

A Vision of the Future for the Air Force (and perhaps the whole DoD)

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Abstract

The Air Force has enthusiastically endorsed, at its most senior levels, advanced thinking with regard to the application of information technology. Recently, the notion of a Joint Battlespace Infosphere (JBI) has emerged as an idea, extending beyond the bounds of the Air Force, which could have significant impact on both the operational procedures of the Air Force and on the technologies that support them. This paper discusses some, but not all, of the many issues that are involved in developing the JBI, and it provides a couple of pointers to research topics that would be beneficial towards furthering the JBI concept.

The vision of the Air Force has been expressed many times by its leadership. The Scientific Advisory Board presented a study in 1993 which outlined how information architecture was an important concept. Since then information superiority has become a recognized core competency of the Air Force. Later studies suggested new structural strategies (reachback) for conducting mission operations that are enabled through sophisticated information technologies. Of course, there was Global Reach/Global Power and the various studies that are outgrowths of the Joint Vision 2010, through them all the Air Force leadership has consistently endorsed forward thinking information centric constructs for how the Air Force might operate in the future.

What I'd like to outline is a simple model on how some of the vision can be turned to practicality. In fact, some of the vision could be achieved using today's technology. The growth towards the full vision is possible through leverage applied to current industry trends, commercial products, legacy AF unique systems, the new operational innovation initiatives, and some modest shifts in the business practices of acquiring systems which further leverages industry trends. (This isn't a message without prospects for action indeed many

of the leverages cited are already underway in various parts of the Air Force—the ideas are like Popcorn in a pan of heated oil. Once the oil is hot enough, randomly located popcorn kernels explode. Similarly, our technological environment around the internet seems to be reaching a critical "temperature" because the same basic idea is popping up in many different arenas. A task before the whole community is to harvest the many "popcorn" ideas and initiatives without having them spill uselessly and messily all over the place.)

1. The Simple Model (A Joint Battlespace Infosphere)

It's the internet—but a bit more sophisticated. Whereas most everyone knows how connecting to the internet provides an enormous prospect for gathering information, everyone likewise knows it is difficult to sort out the "wheat from the chaff". Sorting, prioritizing, providing best communication service for the most time critical information, offering discretionary control of information access which conforms to a commander's intent, seeking the "right information" and getting it to the "right people" are all possible in an internet environment. But some old tools need to be connected in new ways, and some new tools remain to be developed.

The simple model characterizes all participants as both consumers and offerers of information. Every existing system and all new systems can participate as both "publishers" of information, and as "subscribers". The publishers announce the availability of information or services, and the subscribers express their mission objectives. Between the two sits a "broker" (a kind of sophisticated combination of search engine, Backweb - like service, data mediation tool, and all around "good agent" intent inferrer) which can recognize the subscribers "true" needs and make the appropriate connection among the published objects. The broker has additional duties: it can recognize a commander's intent and information distribution policy so that some connections which

appeared appropriate based on the subscriptions and publications—are really in violation of the commander's objectives, and so it can deny those connections. Lastly, the broker can also recognize urgent connections and differentiate them from "less-urgent" connections. It can use that discrimination information to inform the communications network management facility to offer prioritized communications links for the information passing events that require special consideration.

All information passage in the environment (the Infosphere) becomes managed as information objects rather than communications links. This is a major breakthrough concept. We are no longer "network centric" —We're "information centric".

The simple model just grew to be complicated. However, it remains relatively simple in that each of the hypothesized services of the broker can be incrementally introduced and incrementally enhanced by taking a page out of the internet service providers' book (see the next section).

2. Commercial Products and Leveraging Industry

Search engines, profilers, publish/subscribe tools, agent technology, e-commerce, are all products that are arriving on our doorsteps from all quarters of the commercial and research internet communities. Current browsers and search engines provide the means for fairly simple connection of consumers of information to suppliers. There are increasingly sophisticated additional tools (e.g. streaming audio, video, bookmark keepers, language translators, etc.) that are available as "plug-in" compatible capabilities to augment the basic services of the browser or search engine. Just as the basic browser and search engine tools of the internet are getting more and more sophisticated by the addition of these "plug-in" tools, one can imagine the broker referenced above as being a collection of JBI "plug-in" tools. And, the business model that works for the internet could be applied to the JBI. No one organization needs to own the JBI, no one organization has the rights to all development activity. Instead, many organizations (i.e. small and large business enterprises associated with the military or civil commercial marketplace) can make profit by contributing to the JBI.

So, there emerges a new business relationship among the traditional government acquiring organizations and the industry development companies. Things need to be refocused towards getting industry to deliver "plug-ins" that work with the internet-like business model. Spiral development activities at places like the Air Force's Electronics Systems Command is one of the "popcorn kernels" that is taking place to support this new business relationship. Eventually various Product Area Directorates will be sponsoring these kinds of plug-in products.

3. Wrapping Legacy Systems

Legacy systems can be brought into the modern environment. A two stage process can be imagined (and could be followed). The first stage is for the legacy system to express the information it normally provides to external interfacing systems in a way that is readable and accessible by external systems that weren't previously connected. The simplest form of providing that information might be to set up a web page that has the normally provided information expressed in XML. Availability of this stage "one" system's information on a SIPRNET (the military secure version of the internet) would be a means for making the information available to "unanticipated beneficiaries". Once made available to others, the legacy system has the potential for showing "more value" than it had previously. (It is a rare program developer who can't see the marketing potential in making his/her system have a broader appeal to the constituent community!)

Stage two is for the legacy system to recognize that by exploiting other stage "one" information providers, the information products and efficiency of operation within the legacy system might be enhanced. So the stage "two" participants start to use browser and subscription technologies to seek the information made available by the stage one information publishers. As stage "two" legacy systems become more valuable (by exploiting the additional information that they previously weren't accessing), they become themselves more valuable stage on participants. (In the engineer's vernacular it's a positive feedback loop!)

4. Introducing New Systems

Object oriented information structures will be the wave of the future. As systems get built using object technology, participation in the JBI will be easier. The information that is published, no longer has to remain the information at the system's "boundary"—access to information inside of systems can be granted. Similarly, processing information doesn't need to be considered inside the boundaries of other systems. The processing can take place as "fuselets" or information object manipulators that exist in the environment on a variety of platforms but which interact among themselves to provide necessary services for various parts of the enterprise.

5. Operational Innovation Initiatives

The Air Force is a HUGE organization. People don't usually recognize how large and complex it is because one usually just thinks about the combat aircraft. The combat mission itself is quite complex, but when one examines the activities that are in the "background" — one finds real sophistication. In the days when our

adversaries were likewise large and potentially cumbersome, we were faced with what one might rudely call “dueling bureaucracies”. The fastest one wins. (And generally, the US Air Force was so well disciplined and so well constructed that it had the honors.) However, the situation is not only changed, it changes continuously. We don’t know who or what our next adversary will be. It could be a drug lord, a terrorist organization, a terrorist country, or a traditional communistic country; and the combat arena might be city streets, sparse desert terrain, or jungles. In any case, some of the adversaries aren’t blessed with the assets that we possess, and consequently don’t need the hierarchical chain of command that we use to keep our large organization in synchrony. That very simplicity could become an advantage for our adversaries in terms of responsiveness if we don’t do something to enable more flexibility to our forces. While incremental “do same stuff faster” approaches are possible using modern information technology, we’re on the brink of technology that could offer our defense department the chance to “do smarter stuff faster”. If one uses the information technology construct represented by the Joint Battlespace Infosphere to pass the right information to the right people at the right time, one could imagine that Information Technology allows synchrony of purpose to be maintained within the organization. If synchrony of purpose is maintained by the JBI, then we ought to be able to dismantle the old bureaucratic hierarchical structure that previously was used to achieve that synchrony and reassemble a flatter structure. The internet model will allow distributed functions thereby preventing “single point failure”. And, it can enhance the AF emphasis on decentralized execution authority. The concept of the JBI becomes especially important for providing the tactical commander in the field with all the insight normally available only at specialized information centers. And more important it can provide that information without the clutter of superfluous information. The result can lead to reduced micro-management of tactical field commands because the most complete situation awareness will reside in the field.

This would be a breakthrough of immense consequence. I can’t provide the specifics just as the original internet designers couldn’t predict our current internet world. However, just as the original internet developers knew they were onto “something”—We’re onto something here too. It will require participation by the whole community: the technologists, to provide the tools; and the operators, to invent the new organizational structures.

6. Omissions

Information assurance. There has been major success at providing public key capabilities. There is increasing concern and therefore increasing attention applied to protecting the integrity of transactions over the internet. This improvement has come about because the desire for e-commerce needs to assuage the fears of theft of credit card numbers, and more important theft of privacy. So there’s finally surfaced a commercial impetus towards computer security. But the game isn’t won. We’ve still problems with active code, and inadequately tested code. Lastly, the military would like to see multilevel security that recognizes the varying degrees of “need to know” associated with information management.

Real time responsiveness. While the vision is beautiful, it requires attention to TIME. Time doesn’t scale when the volume is large. We’ll always need a prioritization strategy that allows us to work within the limitations of time. Time hasn’t been in the commercial world headlights as an issue. Everyone just assumes Moore’s Law (or its derivatives) will prevail—and everyone will be happily served. The problem is that not everyone is created equal in the combat environment. Some people are trying to “dodge speeding bullets”, and we need to give them priority. So, mechanisms for managing time will still be needed—and the solution mechanisms need to scale beyond the bounds of the individual system and into the realm of the Joint Battlespace Infosphere.