

## SUBNET RELAY (SNR)

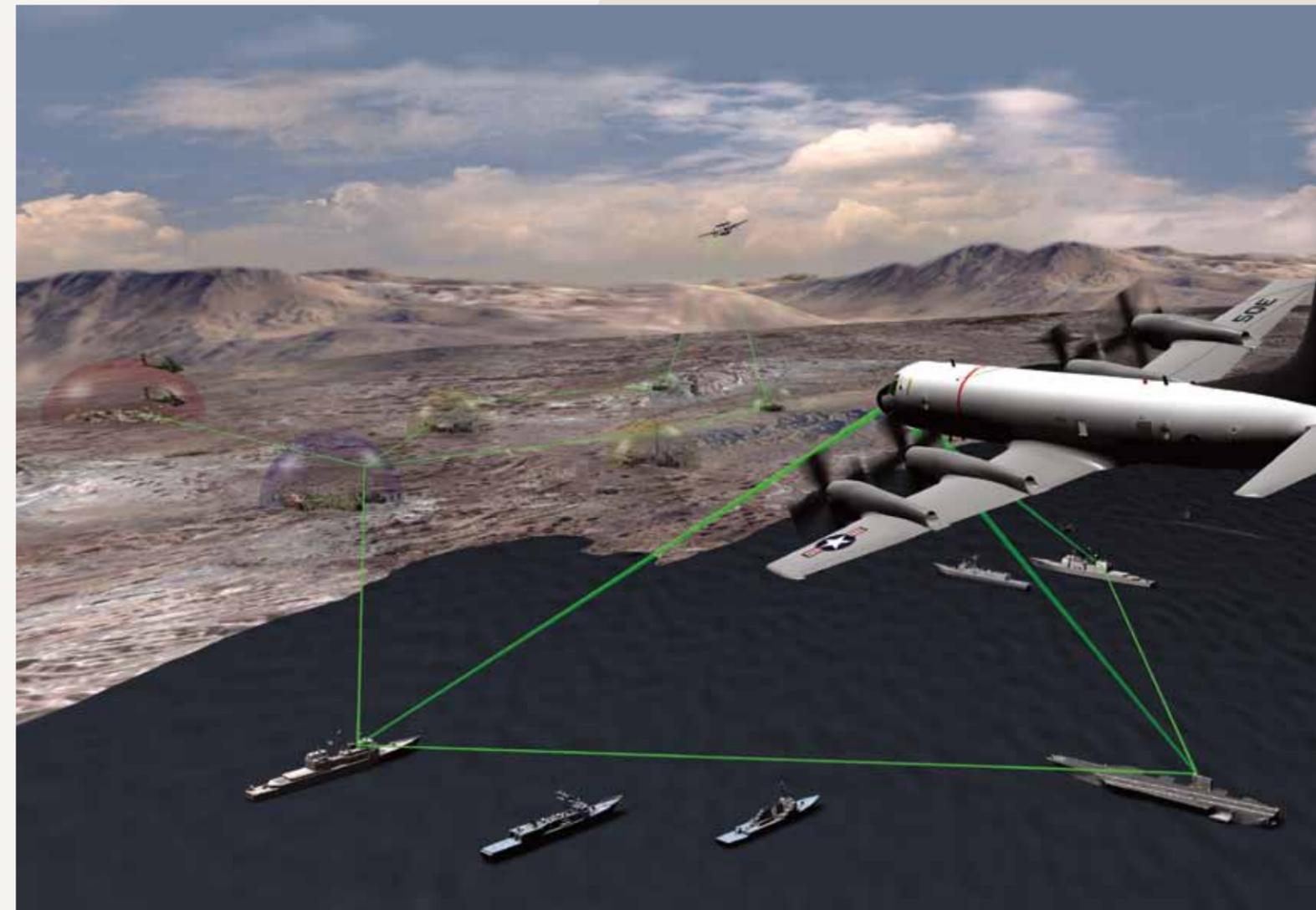
The first fully mobile, cross-platform  
ad hoc IP network utilizing legacy radio systems.

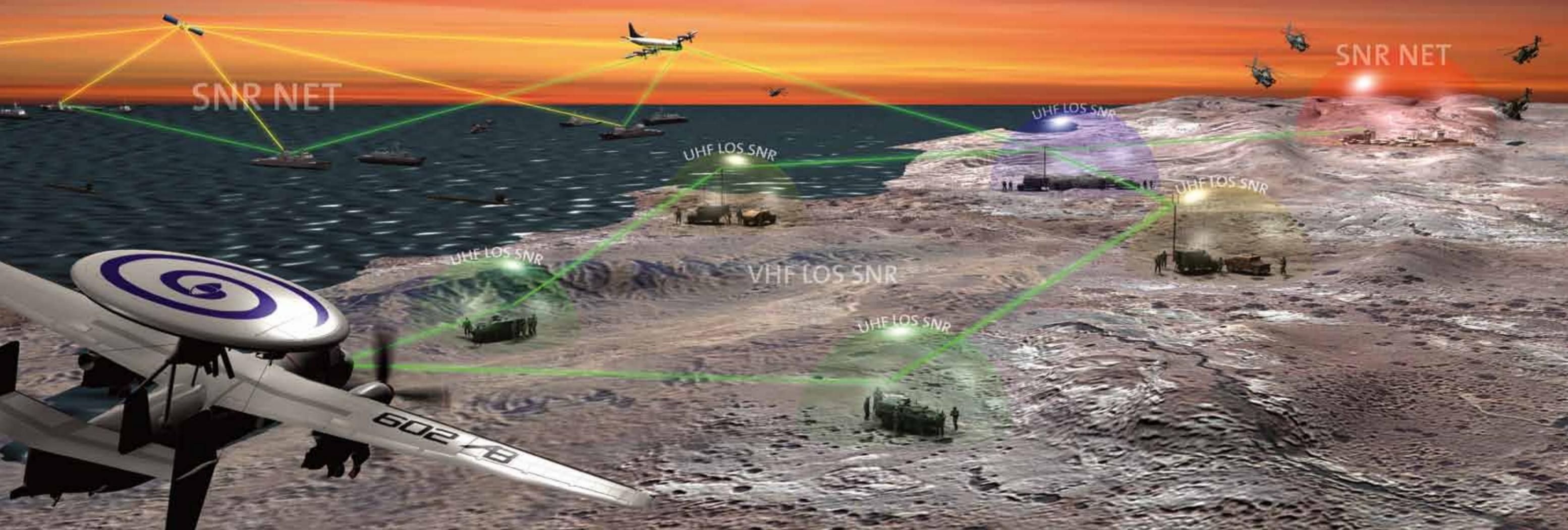
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Rockwell Collins delivers smart communication and aviation electronic solutions to customers worldwide. Backed by a global network of service and support, we stand committed to putting technology and practical innovation to work for you whenever and wherever you need us. In this way, working together, we build trust. Every day.

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## The growing need for a mobile, ad hoc, high-speed IP network.

In today's sophisticated multi-national military environment, mission commanders are faced with the increasing need to provide a continuous flow of reliable, high-speed data communications to national and multi-national forces. In fact, fleet commanders have identified effective coalition communications as their primary C4I warfighting priority.

Although in many instances satellite communications (SATCOM) has become the "go to" remote networking and communications delivery technology, it has its drawbacks, such as system complexity and "available airtime."

In addition, relying too heavily on SATCOM may also create communications breakdowns when enemy forces disable key satellites or during operations with coalition forces that do not have satellite capability.

The bottom line is, while satellite-based communications does have its place in modern military operations, it is not the most viable way to meet mobile networking needs for today's military forces.

### The SubNet Relay solution.

Developed for the navies of Australia, Canada, New Zealand, the United Kingdom and the United States (AUSCANNZUKUS), Rockwell Collins SubNet Relay (SNR) is the first, truly masterless, self-configuring data networking technology that works with currently fielded HF/VHF/UHF radios.

This breakthrough capability gives task commanders what they need – a simple and cost-effective solution to providing reliable, mobile ad hoc IP networking capabilities between a diverse grouping of national or coalition ships. A SubNet Relay network can also include other types of platforms such as aircraft, ground vehicles or fixed sites.

A SubNet Relay network is not only efficient and cost-effective to use, it is easy to install. SNR components are designed to easily integrate with your legacy or modern cryptographic and radio equipment to provide a variety of benefits including:

- › Masterless, self-organizing, distributed operation independent of radio types

WHEN THE SITUATION DEMANDS HIGH PERFORMANCE ROBUST COMMUNICATIONS – SUBNET RELAY.

- › Automatic traffic relay to extend communication range
- › Dynamic bandwidth allocation in response to reported requirements
- › Unicast and efficient broadcast delivery services

SubNet Relay is tested and field proven. It uses legacy or modern HF/VHF/UHF line-of-sight radios to create self-configuring tactical internet networks. Any IP data transmission such as C2, text chat, collaborative planning, Web browsing, e-mail or other Internet applications are supported. When all radio, modem or crypto and protocol overhead are taken into account, TCP throughput is about 75% of the modem data rate. As such, TCP throughputs of about 7 kbps and 1.5 Mbps are possible for 9.6 kbps HF links and 1.92 Mbps UHF links, respectively.

### LOS. ELOS. Extending the SNR to where you need it.

With its dynamic traffic relaying capability, Subnet Relay extends operational coverage of Line-of-Sight (LOS) and Extended-Line-of-Sight (ELOS) communication bearers. By strategically placing SNR-equipped ships, submarines, aircraft, UAS or land vehicles

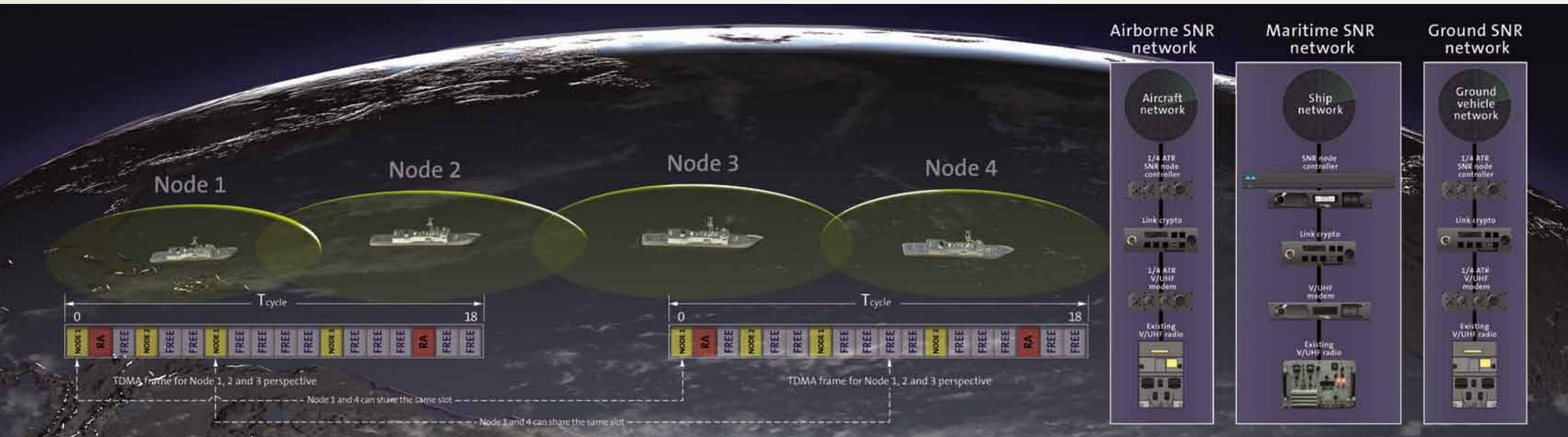
SubNet Relay's automatic relay capability can literally extend your line-of-sight (LOS) and extended line-of-sight (ELOS) coverage area well beyond the horizon.

But no matter how broad the network's reach, your data is secure – SNR is compatible with standard security and encryption devices, which operate with all current and future security architectures, including KG-84, KIV-7 and HAIPE.

SubNet Relay has the capability to support multiple platforms and can automatically enable radios from different operational domains to be used within the same network. SubNet Relay components have also operated flawlessly with a wide variety of current and legacy radio systems including WSC-3, ARC-210, PRC-150 and many others – all while operating on standard channels. Once the system is configured, there is literally no operator interaction required to create and maintain an ad hoc network.

With its unmatched ability to provide tactical commanders a reliable, sustainable and flexible ad hoc IP wireless network, SubNet Relay is another example of Rockwell Collins ongoing commitment to provide allied military forces with the most advanced capabilities at the lowest possible acquisition and operational costs.

## The flexible IP solution from one reliable source.



### Proven performance around the world.

Rockwell Collins SubNet Relay has been standardized as NATO STANAG 4691 – Mobile Ad Hoc Relay Line-of-Sight IP Networking (MARLIN). The system is already in use by the U.S., Canadian, Australian and many NATO navies and provides a new, naval operational, capability to these nations.

SubNet Relay components have also operated flawlessly with a wide variety of current and legacy radio systems including WSC-3, ARC-210, PRC-150 and others – all while operating on standard channels.

A number of at-sea trials have proven the Subnet Relay's automatic relay capability to deliver well beyond LOS communications. Communication ranges in excess of 100 nm at UHF frequencies and 1000 nm with HF Extended Line-of-Sight (ELOS) are possible with SNR-equipped ships. The presence of SNR-equipped airborne platforms further extends these communication ranges.

### Maximum network expandability.

The SubNet Relay system extends operational radio coverage via automatic relay (naval, ground or airborne) without user

intervention. The system dynamically determines optimum relays for up to five radio "hops."

SNR uses an intelligent relay mechanism, which ensures that there is only one active relay possible for each source/destination pair. In addition, to maintain optimum system performance the total number of relays required by the system in any configuration is constantly minimized.

When the end destination cannot be reached using only SubNet Relay, the traffic can be routed through other tactical or strategic networks. This can create seamless bridging of the LOS SubNet Relay back into the global Wide Area Network and literally extend the reach of a battle group's communications around the world.

### SubNet Relay. System throughput versus Latency.

SubNet Relay is a TDMA-based system. As in any TDMA system, there is a trade-off between efficiency, which argues for longer slots to increase the proportion of data relative to overhead, and responsiveness, which favors shorter slots to reduce latency

between transmissions. SNR achieves both efficiency and responsiveness by allowing short slots to be merged together automatically. When a node owns two or more adjacent slots, it has the option of merging the adjacent slots to make a bigger slot with reduced overhead and greater data carrying capacity. This mechanism allows SubNet Relay to adapt to network traffic and to efficiently support both applications with high throughput or low latency requirements.

### SubNet Relay. The highly capable and flexible IP networking solution.

While providing a mobile, yet highly capable wireless network is a key benefit of Rockwell Collins SubNet Relay system, another major feature is that it is a true plug-and-play solution. It works with many HF/VHF/UHF radios and data cryptographic equipment already installed on ships, aircraft and ground vehicles.

To ensure optimum performance and capabilities, the SubNet Relay system features software-defined functionality so upgrades are easily accomplished in the field using a laptop, Ethernet cable and CD-ROM.

To help ensure the system's functionality and flexibility in operational deployments, all of the SubNet Relay's components can be managed remotely, which minimizes the need for local system administrator.

Because the SubNet Relay system is based on a masterless architecture, there is no critical point of failure. Should a node be lost, the system will automatically reconfigure the network and continue its operation.

The system also provides the added advantage of automatically extending its network's coverage area. When two Subnet Relay networks, using the same frequency and cryptographic key, come within communication range of each other, the two networks will merge. Similarly, if a platform or a group of platforms moves out of the communication range of the network they were a part of, it/they will form its/their own SubNet Relay network.



# SubNet Relay. The highly capable and flexible IP networking solution.

## Highly capable. Highly adaptable.

The IP Traffic Manager (IPTM) is Rockwell Collins patent pending TCP Performance Enhancing Proxy (PeP). It has been specifically developed to meet the wireless networking needs of SubNet Relay.

Rockwell Collins IPTM has proven to significantly outperform other TCP PeP-based protocols and, unlike other PePs, can automatically adapt to changing network conditions. IPTM uses a TCP Connection Splitting approach, which splits a TCP connection into multiple segments and delivers TCP traffic to the next proxy or to the destination. Of course, connection management function is completely transparent to the end user. Unlike many deployed TCP PeP implementations, IPTM also ensures data integrity.

IPTM translates into immediate dollar savings by dramatically improving overall TCP throughput over a given link, which eliminates the need to pay for more expensive bandwidth channels.

## SNR in the wideband HF environment.

Another significant advantage of the SubNet Relay system is its ability to transmit accurate, secure data over standard, surface wave HF communications bearers in a naval environment.

SubNet Relay can also take advantage of advancements being made in HF communications. HF bearers with maximum data rates of 64 kbps (12 kHz channel) and 120 kbps (24 kHz channels) using surface wave propagation provide the opportunity for a variety of applications, including:

- > Long-range, ship-to-ship or ship-to-shore, medium data rate communications networking
- > Monitoring of coastal waters through two-way communications with vessels in these areas

BREAKTHROUGH CAPABILITY THAT IS SIMPLE, COST EFFECTIVE AND RELIABLE.

## SubNet Relay components.

SNR system hardware components include the IP Traffic Manager, SubNet Relay and HF/VHF/UHF modems. IPTM can be embedded in the SubNet Relay controller or standalone. To maximize ease of integration with existing radio racks, SNR components (IPTM, SNR, Modem) are available in three form factors:

### Half Rack

- > IPTM Standalone (IPTM-2050)
- > SNR Node Controller (SNC-2050)
- > 96 kbps HF/VHF/UHF Modem (Audio I/F) (HSM-2050)

### Full Rack – VHSM-3000

- > 384 kbps HF/VHF/UHF Modem (70 MHz IF)
- > Tested with USN WSC-3 at 256 kbps

### Full Rack – VHSM-5000

- > 1920 kbps HF/VHF/UHF Modem (70 MHz IF)
- > Tested with Rockwell Collins 721S radio at 1.92 Mbps

### 1.4 ATR-S (in development)

- > IPTM Standalone
- > SNR Node Controller
- > 96 kbps HF/VHF/UHF Modem (Audio I/F)
- > Air qualified

## The best ad hoc IP legacy solution for today and tomorrow.

While providing exceptional wireless data communications networking in a non-satellite dependent environment is critical to the value our SubNet Relay system delivers to today's military leaders, it is equally important that the system be continually upgradeable to meet emerging needs.

To that end Rockwell Collins has determined an in-depth lifecycle upgrade path for the SubNet Relay hardware and software.

No matter how the technology evolves, you can rest assured that the SubNet Relay system you select today will continually evolve to provide tomorrow's naval warfighters the fastest, most capable and most secure wireless ad hoc wireless IP network possible.

