

Big Surge in the use of Open Source in Mission Critical Systems of NTT

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1. How was OSS Center established?

- **NTT OpenSourceSoftware (OSS) Center**
- **Business Trends in Japanese telecom**

2. What are major activities of OSS Center?

- **Total support, OSS Stack Model (OSSVERT),**
- **Middleware enhancement**

3. What is current situation?

- **Applied area of OSS**

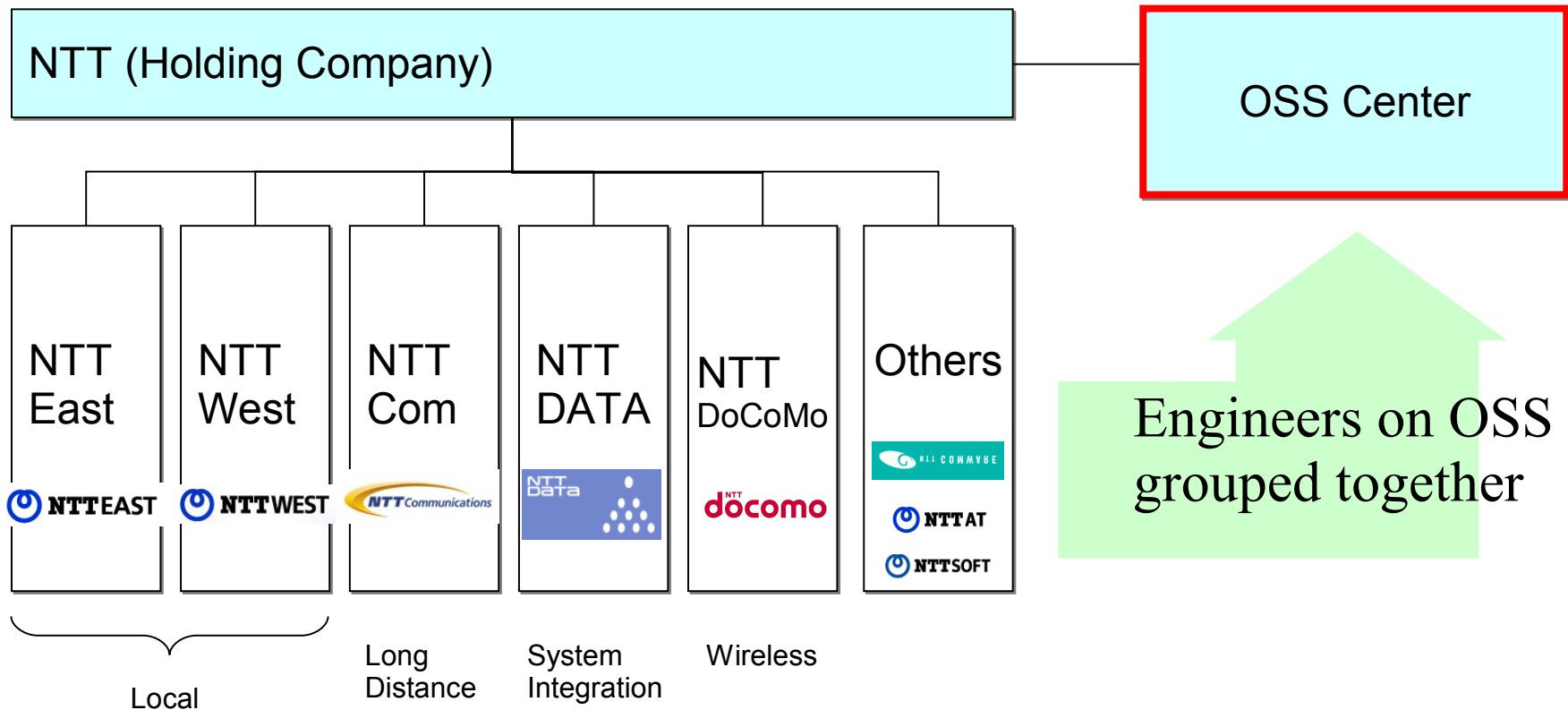
4. What should we do for next step?

- **Migration from commercial product to OSS**

5. Summery: Japanese OSS market and lessons to be learned by NTT

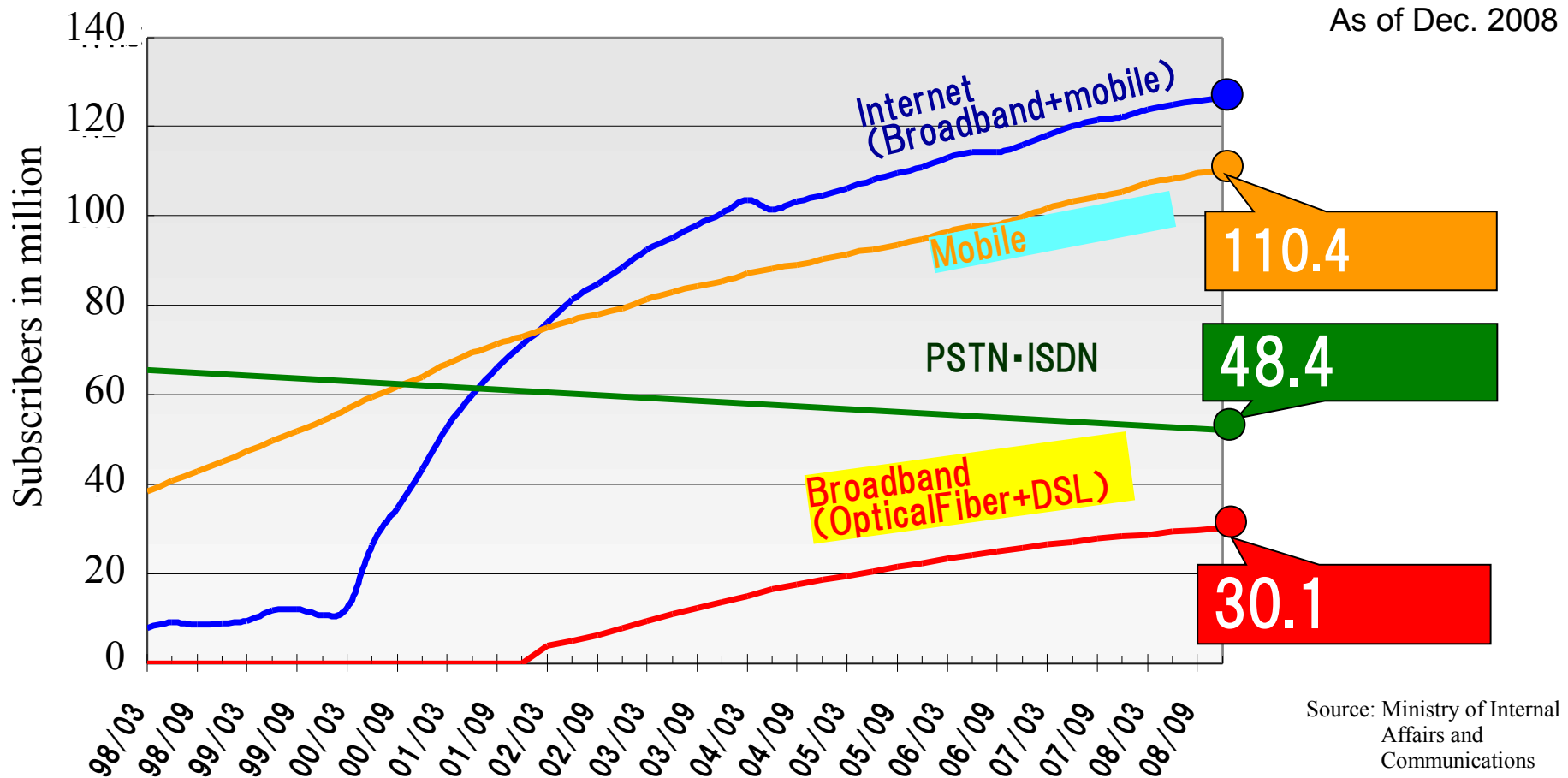
1. How was OSS Center established?

- **NTT is the biggest telecom company in Japan.**
Revenue: JPY 10.4T, Employee: 196,300 (March, 2009)
- **OSS Center belongs to the holding company to support group companies.**
Employee: 100



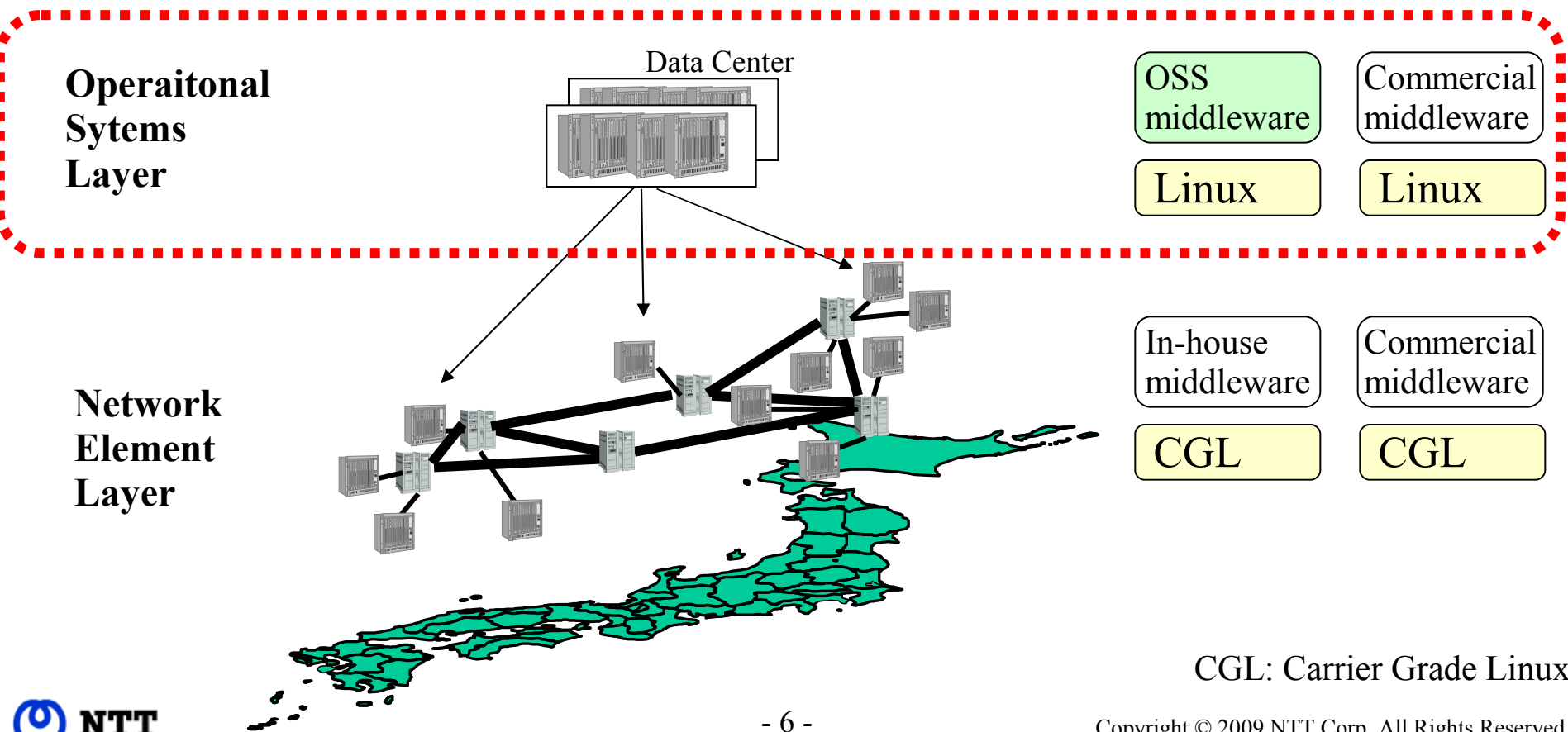
Business trends in Japanese telecom

- The number of subscribers of PSTN is decreasing gradually.
- Cost reduction is crucial matter because income from Broadband can NOT cover up the decreasing of one from PSTN.



Focus using OSS

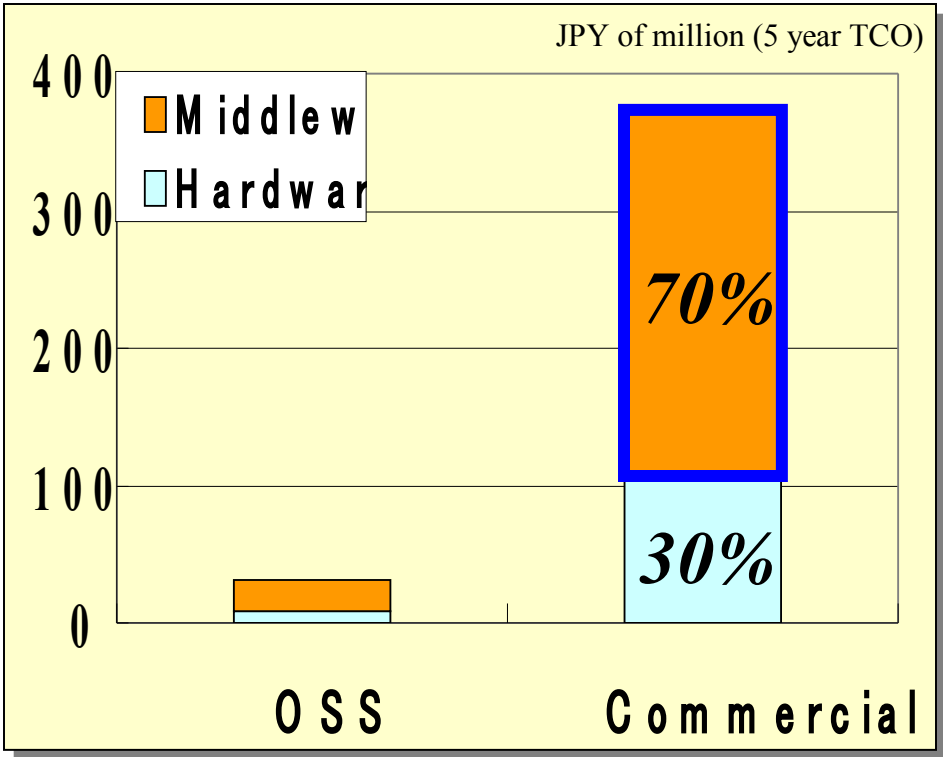
- OSS has been using in both Network element and Operational Systems Layer.
- OSS Center currently focuses on Operational Systems Layer to reduce the system cost



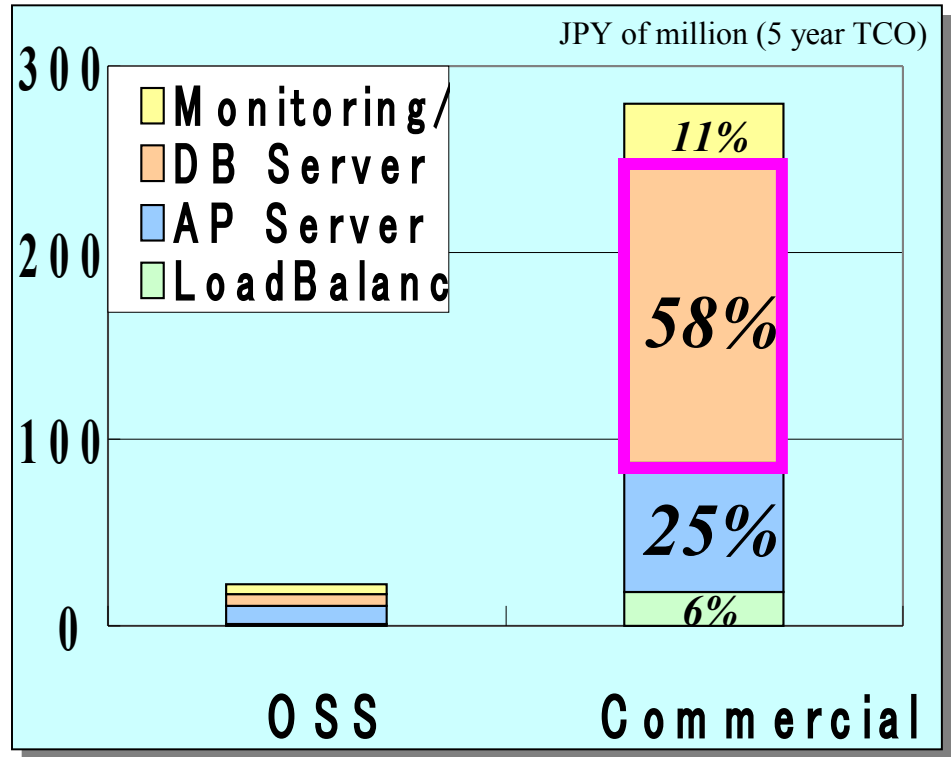
Cost reduction with OSS ~Comparison in standard model~

- **90% of the cost of Hardware (*1) & Middleware can be reduced (*2)**
- **Cost reduction of middleware, especially DBMS and AP Server, is larger than the one of hardware**

(*1) Including cost of OS
 (*2) Comparison in standard price
 (*3) LoadBalancer includes hardware cost



Hardware vs Middleware



Category of middleware(*3)

2. What are major activities in OSS Center?

Approach to promote OSS

- Biggest problem to promote OSS is **lack of support** vender
- SI venders need **information**: characteristic features of each OSS, and how to use them

Major issues

Getting correct information

Support for trouble shooting

Selecting OSS and how to use it

Enhancement of OSS

Solution from OSS Center

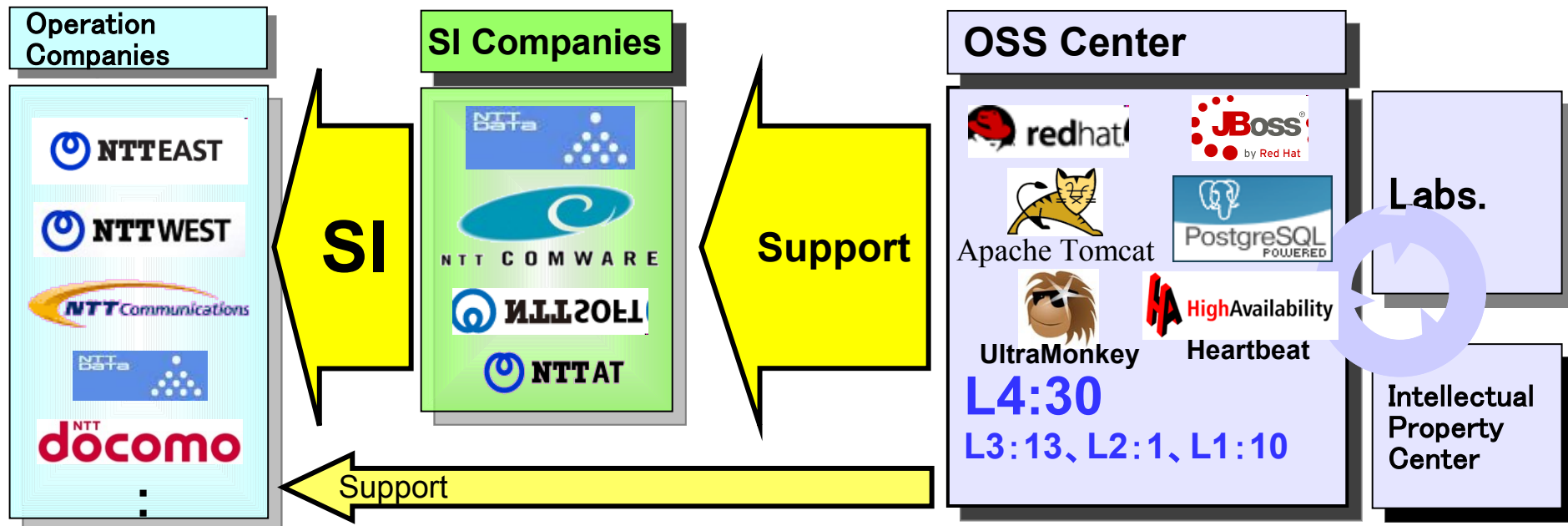
1. **Total support**
 - Consolidate info. sufficiently
 - Trouble shooting
 - Provide original patch

2. **Reference model (OSSVERT*1)**
*1 : OSs Suites VERified Technically

3. **Development of OSSs in community**

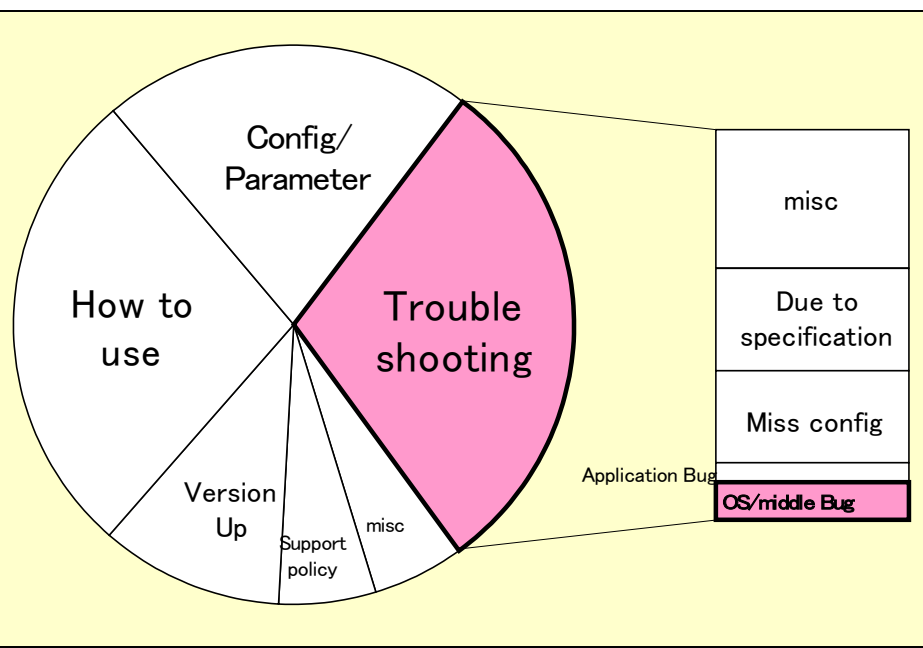
① Total Support

- One stop support of more than 50 middleware which are necessary for operational systems
- Providing a high quality support comparable to commercial products, with the level L1 to L4
 Bug&Patch information(L1), Simple question&answer (L2)
 Trouble shooting(L3), Original patch(L4)
- Providing wide range of consultation from designing to maintenance phase

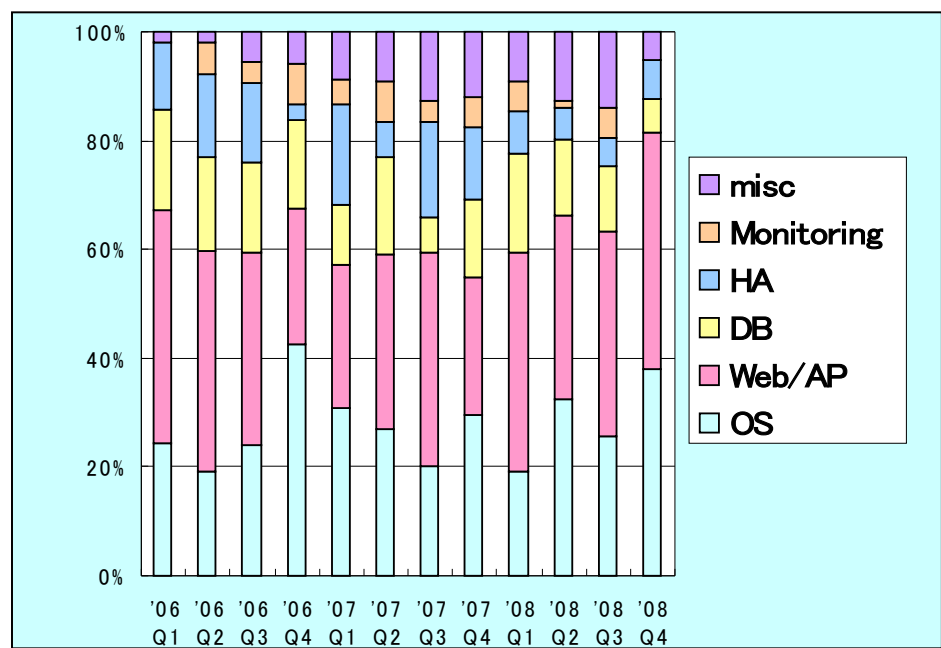


① Situation in total support

- Troubles caused by software bugs were **3%** of total (**3200**) cases: **90 %** of the bugs had been reported from the community. **Quality of middleware is stable.**
- **60% of trouble shootings were for OS-Web / AP**
 OS: included packages, rather than Kernel, in RHEL2.1~4
 Web / AP: peripherals such as auditing tools for JVM



Breakdown of inquiries

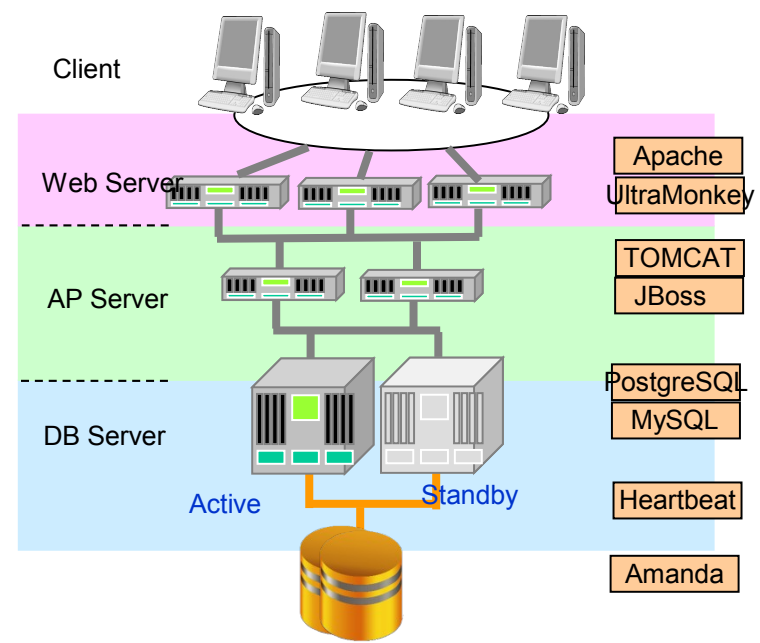


Category of middleware

② OSSVERT (OSs Suites VERified Technically) - OSS Stack Model -

- **OSSVERT is an OSS stack model** to check interconnectivity of multiple OSSs and quality of each OSSs
- **Parameters of each OSS are determined** by the result of testing using OSSVERT
- **Testing is executed more than 10 times** each year according to the time of release of comprised middleware

Model	Middleware	Schedule
		06 07 08
WEB3-R4P	RHEL4 + TOMCAT + PostgreSQL	● → → →
WEB3-R4O	RHEL4 + TOMCAT + Oracle	● → → →
WEB3-R4M	RHEL4 + TOMCAT + MySQL	● → → →
WEJB-R4P	RHEL4 + JBoss + PostgreSQL	● → → →
WEJB-R4O	RHEL4 + JBoss + Oracle	● → → →
WEB3-R5P	RHEL5 + TOMCAT + PostgreSQL	● → → →
WEB3-R5O	RHEL5 + TOMCAT + Oracle	● → → →
WEB3-R5M	RHEL5 + TOMCAT + MySQL	● → → →
WEJB-R5P	RHEL5 + JBoss + PostgreSQL	● → → →
WEJB-R5O	RHEL5 + JBoss + Oracle	● → → →
WEJB-LB]	LoadBalancer Model	● → →
WEB3-R5x[A-h-X]	Virtula Machine Model (Xen)	● → →

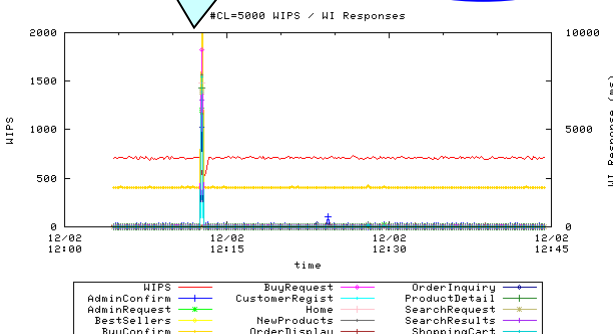


② Example of testing

- We detected **performance degradation** in AP Server at a mock failure testing using released **mod_jk 1.2.27**
- The problem caused by incomplete specification about error handling was **fixed in mod_jk 1.2.28**

Only accepted connection's throughput is degraded.

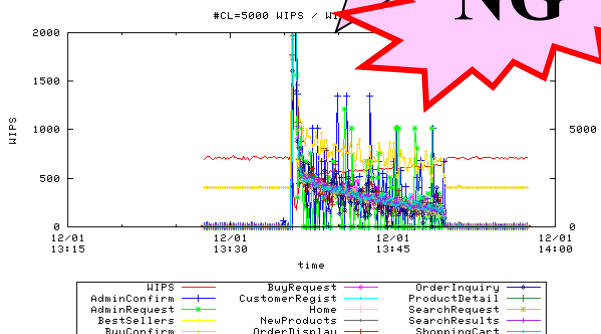
OK



mod_jk 1.2.22

Newly coming connection's throughput is also degraded.

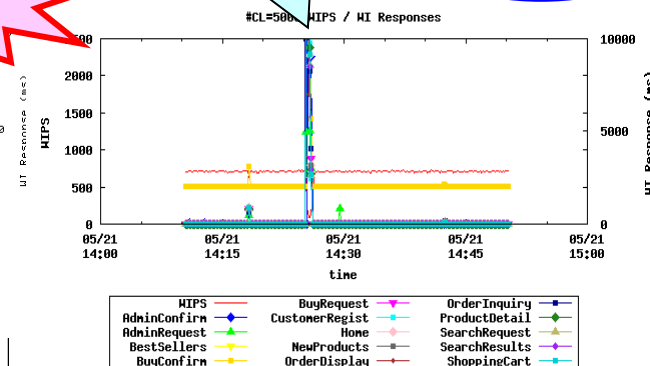
NG



mod_jk 1.2.27

Only accepted connection's throughput is affected.

OK









mod_jk 1.2.28

③ Development of OSS

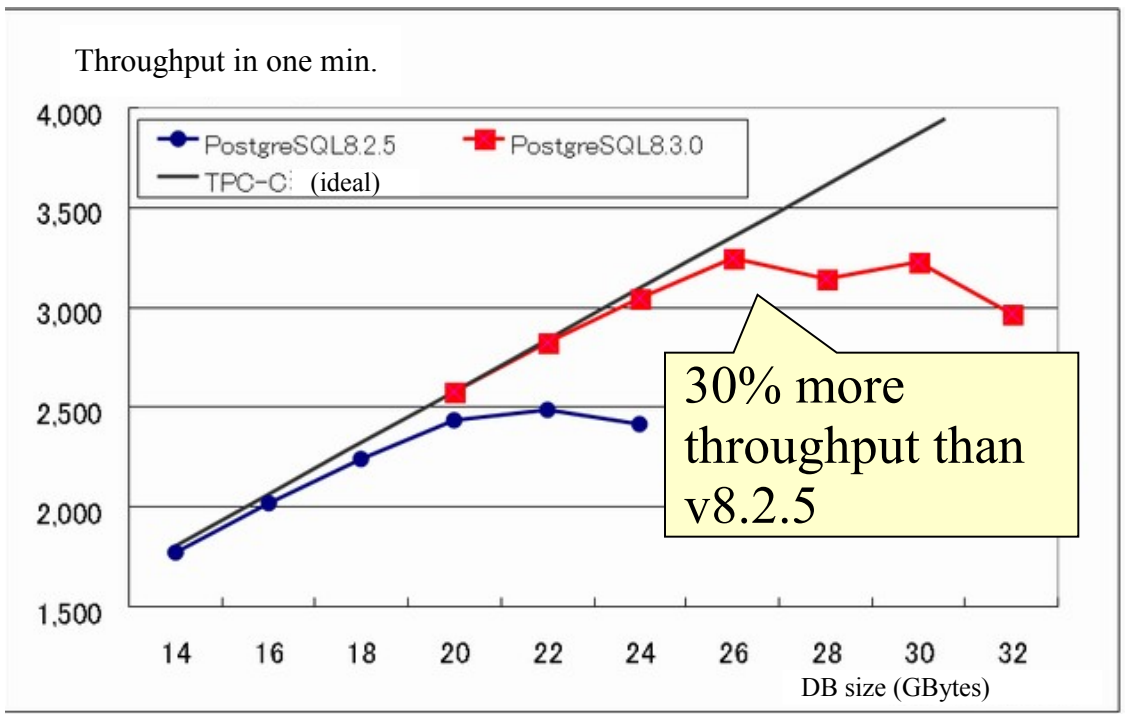
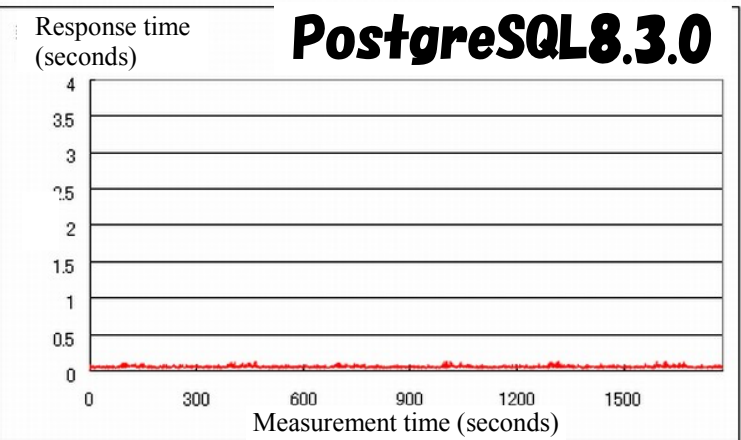
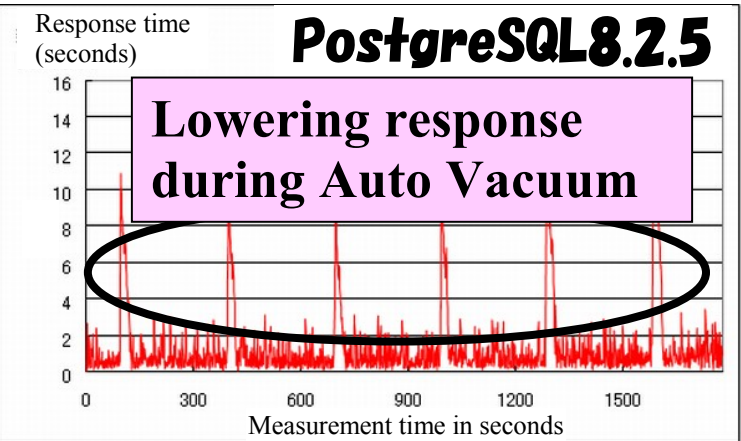
- **Contribution of bug patches and codes** to improve quality, functionality and performance
- **Contribution of manpower** such as board member and committer to activate OSS community

As of Mar. 2009

OSS (code volume)	Major contributing activities by NTT OSS Center
PostgreSQL (800KL) 	<ul style="list-style-type: none"> • Contribution to PostgreSQL community 【Accepted 48 patches】 - to enhance reliability and performance.
Linux (6.0ML) 	<ul style="list-style-type: none"> • Contribution to Linux Kernel community 【Accepted 483 patches】 - to enhance functionality and performance of Linux kernel.
TOMCAT/Mod_jk (630KL) 	<ul style="list-style-type: none"> • Contribution to Apache foundation - to report and provide patches.
Jboss (1.7ML) 	<ul style="list-style-type: none"> • Contribution to JBoss community - to provide Japanese document and bug reports.
UltraMonkey (30KL) 	<ul style="list-style-type: none"> • Contribution to UltraMonkey community - to provide patches and RPM as a core member.
Heartbeat (150KL) 	<ul style="list-style-type: none"> • Contribution to Linux-HA community 【Accepted 53 patches】 - to provide bug patches and code to enhance reliability and maintainability. - to open Japanese site and provide Japanese document, RPM, and tools.

③ Development of OSS (Example of PostgreSQL)

- Deterrence of context switch storm (in 2006) ⇒ PG8.2
- Load balancing checkpoint (in 2006) ⇒ PG8.3
- **Auto Vacuum (in 2006) and its improvement (in 2007) ⇒ PG8.3**
 Deterrence of occurrence frequency of Vacuum, and improvement of processing efficiency



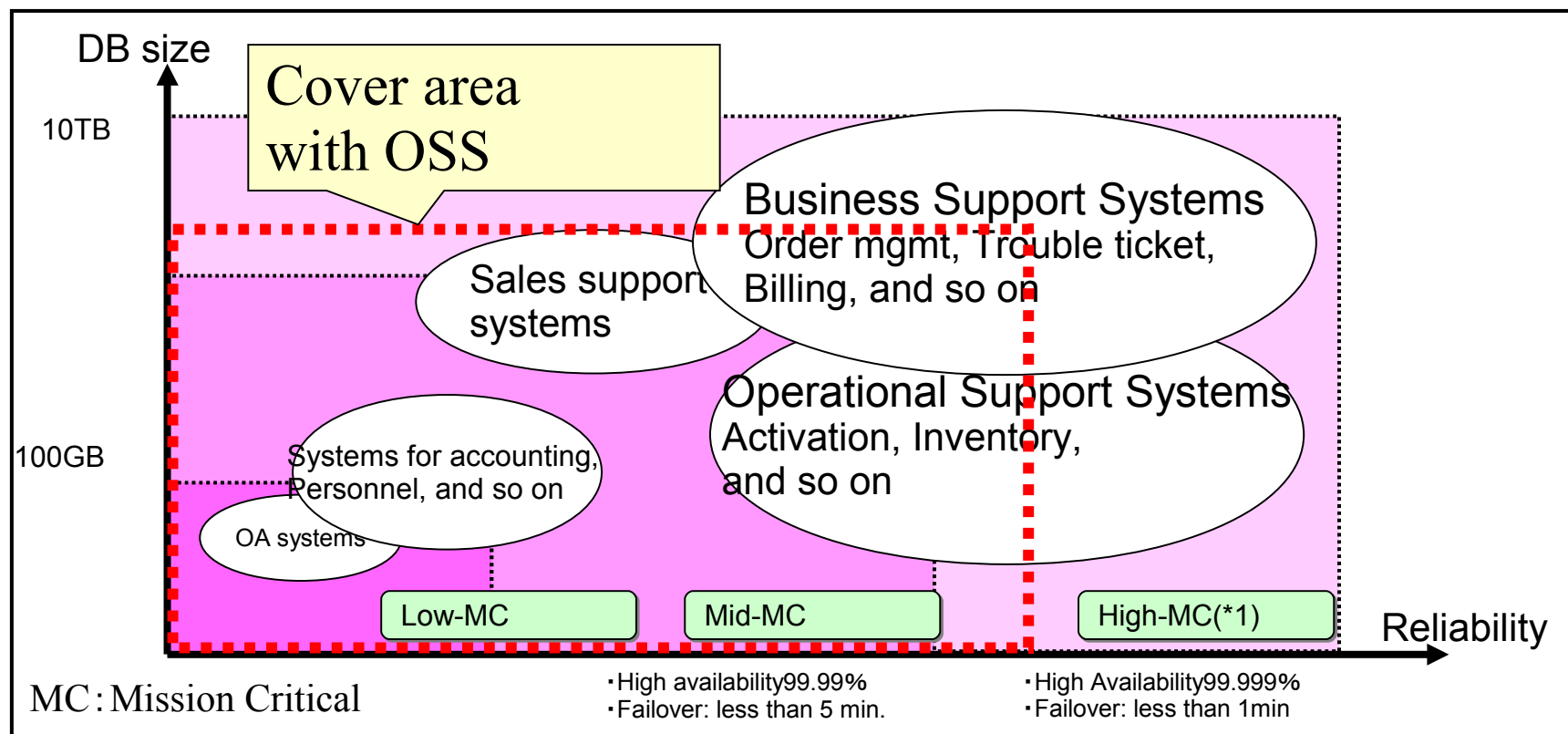
Comparison of throughput

3. *What is current situation?*

Cover area with current OSS

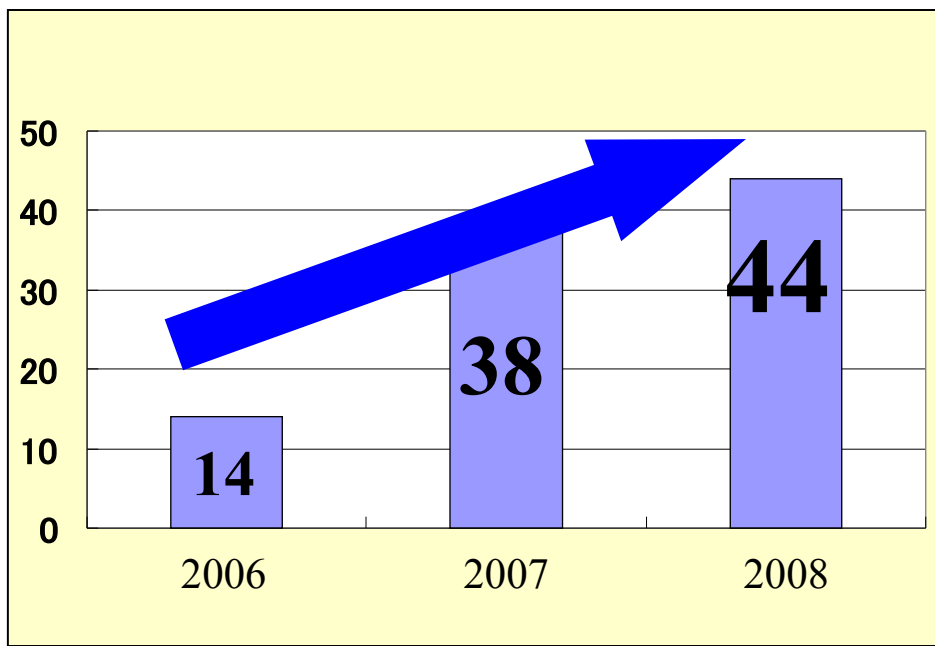
- OSS can be applied in **80% of the telecom systems**
Constraints: Some commercial middleware are NOT support on Linux.
Migration cost from UNIX to Linux is high.
- High-MC is a challenging area to replace with IA servers, to fulfill the maintenance & operation demand, i.e. 24/7 support.

(*1)Some middleware is applied in peripheral systems

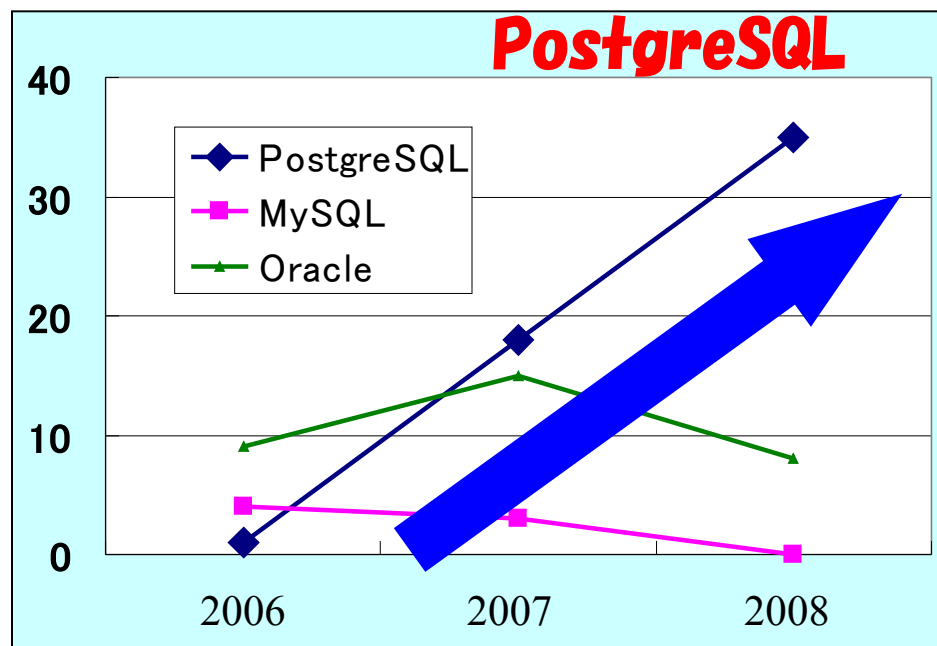


Status of OSS deployment

- The number of systems deploying OSS is **increasing steadily**.
- **PostgreSQL is expanding** dramatically. **80%** of renewal and brand-new systems deployed PostgreSQL in 2008.
- JBoss has come into use these years, starting from small-size systems and going to larger ones.



Number of systems using OSS



OSS DBMSs

- PostgreSQL deployment to operational systems had a **rocket start after version 8.3 released** (in Feb. 2008).

1. Many of back-office systems are migrating to PostgreSQL-based **with minimum effort,**

- Technical seminar, open training courses, etc.

2. Some of telecom-operation support systems are migrating **with careful pre-studying and testing effort,**

- Our engineers had successfully supported to migrate **10 systems** from commercial DBMS to PostgreSQL in 2008.

3. A pilot project to migrate large-scale & mission-critical systems such as customer billing systems is under going **with maximum effort,**

- NTT OSS Center is contributing PostgreSQL community in **function development & performance improvement,**
- **Community-based product development is more profitable than internal project** owing to **world-highest level of design-reviewers** and **least maintenance cost once the community accepted.**

- Number of JBoss deployment is **steadily increasing** for these years,
- Basic features are considered to be good enough in terms of quality & performance.

- 1. A large-scale & dedicated customer relationship management system** was renewed by deploying Linux & Jboss,
 - And successfully reduced a huge amount of license cost.
- 2. A telecom-inventory management system** was migrated from commercial application server to JBoss at the timing of system renewal and server consolidation,
 - Because the volume of application modification was estimated to be equal for both approach.
- 3. JBoss Messaging & JBoss WS** are deployed to an inter-system communication of **telecom-network monitoring systems which work for 24/7.**

4. What should we do for next step?

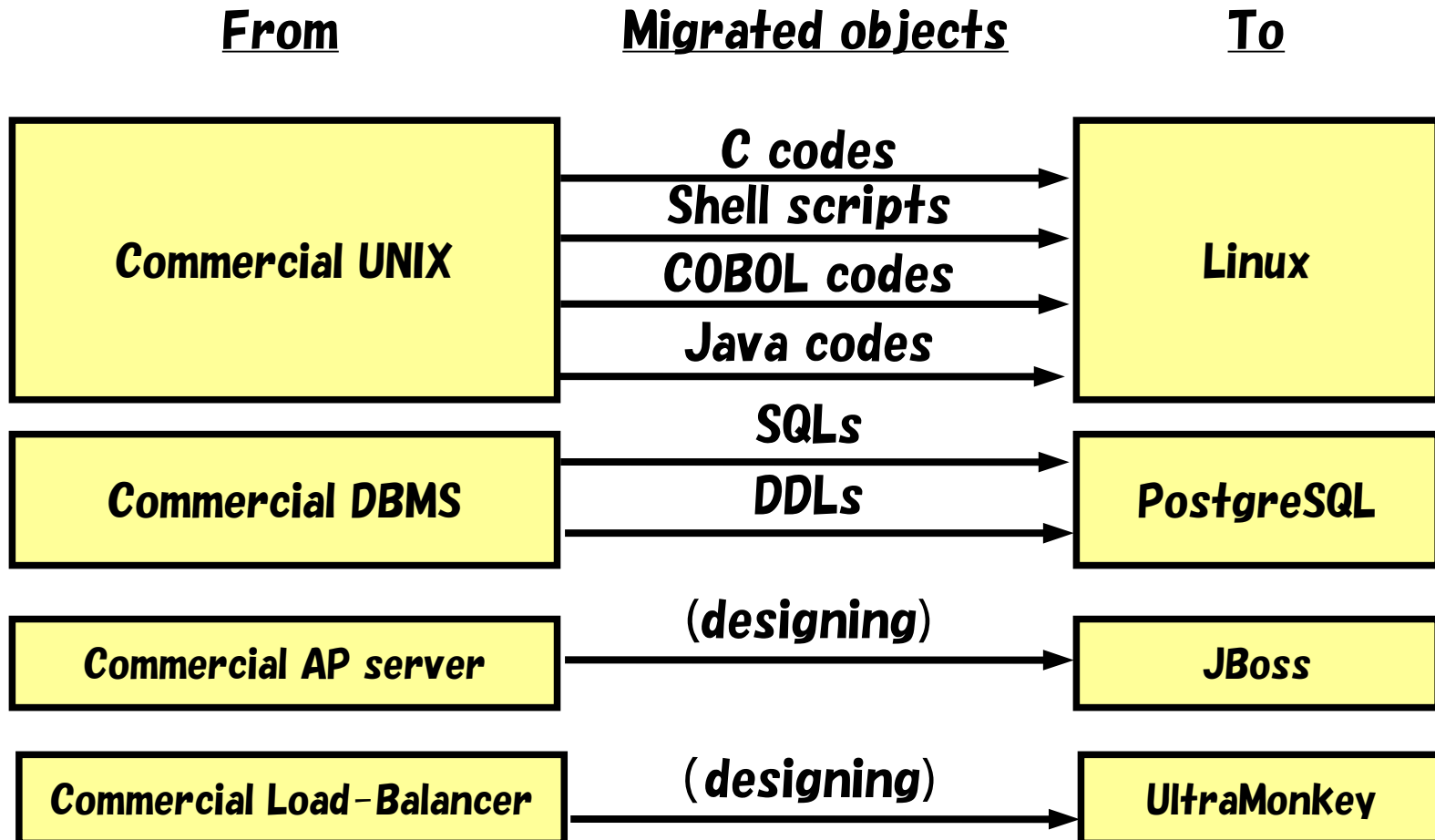
◆ Enhancement of support

- Expanding to other middlewares such as **JavaVM(OpenJDK)**
- **7DX24H support**

◆ Promoting OSS much further

- Server consolidation using **virtual machine environment**
- **Migration solution** from legacy systems
c.f Postgres plus advanced server by EnterpriseDB
- **Training program for OSS**

- **Migrations are on going in each different layers.**



- Different functions in a migration project from commercial UNIX to RHEL5 were studied, and 79 functions in a pilot project are categorized.

Type 1. Abnormal end

- Linux will abnormally end if an argument number delivered to a function is NULL, while commercial UNIX will not.

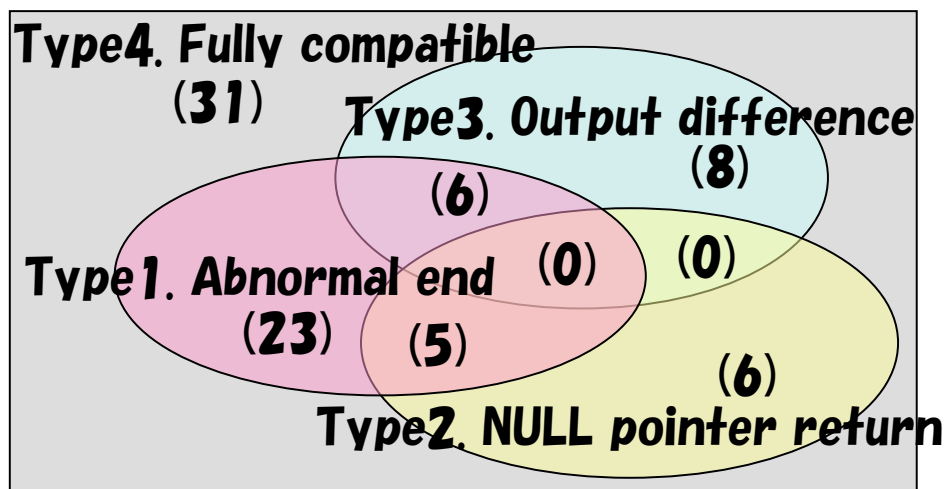
Type 2. NULL pointer return

- Linux will abnormally end if it refer to an address indicated by NULL pointer, while commercial UNIX will not.

Type 3. Output difference

- Calling methods look compatible, but outputs are wrong.

Type 4. Fully compatible



- Application modifying effort & cost in a migration from commercial DBMS to PostgreSQL has been an big obstacle.
- Postgres Plus Advanced Server by EnterpriseDB Corporation is **PostgreSQL-based with advanced interoperability** to commercial DBMS.
- EnterpriseDB & NTT are promoting a close collaboration in PostgreSQL community activities and PostgreSQL deployment in Japanese market.

(before migration)

Application designed
over commercial DBMS

Commercial DBMS

• A pilot project proved a large amount of migration cost reduction,

- Application modifying effort = 1/4 of original approach,
- Total migrating effort = 1/2 of original one.

(after migration)

Original
approach

Application designed
over PostgreSQL

PostgreSQL

Alternative
approach

Application designed
over commercial DBMS

Postgres Plus
Advanced Server

5. Summery: Japanese OSS market and lessons to be learned by NTT

OSS Business Survey in Japan

by Information-Technology Promotion Agency, Japan

- **Information-Technology Promotion Agency, Japan, made a questionnaire survey of OSS use and business in IT companies in Japan, 2008,**
 - **“2nd Market Survey of Business exploiting Open Source Software,” Jan. 2009,**
- **Survey sheets were sent to 4,729 companies, and 802 companies replied,**
 - **Software business (442 companies):**
 - ➔ **Dedicated software development, Software products.**
 - **Data processing and providing business (80 companies):**
 - ➔ **Data processing, system maintenance & operation, database services.**
 - **Accompanying services with Internet (10 companies):**
 - ➔ **ASP, IDC, contents delivery, advertising with portals, billing/accounting/debt collecting agency, etc.**
 - **Others (34 companies):**
 - ➔ **Hardware sales, IT training, etc.**

Barriers to popularize OSS

(Quoted from "2nd Market Survey of Business exploiting Open Source Software," Jan. 2009)

- (1) An insufficiency of talented engineers, (2) of technical support services, (3) of systematic training materials, and (4) complicated license systems" are major barriers.

Outer factors

[Talented engineers] (693 answers)

- **Lack of professional engineers covering a broader range of OSSs (72%)**
- **Lack of architect with insight to exploit OSS (54%)**
- **Lack of experienced project manager (53%)**

[Technical support services] (703 answers)

- **No emergency service provided with professional skills (58%)**
- **A small number of technical support businesses (40%)**
- **A small volume of Japanese technical documentation (37%)**

[Engineer training] (653 answers)

- **A small volume of systematic training materials (54%)**
- **No official standard to measure engineer's skills (49%)**
- **A small number of training schools and courses (38%)**

[Complicated licenses] (702 answers)

- **Hard to grasp (54%)**
- **A small number of educated staff (34%)**
- **No comprehensive guidance (30%)**

Human
factors

Environ-
mental
factors

Internal factors

1. Insufficient function, performance, quality

- Cases in which brand-new functions or performances of commercial product were demanded,
- Cases in which brand-new functions of OSS product were demanded, but not released by community unexpectedly (: **no commitment in community-based development**).

2. Insufficient supporting teams

- This barrier is disappearing these days for major OSS middlewares, by educating engineers and exploiting outside services,

3. Resistance by application building teams

- Higher demand for **cutting human resources and schedule of projects** brings less chance to consider inexperienced OSS products,
- System integrators are reluctant to adopt OSS **without being supported or guaranteed by major product vendors**.

4. Poor delivery channels of accurate & latest information

- **Unsuccessful trials with immature versions** have been passed down,
- Information delivery is poor if it's only by development communities.

5. Price discount by commercial product vendors

- But in many cases, vendors price other products up implicitly...

•Lesson 1

“Only verified suites of OSS middlewares is worth to consider, each single product is not perfect,”

•Lesson 2

“Consider as latest version as possible, experienced version is not necessarily the best choice,”

•Lesson 3

“Never over-expect the development community and roadmap, but help them to be grown as a public property,”

•Lesson 4

“Even OSS development community may be largely affected by M&A of global IT vendors, but enterprise users should keep to be involved in user community and to claim their positions,”

•Lesson 5

“Point is to make engineers aware of “chance to adopt OSS” rather than make executives glad by telling an imaginary cost reduction story,”

•Lesson 6

“Community contributions can be done by different ways: not only by providing development resources, but also by providing use cases, bug reports, organizational staff, etc.”

Thank you