WIN-T - The Army's New Tactical Intranet

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1.0 ABSTRACT

This paper describes the Warfighter Information Network - Tactical (WIN-T), the Army's objective replacement for the legacy Tri-Service Tactical Communications (TRI-TAC) system and the Mobile Subscriber Equipment (MSE). These systems, known collectively as the Area Common User System (ACUS) are now nearing the end of their planned life cycle. Their replacement, WIN-T, will provide an advanced seamless multimedia transport system that will connect and serve all Army echelons. It will be a mobile high capacity secure and survivable network. This paper describes the existing systems and the way in which WIN-T will provide an operational replacement. The paper also addresses the Cost As an Independent Variable (CAIV) acquisition method that will be used by the Army to acquire the new system.

2.0 THE CURRENT SYSTEM

The Army's current legacy tactical Area Common User System (ACUS) is composed of the Tri-Service Tactical Communication (TRI-TAC) system and the Mobile Subscriber Equipment (MSE). The two systems were designed to perform different missions. MSE was designed to serve lower battlefield echelons - Echelons Corps and Below (ECB), and TRI-TAC was designed to serve upper echelons - Echelons Above Corps (EAC). On the battlefield, MSE supports warfighters in Corps and Division and provides connectivity among warfighters and between warfighters and their commanders in Command Posts (CPs) and at the Tactical Operations Centers (TOCs). TRI-TAC, on the other hand, provides a theater-wide communications backbone network that supports information transfer between tactical networks and between tactical and strategic Army and Joint echelons.

MSE began its life cycle circa 1985, and TRI-TAC began its life cycle a decade earlier. Both systems are now nearing the end of their planned useful lives. Logistic support for them is becoming problematic, a situation that is expected to become even worse as time goes on. More importantly, however, these systems, which are based on circuit switching technology, can not satisfy the current and especially future communications requirements of the warfighter. TRI-TAC and MSE were originally designed to accommodate voice communications. They are not expected to be able to satisfy the anticipated future demands for voice, data and video, that is multimedia communications, on the battlefield. In the recent past, as demand for communications resources began to shift from voice to data, the Army initiated several efforts to upgrade its legacy networks. One major effort involved the addition and integration of packet switches as an "overlay" on the existing circuit switched MSE and TRI-TAC architectures. This approach created a wide area packet network known as the Tactical Packet Network (TPN). The TPN is now operational and constituting the Wide Area Network (WAN) between MSE nodes and between MSE and EAC nodes. Though limited in bandwidth to 16Kbps between switches and 64Kbps between node centers, the WAN does provide needed data transport capabilities to the warfighter. The TPN can also be accessed by users on the Army's Tactical Internet (TI). This network is the lowest level, "Brigade and Below", warfighter network. It is composed of rugged Applique computers in mounted and dismounted configurations that are interconnected via Single Channel Ground and Airborne Radio System (SINCGARS) Combat Net Radios (CNRs). Enhanced Position Location Reporting System (EPLRS) radios are used by the TI to provide data transport to the next higher network level.

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3.0 THE NEXT GENERATION VISION

The Army's continuously expanding Command, Control, Communication and Computers (C4) requirements have produced a growing demand for additional network services. Major examples include the need for wired and wireless multimedia services and the need to provide Command and Control (C2) on the move (C2OTM) capability. The expanding networks also created a parallel need for comprehensive network management as well as total network security, referred to as Information Assurance (IA).

These requirements, coupled with the current and projected limitations of the legacy ACUS prompted the Army to investigate potential solutions and determine future direction. These investigations, performed within the framework of overall strategies described in the Army Digitization Master Plan, the Army Enterprise Strategy, and the Army 1998 Modernization Plan, led to the development of the Warfighter Information Network (WIN) concept. This concept is centered on the creation of a new, standards-based, advanced network that will incorporate emerging technologies and could be adapted to new technologies as they are established. Operationally, WIN would support the Army's requirement to function as part of a Joint Task Force (JTF) and would also support operations of an Army headquarters functioning as a Joint Force Land Component Commander or as an Army Forces Commander under either a JTF or Unified Commander.

The original WIN concept consists of seven component elements: Power Projection/ Sustaining Base, Satellite Transport, Terrestrial Transport, Tactical Internet/Combat Net Radio, Information Services, Information Systems, and Network Management. These elements are interdependent and create a seamless information infrastructure that supports the power projection force from the sustaining base to the foxhole.

WIN-T combines several of these elements. It has been widely referred to as "the Army's tactical Intranet". As such, its basic function is to interconnect various Army and non-Army networks together forming a large internet. WIN-T in effect provides the warfighter with an entirely new common user system. This system serves all echelons and provides more capability than the two legacy systems combined, as presented conceptually in Figure 1 below.

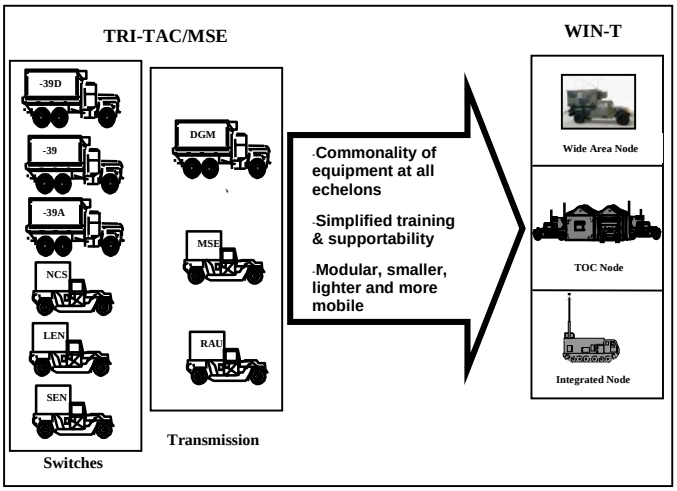

Figure 1. Evolution to Objective WIN-T.

WIN-T will satisfy the Army's growing demand for communications bandwidth. In today's Army, a non-digitized division employs about 1300 computers. Based on requirements documented in the Army Modernization Plan and the Army's Enterprise Strategy and results from various Force XXI Advanced Warfighting Experiments (AWEs), a future fully digitized Force XXI division will employ over 5000 computers. This will increase considerably the demands for communications bandwidth and demand will continue to grow as additional requirements emerge. The new network will, therefore, must be highly flexible in order to allow future growth in capacity without requiring a major system overhaul.

A central tenet of the WIN concept and of WIN-T is that it be based on commercial technologies and support commercial standards. This would facilitate employing the latest available

communications technologies and the future incorporation of advanced technologies as they are developed. The Army will, in effect, not be locked into a fixed approach in a world that is continuously moving forward. Also, the economic advantages of using commercial technologies that enjoy cost benefits associated with large production bases are clear. In order to achieve this, it was determined that WIN-T will employ Commercial Off The Shelf (COTS) technologies that are Joint Technical Architecture (JTA) compliant. JTA is a comprehensive collection of information technology standards that have been agreed to at the Office of the Secretary of Defense (OSD) for building future networks. Standards included in the JTA are mainly commercial standards that reflect the state-of-the-art in communication technology. The WIN-T system will also use an open architecture approach that will allow easy incorporation of future technologies as they become standardized and part of JTA.

Together with embedded or associated information services, WIN-T will become the backbone of the WIN architecture. It will facilitate seamless flow of information and interoperability among JTA-compliant sustaining base systems that produce, use, or exchange information electronically. The system will provide simultaneous voice, data, and video communication services at all levels of security and will take advantage of state-of-the-art technologies in information transport. All WIN-T components will be modular in design to allow the flexibility to insert technological improvements, as they become available.

4.0 THE FIRST STAGE - FDD

The Army's progress towards a fully digitized Army-wide communications infrastructure will occur in several stages with WIN-T or, more precisely, the Objective WIN-T, as the final stage. This stage will be preceded by the establishment of the First Digitized Division (FDD) and the First Digitized Corps (FDC). As the names imply, FDD is an effort to digitize an entire Army division and FDC is an effort to digitize an entire Army Corps. The Objective WIN-T, on the other hand, is an effort to digitize the entire Army. FDD is scheduled to be fielded in the year 2000 and FDC is scheduled for fielding in the year 2004. The Objective WIN-T will begin fielding in the year 2004.

Whereas the Objective WIN-T involves the creation of a brand new network, FDD and FDC involve upgrading legacy ACUS equipment in order to provide dynamic bandwidth allocation and expanded transmission bandwidth. Basically, the upgrade of legacy ACUS, or more precisely MSE, equipment calls for the incorporation of broadband transport technology based on Asynchronous Transfer Mode (ATM) into existing MSE circuit switch assemblages. As in the case of the TPN, the ATM-based network is also an "overlay" on the existing circuit switched network that super-imposes an ATM-based WAN on the existing structure. As a first step in this effort, equipment was developed that adapts current MSE hardware to ATM technology. The concept was later validated in a series of field exercises as part of the Division Slice program. Additionally, in order to provide the broadband communications "pipes" needed to support an ATM backbone, the Army is procuring a new High Capacity LOS (HCLOS) radio that provides transmission bandwidth of up to 8Mbps. Together, these upgrades will allow the Army to go ahead and establish the FDD as planned.

5.0 THE OBJECTIVE WIN-T

The Objective WIN-T will be the next generation Army tactical transport system. It will satisfy a set of operational requirements documented in an Operational Requirements Document (ORD) generated by the Army's Training and Doctrine Command (TRADOC). These requirements have been organized in two fielding phases. The first phase includes so-called Threshold requirements that are deemed essential to the performance of the network. Within this set of requirements there is a small subset of Key Performance Parameters (KPPs) which are considered critical to the system's

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performance. Any system approach to the WIN-T must satisfy these KPPs in order to be considered viable. The second phase includes so-called Objective requirements that are technical enhancements to the first set. They are focused primarily on improving the mobility and security characteristics of the network and depend on advancements in the state-of-the-art before they could be fully realized.

From an architecture point of view, WIN-T, like its predecessor systems is a node-centric system. Its major infrastructure components are the Wide Area Network Node (WN) which is similar in function to the MSE's Node Center Switch (NCS), and the Subscriber Node (SN) which is similar in function to the MSE's Large Extension Node (LEN) and Small Extension Node (SEN). The nodes are interconnected via broadband LOS radios or satellite or troposcatter radio terminals to form the network. The interconnected WNs form the WAN backbone while the SNs provide subscriber access to the network. WIN-T also includes a Remote Access Subscriber Interface (RASI) that will augment both WNs and SNs and provide network access to groups of remote subscribers. The WNs and SNs will provide tandem switching support for voice, data, and video traffic at CPs and TOCs. They will utilize state-of-the-art commercial technologies for switching, routing and transmission function and will provide dynamic bandwidth allocation and support network management.

The implementation of dynamic bandwidth allocation for voice, data and video based on a priority system is one of the WIN-T KPPs. Unlike commercial communications systems where backbones are implanted mainly with fiber-optic cables, tactical backbones are based on radio transmission. This medium is much more limited in capacity and is subject to noise levels that impact performance. Therefore, efficient utilization of network bandwidth in the tactical environment is critical to any system. Dynamic bandwidth allocation allows efficient utilization of bandwidth by giving each transmission the precise amount of bandwidth it needs. It also provides the capability to mix together on a single transmission path different types of information with different characteristics, such as voice, data, and video.

C2OTM is another important Objective WIN-T KPP. It dictates that the network will provide mobile users with the capability to communicate in voice or data (with video being an objective) throughout the theater area of operation. WIN-T will include transmission capabilities with sufficient throughput to support internodal and intra-nodal connections. Internodal connectivity could be achieved by using high capacity LOS radios that will be included within each node. With the planned development and fielding of the digital wide-band radio, and later the Joint Tactical Radio System (JTRS), WIN-T will be capable of supporting full multimedia C2 within and between TOCS and between mobile users throughout the battlespace. To support intra-nodal connectivity, fiberoptic cables and wireless systems will be used. For interconnectivity between nodes that are Beyond Line-Of-Sight (BLOS), WIN-T will be capable of interfacing with the legacy Troposcatter (TROPO) radio system. It will also be capable of interfacing with satellite terminals such as the legacy Ground Mobile Forces (GMF) terminals, the Secure Mobile Anti-jam Reliable Tactical Terminal (SMART-T) and the SHF Tri-band Advanced Range Extension Terminal (STAR-T). Since WIN-T will utilize a mix of space and terrestrial transmission systems. It is planned that the development and fielding of the satellite transport systems will be integrated with the Objective WIN-T program. The functionality of the current MSE Radio Access Unit (RAU) and the Mobile Subscriber Radio-telephone Terminal (MSRT) will be incorporated into the wide-area wireless coverage that will be provided by the new network.

WIN-T will provide secure and non-secure, wired and wireless user devices. Two types of Secure (NSA Type 1 approved) wireless handsets will be supplied. The first will provide service in the vicinity of the TOC area and the second will

provide service within a larger area known as the Corps Area of Responsibility (AOR). Both types will provide voice and data service. The second type will also provide video service as an objective goal. Service to secure and non-secure wired voice telephones will also be provided. WIN-T will also provide services to users equipped with JTA-compliant devices such as secure and non-secure video teleconference (VTC) and white-boarding sessions.

A critical element of Objective WIN-T is the WIN-T Network Management System (WIN-T NMS). This element is crucial to the performance, reliability, security and structure of the network. Like other elements of WIN-T, the WIN-T NMS will also use commercial standards-based network and systems management protocols and interfaces. It will leverage on the network modules that were previously developed as part of the ISYSCON system That includes management tools for the legacy MSE. ISYSCON will continue to manage legacy equipment currently in the field. The new WIN-T NMS will interface with ISYSCON and will eventually replace it as the overall tactical network management system. Since the WIN-T NMS will manage WIN-T and its elements, both systems will be developed with compatible software to ensure the seamless interchange of information and reports.

6.0 THE OBJECTIVE WIN-T ACQUISITION

The design, implementation and logistic support of the Objective WIN-T present formidable challenges. Bringing the WIN network to fruition will involve the integration of a vast array of systems and technologies. The fact that this network has to be flexible to accommodate future technologies that may not even exist today just adds an order of magnitude to the complexity of the program. And, of course, one has to always keep in mind the fact that affordability and life cycle costs are key factor in this or any other system development or fielding program. In order to effectively address these issues on a departmental level, the DoD has established what is known as the Cost As an Independent Variable (CAIV) acquisition method. In this approach, program cost constraints are treated on par with technical requirements and are all subject to the same intensive tradeoff process. To achieve this, the CAIV method calls for technical requirements to be prioritized according to how critical they are to a system's performance. When that is done, cost, which is now an independent variable, that is, it can be fixed at a certain level, is used as "limbo stick" to gage how many requirements can be satisfied for the given cost. The Integrated Product Teams (IPTs) responsible for these efforts continuously investigate tradeoff opportunities in order to see if any more requirements can be satisfied for a given set of budgetary constraints.

The WIN-T program, which is an Acquisition Category 1 (ACAT 1) program due to its size, is being executed using the CAIV approach. As a first step the technical requirements are being prioritized in order of their importance to WIN-T performance. As the CAIV process continues decisions will be made by various IPTs regarding priorities of these performance requirements and the optimum life cycle approach to be used given the program cost constraints.

The currently published milestones for the WIN-T program call for release of the solicitation in April 2000 and contract award in April 2001. For the delivered system, limited user tests are scheduled for Fiscal Year 2003 and First Unit Equipped (FUE) by Fiscal Year 2004.