

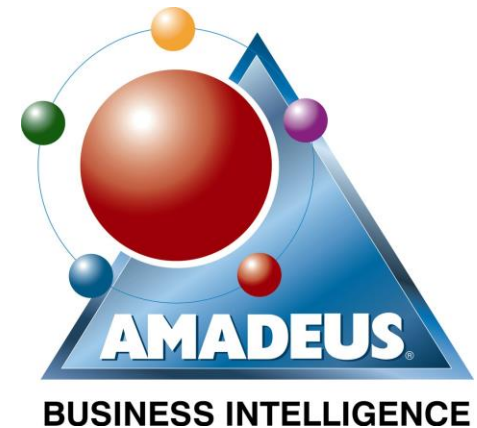


The Use of Java with The SAS® System

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20th May 2003



Introduction

- **AppDev Studio™ is SAS' flagship Java development tool**
- **But it is not the only route to SAS from Java**
- **Four potential routes in to SAS are discussed**
- **Including their software requirements, methods, advantages, and disadvantages**

Client- or Server-Side Processing

- **Client**

- Java applications, applets, and additional classes
- Run from the client machine (or browser) in a distributed network
- Advantages: usable, interactive, rich-client interfaces
- Restrictions: downloading Java classes to client machine

- **Server**

- Servlets, JavaServer Pages (JSPs) , and additional classes
- Run from the server machine (or web server) in a distributed network
- Advantages: quick and functional, downloads small files to client machine
- Restrictions: less interactive, thin-client interfaces restricted to the look and feel of HTML

Java Access To SAS

- **AppDev Studio - webAF™**
- **Directly Using the IOM Server - SAS® Integration Technologies**
- **Java Database Connectivity (JDBC)**
- **SAS Batch Processing with Remote Method Invocation (RMI)**

AppDev Studio(1)

- **Probable Software Requirements**

- **AppDev Studio**
- **SAS/Connect® or Integration Technologies**
- **Additional software:**
 - Java Development Kit (JDK)
 - Web server, such as Apache
 - Servlet engine, such as Tomcat

- **Method**

- **Supports client- and server- side development**
- **Integrated visual programming environment**
 - Wizards
 - Drag and drop
- **Allows simple communication with the SAS System**
 - Submission of Base SAS code and utilisation of remote SCL classes
- **webAF provides a set of JavaBeans called 'TransformationBeans'**



AppDev Studio(2)

- **Advantages**

- Simple and effective for quick development
- Can decrease the time and resources needed to develop web-based applications to interface with SAS
- Many of the complicated tasks involved in connecting to SAS or manipulating data are hidden from the developer

- **Disadvantages**

- All the software involved can be expensive
- Complicated deployment process
- Benefits have to be compared against the costs in deciding on AppDev Studio's utility

Integration Technologies(1)

- **Probable Software Requirements**
 - **Integration Technologies and the classes it provides**
 - IOM Spawner listens constantly for calls to SAS
 - **Additional software:**
 - JDK
 - Web server
 - Servlet engine (for server-side development)
- **Method**
 - **Java programs make use of the SAS IOM server almost as if it were a set of Java objects**
 - **JAR files on the Client Side Components Disk**

Integration Technologies(2)

- **Advantages**

- JAR files on the Client Side Components Disk, without having to license software such as AppDev Studio

- **Disadvantages**

- Development is quicker in webAF using pre-existing classes
- Several more JAR files accompany AppDev Studio

JDBC(1)

- **Probable Software Requirements**

- SAS Integration Technologies or SAS/SHARE®
- Additional software:
 - JDK
 - Web server
 - Servlet engine (for server-side development)

- **Method**

- Connect to, update, and query databases using the Structured Query Language (SQL)
- Standard SQL statements such as SELECT, CREATE, UPDATE, INSERT, and DELETE are supported
- Drivers for SAS can be found attached to other software such as SAS/SHARE
- The SAS/SHARE driver for JDBC enables applications to access and update any SAS data that is available through SAS/SHARE, from Java programs



JDBC(2)

- **Advantages**

- JDBC usage can be relatively straightforward
- SAS users often already have access to the necessary software
- They also often already have knowledge of SQL
- Industry standard, examples of its use can be relatively easy to find.

- **Disadvantages**

- Drivers for SAS are not freely accessible
- Wrapped up with other potentially expensive software



SAS Batch Processing with RMI(1)

- **Probable Software Requirements**

- The SAS System on a server machine alone would be sufficient to use RMI technology for batch processing SAS programs
- A JDK needs to be installed on both the machines aiming to communicate
- Web server

- **Method**

- RMI is a standard used to communicate between two Java Virtual Machines via network protocols such as TCP/IP
- Java application running on a local machine collects information from a user using a graphical user interface, sends that information to a server for processing, which then returns a response

SAS Batch Processing with RMI(2)

- **Advantages**

- Standard Java technology
- Supplied with any recent JDK
- SAS programs can be run in batch
- Server based classes access results and can send them back to the client as sets of objects

- **Disadvantages**

- Can take time to research and set up correctly
- Several classes involved to establish the necessary connections between the client and server machines
- Process can be a little time-consuming to begin with
- Example in paper would not be recommended for large amounts of data, passing large sets of results back to the client could be resource intensive

Other Routes

- **SAS/IntrNet® or other CGI technologies**
- **Web services**
 - Platform independent
 - Based on a set of industry standards which provide basic functions via Internet protocols
 - Relatively inexpensive
- **Methods can be used collectively**
 - RMI technology could be used to run SAS code to manipulate data and create results data sets while JDBC could then be used to access and retrieve those results
 - AppDev Studio in fact utilises technologies such as JDBC and RMI to build much of its operability



Conclusion

- **Specialist tools such as AppDev Studio are not the only way to use SAS from Java based applications**
- **Other routes provided by SAS**
- **Java standards that can be adapted which can utilise SAS**
- **It is important to note that there are alternatives, even if some of these may use SAS in more simplistic or roundabout ways**

Questions?

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