GeoPost: An Army Installation GIS Cloud Management System for Facilities and Emergency Services

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Abstract

In the last couple years cloud services have become mainstream and easily accessible for organizations to purchase and utilize. GeoPost is a variant on that by introducing GIS to it cloud services for installation management. GeoPost takes the Microsoft Azure Cloud and using ESRI’s Enterprise builds a cloud GIS platform. This platform provides services for installation management and emergency services. This paper goes through the process and struggle to what the current and the intended end state is for GeoPost. The different organizations on a military base as well as the units that rotate through are all part of it. The adaptation and requirements from the different organizations are what drive the changes and design of each organizations section of GeoPost.
1. Introduction

With cloud technology becoming more user friendly and applicable to everyday use it only makes sense to apply it to managing a city. An army base is managed and built much like its own city. Often, bases have their own power plants and other utilities facilities while others rely on off installation contracts with local companies. Regardless of where the utilities are derived, there is still a requirement for the location of various aspects of the utilities. With the requirement for contractors to do maintenance as well as for real property management, the need for mapping will always be present. The same goes for emergency services, there is always a need for both police and fire to have the ability to properly manage an incident. The easiest way to do this among other requirements is by using an interactive mapping platform. Each aspect of GeoPost is designed to be both user friendly as well as adaptable for any situation. The different parts of GeoPost cover requirements for each part of the installation, its structure, security, and cloud Geospatial Information Service (GIS) in general.

The idea of GeoPost or an installation wide cloud GIS came from seeing a need at Fort Leonard Wood, Missouri. The installation is home to the Army’s Engineer, Chemical and Military Police Schools as well as training for the Marines, Navy, Air Force and Coast Guard. The installation has a permanent presence of approximately 10,000 personnel and their families with thousands more of trainees that come through the installation annually. The base is one of the largest training installations in the country and has hundreds of facilities and training areas that require constant management. The installation lacks a GIS structure and instead relies upon an outdated and soon to be discontinued SQL Server. The server itself also has issues with access and maintenance. Over the last 20 years the Fort Leonard Wood Directorate of Public Works
GeoPost

(DPW) has suffered from reduced manpower and budgeting in managing their GIS database and products. This reduced manpower and an increase in IT responsibilities has left datasets outdated and many with missing data. The base has grown over the last 20 years as well with a backlog of maintenance requests and many buildings and some roads missing from the data holdings. The missing and incomplete datasets that are managed by DPW are still submitted to national holdings as record. Each quarter the DPW at each installation in the Department of Defense inventory has to submit updated GIS data layers for the national holdings at the Installation Management Command (IMCOM).

The concept and execution of GeoPost is supported by federal law as well. The FAA Reauthorization Act of 2018 in Section F which is called the “Geospatial Data Act of 2018” (s.n., 2019). The bill provides oversight of the National Geospatial Data Infrastructure under the Secretary of the Interior. The intent of the bill is to “promote cost-effective data collection, documentation, maintenance, distribution, and preservation strategies; and leverage Federal and non-Federal resources, such as promoting Federal shared services and cross-agency coordination for marketplace solutions” (s.n., 2019). This bill helps provide the legitimancy to cross platforms between the different commands and outside organizations as needed. The intent of the bill is to provide federal oversight of national geospatial data holdings for federal facilities, properties and standards. The secondary intent is to allow sharing between organizations and encourage the sharing between them to better manage and utilize data in the national holdings.

The poor data management and production of Fort Leonard Wood GIS data layers, such as a basic roads layer is mainly from only having one person working on the GIS while simultaneously serving as the IT manager for DPW. The need for continual update of facilities and utilities layers for a base is constant. The DPW is required to submit updated layers once a
fiscal quarter even if they’ve made no updates to the layers. The Integrated Training Area Management (ITAM) section of Range Control does not have the same limitations as they fall under a different program within the Army wide installation management program. The ITAM program falls under the Sustainable Range Program (SRP). SRP oversees the management, utilization, maintenance and geospatial support of an installations range and training complex. Fort Leonard Woods ITAM Geospatial data is kept current and is well utilized by units for training as well as for mission planning. The weak point with the installations SRP geospatial support is that it is serviced by only one employee. There was a period for several months in 2018 that the position was unfilled. The gap with no geospatial manager left the installations units lacking for custom geospatial products. The ITAM manager was able to print off already made products but nothing more than that. Many units that utilize Fort Leonard Wood use the standard Military Installation Map (MIM) but many request custom geospatial products of certain training areas or for certain analysis to be shown.

Fort Leonard Wood struggles to allow each of its many agencies and units to have the geospatial and mapping support they need to function. Many departments take screenshots of google maps and then make graphics in PowerPoint, so they have some visual representation. While assisting the Police Department on base it was found that was their method since they never received support from the installation GIS manager and the DPW. They have since learned
to use ArcGIS for both their analytics as well as for crime mapping as can be seen in Figure 1.

Figure 1. A training map for the Fort Loenard Wood Police for crime and incident statistics.
They still want to upgrade even further to be able to match what some of the larger cities have but are limited by the installation’s capabilities. The other agencies on the base are affected similarly with the lack of support and the struggle to have the capability within their organizations.

The police, fire, range control, and emergency operations center are the primary focus of GeoPost. These agencies manage the gates, emergency services, and range complexes. Their requirements are complex and need constant changes for utilization and daily operations. The other agencies such as the Environmental Branch and the Engineer School have far different requirements but still have the common need of a system of easy access and use. For the emergency services, the requirements are a common mapping system across all agencies that can be updated and shared constantly, the ability to do analytics, detailed metadata, and a system that can function both online and offline for major incidents. To expand on the Emergency Services requirements the idea behind the updated and shared concept means that the different agencies can see the other agencies operations graphics, maps and data in real time. The ability to do this acts as a force multiplier for these agencies. The current model is reliant upon the installation GIS manager to drive to the installation and then begin to produce the products that were needed before the incident. When incidents do occur the emergency services are limited to outdated maps of the installation that lack information needed such as data on buildings. Often the map is of the entire installation and not the specific area where the need for the metadata and ability to see all the layers of utilities would make managing the incident much easier.

The requirements for the units, schools, Department of Public Works, Environmental Branch and the other organizations on the installations are equally as important but have a lesser need for instant sharing of their operations picture. These organizations still need the ability to file share
especially the DPW and the Environmental Branch. The schools mainly need the ability to have
dozens of users be able to access their data and share it more important than sharing outwards.
The schools will use the system for training soldiers and for building products to use to support
their operations and units. A common mapping system and datasets for the installation across all
agencies that also share a base dataset and standard maps would solve many coordination issues.
For the units to have access to maps and the ability to produce limited custom products would be
a massive time saver as well as encourage a wider understanding and usage of a system that has a
near limitless amount of capabilities.

The idea of using a cloud GIS is not a new concept for a municipality management (ESRI, 2018). There are many cities from small towns to major cities such as Portland, Oregon, that use
a cloud GIS system across all their departments and agencies to efficiently manage daily
operations, special events and emergency incidents. The idea for using a cloud GIS for a military
installation is not a new concept either but for the Army has been delayed multiple times and has
no real clear path forward as the Army IMCOM debates on funding and if they desire to move
forward with an interactive system. The Air Force and Navy have made great strides forward in
facility management with the NAVFAC and GeoBase programs (AFCEC, 2015). The goal with
these programs is to help account for real property management as well as streamline purchasing
and growing maintenance costs of systems such as HVAC. In the past the installations for the
Navy and Air Force bought multiple brands and the costs of buying parts and contractors for
multiple brands was unsustainable. Their solution was a project to consolidate such systems into
a single brand to save money (AFCEC, 2015) The GeoBase and NAVFAC programs contain
such detail to help manage costs and provide long term planning that they allow an installation to
better manage money and time.
The goal of GeoPost is to provide the capability and resources needed to help an installation manage its properties and public safety. With small and large communities implementing GIS web services to help manage their infrastructure and public safety they have the ability to manage their resources more effectively. With different platforms being tried and tested by the government for this purpose it makes sense to only try a platform that is in heavy usage by cities such as Portland, Oregon. Public Safety services on installations need the capability to do limited GIS for safety and crime tracking. To better understand why GeoPost is a practical approach is understanding cloud GIS, the security of the cloud, structure of the community, and the end goal of GeoPost.

2. Understanding the Cloud GIS

When people think of a cloud-based GIS, they most likely think of ESRI’s Enterprise. While ESRI’s Enterprise and Portal are cloud programs they are a platform to use with a cloud program. Instead, systems such as Microsoft Azure, Amazon Web Services and Oracle are the cloud that the ESRI Enterprise and Portal operate on. The different cloud services are very similar in concept but differ in what they offer. Different platforms are only part of understanding cloud GIS for GeoPost (Sosinsky, 2011). You also need to look at what ESRI Enterprise and Portal are capable of and the cloud requirements are for the U.S. Army.

The big-name platforms that currently are leading the market are Amazon Web Services, Microsoft Azure and Oracle. Each of these companies currently have government contracts with limited contracts with the U.S. Army. Currently the Army has its cloud computing contracts in dispute. The Army went with Microsoft Azure as its primary cloud contract in a decision made in 2018. Amazon is currently suing over the decision under the argument that the contracting process was not done correctly (Nickelsburg, 2019). Amazon Web Services also has other
contracts outside the limited ones with the Army. Oracle has its primary contracts with the
Intelligence Community. Each of the companies has commercial uses as well and are used
heavily by industry.

Microsoft Azure is used over a multitude of industries and purposes. Azure does a good job
of being usable over the different industries. Azure is used in healthcare, financial services,
government, retail and manufacturing. Azure gives the capabilities of doing data analysis, edge
analytics and enables users to do more. Regarding security Azure spends millions of dollars in
constantly updating its cyber security. Currently GeoPost resides on Microsoft Azure through the
cloud that TRADOC G-6 manages. The difference between the commercial and the Army
managed Azure clouds is the login process. With the commercial side you login either through
your company site or through the Microsoft Azure login site. With the Army it is currently a
multi-level process. You have to login through a webpage that is password protected and once in
to gain access to the ESRI Enterprise you must open a jump box to the Enterprise Portal. This
process is slow and not overly user friendly. There is supposed to be a public facing page with
Common Access Card (CAC) enabled to make the login in process easy using the Army’s
IAEMS authentication process. Being able to utilize Python Scripts from ESRI to enable this
login method solves some of the Army’s cyber security requirements.

The requirements for a cloud-based GIS system for the Army are simple as the Army is still
figuring out how it wants to go about it. Some unit’s such as the 82\textsuperscript{nd} Airborne Division have
launched their own ESRI Enterprise systems and have found great success in using it to
communicate to their staffs and commanders. On the installation side there are currently two
websites that are being used one is run by the Department of Defense (DoD) and has basic layers
one can look at for all the services installations. The second one is run by the Army’s IMCOM
and is similar in construct to the DoD one but with less utility. The setup doesn’t allow for feature extraction and limited use if one needs to dig into the metadata. This is a major shortfall for local management and usage outside the installation GIS team. The main requirements are that the system have a secured login in using a CAC and reside on an Army server. If the Enterprise resides on an Army server, it is maintained to all the security requirements that get pushed for the Azure and login authentication. The IT teams do not maintain the updates for software and security patches on the Enterprise software, that is left up to the Enterprise Administrator.

The secondary requirements are that at a local level ArcGIS licenses are maintained and installed by the local Network Enterprise Center (NEC). This requirement is important for an organization to maintain (Abdula, 2018). While the Administrator of the Enterprise can authorize license usage to users it cannot authorize the install at a local level. They can only assign the user authorization to login into the software. The ArcGIS Pro software still must be purchased and installed by the local organization. The usage of Roles and User Types is going to be addressed later in the overall explanation of the structure of the Enterprise.

With only one Enterprise license to use and the Army using Azure it was only practical to use Azure for the GeoPost. The costs of one license is typically over $10,000 a year but can be negotiated with ESRI depending on the industry. The cost covers the multiple facets of the software. This means it covers the web adapters, the Portal, the Enterprise as well as the few hundred ArcGIS Pro licenses and roles and user types within the Enterprise. The price also covers the IT support from ESRI in setting up and maintaining the Enterprise. This help is invaluable as the ESRI team is constantly finding new ways to make setting up and running an Enterprise easier to do. They also will send out the security patches for the administrator to use.
to update the image of Enterprise. Administrators have the option to setup either a workflow or a Python script to install automatically as well. Finding the best cost benefit with an expensive license is key in managing both budget and need.

Inside the Enterprise there are a few different components. You have the ESRI Portal which is the connection from the Cloud server to the Enterprise software. The Enterprise also gives the option to use their built in Web Adapters to connect to the security ports. You can do this on your own, but it is recommended to utilize the built-in web adaptors for ease of the installation (ESRI, 2018). From there you install the data store which is simply the connection from the Enterprise to the Azure server to store your data. The amount of storage depends on the size of the Azure Cloud you are using. With the release of 10.8 Enterprise in spring 2020 the concern of file size being stored on the Enterprise is reduced. ESRI is introducing a better file compression into their software to meet this issue. These four main components of the Enterprise are the software side that resides on the Azure Cloud.

The physical is reliant on what hardware was purchased to fit the need of the organization. ESRI has recommendations as to what the hardware should be at a minimum but most basic computers and servers meet that minimum requirement.
Within the Enterprise itself is the organizations structure. This structure has evolved significantly since Enterprise was first release. Originally there were only two levels of users. The creator and the viewer, but after feedback from customers ESRI recognized for multiple levels of users as well as user roles to help better serve organizations. The different roles are as follows:

- **Viewer**—Viewers can view items that are shared with them by other ArcGIS users. This user type is ideal for members of an organization who need to view ArcGIS content in a secure environment. Viewers can’t create, edit, share, or perform analysis on items or data. This user type includes the Essential Apps Bundle.

- **Editor**—Editors can view and edit data in ArcGIS maps and apps that are shared with them by other ArcGIS users. This user type is ideal for users who need to access and edit data that is shared with them, using apps created with Web App Builder for ArcGIS or ArcGIS Configurable Apps. The Editor user type can also be used with custom editing applications created by customers or by ESRI business partners. Editors can’t analyze, create, or share items or data. This user type includes the Essential Apps Bundle.

- **Field Worker**—Field Workers can view and edit data that has been shared with them by other ArcGIS users. Ideal for users who primarily interact with ArcGIS content through ESRI field apps, this user type allows users in the field to view and edit data using any of the apps included in the Field Apps Bundle (Collector for ArcGIS, Survey123 for ArcGIS, and Workforce for ArcGIS) and directly through ArcGIS Enterprise. Field Workers can’t analyze, create, or share items or data. This user type includes the Essential Apps and Field Apps bundles.
- **Creator**—Creators have all the capabilities of the Viewer, Editor, and Field Worker user types, plus the ability to create content, administer the organization, and share content for use in Essential Apps, Field Apps, and Office Apps. The Creator user type is designed for those who need to create web maps and apps, perform in-depth spatial analysis using the analysis tools in the portal, and work with data using field apps such as Collector for ArcGIS. This user type includes the Essential Apps, Field Apps, and Office Apps bundles.

- **GIS Professional**—GIS Professionals have all the capabilities and app bundles of the Creator, plus access to ArcGIS Pro (Basic, Standard, or Advanced). This user type is designed for those who need the full suite of GIS apps to perform their work—that is, create web maps and apps, perform in-depth spatial analysis using analysis tools, and leverage the advanced tools of ArcGIS Pro. The GIS Professional user type can be assigned at the following three levels, which correspond to the three license levels of ArcGIS Pro:
  - **GIS Professional Basic**—The GIS Professional Basic user type includes ArcGIS Pro Basic, which provides the tools and environment for map creation and interactive visualization.
  - **GIS Professional Standard**—The GIS Professional Standard user type includes ArcGIS Pro Standard, which provides the tools and environment for map creation, interactive visualization, multiuser editing, and advanced data management. It also includes access to Parcel Fabric and Utility Network user type extensions.
- GIS Professional Advanced—The GIS Professional Advanced user type includes ArcGIS Pro Advanced, which provides the tools and environment for map creation, interactive visualization, multiuser editing, advanced data management, advanced analysis, high-end cartography, and extensive database management. It also includes access to Parcel Fabric and Utility Network user type extensions.

All levels of the GIS Professional user type include access to apps in all of the app bundles in addition to ArcGIS Pro. This user type does not include access to other ArcGIS Desktop products and extensions, such as ArcMap.

- Insights Analyst—Insights Analysts have all the capabilities required to use ArcGIS Insights, including creating and sharing content and performing analysis. This user type includes an Insights license. It's designed for those who primarily use Insights in their day-to-day tasks and may need to perform administrative tasks in the organization, but who don't need to access other ArcGIS apps. To learn more about this user type, see Licensing in the Insights documentation. (ArcGIS Enterprise, 2020).

The different user types are a mixture of different user levels. This means that you can mix the capabilities of the different user levels. The administrator is the user role that can assign the user types according to the individual users need in relation to their job. An example is that a user with the Field User designation that needs editing capabilities found in the Editor user type. The administrator can then give the capabilities in the editor user type to the specific user in the field user. This ability to allow changes from the basic setup to a customized setup to better serve the individual for the organization.
User roles are the other part of the setup of user identifiers. User roles define the privileges that a user has within the Enterprise. There are five type of user roles; viewer, data editor, user, publisher, and administrator. Each has a set of specific privileges:

- **Viewer**—View items such as maps, apps, scenes, and layers that have been shared with the public, the organization, or a group to which the member belongs. Join groups owned by the organization. Drag CSV, text, or GPX files into Map Viewer to geocode addresses or place names. Get directions in Map Viewer and apps.

  Members assigned the Viewer role cannot create or share content or perform analysis. The Viewer role is compatible with all user types.

- **Data Editor**—Viewer privileges plus the ability to edit features shared by other ArcGIS users. The Data Editor role is compatible with all user types except Viewer.

- **User**—Data Editor privileges plus the ability to create groups and content. Users can use the organization's maps, apps, layers, and tools, and join groups that allow members to update all items in the group. Members assigned the User role can also create maps and apps, edit features, add items to the portal, share content, and create groups. The User role is compatible with the Creator, GIS Professional, and Insights Analyst user types.

- **Publisher**—User privileges plus the ability to publish hosted web layers, ArcGIS Server layers, register data stores, publish from data store items, and perform feature and raster analysis. The Publisher role is compatible with the Creator, GIS Professional, and Insights Analyst user types.

- **Administrator**—Publisher privileges plus privileges to manage the organization and other users.
An organization must have at least one administrator, though two is recommended. There is no limit to the number of members who can be assigned to the Administrator role within an organization; however, for security reasons, you should only assign this role to those who require the additional privileges associated with it. The Administrator role is compatible with the Creator, GIS Professional, and Insights Analyst user types. (ArcGis Enterprise, 2020).

A cloud GIS is an amazing tool if built and used correctly. It expands the possibilities for an organization to use GIS for many things. Understanding the user roles, types and levels are key to managing the assignment of those positions and being cost effective. Since each user assigned counts towards the end cost it is important to be efficient with assignments. The structure and tools offered by the Enterprise can structured anyway that is desired by the organization (Orban, 2017).

3. Structure of the Community

The structure of the community for any military installation is confusing and each organization has multiple reporting requirements for different purposes. The organizations range
from installation command to unit commands which fall under a different hierarchy. For Fort Leonard Wood where GeoPost was designed for it is confusing between the different commands and structures. Figure 4 below is a simplified visual of the relationships and command connections between the major organizations. Each organization has sub-units as well but tie into the GeoPost from their parent organization.

![GeoPost Relationships](image)

As can be seen in Figure 4 there is a complex relationship matrix across the installation. The goal of GeoPost is to provide a central hub for GIS support and products. The organizations are typically grouped under a parent organization. An example of this would be the various schools being grouped under the Maneuver Support Center of Excellence (MSCoE). This grouping system by the installation serves the purpose of easing administrative chains as well as command chains. The actual GeoPost is hosted and owned by the Army Capability Manager Geospatial (ACM-GEO), office which falls under the MSCoE. This is an admin chain but not the command
chain for this organization. ACM-GEO oversees the geospatial capability for the Army. This means that they establish the requirements and goals for furthering geospatial technologies for the Army as well. GeoPost falls under one of the programs they are working to develop and test for implementation of standards and formats for the Army to streamline installation management.

The intent for providing the geospatial support directly to units and subunits is to help those units get the products they need with little effort and trouble. The units would designate someone to be their point of contact to get an account for GeoPost and then filter through what that unit needs from it as well as sending up requests for more specific products (Steintz, 2012). Units already do this for most of their Army systems and is more easily managed. With only a limited number of licenses to utilize limiting units to one or two licenses is the most economic way to do so. Units like the Army Engineer School (USAES) would get more licenses due to their ability to train geospatial soldiers and their need to use a GIS portal. Meeting training needs as well as installation management needs are equally able to be accomplished with proper license management.

Training installations like Fort Leonard Wood are more diverse in their community than installations that fall under Forces Command like Ft. Bragg or Ft. Stewart. Bases that have only combat units are more streamlined since they are split between the active units, National Guard units, Army Reserve units, and the installation. This simplifies the needs for who needs access to GeoPost. This doesn’t change the need for common products and access to those products. The production and dissemination requirements change very little between the two different types of installations. The intent of the service is what is important as well as the accuracy of the products. Providing accurate and high-quality products the units and soldiers is the highest goal
of GeoPost. With ACM-GEO responsible for establishing and maintaining mapping standards for the Army having those products meet those standards is both implied and expected. Soldiers and civilians would be making the different products and using them.

Using the chart in Figure 4 we can see how majority of the organizations fall under the Garrison HQ. These different directorates fulfill many different needs for the installation and require different products to do so. These organizations are also the organizations that make different products to meet their reporting requirements to the IMCOM at Department of the Army quarterly. Having a single place to hold those products and data helps cut down on the amount of data sets being built in parallel organizations. By cutting down on the number of parallel products being built there is better control on the quality of data as well as overall better data management. Data management has become a significant issue in recent times and is only going to become a bigger issue as we get overwhelmed with data. With a centralized data store for the different organizations under Garrison it cuts down on the amount of people needed to provide services among the different organizations (Abdula, 2018). Organizations such as Police and Fire have far different data requirements many of which need to be protected. The GeoPost provides that protection in closed groups and gives other services such as dashboards and specific tools built to provide the analysis that Police and Fire need to better operate.

For organizations such as the Tenant Units having direct access to the GeoPost cuts down on their wait time to get products. In the current setup the wait time can be weeks if the product hasn’t been built or the GIS tech is tasked to a different project or is on vacation. Often these units are utilizing the same basic products repeatedly and just need print outs. With access to GeoPost to pull the files to print as well as put in requests for custom products will cut down on their wait time as well as bypass the point of failure of only one GIS tech for the installation.
These tenant units range from training detachments to actual deployable units that do not have the time to wait for someone to come back from vacation. These tenant units answer to a different command structure and have different time requirements then normal training units do. They need the direct access to meet their training timelines which change rapidly unlike the rigidly structured basic combat training and advanced initial training units.

The schools that fall under MSCoE also have need for direct access to the GeoPost. The Engineer, Chemical and Military Police Schools all have a need for Geospatial support to varying degrees. The schools need the support to provide training aids for their students as well as for other initiatives the schools oversee for their respective branches of the Army. The Engineer School would by far be the largest group of users. With multiple courses for Geospatial Soldiers and Warrant Officers held each year the rotating usage would be heavy on the Enterprise to store data and assist in helping the instruction of cloud usage and publishing products online. Practice in doing that is key to providing services to their commanders when they leave training and are part of a brigade or higher staff. The other two schools would be users in that they would be grabbing standard products and placing requests for special projects. The school’s access would also be extended down to their training brigades. These brigades would simply be pulling standard products and requesting custom products for special events. The brigade’s units are in a rigid schedule with predetermined events and timelines. Sharing access to the schools and their brigades are key to providing stable and consistent support to these units.

Giving access to the different organizations on the installation is what GeoPost is about. The sharing of data, products and giving the option to submit requests in a single location simplifies the getting of maps. These organizations for the most part are users of standard products already made but not easily accessible without driving across the installation to retrieve them. Having
them located on a web portal that is easy to access and secure saves both time and money for the installation. Units can print or just use the digital version of the products for their planning and usage. For the installation management it allows a shared platform that can be easily updated and pulled from for multiple directorates that need the same data and access but can’t afford to hire their own GIS tech to build and maintain.

4. Building the GeoPost Cloud

Building GeoPost was not and is not without its challenges and learning curves. The start to current status of GeoPost is in constant flux as new updates and ideas come out to change the setup to what works best across the board. The project from concept to its current built stage was 20 months which is a rapid project in Army timelines. The initial planning was that from concept to having anything built was three years due to the slow process of the Army in building anything new. By jumping on to an early stage of TRADOC cloud initiative we were able to move forward much faster. Many of the holdups were due to misunderstandings between TRADOC and ACM-GEO. These holdups lengthened the time it has taken to get started and is the current hold up in it being usable by the installation. Currently GeoPost is nothing more than a framework built on a Microsoft Azure Cloud. Much of the visualization of the steps to enter and see the state of GeoPost will be from Appendix A. Inside Appendix A is a walkthrough process to see the challenges that there are to enter the admin part of GeoPost.

The initial thought behind GeoPost was to utilize an existing license of ArcGIS Enterprise to establish a working portal for internal GIS projects for ACM-GEO. It rapidly expanded out to include the various organizations and units on Fort Leonard Wood as we discovered the lack of GIS interoperability and capability for the installation. The building included determining what steps we would need to do to begin implementation. To do so I attended a three-day ESRI course
on Building an Enterprise. This course explained how to establish and build the ports needed to have an operational instance of Enterprise. The course gave the knowledge to run through the installation and basic setup of the Enterprise and showed best practices in administration as well as resources to go to. These resources were invaluable as well as the tech support from ESRI in the initial install.

Finding the opportunity to install the Enterprise license on a cloud was the next step and it was only by happen chance that we found that TRADOC G6 was looking for organizations to put on their cloud. TRADOC G6 is the organization that oversees the signal and cyber components of TRADOC in which Fort Leonard Wood falls under. ACM-GEO initiated conversations with them and over a course of nine months established what the requirements are goals were of building a cloud-based GIS portal. It was sold as a proof of concept and a test for both TRADOC G6 and ACM-GEO. As neither organization has ever setup an Enterprise on Azure Cloud before it was a steep learning curve for both parties. As can be expected this step in the process was complicated by many miscommunications and misunderstandings by both groups. An example that comes to mind is the terminology used by Microsoft contractors in explaining that the initial instance of Azure opened the “jump box” to the instance of the Enterprise. This miscommunication and lack of explanation of how to open the “jump box” led to months of no work and frustration on the ACM-GEO end.

Once it was understood what the “jump box” was and how to work it we were able to get into the Enterprise instance. But at this point it is unclear why the connection issues to open the actual portal software were occurring till Microsoft added a direct link to the web-based portal. This is where limitations were found on the rights of the Azure admins on the ACM-GEO side were found. It was impossible for the ACM-GEO admins to upload the license software to activate the
GeoPost portal software. Microsoft must take the software file and load it onto the Azure cloud themselves for it to be used. This limitation is still there and limits the ability to load updated licenses. This step lead to many frustrations till support from both ESRI and Microsoft assisted in clearing up the issue after many phone calls to understand what work around could be established to load the license.

Despite these limitations and the waiting for the work order to be completed the GEOPOST cloud GIS portal was launched. As can be seen in Figure 5, GeoPost is live but waiting for its public facing page for it to be more user friendly for the administration side and for the daily users. As of right now there are only two administrators on GeoPost with plans in action to add two more to the administrative team. Getting the portal to this point was an achievement itself with the difficulties of dealing with outside IT support that doesn’t understand what ArcGIS is or how to install it. The amount of miscommunication from both sides has made this a frustrating enterprise.
In keeping with current events, the TRADOC Commander, General Funk, requested a dashboard program to track COVID-19. Many dashboards already being used to show the major facts and trends of the spread of COVID-19. There is a need for one at the TRADOC level and it was requested of GeoPost to build one. But due to the lack of a public facing page was unable to assist in providing the TRADOC wide dashboard showing barracks spaces, number of trainees and possible housing issues with trainees unable to leave installations. ACM-GEO decided to use this crisis to push forward on their request to make the page public. Unfortunately, the request once again stalled due to the TRADOC G6 cloud team being undermanned and overloaded on projects.

A major take away from this event is that senior leaders within the Army are beginning to understand what the impacts are of a program like GeoPost can do to serve not only at a local level but at a national level. Looking forward, GeoPost has the potential to impact disseminating information at a major command level on top of its local intent. The portal is a framework in which other installations and commands could base their portals from if they so choose. Working more closely with TRADOC G6 to move forward with gaining more overall control of the Azure cloud and a public facing page a re critical and is already being worked. Having a large-scale crisis hit and the need for a project that was playing with the tools on a small scale is a wakeup in how we move forward in our management of installations and resources.

The lessons learned from building GeoPost are going to be key drivers in moving forward with building out and refining what is needed to be delivered. Building any kind of portal with an outside organization that has different priorities is frustrating and the only real solution to move forward is to stay on top of the contractors and leaders at the TRADOC G6 Cloud Team. This single action would save a major amount of time and would simplify many issues that came up
from miscommunication. An additional lesson learned would be to involve support from ESRI far earlier than I did as their help with communicating the requirements to the Microsoft Azure contractors was irreplaceable. Regardless of having taken a course to setup an Enterprise the doing it outside a classroom environment was challenging and that course ran by ESRI was a huge help in understanding how to set up an Enterprise as well as how to properly administer one and organize it internally.

5. The End Goal of GeoPost

The end goal of GeoPost is constantly evolving but it does have main intents of what it should have. The original intent of GeoPost was to give Fort Leonard Wood a single and reliable cloud platform in which to store and share GIS data across the installation. It has since evolved into something more. The constant evolutions of realizing what it brings to the table for different organizations has forced a change in thought process. Why just stop at being a store house for data? With each new update pushed by ESRI on what is capable on their Enterprise platform the more we realized that we need to be able to offer those services to the different organizations.

The different organizations want the updates that have come out as they have spent the time researching dashboards and new analytical tools that have come out with it. Often these have meant building example products and teaching them how to build and use them to see what the applications could provide. The police force on Fort Leonard Wood are the biggest fans and drivers to push to make this a reality. This capability for them gives them a better idea on how to emplace their resources to provide safety across the installation. Using dashboards and ArcGIS Solutions have been of great interest to the organizations as well.
The structure of GeoPost changes very little with the evolution of what the scope has become. The breaking down of organizations into their own groups with limited access hasn’t changed and is unlikely to change. They will still be able to post publicly and share datasets with other groups but can restrict what is released outside their group. This is an upgrade from the current geodatabase that is hosted on an obsolete server and has access issues as well as interoperability issues with newer versions of ArcGIS software. The reliability of old systems is diminishing as TRADOC migrates their servers to cloud servers and reduces the number of local servers. This issue alone is a driving force in pushing installation management to a GIS cloud platform.

Providing a platform that can be used in emergency management situations was and is the primary intent behind GeoPost. The reason for that is emergency management needs to be able to work in both an online and an offline capability. With a military installation this is even more so. With limited resources and personnel that can be hired to fill roles having a platform that can provide geospatial products with minimal training and be able to be rapidly deployed is extremely valuable. The current state is for the emergency services to operate on outdated maps and data while the GIS tech from the DPW is woken up and commutes to the installation for large incidents. This process is filled with points of failure that could get somebody injured or in the hospital. But giving police and fire the ability to have products already on their computers and updated printouts they can respond more rapidly and better coordinated.

Giving users a platform to manage and disseminate their products and data is the main goal. Without a safe, secure and user-friendly place to store sensitive data and be able to share it with others internally and outside organizations we cannot live up to the goals of GIS users. Sharing data has been a cornerstone of the community since its inception and is what keeps it moving
forward. The same mindset should be what drives the multiple organizations that reside and run a military installation. Since a military installation is the same as a small city the same standards of cooperation and goal to serve the community should reside there.

6. Conclusion

GeoPost has many complexities and has been a 2-year process to get to its current state of being half-built and has a way to go before it is fully functional. But given that is a program funded by the army and dealing with army processes and network security this is an impressive advancement for a minor project in the scheme of things. The lessons learned from building a framework to dealing with network security to pushing the software beyond what it was originally built for have been tremendous. The work from the TRADOC G6 cloud team, Microsoft Azure contractors, ESRI software developers and the internal ACM-GEO team have pushed the idea forward and through red tape to get where it is now. The amount of manhours is staggering as well as the realization that all parties were not prepared for the difficulties that would be involved in launching an ArcGIS Enterprise on an army network.

The decisions made to push forward started with deciding to utilize Microsoft Azure solely because it was available, and a team was willing to help make it happen. The lessons learned from that decision led to a world of confusion for non-IT trained or savvy people, such as myself. Going with a cloud platform already being pushed by the army was an easy decision to make. The platform itself was compatible with Enterprise and is easy to use once its been explained how to administer it.

Fort Leonard Wood has provided an opportunity to design and implement a practical application of GIS on a community that needs. With the variety of different organizations and
their different needs presenting many challenges it was an example of how versatile the Enterpise could become and provide the services that its customers needed. The different groups bought in at different times and the various personalities on the installation either fought it or bought into the idea after it being explained to them. There are still those who do not want to utilize it as they see it as a threat to their job. While this is not the case there are people that you will never win over.

Overall, I would say that while GeoPost is only half complete it is a success. The impacts of what it will be capable of delivering once it is published are known by all parties involved. Events such as the COVID-19 pandemic have only amplified the need for it and what it could provide at the local level as well as for the national level for all training bases in the Army. The higher levels of the Army are seeing what a cloud GIS platform can accomplish in a crisis and how it is providing necessary information to make decisions and plans. The need is present, and the understanding is there as well. If there is a time to push for and complete it is this year with a major crisis that requires constant tracking. The uses on the local level are just as important. Units can track their barracks spaces and the DPW can complete their building inventory with floor plans. The intent of GeoPost has been met but the application has not but is still wanted and has been recognized as a need but not a requirement for installation management. There is still a way to go but significant progress has been made and is still being made.
References


Appendix A

GeoPost Login Information

2. Enter your usernames-Tradoc\douglas.kaiser.so
   a. .so means you have an admin account
3. Enter your password
   a. Must have 2 capital letters, 2 numbers, 5 special characters and be 17 characters long
   b.  
4. Click on TRADOC-Full Desktop then enter username and password twice. It will fail the first time so do not be alarmed it is working.
5. You are now in the Azure Cloud and should see a screen like the one below.

![Azure Cloud Screen](image1)

6. Your next step is to open the command prompt and type in MSTSC, and press Enter.
   a. A window will pop-up and ask for a computer name. Enter 10.100.4.25 and enter your password.
   ![Command Prompt](image2)
7. You are now in the Enterprise Portal
8. To open ArcGIS Enterprise you’ll double click a site shortcut link
9. To login a user account will have to be created by the admin to grant access and rights.