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

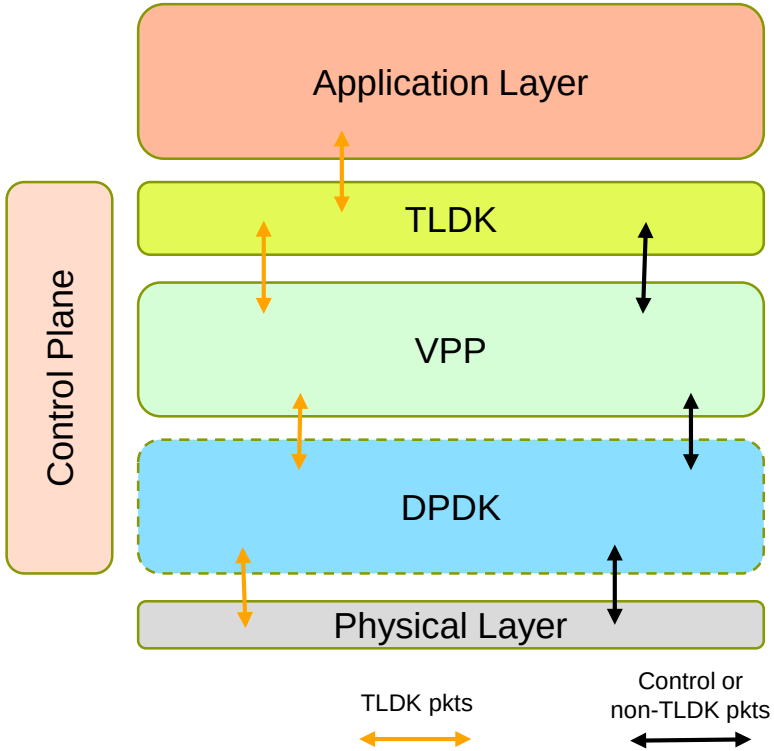
TLDK:
- Handles packet I/O and protocol processing of packets
- Application sets up the UDP/TCP protocol contexts and then calls I/O routines in TLDK to start processing packets

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



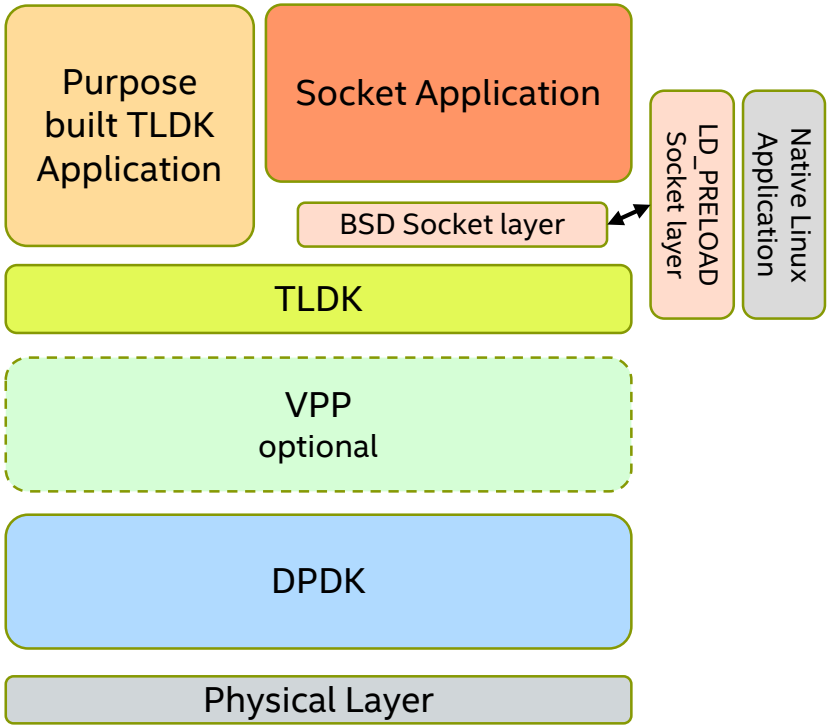
TLDK Application Layer break down

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

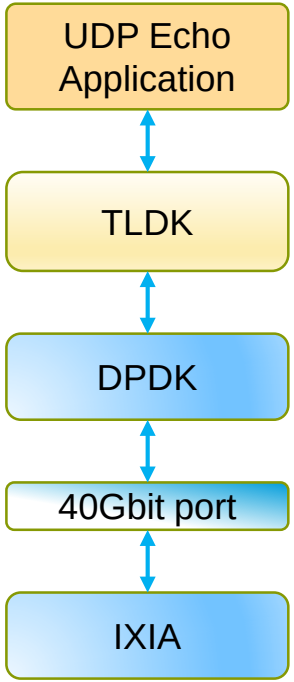
BSD Socket Layer:
- A standard BSD socket layer for applications using sockets in its design
- A lower performance is expected, but allows for current socket type applications to be ported to the system

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



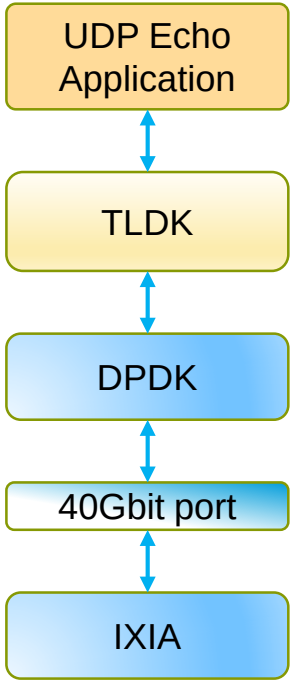
TLDK Developer View

```
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_param;
struct rte_mbuf *pkts[MAX_PKTS], *not_processed_pkts[MAX_PKTS];
int32_t return_codes[MAX_PKTS];
```



TLDK Developer View

```
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);
}
```

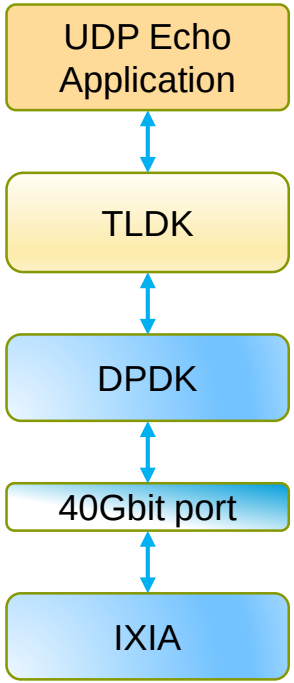


TLDK Performance Numbers (non-optimized code)

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

#Physical Cores	#Queues	Frame Rate Mpps
1	1	7.4
2	2	14.8
3	3	22.2
4	4	29.5
5	5	36.4 (max for PCI)

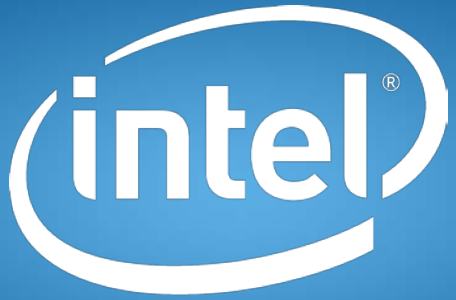


More Information on TLDK

- The project is under the FD.io a Linux Foundation project
  - FD.io Wiki Page (https://wiki.fd.io/view/Main_Page)
  - 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 Wednesday10am 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?



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