Breakout Group 3: Notional CHRIS Architecture

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Definitions

- Definition of terms are an issue!
  - Human Behavior
  - Human Behavior Representation (HBR)
    - stimulus / response
    - situation and the actions that can be taken
    - only things that can be observed
  - Human Behavior Models (HBM)
    - transformation function
    - alternative transformation functions are likely
CHRIS Scope Issues

- Are we describing HBR or HBM or both?
  - (HBR minimal)
  - No single approach to HBM or HBR is satisfying--want them all at different times
- One or more representations?
  - converters & manipulators
- Interaction among Behaviors, ID levels of specification to address
  - agent to agent
  - agent to world
  - agent to subcomponents
  - subcomponents to subcomponents
- Ease of use secondary
- What about tools?
  - Part of architecture?
CHRIS PROBLEM STATEMENT

• Plug-and-Play; Interfaces for:
  - agent to subcomponents/behavior modules
  - agent to outside world
  - groups of agents
  - other people’s behavior
  - e.g., FSM implementations

• Transmission of Knowledge
  - agent architecture/components/... (HBR representation)
  - from one representation framework to another (e.g., FSM)
  - Implementation-independent transmission/storage of human behavior models (agents, groups, sub-agent modules)
## Notional Architecture--What is it?

### Core (relatively stable) components of a CHRIS:

<table>
<thead>
<tr>
<th>Grammar:</th>
<th>Plug &amp; Play APIs</th>
<th>Storage of Representations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal Language for specifying behavior</td>
<td>Reference Model</td>
<td>Mechanism for Retrieval</td>
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<tr>
<td>Minimal</td>
<td>• Meta-Data</td>
<td>• Std interface for behavior “modules”</td>
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<tr>
<td></td>
<td>• Dictionary (but not content)</td>
<td>• Std interface for human/agent/group interaction with environment</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Content</th>
<th>Taxonomy</th>
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</thead>
<tbody>
<tr>
<td>Provable</td>
<td>Tool Set</td>
</tr>
<tr>
<td>• Granularity—competing levels</td>
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</table>
The question is:

Is CHRIS Feasible?

"YES" or "No"

“And Here’s Why...”
# CHRIS Desirability/Feasibility

<table>
<thead>
<tr>
<th></th>
<th>Original Model developers &amp; Researchers</th>
<th>Model Simulators &amp; Integrators</th>
<th>Trainers and Analysts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug &amp; Play at agent level</td>
<td>Desirable? &amp; Feasible</td>
<td>Very Desirable &amp; Feasible</td>
<td>Very Desirable</td>
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<tr>
<td>Plug &amp; Play at subcomponent level</td>
<td>Desirable &amp; Feasible but tough</td>
<td>Not Applicable</td>
<td>Very Desirable</td>
</tr>
<tr>
<td>HBR Transmission</td>
<td>Desirable &amp; Feasible</td>
<td>Very Desirable &amp; Feasible</td>
<td>Not Applicable</td>
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<tr>
<td>HBM Transmission</td>
<td>Desirable &amp; Feasible? but very tough</td>
<td>Very Desirable &amp; Feasible? but very tough</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>
Relationship to HLA

- **HLA**
  - Federate Object Model
  - Only pass what you need gets passed
  - Lower bandwidth relative to DIS
  - Publish and subscribe on selected services

- **HLA for runtime transmission of data**
  - HBR makes sense
  - HBM may not be possible (probably offline?)

- **HLA compliance should be an expected requirement**

- **HLA compliance won’t guarantee interoperability of HBMs**
  - CHRIS should ensure interoperability
Seek DoD investment and achieve a reasonable return-on-investment?

• If the government doesn’t do the investment, it won’t get done.
  - M&S is important
  - Training
  - DoD operational community must participate

• Other Communities:
  - Game community
    • interfaces for robots
    • still primitive compared to DoD(not heterogeneous)
    • Simulation games provide publish/exchange mechanisms
  - Movie community
    • Farther out
Backup
Technical Feasibility

- **HBR & Plug-and-Play**
  - minimal capability

- **HBM transmittal**
  - harder: includes decision process/inference
  - harder: isomorphism not provable

- **API**
  - implementation neutral
Technical Feasibility

- XML
  - Meta-Data
  - RDF

- Runtime Services?
  - Active participant?

- Content
Technical Feasibility

- **Weak & Flexible vs. Constraining**

- **Interaction vs. Representation**
  - If one can handle Plug-and-play for both, may not need both

- **Reference Model**
  - Difficult to define w/o constraining
  - Minimal RM will be needed for storage & retrieval
  - One or more reference models? (flexibility)
  - Implementation neutral
Technical Feasibility
CHRIS PROBLEM STATEMENT

Plug-and-Play Representation of data & Interface for interaction

Transmission of Knowledge

- agent architecture/components/... (HBR representation)
- from one representation framework to another (e.g., FSM)

Representation

- Capability for Representation (HBrx)
- No single approach to HBM or HBR is satisfying--want them all at different times
- Implementation-independent transmission/storage of human behavior models (agents, groups, sub-agent modules)

Interaction among Behaviors

- Interactions of / with Behavior Representations (outside world or internal)
- converters & manipulators

Tool Set

- Tools are required
- Editors
- Testing
- Visualization

Scope

- Are we describing HBR or HBM or both?
  (HBR minimal)
- One or more representations?
- Ease of use secondary
- ID levels of specification to address (e.g., agent I/f to environment; I/f between components of different