An Agent Approach to Data Sharing in Virtual Worlds and CAD

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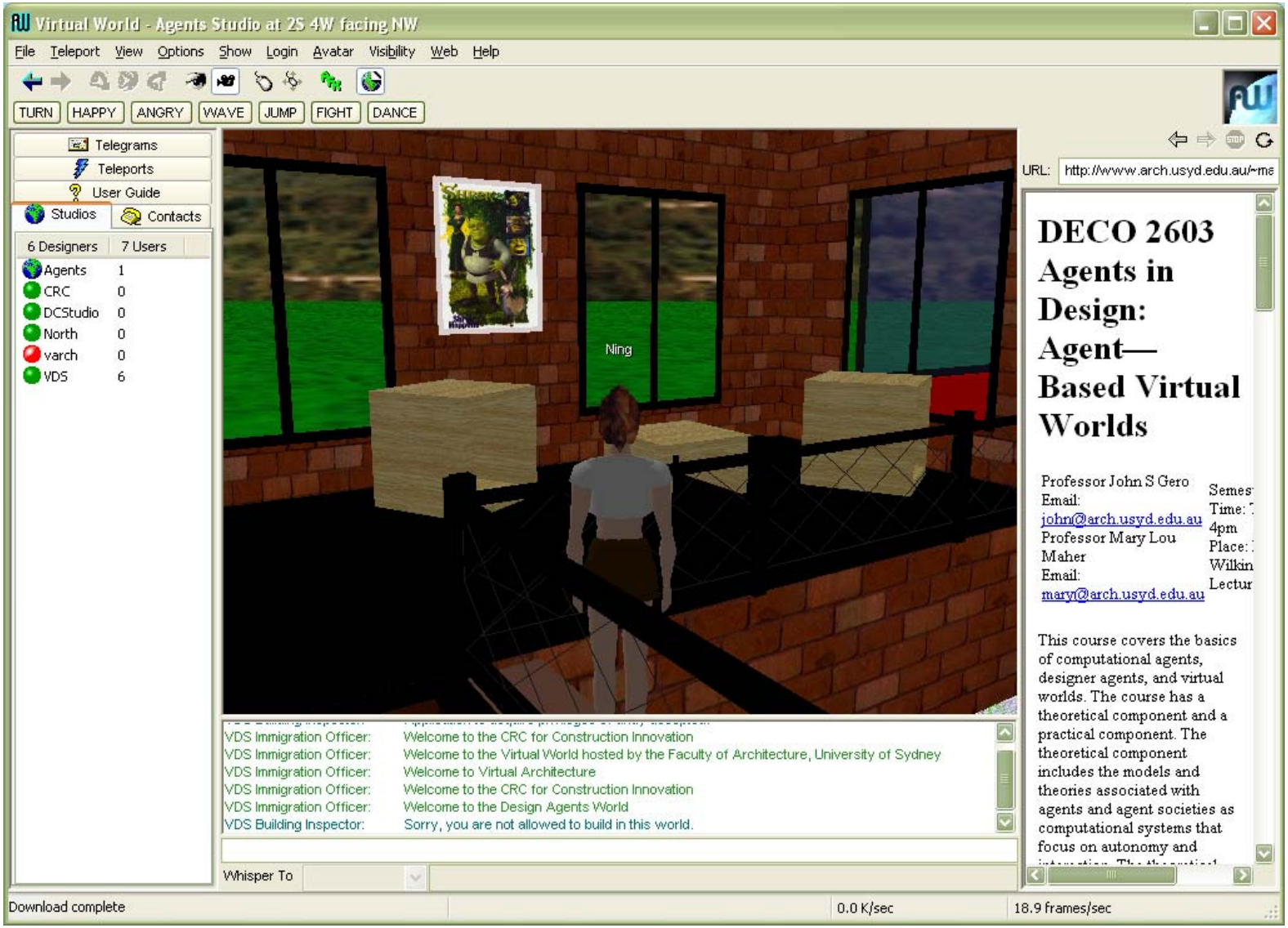
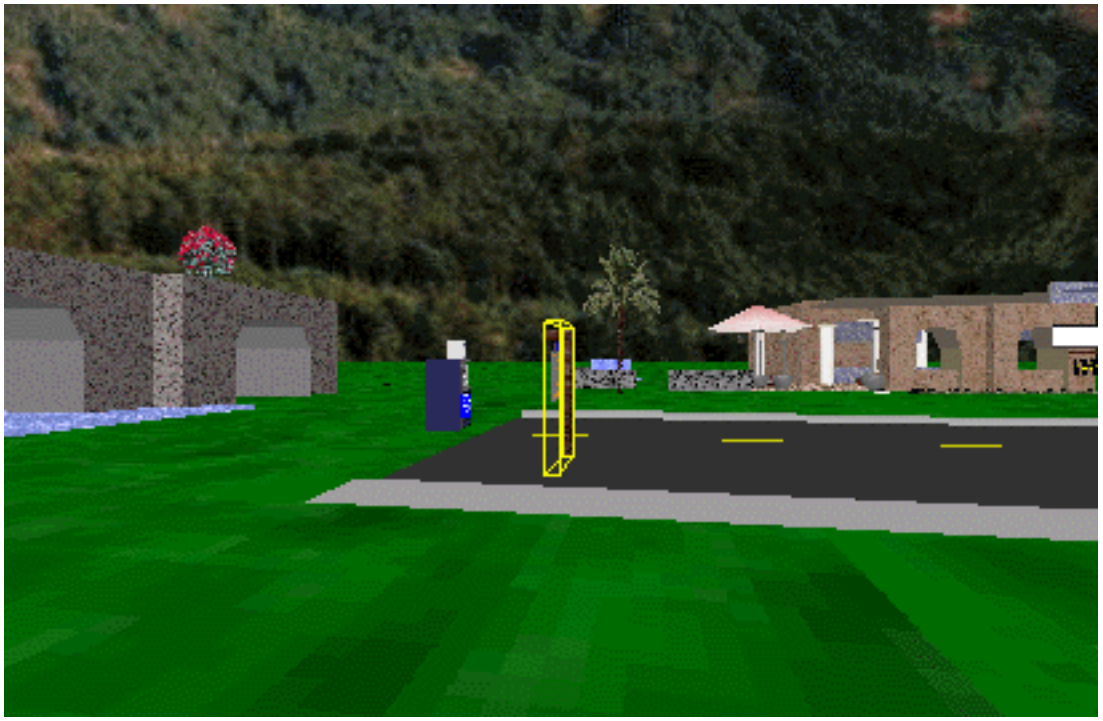
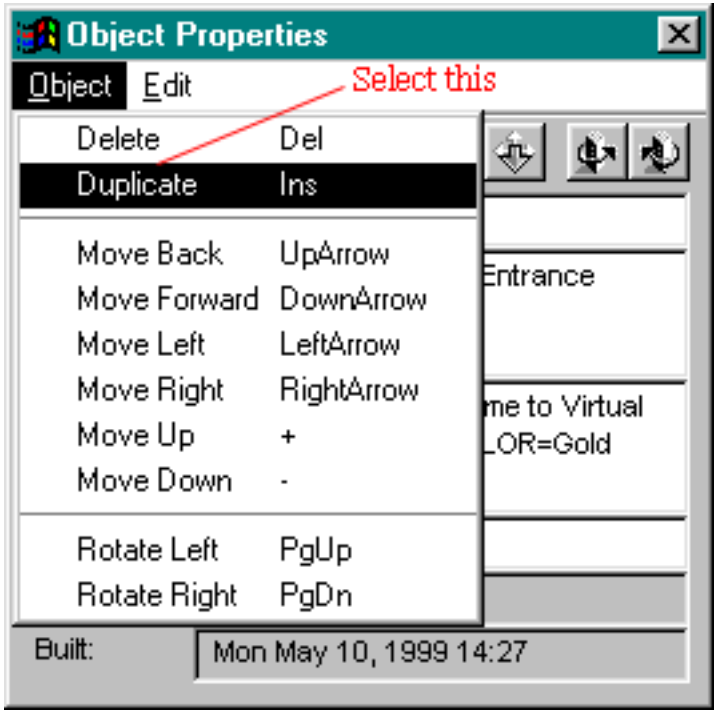
Collaborative Virtual Worlds

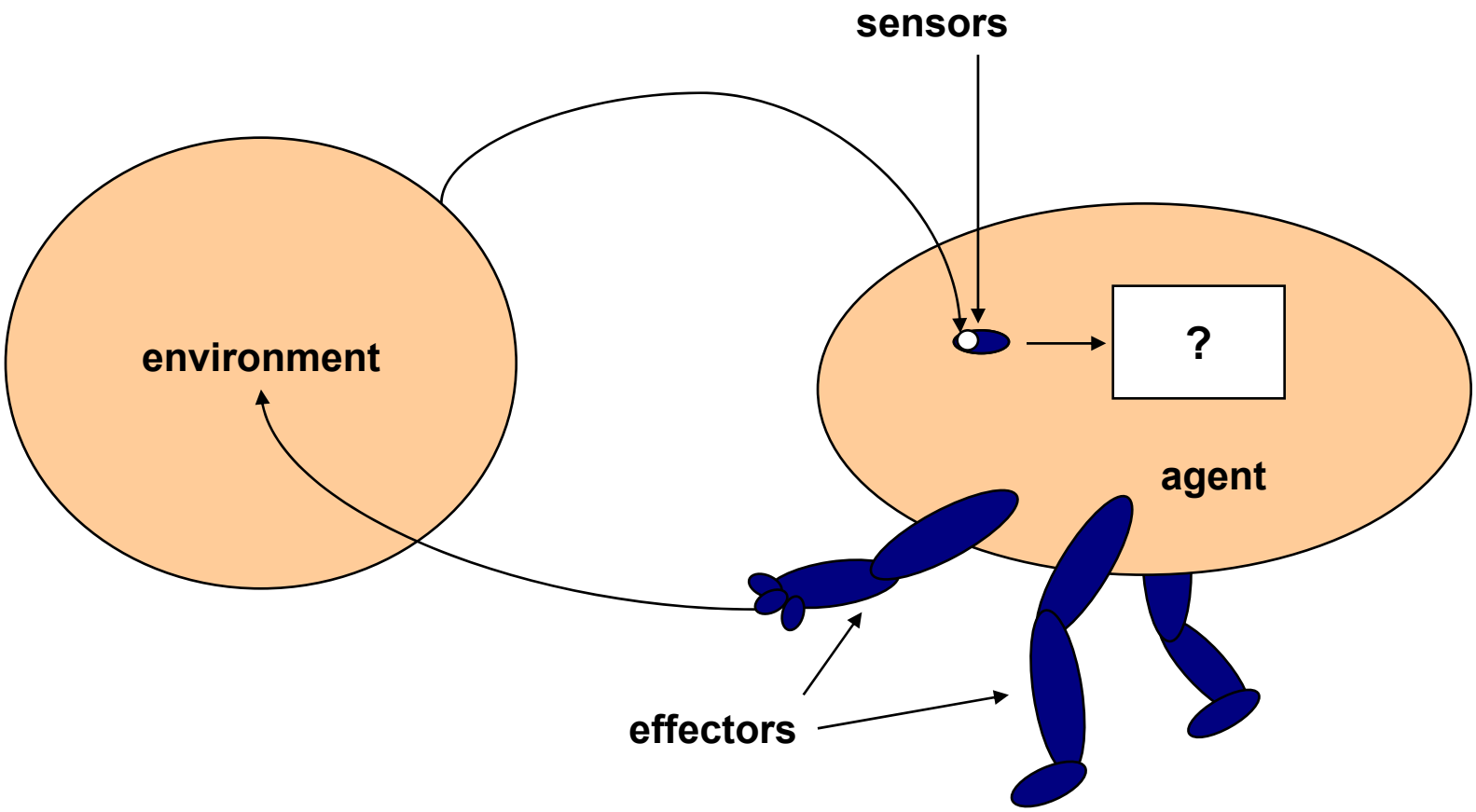


Object-Based Virtual Worlds

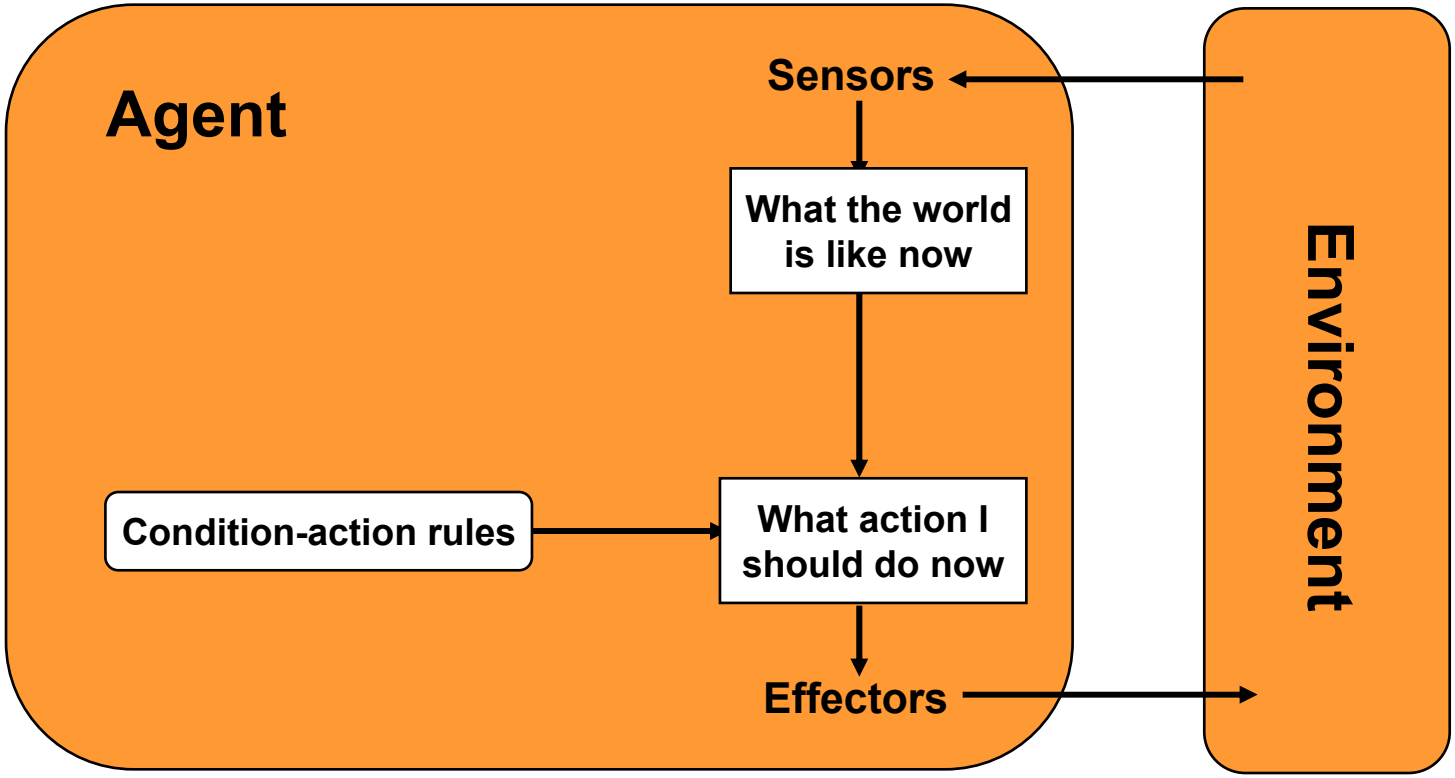




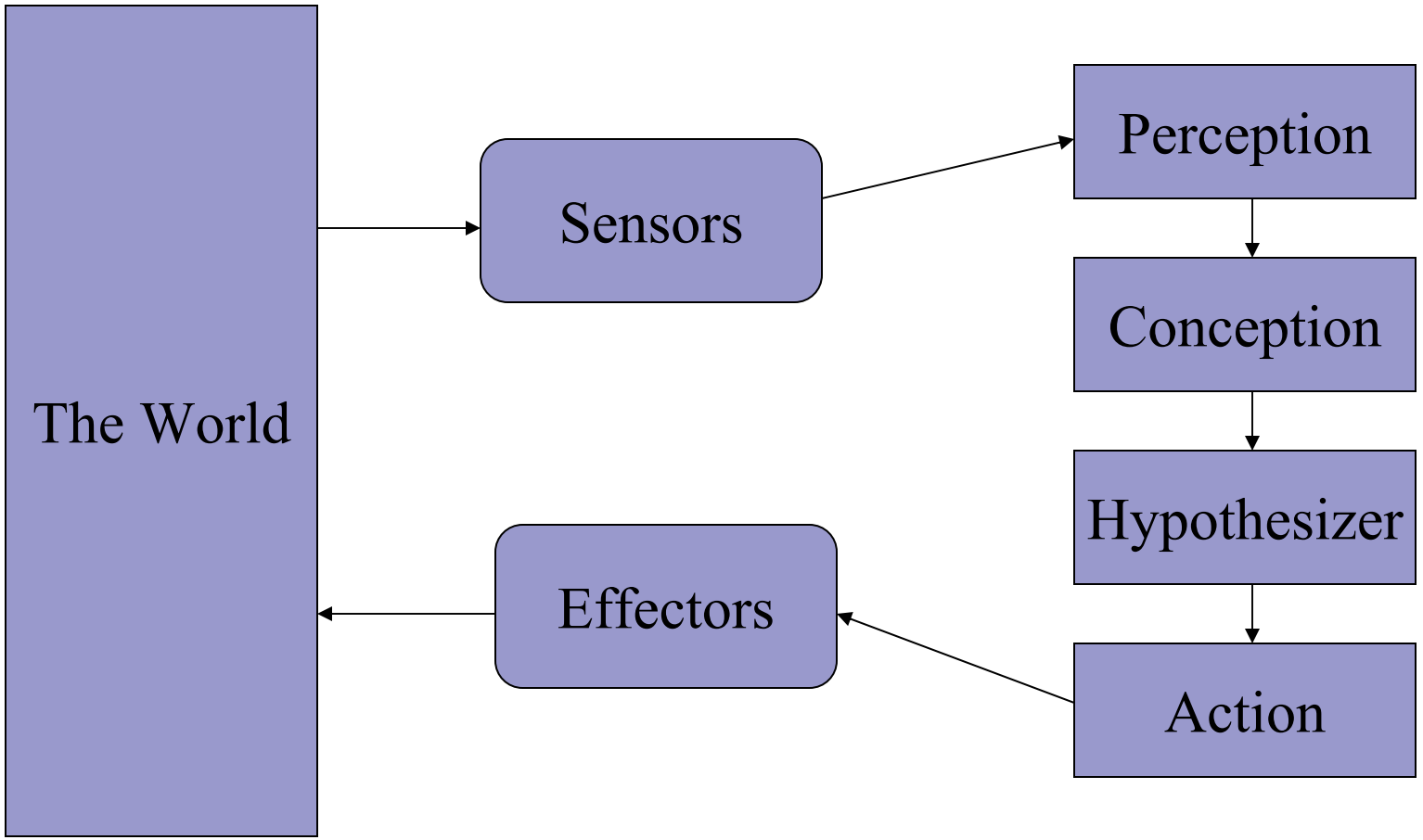
Autonomous Agents



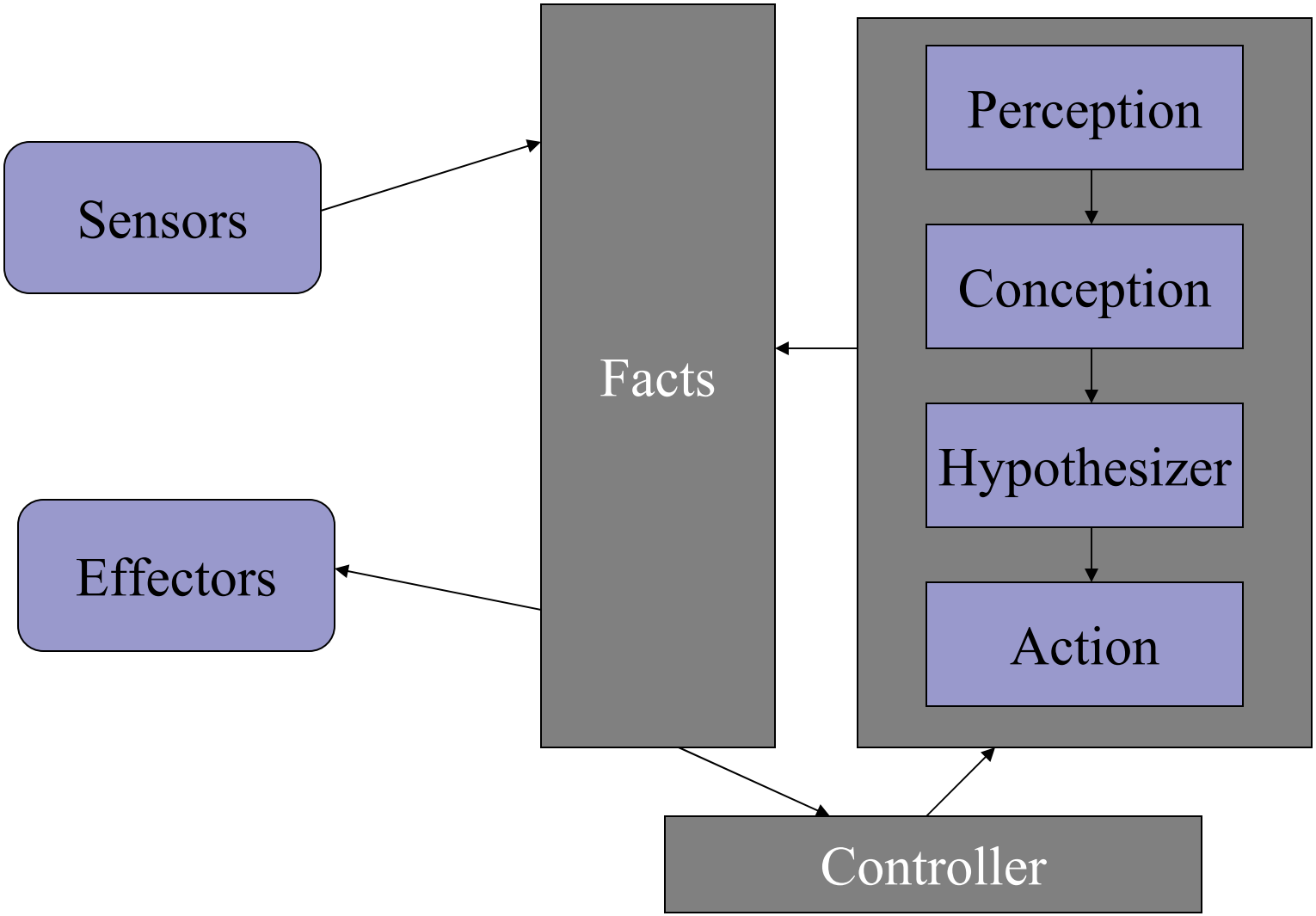
Rational Agents



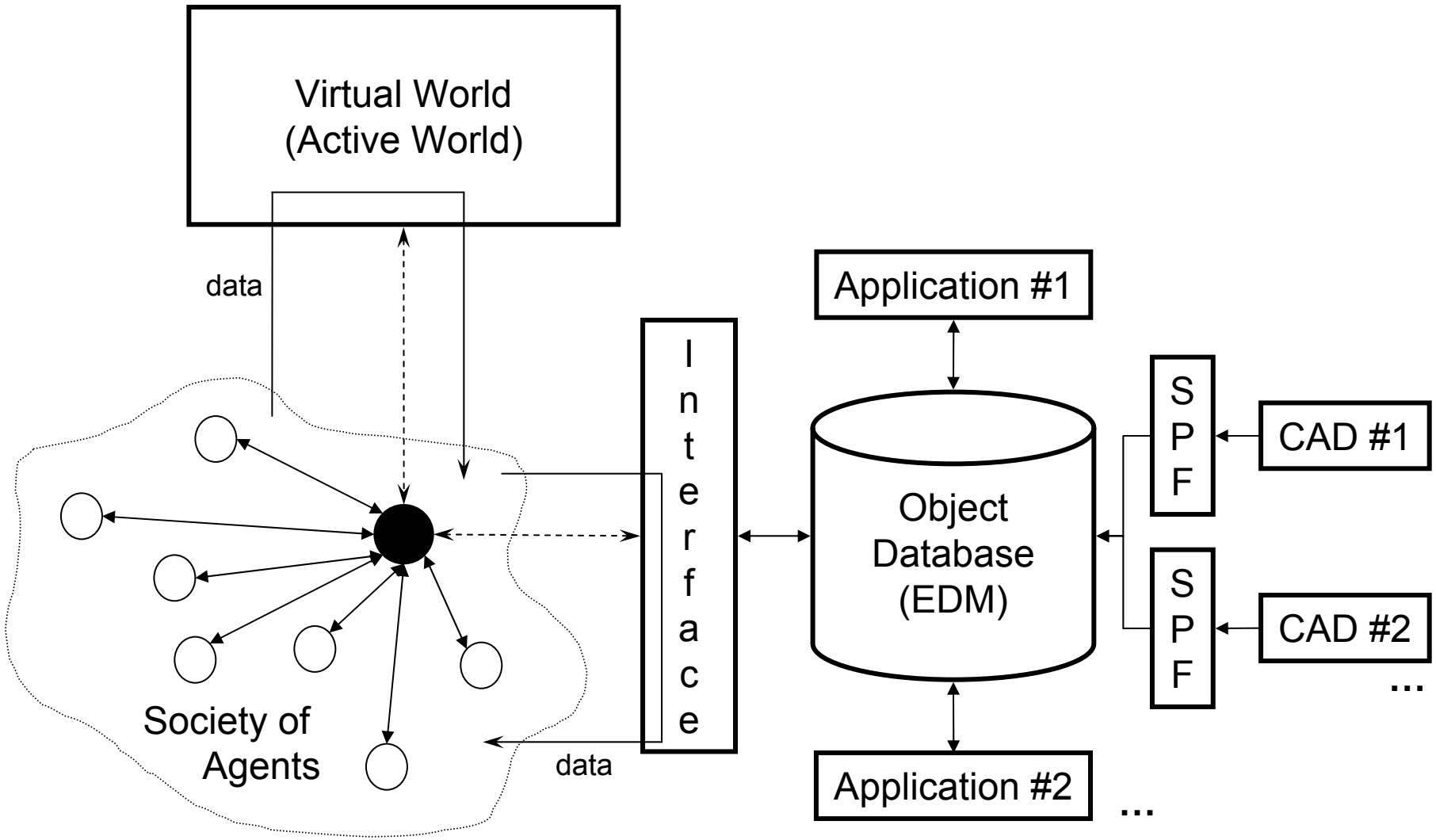
Virtual World Agent Model

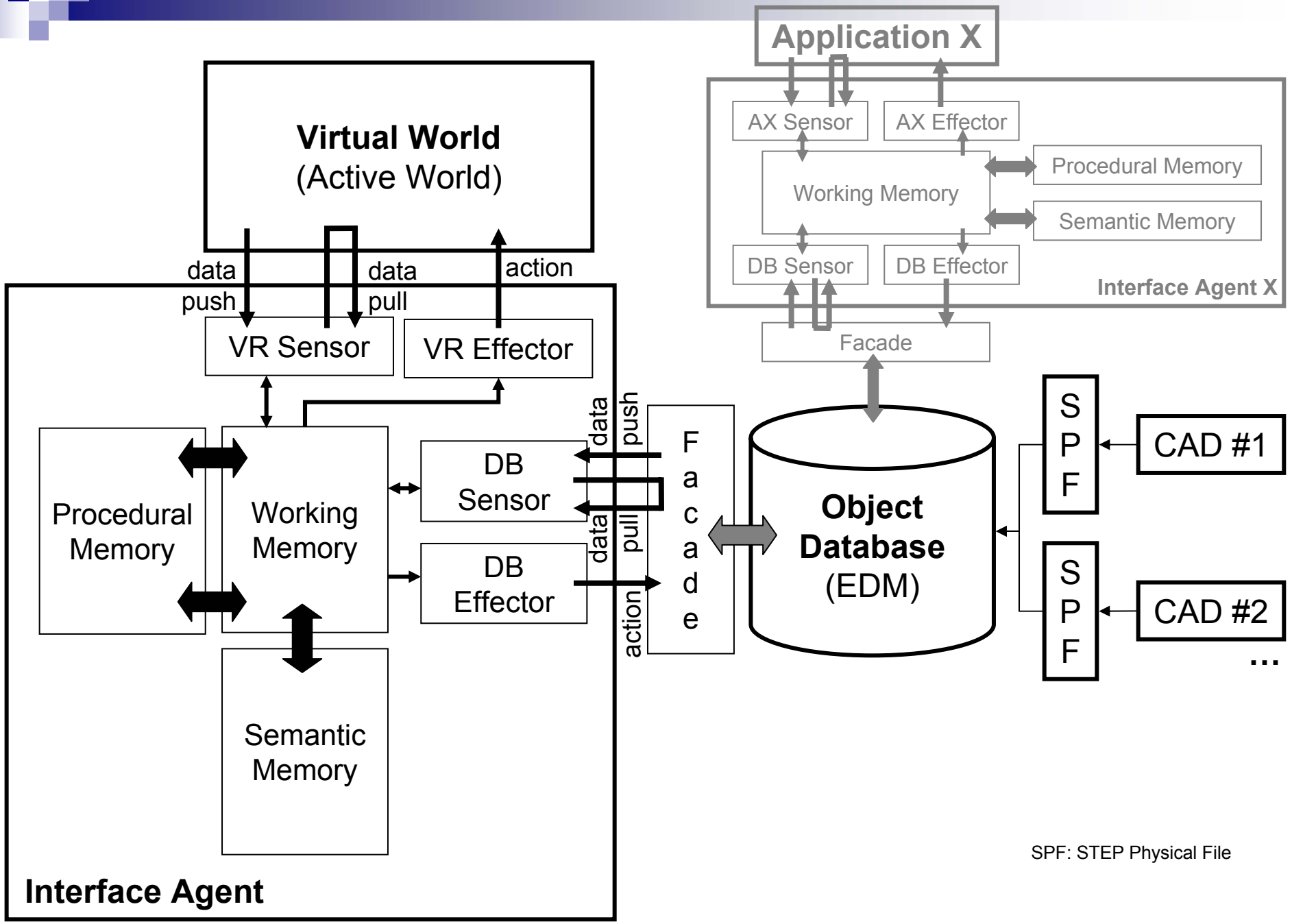


Agents as a Production System

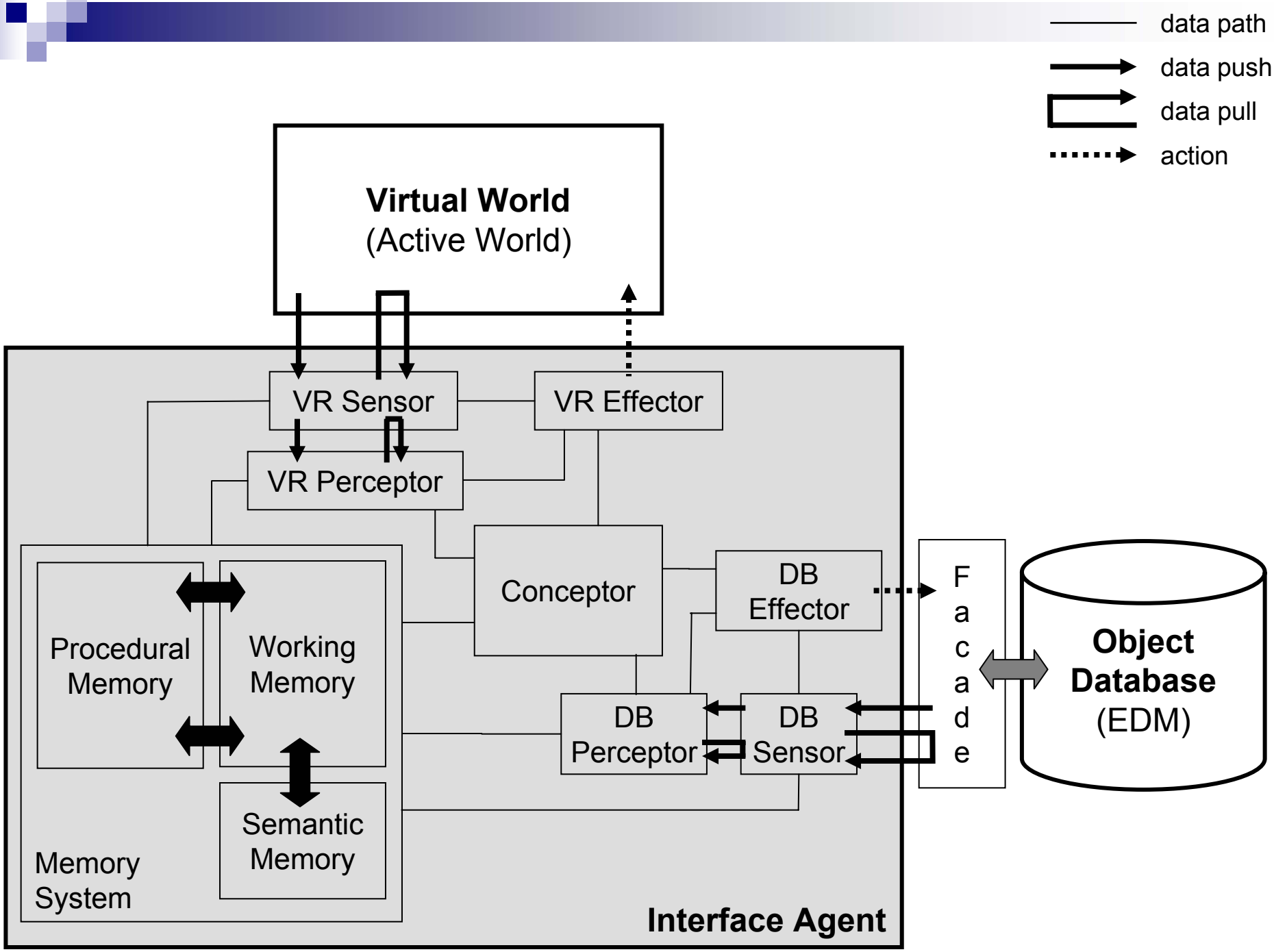


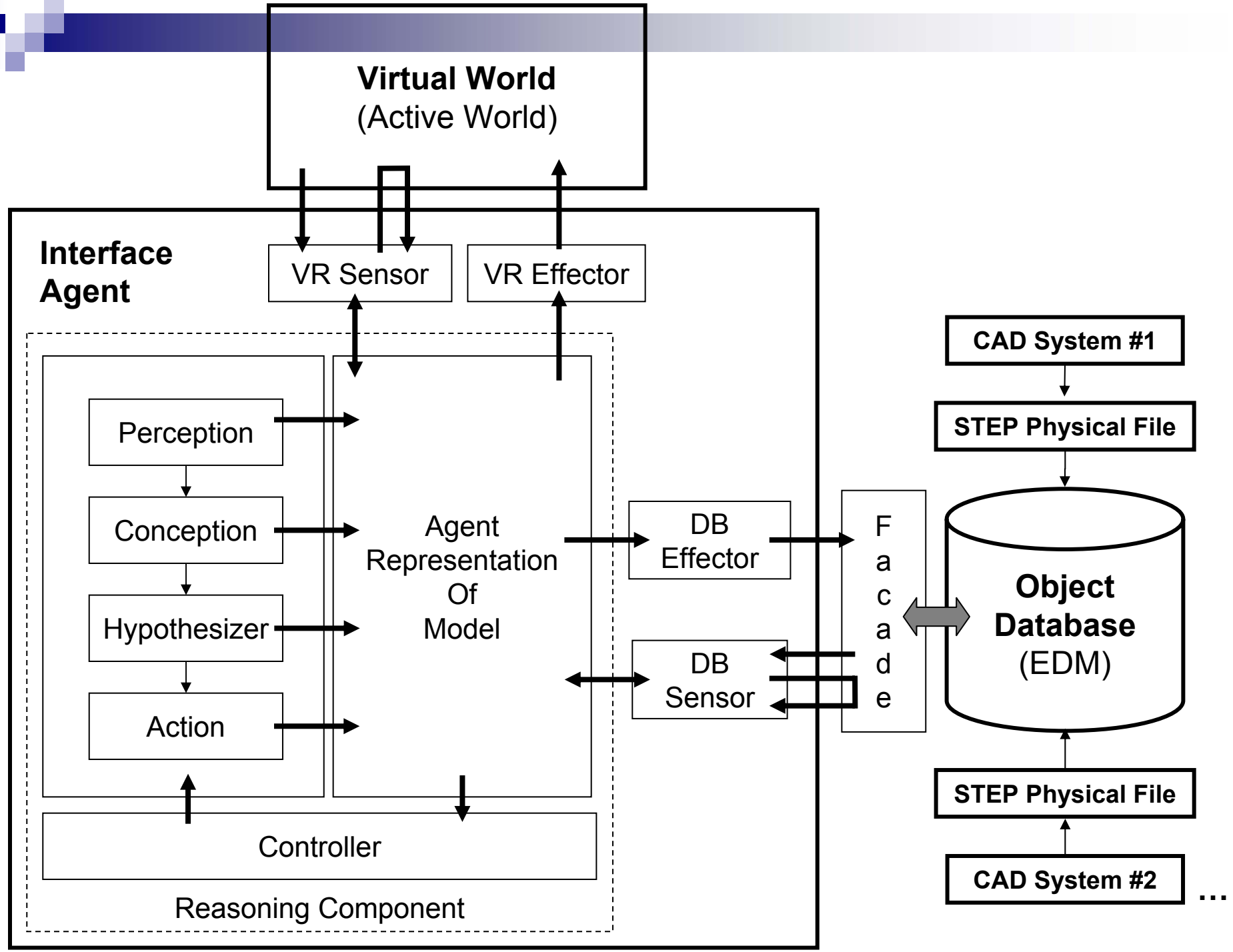
Agents to Support Data Sharing

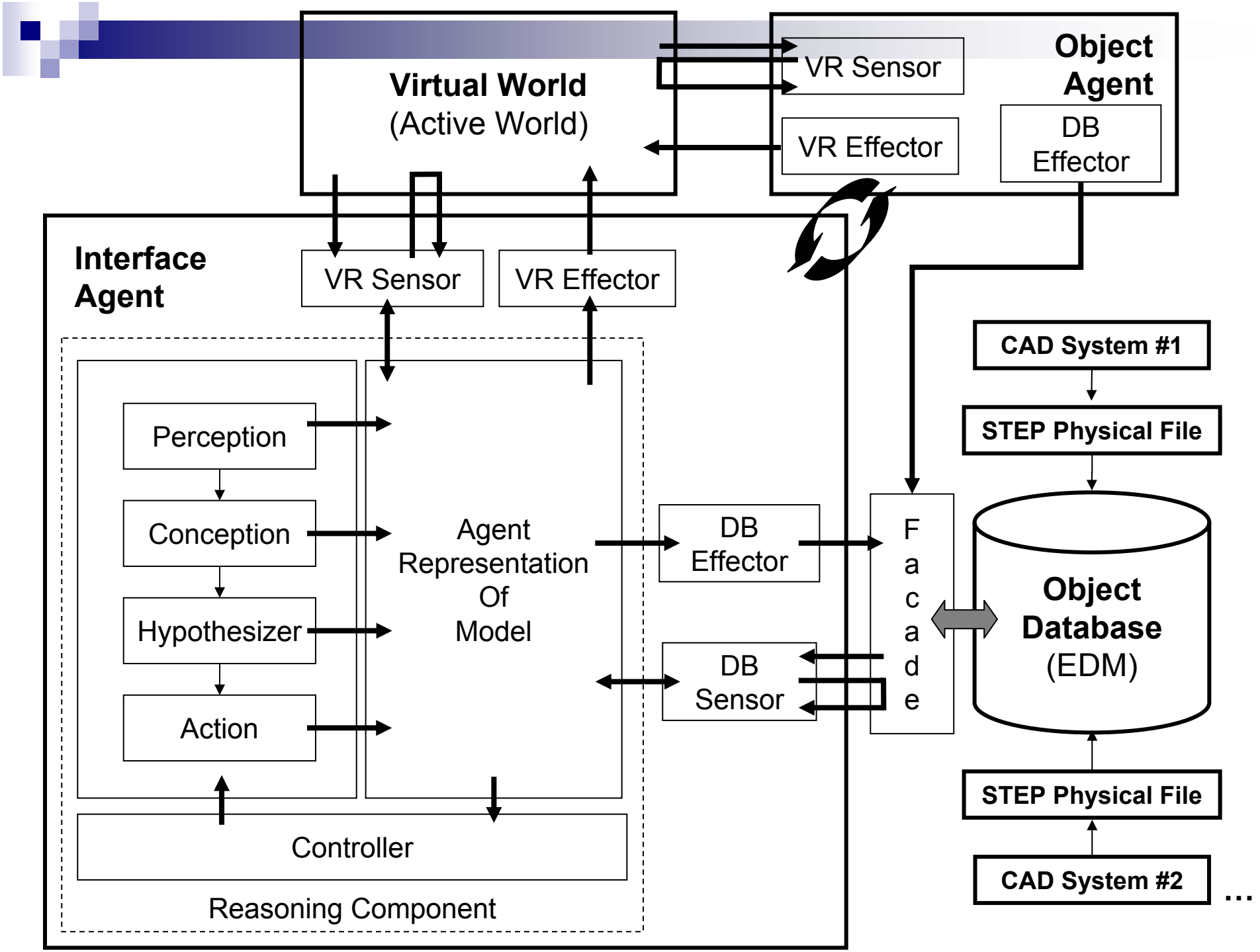




SPF: STEP Physical File


data path
data push
data pull
action
Virtual World
(Active World)
VR Sensor
VR Effector
VR Perceptor
Conceptor
DB
Effector
Procedural
Memory
Working
Memory
DB
Perceptor
DB
Sensor
Facade
Object
Database
(EDM)
Semantic
Memory
Memory
System
Interface Agent


Virtual World
(Active World)
Interface Agent
VR Sensor
VR Effector
Perception
Conception
Hypothesizer
Action
Agent Representation Of Model
Controller
Reasoning Component
DB Effector
DB Sensor
Facade
CAD System #1
STEP Physical File
Object Database
(EDM)
STEP Physical File
CAD System #2
…


Virtual World
(Active World)
VR Sensor
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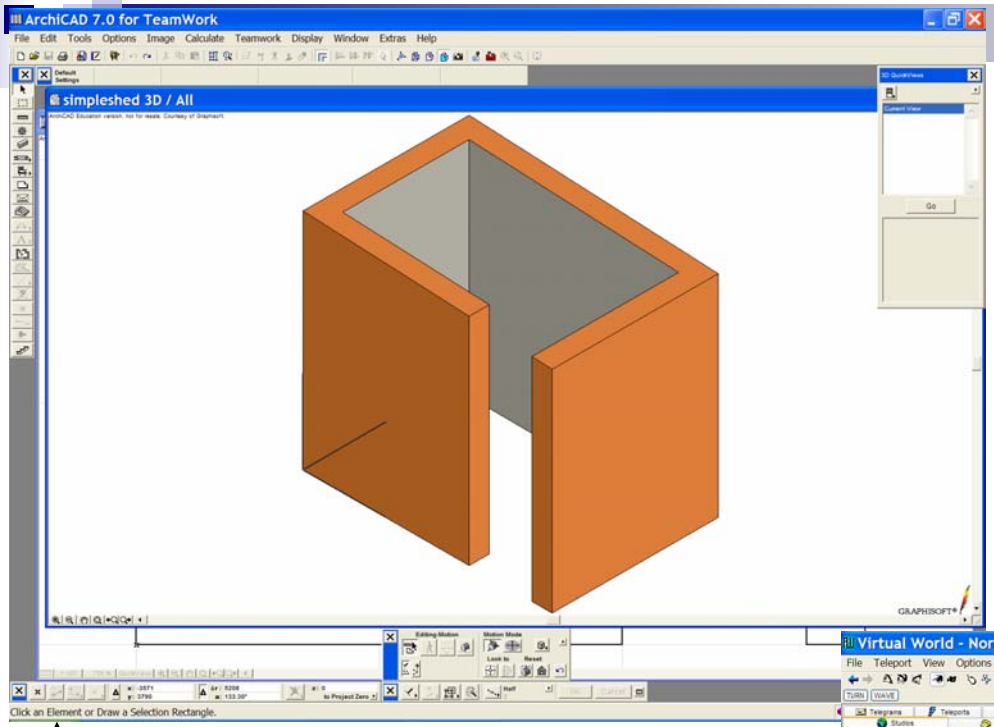
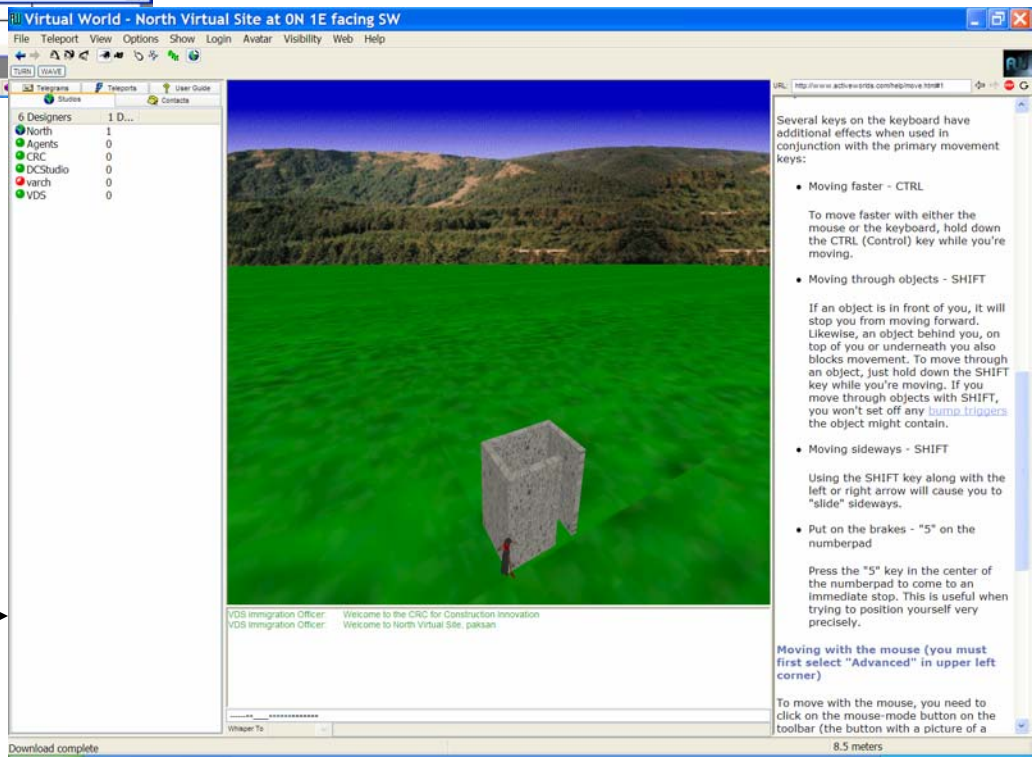
Object
Agent
DB
Effector
Interface
Agent
VR Sensor
VR Effector
CAD System #1
STEP Physical File
Perception
Conception
Hypothesizer
Action
Agent
Representation
Of
Model
DB
Effector
DB
Sensor
F
a
c
a
d
e
Object
Database
(EDM)
STEP Physical File
CAD System #2
...
Controller
Reasoning Component

Example:
Agents for information Flows between ArchiCAD and Active Worlds



Walls as defined in ArchiCAD

Walls for collaborative design in Active Worlds



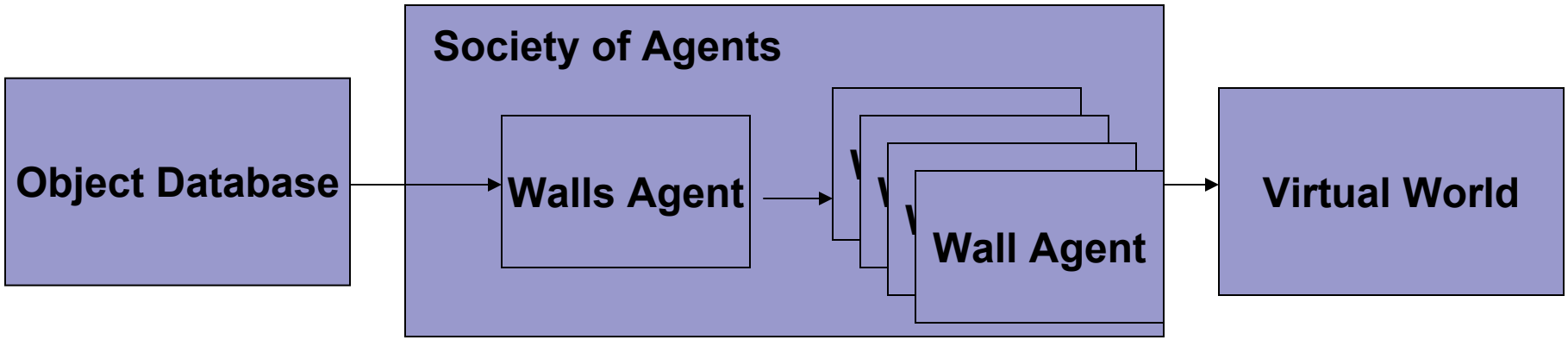
Roles of Walls Agent: An Example of an Interface Agent

- Maintains consistency of geometrical data between EDM database and AW.
- Controls two reversible processes of information flow.
- Creates wall agents.

Roles of Wall Agents: An Example of an Object Agent

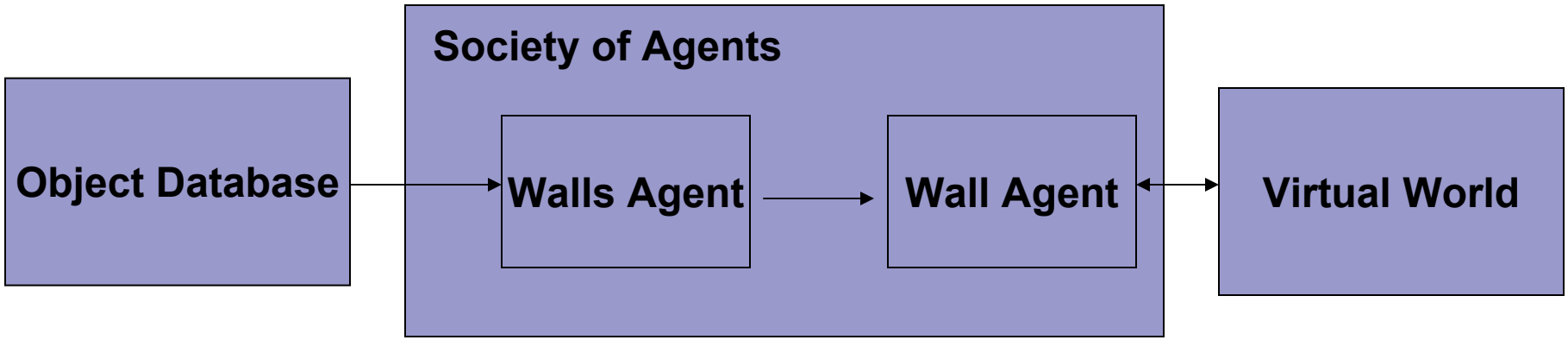
- Assist walls agent to complete the information flow from EDM database to AW.
- Build wall objects in AW.
- Provide intelligent reasoning to the wall objects in AW.

Walls Agent Controls Info Flows



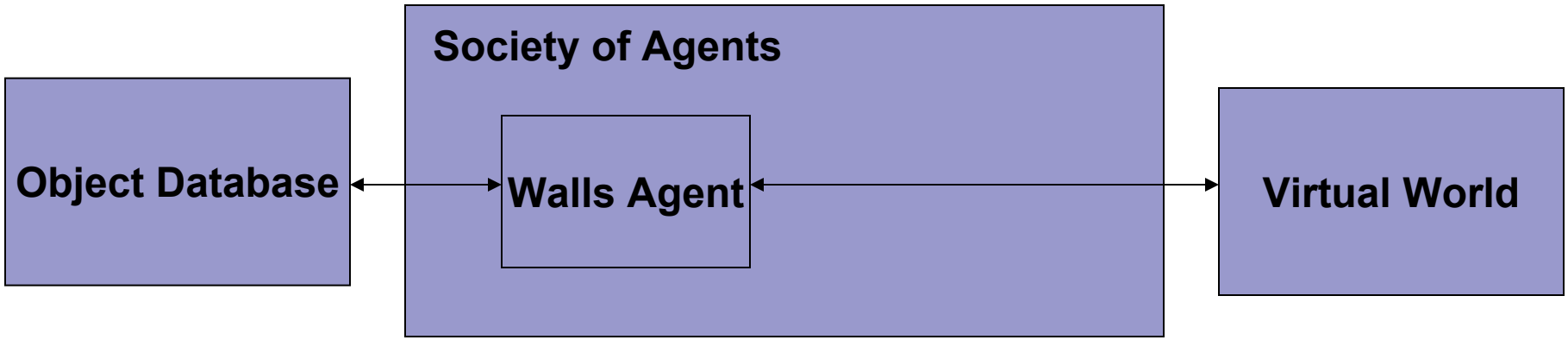
- From EDM database: senses a wall assembly of four separated walls.
- To AW: create four wall agents and passes the EDM wall sense data to the wall agents.

Wall Agents Assist Info Flows



- From walls agent: each wall agent receives the EDM sense data of a specific wall.
- To AW: each wall agent creates a wall object based on the EDM sense data.
- In AW: each wall agent provide a kind of intelligent agency to the wall it builds.

Walls Agent Controls Info Flows



- From AW: senses the changes of the wall objects built by the wall agents, during design collaborations.
- To EDM database: update the EDM database to reflect the above changes.

Walls Agent and Wall Agents

- Hierarchical: walls agent creates wall agents.
- Walls agent communicates with both EDM database and AW.
- Wall agents focus on supporting intelligent agencies in AW. Any communication with EDM database is through walls agent.

Behaviours of Walls Agent

- Maintain consistency of geometrical data between EDM database and AW.
- Allows querying on non-geometrical information (regarding the whole wall assembly) specified in EDM database from AW.

Behaviours of Wall Agents

- Allow querying on non-geometrical information (regarding one specific wall each of the wall agent represents) specified in EDM database from AW.
- Reflexive and reflective behaviours during design collaborations: justify issues like fire rating, acoustics, disability control and etc.

Summary

- Object-based Virtual Worlds support synchronous collaborative design
- Rational agents provide autonomous and proactive data sharing capability between Virtual World platform and CAD
- Rational agents support modifications during a collaborative design session

Acknowledgements

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- Ning Gu for development of wall agent behaviours
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