Overview of KEI for Identity Ecosystem Map Project

OVERVIEW

This document offers a simple overview of a data platform that may be able to provide significant value to the identity map project.

GOALS

1. Provide an overview of the Knowledge Ecology Interface (KEI) platform capabilities as relevant to the identity map: https://www.kumu.io/IdentityFutures/idsystem
2. Suggest possible next steps towards a project that supports the identity community.

KEI BACKGROUND

The Knowledge Ecology Interface (KEI) platform was developed to address advanced analytics and network modeling requirements for the US Department of Defense (DoD). The platform provides the underlying IT infrastructure and user interfaces needed to model an evolving constellation of nodes and connections representing a domain of interest. This software was developed under contract through the Combating Terrorism Technical Support Office (CTTSO) as part of the Advanced Analytics Program. **The software is US Government owned and there are no license restrictions governing number of users or data utilization.** The primary cost factors for transition from CTTSO are ongoing development costs to extend or customize the user interfaces for specific audiences or use cases, modeling services, and data integration/import with existing sources.

While initially developed to address C-IED modeling for the DoD, the application is not domain specific and has been used to model a wide range of networks.

PLATFORM TECHNOLOGY

The KEI software infrastructure provides a basis for application customization with core knowledge modeling and visualization tools in place for immediate use. Designed to work in a broader micro-services infrastructure, the software provides core knowledge persistence and modeling infrastructure with standard REST services interfaces and an intuitive browser based interface that makes complex concepts and tasks approachable. The KEI platform is based on

solid software design and development practices derived from proven industry and government delivery experience. Likewise, the OSS components employed in the software are broadly accepted and understood making the platform extensible and maintainable.

Knowledge Graph

At the core of the KEI platform persistence layer is a graph database. This structure provides a uniquely powerful way to represent data in an infinitely flexible manner as well as model the all-important relationships between objects (vertices) that are often as complex and important as the object itself. The graph database is coupled with a data model made up of class, property and link representation similar to and compatible with RDF. A graph management user interfaces provides users, with the right permissions, to extend the information model in real time. For example, if a new type of relationship is discovered it can be modeled and used without engineering intervention and is immediately useful. This capability makes real the promise of flexible ontology in a graph-based system and enables the rapid assembly of ecosystem models.

The knowledge graph is implemented using Neo4J as the underlying graph database. This facilitates fast graph queries and traversals that drive the visualizations in the application. In addition to graph type queries the application makes use of full text indexing to support unstructured text queries.

Search

All of the information (vertices, process models, documents, data objects) in the KEI system is searchable using full text search, tags, category (class) searches and graph traversals. Optimized for discovery, the application uses Elasticsearch to index the information stored in the graph as well as unstructured data associated with graph vertices such as reference data (documents, videos, images) that has been ingested in the system.

Collaboration Infrastructure

Collaboration is at the center of KEI and is implemented at multiple levels of the application. Users collaborate to build and extend the process models, teams of interdisciplinary analysts collaborate as a case team in all steps of planning and analysis. The KEI supports sharing of files or application data with specific team members or groups as well as making files or application data accessible to all users.

NEXT STEPS

Immediate next steps, if the identity map team is interested, would include:

Requirements Discussion

The mapping team would have an initial discussion about anticipated uses of and requirements for the map, and gain an understanding of how much customization of the KEI platform would be needed.

Data Structure and Decentralized Curation

Before entering the existing data into the KEI, we recommend looking at the existing categories and data structure and assessing if that takes full advantage of the KEI platform and - potentially - the visualizations possible using Kumu (see below).

Access and Clarity Assessment

One additional consideration would be whether the KEI is the main interface for the map, or whether the inviting design of the Kumu platform would be a good way to present the map to the identity community. Using the KEI as the back-end for all data and Kumu as the presentation interface for sections or queries of the information can make the map accessible to a much wider audience, while retaining the powerful features of the KEI platform that are not available in Kumu.

Screen Shots

Note: The following screen shots show examples of the user interface using a dataset developed to model the conflict dynamics in Jordan with the influx of refugees fleeing the war in Syria. As stated the tool set is data and model agnostic and this example demonstrates how custom node data models (ontology) and links can be created in the tool.
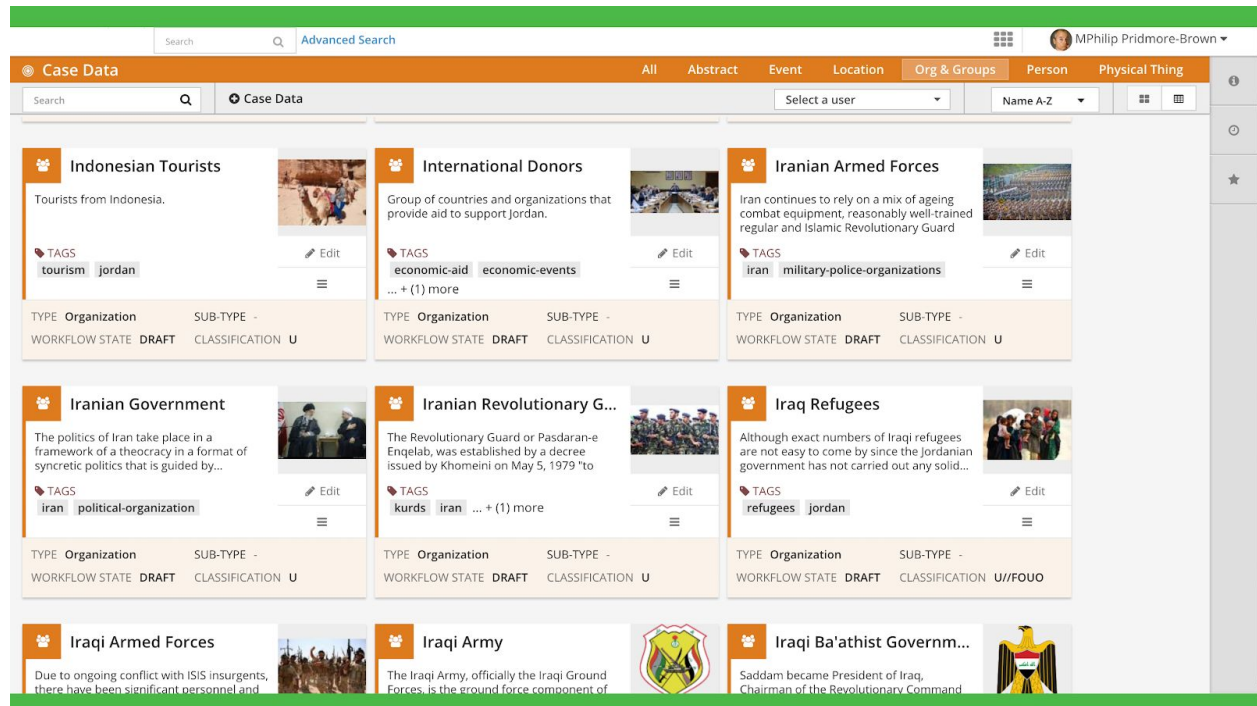
Data Cards Interface

Data Cards are the node elements that form the basis for the graph being modeled. Cards can be created for different node types each with a unique set of properties and relationships. The card browser provides a visual tool to browse and search the KEI.

Data Card Detail (Person Class)

Each data card is a template driven view that can be populated either with imported data and/or with user entered information. All changes are recorded in a history log and access to different cards or sets of cards can be governed with read/write/delete permissions.

Data Card Detail (Location Class)

Location data with Latitude and Longitude properties are rendered on a map for visualization.

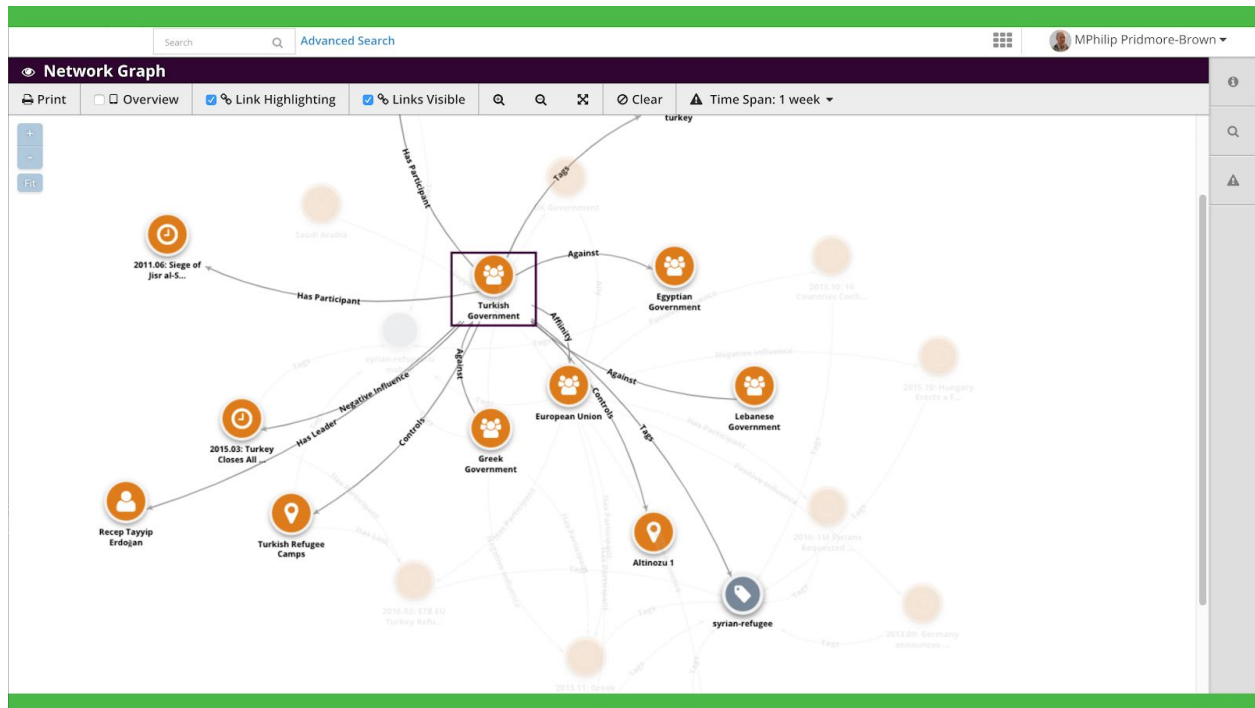*Data Card Detail (Event Class)*

Event data with temporal properties are rendered on a timeline for visualization.

Data Card Detail (Organization Class)

Model Administration Interface

The model administration interface allows users with the right permissions to define the properties and appropriate links that can be applied to nodes in the graph. This interface dynamically updates the data card templates. Users can define new class types, properties and links using the tool.
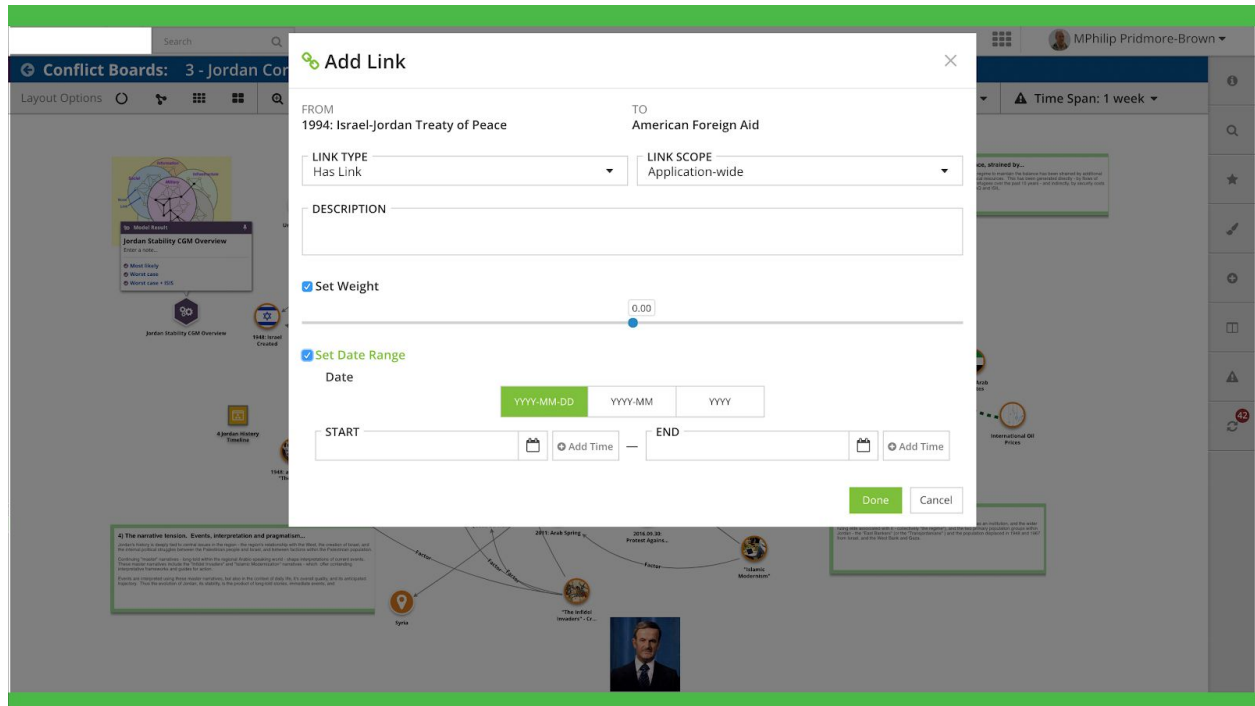
Network Graph Visualization

The network graph visualization allows users to explore the graph by expanding edges on request.

Graph Board Views
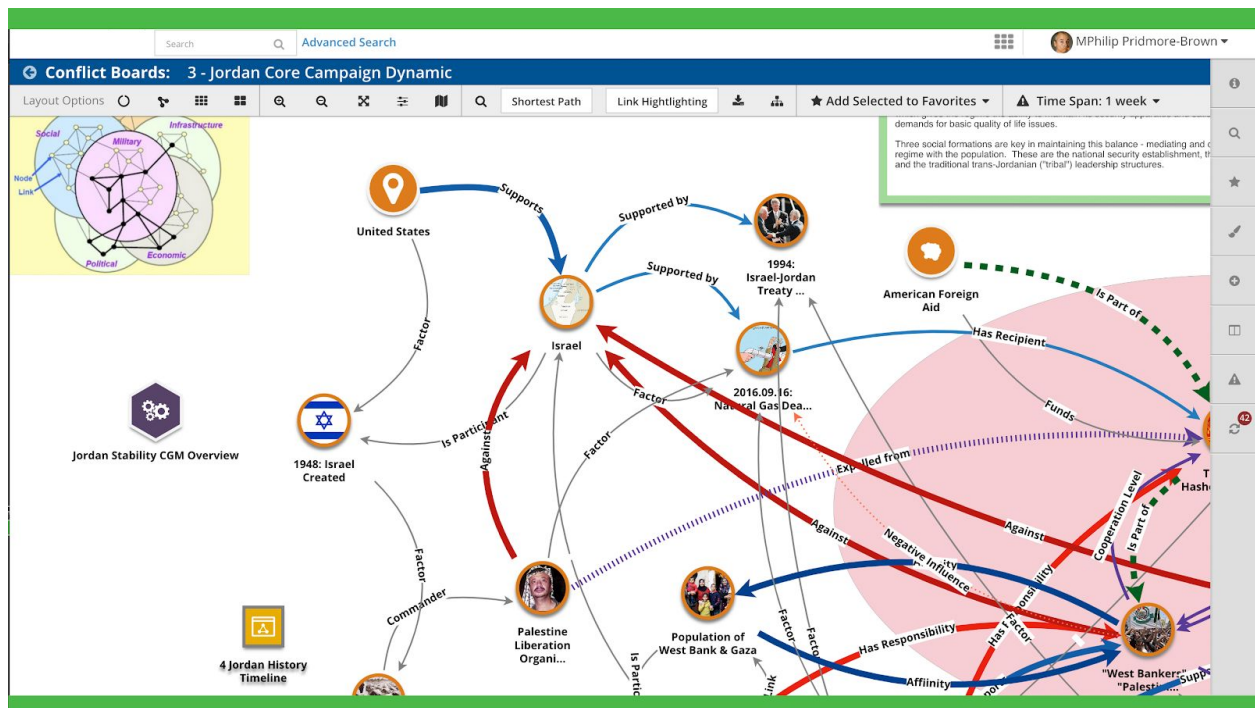
The network boards allows users to assemble specific views with elements from the graph to visualize specific dynamics and add callouts and other annotations and accompanying images and documents.

User Added Links

Links can be added to the graph using the REST API or through the user interface. Links can be qualified with descriptions, weights and date qualifiers.