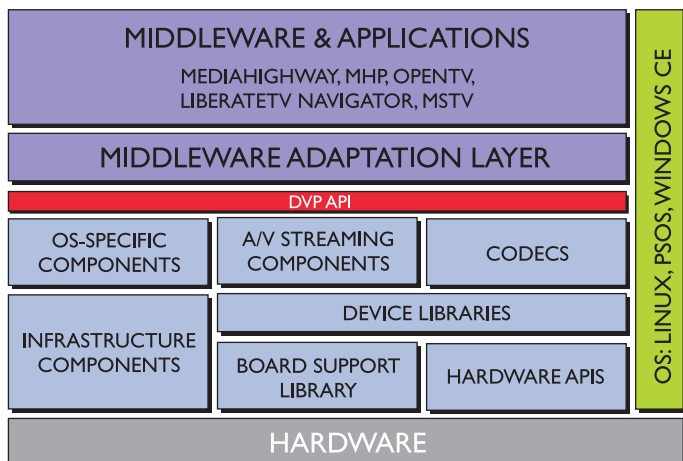


## Software Architecture and Development Environment for Nexperia Home Entertainment Engines



### FEATURES

- + Highly programmable Nexperia architecture helps future proof products by supporting software upgrades
- + Programmable media processor supports new and evolving media and IR standards
- + Operating-system independent architecture supports broad range of popular OSs (Windows CE®, pSOS®, Linux)
- + Hardware and software abstraction layers support popular middleware (OpenTV, Microsoft TV®, Liberate TV®, Canal+ Media Highway, DVB-MHP)
- + Abstraction and adaptation software components speed application development
- + Comprehensive suite of software tools support application development and optimization
- + Nexperia® Digital Video Platform (DVP) compliance ensures software compatibility on all DVP ICs
- + DVP API simplifies porting middleware and applications

# Nexperia DVP Software Architecture

The Nexperia Home Entertainment Engines, a family of compatible system-on-a-chip integrated circuits, comply with Philips Nexperia Digital Video Platform (DVP) architecture, a new architecture for integrated circuits and software used in consumer digital video appliances. Modular and scalable, Nexperia DVP defines a dual-processor, multi-bus architecture, with common bus interfaces for on-chip co-processors and peripherals. Programmable CPU cores allow easy implementation of new capabilities and standards, without changing the silicon. The programmable architecture also helps future-proof products using Nexperia DVP ICs by supporting software upgrades to update applications and add new services. The pnx8500, the first IC in a family of Nexperia Home Entertainment Engines, is designed for advanced set-top boxes and interactive digital television products.

Nexperia Home Entertainment Engines use the Nexperia DVP layered software architecture. Software components in each layer abstract the hardware and operating system functions to a standard Nexperia DVP API. The layered architecture and abstraction components simplify software porting and ensure that software can be reused on other Nexperia DVP ICs.

### OPERATING SYSTEM AND MIDDLEWARE INDEPENDENT

The Nexperia DVP architecture is operating system independent, allowing it to easily support a wide range of popular OSs. Software infrastructure components including a system registry, memory management library, and OS abstraction library provide operating system abstraction. OS-specific software components provide OS adaptation. Hardware APIs, board support library components, and device libraries provide hardware abstraction. OS-independent software components support on-chip peripherals. Middleware abstraction libraries and the Nexperia DVP API support popular middleware.

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## ENABLING SOFTWARE

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Enabling software required to run the IC is included with Home Entertainment Engines. The software provides operating-system independent communication with the hardware, efficient inter-processor communications, support for board functions and components, and a reliable interface with basic streaming-media hardware and software.

The following software components are in the enabling software.

**Hardware API software components** The hardware API software components control all on-chip functions and are the lowest abstraction layer-closest to the on-chip hardware devices. The hardware API components are OS independent.

**Board support library** The board support library (BSL) supports off-chip hardware components required for complete digital video appliances such as tuners, video-audio decoders, and digital encoders. The BSL provides an interface that abstracts hardware-device functions and configures the Nexperia hardware for accessing off-chip devices. The BSL hides board dependencies from applications, separating common from board-specific code, thus allowing the same binary image to run on multiple boards with different peripherals.

**Device library** Device library components are OS-independent higher level device drivers for on-chip peripherals. The library provides a generic device driver for a class of hardware devices with similar functions and shields minor hardware changes from the higher software layers. The device library exports a standard set of functions to initialize and control hardware devices, synchronizing and managing shared device access.

**Infrastructure components** The infrastructure components provide global software services to the system. The OS abstraction library is a key component of the infrastructure which provides a common API and semantics for all OS calls performed within the DVP architecture. The memory management library manages local processor and multi-processor shared memory.

The BSL manager is responsible for board support functions including board activation and interrupt handling. The BSL also includes a DVP system registry API.

An interprocessor communication stack provides a remote procedure call and a host communication component to download and start media images. The streaming software host interface provides streaming applications with an interface for the TriMedia streaming software components.

**Streaming software components** The streaming software components coordinate media streaming driven by hardware and software. The streaming software architecture links media producing and processing components, defines a uniform interface for signal-processing modules, enables code sharing and reuse, and standardizes data exchange among streaming components. The streaming software components provide a framework for applications driven by streams of data and support timestamps for A/V stream synchronization. The streaming software architecture facilitates use of standard A/V software modules in complex systems and time-shift recording.

Because the Nexperia DVP software architecture supports multiple processors, the streaming software architecture allows streaming software components to run on an external processor or streaming software running on the TriMedia core to be controlled by the other processor. For performance optimization, the streaming software architecture also supports load balancing between processors.

**OS adaptation modules** Philips can provide adaptation modules to support Microsoft Windows CE and Wind River pSOS and offers a BSL to adapt pSOS to Nexperia MIPS. Both operating systems support on-chip USB and 1394 hardware using basic software-adaptation components. Philips-supplied software provides a Windows CE OEM adaptation layer and Smart Card support, DOCSIS modem support, a real-time clock, and memory support for NAND and NOR flash and EEPROM.

## VALUE-ADDED SOFTWARE

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Philips Semiconductors and leading software companies are developing and porting a broad range of software modules to the Nexperia Home Entertainment Engine. Planned modules will support new services and features including: time-shift personal video recording, IP telephony (voice and video), picture improvement, MP3, and MPEG-4 services.

**IEEE 1394 and USB 2.0** Philips offers an IEEE 1394 software stack with 5C copy protection. The plug-and-play stack provides content protection for digital transmissions and supports the AV/C, HAVi™, IP/1394, and other protocols. For USB 2.0 support Philips offers a USB host stack and hub.

**V.90 software modem** Philips offers a certifiable V.90 softmodem. The software modem implementation provides significant cost benefits over traditional hardware modems and can be easily upgraded with software. The only hardware required is an inexpensive AFE, bus interface chip, and DAA. The 56-Kbps V.90 softmodem also supports V.34 (33.6 Kbps), ideal for connecting free-to-air or satellite set-top boxes over the public switched telephone network (PSTN).

**Java Virtual Machine (JVM)** Insignia Solutions Jeode™ JVM, a high-performance Java-compatible virtual machine, fully compliant with the PersonalJava™ specification, provides Java™ support for Nexperia Home Entertainment Engines. Insignia JVM employs a proprietary technique, dynamic adaptive compilation, to optimize the performance of Java applications and reduce memory requirements. Well suited for set-top box and digital television applications, the JVM allows the Nexperia Home Entertainment Engines to leverage the benefits of Java technology, including cross-platform support, security, network awareness, dynamic extensibility (which enables field software upgrades over the Internet) and MHP support.

### **SOFTWARE DEVELOPMENT ENVIRONMENT FOR NEXPERIA HOME ENTERTAINMENT ENGINES**

A broad range of software tools from Philips and third-party companies support application development for Nexperia Home Entertainment Engines.

**Development system** Philips offers a versatile PCI-based development system, standard add-in boards, a complete ASTB hardware reference design and demonstration software.

**Advanced environment tools** Advanced environment tools include Metrowerks CodeWarrior™ Integrated Development Environment for developing and debugging applications on the TriMedia and MIPS cores and sample streaming software code. The Philips DVP porting kit for RTOS includes hardware APIs and device libraries to support the Philips STB reference board, DVP APIs for RPC/HOSTCOM, 2D graphics, 3D graphics, and streaming software.

**Software development tools** The Nexperia Home Entertainment Engine dual processor cores currently support two operating systems: Windows CE or pSOS on the MIPS core, and pSOS on the TriMedia core. The TriMedia Software Development Environment supports application development, testing, and optimization entirely in high-level languages. Third-party vendors provide tools to support application development for both operating systems on Microsoft NT and Unix hosts.

## **NEXPERIA APPLICATION DEVELOPMENT TOOLS**

<b>DEVELOPMENT TOOL</b>	<b>VERSION</b>	<b>OS</b>	<b>SUPPLIER</b>
DVP Software Development Environment (includes debuggers)			Philips Semiconductors
WinCE with MSTVPAK	2.12 + b3	NT4	Microsoft
Trimedia Software Development Environment	2.1	UNIX, NT4	Trimedia Technologies Inc.
PSOS PRISM + 2.0.2.1	2.5	NT4	Wind River Systems
Nexperia GNU	Make 3.77 or later	NT4, UNIX	Philips Semiconductors
UNIX shell emulation, Cygnus for Windows	2.02	NT4	Cygnus, Internet freeware
UNIX shell emulation, MKS for Windows NT	6.1	NT4	MKS license required
MS Visual Studio	6.0	NT4	Microsoft license required
MS Windows NT with Service Pack	4.0, 6.0	NT4	Microsoft license required
DOC ++	3.3.13	NT4/UNIX	Internet freeware

**FOR MORE INFORMATION CONTACT:**

**PHILIPS SEMICONDUCTORS DIGITAL VIDEO INTERACTIVE**  
811 EAST ARQUES AVENUE  
SUNNYVALE CA 94088  
PH 800-234-7381  
WEBSITE [www.nexperia.com](http://www.nexperia.com)

**Philips Semiconductors - a worldwide company**

**Argentina:** see South America  
**Australia:** Tel. +61 2 9805 4455 Fax. +61 2 9805 4466  
**Austria:** Tel. +43 1 60 101 1248, Fax. +43 1 60 101 1210  
**Belarus:** Tel. +375 172 20 0733, Fax. +375 172 20 0773  
**Belgium:** see The Netherlands  
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**Bulgaria:** Tel. +359 2 68 9211, Fax. +359 2 68 9102  
**Canada:** Tel. +1 800 234 7381, Fax. +1 800 943 0087  
**China/Hong Kong:** Tel. +852 2319 7888, Fax. +852 2319 7700  
**Colombia:** see South America  
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**Denmark:** Tel. +45 33 29 3333, Fax. +45 33 29 3905  
**Finland:** Tel. +358 9 615 800, Fax. +358 9 6158 0920  
**France:** Tel. +33 1 4099 6161, Fax. +33 1 4099 6427  
**Germany:** Tel. +49 40 2353 60, Fax. +49 40 2353 6300  
**Hungary:** see Austria  
**India:** Tel. +91 22 493 8541, Fax. +91 22 493 0966  
**Indonesia:** Tel. +62 21 794 0040 ext. 2501, Fax. +62 21 794 0080  
**Ireland:** Tel. +353 1 7640 000, Fax. +353 1 7640 200  
**Israel:** Tel. +972 3 645 0444, Fax. +972 3 649 1007  
**Italy:** Tel. +39 2 6752 2531, Fax. +39 2 6752 2557  
**Japan:** Tel. +81 3 3740 5130, Fax. +81 3 3740 5077  
**Korea:** Tel. +82 2 709 1412, Fax. +82 2 709 1415  
**Malaysia:** Tel. +60 3 750 5214, Fax. +60 3 757 4880  
**Mexico:** Tel. +9-5 800 234 7381, Fax. +9-5 800 943 0087  
**Middle East:** see Italy  
**Netherlands:** Tel. +31 40 27 82785, Fax. +31 40 27 88399  
**New Zealand:** Tel. +64 9 849 4160, Fax. +64 9 849 7811  
**Norway:** Tel. +47 22 74 8000, Fax. +47 22 74 8341  
**Pakistan:** see Singapore  
**Philippines:** Tel. +63 2 816 6380, Fax. +63 2 817 3474  
**Poland:** Tel. +48 22 612 2831, Fax. +48 22 612 2327  
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**Russia:** Tel. +7 095 755 6918, Fax. +7 095 755 6919  
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**South Africa:** Tel. +27 11 470 5911, Fax. +27 11 470 5494  
**South America:** Tel. +55 11 821 2333, Fax. +55 11 821 2382  
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**Sweden:** Tel. +46 8 5985 2000, Fax. +46 8 5985 2745  
**Switzerland:** Tel. +41 1 488 2741, Fax. +41 1 488 3263  
**Taiwan:** Tel. +886 2 2134 2886, Fax. +886 2 2134 2874  
**Thailand:** Tel. +66 2 745 4090, Fax. +66 2 398 0793  
**Turkey:** Tel. +90 212 279 2770, Fax. +90 212 282 6707  
**Ukraine:** Tel. +380 44 264 2776, Fax. +380 44 268 0461  
**United Kingdom:** Tel. +44 181 730 5000, Fax. +44 181 754 8421  
**United States:** Tel. +1 800 234 7381, Fax. +1 800 943 0087  
**Uruguay:** see South America  
**Vietnam:** see Singapore  
**Yugoslavia:** Tel. +381 11 62 5344, Fax. +381 11 63 5777

**Internet:** <http://www.semiconductors.philips.com>

**For all other countries apply to:**

Marketing & Sales Communications, Building BE-p, P.O. Box 218,  
5600 MD EINDHOVEN, The Netherlands, Fax. +31 40 27 24825

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