KB Agent:
A Commercial Version of Soar

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Objectives

- Gain market share at high end of RBS and Agent markets
- Position as a tool for automating business policy
  - Automate more of conventional workflow
  - Leverage knowledge for high throughput
  - Accommodate rest of Enterprise
  - Focus on scaleability

Initial Targets

- Agents
- Embedded rule engine
- Programmable kernel API
- Multi-threading for efficiency and flexibility
- CORBA interfaces for operation in distributed environments

Threads vs Processes

THREADS

- Faster agent creation
- Lower memory utilization
- Low comm. overhead
- Low cost of shared data synchronization
- > 1 thread per agent possible

PROCESSES

- Single-threaded apps don’t need to be modified
- Higher task safety
- Less complex maintenance task

Threads vs Serial Processes

MULTI-THREADED

- True asynchrony
- Faster on multiprocessor
- Better task independence
- > 1 thread per agent possible

SINGLE-THREADED

- Simpler implementation
- Easier debugging

Thread Safety

- Removing globals from kernel not enough
- Tradeoff between parallelism and locking overhead of concurrency controls
- Thread-per-method
- Thread-per-object
  - Known in MS circles as the “apartment” model
  - Thread-per-agent
  - Thread-per-interpreter

Agents as Distributed Objects

- CORBA chosen over DCOM/ActiveX, RPCs, BSD sockets
- CORBA standard managed by OMG, a consortium of 700+ companies
- Interface specified in OMG IDL
  - IDL mapped to client stubs (e.g. Java)
  - IDL mapped to server skeletons (e.g. C++)

KB Agent IDL

```
module KB_Agent {

   struct WME {
      string obj;
      string attr;
      string value;
   };

   typedef sequence<WME> wme_list;
```

KB Agent IDL (continued)

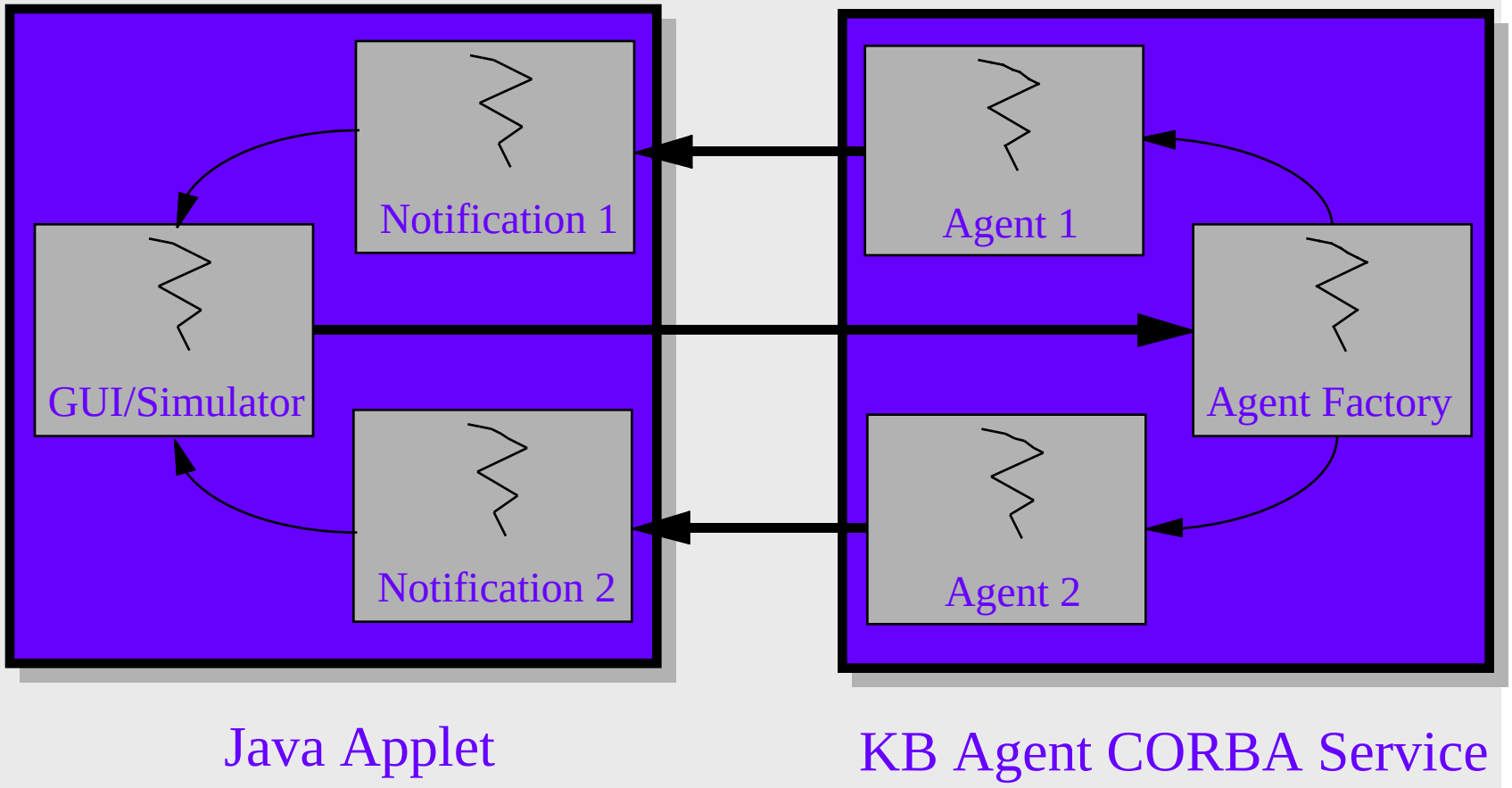
```
interface notif {
   wme_list getInput();
   void putOutput(in wme_list wl);
};
interface Agent {
   exception NotifDoesNotExist {};
   void registerNotif (in notif n);
   void unregisterNotif (in notif n)
        raises (NotifDoesNotExist);
};
```

KB Agent IDL (continued)

```
    interface AgentFactory {
       exception AgentAlreadyExists {};
       exception AgentDoesNotExist {};

       Agent createAgent (in string name)
             raises (AgentAlreadyExists);
       void destroyAgent (in Agent a)
            raises (AgentDoesNotExist);
    };
}; // End of KB_Agent Module
```

Distributed Agent Demo



KB Agent Plans

- Enhance IDL
- Add push input model
- Add Event streams
- RDBMS connectivity
- GUI
- IDE

- Alpha release in July

- Upgrade to Tcl 7.6-8.0
- CLIPS translator
- TP Resource Manager
- Persistence
- Mobility
- IAC, e.g. KQML

- Beta release in Sept

Lumps of Coal

- Business
  - Competitive pressures reduce cooperative development efforts
  - Never enough development resources
- Technical
  - Missing agent elements for a long-lived problem domain: persistence, forgetting, inter-agent communication, mobility
  - I/O to corporate data stores and event streams

Nuggets of Gold

- KB Agent will be first commercial Soar to market
- Already in use at one business site
- Excellent chance will be included in a new financial service product
- Initial version includes: kernel API, embeddability, thread-per-agent, OMG IDL interface