SYSGO EMBEDDING INNOVATIONS

PikeOS

PikeOS is a powerful and efficient paravirtualization real-time operating system based on a separation microkernel. The PikeOS unique virtualization concept satisfies the new generation of safety-critical requirements (exemplified by Integrated Modular Avionics), security requirements (such as MILS) and supports the more general functionality of software virtualization. PikeOS allows multiple "Personalities" (Guest OS and Runtime Environments) to run concurrently.

PikeOS at a glance

- Based on separation microkernel
- Strict time and resource partitioning
- Combines paravirtualization and hard real-time
- MILS compliant
- End to end development solution
- Developed to safety-critical standards (DO-178B, IEC 61508, and EN 50128)
- Linux – Full User Mode
- POSIX, ARINC-653, Native
- C/C++, Java, Ada, Soft-PLC (CoDeSys), OSEK, IData (Quantum 3D)
- µITRON, VxWorks subset, any legacy RTOS
- Available for PowerPC, x86, and MIPS

Virtualization, Safety, Security

The native design of the unique PikeOS separation microkernel specifically addresses the requirements of safe and secure systems. All drivers, stacks, hard real-time applications and hosted OSs or RTEs reside in separate address spaces with pre-defined I/O access controlled by PikeOS. The paravirtualization capability of PikeOS enables the combination of applications with different safety and security certification levels on one platform. It supports hardware convergence efforts and opens the door for open source components to be utilized in safety- and security-critical systems.

Choose the environment you need

PikeOS offers support for a variety of hosted operating systems, runtime environments and APIs. This variety enables legacy applications (e.g. Ada or legacy RTOS) to run concurrently with new applications based on standards like POSIX and ARINC 653. All these OSs, runtime environments and APIs run on the same PikeOS kernel and can be combined as needed.

End to end development solution

Developing embedded applications that use a partitioned system requires specialized support from the development environment; it's not the same as developing standard desktop or mainframe applications. Embedded developers need guided configuration, remote debugging (often down to the hardware instruction level), target monitoring, remote application deployment, and timing analyses in addition to standard application development features such as compilers and assemblers. With the Eclipse-based CODEO integrated development environment and the time and system analyzer extensions, SYSGO offers a complete environment for embedded development.

Unique combination of features

Virtualization
PikeOS incorporates the latest paravirtualization technology, making PikeOS a unique combination of real-time operating system and virtualization environment. PikeOS directly solves issues like hardware convergence, legacy software migration, IP protection and how to use Linux in secure and safety-critical environments.

Safety
The strict time and resource partitioning of the PikeOS microkernel prevents application failures from propagating to any other place in the system. PikeOS is completely developed according to the development process requirements of the DO-178B and IEC 61508 specifications. EN 50128 compliant certification artifacts can be easily derived from DO-178B certification artifacts.

Security
In addition to the PikeOS multi-layer security architecture and complete I/O access control PikeOS can incorporate communication encryption and binary verification. The PikeOS separation microkernel architecture is fully compliant with the MILS separation kernel architecture. A formal verification of the kernel to the highest level of CC's EAL is in progress.

Advanced Scheduling and Timing Support
PikeOS incorporates a new scheduler combining time and priority driven scheduling. Scheduling schemes can be changed on the fly. A ticker-less timing support is provided as an option.

Health Monitoring
PikeOS provides a build-in Health Monitoring Feature which implements all features described in the ARINC-653 standard. Failures like address- and timing violations, illegal instruction a.s.o. will be intercepted by the OS and handled as specified in the system configuration. This adds another layer of determinism without additional application code.

Choose your Personality

Available OSs
Complete operating systems normally don't require a host OS to run on, nor can they tolerate the presence of another operating system. On PikeOS, however, they run in user-space, in non-privileged mode.
· Linux (Kernel 2.6.2x) · OSEK

Available Runtime Environments
Execution runtime environments need an OS host. With PikeOS, they may have their own schedulers, communication and synchronization primitives. Therefore, runtime environments run without losing performance.
· POSIX (PSE51, PSE52) · Java (Aicas and Aonix) · Ada (Aonix and AdaCore) · µITRON · CodeSys (3S) · IData (Quantum 3D)

Available APIs
Application programming interfaces (APIs) provide an interface that is used to access underlying functionality.
· ARINC 653 · VxWorks subset · PikeOS Kernel API · PikeOS SSW API · any legacy RTOS

Supported Platforms
· PowerPC · x86 · MIPS

End to End Development Solution

Configure
The PikeOS system can be configured using PIK, the graphical configuration editor within CODEO. PIK includes a powerful integrity checker that makes it almost impossible to create an invalid configuration.

Implement
CODEO offers a comprehensive C/C++ and Java development environment including project management, code browser, CVS access and much more.

Assemble
CODEO for PikeOS incorporates a graphical feature assembler to add and remove partitions, applications and services such as drivers, stacks and I/O servers.

Deploy
Applications developed with CODEO can be deployed directly on a running PikeOS target.

Debug
Any application running on PikeOS can be debugged independently of all other concurrent applications. Several applications can be debugged at the same time.

Trace
Application timing behavior can be analyzed, using the tracing capability incorporated in each partition. Trace points can be filtered, used as triggers, and extended using the graphical trace configuration and visualization editor.

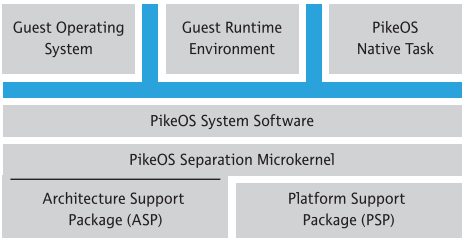

Figure 1: PikeOS enables a concurrent and secure execution of different OSs, RTEs and native real-time tasks on a single CPU.

Monitor
CODEO also includes monitoring capabilities, enabling users to view kernel objects, threads, task and partition information. If configured, the status of each partition can be changed remotely.

Emulate
PikeOS comes with a CPU emulator, which allows to start application development even before the real hardware is available. Due to the modular approach of PikeOS, simulation of I/O channels can be completely transparent to the application. For each of the supported CPU families, a corresponding CPU emulator is available.

Maintain
Updates and upgrades can be deployed remotely on PikeOS targets without rebooting the system or physically accessing the hardware.

Technical Features
· Up to 63 resource partitions
· Up to 63 time partitions
· 253 priorities
· Less then 30 ms boot time
· 150kb RAM
· 150kb ROM

System requirements
· Linux distribution based on kernel 2.4.20 and later or 2.6 and glibc 2.2.5 and later
· Windows Xp SP2 or 2000 SP4 with administrator access for installation
· 1GB free disk space
· 512 MB RAM
· Sun java runtime environment 1.4.2 and later

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