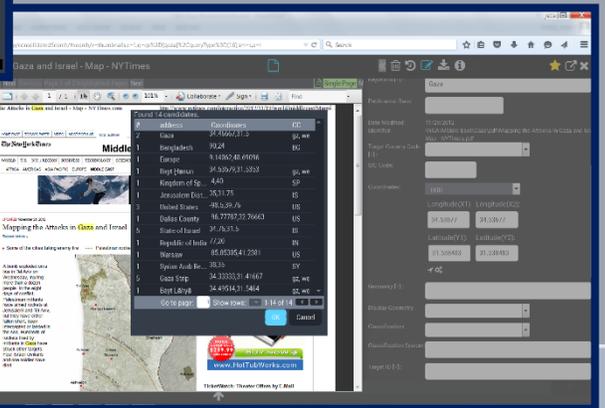
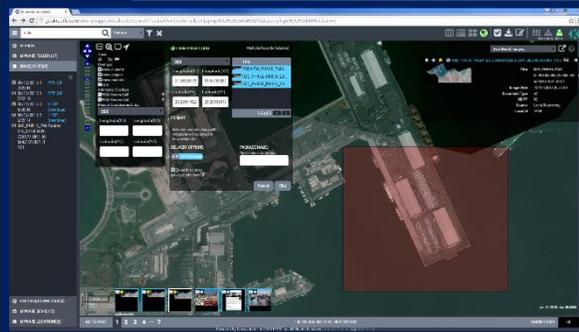


Whitepaper: Knowviation™ Geospatial Content Services Platform





1. KNOWVATION CONTENT SERVICES PLATFORM OVERVIEW

Today’s reality is that organizations are living in a multi repository world. The enterprise content management concept that focused on organizations ingesting and managing all data in a centralized system has proven difficult to implement. This is not due to technological deficiencies; it is primarily a result of organizations’ decentralized structures and operating environments. If all data is not ingested into the central repository, it just does not work. Enter the Knowvation (KV) Content Services Platform (CSP) which uses a robust content management strategy along with technology that allows organizations to find and use their data regardless of its source repository and location. The key is “federating” technology that allows for creation and searching of a master index of an organization’s data, where the data may be stored locally or across the Web. Some of the KV CSP’s other key features are:

- Supports over 225 types of digital documents -- geographical datasets, images, maps and other documents (Word, PDF, etc.)
- Powerful search and discovery, including Boolean (Keyword), concept (Intent-based), pattern (fuzzy-text), metadata, multi-lingual, hierarchical and geospatial (visual) across all data types
- Robust and easy to use tools for ingesting data into a single repository, with the ability to read/write/tag metadata during or after ingestion
- Ability to enhance and normalize data required for data governance and analytical processing
- Extensive administrative tools with security and protected access
- Allows analytical processes to be performed on an ongoing basis as new data becomes available
- Designed to run in a virtual environment on premise or in the cloud.

With diverse query tools, users can effectively search mountains of data to quickly and accurately and pinpoint desired information. This increases their productivity, improves their decision making, and enhances the quality of their work products. Moreover, the unique browser-based interface allows users to access data in the field, wherever Internet service is available. The platform also reduces administrators’ workload for data management. Overall, the results include lower costs, with improved mission performance.

2. SYSTEM DESIGN

The KV CSP’s multi-layer architecture is illustrated in Figure 2-1, below.

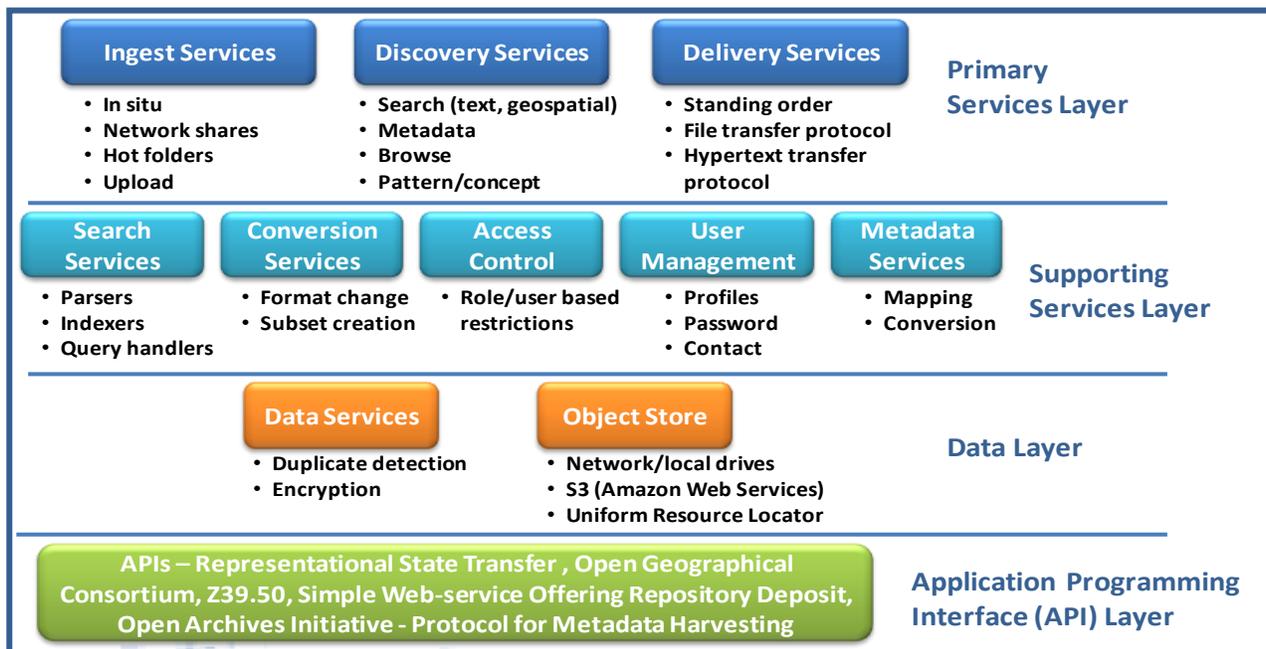


Figure 2-1: KV CSP Architecture



Beneath the four architectural layers, an underlying database structure maintains the fundamental relationship between digital data and descriptive metadata. In the Primary Services Layer, a search engine is pre-configured to index and retrieve data using full text, geospatial, and metadata queries against the complete data repository.

The Supporting Services Layer provides for content management, offering full lifecycle management of digital objects and role-based permissions for granular levels to objects and documents that can be tightly controlled by system administrators. In addition, federated search and discovery capabilities in the Supporting Services Layer provide support for automated data/records governance, creating an index for all the organization’s information that needs to be managed. The federated index allows data to be discovered without moving it from other file shares or systems like SharePoint. The system supports data collaboration and provides the means to flag and select data of interest.

The Data Layer supports services that include duplicate digital object detection and encryption with administrative GUI driven tools to support configuration. This layer supports storage in the cloud (S3) or on premise in conventional data center SAN or NAS facilities.

The platform is designed for flexibility to allow for changes without the need to replace underlying technology and supports a distributed system configuration that can be tuned to maintain performance. The open architecture and Application Programming Interfaces (APIs) enable integration with existing and future third-party applications. For example, our integrated Rules Engine module can be easily integrated with Esri tools to augment the system’s geospatial capabilities.

3. KNOWVATION FAMILY OF CSP APPLICATIONS

Sitting on top of the KV CSP core software is a suite of applications that were designed and built as commercial products to address specific requirements. The applications use features delivered from the platform analytics, discovery and other use cases. The KV Discovery module allows users to store, search, retrieve, browse, manage and analyze a diverse set of content/digital objects; it is required as a component when any of the other modules are needed. Our other products include:

- Knowvation GS™ – geospatial content management (GeoCMS)
- Knowvation DX™ – includes workflow/redaction functionality for declassification, FOIA, and Privacy Act processing
- Knowvation IX™ – database information extension
- Knowvation RM™ – organize and managing regulated content
- Biblioivation™ – open development Library Service Platform
- Droneware™ – light version of (KV) GS specifically for drone users.



The modules are targeted to various customers and provide dedicated offerings into sectors often untouched by standard content management applications.

4. KNOWVATION CAPABILITIES

The following paragraphs describe the capabilities of Knowvation CSP Core and other KV application modules.

4.1 DATA INGESTION

The KV CSP is designed to provide a common interface for ingestion and indexing of data in a user friendly and secure environment. During the process of ingesting data into the platform, information is extracted to build a rich index allowing for fine-grained searches across unstructured data. The KV CSP provides a Data Control and Hosting Platform that support a wide variety of uses.

When ingestion is feasible or for retirement of legacy systems, KV provides users four out-of-box alternatives for migrating, ingesting and publishing data in a managed repository -- create a single record, bulk import, drag and drop load and hot folder. Users can add data via http, ftp, network shares, and APIs. When data is



ingested, KV provides records management capabilities such as version control and retention scheduling.

The CSP extracts metadata by reading/parsing and extracting file information. Ingestion processing can involve multiple processes, including: de-duplication, normalization, metadata extraction and schema mapping, browse hierarchy creation, full text extraction, Optical Character Recognition (OCR), geospatial entity extraction and geo-coordinate lookup. Classification and security information is collected during ingest processing, and KV has the ability to create PDF files from multiple formats and apply classification markings to PDF headers/footers. KV administration is performed using a web-based Graphical User Interface (GUI).

4.2 DATA DISCOVERY AND DISSEMINATION

KV Discovery capabilities are provided with an intuitive and easy to use interface. Once a user logs in (see Figure 4.2-1), a Google-like “Anywhere” search box (circled in Aqua) is provided with discovery options for the user. Users can key in any text and KV searches both metadata and document full-text. When the Geospatial

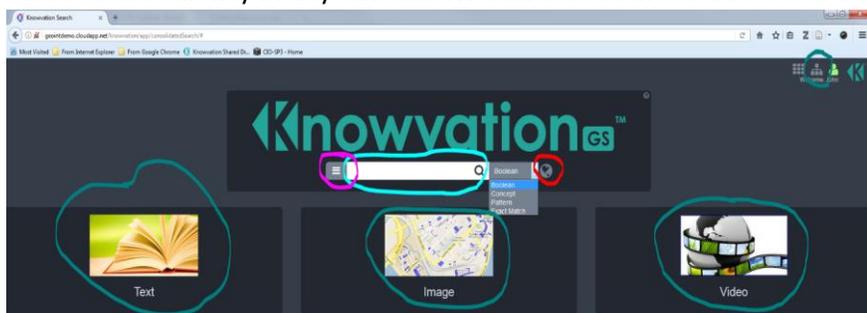


Figure 4.2-1: Knowvation Entry Level Search and Browse GUI

(GS) application is used, a globe icon (circled in red) opens a map interface. Browse capability is provided (circled in teal) by metadata format (data type) and a hierarchical browse can be invoked by clicking the icon (top right). The advanced interface is launched by selecting the icon to the left of the search box (circled in fuchsia).

An important KV feature is the ability to ingest data or index-in-place, and combine in an index for discovery with a variety of tools that are available for images, video or rich text content. Inherited or created metadata is used to help the user limit a query to pinpoint the information they are looking for especially as datasets become “Big Data”.

For federated searches, KV’s browser-based search interface makes it simple to find datasets, images, maps, layers and other documents (see Figure 4.2-2). Regardless of whether the data is ingested and managed by KV or indexed in place, one search finds it all. KV indexes content in other repositories and enables full text searching of that content in situ. With a single click, users can navigate across different views and retrieve all data and links to all source intelligence in an area of interest. KV can integrate multiple data sources, link metadata, extract samples, and link data using multi-term searches.

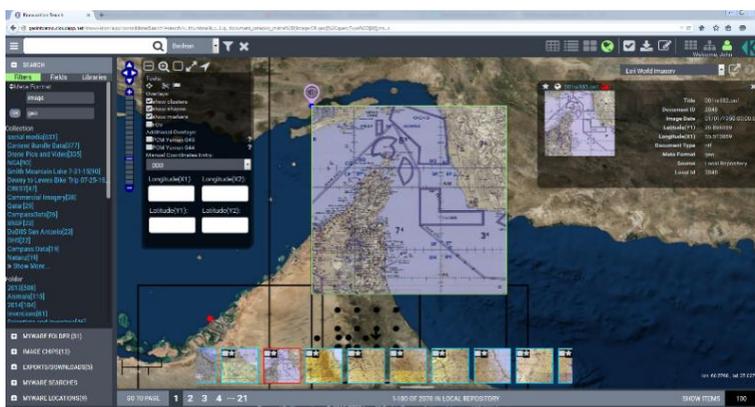


Figure 4.2-2: GIS and Mapping Support

The KV Discovery app includes the ability to OCR images and build image/text PDF files on ingest. This leverages the powerful search capabilities by allowing full text searches to be performed on born-digital materials as well as original hard copy data that has been scanned. In addition, powerful OCR can be utilized to search imbedded text in photograph and imagery.

4.3 DATA ENHANCEMENT AND NORMALIZATION

The Knowvation CSP™ provides a set of tools for enhancement of data and data governance during and after ingestion. Enhancing data quality adds value for evaluation and analytical processes that happen after





the collection and discovery process. KV CSP provides automated, semi-automated and manual tools to enhance and improve data quality.

4.4 FEDERATED INDEXING

KV CSP provides a federated search capability using index-in-place technology in combination with data ingestion. Using a web-based administrative GUI for configuration, KV can index data in place for existing data, file shares, repositories and other systems such as SharePoint, and subsequently builds a federated index with full protection of the integrity and authenticity of the data. This dual function offers a “one search finds all” capability and permits data discovery and management, regardless of whether the software is hosted in the cloud or on premise in a data center.

4.5 ANALYTICS

The KV CSP provides for analytical processes that allow a temporal and geospatial area of interest to be defined to support use of KV or best-of-breed 3rd party analytical tools. KV includes some commonly required analytical tools such as map mensuration and visual image change detection. The CSP enables integration with a wide variety of geospatial and analytical tools to perform analytics. Examples of 3rd party tools successfully integrated include Esri and RemoteView. Data ingestion processing allows image files to be OCRed on ingest; text files can be mined for geospatial place names; and time lapse chipping can be performed to provide the analyst rapid change detection analysis. In addition, the CSP can share data with other KV users or push data outside of the system. MyWare functionality supports analytics by sharing data internal to KV using public or group saved queries and provides auto-notification when newly ingested data is in the area of interest. Built in visual change detection tools include a time-lapse chipping function, change detection layer integration and a side-by-side image viewer for quick temporal analysis of areas of interest.

4.6 ADMINISTRATION

The KV CSP has multiple web pages for managing the system, along with advanced administrative features that allow workflows to crawl and identify new sources and add/define hot folders/parameters for automatic system ingestion. The CSP provides workflows and tasks that can be scheduled and tracked. Users can define tasks for scheduling processes like crawl, index, etc., and there is an e-commerce function that provides a shopping cart capability for delivery of data. workflow tasks include downloads and conversions.

5. ABOUT PTFS

Founded in 1995, PTFS is currently located in a dedicated facility in North Bethesda MD. The company has focused on developing enterprise content management solutions for Federal, state and local government organizations, as well as commercial entities for 23 years. We have gained significant experience implementing and integrating Knowvation and related products and services to satisfy customers’ unique needs in multiple environments. PTFS has a Top Secret (TS) facility clearance and is approved for safeguarding to the TS/Sensitive Compartmented Information (SCI) level. We have more than 100 employees, including nearly 90 with clearances up to the TS/SCI level. PTFS has technical experts in geospatial information systems, geospatial analysis, database management systems, security, records management, and data communications, as well as seasoned and Project Management Institute-certified project managers.



Figure 5-1: PTFS Headquarters

6. CONTACT

To schedule an appointment, obtain more information or request a Knowvation demonstration, please contact Mr. Dan Quinn, VP Sales & Marketing at PTFS. He can be reached at (240) 380-1179, or by email at dquinn@ptfs.com.