Horizontal Fusion: Enabling Net-Centric Operations and Warfare

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The terrorist attack on the Pentagon on Sept. 11, 2001 jeopardized America's command and control system at the very moment the system was most critically needed. Consequently, the U.S. Department of Defense has developed an initiative that enables the military to establish net-centricity, which is a global, Web-enabled environment that leverages existing and emerging technologies. Net-centricity makes it possible to move beyond traditional communities of interest such as command and control or intelligence, to full information exchange across the battlespace. The Horizontal Fusion Initiative is the user-oriented catalyst for net-centric transformation of the department. It will provide real-time situational awareness across the battle chain, allowing users to control and tailor needed information. Users will be able to broadly search or set preferences and subscribe to military operations and intelligence information that support their mission.

On Sept. 11, 2001, the unthinkable in the Department of Defense (DoD) happened. Five terrorists using an American Airlines plane as a weapon attacked the military headquarters of the world's sole superpower in an attempt to decapitate the most lethal military force on earth. While two similar attacks had just taken place in New York City, the attack on the Pentagon cut one of two major trunk lines into the Pentagon, jeopardizing America's command-and-control system at the very moment the system was most critically needed.

This incident called into question everything about how the military manages information. Should the military still have been based on hierarchical structures wired in series? Did every node in the system add value to the information, or was much of the information needed raw but immediately by warriors in the field? Could warriors in battle effectively marshal sufficient data to perform the mission in an age of interconnected forces that needed rapid targeting decisions and zero friendly fire? Could warriors at the edge of the spear make sense of the data they got? The answers were transformational: horizontal fusion.

Horizontal fusion is a new initiative sponsored by the office of the DoD chief information officer (see Figure 1). It is a critical element in Secretary of Defense Donald Rumsfeld's vision of force transformation – to "think differently and develop the kinds of forces and capabilities that can adapt quickly to new challenges and to unexpected circumstances."

An important factor in force transformation is *power-to-the-edge* – equipping warfighters across the entire battlespace with the ability to access needed information at the right time to make the right decisions. Power to the edge means making information available on a network that people can depend on and trust, and populating the network with new, dynamic sources of information to defeat the enemy while denying the enemy advantages and exploiting its weaknesses.

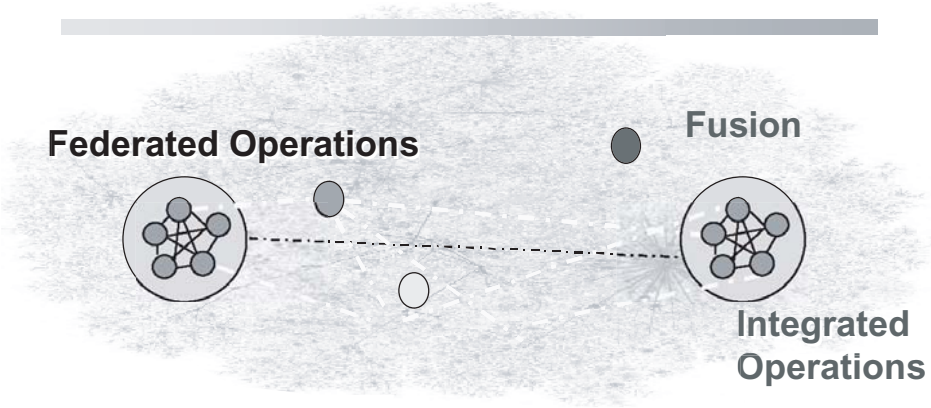
Achieving power to the edge means achieving net-centricity, which is a global, Web-enabled environment that leverages existing and emerging technologies. It assures user-focused information sharing, information fusion, sense making (of complex and ambiguous situations) and decision making across the battlespace. Net-centricity makes it possible to move beyond traditional communities of interest such as command and control or intelligence, to full information exchange across the battlespace.

A central benefit of net-centricity is the increased availability of information via the Task, Post in Parallel, Process in Parallel, and Use in Parallel (TPPU), or *smart pull* paradigm (see Figure 2). For TPPU to work, information must be posted immediately before it undergoes lengthy processing. The principle recognizes that users are smarter than their sources about what is needed operationally right now, unlike the legacy process, Task, Process, Exploit, and Disseminate.

Smart pull means that information is more accessible and gathered in smarter ways: cycle-time is in seconds; infrastructures are interoperable; real-time collaboration supports both standing and ad-hoc communities of interest; networks are robust; bandwidth is secure; operating

Figure 1: *What Is Horizontal Fusion?*

Horizontal fusion ensures that warfighters and analysts have timely and assured access to critical data and the leading-edge capabilities to make sense of that data.



Horizontal fusion is net-centric with the following:

- A focus on data and cross functional posting.
- Ad hoc access to and fusion of data that are created by operations that are both integrated and federated.
- A focus on making sense of that data.

mode is risk management vs. avoidance; and security supports and protects processes, not the other way around. The result is a warrior at the tip of the spear who can access critical information in real time – patrolling both their physical battlespace and the information cyberspace.

Net-centric transformation relies on these efforts:

- **The Global Information Grid (GIG) Bandwidth Expansion Program.** Provides a secure, robust, optical Internet protocol terrestrial network.
- **Joint Tactical Radio System.** A family of software-reprogrammable radios based on an open-communication architecture that will provide interoperable, tactical, wideband Internet protocol communications capabilities.
- **Wide-Band Satellite Communications.** Provides ubiquitous communications with optical quality bandwidth to mobile and tactical users.
- **Net-Centric Enterprise Services.** Provides the infrastructure services to support the broad range of applications and data used in a net-centric enterprise.
- **Information Assurance.** Supports all efforts to ensure that the net is robust, reliable, and trusted.
- **Horizontal Fusion.** Net-centric applications and content needed to provide analysts and warfighters with the ability to make sense of complex and ambiguous situations.

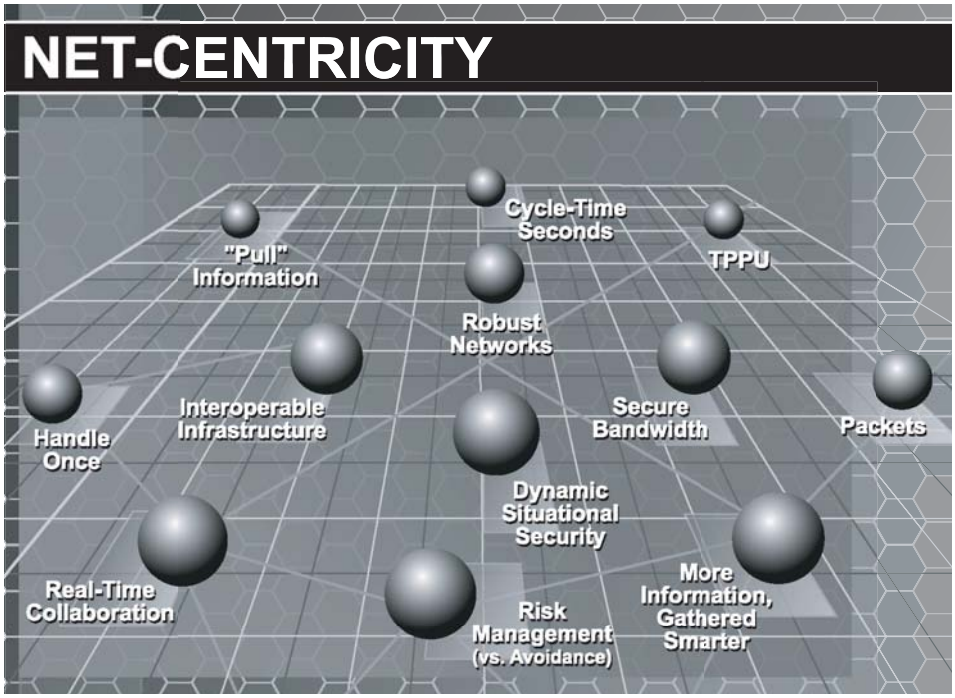


Figure 2: *Net-Centricity Paradigm*

The Portfolio Concept

Horizontal fusion is the user-oriented catalyst for net-centric transformation of the DoD. It will provide real-time situational awareness across the battle chain, sense-making tools, and collaboration among multiple communities of interest and critical intelligence information sharing (see Figure 3).

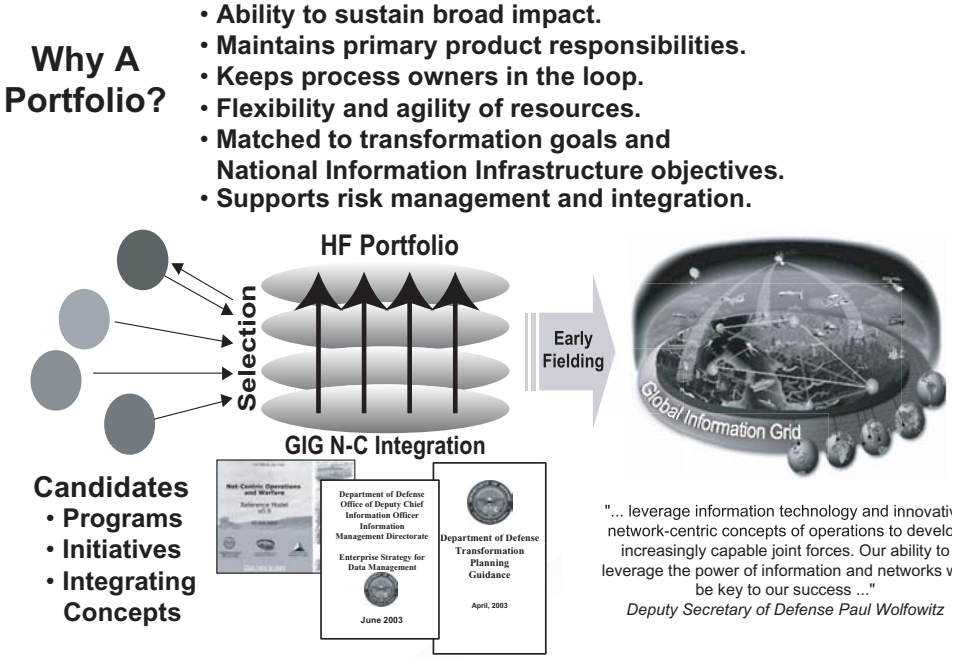
The 2003 Horizontal Fusion Initiative integrates advanced technologies to make the *quantum leap* to net-centric operations, emphasizing support to warfighters located at the edge of the GIG. The objectives for the 2003 Horizontal Fusion Initiative are computing at the edge, publishing information to the GIG, sharing intelligence and surveillance and reconnaissance data in the DoD and the intelligence community, improving operational-intelligence data interoperability, and exploiting many diverse data sources and providing the tools to make sense of the data.

Horizontal fusion is not a single program, but a portfolio of net-centric initiatives. Using a common architecture and integration process, these initiatives are woven into an information tapestry called the Collateral Space, which is accessed via a portal. The portal's main characteristic is that users can control and tailor the pull and portrayal of information. Users are able to broadly search or set preferences and subscribe to military operations and intelligence information that supports their mission.

The 2003 Horizontal Fusion Quantum Leap-1 (QL-1) effects-based assessment and demonstration involves warriors at the edge of the network who can tap various communities of interest and achieve the speed of command and performance improvement needed to neutralize a time-critical target. The scenario for QL-1 was chosen to assess the value of the Collateral Space as the warriors' ready source of situational awareness in a net-centric environment. All capabilities successfully demonstrated remain in place and available for operational use.

Horizontal fusion does not end with

Figure 3: *Horizontal Fusion's Portfolio Concept*



Coming Events

February 1-4
3rd International Conference on COTS-Based Software Systems
Redondo Beach, CA
www.iccbss.org/2004

February 2-7
IT Service Management Forum Conference and Expo
Washington, D.C.
www.jupiterevents.com

February 3-5
WEST 2004
Western Conference and Exposition
San Diego, CA
www.west2004.org

March 1-3
17th Conference on Software Engineering Education and Training (CSEET 2004)
Norfolk, VA
www.cs.virginia.edu/cseet04

March 8-11
Software Engineering Process Group Conference 2004
Orlando, FL
www.sei.cmu.edu/sepg

March 29-April 1
Defense Technical Information Center Annual Meeting and Training Conference
Alexandria, VA
www.dtic.mil/dtic/annualconf

March 30-31
3rd Annual Southeastern Software Engineering Conference
Huntsville, AL
www.ndia-tvc.org/SESEC

April 19-22
2004 Software Technology Conference
Salt Lake City, UT
www.stc-online.org

QL-1; activities are programmed through 2008. In 2004, we will concentrate on expanding to other communities of interest with the Collateral Space and piloting additional enterprise services. Cross-domain information sharing and secure wireless communications are major investment areas. We will continue to add edge users and data sources to the Collateral Space. Working with the intelligence community, we will demonstrate cross-domain information sharing and collaboration in QL-2.

As the Horizontal Fusion Initiative progresses, it will be collaborative and contribute to other transformational efforts such as the Office of Force Transformation (focused on Force Transformation), and Joint Forces Command (focused on inter-service interoperability), as well as current and emerging efforts to transform warfighting and intelligence paradigms into 21st century realities.

The horizontal fusion portfolio will continue to provide value to the warfighters in several ways:

- Incorporating and tagging data from all sources and allowing it to be seen and used in innovative ways.
- Providing sense-making tools to analyze and understand this diverse and immense data set.
- Assuring that data pulled are qualitative, not quantitative.
- Achieving rapid insertion of tools and capabilities that will implement net-centricity across the department.
- Leveraging legacy investments while influencing future investments and introducing new technologies.

With these activities, the overarching goal of horizontal fusion is to be the catalyst for net-centric transformation of the department. It will support DoD and the intelligence community in accelerating efforts to achieve superiority in the transformed battlespace.

It can be summed up this way: By placing the information that is needed immediately at the fingertips of our people who need it, horizontal fusion will revolutionize how America wins wars, and greatly streamline our business processes. No one node of our system of systems will be the chink in our armor allowing an enemy to inflict a mortal wound. No enemy will get inside our observe-orient-decide-and-act loop, because there will be no challenger who can harness facts faster or act more decisively. Horizontal fusion gives us the power to prevail in an age of net-centricity. It will transform the department just as it will transform the world.◆

About the Author

John P. Stenbit is assistant secretary of defense for Networks and Information Integration and chief information officer of the Department of Defense. He has more than 30 years of public- and private-sector service in the telecommunications and command and control fields. This includes two years as principal deputy director of Telecommunications and Command and Control Systems for the Department of Defense, and two years as staff specialist for Worldwide Command and Control Systems in the Office of the Secretary of Defense. Previously, Stenbit was an executive vice president of TRW and was responsible for the planning and analysis of advanced satellite surveillance systems. Prior to that, he was at the Aerospace Corporation and was involved with command and control systems for missiles and satellites, and satellite data compression and pattern recognition. He has chaired the Science and Technology Advisory Panel to the director of Central Intelligence, and served as member of the Science Advisory Group to the directors of Naval Intelligence and the Defense Communications Agency. He also chaired the Research, Engineering and Development Advisory Committee for the administrator of the Federal Aviation Administration. He has served on the Defense Science Advisory Board, the Navy Studies Board, and the National Research Council Manufacturing Board. In 1999, Stenbit was inducted into the National Academy of Engineering. He has bachelor's and master's degrees in electrical engineering from the California Institute of Technology.

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