Ultra Low Latency GDN-Search

170 Million searches/second Key-Value Store in POWER8®

Advanced

Description:

Key-Value Store (KVS) is an essential service for multiple applications. Telecom directories, Internet Protocol forwarding tables, and de-duplicating storage systems, for example, all need key-value tables to associate data with unique identifiers. In datacenters, high performance KVS tables allow hundreds or thousands of machines to easily share data by simply associating values with keys and allowing client machines to read and write those keys and values over standard high-speed Ethernet.

Examples:	Key	Value
Directory	Company: Algo-Logic	Phone #: (408) 707-3740
Forwarding Tables	IP Address: 204.2.34.5	Interface : MAC Address: Eth6 : 02:33:29:F2:AB:CC
Data De-duplication	Content Hash: XYZ	Storage Block ID: 948830038411
Stock Trading	Order ID: ATY11217911101	Symbol, Side, Price: AAPL, B, 126.75
Graph Search	Virtex: v140	Edge List: v201, v206, v225

Algo-Logic's KVS leverages Gateware Defined Networking® (GDN) on Field Programmable Gate Arrays (FPGAs) while running in an IBM® POWER8® server to perform lookups with the lowest latency (less than 1 microsecond), with the highest throughput, and the least processing energy. Deploying GDN solutions save network operators' time, cost, and power resulting in significantly lower Total Cost of Ownership (TCO).

Applications and Use-cases:

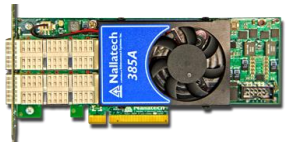
- Telecom ESN and SIM key value tables
- IPv4 or IPv6 Internet addresses
- Block store caching
- Keyword search
- NoSQL database acceleration
- N-Tuple lookups
- World Wide Web cookie keys
- User identifiers (UID, SSN, logins)
- Stock market order IDs
- Pattern matching

Key Features:

- Search rates of up to 170 MSPS (Million Searches Per Second)
- Deterministically under 500 ns latency using fast tables for 100% of packets
- Under 2.2 µs latency using large tables for 99.966% of packets
- Sub µ-Joule/message energy consumption
- 40 Gbps Ethernet line rate support
- Low cost per search ($/search operation)
- Easy to integrate with client software via free, open-source multi-language APIs

Hardware Platform

- Pre-programmed gateware application on a half-height or full-height expansion card that fits into any standard server
- Portable gateware supported on most commercially available FPGA card platforms



Software Controller API Options

- Free, open-source client software API compatible with C/C++, Java, Python, and other programming languages

www.algo-logic.com
Solutions@Algo-Logic.com
+1 (408) 707-3740

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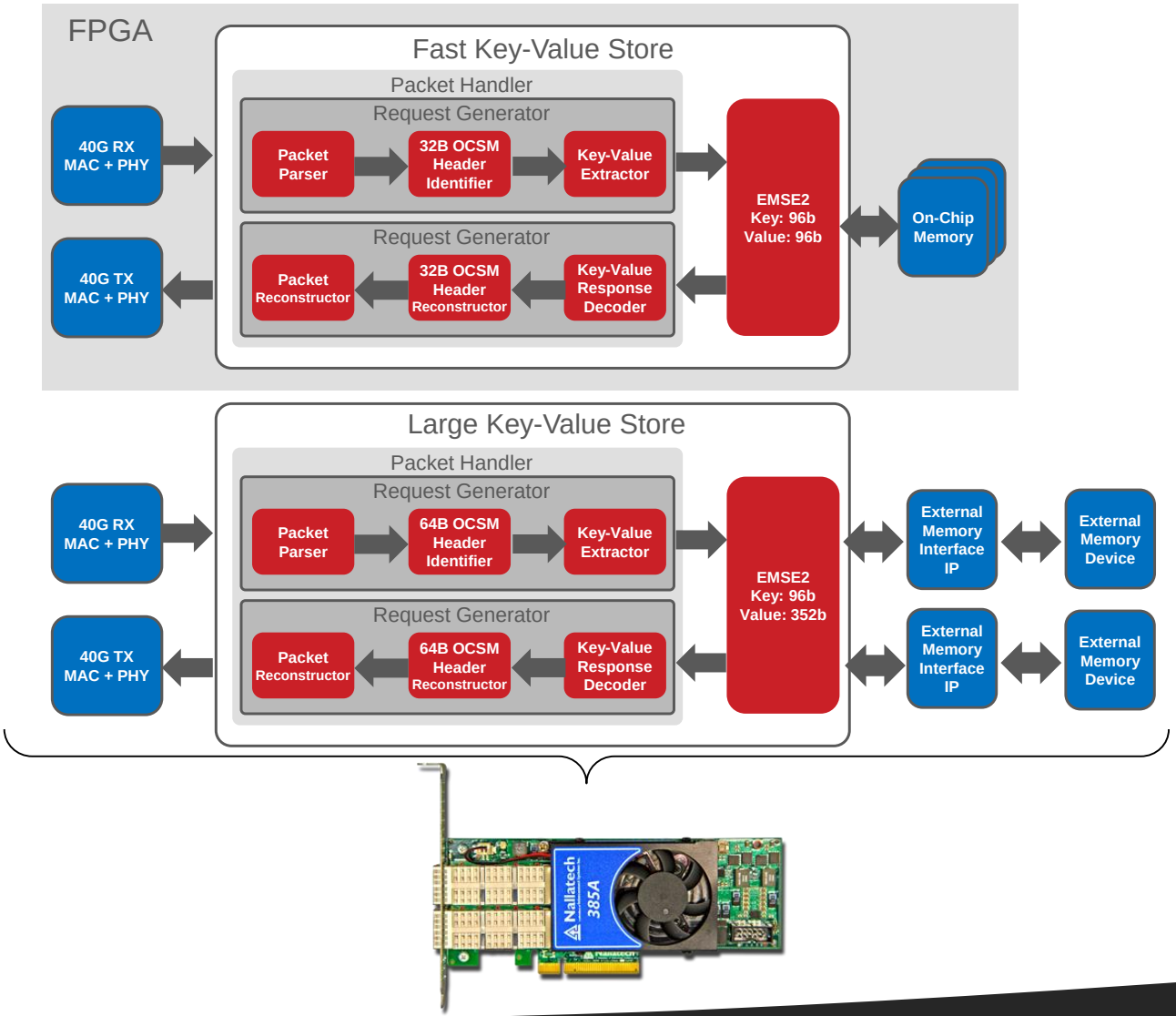
GDN-Search Reference Design Metrics:

KVS Search Rate	Up to 170 MSPS per half-height card with 2 QSFP+ ports
Table Depth	48K for fast tables using on-chip memory and 12M for large tables using off-chip memory
Key Size	96 bits (12 Bytes) default. Customizable interface allows for variable and larger size keys
Value Size	96 bits (12 Bytes), 352 bits (44 Bytes), or larger
Latency	Under 500 ns (~88x less latency than with sockets)
Throughput	Line-rate network interface speeds of 40GE
Power Consumption Rate	Less than 0.52 µ-Joules/message (~21x less than with software sockets)
FPGA Devices Supported	Altera Stratix V A5, A7, AB, Arria 10
Overall GDN Gain vs. Software	Gains between 100x to 1000x for datacenters, storage, ISPs/HSPs & security industries

GDN-Search Block Diagram:



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