

## HPC PORTAL DEVELOPMENT PLATFORM

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### ABSTRACT

*In the world of information technology, enterprise applications must be designed, built, and produced for less money, with greater speed, and with fewer resources. **HPC Portal Development Platform** (Figure 1) is a web portal development platform designed to support applications that implement enterprise services and high performance computing for customers, employees, suppliers, partners, and others who make demands on or contributions to the enterprise. Such applications are inherently complex, potentially accessing data from a variety of sources and distributing applications to a variety of clients. This portal development platform can act as multiple roles of many projects such as personal portals, small business portals, enterprise portals, educational portal, infrastructure portal, and other kinds of portals. It can also allow Java developers to speed up the development and to prevent errors during the deployment process by using this platform. It provides the robust enterprise architecture for enterprise business and high performance computing.*

**Keywords:** HPC Portal Development Platform, Enterprise Architecture, e-Commerce, Job Submit Portlet, Job Status Portlet, Property Portlet

### INTRODUCTION

For several reasons including budget constraints, new portals are needed to be based on an open source solution. Open source portal is important to the different kinds of organizations, educational services, and other business companies in a number of ways. Open source portal wants the technology to be maintainable and customizable. Open Source Portal provides the control it needed to get the most from the software. The mix of skills of open source portal development and support team made an open source portal solution preferable because it costs less to own and is more flexible than proprietary products.

Developing the open source web portal for enterprise applications in e-Commerce and high performance computing has never been easier or faster. **HPC Portal Development Platform** provides developers with a powerful portal development platform while reducing application complexity, reducing development time, and improving

application performance. It also provides the well-designed platform in the fields of e-Commerce and high performance computing for Java developers to design, implement, configure and deploy. In order to separate the presentation tier, the business tier and the database tier, this platform contains the enterprise architecture in which is robust, stable and advances by utilizing the enterprise portal engine and Java EE application server. In addition, this development platform provides the natural user interaction environment for your SOA (Service Oriented Architecture) applications and allows you to leverage all types of services in creating a better, more effective user experience.

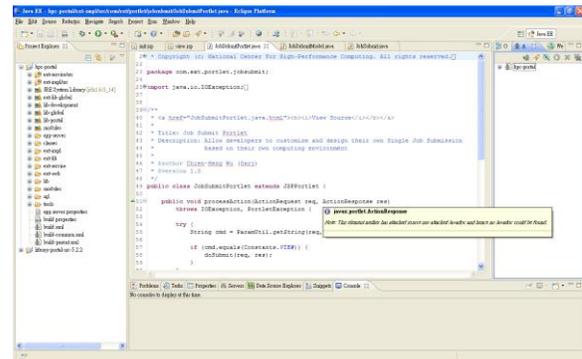


Figure 1. HPC Portal Development Platform

**HPC Portal Development Platform** (Figure 1) will allow Java developers to break down the boundaries between Web-based portals and the applications of e-Commerce and high performance computing. By using this development platform, Java developers are able to design and implement context-rich applications that satisfy their requirements. It will enable them to create flexible and content-sensitive working environments that are based on rich content, portlets, and components in an open, standards-based architecture. By specifically design and implementation, the knowledge workers or web clients of e-Commerce and high performance computing will use a single Web interface to access a wide range of services including communication and collaboration services, applications, content and search.

**What can HPC Portal Development Platform possibly do for high performance computing?**

**HPC Portal Development Platform** contains the built-in portal engine for developers or programmers to customize and scale the content of high performance computing. Being the development platform, Java developers and programmers can design and implement the specific portlets such as the following list shown for their own requirements and purposes.

- Cluster Status
- Single Job Submission
- Queue Status
- Workflow
- Other specific portlets for HPC users to query

This development platform allows having other particular portals within it, but it is required to have the extra configurations and implementation in order to do so.

#### **What can HPC Portal Development Platform possibly impact to academia and how it might fit into curriculum?**

**HPC Portal Development Platform** can be utilized for academia. Professors, students or IT staff in schools that are able to perform Java programming can utilize this platform to design and implement the specific portlets and content such as the following list shown for their own requirements and purposes.

- Computing Room Portal
- Department Portal
- Course Registration Portal
- Students' Project Portal: Students can design and implement particular portlets within this platform.

In addition, **HPC Portal Development Platform** might be able to fit into curriculum because of the following reasons.

1. This platform includes Java source code of HPC portlets and other utility code in which allow academic people to implement and integrate with their backend resources such as clusters, etc.
2. This platform includes all of source code from Liferay that allows students to study, learn and utilize it for their projects.

#### **What Major Benefits of HPC Portal Development Platform Provide?**

- (1) Optimize with Robust Enterprise Architecture and Demands

**HPC Portal Development Platform** (Figure 1) can leverage your existing IT environment because it integrates the enterprise architecture with the portal engine of Liferay Enterprise Portal [4] and bundled with JBoss Application Server [5]. It can works with the various database servers, or operating systems with the specific configurations.

JBoss Application Server is the standard Java EE (Java Enterprise Edition) Application Server, which provides the powerful functionalities for the Web and Java EE development. It's also the most popular and widely used Java EE Application Server in the world wide. The JBoss Application Server also provides the clustering support with High-availability (HA) and Load-balancing. When the server instances start in the all configuration, it detects each other and automatically forms a cluster.

- (2) Scale e-Commerce and High Performance Computing

**HPC Portal Development Platform** (Figure 1) allows scaling with your organizations with clustering and the unlimited capacity for the contents and applications in the field of e-Commerce and high performance computing. It includes the standards-based and developer familiarity with the key technologies, which will shorten development cycle. Furthermore, this development platform allows organizations to leverage existing in-house expertise.

- (3) Collaboration and Customization

In order to collaborate different groups of e-Commerce and HPC users, this Platform allows the users to create true communities of users by using several Collaboration portlets such as Instant Messaging, Message Boards, Blogs and so on. By enhancing their experience and generating user loyalty, individual community members can provide their own pages with a user-defined URL.

The built-in portal within this development platform allows users to drag-and-drop portlets to customize the unique preferences of a user or community. Without dealing with complex code, users can utilize the embedded themes and available portlets to change the look and feel.

- (4) Organize and Access All Data and Applications via Single Sign On

**HPC Portal Development Platform** provides the standard login mechanism (Single Sign On) that developers are not necessary to implement these

mechanisms in their applications. The same application works in a variety of different security environments without changing the source code. Furthermore, it provides you a single point of access to all your content, data, and information from both in-house applications and external sources.

After signing in, the fine-grained permission provided allows you to control and customize who can access sensitive information and functionality in the different levels of HPC and business fields by using the Communities Portlet and the other access control portlets.

### Platform Architecture

The platform architecture (Figure 2) of **HPC Portal Development Platform** provides well-designed enterprise architecture and functionalities for implementing services as multi-tier applications that deliver the accessibility, and manageability and scalability needed for enterprise-level applications. This architecture supports multiple tiers - presentation, service, business logic, and database - to meet your specific load requirements, one processor at a time. This architecture model implements a multitier service into two parts: the presentation and business logic to be implemented by developers, and the standard system services provided by this development platform. It also allows the developer to separate the Web tier, business tier, and database tier to achieve clustering at three levels. Java Beans are used to manage the data flow between an application client or applet and components running on the Java EE server, or between server components and a database. This is true n-tier deploying and allows the most flexibility. In addition, this architecture supports the high availability, which means the zero down time for critical applications with HTTP Failover, Session Replication, and Hardware/Software Load Balancing.

Because Liferay Enterprise Portal [4] was benchmarked as among the most secure portal platforms using LogicLibrary's Logiscan suite, **HPC Portal Development Platform** utilizes and integrates with it to provide the industry standard, government-grade encryption technologies with the advanced algorithms such as DES, MD5 and RSA. It also contains JAAS Web security so that when a user logs in; their principal is propagated to the Servlet and Enterprise Java Bean tiers. Because this platform contains the JBoss-Tomcat Application Server, the Remote Session EJBs can take advantage of this by checking security and permissions at the EJB level so it does not have to be duplicated elsewhere. It wraps

the POJO implementations with Session EJBs to provide heavy scaling and transaction support required by large sites. Local Session EJBs exposes business logic to other Session EJBs and does not specifically check for security since they cannot be called remotely. Principals or business policies are also propagated to POJO implementations that are the base classes for Remote Session EJBs.

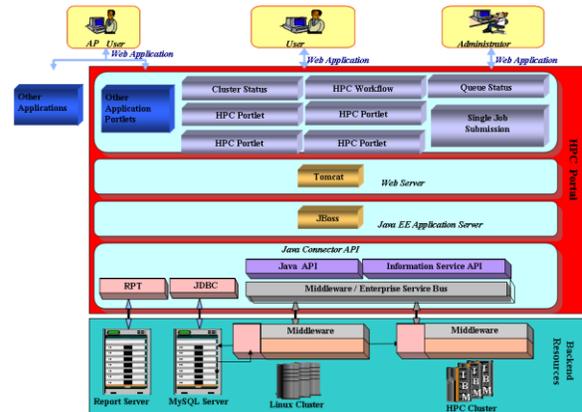


Figure 2. Platform Architecture

Empowering the information means giving workers the power to manipulate and change their applications to suit their work habits and specific needs. The framework of **HPC Portal Development Platform** provides new Struts, Tiles, JSP and JSF components that allow developers to make any of their applications customizable. These new components act as containers into which developers can drop view component or portlet. With these capabilities in place, users can customize virtually any Struts or JSP pages by minimizing/maximizing, hiding/showing, or moving any component on the page.

**HPC Portal Development Platform** (Figure 1) is designed and constructed by using Liferay Enterprise Portal, in which utilizes Service Oriented Architecture (SOA) design principles, and provides the tools and framework to extend SOA to other application portlets. To ease for applications to communicate with each other, the Web Services is required. It uses XML standards to make Java, .NET, and other applications working together easily because of Web Services.

The quest for agility has spurred the recent rise of the adoption of service oriented architecture (SOA) and the face of modern IT integration architecture is changing. Technology stovepipes of the past are now being connected by enterprise service bus (ESB) technology, which provides the backbone for

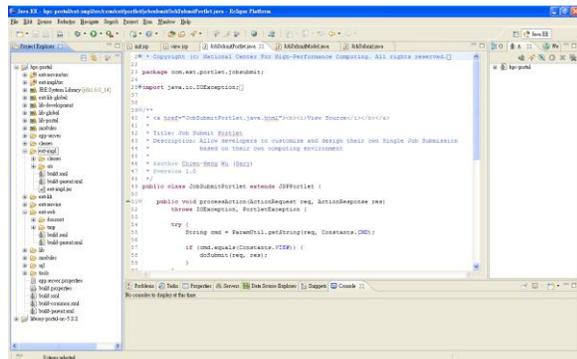
networking, communication, mediation, and service container management needed to support SOA.

In addition, this platform architecture provides Java developers or programmers to enable the function of mobility during the implementation. HPC users can access the portal via traditional and wireless devices.

### How does HPC Portal Development Platform work within Eclipse?

**HPC Portal Development Platform** (Figure 1) within the Eclipse [6] (Figure 3; Java IDE Tool) provides the best development platform for users to customize and create the specific portlets for their particular purposes in their organizations or other companies.

To drill down more depth of this Platform within Eclipse (Figure 3), the more powerful functionalities with the ease of features will be revealed. This platform allows speeding up the development process during the time of implementation and deployment.



**Figure 3.** HPC Portal Development Platform within Eclipse

**"ext-impl"**: All of the implementation of the POJO and Enterprise Java Beans is in this package. This package also contains the source code of the generic HPC Portlets and original Liferay Enterprise Portal for developers and programmers to utilize without duplicate design and implementation. Developers are allowed to continually design and implement their own portlets for desired purposes. To customize the specific development purpose, Java Developers can customize and modify the source code for their specific e-Commerce and HPC environments. In addition, the other specific configurations of the properties files should also be edited within this package.

**"ext-lib"**: This package allows users to include the extra library files in the packages of development, global, or portal. For instance: If users require accessing the database server via the remote host, the desired JDBC connector will be required to place in this package. Once the deployment process is in the execution state, the required library will be deployed into JBoss-Tomcat Application Server. For example, if one development team of a business organization needs to access the specific database system, this team can place the all of necessary library files into this package for the development or production purpose.

**"ext-web"**: This package is for the User Interface (UI) development such as JSP, Struts, Tiles, JSF, HTML, CSS and etc. The UI designer will require placing the source code of their UI pages into this package. This package is also well-constructed for the individual portlet development. UI Developers can design and implement their own portlet pages. In addition to that, other Web related technologies should be placed into this package.

**"hpc-portal"** Tag: Usually, compilation and deployment are time-consuming and error-prone process, but this development platform assists developers to complete these steps easily without worrying the mistakes during the deployment. Java Developers can simply double-click this tag in Ant window. This will automatically perform to finish the process of the Compilation and Deployment into the JBoss-Tomcat Application Server. Therefore, this step could speed up the development process, and save much more time for Java developers.

**"app-server"** Tag: As the figure of "Start HPC Portal Server" (Figure 4) shown, JBoss-Tomcat Application Server is buddled within this package. This development platform is already well configured to boot up or shutdown this application server. Once the compilation and deployment process completes, the built-in portal server can be started for debugging, testing or production by issuing the following command. Therefore, it is quite convenient by using this development platform.

Path:

/hpc-portal-5.2.2/hpc-portal/app-server/jboss-tomcat-5.0.0/bin

Command:

./run.sh -c <config\_name> -b <bind\_address>

Sample Command:

./run.sh -b development.nhc.org.tw

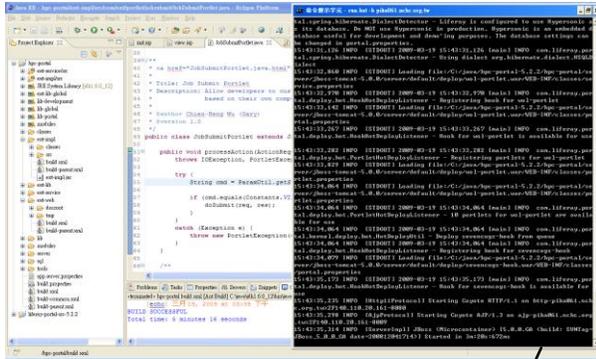


Figure 4. Start HPC Portal Server

```

.....
15:23:12,707 INFO [Http11Protocol] Starting Coyote HTTP/1.1 on http-
pika061.nchc.org.tw%2F140.110.20.161-8080
15:23:12,738 INFO [AjpProtocol] Starting Coyote AJP/1.3 on ajp-
pika061.nchc.org.tw%2F140.110.20.161-8009
15:23:12,753 INFO [ServerImpl] JBoss (Microcontainer) [5.0.0.GA (build:
SVNTag=JBoss_5_0_0_GA date=200812041714)] Started in 2m:53s:859ms
    
```

**Demo**

After the HPC portal is up and running, the users will see the login page of HPC Portal as shown on the following figure (Figure 5). Those default portlets are all highly customizable and configured for any of specific groups or communities.

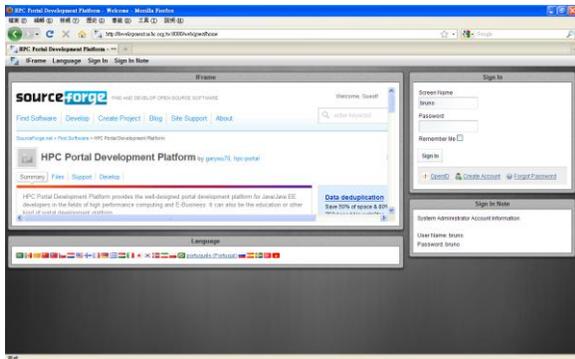


Figure 5. Login Page

**HPC Portal Development Platform** provides the up-to-date and popular technologies with this platform. As the following figure shown (Figure 6), the left pane contains more than 60 portlets for e-Commerce and high performance computing. Java developers can also continue to design and implement the e-Commerce and HPC portlets in order to change their desired contents.

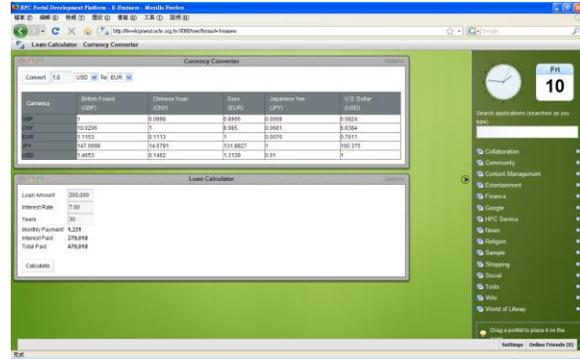


Figure 6. Demo: E-Commerce Portlets

Java Developers or users are also allowed to change the "Look and Feel" (Figure 7) for the different groups of the HPC users. This option will make users more flexible to select their portlets for their own preference.

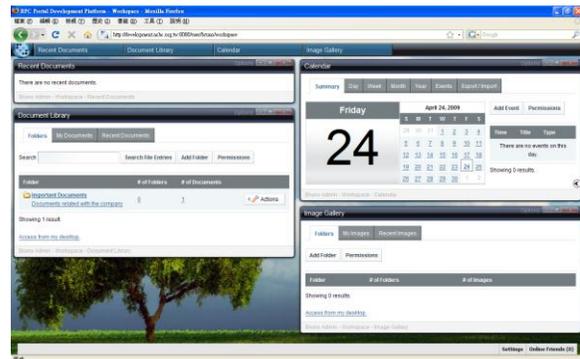


Figure 7. Demo: Look and Feel

When selecting the community or group of HPC Service, users are able to view and access the following HPC portlets such as Job Submit, Job Status, and Property portlets. By using this open source portal platform, developers can directly modify and change the source code in order to fulfill their requirements.

**JOB SUBMIT PORTLET**

**Job Submit Portlet** (Figure 8) within HPC Portal Development Platform is used as the standard portlet for High Performance Computing. It allows HPC Portal developers continually to design, implement, integrate and access the backend resources in their particular HPC environments. This portlet allows HPC users to submit a single job to the backend resources for computation. For example, the HPC users can use this service to submit a generic job into one of the HPC computing systems for complex and high speed computation.

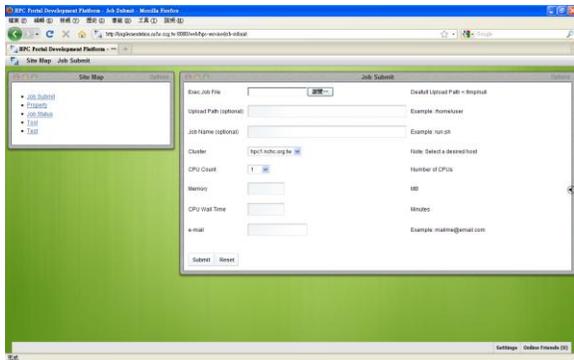


Figure 8. Job Submit Portlet

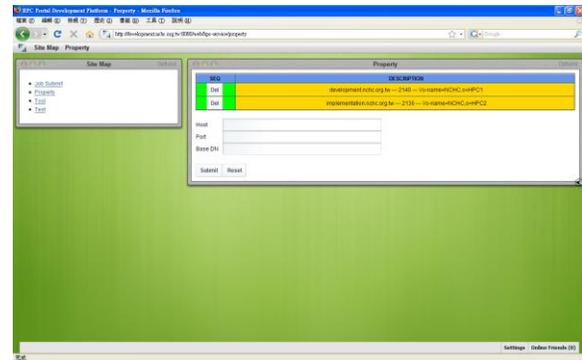


Figure 10. Property Portlet

### JOB STATUS PORTLET

**Job Status Portlet** (Figure 9) is used as the standard portlet for High Performance Computing. This portlet allows users to check the status of their jobs. It's also for Java developers to continually design, implement and integrate their specific backend resources for checking their job status after they submit their jobs.

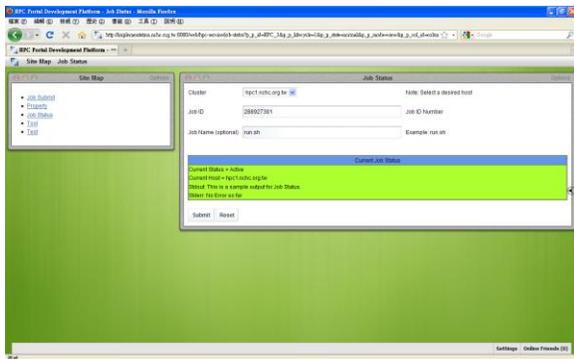


Figure 9. Job Status Portlet

### PROPERTY PORTLET

**Property Portlet** (Figure 10) is used as the standard portlet for High Performance Computing. It allows HPC Portal administrators to access the specific properties such as the LDAP Server or MDS Server. The HPC Portal developers can modify this portlet for their own demands in their particular HPC environments.

### CONCLUSIONS

As organizations, any size of the business companies and personal users continually reinvent them and strive for higher levels of efficiency and productivity, the demands on the information worker are continually increasing. To meet these ever growing demands, the information worker in the field of e-Commerce and high performance computing needs a better, more productive open source portal development platform such as **HPC Portal Development Platform**. This platform must be role- and task- focused so that all elements of a task are provided directly in context for the user. And perhaps most importantly, the information worker must have the ability to tailor and evolve the environment based on their own preferences and the needs of their organization.

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