DYNAMIC REASONING MODELS IN E-NEGOTIATIONS

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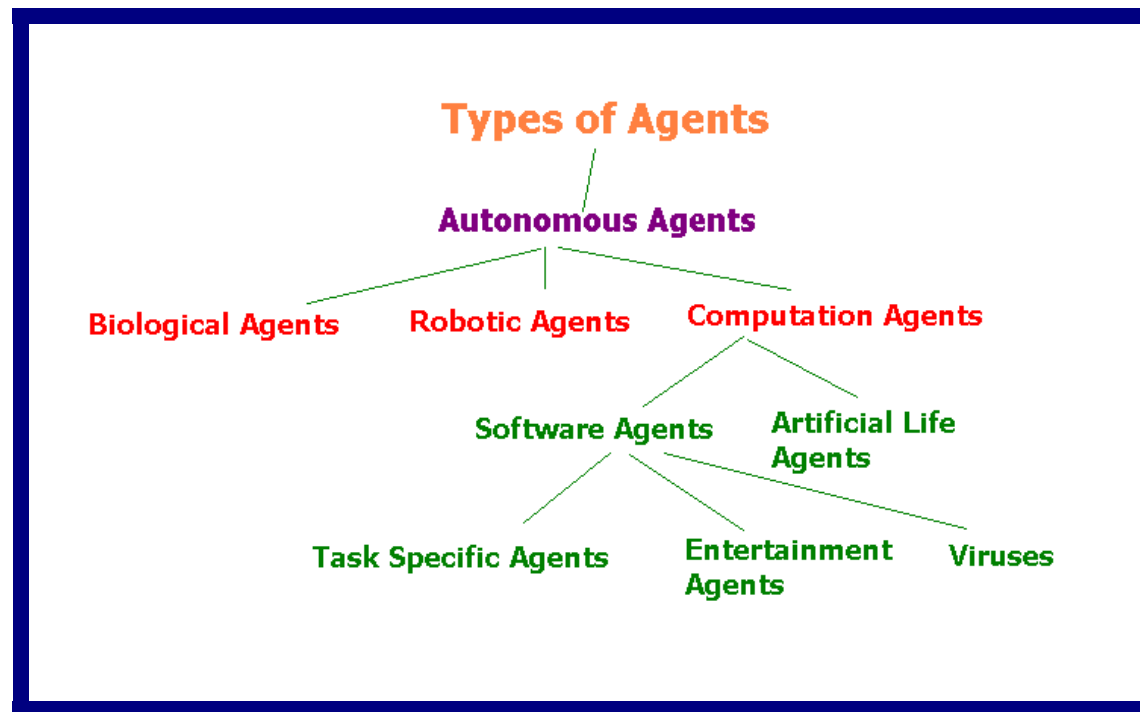Department of Computer Science, Oklahoma State University, Tulsa

Questions?

- How to improve efficiency of agents?
- How to make agents intelligent enough to be adaptable to changing market mechanisms?
- How to automate negotiation?
- What is the desired agent features for flexible negotiation?
- How to benefit from negotiation in several application domains?
- How to decide which negotiation mechanism is the best for an agent?

What is an Agent?

A Software entity that:
- Carries out some set of operations on behalf of a user or another program
- With some degree of independence or autonomy
- And in doing so, employs some knowledge or representation of user's goals and desires.

Types of Agents

Autonomous Agents

Biological Agents   Robotic Agents   Computation Agents

Software Agents   Artificial Life Agents

Task Specific Agents   Entertainment Agents   Viruses

What is the role of Agents in Supercomputing?

- Scientific problem solving environments
- High performance agent systems
- Coordination in large scale systems
- Distributed scheduling
- Task distribution
- Load balancing
- Resource and service discovery
- Data mining and data warehousing
- Air traffic control
- The Distributed Vehicle Monitoring Task (DVMT)

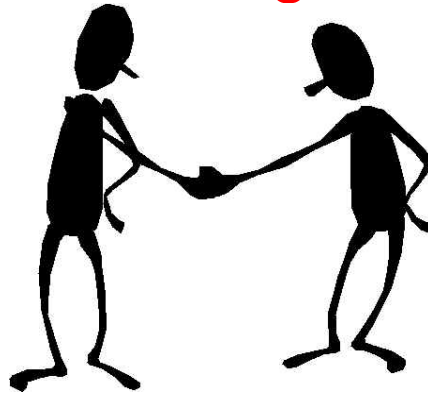# What is the role of Agents in E-Commerce?

Buyer-Seller Agents
Auction Agents
Brokers and Mediators
Negotiating agents

Challenges in Automating E-Commerce?

Automation support
Decision support
Efficient market mechanism support

What is e-Negotiation?

Facilitate and automate business interactions for mutual and efficient agreements on terms of transaction relationships involving complex needs , trade-offs, and options in dynamic e-commerce

Some of the many advantages:
- Increased efficiency (more automation) by shortening the negotiation cycles
- Increased speed and volume of transactions
- reduced manual effort
- Enhanced profitability (better decisions)
- Improved user satisfaction (better decisions)

Negotiation Mechanisms

Negotiation protocols: rules that govern the interaction among agents.
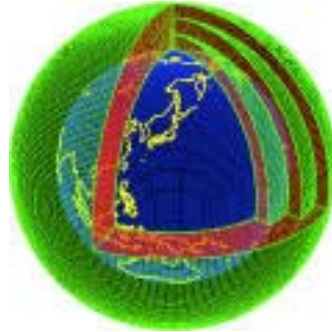
Negotiation objects: the ranges of issues over which agreement must be reached

Negotiation reasoning models: apparatus that participants employ to act in line with the negotiation protocol in order to achieve their negotiation objectives

REASONING MODEL = PROTOCOL + OBJECT
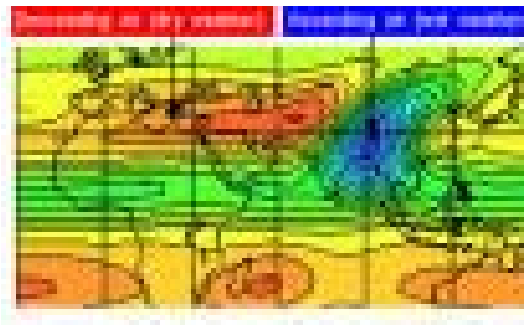
What are the current challenges in Supercomputing?

- ▶ sCalAbility
- ▶ efficiency
- ▶ adaptability
- ▶ flexibility

***On-demand allocation of resources based on user's preferences***

Existing Systems

❖ **GRAIL** - Grid Research And Innovation Laboratory (GRAIL) Focuses on scheduling and the deployment of distributed scientific applications.

❖ **Apples** - Application level scheduling

❖ **Ubero** - Universal binding and execution of redundant objects

❖ **CoABS** - DARPA Control of Agent Based Systems

Proposed Solution

Software mobility

Intelligent Negotiating Agents

Modularity

Flexible Distributed Systems
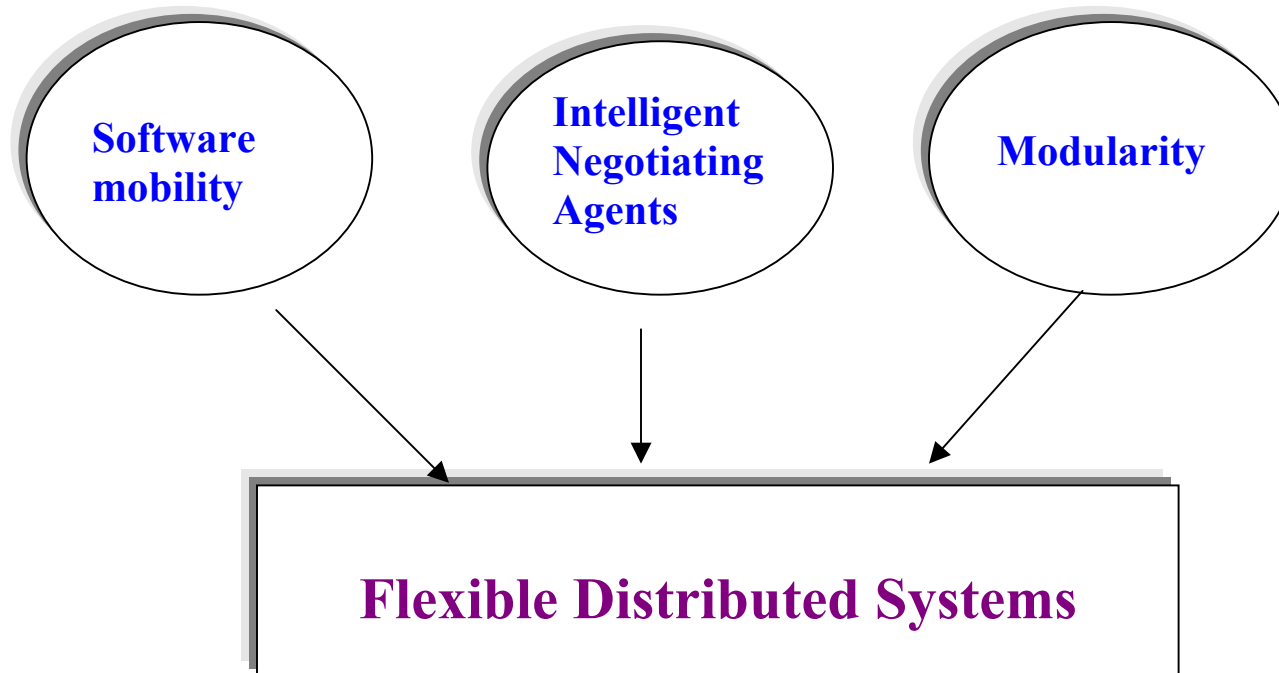
Initial Design

- use light-weight mobile agents
- use a default reasoning model at start-up
- use on-demand loading of complex algorithms
- use a modular approach and componentware technology
- use standard communication protocols like FIPA

SELLEI	PRODUCT	PROTOCOL	STRATEGY	SUCCES RATE
Seller 1	Used Cars	Offer-Counter Offe	Tit-For-Tat	0
Seller 2	Used Cars	Offer-Counter Offe	Tit-For-Tat	60
Seller 3	Used Appliances	Argumentation	Persuade/Critique	90
Seller 4	Used Appliances	Auction	Heuristics	70
Seller 5	Travel package	Offer-Counter offe	Boulware + dependent	40
Seller 6	Travel package	Bidding		
Seller 7	Air tickets	Auction		

Sample matchmaking table for negotiation initialization

Proposed Agent architecture
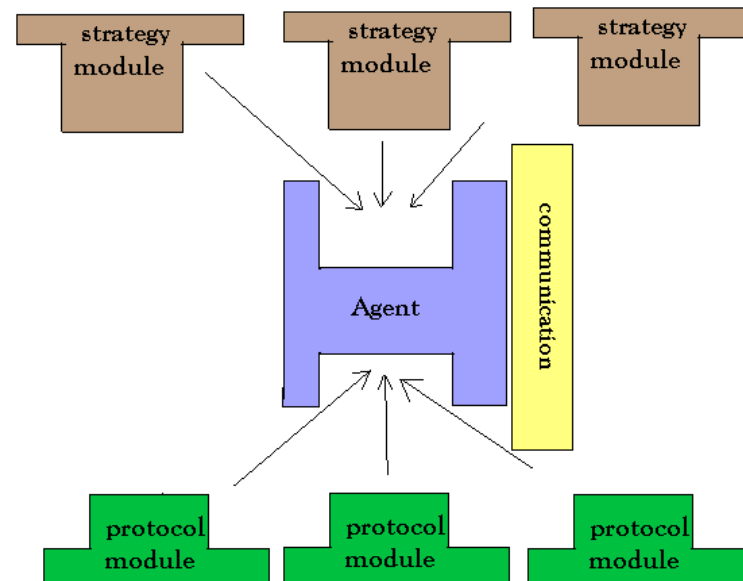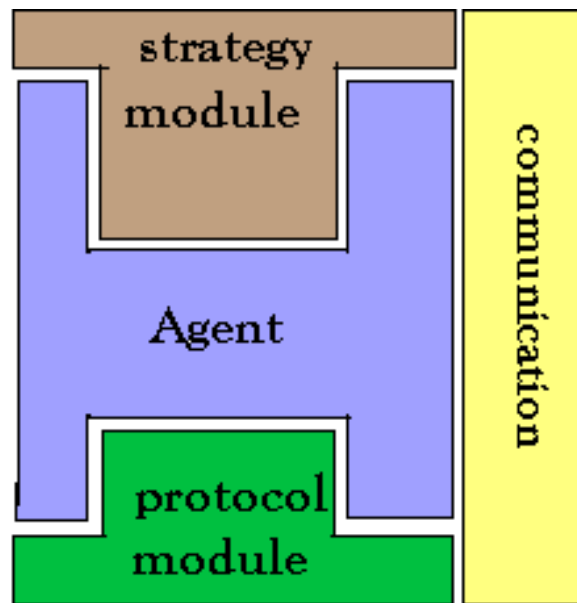
MODULE DESCRIPTIONS

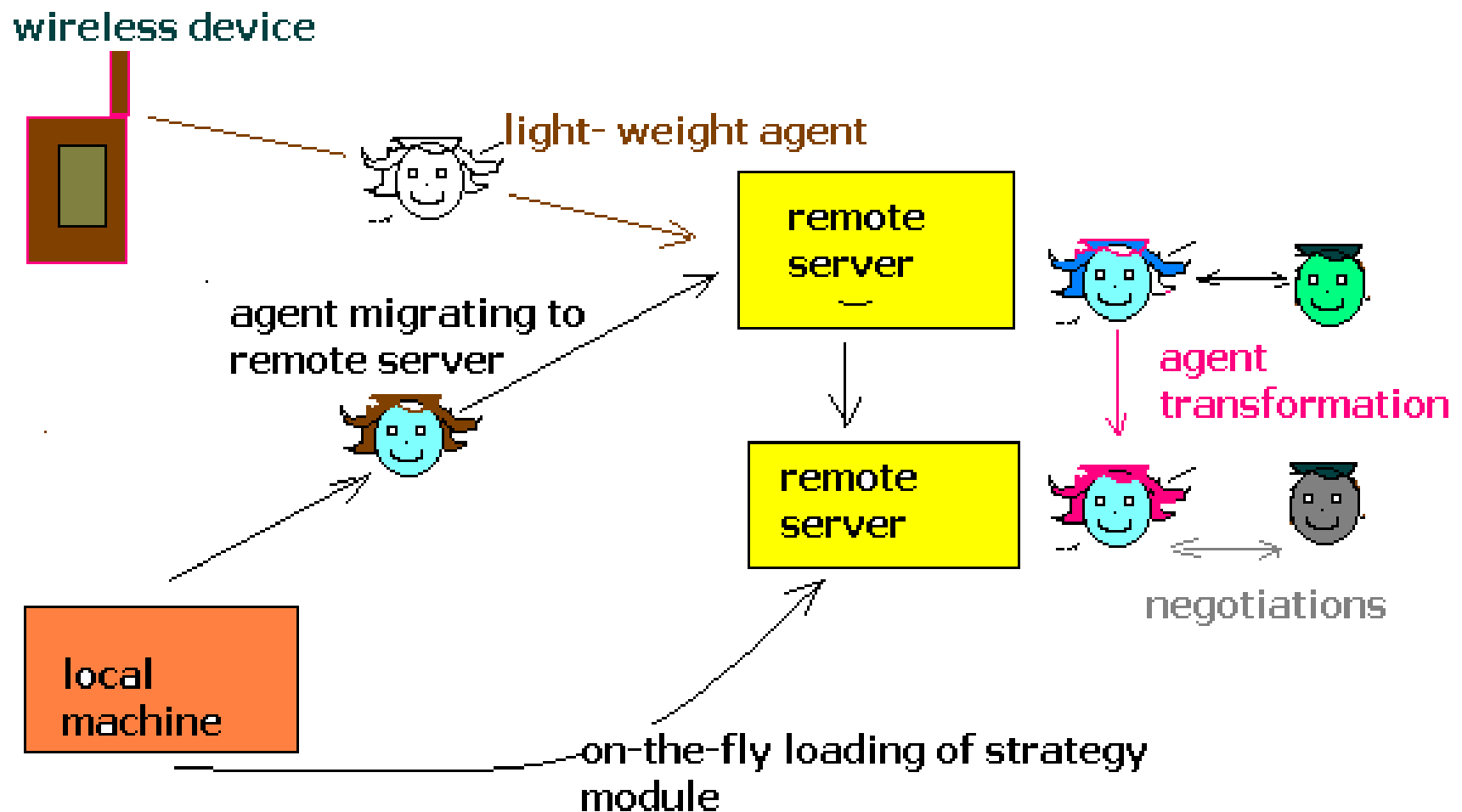| Module	Description
Communication Module	Facilitate "talking" between the agents in a common, understandable way.
Protocol Module	Enable automated negotiation keeping the rules of the negotiation in mind.
Strategy Module	Apply the proper reasoning module so that the negotiation ends in a success.

Technology

Java is used for coding all modules.

JADE Agent platform is used for creating and deploying agents

JESS is used for implementing the Rule-Based logic.

Dynamic Agents in our system

wireless device

light-weight agent

remote server

agent migrating to remote server

remote server

agent transformation

local machine

on-the-fly loading of strategy module

negotiations

CONCLUSION

- **Happy end-users**
- **Higher efficiency**
- **Feasibility**
- **Mobility**

Agents on the web

Buyer and Seller Agents in an E-Marketplace

agent B1   agent S2   agent S3

Market place

agent B2   agent B3   agent S1

Electronic Market available on the WEB:
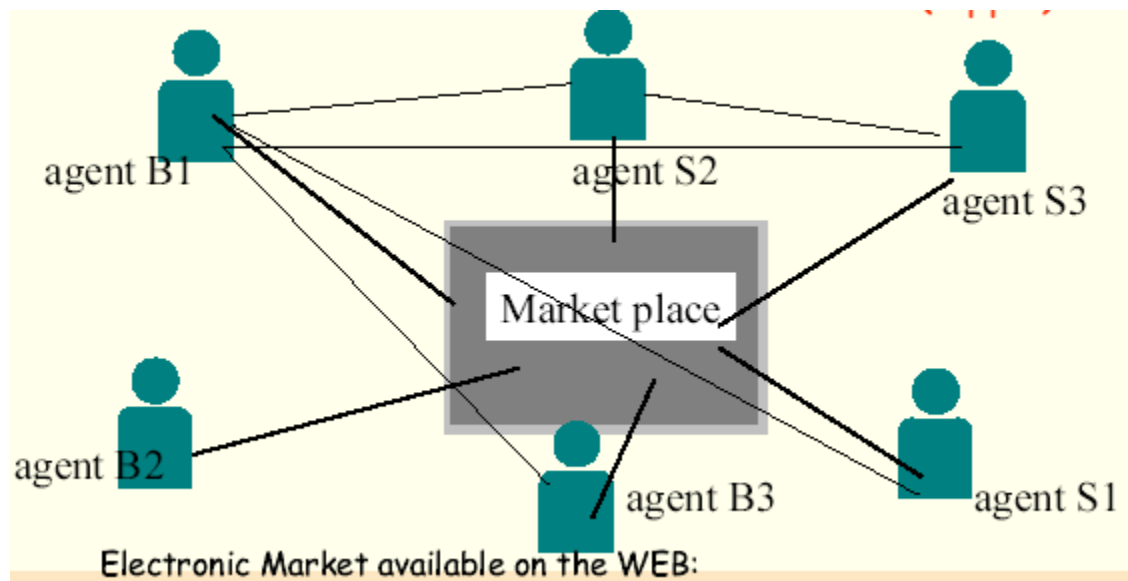
Bidding in an E-Marketplace