Licensable Technologies

Integrated Knowledge Engine (IKE)

Applications:

- Intelligence
- Asset allocation
- Real-time monitoring
- Sensor integration
- Security
- Attribution

Benefits:

- Quantification of uncertainty
- Optimized collection of evidence
- Influence of unobtainable evidence (optional feature)
- Simplified user interface with dashboard and network display
- Analysis (inferencing with uncertainty)
- Evidence marshaling (with uncertainty)

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Summary:

Bayesian Belief Networks (BBNs) are useful in fusing data derived from multiple sources by processing evidence to compute probabilities of hypotheses. Common BBN applications involve monitoring of an adversary's actions to determine intent (hostile or benign), or monitoring of a remote facility to determine what types of covert processing might be taking place. Usually in these applications, collecting the best evidence is costly and risky, and requires intelligence-gathering assets to reach conclusions quickly and with reasonable costs.

IKE (above) supports the Knowledge Discovery Process.

Analysts and decision makers not only want the best-obtainable, quick conclusion, they want to know the uncertainty associated with the conclusion—whether or not it is high quality.

In response to these needs, Los Alamos National Laboratory (LANL) researchers have developed an enhanced Bayesian analysis tool called the Integrated Knowledge Engine (IKE) for monitoring and surveillance. LANL's enhancements are suited for rapid-response situations where decisions must be made based on uncertain and incomplete evidence from many diverse and heterogeneous sources. The enhancements extend the probabilistic results of the traditional Bayesian analysis by:

1. Better quantifying uncertainty arising from model-parameter uncertainty and uncertain evidence;

2. Optimizing the collection of evidence to reach conclusions more quickly; and

3. Allowing the analyst to determine the influence of remaining evidence that cannot be obtained in the time allowed (optional feature).

The IKE software tool spans the entire Knowledge Discovery Pyramid (see figure above). The bottom of the pyramid represents the vast amounts of data collected from multiple sensors and platforms that must be mined and processed. The center of the pyramid signifies integration of results from these processed intelligence sources, leading to formulation of quantified threat hypotheses and situations. The top of the pyramid represents the dissemination of actionable knowledge to users in a collaborative manner. On the left-hand side of the pyramid, from top to bottom, LANL's unique marshaling algorithms provide optimized tasking information to drive subsequent collection of data and information most relevant to further understanding of the threats at hand. Forming the base of the pyramid are the numerous sensors and platforms that must be tasked to collect the data and information through a collection management process.

The IKE BBN, together with the extended features enumerated above, give analysts and decision makers better comprehension of the adequacy of acquired evidence and quality of rapid-response decisions.
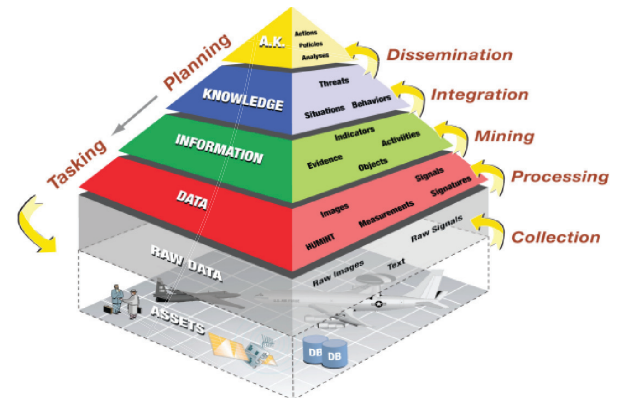
Development Stage: Alpha stage

Intellectual Property Status: Copyright protected

Licensing Status: Available for exclusive or non-exclusive licensing

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