



## Imperas Peripheral Model Guide

Model Specific Information for  
[xilinx.ovpworld.org](http://xilinx.ovpworld.org) / [zynq\\_7000-ocm](http://zynq_7000-ocm)

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## Model Release Status

This model is released as part of OVP releases and is included in OVPworld packages. Please visit [OVPworld.org](http://OVPworld.org).

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## 1.0 Model Specific Information

This document provides usage information for an Imperas OVP peripheral behavioral model.

The document is split into sections providing specific information for this peripheral, including any ports for connecting into a platform, registers, other component parts, and configuration options and general information for peripheral modeling with Imperas OVP.

### 1.1 Description

Zynq 7000 Platform On Chip Memory Controller Registers (OCM)

### 1.2 Licensing

Open Source Apache 2.0

### 1.3 Limitations

This model implements the full set of registers. There is no behavior included.

### 1.4 Reference

Zynq-7000 TRM

([https://www.xilinx.com/support/documentation/user\\_guides/ug585-Zynq-7000-TRM.pdf](https://www.xilinx.com/support/documentation/user_guides/ug585-Zynq-7000-TRM.pdf))

### 1.5 Location

The zynq\_7000-ocm peripheral model is located in an Imperas/OVP installation at the VLNV: [xilinx.ovpworld.org / peripheral / zynq\\_7000-ocm / 1.0](http://xilinx.ovpworld.org/peripheral/zynq_7000-ocm/1.0).

## 2.0 Bus Slave Ports

This model has the following bus slave ports:

### 2.1 Bus Slave Port: *bport1*

Table 1. Bus Slave Port: *bport1*

Name	Size (bytes)	Must Be Connected	Description
bport1	0x1000	T (True)	

Table 2. Bus Slave Port: *bport1* Registers:

Name	Offset	Width (bits)	Description	R/W	is Volatile
ab_OCM_PARITY_CTRL	0x0	32	Control fields for RAM parity operation		
ab_OCM_PARITY_ERR_ADDRESS	0x4	32	Stores the first parity error access address. This register is sticky and will retain its value unless explicitly cleared (written with 1's) with an APB write access. The physical RAM address is logged.		

ab_OCM_IRQ_STS	0x8	32	Status of OCM Interrupt		
ab_OCM_CONTROL	0xc	32	Control fields for OCM		

### 3.0 Platforms that use this peripheral component

Peripheral components can be used in many different platforms, including those developed by Imperas or by other users of OVP. You can use this peripheral in your own platforms.

Table 3. Publicly available platforms using peripheral 'zynq\_7000-ocm'

Platform Name	Vendor
Zynq_PS	<a href="http://xilinx.ovpworld.org">xilinx.ovpworld.org</a>

## 4.0 Peripheral components in the library

Table 4. Publicly available Imperas/OVP peripheral models (224 models)

Peripheral	Peripheral	Peripheral
xilinx.ovpworld.org/zynq_7000-qos301	xilinx.ovpworld.org/zynq_7000-qspi	xilinx.ovpworld.org/zynq_7000-sdio
xilinx.ovpworld.org/zynq_7000-slcr	xilinx.ovpworld.org/zynq_7000-spi	xilinx.ovpworld.org/zynq_7000-swdt
xilinx.ovpworld.org/zynq_7000-ttc	xilinx.ovpworld.org/zynq_7000-tz_GPVsecurity	xilinx.ovpworld.org/zynq_7000-tz_security
xilinx.ovpworld.org/zynq_7000-usb	altera.ovpworld.org/dw-apb-timer	altera.ovpworld.org/dw-apb-uart
altera.ovpworld.org/IntervalTimer32Core	altera.ovpworld.org/IntervalTimer64Core	altera.ovpworld.org/JtagUart
altera.ovpworld.org/PerformanceCounterCore	altera.ovpworld.org/RSTMGR	altera.ovpworld.org/SystemIDCore
altera.ovpworld.org/Uart	amd.ovpworld.org/79C970	andes.ovpworld.org/ATCUART100
andes.ovpworld.org/NCEPLIC100	andes.ovpworld.org/NCEPLMT100	arm.ovpworld.org/AaciPL041
arm.ovpworld.org/CompactFlashRegs	arm.ovpworld.org/CoreModule9x6	arm.ovpworld.org/DebugLedAndDipSwitch
arm.ovpworld.org/DMemCtrlPL341	arm.ovpworld.org/IcpControl	arm.ovpworld.org/IcpCounterTimer
arm.ovpworld.org/IntICP	arm.ovpworld.org/IntICP	arm.ovpworld.org/KbPL050
arm.ovpworld.org/L2CachePL310	arm.ovpworld.org/LcdPL110	arm.ovpworld.org/MmciPL181
arm.ovpworld.org/RtcPL031	arm.ovpworld.org/SerBusDviRegs	arm.ovpworld.org/SmartLoaderArm64Linux
arm.ovpworld.org/SmartLoaderArmLinux	arm.ovpworld.org/SMemCtrlPL354	arm.ovpworld.org/SysCtrlSP810
arm.ovpworld.org/TimerSP804	arm.ovpworld.org/TzpcBP147	arm.ovpworld.org/UartPL011
arm.ovpworld.org/VexpressSysRegs	arm.ovpworld.org/WdtSP805	atmel.ovpworld.org/AdvancedInterruptController
atmel.ovpworld.org/ParallelIOController	atmel.ovpworld.org/PowerSaving	atmel.ovpworld.org/SpecialFunction
atmel.ovpworld.org/TimerCounter	atmel.ovpworld.org/UartInterface	atmel.ovpworld.org/WatchdogTimer
cadence.ovpworld.org/gem	cadence.ovpworld.org/uart	cirrus.ovpworld.org/GD5446
freescale.ovpworld.org/KinetisADC	freescale.ovpworld.org/KinetisAIPS	freescale.ovpworld.org/KinetisAXBS
freescale.ovpworld.org/KinetisCAN	freescale.ovpworld.org/KinetisCMP	freescale.ovpworld.org/KinetisCMT
freescale.ovpworld.org/KinetisCRC	freescale.ovpworld.org/KinetisDAC	freescale.ovpworld.org/KinetisDDR
freescale.ovpworld.org/KinetisDMA	freescale.ovpworld.org/KinetisDMAC	freescale.ovpworld.org/KinetisDMAMUX
freescale.ovpworld.org/KinetisENET	freescale.ovpworld.org/KinetisEWM	freescale.ovpworld.org/KinetisFB
freescale.ovpworld.org/KinetisFMC	freescale.ovpworld.org/KinetisFTFE	freescale.ovpworld.org/KinetisFTM
freescale.ovpworld.org/KinetisGPIO	freescale.ovpworld.org/KinetisI2C	freescale.ovpworld.org/KinetisI2S
freescale.ovpworld.org/KinetisLLWU	freescale.ovpworld.org/KinetisLPTMR	freescale.ovpworld.org/KinetisMCG
freescale.ovpworld.org/KinetisMPU	freescale.ovpworld.org/KinetisNFC	freescale.ovpworld.org/KinetisOSC
freescale.ovpworld.org/KinetisPDB	freescale.ovpworld.org/KinetisPIT	freescale.ovpworld.org/KinetisPMC
freescale.ovpworld.org/KinetisPORT	freescale.ovpworld.org/KinetisRCM	freescale.ovpworld.org/KinetisRFSYS
freescale.ovpworld.org/KinetisRFVBAT	freescale.ovpworld.org/KinetisRNG	freescale.ovpworld.org/KinetisRTC
freescale.ovpworld.org/KinetisSDHC	freescale.ovpworld.org/KinetisSIM	freescale.ovpworld.org/KinetisSMC
freescale.ovpworld.org/KinetisSPI	freescale.ovpworld.org/KinetisTSI	freescale.ovpworld.org/KinetisUART
freescale.ovpworld.org/KinetisUSB	freescale.ovpworld.org/KinetisUSBDCD	freescale.ovpworld.org/KinetisUSBHS
freescale.ovpworld.org/KinetisVREF	freescale.ovpworld.org/KinetisWDOG	freescale.ovpworld.org/Uart
freescale.ovpworld.org/VybridADC	freescale.ovpworld.org/VybridANADIG	freescale.ovpworld.org/VybridCCM
freescale.ovpworld.org/VybridDMA	freescale.ovpworld.org/VybridGPIO	freescale.ovpworld.org/VybridI2C
freescale.ovpworld.org/VybridLCD	freescale.ovpworld.org/VybridQUADSPI	freescale.ovpworld.org/VybridSDHC
freescale.ovpworld.org/VybridSPI	freescale.ovpworld.org/VybridUART	freescale.ovpworld.org/VybridUSB
imperas.ovpworld.org/frameBuffer	imperas.ovpworld.org/uart	imperas.ovpworld.org/usecCounter
intel.ovpworld.org/82077AA	intel.ovpworld.org/82371EB	intel.ovpworld.org/8253
intel.ovpworld.org/8259A	intel.ovpworld.org/NorFlash48F4400	intel.ovpworld.org/PciIDE
intel.ovpworld.org/PciPM	intel.ovpworld.org/PciUSB	intel.ovpworld.org/Ps2Control

<a href="http://marvell.ovpworld.org/GT6412x">marvell.ovpworld.org/GT6412x</a>	<a href="http://maxim.ovpworld.org/max673x">maxim.ovpworld.org/max673x</a>	<a href="http://microsemi.ovpworld.org/CoreUARTapb">microsemi.ovpworld.org/CoreUARTapb</a>
<a href="http://mips.ovpworld.org/16450C">mips.ovpworld.org/16450C</a>	<a href="http://mips.ovpworld.org/MaltaFPGA">mips.ovpworld.org/MaltaFPGA</a>	<a href="http://mips.ovpworld.org/SmartLoaderLinux">mips.ovpworld.org/SmartLoaderLinux</a>
<a href="http://motorola.ovpworld.org/MC146818">motorola.ovpworld.org/MC146818</a>	<a href="http://national.ovpworld.org/16450">national.ovpworld.org/16450</a>	<a href="http://national.ovpworld.org/16550">national.ovpworld.org/16550</a>
<a href="http://national.ovpworld.org/16550_4bytes">national.ovpworld.org/16550_4bytes</a>	<a href="http://nxp.ovpworld.org/iMX6_Analog">nxp.ovpworld.org/iMX6_Analog</a>	<a href="http://nxp.ovpworld.org/iMX6_CCM">nxp.ovpworld.org/iMX6_CCM</a>
<a href="http://nxp.ovpworld.org/iMX6_GPC">nxp.ovpworld.org/iMX6_GPC</a>	<a href="http://nxp.ovpworld.org/iMX6_GPIO">nxp.ovpworld.org/iMX6_GPIO</a>	<a href="http://nxp.ovpworld.org/iMX6_GPT">nxp.ovpworld.org/iMX6_GPT</a>
<a href="http://nxp.ovpworld.org/iMX6_MMDC">nxp.ovpworld.org/iMX6_MMDC</a>	<a href="http://nxp.ovpworld.org/iMX6_SDHC">nxp.ovpworld.org/iMX6_SDHC</a>	<a href="http://nxp.ovpworld.org/iMX6_SRC">nxp.ovpworld.org/iMX6_SRC</a>
<a href="http://nxp.ovpworld.org/iMX6_UART">nxp.ovpworld.org/iMX6_UART</a>	<a href="http://nxp.ovpworld.org/iMX6_WDOG">nxp.ovpworld.org/iMX6_WDOG</a>	<a href="http://ovpworld.org/Alpha2x16Display">ovpworld.org/Alpha2x16Display</a>
<a href="http://ovpworld.org/DynamicBridge">ovpworld.org/DynamicBridge</a>	<a href="http://ovpworld.org/FlashDevice">ovpworld.org/FlashDevice</a>	<a href="http://ovpworld.org/ledRegister">ovpworld.org/ledRegister</a>
<a href="http://ovpworld.org/SerInt">ovpworld.org/SerInt</a>	<a href="http://ovpworld.org/SimpleDma">ovpworld.org/SimpleDma</a>	<a href="http://ovpworld.org/switchRegister">ovpworld.org/switchRegister</a>
<a href="http://ovpworld.org/temperatureSensor">ovpworld.org/temperatureSensor</a>	<a href="http://ovpworld.org/trap">ovpworld.org/trap</a>	<a href="http://ovpworld.org/trap4K">ovpworld.org/trap4K</a>
<a href="http://ovpworld.org/vEthernet_Bridge">ovpworld.org/vEthernet_Bridge</a>	<a href="http://ovpworld.org/VirtioBlkMMIO">ovpworld.org/VirtioBlkMMIO</a>	<a href="http://ovpworld.org/VirtioNetMMIO">ovpworld.org/VirtioNetMMIO</a>
<a href="http://philips.ovpworld.org/ISP1761">philips.ovpworld.org/ISP1761</a>	<a href="http://renesas.ovpworld.org/adc">renesas.ovpworld.org/adc</a>	<a href="http://renesas.ovpworld.org/bcu">renesas.ovpworld.org/bcu</a>
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<a href="http://renesas.ovpworld.org/csie">renesas.ovpworld.org/csie</a>	<a href="http://renesas.ovpworld.org/dma">renesas.ovpworld.org/dma</a>	<a href="http://renesas.ovpworld.org/intc">renesas.ovpworld.org/intc</a>
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<a href="http://renesas.ovpworld.org/tms">renesas.ovpworld.org/tms</a>	<a href="http://renesas.ovpworld.org/tmt">renesas.ovpworld.org/tmt</a>	<a href="http://renesas.ovpworld.org/uartc">renesas.ovpworld.org/uartc</a>
<a href="http://renesas.ovpworld.org/UPD70F3441Logic">renesas.ovpworld.org/UPD70F3441Logic</a>	<a href="http://riscv.ovpworld.org/CLINT">riscv.ovpworld.org/CLINT</a>	<a href="http://riscv.ovpworld.org/PLIC">riscv.ovpworld.org/PLIC</a>
<a href="http://riscv.ovpworld.org/SmartLoaderRV64Linux">riscv.ovpworld.org/SmartLoaderRV64Linux</a>	<a href="http://safepower.ovpworld.org/node">safepower.ovpworld.org/node</a>	<a href="http://safepower.ovpworld.org/NostrumNode">safepower.ovpworld.org/NostrumNode</a>
<a href="http://safepower.ovpworld.org/ring_oscillator">safepower.ovpworld.org/ring_oscillator</a>	<a href="http://safepower.ovpworld.org/TTELNode">safepower.ovpworld.org/TTELNode</a>	<a href="http://sifive.ovpworld.org/gpio">sifive.ovpworld.org/gpio</a>
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<a href="http://smc.ovpworld.org/LAN9118">smc.ovpworld.org/LAN9118</a>	<a href="http://smc.ovpworld.org/LAN91C111">smc.ovpworld.org/LAN91C111</a>	<a href="http://ti.ovpworld.org/tca6416a">ti.ovpworld.org/tca6416a</a>
<a href="http://ti.ovpworld.org/UartInterface">ti.ovpworld.org/UartInterface</a>	<a href="http://ti.ovpworld.org/ucd9012a">ti.ovpworld.org/ucd9012a</a>	<a href="http://ti.ovpworld.org/ucd9248">ti.ovpworld.org/ucd9248</a>
<a href="http://vendor.com/fifo">vendor.com/fifo</a>	<a href="http://xilinx.ovpworld.org/axi-gpio">xilinx.ovpworld.org/axi-gpio</a>	<a href="http://xilinx.ovpworld.org/axi-intc">xilinx.ovpworld.org/axi-intc</a>
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<a href="http://xilinx.ovpworld.org/mdm">xilinx.ovpworld.org/mdm</a>	<a href="http://xilinx.ovpworld.org/mpmc">xilinx.ovpworld.org/mpmc</a>	<a href="http://xilinx.ovpworld.org/xps-gpio">xilinx.ovpworld.org/xps-gpio</a>
<a href="http://xilinx.ovpworld.org/xps-iic">xilinx.ovpworld.org/xps-iic</a>	<a href="http://xilinx.ovpworld.org/xps-intc">xilinx.ovpworld.org/xps-intc</a>	<a href="http://xilinx.ovpworld.org/xps-ll-temac">xilinx.ovpworld.org/xps-ll-temac</a>
<a href="http://xilinx.ovpworld.org/xps-mch-emc">xilinx.ovpworld.org/xps-mch-emc</a>	<a href="http://xilinx.ovpworld.org/xps-sysace">xilinx.ovpworld.org/xps-sysace</a>	<a href="http://xilinx.ovpworld.org/xps-timer">xilinx.ovpworld.org/xps-timer</a>
<a href="http://xilinx.ovpworld.org/xps-uartlite">xilinx.ovpworld.org/xps-uartlite</a>	<a href="http://xilinx.ovpworld.org/zynq_7000-can">xilinx.ovpworld.org/zynq_7000-can</a>	<a href="http://xilinx.ovpworld.org/zynq_7000-ddrc">xilinx.ovpworld.org/zynq_7000-ddrc</a>
<a href="http://xilinx.ovpworld.org/zynq_7000-devcfg">xilinx.ovpworld.org/zynq_7000-devcfg</a>	<a href="http://xilinx.ovpworld.org/zynq_7000-dmac">xilinx.ovpworld.org/zynq_7000-dmac</a>	<a href="http://xilinx.ovpworld.org/zynq_7000-gpio">xilinx.ovpworld.org/zynq_7000-gpio</a>
<a href="http://xilinx.ovpworld.org/zynq_7000-iic">xilinx.ovpworld.org/zynq_7000-iic</a>	<a href="http://xilinx.ovpworld.org/zynq_7000-ocm">xilinx.ovpworld.org/zynq_7000-ocm</a>	

## 5.0 General Information on Peripheral Models

This document provides usage information for an Imperas OVP peripheral behavioral model.

The document is split into sections providing specific information for this peripheral, including any ports for connecting into a platform, registers etc. and configuration options and general information for peripheral modeling with Imperas OVP.

### 5.1 Background

Imperas OVP simulation technology enables very high performance simulation, debug and analysis of platforms containing multiple processors and peripheral models. The technology is designed to be extensible: you can create new models of processors, peripherals and other platform components using interfaces and libraries defined by OVP.

The peripheral models created using the OVP APIs run on the Peripheral Simulation Engine (PSE).

The model is typically written in C and compiled into an executable for the PSE processor architecture. The model is compiled for speed of execution and to protect IP. It is dynamically loaded by the simulator at run time.

## 6.0 Building peripherals easily with Imperas iGen

To aid with model creation, Imperas products include iGen, a model generation tool. iGen takes the laborious and error-prone task of constructing the various hardware model and software element files required for a typical model, and automates this process. iGen creates the needed C files. iGen also creates the C++ SystemC TLM2 interface files needed to run peripheral models in SystemC simulations.

iGen takes as input a simple script specification that includes device internals such as registers and memories, port information, component descriptors, and other elements. iGen then builds the C code model files and user editable templates. These include model frameworks with registers, function calls, memory map, and other items. It ensures that all component parts of the model are well-structured using best practices, and are consistent throughout the files, thus eliminating a common source of errors.

More information on iGen can be found: [imperas.com/products](http://imperas.com/products).

## 7.0 Peripheral model internals

Each instance of a peripheral model runs on its own virtual machine with an address space large enough for the model. This processor (the PSE) and its memory are separate from any processors, memories and buses in the platform being simulated; they exist only to execute the code of the peripheral model.

Interception of functions defined in the peripheral model allows the use of features of the host system in the



implementation of the behavior of a peripheral. As an example, a real platform might contain a video display device. When simulating this system, it is generally more convenient not to simulate the complete video display device but to use a video package available on the host machine, such as SDL, and to use this to render to the host display. Also models of uarts, ethernet devices and USB components can make use of the host PC resources during simulation, to allow, for example, a simulation to browse the real internet, or the simulation to connect to a real USB device.

## 8.0 Parts of peripheral models

### 8.1 *Configuring the Peripheral Instance with Parameters*

A peripheral can include the behaviour of several configurations. These are controlled when the peripheral is instanced in the platform by setting parameters defined on the peripheral.

### 8.2 *Net Ports*

Peripherals may be connected to other peripherals or processors with signal wires (nets). These can be used to act as interrupt signals or used to control behavior between peripherals.

The wires are created in the platform as nets and this net is connected into the peripheral using a net port.

### 8.3 *Bus master ports*

A bus master port initiates (and controls the address of) a bus cycle. Bus cycles are generated by behavioral code within the peripheral model.

### 8.4 *Bus slave ports*

A peripheral can be defined as having several bus slave ports. The bus slave ports can be split into several address blocks. Each address block be either local memory or memory mapped registers. Both of these can have associated callback functions. A memory mapped register can also be defined as specific read/write access, whether it is volatile, and also whether it is associated with a reset pin and mask. A memory mapped register can also have specific bit fields defined.

### 8.5 *Packetnets*

A peripheral can be defined as being connected to packetnet ports. A packetnet is used to model packet based communication such as Ethernet, CAN bus or GSM. A packetnet is created in a platform, then connected to packetnet ports on model instances. A packetnet can have many connections, each able to send or receive packets. A packetnet is used as an efficient method of communication within OVP models.

For more information on modeling with packetnets, please see the peripheral modeling documentation: [OVP\\_Peripheral\\_Modeling\\_Guide.pdf](#), [OVPSim\\_and\\_CpuManager\\_User\\_Guide.pdf](#) and the example: [\\$IMPERAS\\_HOME/Examples/Models/Peripherals/packetnet](#).

## 9.0 More information (documentation) on peripheral models and modeling

More information on modeling and APIs can be found at: [OVPworld.org/technology\\_apis](http://OVPworld.org/technology_apis).

Specifics on modeling peripherals can be found: [OVP\\_Peripheral\\_Modeling\\_Guide.pdf](#).

A full list of the currently available OVP documentation is available: [OVPworld.org/documentation](#).

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