

## Linux for Telecommunication Carrier Systems

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### Abstract

This article reports the standardization of extended specifications of Linux for telecommunication carrier systems. Linux is one of the most popular open source operating systems. With people all over the world contributing updates and bug reports leading to frequent releases of new versions, Linux is becoming an easy-to-use and multi-functional operating system. However, for Linux to be used as an operating system for telecommunication carrier systems, it must be enhanced to provide high reliability and availability.

### 1. OSDL

OSDL (Open Source Development Labs) [1] is a non-profit organization established in 2000 to accelerate the growth and adoption of Linux in enterprises. Its main activity is to define extended specifications of Linux and support open source software development projects by offering test facilities. OSDL is home to Linus Torvalds, the creator of Linux. It has laboratories in the United States (Oregon) and Japan (Yokohama). OSDL members include 49 enterprises and universities in Europe, the USA, Japan, and China. NTT joined in February 2004.

OSDL enacts the specifications in three Working Groups (WGs) called Carrier Grade Linux (CGL), Data Center Linux (DCL), and Desktop Linux (DTL). Each WG is composed of a marketing board that investigates user demands and a technical board that investigates technical requirements. In addition, Special Interest Groups (SIGs), which discuss individual technologies in depth, are organized under the technical board if necessary. A SIG is an organization that crosses WGs. The members of a SIG are not limited to OSDL members and its discussion is open to everyone. Currently, there are two active SIGs: the Security SIG and the Storage SIG. Below, we overview CGL and DCL, which are relevant to NTT.

### 2. Carrier Grade Linux Working Group

The CGL specification is defined as enhancing Linux for use in carrier-grade systems, which must be highly reliable, secure, and scalable. The CGL WG was formed in January 2002. **Figure 1** shows the architecture of CGL. The CGL requirements definition is classified into six categories, including: Standards Compliance (compliance to standards defined by other standard groups), Availability (recovery from hardware or software failure), and Clustering (scalability and high availability through redundant resources). The requirements definition Ver. 1.0 was released in September 2002 and distributions conforming to it are offered by MontaVista, SuSE, and Timesys. The requirements definition Ver. 2.0 was released in September 2003. Currently, the draft of Ver. 3.0 is open to the public and the final release is scheduled for the first half of 2005. NTT is contributing by acting as the editor for the availability area and by opening up its open source projects that relate to the requirements definition. The projects that NTT has opened to the public are the Pannus project [2], which enables bug corrections without stopping processes, and the Resumo project [3], which lets the system restart automatically from backed-up system images when the system could not startup because of faults.

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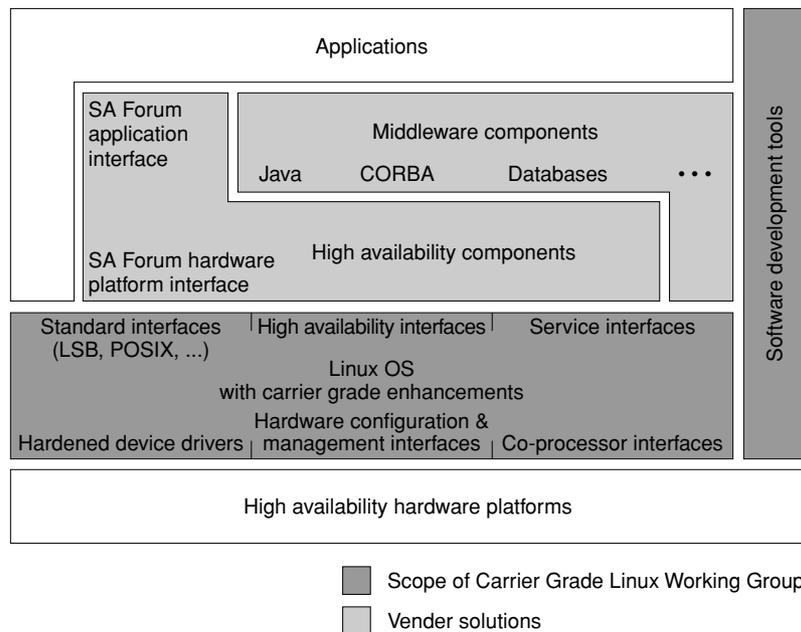


Fig. 1. CGL scope (from OSDL Web Page).

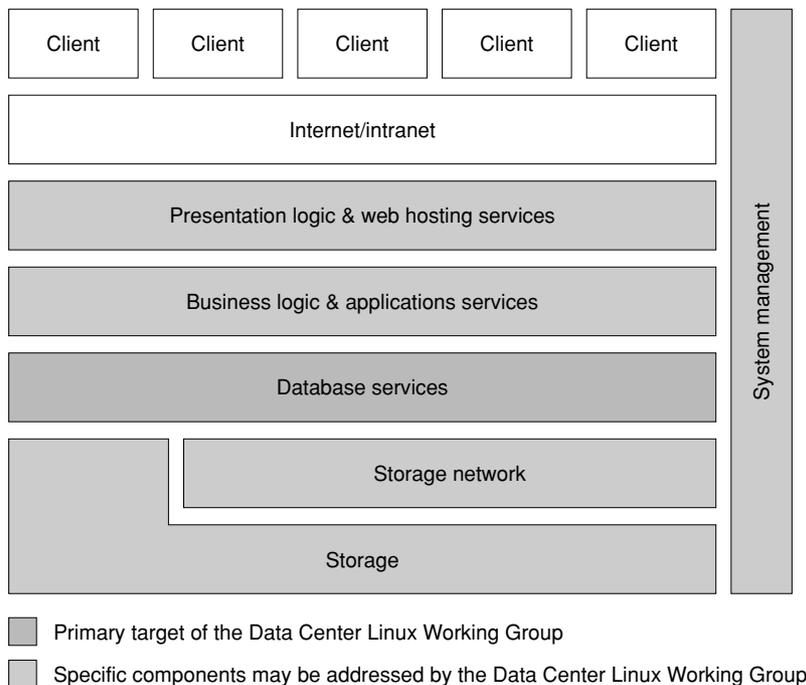


Fig. 2. DCL scope (from OSDL Web page).

### 3. Data Center Linux Working Group

The specification of DCL is defined as enhancing Linux for business systems that use databases. It was formed in April 2002. **Figure 2** shows the architecture of DCL. The main enhancement items of DCL are storage networking to store a large amount of

data, swapping of CPUs, memory, and peripheral equipment without stopping the system, clustering, security, and performance enhancement of Java program execution. The marketing board is defining the marketing capabilities to meet user demands, including non-technical requirements for adopting Linux such as training and support. The technical board has

released the technical capability Ver. 1.0, which lists technical demands and their priority levels. It is scheduled to enact the revised version of the technical capabilities based on feedback.

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#### 4. Concluding remarks

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Major distributors such as SuSE and MontaVista declared that distributions conforming to CGL requirement definition Ver. 2.0 will be put on the market. These releases will enable Linux to be used in many more types of systems. There are some other standardization groups with different purposes, such as CE Linux Forum [4] for improving Linux for embedded systems, SE Linux [5] that provides modules to enhance security, and the Free Standards Group [6] whose aim is internationalization and compatibility among different distributions. With the cooperation of companies in its group, NTT plans to participate in standardization groups that are important to NTT and to widen the range of systems to which open source software can be applied.

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#### References

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- [1] <http://www.osdl.org/>
- [2] <http://developer.osdl.jp/projects/pannus/>
- [3] <http://developer.osdl.jp/projects/resumo/>
- [4] <http://www.celinuxforum.org/>
- [5] <http://www.nsa.gov/selinux/>
- [6] <http://www.freestandards.org/>



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