Introduction to Tait Communications

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TAIT TEAM

Kevin Sumrell
President, Americas

William Mullins
Business Development Manager

Ramin Hafezi
Senior Systems Engineer

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OUR VISION

TO CREATE SAFER, MORE PROACTIVE ORGANIZATIONS BY REDEFINING THE BOUNDARIES OF CRITICAL COMMUNICATIONS

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OUR VALUES

Commitment to Listen

Courage to Act

Integrity to Deliver

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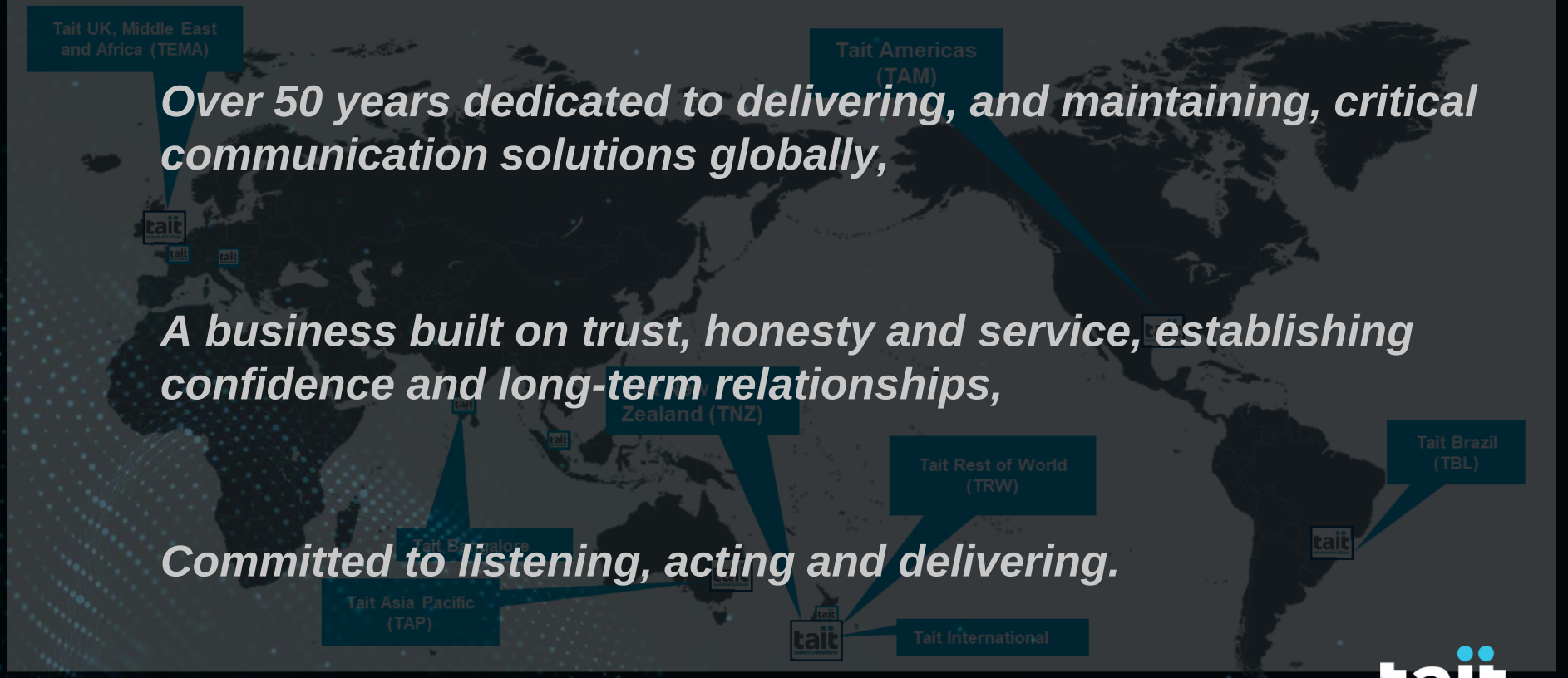
Introduction to Tait



Over 50 years dedicated to delivering, and maintaining, critical communication solutions globally,

A business built on trust, honesty and service, establishing confidence and long-term relationships,

Committed to listening, acting and delivering.

Tait Technology Partner Program

- Enables Best-of-Breed Solutions
- Multivendor solutions for a lower total cost of ownership
- Open standards that allow for flexibility and a secure future
- Commitment to providing a solution that meets the customer's needs
- Large Partner network

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OPEN STANDARDS
CONSOLE ECOSYSTEM

Tait TN9400
Node Controller

CSSI IP Interface

P25 AVTEC

C4i SYSTEMS
Command a stronger position

catalyst
communications technologies

P25 INTERTALK
Critical Information Systems

MODUCOM

omnitronics

TELEX

P25 ZETRON

Standard DMR AIS console integration available with all console vendors

Standard P25 CSSI console integration available with select console vendors

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Technology Overview

Tait Suite of LMR Solutions

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Flexible & Custom-designed Solutions

- Open Standards Based P25 Trunked Solution
- Proposed solution based on customer feedback
- 14 Site Hybrid P25 design
- Console Solution Options (InterTalk & Avtec)
- Digital Microwave Options (Aviat & Ceragon)
- Mission Critical Fault Tolerant System
- Integrated and Scalable Futureproofed P25 Solution
- Tait and Local Partnership for Implementation and Ongoing Support

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700/800 MHz P25 Hybrid P25 Solution

- 6-site simulcast/8-site multicast P25 Phase II
- Spectral efficiency: Less frequencies required
- Simulcast for high-traffic areas - maximizes in-building penetration and roaming efficiency
- Multicast for rural areas – efficiently designed to preserve spectrum and ensure channel availability

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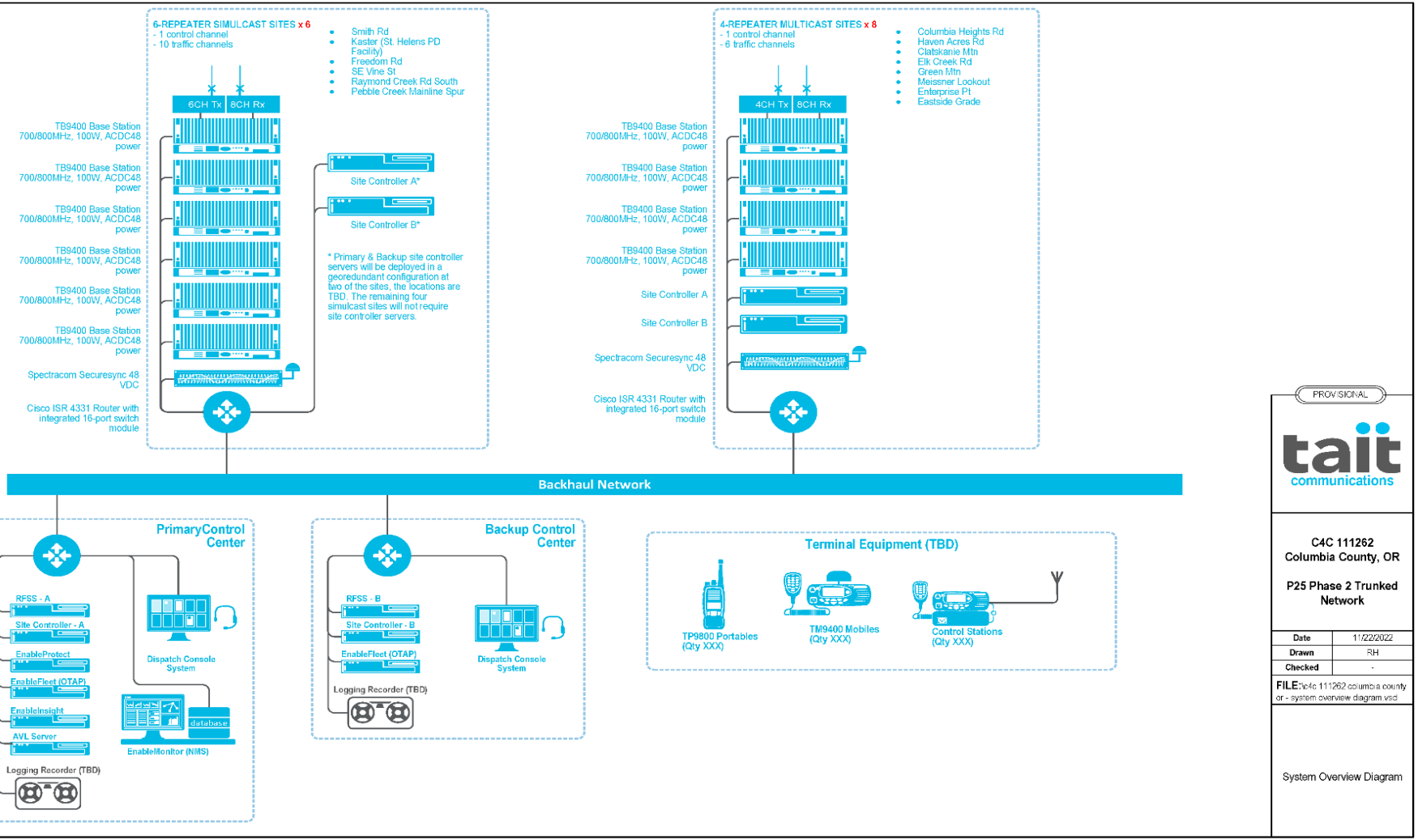

PROVISIONAL

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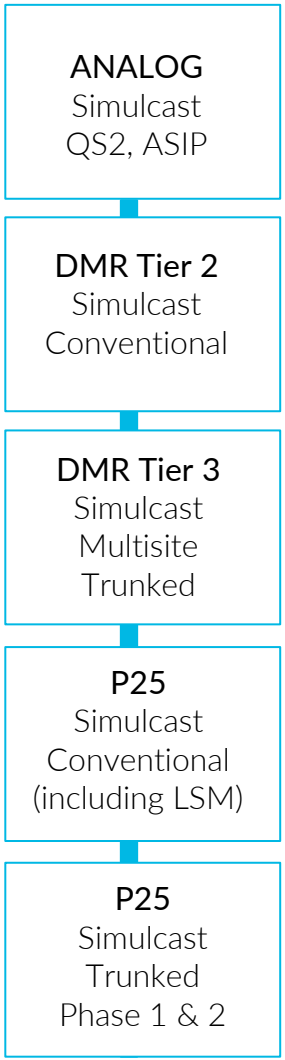
C4C 111262
Columbia County, OR

P25 Phase 2 Trunked Network

Date	11/22/2022
Drawn	RH
Checked	-

FILE: tp4c 111262 columbia county or - system overview diagram.vsd

System Overview Diagram



SIMULCAST INDUSTRY LEADER

- 20+ years experience deploying simulcast
- 400+ simulcast implementations
- Specialized end-to-end standards based solutions
- Refined simulcast technology and shared architecture across the portfolio
- Built-in software-based voters, simulcast control and high availability

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SYSTEM DESIGN AND COVERAGE REVIEW

Excellence in RF Design

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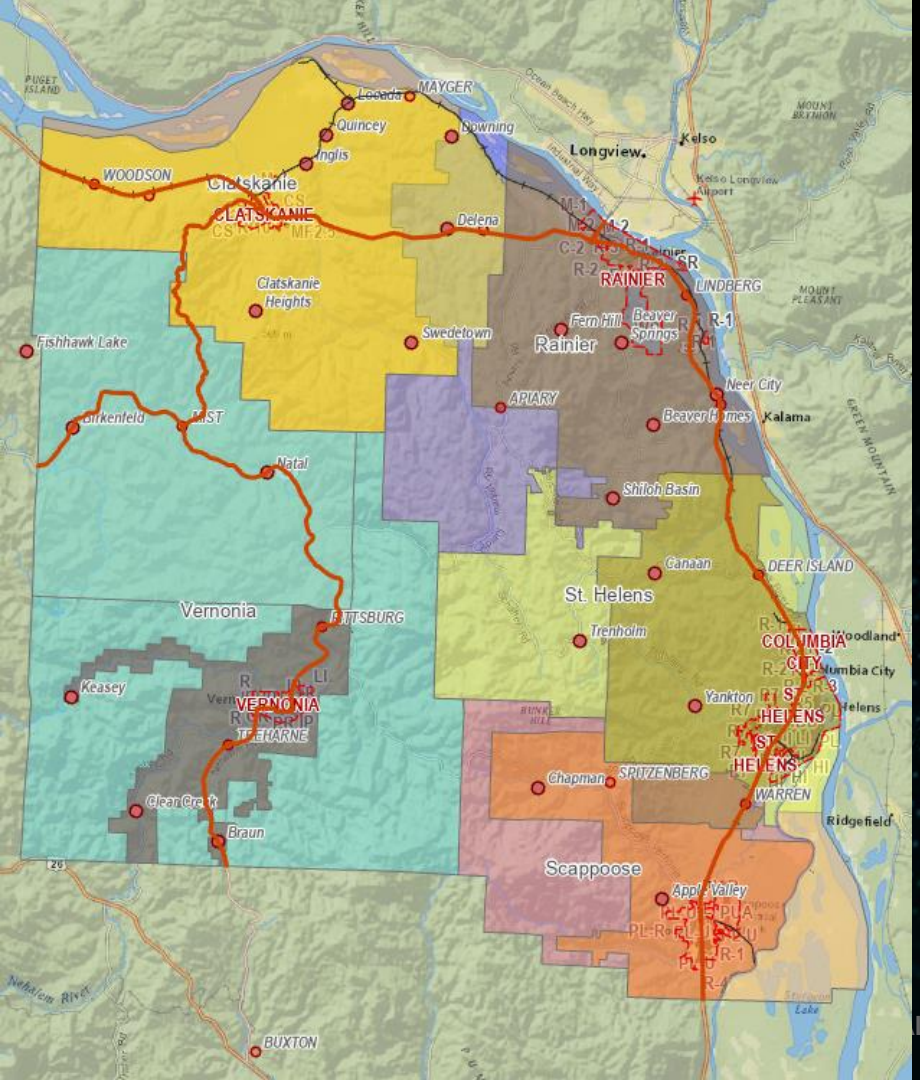


SYSTEM DESIGN REQUIREMENTS

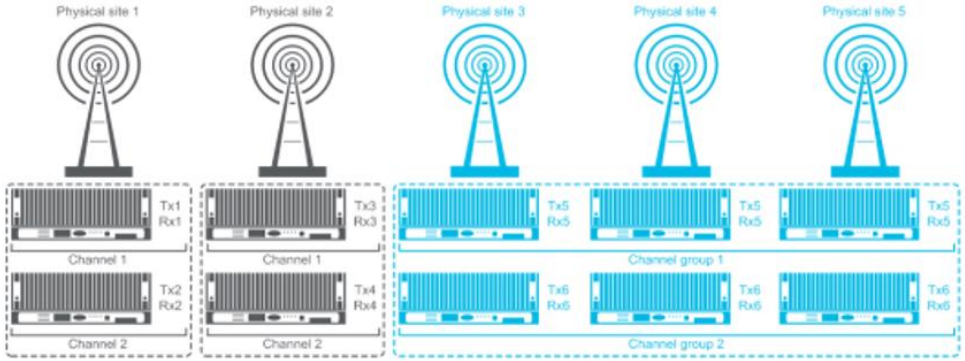
- 95% reliable area coverage – portable based coverage
- Delivered audio quality level of DAQ 3.4
- On-street & Inbuilding Scenarios

Additional Design Considerations

- Minimize site count while maximizing coverage
- Minimize frequency spectrum required in urban areas
- Minimize impact of TDI in simulcast areas

Hybrid Network Option

The Tait network can be a mix of
“simulcast” and “non-simulcast” sites



In this example: you can have 3 “logical” sites, but 5 physical sites

SIMULCAST INDUSTRY LEADER

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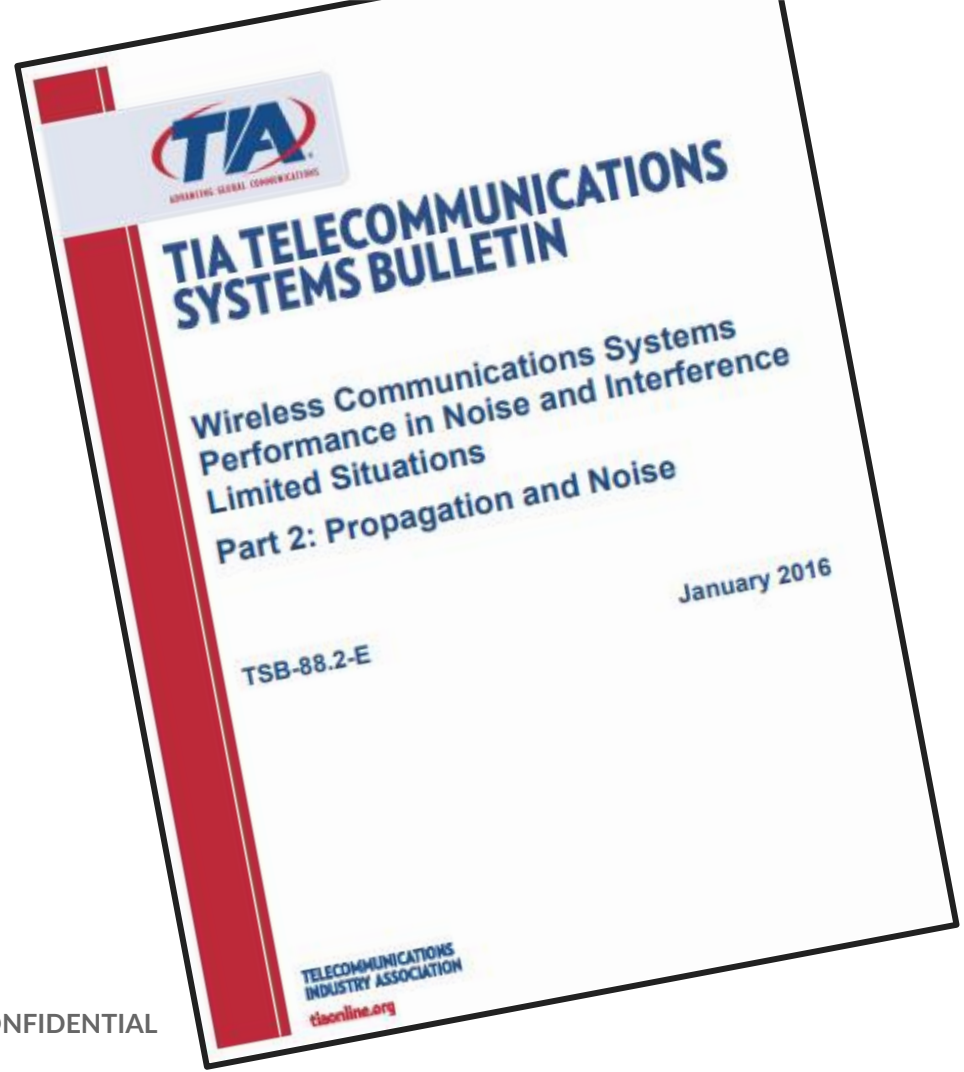


TAIT COVERAGE LINK BUDGET

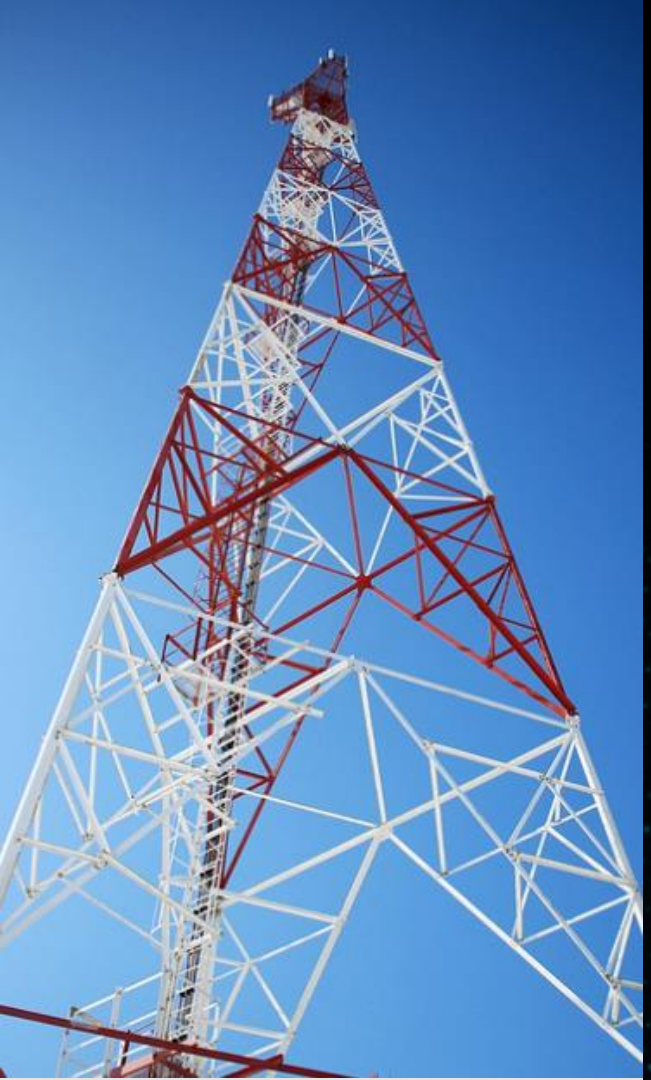
TSB-88 Standards & Guidelines

Coverage Model
Anderson 2D

Terrain
USGS 1 arc sec

Reliability Margin
8.8dB (95% area reliability)

USGS LULC (2016) with attenuation values per TSB-88



TAIT COVERAGE LINK BUDGET

800 MHz P25 Phase II	H-DQPSK	H-CPM	Comment
Parameter	Talk-Out	Talk-In	
Inferred Noise Level	-128.9	-126.8	-144 + 10* log(ENBW)+NF(dB)
Cs/N Static for Modulation Type	7.3	9	TSB-88.1 Table A-1
Reference Sensitivity	-121.6	-121.8	Inferred Noise Level Plus Cs/N Static from TSB88.1 Table A-1
Tower Top Amplifier Gain	NA	-4	Tower Top Amp Receiver Gain
C/(I+N) for Desired DAQ	16.4	18.7	TSB-88 for PhaseII Talk Out / Talk In at DAQ 3.4
Mobile Target Value	-112.5	-108.1	Assume Mobile Power Out at 35 Watts
Body Loss On Hip Swivel Case	8.5	8.5	Swivel Case On Hip Dipole, TSB 88-1 Table D4
Portable On Street Target Value	-104	-100.3	Assume Portable Transmit at 3 Watts, Portable Spec Sheet
Portable in-6dB-Building	-98	-93.6	"Light" Buildings - 6dB
Portable in-26dB-Building	-92	-88.3	"Medium" Buildings - 12dB

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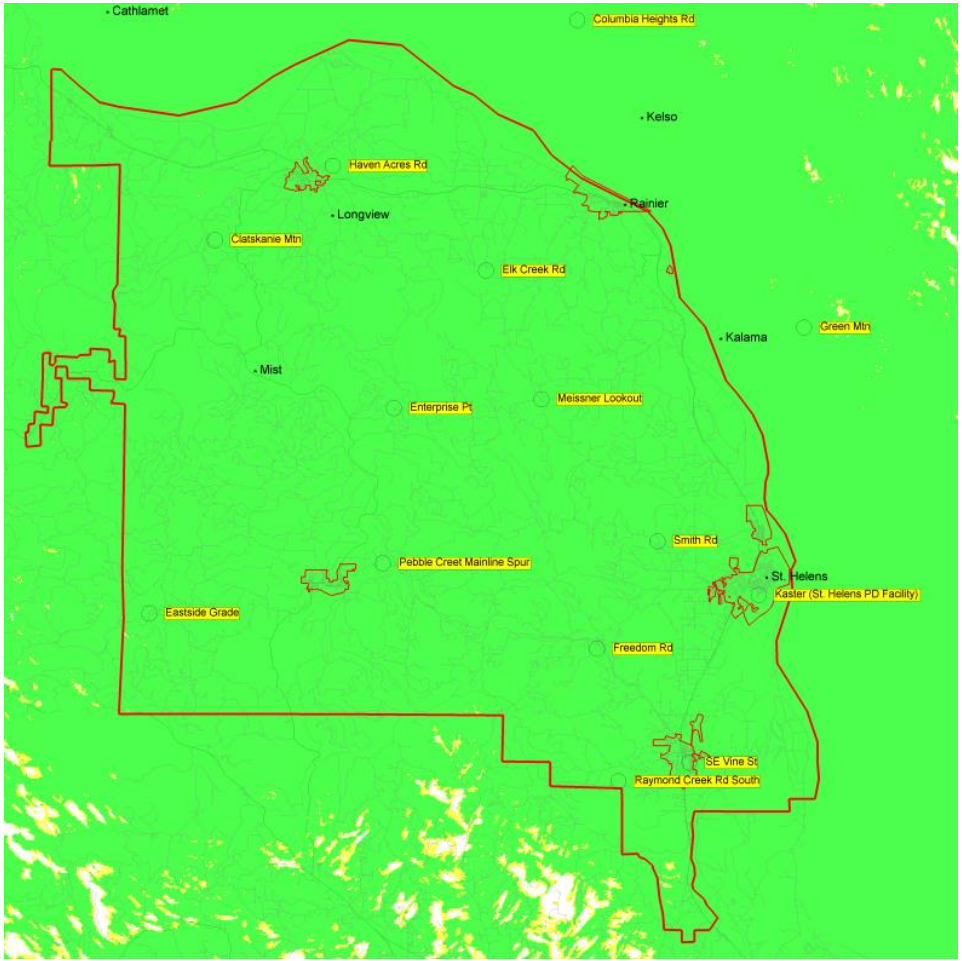
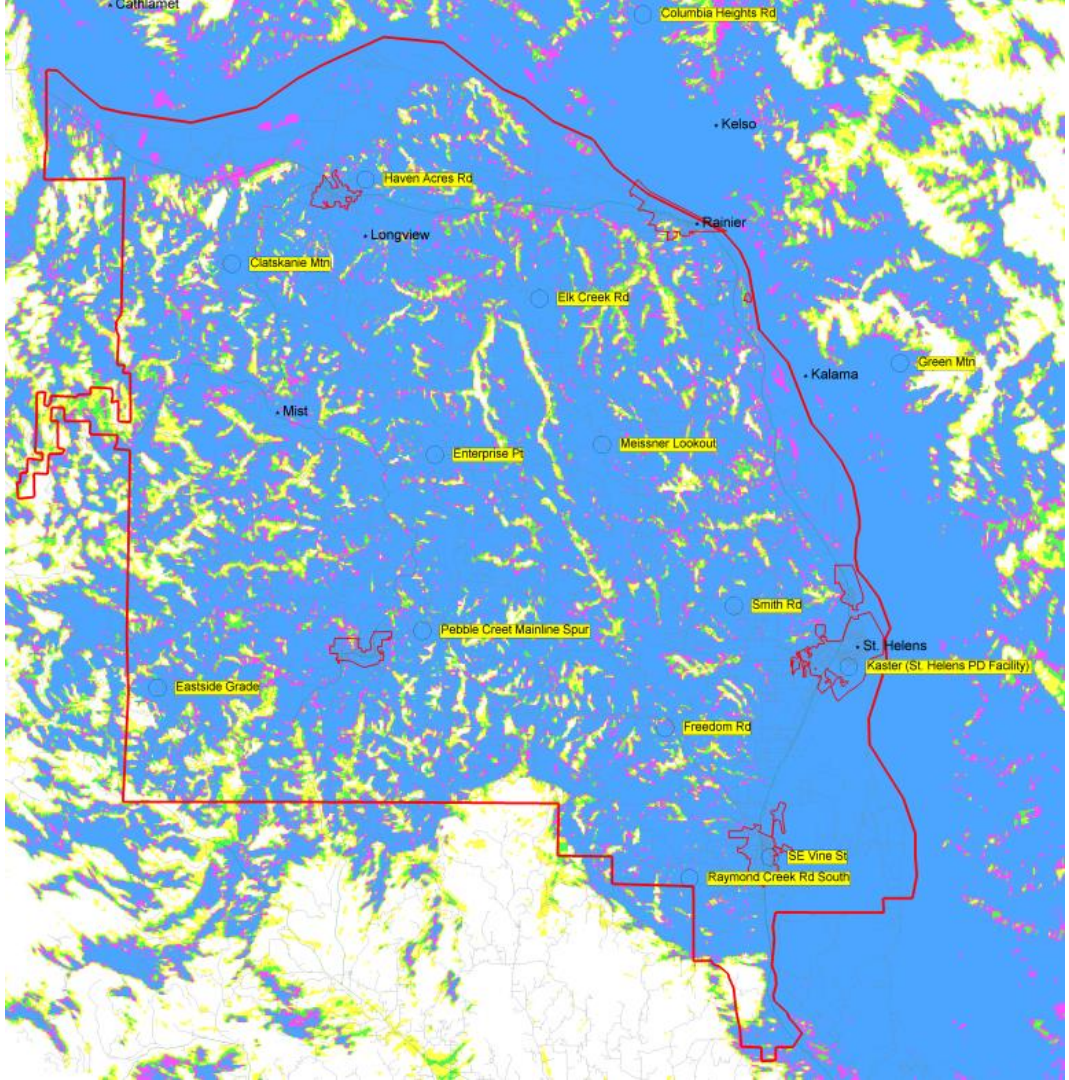


Mobile Coverage

Balanced Talk-In/Talk-Out

7/800 MHz - 14 Sites



Portable Coverage

Blue = 12dB buildings, 6dB buildings, and outdoor

Pink = 6dB buildings & outdoor

Green = outdoor only

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SIMULCAST AND MINIMIZING IMPACT OF TDI

SIMULCAST

- Conserve frequency pairs
- Minimize frequent inter-site roaming
- Minimal TDI impact

BEST PRACTICES

Based on 20 plus years and over 400 simulcast systems implemented

- Optimize site separation
- Customize RF design
- Backhaul

Time Delay Interference “TDI”

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INFRASTRUCTURE

Columbia County P25 System

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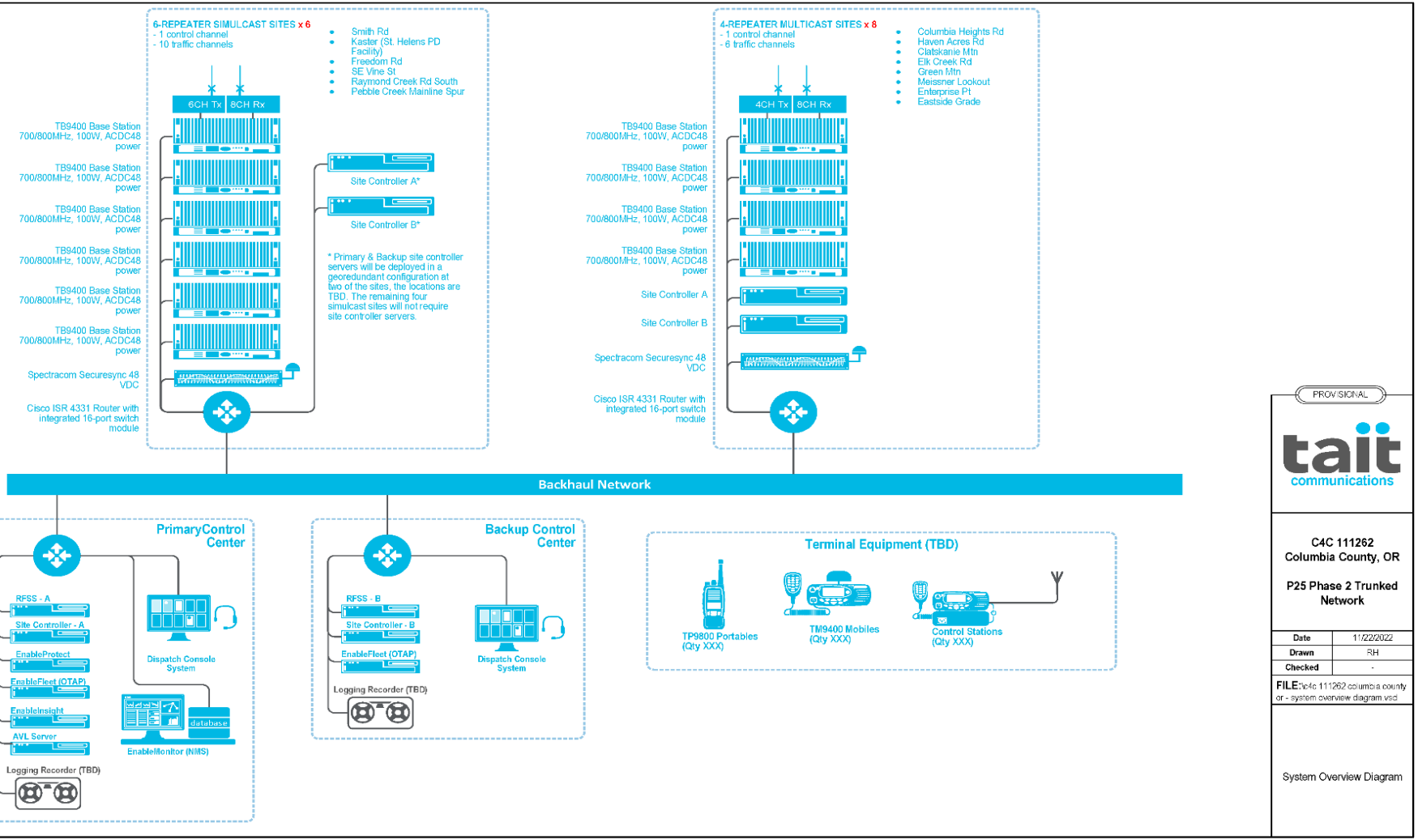

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System Overview Diagram

Site Name	Tower Height (ft)	Site Type	Base Stations	Simulcast/ Multicast
Columbia Heights Rd	190	LMR & Microwave	4	Multicast
Haven Acres Rd	300	LMR & Microwave	4	Multicast
Clatskanie Mtn	190	LMR & Microwave	4	Multicast
Elk Creek Rd	300	LMR & Microwave	4	Multicast
Green Mtn	190	LMR & Microwave	4	Multicast
Meissner Lookout	300	LMR & Microwave	4	Multicast
Enterprise Pt	300	LMR & Microwave	4	Multicast
Smith Rd	300	LMR & Microwave	6	Simulcast
Pebble Creek Mainline Spur	300	LMR & Microwave	6	Simulcast
Kaster (St. Helens PD Facility)	300	LMR & Microwave	6	Simulcast
Eastside Grade	190	LMR & Microwave	4	Multicast
Freedom Rd	300	LMR & Microwave	6	Simulcast
SE Vine St	300	LMR & Microwave	6	Simulcast
Raymond Creek Rd South	300	LMR & Microwave	6	Simulcast
Pisgah Home	300	Microwave	N/A	N/A

Microwave Solution

15 hop – Ring Topology with Loop Protection

6GHz Licensed Spectrum

99.999 availability (commonly called 5 9's availability)

Aviat & Ceragon Options
All-Indoor & Split Configuration Options

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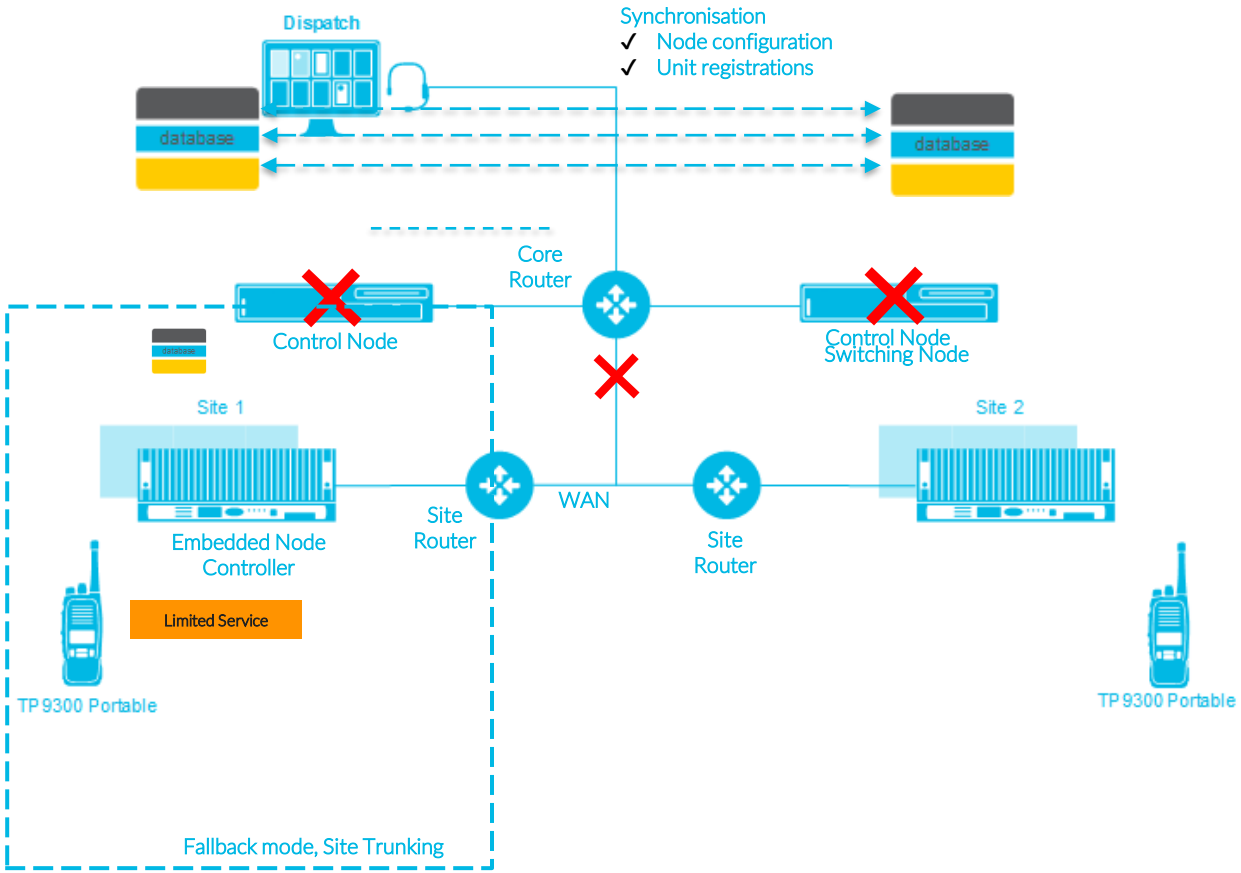

RESILIENCE

What happens when

A node fails?

Multiple nodes fail ?

All nodes fail?

A node-site link fails ?

A site base station fails ?

Firmware upgrade fails ?

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TN9400 RFSS and Site Controller

Kontron CG2400

64-bit, Centos
Dual Ethernet Capability
Full SNMP Support
High Availability

- Depending on system size and High Availability (HA) requirements, three levels of server are available: high mid or low tier
- Checks whether an SU is authorized for the network
- Communicates directly with every base station
- Communicates via CSSI to console systems
- Communicates via ISSI to radio systems
- Manages and assigns call routing
- Hosts Network Manager web site
- Manages subscriber units

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TB9400 BASE STATION

Supports All Bands
136-174MHz, 220MHz,
400-470MHz, 450-520MHz,
700/800MHz, 900MHz

- Multimode: DMR Tier 2 & 3, P25 Phase 1 & 2, Analog
- Modular 4U/1U height station
- 100W with 50W, Dual 50W configurations
- Two time slots available for both voice or data
- Each physical channel provides two logical channels
- DSP-based technology offers native IP
- Simulcast and Voting built-in alarms and monitoring
- Web-based configuration and monitoring
- 100% duty cycle

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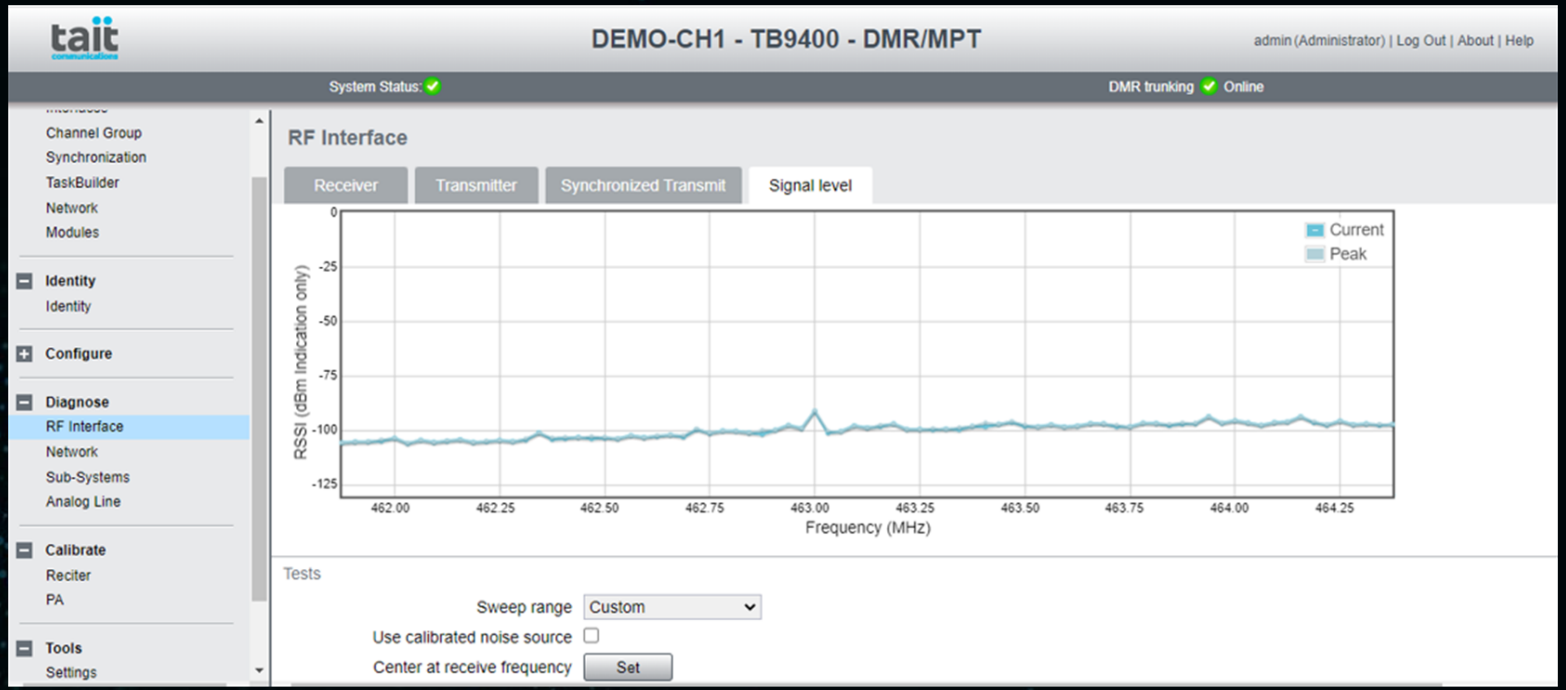
TB9400
SPECTRUM ANALYZER BUILT IN EVERY BASE STATION



TAIT P25 MANAGEMENT SYSTEM

Predictable Delivery of Service

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TAIT ENABLE SUITE

Tait EnableMonitor

Real-Time Monitoring

Alarm and fault management

SNMP compliant

Secure access

Dedicated Terminal

Tait EnableInsight

Performance Reporting

Customizable reports

SLA tracking

Multi-level user access

Application Server

Tait EnableFleet

Network Visibility

Centralized management

System/User configuration

Over-the-air updates

TB9400 P25 Site

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TAIT SUBSCRIBER OVERVIEW

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TAIT TOUGH

The Toughest Radios in the Industry

Ingress Protection (IP):

- IP68: Standard TP9000 radios are dustproof and can be immersed in water:
  - At a depth of 2 meters for thirty minutes
  - At a depth of 1 meter for two hours
- IP65: All TP9000 radios are tested against water jets, 12.5L per min, 30kPa from 3 meters for at least three minutes

Military Standard MIL-STD-810G

- Low pressure
- Low and high temperatures, temperature shock
- Solar radiation
- Rain
- Humidity
- Salt fog
- Dust
- Vibration
- Shock

TP9000 WWW.TAITTOUGH.COM

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TP9800 Multiband

- Lightest weight multiband portable on the market—between 20% and 30% lighter than the competition (depending on battery options)
- 18-hour shift life (5/5/90) in P25 Phase 2 mode with high-capacity battery
- Bridge communications between agencies, or roam between network coverage areas, without the need for several bulky devices

TAIT P25 PHASE 2 » NOW We're Talking

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MAXIMUM CONNECTIVITY

TP9400, TP9600 and TP9800 all feature:

- Quadmode options:
  - Conventional Analog
  - Conventional P25 digital
  - P25 Phase 1 Trunking
  - P25 Phase 2 Trunking
- Connection to 26 conventional networks
- Connection to Simulcast networks
- Bluetooth audio options
- WiFi OTAP capability when used with Tait EnableFleet (TP9600 and TP9800)

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PART OF THE TP9000 FAMILY

- Batteries, chargers, audio accessories and software keys can be used for all TP9400, TP9600 and TP9800

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Fully-compliant P25

Single Key AES, Multi Key DES & ARC4 encryption options

Available frequency bands
VHF (25W or 50W)
UHF-L (25W or 40W)
UHF-H (25W or 40W)
700/800 MHz (35W)

Multi-mode P25 operation: P25 Conventional, Phase 1, Phase 2, and Analog Conventional

IP54 ingress protection rating

Flexible: an options slot for expansion and addition of future capabilities

GPS support
Internal Speaker

Options remote mount, dual control heads, hand held controller

TM9400 P25 MOBILE OVERVIEW

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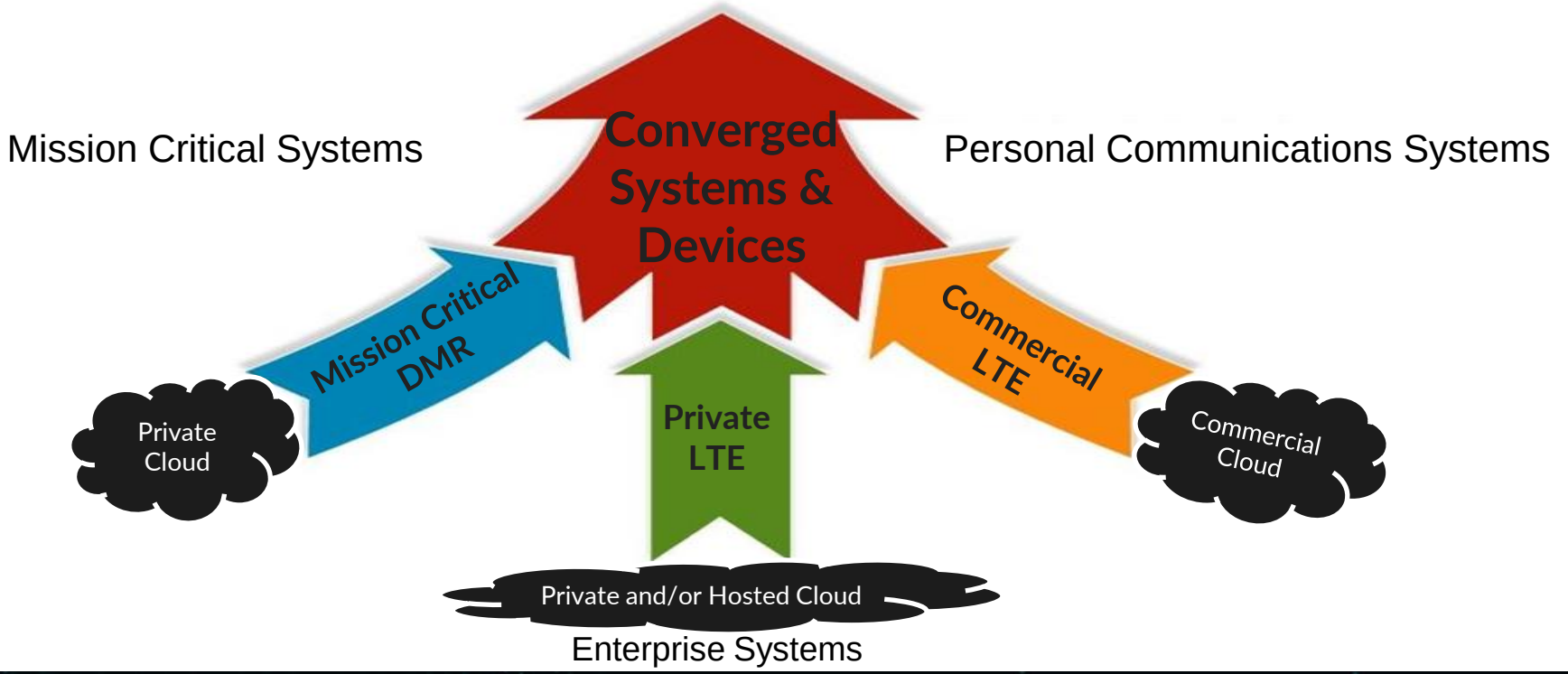
Digital Convergence



Right Communications Tool for the Right Job

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PTT OVER CELLULAR APP

Expand coverage and user access with direct connection to the LMR network via broadband

ESChat®
Enterprise Secure Chat

P25 Interop via ISSI

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CONSOLE DISPATCH SYSTEM OPTIONS

Open Standards Provides Choice

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AVTEC

Flat screen design, centralized feature control

Tabbed navigation, pop-up windows, multi-screen

Converged radio/telephone GUI, all-in-one

Multiple contact list and call queue views

Completely customizable

INTERTALK™

Off-the-shelf screen design, distributed feature control

Tabbed navigation, dynamic drag and drop

Converged radio/telephone GUI, all-in-one capable

Multiple contact list and call queue views

Completely customizable

PROPOSED CONSOLE OPTIONS

Both systems offer:

Distributed and redundant architectures

Standard CSSI protocol integration to Tait TN9400

Enhanced Session Initiation Protocol integration to IP PBX

Active Directory integration for contact management

Highly-flexible screen designs/profiles

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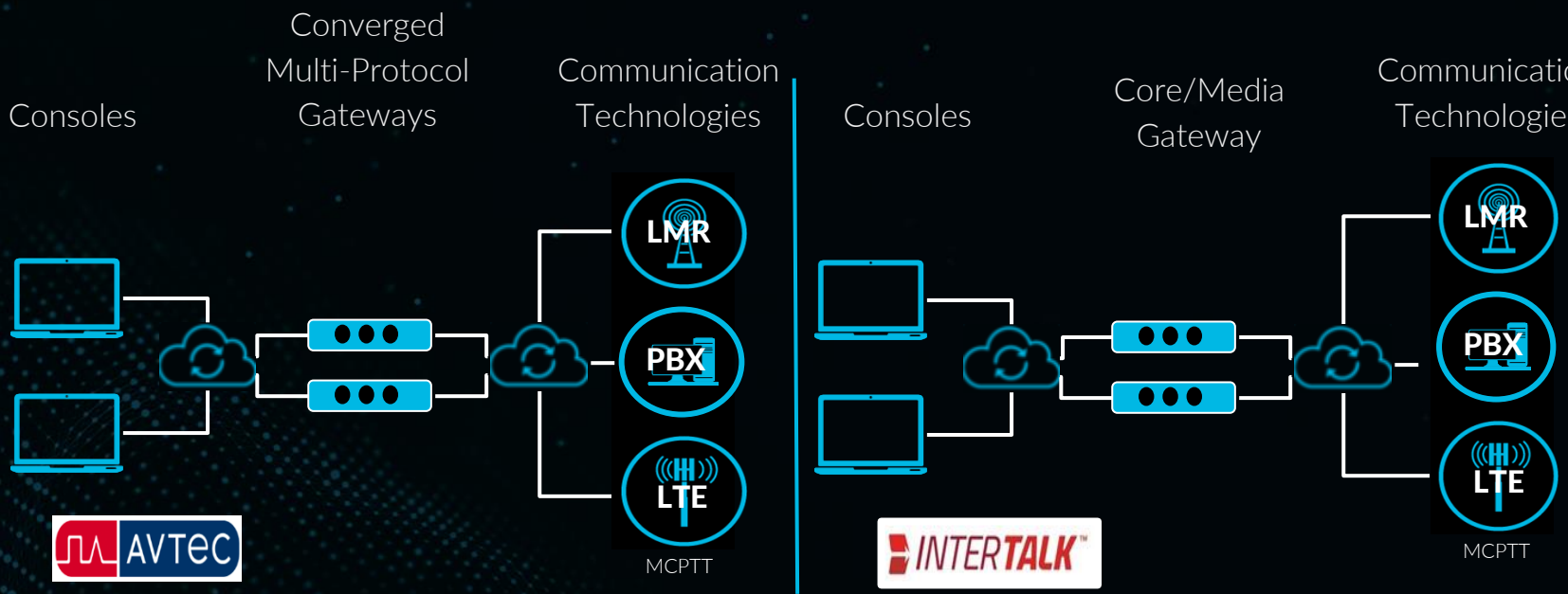
PROPOSED CONSOLE ARCHITECTURES



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WHY PARTNER WITH TAIT

We’re Leaders Where You Need Us to Be

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WE LEAD WHERE YOU NEED US

Tait delivers a standards based P25 solution

Tait's leadership in open standards protects Columbia County

Tait's ecosystem of partners affords Columbia County freedom of choice

50 years in LMR

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WHO WE ARE

Structure ensures we make decisions for our customers, not for stockholders, and grow organically through their satisfaction

Ensured quality by engineering, manufacturing and supporting all our products under one roof

Champion of open standards so our customers, suppliers, your company and ours have flexibility and security to protect investments

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PROPOSAL SUMMARY

Experienced Partner
Tait Public Safety experience and leadership

Protecting Your Interests
Distributed architecture, failover design, monitoring

Solution Fit for You
Open standards P25 Simulcast/Multisite

Commitment to Deliver
Tait designs, deploys and supports your network

Investment Protection
Partners, interoperability, flexibility, future-proof

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