DPDK
DATA PLANE DEVELOPMENT KIT

Shaping the future of IP Broadcasting with Cisco's vMI and DPDK on Windows

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Agenda

- Video Broadcasting industry transition

- Cisco's vMI introduction

- How DPDK on Windows solves data rate problems

- Cisco's vMI-DPDK solution

- Demo

- Code Availability

- Roadmap

- Q&A

Media Broadcasting Evolution

**Past:** Live media production houses embraced technological changes spanning many decades in adoption.

- From ***black-and-white*** to ***color*** television transition in the 1950s and 60s
- ***Analog -> Digital*** video signals through 1980s
- To ***standard definition(SD) -> high definition (HD)*** transition in the 2000s,
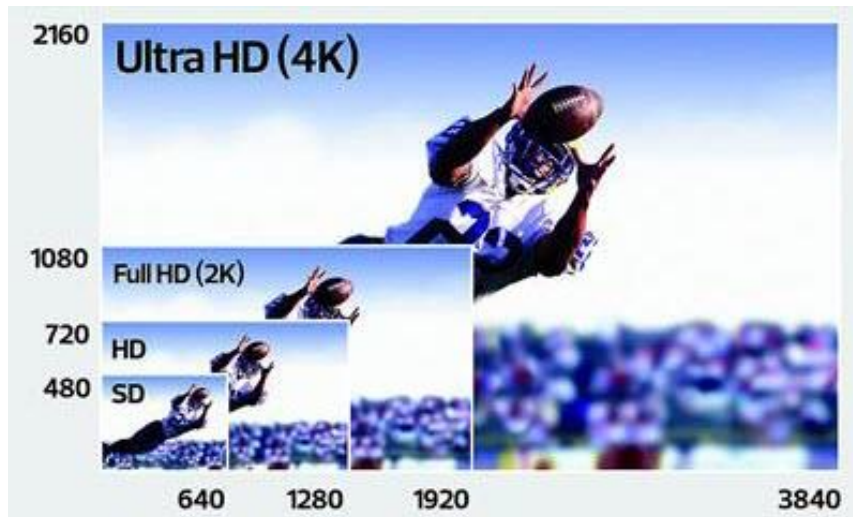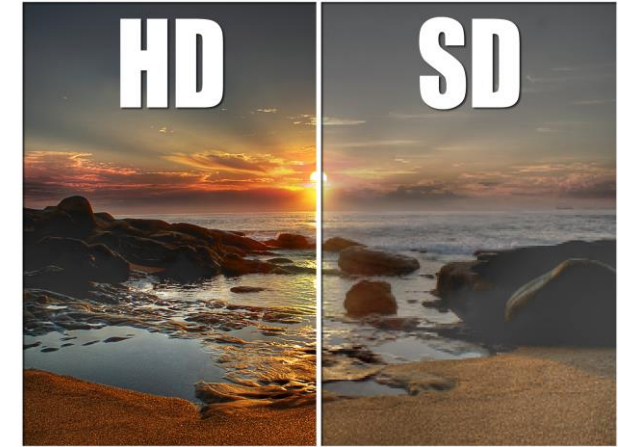
- yet, **Today:** An unprecedented, accelerated transition in the media industry is underway
  - As 4K/UHD and 8K resolutions in the future become a fundamental part of the broadcast landscape.

IP Networking for Media Broadcasters

- Television and Live media broadcasting houses are migrating:

    - Replacing legacy, domain based Serial Digital Interface (SDI) fabrics

    - To IP-based virtualized environment and infrastructure.

    - Using SMPTE protocols

- Motivation

    - Future-proofing the infrastructure to meet increasing bandwidth demands.

        - 4K, 8K bit rates cannot be carried by existing infrastructure.

    - Leverage benefits of the cloud

        - Do away with dedicated equipment

        - Rapidly scale to new technologies.

    - IP over ethernet spans large distances and can be encrypted.

Average GB for 90 mins
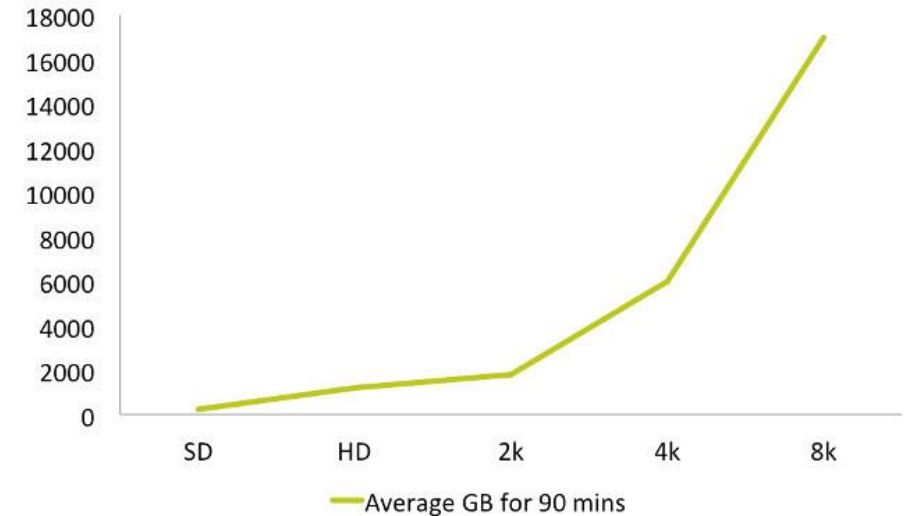
Evolution of Television Resolution

SD HD 4K/UHD 8K

Windows DPDK for Video Broadcasting

- Available today is Cisco's virtual media interface (vMI) software toolkit – open sourced as "Herisson"

  - Aids media software vendors transitioning from SDI to IP/Ethernet workflows.

  - Today vMI stack is optimized for legacy SDI workflows.

- **Ever Increasing Data Rate Challenge:**

  - Data Rates of SMPTE and IP-based media frames exceed the capacity of today's Operating Systems IP stacks.

Single HD Video Stream	Single HDR 4K Stream
1.5Gb/s	Up to 12Gb/s

- **With IP frames, vMI libraries need efficient path to the NICs to realize capacity at parity with legacy SDI workflows.**

- **Cisco-Microsoft-Intel jointly announcing highly optimized vMI libraries with DPDK on Windows.**

  - Software Networking kit to support media workflows on an ethernet network, on Windows Server Operating System.

  - Windows continues to be the Operating System of Choice for many media software vendors with strong graphics and GPU driver support.

- **Cisco vMI library planned for use in multiple end-customer products and broadcaster solutions.**

Introduction to SMPTE standards

- SMPTE is a set of standards addressing transport of uncompressed media over IP.

- Historically, largely derived from SDI standards.

- All based on RTP protocol.

- SMPTE mandates strict packet timing requirements.

# Introduction to vMI(virtual Media Interface) Today

- A set of high-performance open source software tools that processes media IP streams on x86 (Linux/Windows).

- Virtual SDI Card for software appliances.

- Enables virtual SMPTE-stream analysis in virtualized workflow.

- Enables SMPTE traffic pacing.

- **Challenges with IP network.**
  - SMPTE standard based on RTP meaning that there is no flow control.
  - Media processing is a real time process.
  - IP transport is mission critical ➔ must not loose a single packet.
  - Traditional operating systems are implementing best effort strategy.

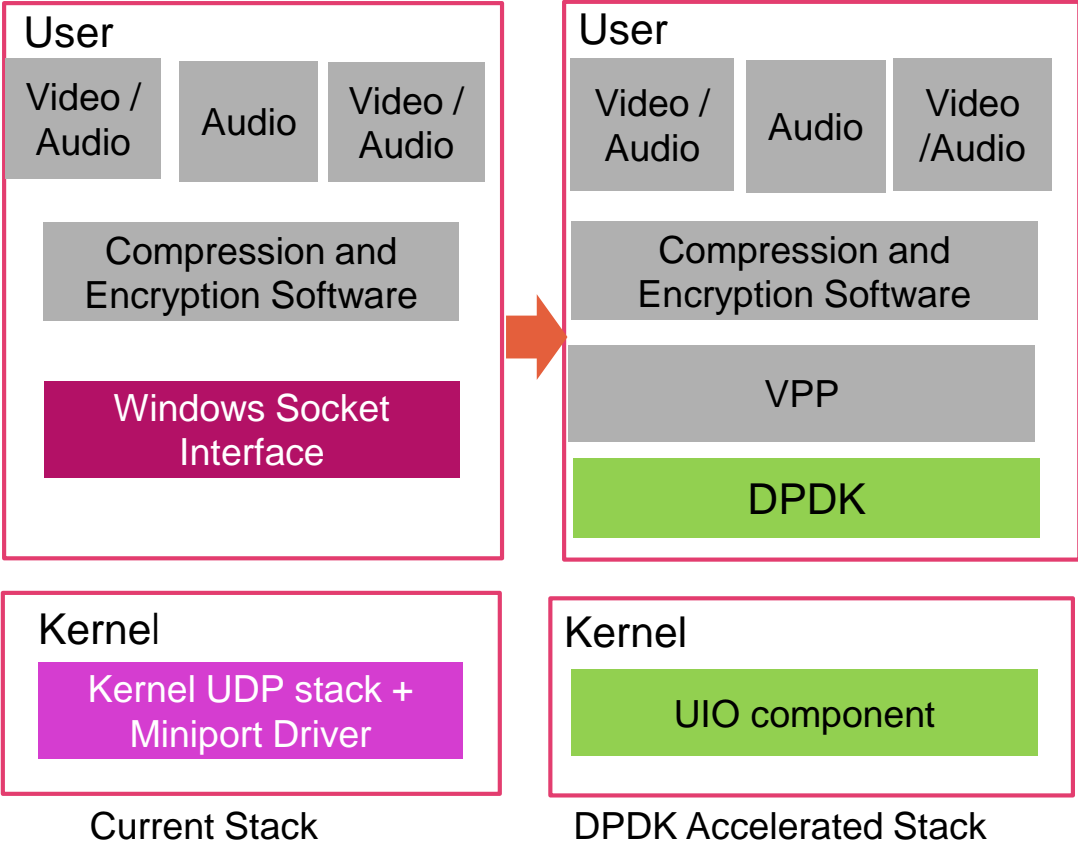# Video Broadcasting and Windows DPDK
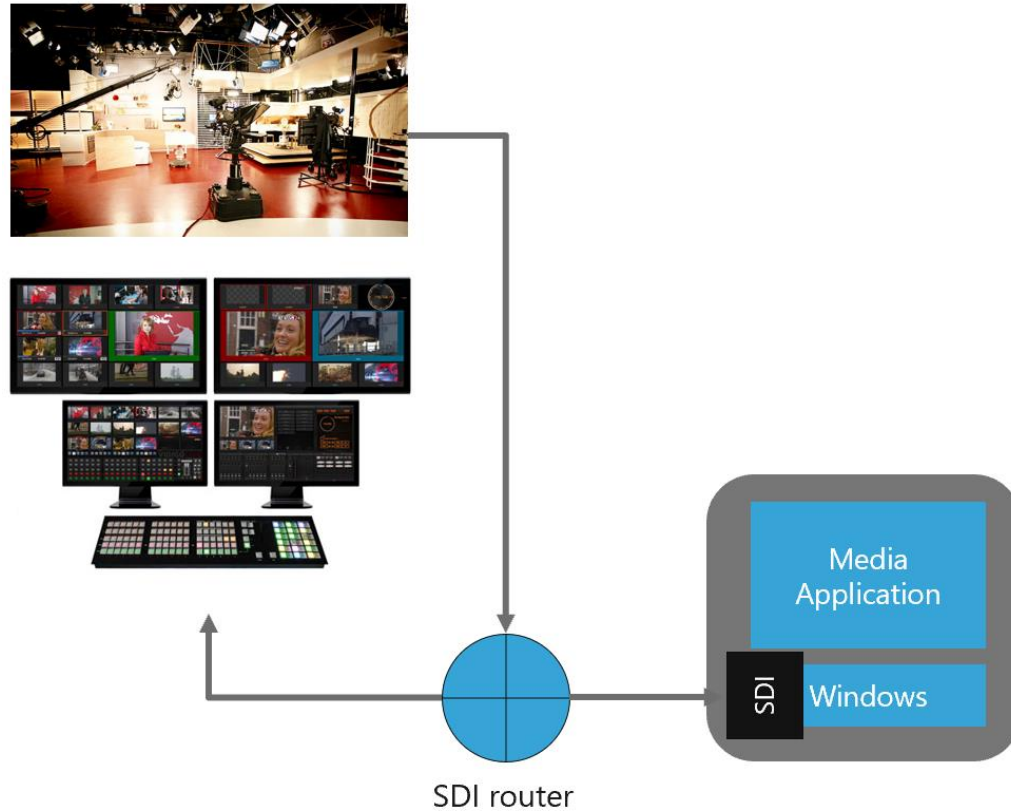
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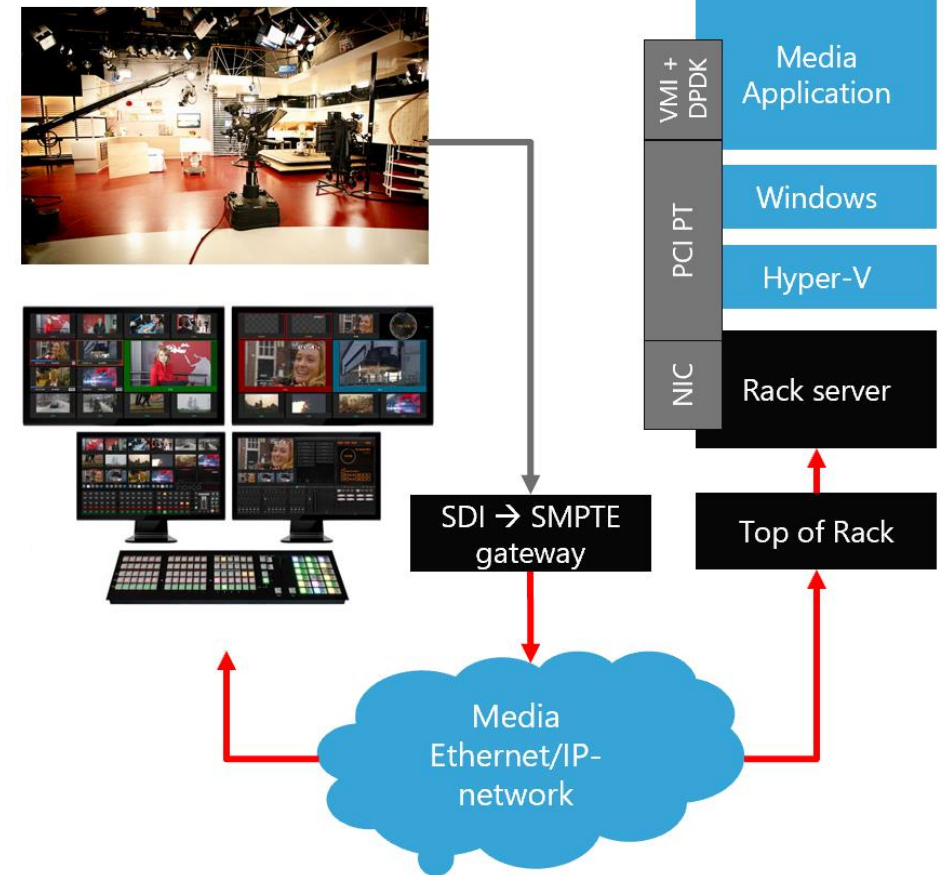
Tomorrow

How Windows DPDK solves the data rate challenge

DPDK DATA PLANE DEVELOPMENT KIT

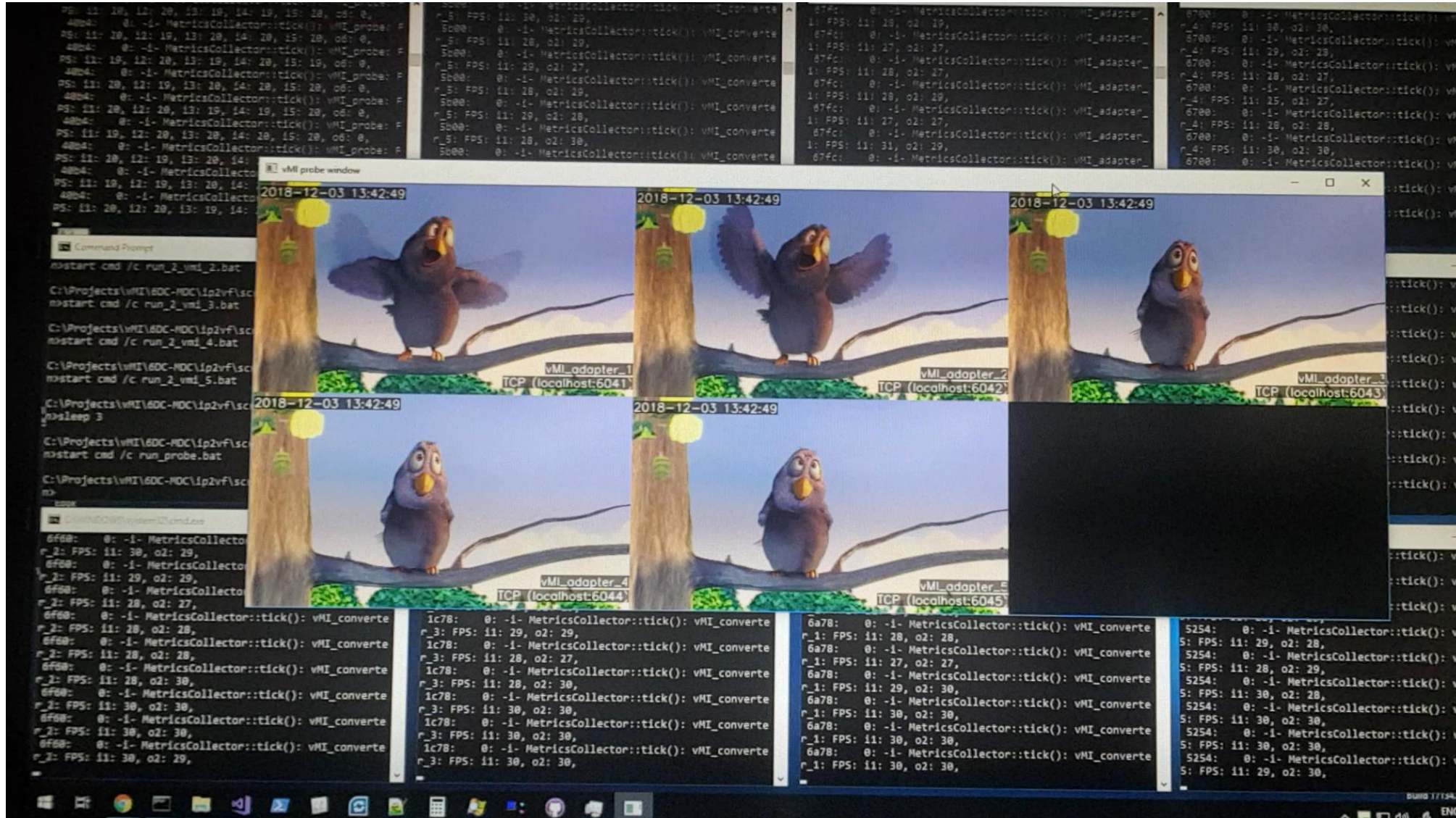Multiple streams of high-quality video broadcast with low latency

Before DPDK	With DPDK
limited to 5 HD (1080p 60 fps) streams representing ~8Gbps max	**With DPDK, saturate 40Gbps link with 25 HD streams with scale-up expected to 100Gbps (5X increase)**

User

Video / Audio | Audio | Video / Audio

Compression and Encryption Software

Windows Socket Interface

User

Video / Audio | Audio | Video /Audio

Compression and Encryption Software

VPP

DPDK

As high-quality video increases from 4K to 8K and beyond, the video broadcasting industry needs a scalable solution using IP and virtualization.

Standard Name	IEEE Standard	# ports	Per Port speed
Dual HD SDI	SMPTE 372 M	2	1.5 Gbps each
3G (1080p60)	SMPTE 424	any	2.97 Gbps
6G (2160p30)	SMPTE.ST2081	any	~6 Gbps
12G (2160p60)	SMPTE.ST2082	any	~12 Gbps

Kernel

Kernel UDP stack + Miniport Driver

Kernel

UIO component

Current Stack

DPDK Accelerated Stack

Demo

Code Availability

vMI

- Open Source vMI library for Windows with DPDK to be available in December 2018!!

- Visit Herisson repo on Github.

Windows DPDK

- Cisco's DPDK patch to support vMI libraries available in branch windpdk-v17.11-rc2.

Call to Action: Download, Build, and Run apps with vMI and DPDK on Windows!

DPDK on Windows – Current Status

- Announced Windows support for DPDK libraries at the DPDK Summit in December 2017, demoed over 70+ Million packets per second !

- **The Windows DPDK draft repo updated to align with v18.08 public release.**

- Windows DPDK branch windpdk-v17.11.rc2, windpdk-v18.02 validated on Windows Server 2016 and Windows Server 2019 with Intel 40GbE network adapters.

  - Essential libraries and toy applications compiled and working on Windows.

- Intel now supports DPDK Poll Mode Drivers (PMD) for Windows native host.

- **Windows Poll Mode drivers from Chelsio, Cavium and Broadcom are under development.**

DPDK on Windows – Goals and Vision

- Upstreaming Windows DPDK patches in the main repository.

  - Expect phased upstreaming of Windows DPDK core libraries through 2019.

- Support for alternative compilers such as clang.

- More secure, multi-process/multi-user driver model to expose the device to user-mode applications.

  - In-depth look at next session from colleagues at Microsoft and Intel.

- Ensure all DPDK libraries and APIs are fully functional on Windows.

- Future Investigations:

  - Support DPDK in a Windows VM

    - Moving from Native Host to Guest with Direct Device Assignment (DDA) and eventually using a Guest VF

  - Support for Packet Pacing.

  - Core Isolation and reservation with Windows scheduler.

Thank You Contributors!

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Questions?