

ALGORITHMS IN LOGIC



Low Latency Key-Value Store

- Up to 170 Million searches per second
- Under 400 ns Latency
- Table depth of up to 12 Million records per Alveo™ U200
- Data Center Acceleration Card



INTRODUCTION

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

SOLUTION OVERVIEW

Algo-Logic's KVS leverages Gateway Defined Networking® (GDN) on Field Programmable Gate Arrays (FPGAs) 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).

Software Controller API Options

Client software API compatible with C/C++, Java, Python, and other programming languages

Hardware Platform

- ❖ Pre-programmed gateway application on a standard PCIe expansion card that fits into any standard server
- ❖ Portable gateway supported on most commercially available FPGA card platforms, including the Alveo™ U200 data center acceleration card



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)
- ❖ Stoc market order IDs
- ❖ Pattern matching



KEY FEATURES

- ❖ In memory NoSQL database with search rates of up to 170 Million Searches Per Second
- ❖ Under 0.4μs latency using fast tables
- ❖ Compatible with C++/OpenCL host API
- ❖ Open standard message format integrates with multi-language client software applications
- ❖ Ideal for receiving real-time data from acquisition systems such as the Algo-Logic Black Diamond Rackmount (BDR-3)

GDN-SEARCH REFERENCE DESIGN METRICS:

KVS Search Rate	Up to 170 MSPS per Alveo™ U200
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
Value Size	96 bits (12 Bytes)
Latency (On-Chip)	Under 400 ns (excluding host bus latency)
Application Architecture	Custom RTL kernel within SDAccel platform
Accelerator Card support	Xilinx Alveo™ U200
Target Application Markets	Real-time data, datacenters, connected cities, inference, ISP, security industries

KEY VALUE STORE (KVS) ARCHITECTURE

