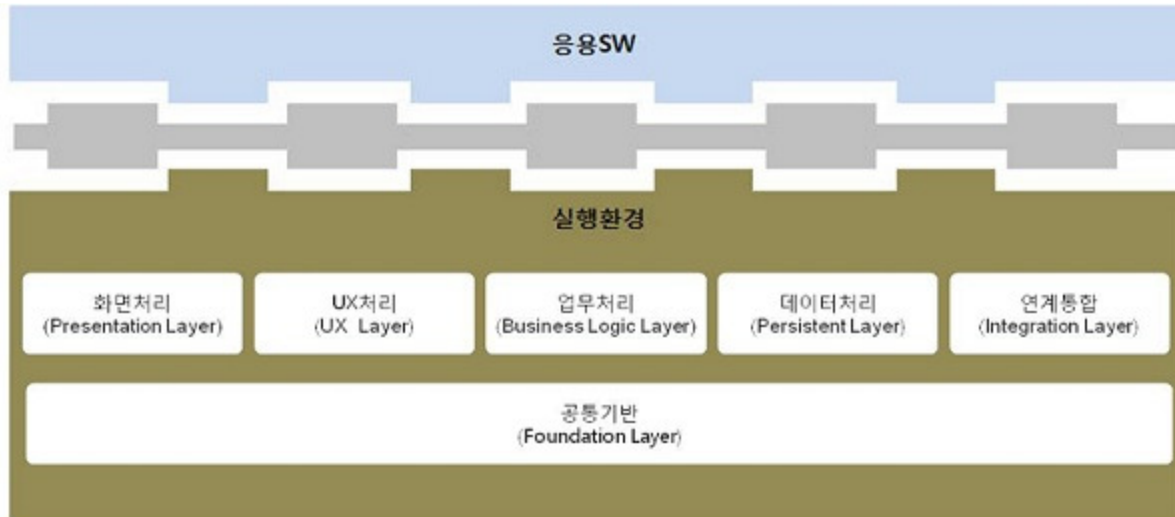


Introduction to Execution Environment 2.0 of the Development Framework

Summary

The execution environment of the development framework works as the foundation of application SW and is the environment of providing the basic function required for running applications. In other words, it is the group of SW structure and reusable server execution module which support the developed program for implementing e-government tasks to run normally as the user intended.



Goal

The e-government development framework execution environment has a goal to establish its standard for improving the quality of the e-government service and efficiency of informatization investment; and to standardize and improve the quality and reusability of the applications by applying the standard. In addition, it provides the standard patterns and guide cords based on the mobile web which they allow developers to build on the existing execution environment, so that the convenience and usability of the mobile web will be increased.

Background

Current e-government applies and manages various kinds and versions of frameworks with similar functions in the unit of individual system and a variety of problems occur accordingly. The development framework applied to the e-government is provided in the form of Black Box and is difficult to maintain the applications without specific technical support, causing dependence for its business operators. In case of business where several development frameworks are applied, overlapping investment is required with a separate maintenance system as well as definition of a development standard per development framework, supply and demand of developer, and execution of education. Lack of systematic management process of development framework may result in version management even if they are the same development framework.

Accordingly, through standardization of e-government development framework:

- Exclude the technology dependence on the unique development framework of the business operator.
- Improve the reusability, quality and standardization of application SW through framework standardization.
- Improve the investment efficiency through the unification of maintenance for the development framework.
- In addition, improve the convenience of users by presenting mobile standard patterns and guide codes.

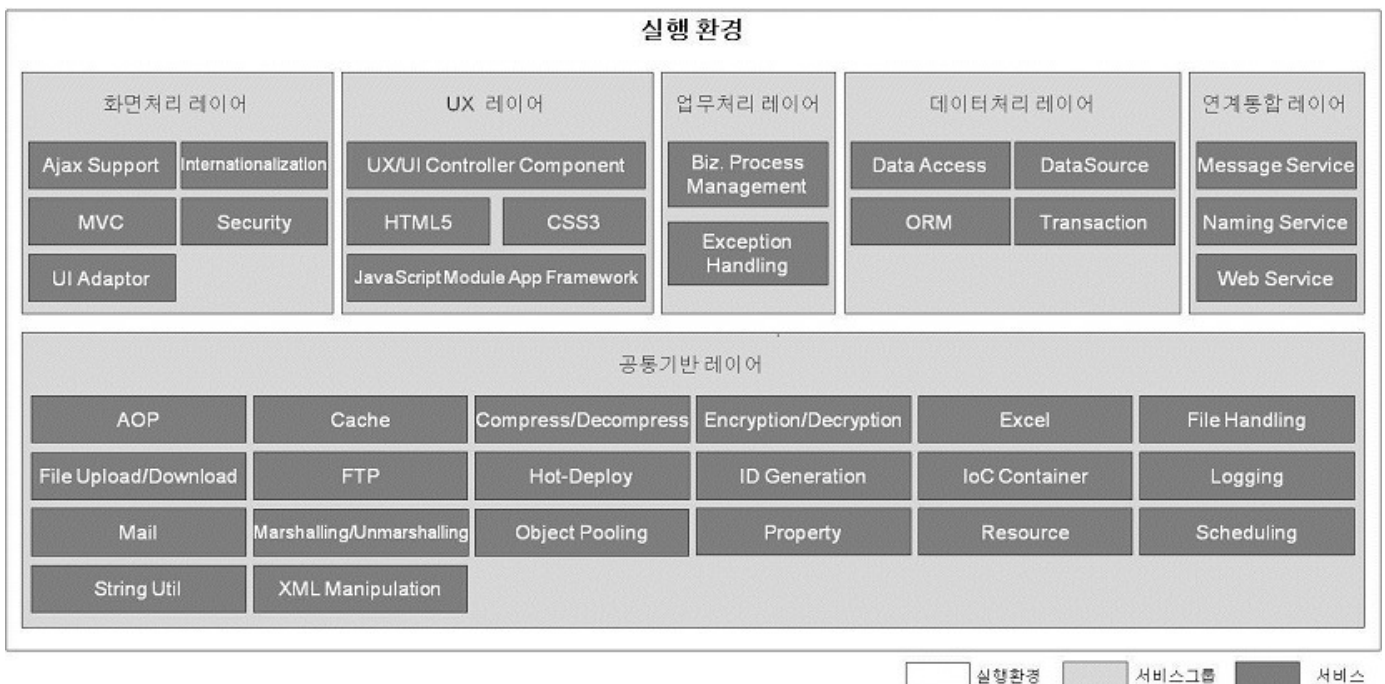
Feature

The development framework execution environment is based on the requirements for the e-government framework and 38 of the execution environment framework services are defined by comparing and analyzing frameworks per company applied to the existing e-government project. The development framework execution environment is selected through an open-source software evaluation process. As a light-weighted development framework, it is based on the spring framework close to the actual business standard. It defines the standard association interface of e-government development framework independent of the association solution, provides web service based implementation and implements integrated web service of UX processing in the case of mobile web.

- Consists of 6 service groups and 38 services – Development framework execution environment consists of 6 service groups such as screen processing, UX processing, task processing, data processing, association integration and common foundation. It provides core services such as MVC, UX/UI Controller Component, IoC container, AOP, Data Access and Integration.
- Select open source software optimized for e-government project – development framework execution environment selects the optimal open source software per 38 services based on requirement for e-government framework.
- Apply Spring framework close to the business standard as a lightweight development framework – provide an independent environment to WAS or DBMS of specific company by adopting spring framework in compliance with J2EE standard.
- DI (Dependency Injection) type dependence relation processing – development framework execution environment improves reusability and ease of change by defining the dependence between component and object through Dependency Injection.
- Support AOP (Aspect Oriented Programming) – Development framework execution environment enables the developer to focus on the development of business tasks by defining common areas of interest such as logging, transaction and exception processing separately.
- Provide MVC Model2 architecture structure and supports various kinds of UI client association – development framework execution environment is based on Spring MVC and defines interface for various UI client association.
- Define standard association interface of e-government development framework – exclude the dependence for association solution by defining standard association interface of development framework execution environment and enable development of independent application.
- UX/UI Controller Component – provide required UI controller component touch optimized for flexible action for mobile 'web' user environment (UX/UI).

Service Construction of Execution environment

E-government development framework Execution Environment consists of 6 service groups and provides 38 services. Execution Environment service group and services are as shown in the figure.



Screen Processing

Screen processing service group is the service that takes charge of interface between user and task processing service, and supports the user screen configuration and user input validation function.

- **Ajax Support:** Ajax is the web development technique using a combination of HTML and CSS, DOM, Java script, XML and XSLT for production of interactive web application, and provides Custom Tag Library for support of Ajax function.
- **Internationalization:** Internationalization is the service that can support various regions and language environments, and provides an automated multi-language function according to server setting and client browser environment.
- **MVC:** applies MVC design pattern and provides MVC foundation structure so as to develop the user screen.
- **Security:** provides function to cope with weakness of web security (XSS, SQL Injection, etc.) that may occur when creating web application programs.
- **UI Adaptor:** defines the data type to be used at task processing layer, in order to prevent the business logic layer from changing depending on the implementation type of screen layer, and provides the function to convert the in/out parameter used in screen layer to the relevant implementation type.

UX Processing

UX processing service provides a user experience function for improving the convenience and usability of mobile web and supports to enable the vision, interface effect and experience.

- **UX/UI Controller Component:** provides Touch Optimized essential UI controller component for flexible action for mobile 'web' user environment (UX/UI).
- **HTML5:** provides mobile specialized tag and device API as a markup language to use at configuration of mobile web page.
- **CSS3:** enables to show suitable component depending on mobile device and browser.
- **JavaScript Module App Framework:** provides Javascript and Json structures guaranteeing the effectiveness of UX/UI controller component.

Duty Processing

The duty processing service is in charge of business logic of the duty program and provides the function of the duty flow control and error processing.

- **Process Control:** supports the separation of task flow and business logic, provides the task flow configuration in the external setting of XML and provides the function to execute pre-defined process.
- **Exception Handling:** provides the standardized method for processing Exception that occurs at the execution process of application programming.

Data Processing

Data processing service supports persistence processing and connection for database, as well as declarative transaction management.

- **Data Access:** provides abstract approach type for various kinds of database solutions and database approach technology and provides the function for excluding dependence between business logic, database solution and approach technology.
- **Data Source:** provides the function to exclude dependence between business logic and database connection type by providing database connection of various types and providing the abstract layer for this.
- **ORM:** supports to enable writing of business logic using the object rather than SQL by providing ORM (Object-Relational Mapping) function, the mapping function between object model and relational database.
- **Transaction:** as a service to process Database Transaction, it provides a consistent programming model by providing an abstract method for Transaction processing.

Integration

The integration layer supports a function to synchronize with other systems.

- Naming service: provides a function to find the module and resources in remote places.
- Web service: provides a function to use the service at the other system or application by exposing the web service in the form of web service.
- Integration service: provides a common interface for association with e-government system and provides the standard processing type for various types of solution association.

Common Foundation

The common foundation service provides functions used in common between execution environment service.

- AOP: implement and support Aspect Oriented Programming (AOP).
- Cache: a function to enable the fast approach for the frequently used content and play a role to shorten overhead or time through frequent approach.
- Compress/Decompress: provides the function to compress and restore the data. Can be used to obtain original data by compressing original data or restoring the compressed data to effectively save and transfer the data.
- Encryption/Decryption: provides the encryption and decryption function for the data and can be used for security during data reception/sending through network.
- Excel: provide Java library that can deal with Excel file format.
- File Handling: provides the function to access the file for file creation, approach and change.
- File Upload/Download: used in the screen processing service group and provides the function to upload and download the file.
- FTP: provides FTP client function to send and receive data (file) using FTP (File Transfer Protocol).
- ID Generation: provides the function to create ID (Identifier) used at the system according to UUID (Universal Unique Identifier) standard.
- IoC Container: provides the basic function of framework, IoC (Inversion of Control) container function.
- Logging: provides the function to reduce the overhead using System.out.println sentence, save and control the log through a convenient setting.
- Mail: provides the function to comply with SMTP standard and to send e-mail client function for sending e-mail.
- Marshalling/Unmarshalling: provides the function to convert the object to the specific type of data and to convert the data created in specific type of data to the object reversely.
- Object Pooling: provides the function to create and assign new objects according to pool size if there is no object to be assigned. Or to receive an assignment of object if there is an available object in the pool.
- Property: provides the function to enable the application to approach the value for specific key and to internally save the pairs of key and value that composes the external file or environment information.
- Resource: as a function to support internationalization and localization, it provides the function to read the message relevant to the language and the country.
- Scheduling: as a function to support the task that regularly or repeatedly occurs in the application server, it provides the function similar to Cron command of Unix.
- Server Security: provides the function to manage user certification and authority for security management at the approach of data and server function.
- String Util: provides various kinds of function to handle data of character string.
- XML Manipulation: provides the function to read and write XML.

Status of Using Open Source Software of the Execution Environment

To provide execution environment service, foundation open-source software was identified and open source software was selected per service through open source software evaluation and testing. Open-source software was evaluated comprehensively on various items such as industrial standard, license, function requirement, support at the expansion and maturity, as well as the development environment. Development framework execution environment service was recycled based on the open source

software or implemented with expansion. For some services, open source software satisfying selection standard was not selected, but implemented in itself.

Service Group	Service	Open Source Software	Version	Expansion and Development
Screen processing	Ajax Support	Ajax Tags	1.5.5	
	Internationalization	Spring MVC	3.0.5	
	MVC	Spring	3.0.5	Expand function in addition to Custom Tag
	Security	Apache Commons Validator	1.3.1	
	UI Adaptor	Not Selected		Provide UI Adaptor association manual
UX processing	UX/UI Controller Component	jQueryMobile	BETA 3	
	HTML5	Not Selected		HTML5 support function
	CSS3	Not Selected		CSS3 support function
	JavaScript Module App Framework	Not Selected		Provide guide guaranteeing efficiency of UX/UI Controller Component
Business processing	Process Control	Web Flow	2.0.5	
	Exception Handling	Spring	3.0.5	Expand Exception function
Data processing	Data Access	iBatis SQL Maps	2.3.4	Expand Spring-iBatis function
	DataSource	Spring	3.0.5	
	ORM	Hibernate	3.4.0	
	Transaction	Spring	3.0.5	
Association Integration	Naming Service Support	Spring	3.0.5	
	Integration Service	Not Selected		Develop standard interface processing function
	Web Service Interface	CXF	2.3.3	Expand web service to comply with standard interface
Common Foundation	AOP	Spring	3.0.5	
	Cache	EHCACHE	2.4.1	
	Compress/Decompress	Apache Commons Compress	1.1	
	Encryption/Decryption	java simplified encryption (jasypt)	1.7	Expand encryption function
	Excel	Apache POI, jXLS	3.2, 0.9.9	Expand Excel function
	File Handling	Jakarta Commons VFS	1.0	Expand File Access function
	File Upload/Download	Apache Commons FileUpload	1.2.2	
	FTP	Apache Commons Net	3.0.1	
	ID Generation	Not Selected		Develop system unique ID creation function
	IoC Container	Spring	3.0.5	
Logging	Log4j	1.3		

Mail	Apache Common Email	1.2	
Marshalling/Unmarshalling	Castor , Apache XML Beans	1.3.2, 2.4	
Object Pooling	Apache Commons Pool	1.5.6	
Property	Spring	3.0.5	Expand Property function
Resource	Spring	3.0.5	
Scheduling	Quartz	1.8.5	
Server Security	Spring Security	2.0.4	Expand authentication, authority management function
String Util	Jakarta Regexp	1.5	Expand character string processing function
XML Manipulation	Apache Xerces 2 , JDOM	2.10.1, 1.1	Expand XML processing function