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C2 at the Edge of Chaos: The Real Transformation to Enable Network Warfare

Topics

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Abstract

The United States Army, along with the Department of Defense, has been undergoing a transformation that initially focused on technologies and structures instead of personnel and training policies. Network-centric theories focus on technology, structure, doctrine or social interaction depending on one's view of warfare. American theorists tend to emphasize technology and the network itself and the Depart of Defense adopted the term Network-Centric Operations. The British adopted the term Network Enabled Capabilities and emphasize the network as a tool. The US Army recently adopted the term Network-Enabled Battle Command and the same tool emphasis. Clausewitz differentiated between theoretical and real war and this paper attempts to do the same with network warfare. The possible is operations executed by balanced hierarchical and network organizations where commanders grow units that operate at the edge of chaos. What enables networks? As the Germans learned during the inter-war years and Special Operations Forces have emphasized, trust and a common view attained through years of shared experiences is the key to networked organizations. If the Army, like any organization, is to execute networked operations then it must implement personnel and training policies that grow the commanders and soldiers that operate at the edge of chaos.

Introduction

Around 1600 hours on 31 December 2003 about a dozen rockets landed in a forward operating base in Northern Iraq. The commander of the battalion responsible for securing the area around that base moved to his command post as two companies were moving to investigate the action and attempt to interdict those who launched the rockets. The battalion commander stayed at the command post from 1600 to about 0200. During that time all five companies in the battalion were involved in cordon and searches, interdicting people and vehicles in the night, attempts to run checkpoints, aircraft being shot at, and even a drunk driver hitting a roadblock and a dog biting a soldier. All five companies were engaged along with a couple of Apache and Kiowa helicopter teams. Throughout the night, sections, squads and platoons were passed between company commanders and platoon leaders with little regard for boundaries. Command rested with who had best situational awareness and ability to control. The battalion commander did not talk much on the radio other than passing off helicopters and coordinating boundaries to deconflict two or more teams of aircraft. That battalion commander did not read about swarming until over two years later, but a theorist would recognize what that battalion did that night as just that. A few weeks later the same battalion was given control of an unmanned aerial vehicle for a night. An improved explosive device went off in the battalion's area that night and one of the companies sent a patrol out to investigate. While the battalion commander had the ability to observe the patrol's actions from the brigade headquarters, the company commander could communicate with the patrol but not see it. After almost two hours of communications between the two leaders, where one could sense frustration build, the company commander finally told his battalion commander, with rather colorful language over the radio, that the battalion commander was welcome to come personally command his company. The battalion commander quickly recognized he had forgotten his role and fallen into the trap that network theorists abhor – the ascendancy of control.

In a matter of a couple weeks that commander experienced both the benefit and pitfall of network warfare. Network warfare is no longer the future or transformational – it is here and "an accepted and enduring part of current and future combat." (26: 4) The United States military already practices network warfare. The transformation process initially focused on the theories of the network and technologies and not on the human aspects of network warfare. This paper focuses on the human aspects of network warfare. The first section is a discussion of the evolution of network theories towards complex adaptive systems. Real war is different than war on paper (38: 138) in that real war is among people and subject to frictions that will continue with network warfare. The second section of this paper is a discussion of the primacy and centricity of people, leaders and friction. Next comes the question of what traits are most important in a network force working in a complex and chaotic environment? Trust and shared experiences stand out, and fortunately this is not a new concept for the United States (US) Army. "Developing these networks requires major changes in the way we train, promote and employ our people," (22: 225) and this true transformation is how the US Army will enable networked warfare. Some of these changes have begun to be put in place but more radical changes are needed. Fortunately again, much of this is not new but it is change. Finally, not all questions can be answered in this paper and the final concluding section leaves questions for others on doctrine and organizations.

From Networks to Complex Adaptive Systems

The revolution in military affairs tied to network warfare was launched by the late Vice Admiral (VAdm) Arthur Cebrowski in the January 1998 *Proceedings* Magazine where the emphasis on the revolution was a change in focus from platforms to the network and the promise of speed of command and the ability to self-synchronize. (11: NP) The tenets of this network warfare called for robustly networked forces to improve information sharing that, in turn, would enhance quality of information and shared situational awareness, thus enabling collaboration and self-synchronization and enhancing sustainability and speed of command; leading to increased mission effectiveness. (35: 7)

The "first generation" theories tended to focus on machine to machine and simple and linear or complicated and linear relationships. These can be described as using technology to speed up sensor-shooter links. The theories in the US tended to focus on technology and the network itself as demonstrated by the term used to define this warfare as Network-Centric. The British, on the other hand, being less endeared to technological answers to military problems and possessing a much smaller budget than their US counterparts, termed their process Network Enabled Capability (NEC). The British NEC shares the same tenets as Network-Centric Warfare (NCW) but "does not seek to place the network at the centre of capability in the same doctrinal way as NCW . . . NEC only has value when set in an operational context . . . it enables the work of others." (34: NP).

The US Army, having a people-centric view of warfare, could easily embrace the British view. The US Army can easily understand Col John Boyd's famous statement that, "Machines don't fight wars, people do and they use their minds." (23: 122) It is not surprising that General William Wallace, Commander of the US Army Training and Doctrine Command, first publicly

stated the US Army's adoption of a term that clearly stated how the institution should view network warfare in a British military journal. He stated this as Network-Enabled Battle Command that he first put forth in an article in RUSI. In that article GEN Wallace, then the Commanding General of Combined Arms Command stated, "A more accurate way to conceptualise initiatives associated with NCO is as commander-centric operations enabled by the network." (39: 2) At the same time, there came the advent of what Edward Smith calls the second generation theories.

This second generation of theories puts humans back in the loop. (31: 312-315) It is a recognition that because warfare remains chaotic, we can never achieve a "perfect view of the battlefield." (22: 285) The current lead in this evolution of the theories is found in Alberts' and Hayes' *Power to the Edge.* The advent of edge organizations is a realization of the complexity of war and an attempt to define organizational concepts on dealing with that complexity while taking advantage of the potentials of networking. (3: NP)

War is a conflict between people and people interact in complex and non-linear ways; further adding to the complexity. (31: 33). War has, is, and will always be the realm of complexity and chaos. Before going further, there is a need to discuss complexity and chaos. It is important to understand that in complex and non-linear systems the whole is not equal to the sum of the parts, the outputs are not always proportionate to inputs, and chains of causes and effects are not predictable. (31: 40). Complexity allows for an organization that is integrated with some degree of order but has too many elements and relationships to understand in simple analytic or logical ways." (5: 290). Chaos, on the other hand, is the, "condition of a system exhibiting disorganized behavior with little or no predictability." (5: 290) Chaos brings fear but it is a constant part of today's environment for leaders. (13: 1) Chaos is contained through control but too much control stifles organizations. The key is understanding that "too much structure creates gridlock while too little creates chaos" . . . and that to achieve success, "is to stay poised on this edge of chaos." (10: 14) Complex environments require complex systems and these systems must have greater variety and unpredictability than their environment in order to succeed. (31: 41) As detailed in Ashby's law, too much variety leads to chaos and too little means an inability to respond to complexity (5: 303). Complex adaptive systems are required in complex and chaotic environment. These organizations have the requisite level of variety and unpredictability. "When two complex adaptive systems are interacting, the one with the greatest variety will dominate. However, too much variety may lead to chaos." (5: 297)

Daryl Conner proposes that order and chaos cannot be seen as mutually exclusive but as two extremes of an "interdependent continuum that can be traversed as often as necessary to harvest the important lessons from each end" as the only way to achieve an integration of the two. (13: 243) He goes on to define this continuum as three areas. The noncompetitive area of the environment avoids instability but is dangerous in that organizations that opt for this comfortable less stressful area find it difficult to stay viable. The other end of the spectrum is chaos where significant disruptions pile up beyond an organization's adaptive abilities. The middle ground is where organizations and people begin to show dysfunctional behavior. They key is to stay in this middle area that is filled with danger but provides the "greatest hope for survival and prosperity." (13: 15) He further lays out this continuum by listing six degrees of change that include complacency, continuous improvement, intermediate movement, dramatic

movement, paradigm shifts, and chaos. (13: 79) They key is to find the area just before chaos or within the area of change defined as paradigm shift. This is the edge of chaos. It is that area where organizations begin to display dysfunction. It is a dangerous area where there is the greatest potential for agility or crossing the threshold into chaos and resulting untenable dysfunction. This is where leadership can most leverage the advantages of agility or "nimbleness." (13: 82) Staying on the edge of chaos requires that leaders keep their organizations in "a never-ending contained slide, always pushing the limits of the adaptation envelope without losing control and falling into full chaos." (13: 86) Note that theorists see the continued need for leaders and some form of control. Keeping an organization on the edge requires "organizing to change constantly and letting a semi-coherent strategic direction" (10: 7) that emanates from within that organization.

Part of the uniqueness of edge organizations is unpredictability, uncontrolled, inefficient, proactive, continuous, and diversity. (10: 7-8) Complex adaptive systems, being edge organizations cannot be efficient and survive in a complex and dynamic environment. They require some level of inefficiency to learn, change, and adapt. Complex adaptive systems also require effective structures to survive. (7: Slide 8) The key is a balance of decisive decision making while exploiting the talents and variety of the people within the organization – a balance of delegation and empowerment. (13: 225-226) Conner proposes that such an organization, to operate at the edge of chaos, has the structural flexibility that provides employees closest to the problems to act on and apply creative ideas while management still has the ability to correct if the system strays too far outside predictable limits. (13: 246) Thus theorists that propose organizations that thrive on the edge in order to maintain competitiveness do not advocate an end to hierarchical structures. "Chains of command, responsibility, and accountability are needed in all organizations; they just play a different role in complex adaptive systems." (5: 302)

There are no pure networks or hierarchical organizations in the real world. (33: 2) A hierarchy in complex adaptive systems provides administrative oversight, communication and direction along with resources without dictating tactical decisions. (5: 302). "Even as top commanders delegate their traditional authority, they are indispensable in managing and mediating interdependencies and in allocating scarce resources." (18: 29)

Organizations that operate on the edge require leadership that is without boundaries but sets direction and balances coherence and agility. (6: Slide 18) The great fear of network theorists is an inability to achieve this balance. The balance is leadership that exercises command by giving implicit direction and not too much control so as not to stifle agility but ensuring the organization does not step off the edge of chaos. "A controlling intelligence is deemed to be necessary in order to guide the system towards a particular goal." (25: 54) But how to overcome this with terms like command and control? Control connotes putting the brakes on variety. Col John Boyd offers changing the terms to "appreciation and leadership" (23: 167) as a better way to define what is really required to command on the edge. In this way leader and led understand the relationship is one where the leader provides guidance and direction and instead of control, the leader is gaining more knowledge in order to conduct his own continuous decision loop.

Leadership is required because warfare is a human endeavor and though the networks that permit people to talk are important, "it is the human requirements that will dictate the form that any network takes." (31: 264) The initial theories of network warfare dealt with technologies and the machine to machine and man to machine loops. The more current theories focus on social networks and the acknowledged complexity and chaos inherent in the current environment. The "underlying theory of complexity and networks is not mathematics, science, and technology, but people – the way we work and aggregate ourselves." (4: 13)

"It's the People, Stupid" (13: 6)

Warfare continues to be and will always be a "human activity" (24: 43) that is "infused by chance, uncertainty, violence, and physical exertion." (24: 3) Networks have demonstrated the lifting of some of the frictions in warfare but "significant gaps in the information landscape of a dynamic battlefield will always exist." (39: 2) Friction will not go away precisely because it is a contest between people and since people think non-linearly contributes to warfare being the realm of complexity. It is important to remember that networks connect people and the most important aspect of networks is connecting thinking people. (18: 7)

Addressing networks without accepting the importance of people in the process will lead to failure. Most efforts to change corporate hierarchies without addressing the human side of the process have in fact led to failure. (13: 7) Conner adds that Michael Hammer reflected that he focused on his "engineering background and was insufficiently appreciative of the human dimension." (13: 7) It is important to remember Col John Boyd's famous statement; "Machines don't fight wars. Terrain doesn't fight wars. Humans fight wars. You must get into the minds of humans. That's where the battles are won." (14: 341) If people are important then they need leaders and networks can be most useful aids to connect leaders and led.

People need leaders. LTG Petraeus, the Commanding General of the 101st Airborne Division during Operation Iraqi Freedom reminds us of the need for leadership today.

> "In fact, even in the 101st Airborne Division, which prided itself on its attention to nation-building, there were a few mid-level commanders early on whose hearts really weren't into performing civil affairs tasks, assisting with reconstruction, developing relationships with local citizens, or helping establish local governance. To use the jargon of Iraq at that time, they didn't "get it." In such cases, the commanders above them quickly established that nation-building activities were not optional and would be pursued with equal enthusiasm to raids and other offensive operations." (28: 10)

LTG Wallace reminds of the need to keep the emphasis on the "person using the gizmo" and not follow any "dangerous temptation to shift responsibility for making military decision from commanders to the systems themselves." (39: 2) Networks can assist commanders and the people within organizations but networks will not solve problems themselves. They enable commanders, staffs and operators who are trained to exploit the potentials that those networks provide (26: 3). As best expressed by Col John Boyd, "machines and technology must serve the

larger purpose." (14: 354) But what is this larger purpose and what is it networks provide for commanders?

Warfare is the realm of complexity and a conflict among people and people further add to the complex never-ending change found in warfare. This change can be chaotic if faced "without the benefit of a sense of control" but manageable "if it can be directed or at least anticipated." (13: 30) Control is attained with the help of a network but the command that provides direction "remains fundamentally a human, not technological, activity." (39: 2) The network is the tool that assists the commander. "We are a commander-centric military, using a network to network." (39: 5) The question then comes how are decisions made in any conflict?

For this we turn to Col John Boyd's famous, proven and accepted Observe, Orient, Decide, Act (OODA) Loop. (36: Appendix A) A detailed discussion of Col Boyd's OODA Loop can be found in Robert Coram's *Boyd: The Fighter Pilot Who Changed the Art of War*, Dr. Grant Hammond's *The Mind of War: John Boyd and American Security*, and the US Army's Field Manual 6-0, *Mission Command*. Col Boyd recognized the same problem with hierarchies that network theorists understand today. A pure hierarchy results in a long, and thus slower, decision loop. He theorized that in order to maintain speed in decision each level within an organization had its own decision loop. These decision loops are each faster than the larger loop. Each of these decision loops must work within the larger slower loop so as not to lose cohesion. This effort is harmonized by allowing freedom within the command's intent. In order to achieve this harmonious effect there must be a "high level of implicit trust, based on a thorough knowledge of the commander's intent." (23: 141) Col Boyd studied the history of ground warfare and, more importantly, maneuver warfare, to take his initial theories on air combat to true decision theories. He further studied in detail how the Germans developed the theories and practice of blitzkrieg. Blitzkrieg in theory and practice is the birth of edge organizations. Blitzkrieg is the beginning of the loosening of hierarchies in warfare. Blitzkrieg and modern maneuver warfare only comes about by allowing subordinates to operate within a larger intent. It is the advent of implicit over explicit control. But blitzkrieg requires its own form of control.

"In a complex, ever-changing environment such as battle, asked Boyd, how do those who utilize blitzkrieg sustain this rapid pace while adapting to changing circumstances without losing cohesion themselves or the coherency of their overall effort?" (23: 141) The rapid pace and change are harnessed by a leadership "near the edge of chaos demands the utmost skill and dedication from those who are at the helm." (13: 133) It is an agile command and control that deals with complexity and takes full advantage of what the network provides. (2: 204) It is a command and control based on a contract between leaders and led. Blitzkrieg required trust between leaders and led in the organization. It is with trust that people take the initiative instead of worrying about justifications to their leaders and others in the organization. (1: 3) Leaders set direction and provide intent within which edge organizations have the freedom to maneuver, but it is trust that allows the system to work. "Unity and trust are the moral forces that harmonize a group by enabling people to subordinate their personal goals to the team goals and the goals of the organization." (1: 3)

The other half of the balance is understanding that the network does not completely remove the fog and friction of war. Network warfare has and will help raise that fog but "even

with net-centricity, there is less information than one would like to have." (39: 4) Instead of seeking certainty in network warfare, the US Army should seek "understanding of patterns and how expert decision makers use those patters in recognitional decision making." (22: 283) It is seeking to build the two traits of trust and intuitive agility that comes about from years of shared experiences that the US Army will enable network warfare.

What Traits Enable the Network?

The battalion described in Chapter 1 had, by December 2003 been conducting operations in Iraq since March of that year. Previously the battalion had gone through an intensive period of training. Much of the battalion and almost all leaders had trained, lived and fought together for almost a year. By New Year's 2003 passing sections and platoon between commanders in the night was fairly simple. All understood the language being spoken over the radio and the meanings behind words and intent. There was little need for lines on the ground to deconflict units. If one were to look on the surface for a network the only thing that person would find would be a very robust but simple voice radio net. The real network though was not the apparent strength "in communications but in social network." (31: 201-203) This social network, built on trust and accepting that friction is alive and well on the modern battlefield is what allowed what some theorists might recognize as swarming. The traits demonstrated that night by one battalion in the US Army are not surprising. They are traits built on a history of doctrine, organization, training and policies. They are traits developed by other Armies that understood their importance in conducting maneuver warfare.

Col John Boyd explained that the German Army's use of blitzkrieg was a perfect application of his OODA Loop. Col Boyd stated, "In a blitzkrieg situation, the commander is able to maintain a high operational tempo and rapidly exploit opportunity because he makes sure his subordinates know his intent, his *schwerpunkt*." (14: 336) Subordinates are not told how to execute a mission but are instead given mission orders. (14: 336) The US Army has established mission orders and working within commander's intent in doctrine and practice for years. The requirement to make the idea of mission orders work properly is trust between commanders and subordinates. This trust is what holds the effort together. Trust requires implicit over explicit control and trust gives subordinate freedom of action. (14: 337). Col Boyd, in discussing these ideas with a US Marine Corps tactics class stated, "This stuff has got to be implicit. If it is explicit, you can't do it fast enough." (14: 381). Dr. Grant Hammond, in his book about the life of Col Boyd, in comparing attrition versus maneuver warfare provides that the requirements for maneuver is, "trust, professionalism, (and) individual leadership" and he further places an emphasis on trust, innovation and speed (14: 153). The other trait that is directly tied to trust and key to operate on the edge is the ability to deal with uncertainty.

Though one would think that dealing with uncertainty would be less important, that trait has actually gained importance in network warfare. Initial theories of network warfare conjured ideas of the fog of war being lifted. Though some of the fog has lifted, it continues on today's battlefields and the practitioners of network warfare must not be held waiting for perfect information. Agility must not be given up waiting on perfect information. In fact greater situational awareness will increase risk taking. As one senior commander from Operation Iraqi Freedom indicated after experiencing network warfare on the attack to Baghdad that, "he could

assume risk, discover he had made a mistake and correct it before the enemy realized he had taken the initial action." (26: 3) This ability to accept greater risk is an important positive aspect of network warfare but it is more important to understand that all will not be known. As the US Marine Corps most correctly state, "In practical terms this means that we must not strive for certainty before we act for in so doing we will surrender the initiative and pass up opportunities. We must not try to maintain positive control over subordinates since this will necessarily slow our tempo and inhibit initiative." (37: 83) Trust in subordinates and implicit control go hand in hand with maintaining agility and accepting that networks will not provide all the information required for decisions. But, how are these traits developed in a military?

The German Army developed these traits in the interwar years. The German blitzkrieg was a transformation in technology, training and doctrine. (12: 211) The Germans went so far as to write in their Army Regulation 487 in 1923 that, "commanders decentralize operations to the lowest level possible." (12: 37) German Field Service Regulations *Combined Arms Leaderships and Battle* of 1923 emphasized leaders had to have trust and respect of their troops and the 1935 regulations required "mutual trust" between leader and led. (12: 13, 224) The German blitzkrieg was not the result of more or better armor forces or a greater understanding of the potential of merging tanks and the wireless radio. In fact the Germans at the dawn of World War II had less quality and quantity in armor forces. "We had therefore to attempt to make up those deficiencies (in armor numbers and quality) by means of superior organization and leadership." (21: 35) The true genius of the blitzkrieg is not found in the German generals who led Panzer Divisions across Europe and North Africa. The true genius likely did not have a vision of Panzer Divisions racing across Europe but he created the leaders in the interwar years that would command on the edge of chaos.

General von Seeckt, Chief of Staff of the German Army saw great opportunity in the Treaty of Versailles. That treaty demanded a decrease in the officer corps and allowed von Seeckt the opportunity to keep only his choice of General Staff and front line offices and purge the aristocracy keeping only those with "intellectual as well as tactical and operational excellence." (12: 36) He molded an officer corps that tolerated much debate about tactics and operations and an outspokenness that contributed to a high level of trust between various levels of command. (12: 47) Von Seeckt made training the Reichswehr his top priority. He spent about one-third of his time each year observing training. (15: 74) Each year he also provided candid critiques of what he observed. The US Army takes great pride in the After Action Reviews (AARs) conducted after training and operations. Von Seeckt required AARs as we know it today – open and frank discussions in the 1920s.

Part of the system he built included regimental commanders being held responsible for training the officers in the regiment beyond basic officer/branch training. (15: 85) The training system also required that officers and NCOs move between units in different branches in order to understand the requirements of these different branches. "The whole system worked to create considerable unit cohesion. Men who trained together were generally kept together." (15: 68) Von Seeckt even led staff rides for generals where he set the problems and conducted the critiques "The idea that a commanding general still needed to learn was unusual. However, the result was that the General Staff was trained in a set of common principles." (15: 89) Further, the new General Staff course had no formal examinations and all papers and problems to solve

were graded subjectively emphasizing there was no on solution to a problem contributing to an atmosphere that emphasized critical and creative thinking. (15: 91) This training program and the emphasis on multiple maneuver exercises meant "a typical German Army captain or major in 1940 would have participated in more multidivisional maneuvers than the average British or French general." (15: 205) It was through constant training together as units that the Reichswehr created the commanders that would lead the Wermacht across Europe and North Africa.

In fact the true transformation of the German Army came about because of General von Seeckt's personnel and training policies. As late as 1934 Heinz Guderian was arguing with General Beck, Chief of the General Staff, about concentrating tanks in Panzer Divisions and had to fight to create Panzer Brigades, eventually gaining acquiescence for one Panzer Division. The German General Staff was not prepared for transformational ideas such as Panzer Divisions or commanders using wireless radios to command among forward units in 1934. (21: 32) The blitzkrieg army of 1939 and beyond was already created though. That was an army built on trust and a common view of how to solve problems through extensive tough realistic training.

As Guderian states, "The only way to secure good communications within the tank forces and their co-operations with the other arms is through constant practice, and specialized tactical and technical training." (20: 198) Maneuver warfare ". . . is created by the bonds of implicit communications and trust that evolve as a consequence of the similar mental images or impressions each individual creates and commits to memory by repeatedly sharing the same variety of experiences in the same ways." (8: Slide 18) The Wermacht and Luftwaffe had not practiced close air support prior to the invasion of Poland. After the Polish campaign there were relentless exercises and training between Stuka units and armored formations. When the campaign against the Soviet Union opened Richthofens's *Fliegerkorps* VIII could provide reliable close air support – something other units could not. The result of the trust this unit attained among armored formations resulted in it being regularly transferred across all the Eastern Front with the headquarters alone having to shift 18 times in the summer and fall of 1941. (12: 181) Trust in the case of *Fliegerkorps* VIII was based on comfort attained from relentless training. That unit had to prove itself to the armored formations. The same must happen between leader and led.

Network warfare cannot work without trust. Network warfare requires that information flow freely and transparency only occurs with trust. Trust develops from peer-to-peer and hierarchical relationships. (18: 112) LtCol Freeman, in comparing recent network warfare case studies, found that two of the three ingredients common to all and essential to success were leadership and training with leadership being the most important. (Freeman: NP) "Far from making leadership less important, networking gives it a more expansive meaning and demands more of it." (19?: 29) Leadership in networks is understanding that, "Too much changes too fast to wait for strategy to trickle down through a hierarchy. Success comes from skilled, fast, and agile moves at the business (tactical) level." (10: 247) Instability increases at the edge of chaos and with that increase comes a greater reliance on indirect control, "which is far better than having no control whatsoever." (13: 32)

Leadership provides implicit or explicit focus and direction and diminishes friction through implicit understanding and trust. Success comes from the ability to emphasize the

implicit over the explicit. (8: Slides 4, 8, 22) The freedom to communicate based on commander's intent "is the fundamental key to converting today's hierarchical organization into tomorrow's flexible, networked organization." (22: 275) This freedom comes from a contract between leader and led based on trust. This trust comes "from operating together under combat-like conditions." (22: 236) This trust comes about because the leader mentored the subordinates through multiple iterations of problem solving providing a common view. This trust comes about because the leader, understanding the subordinate has a thorough understanding of this common view will act within his intent. The subordinate's contract is to work within that intent in exchange for the freedom to determine how to solve problems. The subtleness in this trust is the leader has mentored the subordinate through multiple iterations of problem solving not in coming up with a single solution but how to think through situations. Leader and led are left with a common view of situations and language that is based on training. "The importance of the role trust plays in networks also means changes in personnel rotation policies and the role they play in promotion." (33: 5) Network warfare is possible through mutual trust and understanding that comes about "from living, training, and fighting together." (22: 276) General von Seeckt, the true father of the blitzkrieg, determined this was the way to create the leaders of the Panzer Divisions that raced across Europe and North Africa. The US Army must adopt the same principles to create the leaders that will command at the edge of chaos in the 21st Century.

What is to be Done?

"The greatest hurdle on the way toward transforming the military into an entity using Internet-based warfare will be getting people to change and work together . . . " (27: NP) The technologies behind network warfare is not the hard part of transformation. Recruiting, training, mentoring, assigning, and promoting the people that will conduct warfare on the edge of chaos through social networks is what will truly cause an embrace of network warfare. The good news is much of this is not new to the US Army.

> "This is not a new phenomenon. Nor is it a mystery how to build it. Many military units in the past have achieved it. Certain elements are essential: a forward-thinking commander who provides clear, understandable, actionable guidance; aggressive, well-trained subordinates who have a network of trust; freedom at all levels to take initiative (even to deviate from the plan) as long as it conforms with the commander's overall intent; hard, realistic unit training that ensures those who can thrive in the chaos of war are in leadership positions; and enough time together to learn how each member of the team will react in a crisis." (22: 276)

These are all ideas the US Army, along with other militaries understand.

Networks are based on relationships among people while hierarchies are based on relationships between offices. It is important then that individuals develop longevity within the network. Trust, we have seen, is most important in networks and trust is only developed over time. "The investment of time in developing personal relationships that can later be used to attain desired ends may be one of the most difficult attitudinal changes required for results-

oriented Americans." (33: 3) The greatest change and enabling networks will come about in how the US Army assigns people.

General von Seeckt's Observations in 1921 of what he witnessed in exercises was that one of three imperatives to success was combined arms training or conducting more cross-service training in order to help build trust and understanding. (12: 44)(18: 31) The German emphasis on wargames, exercises and maneuvers had a purpose to create situations where small unit leaders made quick decisions during fast changing situations. (12: 105, 123). Trust and appreciation of how disparate teams approach problems will not be achieved if teams are not routinely formed during training – if they do not live and train together. (18: 31)

The other major trait the US Army must ensure of its personnel is agility through intuitive decisionmaking. This can best be done by isolating the kinds of decisions that have to be made even if the contingencies themselves are not foreseen. It is important to train the pieces of the decisions versus the whole contingency. (18: 26) By training many realistic contingencies one will recognize patterns even if the situation is not exactly the same. (18: 25) The resulting training is what General Gunther Blumentrit meant by "A body of professional officers who have received exactly the same training." (23: 141) This is what leads to trust.

Trust evolved as "a consequence of the similar mental images . . . shared impressions . . . committed to memory by repeatedly sharing the same variety of experience in the same ways." (23: 164) Col Boyd offered that this common outlook is the unifying force "that can be used to simultaneously encourage subordinate initiative yet realize superior intent." (9: Slide 74) The US Army must "foster and support the development of networks without co-opting them – and without seeing them as a threat to formal lines of command." (33: 5) This can only be done through people as it is people that will make up the social networks and in fact there are "discussions on replacing 1990s weapons systems, while there is no discussion on replacing our 1890s personnel system." (22: 232) Much has been done but more must be accomplished in order to enable network warfare.

Von Seeckt saw an opportunity in the Treaty of Versailles to change the German Army. The US Army has used current opportunities to institute change while prosecuting a war. But, much more has to be done in order to prepare the soldiers that will fight at the edge of chaos in the 21st Century. The US Army has to change a "100 year old system that grooms people to run an Industrial-Age organization." (22: 234)

The Army's personnel system focused on creating generalists and large staffs meant combat arms officers – those who will command at the edge of chaos, spent "less than 25% of time training for combat." The US Army changed that by starting a program to increase the amount of time those officers spend in combat units. (22: 235-6) The Army has made greater strides in personnel assignment since. With the advent of the transformation to a Brigade-centric Army personnel are assigned directly to a Brigade Combat Team (BCT). Previously personnel were assigned to an Army Post or a division. Recent change to Army Forces Generation (ARFORGEN) will improve assignment policies and, most important, enable teams coming together to train and deploy together. In ARFORGEN a BCT is assigned together for three years. In that time the BCT trains and deploys together. At the end of the three year cycle up to

one half the BCT departs and a new BCT is formed with the remaining personnel and the cycle starts again. Though this is a move in the right direction it falls short of the long term requirement for trust and a common outlook among leaders. An officer will most likely be assigned to different BCTs as a lieutenant, captain, major, lieutenant colonel and colonel. ARFORGEN does much to enhance readiness and building trust in one BCT for one deployment but changes nothing for the Army in the long term. The US Army will still be one where "our people are always trying to get to know each other and learn how they will react in various situations." (22: 236)

The US Army must, in order to enable network warfare, adopt a regimental system for the BCTs. In such a system an officer, Non-Commissioned Officer (NCO) or soldier would be assigned to a BCT for a career. That officer or NCO could be assigned away to fill other positions in other headquarters or requirements in the Army or Department of Defense but when that officer or NCO is to be assigned to a combat unit he/she is assigned to that BCT. In essence for officers a group of Second Lieutenants comes into a BCT during an ARFORGEN cycle and grows up together – with one of those lieutenants eventually commanding the BCT. Anecdotally the friction of some of those lieutenants not staying for a 20 year career and some moving to a Functional Area should mean the numbers work out. Thus a group of leaders learns to trust each other through common training and mentoring.

The historical argument to this is the Army's personnel system has prepared generalists because the Army has had different kinds of units throughout its history. That is less the case now with modular brigades. It will be even less so with Future Combat System. The Army is down to three kinds of BCTs and may eventually get down to one. BCTs are no longer assigned to divisions or corps but task organized to them on deployment. The US Army will have generalists even if officers grow up in one particular BCT. What is gained is the trust between leader and led within that organization. A regimental system does away with officers and NCOs having to gain trust in new groups of people every time they come to a new unit. The same system will help mentor officers and NCOs to a common view.

The Army has been addressing intuitive thinking in education and training. Selection to a school is tied to performance and potential. Performance in school is not tied to promotion. This allows creative and critical thinking while in the Army's education system. Very little importance is placed on objective performance while in school further adding to freeing creative thinking. The real importance in training intuitive thinking has been the Army's Combat Training Center. The German Army of the interwar years would easily recognize what goes on in a Combat Training Center. A BCT undergoes tough training and is faced with problems that have no easy or even viable solutions. Mentors help leaders through their problem sets. AARs are conducted throughout the training. Some Army leaders have stated that going to actual combat is preferred to the training at a Combat Training Center. With ARFORGEN comes the possibility of two Combat Training Center rotations during a BCT's three year cycle. This will only enhance the Army's enabling network warfare.

Some uninformed critics may make statements about the US Army having "under-skilled, under-educated military personnel currently being recruited" and the US Army training's focus only on "discipline, unquestioning obedience to orders, and strict adherence to routine" or

current incentives for success in the US Army being "obedience, keeping one's head down, unquestioned compliance to rules and orders rather than taking initiative, acknowledging and correcting mistakes, or organization learning." (30: 9-10) Critics like this have not taken the time to see what the US Army, along with the rest of the Department of Defense, has been doing for the past 200 years in terms of doctrine, education, and training. The US Army is as it is because of the American people that are a part of it. The US Army's culture is a reflection of the American culture. It is a culture that understands initiative and working within intent. It is a culture that has developed network theories in the business world.

Network warfare theory has evolved from the first generation focus on technology and bringing speed to machine to machine or man to machine decision cycles. The current generation theories focus on the more important social networks or man to man decision cycles. These theories recognize that though networks help lift some of the fog of war much remains and will remain. These theories also recognize that as war is a conflict between people and people think non-linearly then war will be the realm of complexity and chaos. The US Army understands this realm and has adopted the view that a network is a tool that assists commanders in commanding soldiers on complex and chaotic battlefields. The US Army has thus adopted the Network-Enabled Battle Command to define network warfare. As Clausewitz differentiated between theoretical and real war this paper differentiates between the theoretical and the possible. The possible is a means of warfare that balances hierarchical and network structures where commanders grow units that operate at the edge of chaos – the most efficient for a networked organization. The traits required to operate on this edge are trust and intuitive decisionmaking and the way to ensure those traits in leaders is by years of living, training and fighting together. These traits are gained through years of shared experiences. The US Army has used the opportunity of the current war to transform organizations and assignment policy but one more change must be made to enable the network. The US Army must adopt a regimental system for its BCTs that enforces career-long assignment to one BCT enabling building long term team-building and trust.

Conclusion and Questions Left Unanswered

This paper has focused on the US Army and on one particular recommendation that, though small, will have long term effect on enabling network warfare. That one recommendation focuses on the people that will make up the social networks that are key to network warfare. The ultimate goal of network warfare in very simple terms should be that a US Army platoon is able to talk directly to an Air Force aircraft and the pilot and platoon leader conduct a mission together while their two respective headquarters monitor. That mission should be within the intent of both the pilot's and platoon leader's commanders. In conducting research for this paper more questions than answers came up. This final chapter is a list of some of the questions that need answering in order to help enable the transformation the US Armed Forces is already embarked upon.

1. Doctrine. As others have noticed with the advent of network warfare, doctrine must dictate implementation. The degree of acceptance of network warfare in varying commands across all the services has been dependent on individual leaders. "In each of the case studies, leadership set the stage and inspired change." (17: 1) Lasting acceptance can come from doctrine or a

leader having bought into the system. (17: 2) Unfortunately if dependent on leader acceptance, the importance of fully utilizing networks may leave with the commander. Studies of the implementation of the US Army's Command Post of the Future demonstrate just that. Initial effort by the 1st Cavalry Division Commander was not maintained when a new division took over the mission. (16: 200).

2. Doctrine. A further, and more important question is the need for a fresh look at joint and service doctrine based on how we will fight as networks. Even though leadership and friction will not go away and warfare continues to be a conflict between people, the command and control doctrines developed for Industrial Age warfare should change. The ability to shift authorities, and architectures that allow units and decisionmakers to support and be supported by others in an agile manner leads one to think command and control doctrine should be defined. Further, the doctrines related to ideas of geographical, service, functional and operational command boundaries may need to change as "local and peer-to-peer problem solving may weaken vertical control." (19: 29)

3. Building Trust Outside the Army and Lowering the Joint Line. This paper has focused on how to build trust inside the US Army's basic combat formation, the BCT, enabling network warfare inside that organization. How is the same trust built in joint formations? Right now the "joint line" in the US military stops at the Joint Task Force and Component Command level. Networks permit deeper operational integration that would lead not to surmise the joint line must lower or senior joint commanders will exert more micro-management – just the opposite of what is needed in networks warfare. (19: 29) In order to achieve greater trust among joint forces the Department of Defense must bring about deeper joint integration, greater joint experimentation and training and possibly transforming the lowest level combat organizations in each service into joint forces. (18: 151) This would require greater cross-fertilization by assigning personnel across services to those combat formations.

4. Changing hierarchical to edge organizations. There is some truth in Dr. Scott's criticism of the US military's ability to adopt new ideas in how organizations should be physically transformed to fight as networks. (30: NP) Change is hard to accomplish and breaking through longstanding ideas of corps, divisions, brigades, battalions, companies, platoons and squads may prove some of the toughest. The Army's current transformation to a BCT structure should not have been the leap that it was. The transformed BCT is not very different than the way brigades trained and fought. What the US Army did was make that organization permanent – something that will greatly increase the level of trust within said organizations. Changing from those historical organizations to the equivalent of pods, clusters and swarms may prove overly difficult. Regardless, an unemotional look needs to be taken regarding the physical construct of fighting organizations. A company in the future may be called a company but it should, intuitively, look very different than a company today. The Stryker BCTs took a step in that direction but not far enough. Stryker BCTs, taking advantage of their internal network, have fought differently. Unfortunately the US Army's work in organizing the Future Combat System Brigades falls short of the mark. The US Army must look at how Stryker BCTs and Special Operations Forces are currently fighting and use those lessons to look at the physical structure of future organizations. (32: NP)

4. Hierarchies within Networks – Headquarters and Staffs. The US Army must also look at current and planned headquarters and staff structures. The theories of network warfare focus on the need for "cross-boundary team cognition and problem solving " (19: 151) and pushing joint command and control downward." (19: 157) In Conner's description of "nimble organizations," he states, "In addition to individual assignments, people are accustomed to working in synergistic, cross-functional work teams."(13: 43) What to take from this? Control should be pushed down and out to the edge where tactical leaders are empowered to come together with other teams, share information and execute a mission within higher commanders' intent(s). Theoretically staffs should grow at lower levels. The US Army is experiencing just the opposite. In the current transformation of BCTs, there has been no change in platoon, company, and battalion level headquarters and staffs. Brigade staffs have grown to over twice their previous size. Current efforts are underway to do the same with division and corps staffs. Just the opposite should be going on. Staff growth, if any, should be shared if not pushed to lower levels to allow for the expected level of information gathering, sharing and decisionmaking at the edge. Brigade, division and corps commanders should, in theory, require less staff in their headquarters to conduct their command and control (or Col Boyd's appreciation) tasks. The other change needed to staffs is to make them truly cross-functional in an effort to break through stove-pipes. It is time to break from Napoleonic stove-pipes. Network theory leads us to moving away from staff sections by branch or function to cross-function staffs. Smaller and cross-functional staffs at multiple echelons fill the requirement for command and control. More importantly, perhaps the future force construct should focus less on identifying the right structure than being able to "identify the right force structure, but to be able to identify, communicate, and respond to those elements of time and space that define the appropriate force structure." (33: 5) Larger staffs and headquarters mean our "information systems are still tied to an outdated, hierarchical organization that slows the dissemination of information" and our agility is nullified as information must be routed "through our vertical bureaucracy." (22: 193, 192)

Times of crisis provides great opportunity for change. General von Seeckt found opportunity for changing the German Army after World War I and General Peter Schoomaker, Chief of Staff of the US Army has taken advantage of the opportunities in the crises following 11 September 2001 to institute changes in the US Army that might have taken many years and bureaucratic friction to achieve. Change that has been instituted has been subtle, like a uniform that does not depict branch of service emphasizing individual abilities regardless of branch, a transformation of Army units emphasizing multi-functional teams down to battalion level and even opening BCT Command to Armor, Engineer and Field Artillery Officers (29: NP). These are all examples of needed change that came about with a leader sensing an opportunity. But, more radical steps are needed to institutionalize change that sets conditions to enable network warfare. The Army must train and educate soldiers and leaders that gain trust in each other through long term realistic training and assignments together. That trust will truly enable network warfare. Attaining that trust is not new to the US Army but changes in personnel assignment will require overcoming bureaucratic friction. Greater changes in structure and doctrine must be pushed through bureaucracies in all the services in this time of opportunity for change.

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Disclaimer

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