Agent-Oriented Programming for Modern Cyber-Infrastructures

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Introduction

- Importance of data in all domains of human activity has brought the requirement for more complex data-sharing Cyber-Infrastructures.
- These Infrastructures exhibit the double status of *computational* and *social* systems and regulating them requires higher level reasoning.
- Agent Oriented Programming (AOP) is extensively studied and used for modeling and simulation of social systems.
- The **A**gent**S**cript Cross-**C**ompiler (ASC) is built to bridge the modelling power of AOP with operational requirements of modern Complex Cyber-Infrastructures

Summary

This work introduces **A**gent**S**cript Cross-**C**ompiler (ASC):

- Provides a high level DSL agent programming language
- A Cross-Compiler to translate the Agent DSL into executable code.
- Allows use of modern development tools such as Testing, Debugging and Profiling.
- Enables seamless deployment into modern infrastructures with minimum runtime dependencies and transport-layer agnostic communication.

AgentScript's Compile, Build and Deploy Process

Agent's Script

High Level Logic-Based DSL motivated by *AgentSpeak(L)*

- Intuitive modelling of social agents
- *Readable* and Verifiable DSL
- Enables logical reasoning

Scala/Java Presentation of the Agent's Script

Off-the-shelf development tools

- Test tools: JUnit, ScalaTest, etc.
- Debuggers
- Profilers: Flight Recorder, etc.

- Off-the-shelf build tools:
  - sbt, maven
- Standard CI/CD operations

Verifiable via ByteCode verification tools: JPF

JVM-Based ByteCode Presentation of the Agent's Script

- Stand-alone Application
- Only Requires a JVM to execute
- Can use containerization tools for seamless deployment: docker, k8s

- Agent's communications are Transport layer agnostic
- Enables plugins for interoperability
  - rest, amqp, kafka, etc.

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