

Communication Network Processor Solution for Broadband Access (BBA)



FEATURES

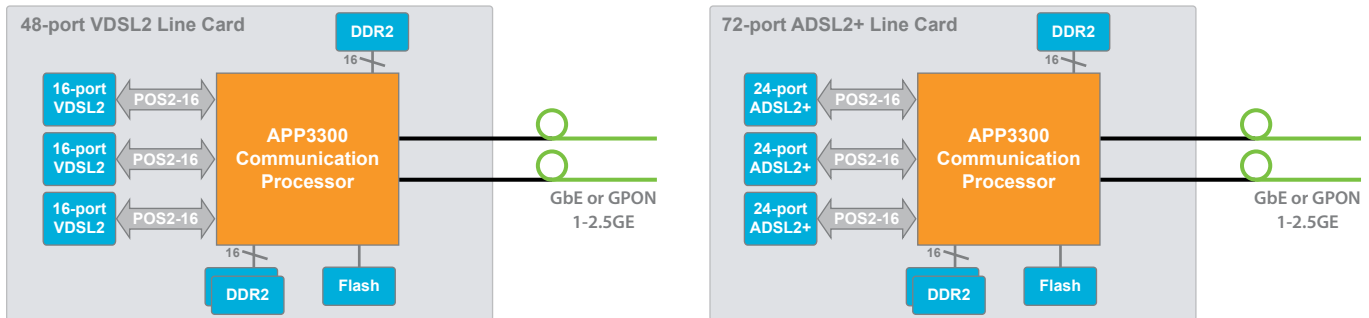
- Integrated hardware and software development platform for BBA applications
- TR-101 compliant software with differentiated traffic management, service provisioning, policing, and security features
- Hardware-ready for developing standards such as WT-145, WT-156, WT-177, and others
- Support for VDSL2, VDSL, ADSL2+, ADSL2, and/or ADSL on a per port basis
- VDSL2 with ADSL fallback
- IPv4 and IPv6 traffic
- Support for subtended DSLAMs
- Support of up to 48 VDSL2 or 96 ADSL2+ ports at 3.0 Gb/s aggregate sustained throughput with a single communication processor
- Low-power, cost-efficient portfolio that scales across a wide range of performance and feature requirements for target application
- Factory-hardened with over 1000 system-level test cases
- Device-independent APIs that provide a functional level of abstraction
- All data and control plane code is delivered in source form
- Comprehensive tool suite and communication processor device APIs that allow addition of proprietary features
- Pre-integrated third-party control plane stack and management software availability
- Hardware solutions available from ODMs with proven track record in developing BBA products based on the LSI solution
- Dedicated, global system and field application engineering teams with deep product and domain expertise

BENEFITS

- Rapid system integration, as low as three months
- Flexibility to add proprietary features for product differentiation
- Ability to leverage a single application software investment across an entire portfolio of products (CO line cards, remote units, port densities of up to 48 VDSL2 or 96 ADSL2+, GPON, next generation IPv6 ready networks, etc.)
- High reliability provided by factory-tested, field-hardened solution

LSI provides best-in-class communication processor silicon, scalable, and customizable software optimized for broadband access applications, and system-level technical support from an experienced global applications engineering team. LSI enables the creation of differentiated BBA products and the ability to quickly bring them to market. The LSI solution has been hardened from over eight years of usage by numerous development teams and has been field-proven in VDSL and ADSL products deployed by several tier 1 service providers. Additionally, LSI has established strong relationships with leading third-parties to create a full ecosystem of hardware, pre-integrated software applications, and system integration services tailored to the LSI broadband access solution.

xDSL Line Card System Diagram



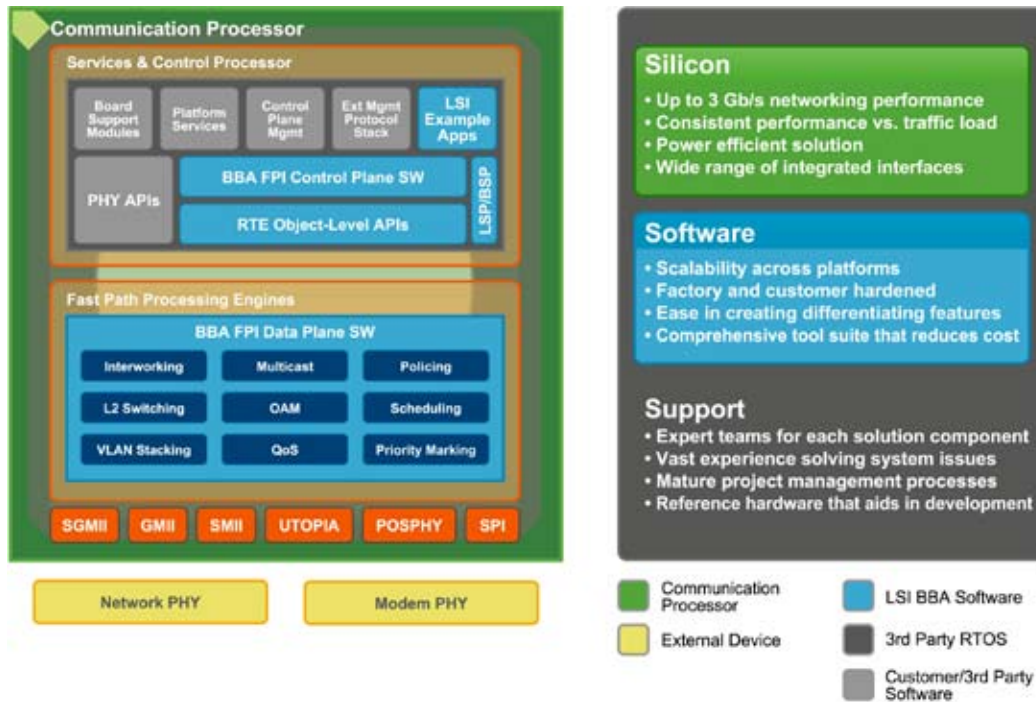
Comprehensive TR-101 Support & Differentiated Features

The LSI BBA solution enables differentiated services for DSLAM deployments in service provider networks around the globe. Powered by flexible, programmable communication processors, this BBA solution reaches substantially beyond TR-101 requirements. The LSI BBA solution is continually enhanced to incorporate requirements found in developing standards such as WT-145, WT-156, WT-177 and others, as well as the unique requirements of service providers.

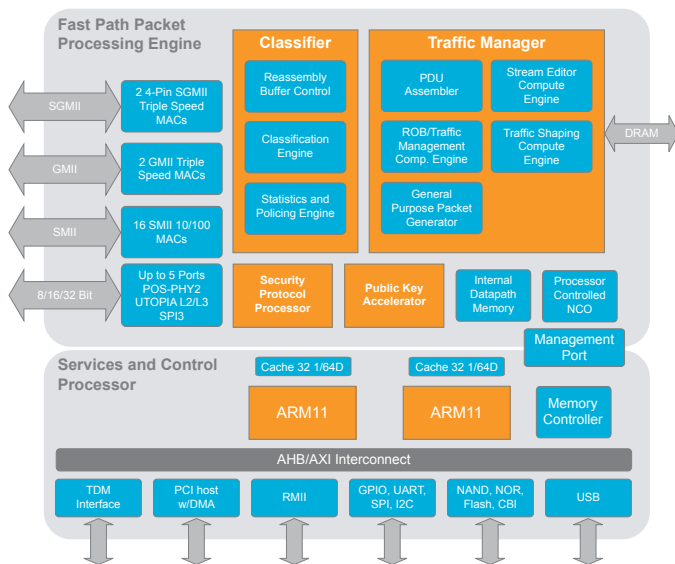
The LSI BBA solution provides the following:

- TR-101 compliance for Access Node requirements.
- IPv4 and IPv6 protocol support.
- Flexible transport encapsulations, including PPPoA, IPoA, PPPoE, and IPoE made possible by patented, programmable packet classification engines.
- VLAN support that includes 802.1q and 802.1ad with 2-level stacking.
- Flexible service provisioning on a per-subscriber basis, including transparent LAN service, both network-subscriber and subscriber-subscriber traffic, up to 16K MAC address entries, and auto-detection of protocol encapsulation.
- Highly flexible service and subscriber association rules for fine-grained, per flow traffic handling of L2/3/4 protocols and services.
- Wire-speed multicast for IPTV, podcasting, and other streaming services, supported by dedicated hardware so that processing performance is not impacted. IGMPv2/v3 support allows for rapid channel changing.
- Robust QoS for high-value, revenue-generating services made possible by best-in-class traffic management. Support of up to eight queues per logical port, multiple QoS service categories, and priority-marking support enable service providers to create tiered subscription revenue models.
- Advanced triple-play scheduling algorithms that provide fine-grain traffic management for IPTV, VoIP, and traditional data services, including WRED and tail-drop buffer management, configurable traffic shaping, and multi-level hierarchical scheduling.
- Carrier-grade SLA enforcement made possible by a flexible, multi-level packet policing and marking scheme, and comprehensive per port, per subscriber, and per flow statistics. Priority marking is configurable for upstream and downstream traffic based on multiple L2-L3 fields, and can also be configured for policed subscribers based on a 2-rate, 3-color marking packet policing result.
- Robust system security features such as 1:1/N:1 MAC address mapping, ARP proxy, MAC forced forwarding, configurable rate limiting, and highly flexible access control lists. These security features prevent denial of service (DoS) and IP/MAC spoofing attacks by separating subscribers from each other and network-side intruders. Security functions are performed at wire rate with no impact on processing performance.
- Comprehensive control PDU snooping including ARP, ATM-ARP, RARP, DHCP, PPPoE Discovery, IPCP, LCP, IGMP in PPP, LACP, BPDU, GARP/GVRP/GMRP, 802.1x, PNAC, and Radius snooping.
- Fast path support of spanning tree protocol state including STP, RSTP, MSTP, and 802.3ad Ethernet link aggregation.
- Subscriber traffic interception for law enforcement or debugging purposes is supported.

The LSI Broadband Access Solution - Conceptual Diagram



APP3300 Communication Processor Block Diagram



Communication Processors

The LSI APP3300 and APP300 communication processor family is architected to meet the needs of access applications and offers a fully integrated programmable solution providing data path, security, traffic management, application, and control plane processing at wire speed on a single device. The APP3300 and APP300 communication processor portfolios include devices with throughput performance ranging from 600 Mb/s up to 3.0 Gb/s. The high level of integration and fast path processing provided in the APP3300 and APP300 devices enable the following unique advantages:

- APP3300 provides up to 3.0 Gb/s of interworking performance.
- The LSI field-proven pipelined NPU architecture has been enhanced over several generations, resulting in a network processor that provides consistent performance regardless of load. Other competing NPU's rely on packet engines with different degrees of hardware assistance, resulting in decreased throughput if processing consumes too many cycles.
- Programmable fast path processing engines support constantly evolving industry standards and diverse deployment requirements for service providers around the globe.
- High level of integration, wide array of interfacing options, and use of off-the-shelf memories simplify the hardware design, lower the system BOM, enable platform products, and reduce power consumption.

**Broadband Access Software Package
Functional Programming Interface (FPI)**

The BBA FPI is composed of data-plane and control-plane software with a set of device-independent APIs that provide high-level functional interfaces specifically tailored for DSLAM applications. The LSI communication processors provide a variety of processing capabilities such as bridging, routing, connection management, etc., that are abstracted by the BBA FPI, allowing software developers to treat the network processor as an application-specific standard product. Application programming to the BBA FPI layer provides the following advantages:

- Significantly reduces development time since software developers are not required to program the underlying network processor.
- Allows creation of differentiating features in BBA products, as complete data and control plane source code is provided.
- Leverages software investments and application development team skill sets across multiple platforms based on the APP3300 or APP300 communication processor portfolios.

- Allows OS-independence. LSI provides a Linux® support package (LSP) for the 2.4 and 2.6 kernels, and a board support package (BSP) for VxWorks®.
- Enables product life-cycles to be extended by adding new features and functionality to systems in the field through zero-touch upgrades.
- Ensures high reliability with a factory-hardened solution with a system test plan covering over 1000 test cases.

Run-Time Environment (RTE)

The LSI Run-Time Environment (RTE) is a set of ANSI C-based object-level APIs and command line interfaces that allows the configuration, control, monitoring, and testing of LSI communication processors. In BBA applications, the RTE is used by the BBA FPI to manipulate discrete network processor data plane structures.

In addition to the BBA FPI, LSI provides full access to the RTE APIs, enabling proprietary features to be added to create a differentiated

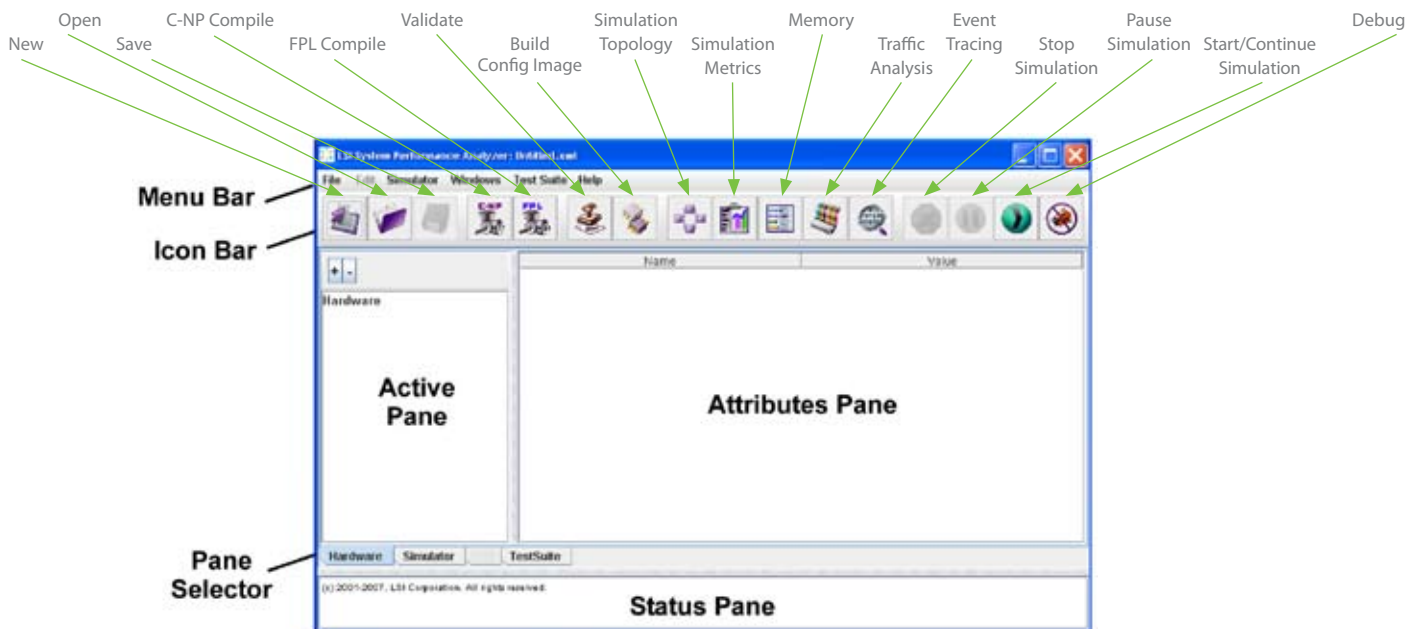
solution. The RTE layer is optimized to specific LSI communication processors, and is factory-hardened with a system test plan covering over 900 test cases.

Software Development Environment (SDE)

The LSI Software Development Environment (SDE) provides a comprehensive suite of tools for rapid software development on the LSI communication processor portfolio. The SDE enables development, debugging, simulation, testing, and optimization of applications without the use of actual hardware. The SDE can be used to add proprietary features to the BBA FPI software package, allowing the creation of differentiated products without expanding development teams or sacrificing time-to-market. Key advantages of the SDE for BBA applications include the following:

- Proprietary data plane software can be added to create differentiated DSLAM products.
- Comprehensive tool suite has been hardened by more than eight years of customer use.
- No third-party tools required.

SDE GUI



The SDE is supported on Windows® XP/2000, Red Hat® Linux 9.0, and Solaris™ 8.0 platforms.

Turnkey Solution Available from Third-Parties

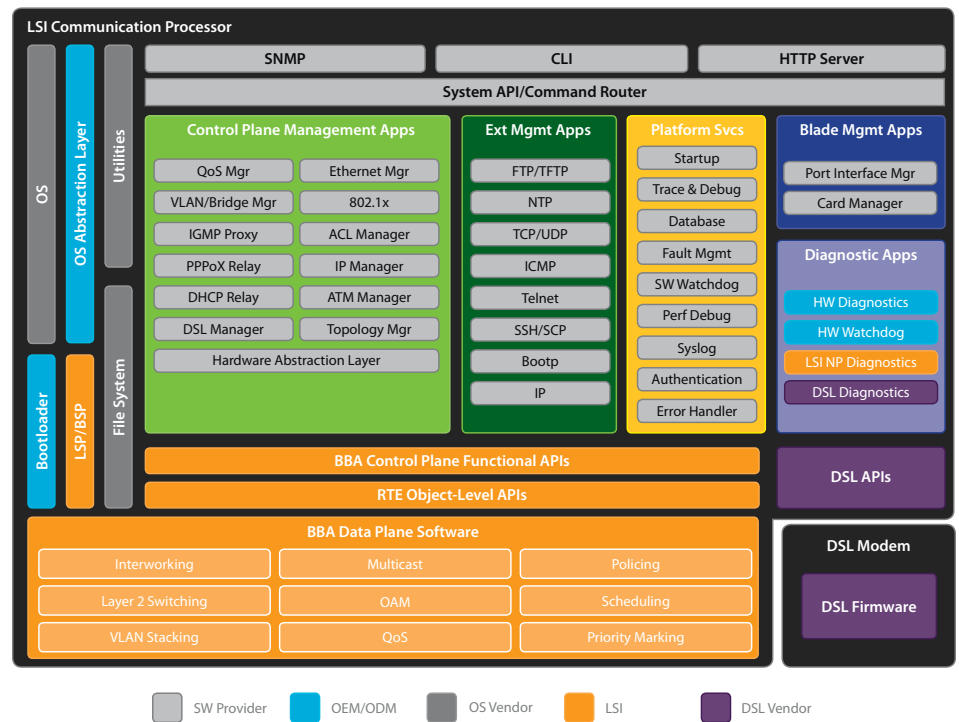
LSI has strong relationships with leading third-party software and hardware original design manufacturers (ODM) that have years of experience working with the LSI BBA solution. As shown to the right, complete turnkey application software, already pre-integrated with the BBA FPI, is available from third-parties.

Development Support Services

Development support is available from the LSI global system and field application engineering teams. These support teams possess domain knowledge, system expertise, and extensive experience working with OEM, ODM, and third-party development teams to quickly resolve system and integration issues encountered during the development and productization cycle. LSI maintains a staff with expert teams for each component of the BBA solution offering – communication processor silicon, BBA FPI, RTE, SDE, and hardware development systems. The LSI extensive development support services include the following:

- Specific training sessions for the different hardware and software components of the BBA solution are available to quickly bring development teams up to speed.
- LSI communication processor hardware development systems allow customers to emulate real-world BBA platforms in advance of production hardware.
- Reference designs and hardware design review services minimize issues in production hardware and further reduce time to market.
- System application teams are adept at dealing with complex system-level issues involving software and hardware components from multiple parties, and driving issues to resolution through regular program management calls.

Turnkey Software Solution



The LSI HySpan Hardware Development Platform



- Mature project management systems drive response, reporting, and resolution of all issues and questions, with defined priority level and escalation processes that ensures constant visibility with management teams.
- Onsite hardware and software support for critical issues is available.

For more information and sales office locations, please visit the LSI web sites at: lsi.com lsi.com/contacts

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