Incorporating Off-The-Shelf Components with Event-based Integration

Jie Ren, Richard Taylor
Institute for Software Research
University of California, Irvine

Outline

- Background
- Event-based Integration
- Microsoft Java Virtual Machine
- Integrating with MS JVM
- Integrating using RMI
- Related Work
- Conclusion

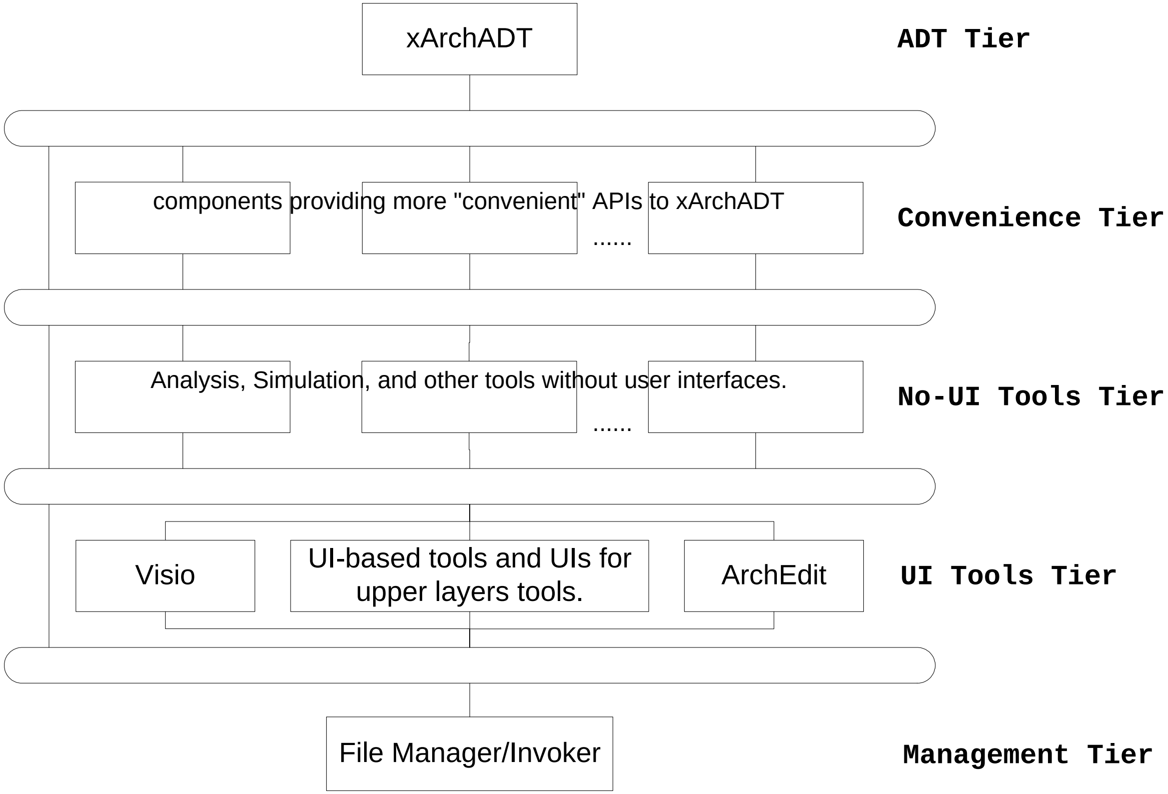
Event-based Integration

- Components send events to each other
- Connectors provide messaging infrastructure
- Benefits
  - Heterogeneous components
  - Loosely-coupling
  - Easy evolution

An Event-based Architecture Style: C2

- C2's basic tenets:
  - Components communicate with each other only sending events, which are routed by connectors.
  - Components and connectors both have one top interface and one bottom interface.
  - Components and connectors are connected in a layered manner.
  - Components can be connected to at most one connector at any of its interfaces, while connectors can connect any number of components and connectors at any of interfaces.
  - Components send request events to upper components for service, the upper components reply by sending notification events downwards.

ArchStudio

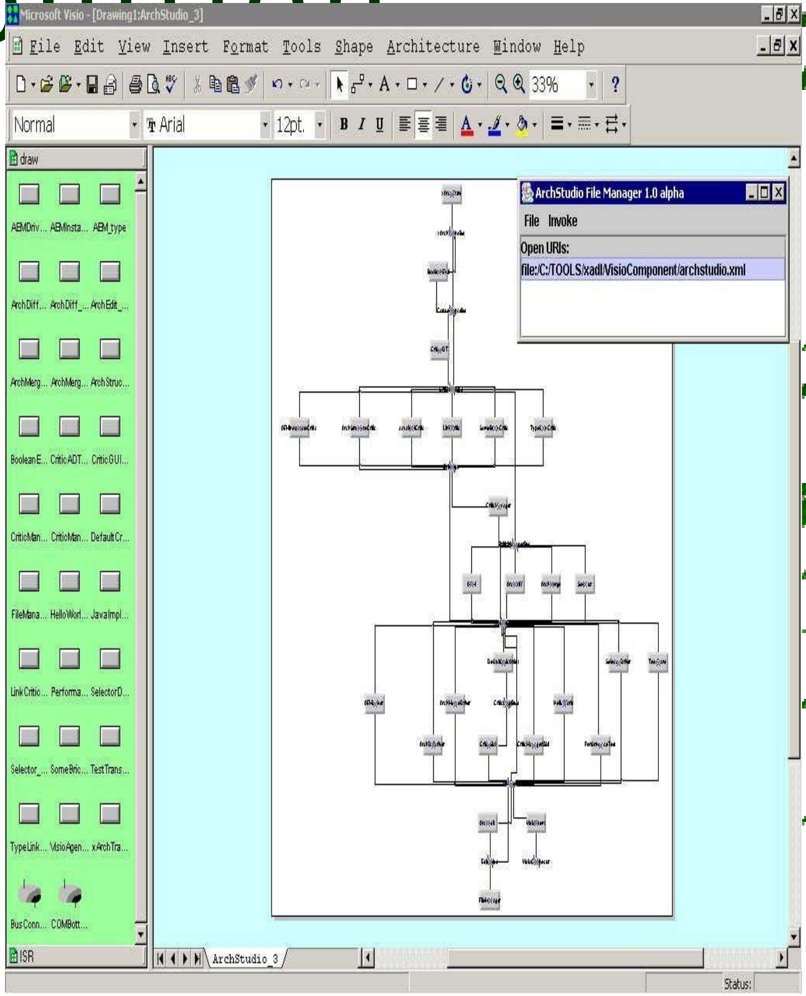

xArchADT
ADT Tier
components providing more "convenient" APIs to xArchADT
......
Convenience Tier
Analysis, Simulation, and other tools without user interfaces.
......
No-UI Tools Tier
Visio
UI-based tools and UIs for upper layers tools.
ArchEdit
UI Tools Tier
File Manager/Invoker
Management Tier

The problem

- ArchStudio is in Java
  - Integrate non-Java tools
- Enhance the graphical front end
  - Argo, based on GEF
  - Mica

The Solution

- Using event-based integration to integrate Microsoft Visio as the graphical frond-end
- Request and notification


Microsoft Visio - [Drawing1:ArchStudio_3]
File Edit View Insert Format Tools Shape Architecture Window Help
33%
Normal
Arial
12pt.
B I U
draw
ABMDriv... ABMInsta... ABM_type
ArchDiff... ArchDiff_... ArchEdit_...
ArchMerg... ArchMerg... ArchStruc...
BooleanE... CriticADT... CriticGUI...
CriticMan... CriticMan... DefaultCr...
FileMana... HelloWorl... JavaImpl...
LinkCritic... Performa... SelectorD...
Selector_... SomeBric... TestTrans...
TypeLink... VisioAgen... xArchTra...
BusConn... COMBott...
ISR
ArchStudio_3
Status:
ArchStudio File Manager 1.0 alpha
File Invoke

Open URIs:

file:/C:/TOOLS/xadl/VisioComponent/archstudio.xml

Integration Plan

- ArchStudio is event-based
- Visio is also roughly event-based
  - In a lower-level
- The missing part:
  - How to deliver events from one part to another?
  - Integrate Java and COM

Integrate Java and COM

- Sun’s products
- Intrinsyc/Linar’s Jintegra
- Microsoft’s Java Virtual Machine
  - Access Java object from COM
    - COM Callable Wrapper: Construct standard and real COM interfaces
  - Access COM object from Java
    - Java Callable Wrapper: Special directives and tools

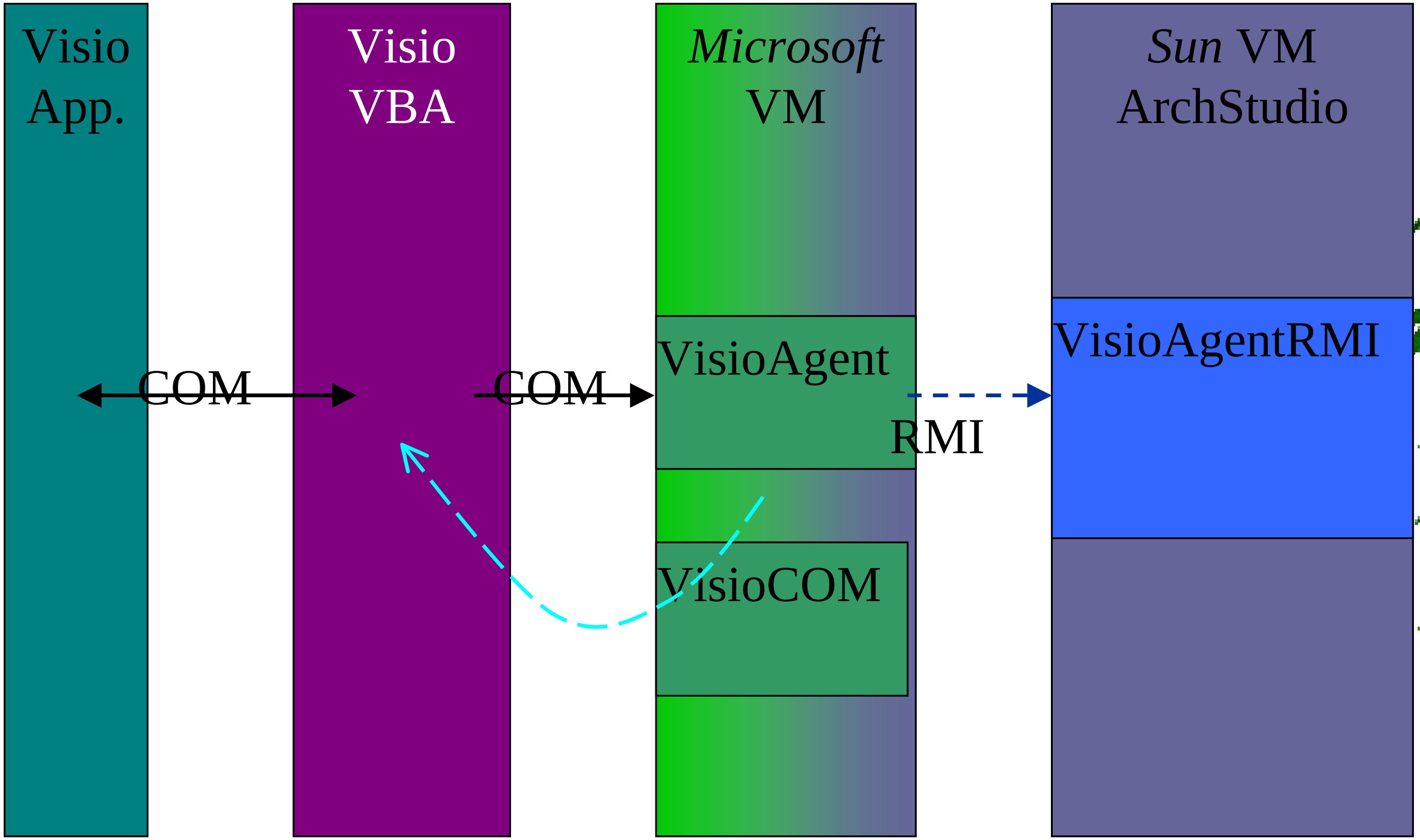
First Integration

- Three components in Microsoft JVM
  - VisioAgent: doing the work of Java side
  - VisioCOM: passing reference of VisioAgent to Visio through COM Running Object Table
  - VisioStub: doing the work of COM side
- When one event happens on one side, Microsoft JVM performs the low-level marshalling so another event happens on the other side

Second Integration

- Problem with the first integration scheme:
  - Limited to Microsoft JVM, which is only JDK 1.1.4-compliant
  - Cannot use the latest Java technology
- Solution:
  - RMI
  - Supported by both Sun JVM and MS JVM

The complete picture



Evaluation

- Integrated Development Environment
- Utilize capabilities from both a commercial editing tool and latest Java technology
- Small footprint
- Acceptable interactive performance
- Positive initial feedback

Future Improvement

- Performance Improvement
  - Early binding vs. Late Binding
  - Lightweight transport vs. RMI
- General connector
- Stronger messaging capability
  - Topology
  - Event type

Related Work

- Goldman/Balzer’s customization of PowerPoint
  - A control dispatcher
  - OS level hook to supplement PowerPoint 97
- Coppit/Sullivan’s Galilieo: integration of Visio/Word/IE
  - Old problems: high-level operations, undo
  - New capabilities: delete event, multi page

Conclusion

- Event-based Integration is effective in integrating off-the-shelf, heterogeneous components
- Extend ArchStudio by integrating Visio’s rich functionalities
- Applicable to other similar cases