Integrating COM and Java using Microsoft solution

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Why

* To combine two great technologies

How?

* To call Java in COM,
    - ActiveX Bridge for JavaBeans(Sun)
        * enables JavaBeans to be used in a COM container.
    - Enterprise Edition Client Access Services COM Bridge(Sun)
        * allows COM clients to access EJB components.
* To call COM in Java,
    - Java2COM(Neva)
    - Bridge2Java and OLEBridge(IBM)
    - JACOB(Dan Adler, open source bridge)
    - jacoZoom(infoZoom)
    - rJAX(Halcyon)

Integrate COM and Java

How, cont.

* J-Integra (Linar, www.linar.com)
  - an innovative pure Java-COM bridge, implementing DCOM in Java. It provides both Java-to-COM and COM-to-Java capability.
  - Nov. 8, 1998 (1.0), Sep. 26, 2000(1.3.6)

* Microsoft Virtual Machine(Microsoft)
  - provide both Java-to-COM and COM-to-Java bridge
  - Microsoft, free, works!

Microsoft SDK for Java

* JDK 1.1.4 compliant
* Microsoft Virtual Machine
  – Build 3316, 09/25/2000
* Compiler: jvc
* Interpreter: jview, wjview
* COM tools: javareg, jactivex

History of Microsoft SDK for Java

1.0:   *Oct. 15, 1996 (JDK 1.0.2)*

1.51   *June 20, 1997*

2.0:   *Oct. 6, 1997 (JDK 1.1.1, Lawsuit)*

2.01:   *Dec. 1, 1997*

2.02:   *June 26, 1998*

3.0:   *July 16, 1998 (JDK 1.1.4)*

3.1:   *Sep. 2, 1998*

3.2:   *Mar. 18, 1999*

4.0:   *Dec. 6, 1999*

        Jan. 23, 2001 Lawsuit Settlement

Continue shipping for 7 years,
but no more Microsoft Java

COM basics

* Interface, Class
  - Class implements several interfaces
  - All call is based on interface pointer
* Automation
* IID, CLSID, ProgID
  - Stored in registry
* RunningObjectTable

Visio and ArchStudio

* Visio: a great drawing tool
  – Automation, VBA
* ArchStudio
  – Design environment for C2 architecture style
  – ArchADT(repository), AEM(run time support)
  – Tools: Jargo, ArchShell

Call Java in COM

* Register any Java class using javareg
  – IID, CLSID, ProgID, type library,
  – COM server: VM, msjava.dll
* CreateObject in VBA
  – VM will create COM Callable Wrapper (CCW) over Java object
* Use COM reference to call function
  – Automation Interface by VM

Call COM in Java

* Use jactivex to generate Java files from type library

    – Interface definition, class definition

* In Java, new object and cast to interface

    ```
    COMInterface i = (COMInterface)new COMClass();
    ```

* Use jview to execute Java

    – VM will create Java Callable Wrapper (JCW) for the COM object

Integrate COM and Java

Both are used

* Use Java to write a class, register it as COM object

* Use the generated type library to generate other Java files, use them in another Java to create COM object

* Get the object in VBA

Call Windows in Java

* J/Direct: call any Windows DLL functions in Java

  – Special tags: @dll.import, @com

```
/** @dll.import("OLEAUT32", ole) */
public static native int RegisterActiveObject
   ( IUnknown obj, _Guid rclsid, int flag);
```

Conclusion

* Microsoft VM provides both COM-to-Java and Java-to-COM integration, in an easy to use way.

* It will be interesting to know how VM itself is implemented

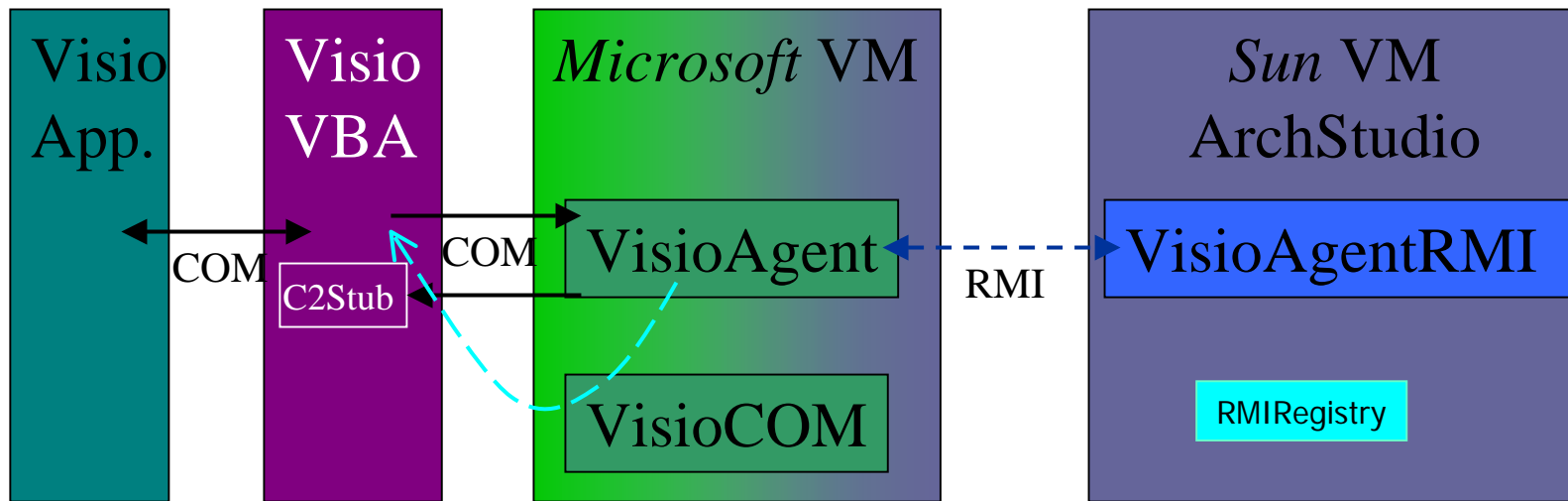* Future work: using COM events to implement C2 notification

More work after Oct.

* Add notification support
  - Use VBA to implement a COM interface, let Java to call that interface
* Use Microsoft VM for COM/Java integration ONLY
  - So ArchStudio can run as a standard Java application. Microsoft Java talks with Sun Java via RMI
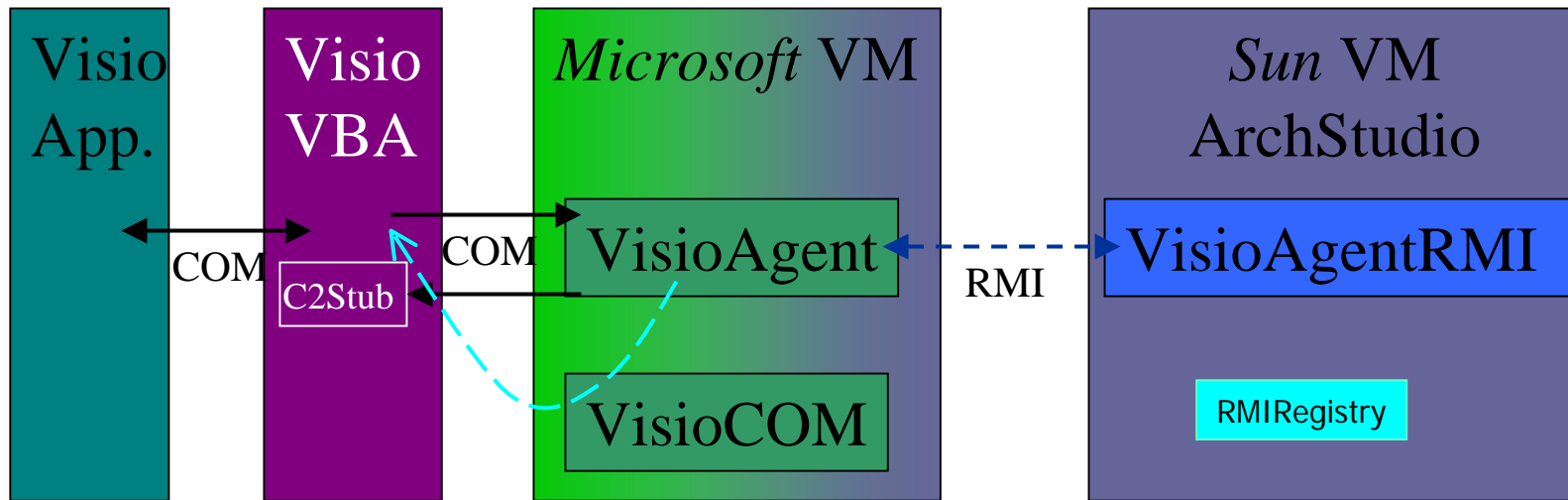
Architecture

COM World   Java World

Visio App.	Visio VBA	*Microsoft* VM	*Sun* VM ArchStudio

COM

C2Stub   COM   VisioAgent ◄┈┈► VisioAgentRMI

RMI

VisioCOM

RMIRegistry

Integrate COM and Java

Initialize

COM World   Java World

Visio App.	Visio VBA	*Microsoft* VM	*Sun* VM ArchStudio

VisioAgent ←---RMI---→ VisioAgentRMI

C2Stub   COM   COM

VisioCOM

RMIRegistry

Visio does something

COM World   Java World

Visio App.	Visio VBA	*Microsoft* VM	*Sun* VM ArchStudio
	C2Stub	VisioAgent	VisioAgentRMI
		VisioCOM	RMIRegistry

COM ← → COM → RMI

Integrate COM and Java
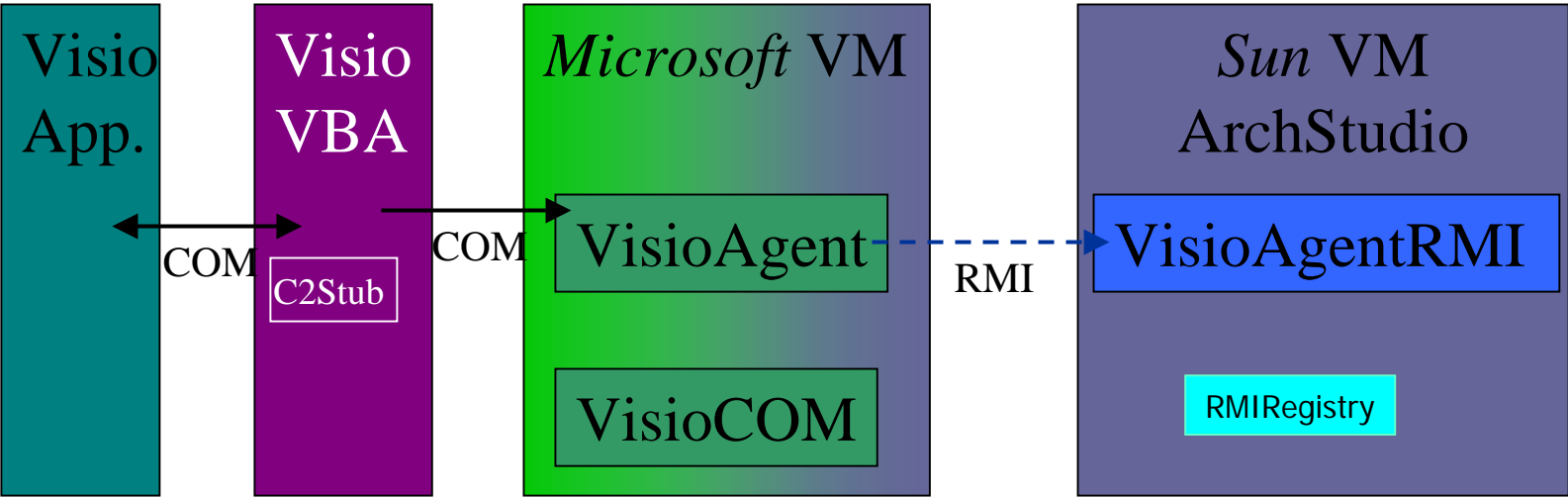
ArchStudio does something

COM World   Java World

Visio App.	Visio VBA	*Microsoft* VM	*Sun* VM ArchStudio
		VisioAgent	VisioAgentRMI
	C2Stub	VisioCOM	RMIRegistry

COM

COM

RMI