

Rural Communication Solutions for Road Weather Information Systems

Alaska Department of Transportation
and Public Facilities



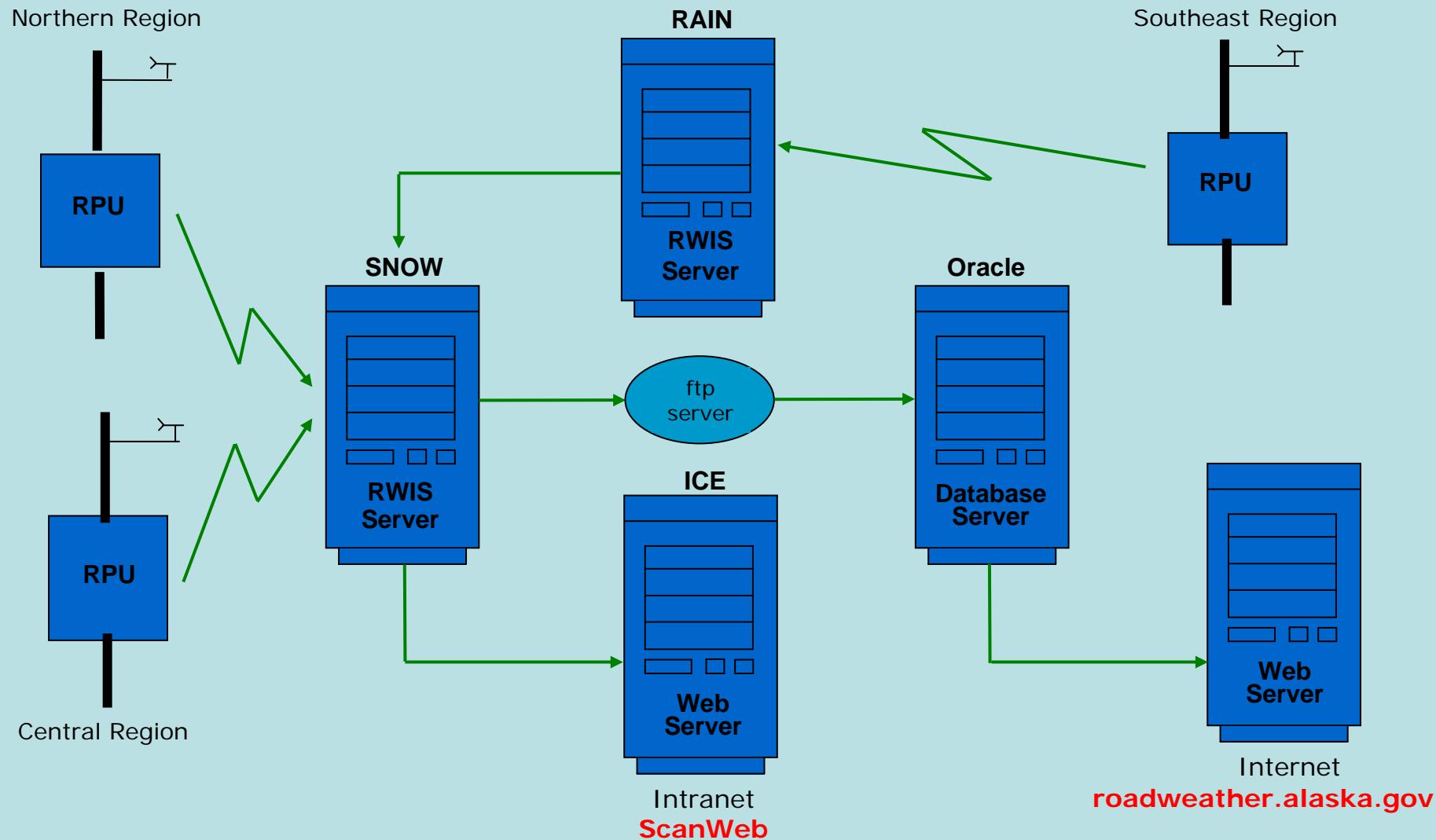
Jack Stickel

NRITS 2006

Rural Communication Solutions

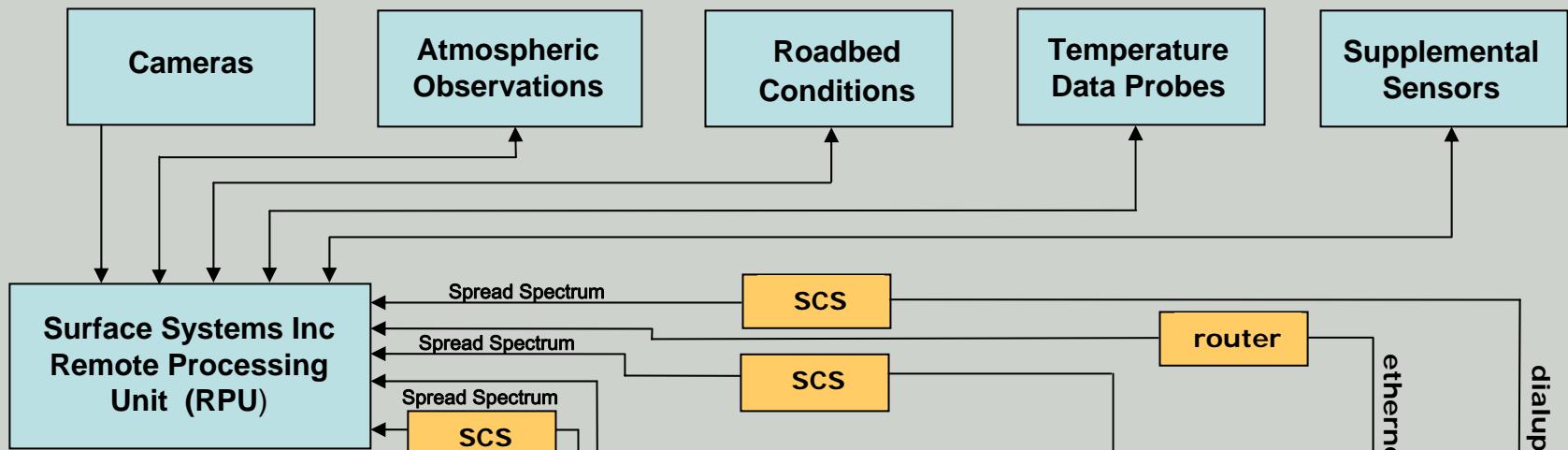
- Communication network
- Spread spectrum wireless communication
- Satellite communication
- Communication topology
- Metadata – communication maps
- Future work

Statewide RWIS Server Network Architecture

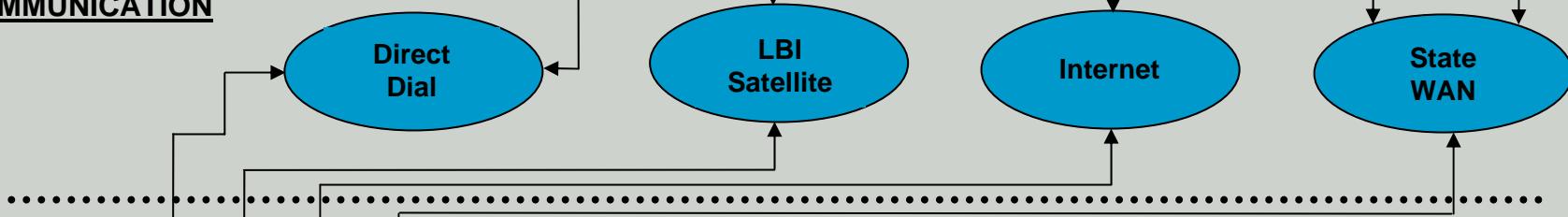


RWIS Communication Network

ESS



COMMUNICATION



ADOT&PF



Spread Spectrum Communication

- Proven Technology - follows lead of other Alaskan deployments
- Cost Effective - eliminates long distance and cell phone charges
- No Licensing - Operates in the FCC industrial, scientific, and medical bands
 - 902 - 928 Mhz
- Alaskan Environment – working for sites 20 miles line of sight

Spread Spectrum- Proven Technology In Alaska

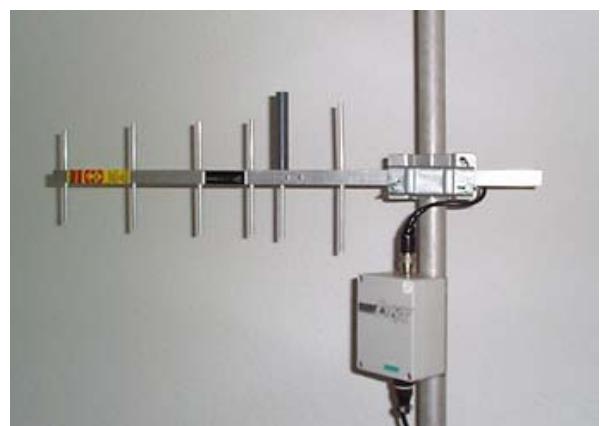
- Juneau Wind Profiler - UCAR
http://juneau-winds1.rap.ucar.edu/JuneauOps/combo_table.html
- Alaska Railroad Avalanche Program
<http://www.akrr.com/wthr/>
- University of Alaska @ Fairbanks
Water and Environmental Research Center
<http://www.uaf.edu/water/projects/atlas/atlas.html>
<http://www.uaf.edu/water/projects/cpcrw/metdata/cpcrwmetsitemap.htm>

Spread Spectrum Communication

- Multiple operation modes
 - Point-to-point
 - Point-to-multipoint *
 - Store-and-forward repeater
 - Serial & ethernet
- Performance
 - Set to 38,400 baud rate for good comm
 - Benchmark transmissions times (data + image) range from 39 sec to 4 min 17 sec
- Versatile
 - AC to power transformer
 - 12 Volts DC, solar panel, & power module

Spread Spectrum Antennas

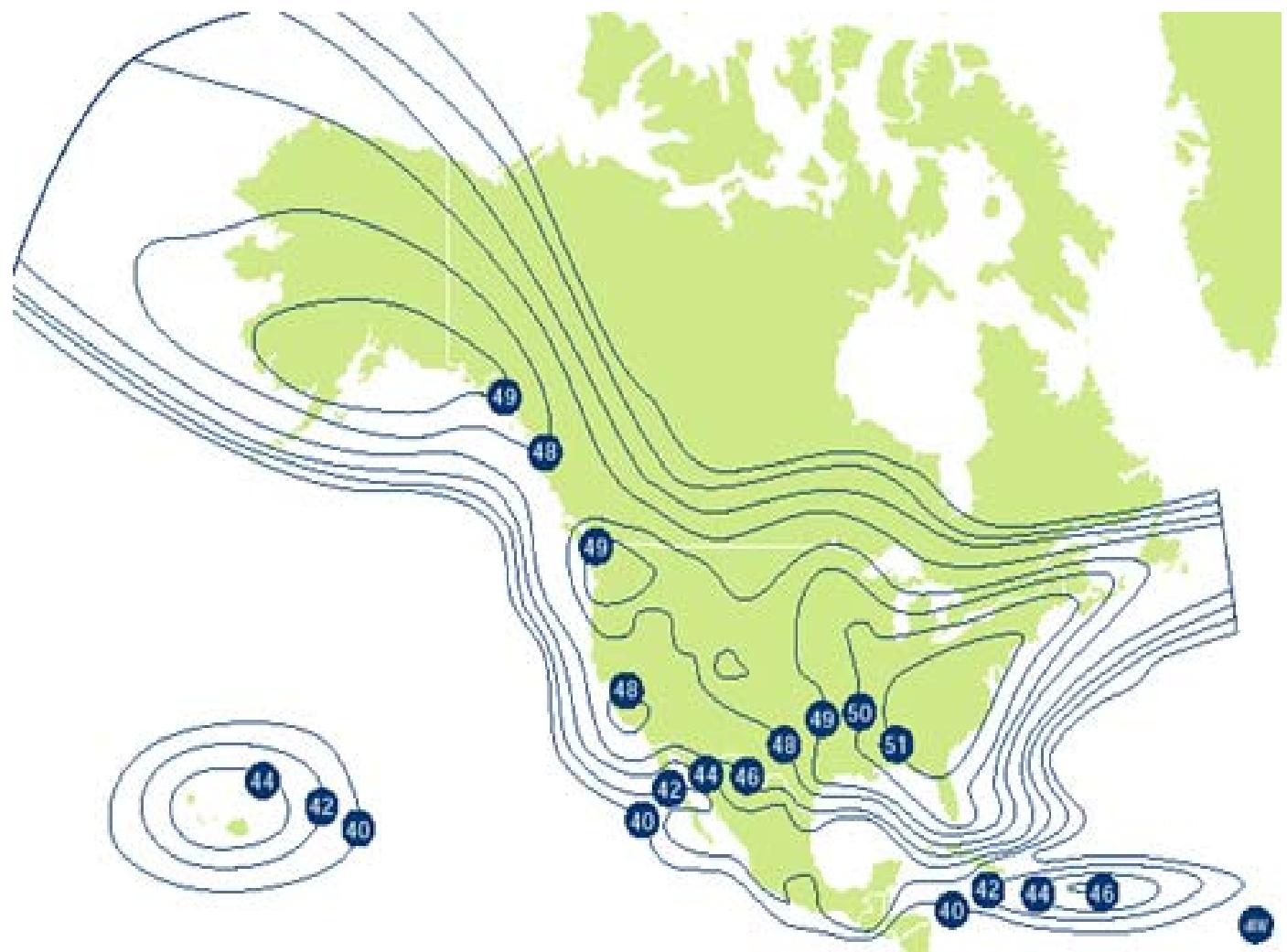
- 3 dB Omni-directional
 - Lower performance
 - Environmentally less sensitive
 - Point to multi-point capability
- 9 dB Yagi directional
 - Better performance
 - Environmentally sensitive to rime icing
 - Master to slave capability

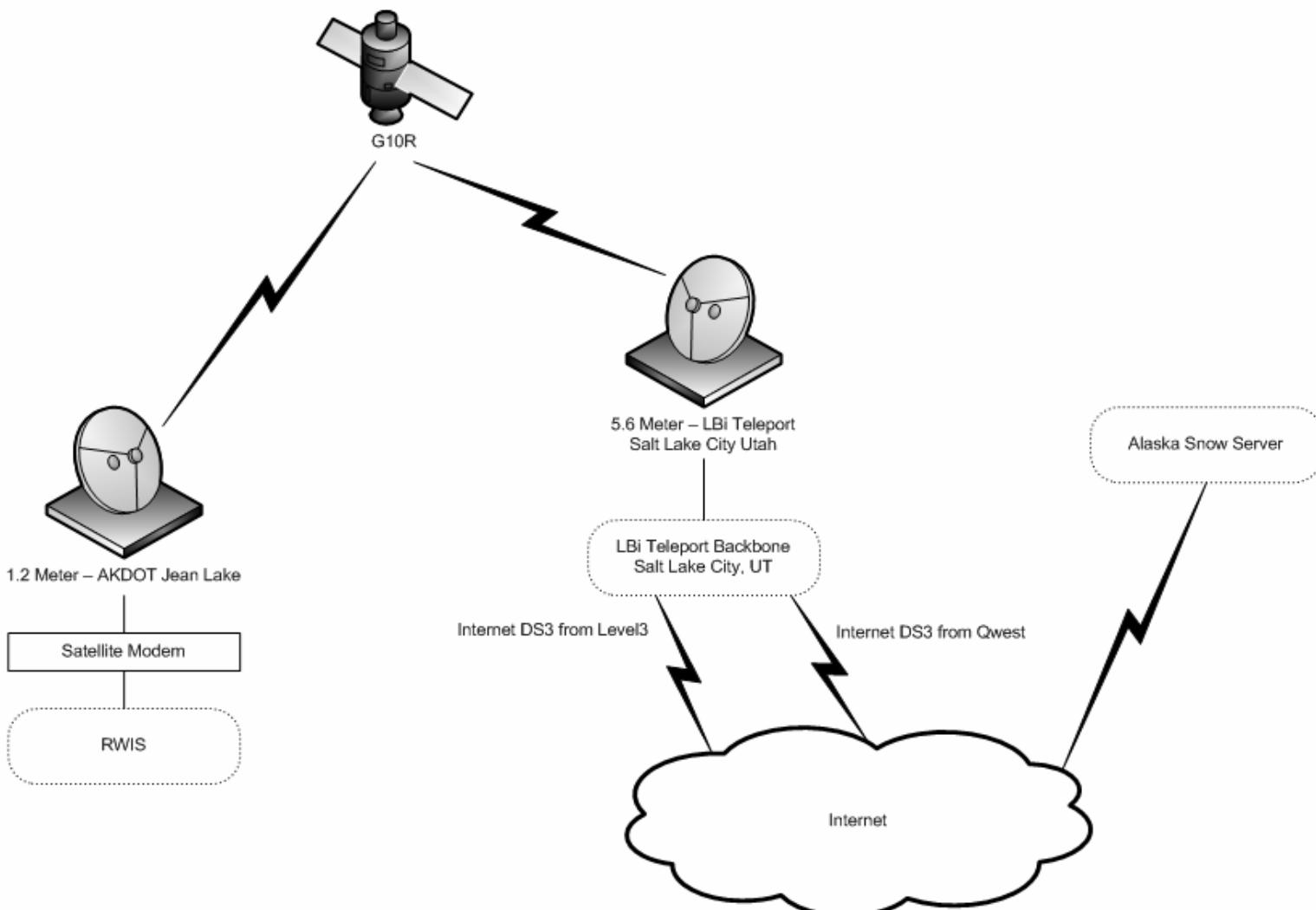


Satellite Communication

- LBiSat – Lyman Brothers
- Galaxy 10R satellite
- Surface Systems Inc leases bandwidth
- Could potentially match POTS pricing

Galaxy 10r Footprint





SSI AKDOT Jean Lake - Logical

Author: Mark Lyman
Date Created: 08/10/2006
Last Update: 08/10/2006

B

Jean Lake



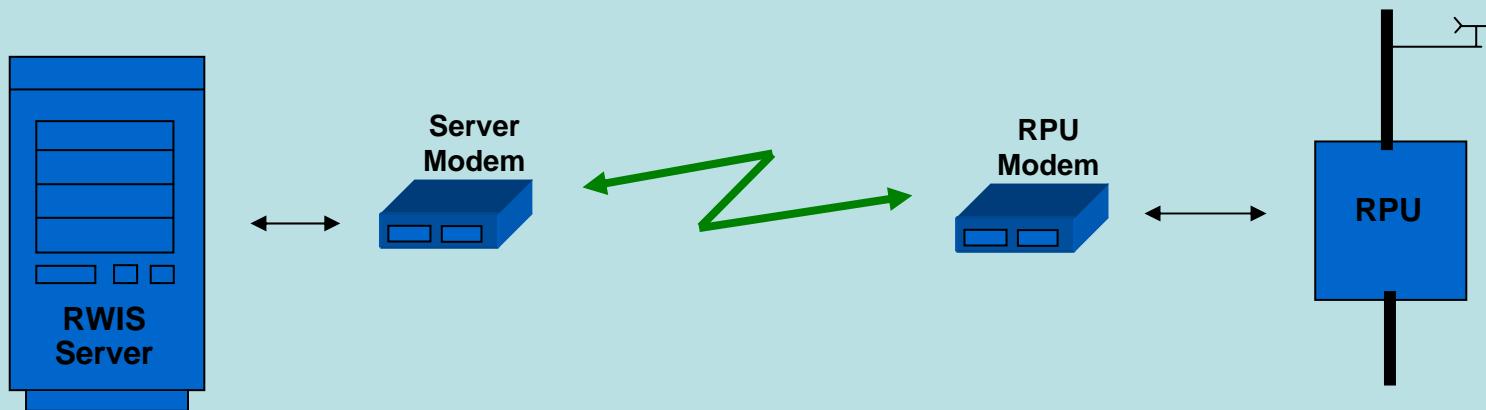
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Jean Lake

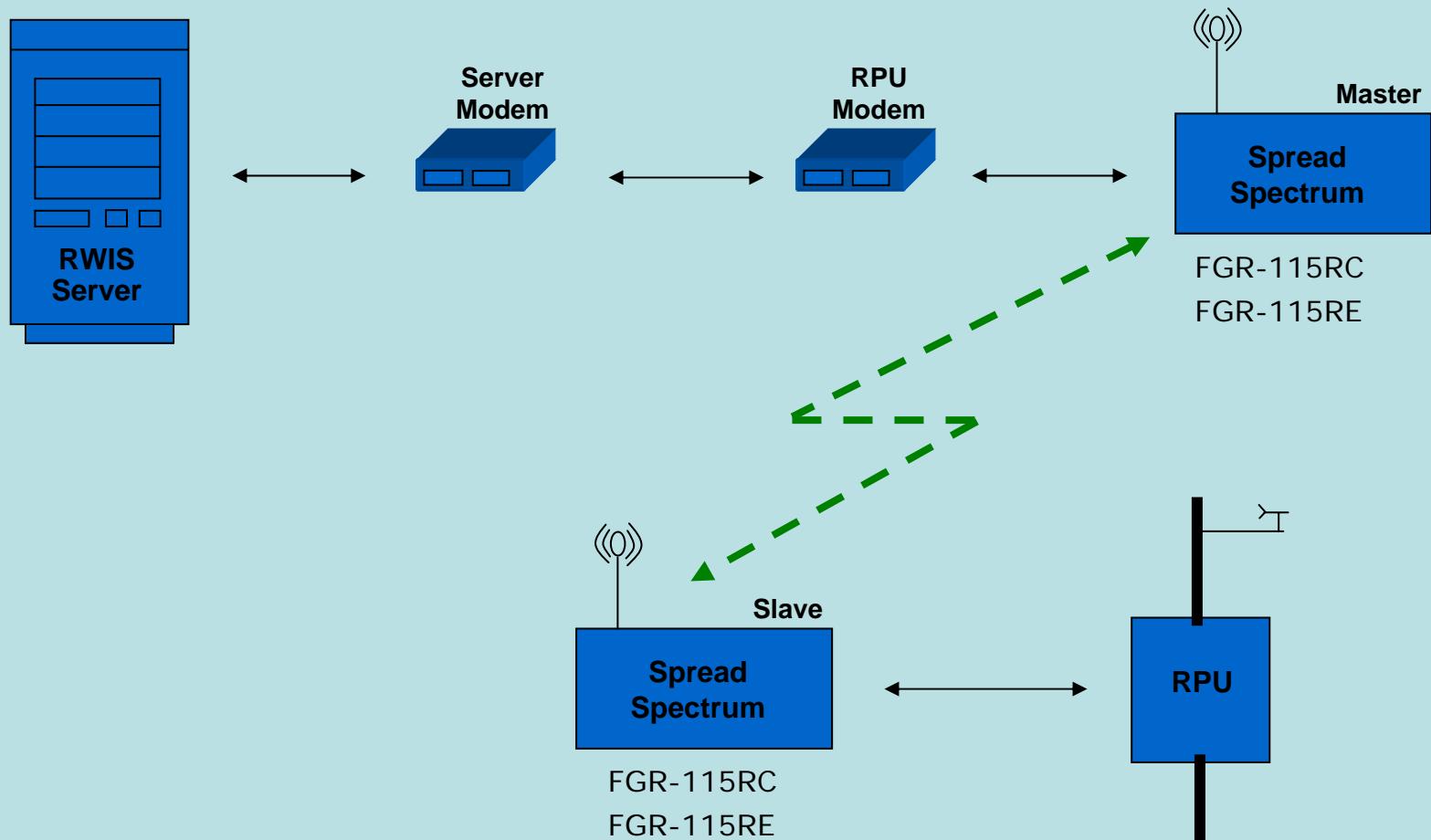


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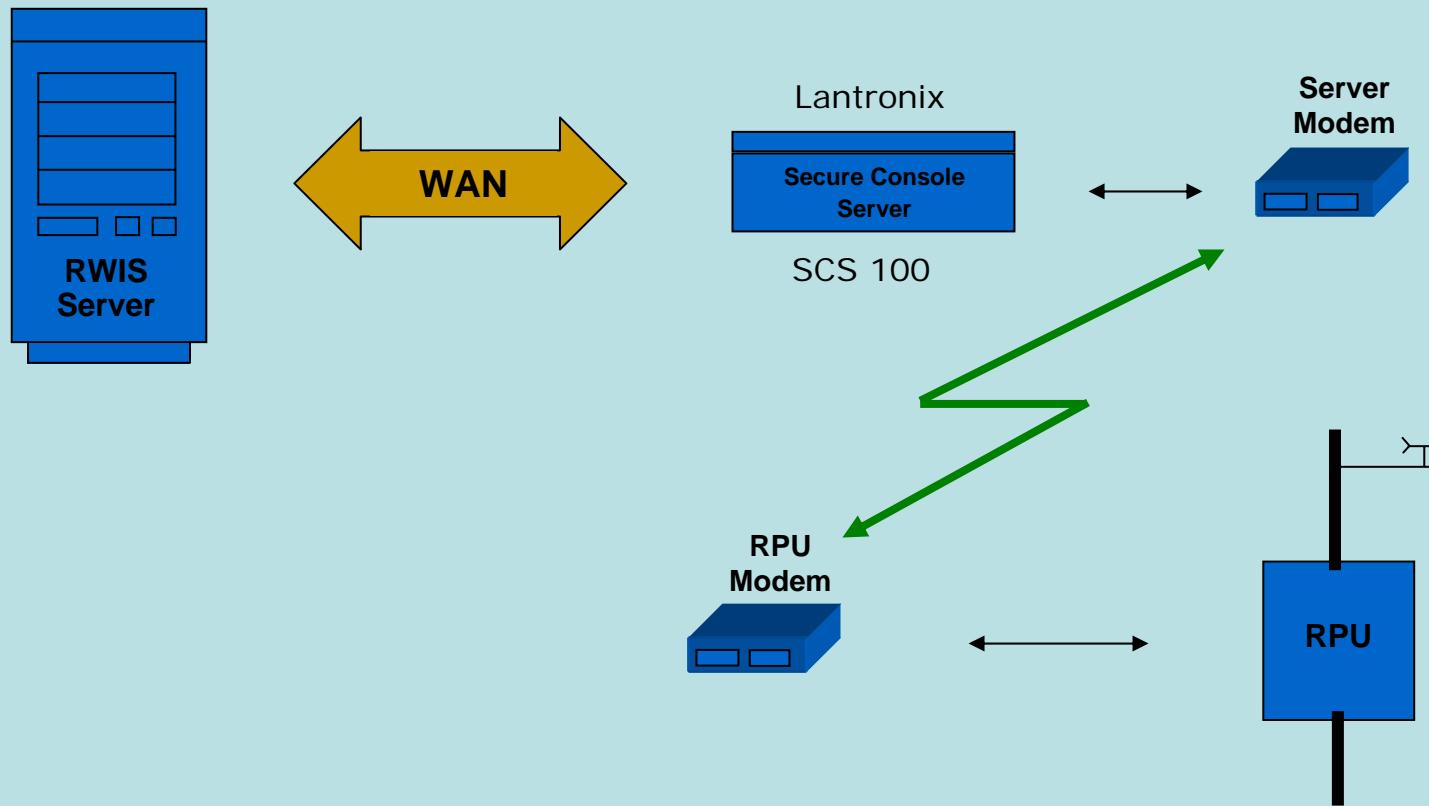
Direct Dialup Polling



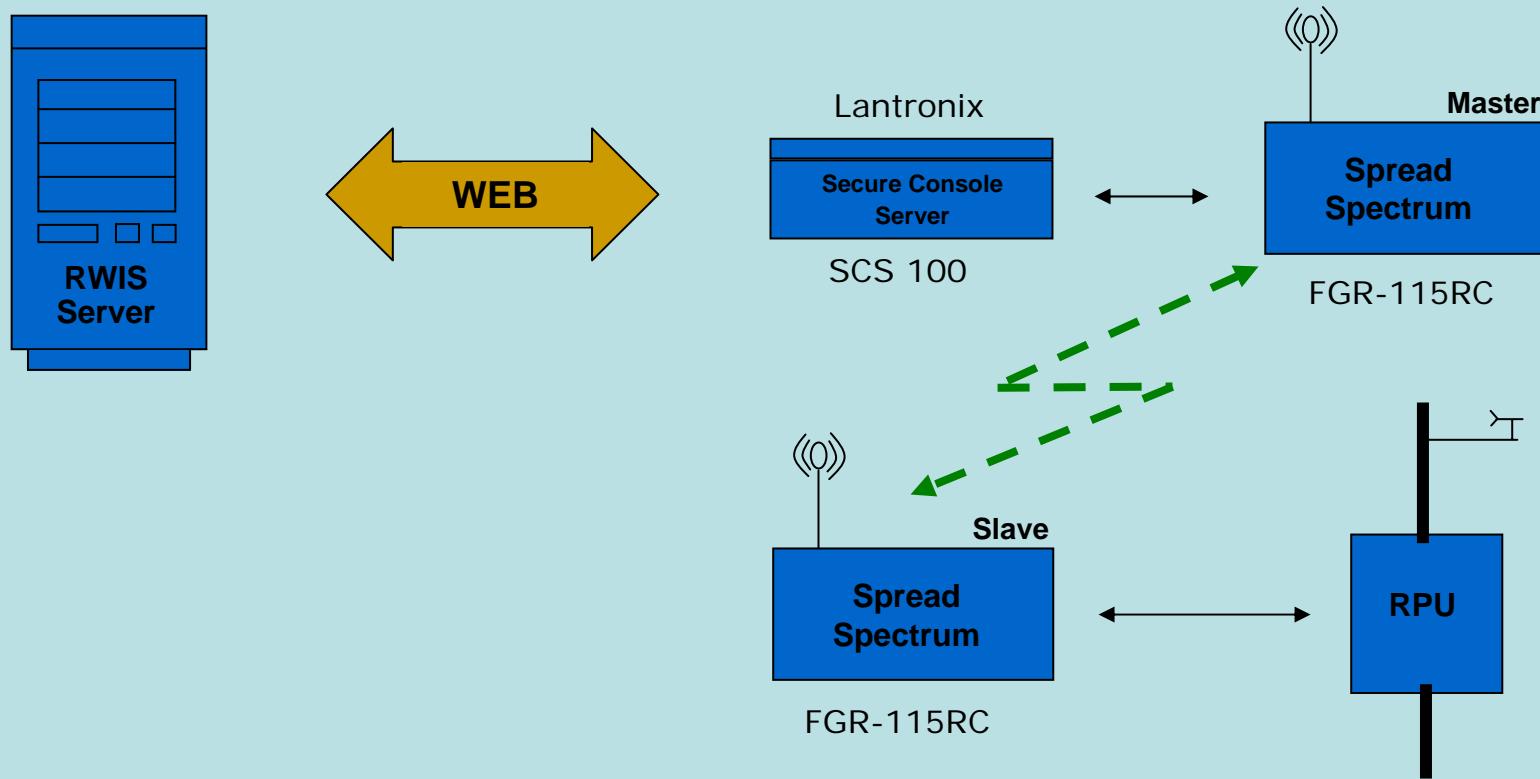
Direct Dialup Serial / Ethernet Wireless Polling



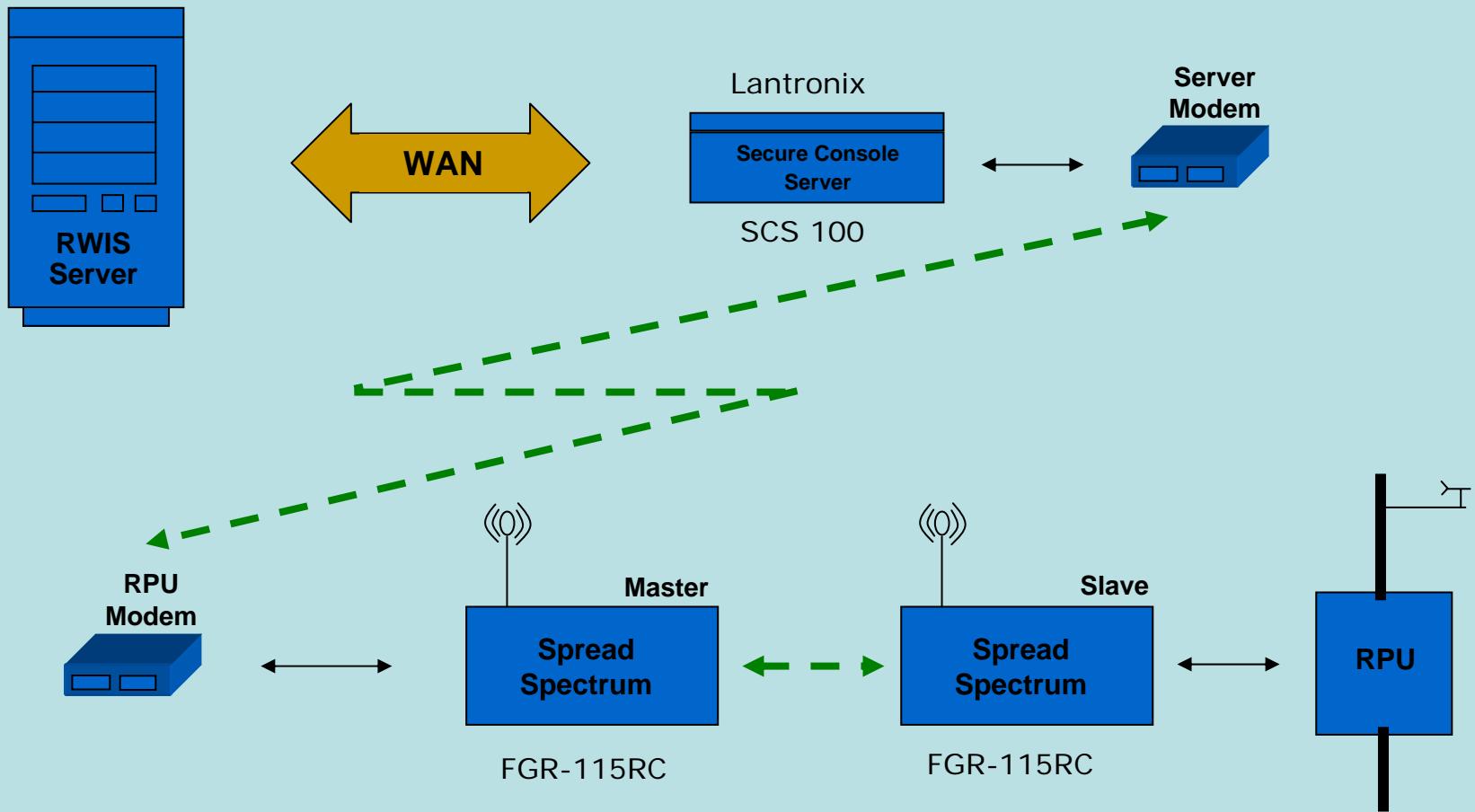
Wide Area Network Remote Dialup Polling With Secure Console Server



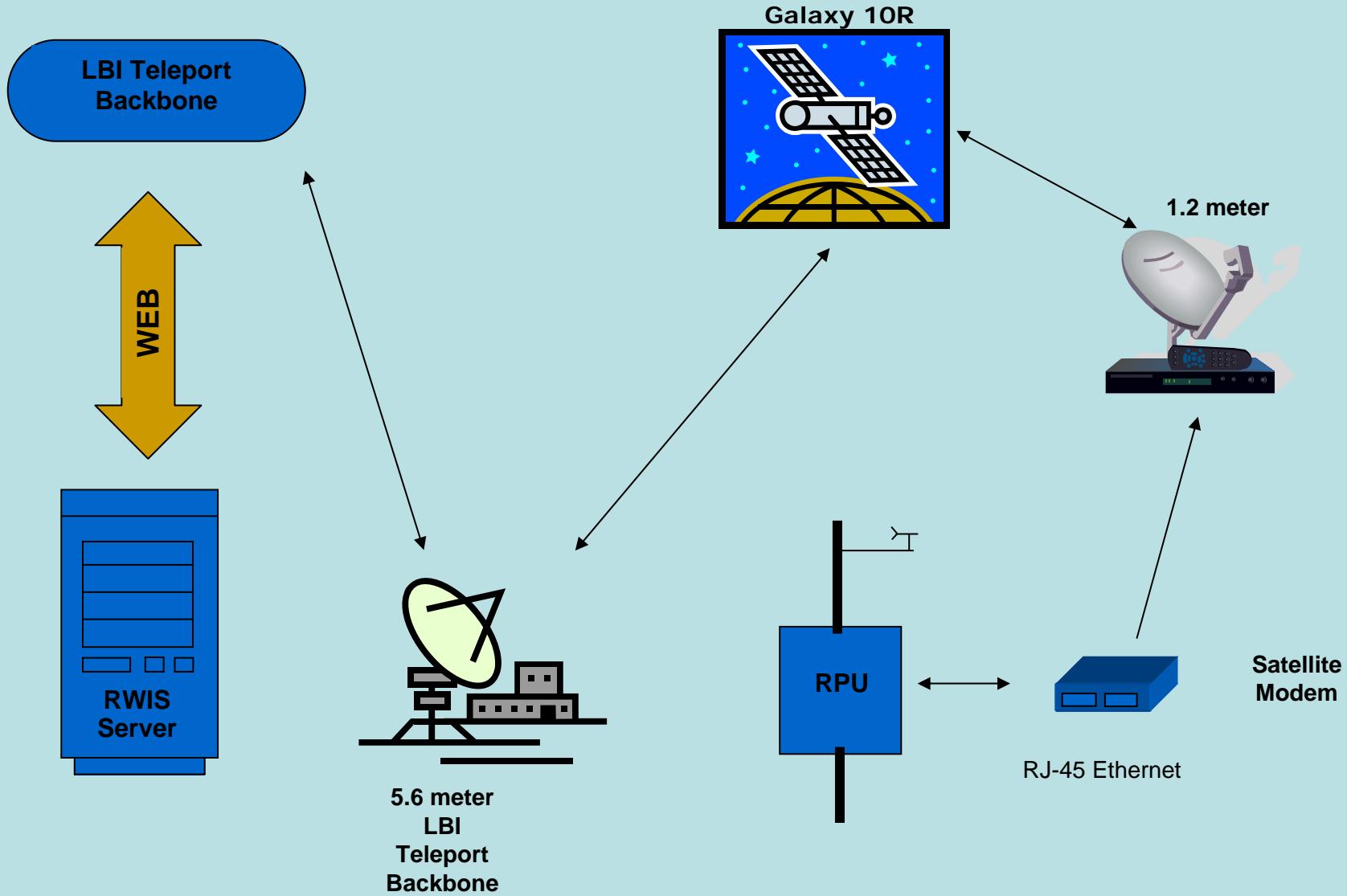
Internet Serial Wireless Polling With Secure Console Server



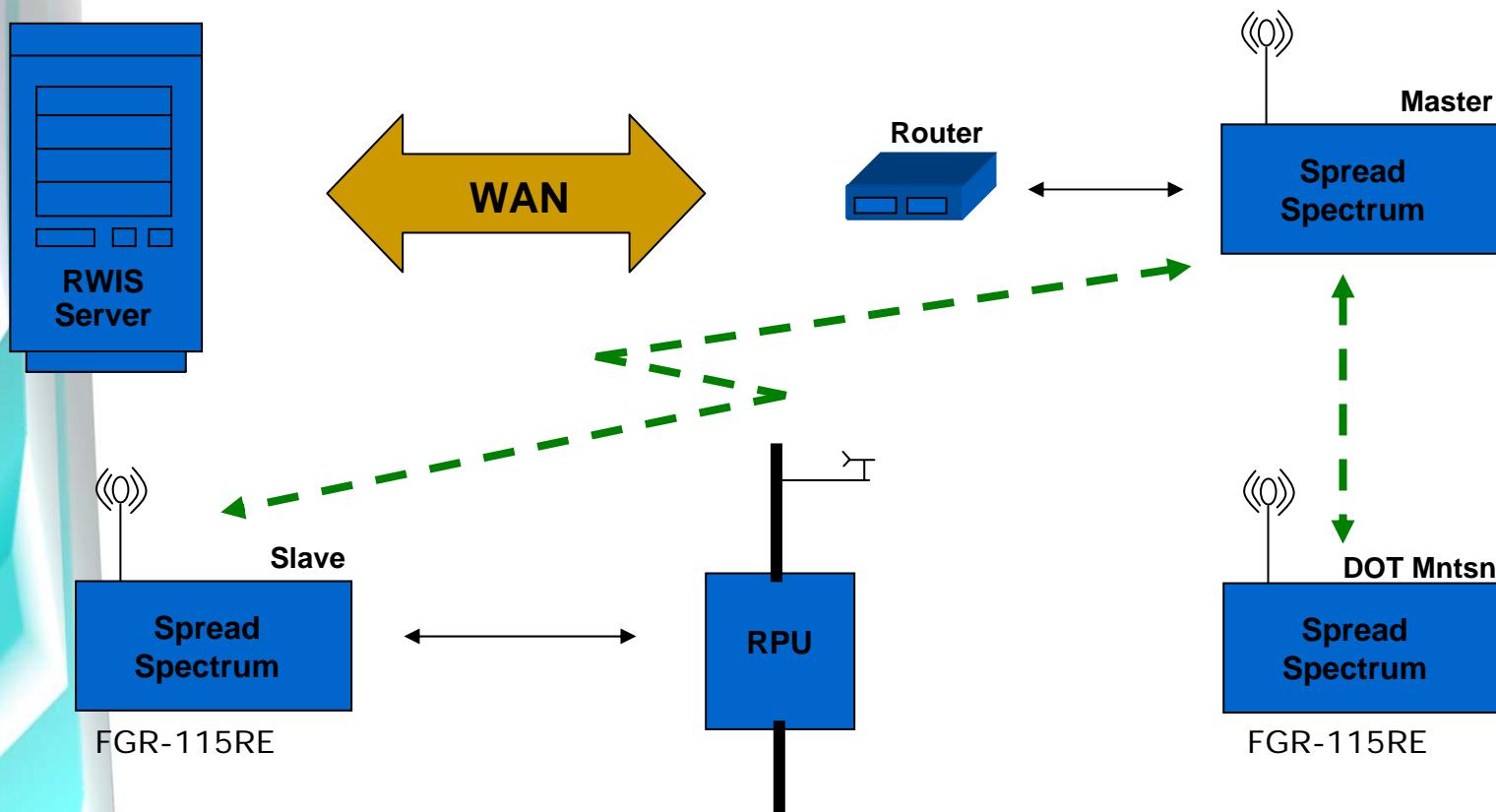
Wide Area Network Remote Dialup Serial Wireless Polling With Secure Console Server



Satellite Polling



Wide Area Network Ethernet Wireless Polling With Secure Console Server



ROAD WEATHER INFORMATION SYSTEM

January 2006



Prepared By The
ALASKA DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES
DIVISION OF PROGRAM DEVELOPMENT

LEGEND

City or Town	● Anchorage	Historic Milepost	(99)
Roads	—	CDS Milepoint	99.99

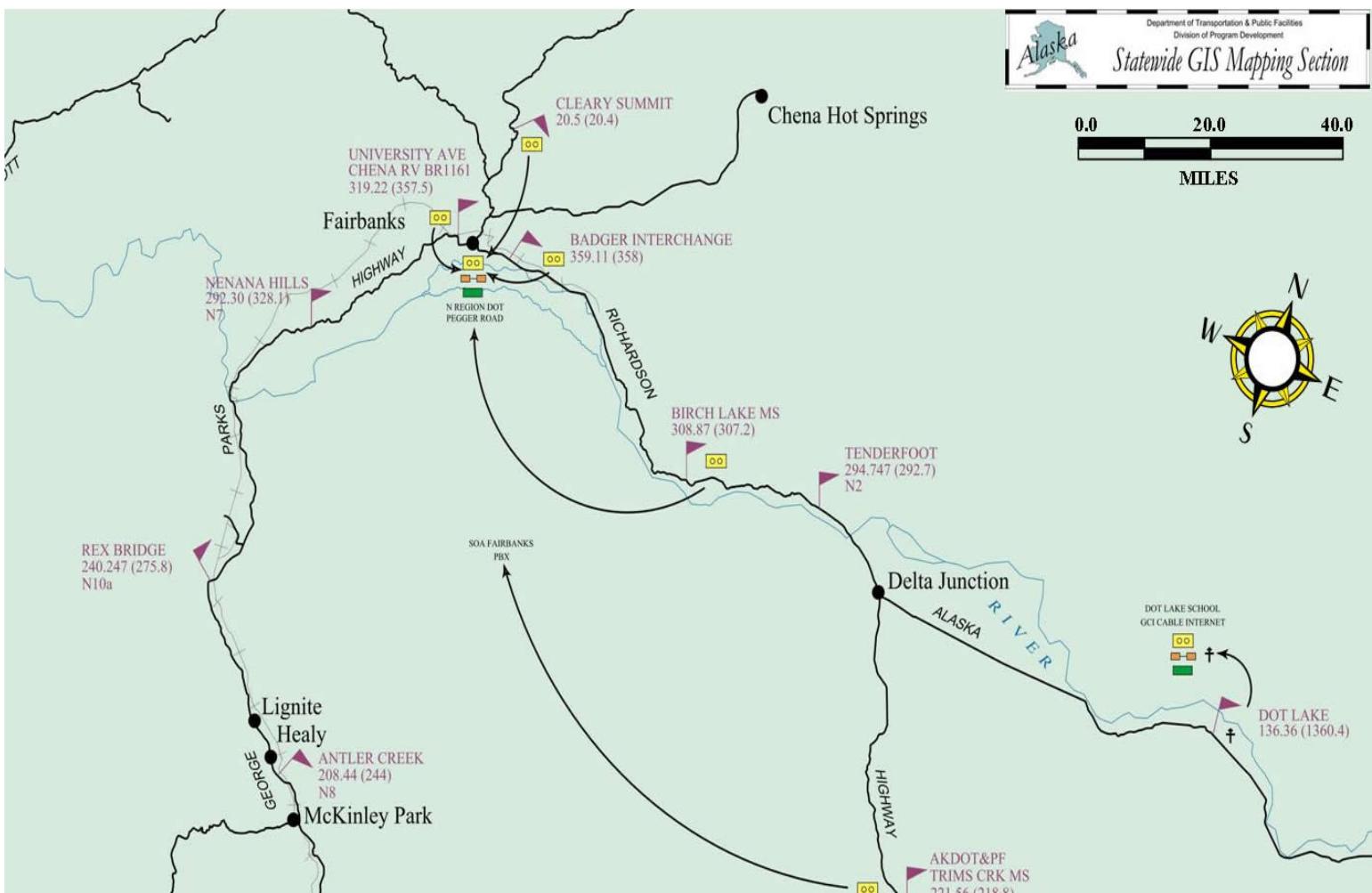
ROAD WEATHER INFORMATION SYSTEM (RWIS)

Proposed Site	■	Existing Pavement Sensor	■
Existing Site	■		

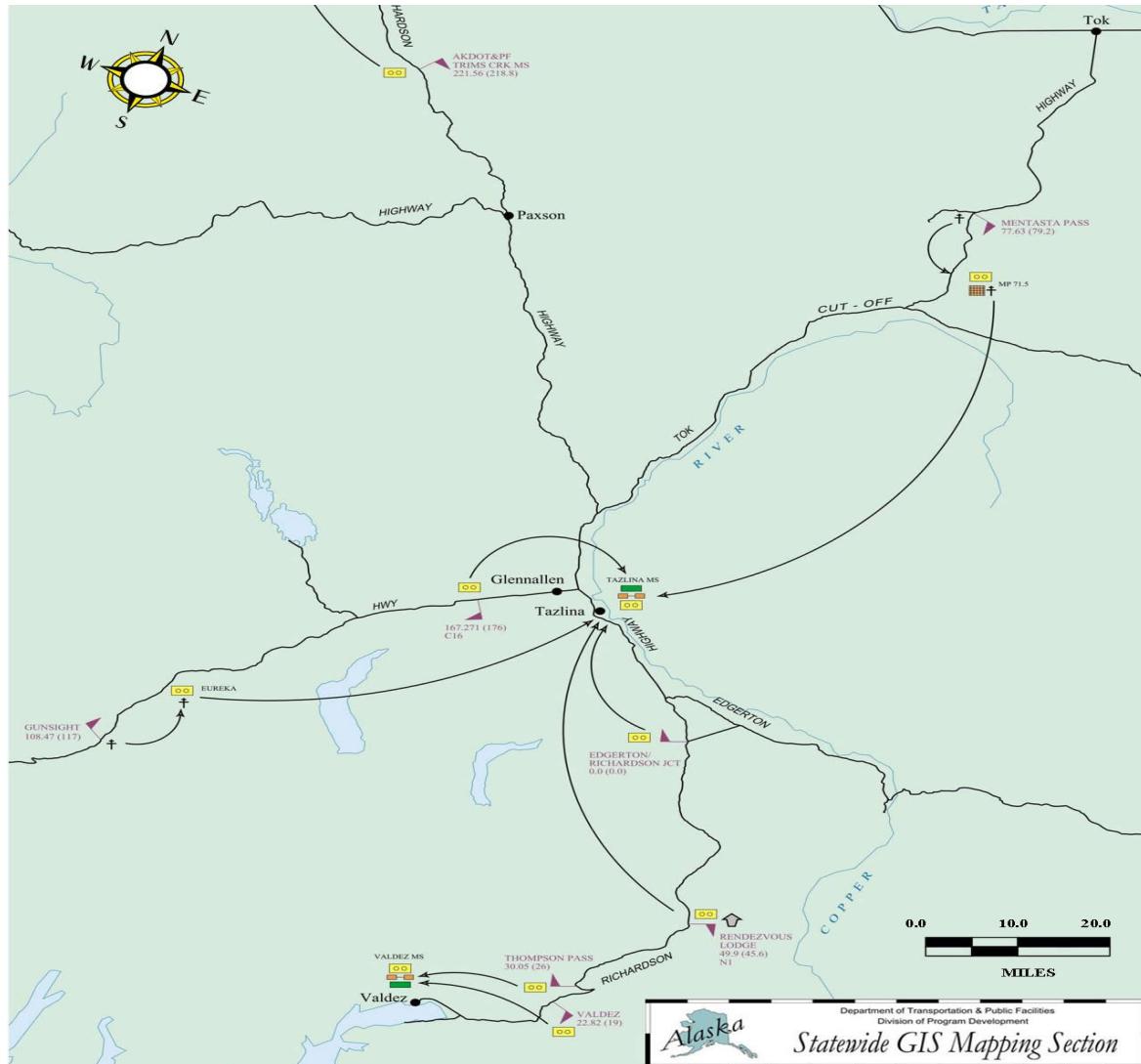
COMMUNICATION EQUIPMENT

Server	■	Lantronix SCS 100	■
Phone and Modem	□	Network Connection	□
Freewave	†	Router	■
Solar Panel	■	Ethernet Freewave	■
Power Module	□	Repeater Site	RS

Fairbanks – ALCan Border Communication Map



Anchorage – Tok Communication Map



Future Work

- LBiSat expansion
- Broader ethernet spread spectrum
- Alaska Land Mobile Radio (ALMR) leverage
 - Two-way radio system for first responders & public safety
 - Multiple frequencies between 154.6500 MHz and 156.2375 MHz
 - Uses digital, narrow band technology (12.5Khz) & public safety communication standards

Alaska Land Mobile Radio (ALMR)

- Leverages existing statewide microwave network
- 9600 baud secure communication
- Shared agency system – DOT is a founding agency
- RWIS employs data-only radios
- Limitations:
 - Shared system
 - Slow baud speed
 - Potential access restrictions during natural disasters and other emergency response

Aurora RWIS Pooled Fund



Aurora

**working to advance road weather
information systems technology**

GLACIER VIEW





TOK CUTOFF NORTH VIEW









Contact Info

Jack Stickel
RWIS Project Manager
Jack_Stickel@dot.state.ak.us
(907) 465-6998

<http://roadweather.alaska.gov>

AURORA RWIS Pooled Fund

<http://www.aurora-program.org>