

# Creating Cognitively-Inspired Context Models to Facilitate Human-Systems Interaction

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February 10, 2016

# Context and Cooperative Interaction

- People use understanding of shared context as tacit basis for interaction, cooperation, teamwork (ICT)
- Domain-specific knowledge presumes and leverages this shared context understanding
- Computational systems don't have human-like context understanding, and have difficulty interacting with people
- Cognitively-inspired (computational) context representation and context-based reasoning can enable improved computational systems' ICT behavior

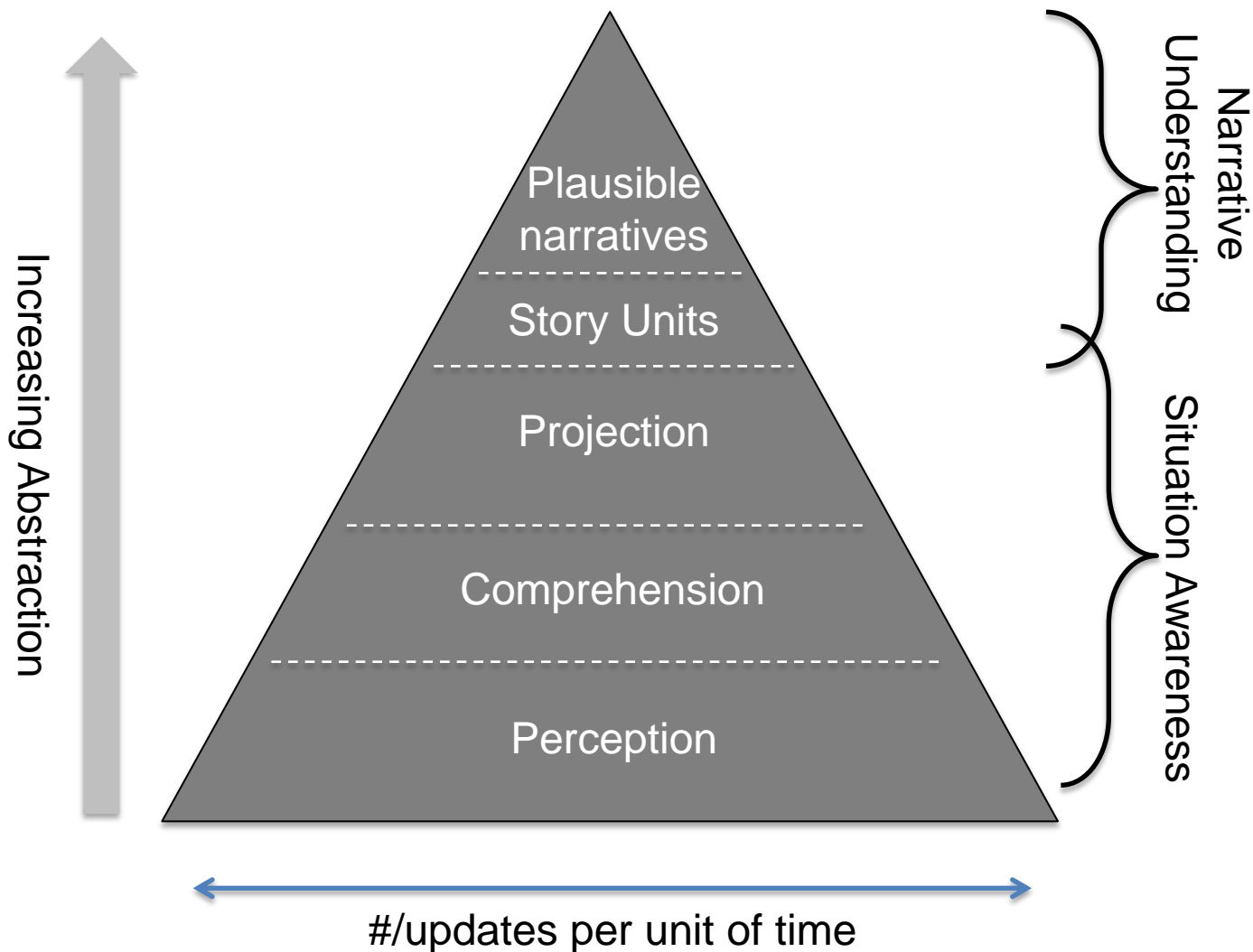
# Context from a Human Perspective

- A product of sensation, perception, and cognition
- People understand and think about context at multiple levels simultaneously
  - moving across/between levels as needed
- Context includes
  - physical/natural environment
  - intentional environment (rational agents, including self, and their behavior)
  - momentary picture, plus links into the past and future

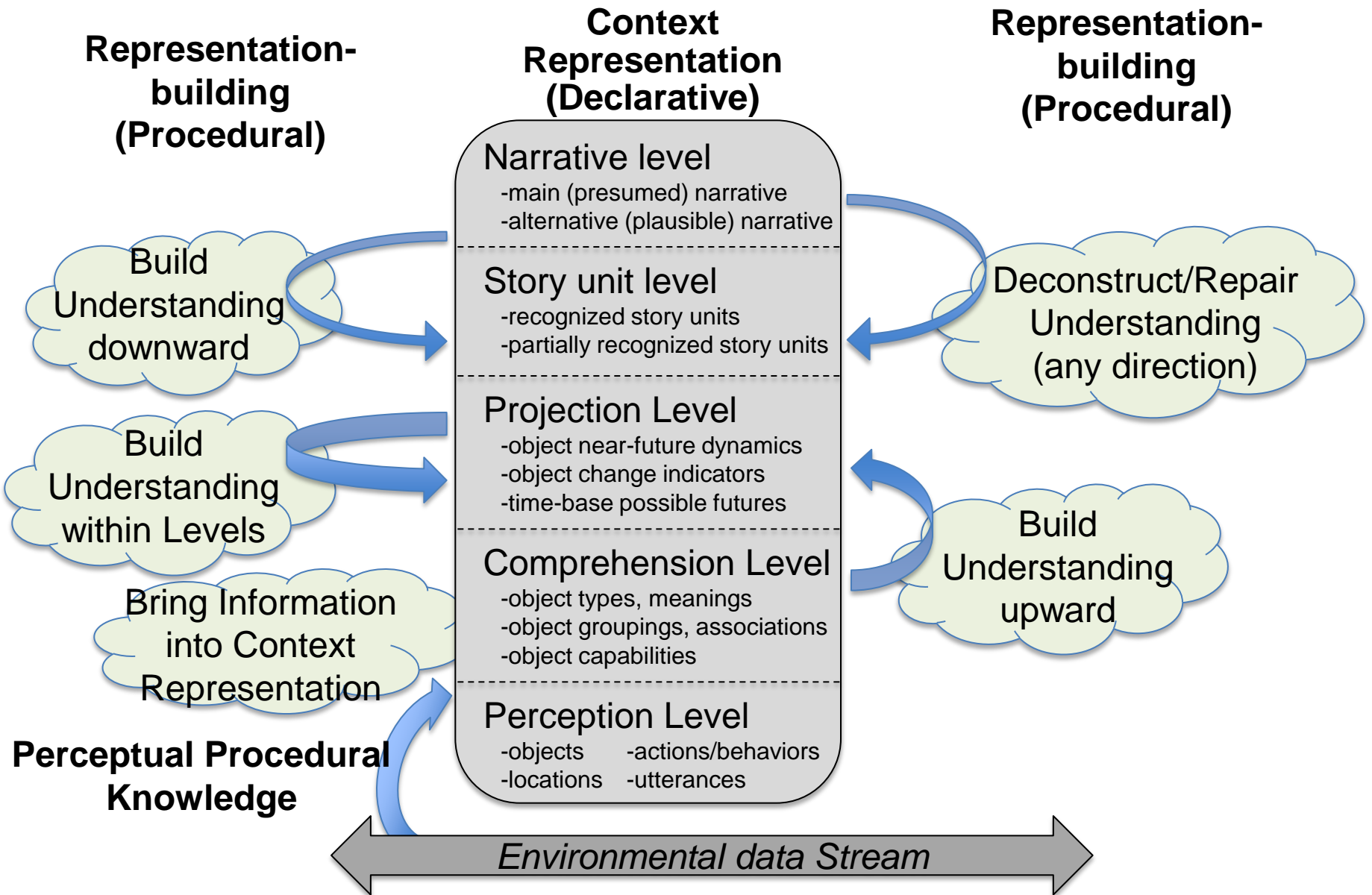
# Requirements of Synthetic Context

- Continuous
- Constructive
- Self-organizing
- Operates simultaneously at
  - at multiple (hierarchical) levels of abstraction
  - multiple time-scale across levels

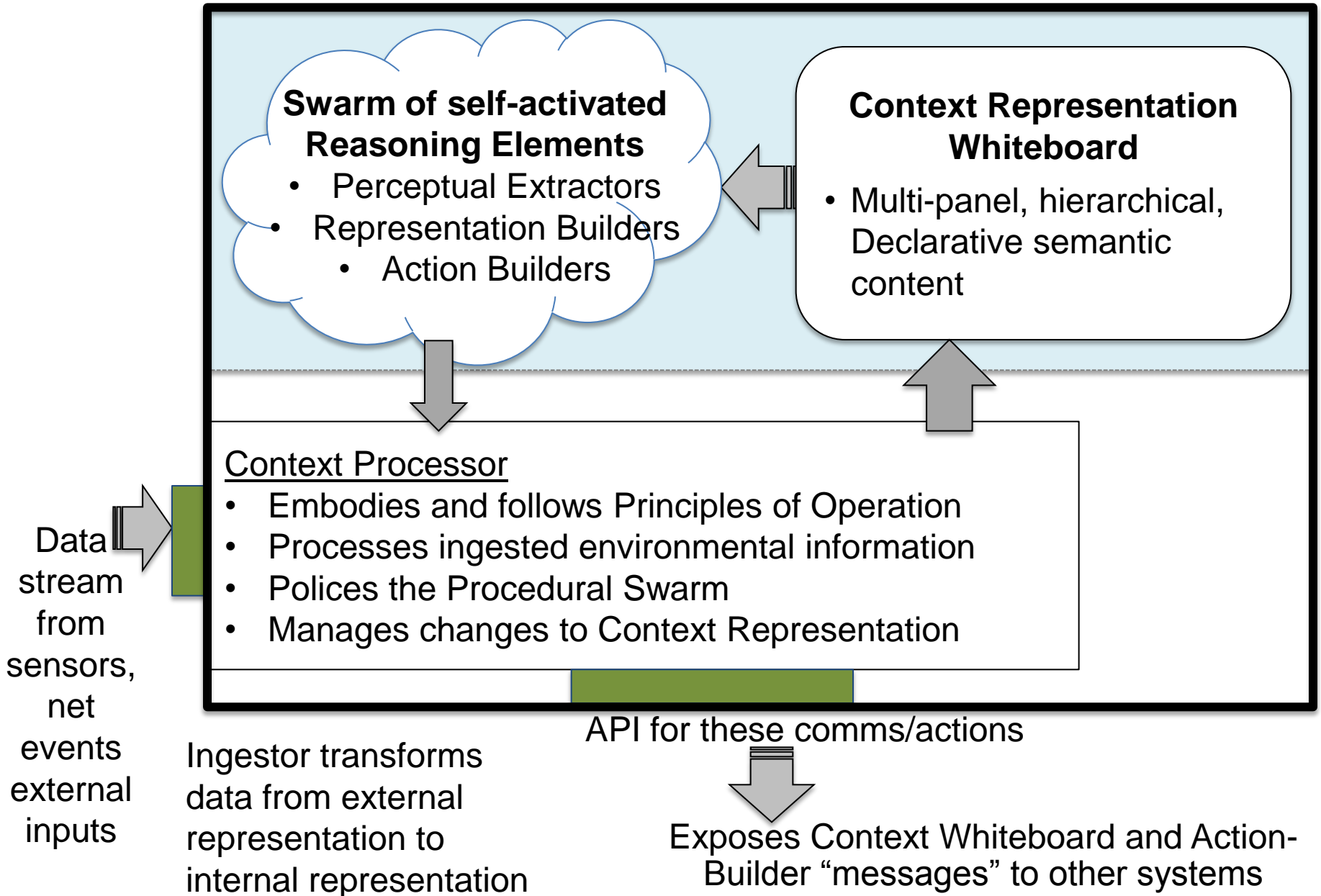
# Integrating perspectives on context representation



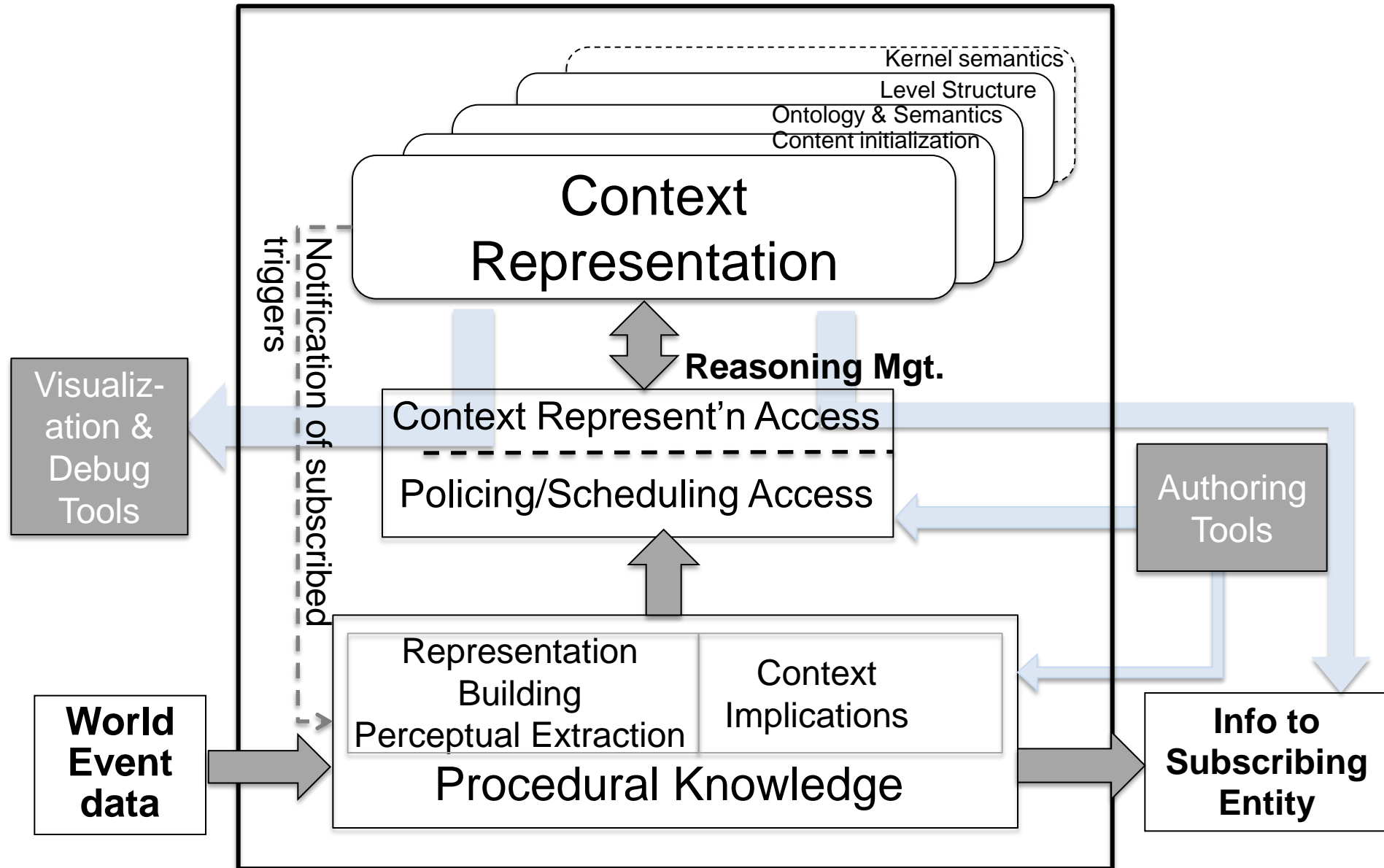
# Narratively-Integrated Multi-level (NIM) Synthetic Context Representation



# Translation to Computational Architecture



# Integrated Context Engine (ICE)

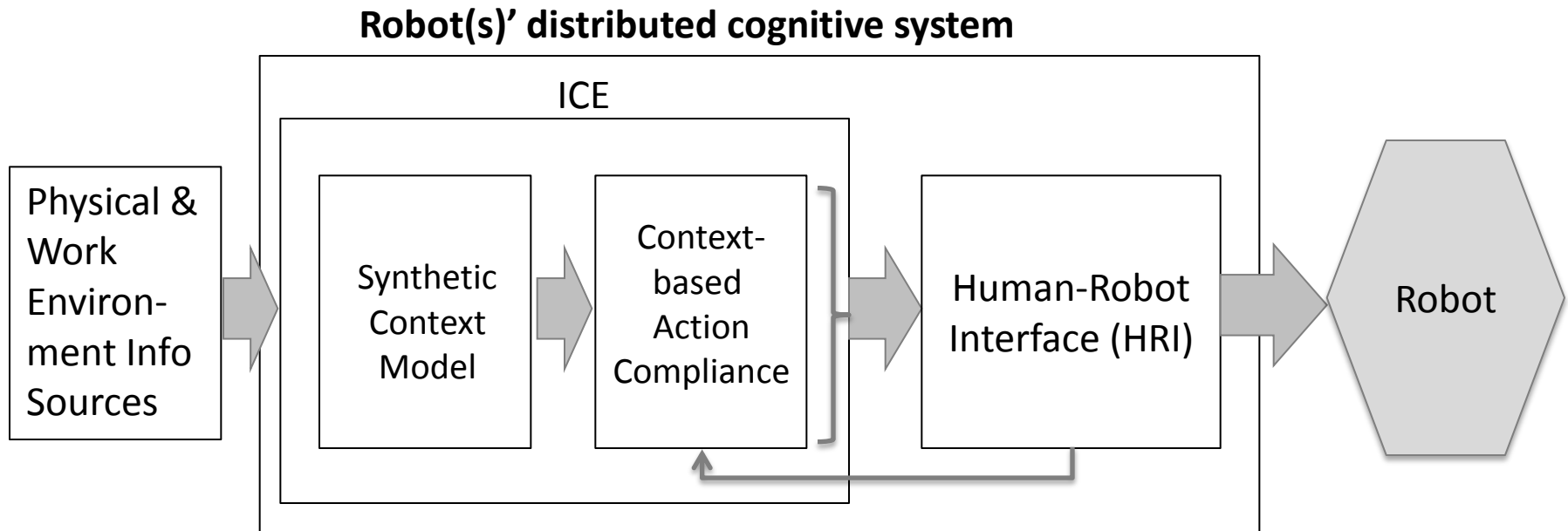




# Example: The Robotic Interaction Problem

- Robots can (unintentionally) be dangerous
  - “*robots do not know that they are in the world that they have within themselves as a model of that world*”
  - they are **Force compliant** but not yet **Action Compliant**
- Fundamental action compliance – *non-interference*
  - not being “underfoot” or in the way of people
  - surprisingly hard to learn, even for humans
- Give the robot an explicit context representation
  - make the robot a part of that context, so that it can reason about its own role/place in that context
  - and achieve action compliance

# CARIL – Context-Augmented Robotic Interaction Layer



- Have developed increasingly robust non-interference behavior, via simulation
- Beginning with no communication, now adding context-driven communication to enhance non-interference

# Conclusions

- Working toward general synthetic context plug-in for computational systems
- Ongoing work on
  - Robot action-compliance for NASA
  - Context-based proactive Decision Support for Naval C2
  - Control for synthetic players in air combat training
- Beta Release of Commercial ICE – late 2016
- Enhance Authoring Tools beta – mid 2017