

## Featured Articles III

# Development of New Enterprise Applications to Achieve Financial Innovation

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*OVERVIEW: The market for the development of large enterprise applications like those used in the finance industry demands robust architectures that combine long-term stability and quality to ensure system availability, and also improvements in productivity and development speed (ultra-rapid development) to ensure a timely response to the hectic pace of change in business requirements. This changing environment and other challenges facing financial institutions have reinforced the need for an application development platform that can satisfy new requirements. In response, Hitachi, Ltd. is supplying a new application development platform service for achieving financial innovation using the latest Java EE 7 technology.*

## INTRODUCTION

AMID a rapidly changing world economy and an upsurge in the pace of change associated with globalization, it remains necessary to deal with the challenges of responding quickly to business requirements, revitalizing business through the optimization of information technology (IT) costs, and delivering secure and high-quality systems. The period since the crisis triggered by the Lehman Brothers collapse has seen the rise of new players, including the financial technology (FinTech) startups that are appearing in the USA in particular, and who are developing services in areas not covered by existing financial institutions, such as payment services based on the Internet of Things (IoT), which has caught the eyes of general consumers, and also the emergence of advanced marketing services that make use of large quantities of credit card or other transaction data. Given these factors, how to deal with financial innovation has also become an important question.

Together with the improvement in business sentiment following an extended period of stagnation in the wake of the global financial crisis and the Great East Japan Earthquake, this means that there is growing sense among financial institutions that now is the time to upgrade their existing core business systems to a new generation of systems. Hitachi believes that the following new requirements need to be taken into account in the development of next-generation systems.

- (1) Build systems that reduce total cost of ownership

(TCO) by switching from mainframes to open systems and that can provide the best possible return on investment

- (2) Avoid proprietary products and seek to use technologies based on open standards
- (3) Take advantage of advances in open source software (OSS) and its use
- (4) Use third-generation platforms, and development and operations (DevOps)
- (5) Use new services that take account of systems of engagement (SoE), systems of record (SoR), and the IoT
- (6) Shorten development times

## OVERVIEW OF HITACHI APPLICATION FRAMEWORK'S APPLICATION DEVELOPMENT PLATFORM FOR ENTERPRISES

Hitachi has announced the Hitachi Application Framework, as an application development platform service that can satisfy the new requirements of financial institutions described above.

Providing four services (an application framework, a development framework, a cloud-based development environment, and development standards), Hitachi Application Framework is designed to overcome challenges by providing solution services in collaboration with customers that can develop in tandem with system growth and enhancements over time, while still maintaining the same “mission critical” standard of uninterrupted operation that has always been expected of core business systems.

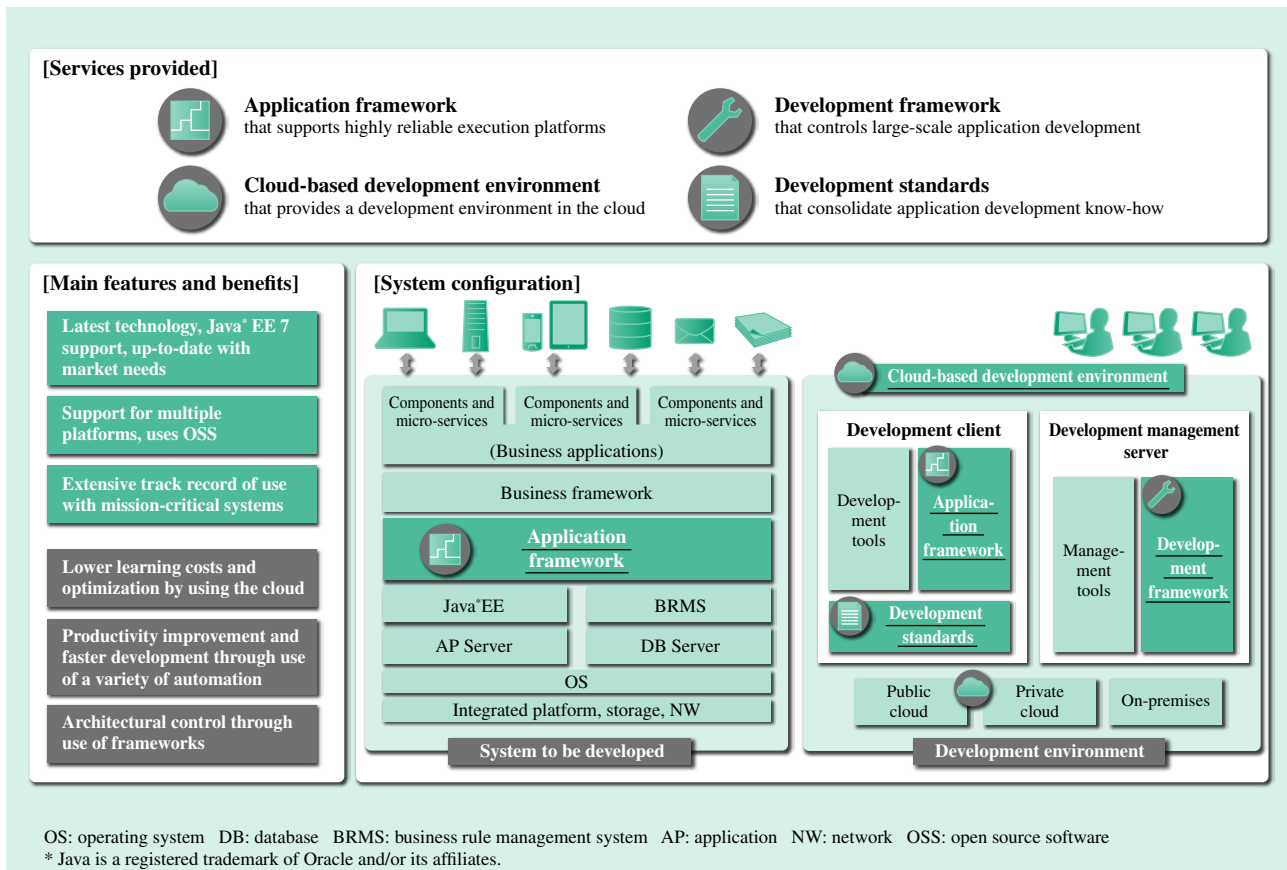


Fig. 1—Overview of Services Provided by Hitachi Application Framework.

Hitachi Application Framework deploys services with respect to two main areas: the system to be developed and the development environment. They provide an application framework, a development framework, a cloud-based development environment, and development standards.

## FEATURES OF HITACHI APPLICATION FRAMEWORK'S APPLICATION DEVELOPMENT PLATFORM FOR ENTERPRISES

Fig. 1 shows how the four services provided by Hitachi Application Framework relate to one another and gives an overview of its main features and benefits.

Hitachi Application Framework provides an application framework for use in systems being developed in the SoR and SoE areas, and a development framework, cloud-based development environment, and development standards that are used to provide the development environment.

The Hitachi Application Framework application model provides a loose coupling between these four services so that they can be used as needed based on the requirements of the core business systems being developed.

### Application Framework

The core service provided by Hitachi Application Framework is the application framework. The role

of the framework is to sit between the application (AP) server and a framework called the “business framework,” which is used to provide common processing functions for business processing. It is made up of the frameworks used for transaction patterns (boundaries) required to implement mission-critical systems and the components required for application development (logging, checking and editing, database management, and other components), and has the following features (see Fig. 2).

(1) Support for Java Platform, Enterprise Edition 7 (EE 7)

The Hitachi Application Framework supports the latest version of Java EE. Java EE has evolved as a platform that provides standard technology and stable technology for Java-based enterprise applications. Having evolved from the initial Java 2 Platform, Enterprise Edition (J2EE) through augmentation by OSS (including Struts and Spring) and the transition to Java EE, Java EE 7 continues to provide the stability, high quality, and support for new technology required by enterprise applications. With the aim of building on

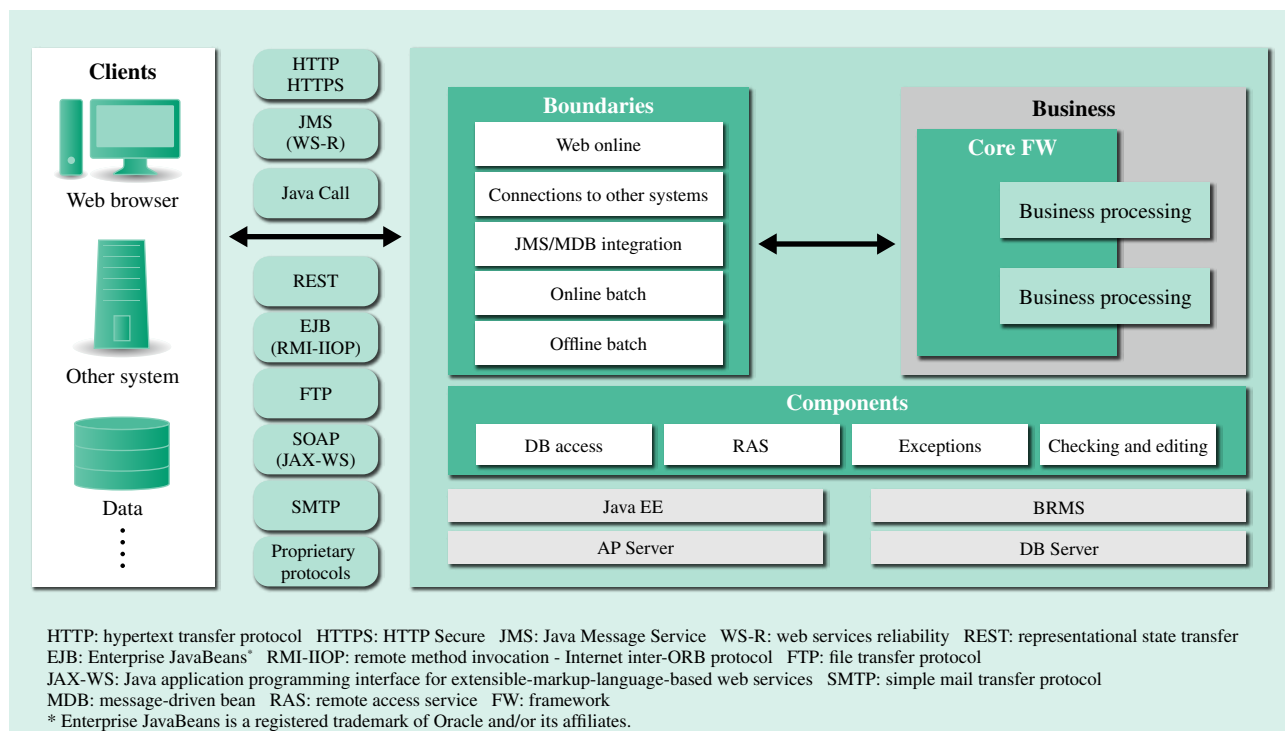


Fig. 2—Overview of the Application Framework.

The Hitachi Application Framework is made up of a number of frameworks provided as boundaries and core areas that perform business processing. The framework includes various components required for application development.

Java EE to provide a framework for mission-critical systems that are used over long periods of time, Hitachi

TABLE 1. Support for Multiple Platforms

Hitachi Application Framework enables systems to be implemented by combining solutions from various vendors using Java, BRMS, AP Server, and DB Server, which can be thought of as platform areas.

Platform	Supported products (*TBD: Under consideration)
Java	• Java SE 8/Java EE 7
BRMS	• [Red Hat <sup>*1</sup> ] JBoss <sup>*1</sup> BRMS • [InnoRules] InnoRules <sup>*2</sup> , *TBD • [Pegasystems <sup>*3</sup> ] Pega <sup>*3</sup> , *TBD
AP Server	• [Hitachi] Hitachi Application Server • [Red Hat <sup>*1</sup> ] JBoss <sup>*1</sup> EAP • [Red Hat <sup>*1</sup> ] WildFly <sup>*1</sup> , *TBD • [IBM <sup>*4</sup> ] WebSphere <sup>*4</sup> • [Oracle <sup>*5</sup> ] Oracle WebLogic <sup>*5</sup> Server <sup>*TBD</sup>
DB Server	• [Hitachi] HiRDB • [IBM <sup>*4</sup> ] DB2 <sup>*4</sup> • [Oracle <sup>*5</sup> ] Oracle <sup>*5</sup> • [OSS] MySQL <sup>*6</sup> , PostgreSQL <sup>*7</sup> , *TBD

HiRDB: highly scalable relational database    EAP: enterprise application platform

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<sup>\*5</sup> Oracle and WebLogic are registered trademarks of Oracle and/or its affiliates.

<sup>\*6</sup> MySQL is a registered trademark of Oracle and/or its affiliates.

<sup>\*7</sup> PostgreSQL is a trademark of the PostgreSQL Community Association of Canada.

Application Framework provides the functions of an application framework in the form of extensions and augmentations that cover things that cannot be achieved with Java EE 7 on its own.

## (2) Multi-platform

Another reason for supporting Java EE 7 was to be able to work on multiple platforms. By basing the framework on Java EE 7 (and taking note of the trend among customers away from proprietary technology), Hitachi ensured that it could support a wide range of commercial and OSS-based AP servers that are able to host Java EE 7, and thereby support a wide variety of system configurations. Another advantage is that technical support for Java EE is available for commercial application servers (see Table 1).

## ULTRA-RAPID DEVELOPMENT USING THE HITACHI APPLICATION FRAMEWORK'S APPLICATION DEVELOPMENT PLATFORM FOR ENTERPRISES

Today's financial institutions have a very strong requirement for shorter development times to enable the rapid rollout of new loan products, changes to insurance premiums, compliance with regulatory reforms, and so on. While the term "ultra-rapid

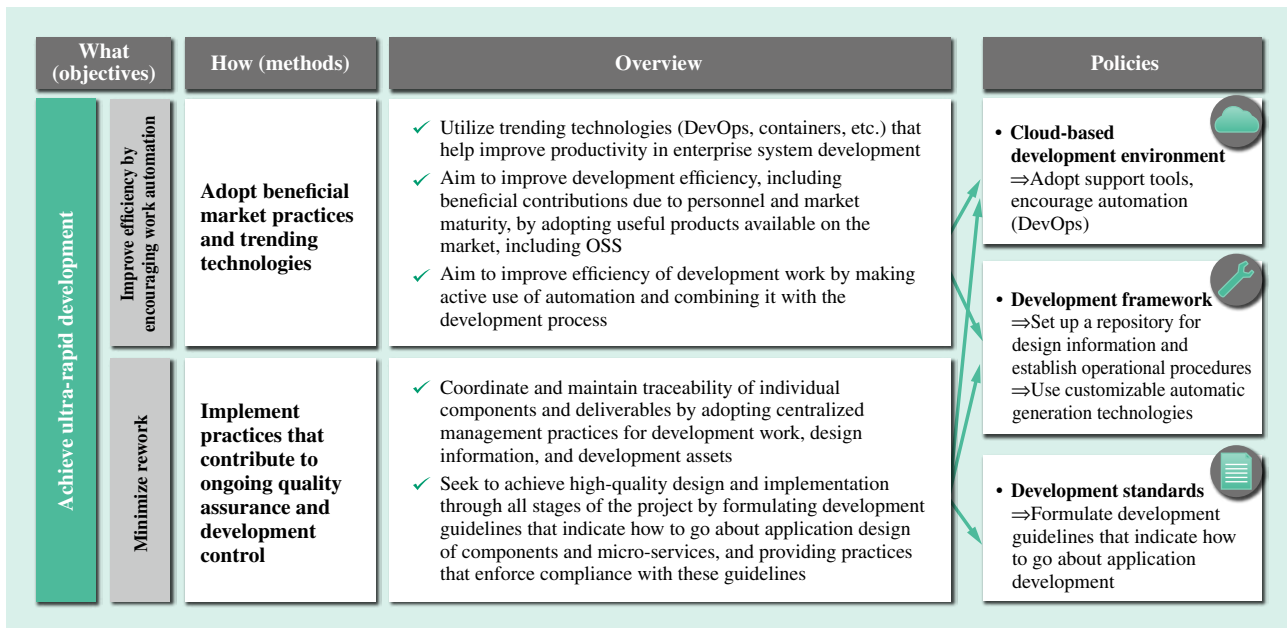


Fig. 3—Achievement of Ultra-rapid Development.

To achieve ultra-rapid development, implementation methods are considered on the basis of ways of thinking that have been collated with the two objectives of improving efficiency by encouraging the automation of work and minimizing rework.

development” has a variety of definitions within the IT industry, it is used in Hitachi Application Framework with the following meaning.

“Development that improves productivity and provides ongoing controls and quality improvement

throughout the life cycle of an enterprise application, which extends from design through to operation and maintenance”

To shorten development times (improve productivity and development speed), Hitachi places

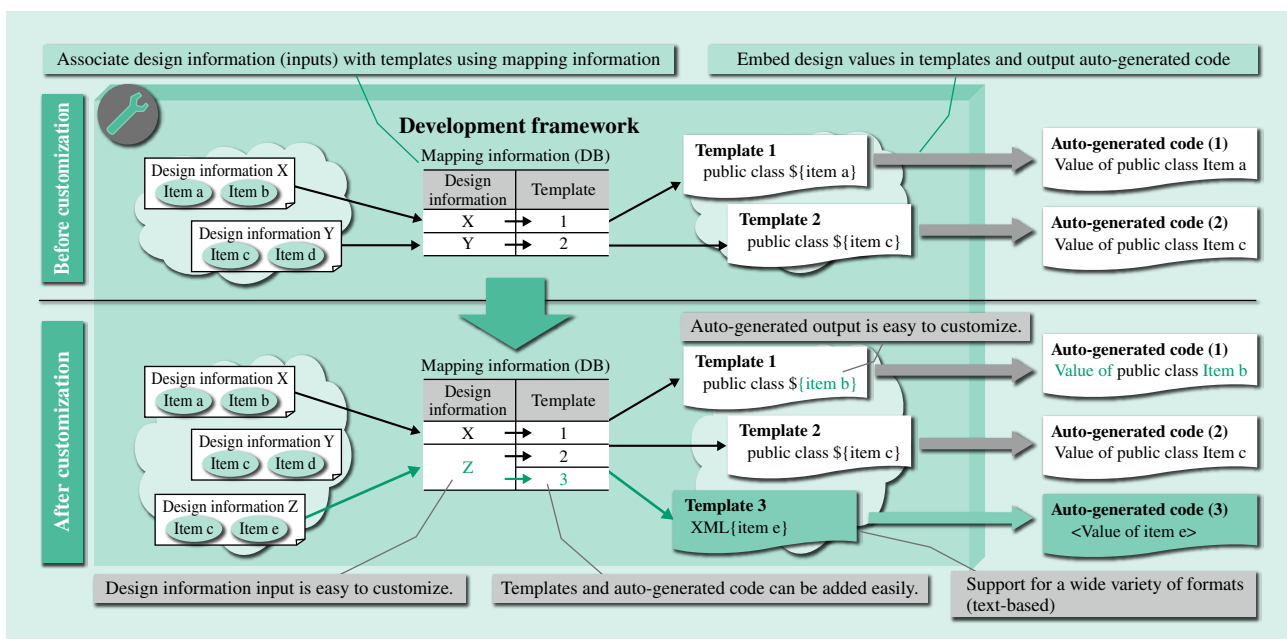


Fig. 4—Customization and Extension of the Development Framework.

The approach adopted by Hitachi Application Framework gets the maximum benefit from productivity improvement measures based on the customer and system being developed, with the ability to customize both the design information that serves as input to the development framework and the auto-generated source code output.

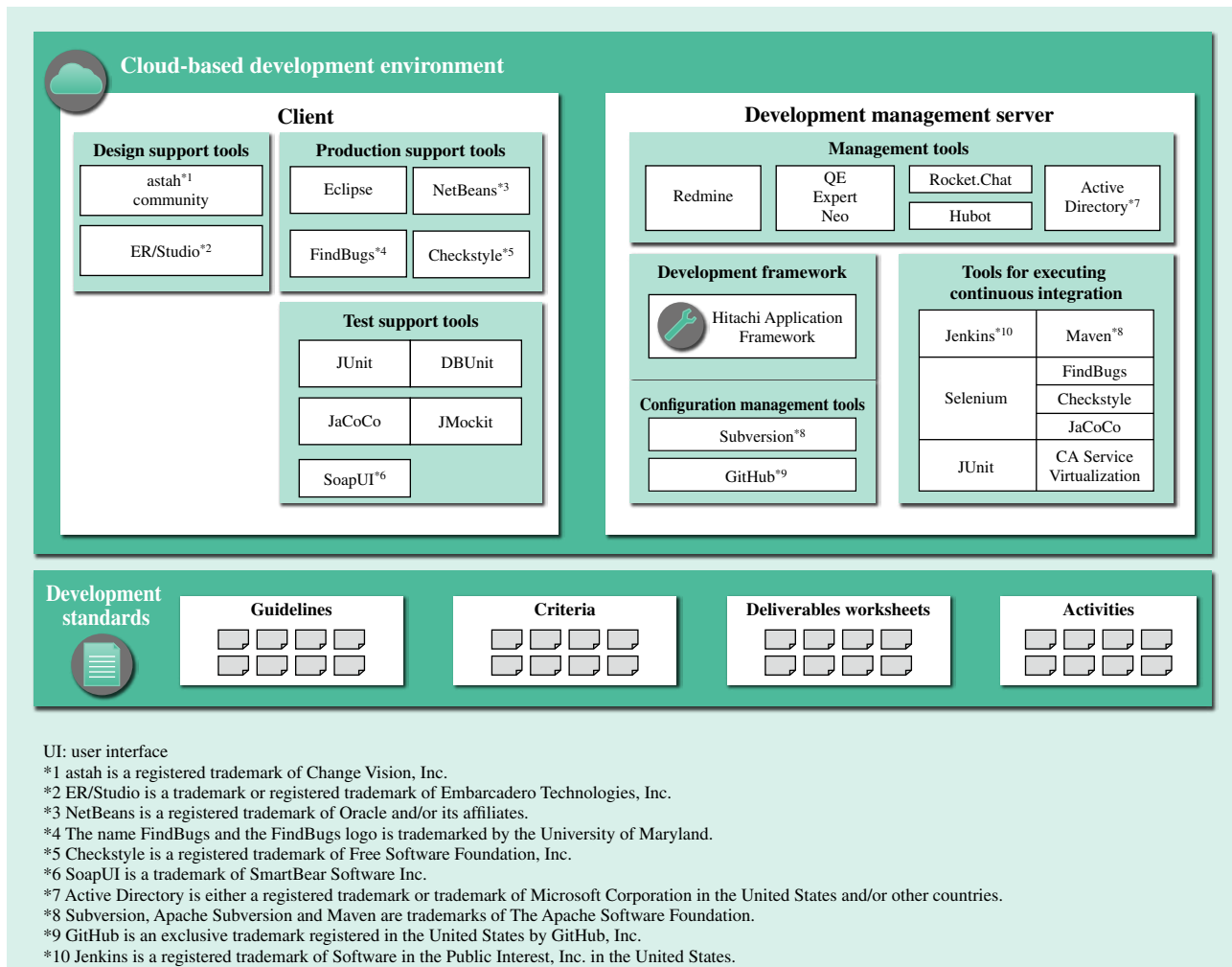


Fig. 5—Overview of the Development Environment.

The diagram shows the positioning of the development framework, cloud-based development environment, and development standards in one example of the development environments provided by Hitachi Application Framework.

a priority on encouraging the automation of work to improve efficiency and on minimizing rework, and achieves this by adopting beneficial market practices and trending technologies and by implementing practices that contribute to ongoing quality assurance and control of development (see Fig. 3).

Hitachi offers an approach to developing the latest mission-critical systems that incorporates new elements in hybrid form while also utilizing the know-how and experience in enterprise application development it has built up over time since the era of mainframes.

### Development Framework

The main functions of the developer support framework, which enables the rapid development of high-quality enterprise applications, are listed below.

- (1) Data item control function
- (2) Design information consistency checking function
- (3) Impact analysis and traceability functions

### (4) Automatic program generation function

It also enables the greatest possible improvements in development speed to be pursued, with control handled by mapping information (which contains design data) and templates (automatic generation engines), and functions for flexible customization and expansion to satisfy the business requirements of next-generation systems (see Fig. 4).

### Cloud-based Development Environment

The maintenance and operation of the application development environments used for enterprise applications face the following challenges.

- **Cost:** Optimization of TCO by building and maintaining hardware and software in accordance with peak developer workloads
- **Control:** Control of development practices and governance that covers all developers involved in large development projects



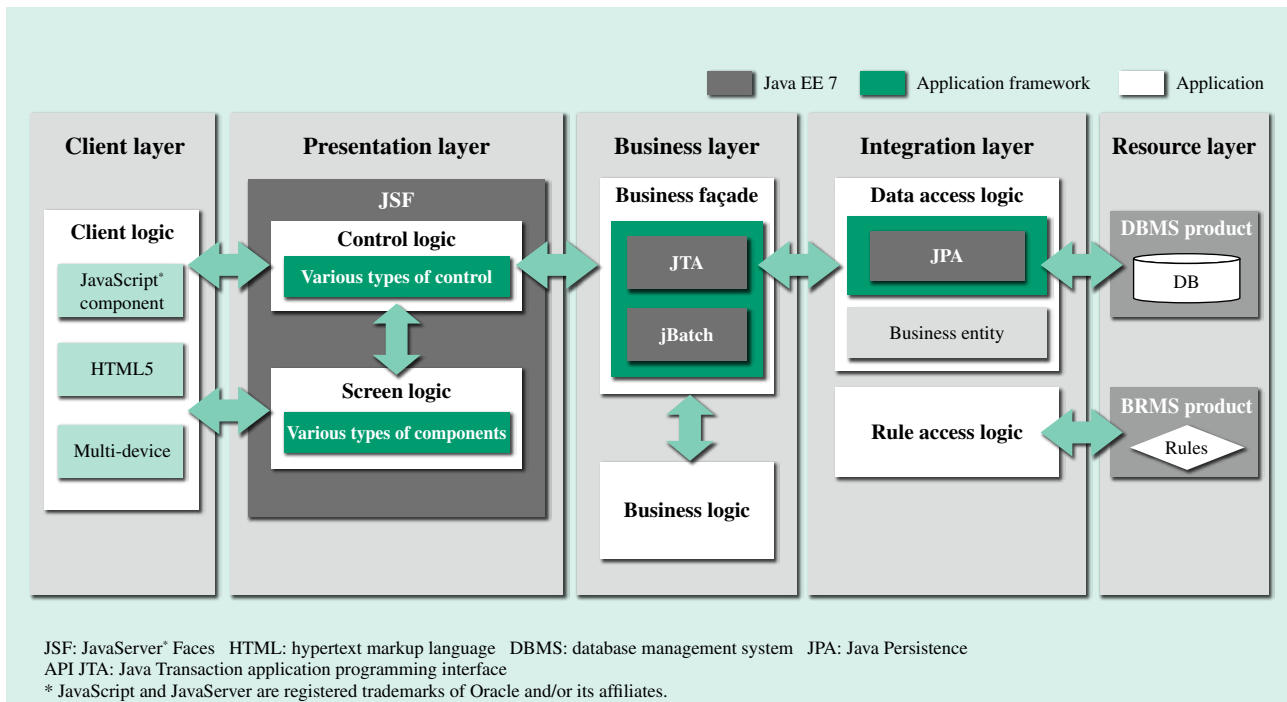


Fig. 6—Overview of the Five-layer Architecture.

Using a five-layer architecture, Hitachi Application Framework provides transparency for the technical components and logic configuration, and facilitates architectural control and loose coupling of the technical component dependencies.

- **Flexibility:** Control of lead times for everything from hardware and software procurement to the establishment of infrastructure based on project progress

To overcome these challenges, Hitachi supports an approach to development that provides the development environment in the cloud, thereby reducing TCO, ensuring control of governance by using a common software stack, and achieving faster provision of the development environment (see Fig. 5).

Hitachi also goes out of its way to use OSS in the development environment, enabling it to increase development speed through continuous integration (CI), undertake quality assurance, and maintain portability by using containers.

### Development Standards

Hitachi Application Framework stipulates a five-layer architecture adapted for enterprise applications (see Fig. 6) and stipulates design items based on these layers, using this as the basis for specifying how to go about component separation and micro-service design, standards, worksheets, work breakdown structure (WBS), and deliverables in the form of development standards (see Fig. 5).

Undertaking development in accordance with these standardized development practices enables quality

assurance of the entire application, reducing issues like overlooked work and work stagnation time. Hitachi also provides knowledge of design methodologies used in early-stage design based on experience from previous large development projects in the finance industry.

### CONCLUSIONS

This article has given an overview of the Hitachi Application Framework, which supports enterprise application development for next-generation systems, and described its features.

Hitachi, Ltd., intends to remain up to date with the latest technologies, such as Java EE, hypertext markup language 5 (HTML 5), multi-device, OSS, and the cloud, and is increasing the pace of open innovation with a view to providing feedback to the standard technologies of the IT market. Hitachi believes it can participate from the planning stage and help with proof-of-concept (PoC) in conjunction with customers by enhancing enterprise application development platforms that can satisfy customer and market requirements, and by providing excellent application development solutions and consulting based on its know-how and practical knowledge from large numbers of large-scale application development projects.

Through these efforts, Hitachi intends to help establish new financial innovation businesses

by serving in the finance industry as a partner in collaborative creation with customers.

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