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AgentScape Demonstration

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Introduction

The AgentScape framework is the current focus of research within the IIDS Group in close collaboration with the Computer Systems Group at the Vrije Universiteit Amsterdam. This framework includes the AgentScape OS, a number of services including the Generative Migration Facility, and support for application developers.

AgentScape Middleware: Agent Operating System

The AgentScape operating system (AOS) [5] provides a platform with which mobile, autonomous agents can be managed. The rationale behind AgentScape's design is (1) to provide a platform for large-scale agent systems [1], (2) to support multiple code bases and operating systems, and (3) to support interoperability with other agent platforms.

A *location* is a "place" in which agents and objects can reside. *Agents* are active entities in AgentScape that interact with each other by message-passing communication. *Objects* are passive entities that are only engaged into computations reactively on an agent's initiative. Besides agents, objects, and locations, the AgentScape model also supports external *services*, an example of which is the Agent Factory and generative migration. The AgentScape middleware consists, per location, of a distributed AgentScape operating system kernel, agent servers (to host agents), object servers (to host objects), and service access providers (to make external services available).

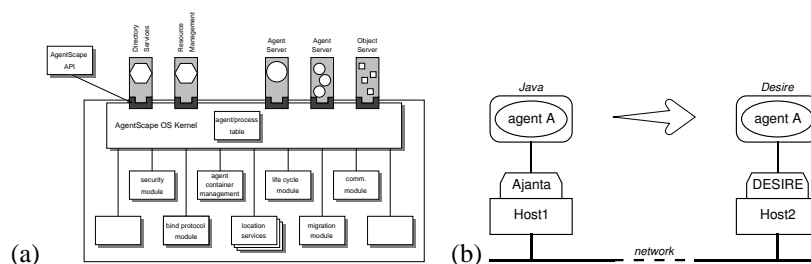


Figure 1: (a) AgentScape middleware architecture. (b) Principle of generative migration.

AgentScape is, in fact, a virtual machine distributed over a wide-area network consisting of heterogeneous hosts. AOS kernels host agents, objects, and provides service access (see Fig. 1a). Distributed and replicated objects are supported by integrating Globe [4] functionality, a large-scale distributed object system. All calls are filtered by the AOS and appropriate calls are dispatched to the underlying operating system, services, etc.

A location in the distributed system is a set of hosts run by a single administrative entity. Each host runs a *minimal* AOS kernel, and zero or more agent servers, object servers, and service access providers. An agent server hosts agents, an object server hosts objects, and a service access provider makes external services accessible within AgentScape. A location is implemented by the distributed AOS kernels, the agent servers, the object servers, and service access providers. On top of the AOS agent applications and agent platforms can be developed (see Fig. 1b). The current prototype implements the basic functionality required.

AgentScape Services: Generative Migration and Agent Factory

One specific AgentScape service extends the basic mobility of agents to true heterogeneous environments, i.e., different agent platforms and different programming languages (see Fig. 1b). The Agent Factory service automatically adapts mobile code to a specific host: a form of generative mobility [2]. In this approach, the mobile code need not be sent to another host, but a blueprint of the agent's functionality is sent, together with information needed to resume work. At each host, a service is available which inspects a blueprint and generates the corresponding agent code. The (re)generation process uses libraries of "building blocks" to reconfigure agents.

Current Status

The current prototype of the AOS is implemented in both Java and Python, using XML-RPC for inter-process communication. The next prototype will implement the security model based on [3], p2p services, and other functionality. It will also support the application developers support environment Mansion and an agent-based market-place.

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