Managing Dynamic Distributed Jini Systems

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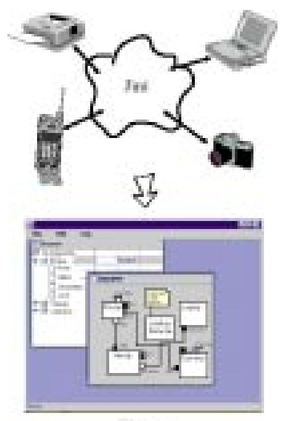
Introduction

Dynamic Distributed Systems
Are distributed systems that are able to change their structure (set of components & wiring) autonomously during runtime.

Examples for DDS are: Salutation, UPnP and *Jini*

Problem:
If the wiring of the components is done autonomously errors and internal processes are much harder to trace.

Goal:
Design a tool that graphically describes the internal mechanisms in a DDS on the fly.



Carp@

Outline

I Platform: **Jini**

II **Tool Carpat**
- Principle: Reflective Meta Level
- The meta model
- Carpat Beans
- GUI and features

III **Future Work & Outlook**

Jini in a Nutshell

- developed by Sun Microsystems
- based on Java and partly on RMI
- proposes interfaces to program **dynamic** distributed systems
- idea: dynamic pool of cooperating services

Services
- are described by **attributes and interfaces**
- are accessible with a mobile **service proxy**
- **Join**: services announce their presence at discovered lookup services

Lookup Services
- are **catalogs** of available services
- contain for each service descriptions and service proxies

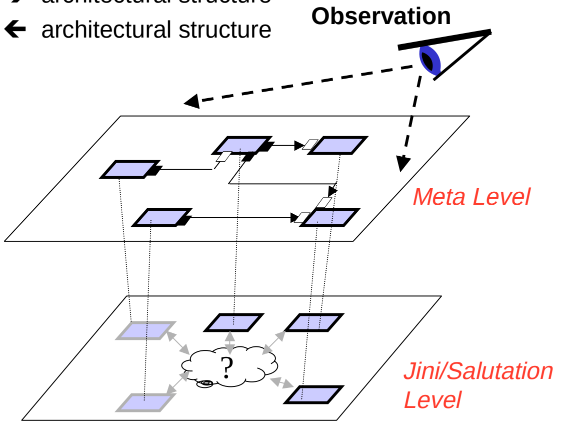
Clients
- **Lookup**: search services in discovered lookup services with templates
- retrieve service proxies to use a services
- Services can also be clients

Principle: A Reflective Meta Level

Observation: Runtime structure ➔ architectural structure
Management: Runtime structure ← architectural structure

Architectural structure:
Components and Connectors

Invisible structure at runtime:
Jini / Salutation Services



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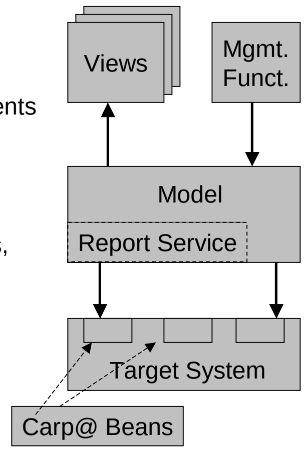
A tool to create an **architectural overview** to **observe and manage** Jini services and clients

Observation
- Clients & Services, Locations
- Channels, Messages exchanged between components
- Provided and required interfaces

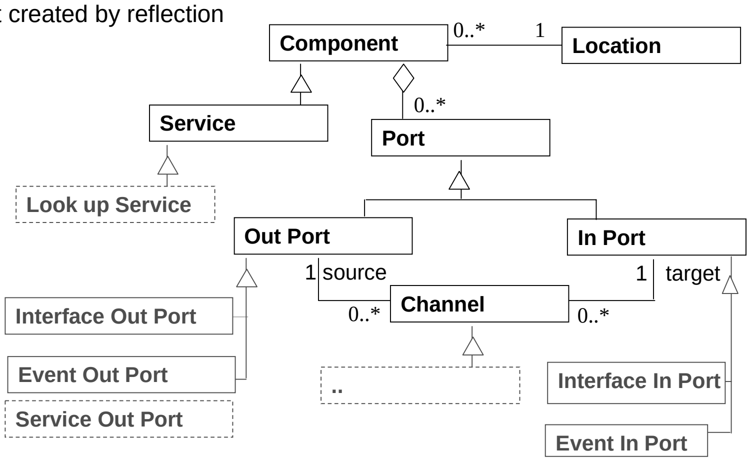
Administration and management
- change service attributes, check memory resources, start & stop components
- configuration of channels and locations

Carp@ is itself a set of Jini services and clients



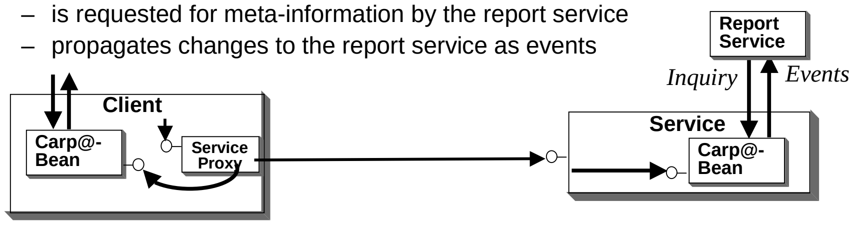
The Meta Model

- Abstraction of service components
- Independent of middleware
- Content created by reflection



Carp@ Beans

- Not all information was available by standard interfaces
- Selected Solution:
  - in each client or service a single Carp@ - Bean is introduced
- Carp@ - Bean is a special Jini Service
  - analyzes the service with standard reflection as far as possible
  - provides additional information (for example the location)
  - is notified by client or service about changes
  - is found by report service with normal Jini techniques
  - is requested for meta-information by the report service
  - propagates changes to the report service as events



Carp@ Beans

	Java	Jini	Carp@	
Locations	-	-	+	Introduced API calls
Components	-	+	+	Also clients became Jini services
Interfaces				
- Provided Ports	+	+	+	By normal reflection, like Jini does
- RequiredPorts	-	-	+	Tracing received references
Events				
- Provided Ports	-	-	+	By normal reflection (rules)
- Required Ports	-	-	+	Tracing received references
Channels	-	-	+	By meta-model consistency
Message tracing	-	-	+	Carp@-Bean notification
Memory Usage	-	-	+	Introduced API calls

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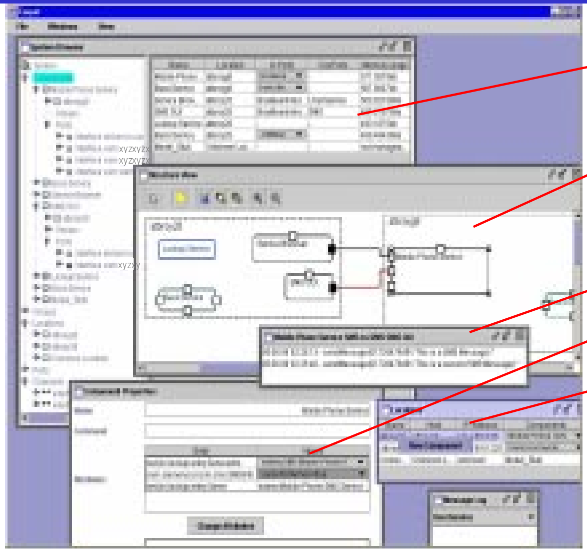
Carp@: GUI



Navigation Tree
with different lists

Structure View
- Clients & Services
- Locations

Message Tracing

Attribute Editor

Start & Stop services

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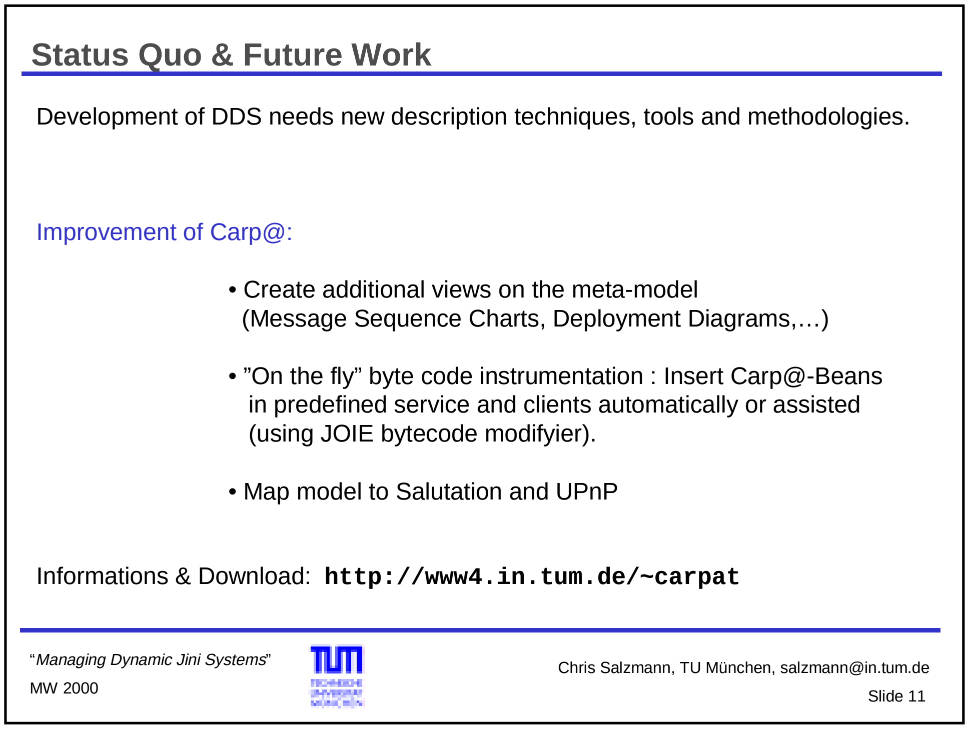

Status Quo & Future Work

Development of DDS needs new description techniques, tools and methodologies.

Improvement of Carp@:

- Create additional views on the meta-model
  (Message Sequence Charts, Deployment Diagrams,…)
- ”On the fly” byte code instrumentation : Insert Carp@-Beans
  in predefined service and clients automatically or assisted
  (using JOIE bytecode modifyier).
- Map model to Salutation and UPnP

Informations & Download: **`http://www4.in.tum.de/~carpat`**

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