DPDK

DATA PLANE DEVELOPMENT KIT

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Lib1Net

OPTIMISING VNF PERFORMANCE AND DENSITY AT THE ENTERPRISE EDGE

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emutex

where software meets silicon

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Overview

- Who am I?
- Enterprise Edge Characteristics
- Lib1Net and its Benefits to VNF deployments
- Lib1Net Features
- Q&A

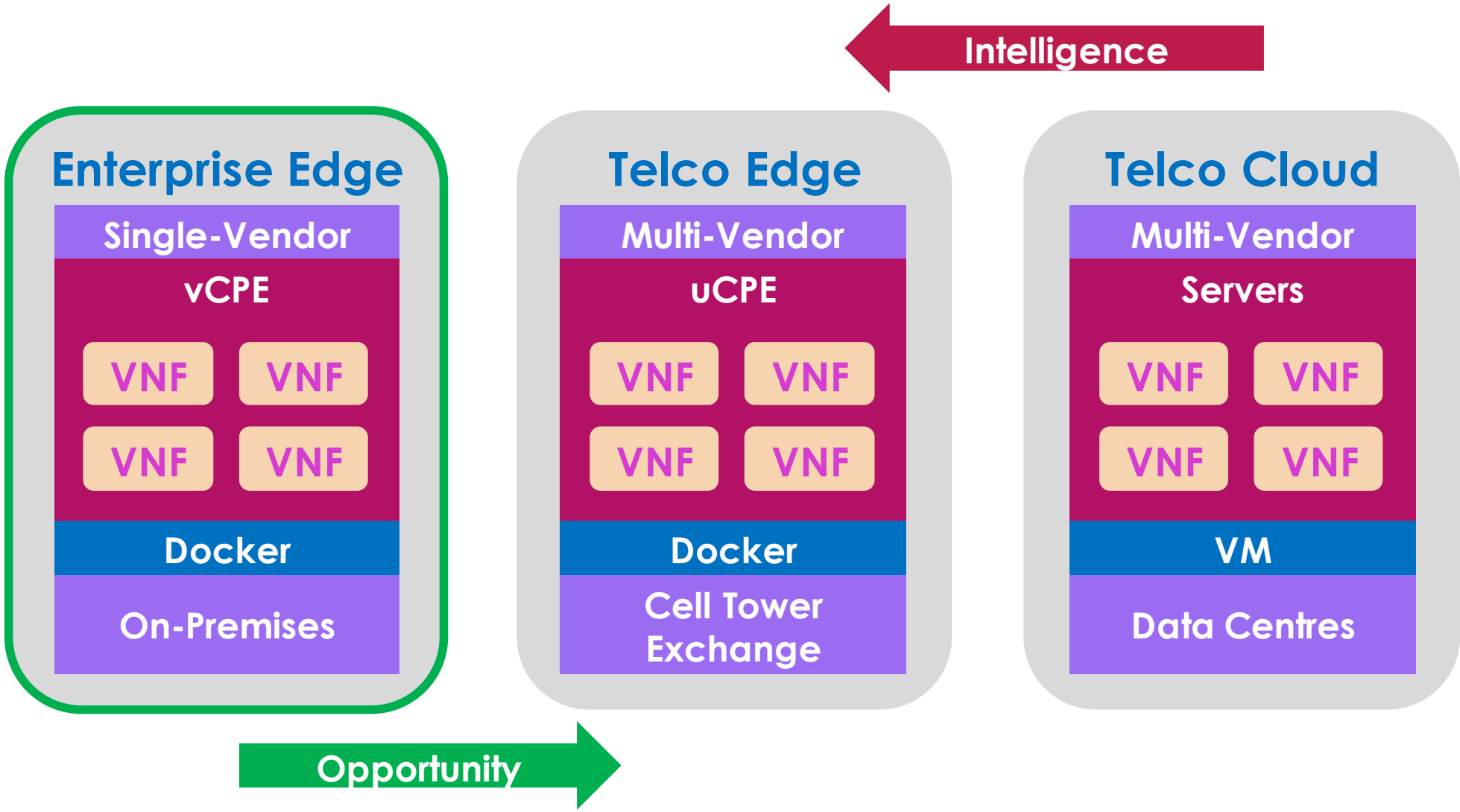
Introduction

- Anthony Fee, Principal Network Software Engineer at Emutex Madrid.

- DPDK experience:
  - Developer of high performance DPDK-based network applications and VNFs.
  - Co-author of initial vhost-user example application.
  - Integrator of vhost-user with OVS-DPDK (Open vSwitch).

- Emutex:
  - Developer of high-performance DPDK network applications on Intel architecture.
  - Developer of Linux Kernels, drivers and distributions for embedded systems.

Enterprise Edge Characteristics

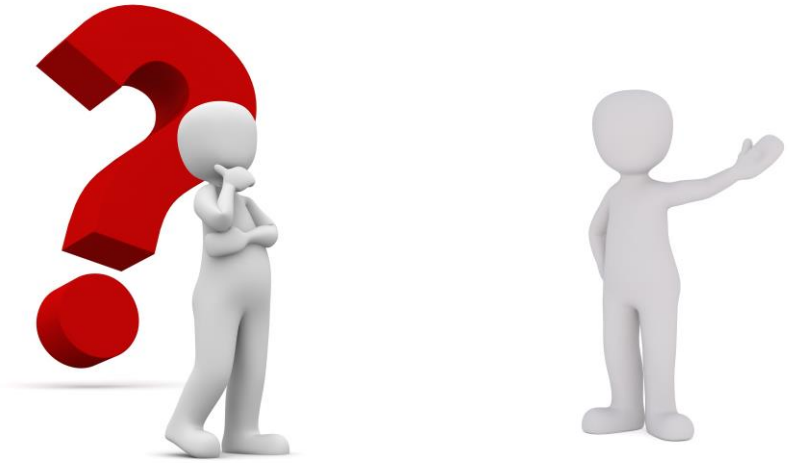


Enterprise Edge Characteristics

- Single vendor VNF solutions (e.g. Security Appliance).
- Hardware cost has significant impact on solution cost.
- Maximising network packet throughput is a challenge.
- Service chain configuration is common.
- Trending towards use of Docker containerised VNFs.

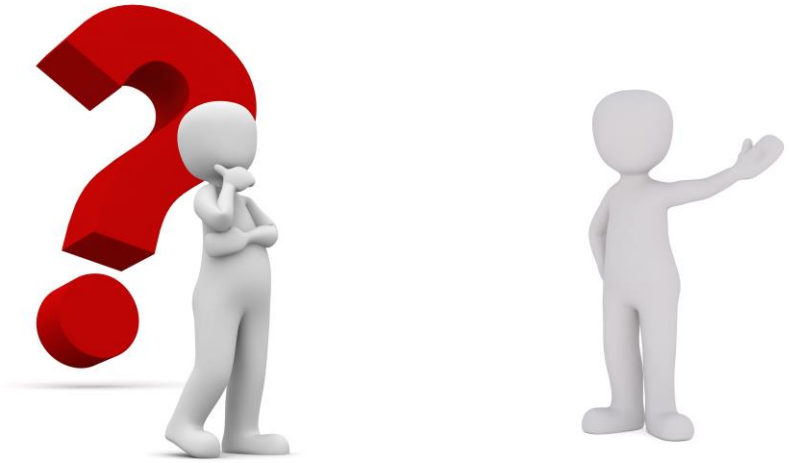
Lib1Net

How can I maximise network packet throughput and VNF density in my Enterprise Edge solution?



Lib1Net

Build your Docker containerised VNFs using **Lib1Net** and **DPDK!**



Lib1Net

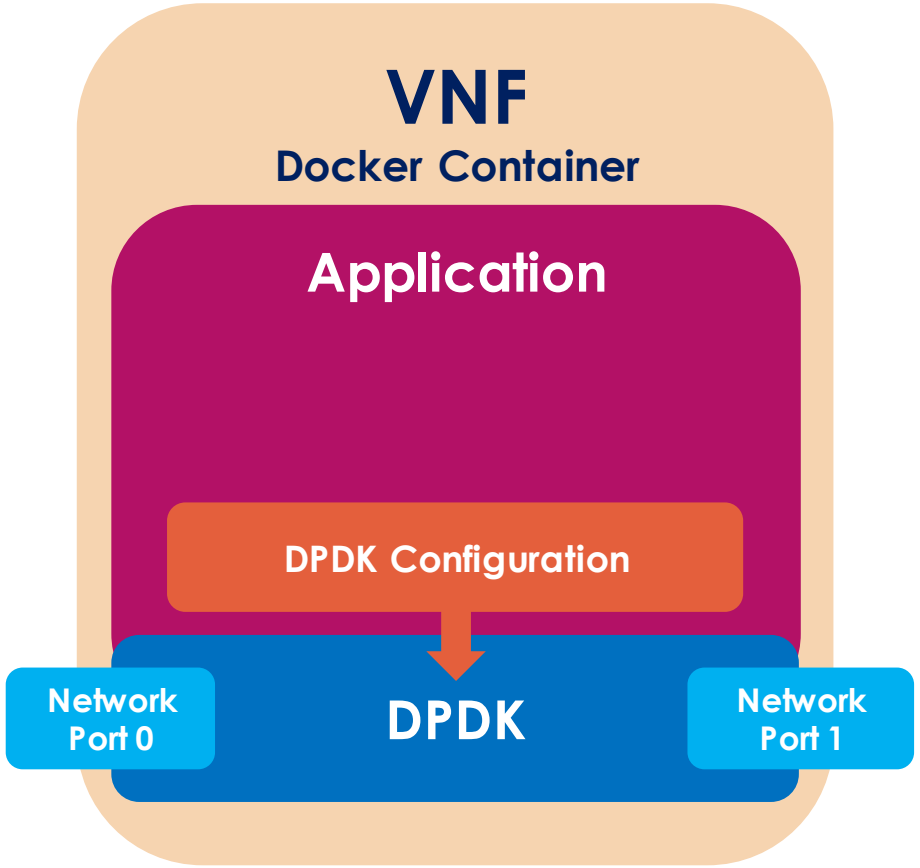
- Light-weight DPDK-based software library.
- Simplifies the integration of DPDK packet acceleration.
- Exposes a simplified API focussed on VNF requirements.
- Targets enterprise edge Docker containerised VNFs.

Lib1Net - Benefits

- Abstracts VNF applications from DPDK configuration.
- Optimises packet receive polling and transmission.
- Maximises hardware utilisation for service chaining.
- Simplifies port management through JSON configuration.
- Standardises how configuration is provided to VNFs.

Lib1Net - DPDK Configuration

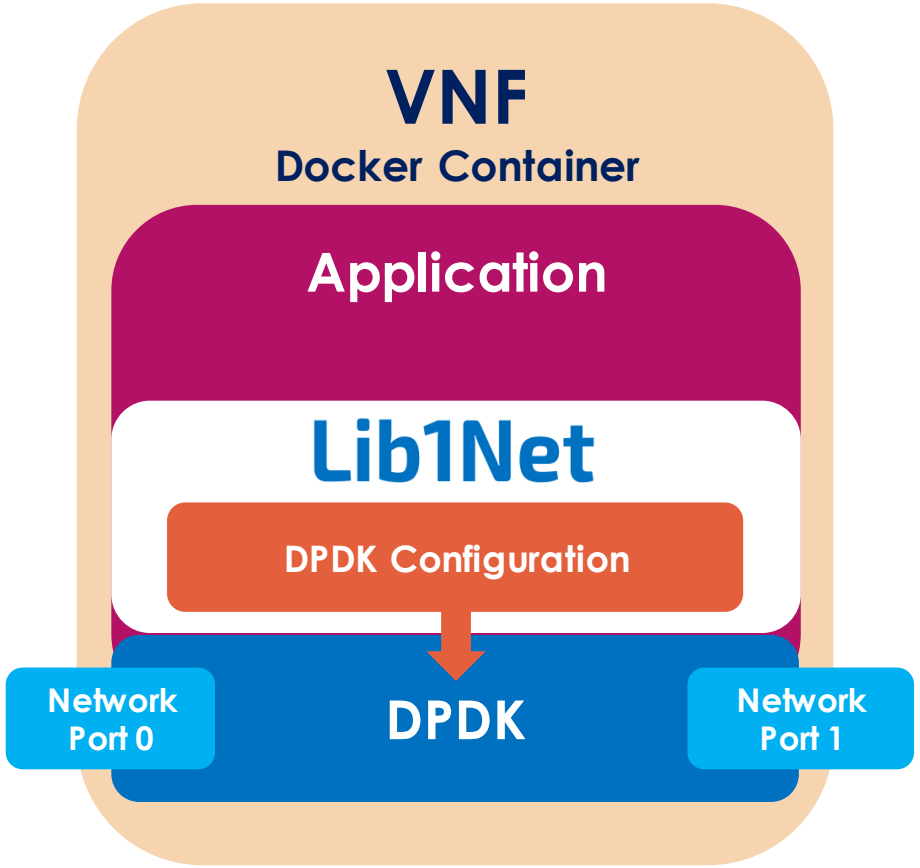
How can I configure **DPDK** to maximise the packet processing performance of my VNF?



Lib1Net - DPDK Configuration

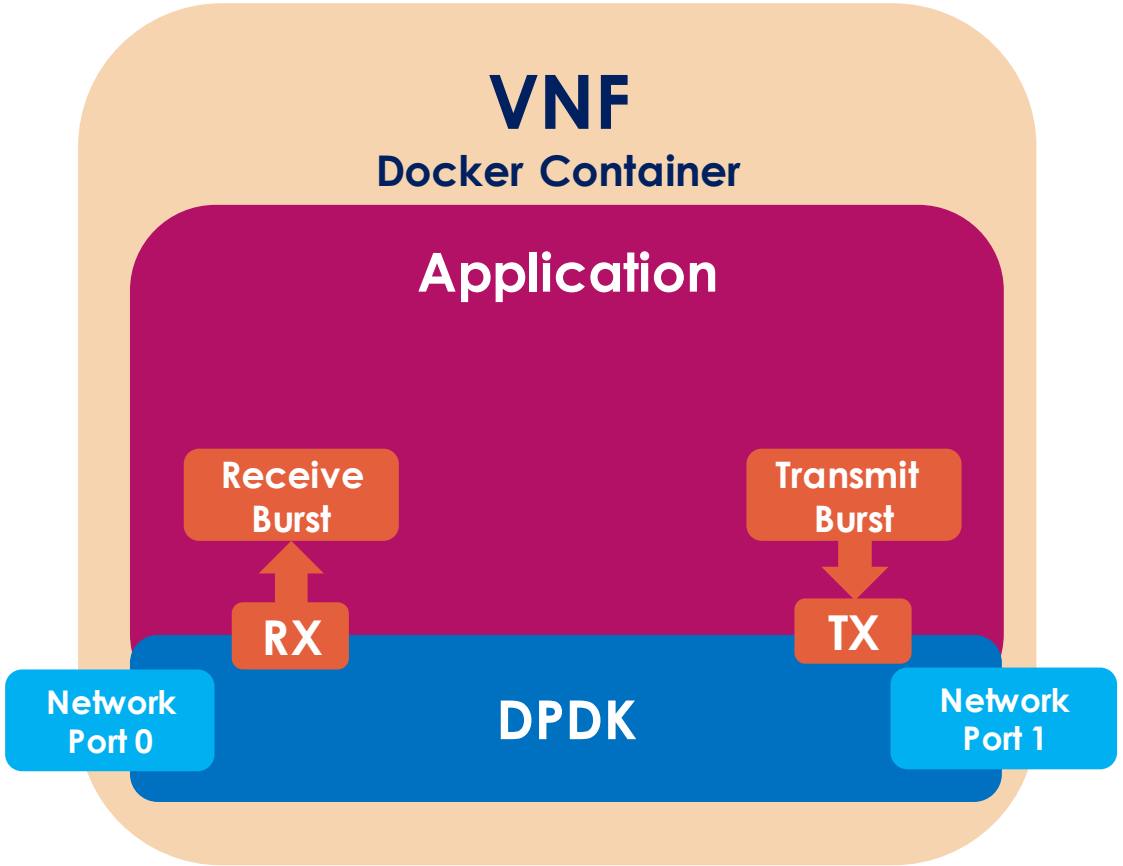
Lib1Net does this for you by:

- Configuring DPDK Memory
- Configuring DPDK Ports
- Initialising DPDK



Lib1Net - DPDK Packet Handling

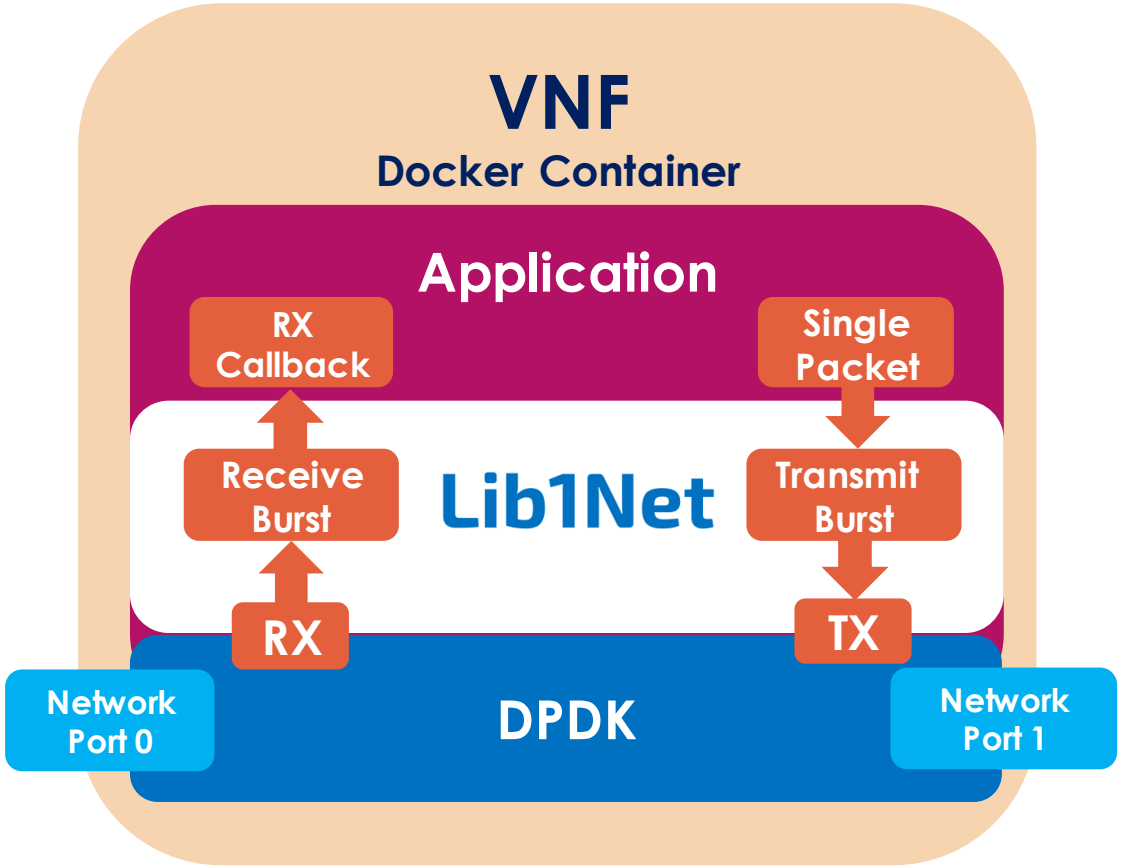
What is the most efficient method of receiving and transmitting packets with **DPDK**?



Lib1Net - DPDK Packet Handling

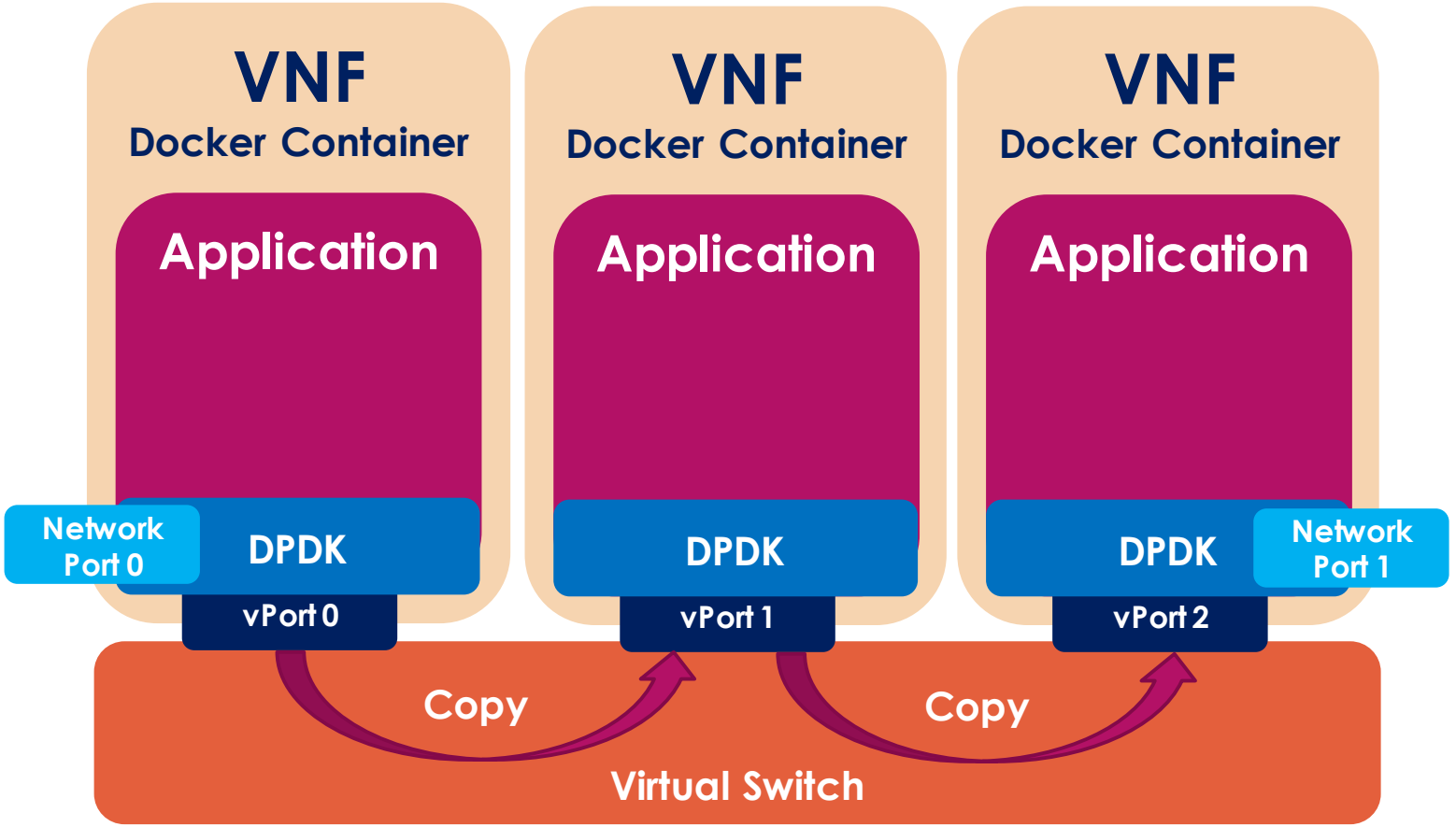
Lib1Net manages RX/TX by:

- Handling RX polling.
- Passing packets to the application through an RX callback.
- Internally buffer TX packets to efficiently transmit bursts.



Lib1Net - Service Chains

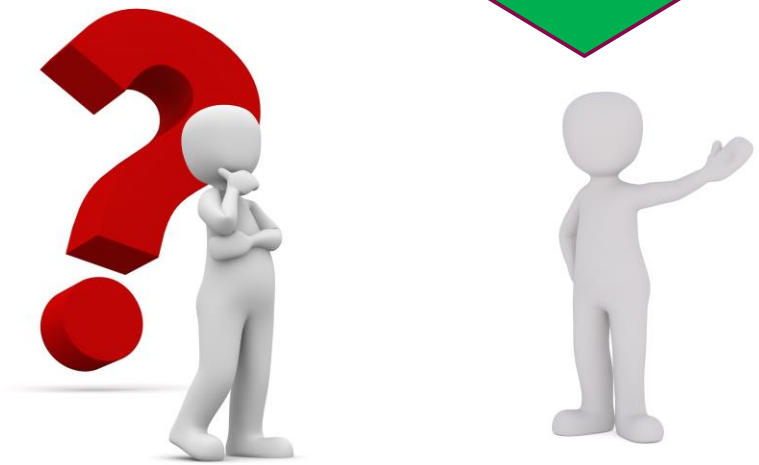
How can I maximise network packet performance and VNF density in my service chain?

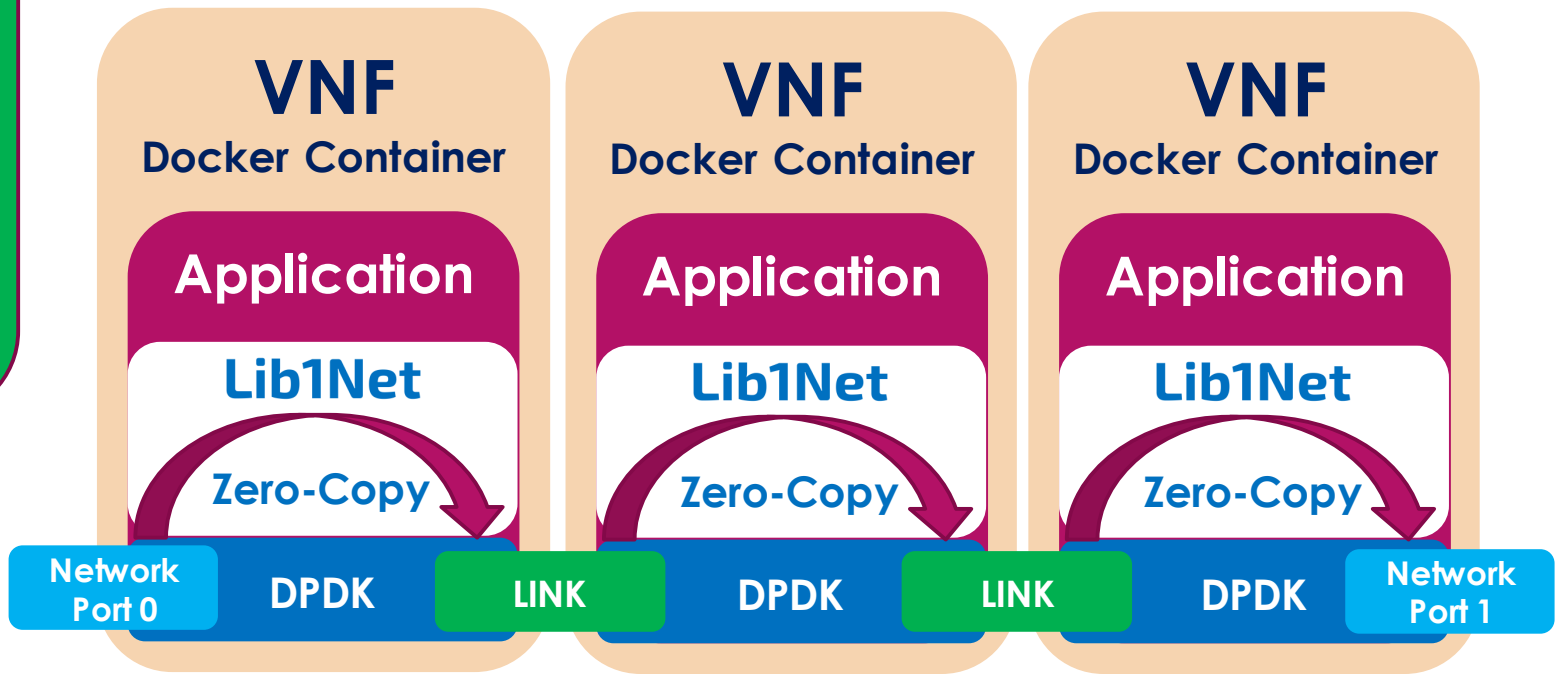


Lib1Net - Service Chains

The **Lib1Net LINK** network interface:

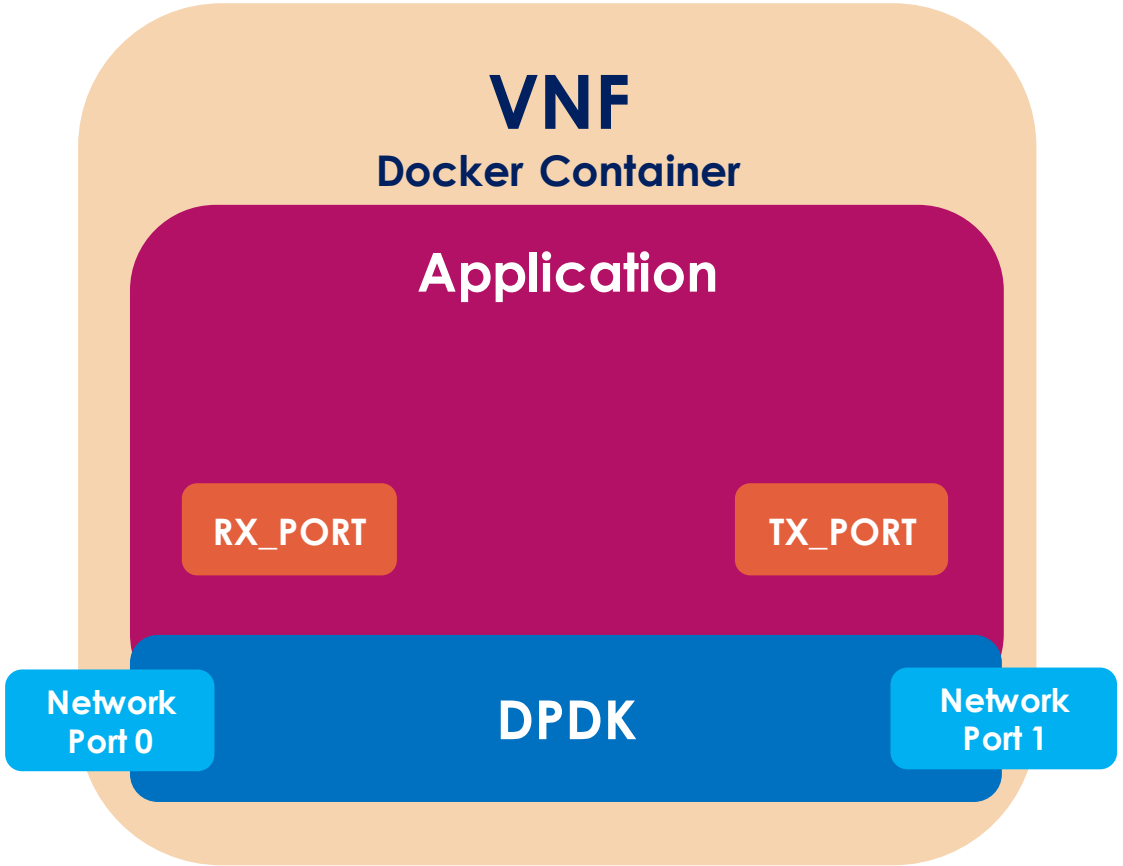
- enables **zero-copy** through the entire service chain.
- Frees system resources by removing the virtual switch.
- Hides the management of DPDK primary/secondary processes.





Lib1Net - Port Management

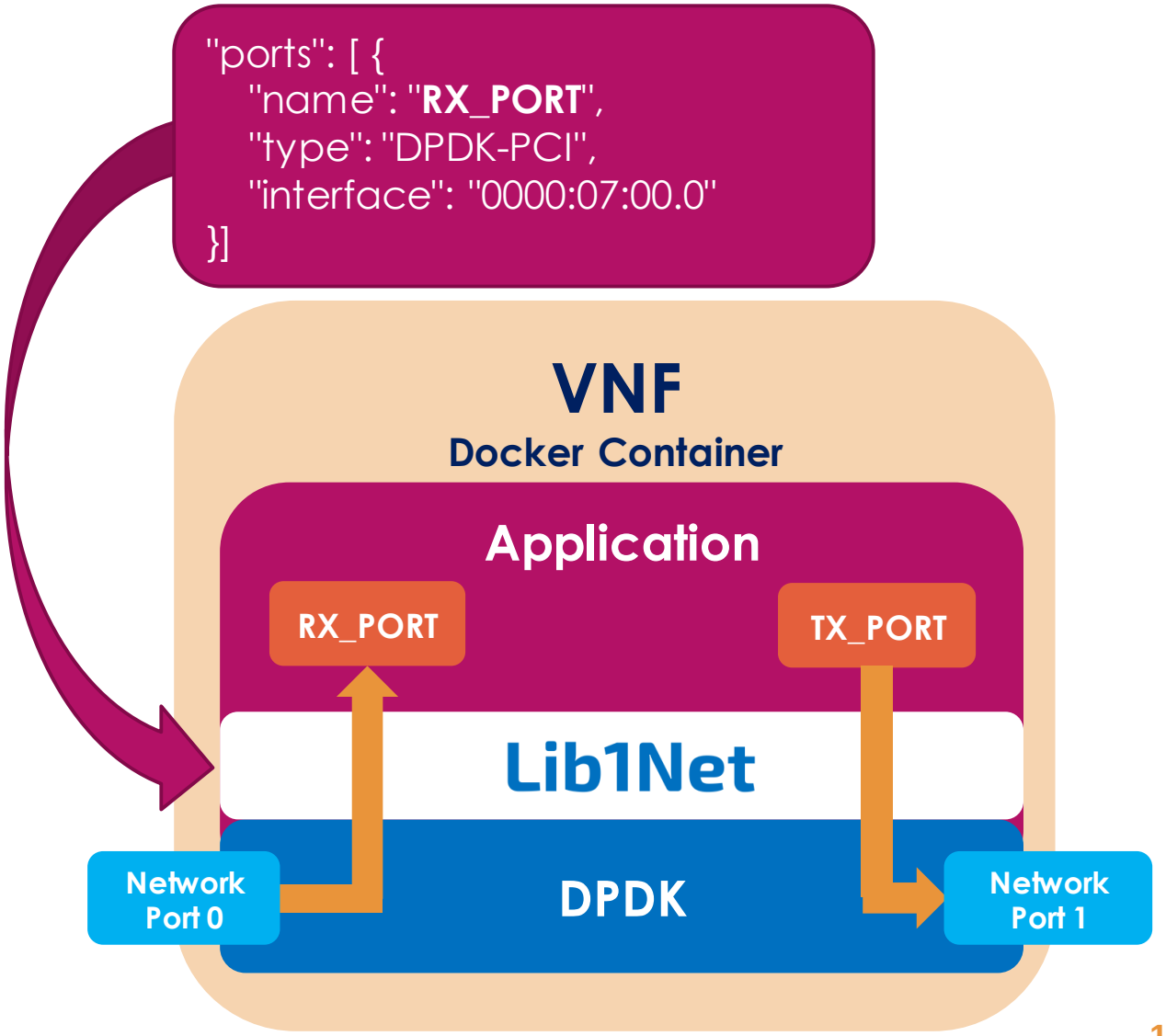
How can I attach network interfaces to specific application ports?



Lib1Net - Port Management

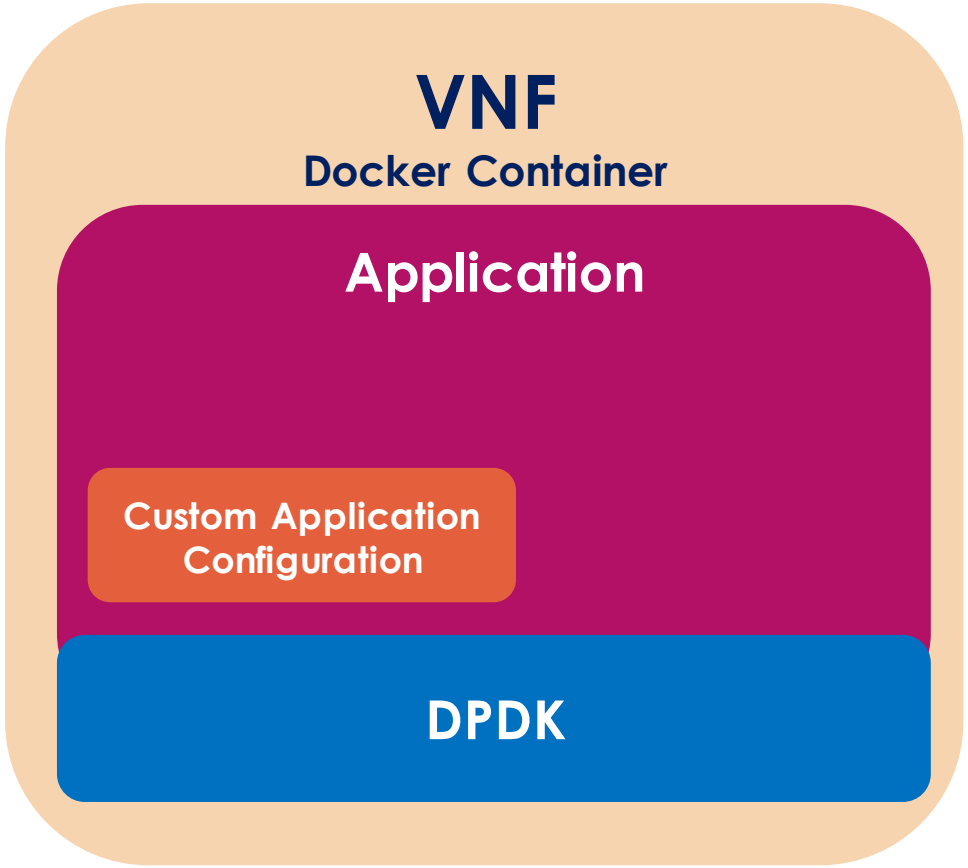
Lib1Net makes this easy by:

- Defining application port names within the application.
- Mapping port names to network interfaces through JSON configuration.



Lib1Net - App Configuration

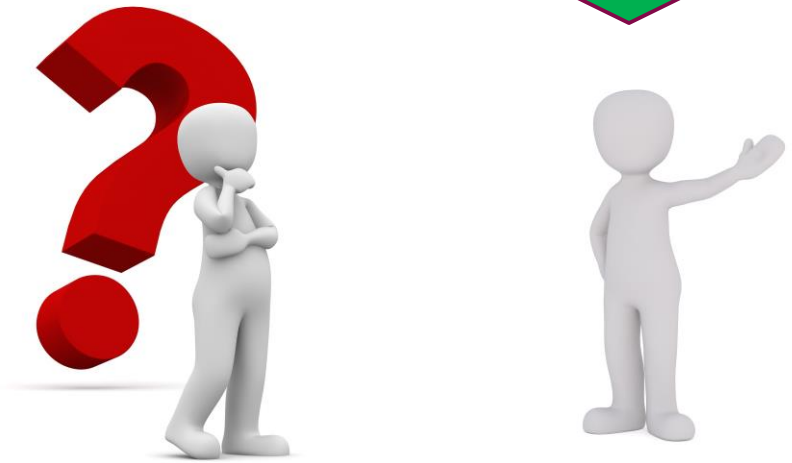
How can I manage my VNF configuration?

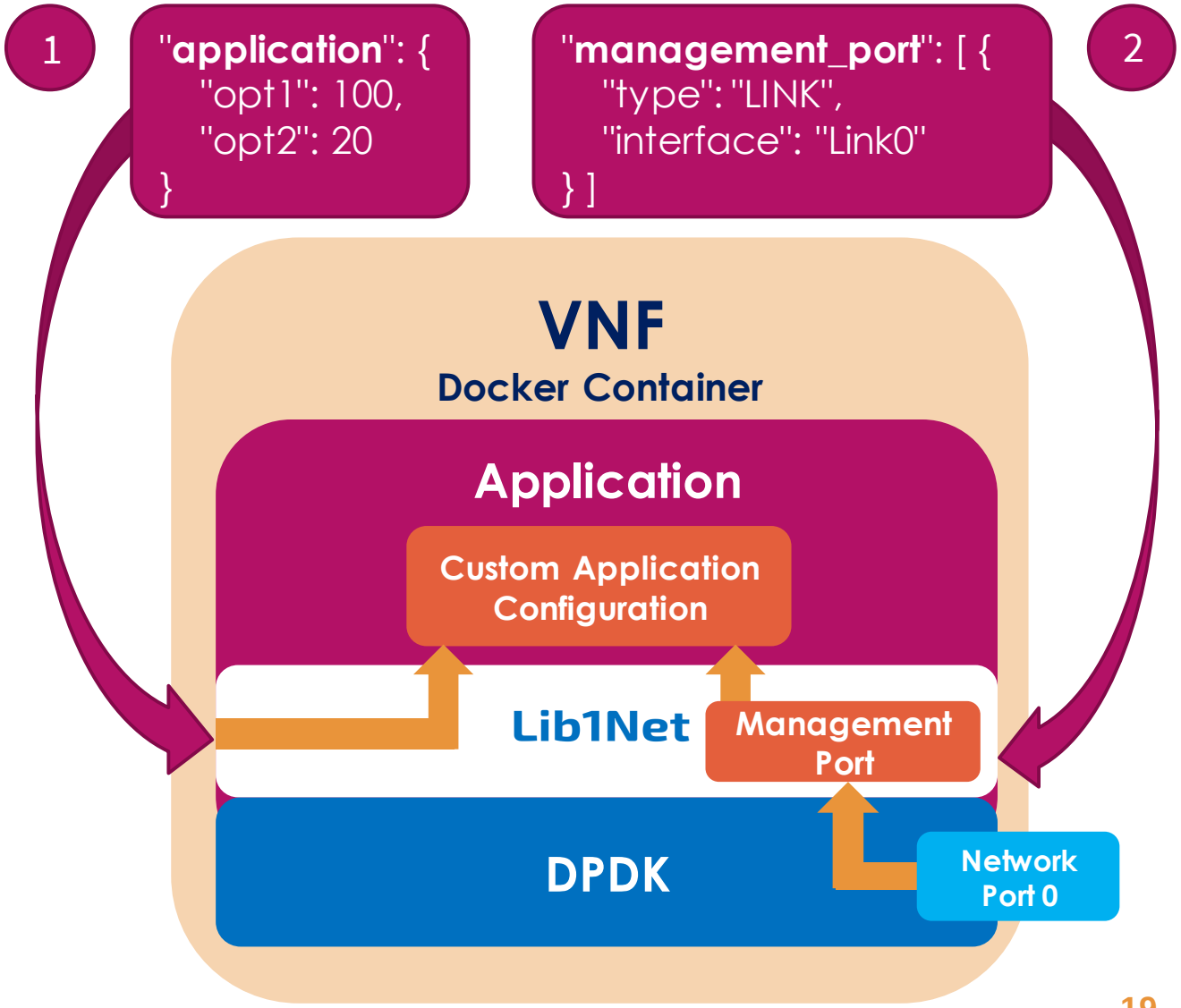


Lib1Net - App Configuration

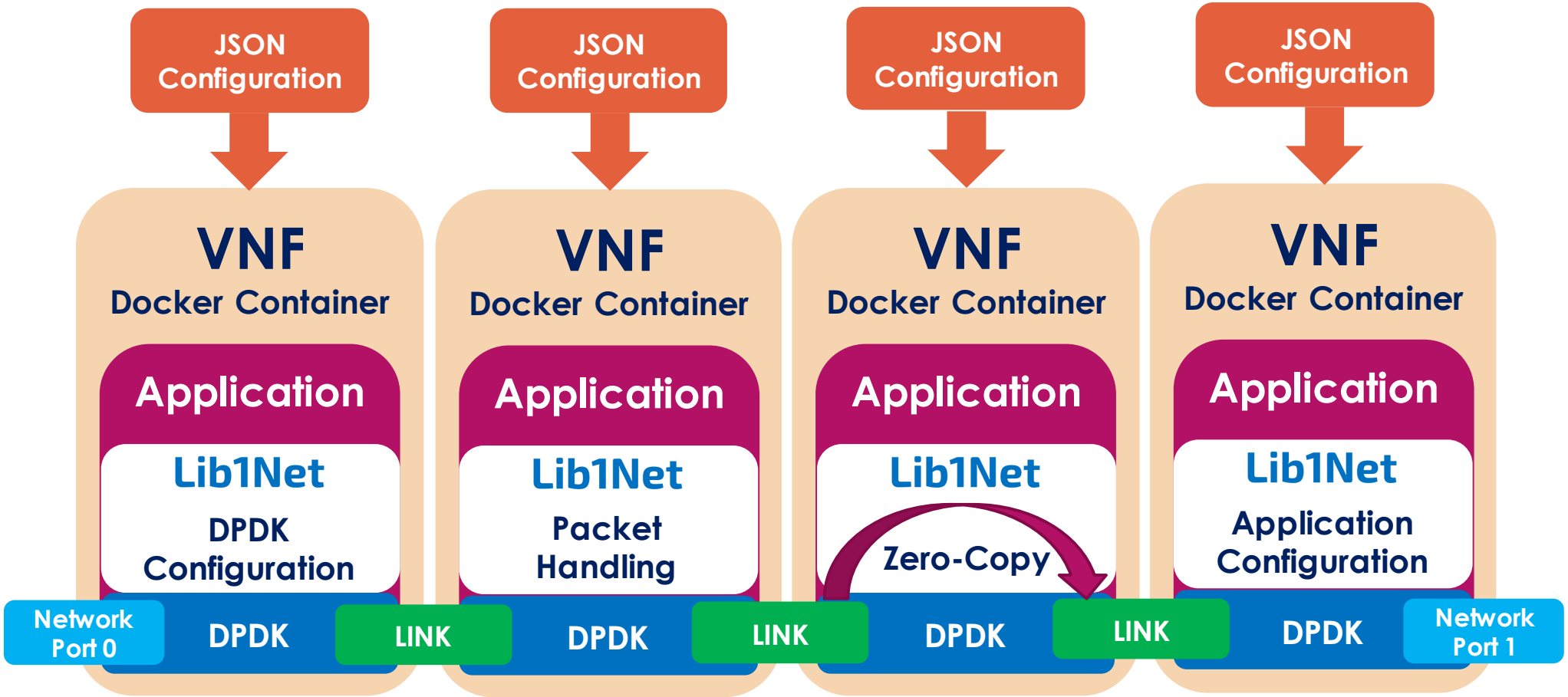
Lib1Net includes two methods for passing configuration messages to your VNF :

1. A reserved field is included in the Lib1Net JSON configuration file.
2. A management port can be attached to the VNF.





Lib1Net - Enterprise Edge Solution



Summary

- Enterprise Edge solutions developed using Lib1Net benefit from:
  - Increased VNF density by optimising hardware usage when service chaining.
  - Maximised network throughput using the Lib1Net LINK interface.
  - Configuration of DPDK and optimised RX/TX packet handling.
  - Simplified mechanism to pass custom application configuration to VNFs.

- For further information:
  - anthony.fee@emutex.com
  - www.emutex.com

Q&A

Backup

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Lib1Net Packet Forwarding Example

main.c

main.c

```c
#include "ports_definition.h"

/** Simple receive callback that forwards all packets to a single interface. */
static void rx_callback(unsigned port_id, liblnet_buffer_t *buffer) {
    liblnet_tx(TX_PORT, buffer);
}

liblnet_config_t config = {.static_config = &static_config, .rx_callback = rx_callback};

int main(void) {
    liblnet_init(&config);

    return 0;
}
```

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Lib1Net Packet Forwarding Example

ports_definition.h

ports_definition.h

```c
#include "lib1net.h"

/**
 * Ports must be defined as an enum. This is used to define the ports in the static_config below.
 */
enum { RX_PORT, TX_PORT, NUM_PORTS };

/**
 * The Lib1Net configuration should be defined at the beginning of application development. It
 * describes the ports as well as configuration file paths which should not need to change once
 * defined.
 */
const static lib1net_static_config_t static_config = {
    /** RX port definition */
    .port_definitions[RX_PORT] =
    {
        /** Define the same port name as set in the enum above */
        .name = "RX_PORT",

        /** Define the port direction as RX only */
        .direction = lib1net_direction_rx,

        /** Set the port as required as it is always needed for the application to function */
        .required = true
    },

    /** TX port definition */
    .port_definitions[TX_PORT] =
    {
        /** Define the same port name as set in the enum above */
        .name = "TX_PORT",

        /** Define the port direction as RX only */
        .direction = lib1net_direction_tx,

        /** Set the port as required as it is always needed for the application to function */
        .required = true
     },

    /** Define the number of ports used by the application */
    .num_ports = NUM_PORTS
};
```

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Lib1Net Packet Forwarding Example

vnf_configuration.json

vnf_configuration.json

```
{
    "container_name": "pkt_fwd",
    "core": 2,
    "ports": [
        {
            "name": "RX_PORT",
            "type": "DPDK-PCI",
            "interface": "0000:04:00.0"
        },
        {
            "name": "TX_PORT",
            "type": "DPDK-PCI",
            "interface": "0000:05:00.0"
        }
    ]
}
```