓	
Chulitna	✓	✓	
Clear Air Force Station	✓	✓	✓
Cooper Mountain	✓	✓	✓
Cottonwood	✓		
Diamond Ridge	✓	✓	
Dimond Courthouse (Juneau)	✓	✓	
Divide	✓	✓	
Donnelly Dome (2 Sites: ALMR and SOA Microwave)	✓	✓	✓
Dot Lake	✓	✓	
Ernestine Mountain	✓	✓	
Ester Dome	✓	✓	
Fire Station 12	✓	✓	
Fort Greely	✓	✓	✓
Garner	✓	✓	
Girdwood	✓	✓	
Glennallen	✓	✓	
Goose Creek CC	✓		
Haines	✓	✓	
Harding Lake	✓	✓	
Heney Range	✓	✓	
High Mountain (Ketchikan)	✓	✓	

Appendix B.
ALMR Specific Site Information (Continued)

Site Name	ALMR	Microwave	DoD/ALMR Ownership
Hill 3265	✓		✓
Honolulu	✓	✓	
Hope	✓	✓	
Hurricane	✓	✓	
Independent Ridge	✓	✓	
Kasilof	✓	✓	
Kenai	✓	✓	
Lena Point	✓	✓	
Lion's Head (Sheep Mountain)	✓	✓	
Money Knob	✓	✓	
Moose Pass	✓	✓	
Nenana	✓	✓	
Nikiski	✓	✓	
Ninilchik	✓	✓	
Paxson	✓	✓	
Peger Road	✓	✓	
Pillar Mountain	✓	✓	
Pipeline	✓	✓	
Pole Hill	✓		✓
Portage	✓	✓	
Quarry Hill	✓		✓
R1 North	✓	✓	✓
Rabbit Creek	✓	✓	
Reindeer Hills	✓	✓	
Saddle Mountain	✓	✓	
Sawmill	✓	✓	
Seldovia	✓	✓	
Seward	✓	✓	
Silvertip	✓	✓	
Site Summit	✓	✓	
Skagway	✓	✓	
Ski Hill	✓	✓	

Appendix B. ALMR Specific Site Information (Continued)

Site Name	ALMR	Microwave	DoD/ALMR Ownership
Sourdough	✓	✓	
Sterling	✓	✓	
Summit	✓	✓	
Tahneta Pass	✓	✓	
Tok	✓	✓	
Tolsona	✓	✓	
Trims	✓	✓	
TSAIA (Anchorage Airport)	✓	✓	
Tsina	✓	✓	
Tudor Road	✓	✓	
Valdez	✓	✓	
Whittier	✓	✓	
Willow Creek	✓	✓	
Willow Mountain	✓	✓	
Wolcott Mountain	✓	✓	
Woman's Bay	✓	✓	
Yanert	✓	✓	

Appendix C. Site Distances

Site characterization based on ease of access for all types of SOA sites. (See Table 4, Page 22). Sites are characterized as Urban, Accessible within the road system, Helicopter access only high-sites and high-sites that are challenging to service, even with helicopters. Red cells are main ETS facilities. Distances are in miles.

Blue	Urban Site,	Category A
White	Road Access Site,	Category B
Yellow	High Site,	Category C
Orange	Extreme Site,	Category D

Site Name	Latitude	Longitude	Anchorage	Fairbanks	Juneau
7 Mile Dalton Hwy	65.940361	149.854778	328.9	97.5	722.5
Alcantra	61.601667	149.363611	32.1	228.2	563.7
Anchor Pt	59.755556	151.774722	119.7	372.9	623.6
Anchorage ARR	61.222500	149.888028	4.8	257.6	573.4
Auke Lake	58.378556	134.629556	559.5	618.2	9.5
Bailey Hill	61.623917	149.117222	37.6	225.1	556.4
Birch Hill	64.863361	147.642583	263.1	4.7	626.0
ASB	61.182500	149.996917	7.5	261.1	576.3
Beaver Creek	63.050056	141.740389	289.7	220.4	410.8
Bede Mt.	59.306556	151.914583	148.8	404.0	628.4
Black Rapids	63.498056	145.849722	203.6	108.5	524.6
Blueberry	61.314972	149.462861	13.9	248.2	561.3
Bold Ridge	61.361389	148.955000	29.9	242.2	546.0
Atwood Bldg	61.215278	149.894139	4.7	258.1	573.5
Byers	62.687778	150.225833	105.2	165.6	615.3
Capitol Bldg.	58.302167	134.410083	569.0	627.3	0.1
Camp Denali	61.267778	149.638861	7.5	252.6	566.1
Campbell Pt.	61.142500	150.017750	8.6	264.0	576.3
Canyon Creek	64.305417	146.548167	238.8	51.2	576.3
Cathedral Rapids	63.384056	143.797500	244.9	156.0	471.5
Chena Dome	65.083056	146.468056	288.6	42.2	610.8
Chugach Elec.	61.168611	149.909972	4.6	261.4	573.2
Chulitna	62.404194	150.271694	86.1	184.0	609.5
Cooper Mt	60.461611	149.811556	49.7	308.3	560.6
Colorado	63.203694	149.388944	140.4	122.2	606.3
Cordova-F&G	60.540361	145.743889	142.5	303.0	426.6

Appendix C, Contd., Site Distances

Site Name	Latitude	Longitude	Anchorage	Fairbanks	Juneau
Cottonwood	61.576056	149.416444	29.8	230.2	564.8
Court House	61.219167	149.900806	5.1	257.9	573.8
Curry	62.599472	150.019694	98.4	168.4	606.9
Delta	64.055972	145.733417	236.5	80.9	546.5
Denali Park	63.730917	148.912278	178.4	82.9	611.2
Diamond Court House	58.302222	134.409722	569.0	627.3	0.1
Diamond Ridge	59.671861	151.562972	120.8	376.2	616.1
Dillingham	59.061889	158.470667	332.9	527.2	861.0
Divide	61.128917	145.775083	133.3	263.0	440.7
Donnelly Dome	63.776667	145.863889	218.5	92.4	537.0
Dot Lake	63.648222	144.064750	249.7	138.0	490.1
Douglas	61.763889	150.023889	41.2	222.7	587.6
Ellamar	60.918056	146.669833	105.3	272.2	464.2
Ernestine	61.445056	145.195139	152.9	247.0	431.7
Ester Dome	64.875111	148.066028	260.8	9.2	636.1
Fairbanks Airport	64.813389	147.873444	258.0	3.0	629.0
Fairbanks Divcom	64.825667	147.776861	259.5	0.0	627.3
Fairbanks DNR	64.838750	147.818861	260.1	1.5	628.9
Fairbanks ARR	64.847889	147.745472	261.2	1.8	627.6
Fairbanks AST	64.829000	147.774639	259.8	0.2	627.4
Fairbanks PD	64.839278	147.720333	260.9	1.9	626.7
Fairplay	63.673194	142.216361	296.5	184.9	453.4
FROB	64.840472	147.724028	260.9	1.9	626.8
Fire Station 12	61.148333	149.857778	3.6	262.3	571.2
Frontier Bldg.	61.187500	149.917472	4.9	260.1	573.8
Fort Greely	63.972778	145.716944	232.0	85.2	542.3
Garner	63.836472	148.979528	185.3	77.2	616.8
Geophysical Inst.	64.859556	147.849917	261.2	3.2	630.5
Girdwood	60.952750	149.110000	27.1	270.8	543.8
Glennallen	62.111472	145.550861	152.7	199.7	463.3
Gore Peak	59.279167	150.934722	137.2	396.5	593.8
Government Peak	61.733778	149.301722	41.3	218.8	564.5

Appendix C, Contd., Site Distances

Site Name	Latitude	Longitude	Anchorage	Fairbanks	Juneau
Gov. Hill, ARR	61.229167	149.878861	4.9	257.0	573.2
Haines	59.213611	135.409722	510.4	556.0	72.5
Harding	64.409000	146.948194	240.2	37.8	590.1
Heney Range	60.525722	145.690250	144.6	304.3	424.6
High Mtn	55.361472	131.796278	763.2	849.9	225.9
Homer	59.647500	151.528889	121.7	377.4	614.9
Hope	60.918028	149.538833	19.7	275.6	557.3
Hogback	61.038639	145.982278	126.9	267.6	445.0
Honolulu	63.097361	149.502472	132.8	130.4	606.2
Horseshoe	63.747056	148.883417	179.6	81.6	611.0
Hurricane	62.976861	149.637806	124.2	139.7	606.4
Independent Ridge	63.739333	144.847278	236.6	115.5	511.8
Jack Peak	61.055139	146.597833	106.3	263.1	464.8
Juneau 3.5 Mile	58.328278	134.471194	566.2	624.5	2.9
Juneau 7 Mi Tower	59.359111	134.527583	536.0	569.2	73.2
Juneau AST	58.371611	134.619000	560.1	618.9	9.0
Juneau DOL	58.299667	134.423417	568.6	627.2	0.4
Juneau SOB	58.301056	134.412028	569.0	627.3	0.0
Kasilof	60.275556	151.308889	81.2	333.8	609.8
Kenai BEACON	60.566389	151.225694	64.7	313.8	609.3
Ketchikan AST	55.410278	131.727500	763.2	848.5	224.0
Ketchikan SOB	55.343222	131.648333	768.5	854.1	229.5
Kitoi Bay	58.202889	152.445750	225.8	482.4	653.7
Kobe	64.214250	149.300944	210.2	61.9	638.9
Kodiak	57.790278	152.396389	251.6	509.4	656.6
KTOO	58.299389	134.414806	568.9	627.4	0.2
Lake Hood	61.176389	149.962750	6.3	261.3	575.1
LaTouche Island	60.001667	147.887778	103.5	333.3	490.7
Lena Point	58.388333	134.762500	554.9	614.7	14.1
Lions Head	61.785000	147.666111	81.1	210.1	515.5
MATCOM	61.575417	149.406472	29.9	230.2	564.5
Miami Lake	62.853889	149.561944	115.9	146.7	600.6
Mine Mtn	59.591917	135.170194	509.3	542.1	93.2

Appendix C, Contd., Site Distances

Site Name	Latitude	Longitude	Anchorage	Fairbanks	Juneau
Money Knob	65.511222	148.511389	301.8	51.9	674.2
Moose Pass	60.489694	149.353528	49.7	303.7	545.6
Mt Nueburger	63.311861	143.510861	249.4	165.9	461.6
Mt Susitna	61.466778	150.739000	37.7	249.7	604.8
Murphy Dome	64.958444	148.231583	265.5	16.2	643.5
Naked Island	60.645833	147.346111	89.5	289.1	481.0
Naknek	58.743611	156.979167	300.5	515.6	810.9
Nenana	64.592500	149.068611	236.8	41.4	647.8
Ninilchik	60.009111	151.714694	104.3	355.7	622.3
Nikiski	60.768056	151.154167	54.4	299.9	608.9
Northway	62.959000	141.634167	290.4	226.8	403.8
Palmer DNR	61.603333	149.094722	36.9	226.4	555.3
Palmer DOT	61.585556	149.120528	35.4	227.7	555.7
Palmer PD	61.601389	149.106944	36.5	226.6	555.6
Paxson	63.032361	145.496389	188.3	141.9	496.4
Paxson Mtn North	63.037611	145.620833	185.6	139.8	499.8
Paxson Mtn South	63.031250	145.620556	185.3	140.2	499.5
Penguin Peak	60.964167	149.397722	19.5	271.6	553.4
Pillar Mountain	57.789417	152.435028	252.2	509.8	658.0
Pillsbury	63.567639	146.007278	204.3	101.9	531.4
Pipeline Hills	60.546111	150.617778	52.2	309.0	588.6
Portage	60.840250	148.980500	35.4	278.0	537.8
Ptarmigan	61.204500	145.630667	137.9	259.1	438.2
R1 North	61.260944	149.831639	5.9	254.5	572.2
Rabbit Creek	61.088889	149.739111	6.4	265.4	566.4
Reindeer Hills	63.405639	148.855056	156.6	103.4	598.3
Rugged Island	59.857778	149.377222	92.3	347.0	540.9
Saddle Mtn	58.297444	134.511472	565.9	625.3	3.6
Sawmill	61.807250	148.329972	64.3	209.3	536.2
Seldovia	59.454083	151.673750	135.8	391.7	619.8
Seward	60.120528	149.425750	74.1	329.3	544.4
Shaw Creek	64.285722	145.364861	255.8	80.7	549.1
Shuyak Is.	58.609583	152.398806	199.5	455.1	648.6

Appendix C, Contd., Site Distances

Site Name	Latitude	Longitude	Anchorage	Fairbanks	Juneau
Silvertip	60.781083	149.447972	29.6	284.4	552.4
Slana DOT	62.708333	143.977222	215.8	186.7	444.8
Skagway	59.460778	135.328750	507.1	545.0	86.6
Sitka	57.050833	135.351667	583.9	677.6	93.1
Site Summit	61.258056	149.529139	9.7	252.5	562.4
Ski Hill	60.464722	151.075556	66.1	318.9	603.3
Soldotna AST	60.474694	151.088056	65.9	318.4	603.8
Soldotna DNR	60.497139	151.014306	63.0	316.1	601.5
Soldotna ERC	60.482500	151.075000	65.2	317.7	603.5
Sourdough	62.526500	145.545500	166.2	172.9	478.0
Stephan Lake	62.742722	149.091083	110.2	149.4	583.9
Sterling	60.536917	150.906083	58.6	312.4	598.2
Summit Lake	60.638556	149.489333	38.6	294.3	551.9
Sunny Hay	55.463667	133.080417	719.9	816.8	202.4
Susitna Dam	62.830000	148.534778	120.9	139.8	570.7
Tahneta Pass	61.832222	147.328889	92.3	207.3	506.5
Talkeetna	62.323667	150.110333	79.8	187.1	602.7
Tazlina	62.044444	145.423889	154.8	205.4	457.5
Tok	63.324167	142.998889	263.3	177.7	451.1
Tolsona	62.105056	146.173833	134.3	194.4	480.8
Trims	63.416250	145.754472	201.2	114.9	518.8
Trims Passive	63.415556	145.796944	200.3	114.3	519.8
Tsina	61.222556	145.343167	147.4	260.3	429.9
Tudor Office	61.180000	149.772500	0.0	259.5	569.0
Tudor Tower	61.175833	149.784417	0.5	259.9	569.3
Valdez	61.136139	146.340639	114.4	258.9	458.6
Wasilla PD	61.575417	149.406472	29.9	230.2	564.5
Whittier	60.775972	148.673333	46.2	281.2	526.7
Willow Ck	61.767528	149.760556	40.6	220.1	579.5
Willow Mt.	61.778389	145.209056	156.1	225.1	442.5
Wolcott	60.343028	149.316028	59.8	313.5	542.7
Woman’s Bay	57.722500	152.520833	257.6	515.1	662.0
Wrangell	56.453556	132.383333	699.6	774.8	148.3

Appendix C, Contd., Site Distances

Site Name	Latitude	Longitude	Anchorage	Fairbanks	Juneau
Yanert	63.655639	148.773389	174.0	86.2	604.9
Yukon River	65.824250	149.546444	321.0	85.8	710.7

Appendix D. Telecommunications Statutes

Alaska Statutes 2013

Chapter 44.21 DEPARTMENT OF ADMINISTRATION

Article 01. DEPARTMENT FUNCTIONS

Sec. 44.21.010. Commissioner of administration.

The principal executive officer of the Department of Administration is the commissioner of administration.

Sec. 44.21.020. Duties of department.

The Department of Administration shall

(1) make surveys and studies to improve administrative procedures, methods, and organization;

(2) keep general accounts;

(3) approve vouchers and disburse funds for all purposes;

(4) operate centralized purchasing and supply services, and necessary storerooms and warehouses;

(5) allot space in state buildings to the various departments according to need and available space;

(6) supervise telephone, mailing, messenger, duplicating, and similar services adaptable to centralized management;

(7) administer the public employees' retirement system and teachers' retirement system;

(8) administer a statewide personnel program, including central personnel services such as recruitment, assessment, position classification, and pay administration;

(9) administer and supervise a statewide automatic data processing program;

(10) study, design, implement, and manage the telecommunications systems and services of the state under AS 44.21.305 - 44.21.330;

(11) provide administrative services to the Violent Crimes Compensation Board.

Sec. 44.21.310. Telecommunications powers and duties.

(a) In accordance with the state information systems plan adopted by the commissioner and with the departmental information systems plan, the department shall

(1) advise the commissioner and the governor on matters of policy and comprehensive state planning for telecommunications services;

(2) coordinate, manage, and supervise state programs in telecommunications, including the management of those telecommunication services for the state obtained from common carriers and from the communications industry;

(3) when requested, provide technical and consulting assistance to the executive, judicial, and legislative branches of state government, to the University of Alaska, and to private noncommercial entities which request that assistance in facility procurement and leasing and in identifying long-range goals and objectives for the state and its political subdivisions in all aspects of telecommunications, including public, educational, and instructional telecommunications;

(4) prepare and maintain a state comprehensive telecommunications development plan to further state telecommunications development and to meet state telecommunications needs and prepare and maintain a comprehensive inventory of all state communications facilities;

(5) whenever feasible, procure services from private enterprise or certified and franchised utilities and contract for the construction, management, operation, and maintenance of telecommunications systems, and develop a procurement policy consistent with AS 36.30 (State Procurement Code); the procurement policy must seek to

achieve the maximum benefit to the public, and methods of procurement, including lease, purchase, rental, or combinations of lease, purchase, and rental, must be selected on the basis of factors such as the ratio of long-range costs versus benefits, life cycle costing, and the costs to the communications industry to the extent that these costs may affect local and long distance basic telephone rates; procurement, contracting, construction, and maintenance under this paragraph is governed by AS 36.30;

(6) provide information and assistance to state agencies to promote governmental coordination and unity in the preparation of agency plans and programs involving the use of telecommunications;

(7) apply for and accept federal and private money, property, or assistance, that may be appropriated, granted, or otherwise made available to the department and use and disburse money and property for purposes consistent with AS 44.21.305 - 44.21.330 and AS 44.21.256 - 44.21.290, subject to reasonable limitations imposed by the grantor;

(8) participate with other governmental units in planning, and assist local governments and governmental conferences and councils in the state in planning and coordinating their activities relating to telecommunications;

(9) provide for the orderly transition to new telecommunications services and systems by state agencies;

(10) serve as a clearinghouse for information, data, and other materials that may be necessary or helpful to federal, state, or local governmental agencies in the development of telecommunication systems;

(11) coordinate department services and activities with those of other state departments and agencies to the fullest extent possible to avoid unnecessary duplication; and

(12) provide that all activities of the department are responsive to state statutes and regulations, and to the regulations and rulings of the Federal Communications Commission.

(b) The department may

(1) coordinate its functions with local, regional, state, and federal officials, private groups and individuals, and with officials of other countries, provinces, and states;

(2) enter into contracts and subcontracts on behalf of the state to carry out the provisions of AS 44.21.305 - AS 44.21.330;

(3) act for the state in the initiation, investigation, and evaluation of, or participation in, programs related to the purposes of the department that involve more than one government or governmental unit;

(4) on behalf of the state, apply for, accept, and expend gifts or grants made to the state if the gifts or grants are for the purposes of furthering the objectives of the department;

(5) hold public hearings to obtain information for the purpose of carrying out the provisions of AS 44.21.305 - 44.21.330; and

(6) provide telecommunication services to commercial entities for television broadcast and charge for those services.

(c) The department may not attempt to influence or affect the content or airing of program material.

Sec. 44.21.315. Telecommunications services.

(a) In accordance with the state information systems plan adopted by the commissioner and with the departmental information systems plan, the department shall provide

(1) technical consultation to educational and public telecommunications users;

(2) coordination and support to telecommunications services for instruction, including technical assistance and assistance in preparation of applications for grants related to program development as may be requested by

(A) public school districts and the Department of Education and Early Development;

(B) the University of Alaska; and

(C) other state agencies as approved by the commissioner;

(3) coordination and support for health and safety-related functions, including the

administrative and client services provided by state, federal, and private agencies;

(4) coordination and support to telecommunications services for public participation in state-financed services, including the public hearing process, as may be statutorily required or otherwise appropriate;

(5) assistance, through design, development, and promotion, to local school districts or other local and regional education agencies for the regionalization of instructional telecommunications services;

(6) establishment of operational policies for public telecommunications services other than public broadcasting; and

(7) assistance to the Alaska Public Broadcasting Commission and any commission-designated subcommittee, as necessary to perform assigned department functions; the department shall cooperate with the commission and subcommittees in order to develop policies which are responsive to the user groups which are represented on the commission.

(b) Subject to available funding, the department may make grants to educational and public telecommunication users except grants for public broadcasting purposes.

(c) The department shall study, plan, and develop integrated instructional telecommunications services for all residents of the state and, after public hearings, submit to the governor and the legislature an annually updated long-term development plan prepared in consultation with the Department of Education and Early Development, the University of Alaska, local school districts, and other local and regional education areas.

(d) The department shall, after public hearings, submit to the governor an annually updated long-term development plan for teleconferencing facilities and services, including facilities and services used both by state agencies and groups other than state agencies.

(e) The department may not own, operate, or be the licensee of a public noncommercial broadcast station or production center.

(f) Nothing in this section implies department responsibility for programming content. Program design, production, and use are the responsibility of the program-sponsoring agency or other entity, not the department.

Sec. 44.21.320. Telecommunications operations.

(a) Except as provided in (d) of this section, the department may, consistent with the provisions of AS 44.21.310(a)(5)

(1) plan, design, construct, manage, and operate all telecommunications systems owned or leased by state agencies;

(2) manage Centrex and other telephone-related services of state agencies;

(3) be responsible generally for telecommunications systems and design for state agencies; and

(4) coordinate with state agencies in performing their data and word processing tasks.

(b) Within the limits of available financing, the department shall administer and operate the satellite television project, by

(1) coordinating with the satellite television user groups and entities; and

(2) providing liaison, management support, and technical assistance for the satellite television project.

(c) Decisions and policies relating to programming under the satellite television project, including scheduling and allocation policies, may not be made by the department, but may only be made by a network that is representative of participating rural television users, by commercial broadcast users, or by other affected participating user groups and entities under procedures provided by statute or, if no statute applies, then by agreement of the affected user networks or groups. The department shall assist users in preparing agreements that may be required under this subsection.

(d) The department may not engage in any activity that interferes with a contract or program right relating to commercial television programming, including but not limited to any right protected by copyright.

(e) Nothing in AS 44.21.305 - 44.21.330 prohibits a state agency from developing telecommunications systems within its own agency if the agency is in compliance with the state information systems plan adopted by the commissioner and with the agency's own information systems plan and if the commissioner gives written authorization for the agency to engage in its own design, development, management, or operation. The commissioner may authorize independent development only upon a showing of necessity.

(f) A state agency authorized to develop an internal telecommunications system shall, whenever feasible, coordinate its design development, management, and operation with the department.

Sec. 44.21.330. Definitions.

Article 05. TELECOMMUNICATIONS INFORMATION

In AS 44.21.305 - 44.21.330,

(1) "commissioner" means the commissioner of administration;

(2) "department" means the Department of Administration;

(3) "public broadcasting" means the delivery of radio or television noncommercial programming intended for the general public by any method of telecommunications;

(4) "public telecommunications" means telecommunications which serve public broadcasting, general educational, instructional, medical, safety, emergency, or public participation functions;

(5) "state agencies" means all departments, divisions, and offices in the executive branch of state government; it does not mean an agency of the legislative or judicial branch of government or the University of Alaska;

(6) "telecommunications" means the transmission and reception of messages, impressions, pictures, and signals by means of electromagnetic transmission with or without benefit of a closed transmission medium including all instrumentalities, facilities, apparatus, and services, whether conveyed by cable or wire, radiated through space, or transmitted through other media within a specified area or between designated points;

(7) "telecommunications systems" means those systems in which the principal service and functions are telecommunications.

Appendix E. Acronym Glossary

ALMR – Alaska Land Mobile Radio System

M/W— Microwave

MPLS — Multiprotocol Label Switching

NOC — Network Operations Center

QoS — Quality of Service

SATS — State of Alaska Telecommunication System

SoS — System of Systems

TPA — Telecommunications Partnering Agreement

References

1. **ComputerWorld.** Alaska Kills $100M Voice and Data Contract. *www.computerworld.com.* [Online] September 22, 2003. [Cited: 2 28, 2014.] http://www.computerworld.com/s/article/85183/Alaska_Kills_100M_Voice_and_Data_Contract.

2. **Michigan Public Safety System.** About the Michigan Public Safety System. *Michigan. GOV.* [Online] 2014. http://www.michigan.gov/mpscs/0,4640,7-184-58837---,00.html#.

3. **Michigan Department of Technology Management and Budget.** MICHIGAN'S PUBLIC SAFETY COMMUNICATIONS SYSTEM REVENUE COLLECTION. [Online] 2013. http://www.michigan.gov/documents/dtmb/MPSCS_revenue_report_093013_437348_7.pdf.

4. **Virginia State Police.** Virginia Statewide Agencies Radio System. *Virginia State Police.* [Online] 2013. http://www.vsp.state.va.us/stars.shtm.

5. **Heney, Alan.** Virginia Signs With Motorola. *The Capitol Hill Monitor.* [Online] November 2014. http://henney.com/chm/1104/CHM1104.pdf.

6. **Flaherty, Col. Michael.** Report to the Governor, House Appropriation Committee and Senate Finance Committee for the Commonwealth of Virginia on the Statewide Agencies Radio System. *Commonwealth Of Virginia State Legislature.* [Online] October 1, 2013. http://leg2.state.va.us/dls/h&sdocs.nsf/By+Year/RD2172013/$file/RD217.pdf.

7. **Colorado Office of Information Technology.** The Story of the Colorado Statewide Digital Trunked Radio System (DTRS). *Public Safety Communications Network.* [Online] 2013. http://www.colorado.gov/cs/Satellite/OIT-ServicesApps/CBON/1251575060697.

8. **Kirstin D. Russell, Secretary of Technology and CIO.** The State of Colorado Legislature. *The Colorado Statewide Digital Trunked Radio System: An Overview.* [Online] 2013. http://www.leg.state.co.us/CLICS/CLICS2013A/commsumm.nsf/b4a3962433b52fa787256e5f00670a71/ea573f415b90b58b87257b1e004e93b3/$FILE/130226%20AttachC.pdf.

9. **National Telecommunications and Information Agency.** Sharing Trunked Public Safety Radio Systems Among Federal, State, and Local Organizations. *www.ntia.doc.gov.* [Online] 2000. http://www.ntia.doc.gov/legacy/osmhome/reports/slye_rpt/appendix.html.

10. **Kim Coleman, DTR Project Manager, Office of Information Technology.** www.colorado.gov. *Digital Trunked Radio System Upgrade and Colorado Wireless Interoperability Network, Lessons Learned.* [Online] 2011. http://www.colorado.gov/cs/Satellite?blobcol=urldata&blobheadername1=Content-Disposition&blobheadername2=Content-Type&blobheadervalue1=inline%3B+filename%3D%22Digital+Trunked+Radio+Project.pdf%22&blobheadervalue2=application%2Fpdf&blobkey=id&blobtable=Mun.

11. **Colorado State Web Portal.** State budget office submits amended spending request to JBC. *www.colorado.gov.* [Online] 2013. http://www.colorado.gov/cs/Satellite/GovHickenlooper/CBON/1251638962764.

12. **California Office of Emergency Services (Public Safety Communications Office).** Public Safety Communications Services. *02-23-2012_PSCO_Virtual_Tour_Ver_1.ppt.* [Online] 2012. www.caloes.ca.gov/.../Publications/.../02-23-2012_PSCO_Virtual_Tour_Ver_1.ppt.

13. **California Office of Emergency Services.** Public Safety Services. *California Office of Emergency Services.* [Online] 2013. http://www.caloes.ca.gov/PSC/Pages/Services/Public%20Safety/Public%20Safety%20Services.aspx.

14. **McKenna, Correy.** California Sets Strategic Direction for Upgraded Microwave Network. *Emergency Management.* [Online] April 15, 2011. http://www.emergencymgmt.com/safety/California-Upgraded-Microwave-Network-041511.html.

15. **Oregon Department of Transportation: State Radio Project.** *October 2013 Monthly Report.* [Online] 2013. http://www.oregon.gov/ODOT/HWY/StateRadioProject/docs/MPR/2013.10_MPR.Full.Report.pdf.

16. **Oregon State Radio Project.** WWW.Oregon.Gov. *State Radio Project.* [Online] 2011. www.oregon.gov/ODOT/HWY/StateRadioProject/docs/SRP_FAQs.pdf.

18. **State of Alaska, Department of Administration, Enterprise Technology Services.** *Alaska Land Mobile Radio.* s.l. : Alaska State Legilsature Presentation, 2012. p. 12.

19. **Federal Communication Commission.** ULS Online. *Universal Liscensing System.* [Online] 2014. http://wireless.fcc.gov/uls/index.htm?job=home.

20. **State of Alaska Department of Administration, Enterprise Technology Services.** ALMR 101. *Alaska. GOV Department of Administration-Enterprise Technology Services-ALMR.* [Online] JANUARY 25, 2012. http://doa.alaska.gov/ets/almr/ALMR%20January%2025%202012%20Presentation.pdf.

21. **Alaska Land Mobile Radio.** Agencies on ALMR. *Alaska Land Mobile Radio.org.* [Online] 2013. [Cited: February 20, 2014.] http://alaskalandmobileradio.org/pdf/20131125_Users%20on%20System.pdf.

22. **Alaska Communications System.** Alaska Communications Systems Awarded State of Alaska Telecommunications Contract. *ACS Investor Relations.* [Online] December 10, 2001. [Cited: 2 28, 2014.] http://investors.alsk.com/releasedetail.cfm?ReleaseID=66951.

23. **Alaska Communication Systems.** ACS and State of Alaska to Proceed with Disentanglement From Contract. *ACS Investor Relations.* [Online] September 15, 2003. [Cited: 2 28, 2014.] http://investors.alsk.com/releasedetail.cfm?ReleaseID=118072.

Contact Information

World Wide Technology
3800 Centerpoint Drive
Suite 901
Anchorage, AK 99503

Peak Signals, LLC.
8585 Old Dairy Road, STE 200
Tel (907) 523-1334
Fax (907) 523-1318
http:/www.peaksignals,com