Low Latency Key-Value Store (KVS)

Accelerated by Xilinx Alveo U50

INTRODUCTION

Key-Value Store (KVS) is an essential service for many 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 data centers, 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.

KVS is more flexible than traditional database with fixed schema allowing users to dynamically mix different types of data in the same table.

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 lookup
- World Wide Web cookie keys
- User identifiers (UID, SSN, logins)
- Stoc market order IDs
- Pattern marching

Examples:

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

- **Up to 170Million searches per sec**
- **Under 400ns Latency (on board)**
- **Table depth of up to 12Million records on Alveo™ U50**
- **GET performance 7-8usec (over network) compared to 170usec for software NoSQL**

Key Value Store

- Associates all types of values (data) with keys (names)
- Keys hold: names, devices, sensors
- Values store: numbers, conditions, locations

- In-Memory Object Store for
    - Directories {Names, numbers,, …}
    - Sensors {location, movement, …}
    - Social {status, updates, …}
    - Security {image and video metadata}
    - Communication {status, messages, …}
    - Prices {stocks, energy, …}
- Enables Real-Time Analytics on Live Data

SOLUTION OVERVIEW

Algo-Logic's KVS leverages Gateware 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)

GDN-SEARCH REFERENCE DESIGN METRICS:

KVS Search Rate	Up to 150 Million Searches Per Second (MSPS)
Table Depth	48K for fast tables using on-chip memory and 12M for large table 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
FPGA Devices Supported	Xilinx Alveo™ U50
GET performance	7-8μsec (over network) compared to 170μsec. for software NoSQL implementation
Target Application Markets	Real-time data, datacenters, connected cities, inference, ISP, security industries
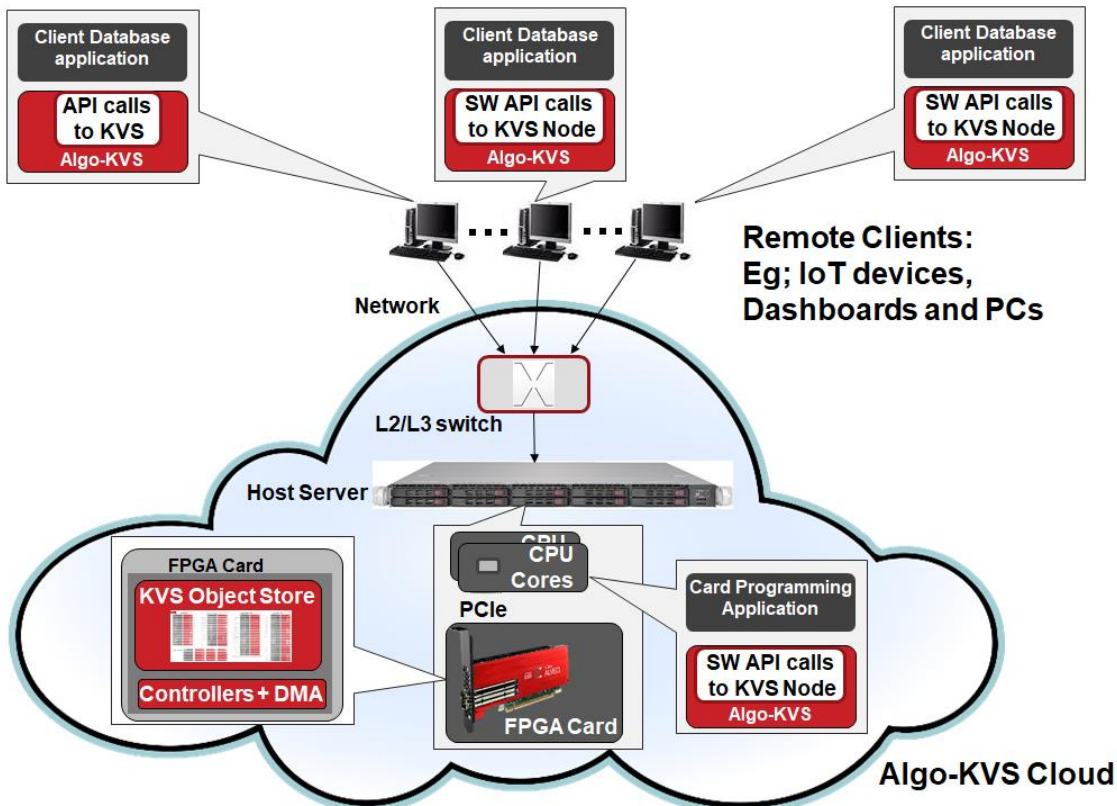
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Learn more about Algo-Logic: www.algo-logic.com
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