



Control of Agent Based Systems (CoABS)

&

DARPA Agent Markup Language (DAML)

Prof. James Hendler

jhendler@darpa.mil

Program Manager, CoABS & DAML

Information Systems Office

Presented by

Jaynarayan H. Lala

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CoABS PROGRAM GOALS

- To develop and demonstrate techniques to safely control, coordinate and manage large systems of autonomous software agents.

CoABS VISION

- **To increase military user's productivity, "Software Agents" are being developed to**
 - automatically accept abstract tasking, get needed information
 - decide how to solve simple problems
 - help the user solve difficult problems, and
 - take action on the user's behalf.
- **This would allow automation of relevant command and control functions** such as information gathering and filtering, mission planning and execution monitoring, and information system protection

PROBLEM STATEMENT

- ***R&D is needed in control of agent-based systems***
 - to mitigate dangerous and chaotic behaviors such as resource consumption, faulty communication, poor performance, system shutdowns, and security vulnerabilities.

EXAMPLE PROBLEMS

- Agents or agent systems produced by different developers cannot cooperate in any meaningful way.
- No sufficient algorithms, policies, or mechanisms that prevent a large heterogeneous set of agents from exhibiting dangerous or chaotic behavior on a network.
 - can lead to clogged networks, wasted resources, poor performance, system shutdowns, and security vulnerabilities

CoABS PROGRAM THRUSTS

- Cooperative Control Strategies
- Reliability Assurance Methods
- Computer Systems Architectures
- Related Technologies

Cooperative Control Strategies

- Models of collaborative behavior
- Role of competition, policy and mechanisms for competition and cooperation
- Semantic representation and translation methods
- Agent facilitation, brokering, and mediation

Reliability Assurance Methods

- Resource allocation and control
- Security mechanisms
- Methods of agent creation and deletion
- Distribution of agents on the network
- Trade-offs between control mechanisms and collaboration

Computer Systems Architectures

- Communication protocols
- Standards for agent interoperability
- System integration
- Application programmer interfaces

Related Technologies

- Agent development languages
- Tools and environments
- Test & demo environments, evaluation methods
- Component capabilities
 - AI-based techniques such as planning, scheduling, execution monitoring, machine learning, user interfaces, knowledge-sharing, and acting

DAML PROGRAM GOALS

- Create technologies that will enable software agents to dynamically identify and understand information sources, and to provide interoperability between agents in a semantic manner.

DAML TASKS – 1/6

- Create an Agent Mark-Up Language built upon XML that allows users to provide machine-readable semantic annotations for specific communities of interest.

DAML TASKS – 2/6

- Create tools that embed DAML markup on to web pages and other information sources in a manner that is transparent and beneficial to the users.

DAML TASKS – 3/6

- Use these tools to build up, instantiate, operate, and test sets of agent-based programs that markup and use DAML.

DAML TASKS – 4/6

- Measure, via empirical experimentation, the productivity improvements provided by these tools.

DAML TASKS – 5/6

- Apply these tools to third party agent development, military-specific problems, and support for the intelligence community so as to evolve DAML technologies towards large-scale use.

DAML TASKS – 6/6

- Transition DAML to the commercial and military markets via partnerships with industrial and defense-related (C2 - Command & Control - and intelligence) organizations.