Knowledge
Enhanced
Electronic
Logic

Predict & Prevent

Using Compsim's KEEL® Technology

KEEL Technology

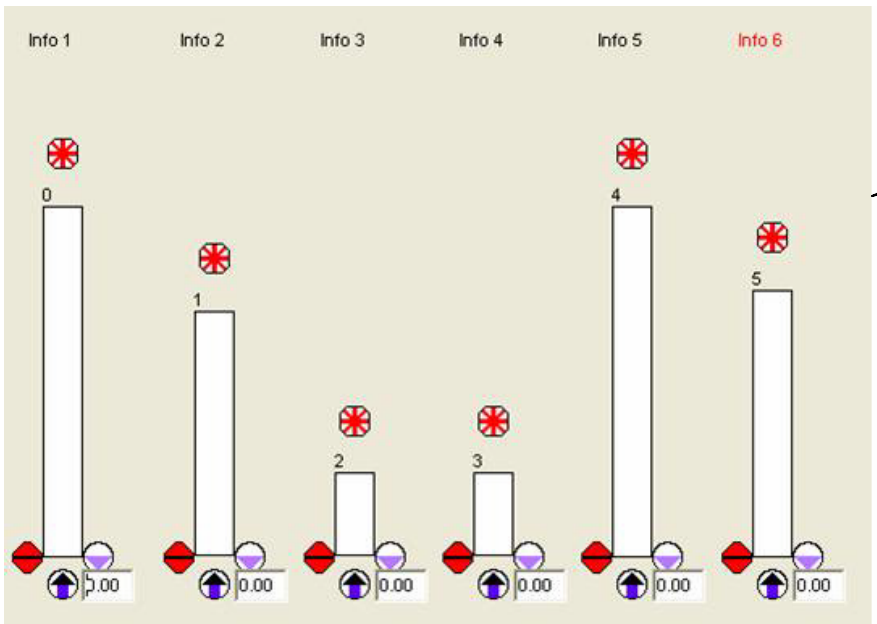
- A “technology” provides a way to address a problem.
- “KEEL Technology” provides a way to address complex (dynamic, non-linear, inter-related, multi-dimensional) problem sets.
- “KEEL Technology” provides a way to capture, test, package, and audit human-like reasoning and judgment for deployment in devices and software applications.

Prediction & Prevention

- Prediction and Prevention requires the interpretation of information in order to “predict events” and take action to “prevent events”.

Interpretation of Information

- The “interpretation of information” requires that information items be evaluated for their importance.



Partial view of KEEL dynamic graphical language

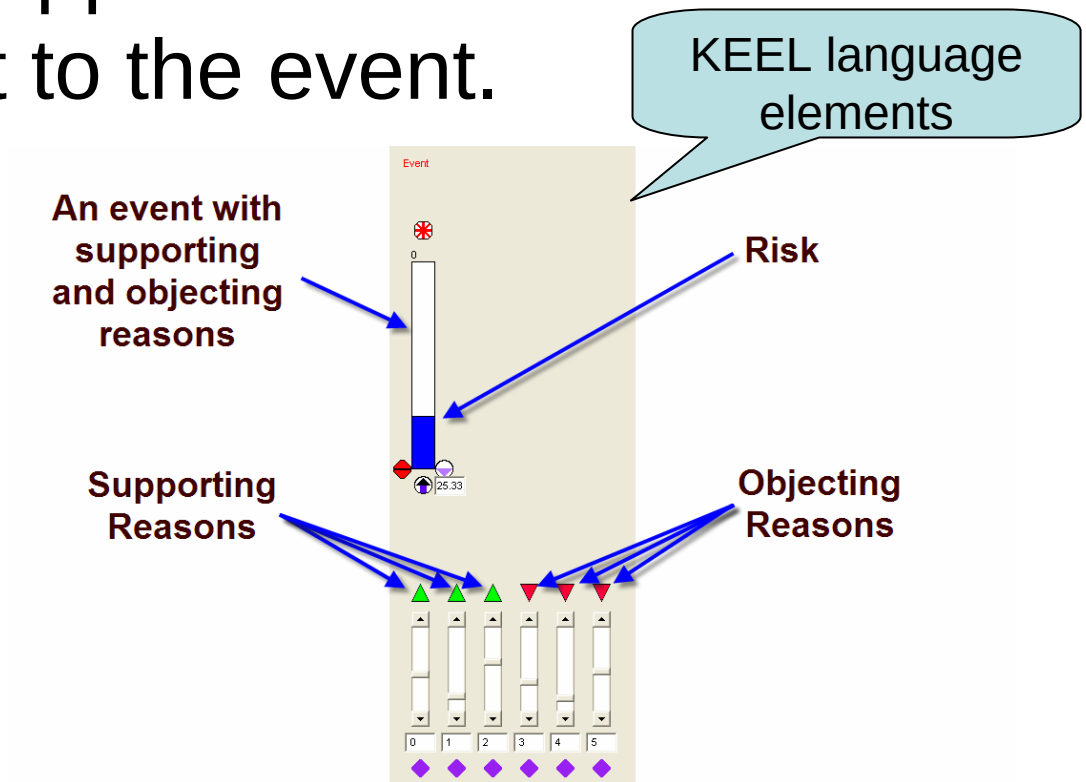
The height of a bar is an indication of the importance of an information item.

Interpretation of Information

- The “interpretation of information” requires that the information be interpreted within a context.
- Relative to “Predict and Prevent”, the interpretation of information requires that information is interpreted within the context of an “Event”.

An Event

- For any “event” there are characteristics that support the event and those that object to the event.

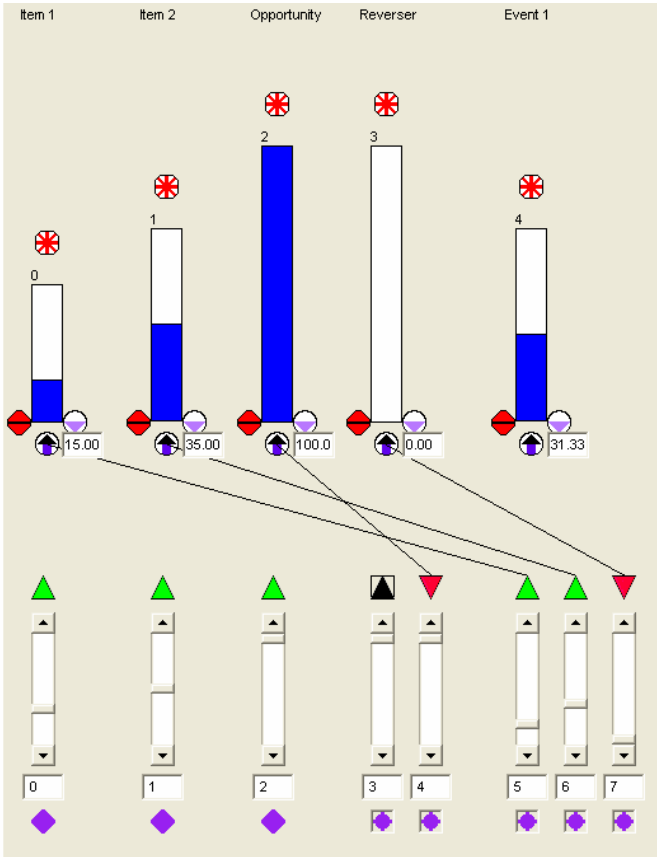


Characteristics of an Event

- When interpreting the characteristics of an event, some factors are more important than others.
- When interpreting the characteristics of an event, that interpretation must be able to handle dynamically changing scenarios.
  - The importance of information changes throughout the life cycle of the event planning and execution.

Modeling Risk

The user interacts with the model during development.

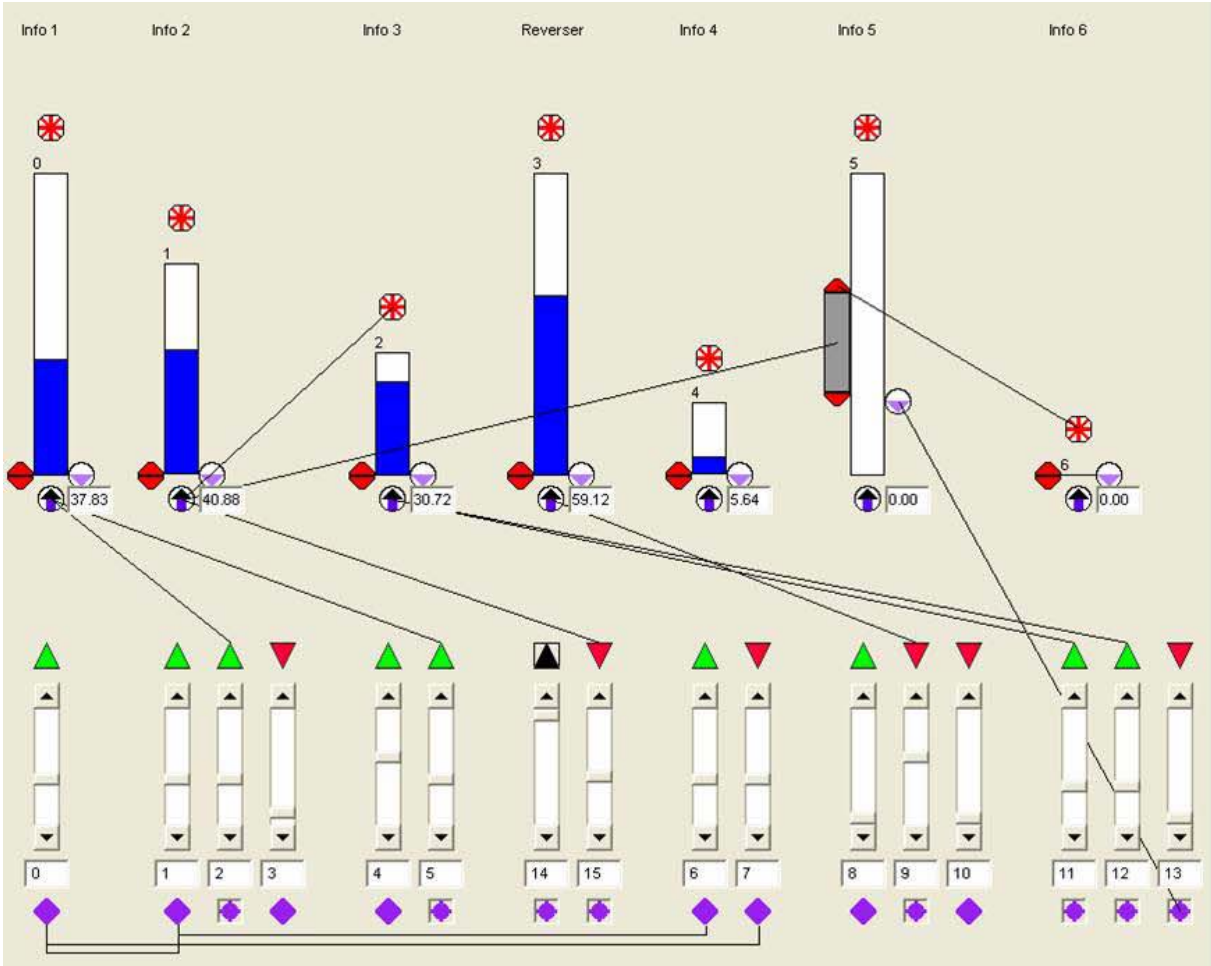


The likelyhood of an event (risk) is the integration of supporting and objecting reasons that can change continuously.

Interpretation of Information

- The “interpretation of information” requires an understanding of how information items interact.
- Using KEEL, one models the functional relationships between information items.
  - This is done graphically, without the need to utilize complex mathematical formulas.

Functional Relationships



Wires define explicit functional relationships: linear and non-linear

Predict and Prevent

- Prediction is accomplished by Modeling Events with their driving and blocking characteristics.
  - Driven by external data sources and sensors.
- Prevention is accomplished by reducing the driving influences and increasing the blocking characteristics.

Multiple Event Risk

- Prediction requires the analysis of multiple potential events.
  - Allows focus on highest risk events.
  - Or allocation of resources according to risk.
- Prevention requires the analysis of inter-related events.
  - Allows focus on intermediate events that can block a more significant event.

Diagnostics / Prognostics

- “Predict and Prevent” is not just a Homeland Security issue:
  - Medical diagnostics and prognostics have similar drivers and analysis requirements
  - Automotive prognostics can help a vehicle self correct for degraded components, or can advise technicians how to correct problems before they happen.
  - Industrial automation systems can self adjust by detecting change.
  - Many others……

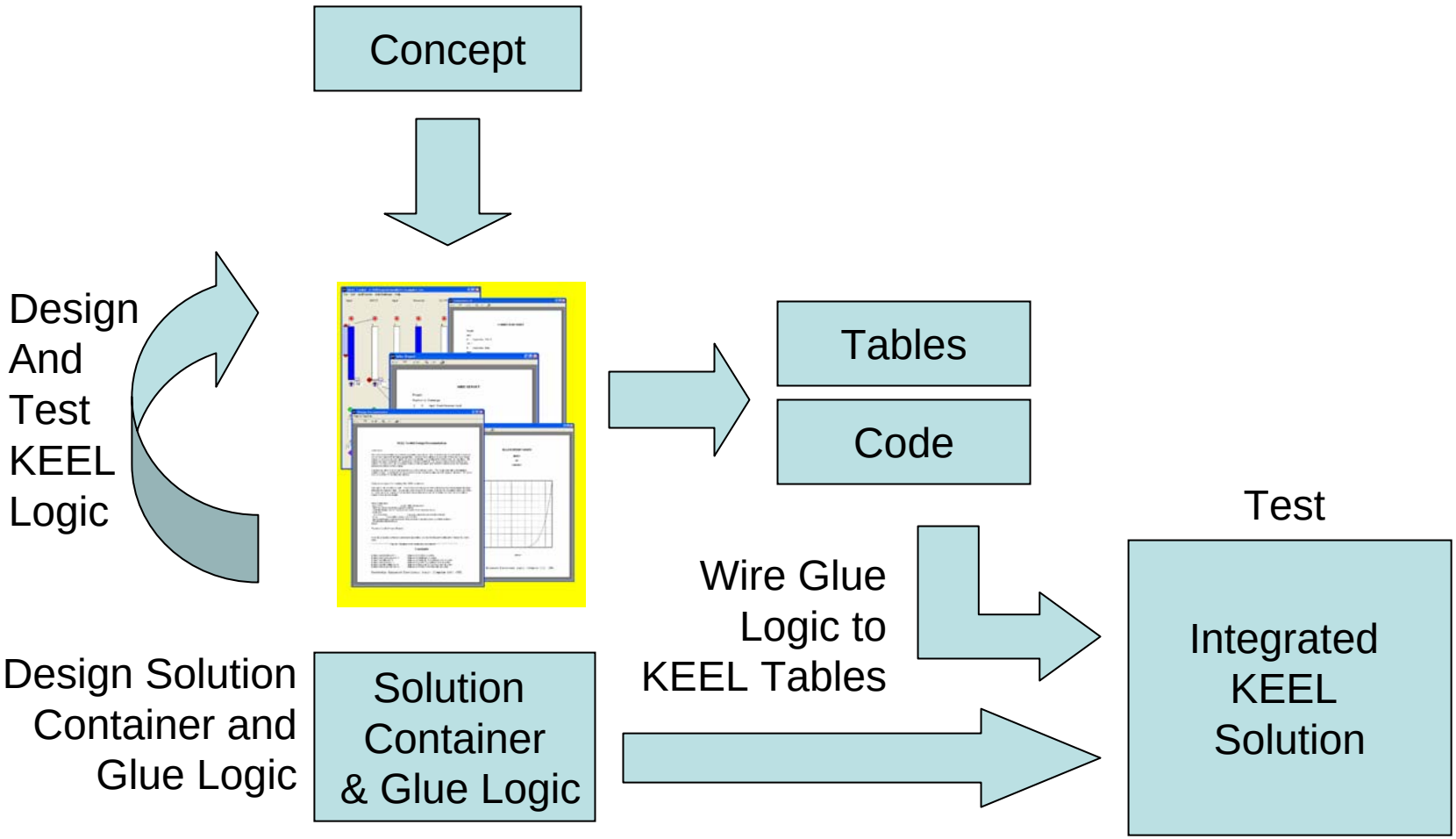
Modeling Complex Behavior

- The act of creating complex models is a learning process.
  - Dr. Jacqueline R. Henningsen (DOD) has highlighted that the act of modeling must help us understand the problem, because we don't know everything all the time.
  - With KEEL, one models how one "thinks" data items are valued and inter-related. The model will immediately react as it is being developed. The user gets immediate feedback into the effectiveness of the model.

Deployment

- Using the KEEL “dynamic graphical language” complex cognitive models are created.
- The models can be packaged in conventional computer languages (C, Java, C++, C++ .NET, Microsoft C#, Microsoft Visual Basic 6, Microsoft VB.NET, Macromedia Flash, Macromedia Flash Object Model, VBScript, JavaScript, or PLC Structured Text) where they can be used in the development environment of choice to create real-time adaptive solutions.

Basic Development Process



KEEL-based Solutions

- 100% explainable and auditable (explicit solutions)
- Rapid development process with the dynamic graphical language
- Easily extended
- Simple API for easy integration into existing and new systems
- Small memory footprint for embedded systems
- Suitable for dynamic, non-linear, inter-related, multi-dimensional problems

Summary

- KEEL® – Knowledge Enhanced Electronic Logic – focuses on embedded decision-making
  - Incorporating human expertise into devices and software applications
  - "Heuristic reasoning"

KEEL®

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Compsim™

Compsim LLC

(262) 797-0418

http://www.compsim.com