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Wireshark vs. „The Cloud“:

Capturing packets in virtual environments

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Topics

- General virtualization basics
- Virtual Switches (vSwitch/dvSwitch)
- Capture Scenarios
- Best practises

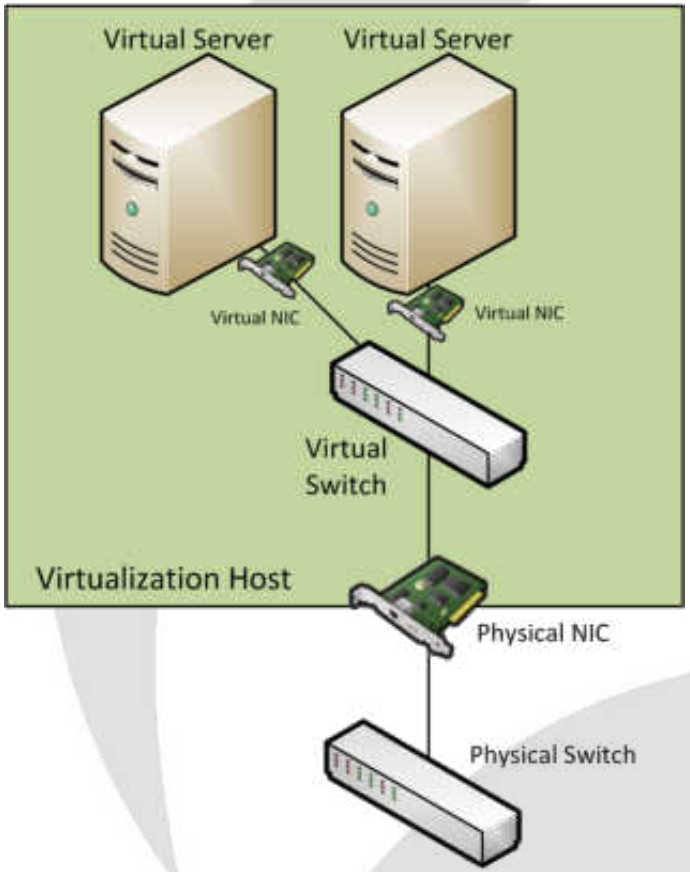
- See also my blog posts at:
  - https://blog.packet-foo.com/category/vm/

Virtual Machines

- Two basic plattforms:
  - Desktop virtualization: VirtualBox, VMware Workstation, Parallels Desktop, etc
  - Enterprise virtualization: Hyper-V, VMware vSphere, XEN Server, KDE, etc.
- Here, we‘ll look at VMware vSphere as an example
  - All others should behave more or less the same

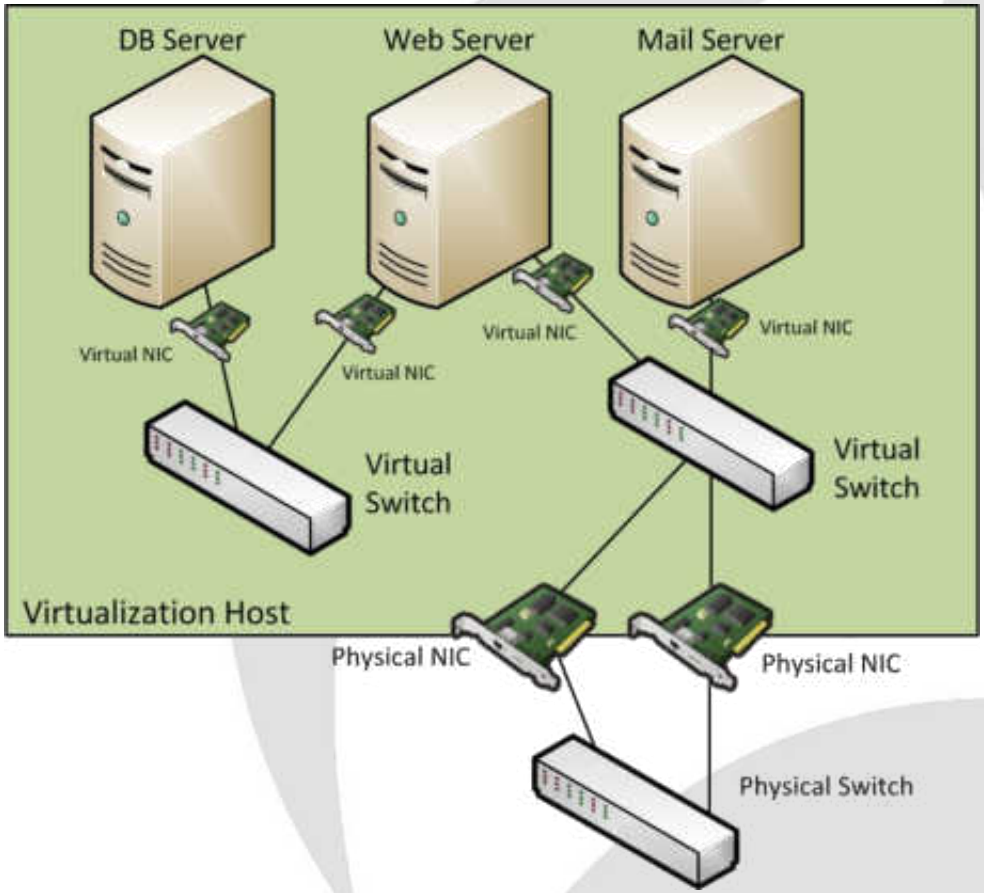
VMs and virtualization hosts

- Virtualization host runs multiple Virtual Machines on a single NIC
- The host may use the NIC for its own data communication, too
- Potentially dozens of virtual servers showing up with their own virtual MAC address on the physical NIC



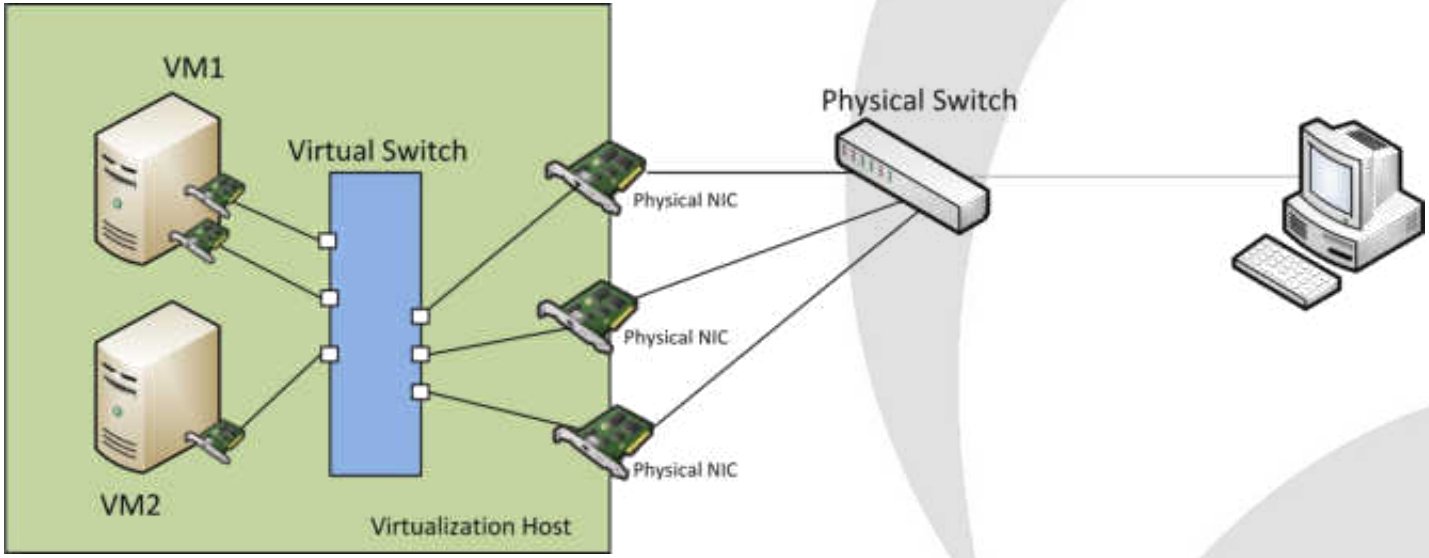
Internal communication

- There may also be „internal only“ switches making things complicated
- Data on internal switches never leaves the virtualization host
- No physical pickup possible



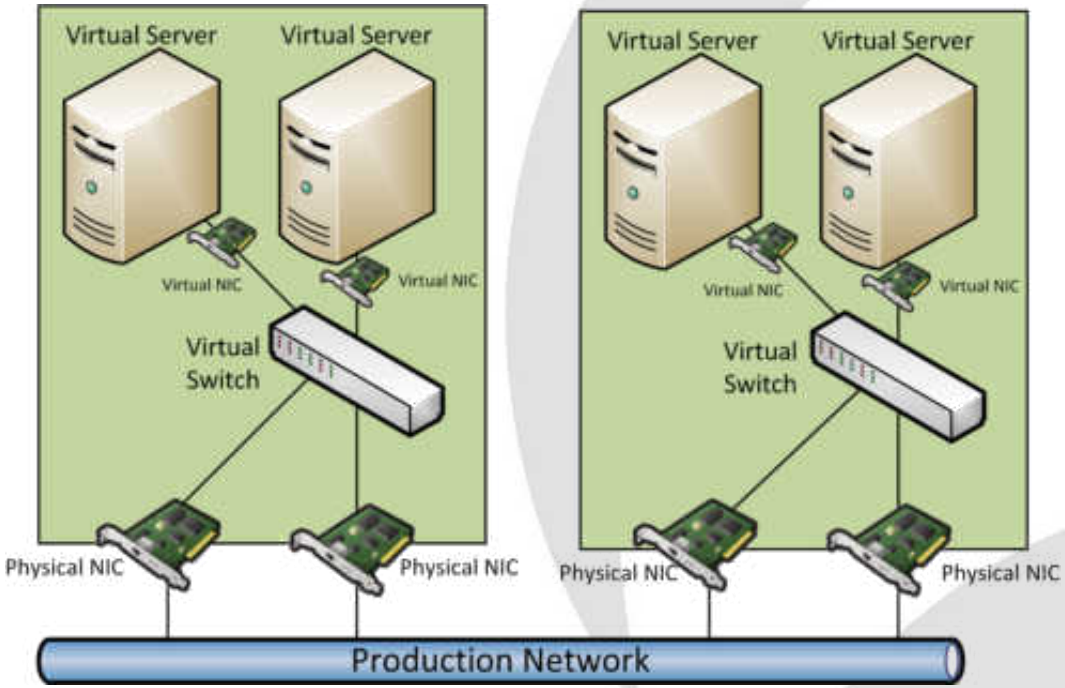
NIC teaming

- NIC teaming means that a VM can use more than one physical adapter
  - some virtualization hosts have dozens of NICs
  - virtual machines are balanced over multiple NICs



Clustering virtualization hosts

- Groups of virtualization hosts are usually combined into a cluster
  - provides automatic load balancing and "high" availability features

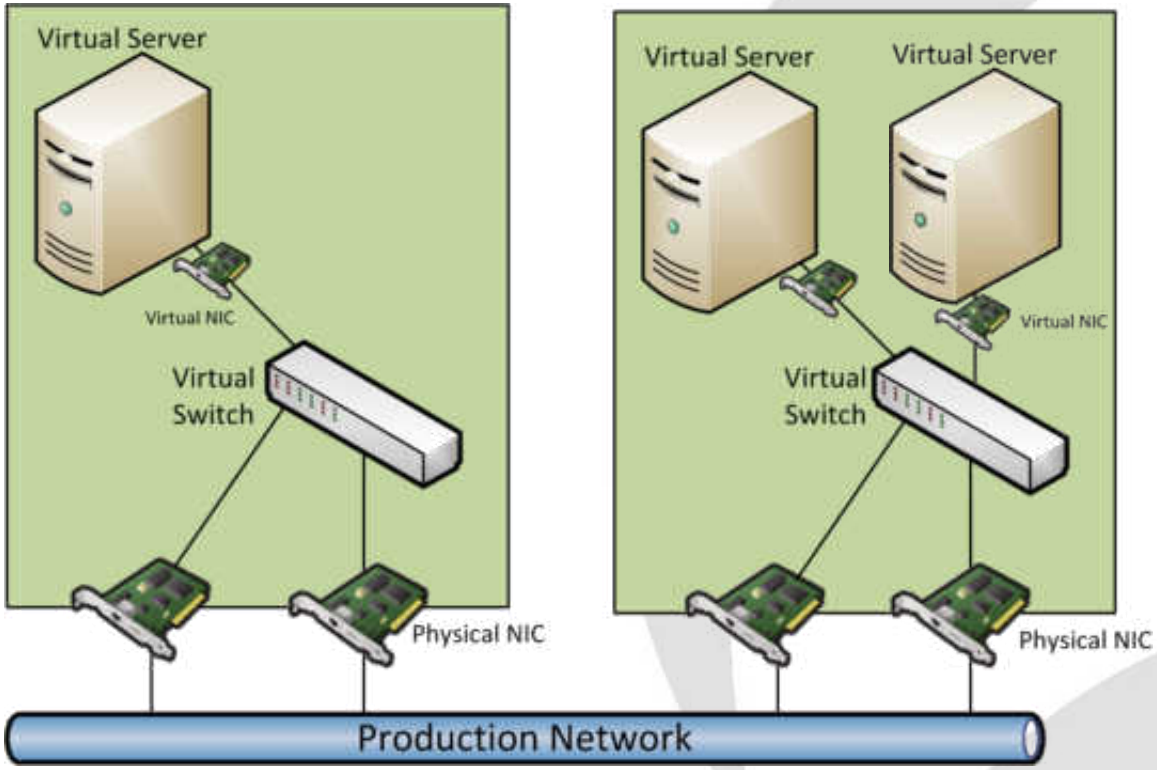


Capturing virtual servers

- In virtual/cloud environments
  - virtual servers, applications, services may run everywhere
  - multiple virtual servers on physical hosts may share a network card
- If you have access to the virtualization host you can SPAN/TAP its connections
- Challenges:
  - Find and capture the correct NIC
  - Isolate traffic for the virtual server/application
  - Servers with 10GBit or even faster links
  - Blade Centers

Migrating VMs

- Virtual Machines may move from host to host while running



Reasons for VMs changing hosts

- High Availability (sort of)
  - Restart virtual machines on other hosts if there is a host crash
- Real High Availability
  - Running an “invisible” hot standby VM on a secondary host that is kept in sync
- Fully automatic live VM moving
  - Load Balancing virtual machines across virtualization hosts

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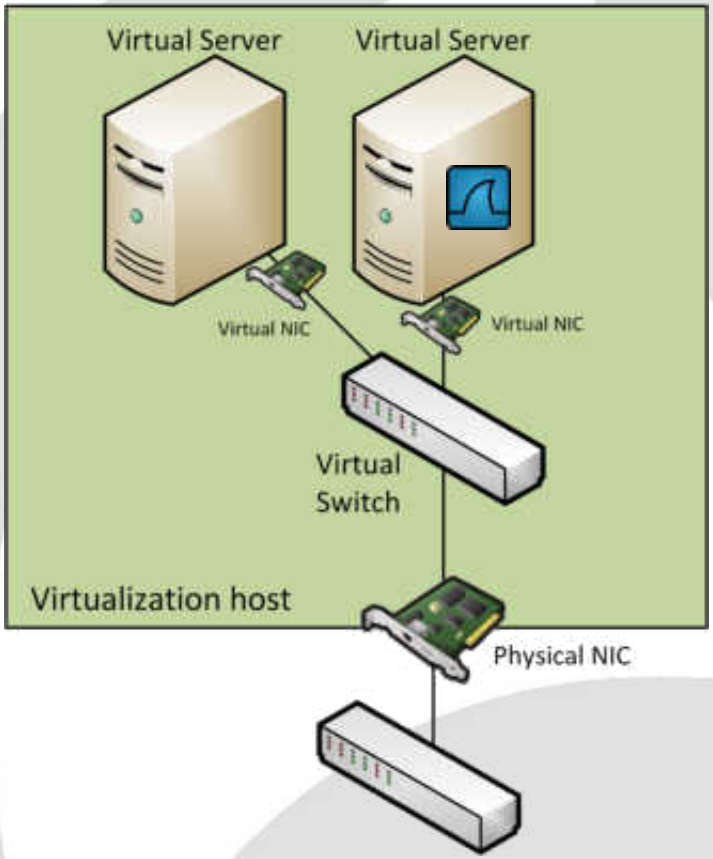
Capture Strategies

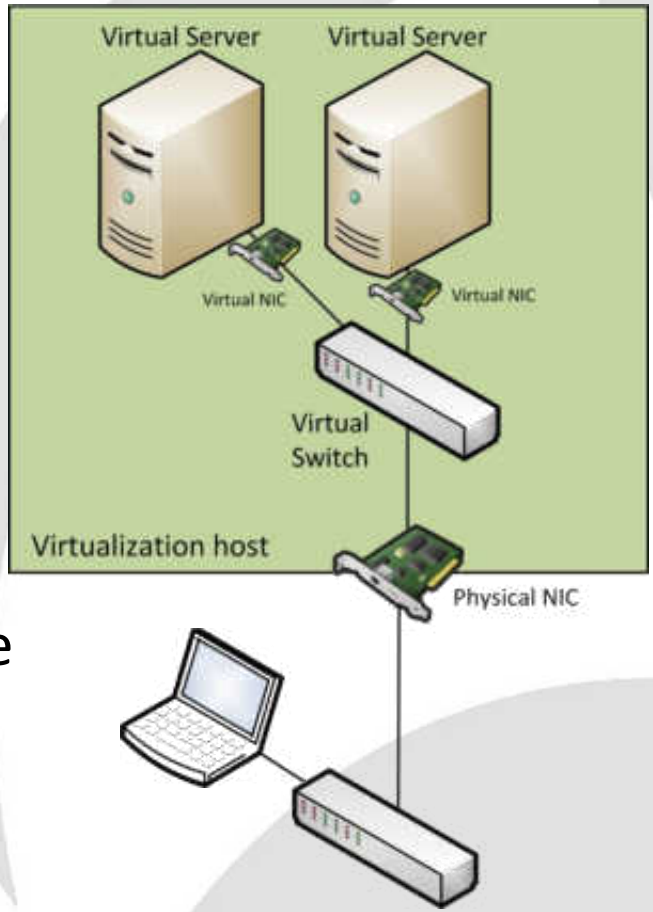
Wireshark on the problem VM

- Install Wireshark on the virtual system of interest
- Advantages:
  - Can capture, even on VMs with internal only NICs
  - Sometimes your only option
- Disadvantage:
  - Changes the environment
  - Gets funny results (way too often)
  - May crash the VM



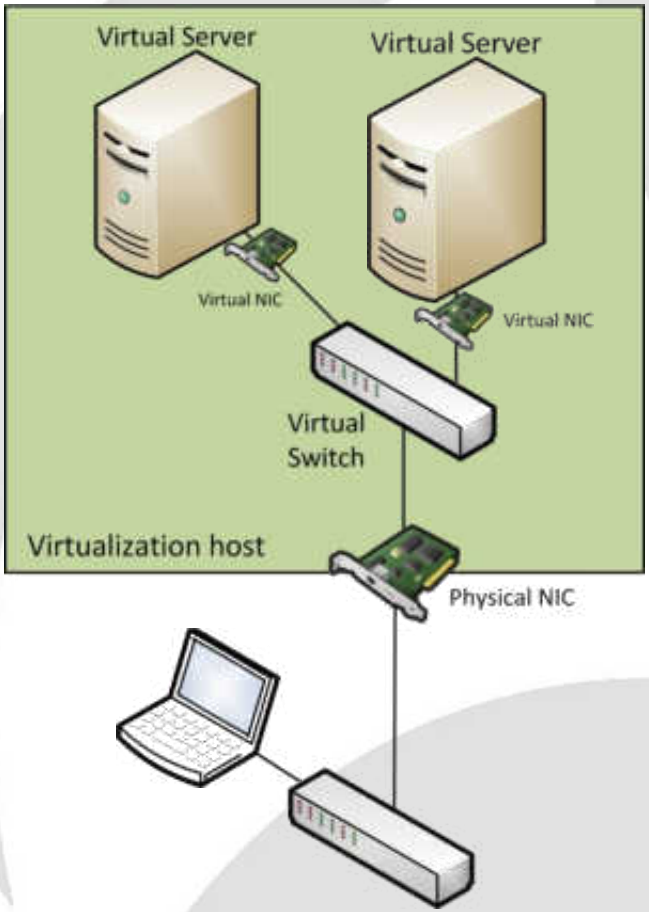
Capturing the host uplink (1)

- Capture at virtualization host uplink (TAP/SPAN)
- Maybe your only option when you have no better access to thevirtual infrastructure
- Advantages:
  - Easy to do in simple setups
  - Usually gets good data
  - Most familiar way to get data since its similar to physical captures



Capturing the host uplink (2)

- Disadvantages:
  - May get you tons and tons of data to sort
  - Server uplink may be too fast for your capture device or the SPAN port
  - VM may be live-moved off the server, interupting the capture
  - Worst case: you don‘t even know *where* to capture!



Virtual capture setups (1)

- VMware virtual switches come in two flavors:
  - vSwitch (always available)
  - Distributed virtual switch/dvSwitch (E+ license only)
- Virtual switch features helping with captures:
  - "Promiscuous mode" on port groups
  - SPAN sessions (dvSwitch only)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Demo

Best Practises

Scenarios

- Problem with a single/a few VMs
  - SPAN the problem VM traffic (if on dvSwitch)
  - isolate problem VM on a port group with a capture VM
  - run dumpcap/tcpdump inside problem VM (only as last resort)
- Intermittent problems concerning multiple VMs
  - e.g. trouble with a Citrix farm running virtualized on a cluster
  - SPAN/Promiscuous mode is usually no option
  - instead, capture physical uplinks

Virtual capture heads-up

- Promiscuous mode on vSwitches puts packets on the NICs of all VMs on the same port group
  - keep security in mind; all VMs see everything (like a hub)
- Storage of packets
  - where? NAS, SAN, local storage?
  - do **NOT** overload the NAS/SAN links with capture I/O
- Keep capture VM and problem VM on the same hosts
  - or you'll not be able to capture the packets you want

Too much data

- Ways to handle „too much data“ (a.k.a „dropped frames“) on physical captures:
  - use frame slicing if possible
  - SPAN only as few affected ports or VLANs as possible
  - use a filtering TAP
  - Capture Filters on the Wireshark itself may help, too
  - Use dumpcap on command line

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Thanks. Questions?

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