Open Virtual Platforms™

In 2008, Imperas enlisted the support of software tools suppliers, users, processor developers, consultants, and educators to take the Imperas developed virtual platform simulation solution and make it public and freely available under the auspices of Open Virtual Platforms (OVP™).

The OVP approach of an open source strategy, the use of open APIs, the easy access to tools and documentation, the wide range of processor and peripheral models available, the ease of use in other systems, and the large collection of examples and demonstration platforms continues to attract more and more users.

The www.OVPworld.org website enables easy download of documentation, demonstrations and examples, and an automatic 90 day evaluation license with click through licensing. The public forum on the web site has an active and growing user community with solutions to most questions.

With over 90 CPU models, OVP is the de facto source for fast processor models.

As electronic products are defined by more and more software content, the tools and methodologies used by embedded software developers are evolving. Try OVP for free to see how productivity is improved, schedules are shortened and software testing made easier with Open Virtual Platforms.

Visit **www.OVPworld.org** to download models and simulator

OVP™ Components

OVP has three main components:

- OVP open standard APIs
- Open Source model library
- OVPsim: reference simulator

Use OVP to create a simulation model of a platform, including all components, and connect it to your debugger to provide a very efficient, fast, embedded software development environment.

Benefits of Virtual Platforms for Embedded Software Development

Virtual platforms lower software development costs, increase quality and reduce the risks involved with the software development side of delivering advanced electronic systems. This is accomplished by enabling:

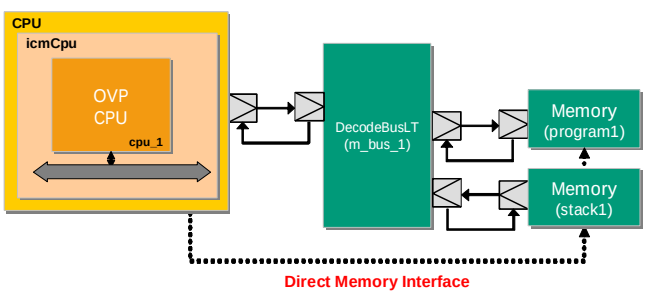
- ✓ Ability to run the real hardware executables on the virtual platform
- ✓ Early start of software development and hardware-software integration
- ✓ Accessibility of the virtual platform for the entire development team, no matter the location
- ✓ Full visibility and controllability of the simulation environment for improved software testing
- ✓ Repeatable, deterministic simulation makes debugging easier
- ✓ Flexibility of the virtual platform to easily accommodate changes in the specification
- ✓ Ability of the virtual platform to connect to real world resources

OVPsim™: Fast, Freely Available Simulator

OVPsim is free for evaluation and non-commercial usage, is released as closed source in a binary compiled form, and is maintained and supported by Imperas. OVPsim simulates the platform and provides a very flexible vehicle for embedded software development. OVPsim can simulate single-, multi-, or many-core platforms very efficiently. OVPsim uses Just In Time (JIT) code morphing, or binary translation, to achieve hundreds of millions of instructions per second simulation performance, and provides easy access to host workstation resources.

SystemC Integration

Many development teams have adopted SystemC for virtual platform behavioral and peripheral components, utilizing IEEE 1666 compliant simulators. All OVP Fast Processor Models include a native SystemC/TLM-2.0 interface, enabling easy use in SystemC simulation environments. These models automatically negotiate Direct memory Interface (DMI) with external memories in the SystemC virtual platform for fastest possible simulation performance. OVP Fast Processor Models can be instanced individually in SystemC virtual platforms, just as with any other component.



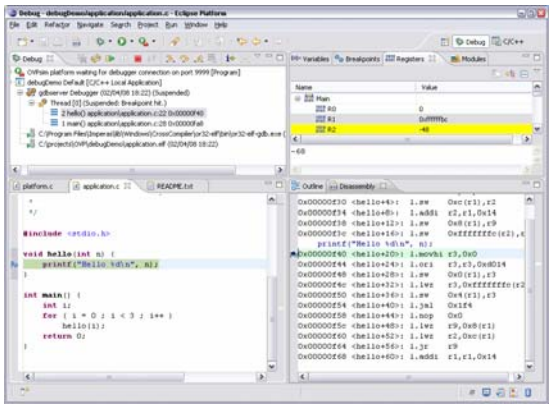
OVP models have been used with the OSCI simulator, as well as with the SystemC simulators from all the major vendors.

Debugging Is Easy With OVPsim

Debugging with OVPsim is straightforward using the provided GDB interface.

Encapsulation Within Eclipse IDE

OVPsim is easily integrated into an Eclipse Integrated Development Environment (IDE). The OVPworld.org website includes full documentation, videos and example launch scripts to explain using OVPsim within the Eclipse IDE.



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OVP Community

The OVP community includes commercial users, universities, service providers, model developers and tool vendors. Many of these community members can be found either on the OVP Partner web page, or have a wiki page in the OVP Library section. These wiki pages allow users to publish information on models and platforms they have developed, or tool integrations that have been done with OVPsim.

The Imperas™ Supported OVP Model Library

The Imperas/OVP model library comprises several model categories: platform, processor, peripheral, memory, hosting, and tools. These are written in C and use the OVP APIs. They are provided as source and where they have been created by Imperas are released using a modified Apache 2.0 open source license. Some models are derived from other open sources – and they therefore use the original license. The components have been used in virtual platforms with various processors to run many different operating systems: Linux, uClinux, Mentor Nucleus, FreeRTOS, eCoS and Micrium µC/OS II.

The **platform library** includes platforms that can be used to execute complete operating systems, for example Linux, and provides all the necessary peripheral models to do this. On a 2GHz laptop running Windows XP an OVP model of a MIPS or ARM based virtual platform can boot to the Linux prompt (single core or SMP Linux) in under 10 seconds.

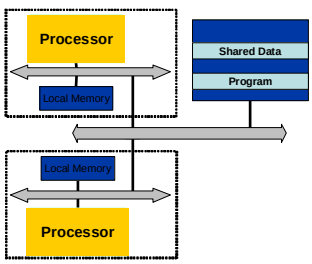
Single Core or SMP OS

The **peripheral library** has 40+ components that are used to provide functionality in virtual platforms. The component models range from simple timers, to programmers views of a floppy disk interface through to full functionality of an Ethernet controller that connects to the real ethernet/internet from within the simulation.

The **OVP Fast Processor Model library** includes the following families, totaling more than 100 processor variants:

- **ARM** 7, 9, 10, 11, Cortex-A, M, R families
- **Renesas** V850 ES/E1/E2, M16C
- **Altera** Nios II
- **Xilinx** MicroBlaze
- **MIPS** 4K, 24K, 34K, 74K, 1004K, 1074K, M14K, microAptiv, interAptiv, proAptiv, MIPS64 – certified correct by MIPS
- **PowerPC**
- **ARC** 600, 700 – Verified by ARC, now part of Synopsys

These models run different benchmarks at over 2,000 million instructions per second on an average desktop PC. For most processor families several bare metal OVP platforms are available showing usage of 1 processor core, 2 cores, and 24 cores. These show how a platform is constructed, how cross compiled application software is loaded onto the platform and the how the platform is run. The platforms are available as C and SystemC TLM-2.0, with the source of the platforms provided.



OVP Application Programming Interfaces (APIs)

Platforms, processors, and peripheral models are written in the C or C++ programming language and the functionality is defined in different APIs. These API functions are well documented and there are many examples available from the OVP web site. The freely available OVPsim simulator provides the reference implementation of these APIs and executes the models written using them.