Oxide TFT Fabrication Technology
-Aiming to realize a large screen sheet-type display system-

In order to make Super Hi-Vision (SHV) with its strong sensation of reality available for viewing at home, STRL is advancing research on a thin, lightweight, flexible, large-screen, sheet-type display device. While an Organic Light-Emitting Diode (OLED) display that will allow the fabrication of a thin display is considered promising, its driving operation requires the fabrication of a Thin-Film Transistor (TFT) to control the light-emission of the individual pixels of the OLED (Figure 1). For this reason, research is progressing with a focus on oxide TFTs based on oxide semiconductor materials with higher mobility in comparison with the current amorphous silicon TFTs.

One of our recent advancements involves a new fabrication technology for miniaturization of TFTs with the goal of enhancing the resolution of a display based on oxide TFTs. An oxide TFT controls the electric current that flows between the source and drain electrodes using the voltage applied at the gate electrode (Figure 2). These types of TFTs are fabricated through the positioning and processing of the semiconductor insulator and electrodes using photomasks with the desired pattern. The current TFT configuration has alignment margins for positioning to avoid gaps (Figure 2). This alignment margin produced a longer current path and hindered further size reductions. We recently succeeded in self-aligned TFT fabrication, in which a laser beam is irradiated from the back side to use the gate electrode itself as a mask for processing the source/drain electrodes without the use of a photomask (Figure 3). This fabrication technology requires no alignment margin. Thus, the current path is shortened and smaller TFTs can be fabrication.

In the future, research will move forward on attaining higher oxide TFT mobility, with the goal being fabrication of a large-screen sheet-type display device.

Figure 1: OLED display pixel cross-sectional view

Figure 2: Current oxide TFT structure and fabrication method

Figure 3: New self-aligned oxide TFT structure and fabrication method
Parallel Distributed Processing System for Broadcasting Content

The next generation of broadcasting editing system will use cloud computing. The editing system will be located in the cloud, and it will be easily accessed via a network from various locations. It will also feature the capability to add processing functions and new compression schemes solely through the use of software, without the need for new hardware.

Parallelization is one of the effective ways to enhance the performance of processing in the cloud. However, conventional parallel distributed processing has issues involving lower processing speeds over the entire system and unstable operation when there is a server with low processing performance or when congestion occurred in part of the network.

To overcome these issues, STRL is developing a parallel distributed processing system based on the Flow Media File Transfer Protocol (FMFTP) technique, which can dynamically control the amount of data transferred.

A management server within the cloud monitors the buffer status of the FMFTP data transfers in order to estimate the performance of the parallel processes and the network traffic status. If it determines that there is a deficiency in the process performance, it will adjust the number of parallel processes or the amount of data transferred by each process, and it will maintain the overall system processing speed by distributing the processing load to other servers. When it estimates that there is network congestion, the system will guide the data transfer network path to a less congested route using OpenFlow* technology (Figure).

An evaluation of the processing performance on an experimental system that we constructed confirmed that the processing speed could be maintained even when part of the server experienced an increased load. It also verified that the system processed quickly and stably by rerouting data paths when there was heavy data traffic in part of the network.

Our future work will involve making performance enhancements to the processing system by verifying its ability to control a larger scale system.

* OpenFlow: a technology that allows dynamic path control by separating the path control function from the individual network switches.