The total virtualization

History and buzz words

Lecture #1

Content

✓ "Virtualization"

✓ "Virtual machine", types of virtual machines

✓ VM history

✓ Evolution

In order to operate the technology correctly, one needs to know its limits, variations and history

The virtualization is

In computing, virtualization refers to the act of creating a virtual (rather than actual) version of something, including (but not limited to) a virtual computer hardware platform, operating system (OS), storage device, or computer network resources

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The term virtualization broadly describes the separation of a resource or request for a service from the underlying physical delivery of that service

© VMware

Virtualization adapts some real resource for the specific user needs

©me ☺

The virtualization is

«*Time Sharing in Large Fast Computers»* (Christopher Strachey, June 1959)

Virtualization as it is

✓ virtualization of processor = scheduling, quasi-parallel tasks

✓ virtualization of memory = virtual memory, network memory

✓ virtualization of disk = partitioning, RAID

✓ virtualization of network = VPN

✓ virtual machine

Virtual machine is

In computing, a virtual machine (VM) is an emulation of a particular computer system
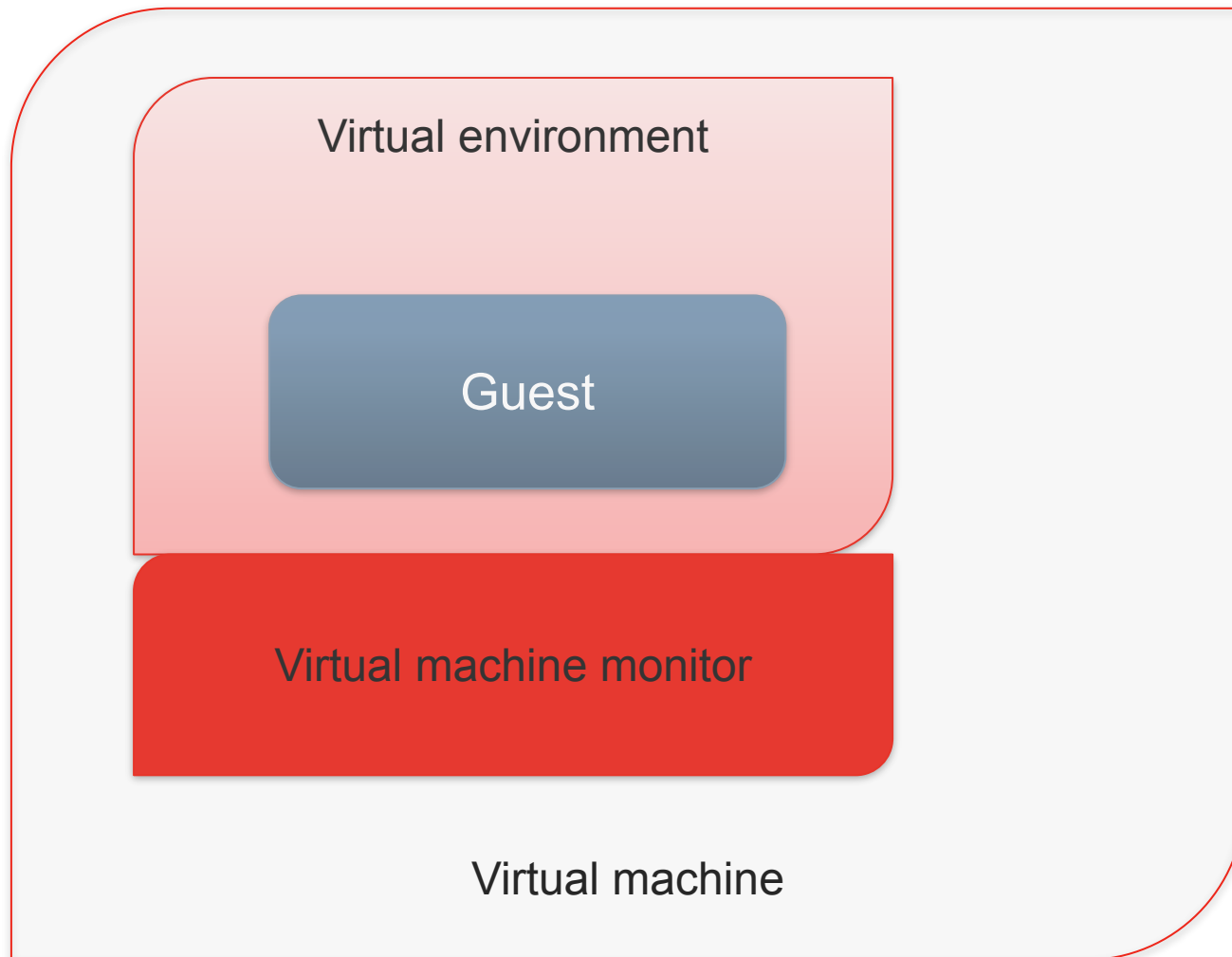
© wiki

A virtual machine is the environment created by virtual machine monitor (VMM)

© Popek & Goldberg

A virtual machine is a virtual execution environment with a job/client executed inside
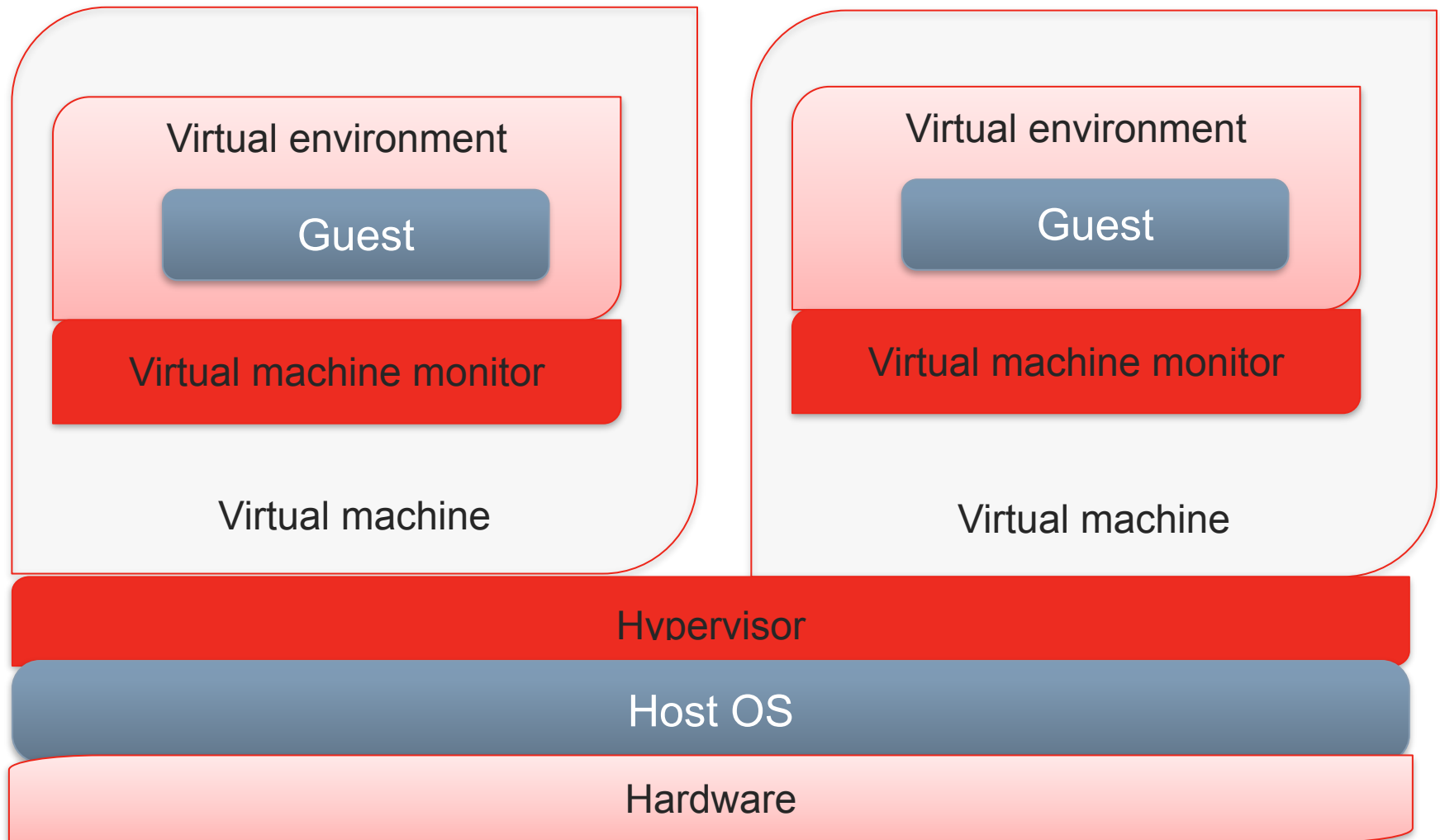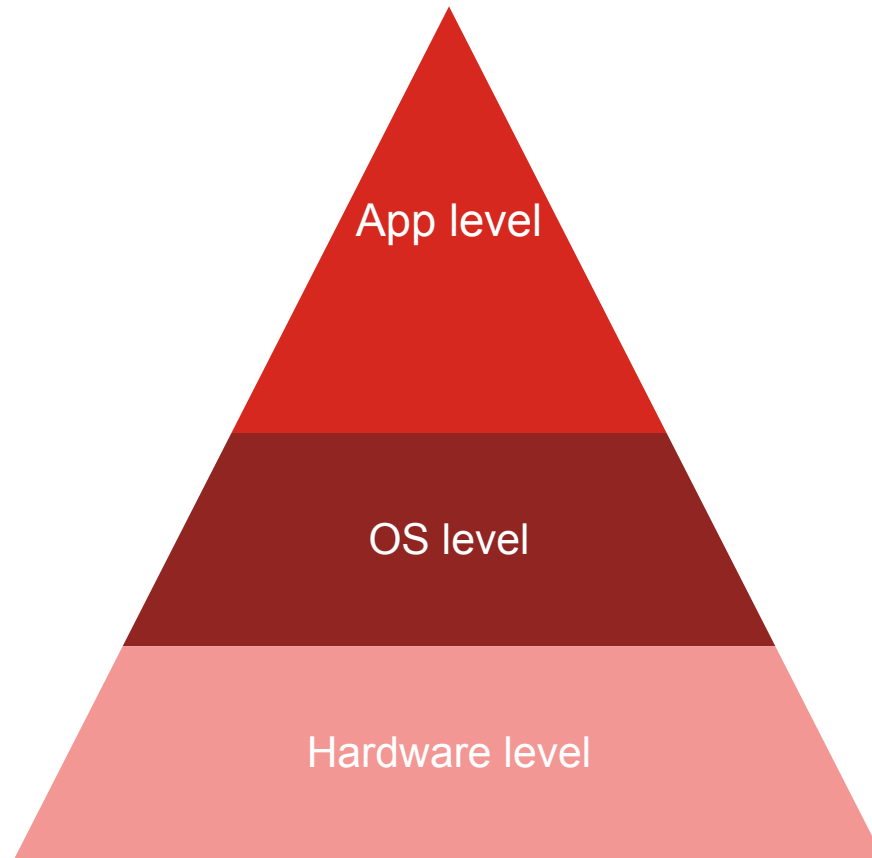
© me

Virtual machine is

Virtual environment
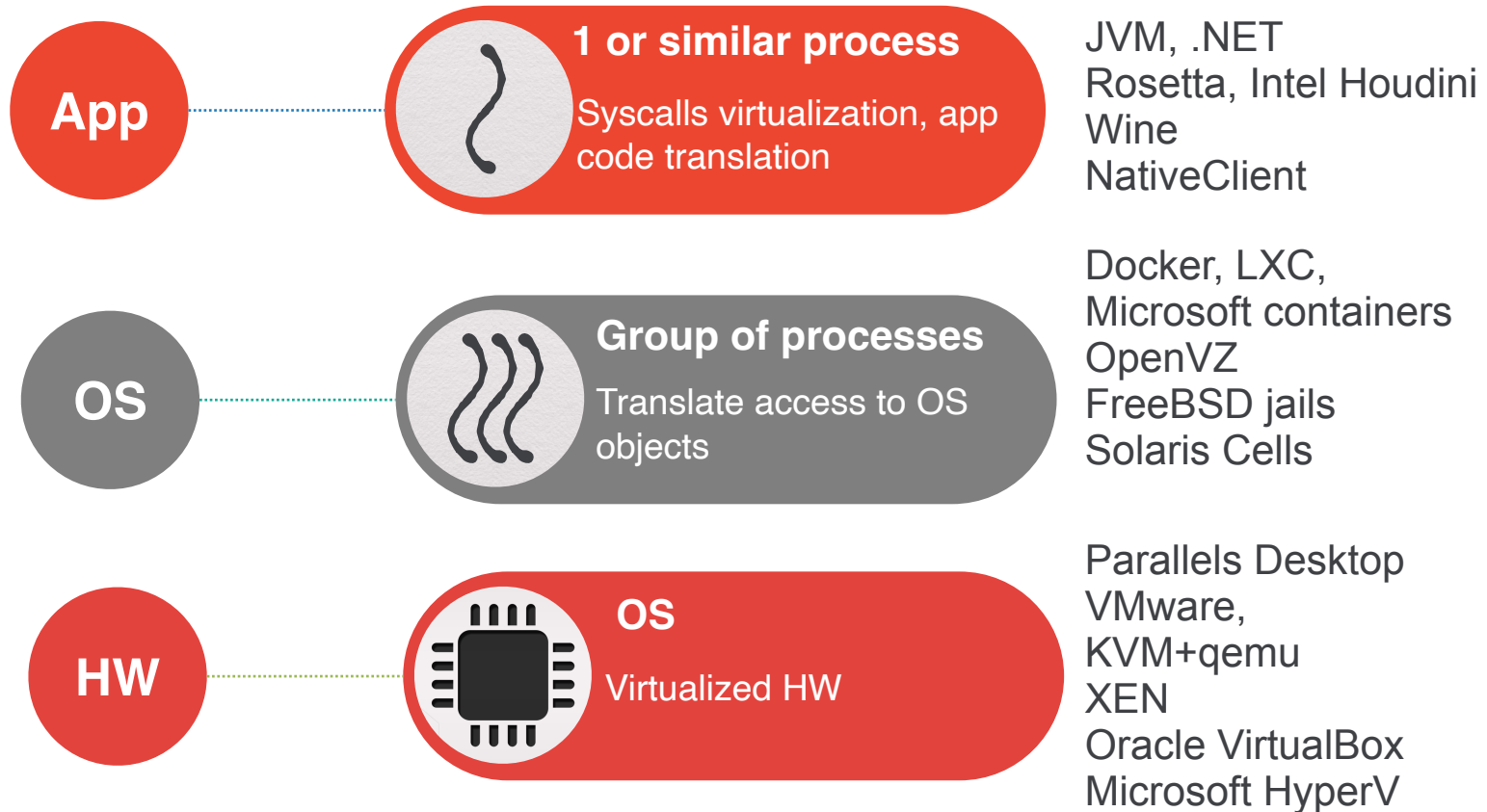
Guest

Virtual machine monitor

Virtual machine

Virtual machine is

Virtual environment

Guest

Virtual machine monitor

Virtual machine

Virtual environment

Guest

Virtual machine monitor

Virtual machine

Hypervisor

Host OS

Hardware

Types of virtual machines

App level

OS level

Hardware level

Types of virtual machines

App ····· **1 or similar process**
Syscalls virtualization, app code translation

JVM, .NET
Rosetta, Intel Houdini
Wine
NativeClient

OS ····· **Group of processes**
Translate access to OS objects

Docker, LXC,
Microsoft containers
OpenVZ
FreeBSD jails
Solaris Cells

HW ····· **OS**
Virtualized HW

Parallels Desktop
VMware,
KVM+qemu
XEN
Oracle VirtualBox
Microsoft HyperV

VM history: 60-70s

The era of IBM: CP-40, CP-70, VM/370

Virtualization as a method of
- Isolation of users
- Back compatibility
- Privilege slicing

VM history: 80-90s

PC boom

VM history: virtualization rebirth in '99
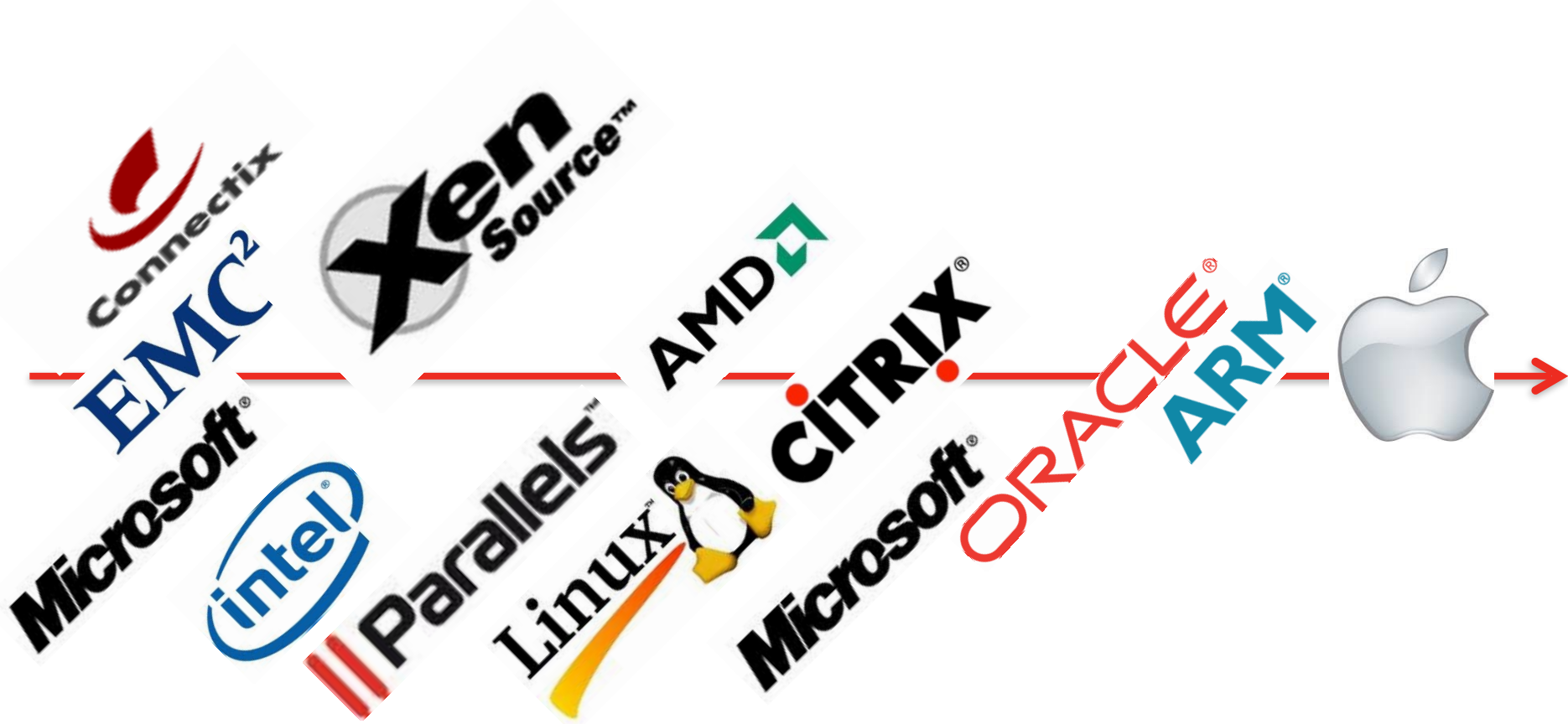
8-Feb-1999

Diana Greene, Mendel Rosenblum

VM history: virtualization rebirth in '99

SERVER CONSOLIDATION is the reason why

Parallels™

Virtual machines history
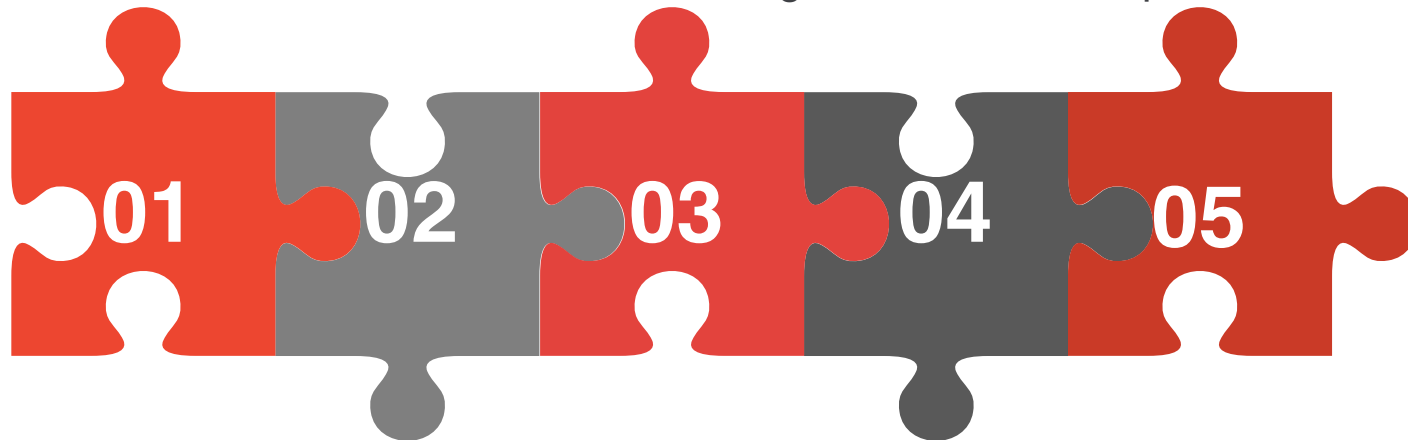
One or many - a short history

Mainframe
A new OS for each HW.
One user per each HW

PC start
Exhaust of heap resources.
One user per each HW, DOS,
no multi-tasking

Consolidation
Decrease HW, a few virtual
OS on one HW. One serious
task per one virtual OS

01 **02** **03** **04** **05**

Era OS/370
Time-sharing systems. Virtualization
as a method to support multiple users
and back compatibility

PC wide-spreading
Many PC, one OS per each PC. OS are
multi-tasking but mostly one serious
task per one PC (SQL, Exchange, etc)

Evolution: what is next

Indeed, some researchers have argued that we should perhaps consider hypervisors as "**microkernels done right**" (Hand et al., 2005). The first thing to mention is that this is a highly controversial topic and some researchers have vocally opposed the notion, arguing that the difference between the two is not fundamental to begin with (Heiser et al., 2006). Others suggest that compared to microkernels, hypervisors may not even be that well suited for building secure systems, and advocate that they be extended with kernel functionality like message passing and memory sharing (Hohmuth et al., 2004). Finally, some researchers argue that perhaps hypervisors are not even "operating systems research done right" (Roscoe et al., 2007). Since nobody said anything about operating system textbooks done right

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Evolution is continuing

Conclusions

Virtualization demonstrates the spiral of progress. It is also the inspiring example of successful university projects

Questions?