The Big Data Challenge…from Data to Knowledge.

FactWeave™ Structured Analysis

The Challenge: Analysts are constrained by data-centric tools

Given the complex nature of asymmetric threats, and the projected growth in global data, intelligence analysts need "smarter" tools and methods for conducting structured analysis to make sense of Big Data. Intelligence analysts today are limited in their analysis efforts by tools that are "data-centric", where the focus is on tedious data search, mining, preparation, integration, visualization and analysis workflows. Data-centric tools can't cope with the fact that most, if not all, standalone data sources lack sufficient context, uniformity, meaning, and veracity to be directly useful. Moreover, data-centric approaches are severely limited in their ability to automate higher-order analytical processes – the very processes that hold the key to enhancing analyst productivity and effectiveness. In this setting, analysts must spend the majority of their time coping with data instead of conducting productive analyses. The onus is on the analyst to triage, fuse, make sense of, and infer the meaning, relevance and significance of what data evidence conveys.

The Solution: Next generation knowledge-centric structured analysis with FactWeave, featuring:

SmartLens™ Solution

FactWeave is a revolutionary analyst-centered toolkit for building and sharing robust knowledgebases about any subjects and topics of interest for any intelligence problem domain.

- Integrates and analyzes all source Big Data through its unified "Knowledge Layer", employing *kNotes* and *Facts* as the building blocks of machine-encoded, structured knowledge about any subjects of interest.

FactWeave reduces the cognitive load on analysts and empowers them with unique capabilities for higher-order analysis tasks like:

- Conducting Analysis of Competing Hypotheses
- Performing forensic and predictive analyses
- Finding hidden patterns and leading-indicators
- Filling intelligence gaps and "connecting dots"
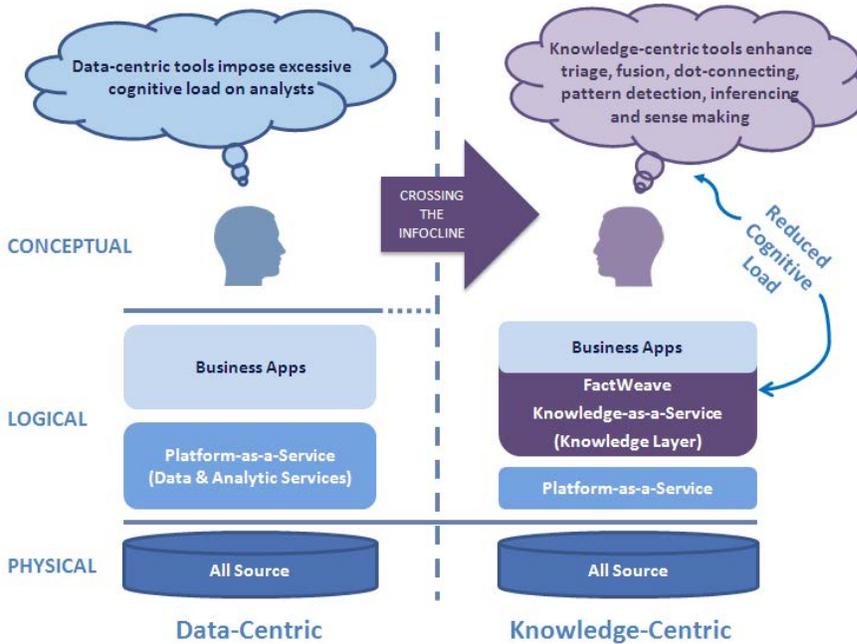- Sharing analysis tradecraft.

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IMAGE MATTERS

- Has specialized *SmartLens™* "knowledge-on-demand" services, which filter, fuse, analyze, and reason on-the-fly about all source data, so that even data with limited semantics and context can be exploited in an automated fashion.
- Provides tools to produce *kNarratives* about any topics ("shared arguments and stories") for collaboration and further exploitation, which are also grounded by its knowledgebase.

FactWeave inverts the analyst's balance-of-work so that more time is spent on productive analysis and collaboration tasks, and less time is spent on coping with data.

A paradigm shift from data-centric analysis to knowledge-centric analysis

Data-Centric Limitations	Knowledge-Centric Advantages
Data are limited in scope, lacking semantics and context. Data-centric systems produce "noisy" results that require excessive manual filtering and fact-checking, which hinders higher-order analysis and collaboration.	Analysts work collaboratively to build and exploit a context-rich knowledgebase of *kNotes, Facts* and *kNarratives.* The knowledgebase has clear semantics and context, giving analysts a more complete, unambiguous understanding of how data evidence and its related contextual knowledge fits in the world.
Analysts use many data-centric tools to search, mine, filter, prep, view and analyze data. This perpetuates stovepipes that lack a unifying data and services integration framework.	Data sources are integrated through a unified knowledgebase and *SmartLens™* service layer so that they too can be exploited on-the-fly in a contextually-rich knowledge realm. Analysts use tools to mine, filter, view and analyze shared knowledge, not data.
All challenging uses of data, like triage, fusion, dot-connecting, pattern detection, inferencing, and sense making, require the onerous cognitive efforts of analysts.	*SmartLens™* services assist analysts with complex tasks like fusion, analytics, reasoning, inferencing, and sense making, overcoming fundamental challenges in discerning relevance and significance, and identifying complex indicators and patterns.
Collaborative structured analysis is not possible. Analysts are overly reliant on tedious, arbitrary "tagging" operations to place shared meanings on data. Data have limited provenance and pedigree.	Analysts contribute to a unified, structured knowledgebase where they can build arguments and corroborate or refute evidence. Analysis tradecraft is encoded incrementally throughout the structured analysis process for instantaneous sharing. Full provenance and pedigree is captured / generated and shared.

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Key Innovations

- Analyst-friendly knowledge interface
- Encoding and sharing of knowledge (*kNotes* & *kNarratives*)
- Unified ops-intel knowledge domain model
- Multi-modal spatial, temporal, social analytics… fully integrated with reasoning framework
- Powerful, extensible *SmartLens ™* algebra; the means to answer intelligence questions and test hypotheses
- Unique all source data-to-knowledge integration layer
- Self-describing, configurable service integration layer
- Automatic provenance and pedigree propagation

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Features and Benefits: FactWeave shifts the emphasis to collaborative structured analysis
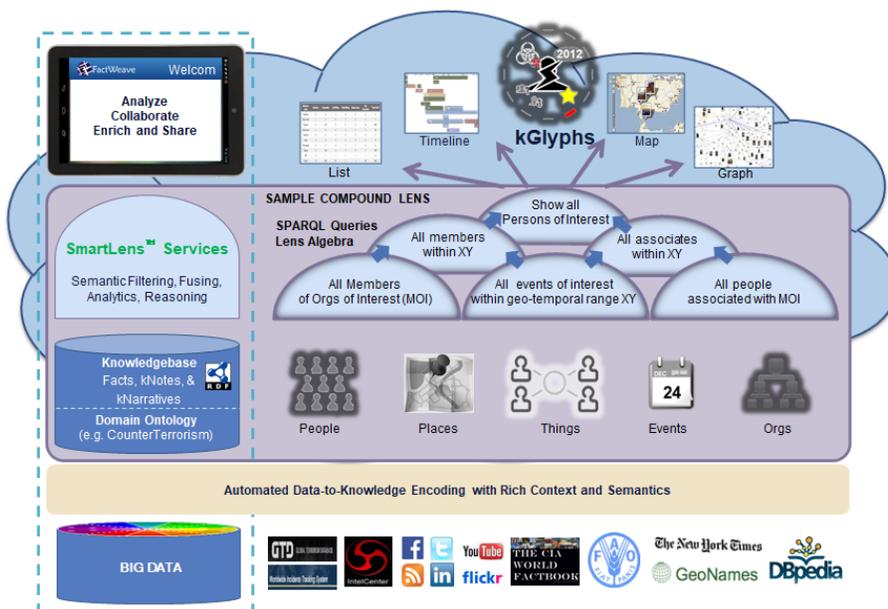
FactWeave is a revolutionary analyst-centered toolkit for building and sharing robust knowledgebases about any subjects and topics of interest. *FactWeave*:

- Dramatically reduces cognitive load on the analyst through computer-assisted methods for activity-based intelligence

- Employs revolutionary *SmartLens™* services to assist analysts in rapidly triaging, fusing, analyzing and making sense of all source data

- Enhances collaboration and rapid sharing of fused intelligence and analysis tradecraft

- Formally captures and exploits provenance and pedigree of sources to increase analyst confidence, efficiency and effectiveness

- Includes robust geo-social analytics and the means to integrate and exploit non-geographic human-socio-cultural data with geospatial data

- Improves data and service integration through its unique data-to-knowledge integration layer

- Leverages disparate all source data in their native form and, at their native sources (doesn't require data conversion/migration), and can tap into new sources with minimal effort

- Improves "tagging" workflows through robust treatment of semantics and context

- Highly flexible, scalable, standards-based architecture

- Complements existing "data-centric" ecosystems

- Low cost, high impact structured analysis

A Legacy of Innovation: FactWeave is the result of 10 years of award-winning research and innovation

Image Matters has been pioneering the development of knowledge-centric approaches to structured analysis since 2005, including joint R&D efforts with DARPA, NGA, DoD and others, combining machine-encoded, structured knowledge with *SmartLens™* services to enable robust computer-assisted processing of the spatial, temporal, social, and semantic aspects of knowledge.

A Focus on Innovation: *FactWeave* innovations include new and improved methods and technologies for: unifying all source data-to-knowledge integration and triage processes; context-rich knowledge encoding, disambiguation, and management; intelligent filtering, fusion, analytics and reasoning through *SmartLens™* services; and knowledge visualization, collaboration, publishing and enrichment.

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Summary

FactWeave addresses the following Intelligence Community challenges:

- Data analytics and visualization
  - *SmartLens™* services accomplishes "intelligent" triage, fusion, analytics and reasoning... enhancing forensic and predictive analytics
  - *kGlyphs* enhance viewing of knowledge as patterns of life
- Social media exploitation
  - Supports a full range of geo-social media and analytics
  - Integrates non-geographic aspects of human-socio-cultural experiences with rigorous geospatial data and analytics
- Data modeling
  - Formal models (*kNotes*) for encoding /exploiting knowledge about any subjects of interest
  - Formal model (*kNarratives*) for encoding and sharing arguments and stories about any topics of interest
- Decision support
  - Enhanced collaboration by sharing analysis tradecraft
  - Enhanced confidence through meticulous tracking of provenance and pedigree
- Automated systems
  - Computer-assisted inferencing and reasoning
  - *SmartLens™* services find hidden activity patterns and leading indicators
  - *Analysis of Competing Hypotheses*

FactWeave reduces the cognitive load on analysts, enhancing their productivity and effectiveness, so that they can better answer key intelligence questions and inform critical decisions with greater confidence.

For more information about FactWeave, contact Image Matters LLC: 703-669-5510

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Image Matters LLC is a nationally recognized research and advanced technology development company dedicated to developing innovative solutions to help keep America safe and strong. We serve defense, intelligence, homeland security, earth science, and commercial markets. Image Matters excels at systems engineering and developing innovative solutions for clients with complex Big Data, geospatial, social, semantic, and mobile challenges.

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