Can You Hear Me Now?

Radio Planning for the Modern Brigade

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Driven by advancements in technology, radio planning has undergone a significant evolution with the recent changes in military strategies and the introduction of new waveforms. Traditional radio planning focused on optimizing coverage and frequency allocation for terrestrial broadcasts; however, the emergence of Integrated Tactical Network (ITN) digital radio and streaming services has introduced new complexities to the process. With the establishment of ITN, a new radio programming and planning platform was introduced. This platform helps signal planners manage the modernized frequency modulation (FM), high frequency (HF), Tactical Scalable Mobile ad hoc network (TSM) and Multiple User Objective System (MUOS) waveforms.

Modern radio planning now encompasses considerations for a wide range of capabilities, including video streaming services, common operational picture (COP) distribution, mesh network design, and network scalability. Despite these advancements, the fundamental principles of effective radio planning remain unchanged. Understanding audience demographics, optimizing signal propagation, and ensuring reliable communication remain paramount.

A Soldier with 1st Battalion 320th Field Artillery Regiment conducts a radio check in preparation for a gun raid during Operation Lethal Eagle 24.1 on 29 April 2024 at Fort Campbell, KY. (Photo by SPC Zachery Blevins)

Commanders now have a plethora of options to communicate with their formations thanks to the introduction of ITN radio systems. These systems bridge the gap between traditional analog voice networks and Internet Protocol (IP) computing networks, significantly increasing the requirement for detailed planning by the unit's communications team.

In this dynamic landscape, effective radio planning is essential for maintaining situational awareness, facilitating command and control, and ensuring seamless communication across the battlefield. By embracing new technologies, while also adhering to established principles, units can optimize their communication capabilities to support mission success in ever-changing operational environments.

Ruggedized Applications Platform - Tactical Radio (RAP-TR)

Radio planning begins with RAP-TR. This system serves as the cornerstone for creating, manipulating, and distributing radio plans across formations. Within the RAP-TR system, the radio planning application Atom takes center stage; it is designed to act as the "one-stop shop" for organizational radio planning.

ITN radios were specifically developed to streamline communication planning and operations across formations, and they represent a significant advancement in simplifying the complexities of communication planning by offering intuitive interfaces and enhanced capabilities to meet the evolving needs of modern military operations.

Together, the RAP-TR system and ITN radios empower units to efficiently plan and execute radio communications, ensuring seamless connectivity and interoperability across formations while enhancing situational awareness and mission effectiveness.

Current Tactic: The process of radio network ownership involves owners creating baseline configurations and seeking feedback from subordinate elements. This feedback is then integrated into the base plan, consolidated, and redistributed. Ownership of radio networks is determined based on the highest echelon requiring access. This approach has demonstrated to be effective and is sustainable moving forward.

Ensuring ownership at the correct echelon minimizes the impact of plan changes on the formation. However, implementing changes to plans can be challenging during active operations. Certain waveform plans necessitate a complete reload of every radio across a formation, rendering execution impossible in such scenarios.

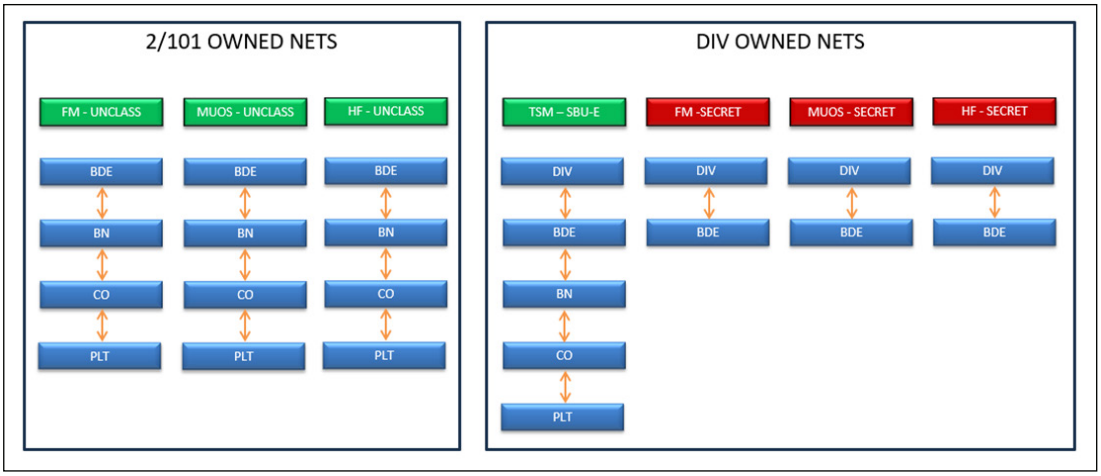


Figure 1 – Example Brigade- and Division-Owned Nets

Implementing plan changes during our active operations would have required a consolidation of the brigade and the establishment of complex mechanisms to maintain communications during the transition. The problem we learned was the mass distribution of the updated plan and the time it would take to physically reload the required equipment. Due to the lack of an established and vetted process, we decided against enforcing a new radio plan. A radio network change management plan would have allowed for network changes and minimized disruptions to critical communications, thereby supporting mission success.

Recommendation: Maintaining the current ownership structure of radio network management while codifying a change management plan is crucial for effective communication. The plan should outline specific criteria and processes for initiating plan changes. Key tasks to prevent changes include:

• ***Early enabler integration:*** Ensure that enablers are integrated early in the planning process to provide input and identify potential challenges or opportunities for improvement.

• ***Bottom-up refinement:*** Encourage bottom-up refinement of plans by soliciting feedback from organic subordinate elements. This allows for input from those directly impacted by the changes and helps to ensure that plans are practical and effective in meeting operational needs.

• ***Thorough Testing:*** Conduct thorough testing of proposed plan changes prior to unit deployment. This includes testing the compatibility of new configurations with existing systems as well as evaluating their performance under simulated operational conditions. Testing helps to identify and address any issues or shortcomings before implementation.

By incorporating these key tasks into the change management plan, units can better anticipate and mitigate potential disruptions to communications caused by plan changes. This approach fosters a more systematic and controlled process for managing changes, ultimately enhancing the reliability and effectiveness of communication systems in support of mission objectives.

FM Planning

With the FM waveform serving as the longstanding backbone of military communications, the integration of ITN radios required minimal special planning. The fundamental infrastructure and procedures for FM communication remained largely unchanged, with the primary enhancement being the ability to prebuild presets for each FM net.

This addition streamlines operations by allowing for the setup of predefined presets tailored to specific FM networks. With these presets in place, users can swiftly access the appropriate FM nets without the need for manual configuration, enhancing efficiency and reducing the potential for errors during communication setup.

Overall, the incorporation of ITN radios into FM communication systems represents a seamless integration that builds upon the existing robust framework of the FM waveform, reinforcing its role as a reliable and enduring component of military communications.

Current Tactic: At each echelon, units determine the FM nets required for their specific operational needs and include only those nets in their published communication plans. Excess nets are stripped out to simplify radio preset management and ensure that users are not overwhelmed by unnecessary presets when accessing their radios.

This streamlined approach ensures that each unit's communication plan is tailored precisely to its requirements, optimizing efficiency and minimizing confusion for radio operators. By focusing on the essential FM nets relevant to their operations, units can effectively manage their radio presets without having to sift through a multitude of unnecessary options.

Ultimately, this practice enhances operational effectiveness by providing clear and concise communication plans that enable users to quickly access the required FM nets without unnecessary clutter or complexity.

Recommendation: Maintain this tactic without adjustment.

HF Planning

The HF waveform has long served as a dependable last resort for organizations requiring beyond line-of-sight communication. Despite its reputation as the least robust waveform in use, its enduring popularity among seasoned communicators, affectionately known as “old timers,” can be attributed to its relative simplicity and ease of use when properly trained.

While other waveforms may offer greater robustness and sophistication, the HF waveform remains a staple in communication arsenals due to its ability to provide connectivity in situations where other methods may fail. However, its underutilization by some organizations is often linked to a lack of training and familiarity rather than inherent deficiencies in the technology itself.

With proper training and expertise, the HF waveform can be effectively deployed as a reliable communication solution, particularly in challenging environments where other options are limited or unavailable. Its continued presence underscores its enduring value as a fallback option for maintaining connectivity in critical situations.

Current Tactic: Units report their HF communication requirements to either the brigade or division level, where a plan is formulated and disseminated. The HF waveform is tailored to a single radio that only operates on the HF waveform; no additional complexity is needed. This radio is equipped to establish both voice and data connections through point-to-point calls or network broadcasts, ensuring streamlined and efficient communication within the designated network. The simplicity of this approach minimizes logistical overhead and maximizes operational effectiveness in fulfilling HF communication needs.

Recommendation: Maintain current planning tactic and provide additional training to users as this waveform is robust and underutilized.

TSM Planning

The TSM network represents a revolutionary solution to a constant challenge in communications: terrain. By leveraging a barrage relay mesh network, the TSM network effectively overcomes terrain obstacles that have historically impeded communication. In this network architecture, each radio functions as a repeater for all other radios within the network, creating a resilient communication infrastructure that circumvents terrain barriers.

Strategic placement of radios is key to the success of the TSM network. Radios are positioned on hilltops, at corners inside bunkers, and at the peripheries of radio transmission bubbles to maximize coverage and fill in communication blackout areas. This proactive approach ensures that commanders have access to reliable voice and data communication even in rugged terrain where traditional communication methods would falter.

By defeating terrain limitations, the TSM network empowers commanders with enhanced situational awareness and operational effectiveness, enabling seamless communication across the battlefield and facilitating decisive action in challenging environments.

Current Tactic: To create a flexible and adaptable radio plan that can be easily updated on the fly, we employed a system that relied on colors for preset identification and numbers for talk groups. By avoiding permanent assignments of unit names or organizations to specific presets or talk groups, radio planners are quickly able to adjust and distribute new plans by updating the radio plan spreadsheet and issuing the updates via an operation order (OPORD).

The general framework for the plan:

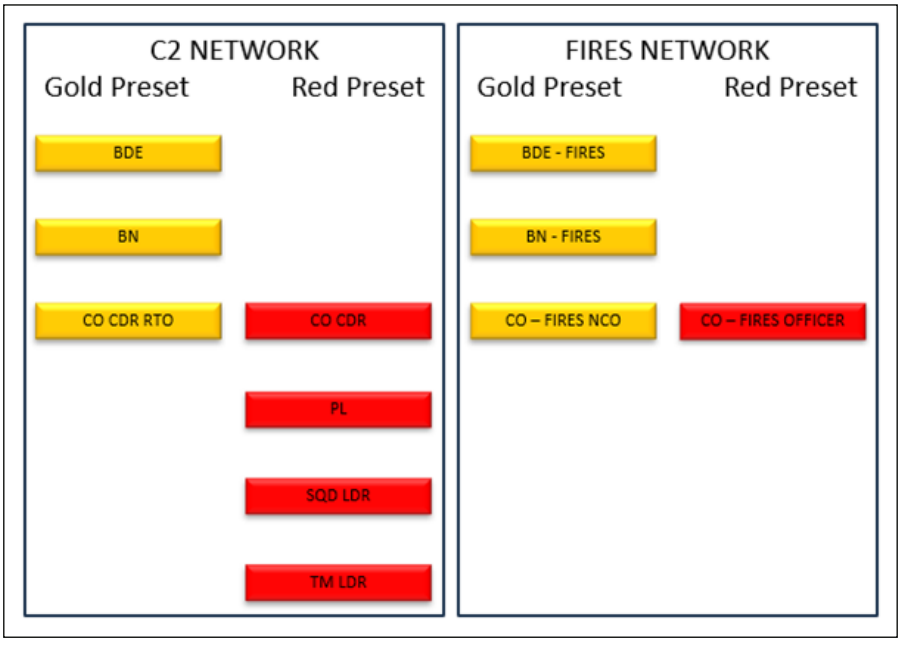
Preset Organization:

- Presets are identified by colors (e.g., blue, red, green).
- Brigade and battalion nets are nested on the same preset for streamlined communication within the chain of command.
- Company and platoon networks are nested by battalion in additional presets to facilitate communication within subordinate units.

Talk Groups Assignment:

- Talk groups are assigned numbers for easy reference and organization.
- Each unit within the brigade or battalion is allocated specific talk groups for internal communication.
- Talk groups for command and control, fires coordination, logistics, and other functional areas are predefined for quick access.

Figure 2 — Example C2 and Fires Network Presets



Talk Group	GOLD PRESET	Talk Group	RED PRESET	Talk Group	YELLOW PRESET	Talk Group	BLUE PRESET	Talk Group	WHITE
1	BDE CMD	1	O&I/1-502	1	O&I/2-502			1	O&I/1-26
2	BDE O&I	2	A&L/1-502	2	A&L/2-502			2	A&L/1-26
3	BDE A&L	3	HHC/1-502	3	HHC/2-502			3	HHC/1-26
4	BDE FIRES	4	MEDICS/1-502	4	MEDICS/2-502			4	MEDICS/1-26
5	PZ CONTROL	5	A-CMD/1-502	5	A-CMD/2-502			5	A-CMD/1-26
6	HEAVY PZ	6	1PL/A/1-502	6	1PL/A/2-502			6	1PL/A/1-26
7	LIGHT PZ	7	2PL/A/1-502	7	2PL/A/2-502			7	2PL/A/1-26
8	SHHC	8	3PL/A/1-502	8	3PL/A/2-502			8	3PL/A/1-26
9	BN CMD/1-502	9	FIRES/A/1-502	9	FIRES/A/2-502			9	FIRES/A/1-26
10	FIRES/1-502	10	B-CMD/1-502	10	B-CMD/2-502			10	B-CMD/1-26
11	BN CMD/2-502	11	1PL/B/1-502	11	1PL/B/2-502			11	1PL/B/1-26
12	FIRES/2-502	12	2PL/B/1-502	12	2PL/B/2-502			12	2PL/B/1-26
13	BN CMD/1-26	13	3PL/B/1-502	13	3PL/B/2-502			13	3PL/B/1-26
14	FIRES/1-26	14	FIRES/B/1-502	14	FIRES/B/2-502			14	FIRES/B/1-26
15	BN CMD/1-320	15	C-CMD/1-502	15	C-CMD/2-502		NOT IN USE	15	C-CMD/1-26
16	FIRES/1-320	16	1PL/C/1-502	16	1PL/C/2-502			16	1PL/C/1-26
17	HHB/1-320	17	2PL/C/1-502	17	2PL/C/2-502			17	2PL/C/1-26
18	A/1-320	18	3PL/C/1-502	18	3PL/C/2-502			18	3PL/C/1-26
19	B/1-320	19	FIRES/C/1-502	19	FIRES/C/2-502			19	FIRES/C/1-26
20	C/1-320	20	MPC-CMD/1-502	20	MPC-CMD/2-502			20	MPC-CMD/1-26
21	MFRC-CMD	21	1PL/MPC/1-502	21	1PL/MPC/2-502			21	1PL/MPC/1-26
22	HKP1/MFRC	22	2PL/MPC/1-502	22	2PL/MPC/2-502			22	2PL/MPC/1-26
23	HKP2/MFRC	23	3PL/MPC/1-502	23	3PL/MPC/2-502			23	3PL/MPC/1-26
24	JKP3/MFRC	24	4PL/MPC/1-502	24	4PL/MPC/2-502			24	4PL/MPC/1-26
25	TUAS-EW/MFRC	25	FIRES/MPC/1-502	25	FIRES/MPC/2-502			25	FIRES/MPC/1-26
26	FIRES/MFRC	26	G-CMD/1-502	26	H-CMD/2-502			26	J-CMD/1-26
27	BN CMD/526	27	Maint PLT	27	Maint PLT			27	Maint PLT
28	BN CMD/39	28	Distro PLT	28	Distro PLT			28	Distro PLT
29	PZ NORTH	29	NOT ASSIGNED	29	NOT ASSIGNED			29	NOT ASSIGNED
30	PZ NORTH	30	NOT ASSIGNED	30	NOT ASSIGNED			30	NOT ASSIGNED
31	PZ SOUTH	31	NOT ASSIGNED	31	NOT ASSIGNED			31	NOT ASSIGNED
32	PZ SOUTH	32	NOT ASSIGNED	32	NOT ASSIGNED			32	NOT ASSIGNED

Figure 3 – Example Brigade Talk Group Assignments

Dynamic Updates:

• A centralized spreadsheet serves as the master document for the radio plan, allowing for easy modification of preset and talk group assignments.

• Changes to the plan can be made swiftly and efficiently by updating the spreadsheet.

• An OPORD is issued to communicate the updated plan to all relevant personnel, ensuring widespread dissemination.

Position Location Information (PLI) Propagation:

• PLI dissemination is integrated into the plan to ensure situational awareness across the battlefield.

• Nested nets facilitate the propagation of PLI data within and between units, even in areas without PLI gateways such as Tactical Radio Integration Kits (TRIK) or Mounted Mission Command – Software (MMC-S).

By implementing this approach, the 2nd Mobile Brigade Combat Team (MBCT), 101st Airborne Division (Air Assault) can maintain flexibility and adaptability in radio communications. This enables seamless updates and adjustments to the plan while ensuring widespread connectivity and situational awareness across the battlefield. This flexibility allows for swift responses to changing operational requirements and ensures that communication remains robust and effective in dynamic environments.

Recommendation: Leverage TSM's flexibility during operations. The approach proved highly effective for 2/101 MBCT, allowing for real-time adjustments to the plan with minimal disruption to subordinate units. When it became apparent that one preset was causing interference with aircraft, 2/101 swiftly executed a full preset move for 1st Battalion, 26th Infantry Regiment, demonstrating flexibility and adaptability in response to operational challenges.

Maintain spare nets at the brigade echelon. Maintaining spare nets enabled 2/101 MBCT to promptly address the needs of units requiring additional resources. Throughout various phases of the operation, requests for extra nets were met with swift allocation and distribution. Updating the communication card with the latest OPORD ensured widespread dissemination of information, facilitating seamless coordination among units.

Multiple User Objective System (MUOS) Planning

The MUOS is ushering in a new era by replacing the outdated Integrated Waveform (IW) and Demand Assigned Multiple Access (DAMA) tactical satellite (TACSAT) networks. MUOS offers a robust beyond line-of-sight network solution that brigades can rely on, supporting both voice and data transmission. It's particularly adept at facilitating command and control operations as well as voice and digital fires.

In MUOS planning, radios can be connected in three primary ways:

• Point-to-Point: Direct calls between radios using their Mobile Subscriber Integrated Services Digital Network Number (MSISDN) or phone numbers;

• Point-to-Group: Group conference calls; or

• Point-to-Net: Connecting radios to an IP network for data sharing.

MUOS comes in two classifications: secret and unclassified.

Secret Waveform: This version offers reliability and scalability, dynamically discovering IP addresses and accommodating a network of 250-plus radios. With this capability, adding a single radio to a plan enables seamless communication without the need to reload every radio.

Unclassified Waveform: While also reliable, this version lacks scalability due to its inability to support dynamic IP discovery, limiting it to 100 radio profiles. Unclassified networks primarily support voice communication, with voice groups and communications security (COMSEC) configurations mirrored across networks.

Both classifications support Secure Communications Interoperability Protocol (SCIP) voice calls. SCIP calls enable users to conduct telephone conversations through the radio via a dedicated voice bridge, proving invaluable for

commanders requiring remote participation in conference calls while deployed on the battlefield.

Current Tactic: 2/101 MBCT has spearheaded the adoption of the unclassified version of MUOS within the division. However, due to the network's limitation of 100 profiles, there were significant constraints on profile distribution across the formation. To overcome this limitation, the unit opted to divide its networks into two distinct entities: command and control (C2) and fires. These networks operated autonomously and were unable to communicate with each other. The C2 networks were dedicated to command-and-control systems, whereas the fires network was designated for voice and data fires systems. Each radio was equipped with a FireFly Vector set for point-to-point calls, pre-placed keys for point-to-group calls, and two profile keys issued to the COMSEC office for each requested profile. Additionally, a limited number of SCIP call keys were provided to facilitate secret meetings at the division level.

Recommendation: Based on the insight that two unclassified MUOS networks can communicate with each other via point-to-group calls, we propose a refinement in network structure. It is recommended to divide networks into voice-only and data-only networks. For voice networks, it's essential to ensure that all have identical group and group COMSEC configurations. This approach allows for the creation of multiple voice networks as needed to encompass all profiles across any given formation. By organizing networks in this manner, communication efficiency can be optimized while maintaining consistency and interoperability across the system.

Conclusion

Radio planning has evolved into a meticulous process that demands collaboration from every organization within a unit to ensure wide-ranging network coverage. Commanders must convene planning sessions with their teams at all echelons to refine their network architecture. The introduction of ITN grants commanders the flexibility to tailor their communication infrastructure according to their specific requirements. Drawing from both successes and setbacks, 2/101 MBCT has accumulated invaluable insights and anticipates ongoing learning opportunities. While positioned at the forefront of innovation, the unit remains committed to continuous refinement through planning, testing, execution, assessment, and iteration.

MSG John Tibbitts currently serves as the S-6 NCOIC for the 2nd Mobile Brigade Combat Team, 101st Airborne Division (Air Assault) at Fort Campbell, KY.

A Soldier assigned to the 101st Airborne Division (Air Assault) waits on standby to make movement while helicopters depart at the Oxford University Airport in Mississippi during forward arming and refueling point operations on 14 August 2024. (Photo by SSG Raymond Valdez)