

WinPath Product Family

WINPATH™ ACCESS PACKET PROCESSORS

Highlights

- **Broad family of highly integrated packet processors supporting IP, ATM, Ethernet, FR, HDLC, PPP, TDM, and PWE3**
- **Single-chip, programmable protocol Termination and Interworking features tailored to the needs of access networking equipment such as base stations, media gateways, DSLAMs, multiplexors, and access routers**
- **Communications throughput up to 2.7 Gbps full duplex at less than 5 Watts (maximum)**
- **Incorporates the Data and Control Path functions together in a single, highly programmable packet processor for cost efficiency and flexibility**
- **Production-ready software including more than 40 Data Path protocols are provided royalty free with no NRE**
- **All Data Path protocols in a Ready-to-Use format may operate simultaneously on different ports**
- **Highly configurable memory configurations tuneable to support wide range of diverse applications**
- **Data Path Software managed by up to four engines (WinGines) programmed as a uniprocessor in C for fast time to market**
- **Custom programming available via extensive suite of development tools, including over one hundred application examples**
- **Processing of L2 to L7 headers on a single device with extensive voice/data QoS features using the "WinComm" on-chip interworking architecture**
- **Includes family of market specific devices targeted at particular vertical markets**

Any Protocol/Any Port

WinPath™ is the flagship semiconductor product family from Wintegra. Targeted for the Access Infrastructure, WinPath offers designers a comprehensive method to handle the data path. Wintegra supplies factory verified, production quality protocols for IP, ATM, Ethernet, Frame Relay, HDLC, PPP, and TDM. For most customers, WinPath is highly configurable, utilizing the supplied software as is, but the device is also fully programmable, and can support non-standard or custom protocols as well. Any supplied protocol can be independently selected as a transport mechanism on a per port basis. Additionally, any port can instantly migrate from an initial protocol to a new protocol with zero hardware changes. WinPath provides a world-class set of ATM features for both termination and switching. It also includes interworking from ATM to TDM and from ATM to IP transport media. Or a full set of IP services may be offered over any L2 protocol, including ATM



Wintegra Device Family										
Device	Frequency			Vertical Market	Typical Application	Key Features				
	160	200	233			UTOPIA	Ethernet	TDI	Busses	MIPS
717D4	X			DSL	Low-end Fast Ethernet based IP DSLAMS	1	2 10/100		2	YES
717D6	X			DSL	Low-end DSLAM with IMA uplink	1	1 10/100	8	2	YES
717P4	X			PON	Low-end PON Device	2	2 10/100	6	2	YES
717I1	X			IAD	Low-end IADs	1	2 10/100	1	2	YES
717I8	X			IAD	High-end IADs	1	2 10/100	8	2	YES
717W3	X			WIRELESS	Radio BaseBand Cards, ATM and IP Based	2	1 10/100		2	YES
717W6	X			WIRELESS	IUB Transport w/ATM and IP	1	2 10/100	8	2	YES
730	X	X		GENERAL MARKET	Misc Applications	2	2 10/100	8	3	NO
737	X	X		GENERAL MARKET	Misc Applications	2	2 10/100	8	3	YES
737D4	X	X		DSL	Medium Perf. DSLAM with Fast Ethernet	2	2 10/100	0	3	YES
737P4	X			PON		2	2 10/100	6	2	YES
737M6	X	X		MULTI-SERVICE/WIRELESS	Low-end MS (DS3) Acc. Rout/AR Line Cards	2	2 10/100		3	YES
747	X	X		GENERAL MARKET	Misc Applications	2	2 10/100/1000		3	YES
747D2	X	X		DSL	DSL Uplink Card	2	2 10/100/1000	16	3	YES
747D4	X	X		DSL	Low-end IPDSLAM Line Card	2	2 10/100/1000	1	3	YES
740P6	X	X		PON	PON MxU	2	2 10/100/1000	6	3	NO
747P6	X	X		PON	PON MxU	2	2 10/100/1000	6	3	YES
747W6	X	X		WIRELESS	BTS	1	2 10/100/1000	8	3	YES
770	X	X	X	GENERAL MARKET	Misc Applications	2	2 10/100	8	3	YES
777	X	X	X	GENERAL MARKET	Misc Applications	2	2 10/100	8	3	YES
770M6	X	X		MULTI-SERVICE/WIRELESS	High Perf. Access Router, RNC	2	2 10/100		3	NO
777M6	X	X		MULTI-SERVICE/WIRELESS	High Perf. Access Router, RNC	2	2 10/100		3	YES
780	X	X	X	GENERAL MARKET	Misc Applications	2	2 10/100/1000	16	3	YES
787	X	X	X	GENERAL MARKET	Misc Applications	2	2 10/100/1000	16	3	YES
780M6	X	X		MULTI-SERVICE/WIRELESS	High Perf. Access Router, RNC	2	2 10/100/1000		3	NO
787D4	X	X		DSL	IPDSLAMS Line Cards or Pizza Boxes	2	2 10/100/1000	0	3	YES
780W4	X	X	X	WIRELESS	IUB Transport w/ATM and IP	2	2 10/100/1000	0	3	NO
787M6	X	X	X	MULTI-SERVICE/WIRELESS	High Perf. Access Router, RNC	2	2 10/100/1000		3	YES

AAL5, PPP and Ethernet. The WinPath family includes numerous versions offering high functionality and broad features, plus down-scaled versions providing less performance and reduced prices.

WinPath complements the protocol offering with an ideal mix of fine-grained quality-of-service support, Layer 2/3 Ethernet switching, legacy TDM protocols, plus Point-to-Point protocol (PPP) support features, all which are increasingly important in access equipment designs.

Family Members

The WinPath family includes general market devices, plus numerous Market Specific versions. The WIN777 was Wintegra's first general market access packet processor and provides the starting point

to understand the WinPath family. WIN7x7 devices include a MIPS 64-bit 5Kc core for control path operations. The WIN7x0 devices do not include the MIPS 5Kc core.

For less intensive interworking demands the WIN737 is offered with half the performance of the WIN777 at a reduced price. The 737 is also available as a non-MIPS variant, the WIN730. Wintegra has two devices, the WIN787 and WIN780 which integrate 2 Gigabit Ethernet MACs and have 16 TDM style interfaces, 8 more than the 777. The WIN780 has no MIPS core. Wintegra also has market-specific devices focused on particular vertical markets. The WIN77xM6 is targeted for the Multi-Service Access market while the WIN717D4 and WIN717D6 are primarily for the DSL market.

Scalable Performance Architecture

WinPath is designed for applications with a data path throughput ranging from 8 Mbps to more than two full-duplex ports at 622 Mbps, with connectivity to 1 Gbps. The WinPath family members are available in 233 MHz, 200 MHz and 166 MHz speed grades. Low-end applications can eliminate unneeded memory interfaces, and mix parameter and packet structures on the host bus, while two devices may be used separately in ingress and egress modes for more performance.

Wide Choice of Interfaces

WinPath is designed to allow direct interface to all common access equipment physical standards, including: T1, E1, J1, T3, E3, xDSL, OC-3 ATM, OC-3 POS, OC-12 ATM, OC-12 POS and 10/100/1000 Ethernet.

Scalable External Processing

WinPath gives designers access to a scalable control path processing resource. This is achieved using either the internal 64-bit MIPS core or an external processor (such as the PowerPC™ 750). A PowerPC processor can be gluelessly connected to these device in cases where additional performance is required, since WinPath also offers memory control functions on

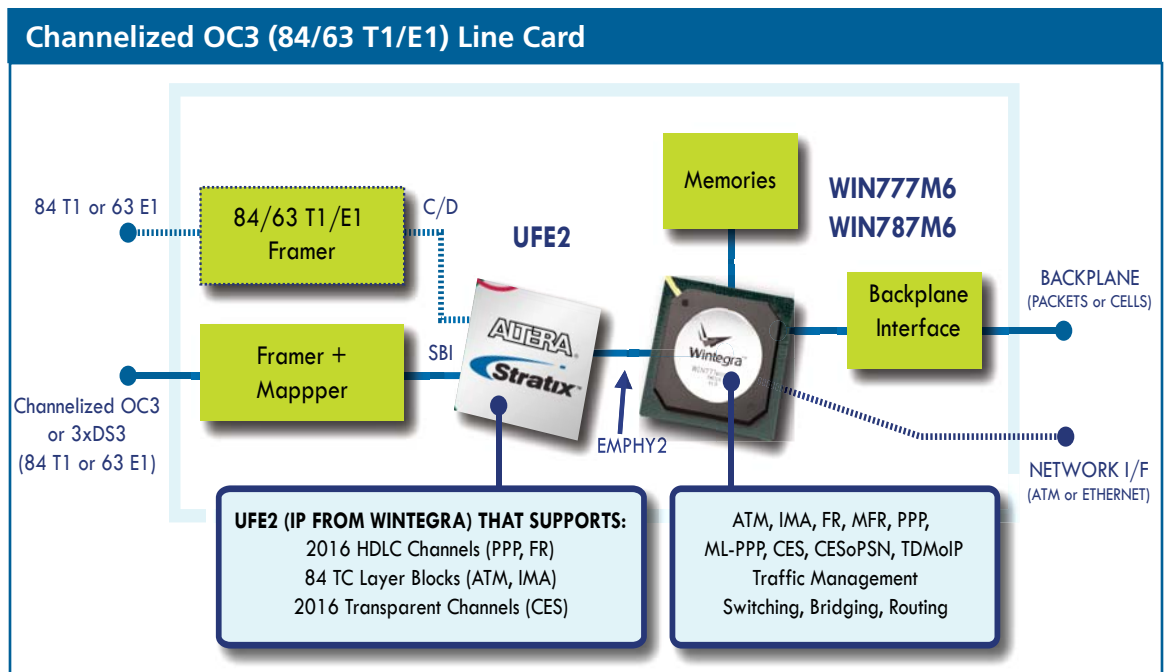
behalf of the external processor.

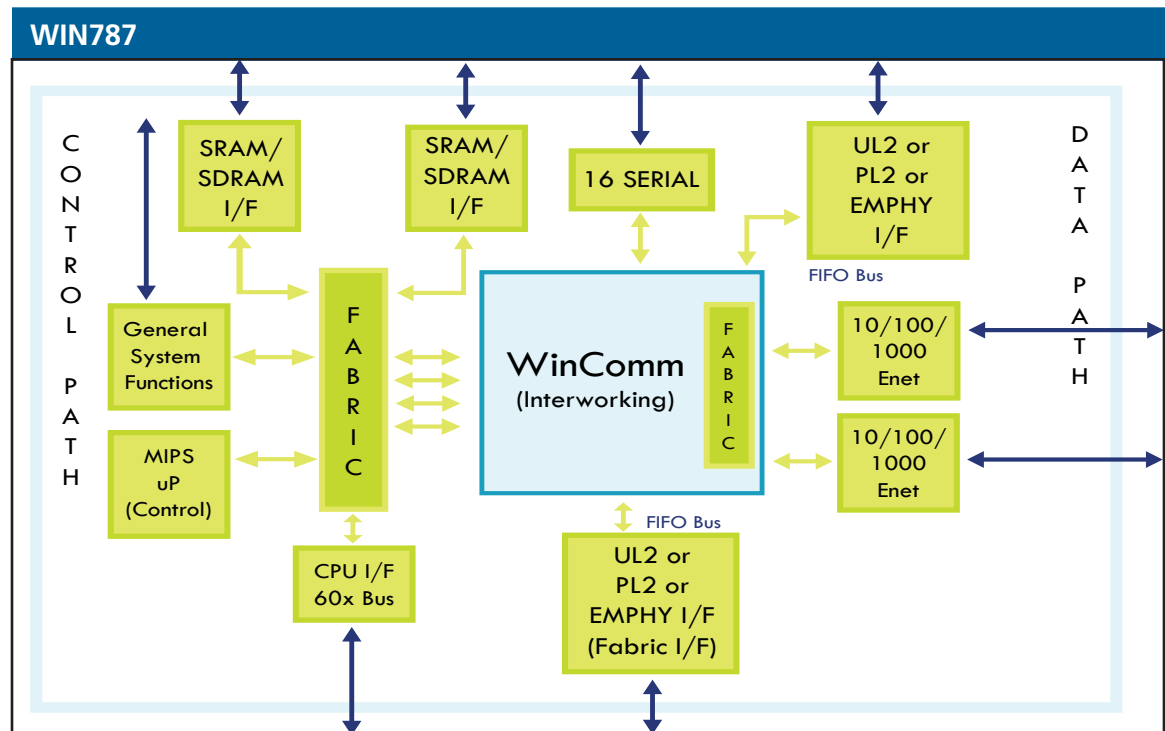
Market-Specific Devices

Wintegra has a broad family of market specific silicon targeting four vertical markets, Voice over Packet, Multi-Service Access, DSL, and Wireless Infrastructure. The WIN77xM6 devices target the Multi-Service Access (MSA) market providing an industry-leading mix of hardware and software features for this particular market space. The 777M6 with its companion FPGA provides a fully channelized OC3 solution of MSA protocols.

Like other WinPath processors, these devices are available with an on-board MIPS 5Kc core for control path applications, or without, utilizing an external PowerPC processor for these software functions. Both devices are bundled with a rich set of MSA-focused protocols including Frame Relay, Multi-link Frame Relay, ATM-UNI, Inverse Muxing for ATM (ATM IMA), ATM Circuit Emulation Services (CES), PPP, Multi-link PPP, multi-channel HDLC, and PWE3 (pseudo wire emulation end to end).

WinPath complements these protocol offerings with fine-grained (QoS) quality-of-service support, which is increasingly important in MSA equipment designs. A MSA line card is shown below.





Wintegra also has "one WinGine" 717D4 and 717D6 DSL market-specific silicon devices. The 717D4 is targeted at IP-based DSL line cards, uplink cards and "pizza-box" systems, while the 717D6 is more suitable for ATM-based designs.

Simplified Systems Design

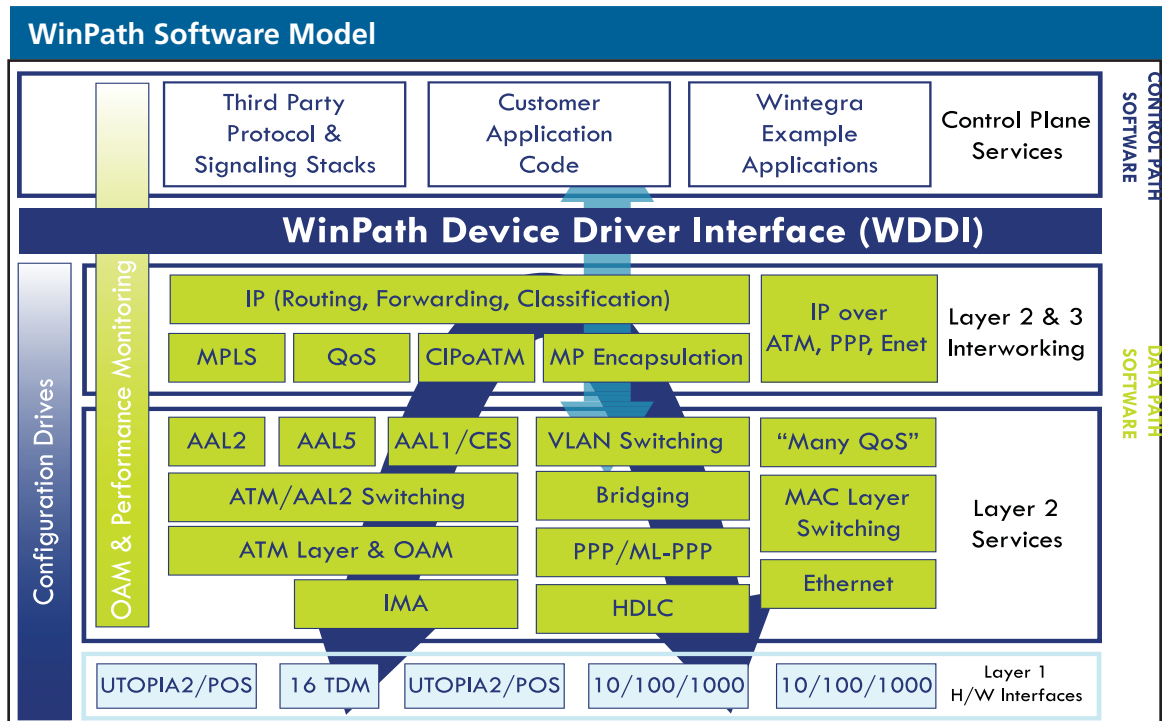
Fully integrating the control path and the data path for the access infrastructure, WinPath combines the best aspects of a communication processor and a network processor into a single chip. This not only allows cost savings, but also simplifies design. The external "bus" between data path and control path is eliminated. In addition, WinPath offers a single integrated concept for buffer handling that simplifies the handoff between data path and control path.

Wintegra Software Environment

All WinPath devices are software compatible. Utilizing one of the example applications provided by Wintegra, the user can program a new system-specific device configuration in as little as ten minutes. Wintegra offers best-in-class software integration and support through its WinPath Device Driver Interface (WDDI). WDDI consists of a networking API and a series of ANSI-C drivers that are production

tested and field hardened for carrier-class demands. WDDI is a host-based architecture that permits all configurable WinPath features to be accessed and managed via a standard ANSI-C interface, with no loss of generality. Configuration and management are simplified by showing only user-definable fields. WDDI is a truly portable implementation with no RTOS or Board Support dependencies. Additionally, a host registry is provided that allows tracking of specific WinPath configurations. Object-oriented design allows WinPath-based systems to be configured from the "bottom-up" yet managed from the "top-down" simplifying the overall software design.

Wintegra has worked with major RTOS providers and has ported VxWorks to its reference boards. Check with Wintegra for other porting schedules or use Wintegra's "roll your own BSP" development kit. Additionally, reference implementations of ATM signalling stacks, higher layer routing protocols, and PPP authentications services have been integrated with the WinPath API and drivers. See the diagram "WinPath Software Model" on the following page.

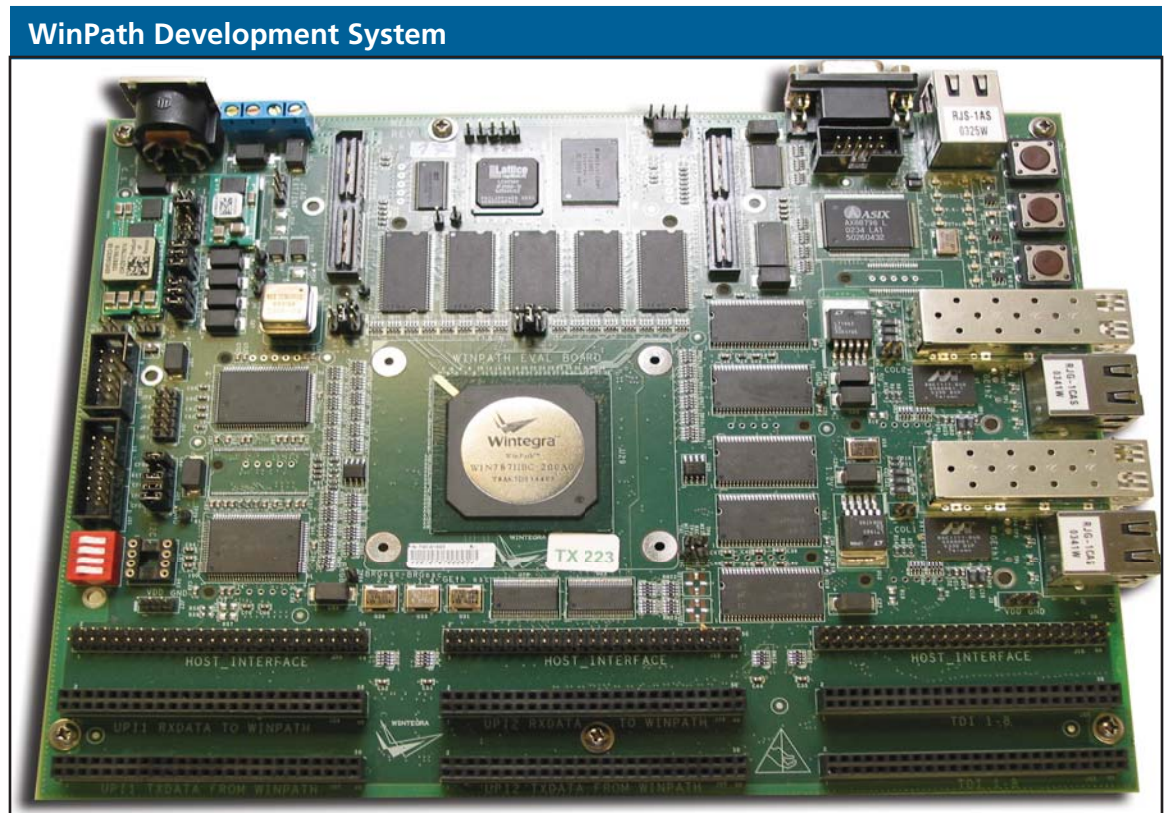


Performance

Contact Wintegra to have a performance analysis test run on your configuration to an accuracy of a few percent

Wintegra Development System

Wintegra offers reference boards and various PHY configuration cards for early customer software development. MIPS and PowerPC version are available. BSPs have been ported as well. Schematics, BOMs, and example code are all available from Wintegra



Protocols Available in Standard Releases

IP Routing	Support for IPv4 (including TOS, TTL, Header Checksum)
Interworking	Per-flow WFQ and Shaping
	Routing and Forwarding over ATM (RFC 1483/2384/1577)
	IP routing and forwarding over Ethernet (RFC 894)
IP Classification	IP/AAL2 interworking
	Supports multi-field classification and differentiated services according to RFC 2474 and 2475. Single or multiple passes with fields located anywhere in the packet without external CAM. Single pass up to 128 bits.
IP Address Resolution	Supports full LPM of >1M IP addresses without external CAM.
L2 Ethernet Switching	Using MAC address or 802.1P/Q VLAN tags.
Bridging	ATM Ports to Ethernet Ports
PPP and ML-PPP	Supports PPP (RFC 1661), HDLC and ML-PPP (RFC 1990). ML-PPP supported 1 to 32 ports.
MPLS	Tagging and de-tagging.
NAT/PAT	
Statistics	Extensive collection at the channel and flow.
Frame Relay/Multi-link Frame Relay	
PWE3	CESoPSN and SAToP over TDM & EMPHY (Wintegra proprietary bus)

Serial Interfaces

Two UTOPIA-2 or POS interfaces supporting up to 50 MHz operation. Master or slave mode. Each port supports OC-12/STM-4 or 4 OC3/STM-1 Interfaces, or 12 OC-1/DS-3/E3 interfaces or 63 low-speed devices such as xDSL framers or DSPs. On 78X devices, 127 PHYs are supported.

Two 10/100/1000 MAC interfaces supporting MII, RMII or GMII

Sixteen (16) serial interfaces supporting T1, E1, J1, xDSL, E3, DS-3 or other serial interfaces up to 50MHz. Built-in support for ATM Transmission Convergence. Through on-chip TDM machine, supports fractional ATM, HDLC and Transparent/CES modes.

RISC Control Processor (Optionally Disabled on 7x0 Devices)

MIPS 5Kc 64-bit Core

16K I-cache and 16K D-cache

MIPS64 Instruction Set and MMU

Bus and Memory Interfaces

64-bit System CPU Data Bus with 32 address pins. PowerPC 60x Bus compatible. Interfaces directly with SDRAM, SRAM, EPROM and an external PowerPC 750 family processor.

Two Optional 64-bit SDRAM/SRAM interfaces at up to 155MHz. Used for serial data or serial parameters in a High Performance configuration. Supports industry-standard SDRAM, ZBT SRAM and Asynchronous SRAM.

May be optionally populated with 32-bit memory widths for space/power savings

CPU Data/Program, and Serial Data/Parameters may be optionally mapped to any combination of interfaces.

General System Functions

32-bit Timer

16550 Compatible UART

General Purpose Interrupt Controller

I2C Connection to boot EEPROM. Master mode supported.

JTAG-based Debug port

Other Features

Approximately 2.5-4.7W power (maximum) dissipation depending on loading

2 WinPaths may direct connect in split ingress and egress processing tasks

3.3 I/O. 1.8V internal.

913 Lead HSBGA 40x40mm, 1mm Pitch

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