Chapter 12

Cutting the Gordian Knot

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The views expressed in this chapter are the opinions of the author, and do not reflect the official opinions of any U.S. government agency.

12.1 THE GORDIAN KNOT

{gohr'-dee-uhn}
In Greek legend, the Gordian knot was the name given to an intricate knot used by Gordius to secure his oxcart. Gordius, who was a poor peasant, arrived with his wife in a public square of Phrygia in an oxcart. An oracle had informed the populace that their future king would come riding in a wagon. Seeing Gordius, the people made him king. In gratitude, Gordius dedicated his oxcart to Zeus, tying it up with a peculiar knot. An oracle foretold that he who untied the knot would rule all of Asia. According to a later legend, Alexander the Great cut the knot with his sword. From that time, "cutting the Gordian knot" came to mean solving a difficult problem.

-Original source unknown

12.2 THE REALITY OF C2 INTEROPERABILITY

There are numerous pundits who describe interoperability in abstract terms and then prescribe utopian solutions. The reality of C2 interoperability is on the battlefield. Soldiers are adaptable, hardware is not and software is less adaptable than generally believed. Consider non-C2 hardware. A 7.62mm round of ammunition is not interoperable with a 5.56 round.

Command and control interoperability is a technical problem. Although there are other challenges in terms of training, procedures, etc., the fielded technology is the one thing that cannot be easily fixed in the field.

In US usage, an APOE is an aerial port of embarkation (where troops leave home base for deployment) and an APOD is an aerial port of debarkation (where troops arrive in theater). In Australian usage, an APOE is an aerial point of entry and an APOD is an aerial point of departure – exactly the opposite meanings. Soldiers are intelligent and flexible and can learn what meanings are appropriate to what audience and in what context. A Link 11 communications device at sea will never, on its own, learn how to communicate with a Link 16 device flying above it.

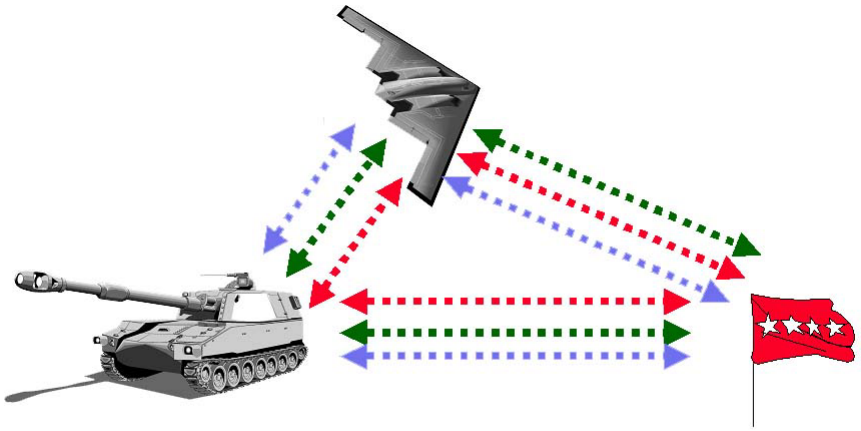

Figure 12–1 *Command and Control to allow a headquarters to put ordinance on target*

Ultimately, C2 interoperability is about putting steel on target (Figure 1). There are many enabling technologies but the ultimate goal is putting steel on target. Information superiority, in and of itself, does not achieve success on the battlefield.

12.3 INTEROPERABILITY MYTHS AND TRUISMS

- Translators are brittle (hard to change, easily broken). For a high priority pair of systems, effective translators may sometimes be constructed. For systems with hard real-time deadlines, performance constraints may make a useful translator infeasible. However, even when a successful translator is

developed and fielded, updates to the software of either system can break the translator.

- COTS (commercial off-the-shelf) software is designed to be non-interoperable and generally succeeds in that task. The emphasis on COTS products has been misplaced. The business model that strives to lock customers into proprietary products is alive and well. More importantly, there are very few commercial products that are militarily significant – you generally cannot purchase target acquisition software from your local CompUSA store. Wars are not won with superior word processors.

- Interoperability problems exist because of Title 10 prerogatives of the services. They exist for many reasons, not least of which is the sheer number of agencies and commands that are engaged in procuring communications and computer equipment. When the CIPOs/JFPO was tasked to query the Combatant Commands about which C2 systems gave them the most interoperability problems, seventeen of the top twenty issues were related to systems being procured by Defense Agencies or other joint organizations.

- Standards help but are not a panacea. First, standards are fleeting. The DoD has been cavalier in demanding standards and then abandoning standards. The dropping of the Ada programming language standard in 1997, just as commercially viable compilers were becoming available, is one example. The "mandate" to replace the successful Distributive Interactive Simulation (DIS) standard with the High Level Architecture (HLA) is another example of DoD rather arbitrarily changing from one standard to another. Commercial standards can be promising. But it is very difficult to determine which commercial standards are going to be long-lived. (Sidenote: Microsoft products are useful, popular and pervasive, but they are not a standard.)

- "There are no technical problems, only…" It is really frightening to hear senior DoD information technology leaders say such things. There are clearly structural, organizational and managerial problems in fielding interoperable systems across an enterprise as large as the US Department of Defense. Strip out all the administrative and bureaucratic issues and you still have hard technical problems. Those who say that there are no technical problems associated with interoperability should try writing a translator between a Link 11 message and a Link 16 message in which one message format has a field for which there is no corresponding field in the other format. All the quality, process and management techniques will not solve that technical issue.

12.4 CUTTING THE KNOT

Consider an attempt by staff officers at US Joint Forces Command to simply align the major players in C2 interoperability as shown in Figure 2.

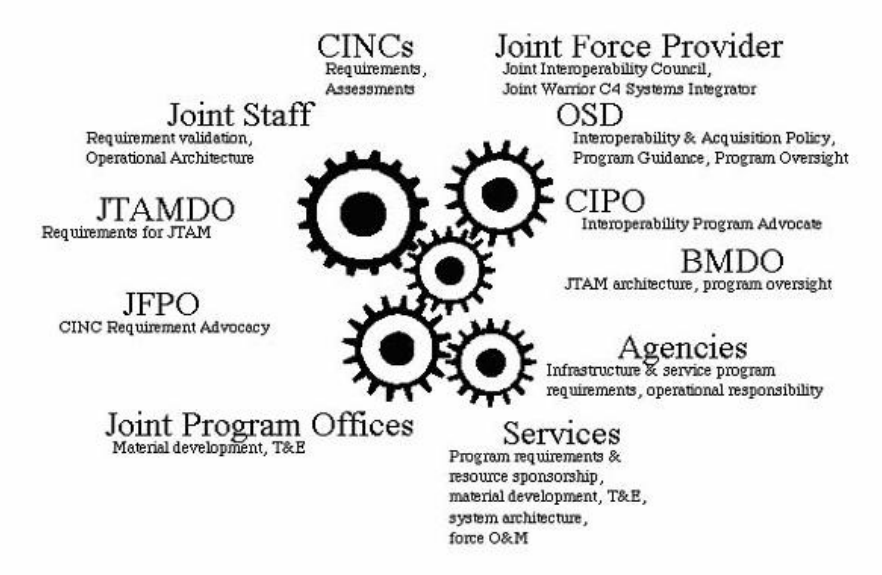

Figure 12-2 *Aligning the interoperability power train*

Even here we see a lot of different players; therefore, coordination is difficult. Software engineers use a direct technique to deal with intractable problems – simplification. Four simplification strategies are readily apparent.

- Reduce the number of organizations allowed to procure communications and computer equipment
- Reduce the number of new systems being procured
- Reduce the number of existing systems currently fielded
- Ruthlessly eliminate use of "home grown" systems

Based on surveys of the Combatant Commands, their interoperability issues do not come primarily from the individual service C2 acquisition commands: CECOM, SPAWAR and ESC. One viable strategy would be to simply let the service C2 acquisition commands execute their USC Title 10 responsibilities and ensure that the combatant commands establish the communications-computer requirements the service C2 acquisition commands build to. Ships, aircraft and rucksack communications-computer systems have very different technical requirements. No amount of "Powerpoint Engineering" will make those problems

go away. It makes sense to have the services responsible for developing the systems their forces will use.

There are simply too many communication-computer systems being procured. Reducing the number of systems procured will simplify the problem space. One means of doing this is to shift greater responsibility and authority for requirements generation to the Joint Staff and the Combatant Commands and then to make CECOM, SPAWAR and ESC responsible for the development and fielding of the interoperable systems.

There are too many C2 systems currently fielded that partially overlap each other in functionality. In a perfect world, the best of breed systems would be saved and the losers eliminated. In the real world, even if the worst of breed is selected for continuation, it will be cheaper and more efficient to fix that one system than to continue to maintain multiple systems with overlapping functionality.

Some of the hardest interoperability problems occur when systems are procured directly by a Combatant Command or a Service component. There is no program office, no support and usually no interoperability. An example of this common problem occurred in a Combatant Command. The CIPOs were asked to investigate interoperability issues between a new Air Force system to control strike aircraft and an existing Army field artillery target acquisition system. We soon learned that the division artillery had quit using the system of record and was using a homegrown program written by a West Point professor. From an interoperability standpoint, there is no way to design a system to ensure interoperability with locally procured systems.

The CIPO initiative has demonstrated that CECOM, SPAWAR and ESC can work effectively together towards interoperability. Unfortunately, the current "Balkanization" of C2 acquisition policy makes it impossible for any command to be held accountable for interoperability. The CIPOs were established to correct perceived interoperability deficiencies in the services' C2 systems. The reality was that the Combatant Commands were most concerned with systems over which CECOM, SPAWAR and ESC had no oversight or control. The problem is not that the services cannot build interoperable systems. The problem is that there are too many organizations developing too many systems.

There is no way to untie the Gordian Knot of intertwined communications-computer systems across the DoD in the current environment. Only radical measures can cut through the tangled mess of systems currently fielded. By cutting the number of existing systems fielded, by cutting the number of new systems procured and by concentrating system acquisition authority, the DOD can cut through its interoperability knot.