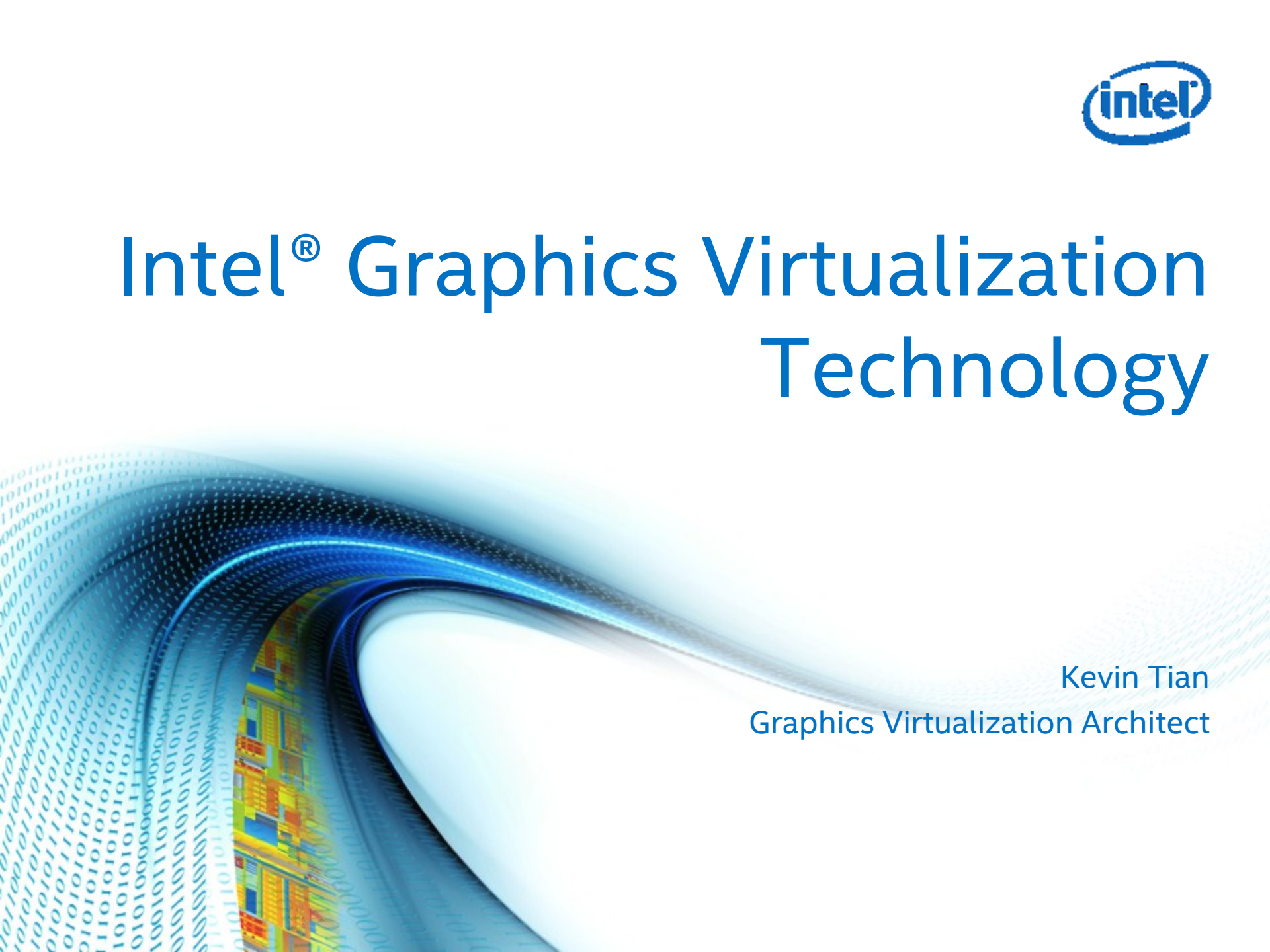


Intel® Graphics Virtualization Technology

Kevin Tian
Graphics Virtualization Architect

Legal Disclaimer

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

A "Mission Critical Application" is any application in which failure of the Intel Product could result, directly or indirectly, in personal injury or death. SHOULD YOU PURCHASE OR USE INTEL'S PRODUCTS FOR ANY SUCH MISSION CRITICAL APPLICATION, YOU SHALL INDEMNIFY AND HOLD INTEL AND ITS SUBSIDIARIES, SUBCONTRACTORS AND AFFILIATES, AND THE DIRECTORS, OFFICERS, AND EMPLOYEES OF EACH, HARMLESS AGAINST ALL CLAIMS COSTS, DAMAGES, AND EXPENSES AND REASONABLE ATTORNEYS' FEES ARISING OUT OF, DIRECTLY OR INDIRECTLY, ANY CLAIM OF PRODUCT LIABILITY, PERSONAL INJURY, OR DEATH ARISING IN ANY WAY OUT OF SUCH MISSION CRITICAL APPLICATION, WHETHER OR NOT INTEL OR ITS SUBCONTRACTOR WAS NEGLIGENT IN THE DESIGN, MANUFACTURE, OR WARNING OF THE INTEL PRODUCT OR ANY OF ITS PARTS.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined". Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order.

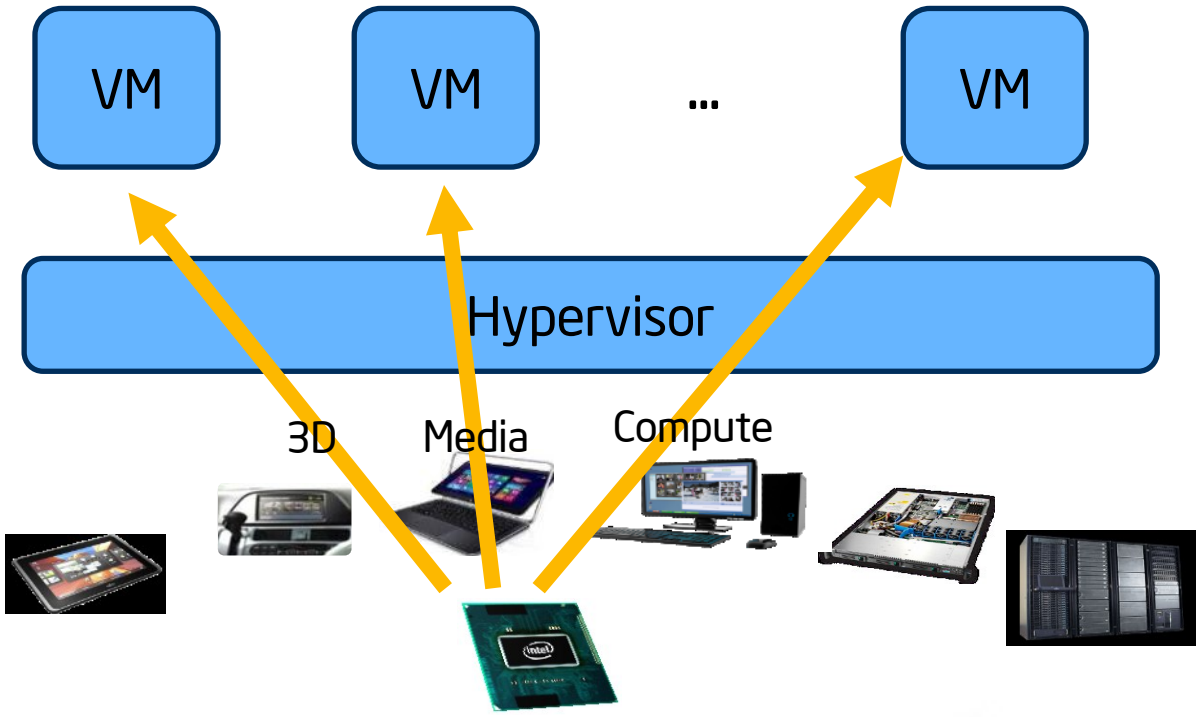
Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or go to: http://www.intel.com/design/literature.htm

Intel, Core, Look Inside, and the Intel logo are trademarks of Intel Corporation in the United States and other countries.

*Other names and brands may be claimed as the property of others.

Copyright ©2014 Intel Corporation.

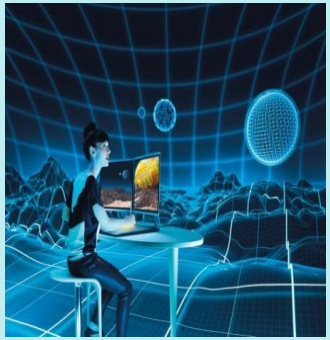
GPU Virtualization



GPU Cloud

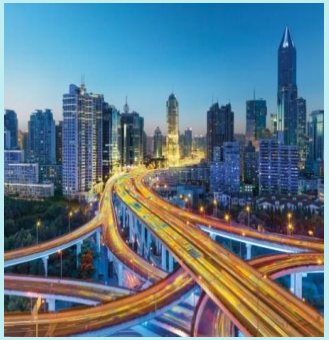
Video Delivery

Store/Stream, Transcode



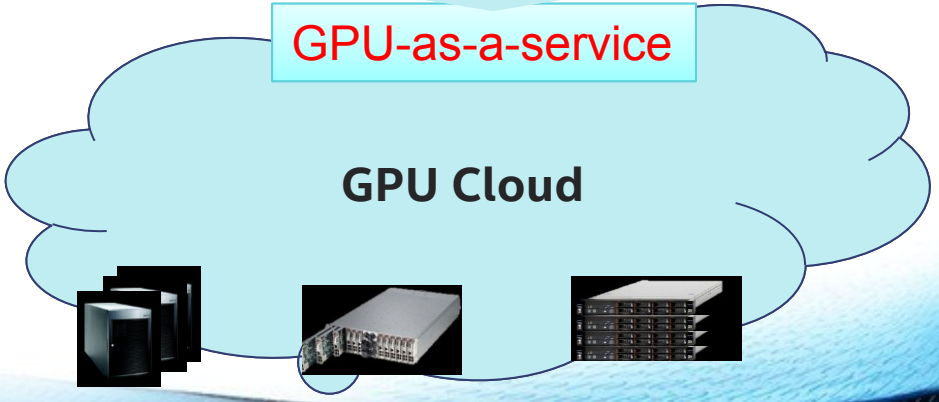
Cloud Graphics

Gaming, Remote Apps, Rendering

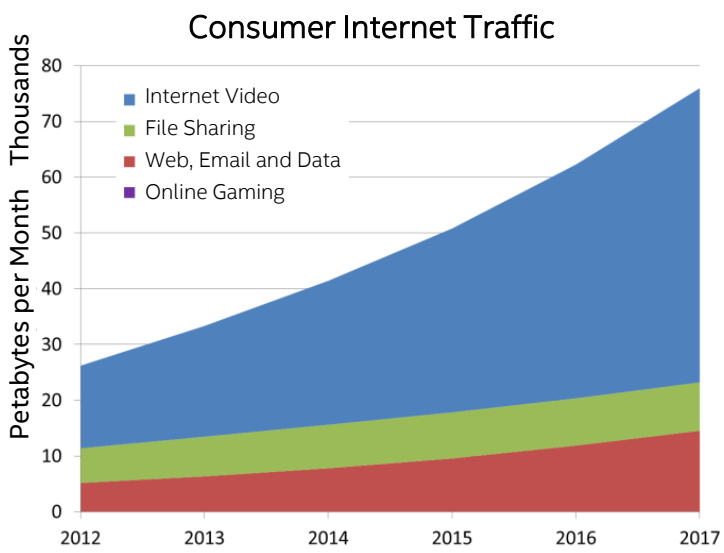


Visual Understanding

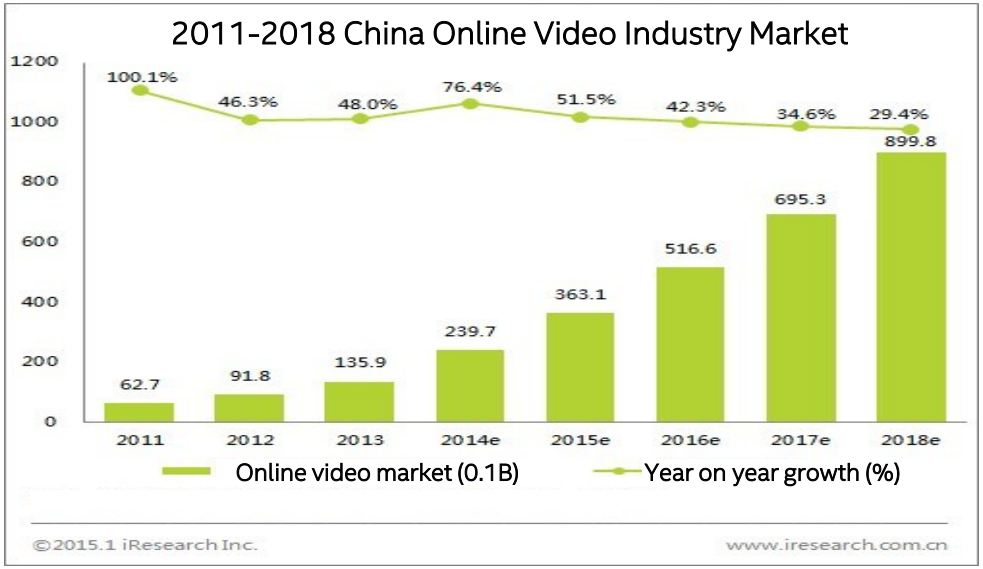
Search, Surveillance



Media Processing Opportunity



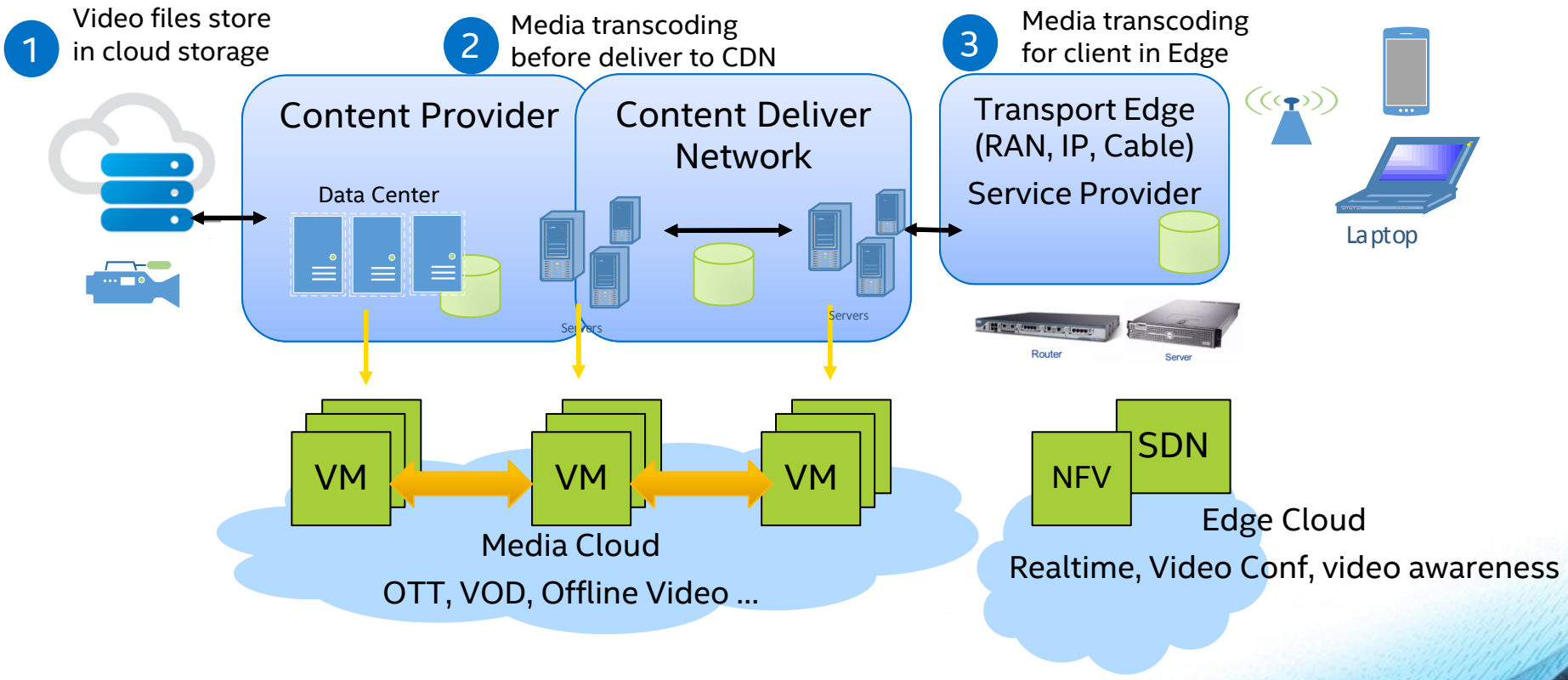
Source: Cisco Systems Inc., Visual Network Index (VNI), 2013, 2015



Source: 2015.1 iResearch Inc., www.iresearch.com.cn

Internet video traffic is forecasted to grow at 29% CAGR and will represent 69% of consumer traffic by 2017

Media Delivery Example



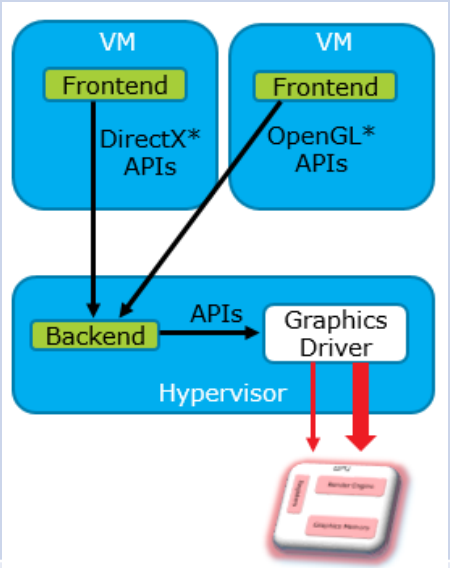
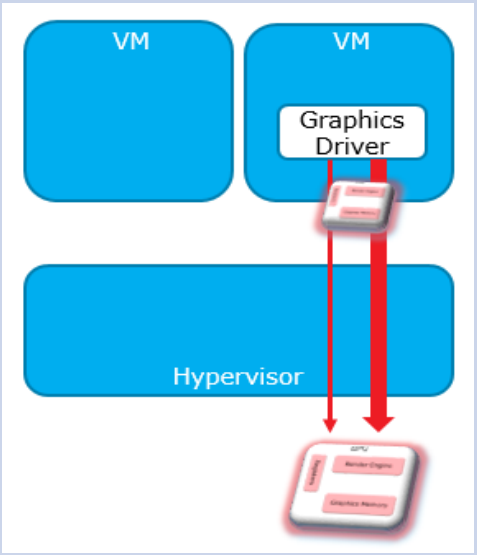
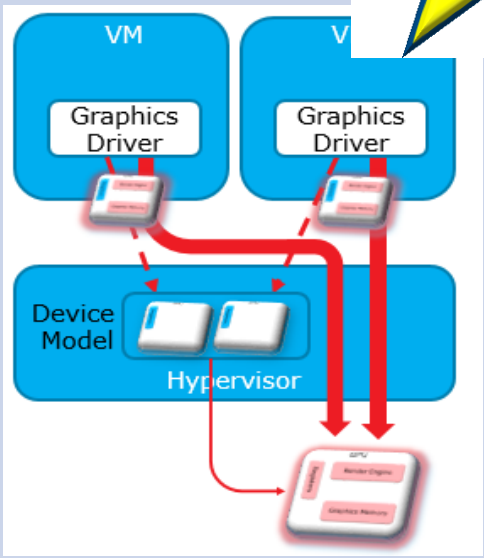
Requirements of GPU Virtualization

Performance → Direct GPU acceleration

Capability → Consistent visual experience

Sharing → Multiple Virtual Machines

GPU Virtualization Approaches

API Forwarding	Direct Pass-thru	Full GPU Virtuali
		
Pros: • Performance • Sharing **Cons:** • No media/GPGPU • Compatibility	**Pros:** • Performance • Capability **Cons:** • No sharing	**Pros:** • Performance • Capability • Sharing

Intel® Graphics Virtualization Technology

- Intel® GVT-s for API level GPU sharing
  - Make existing API forwarding protocols running best on Intel platform
- Intel® GVT-d for direct GPU passthrough
  - Xen GPU passthrough upstreaming in progress
  - KVM PoC patch in community
- Intel® GVT-g for vGPU based sharing
  - Achieve a good balance of performance, feature and sharing
  - Xen implementations (a.k.a XenGT) in production quality on HSW
    - BDW support is in alpha quality in 2015/Q1 release
  - KVM support (a.k.a KVMGT) in prototype quality on HSW

Intel GVT-g: Full GPU Virtualization

Performance

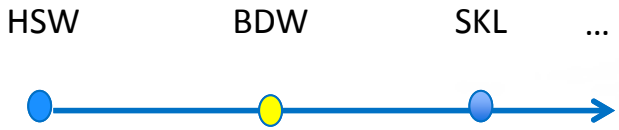
3DMark: 80%

H.264 transcoding: 90%
(of native performance)

Feature

Native driver

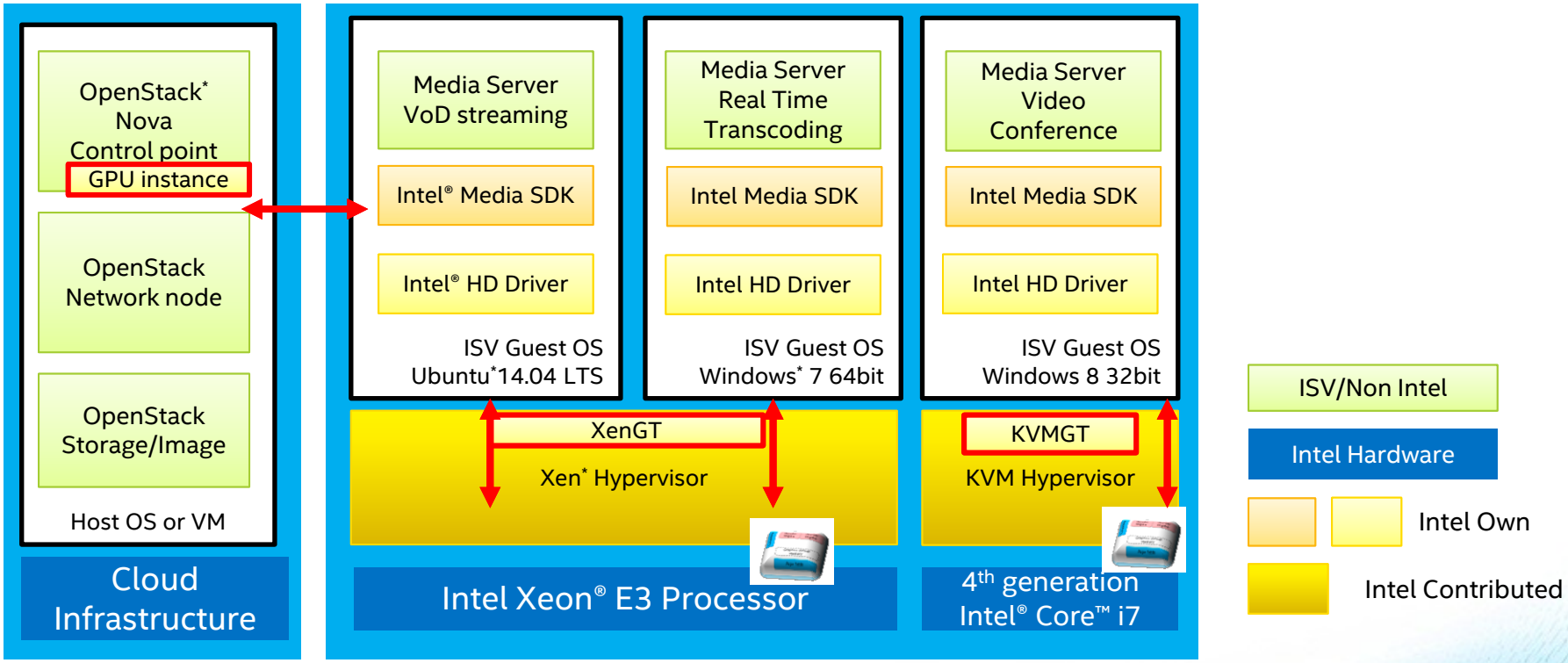
DirectX 11.1, OpenGL 4.2, OpenCL 1.2, MediaSDK x.x



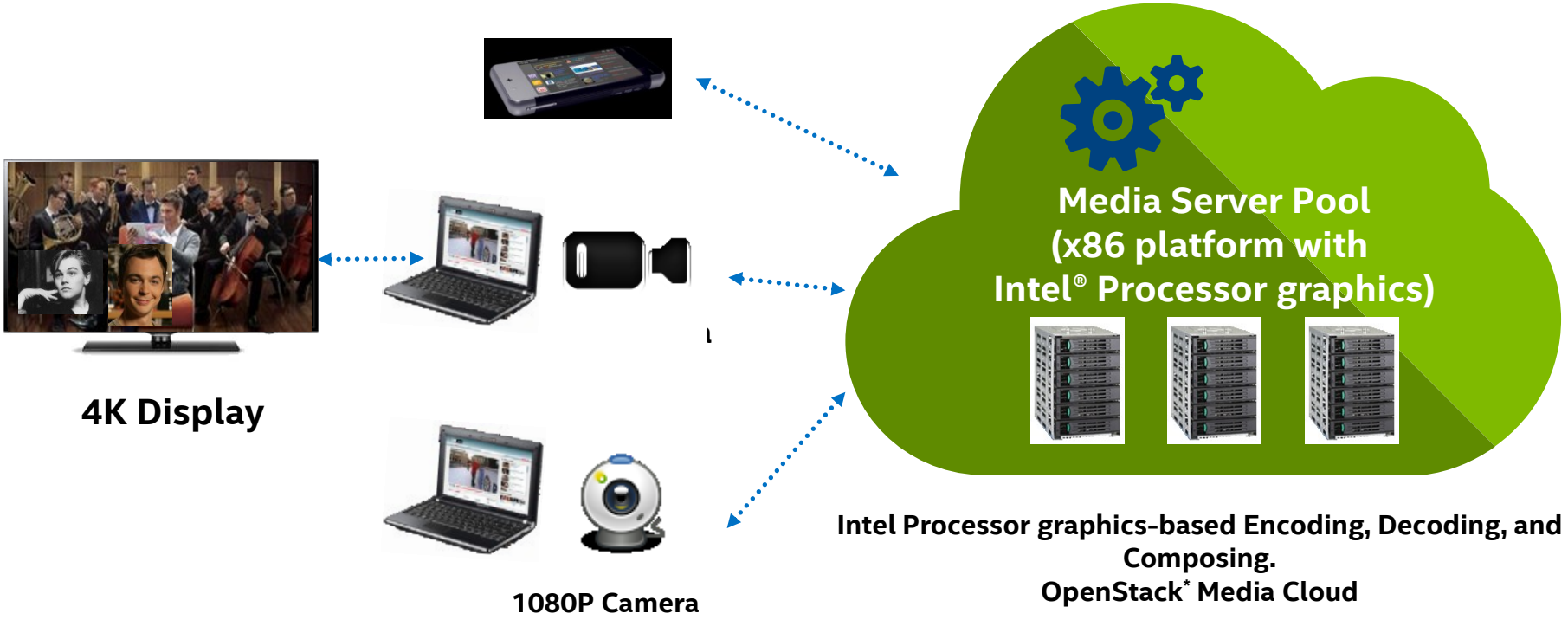
Sharing

Simultaneously accelerate multiple VMs

Building Blocks

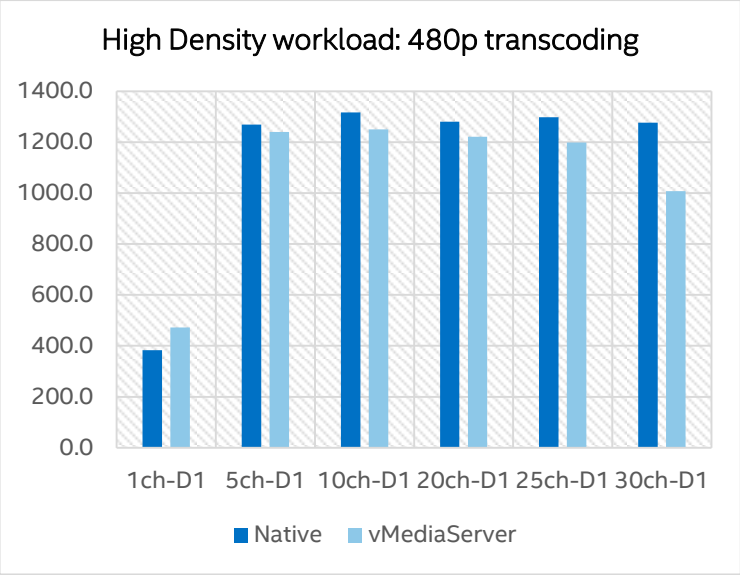


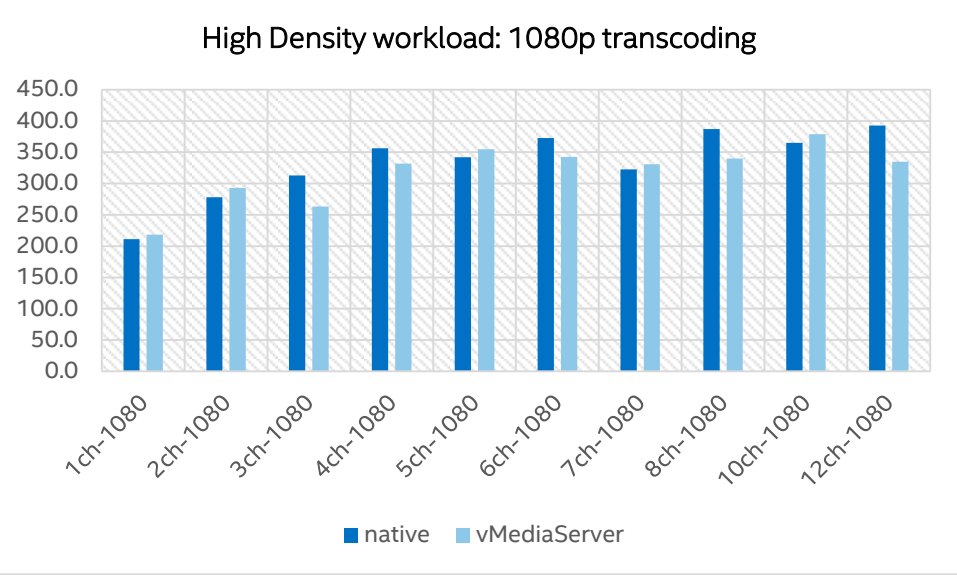
Video Conference Usage Case



4K Video Conferencing on Media Plane NFV Demo @ MWC'15

Performance Summary

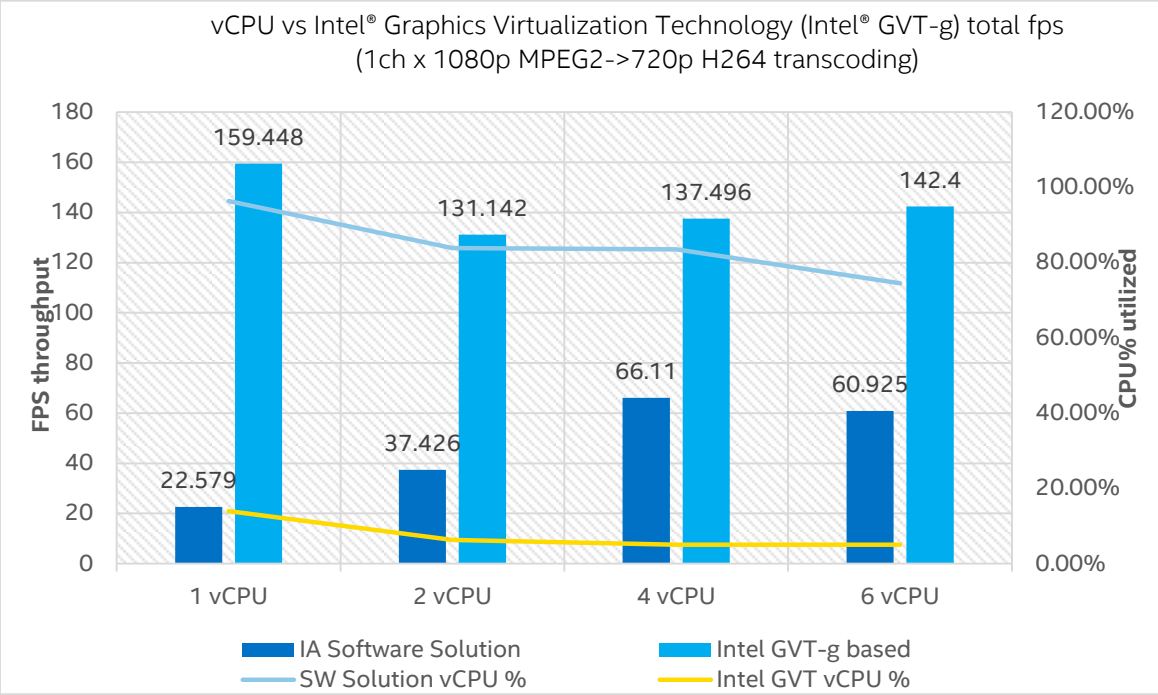




Config: I7 4770, Guest Ubuntu* 14.04LTS, 4GB mem, 1.5G GraphicMem, MediaSDK

Avg S90% of native H.264 transcoding performance

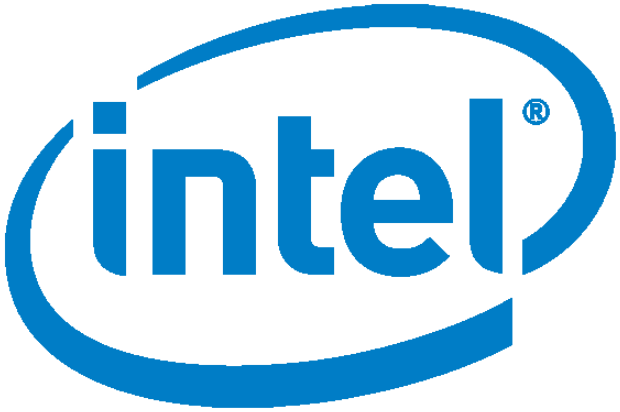
CPU Transcoding vs. GPU Transcoding



Lab data. Config: I7 4770, Guest Windows* 7_x64, 4GB mem, 1.5G GraphicMem, MediaSDK

Performance boost with Intel GVT-g!

Q&A


intel