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Press Release

YRP Ubiquitous Networking Laboratory  
Sakamura Laboratory, the University of Tokyo  
T-Engine Forum

## Successful Development of Multiprocessor compatible MP T-Kernel

YRP Ubiquitous Networking Laboratory (Location: Shinagawa-ku, Tokyo; Representative: Ken Sakamura, Professor of the University of Tokyo), Sakamura Laboratory at the University of Tokyo and T-Engine Forum (Location: Shinagawa, Tokyo, Chair: Ken Sakamura, Professor at the University of Tokyo) has been advancing the development and provision of T-Engine, a standard development platform for embedded systems and T-Kernel, a new generation real-time OS, in order to answer the needs of sophisticated and various embedded systems in the 21<sup>st</sup> century.

We would like to announce the successful development of MP T-Kernel, a multiprocessor version of the T-Kernel and its execution platform,  $\mu$ T-Engine/MP211, in which multi-core processor is used.

### **Multiprocessor version of real-time OS, MP T-Kernel**

As embedded systems become increasingly sophisticated, demand for the processing capability of processors has increased and multi-processor systems that were used for servers and PCs have been drawing attentions. In addition, multi-core chips with multiple processors on a single chip are expected to be used for sophisticated embedded systems as they can provide multi-processor systems with less power consumption.

However, conventional multi-processor version of OSs are used for information systems such as servers and PCs and were not appropriate for systems that required real-timeness such as embedded systems. Therefore, the T-Engine Forum has developed the MP T-Kernel as a real-time OS for multiprocessors, which is very suited for embedded systems.

The MP T-Kernel realizes the same level of real-timeness as T-Kernel and  $\mu$ ITRON in multiprocessor systems. Furthermore, it is highly compatible with the conventional single processor T-Kernel and has the ability to share software assets and know-how.

Multi-processors are classified broadly into Asymmetric Multiple Processors (AMP) and Symmetric Multiple Processors (SMP). The MP T-Kernel supports these types with the AMP T-Kernel and SMP T-Kernel respectively.

The AMP T-Kernel for Asymmetric Multiple Processors will be released at this time of this press release. The SMP T-Kernel is also under development.

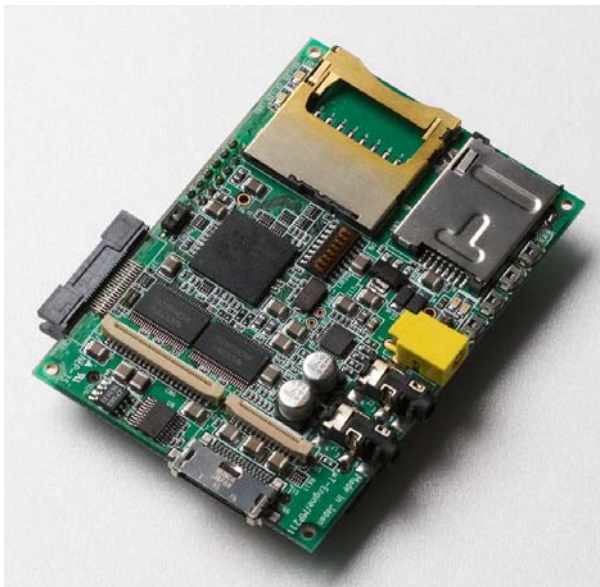
### **$\mu$ T-Engine/MP211 with Multi-core Processors**

$\mu$ T-Engine/MP211 is a  $\mu$ T-Engine that uses an MP211 (manufactured by NEC Electronics Corporation), an asymmetric multi-core processor with 3 CPU cores (ARM926) and DSP on a single chip. The main memory has 128MBs built in the MP211 package. Its peripheral functions include LCD interface, audio input/output, and MMC card interface, etc.

The  $\mu$  T-Engine/MP211 was developed at YRP Ubiquitous Networking Laboratory and Sakamura Laboratory, the University of Tokyo for development of the AMP T-Kernel.

#### [ $\mu$ T-Engine/MP211 Basic Specifications]

|                               |  |
|-------------------------------|--|
| Processor                     | MP211(ARM926 $\times$ 3, DSP(SPXK602) $\times$ 1)<br>Maximum Operating Frequency 192MHz                                |
| Memory                        | DDR SDRAM 128MBs, Flash memory 16MBs   |
| Peripheral function           | Real-time clock  |
| Card I/F                      | CF TypeII x1, MMCx1, eTRON SIMx1   |
| Additional Input/output ports | LCD I/Fx1, Audio Inx1, Audio Outx1, Serial I/Fx1,<br>Expansion bus I/F(16bit local bus), 8bit DIP SWx1,<br>Debug I/Fx1 |

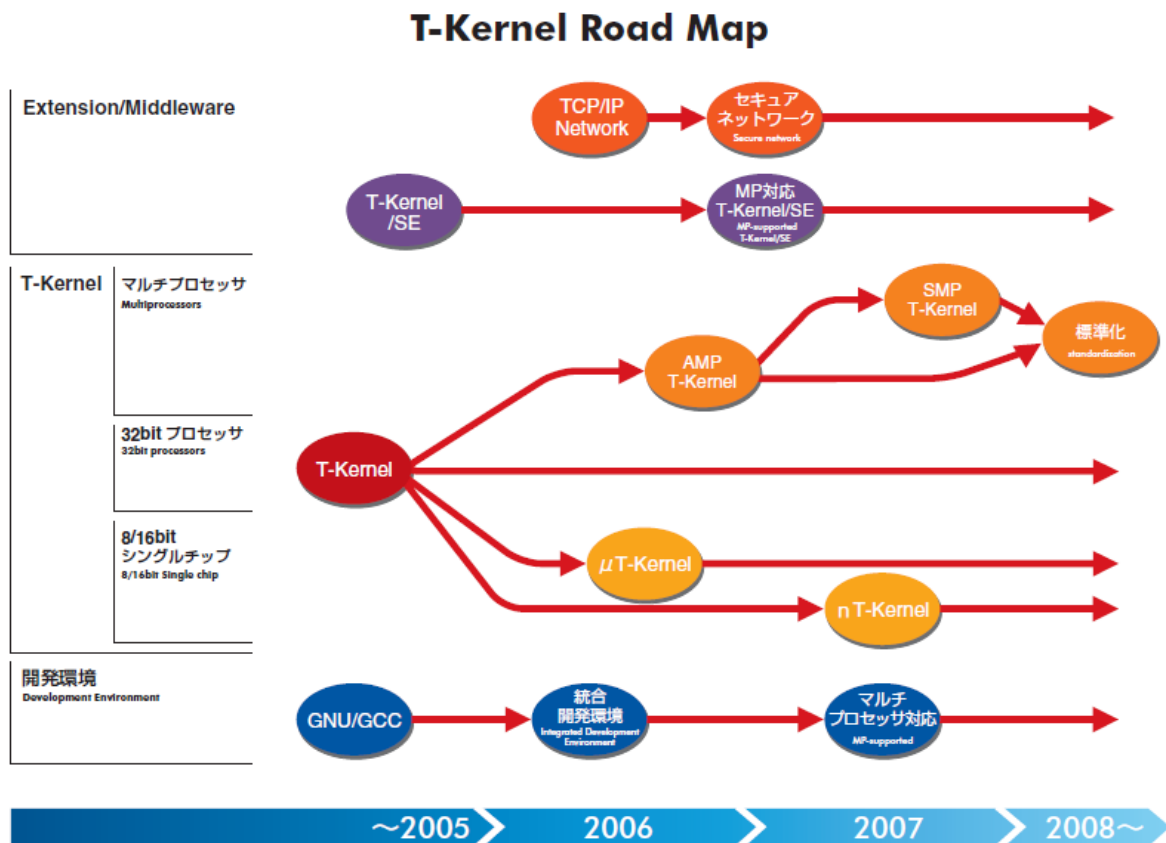


[Photo  $\mu$ T-Engine/MP211]

## Future MP T-Kernel Roadmap

Specifications for this AMP T-Kernel are scheduled to be released to the public in December 2006. In addition, a prototype SMP T-Kernel that is under development will be completed in December 2006. This will be followed by the consolidation and standardization of specifications for the AMP T-Kernel and SMP T-Kernel within 2007.

All source codes will be made open to the public like the standard T-Kernel.



\* Please note that results of the “Secure Ubiquitous Computing Platform” (2005 to 2007) research sponsored by the Ministry of Education, Culture, Sports, Science and Technology are included in this work.

### [Inquiries regarding this release]

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