## What’s Hot in R&D

### Information Sharing Platform Technologies

Technologies for achieving common functions essential to content sharing business and electronic commerce such as copyright management, electronic settlement, and information delivery.

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Sheepdog: Distributed Storage System for Virtual Machines

Overview
Sheepdog is a distributed storage system for virtual machines based on Linux\(^1\) QEMU/KVM\(^2\). It runs on multiple commodity servers and provides highly available and variously sized volumes to virtual machines. Sheepdog is an autonomous system; new servers join automatically, and failed nodes are automatically removed. In addition, Sheepdog scales to hundreds of servers and has linear scalability.

Features
- Reliable system with no single point of failure
- Autonomous and easily manageable system
- Scalable to hundreds of servers in performance and capacity
- Developed as open source software and merged into QEMU/KVM
- Supported by many other management systems (e.g. OpenStack, libvirt)

Application scenarios
- Infrastructure as a Service
- Hosting service based on virtualization
- Server consolidation of many servers
- Online storage service

Footnotes:
\(^1\) Linux is a registered trademark of Linus Torvalds in the U.S. and other countries.
\(^2\) KVM: Kernel-based Virtual Machine
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Data encryption, Access control, Content distribution

### Intelligent Cryptosystems

#### Overview

Intelligent Cryptosystems have advanced logic in their encryption/decryption mechanisms and provide more sophisticated control of data communications.

For example, each document can be encrypted with a decryption condition such as “only division directors or personnel division managers can decrypt it”. Through such advanced encryption/decryption mechanisms, Intelligent Cryptosystems will promote broader usage of cloud computing.

#### Features

- Users can share data securely in a cloud computing environment, because the data encryption and access control mechanisms are integrated.
- A user can encrypt data by specifying only a decryption condition, without specifying who can decrypt it.
- The decryption keys can be independently generated after the encryption process.
- Intelligent Cryptosystems are constructed efficiently and securely by using a new advanced mathematical methodology called “dual pairing vector spaces”.

#### Application scenarios

- Confidential data sharing in a company’s systems
- Content delivery that has flexible access conditions

- Intelligent Cryptosystems were developed by NTT and Mitsubishi Electric Corporation and announced in a news release in July 2010.
Thin Client Technology for Smartphone

Overview
As the adoption of smartphones accelerates rapidly, more and more people use smartphones as a replacement for laptops. There are commercial solutions that bring the conventional thin-client (remote desktop sharing) technology to smartphone users as a way to prevent data leakage. However, since controlling a PC desktop through a small touch screen of a smartphone presents a number of usability issues, mobile thin-client technology tailored for smartphones is in demand. Our approach adopts Android OS (instead of a PC OS) as a thin-client server. This not only allows smartphone users to access a remote Android desktop optimized for small screens, but also utilize the rich devices such as touch panel, camera, GPS, accelerometer and SD card embedded in a smartphone. As a result, users can enjoy greater usability and productivity, while maintaining the same security level of conventional thin-client solutions.

Features
- Supports Android, iPad/iPhone, Windows Mobile, etc.
- Mobile applications installed on a thin client server can support gesture control and access sensor readings, camera and microphone on the client device. These features create new user experience different from that of conventional desktop sharing for PC users.
- Bulk data (sensor log, photos, etc.) stored on a thin-client server can be processed at high-speed through large-scale distributed computing resources in the cloud.
- By mounting an NFS*1 remote storage to a smartphone as a virtual SD card, all applications on the smartphone can read/write data directly from/to the remote storage (without any dedicated API*2).

Application scenarios
- Store confidential location information on a corporate map server, receive GPS signals from a smartphone and prevent data leakage by transmitting only the graphic pixels of map images back to the smartphone.
- Decode a QR code on the server, extract additional corporate information and transmit the graphical image of the result back to the smartphone.
- Make phone calls by looking up a remote client telephone directory without importing it to the smartphone.
- Take confidential photos and save them directly to the remote storage without leaving any local copy.

*1 NFS: Network File System
*2 API: Application Programming Interface