Integrating Enterprise Resource Planning (ERP) applications is becoming a must for corporations looking to streamline their information and maintain a competitive edge. While ERP packages were supposed to enable enterprisewide data flow, they didn’t satisfy the promise of being a one-stop enterprisewide solution. So, today, ERP applications need to be integrated with other data islands and applications within the enterprise and trading partner communities.

Companies must consider many factors in identifying and defining their integration strategy around their ERP solutions. Customers running J.D. Edwards’ WorldSoftware™ need to evaluate unique characteristics when connecting with other applications — such as the fact that WorldSoftware is an RPG-based application running exclusively on the IBM iSeries (AS/400) platform. Companies that have J.D. Edwards’ OneWorld running on a distributed or client/server environment need to realize that there’s a larger install base of WorldSoftware than OneWorld, though J.D. Edwards is promoting a migration to OneWorld to benefit from newer technology and open standards. Over time, we’ll see a greater install base of OneWorld as the older version continues to be phased out. Meanwhile, it’s important to understand the integration options as customers may have both products deployed at one time or another.

It takes careful deliberation and analysis to establish an integration solution from among the many technology standards, tools, and products available today. This article analyzes the integration options for WorldSoftware and OneWorld and issues to consider in selecting the best option for your environment and integration strategy.

### J.D. Edwards’ Open Systems Evolution

WorldSoftware is the first flagship J.D. Edwards ERP product offering built on monolithic iSeries/RPG technology. OneWorld is the latest offering that’s been completely redesigned to leverage a distributed, open architecture and newer technology. Whereas WorldSoftware offers minimal extensions to core functionality, OneWorld’s core business objects are written in C, which supports improved extensions to the core functionality.

OneWorld’s latest version, Xe, is more open and accessible via external applications than its predecessors. OneWorld Xe supports integration with:

- Java
- C/C++
- Visual Basic
- Common Object Request Broker Architecture (CORBA)
- Component Object Model (COM)
- Distributed COM (DCOM)
- eXtensible Markup Language (XML)-compliant applications.

Earlier versions of OneWorld support a subset of these interoperability types, but the focus here is on the Xe version. Figure 1 provides a high-level comparison of the relevant technical parameters between the two products. In identifying the WorldSoftware/OneWorld integration strategy for your particular organization, it’s important to carefully evaluate the:

- Particular product version and integration features it offers

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Figure 1 — World and OneWorld Technical Comparison
user interface level, database level, and application level.

**User Interface-Level Integration**

WorldSoftware integration uses a screen-based processing Application Program Interface (API) or user interface to exchange information. An application takes control of the emulator session (e.g., 5250, 3270, VT100/220, etc.) and then sends and receives data streams that the host application (WorldSoftware) interprets to be a normal host screen. The application can thus extract and exchange the information with WorldSoftware. Many third-party, “screen-scraping” applications are available and can be used for integration. Some of these are two-tiered based on IBM’s High-Level Language Application Program Interface (HLLAPI). More recent applications, such as Seagull’s Transidiom, are three-tiered and use an object wrapper to support access to the screen-scraping server via DCOM, CORBA, or XML. This screen-scraping integration option isn’t readily available in the newer multi-tiered applications such as OneWorld due to the nature of the “fat client” and Graphical User Interface (GUI).

Two advantages of user-level integration are its non-intrusiveness (e.g., the WorldSoftware application won’t need to be modified) and a lower probability for data corruption during exchange. A disadvantage is that there’s a strong coupling between integrated applications. So every time the user interface changes, the integrated framework may need to be reprogrammed. Performance or throughput also typically degrades due to the screen navigation that must take place during each host transaction. This option is typically used in batch processing or for quick-running host transactions.

**Database-Level Integration**

As with most ERP products, the application revolves around the massive amounts of data stored in a database, typically a relational one. Database-level integration can be divided into direct database and Z-table integration. Direct database integration reads and writes information directly into the core tables, while Z-table integration uses interface tables called “Z-tables” or “Z-files” and its related Universal Batch Engine (UBE) provides data processing before reading and writing to the database. Direct database and Z-table integration both use database-specific connectivity tools, such as DB2 Connect, Open Database Connectivity (ODBC), or Oracle SQLNet, to achieve integration. Z-table integration also can be achieved via XML application-level integration.

See Figures 2 and 3 for a clear view of WorldSoftware and OneWorld interoperability architecture.

**Direct Database Integration**

Direct database integration requires us to understand business rules and technical details such as precise database, table, and column names where information resides. It also requires creating data elements and values. While it provides a fast, cost-effective integration solution, especially in reading information, effective use requires attention to data integrity rules. The issue is particularly relevant for ERP applications where the applications themselves are responsible for the referential integrity of the data. In addition, a detailed understanding of the database and application is required to ensure data isn’t corrupted when we insert or update information directly into the database (bypassing the application logic). Direct database integration works well for situations where we need to read information from WorldSoftware/OneWorld, but it may not be viable for inserting or updating information into the application.

**Z-Table Integration**

Z-tables are created within the database
The developer needs a detailed understanding of information requirements, database layout, and design and read/write processing logic. Even though WorldSoftware and OneWorld are architecturally different, the complexities and pros/cons of database-level integration are the same for both.

So when should you use direct data-level integration and when should you use Z-table data integration? Although each integration environment is unique, typically, one would use direct data-level integration to read from the database and Z-tables to insert/update data in the database. As shown in Figure 4, database integration for both WorldSoftware and OneWorld offers the strongest level of support, maturity, and functionality.

Application-Level Integration
WorldSoftware and OneWorld both support application-level integration. WorldSoftware’s RPG foundation, however, is inherently more challenging for application-level integration. Since RPG is a procedural development language, it doesn’t provide exposable business objects. Accordingly, WorldSoftware can be accessed through RPG or Java application custom programming, but this integration requires significant development effort and produces limited business functionality that’s difficult to use.

By contrast, OneWorld’s open architecture exposes function-level APIs that can be invoked externally through connectors. Doing this requires wrapping the desired business functions and interface logic using a wrapper generator. These OneWorld wrappers support Java (via GenJava), Visual Basic, COM/DCOM components (via GenCOM), C/C++, and CORBA components (via GenCORBA). Figure 5 depicts these connections.

J.D. Edwards recently announced XML integration support based on OneWorld ThinNet components. ThinNet is a J.D. Edwards public API designed to simply pass an XML document as a string of characters to the OneWorld Server and wait for the response. Using XML connectors provides several benefits:

- XML can be used to aggregate business function calls into one object, thus reducing network traffic.
- XML doesn’t require the business functions to be wrapped, though the programmer must know what function and parameters to use.
- Because XML uses ThinNet, it’s scalable so multiple connections can be open.
- XML exposes both business functions and Z-tables.
- Direct data access can be planned.

Application-level integration provides real-time integration capabilities and is more flexible than user interface- and database-level integration. The disadvantages are that the approach requires sophisticated error-handling capabilities and a detailed understanding of business objects and data structure information requirements. Often, the data structure is complex and the information that needs to be passed to execute business objects is challenging to define and generate. Typically, we want to use generic business objects (APIs) that offer a higher level of abstraction to transfer the processing logic from the integration framework into OneWorld. Thus, while application-level integration is a fairly complex integration option, it’s more powerful than user interface- and database-level integration.

Other Options
The integration options described above are the most fundamental routes available to integrate WorldSoftware or OneWorld application with other applications, but there are other options that we can briefly describe here:

- Electronic Data Interchange (EDI) is useful for internal and external data integration, and both WorldSoftware and OneWorld support EDI. However, EDI was designed for external integration and offers limited functionality for internal integration. EDI is also often used with a Value-Added Network
Integrating your J. D. Edwards system and other enterprise applications requires careful planning and evaluation of available tools and methods.

WorldSoftware can be integrated at the user interface level using screen-scraping technology, while database-level integration can be achieved using either direct database or Z-table integration. WorldSoftware can also accommodate integration using RPG custom interface programming. A company using WorldSoftware requiring real-time integration may choose to implement application-level integration, but this will require a significant programming investment, offers limited functionality, and may prove obsolete if the company migrates to OneWorld.

A good solution for the company that’s able to tolerate batch processing is to provide a combination of direct database and Z-table integration. Direct database integration handles real-time reading access of information (e.g., product availability and pricing information), while Z-table integration provides for writing and updating information (e.g., purchase orders) into the application database. While the WorldSoftware company can leverage user interface-level integration to achieve repetitive information input (e.g., inputting multiple common sales that are manually keyed in), it only performs well in a static environment.

OneWorld integration options are similar to WorldSoftware for batch integration, but OneWorld doesn’t support user interface-level integration. For the OneWorld company, where batch integration is feasible, a combination of direct database and Z-file integration is a viable option. The distinguishing feature for OneWorld is real-time integration capability using application-level integration where there are many more scalable and flexible options such as CORBA, Java, COM/DCOM, and XML.

The third-party integration tools listed earlier can also be used for integration with J.D. Edwards. To choose the best-fit EAI product for your specific integration strategy, it’s important to understand the EAI tool’s underlying method of integration — user-level, database-level, or application-level integration — to evaluate its strengths and weaknesses.

Ultimately, your integration option strategy depends on your organization’s unique integration requirements. Factors to consider include:

- Flexibility, adaptability, scalability, and maintainability
- Data integrity and audit support
- Cost and ease of implementation.

Integrating your J.D. Edwards system and other enterprise applications and trading partner communities has proved to demonstrate several business benefits, but it requires careful planning and evaluation of available tools and methods.

Figure 5 — OneWorld Connection Models

(VAN) that handles the management and control of transaction processing between trading partner communities. VAN-based EDI is often expensive.

- OneWorld Xe supports the SAP Intermediate Document (IDOC) standards to enable exchange of information between various applications. IDOC is similar to EDI in its use of agreed-upon, application-specific record formats for data transport and processing by a receiving system. Data-level integration is used as “information packets” and exchanged between OneWorld and SAP. However, the applications themselves are responsible to interpret and process the data they receive/send. This option is limited to SAP- or IDOC-compliant applications.

- Message broker and EAI tools: A growing number of new integration tools are specifically targeted to enable integration within the enterprise and trading partner communities. These tools are known as EAI tools and include products from vendors such as WebMethods (Enterprise Broker), Vitria (Businessware), J.D. Edwards (XPI), IBM (MQSeries), etc. These EAI tools typically connect with both WorldSoftware/OneWorld through pre-built connectors or adapters. The relative strength and comprehensiveness of these adapters or connectors vary based on the vendor and ERP version. The fundamental integration options used by the connectors also differ from vendor to vendor.

Choosing a Method

There are several options available to integrate with J.D. Edwards. The option a company chooses largely depends on the particular integration requirements, whether the business requires real-time or batch integration, and the level of programming investment the company is willing to make. In general, real-time processing is more complex, expensive, and challenging than batch processing.