OSS Applications for Cloud Computing in Hitachi

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Agenda

- Company Overview
- Cloud Computing and Topics
- OSS Application for Private PaaS

Outline of Hitachi (consolidated)

Company Name	**Hitachi, Ltd.**
Head Office	**6-6, Marunouchi 1-chome, Chiyoda-ku, Tokyo, 100-8280 Japan**
Representative	**Takashi Kawamura, Chairman, President and Chief Executive Officer**
Established	**1910**
Employees	**400,129**
Net Sales	**10,000 Billion Yen (US $102 Billion)**
Subsidiaries	**943 Companies (403 Japan, 540 Other countries)**

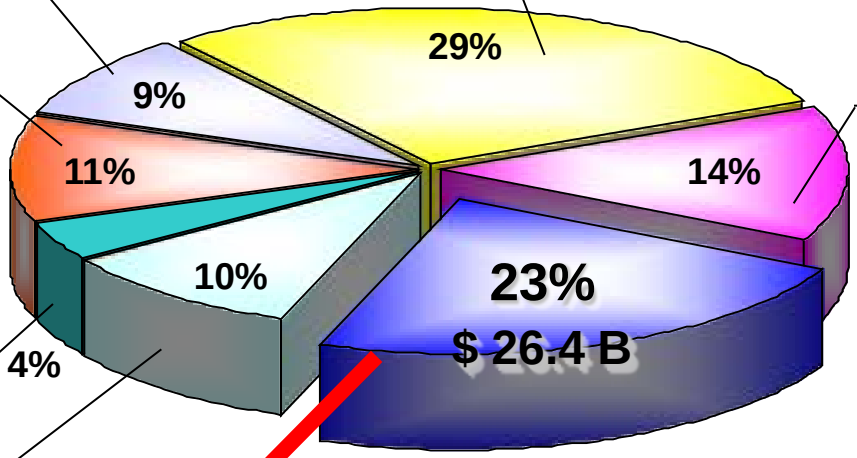
* 1 US$ = 98 JPY

(As of March 31, 2009)

Revenue Breakdown (consolidated)

Ratio by Industry Segments

(FY2008 Net Sales: $102B)



Power & Industrial Systems

High Functional Materials & Components

Digital Media & Consumer Products

Logistics

Financial Services

Electronic Devices

Information & Telecommunication Systems

* 1 US$ = 100 JPY

* 1 US$ = 98 JPY

Outline of Hitachi Information Systems

Company Name	**Hitachi Information Systems, Ltd**
Head Office	**1-2-1 Osaki, Shinagawa, Tokyo 141-8672 Japan**
Representative	**Iwao Hara, President and CEO**
Established	**June 15, 1959**
Employees	**7,328**
Net Sales	**192 Billion Yen (US $2.0 Billion)**
Capital	**13 Billion Yen (US $132 Million)**

* 1 US$ = 98 JPY

(consolidated, As of March 31, 2009)

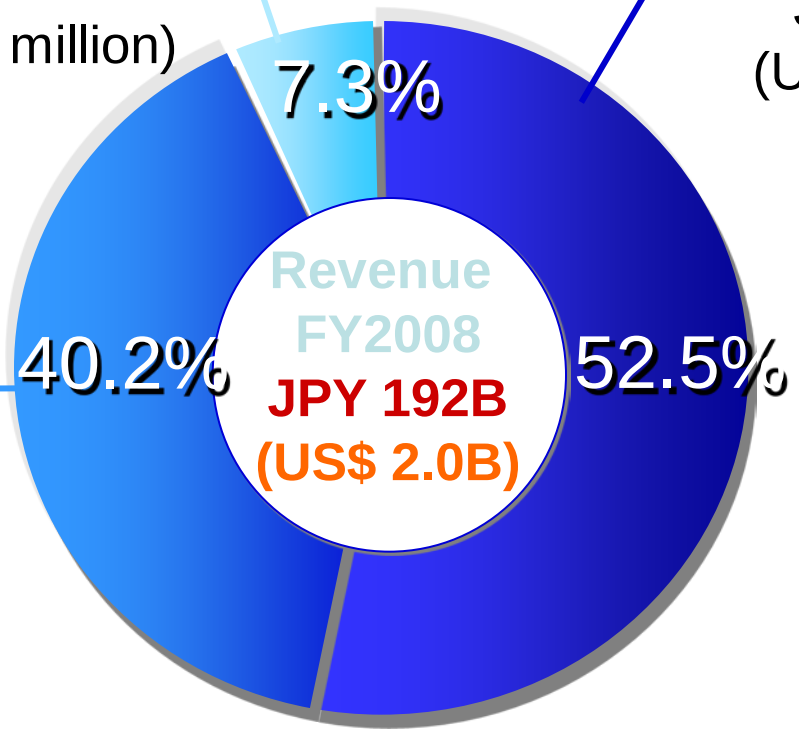
Revenue Breakdown (consolidated)

Business Portfolio(FY2008)

Equipments & Supplies Sales
JPY 14.0 billion
(US$ 140 million)

Systems Operation
JPY 100.9 billion
(US$ 1,009 million)

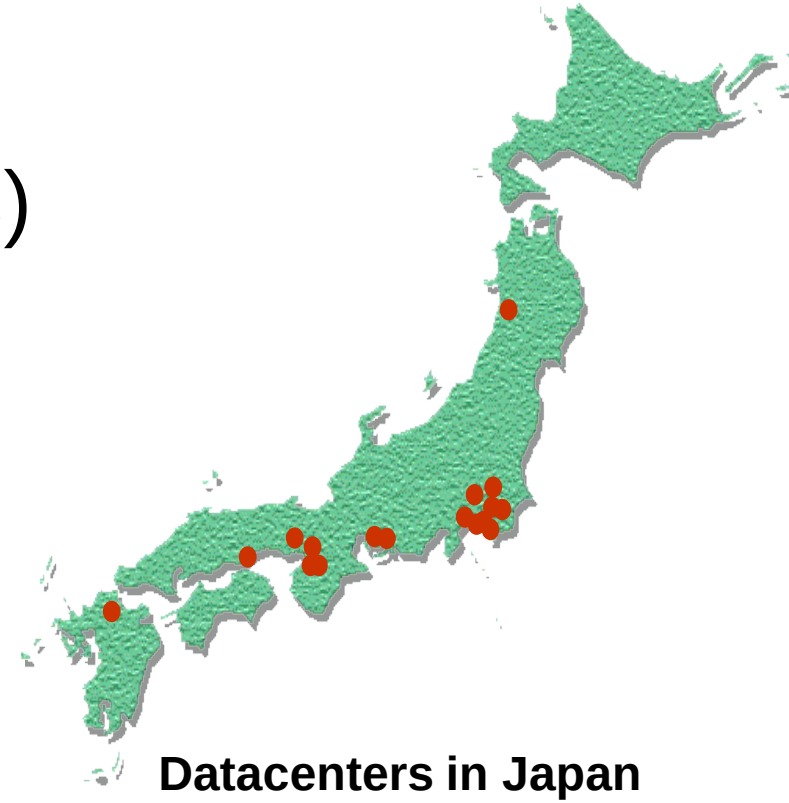
System Integration
JPY 77.2 billion
(US$ 772 million)



* 1 US$ = 98 JPY

Our Company's Characteristics

- Main customer base
  - Small and Medium Businesses (SMB)
  - Local Governments
- Datacenter (16 locations)
  - Managed hosting
  - Co-location
  - Cloud service
  - Network



Datacenters in Japan

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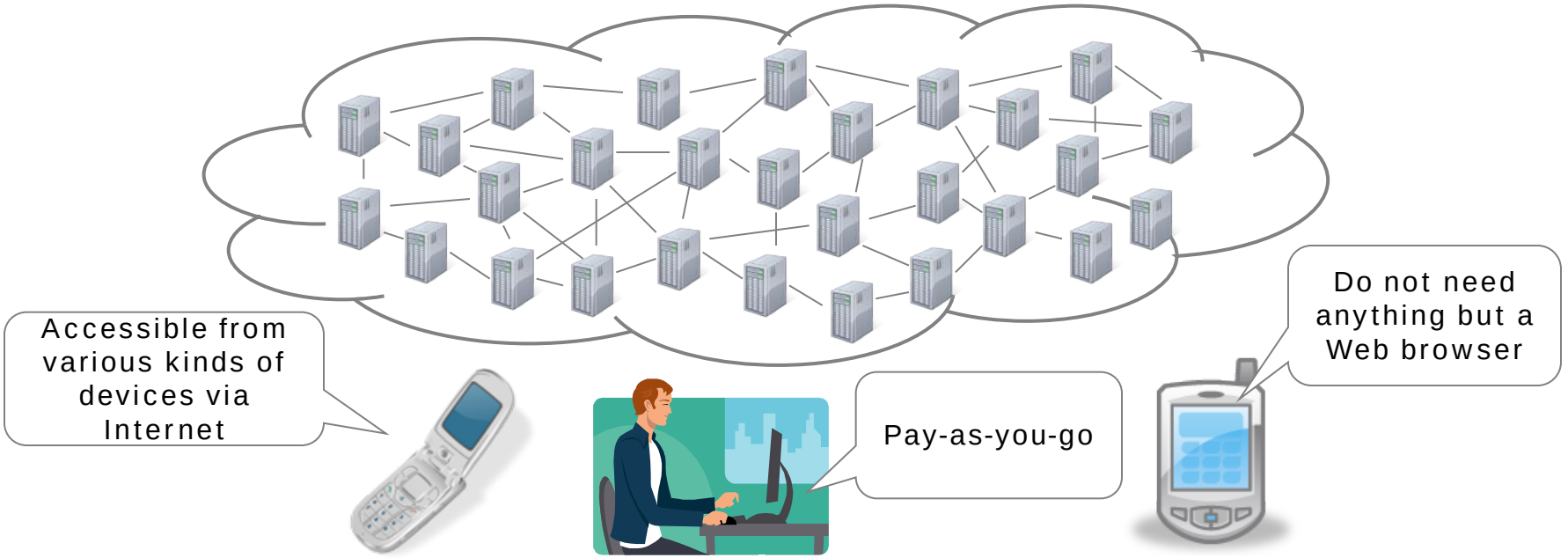
Definition of Cloud Computing

A standardized IT capability (services, software, or infrastructure) delivered via the Internet in a pay-as-you-go, self-service way

Source: Forrester Research, Inc.

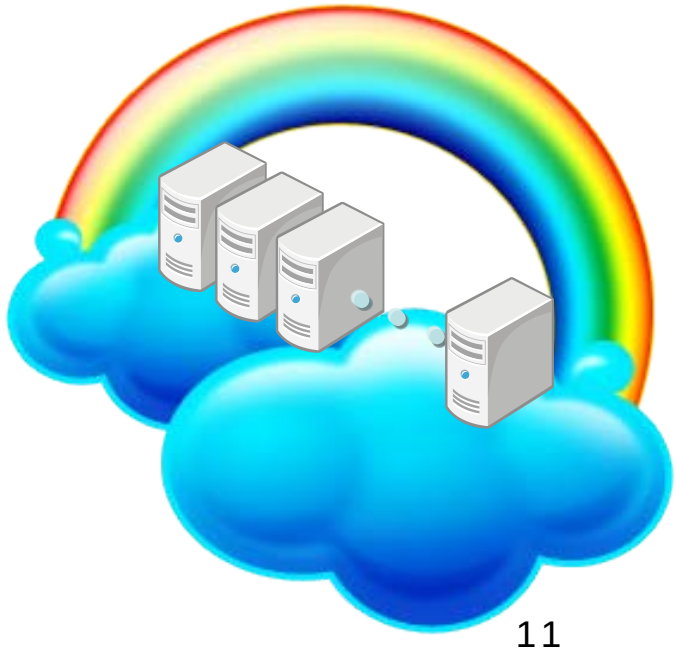


Cloud Key Features

- No need to worry about system operation and maintenance
- Accessible from various kinds of devices via Internet
- Pay-as-you-go model, affordable
- API to collaborate with other services
- Self-service portal for configuration

Cloud-related Events

- Aug 2006
  - Dr. Eric Schmidt, CEO of Google, called Google's servers as "cloud"
- Dec 2006
  - Amazon began EC2/S3 service
- Jan 2008
  - Salesforce.com began Force.com
- Apr 2008
  - Google began Google App Engine
- Feb 2010
  - Microsoft began Windows Azure



Cloud Taxonomy

Three Cloud Service Layers

SaaS (Software as a Service)	**Finished applications that you rent and customize** (CRM/SFA, EC, HRM, ERP, Advertisings, etc.)
PaaS (Platform as a Service)	**Developer platform that abstracts the infrastructure, OS, and middleware to drive developer productivity** (IDE, File, Database, Libraries, etc.)
IaaS (Infrastructure as a Service)	**Deployment platform that abstracts the infrastructure** (Virtual Server, Shared Storage, Virtual Network, etc.)

Source: Forrester Research, Inc.

Cloud Players

- Major Cloud Players by Taxonomy

SaaS
(Software as a Service)

PaaS
(Platform as a Service)

IaaS
(Infrastructure as a Service)

OSS in Cloud

- Amazon EC2
  - Xen based platform
  - Provide Linux VM
- Google App Engine
  - Jetty (Open Source Java Application Server)
  - Platform for Python (Open Source Language)

Why they choose OSS?

- Cost advantage
- Ease of customization

Cloud Foresight

- Worldwide cloud service revenue is on pace to surpass $56.3 billion in 2009.
- The market is expected to reach $150.1 billion in 2013.
- Much of the growth represents a transfer of traditional IT services to the new cloud model.

Source: Gartner, Inc., 2009

Cloud market is rapidly growing

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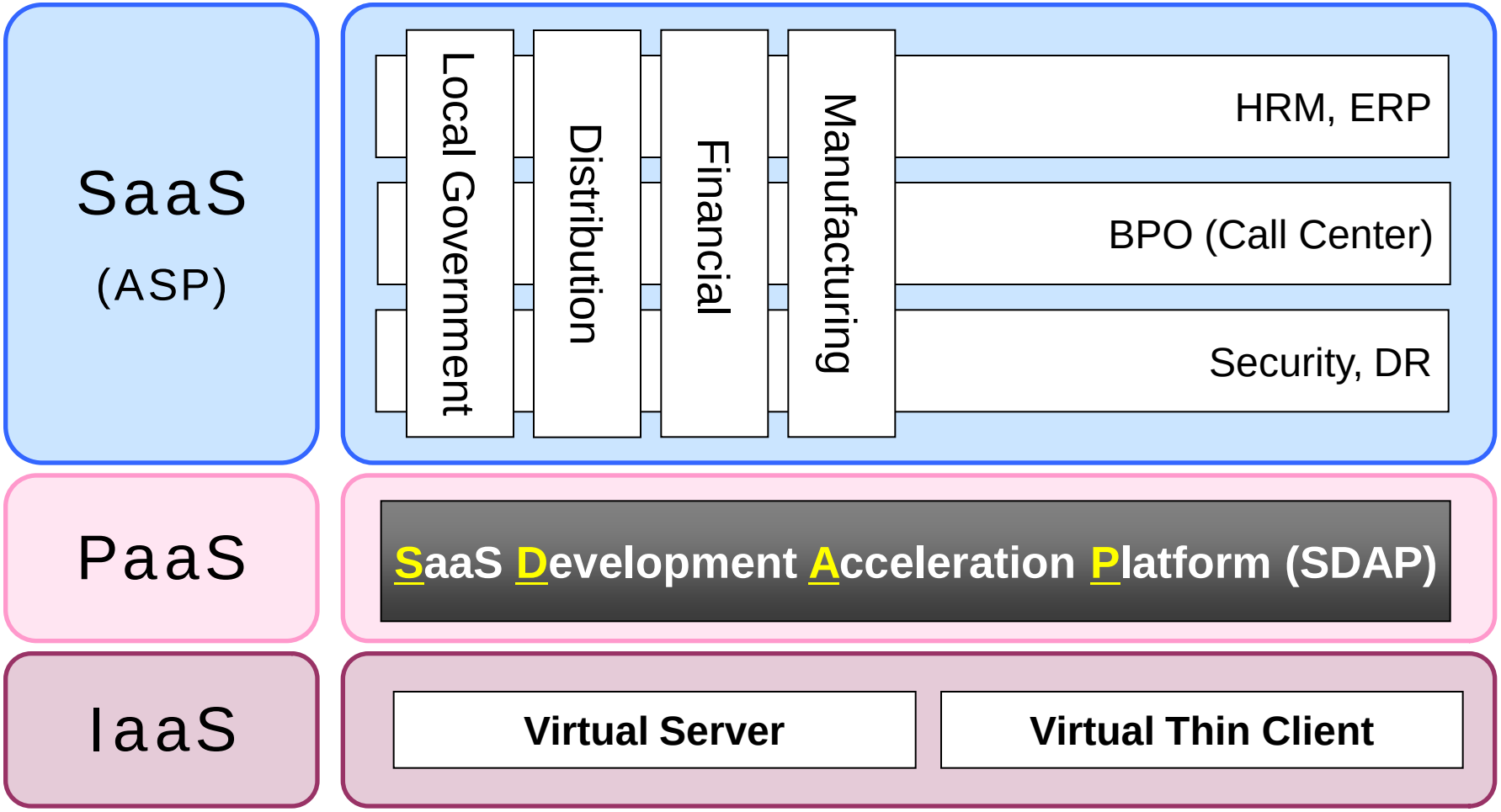
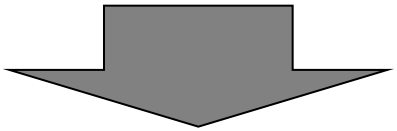
Our Cloud Service Stack



*HRM: Human Resource Mgmt, *ERP: Enterprise Resource Planning
*BPO: Business Process Outsourcing, *DR: Disaster Recovery

Goal to develop SDAP

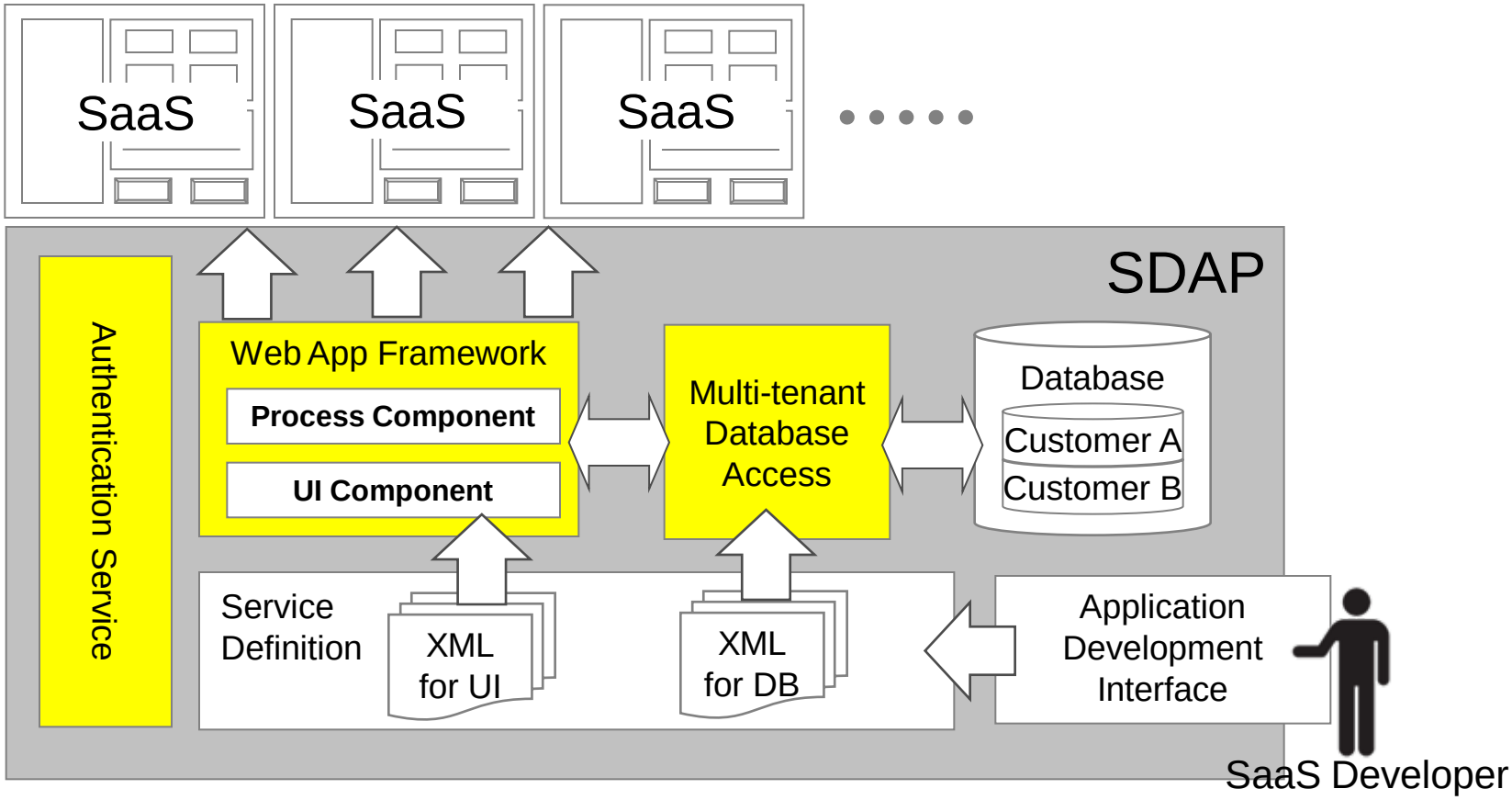
- Accelerate SaaS development and deployment
  - Provide run-time to improve productivity
    - Framework for SaaS Services
  - Provide common services used by applications
    - Authentication Service, Printing Service
- Keep competitive cost structure
  to satisfy the cheaper price requirement to cloud
  - Cost strength of OSS



Develop SDAP with OSS

SDAP Overview

- Private platform specialized for SaaS service
- Using various kinds of OSS (Middleware, Library…)



Authentication Service

Requirements for Authentication Service

- Transparent authentication between multiple SaaS services
- High reliability
  - Redundant configuration

Single Sign-On software

- Tight linkage with the platform
  - Customer information, Log-in record

Need to customize the source code

Open Source SSO Comparison

Compared three Open Source SSO Software

Software	License	Community's Activity	Features	Software Size
JOSSO	BSD	Moderate	Good Enough	Tiny
CAS	APL	Moderate	Moderate	Moderate
OpenSSO	CDDL	Not active	Highly Functional	Large

*CAS: Central Authentication Service

- Why we chose JOSSO?
  - Proper license to modify the code
  - Simple and tiny code
  - Good enough features to satisfy our requirements

About JOSSO

- Java Open Single Sign-On (JOSSO)
  - SSO for Web Applications
  - License：BSD
- Features
  - Transparent cross-domain Single Sign-On
  - Run as a reverse proxy and an agent
  - Support various kinds of Java application servers including Tomcat and JBoss
  - Support LDAP and RDBMS for storing credentials
  - Standard based: SOAP, JMX, JAAS
  - Simple framework to allow flexible customization

Web Application Framework

Requirements for Web App Framework

- Automatic page generation
  - Generate a HTML page from a definition file and UI components
  - Support add-on development of UI components

Easy development of UI components

- Good user experience
  - Rich UI components with JavaScript

AJAX support

***AJAX: Asynchronous JavaScript + XML**

Open Source Web App Framework Comparison

Compared three Open Source Web App Frameworks

Software	Engineer Experience	UI Component Development	AJAX Support
Wicket	Moderate	Easy	Support as default
Struts	Rich	Hard	None
JSF	Rich	Moderate	Partially

- Why we chose Wicket?
  - The only one which satisfy the requirements (Ease of development, AJAX Support)
  - Low dependency on other libraries (Only one 3rd party library)

About Wicket

- Web Application Framework
  - Maintained by Apache Software Foundation
  - License: APL
- Features
  - Object-oriented programming style
  - Simple structure (Pure Java + HTML)
  - Reusable component
  - Default AJAX support
  - Transparent clustering support

Multi-tenant Database Access

Requirements for Multi-tenant Database Access

- Need to customize the database fields for each customer
  - The custom field can be defined by each customer

Require an O/R mapping software

- Need to isolate customer's data
  - Secure multiple customers' data in the same table
  - SaaS developer can develop without special knowledge over the multi-tenancy

Need good extensibility

Open Source O/R Mapping Software Comparison

Compared three Open Source O/R Mapping Software

Software	Document	Engineer Experience	Extensible Interface
Hibernate	Many	Rich	Available
iBATIS	Moderate	Barely	Partially
Torque	Too Few	Barely	Partially

- Why we chose Hibernate?
  - Nice extension Interface for customization
  - Document sufficiency and engineer experience
  - Middleware compatibility (the same OSS community)

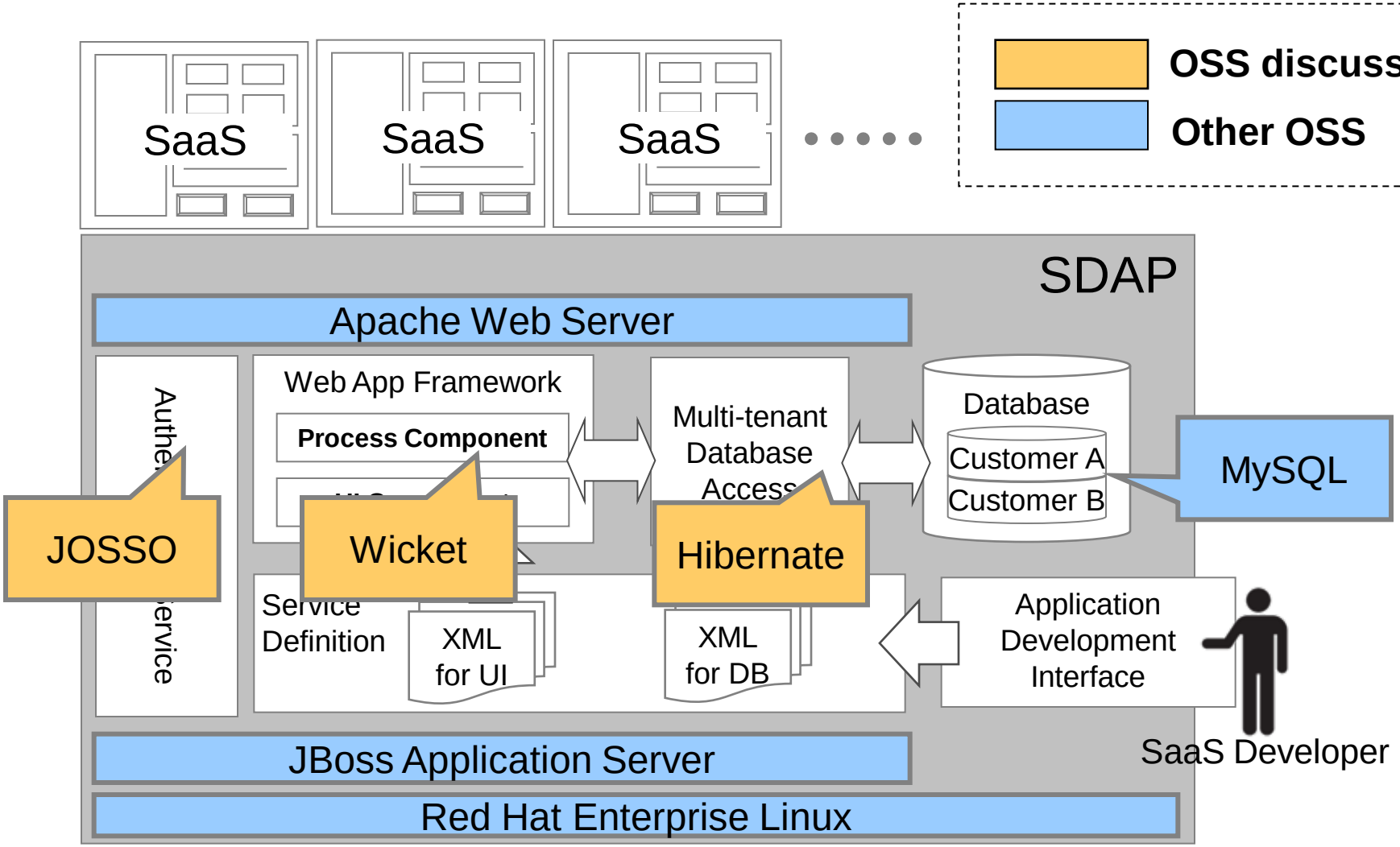
About Hibernate

- O/R Mapping Software in Java
  - Developed by JBoss.org
  - License：LGPL
- Features
  - Simple usage, POJO (Plain Old Java Object) based
  - Rich documents and tools
  - Flexible mapping definition
  - Support many RDBMS
  - Highly functional: extension interface, caching
  - Paid support by Red Hat

Criteria for OSS Adoption

- License
- Feature (requirement satisfaction)
- Activity of community
- Maturity and stability
- Amount of document
- Engineer experience
- Software size, complexity
- Paid support

OSS in SDAP



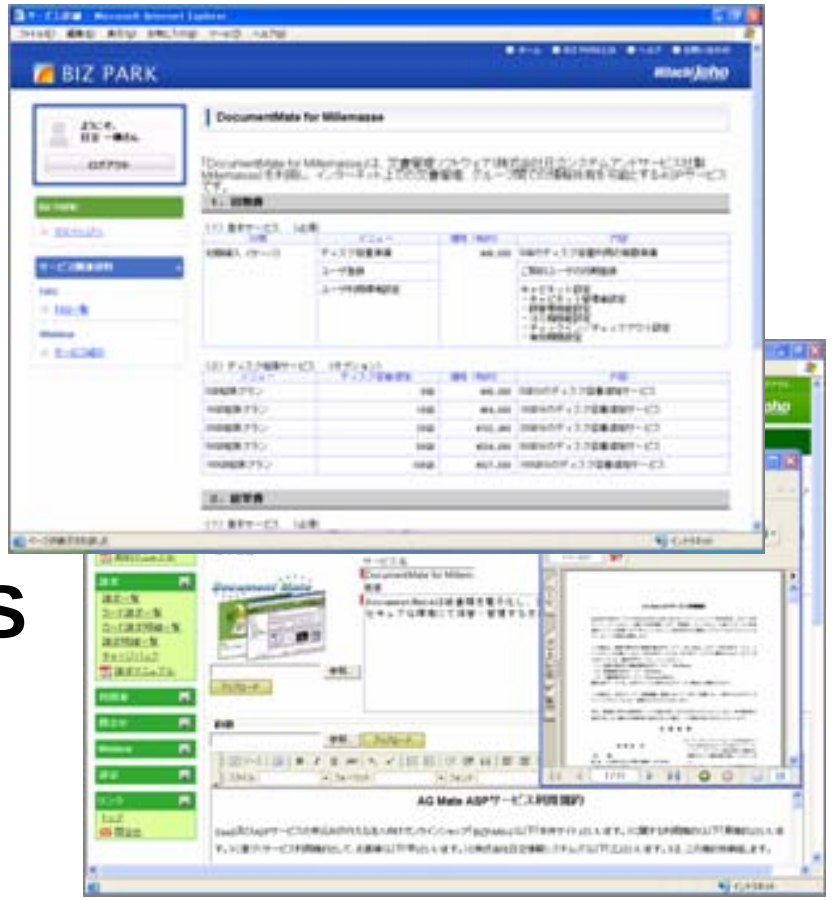
List of OSS in SDAP

- Service
  - JOSSO (single sign-on)
  - JasperReports (printing)
- UI
  - Wicket
  - Mootools (javascript)
  - Dojo (javascript)
- Persistent
  - Hibernate
  - XStream (XML)
- Tool
  - Apache AXIS (SOAP)
  - OGNL (expression)
  - Log4j (log)
  - Commons Utilities
- OS/Middleware
  - RedHat Enterprise Linux
  - Apache Web Server
  - JBoss Application Server
  - MySQL

Example of Application of SDAP

- **BIZPARK**
  Web selling system for SaaS

  - ✓**Self-service portal**
    - Contract mgmt
    - Usage report
  - ✓**Online storefront**
    - Service catalog
    - Service subscription
  - ✓**Billing engine for SaaS**
    - Recurring payment
    - Credit-card settlement



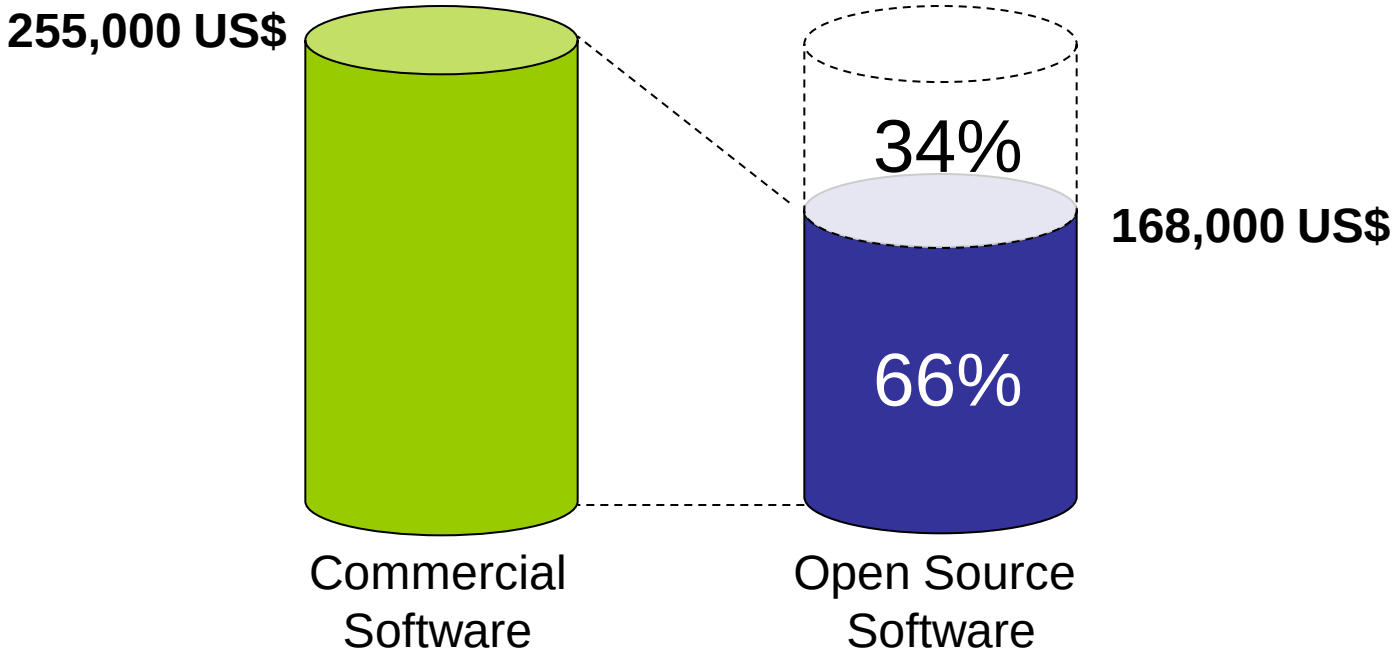
Efficacy of SDAP (Productivity Improvement)

- BIZPARK Development Process
  - Number of Pages: 163
  - Source lines of code (SLOC): 28,000 lines
    - Reduced SLOC by 43%

  - Programming Phase: 224 man-days
    - Reduced man-days by 31%

Efficacy of SDAP (Cost Reduction)

- Software cost estimation in BIZPARK
  - Fees for license, maintenance and support
  - Assumed 5 years running



* 10 servers (App Server: 2, DB Server: 2, Others: 6)
* 1 US$ = 98 JPY

Conclusion

Wrap-up

- Developed PaaS platform with OSS
- Reduced man-days by 31%
- Reduced software-related cost by 34%

Conclusion

OSS is effective for developing cloud service

- Cost Advantage
- Ease of Customization

Key Points to Adopt OSS

Guideline

1. **Choose OSS which meets the requirements**
   - Minimize the customization
2. **Choose extensible software with simple interface**
   - Code-level customization is always risky
3. **Choose the most simple one**
   - Ease of customization

Thank you!

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