

# Next-Generation Real-Time OS Conforming to $\mu$ T-Kernel Specification

## SOFTUNE $\mu$ T-REALOS/FR



SOFTUNE  $\mu$ T-REALOS/FR is a real-time OS conforming to the  $\mu$ T-Kernel specification, which is currently under the spotlight as the successor of the conventional  $\mu$ ITRON. It supports originally reinforced functions such as those for memory saving and power saving, thereby contributing to improved efficiency and reduced cost in customer application program development.

### Overview

$\mu$ T-Kernel specification is a real-time OS specification for small-scale embedded devices. The  $\mu$ T-Kernel specification document and reference codes were opened to the public on March 28, 2007 by the T-Engine Forum, an organization for the standardization and promotion of ubiquitous computing infrastructure technology.

This product conforms to this  $\mu$ T-Kernel specification. So, this enables tuning for the architecture and realizes speedup and memory saving for the kernel. FUJITSU is the first in the industry to release an OS conforming to the  $\mu$ T-Kernel specification.

This product is optimal for household appliances such as TVs and air conditioners, automotive products such as automobile meters and automobile audio systems, and industrial inverters.

### Product Features

#### ■ Excellent transition properties

At a higher order of  $\mu$ T-Kernel specification, there are high-

function T-Kernel specification, T-Kernel/SE specification with the addition of communication, file system, and so forth, and MP T-Kernel specification for multiprocessors; the overall specification is systemized as the T-Kernel family. The transition to an OS for larger embedded systems such as T-Kernel specification OS and MP T-Kernel specification OS is straightforward adopting this  $\mu$ T-Kernel specification OS.

SOFTUNE  $\mu$ T-REALOS/FR plans to support  $\mu$ ITRON-compatible API so that conventional  $\mu$ ITRON users can easily shift to a  $\mu$ T-Kernel specification OS with these features. This will facilitate the reusability of  $\mu$ ITRON middleware and applications and enable smooth transition from a  $\mu$ ITRON-specification OS to a  $\mu$ T-Kernel-specification OS.

#### ■ Memory saving

The FR family has been utilized in household products such as TVs and air conditioners, automotive products such as automobile audio systems, industrial inverters, and so forth. To reduce parts cost for the final product in such applications, it is essential that the amount of memory used by the kernel be minimized.  $\mu$ T-REALOS/FR is equipped with a configuration tool to obtain and select the kernel function to be used by the

application program and optimize the memory usage.

**Fig.1** presents the memory-saving functions.

**Power saving**

Power-saving requirements of electronic devices have also been directed toward the OS. μT-REALOS/FR supports unique power-saving functions to control the power by the unit of tasks. It will also be possible to save application program power by utilizing a performance-tuning tool that is being planned to be provided separately.

**Fig.2** presents the power-saving functions.

**Development Environment**

**SOFTUNE REALOS configurator**

By using the configurator to obtain and select the kernel function, it is possible to construct a kernel with optimal performance and memory size for the application program. Our customers will be able to concentrate on document-less system development using the tree-view-type GUI.

**[Features]**

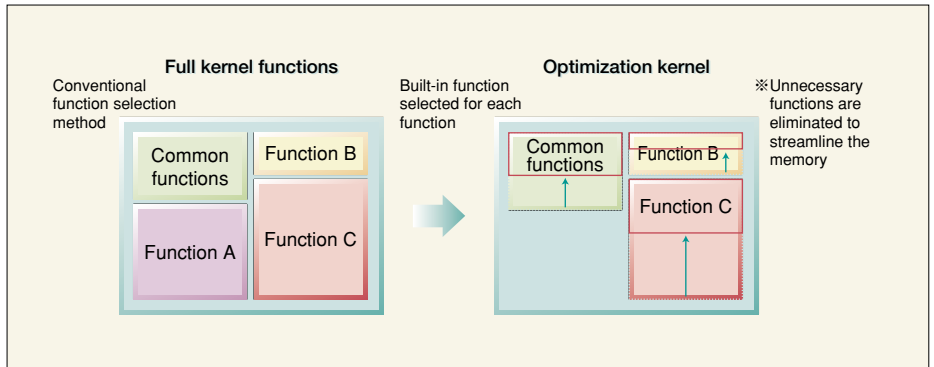
- System development by the tree-view method
- Definition of configuration data
- Consistency check on configuration data
- Calculation of OS kernel size

**Fig.3** presents a configurator screen.

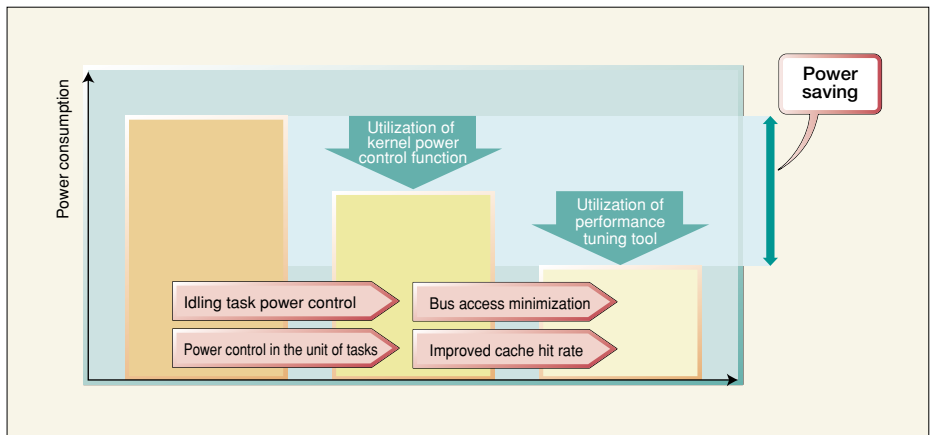
**SOFTUNE REALOS analyzer**

This is an analysis tool for application programs using REALOS. By adding the task analysis module to the user system, various analysis results including task transition graph with time stamps can be displayed graphically.

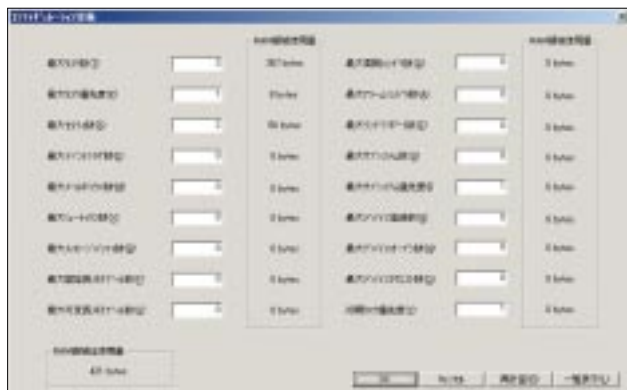
**Figure 1** Memory-Saving Functions



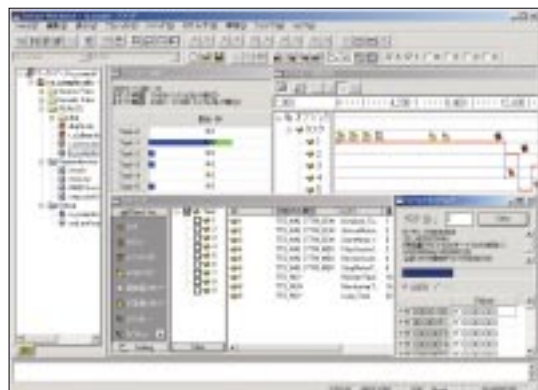
**Figure 2** Power-Saving Functions



**Figure 3** Configurator Screen



**Figure 4** Analyzer Screen



**[Features]**

- Object display
- Trace log (statistical data, transition graph)
- OS kernel break
- Task context display
- Stack data display
- System call issuance

**Fig.4** presents an analyzer screen.

## Evaluation Platform

We offer the Ansel-Tea/FR evaluation kit as a platform to evaluate  $\mu$ T-REALOS/FR. This evaluation kit integrates “MB91403,” a secure network microcontroller with various built-in security functions and network functions that was added as the core of FR family. It is possible to use peripheral I/Os defined by a standard T-Engine such as an LCD board—this will contribute to developing a prototype user system in a very short period. \*

**NOTES**

\* For details about the  $\mu$ T-Kernel specification and T-Engine Forum (Shinagawa-ku, Tokyo, Chairperson: Ken Sakamura, Professor of Tokyo University), please visit <http://www.t-engine.org/>

\* Other company names and brand names are the trademarks or registered trademarks of their respective owners.

**Photo 1** Ansel-Tea/FR Board

