TLDK
TRANSPORT LAYER DEVELOPMENT KIT
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TLDK project

• Transport Layer Development Kit – TLDK

• TLDK is a project housed under the FD.io Linux Foundation group
  • FD.io (pronounced Fido) contains many projects the primary is VPP
  • VPP is the Cisco contributed Vector Packet Processing code base for L2/L3 fast path used in Cisco routers today

• TLDK and other projects in FD.io are open source projects
  • Anyone can contribute to the project without having to pay any fees
  • Need a free Linux Foundation login ID to contribute code
  • The code is free to clone via Git or tarball from:
    • TLDK Wiki page https://wiki.fd.io/view/TLDK
TLDK (Transport Layer Development Kit)

• TLDK is to provide a clean set of ‘C’ libraries to enable network protocol handling at the application layer

• TLDK will provide IPv4/v6 and TCP/UDP protocols along with others as required for normal network operation

• Goal is to provide a very high performance network stack with termination support for applications using VPP and DPDK

• TLDK will provide a set of libraries to allow for applications to build a complete network stack support
  • Including a high performance non-socket type application interface
  • Including a socket layer for applications linked with the application
  • Including a LD PRELOAD socket layer to run native Linux applications
TLDK (Transport Layer Development Kit)

- TLDK is not a normal network designed stack!
  - TLDK has turned the network stack upside down for better performance
- Network protocols are driven by the application needing the data

- Normal network stack designs drive packet into the protocols, then to the application
  - In TLDK the packets are per-filtered to a given DPDK core/thread first
  - The application then drives the packets into the stack when it needs the data not before
  - The design attempts to keep the CPU cache warm to reduce wasted cycles

- The goal is to move multiple packets thru the stack at a time, using the vector style packet processing
- Multiple packets at a time allows us to amortize packet processing overhead for higher throughput
TLDK Uses case with VPP

TLDK:
• Handles packet I/O and protocol processing of packets
• Application sets up the UDP/TCP protocol contexts and then calls I/O routines in TLDK to start processing packets

VPP Fastpath:
• Using VPP as the first layer for packet processing before packets are sent to the application layer

DPDK:
• DPDK provides the I/O abstraction to the physical layer for the network devices. The DPDK could be optional here only if some other I/O layer is used.

Physical Layer:
• Ports and other devices like crypto, compression, ...

Control Plane:
• Not fully defined yet, but will need support in the future
TLDK Application Layer break down

**Application Layer:**
- The application layer utilizes the TLDK library to process packets for UDP and TCP

**Purpose Built Application:**
- A purpose built application is one that uses TLDK APIs directly and is built to use these APIs
- Highest performance is expected with this design

**BSD Socket Layer:**
- A standard BSD socket layer for applications using sockets in its design
- A lower performance is expected, but allows for current socket type applications to be ported to the system

**LD_PRELOAD Socket Layer:**
- LD_PRELOAD is used to allow a ‘native binary Linux’ application to use the accelerated path of VPP/DPDK
- The performance should be a bit better, but does allow these native binary applications to work without any change
struct tle_ctx *tle_ctx_create(struct tle_ctx_param *ctx_param);
struct void tle_ctx_destroy(struct tle_ctx *ctx);
struct tle_dev *tle_add_dev(struct tle_ctx *ctx, struct tle_dev_param *dev);
void tle_del_dev(struct tle_dev *dev);
uint16_t tle_udp_rx_bulk(struct tle_dev *dev, struct rte_mbuf *pkts[], struct rte_mbuf *rp[], int32_t rc[], uint16_t num);
uint16_t tle_udp_tx_bulk(struct tle_dev *dev, struct rte_mbuf *pkts[], uint16_t num);
struct tle_stream *tle_udp_stream_open(struct tle_ctx *ctx, struct tle_udp_stream_param *udp_parm);
int tle_udp_stream_close(struct tle_stream *udp);

/* Global variables and structures */
struct tle_ctx *ctx;
struct tle_stream *udp;
struct tle_ctx_param ctx_param;
struct tle_dev_param dev_param;
struct tle_udp_stream_param udp_parm;
struct rte_mbuf *pkts[MAX_PKTS], *not_processed_pkts[MAX_PKTS];
int32_t return_codes[MAX_PKTS];
int main() {
    uint16_t n, r, running = 1;

    ctx = tle_ctx_create(&ctx_param); /* Fill in the ctx_param structure */
    tle_add_dev(ctx, &dev_param); /* Fill in the dev_param structure */
    /* fill in udp_param here */
    udp = tle_udp_stream_open(&udp_param);

    while(running) {
        n = tle_udp_rx_bulk(dev, pkts, not_processed_pkts, rc, MAX_PKTS);
        if (n && ((r = tle_udp_tx_bulk(dev, pkts, n)) != n))
            handle_extra_pkts(dev, pkts, r); /* Free or resend? */
    }

    tle_udp_stream_close(udp);
}
TLDK Performance Numbers (non-optimized code)

CPU: Intel(R) Xeon(R) CPU E5-2699 v3 @ 2.30GHz
64G Ram, Dual socket system, 2x400GB SSD, 2x1TB drives

NIC: Ethernet Controller XL710 for 40GbE QSFP+
      Firmware: 5.04 0x80002505 0.0.0

DPDK: 16.07

Linux: Ubuntu 15.10 (GNU/Linux 4.2.0-16-generic x86_64)
TLDK: Current release (2016-09-15)

UDP Packet size used is 64 bytes, 5 cores we max out the PCI

<table>
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<tr>
<th>#Physical Cores</th>
<th>#Queues</th>
<th>Frame Rate Mpps</th>
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<tr>
<td>1</td>
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<tr>
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<td>22.2</td>
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<tr>
<td>4</td>
<td>4</td>
<td>29.5</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>36.4 (max for PCI)</td>
</tr>
</tbody>
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More Information on TLDK

- The project is under the FD.io a Linux Foundation project
  - TLDK is located at: https://wiki.fd.io/view/TLDK
  - Source Code at: git clone https://gerrit.fd.io/r/tldk

- Current code base includes an optimized UDP implementation
- Currently working on TCP implementation

- Each Wednesday 10am CST is the TLDK community meeting
  - Meeting info: https://wiki.fd.io/view/TLDK/Meeting
  - Additional ideas and contributions welcomed!
TLDK - Status Update

Thank you for attending, any questions?