Embedded computing is breaking new ground of late—from SPOT watches to smart phones. Along with a demand for lower hardware costs, high-end embedded systems have acquired much more sophisticated capabilities, such as GUI and networking capabilities. Hence, the OS to support such high-end capabilities has also become a crucial choice. Let's see how industry experts rate Linux in the embedded domain.

HOW GOOD IS LINUX IN THE EMBEDDED DOMAIN?

"Linux supports the widest range of communication protocols, like IPv4, Bluetooth, IrDA, ATM and RTP."

Dhaval Vasa
project leader—embedded division
eInfochips Inc.

In today's changing scenario, thanks to Linux penetration, it has now emerged as the last frontier of the embedded operating system world. It is widely used, especially for ARM architecture, due to its low power consumption compared to its processing power. Demands of economics, reduced time to market and the need to manage complexity have fuelled its popularity.

Linux not only offers the scope to standardise, but also offers the ability to access the code and customise it at will. The emergence of Linux as an embedded operating system, used in cell phones, set-top boxes and navigation systems has made commercial embedded OS vendors foray into Carrier Grade Linux (CGL).

Let's analyse Linux as a choice as the embedded OS on some popular parameters:

Concurrency: Linux is a pre-emptive multitasking (the ability to multitask or run multiple processes at the same time) operating system from the very beginning. With Native POSIX Threading Library (NPTL) in the 2.6 version of the kernel, thread support has improved with signal support added to each thread in process.

Stability: A system crash can be catastrophic in some cases. Linux is known for its stability due to the influence of the UNIX architecture in its design. It comes from being an open source operating system, where the source code is widely reviewed.

Protocol and interface support: With the proliferation of the Internet, network aware embedded systems are a must. Linux supports the widest range of communication protocols, like IPv4, Bluetooth, IrDA, ATM and RTP. The ease of writing new drivers makes it even more adoptable.

Real-time support: In order to add real-time support to Linux, preemption patches, like RTLinux and RTAI, are required to be applied to the Linux kernel. By applying these patches, Linux can be used as a hard real-time embedded OS.

Tools support: The Linux platform has the widest array of development tools. The GNU tool-chain (gcc, gdb.) is known for its high quality and wide processor support.

Scheduling and latency: The standard Linux scheduler is a fairness-based heuristic scheduler. Thus, it is not possible for the designer to specify an absolute "highest" priority thread. When an interrupt handler makes a thread ready to run in order to process the event, the Linux scheduler is quite likely to choose some other thread to run first. Thus, higher preemption latency makes Linux avoidable for hard real-time systems. With the O (1) scheduler in the 2.6 kernel, it scales well with a number of tasks and a number of processors for scheduling and balancing (O(1)).