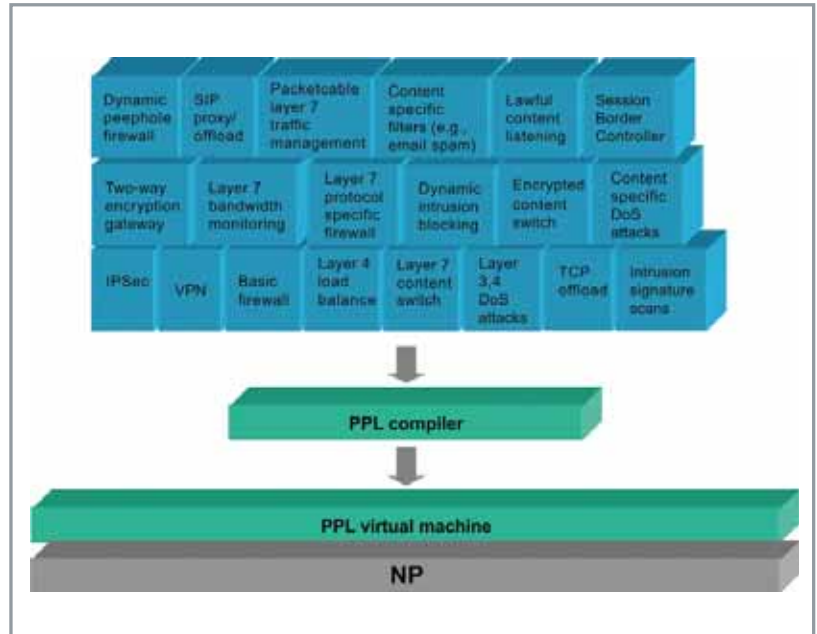


PPL for Intel 23xx/28xx

FEATURES/BENEFITS

- PPL Software harnesses network processor (NP) complexity**
Powerful, easy-to-use, high-level programming model - no need to learn the underlying NP architecture or write any NP microcode.
- Complete development environment and run-time software shortens time-to-market**
Provides everything needed to create, test, and deploy applications for Intel NPs
- Powerful, optimized algorithms and state machines for advanced packet processing**
Makes complex, content-oriented packet processing applications such as security, VoIP, and deep-packet processing fast and easy to write, maintain and enhance
- Virtual Machine (VM) approach supports popular NP platforms and is easily configured to custom designs**
Verified on Intel® Netstructure, RadiSys® Promentum and IP Fabrics' Double Espresso



PPL's Functional Language and Virtual Machine approach manages NP complexity, and excels in scalability, portability and robustness

Create, test, and deploy powerful NP applications in a fraction of the time

compared to conventional programming approaches using IP Fabrics' Packet Processing Language (PPL) for the Intel IXP23xx/28xx families. Develop prototypes and proofs-of-concept in days or weeks instead of months. Optimize critical sections by gaining visibility of system-wide performance far earlier in the development process, and deliver the final product much sooner and with fewer resources than is possible using other methods that require the development of very low-level, hardware-specific programs.

PPL provides everything needed for many complex IXP23xx/28xx-based applications – without requiring knowledge of the underlying NP details and without writing ANY hardware-specific microcode.

PPL manages network processor complexity via a very high-level, functional language designed to run on a virtual machine (VM) (see Figure). By providing an application-specific functional language, PPL eliminates the need for detailed knowledge of the underlying NP. Implementing PPL as a VM in software atop the NP provides the programmer with a robust, machine-independent environment, designed to take advantage of

proven parallel programming optimizations and highly-optimized 'built-in' functions.

Using IP Fabrics' revolutionary new approach enables the application developer to focus attention on packet processing logic and not on the underlying NP architecture. IP Fabrics' virtual machine's performance compares very favorably to the performance of the native machine programmed in a traditional embedded language such as C because the virtual machine and 'built-in' functions are highly-optimized microcode, capitalizing on the NP's parallel processing environment. In many cases, virtual machine performance may in fact be higher than un-optimized or lightly-optimized software developed using other languages.

PPL's 'built-ins' support complex network processing capabilities such as tracking connections, removing/adding headers, encrypting a packet, scanning the payload for a regular expression and so on. Such high-level abstractions enhance productivity and enforce consistency and re-use of code modules. And, since the PPL built-ins have been highly tuned to the NP architecture, they offer superior performance.

PPL IDE & Language Highlights

POWERFUL BUILT-IN ALGORITHMS AND STATE MACHINES

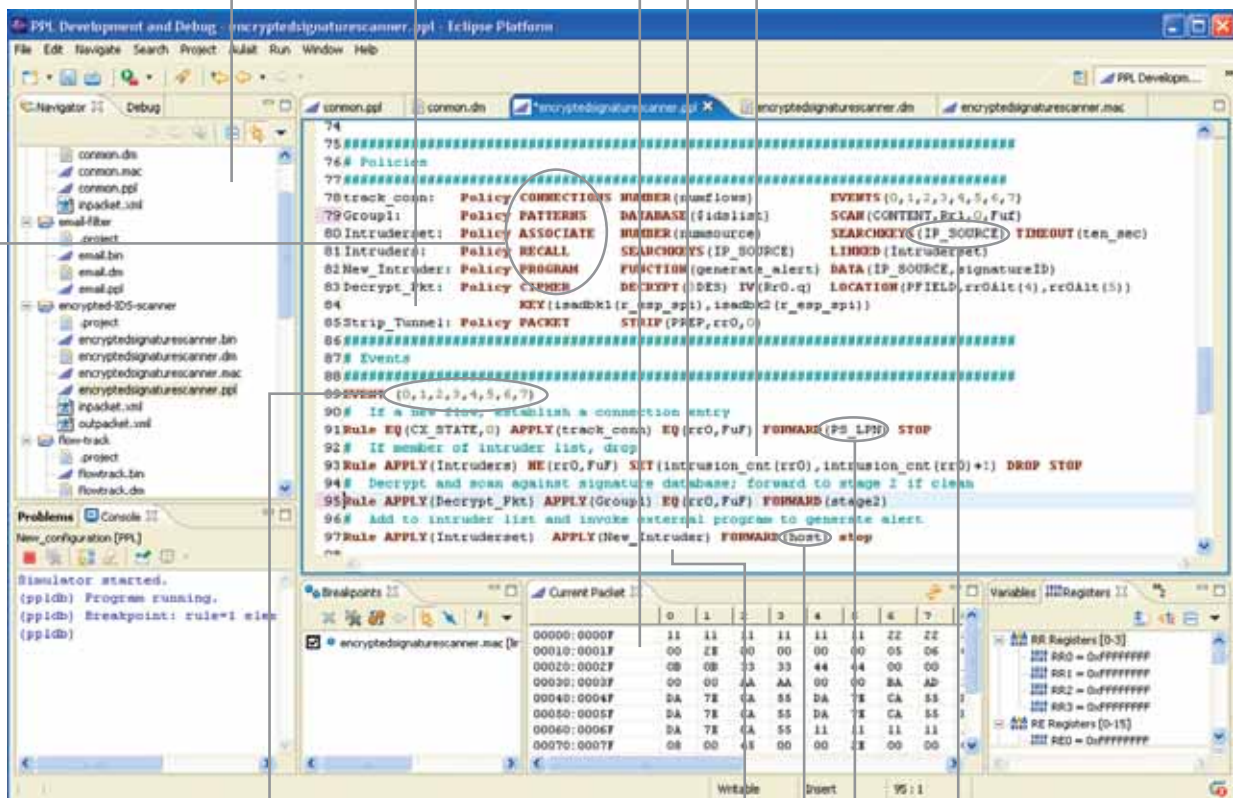
- Automatically establish and track connections
- Effectively scan packet parts and signature database
- Perform associative table lookup
- Encrypt/decrypt
- Insert/strip headers

INTEGRATED DEVELOPMENT ENVIRONMENT (IDE)

- Manage multiple projects
- Integrated editor and compiler
- Simulator and debugger

FLEXIBILITY

- Ability to invoke user/3rd party written programs
 - microcode
 - XScale
 - other remote processor
- Shared data structures with control and management planes logic



CONCURRENCY

- Concurrent events
- Multiple packets being processed concurrently
- Expressions evaluated in parallel

VERY HIGH-LEVEL FUNCTIONAL LANGUAGE

- Symbolic, logical syntax
- Logical port concept-forward packets to network ports, host computer, remote programs, or another PPL event
- PPL automatically calculates common layer 3/4 headers and payload locations

IP Fabrics' PPL Workbench integrated development environment

PPL DeviceMap – Mapping the VM to the Target Hardware

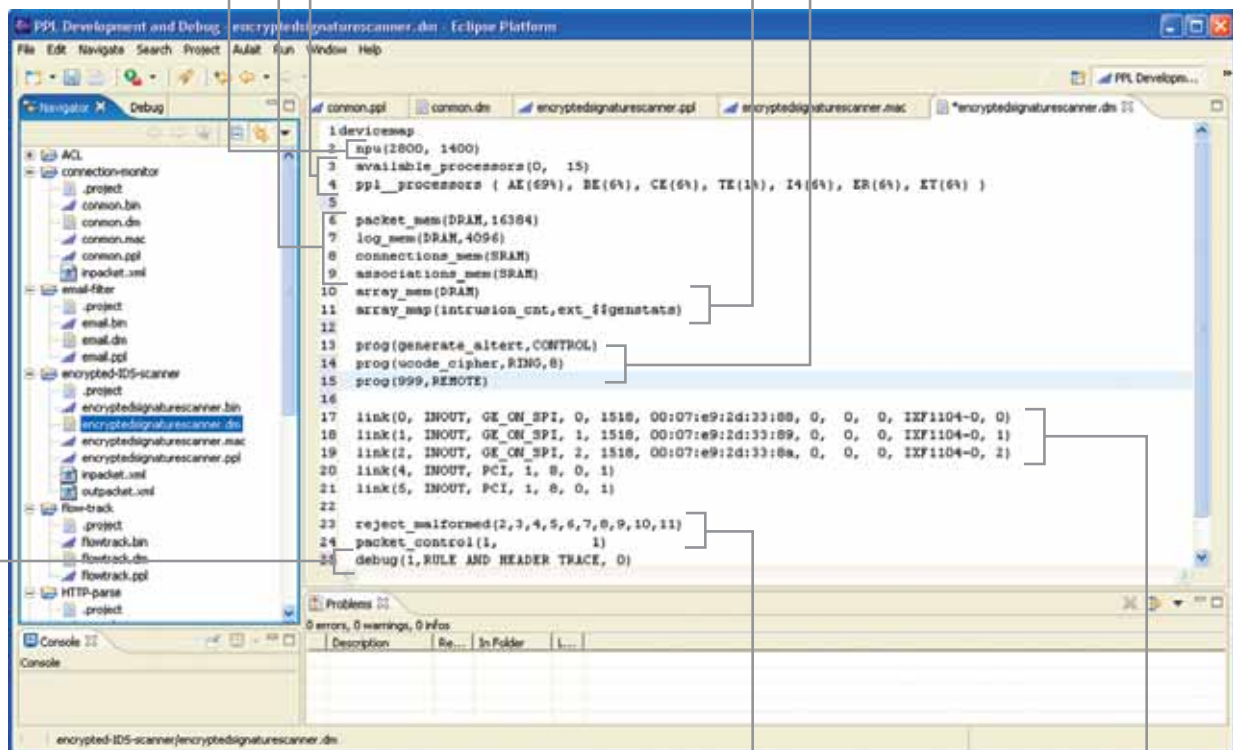
SELECT NP MODEL AND SPEED

PROCESSING RESOURCES & MEMORY

INTERFACE WITH REMOTE PROGRAMS

- Specify size and type of memory
- Allocate NP processing resources to VM
- Map data structures to pre-allocated memory

- Microcode
- XScale
- Remote host



IP Fabrics' DeviceMap provides a flexible, tunable way to map PPL to the target hardware

DEFINE TRACE & DEBUG CONFIGURATION

DEFINE PACKET MANAGEMENT

DEFINE LOGICAL PORTS

- Automatic Denial of Service (DoS) and malformed packet rejection
- Flow ordering

- Network interface
- Remote host

PPL Data Sheet

PPL INCLUDES

PPL Compiler: Integrated with Eclipse-based user interface or scriptable using a simple CLI, the PPL Compiler runs on both Windows and Linux PC's.

PPL Virtual Machine: The complete base PPL runtime environment optimized for the IXP23xx/28xx, including features such as:

- Parallelizing PPL applications across up to 16 microengines (IXP28xx).
- Optimizing/hiding costly memory accesses.
- Abstracting hardware-specific details such as the thousands of registers, complex memory model, and hash/crypto units.
- Interfacing with external programs, such as user-written microcode or programs running on an adjunct or remote processor.
- Sophisticated built-in functionality, such as regular-expression content scans, associative memory lookups, rate monitoring, packet management, and connection tracking.

Ethernet, SPI-3, and SPI-4 receive and transmit interfaces.

Full Linux-based XScale support: Includes Intel IXA Portability Framework compliant functions and utilities for:

- data plane loading
- data plane configuration
- data plane management

Linux-based APIs & Libraries: Includes Linux user-mode interfaces for integration with control and management plane and software.

Sample PPL programs and Linux-based XScale utilities

Complete product specifications and supporting documentation.

APPLICATION-SPECIFIC ADD-ONS

The following Add-Ons are fully integrated into the PPL Virtual Machine, and require no further integration or testing by the user. Similar to the base product, the PPL Add-Ons are specific to a particular network processor model:

PPL Basic Encryption/Decryption: Protocol-independent crypto support, including DES, 3DES, AES, AES192, AES256 ciphers and SHA1 hash. Ideal for SSL, TLS, user-supplied IPSEC, and customer protocols. Requires Intel IXP2850.

PPL PCI Express Delivery (PXD): A very high-speed mechanism for remote procedure call and packet transfer across PCI/PCI-Express buses, ideal for interfacing with tightly-coupled processors (e.g., Pentium). Includes customizable Pentium companion software, allowing the NPU ports to appear as standard linux 'eth' devices.

PPL Advance Classification Support: Dynamic and flexible multi-field, multi-comparator ideal for packet classification against list of classification rules. Supports a broad set of operators including full match, masked match, wildcard, and greater than/less than.

PPL SuperPacket Support: Support for aggregating multiple packets/fragments into larger 'SuperPackets', which are then treated as logical packets. Ideal for fragmentation and TCP segment re-assembly.

PPL Multi-Pattern Match Support: Highly-optimized algorithm for scanning a packet against a large database of patterns and signatures. Also includes the PPL Multi-Pattern Match Database Builder.

PPL Longest Prefix Match Support: Highly-optimized algorithm for LPM searches. Also includes the PPL Longest Prefix Match Database Builder.

INTEROPERABILITY

In some NP-based solutions, communications between PPL programs and applications outside of the scope of PPL will be required. PPL supports this capability with a flexible interoperability model, allowing PPL applications to interface with external programs sharing the same NP or residing on external processors, such as other NPs and control plane processors.

DOUBLE ESPRESSO INTEGRATED PLATFORM

PPL is also available from IP Fabrics as part of an integrated application reference platform. The application reference platform includes an IP Fabrics Double Espresso PCI Express form factor card with dual IXP2350 NPs, installed in an appliance-type server with preloaded Linux and PPL software.

ORDERING INFORMATION

PPL products are licensed on a subscription basis, with subscriptions available in annual and quarterly installments. A PPL Product Subscription is valid for a commonly-located development team working on a specific product family and entitles the customer to full use of the PPL product as well as standard support and maintenance. Other licensing and support levels are available.

For more information, including pricing, availability, and ordering, please contact IP Fabrics by email at info@ipfabrics.com or at the phone numbers below right.



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