

How ArcGIS® for the Military Supports Land Operations

An Esri® White Paper
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How ArcGIS for the Military Supports Land Operations

A Complete Geospatial Platform

Geography is at the heart of every defense mission. Geospatial technology helps warfighters answer the *where, what, when, who, and why* questions, generating information that will help them make well-informed decisions. They collect intelligence, conduct intelligence analyses, plan missions, and monitor operations using mapping products and applications.

ArcGIS® for the Military—Land Operations is Esri® technology configured to provide a complete and interoperable platform to manage, visualize, analyze, and share geospatial information for land-based missions.

Servers, portals, ready-to-use basemaps, operational map templates, and application templates form the geospatial platform. ArcGIS for the Military—Land Operations puts the latest geospatial knowledge into the hands of everyone from the commanders at headquarters to the troops in the field.

ArcGIS for the Military—Land Operations provides a configuration for server and portal technology warfighters can use to manage, analyze, and share geospatial information, including imagery and positional information. Basemaps serve as background reference information they can use to create custom maps, saving them time. Operational map and application templates will give them the tools and information to quickly build, configure, and deploy their own web-based and mobile applications.

In today's defense operational environment, geospatial intelligence is often managed and distributed using isolated stovepipe applications. Deployed ground forces lack an enterprise-level solution to share and manage geospatial data, analytics, and products. ArcGIS for the Military—Land Operations, coupled with a central information model (the geodatabase), eliminates the need to use stovepipe systems.

The ArcGIS for the Military—Land Operations configuration is able to operate with other systems because of adherence to open standards such as the Open Geospatial Consortium, Inc. (OGC), making it easier to exchange geospatial information. Why is that critical? It increases the flow of geospatial data back and forth between the field and headquarters. This information is vital for intelligence analysis; situational awareness; and, ultimately, decision making.

Stovepipe systems slow many processes including managing data, creating and sharing maps and mapping applications, and conducting analyses. If different types of noninteroperable systems are used within the same organization or a group of agencies that work together, it's more difficult or impossible to share these maps and mapping applications and analyses with colleagues. Working with multiple and/or disparate data models forms a bottleneck, again making data management and analysis hard to do. Training on stovepipe systems does not serve organizations well, either, as personnel

with expertise in one system will likely have difficulty transferring their knowledge to another system. This often happens when they deploy to a new unit.

ArcGIS for the Military—Land Operations provides a simple, streamlined platform for creating and sharing geospatial information, including maps, applications, analyses, and situational awareness.

The Warfighter's Toolbox

Servers, Basemaps, and Templates

The ArcGIS for the Military—Land Operations configuration offers a toolbox of technology and resources to set up a geospatial system for land forces that includes elements for situational awareness and command and control (C2). Components include the following:

- **Servers and portals** to store, manage, and share internal collections of imagery, maps, and data such as the following:
 - Defense and national mapping agency basemaps in a variety of formats and services
 - Satellite, aerial, and unmanned aerial system (UAS) imagery in multiple formats
 - Elevation data such as digital terrain elevation data (DTED) and models derived from lidar
 - Streaming information for blue force tracking (BFT) and ground moving target indicator (GMTI) platforms
- **Ready-to-use basemaps** to quickly visualize areas of operation. Basemaps provide authoritative and consistent geographic context for analysis, planning, and situational awareness. They are the reference content that serves as the foundation for creating custom map products on which an organization adds operational layers. The basemaps can be printed, shared via the secure web, or loaded in a mobile application. Esri basemaps are available on ArcGISSM Online at arcgis.com. Esri basemaps include the following:
 - The topographic basemaps, such as boundaries, cities, water features, physiographic features, parks, landmarks, transportation, and buildings
 - The Light Gray Canvas basemap, which draws attention to your thematic content by providing a neutral background map with minimal colors, labels, and features

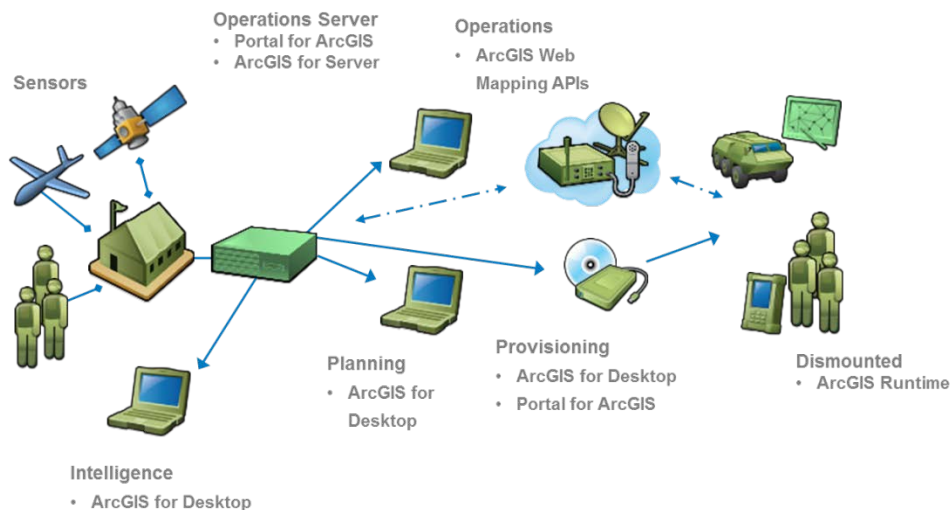
Note: ArcGIS Online is available via the web. Organizations can purchase a similar capability that works behind an intranet firewall.

- **Operational map templates** to capture common workflows and create customized maps and map overlays. The maps may include specific feature types, analytical tools, and layouts needed for particular products. Operational map templates are available in the gallery on the ArcGIS Resources Defense and Intelligence Communities web page at resources.arcgis.com/defense. The templates make it easy to reuse or standardize a series of maps and include the following:
 - **Military Aspects of Terrain (MAoT)** to describe the terrain of the battlefield environment
 - **Lodgment** to create a lodgment or place of accommodation plan for a unit the size of an infantry company
 - **Range Cards** to simplify the process of creating range cards or diagrams for a weapons/fighting position
- **Application templates** to simplify the development of web-based and mobile solutions using Esri technology. Application templates also are available in the gallery on the ArcGIS Resources Defense and Intelligence Communities web page. These solutions can then be embedded in mounted and dismounted (mobile) devices running on Linux, Android, iOS, and Windows Mobile and include the following:
 - **Squad Leader** for Android devices, designed to enhance situational awareness for platoon and squad-sized units during operations
 - **Vehicle Commander** to demonstrate best practices for building in-vehicle military applications with ArcGIS
 - **Operations Dashboard** for use in an operations room to view troop movements and provide other aspects of situational awareness

The System Architecture

The system architecture for ArcGIS for the Military—Land Operations includes ArcGIS technology and a suite of tools configured for military land operations. It also includes a common information model, designed to work well with ArcGIS, called the geodatabase. The architecture's main components include ArcGIS for Desktop, ArcGIS for Server, Portal for ArcGIS, ArcGIS Runtime, and several application programming interfaces (APIs). Developers use the APIs to tailor the system and/or build applications.

Operations and Intelligence Convergence Using a Geospatial Enterprise



Common Information Model

The geodatabase is the common information model for ArcGIS, meaning it's the central data repository for storing and managing spatial data. All ArcGIS technology leverages the geodatabase, which contains the schema for various geospatial datasets such as road networks, elevation data, and satellite imagery. The schema defines the geospatial objects, rules, and relationships for adding behavioral characteristics such as one- or two-way roads. It also ensures integrity to protect against making unintended changes or introducing errors to the datasets.

ArcGIS for Desktop

Compiling, managing, analyzing, and sharing geospatial information begins with ArcGIS for Desktop. The software's users can deploy maps, geographic knowledge, and geospatial intelligence throughout an organization and onto the secure network.

Esri also offers operational map templates to use with ArcGIS for Desktop. These templates simplify the process of creating military planning workflows. For example, a helicopter landing zone (HLZ) for an upcoming operation can quickly be mapped using the HLZ template.

Experienced users can develop operational map templates to capture their workflows and best practices, without programming. They can share the templates through Portal for ArcGIS and ArcGIS for the Military—Land Operations Server.

Server Technologies

ArcGIS for the Military—Land Operations Server acts as the central component of the geospatial system built with ArcGIS technology. It can be configured using one or more Esri server technologies, which include ArcGIS for Server, Portal for ArcGIS and Data Appliance for ArcGIS. These technologies can deliver geospatial services such as the OGC Web Feature Service (WFS). They also provide scalability, power web and mobile applications, and serve data in a variety of formats, such as JPEG 2000, to use in applications, such as FalconView.

ArcGIS for Server delivers and manages geospatial information, maps, imagery, and data services across the enterprise and the web.

ArcGIS GeoEvent Processor for Server makes it simple for users to configure and use streaming data. This includes receiving streams such as from UASs, performing continuous analysis (stream processing), and producing new streams from analyzed data.

Portal for ArcGIS provides the same collaboration and sharing tools as Esri's public, subscription-based ArcGIS Online but differs in where it is hosted and what content users can access. Portal for ArcGIS can be deployed behind an organization's firewall. Esri also can host and manage a private instance for the organization.

Data Appliance for ArcGIS is a turnkey solution that provides terabytes of worldwide imagery; basemaps; and geospatial layers, such as roads, preloaded onto a network-attached storage device that plugs right into an organization's internal network.

Web Technologies

People use web-based mapping to work with maps when connected to the secure network. These maps can be tailored for specific user communities and customized to provide a focused set of information for a particular mission. They combine ready-to-use basemaps with layers of static data, such as roads, and dynamic data, such as full-motion video (FMV), to provide up-to-date knowledge about what's happening in an area of operations.

Story maps that document and map events or activities can be built using JavaScript and Flex components. An alternative is to download one of Esri's ready-to-use templates from ArcGIS Online, which can be customized if necessary.

ArcGIS Explorer Desktop or ArcGIS Online can be used to find and visualize geospatial information and produce map-based presentations for briefings. ArcGIS Explorer users can play the briefs back in a planned order or explore the content using the map interface.

ArcGIS for the Military—Land Operations Server also deploys web applications. To assist users in creating these applications, Esri provides sample application templates on the ArcGIS Resources site. For example, the Vehicle Commander application template can be used to develop an in-vehicle application that provides near real-time situational awareness.

The Operations Dashboard application template lets users create a configurable web viewer that is used in an operations room to view situational awareness information and collaborate with other service members using chat text.

Mobile Technologies

Developers can use ArcGIS Runtime tools to create mobile applications customized to do what the users require, such as gather information in the field in a connected or a disconnected environment.

Mobile clients include smartphones, tablets, and other handheld devices.

For example, Esri offers a Squad Leader application template for the Android platform that developers can quickly deploy on smartphones and tablets. This application provides situational awareness for platoons and squads. The user can also provide situational reports and denote areas to avoid or mark as clear using electronic ChemLights.

Open Standards

Military applications handle an increasing variety, volume, and velocity of data. This can burden the system, creating interoperability and performance problems. The consistent use of standards makes it easier for systems that were developed by different vendors to be interoperable.

Standards help solve many interoperability problems through the use of common data formats, application interfaces, and information schemas. ArcGIS for the Military—Land Operations supports many standards including the following:

- OGC Web Map Service (WMS) and WFS, Geography Markup Language (GML), and Keyhole Markup Language (KML)
- National Geospatial-Intelligence Agency (NGA) standards such as Compressed ARC Digitized Raster Graphic (CADRG), DTED, and National Imagery Transmission Format (NITF)
- North Atlantic Treaty Organization (NATO) geospatial data specifications such as Digital Geographic Information Exchange Standard (DIGEST)
- Department of Defense (DoD) messaging standards such as Variable Message Format (VMF) and Cursor on Target (CoT)
- Military symbology standards such as MIL-STD-2525C and APP-6B
- World Wide Web Consortium (W3C) standards including XML, HTTP, SOAP, and HTML

ArcGIS for the Military—Land Operations Server supplies data in a variety of formats and standards including open standards such as WMS, WFS, KML, and the Open GeoServices REST interfaces. Simple web clients built on JavaScript; desktop clients, such as ArcGIS and FalconView; or 3D viewers, such as ArcGIS Explorer, Google Earth, or National Aeronautics and Space Administration (NASA) World Wind, can either use the files directly or connect to web services. ArcGIS for the Military—Land Operations Server also can consume and then serve maps built from data provided by non-Esri WMS map services such as KML.

ArcGIS for the Military—Land Operations can consume and export data using open standards. Additional tools are also available to import nonstandard/unsupported data types using tools such as the ArcGIS Data Interoperability extension. Using the ArcGIS Data Interoperability extension provides direct data access; data translation tools; and the ability to build complex spatial extraction, transformation, and loading (ETL) processes to import hundreds of data formats.

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**Leveraging Existing
Enterprise License
Agreements**

ArcGIS for the Military—Land Operations is ArcGIS. ArcGIS is available through numerous enterprise license agreements (ELAs) that exist within many national governments and agencies such as NGA's Commercial Joint Mapping Toolkit (CJMTK) Program and the NATO Core Geographic Services.

**Additional
Resources**

Visit resources.arcgis.com/defense to learn more about ArcGIS for the Military—Land Operations.

Appendix A—Esri Professional Services

ArcGIS for the Military—Land Operations components are ready to use off the shelf. However, Esri has also created a set of implementation packages to help developers in programs, offices, and agencies integrate the components into existing architectures and systems. The packages cover a range of functions that may include conducting site surveys, reviewing system configurations, and making suggestions on how to optimize the geospatial architecture. The services can be purchased as a complete package or tailored according to a user's unique needs and requirements.

System or Application Review

Esri subject matter experts (SMEs) will review an organization's system or application. SMEs will create a document with estimates that will include a rough order of magnitude of the time and materials it will take to integrate the system or application into the customer's existing environment. Esri SMEs will do the following:

- Meet with the customers and end users to determine the workflows and user interface requirements. The SME(s) will do this at the customer's facility or a designated site.
- Review the system architecture, geospatial requirements, and hardware and software requirements. Part of this review is to physically examine the hardware. The SME will write a report that will thoroughly cover the requirements.
- Present the findings to the customer.

The offerings help set the initial stage for a review of the program to ensure its success. The review takes approximately one workweek to perform, with the results to follow in a timely manner.

ArcGIS for the Military—Land Operations Implementation

Esri SMEs will travel to the developer's or end customer's site to install and configure ArcGIS for the Military—Land Operations. This includes the following:

- Installing and configuring associated Esri components
- Configuring web services, such as ArcGIS for Server web services, and/or external connections to non-Esri web services
- Optimizing the speed and/or efficiency of existing map services and/or migrating them to ArcGIS for Server

The system can be implemented in one workweek.

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Application and Map Template Development

Esri personnel will identify existing applications and templates in the organization's system that can be used in the new system's geospatial architecture. The package to do this includes the following:

- Traveling to and from the customer site
- Examining the findings from the system or application review
- Developing applications and templates to match end-user requirements
- Installing, configuring, and testing the applications and templates that were developed and/or reused

This covers two workweeks.

Information Modeling

This package includes the work necessary to modify existing information data models. This work may reuse or modify models to comply with existing geospatial data model standards. This is necessary to support the analytics, workflows, and geospatial production requirements of the program or office. This includes a review of the program's data, existing data storage and dissemination infrastructure, and interoperability requirements. Esri SMEs will modify and/or enhance existing information models to allow the most efficient data storage and access capabilities available. This takes one workweek.

Appendix B—Esri Training

Esri offers a variety of training to match most budgets, including instructor-led and self-paced web courses, training seminars, and free online training.

US government customers can also use the Esri Training Pass. Organizations can purchase a specific number of training days. Personnel can then access the courses or seminars when they need them. The pass is available through Esri's GSA schedule.

Instructor-Led Training	
Instructor-Led Course	■ Courses are held in a traditional classroom setting, where discussions, group activities, and hands-on exercises emphasize peer-to-peer learning and real-world GIS problem-solving skills. ■ Esri can host a private class for an organization at one of our training facilities or teach a class at the client's facility. Contact GIStraining@esri.com or call 800-447-9778, extension 1-5757, about setting up a class.
Instructor-Led Online Course	■ These courses provide all the benefits of traditional classroom learning presented in a real-time interactive online classroom. ■ Students can communicate with the instructor and other students via the telephone and typed messages.
Instructor-Led Course Offered by Professional Services	■ These courses are designed and taught by Esri Professional Services staff members, who have expertise in real-world projects. ■ The courses cover specific industry solutions or products. ■ The format varies from course to course.

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Self-Paced Training	
Virtual Campus Web Courses	■ The web courses include conceptual material and presentations, hands-on software exercises, and an exam. ■ The courses with a recorded presentation require a broadband connection. ■ Participants must have access to the appropriate ArcGIS software to complete the course exercises.
Virtual Campus Training Seminars	■ The free, one-hour recorded presentations include software demonstrations and question-and-answer sessions with Esri SMEs. ■ Attending the seminars requires a broadband connection.

Appendix C—Example Scenario

ArcGIS Helps Hornets Home In on Weapons Cache

When land forces deploy on a mission, geospatial technology goes with them to provide the situational awareness they need to plan operations and minimize threats.

ArcGIS for the Military—Land Operations, for example, gives a Brigade Combat Team (BCT) the software components needed to collect, view, manage, analyze, and share geospatial information. To illustrate its usefulness, follow the "Hornets" BCT to their forward operating base (FOB), where they will use the configuration in their mission to provide security assistance in the province where they will be stationed and help locate a weapons cache.

Prepare and Rehearse at the Home Station

The Hornets' motto is "Sting 'em before they sting you!"

They take pride in their combat record of stinging the enemy first rather than being caught off guard. Their not-so-secret weapon: carefully laying the groundwork for the mission before moving outside their FOB. They rehearse their security duties and prepare and preload their geospatial information using the ArcGIS for the Military—Land Operations configuration at their home station before they deploy.

The Hornets' brigade staff implemented ArcGIS for the Military—Land Operations because they needed a way to ease the problems of managing their intelligence assets such as imagery, geospatial information, and situation reports (SITREPs). The foundation they lay at the home station enables the BCT to satisfy mission requirements and improve after action reports (AARs).

The configuration includes ArcGIS for the Military—Land Operations Server, which is preloaded with basemaps, imagery, web and mobile applications, and operational map templates. The operational map templates will be very useful in their area of operations (AO) so the staff can quickly generate map products, reducing training and production time to support faster decision making.

The Hornets have kept in contact with the unit they are to replace. They're ready to go.

The Transfer of Knowledge

After arriving in their AO, the Hornets brigade staff set up an FOB dubbed the "Hornets' Nest." They unpack and put together their servers, workstations, and mobile devices. It takes them a week to get to their AO, so they need to perform checks to ensure the equipment works properly.

After completing the checks, the brigade staff begin to work with the "Golden Bears," the BCT they are replacing. The Golden Bears transfer their information and knowledge to the Hornets. This includes imagery, the latest intelligence products, past patrol routes, geospatial-enabled mission briefs and AARs, and operational map templates the Golden Bears modified for operational readiness. The Hornets are quickly trained on how to use the new ArcGIS for the Military—Land Operations operational map and application templates. The templates aren't really new in the sense that the Hornets are completely

unfamiliar with them. They are the same templates the Hornets possess but have been slightly modified by the Golden Bears to satisfy the security mission for the AO.

The Hornets staff quickly produce new maps of the AO, such as an updated engagement area map. The engagement area map is created using an operational map template called the Engagement Area Template. It details how the Hornets will delineate their AO boundaries, identify key terrain, and plot where they anticipate enemy movement within their AO.

The Hornets get briefed about the current situation including recent attacks and the improvised explosive devices (IEDs) found in the area. The main concern? Villagers who are helping the enemy by hiding weapons caches in their homes and underground bunkers. The Patrol Data Capture Template is used to set up their mobile devices to capture relevant information such as bridges and choke points while on patrol.

The Hornets BCT headquarters (HQ) is set up and the technology and situation information transferred. The HQ includes trucks and tents with a building in the center. Within the building, ArcGIS for the Military—Land Operations Server is unpacked and turned on. Large computer monitors are the focal point of the room. The Hornets brigade staff quickly display the web-based situational awareness (SA) viewer, where they can see friendly and enemy positions. The SA viewer was created using the operations dashboard template from ArcGIS for the Military—Land Operations. Technicians connect the intelligence feeds to the server, such as FMV from a UAS, weather, blue force tracking (BFT), and seismic sensors.

Reviewing the Operations Order

Higher HQ delivers the latest briefing. The Hornets staff quickly go through the operations order (OPORD) looking for information pertaining to their AO. The Hornets need to increase the frequency of patrols covering their AO while looking for hidden weapons caches. Along with the OPORD, HQ has provided an Excel spreadsheet containing military grid reference system (MGRS) point coordinates of past weapons caches and areas where other weapons caches might be concealed. Using ArcGIS for Desktop, an analyst can drag and drop the spreadsheet to quickly view the point information. Other information in the OPORD includes intelligence map products of locations of where unexploded IEDs were found, where IEDs exploded, and where enemy ambushes occurred over the past three months.

Gathering Intelligence

Personnel gather more information with a geospatial reference, including the most current imagery, the latest FMVs, recent SITREPS, and other intelligence. Since all the information contains a geospatial reference, it can be easily cataloged for use within ArcGIS for the Military—Land Operations Server and the desktops. The common information model, the ArcGIS geodatabase, ties geography-based information, such as FMV, imagery, and SITREPs, together. The geodatabase is the common data storage and management framework for ArcGIS. It is a central data repository for spatial data storage and management. ArcGIS for the Military—Land Operations is optimized to work with the geodatabase. This ensures consistency and speed of use within the system.

Analyzing Past and Present Situations

The Hornets' image, all-source, and geospatial analysts, along with the US Air Force (USAF) Combat Weatherman attached to the BCT, get to work planning security assistance missions including sending patrols out to look for weapons caches.

Image analysts add new imagery to the existing mosaic datasets and prepare FMVs to brief the commanders. All-source analysts add MGRS point information, such as recent enemy activities, derived from SITREPS reported by troops in the field. Analysts use this data to quickly generate geodatabases. Information stored in Excel spreadsheets, containing locations of weapons caches that were previously found, are dropped directly into ArcGIS for Desktop. They quickly symbolize the information and make the data available for the entire staff to use. To plan a patrol mission to find new weapons caches, geospatial analysts create buffers around past patrol routes, areas deemed dangerous, and ambush sites. The USAF Combat Weatherman uses the military aspects of weather operational map template to create the weather forecast maps used to help plan patrols, ensuring the Hornets are properly clothed and that they carry the proper equipment to accomplish the mission. The mission planners are notified when analysis products are completed.

Planning the Mission

Planning follows the military decision-making process (MDMP). Using the ArcGIS for the Military—Land Operations operational map and application templates reduces mission planning time. These predefined and built templates capture and simplify complex intelligence, planning, and operational geospatial workflows. The analyst no longer needs to re-create a common workflow from scratch.

The operational map templates have captured the intelligence workflows, speeding up input into the MDMP. Templates include the patrol data capture template and the hostile operations template. They help planners create intelligence and map products for mission planning and other operations such as base security.

The Hornets keep track of friendly and enemy movement within the AO using the SA viewer, an application template. They view current intelligence information, including the locations of incidents being reported from the field, as well as create density maps showing patterns and trends of attacks. Historical patrol routes and patrol reports are overlaid on basemaps. The Hornets staff complete additional analysis to identify areas that have been patrolled frequently or where units have spent long periods of time. All this information is used to create maps for planning optimized patrol routes. These maps are printed, and the digital map is shared directly to the Android mobile devices and embedded system in vehicles taken on patrol.

Searching for the Weapons Caches

The Hornets patrol gathers at the initial rally point inside the FOB for communications and equipment checks of the radios and the mobile devices such as Android tablets, preloaded with the ArcGIS for the Military—Land Operations Squad Leader application template and the ArcGIS for the Military—Land Operations Vehicle Commander application template for Linux-based systems in vehicles. The Patrol Leader (PL) uses both printed maps and those on his tablet that the Hornets staff created to review the routes and the locations of the suspected weapons caches. After the PL counts the troops and pieces of equipment, the patrol members move out in their vehicles. Their progress is monitored in the Hornets' HQ. The commanders and staff there are using the SA viewer, configured for different roles such as the logistics staff officer. For example, the logistics officer uses the viewer on his workstation to monitor fuel levels in the vehicles and other

readiness information, while the operations officer reviews the current alerts and SITREPS from adjacent units patrolling near the Hornets' AO. About 30 minutes after leaving the FOB, the patrol vehicles stop. The operations staff already knows they are close to stopping due to the geotriggered alert on the SA viewer marking where a suspected weapons cache may be. To avoid being detected by the enemy because of the noise produced by the patrol vehicles, the foot patrol begins.

The PL uses both a paper map and digital map on his tablet to ensure the patrol sticks to its preplanned route. Soon, the PL receives an alert on the tablet, a red electronic ChemLight appearing on the screen. An analyst reviewing ongoing FMV from a UAS has detected suspicious activity near the patrol route. A red ChemLight is used to alert all in the area that danger is near. The ChemLight also appears on the SA viewer in the HQ. The PL, after communicating via chat on the tablet and on the radio with the operations staff, receives an updated route to observe and report on the activity. The soldiers left with the vehicles also see the ChemLight alert and the new route on their ArcGIS for the Military—Land Operations Vehicle Commander application.

As the patrol approaches the new target to observe, the PL drops or marks the tablet with a yellow ChemLight on the tablet, marking areas that may be prone to ambushes, for future reference. Shortly thereafter, he submits a SITREP, using his tablet, detailing what was observed: he marks on a map where a group of suspicious men are carrying boxes into an adjacent unit's AO. After collaborating with the adjacent unit, soldiers in the other unit take over, observing and following the suspicious men. The Hornets go on their way, after the PL drops a green ChemLight on his tablet to declare the area clear. While on patrol, the PL, using his tablet, preloaded with the Squad Leader application, drops ChemLights and submits SITREPS detailing what he and his men saw. The SITREPS included MGRS coordinates and geotagged pictures of bridges, choke points, and possible ambush sites.

The Hornets patrol continues on its mission to find weapons caches. As it enters the village where previously derived intelligence indicated weapons are hidden, the PL, using his tablet, drops a red ChemLight and writes that everyone needs to be on alert. According to the Hornets staff, a weapons cache is in one of the four permanent buildings in the village.

The PL instructs the first and second squads to take up security positions around the village. He then orders the third and fourth squads to sweep the permanent structures. The third squad finds a weapons cache hidden in a pit covered by wooden planks and a rug. The PL immediately drops a green ChemLight and writes on his tablet that a weapons cache has been found. The Hornets staff back at the FOB see it immediately. While the fourth squad continues its search, the PL takes pictures of the cache and of the village, which are automatically geotagged. The fourth squad does not find additional weapons. After the PL submits his SITREP using his tablet, the patrol destroys the weapons using white phosphorus incendiary devices that melt the weapons so they cannot be used again. After melting the weapons, they move out to the rally point (RP) where they will meet the trucks that will bring them back to the FOB.

Meanwhile, the soldiers guarding the trucks see an alert appear on their Vehicle Commander application warning them that a large group of enemy forces is nearing the RP the Hornets' truck drivers are heading toward. Alternate routes were preloaded into the Android and in-vehicle systems. This was done as part of the mission planning process. The soldiers on patrol and the soldiers in the trucks switch to the routes they each need to take to get to the alternate rally point. The patrol meets up with its transportation home and proceeds back to the Hornets' base.

***Creating an After
Action Brief for the
Commander***

After the troops and vehicles safely return to the Hornets' Nest, the mission continues. The PL connects the tablet to the BCT network. This is when the actual route the patrol took, the SITREPs, geotagged pictures of the weapons cache and village, and other intelligence that was gathered is transferred to ArcGIS for the Military—Land Operations Server. Analysts quickly validate and help the PL prepare an AAR brief for the BCT commander and staff. The PL uses Esri's ArcGIS Explorer Desktop to create a geospatially enabled presentation. When the commander has questions, the PL can zoom in on the maps to show greater detail and provide the answers. The patrol's mission was a success; the soldiers found and destroyed a weapons cache. The operation to plan, conduct, and document the mission and the sting of destroying a cache of weapons was made easier using ArcGIS for the Military—Land Operations technology.



Esri inspires and enables people to positively impact their future through a deeper, geographic understanding of the changing world around them.

Governments, industry leaders, academics, and nongovernmental organizations trust us to connect them with the analytic knowledge they need to make the critical decisions that shape the planet. For more than 40 years, Esri has cultivated collaborative relationships with partners who share our commitment to solving earth's most pressing challenges with geographic expertise and rational resolve. Today, we believe that geography is at the heart of a more resilient and sustainable future. Creating responsible products and solutions drives our passion for improving quality of life everywhere.



Contact Esri

380 New York Street
Redlands, California 92373-8100 USA

1 800 447 9778
T 909 793 2853
F 909 793 5953
info@esri.com
esri.com

Offices worldwide
esri.com/locations