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Overhaul New Hampshire’s Broadband Network

Mountainous State Brings Wireless Network Up to Speed
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Summary

The state of New Hampshire needed to update its broadband technologies in all 10 of its counties to meet growing demand for reliable communications with public services and state agencies. The state’s telecommunications infrastructure was lagging behind consumer demand and that of other states. The badly needed upgrades were uniquely challenged by conditions endemic to New Hampshire. A program was implemented to combine technologies, infrastructure assets, funding and effort to tie disparate local systems together and bring the statewide communications network up to par with the rest of the country. The resulting enhanced network better serves New Hampshire public assets including the Departments of Safety, Transportation, and Resources and Economic Development; NH Public Television; and the National Guard with increased broadband functionality, resiliency and bandwidth to other public safety offices throughout the state.

New Hampshire At A Glance

- New Hampshire is about 190 miles long from north to south and about 70 miles wide from east to west.
- New Hampshire features rugged mountains, lakes and ocean beaches.
- Contained within the Appalachian Highlands, the three primary geological features and landforms (physiographic regions) of New Hampshire are the Coastal Lowlands, the Eastern New England Upland, and the White Mountains.
- The White Mountains cover the northern portion of the state and consist of rugged mountains and narrow valleys.
- Mount Washington, the highest point in New Hampshire and the highest point in New England, is part of the Presidential Range. It is 6,288 feet above sea level and home to some of the worst weather in the world.
- Five other peaks in the Presidential Range are over a mile in height. The Franconia Range includes Profile Mountain which formerly hosted the Old Man of the Mountain, a granite profile of an old man’s face, near the peak.
- The lowest temperature in New Hampshire, -47 degrees F, was recorded on January 29, 1934 on Mount Washington.
- Winters are cold and snowy throughout the state, and especially severe in the northern and mountainous areas. Average annual snowfall ranges from 60 inches (150 cm) to over 100 inches (250 cm) across the state.
Green Mountain Communications

Green Mountain is an end-to-end wired/wireless solutions provider delivering integrated communication solutions for businesses in the northeast region. Serving as an expert source to its customers, Green Mountain is a trusted partner for entities in enterprise, education, government, healthcare, service provider, and utilities industries. Green Mountain believes that quality and safety are paramount in providing the exceptional service that they have been delivering to customers for over 20 years. With more than 10,000 installed projects, Green Mountain has the experience and knowledge to successfully assess its customers’ needs and deliver comprehensive communication solutions proficiently, rapidly, and cost-effectively.

Green Mountain is equipped to engineer, install, and furnish the wired/wireless systems that today’s businesses need to stay competitive and serve their customers. Through industry awards and customer feedback, Green Mountain has been acknowledged for its ability to integrate the most advanced technologies with a high level of attention to detail and unmatched dedication to customer service.

The Project

Green Mountain, an integrated communication provider for businesses in the Northeast, was contracted to design, develop and construct the NH SafeNet microwave network. Green Mountain developed a strategic plan to improve and consolidate the existing statewide point-to-point microwave analog and time division multiplexing (TDM) network that included towers standing on 20 mountaintop sites throughout the state. RFS supplied essential network equipment such as wideband microwave antennas and other ancillary products required for reliable performance under rigorous conditions.

The Challenge

Numerous existing networks had to be integrated into a single, closed broadband system; their protocols needed to be streamlined so traffic could flow seamlessly across the network, prioritizing data transmissions and allocating bandwidth limits based on the IT platforms of stakeholders. Existing infrastructures including several outdated towers that did not comply with current standards had to be updated and integrated into the network. New mVPN code had to be developed that could handle video streaming, digital television broadcasting and planning for future expansion. Wind was a major issue, with towers needing to be installed and maintained on mountaintops including Mount Kearsarge, Mount Belknap, Tenney Mountain and even Mount Washington, where access was remote and extreme conditions could severely threaten the stability of equipment.

The Solution

The network designed for NHSafeNet incorporated carrier class capabilities by leveraging Multiprotocol Label Switching (MPLS). Code was developed for new routers to enable streaming of video traffic and deliver optimum performance. MPLS was required in order to manage the complex system integration and develop a highly efficient, scalable and secure network.

New equipment was designed to integrate with existing structures and to withstand high winds. Another notable deployment scenario that was unique for this project was the use of RFS circulators in combining the legacy equipment with the new equipment. NHSafeNet was able to build in future expansion capabilities for the data network, as demand and use continue to grow. Introduction of the RFS circulators also allowed Green Mountain to install and test the system prior to cutting over the traffic, minimizing system interruptions.

Photo supplied by Green Mountain

Hoisting a dish on Mount Washington, where the rugged landscape and extreme weather conditions pose exceptional challenges.
The Solution

RFS was contracted by Green Mountain to provide critical equipment including microwave antennas, waveguide and related components to meet project requirements. The high-performance antennas manufactured by RFS were used to meet the stringent delivery timelines necessary for the aggressive implementation schedule. Ever since Green Mountain was founded, it has been installing RFS-manufactured components, including cables, connectors, antennas, and more, for its tower construction and indoor DAS business unit.

Use of RFS 6 GHz wideband antennas was a key element of this network upgrade solution, which permitted Green Mountain to combine existing equipment frequencies and new equipment frequencies over the same system. This consequently simplified deployment given that there was limited tower space, structural issues, and a need to run the legacy equipment in conjunction with the new equipment until the testing and cutover was completed. A robust spun backring design reinforced the antennas’ mechanical stability, providing more secure links and exceptional operational wind speeds. Wind resistance was confirmed in actual wind tunnel testing, assuring that the antennas would be able to withstand New Hampshire’s rugged weather. A few years after installation, the equipment continues to perform well, despite the harsh mountaintop conditions presented at some sites.

Conclusion

New Hampshire’s new Internet Protocol (IP)-based microwave network supports legacy TDM natively and improves transmission of emergency communication, including Amber Alerts, the state department of intelligent transportation system (ITS), the public safety 911 network and natural disaster warnings. With speeds up to 10 Gbps, the state-wide fiber optic network provides resiliency for the microwave network and is on par with others in MA, TX and CA. The NHSafeNet public safety network provides increased functionality, resiliency and bandwidth for stakeholders and public safety offices throughout the state. NHSafeNet will even save taxpayers money in the long term, thanks to reduced support and equipment costs.

The solutions created in New Hampshire set new precedents for other broadband network systems where expansion and improvements are needed. New Hampshire gained a new, high-speed broadband network with enhanced capabilities. The expanded broadband coverage will help keep New Hampshire vibrant, innovative and relevant for businesses, citizens and education institutions for years to come.

“This project required tight scheduling with uninterrupted customer service while executing a seamless cutover to the new system. RFS’ experience and high performance equipment made it possible for us to pull off a very complicated, multifaceted upgrade, making dramatic improvements to New Hampshire’s communications infrastructure.”

Victor Drouin
President at Green Mountain
RFS Ferrocom

RFS Ferrocom proudly offers the marketplace a broad range of ferrite devices which are unequalled in performance, quality and reliability.

In keeping with our commitment to quality, our facility is registered to the ISO-9001/2000 quality standard and fully compliant with MIL-I-45208A.

RFS Ferrocom currently carries over 2,000 existing designs as well as a highly skilled engineering staff that is ready to develop isolators/circulators to your specifications. Our units are ideally suited for integration into compact systems requiring dependable performance with stripline, waveguide, drop-in and isodapter packages available.

RFS Ferrocom, an industry leader in the manufacture of isolators and circulators, offers a complete line of ferrite devices covering the range of 80 MHz to 40 GHz. Our extensive line of isolators and circulators extend from narrow band models to units with greater than octave bandwidths. These units provide the lowest possible insertion loss for a specified set of operating conditions and requirements. Optimized isolation characteristics are accomplished as a result of state of the art impedance matching and design techniques.

Microwave Antennas

RFS offers four types of microwave antennas, each one designed for a specific application in your network. Together, our complete portfolio of microwave antennas takes your network from rooftops in dense urban areas, through suburbs and across long stretches of land to the harshest mountaintop and seaside environments.

Whether you are a telecom operator, a telecom manufacturer, a government agency, an enterprise or a strategic industry, RFS offers microwave antennas that support your applications and deliver dependable performance at low total cost of ownership (TCO):

→ Stringent design and quality testing procedures ensure that every RFS microwave antenna meets or exceeds electrical, mechanical and environmental performance standards with no compromises and no surprises.

→ Simplified installation and deployment procedures, low maintenance and longterm reliability keep post-purchase costs to a minimum. Compact packaging keeps transportation costs low.

→ Modular designs let you “pay as you grow”, evolving antennas and adding capacity as needed without the cost of replacing the antenna.

About RFS

Radio Frequency Systems (RFS) is a global designer and manufacturer of cable, antenna and tower systems, as well as active and passive RF conditioning modules, providing total-package solutions for outdoor and indoor wireless infrastructure. RFS serves OEMs, distributors, system integrators, operators and installers. Its customers currently include the four largest wireless carriers, the majority of tier 2 and 3 wireless carriers in North America and many of the top wireless and microwave OEMS worldwide.

For more than 70 years, RFS has provided its customers world-class service that today is backed by a global presence of nine manufacturing facilities worldwide and sales and technical support centers in 23 countries. RFS offers advanced engineering capabilities, superior field support, and expert technical assistance and training to provide scalable, flexible, future-proof and lightweight end-to-end solutions optimized across the entire RF chain. As an ISO-compliant organization, RFS solutions offer proven longevity, premium performance and unrivalled quality.
RFS offers a complete portfolio of microwave antenna systems to meet all of your needs

Quad-band Dual-Polarized Antennas Give Customers the Flexibility to Access the Recently Released 7 GHz Spectrum and to Add Capacity

**Ultra-wideband microwave antennas** from RFS were the first in North America to cover the unlicensed band (5.725 to 5.85 GHz), the lower 6 GHz band (5.925 to 6.425 GHz), the upper 6 GHz band (6.425 to 6.875 GHz) and the 7 GHz band (6.875 to 7.125 GHz) in a single antenna.

**Ultra-Wideband Antennas**

Radio Frequency Systems’ (RFS) quad-band, dual-polarized microwave antennas give customers the flexibility to access the recently released 7 GHz spectrum and to add capacity when needed. With a single antenna, customers can easily switch among the four bands – unlicensed band (5.725-5.85 GHz), the lower 6 GHz band (5.925-6.425 GHz), the upper 6 GHz band (6.425-6.875 GHz) and the 7 GHz band (6.875-7.125 GHz) – to access new spectrum. In addition, they effectively gain two antennas in one because they can stack multiple channels on each polarization to increase capacity.

These 6-, 8- and 10-foot diameter antennas are available in dual-polarized, un-shrouded models (PADX Series) that deliver superior radiation performance and in dual-polarized, ultra-high-performance models (UXA Series) that feature high cross-polarization discrimination (XPD) to reduce interference.

The antennas feature a spun backing design for mechanical stability and secure links. They also feature a powder-painted finish, rather than a wet-painted finish. RFS is the only vendor to offer powder-painted microwave antennas to the North American market. Powder painting improves the antenna’s ability to resist corrosion due to harsh environmental conditions, such as pollution and salt.

**Features and Benefits**

- **Utilizes the new 7 GHz band for fixed services**
  - Provides a solution to address the challenges of 4G such as increased data usage, spectrum availability and network congestion

- **Dual-polarization for higher capacity**
  - Operates as two antennas in one
  - Stack multiple channels on opposite polarization of the same antenna to increase capacity
  - Reduces OPEX and CAPEX

- **Ideal for 7 GHz, lower 6 GHz, upper 6GHz and unlicensed bands**
  - Allows frequency changes between the four bands without changing the microwave antenna to reduce CAPEX
  - Allows operation of main radio in 7 GHz
  - Stack multiple channels to increase capacity in any of the four bands
  - Offers maximum flexibility and return on investment

- **Spun backing design on 6-10 ft antennas**
  - Greater mechanical stability and more secure links ensure the best operational wind speed performance on the market

- **Powder painted antenna finish**
  - Unique industry process guarantees a longer product life and protection on your investment

**FLEXWELL Elliptical Waveguide**

The industry-renowned FLEXWELL elliptical waveguide can achieve the radio-to-antenna link in a single run, directly from the equipment building to the tower mounted antenna.

Designed to support microwave frequency bands from 3 to 40GHz, it is available in various sizes and types, and two different categories:

- **Standard** – Cost-efficient solutions for low and medium-capacity radio relay systems
- **Premium** – Low VSWR waveguide for high capacity radio systems
Radio Frequency Systems (RFS) is a global designer and manufacturer of cable, antenna and tower systems, as well as active and passive RF conditioning modules, providing total-package solutions for outdoor and indoor wireless infrastructure. RFS serves OEMs, distributors, system integrators, operators and installers. Its customers currently include the four largest wireless carriers, the majority of tier 2 and 3 wireless carriers in North America and many of the top wireless and microwave OEMs worldwide.

Serious about services

Customers know they can count on RFS for comprehensive logistical capabilities, flawless execution and outstanding technical skills and support. The company’s dedicated shipment coordinators, hotline staff and on-site engineers go well beyond mere technology, striving to offer tailored solutions to meet even the most complex site engineering and delivery challenges.

RFS’ value-added services match the exact needs of business partners large and small.

A tradition of innovation

For over a century, RFS has been at the forefront of the wireless communication industry through its unwavering commitment to design and develop the world’s most advanced technology in the field. Dedicated R&D teams, along with a privileged partnership with Bell Labs, are at the source of breakthroughs that are ensuring the mobility of an increasingly wireless world.

RFS is at the frontier of wireless technology innovation, sustaining the boldest ventures to enhance the way people communicate and live.

Ever-present quality guarantee

From design to manufacture, ISO 9001 and ISO 14001 certification standards encompass all aspects of RFS’ business worldwide. Every product RFS ships has stood up to the most stringent technical, environmental and quality control tests, continuously meeting and surpassing the expectations of a long list of wireless carriers, transportation and utility operators, and broadcasters.

RFS backs every product bearing its name with a quality guarantee that is unrivaled in the market.

A truly global company

With on-the-ground personnel in more than 20 countries and on every continent, RFS always delivers on its commitments, providing a comprehensive range of premium products, systems and services. Its clients benefit from all the advantages of a global supplier, while relying on dedicated support from RFS’ local engineering, manufacturing and shipping teams.

RFS’ products, systems and personnel can be found in every corner of the planet. As a global group, RFS is committed to upholding the most stringent environmental, health and safety standards, and seeks to integrate green initiatives in every aspect of its business.
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