



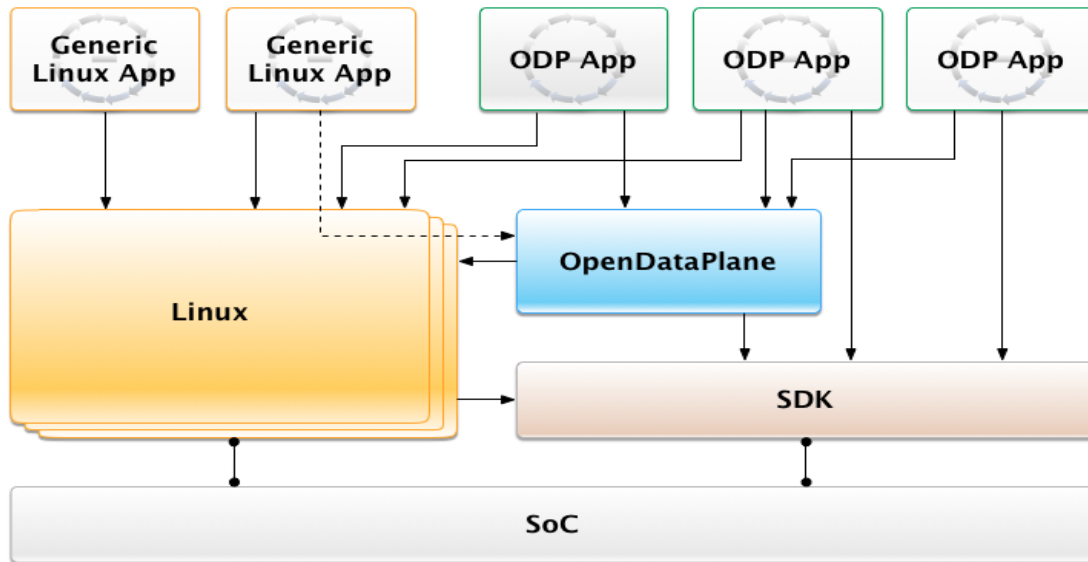
Linaro Networking
Group (LNG)

Presented by
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Date
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OpenDataPlane (ODP)

Project Overview and Relationship to g-API



Discussion Topics

- What is ODP and why is it needed?
- ODP sponsorship and governance model
- Essential requirements ODP is designed to address
- ODP split API / implementation model
- Portability and Performance results to date
- Application Migration Considerations

ODP: History and Motivation

- ODP was launched in 2013 by a cross section of stakeholders
 - Application/system providers (e.g., Cisco, Nokia)
 - Silicon providers (e.g., Broadcom, Cavium, Freescale, HI Silicon, Texas Instruments)
- From the beginning, our goal has been to define a “g-API” for enabling data plane acceleration while ensuring application portability across diverse ISAs and platforms
- ODP API design is a balance between portability and ability to be mapped efficiently to widely varying platform capabilities
 - Not interested in “least common denominator” APIs
 - Not interested in overly high-level APIs that few if any platforms can support efficiently
 - Expect APIs to evolve as underlying platform capabilities increase

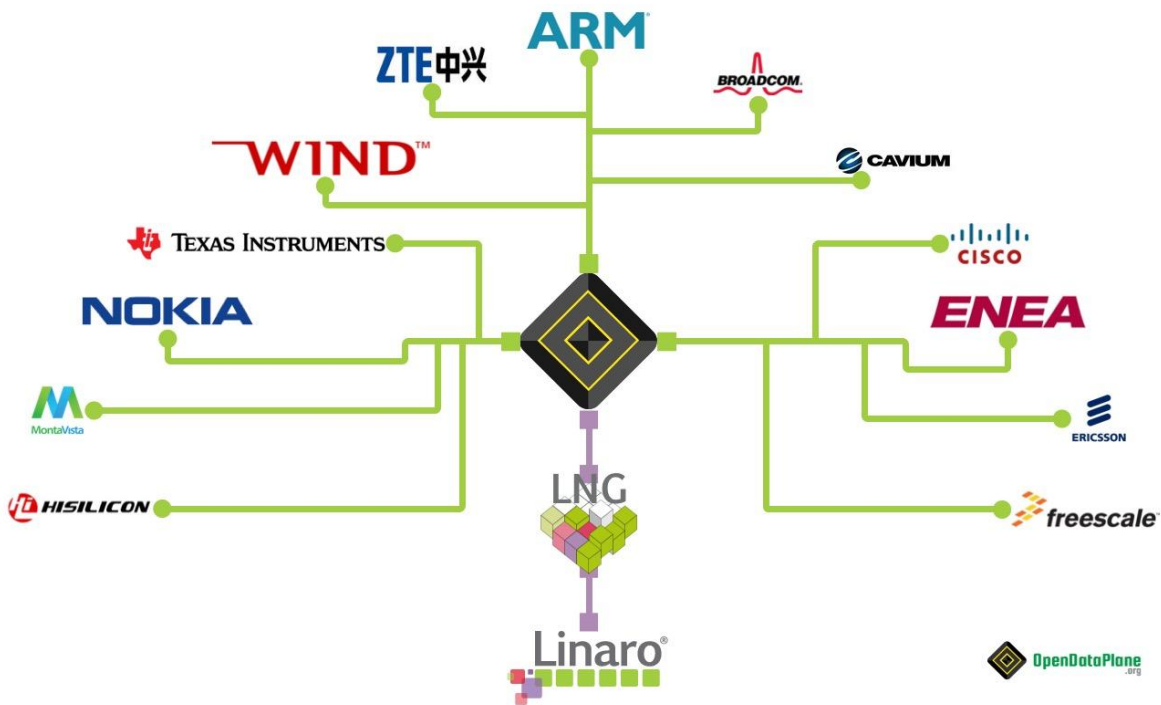
ODP Sponsorship and Governance

The Linaro Networking Group and its 13 member companies are sponsors and upstream maintainers of ODP

LNG membership is open to all

ODP is fully open source and open contribution, uses BSD 3-clause licensing

All ODP design work is carried out in public with both open face-to-face meetings and weekly public architecture calls, and on the ODP mailing list



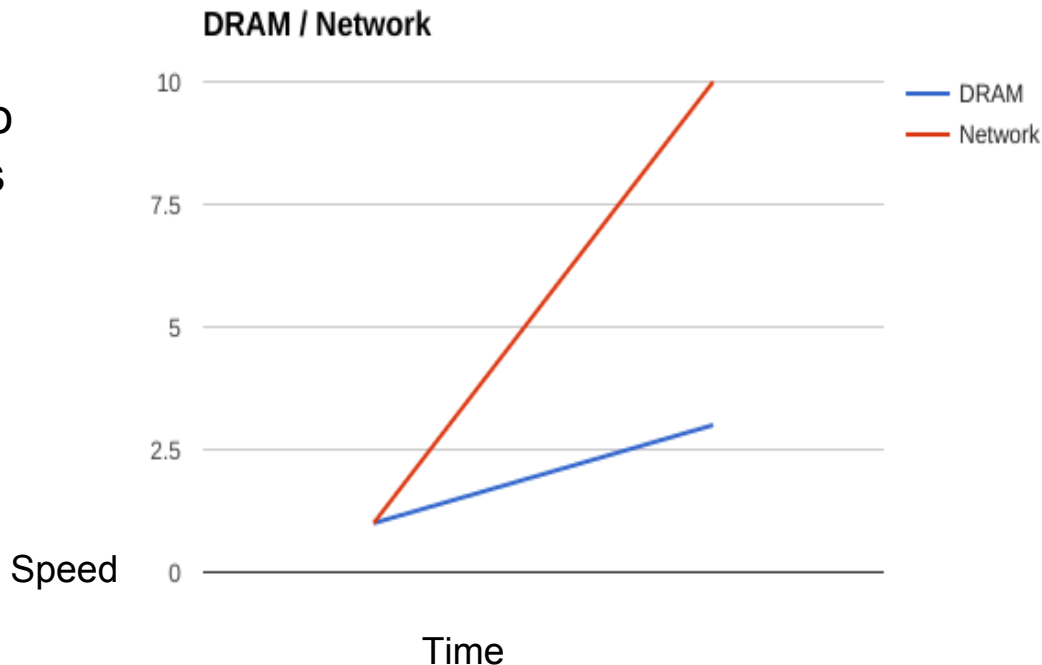
ODP Essential Requirements

- Support application portability across diverse ISAs and system architectures
 - Core counts, memory organization, integrated HW capabilities, etc.
- Be able to exploit platform-specific acceleration and offload capabilities (HW and SW) without application effort
 - e.g., HW buffer/packet mgmt, integrated I/O, HW parsing and classification, HW scheduling and flow ordering, etc.
- Support scalability to many-core architectures without application redesign
 - Application fundamental design unchanged if running on 4, 40, or 400 cores

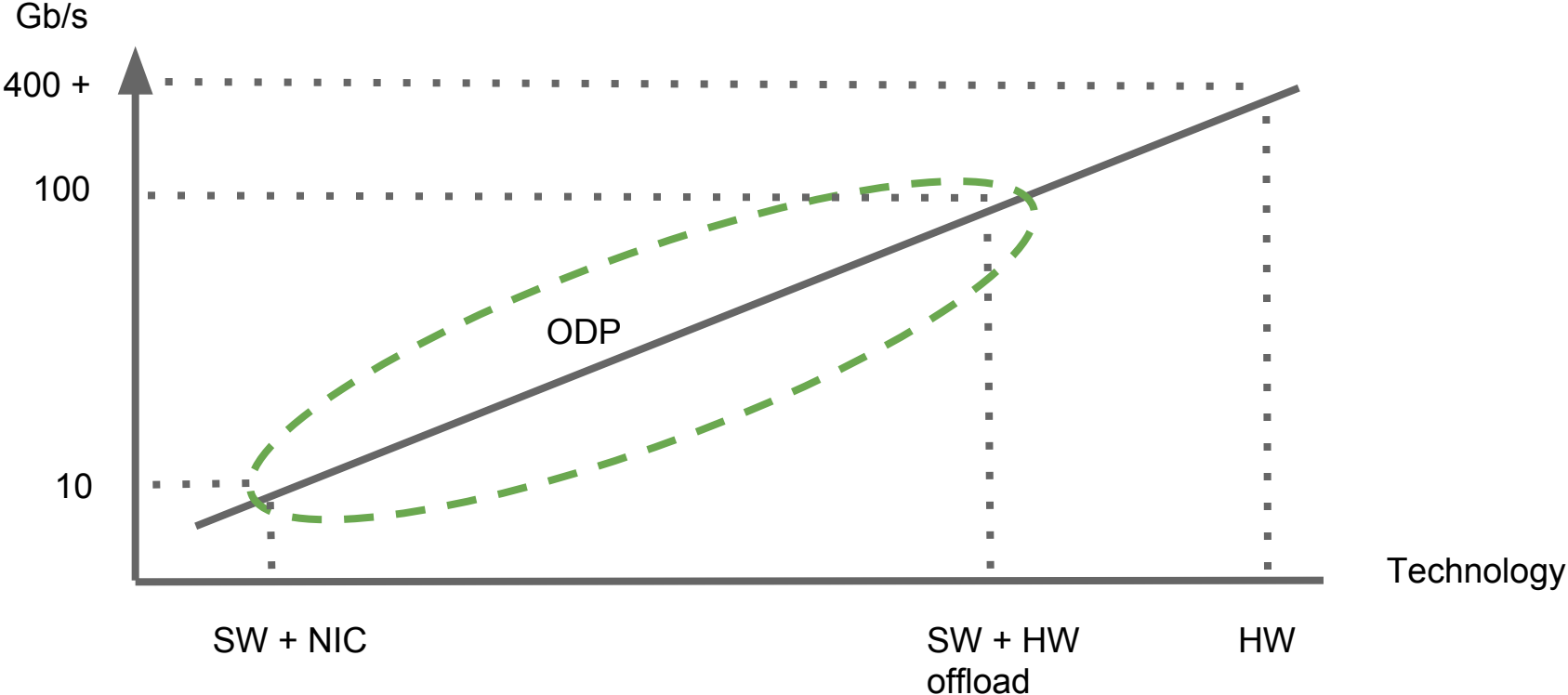
What is the dataplane problem?

Memory Bandwidth

- Limited by memory technology
- In time it takes network speeds to increase by 10x, memory speeds only increase by 3x
- Problem gets worse over time
- NUMA is partial solution
- Forcing rapid evolution in HW designed for packet processing
- Apps struggle to keep pace



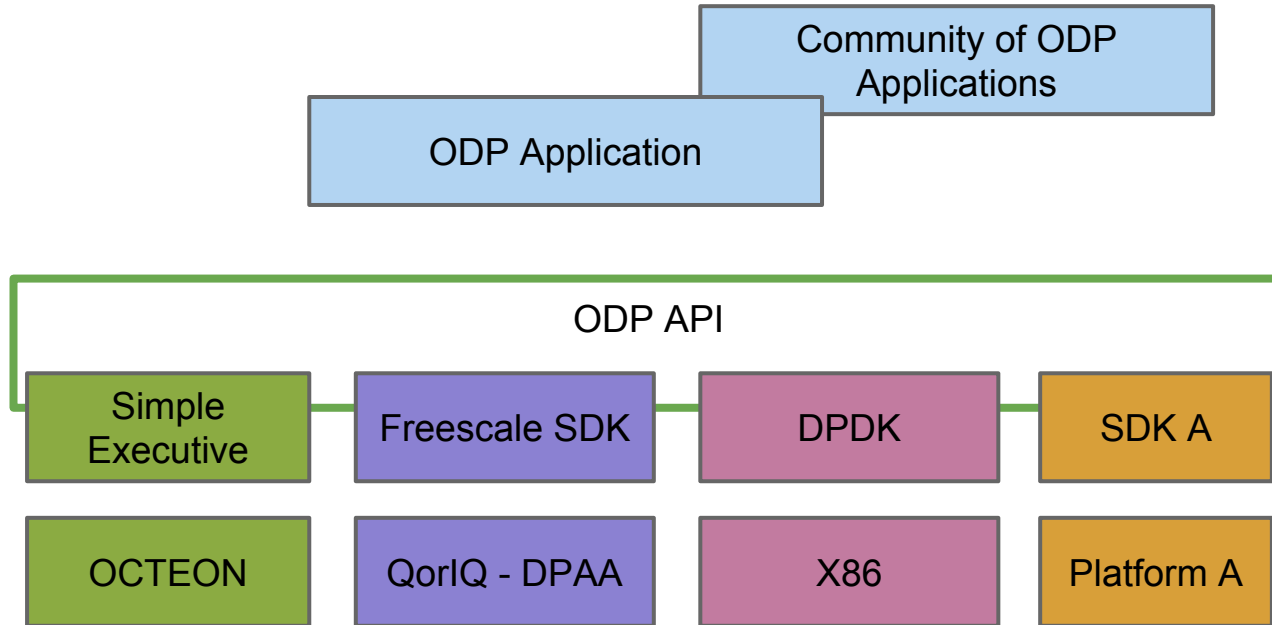
ODP Target Solution Space



ODP Key Design Concept: Separation of API from Implementation

- The ODP API is fully open source and defined abstractly for portability and platform-independence
- Each *implementation* of ODP realizes the ODP API in an optimal manner for that platform
 - LNG supplies a number of fully open source *reference implementations* of ODP
 - Each ODP implementation is fully under the control of its owner
 - Implementations can be open or closed source as business needs determine
- LNG also supplies a *validation test suite* for ODP
 - Enables applications and vendors to confirm that implementations conform to the ODP API specification

ODP - Application View

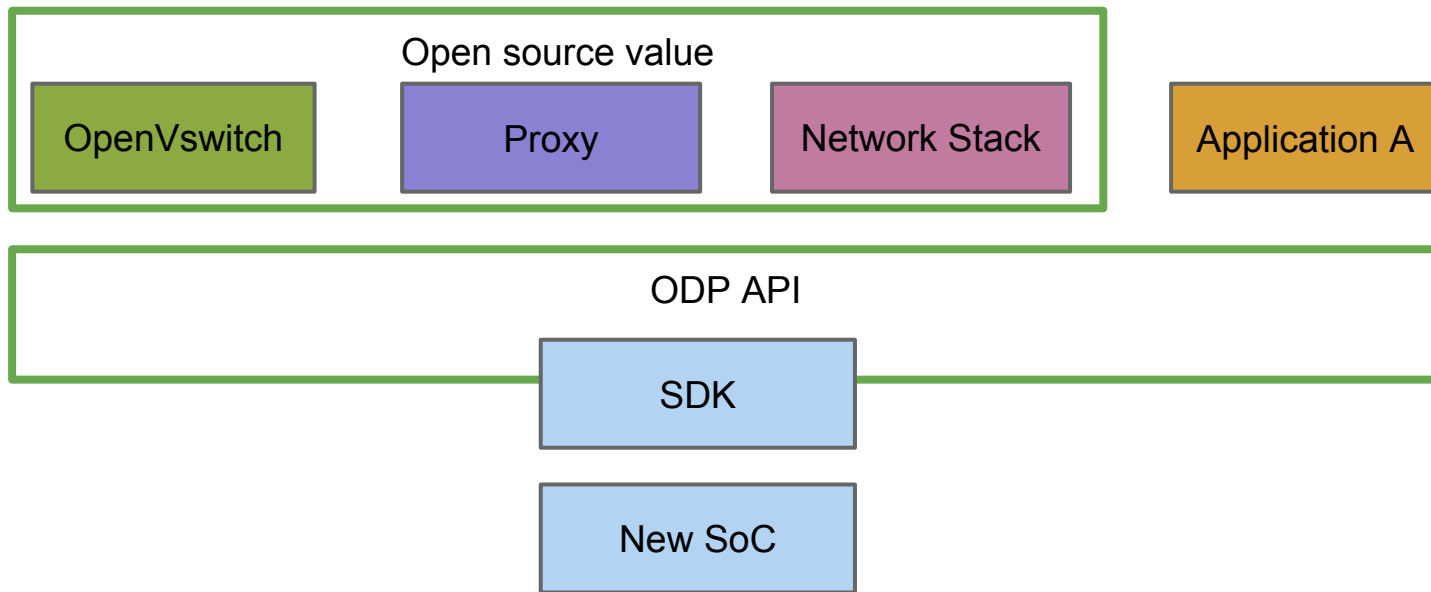


Application can run on any Platform

ODP demonstrated to run at negligible overhead on several Platform SDKs

Intel x86/DPDK a work in progress. Currently at single-digit overhead. Need to achieve <2%

ODP - SoC Vendor View



Platform can compete for any Socket

ODP Implementations - 1 of 2

Name	Owner/Maintainer	Target Platform	Architecture
linux-generic	Open contribution, maintained by LNG	Pure SW, runs on any Linux kernel. Functional implementation, not a performance target.	Any
odp-dpdk	Open contribution, developed by LNG	Intel x86 using DPDK as SW acceleration layer	Intel x86
odp-netmap	Open contribution, developed by LNG	Linux + NETMAP support (experimental)	x86 + ARM

ODP Implementations - 2 of 2

Name	Owner/Maintainer	Target Platform	Architecture
odp-keystone2	Texas Instruments	TI Keystone II SoCs	ARM Cortex A15
linux-qorIQ	Freescale	Freescale QorIQ SoCs	Power
OCTEON	Cavium Networks	Cavium Octeon SoCs	MIPS64
THUNDER	Cavium Networks	Cavium ThunderX SoC	ARMv8
odp-mppa	Kalray	Kalray MPPA SoCs	Proprietary

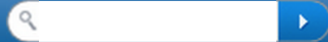
Additional implementations under development by others

Portability and Performance Results to Date

- ODP currently showing application portability across all of its published implementations
- 100Gb/s IPsec application performance demonstrated publicly



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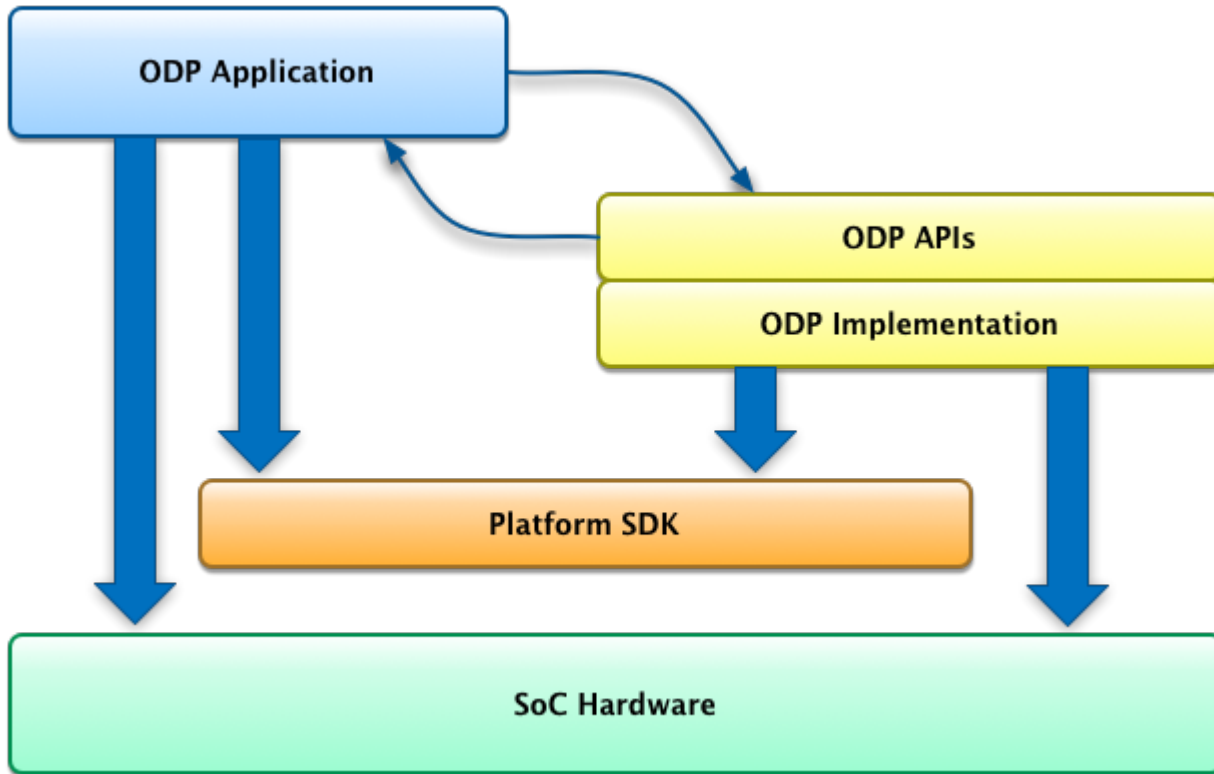
News & Events > Press Releases

Cavium Breaks 100Gbps IPsec Throughput Barrier using OpenDataPlane™ at Mobile World Congress 2015

OCTEON® III 48 Core 64bit Processor SoC Provides 2.5X+ Performance Boost delivering the critical secure backhaul requirements for future LTE-A and 5G Wireless Core Network Applications

Mobile World Congress – Barcelona, Spain March 2, 2015 –Cavium, Inc., (NASDAQ: CAVM), a leading provider of semiconductor products that enable intelligent processing for enterprise, data center, wired and wireless networking, will demonstrate its single-chip OCTEON III processor running a full IPsec security application at 100Gbps throughput, necessary for next generation LTE-A and 5G networks using standard OpenDataPlane (ODP) software API's at Mobile World Congress 2015.

ODP Application Migration Path for Legacy Apps



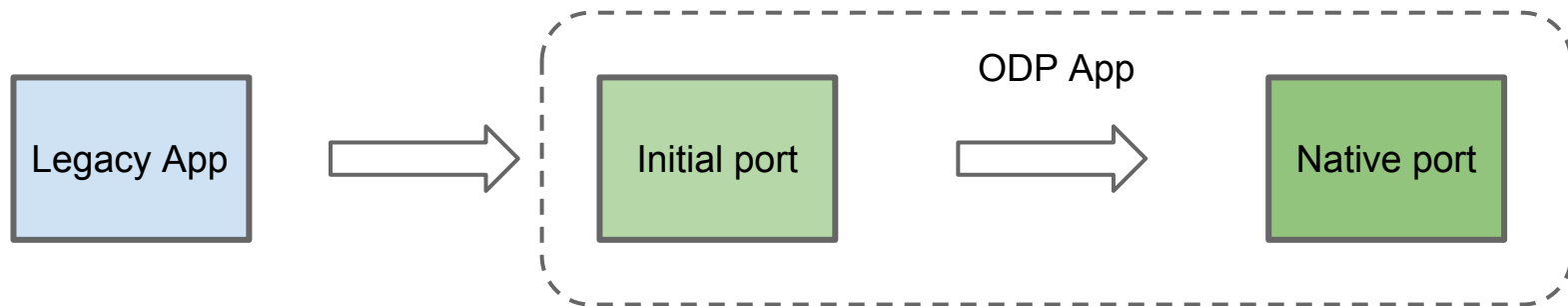
Existing Applications can add ODP functionality on an incremental basis

ODP implementations leverage existing SDKs

Apps still have access to platform SDKs if they wish

Apps can access HW directly if they wish (real or virtual)

Application Staged Migration Path to ODP



- Uses SDK or RYO APIs
- Directly tied to specific HW platform
- I/O via PMDs

- Uses mix of ODP and legacy APIs
- Semi-portable to other platforms, limited acceleration
- I/O via ODP packet I/O (poll mode) APIs

- Uses ODP APIs
- Fully portable with transparent platform-specific acceleration
- Restructured to use ODP event scheduler for processing and I/O scalability

Summary

- ODP was designed as g-API from the start 2+ years ago
- The open and equal governance model of an open source project with all relevant hardware suppliers is absolutely required to arrive at a solution
 - The only way forward is to work together in collaborative development
 - Opendataplane.org is already set up to manage this sort of governance and collaboration: all the relevant CPU/SoC stakeholders are members or otherwise participating
- PoCs with benchmarks under development now

Thank You

For more information, visit:



OpenDataPlane
.org