

Supporting Architecture-Based Runtime System Management

--An application of bi-transformation

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About Myself



- Hui SONG (宋暉)
- Background
 - PhD student in Peking University, China
 - Research group on middleware and self-adaptation
 - Advisor: Dr. Gang HUANG, Prof. Hong MEI
 - Visitor at GRACE center, NII, Japan
 - Research group on bidirectional transformation
 - Advisor: Prof. Zhenjiang HU and Co-researcher: Yingfei XIONG

Problem Origin

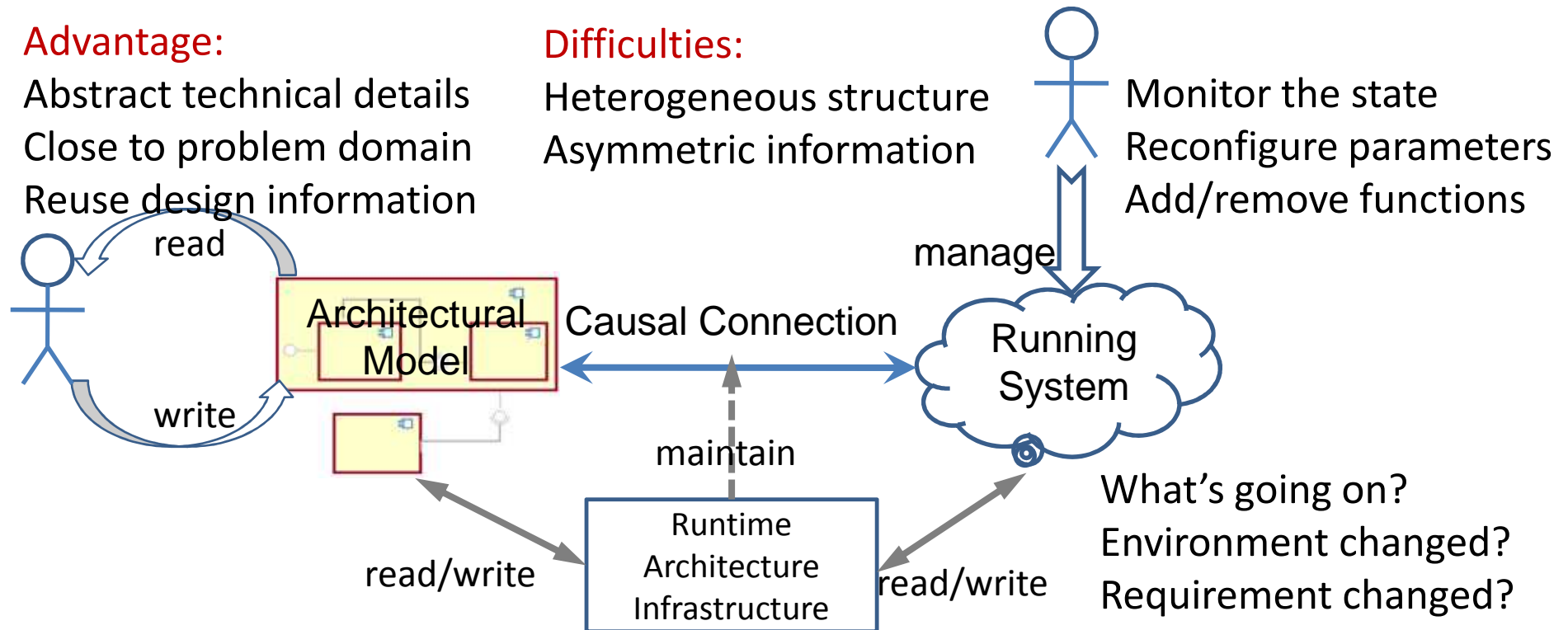
Advantage:

- Abstract technical details
- Close to problem domain
- Reuse design information

Difficulties:

- Heterogeneous structure
- Asymmetric information

- Monitor the state
- Reconfigure parameters
- Add/remove functions



What changes mean on the other side?

JOnAS Administration - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://127.0.0.1:9000/jonasAdmin/Welcome.do

- EJBModule
- EntityBean
- J2EEApplication
- J2EEDomain
- J2EEServer
 - jonas:j2eeType=J2EE
 - JCAActivationSpec
 - JCAConnectionFactory
 - JCAManagedConnection
 - JCAResource
 - JDBCDataSource
 - jonas:j2eeType=JDBC
 - JDBCResource
 - jonas:j2eeType=JDBC
 - JNDIResource
 - JTAResource
 - JVM
 - MessageDrivenBean
 - ResourceAdapter
 - ResourceAdapterModule
 - Servlet
 - StatefulSessionBean
 - StatelessSessionBean
 - WebModule
- Owner MBeans
- Other MBeans

JOnAS A

Reset

Domain (jonas) > MBeans > J2EE MBeans

jonas:j2ee Type=JDBCDataS

MBeans J2EEs Properties **Attribu**

Filtering

Values Descriptions

List of attributes

java.lang.Integer	busyMax == 0
java.lang.Integer	busyMin == 0
java.lang.Integer	connectionFailu
java.lang.Integer	connectionLeaks == 0
java.lang.Integer	currentBusy == 0
java.lang.Integer	currentInTx == 0
java.lang.Integer	currentOpened == 10
java.lang.Integer	currentWaiters == 0
java.lang.String	description == no desc
boolean	eventProvider == false
java.lang.Integer	jdbcConnCheckLevel == 0
java.lang.Integer	jdbcConnMaxAge == 1440
java.lang.String	jdbcDriver == jonas:j2eeType=JDBCDataSource,name=aJDBCDataSource-HSQL1,J2EEServer=jonas
java.lang.Integer	jdbcMaxConnPool == 100
java.lang.Integer	jdbcMaxOpenTime == 60
java.lang.Integer	jdbcMaxWaiters == 100
java.lang.Integer	jdbcMaxWaitTime == 5
java.lang.Integer	jdbcMinConnPool == 10
java.lang.Integer	jdbcPstmtMax == 12

Done

Welcome to the BluePrints Petstore - Mozilla Firefox

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http://127.0.0.1:9000/petstore/

JOnAS Administration Welcome to the BluePrints Pe...

Java™ Pet Store

J2EE™ BluePrints Sample Application

[Account](#) | [Cart](#) | [Sign in](#)

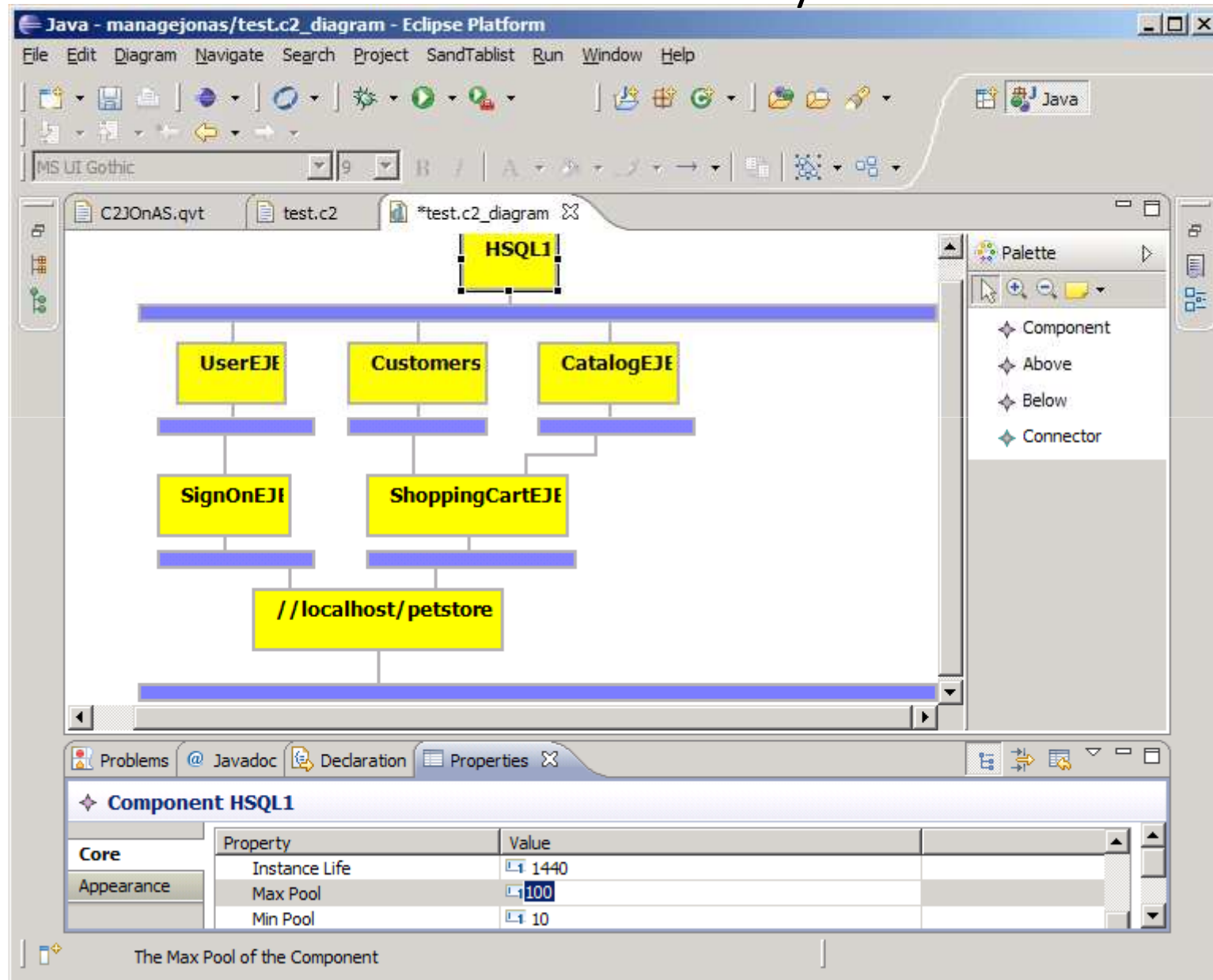
Pets

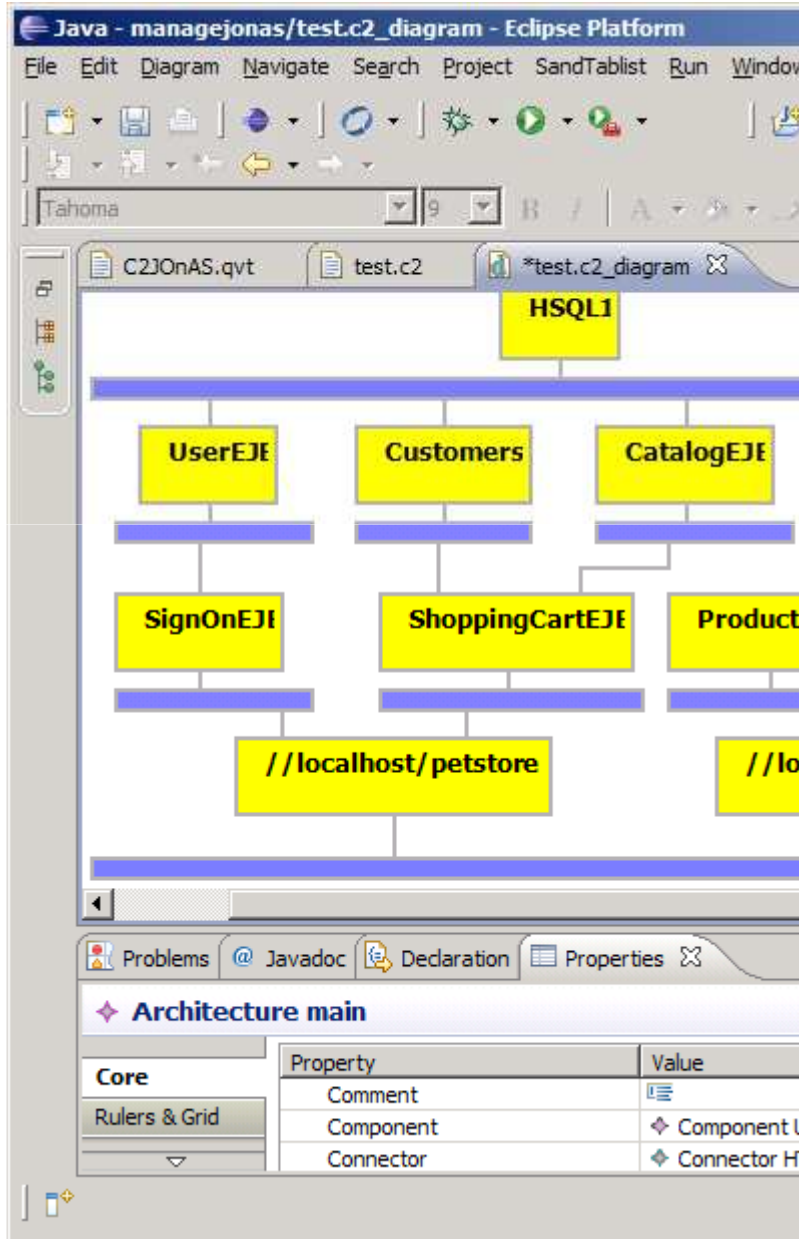
- [Birds](#)
- [Cats](#)
- [Dogs](#)
- [Fish](#)
- [Reptiles](#)



Done

- C2: a mature architecture style for design and management of GUI-oriented software systems





List information of pet items seperately - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://127.0.0.1:9000/rss/m

JOnAS Administration List information of pet items ...

List information of pet items seperately

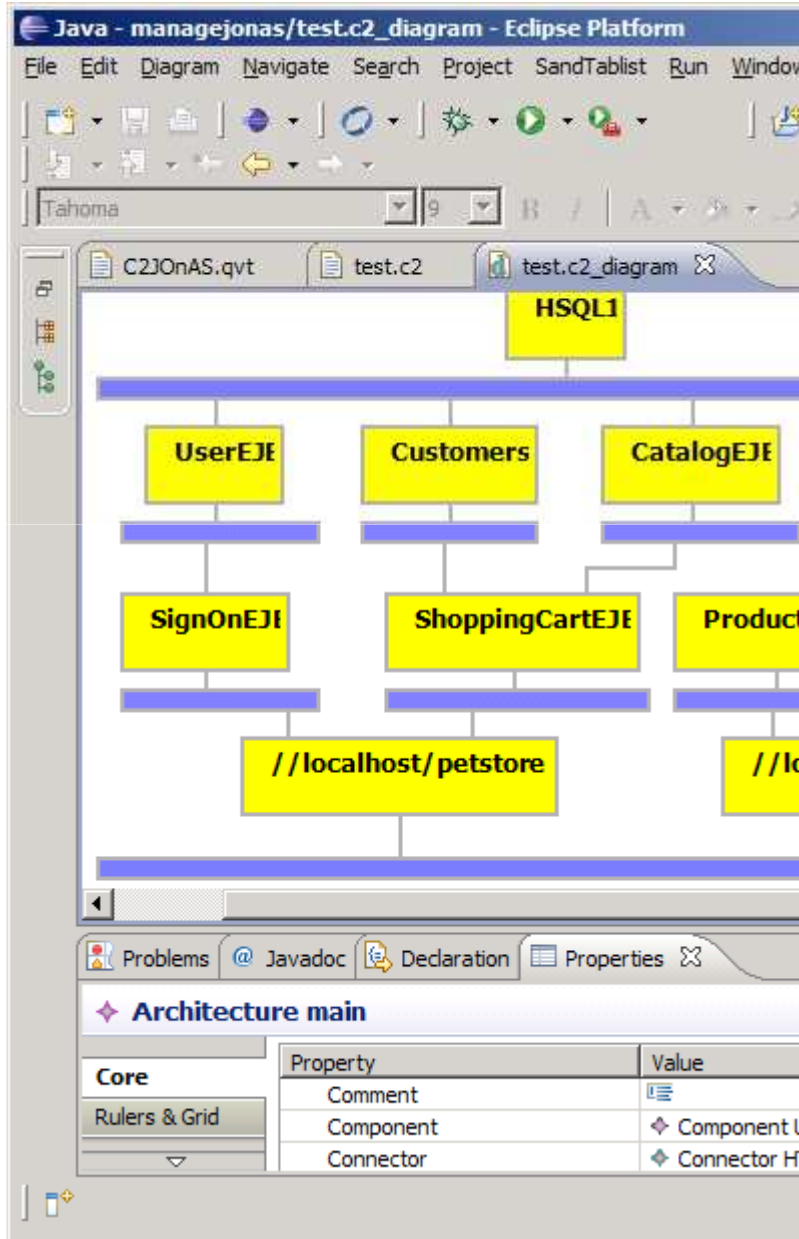
[Angelfish](#)
Salt Water fish from Australia(10.00)

[Dalmation](#)
Great dog for a Fire Station(12.00)

[Rattlesnake](#)
Doubles as a watch dog(12.00)

[Rattlesnake](#)

Done



List information of products with summarized price information - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://127.0.0.1:9000/rss/m

JONAS Administration List information of products ...

List information of products with summarized price information

[Amazon Parrot](#)
Great companion for up to 75 years with prices (92.00)

[Angelfish](#)
Salt Water fish from Australia with prices (10.00, 10.00)

[Bulldog](#)
Friendly dog from England with prices (12.00, 12.00)

Done

Architecture-based Runtime Management



- Many approaches these years
 - From embedded to enterprise systems
 - Various architecture styles for evolution, self-adaptation...
- Infrastructures used in these approaches
 - Manually constructed, specific infrastructures

Framework to support architecture-based management

- Problem
 - Too many architecture styles, and system types
 - Maintainability and reusability
- A Framework is necessary
 - Declarative specification
 - Automatically maintaining
(despite of the heterogeneity and asymmetry)
- Bidirectional Transformation!

Applying Bi-Transformation



- Obstacles
 - **Various data formats**
 - Simultaneous change and uncertain modification
- Our solutions
 - **Meta-modeling** for defining data formats and automatically generating **adapters** according to meta-models
 - A model-to-runtime synchronization algorithm
 - Forward, difference & merge, backward, check

What we got



- A model-driven framework to support architecture-based runtime management
 - Work required for developers
 - Two MOF meta-models
 - One QVT transformation
 - Advantage
 - Productive
 - Clear and stable behavior, good for maintenance
 - Separation of concerns, good for reuse

What we expect

- Formalization and proof
 - Correct behavior of architecture-based management
 - Properties of the generated infrastructure
- Performance improvement
 - incremental bi-transformation
- Static check of specifications
- Identification and representation of conflicts

We'd like to share in this meeting

- Tool demonstration
 - A non-trivial case study
 - Managing **J2EE** system based on **C2**-styled architecture
 - How to construct it under our framework
- A technical presentation (~30 minutes)
 - Architecture-based runtime management
 - Wrapping data as standard model
 - Synchronization algorithm...

In case you are very interested about our work

- Open source project of our work
 - <http://code.google.com/p/sandtablist/>
 - Source code
 - A tutorial with a small but interesting case
- Unpublished paper
 - GRACE Technical Report:
 - <http://grace-center.jp/downloads/GRACE-TR-2008-05.pdf>
 - Hard copy available.

Thank you!

