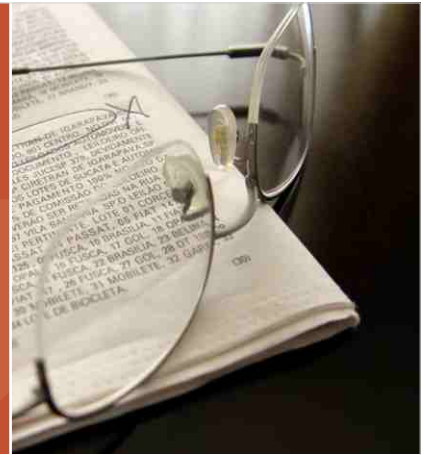


Case Study

Conversion of a e-Procurement automation product suite to an On-Demand model



➤ THE CUSTOMER

An e-procurement automation vendor with a suite of products that enable research institutions and pharmaceutical labs to streamline the entire procurement process of finding catalogs, comparing products, requisitioning and processing of ordered products.

➤ THEIR NEED

An On-demand version of their software. They wanted a multi-tenant system to be architected, with the flexibility to provide “templated” customizations for individual tenants, so that their customers had the option of enabling any or all aspects of their purchasing from sourcing to settlement through SaaS deployment.

➤ OUR DEED

Aspire helped them build various SaaS characteristics including multi-tenancy, configurability, security, internationalization and integration with various 3rd party applications. This allowed for each tenant to customize workflows as per their business needs. Aspire’s solution was fully database-driven and followed a minimalist approach.

➤ TECHNOLOGY/TOOLS USED

Application Servers: Web Sphere, Tomcat

Distributed Object Technology: J2EE

Databases: DB2 8.1

Programming Language: Java1.4

Server Languages: JSP, Servlets

IDE/Tool: Eclipse

Scripting Language: JavaScript

Web Technologies: XML,cXML

ENABLING AN ON-DEMAND SOLUTION: MULTI-TENANCY AND CONFIGURABILITY

In a Software-as-a-Service model, characteristics of business entities are typically different for each tenant. Hence, Aspire designed the database tables of the e-procurement system to use “Attributes” and also defined a unique identification number for each tenant (OrgID).

By doing this, the different characteristics of business entities were stored horizontally in rows and grouped together by their unique identification number (common across the same tenant), so that there was no need of having a separate db column for each

Key benefits to the customer:

All the SaaS characteristics in this procurement solution used a minimalistic approach and the solution was entirely database-driven. This allowed the customer to enhance their e-procurement system to offer an on-demand version quickly and the trade-offs through this approach were minimal...



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characteristic. An example of this is shown below.

ATTRIBUTE:

Attribute ID	Attribute Name	Encrypted
1	User_Name	false
2	User_Password	true
3	User_Phone	false

Various secure processes were implemented in the e-procurement system

USER ATTRIBUTE:

Org ID	User ID	Attribute ID	Attribute Value
5	429	1	Jerry Garcia
5	429	2	Q8EZE7#6@AN
5	429	3	206-233-2096

In this model, all tenants are in a single database with a variable number of custom fields and with the appropriate encryption where needed.

Every business entity that needed custom features was stored in these database tables and governed by a rules hierarchy inspired by the inheritance principle of Object Orientation (OO). Also, the key configurable business rules were stored in the database and a separate set of UI screens was provided for managing these rulesets. This allowed the product to be flexible in terms of customization, at the same time retaining the design simplicity and elegance.

Security

Various secure processes were implemented in the e-procurement system, including:

- All interaction with supplier websites happen over Secure Socket Layer (SSL)
- Use of Public Key Infrastructure (PKI) to securely transfer credential information as follows:
 - User requests a secured (https) supplier URL
 - The supplier send its public key
 - A shared secret is encrypted using the public key and it is sent along with the shared-secret-encrypted-data



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- The supplier decrypts the shared secret using its private key and uses it to decrypt the passed data
- Support of Federated Authentication i.e. Suppliers can authenticate the users against their own repository/LDAP
- All private data is stored in encrypted format
- Use of UTF-8 to encode XML data that is exchanged
- Regular form-based authentication for user login
- Role-based user authorization

Custom Workflows

Each tenant of the e-procurement system was given the ability to define a specific business process flow. For instance, conversion of a Purchase Requisition (PR) to a Purchase Order (PO) can be a 2-step process for one tenant whereas it can be a 4-step process for another.

The Administrator for each tenant is provided the rights to define multiple workflows and the defined workflows would be active only for that tenant. The master definition of the workflow is stored in one table and the workflow steps (including business rules) are stored in another table. The sequential order of the steps that constitute the workflow are stored in yet another table. The data from all these tables are used to enable the PR to move from one step to another in the process of becoming a PO.

Thus by using this minimalist approach, we designed a database-driven solution for custom business processes, rather than going for, say, workflow engines.

Internationalization

Internationalization (I18N) was implemented using the same principle of “attributes”. This design allowed us to provide flexible field visibility, field-reuse, user-specific languages, ability to choose custom display text, preferred time zone, currency and number formats.

Integration Scenarios

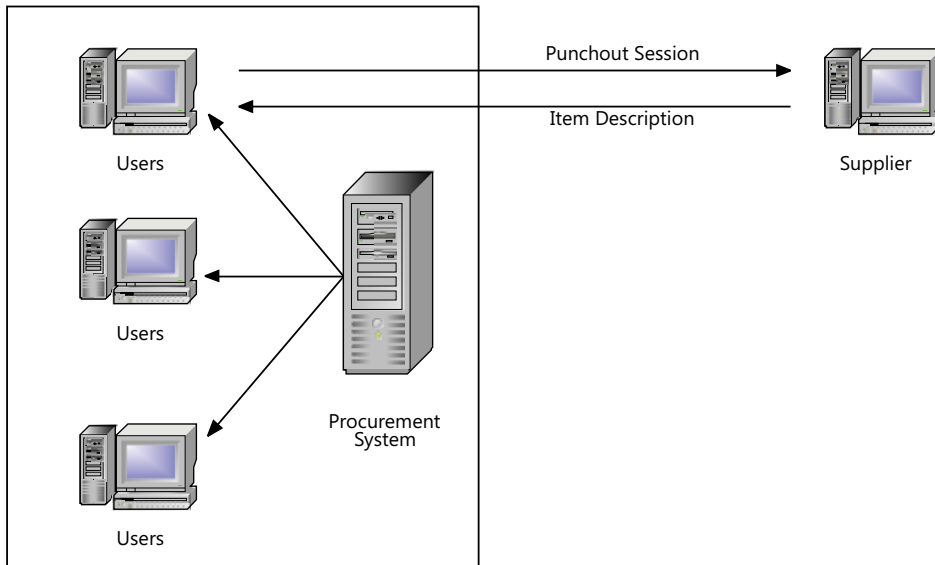
The e-procurement system needed to interface with disparate applications for various data-exchange scenarios. For example, a user had to be able to view live catalog information of various suppliers and search for items directly on the supplier’s site (called punch-out in e-procurement parlance).

We implemented punch-out using cXML (Commerce XML) format. cXML is a protocol created by Ariba, intended for communication of business documents between procurement applications, e-commerce hubs and suppliers. It is based on XML and provides formal XML schemas for standard business transactions, allowing programs to modify and validate documents without prior knowledge of their form.

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Apart from punch-out, cXML is also used to punch-in (i.e. allowing external applications to view item information from the procurement system) and to send Purchase Orders to suppliers. Moreover, the system also uses XML to communicate catalog information with Oracle's iProcurement.

Technical aspects of Integration

- For the punch-out operation, the external supplier websites had to publish an entry URL. When the user initiates the process, the system invokes the supplier URL with the necessary credentials. The supplier then displays the catalog information to the user.
- We designed a simplistic approach to use the open source Jakarta Commons HttpClient framework. It is a rich implementation of the client-side standards of HTTP. We leveraged the HttpPOST class of this framework to interface with the suppliers.
- While this functionality can also be implemented using other technologies like Web Services, we took this approach to avoid too much of changes to the product and to ensure quick time-to-market.

Key benefits to the customer

All the SaaS characteristics in this procurement solution used a minimalistic approach and the solution was entirely database-driven. This allowed the customer to enhance their e-procurement system to offer an on-demand version quickly and the trade-offs through this approach were minimal.

The customizations provided by Aspire allowed each tenant of the customer to customize workflows as per their business needs, not just at the tenant level but also at the end-user level.



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ABOUT ASPIRE SYSTEMS

Aspire Systems is an Outsourced Product Development firm committed to helping our customers build software products better and faster. We work with some of the world's most innovative Independent Software Vendors and software-enabled businesses, ranging from start-ups to established industry leaders, transforming the way software is built.

Aspire provides complete product lifecycle services, ranging from new product development and product advancement to product migration, re-engineering, sustenance and support. Our product development teams are spread between our Global Innovation Center in Chennai, India and offices in the United States.

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