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Key Points

- Dealing effectively with contemporary security challenges requires prepared coalitions of partners that are able to operate together.
- The Global Knowledge Networking (GKN) initiative supports local decisionmaking and makes knowledge actionable. Its core is the "composable organization," where people, ideas, processes, and technology can be brought together as needed.
- The GKN supports initiatives from NATO's Wales Summit, focused especially on interoperability and capacity-building. A proposed Gulf Knowledge Center test bed also would support recent decisions by a Gulf Cooperation Council Summit concerning military command and education.
- Building new learning tools with coalition partners can improve common understanding and shared procedures. This vision is a key part of the next generation of training and readiness capability, led by the Office of the Under Secretary of Defense (Personnel & Readiness). The GKN initiative could be adapted for regions beyond the Gulf.

Global Knowledge Networking: Smart Strategies for Promoting Innovative Learning and Leader Development

by Walter L. Christman, Frank C. DiGiovanni, and Linton Wells II

Smart security builds on actionable knowledge. The North Atlantic Treaty Organization (NATO) Wales Summit in September 2014 highlighted the need to build on partnerships to prepare and operate together better. Building on the successes of past partnership initiatives and capabilities, this paper proposes new ways to embrace and extend techniques and relationships originally developed under successful Secretary of Defense (SECDEF)-level memoranda of understanding (MOUs) within NATO's Partnership for Peace (PfP) program. The Global Knowledge Networking (GKN) initiative supports smart decisionmaking by educating and training tomorrow's agile, resilient, and effective leaders. GKN is a network of people, ideas, and processes to make knowledge actionable and is focused on improving on U.S. and coalition interoperability through improvements in existing training and education capabilities. It has begun to convene strategic dialogues around key challenges and collectively owned opportunities. Its initial framing is globally relevant and focused on the Arabian Gulf region through a proposed test bed for collaboration with the member states of the Gulf Cooperation Council (GCC). This will allow new tools for interoperability to be explored and created together as enablers of joint capability. Drawing on the experiences of NATO's Partnership for Peace, it will promote an innovative systems approach that could help cultivate and sustain more effective security partnerships around the globe.

Introduction

The U.S. Department of Defense (DOD) and NATO recognize that today's increasingly complex, dynamic, globalized, and evolving challenges require both collaborative approaches with partners and innovative ways of learning for leader development. NATO Summit communiqués, defense reviews, and other security policies reflect this. To implement them, however, the Alliance and member nations will have to integrate political, economic, and civil instruments in concert with military means, based on a greater understanding and appreciation of the operational environment. Significant changes in national and global security strategies and expenditures will be needed as well as, in some cases, changes in core security concepts. Any new approach must empower stakeholders, encouraging partners at many levels to contribute their solutions to shared problems. As Carol Dumaine observed, "the globalization of national security risks demands the globalization of cooperation."[1]

GKN will help develop agile, resilient, and effective leaders who can recognize, analyze, and solve complex "wicked problems" better

This *cooperation* is best approached through international partnerships drawing on holistic systems-and effects-based thinking designed to support both global security and sustainable development. New platforms to promote global research and educational partnerships will be needed. This, in turn, promotes a new paradigm of defense and military training and education, one that encourages lifelong personalized learning, creativity, and active engagement supported by the judicious use of modern technology tools and networks, community-building, and citizen participation.

The synchronization of land, sea, air, space, and cyber campaigns will remain a cornerstone of joint and coalition operations. However, the diversity of global challenges increasingly poses an additional demand: the need to achieve *unity of purpose* and *unity of effort* among such diverse players even when there is no *unity of command*. Achieving such unity requires that engaged actors have sufficient common appreciation of the challenges being addressed, the current situation, and the desired endstate, as well as a common framework in which to address the problems.

To help create the necessary shared understanding and common appreciation, the GKN initiative is intended to enhance U.S. coalition interoperability through improvements to existing training and education capabilities. It would build on and incorporate proven achievements and capabilities developed over the past 15 years in a variety of areas, to include: NATO's PfP, improved tools to support innovative and personalized lifelong learning supported by point-of-need content delivery, and the development of technologies to support distributed collaboration, analysis, and simulation.

The primary objective of the GKN initiative is to provide a framework that will promote learning for today's decisionmakers and their successors to help them become more agile, resilient, and effective leaders. The GKN framework provides for practical, cross-cultural, and interagency collaboration, while cultivating and sustaining security partnerships around the globe. GKN builds a dynamic, collaborative federated network of people, ideas, and processes to make knowledge actionable. It can address current and emerging challenges, initially in such areas as disaster preparedness and humanitarian assistance, to build community resilience. Over time it could respond to threats to the environment, human security (including health), maritime and cyber security, and energy security, as well as challenges posed by terrorism and hybrid warfare.

GKN focuses on knowledge development for collective intelligence, enabling a better understanding of

complex problems by exploiting information and analyses from diverse sources. It will help organizations better prepare and operate together to confront diverse challenges by improving situational awareness, supporting collaborative planning,[2] and helping to determine the most appropriate responses using both military and nonmilitary means. A unified knowledge development process, which would encompass all the involved decisionmakers and their respective staffs, would:

- provide more comprehensive and adaptive perspectives based on shared trust (which must be built)[3] in contrast to the currently stovepiped (yet still highly dynamic) problem space
- enhance and unify existing, noncoherent knowledge-development techniques in various organizational subunits, including the promotion of personalized learning
- promote communities of interest that would encourage lifelong learning and knowledge generation
- systematically capture knowledge in ways that support leaders and organizations in working better together
- support improved interoperability between actors across a wide spectrum of tasks using agreed-upon information formats
- make knowledge persistent in organizations so they can be less reliant on access to subject matter experts, who may not be available when needed.

A whole array of new security risks accompanies the problems of globalization, many of which are so-called *wicked problems*[4]—hard to define clearly and highly resistant to resolution. The phrase, coined by Rittel and Webber in 1973, evokes a problem considered extremely difficult or impossible to solve due to incomplete, contradictory, and/or changing requirements that are often hard to recognize or anticipate. Multiple stakeholders make it hard to arrive at an agreed-on definition of any particular wicked problem, much less a solution. Viral global threats can intersect and combine into larger order problems, creating cascading effects. Many of these problems show a hydra-like resilience. Due to complex interdependencies, efforts to solve one aspect of a wicked problem may reveal or create other issues, and so the approaches often have to be iterative, despite our incentive structures that reward steadfastness and resolution.

To address such wicked problems, GKN can serve as a catalyst for new areas of research and education. If knowledge is power, then restructuring the way knowledge is created and shared will revise power's distribution, creating new opportunities for innovative solutions. Many organizations around the globe are engaged in research to solve technology gaps and social ills, but few can take full advantage of the vast intellectual capital now at their disposal. By taking a more "systems approach" to innovative learning, GKN can help leaders recognize, align, synchronize, and harmonize options and solutions across a wide set of dynamic variables. In turn, this can help make them more agile, resilient, and effective leaders and better able to address the challenges posed by wicked problems. Since one of the GKN initiative's aims is empowerment—customizing cooperative associations to face increasingly interrelated global risks—it can help distribute these skills across the leaders of a coalition.

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Hybrid warfare, for example, is a growing challenge to the United States, NATO members, and potential partners, including friendly Arab states. It is a potent, complex blend of conventional, irregular, and cyber warfare through the systematic and synergistic incorporation of a wide array of military and paramilitary concepts. It can include nuclear, biological,

and chemical weapons, improvised explosive devices, and information warfare. This significantly raises the demand for comprehensive responses and the need for shared knowledge and understanding to build the trust necessary to prepare and operate together against such threats.

The GKN initiative and its processes are intended to transform traditional security exercises and classroom instruction by creating on-call, real-time, composable training events that emulate emerging crises and complex emergencies. The concept of composable training means that training events can be constructed "on the fly" because the underlying foundation material is granular enough to be repurposed. To achieve this, the GKN initiative is intended to advance (to the next-generation level of capability for multinational engagement) some of the leading elements of the DOD Combatant Commanders' Exercise Engagement and Training Transformation (CE2T2) program[5] in concert with other activities, such as the DOD Regional Centers. As a network of people, ideas, and processes to make knowledge actionable, GKN seeks to strengthen existing policies and programs in order to promote the next generation of training transformation.

Building Global Networking to Address 21st-Century Challenges

Dr. Talal Abu-Ghazaleh, one of the Arab world's leading information technology advocates and a former chairman of the United Nation's Global Alliance for Information and Communications Technology and Development, told the First Arab Conference on Arabizing the Internet that "[t]echnology is not simply additive; it is more often exponential. An invention usually triggers other inventions."[6] The technology applications included in the GKN initiative are not new. They were pioneered as part of the 1999 NATO Summit in Washington with the decision to establish a Training and Education Enhancement Program (TEEP) under NATO's PfP program. The TEEP consisted of three interrelated elements: the PfP Training Centers; a PfP Simulation Network; and the PfP Consortium of Defense Academies and Security Studies Institutes. Promoted by then–Secretary of Defense William Cohen, they were expected to lay the foundations of a global security network for the 21st century and came to include SECDEF-level Memoranda of Understanding (MOUs) with Sweden and Switzerland.[7] The GKN concept can build on more than 15 years of success from these initiatives, which have developed a global security network that employs regional schools, distributed learning and simulation, and a networking of institutions. The challenge today is to embrace and extend these capabilities through a next-generation effort—to "trigger other inventions," in Dr. Abu-Ghazaleh's words. This could start with a pilot project in another region of the world, such as the Middle East with the member nations of the GCC—Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE). Follow-on endeavors may extend to Asia, Latin America, and Africa.

The GKN initiative supports the requirements stated in the NATO Wales Summit Declaration of September 4–5, 2014, in which NATO Heads of State and Government reaffirmed their commitment to building partnerships and the development of a broad cooperative security network.[8] The Summit Declaration promoted the development of an "Interoperability Platform" by declaring the resolve of the nations to build on the legacy of the Partnership for Peace at its 20th anniversary, and likewise celebrating "ten years of the Istanbul Cooperation Initiative, which has helped to promote understanding and security cooperation with our partners in the Gulf region." The Summit Communiqué further affirmed, "We will . . . look to further develop relations with relevant regional international organizations, such as the Gulf Cooperation Council and the Arab League . . . including in the context of regional crisis situations." The Summit messages were reinforced at Allied Command Transformation (ACT) Chiefs of Transformation Conference in December 2014.[9]

The GKN and Gulf Security: Establishing a Regional Test Bed Pilot Project

Since 1987, when the GCC member states approved a comprehensive security strategy,[10] a general framework has existed for organizing mutual cooperation in multiple aspects of defense and security. Since then, and particularly in the past decade, GCC members have taken important steps to develop their defensive capabilities, strengthen their bilateral relationships with Western militaries, and integrate their armed forces. They have recognized the value of significant investments in relevant research and training. For them, a key question has become: What is needed to strengthen our existing capabilities beyond what has already been done?

There is no doubt that the Gulf region is a particularly challenging part of the world where possibilities for miscalculation and misfortune abound. Iran's emergent nuclear capabilities and regional ambitions, as well as its support of militant Shiite movements, represent but one example. The Israeli-Palestinian conflict is another. The civil war in Syria provides many examples of hybrid warfare, not only by Bashar al-Asad's regime, but also by radical extremists.[11]

In December 2013, these developments obliged the six leaders of the GCC member states to deepen preparations for mutual military assistance. They established a Joint Military Committee to supervise cooperation and a Joint Military Command to promote collaboration, in addition to joint military exercises and better coordination in the field of military industries.[12] They also agreed to establish the Gulf Academy for Strategic and Security Studies in the UAE. The academy aims to increase knowledge transfer and address threats across the entire Gulf region. The future academy will initially focus on missile defense, border security, and counterterrorism. Establishment of a Joint Command Structure and Academy is part of an intensified construction of a regional security architecture, which began with the Peninsula Shield force in 1984. The participants at the December 2014 Summit meeting of the GCC in Qatar agreed to create a joint naval force based out of Bahrain and a UAE-based law enforcement agency (GCC-POL) for sharing intelligence and dealing with organized crime. The Joint Military Command, which would be based in Riyadh, will allow the GCC to deal better with outside threats, especially from Iran, while the GCC-POL will share information to combat regional crime and terrorism.

The civilian and military organizations that would participate in this unified endeavor are at different levels of scale, maturity, and readiness. This can have severe consequences in a crisis from a *unity of effort* perspective. To assure adequate response to a complex security situation—for the protection of both lives and critical infrastructure, for example—both common procedures and comprehensive training will be required. Network-connected simulated exercise scenarios can help to build shared readiness and capability.

GCC members have taken important steps to develop their defensive capabilities, strengthen their bilateral relationships with Western militaries, and integrate their armed forces

Leading figures in the Arab world are speaking out on the need to address these challenges. In February 2014, Dr. Nabil Elaraby, the Secretary General of the Arab League, addressed the Crisis and Emergency Management Conference in Abu Dhabi. Dr. Elaraby spoke on the issue of "The Future of Collective Arab Action,"[13] and he asked League members to develop common policies to deal with economic, political, social, and security problems. The region is facing growing challenges, and the "nature of these challenges imposes on the Arab states the necessity to work jointly. . . . We are capable, if we have the

vision and will and if we work on developing Arab policies, to achieve a lot, like the European Union and the African Union."

These statements supported the December 2013 GCC leadership decisions. To that end, Arab states have begun working on a regional emergency network to coordinate their responses to crises, ranging from political upheaval to armed revolt and from natural disasters to disease pandemics. The Arab League has already set up an early intervention center to strengthen the capabilities of countries facing risks and emergencies. The second phase of the project now foresees a network for all Arab states to communicate in a crisis in order to pool efforts and ensure swift political response and action. As

a GKN-like pilot program embraced by the GCC states could contribute to a shared understanding of the crisis/operational environment in this strategic region

Dr. Elaraby stated, "Complex events require an ability to read and analyze all the information and to give decision-makers proper knowledge to make good decisions at good times. . . . That requires a rapid ability to gather information . . . to guarantee effective response and provide good recovery."

The need for the United States and NATO to strengthen their own knowledge-development processes to meet emerging challenges creates precisely the opportunity that Dr. Abu-Ghazaleh suggested. A GKN-like pilot program embraced by the GCC states could enable the collection, analysis and distribution of information in the Gulf area that would contribute to a shared understanding of the crisis/operational environment in this strategic region. The development of a "Gulf Knowledge Center" could help identify, build, and develop an important knowledge base in the Gulf region—and also beyond—as a continuous, adaptive, networked activity carried out at the strategic, operational, and tactical levels. It could provide:

- local horizon scanning and monitoring
- assessment of crisis situations
- development of response options
- operations planning and/or civil emergency planning
- crisis management
- return to stability/normality.

Within the different phases of any GCC Crisis Management Process, four key functions—Sensing/Framing, Planning, Implementation, and Assessment—must rely on knowledge development. Switching from traditional reactive approaches to a more proactive knowledge-development approach would reduce barriers to collaboration within respective national and regional crisis management organizations and increase the effectiveness of collaborative responses. This would also provide a more coherent understanding at all decisionmaking levels.

It is worth noting that the NATO Wales Summit "Partnership Interoperability Initiative" identified the UAE as an "Interoperability Platform" partner among the Arab nations and Jordan as a "Defense and Related Security Capacity Building" (DCB) partner. As these two nations have agreed to these roles and designations with NATO, it would appear that the GKN initiative encompassing both could be within reason. To promote rapid knowledge development, a pilot project called "Gulf Knowledge Center"—to be established at an appropriate location in the Gulf region or possibly by common agreement in another country such as Jordan—could enhance coalition responses through a global, network-enabled environment. A placeholder title for such a prototype endeavor could be "Gulf Knowledge Online."[14]

In whatever manner a pilot project might be developed, it is important to draw from both regional

sources and the knowledge base of the GCC's international partners, such as the United States and its NATO Allies, to form a more collaborative information-sharing environment. The goal would be to leverage existing and emerging technologies in a "smart-pull" fashion and co-develop next-generation applications. The proposed GKN learning environment could become a continuously available education resource that could help guide the planning and execution of disaster and crisis preparedness as well as joint operations in the execution of a crisis response. Were this to be joined with a curriculum, degree-granting and certification initiatives for defense and military professionals from throughout the region, and the development of online strategic wargaming capabilities, then the eventual establishment of a GCC Virtual Security University might be possible, which would be a significant achievement.

GKN: Key Concepts and a Strategic Roadmap

The GKN initiative is intended to promote coalition interoperability worldwide. In U.S. military training and education it would be a key component in next-generation capability, using advanced distributed learning (ADL) and simulation networks. Initial concepts already are being explored in collaboration with NATO and GCC members. These can build on relationships and methods from the successful SECDEF-level MOUs under NATO's PfP program noted earlier, forging partnerships of nations that can prepare and operate together. It can be followed by appropriately tailored networking initiatives and consortium approaches in Asia, Latin America, and Africa.

A concept of operations and a strategic roadmap for the Global Knowledge Network initiative will need to be developed to inform the creation of a "GKN Learning Environment." These can identify effective pathways for both individual and collective education and training opportunities for U.S. and coalition military forces as they prepare to operate together, very often in collaboration with host-nation governments, nongovernmental organizations (NGOs), and international organizations. A central issue is the collaboration strategy necessary to achieve *unity of effort*.[15] In this regard, Joint Publication 1-02 provides the following useful definitions:[16]

- Unity of effort: Coordination and cooperation toward common objectives, even if the participants are not necessarily part of the same command or organization—the product of successful unified action.
- Unified action: The synchronization, coordination, and/or integration of the activities of governmental and nongovernmental entities with military operations to achieve unity of effort.

The remainder of this paper advances the C5 (command, control, cooperation, coordination, and collaboration) concept as an integrating strategy for a "composable organization" model as the core feature of the GKN initiative. *Composable* means that organizational elements can be brought together as needed. Together with the C5 concept, this approach is well suited to pursuing unified action and enabling unity of effort. An important reference is the 4th edition of the *Insights and Best Practices Focus Paper: Interorganizational Coordination*, written by the Deployable Training Division of the Joint Staff J7 and published by the Joint Staff J7.[17]

The GKN initiative, as it fosters the next generation of training transformation capabilities to empower C5 thinking, globally proposes to build on three existing foundations. First are U.S. DOD components that support online learning as part of individual training. Second are collective-training components with prior direct experience with NATO-PfP education and training initiatives. The third capability is represented by the DOD Regional Centers managed by the Defense Security Cooperation Agency. The GKN initiative, therefore, is not just another communications pipeline. Rather, it is a powerful catalyst to enable global knowledge development for collective understanding that may ride on any chosen network, whether it

is classified, unclassified, or the Internet. This concept should be further refined and developed in the spirit of emerging concepts for Multinational Information Sharing networks. There is a need to integrate all potential contributions across all communications channels into a more holistic interoperability platform for worldwide application, which will allow qualified users anywhere to create the composable organization in a "smart-pull" fashion. The composable organization is, in essence, a fusion center in the hands of users to employ worldwide collective intelligence for collaboration and decisionmaking, even to address local problems.

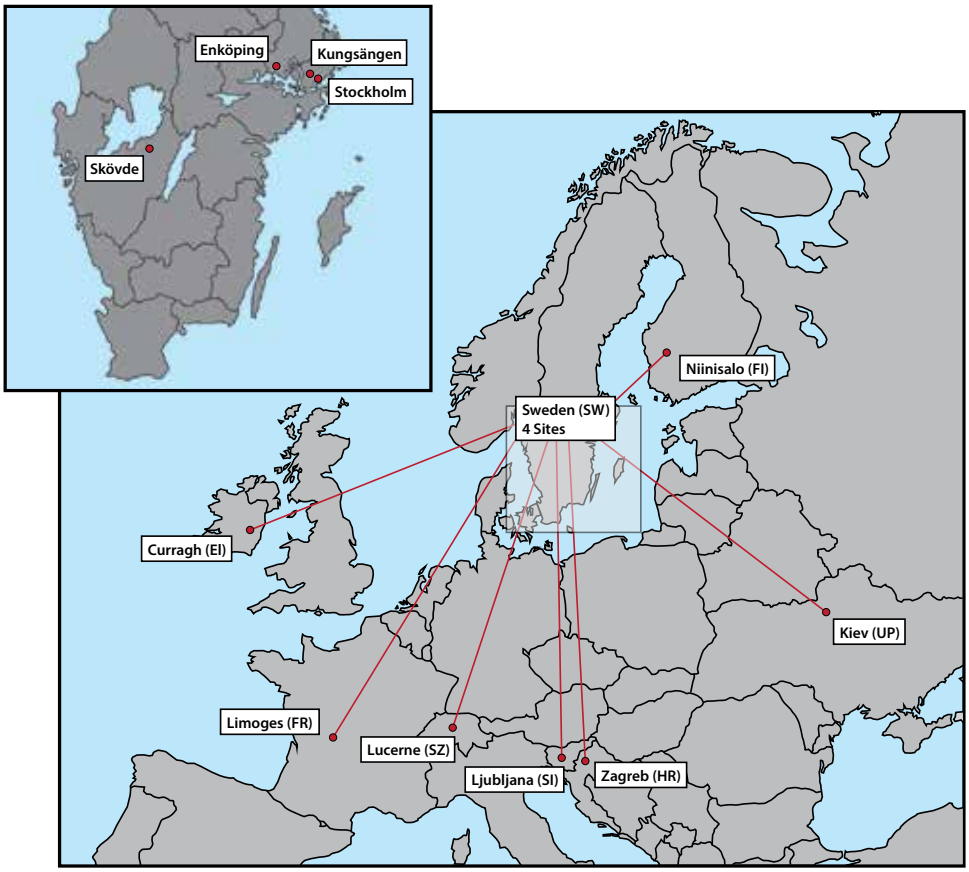
1. Individual (Personalized) Learning. Wisdom for action emerges from the collective intelligence and situational awareness formed through experience. The U.S. military typically groups "learning" into the stovepipes of training, experiential learning, and education. Yet capabilities are available today to support continuous lifelong learning, from recruitment to retirement, with point-of-need content delivery. One of the key elements of personalized learning is big data and the granularity of the knowledge database, which can include curricula, performance indicators, and organizational goals. Personalized learning could be a course, document, or doctrine. This promotes both organizational and personal learning goals.[18] Today, several diverse U.S. and NATO initiatives must be enhanced to achieve such an endstate.

the GKN initiative is intended to promote coalition interoperability worldwide and enable global knowledge development for collective understanding

The GKN challenge is to make these tools more relevant and accessible. Both U.S. and coalition military forces should be able to access the same learning events, in the native languages of students and organizations, through a learning management system via their local duty stations, their homes, or when deployed. "Anytime, anywhere" availability currently allows U.S. military personnel to study at their own pace and arrive better prepared. An Interactive Learning Library for Training and Exercise Environments can further enhance preemployment preparation for foreign military personnel. The National Defense University's "Innovative Learning" initiative should be engaged, along with NATO e-learning innovations. Supporting concepts and capabilities developed under the U.S.-Swiss MOU for PfP ADL should be investigated and considered for incorporation into the GKN approach. The initial cadre of learning events for a "Gulf Knowledge Online" pilot project will likely emerge from U.S. online learning repositories and may be augmented by the curriculum of leading DOD, NATO, and PfP education and training centers as well as input from leading regional research centers.

2. Collective Learning. Organizations as well as individuals must learn and adapt. Based on U.S. capabilities and NATO's PfP Simulation Network (PfP SIMNET), the GKN roadmap and concept of operations should investigate options to develop distributed computer-assisted exercises (CAX) using realistic, regionally relevant, and appropriate scenarios and also invite coalition military forces and civilian agencies to participate in developing the framework. NATO training installations, including the U.S. Joint Multinational Training Center (JMTC) and the NATO Joint Force Training Center in Bydgoszcz, Poland, would be natural partners to engage. In particular, JMTC's robust and dynamic expeditionary training teams, who bring efficient and effective training solutions anywhere they are needed, could set excellent examples of what to achieve. The Naval Postgraduate School's Massively Multiplayer Online War Game Leveraging the Internet (MMOWGLI) is a particularly notable way to address "wicked problems"—indeed, doing so in an environment of trust created by allowing players anonymity in game play. MMOWGLI could also be the launching point for communities of interest in which lifelong learning could be promoted.

Figure 1. Viking Exercise Example Distributed Simulation Architecture



Coalition military forces and their counterpart national civilian organizations in an (eventual) GKN learning environment system should be able to participate in an exercise from their national simulation facilities, defense academies, or regional training centers as appropriate. For more universal application, the GKN should explore the PfP SIMNET implemented by Sweden in the Viking series of exercises (see figure 1). Adding practical experience to the knowledge gained from GKN advanced distributed learning courses in conjunction with such events would enhance effective performance in the field. Additionally, exposure to the civilian organizations that support stability operations, but in a training environment, would reduce cross-cultural barriers and foster mutual trust and confidence.

In due course, a U.S. Central Command (USCENTCOM) exercise for the Gulf and GCC could build on these experiences and best practices developed elsewhere. The goal should be to enable the GCC nations to improve their interoperability by building a learning organization that adapts to a continuously changing environment. In other words, the objective should be to develop adequate capabilities and capacity in mission command training, incorporating technical innovations to provide service, joint, interagency, and multinational capabilities at home and across the GCC area of responsibility. In principle, the challenge is to "win in a complex world." To this end, collaboration partners need to detect the specifics in their lack of interoperability—nationally, within the GCC, and with U.S. and NATO partners.

3. The DOD Regional Centers. The five DOD Regional Centers provide unique academic forums for building strong, sustainable international networks of security leaders. These networks promote enhanced policy understanding and mutually supporting approaches

to security challenges, effective security communities that support collective and collaborative action, and improved sustainable partner institutional capacity and capabilities. The Regional Centers accomplish their mission primarily through resident and in-region programs, including conferences, seminars, and courses, as well as through bilateral workshops, alumni outreach events, and research publications. The center locations and dates established are as follows:[19]

- George C. Marshall European Center for Security Studies, Garmisch, Germany, established 1993
- Asia-Pacific Center for Security Studies, Honolulu, Hawaii, established 1995
- William J. Perry Center for Hemispheric Defense Studies, Washington, DC, established 1997
- Africa Center for Strategic Studies, Washington, DC, established 1999
- Near East-South Asia (NESA) Center for Strategic Studies, Washington, DC, established 2000.

The particular DOD Regional Center most closely associated with the Gulf region is NESA, which is presently assisting in the development of a National Defense Academy for the UAE.

4. The Composable Organization. The development of the GKN roadmap for implementation should include examination of the composable organization capability based upon the C5 principles described earlier. The composable organization is a propositional concept: it loosely represents the idea of a global, on-call, community-oriented knowledge development process that fosters collective awareness in order to empower the leaders of organizations who see the need to compose team-oriented responses using global assets. It implies the development of "fusion center" capabilities empowering participants to choose and invite collaboration partners to help establish and manage "unity of effort" to address local or regional challenges, threats, and risks.

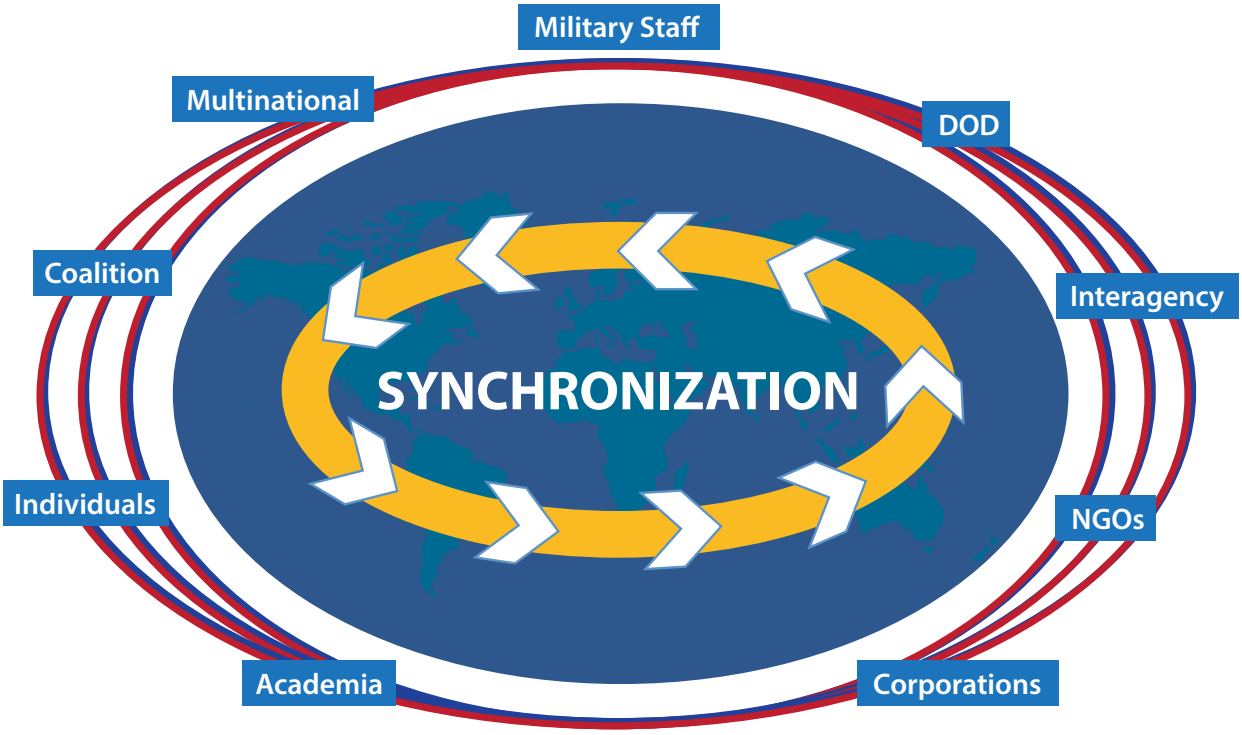
The goal is to enable user-driven, point-of-need C5 to inform individual and coalition information security needs. This paper cannot address all possible constellations of partnerships envisioned under GKN, but they will likely cover the spectrum from open access to highly classified enclaves. In another dimension, the possibilities range from organizing small communities of practice to the establishment of a robust fusion center that integrates the streams of information necessary to inform collective intelligence. In addition to internal military networks, a more open information-sharing environment is required that will allow GCC network-enabled militaries to reach outside the boundaries of their ".mil" domains to work with coalition partners and nontraditional mission participants, such as NGOs.[20]

This means that the governance, policy, and supporting technical framework of GKN must allow for and enable composable organizations. The use of distributed scenario-based simulations in the development of shared knowledge offers a means to test specific aspects of organizational security architectures, both technical and policy, in a collaborative arena.

The first such use of a composable organization will likely be to address disaster preparedness and humanitarian assistance/disaster relief (HA/DR) requirements. As the GKN capability matures, it should be able to address challenges in other domains such as maritime security, heath security, cyber security, and energy security as well as hybrid warfare.

U.S. forces are growing accustomed to the fact that the battlespace in contemporary conflict is both nonlinear and without borders. Success or failure in battlespaces without definable boundaries means that joint, coalition, and interagency operations must increasingly rely on rapid and responsive knowledge development for collective awareness. GKN must support the rapid integration of lessons from current events into education and training to help maintain decision-cycle dominance. This also is true across the C5 realm for virtual and composable collaboration. The social networks that evolve in the composable

Figure 2. Composable Organizations



organization environment should link participants in an information-sharing framework. This would enhance ongoing operations and provide essential feedback to an Interactive Courseware Library and Training and Exercise Environment—enhancing both predeployment preparation and engaged response from a "user-driven" perspective. Dr. David Alberts has described these possibilities as an application of "power to the edge" principles, which enable "an enterprise to bring all of its available information and its brain power to bear by allowing information to be recombined in untold ways and by allowing individuals to interact in unplanned ways to create understandings and options not previously possible."[21] When the relationship between knowledge and power is changed, most especially in relation to factors such as time and space, a world of new possibilities is created.

Regional differences, technology levels, and comparative education and training will all affect how technology and people work together in GKN, but the development of sharable local best practices can be a major contribution to the global storehouse of knowledge in addressing shared 21st-century global challenges.

At endstate, the Global Knowledge Networking initiative should provide a full-spectrum capability to support C5 distributed learning requirements throughout NATO and the entire global community of nations friendly to the United States. For USCENTCOM and, eventually, all other geographic combatant commands, the return on investment of a GKN pilot project with the GCC would be the development of a better educated and trained cadre of coalition officers and civilians in the United States and abroad who trust each other and are more confident in each other's capabilities and processes.

"Where We Are Going": Scoping the Effort and Defining the Task

The GKN learning environment addresses what might be called "cognitive interoperability." Effective integration of C5 is a core competency and task, both among and between foreign militaries, in addressing this

challenge. The GKN learning environment will specifically address the problem of how to provide ADL capabilities (right time/right place educational opportunities, with on-demand potential) to a multinational audience. Primary audiences include U.S. and coalition civilian and military personnel engaged in operational-level multinational command and staff tasks (for example, in a combined joint task force [CJTF]). Secondary audiences for the GKN learning environment include all those concerned with operational and strategic level C5 cooperation in a wide array of complex contingencies.

The GKN learning environment should, at a minimum, provide the essential familiarization of C5 planning skills necessary to integrate information technologies and command and control processes among and between coalition partners. To define the effort further, the initial GKN learning environment program planning process has adopted the following project goals:

- Develop with the C5 community of NATO and PfP nations an Internet-based online repository of e-learning content/materials, communities of interest structures, and ADL tools to further C5 education opportunities and to support enhanced coalition interoperability planning and exercises, embracing and extending it to the GCC organization and its member states.

- Develop planning competencies in support of disaster preparedness and U.S. military support to coalition partners based on experiences learned from the CJTF concept and through establishment of a Viking-type exercise experience developed by Sweden.

Phase I: Gap Analysis

Building capability in the C5 domain is a technical challenge, where leaders face seemingly infinite choices when they contemplate strategies based on incorporating emerging technologies. Like their counterparts in the private sector, they may choose inappropriate paths if they do not know their destination. It is essential then that U.S. and coalition leaders are clear where *there* is in the C5 world. By knowing the desired endstate, leaders can compare that to the current state, identify the size and nature of the "gap" between the two, and take action to close the gap.

This first stage of the gap analysis for the GKN learning environment should be to evaluate how existing content—developed for U.S. and NATO purposes—can be adapted to robust multinational applications. Intellipedia offers one environment for exploration at various classification levels. This approach requires that content factors be identified systematically via interdisciplinary approaches across the range of political, military, economic, security, infrastructure, and information (PMESII) domains. The resulting GKN learning environment analysis can provide a baseline for coalition C5 learning outcomes worldwide by addressing the challenges from the broadest context possible. It should provide a foundation for further study in C5 that should allow future learners from the coalition partners to be able to:

- understand and create partner capacity-building strategies and policies

- understand and create agile organizational structures and decision processes responsive to real-time mission and situation requirements

- understand information technology and systems as a provider of opportunities to gain information and knowledge superiority and perform information operations

- integrate technology, organization, policy, and strategy into a partner capacity-building framework and use it in crisis planning and execution across the range of military operations.

Regarding the "learning continuum," this gap analysis should determine not only the present needs but also help anticipate future learning needs based on emerging technologies or operational contingencies. At the same time, U.S. and coalition militaries have often tried to impose their own solutions on host countries without first inventorying partner strengths, weaknesses, and needs.[22] Numerous reports and observations of

recent stability operations highlight that pre-deployment training programs are nonstandard, uncoordinated, and create the following gaps.

A Capability Gap. Multinational military forces may not have defined their capability framework comprehensively to include doctrine, organization, training, material, leadership, personnel, facilities, and interoperability (DOTMLPFI). Without such a framework they cannot readily develop integrated capabilities for effective joint and coalition operations.

An Education Content and Training Delivery Gap. Multinational military forces are not receiving essential training because relevant educational material is not readily available to the individual and because the investment—time and funding—necessary to participate in learning events or exercise activities at training venues is prohibitive. Yet blended learning has been proven to be more effective than just classroom or online approaches alone. The network could create a set of interoperable tools that could be a leader across education and training venues. There is truly a gap between how we "teach" now and where learning is going in the future. For example, gaming, communities of interest, and 21st-century literacies, among others, will all increase in importance and should be factored into the GKN.

A Discipline Gap. The different disciplines of security, governance, and development must be mutually reinforcing, but too often are not. Each is addressed individually by different organizations with their own cultures and approaches. The lack of understanding among military, civilian, and nongovernmental actors regarding each other's perspectives of stability operations, disaster relief, and related activities creates friction and dysfunction.

An Institutional Process Gap. An institutionalized process is lacking for analysis and assessments of documented activities, operation reports, and unit debriefs from the multidisciplinary perspective (security, governance, and development). Lessons that can assist foreign militaries in future stability operations continue to be lost or not considered due to mere lack of awareness.

An Operational Picture Gap. Civilian and military actors need a shared understanding of their environment to develop and execute coherent strategies. The lack of interoperable communication protocols and information technologies makes it hard for foreign militaries to share information among themselves and with the nonmilitary agencies involved in stability and other peace support operations.

The education content and training delivery gap is a practical problem that consists fundamentally of inadequate resources, both technical and financial, and can be overcome with an appropriate application of technology and funding. However, the discipline, institutional processes, and operational picture gaps are more social in nature and require an approach that blends technology with an effort that builds social networks that reduce the barriers to communication and cooperation between military and civilian organizations.

borderless actions, hybrid threats, and nonstate actors create an immediate need for the right sharing of knowledge and the development of leaders who can quickly formulate decisions based on new and changing information

Determining how best to create necessary learning environments and associated opportunities will necessarily be a process of trial and error. In addition to the training of practical skills for partners, the education of defense leaders and decision makers must also be addressed. Traditional methods, simple analysis, and intuition are no longer sufficient for addressing the critical and complex challenges facing the United States and its global network of partners. Borderless actions, hybrid

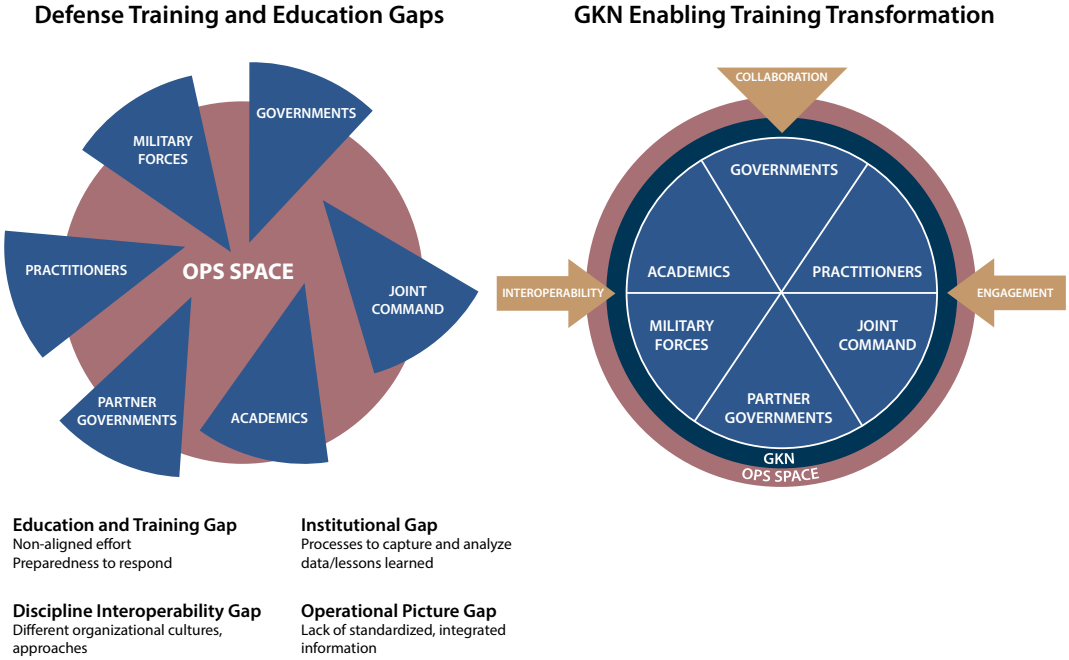
threats, and nonstate actors create an immediate need for the right sharing of knowledge and the development of agile, resilient, and effective leaders who have data immediately accessible, who understand how to assimilate new knowledge quickly, and who can formulate decisions rapidly based on new and changing information. In the areas of practical skills training and the teaching of critical thinking skills, more focus is needed to identify where current training and education gaps exist and understand how those impede knowledge development and sharing.

Phase II: Content Development and Establishing a Community of Learners

Today's global security environment demands effective multinational technical and "human" interoperability. Theater commanders are finding that the inability of coalition partners to plan and coordinate rapidly with each other puts an added burden on U.S. forces to become the lead responder to ensure success. As coalition partners often have not developed interoperable concepts of operation and a respective doctrinal framework, they are not in a position to cooperate with U.S. forces. The GKN learning environment can certify the professional accomplishment of a strong cadre of both civilian officials and foreign military officers in acquiring the capacity-building skills to interoperate with U.S. forces. This implies the need for a comprehensive educational curriculum at the highest standards possible.

The creation of a variety of learning modules/courses leading to professional development and certificate programs could be a valuable contribution. These could be based on a tightly knit set of coalition "learning domains" and result in the award of a Master in International Public Administration (I-MPA). Shorter certificates could be offered as well, keyed to specialty areas of emphasis. National Defense University's iCollege has both degrees and certificates, which gives its program more agility. Development of the I-MPA modules would be an innovative educational initiative, leveraging graduate degree program-level content already being implemented at multiple universities in the United States, Europe, the Middle East, and elsewhere throughout the world. This

Figure 3. Analyzing the Gaps and Achieving Mutual Support



model has the potential to cross many boundaries and with a consortium be the evaluator and broker for degrees.

Combining practitioner interaction with skills honed through an intensive, blended combination of virtual and classroom experiences, simulations and capstone projects will enable GKN participants to examine the real-world challenges faced by their nations and organizations in their respective regions. GKN learning environment members would join peer-level professionals from governments and militaries around the world to develop and share new skills and perspectives and improve their ability to respond to the challenges they face.

Additional knowledge domains could include:

- planning and execution processes, including improving coordination among distributed staffs[23]
- battle staff decision processes
- psychological operations and civil affairs
- electronic warfare
- computer network attack and defense
- sociopolitical issues
- media and public affairs
- diplomacy and negotiation.

Phase III: Designing the GKN Learning Environment to Support the Composable Organization

The GKN learning environment must be supported by a coherent technology vision and strategy. Higher order capabilities are achieved by combining basic user capabilities and content into interoperable and interacting systems. Examples of such higher order capabilities and systems follow.

Executive Education Workshop. In addition to developing a core body of future leader education in the form of an I-MPA degree, the GKN learning environment could be tailored to support workshops that help to address the gap analysis issue identified in Phase I. These workshops, conducted in collaboration with the GKN, can be an open-ended inquiry into the ways and means of achieving *unity of effort* among and between multi-stakeholder partnerships, where *unity of command* cannot be foreseen, or perhaps even be desirable to achieve. Workshops can also help to define the parameters of prototyping efforts and experimentation for further application and evaluation.

Distributed Simulation. Since the GKN learning environment would be a Web-based system of capabilities, it would be possible for users to access and execute distributed simulations through the GKN portal itself in support of workshops and exercises. A properly integrated application interconnection from the portal to the distributed simulation system would be required. The users could then use the GKN's communication and collaboration functions to contact each other and establish their parameters for a distributed simulation event. This endeavor would help to test and validate the possible parameters of a composable organization to enable "power to the edge" responses to an emerging humanitarian disaster, nontraditional threat (for example, terrorist, cyber, maritime, or border domain violations of sovereignty), or hybrid warfare.

today's global security environment demands effective multinational technical and "human" interoperability

Cooperative Security Community. The GKN concept lends itself well to establishing "communities of interest." Users could use the communication and collaboration functions to identify interest in a cooperative security community, developing content to stimulate and facilitate discussions. The users could establish online seminars and use the GKN portal knowledge pool to facilitate face-to-face events. This would become a community of people who could share ideas and concepts across many political

borders, while allowing for multilevel security. There is no inherent reason why this environment cannot handle classified or sensitive information if adequate safeguards are built in. Intellipedia has learned how to do this well.

It is clear from these examples that many of the functions proposed for the GKN learning environment, such as learning management systems and digital libraries, already exist—indeed some have existed for decades. They can be expanded, developed, and networked together. The process of applying them in a composable fashion then becomes primarily an organizational rather than a technical question. A properly linked and managed GKN environment would provide a catalyst for developing a wide variety of higher order capabilities limited only by imagination and bandwidth. These would fuel further development of online communities and provide more opportunities for qualified users across the globe to interact with, exchange, and create knowledge. The development of human interfaces and expanded functionality (for example, multilingual, multisensory interface) greatly facilitates the use and accessibility of higher order systems. In sum, this approach provides a key enabler for the next generation of training transformation to support multinational interoperability in addressing the global challenges of the 21st century.

a properly linked and managed GKN environment would provide more opportunities for qualified users across the globe to interact with, exchange, and create knowledge

Principles for Establishing a GCC Prototype

The suggested "Gulf Knowledge Center" or "GCC Virtual Security University" to be explored in collaboration with organizations and member states of the GCC is an exploratory test bed for compelling coalition education and training approaches for the region. As previously noted, "Gulf Knowledge Online" could be the first pilot project endeavor. Any such endeavor should be aligned and implemented in accord with five basic principles.[24]

Focus on Coalition-Based Interoperability. U.S. allies and partners need to shift their interoperability focus from one devoted almost exclusively to technical interoperability, in favor of a balanced treatment of the technical, cognitive, organizational, doctrinal, and "human" aspects of interoperability and multinational cooperation.

Incorporate an Interagency, Multinational, and NGO Perspective. Operations today almost always require interagency cooperation by many contributing and host-nation actors, including international organizations and nongovernmental and private sector entities.

Incorporate a "Transformational" Perspective. A "transformational" perspective seeks not only incremental improvement but also an order of magnitude improvement from current baseline characteristics. One GKN contribution could be to help to establish the point of departure for national efforts to improve coalition interoperability. At the same time, the initiatives should start by addressing real world problems.

Foster Cooperation in Command, Control, Communications, Computing, Intelligence, Surveillance, Reconnaissance (C4ISR) Infrastructure. Fostering cooperation in C4ISR research, development, and acquisition of systems, doctrine, and procedures for multinational operations should help ensure the genuine transfer of "lessons learned" into the coalition partner's actual military capability.

Promote the Fielding of Prototype Pilot Programs. Using different levels of complexity and reality (collaboration, war games, simulations, command post exercises, and lessons learned), the development of prototyping efforts will enable the GKN to ensure a process to build systematic and empirical knowledge about what actually works in multinational operations while reducing the risk of investing in solutions that do not deliver required results. Development of these prototypes would typically be linked as the result of experiments and/or the application of other legitimate research and development efforts. GKN can help build

a highway to the operational use of the most effective partnership collaboration capabilities.

The GKN learning environment can provide participating nations with tangible measures and evidence of the benefits to be expected from investments in coalition interoperability. It must help develop a common methodology, which requires agreement with the participants on the relevant representative mission areas (for example, HA/DR, regional conflict, peacekeeping, peace support operations, and others), as well as the appropriate C5 interoperability learning objectives. The focus should be on the integration of technology development efforts, organizational concepts, doctrine development, and—above all—leader development. It should build on existing efforts, which requires the application of Web-based, Internet e-learning technologies necessary to help counterpart foreign military organizations to "co-evolve" with U.S. forces. By taking advantage of existing laboratories, networks, and currently planned experiments, the GKN learning environment may catalyze the initiation of a broadened interoperability effort with relatively few added infrastructure costs to the participating nations.

Even while building on existing architectures, the future architecture must be tailored to the needs of the nation or region and the contributing partners. Specific technical solutions that could be facilitated through the GKN learning environment include:

- conducting multinational distributed CAX using high-fidelity simulations
- sharing lessons learned and knowledge resources through interconnected repositories of digital technical information
- increasing interoperability through real-time application of distributed learning
- conducting a thorough examination of the C4ISR modifications necessary to accomplish the above while producing integration and synergy with other global platforms.

Summary

The Global Knowledge Networking initiative is intended to enhance U.S. and coalition interoperability through improvements to existing training and education capabilities. The GKN initiative promotes C5 capabilities, thereby supporting U.S. needs, the NATO Wales Summit Communiqué decision to establish a partnership Interoperability Platform, and a recent GCC Summit decision to establish a Joint Military Command. The GKN concept starts by bringing together NATO and PfP members in collaboration with organizations and member states of the GCC, as well as educators, researchers, developers, and military professionals from around the world. They will jointly develop commonly agreed-on educational approaches/content leading to both practical applications and academic certification. The GKN seeks to integrate—on a coalition and multinational basis—several essential components: knowledge-centric people; adaptive organizations and architectures; and doctrine, standards, and networks to empower innovative learning and leader development for security cooperation on a global basis. This network-enabled approach to distributed simulations will enable the discovery, exploration, testing, assessment, and demonstration of transformational approaches that have been co-developed with coalition partners.

GKN can help build a highway to the operational use of the most effective partnership collaboration capabilities

The GKN framework (including its learning environment) at initial operating capability will be a Web-based, cooperative security capability that

links knowledge centers of excellence within regions and around the world. At full operational capability, a strong global network of regional fusion centers would provide robust intellectual and instructive paths to international cooperation to address global challenges and regional threats. Knowledge development centers focused on concept development, experimentation, and battle laboratories will feed "smart" command centers and virtual security universities to support complex system adaptation to carry out joint, interagency, and coalition operations better. It will be based primarily on an open system of knowledge to allow for wider participation in concept development and experimentation, leading to prototype applications and research-led education and training. Promising approaches to international security cooperation can be examined through simulations, gaming, exercises, and other forms of interaction. This methodology facilitates the use of "test laboratories" and related approaches to promote coalition interoperability and political-military cooperation. These efforts will integrate technology development efforts, organizational concepts, and doctrine development to address the most difficult global, regional, and local security challenges.

This paper advances a new composable organization model. It is a "power to the edge" vision of user-driven security cooperation emanating from the local level, reaching outward and upward, collecting and embracing collaborative capability and power to act in response to any threat. GKN promotes coalition interoperability from both "top down" and "bottom up" perspectives, empowering a democratization of education for security collaboration with potential friends and partners across the entire world. At the same time it focuses on point-of-need personalized learning, as well as collective learning through massive multiplayer gaming.

Providing requisite knowledge for coalition leaders to manage a volatile, rapidly changing C5 landscape in a joint environment—without losing sight of the commander's intent or coalition objectives—is a challenge of the first magnitude. Such challenges can be addressed one step at time, but we must begin. The Global Knowledge Networking concept provides a framework to promote cooperative development in multinational education and training to address a new generation of threats and risks posed by globalization. It seeks to achieve the next generation of capability in training transformation for coalition interoperability by moving from challenges to opportunities to solutions.

Notes

[1] Carol Dumaine, "On a Global Foresight Commons," *SEED* Magazine, November 23, 2010, available at <http://seedmagazine.com/content/article/on_a_global_foresight_commons/>.

[2] North Atlantic Treaty Organization (NATO), NATO Comprehensive Operations Planning Directive, December 17, 2010, available at <https://publicintelligence.net/nato-copd/>.

[3] Paul T. Bartone and Albert Sciarretta, "Human Dimension Issues in Distributed and Virtual Teams," *Small Wars Journal*, January 20, 2015, available at <http://smallwarsjournal.com/jrnl/art/human-dimension-issues-in-distributed-and-virtual-teams>.

[4] Horst Rittel and Melvin M. Webber, "Dilemmas in a General Theory of Planning," *Policy Sciences* 4 (Amsterdam: Elsevier Scientific Publishing Company, Inc., 1973), 155–169.

[5] The purpose of the Combatant Commanders' Exercise Engagement and Training Transformation program is to exercise and train for joint operations (tactical through strategic), improve the realism and robustness of the training environment, improve joint enabling capabilities, and directly support combatant commander theater engagement activities in order to achieve joint readiness of the total force and theater campaign plan objectives.

[6] Talal Abu-Ghazaleh, First Arab Conference on Arabizing the Internet, Amman, Jordan, April 1, 2001; see <http://izquotes.com/quote/205214>.

[7] On November 18, 1998, at the NATO Summit in Washington, DC, Secretary of Defense William Cohen and Swedish Minister of Defense Björn von Sydow signed a memorandum of understanding (MOU) in support of the PfP [Partnership for Peace] Simulation Network. They thereby established what has become the world's leading multinational civil-military exercise to address complex emergencies. The MOU enabled long-term joint planning that placed Sweden at the forefront in developing computer simulations and distributed command post exercises to support Commander and Staff training in peace support operations through the Viking series of PfP exercises. Success enlarged to include the South East European Simulation Network under the auspices of the South East European Defense Ministerials. The subsequent signing of the Swiss-U.S. MOU on April 25, 1999, by Secretary Cohen and Swiss Defense Minister Adolf Ogi, was the inauguration of a collaborative multinational effort to develop and facilitate the development of open-source Advanced Distributed Learning among PfP nations. This multinational effort has since expanded to include contributions and participants from many other countries. The successes of the Swiss-U.S. and Swedish-

U.S. efforts are well documented, and the demand for the quality products and services provided by these European nations have grown beyond PfP and NATO, with calls for similar efforts with partners in other regions of the world.

[8] NATO, Wales Summit Declaration, available at <www.nato.int/cps/en/natohq/official_texts_112964.htm>.

[9] NATO Allied Command Transformation, "Preparing for Future Challenges: NATO Transformation Chiefs Meet for 2014 Chiefs of Transformation Conference," Public Affairs Office, December 19, 2014, available at <www.act.nato.int/preparing-for-future-challenges-nato-transformation-chiefs-meet-for-cotc-2014>.

[10] For details, see the Cooperation Council for the Arab States of the Gulf (GCC) Secretariat Web site, available at <www.gcc-sg.org/eng/index142e.html>.

[11] See "Report: ISIS Steals $429 Million from Central Bank After Capturing Mosul," Al Arabiya News, June 13, 2014, available at <http://english.alarabiya.net/en/News/middle-east/2014/06/13/Report-ISIS-steals-429mn-in-Mosul-capture.html>; and Hubbard, Krauss, and Schmitt, "Rebels in Syria Claim Control of Resources," *The New York Times*, January 28, 2014, available at <www.nytimes.com/2014/01/29/world/middleeast/rebels-in-syria-claim-control-of-resources.html?_r=0>.

[12] Awad Mustafa, "GCC Announces a Joint Military Command," *DefenseNews*, December 11, 2013, available at <http://archive.defensenews.com/article/20131211/DEFREG04/312110011/GCC-Announces-Joint-Military-Command>.

[13] Caline Malek, "Arab League Nations 'Need to Work More Closely on Common Problems,'" *The National* (Abu Dhabi), February 27, 2014, available at <www.thenational.ae/uae/government/arab-league-nations-need-to-work-more-closely-on-common-problems>.

[14] Program development should incorporate lessons, both positive and negative, learned from Army Knowledge Online and Defense Knowledge Online.

[15] See DOD, *Unity of Effort Framework Solution Guide*, Joint Staff J7, Future Joint Force Development, August 31, 2013, available at <www.dtic.mil/doctrine/doctrine/jwfc/uef_solution_guide.pdf>.

[16] Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington, DC, The Joint Staff, November 8, 2010, as amended through January 15, 2015), available at <www.dtic.mil/doctrine/DOD_dictionary/>.

[17] "Insights and Best Practices Focus Paper: Interorganizational Coordination," 4th ed., Deployable Training Division, Joint Staff J7, July 2013, available at <www.dtic.mil/doctrine/fp/fp_ia_coord.pdf>.

[18] The authors would like to thank Dr. Paulette Robinson for these insights.

[19] Drawn from the Defense Security Cooperation Agency Web site, available at <www.dsca.mil/programs/DOD-regional-centers>.

[20] Global Knowledge Networking will also need to reference data exchange standards, like NIEM (National Information Exchange Model), available at <www.niem.gov/Pages/default.aspx>; and HXL (Humanitarian eXchange Language), available at <http://hxl.humanitarianresponse.info/ns/index.html>.

[21] David S. Alberts and Richard E. Hayes, *Power to the Edge: Command and Control in the Information Age* (Washington, DC: Command and Control Research Program, 2003), 90.

[22] Robert W. Komer, *Bureaucracy Does Its Thing: Institutional Constraints on U.S.-GVN Performance in Vietnam*, R-967-ARPA (Santa Monica: RAND, 1973). This is a very sad memo in that many of the mistakes he cites from Vietnam were repeated in Iraq and Afghanistan.

[23] Bartone and Sciarretta.

[24] These operational principles were developed in accordance with the recommendations outlined in the Report of a French-German-UK-U.S. Working Group: *Coalition Military Operations: The Way Ahead Through Cooperability* (Arlington, VA: U.S.-CREST, 2000).

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