

WinPath™ Access Packet Processor

Highlights

- Wintegra's next generation single-chip, programmable protocol Termination and Interworking features exactly tailored to the needs of the Access Infrastructure market
- Silicon is provided with factory verified Layer 2 and 3 software with no royalties or NRE
- Incorporates the Data and Control Path functions together in a single, highly programmable packet processor for cost efficiency and flexibility
- Greatly enhances the WinPath 7xx family with introduction of dual integrated Gigabit Ethernet MACs plus sixteen 50 MHz serial channels
- Higher speed option is available (233 MHz)
- UTOPIA ports enhanced to support 127 PHYs
- Every ATM and IP function integrated and ready to use.
- The WIN787 like other members of the WinPath family is 100% software compatible with all other devices.
- Protocols are future proof, running out of on-chip RAM.

WIN787, Integrated Gigabit Ethernet and additional TDM ports..

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, HDLC, PPP, FR, and TDM. 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 inter-working 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 AAL5, PPP and Ethernet.

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. Two devices may be used separately in ingress and egress modes for more performance. Low-end applications can eliminate unneeded memory interfaces, and mix parameter and packet structures.



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.

A significant enhancement of the 787 over the 777 is the addition of 8 additional 50 MHz serial interfaces. Utilizing these ports, designers can build telephony cards supporting up to 16 T1/E1 connections or 16 T3/E3 ports, clear channel. The UTOPIA L2 interfaces now support 127 PHYs each.

Simplified Systems Design:

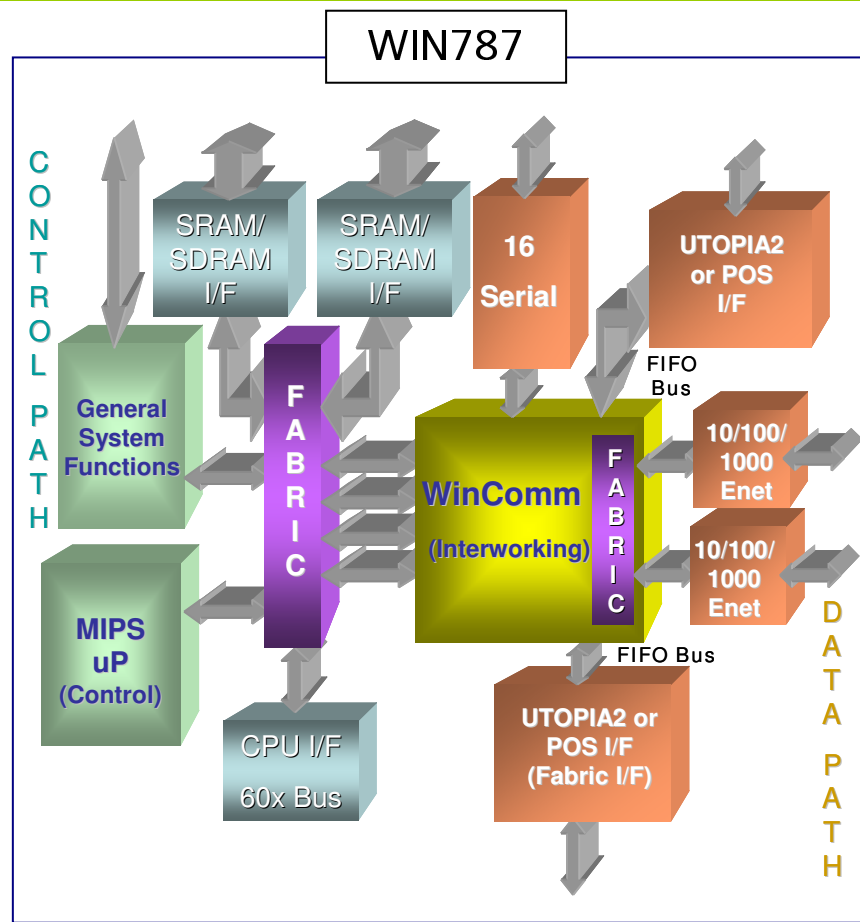
Fully integrating the control path and the data path for DSLAM designs, WinPath combines the best aspects of a communication processor and a network processor into a single chip. This not only allows cost savings, but also simplifies design. In addition, WinPath offers a single integrated concept for buffer handling that simplifies the handoff between data path and control path. The on-board control path processor is a standard MIPS 5Kc core running at 233, 200, or 166 MHz. All standard MIPS 5Kc tools will work with this core, such as compilers, assemblers, linkers, EJTAG, etc.

Software Environment:

Wintegra supplies a rich set of production ready software for access network system designers. No license is required and software is supplied with the silicon. A development environment (Wintegra Evaluation Board) WEB is available with either VxWorks or Linux support. Full test suites and example applications are available as is source for our API. This API (WDDI) is a C type construct that provides WinPath users a simple interface to internal ports as well as software features. 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

Software/Hardware Features:

WinPath software protocols are all RAM based and downloaded into the silicon as part of their power-on, initialization sequence. This design provides an architectural future-



proofing as modifications can be easily made to existing protocol software, plus new protocols can be added, all without changing of any hardware in a particular system. All of the following protocols have been rigorously tested and verified both through internal Wintegra based testing plus in conjunction with our early alpha and beta customers. These protocols require no royalties or NRE and are provided free from Wintegra. Particular restrictions between the devices are noted:

- ATM Adaptation layers AAL0, AAL1, AAL2 and AAL5.
- ATM traffic shaping for CBR, VBR, GFR and UBR, Compatible with ATM Forum TM-4.1
- Up to 64K simultaneous ATM channels (VC or VP) with per-VC queuing.
- ATM cell and CPS switching up to 622 Mbps full duplex.
- AAL1 — Supports structured and unstructured Circuit Emulation Services (CES 2.0) ATMF-0078..
- IMA — Inverse Multiplexing over ATM in one or more IMA groups according to ATMF 0086.001.
- IP Termination — Support for IPv4 (including TOS, TTL, Header processing).
- IP Routing — Support for IPv4, RFC 1812 (including TOS, TTL, Header processing)
- IP Interworking
 - Per flow WFQ and shaping.
 - Routing and forwarding over ATM (RFC 1483/2684)
 - IP routing and forwarding over PPP (RFC 2364/2472) and PPP-Mux (RFC 1661).
 - Supports IPv4 IP routing and forwarding over Ethernet (RFC 1042).
- IP Classification — Supports Multi-field classification and Differentiated Services according to RFC 2474 and 2475. Algorithmic with single or multiple passes without external CAM
- IP Address Resolution — Supports full Longest Prefix Match (LPM)
- L2 Ethernet switching using MAC address or 802.1P/Q VLAN tags.

- **Bridging** – Ethernet to Ethernet or Ethernet to ATM.
- **Direct Mapping** – from ATM VC to Ethernet port or PPP port
- **PPP and ML-PPP** — Supports PPP (RFC 1661), ML-PPP (RFC 1990), PPP-Mux and HDLC. ML-PPP supports 1 to 32 ports
- **MPLS** — Tagging and detagging
- **Statistics** — Extensive collection at the channel and flow.

For a more complete list contact Wintegra.

Software Tools: WDDK: WinPath DPS Development Kit

Although most customers use the available DPS software, some customers prefer to develop their own. In that case, a full suite of integrated development tools is provided to all DPS source licensees, including a DPL compiler and linker, a source-level debugger, a WinPath simulator, and a thread analyzer. Also included are a performance profiler, language sensitive editor and on-line documentation. For more information please contact Wintegra.

Software Tools: Control Path Software (CPS)

Another key component of the WinPath software architecture involves management of the control path, including termination of packets and cells, processing of signaling protocols and handling of OAM, statistics and error conditions. The Control path software operating on the internal MIPS host processor (or external PowerPC processor) provides the control path capability such as ATM signaling, TCP/UDP/IP stacks, PPP authentication, etc.

WinPath supports Control Path data flows with either the on-board MIPS processor or an external PowerPC processor such as an IBM PPC750.

The on-board MIPS core is a standard 5Kc, so Integrated Development Environments (IDEs) are available from various suppliers. WinPath also utilizes standard EJTAG 2.5 debug ports so numerous debugging hardware

devices are available as well. For PowerPC customers, numerous development and debug tools are available from many suppliers.

Control Path software is supplied from various vendors or developed by customers. Wintegra is partnering with a number of these third parties to ensure that their software inter-operates with the architecture and is fully compliant with standards. Many of these vendors have links on the Wintegra website. Various BSPs are also available. These BSPs and other packages are outlined below:

- Initial board support packages available for VxWorks and Linux¹.
- Voice over Packet: Reference board from TI/Telogy, utilizing their new family of DSPs and WinPath as the aggregation device
- Protocol stacks from various third party vendors like FutureSoft, HSS, NetBricks and others.

Control Path Software can often be tested on Wintegra's WEB, reference board, to give programmers a head start until their own system board has been completed.

Wintegra Evaluation Board (WEB)

As briefly mentioned previously, Wintegra has a reference platform to provide a programming and development environment for WinPath, plus act as a demonstration device. The WEB is supplied with SDRAM and high performance SRAM or packet and parameter memory, and can be configured with optional daughter cards supporting protocols such as OC-3 or OC12 ATM, T1/E1 or Gigabit Ethernet. The WEB is available in two configurations for control path support, one using the on-chip MIPS core, the other with an on-board IBM PPC750. Debug support is facilitated by an EJTAG 2.5 port with various vendors supplying debuggers.

See our website, www.wintegra.com for more information on the WEB(s).

¹ Please contact Wintegra for a full list of OS supported.

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