

Connected Limited Device Configuration HotSpot™ Implementation Multitasking

Version 1.1.2 for the Java™ 2 Platform, Micro Edition



Key feature highlights

- Connected Limited Device Configuration HotSpot™ Implementation supports an optional multitasking virtual machine running multiple MIDlets
- Multitasking requires no API changes exposed to application developers
- Multitasking works in resource-constrained environments

Connected Limited Device Configuration (CLDC) HotSpot™ Implementation is Sun's high-performance Java™ virtual machine for wireless phones and communicator-type devices. With this latest release, Version 1.1.2, CLDC HotSpot Implementation supports multitasking — the capability to concurrently run multiple Java applications (MIDlets). Multitasking in the virtual machine enables a much more dynamic user experience. In addition, multitasking is well-suited to mobile applications such as e-mail and instant messaging, which demand immediate user attention even when running another application.

Why Multitasking in CLDC HotSpot Implementation?

There is considerable interest among manufacturers for running multiple MIDlets in next-generation handsets. The key reasons for this interest include:

- *Native System-level Applications* — System-level services written as native applications are inherently nonportable and expensive to maintain. They must be rewritten for each new model of handset.
- *The Security Offered by Java Technology* — The security features of Java technology prevent MIDlets from being used as hacking tools.
- *System-level Applications* — System-level services that typically run on today's handsets include applications such as instant messaging (IM) clients, calendar clients, call management, and the application management system (AMS), which allows users to launch other applications and MIDlets. Today, most system-level services on handsets are provided as native applications.

- *The Portability of Java Technology* — There is a tremendous advantage, namely the high degree of portability, if the native applications can be replaced by Java applications or MIDlets.

These factors, and more, drive the need for a multitasking virtual machine.

Providing Multitasking in CLDC HotSpot Implementation

There are a variety of problems that need to be solved to run multiple MIDlets in limited-resource environments. These problems include:

- *Backwards Compatibility* — Due to the success of the Java 2 Platform, Micro Edition (J2ME™ platform) and the large number of MIDlets that are already deployed, these MIDlets must be usable in a multitasking environment without being rewritten to require new APIs. The MIDlets must be able to run without knowledge of other running MIDlets.

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- **Robustness** — In prior versions of CLDC HotSpot Implementation, a virtual machine needed to run only as long as a single MIDlet was running. The virtual machine would be restarted every time a MIDlet was launched. With the multitasking capability, the virtual machine must now run continuously, and robustness requirements must be correspondingly high.
- **OS Limitations** — Most designs for emerging handsets do not have enough processor or memory resources to run a full-scale operating system such as Linux. This would be inappropriate for products produced on a mass scale. A multitasking solution must work within the resource constraints of this class of device.



Figure 1: Multiple running MIDlets, and the current foreground (active) MIDlet

Virtual Machine Support for Multitasking

It is the responsibility of the virtual machine to provide basic facilities and safeguards for multiple running MIDlets, such as:

- **Fair, Preemptive Scheduling** — Similar to the operating systems of large platforms, the multitasking option of CLDC HotSpot Implementation virtual machine provides the mechanisms for scheduling of applications.
- **Works Within Resource-Constrained Environments** — The targeted platforms of CLDC HotSpot Implementation are limited in memory and processor power.
- **Firewalled Tasks** — Tasks (MIDlets) are isolated from one another except for orderly and appropriate exchange of data.
- **No Runaway Tasks** — The virtual machine insures that no tasks can run past memory boundaries.
- **Cleanup** — The virtual machine gracefully ends each task when it completes and reclaims the system resources of the task.

How CLDC HotSpot Implementation Provides the Multitasking Solution

Multitasking support within the virtual machine is now available in Version 1.1.2 of CLDC HotSpot Implementation. Sun achieved this milestone by:

- Solving the problems of fair, preemptive scheduling of multiple tasks

- Not relying on multitasking services from an operating system
- Implementing multitasking within a resource-constrained, virtual machine implementation
- Creating a multitasking implementation that is very robust and reliable

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For More Information

To learn more about Connected Limited Device Configuration HotSpot Implementation and its multitasking capabilities, please visit java.sun.com/j2me.

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