arch-raimund
technische dienstleistungen

OpenVMS hypervised

as-is

artedi e.U.

Agenda – I

- so what …is Hypervision ?
- and why is it needed/used ?
- Types of Hypervision
- why not OpenVMS ?
- Processor Architectures

Agenda - II

- what else …is needed ?
- Emulation, bringing things together
- Types of Emulators
- who does it for VAX and Alpha (VMS)?
- Example, more detailed
- Life Demo

Hypervise, divide and conquer

- hyper …ancient greek for ‚over‘
- videre … latin word for ‚to see‘
- Hyper+visor …the ‚overseer‘ /surveillant
- controlled distribution by Monitor Machines →VMMs

Reasons for hypervision

- Money→optimized use of HW expenses made
- Resources → optimized use of HW infrastructure
- Hardware evolves rapidly → miniaturization
- Clock rates stall → rejected heat
- Parallelism has its limits → synchronisation issues

General Models

- Divide in Groups (Virtual Systems→OSes)
  - which use their own groups(Processors/Interfaces)
- Two types of Hypervisors/VMMs

  („Principles for Virtual Computer Systems“,Robert P.Goldberg/1972)
  - Type-1 native or Bare Metal
  - Type-2 hosted

Hypervisor, Type-1 Bare Metal

- doesn‘t need an underlying Software Infrastructure (Host OS)
- Kernel which supports HW Infrastructure + Management Interface
- allows controlled distribution of given Infrastructure
- is used by diverse higher level Infrastructure aka Guest OS Systems (like OpenVMS)

Hypervisors Type-1, practical use

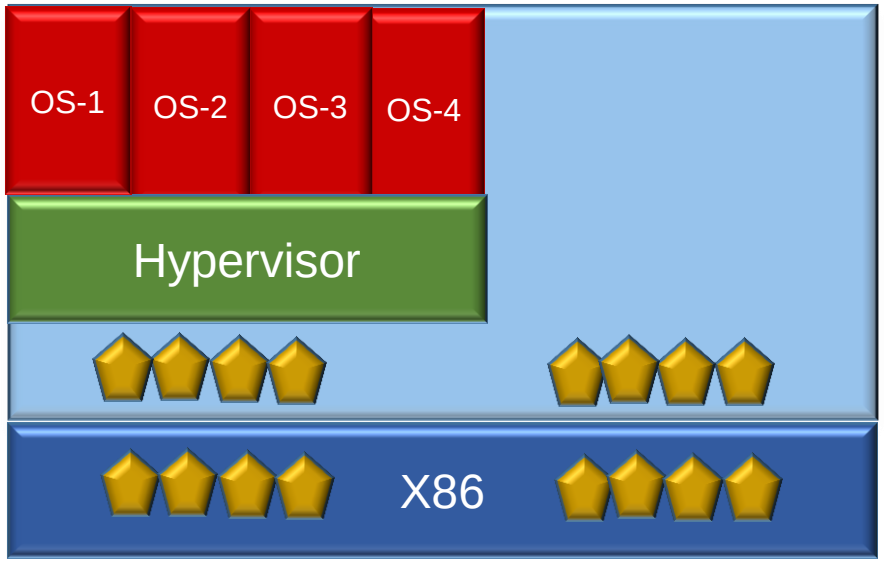
- Hardware (X86 most likely)
- 8 Cores
- the Hypervisor
- 1st Virtual Machine (VM)
- 2 Cores assigned
- OS installed
- others to follow

Hypervisor, Type-2 hosted

- needs supporting Software Infrastructure →fully-fledged OS
- does share HW Investment and electrical Power resources
- has to share with other ‚normal‘ applications
- is fully dependent on hosting OS
  - Patches
  - Security Updates
  - License prolongations
  - …

Hypervisors Type-2, practical use

- Hardware (X86 most likely)
- 8 Cores
- the Host OS(grabs Cores)
- the Hypervisor (an aplication)
- 1st Virtual Machine (VM)
- one Cores assigned
- OS installed
- others to follow



Why not for OpenVMS ?

- most of the Hypervisors use x86 (AMD64, iE64, x64)
- VMS runs on VAX (CISC), Alpha (RISC) and Integrity (EPIC)
- Hypervisors neither translate nor emulate
- Type-2 Integrity based Hypervisors running on HP-UX
  (Integrity Virtual Machine)
- most customers want x86

Types of Processors

- CISC … Complex Instruction Set Computing
  PDP-11 (16bit),VAX (32 bit), x86
- RISC … Reduced Instruction Set Computing
  - Alpha, MIPS, PA-RISC, Power(PC), SPARC,ARM (64bit)
- EPIC … Explicit Parallel Instruction Computing
  - Integrity (Itanium) (64bit)
- Hybrids … CISC to RISC (Emulators ?)
  - x86 starting with Pentium Pro

Emulate

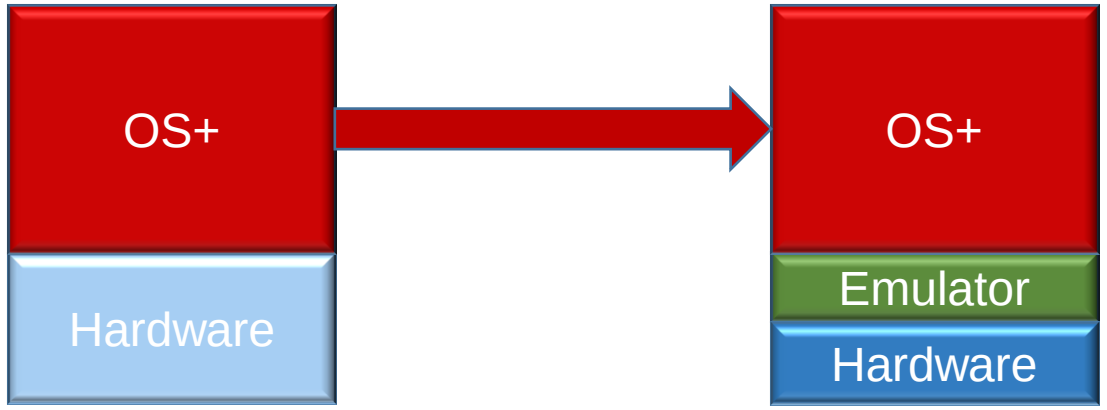
- aemulare…lat.word for ‚to imitate‘
- System/Software which imitates another System…in some aspects
- Imitation by Transformation
- Emulators transform translated code for
  - different Processors with different ‚vocabulary‘
- Emulators are the supporting pillars for bridging
  - different Architectures with different Infrastructures
- transparent to the upper Layers (Operating Systems)

Emulators, types of

- Hardware Emulators
- ICE …In Circuit Emulator
- Printer Emulator → HP-PCL
- Terminal Emulator
- Processor Emulator
  - Alpha, VAX
  - HP 3000
  - SUN Sparc

Emulators, practical use

- original Hardware
- original Operating System + Apps (OS+)
- new Hardware
- Emulator
- transfer OS (still original)
- discard old Hardware



hypervise→emulate→translate

- Hypervisors
  - divert a given Infrastructure and assign it to upper Layers
- Emulators
  - ‚mask‘ the underlying Infrastructure
- Translators
  - make HighLevelLanguages readable to the Processor

Hypervisor

Example

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AVTware

OpenVMS and Tru64 on X86

Desires; to fulfil

- keep OpenVMS based Applications alive
  - highly customized
  - high value
  - Mission Critical
  - Continuity Issue
- reduce Operating Expenses
  - converge Infrastructure
  - reduce space requirements
  - reduce power consumption
  - reduce costs (and complexity) of Hardware Maintenance

Obstacles; to overcome

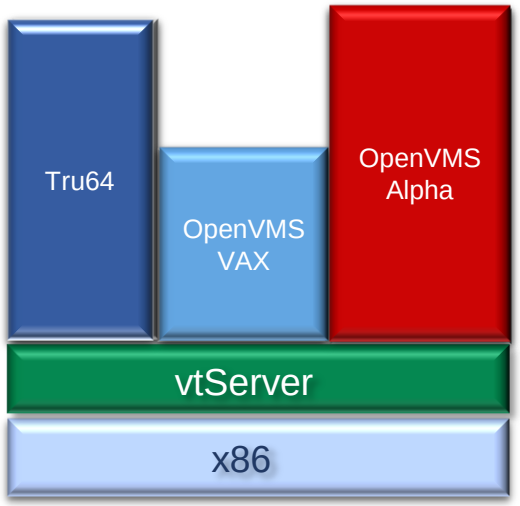
- no Code Migration, due to
  - Source Code missing
  - Application Vendor doesn‘t sell Migration
  - Application Vendor does sell, but is way to expensive
  - still risk of incompatibilities
- Hardware Infrastructure to maintain
  - Storage Arrays
  - TapeDrives
  - FC-Switches to connect to

Expectations to be met

- no software changes
- reliable & secure
- support modern infrastructure
- easy to manage
- performance

Solution; first choice → Bare Metal

- get new Hardware
- get and install Hypervisor
- hook emulated Systems onto
- transfer Systems currently in use
  - copy disk content
- continue with original SW (OS+Apps)



Bare Metal

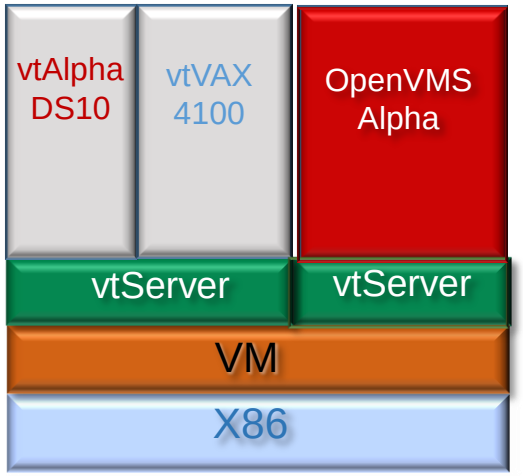
- ~~Windows~~
- ~~Linux~~
- ~~other Hypervisor~~

} no cost, no maintenance, no sync time delays

- Alpha/VAX Reliability
- Single Point of Contact

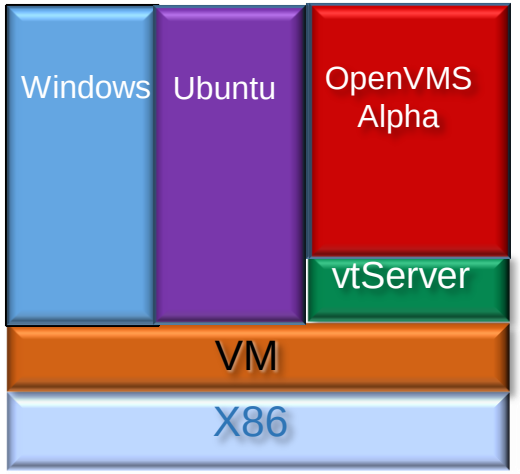
Solutions; other Options(Type-2)

- use existing Hardware
- use existing Hypervisor
- install vtServer onto it (one to many)
- create virtual Alphas and VAXes (one to many)
- Install System(s)
- live migration



Solutions; and another one

- use existing Hardware
- use existing Hypervisor
- host other guests
- install vtServer as another guest
- create virtual Alphas and VAXes (one to many)
- Install System(s)



Sizing; CPU

- # Cores
  - virtual CPU = 1,5 Host CPU-cores
- Intel/ AMD
- Generation (Haswell)
- Freqency, the more the better (3GHz +)
- ~~Hyperthreading~~

Sizing; Memory

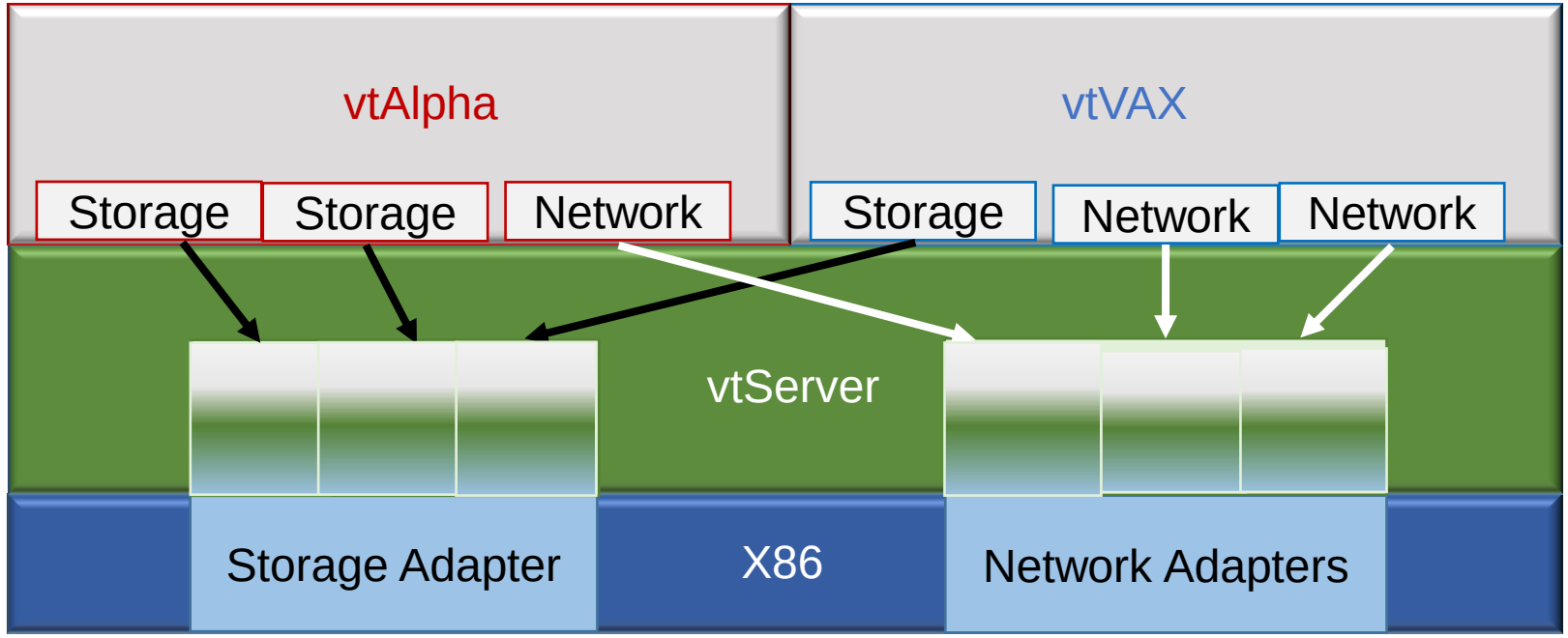
per virtual Alpha/VAX :

- Virt.Mem + 25% +1 GB

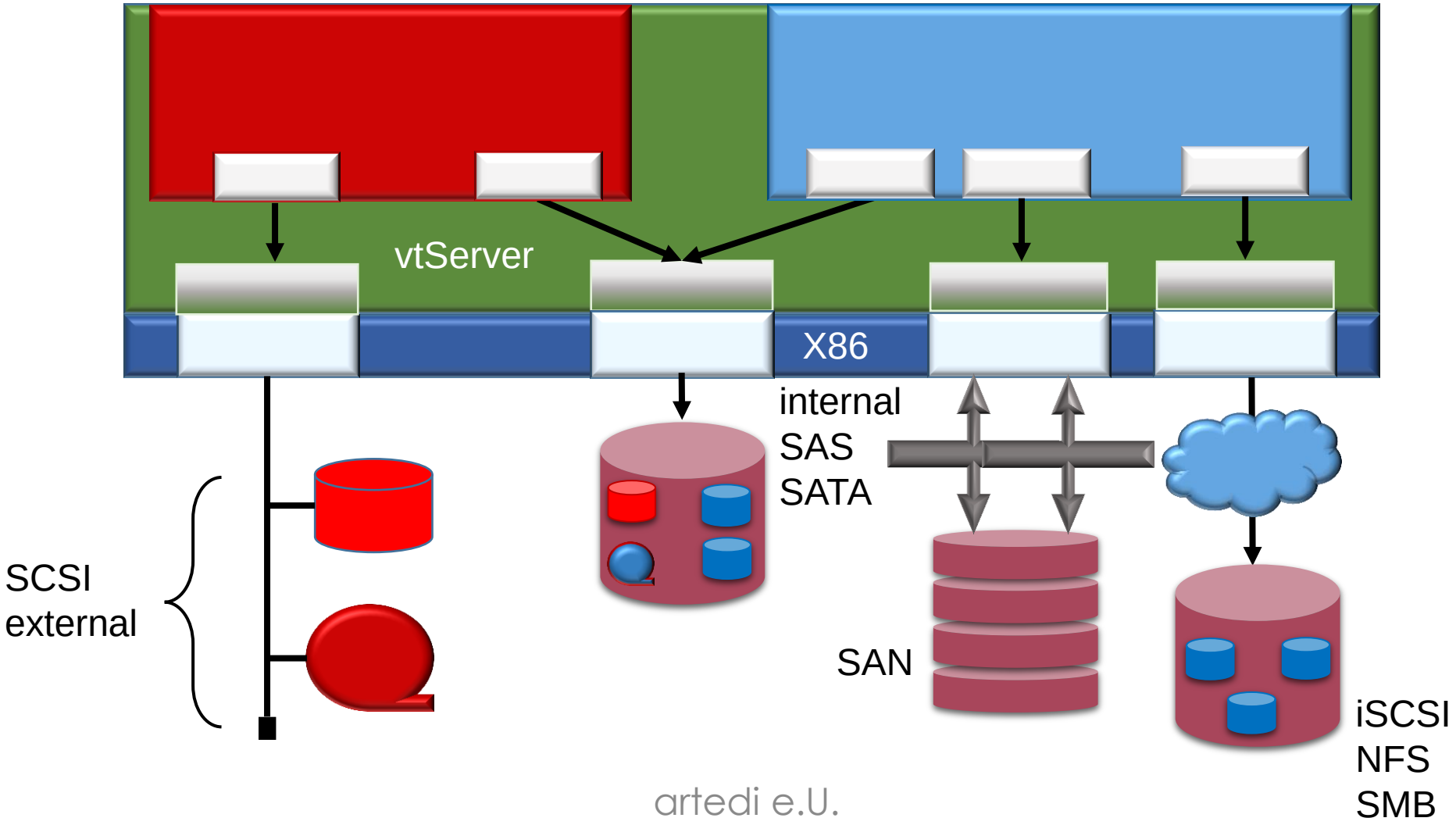
1024 + (1024*0,25) +1024 = 2304

- safety valve

Infrastructure; Transparency

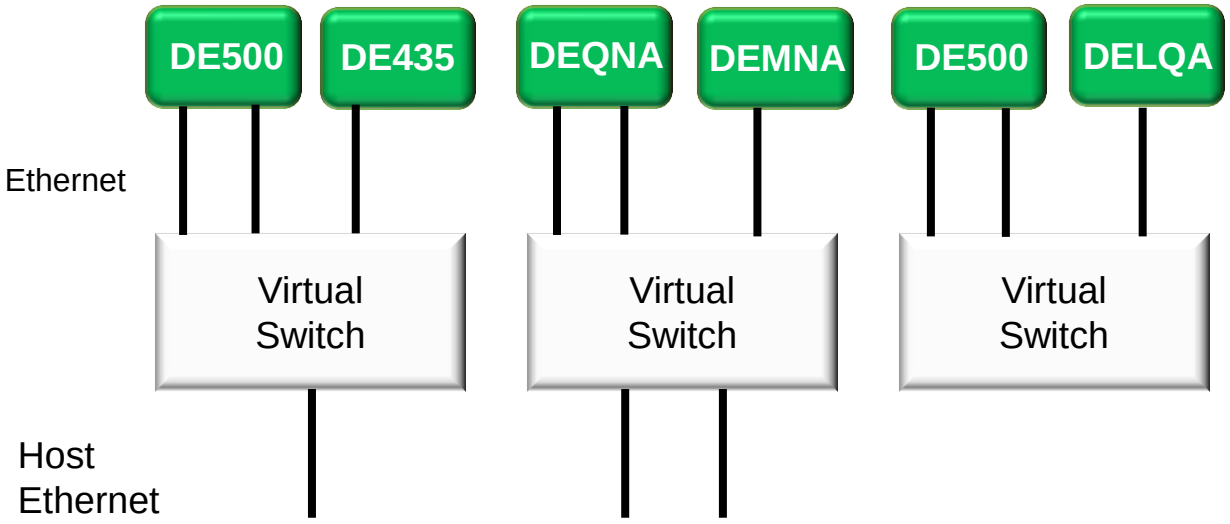


Infrastructure; Flexibility



Networking; Options

- Alpha
  - ✓DE435
  - ✓DE450
  - ✓DE500
  - ✓DE600
- VAX
  - ✓DELQA
  - ✓DEQNA
  - ✓SGEC
  - ✓DEMNA

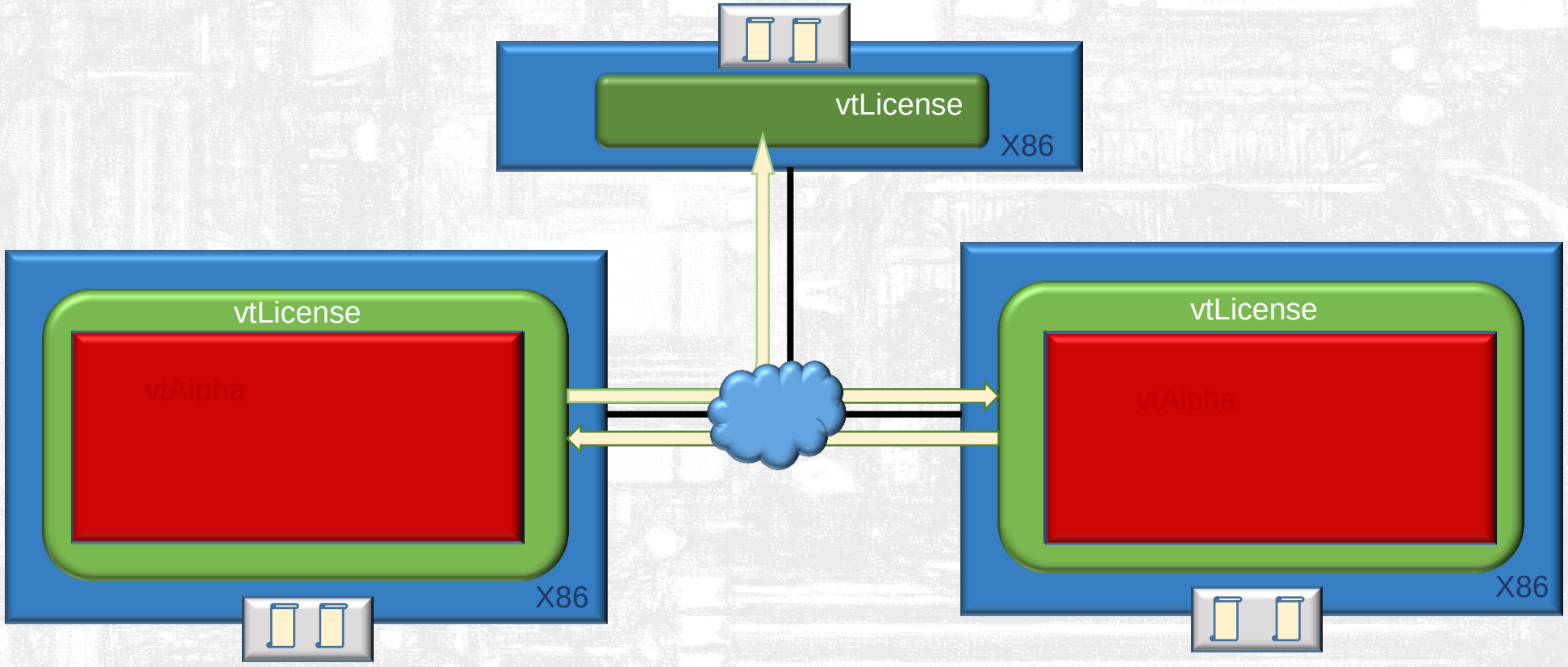


- Combine links
- VLAN support
- Bonding support

Licensing

- licensed via LicenseKeys
- presented via
  - License Dongles connected to USB Port
  - Network (TCP/IP) Link
- limited Timeframe or perpetual
- redundant License Keys to overcome SPOF

Licensing; distributed



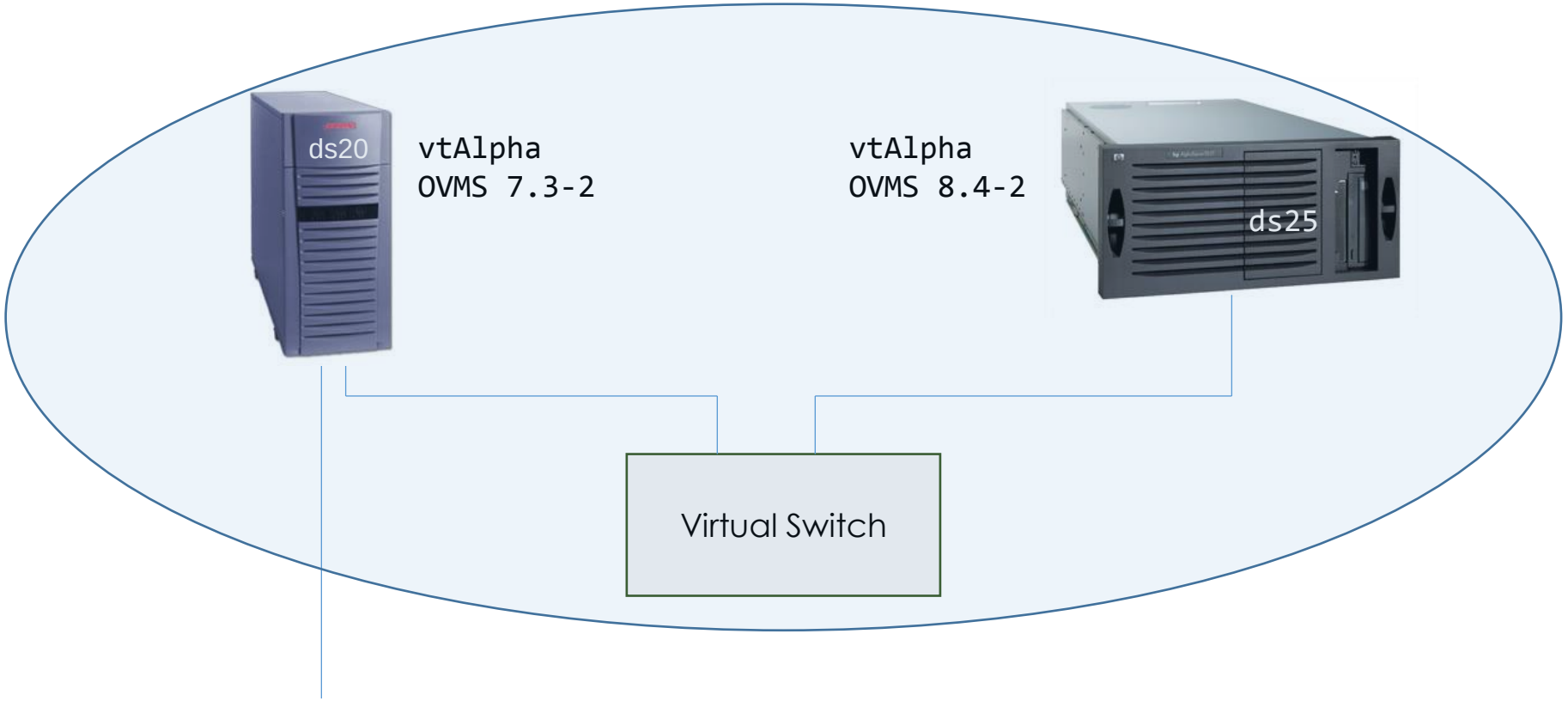
vtAlpha, Licensing

AlphaStation 200, 250, 255, DEC3000 AlphaServer 300, 400	**vtAlpha-AS**
AlphaServer 800, 1000 AlphaStation 500, 600, DPW, XP900, XP1000	**vtAlpha-BS**
AlphaServer 2000, 2100 AlphaServer 4000, 4100	**vtAlpha-CS**
AlphaServer DS10, DS15 AlphaServer DS20, DS25 AlphaServer 1200	**vtAlpha-DS**
AlphaServer ES40, ES45, ES47	**vtAlpha-ES**
AlphaServer GS80, GS160, GS320	**vtAlpha-GS** (Q2/2015)

vtVAX, Licensing

VAXstation II, GPX, 2000, VAXserver 3600/3900	**vtVAXstation**
MicroVAX II, 2000 MicroVAX 3100 - 3900 VAX 4000	**vtVAX-128 (+ AC)**
MicroVAX 3100 VAX 4000 VAX 6000	**vtVAX-256 (+ AC)**
MicroVAX 3100 VAX 4000 VAX 6000	**vtVAX-512 (+ AC)**
VAX 6000 1 – 6 CPU, up to 3.5 GB memory VAX 7000 1 – 6 CPU, up to 3.5 GB memory	**vtVAX-7000**

Life Demo



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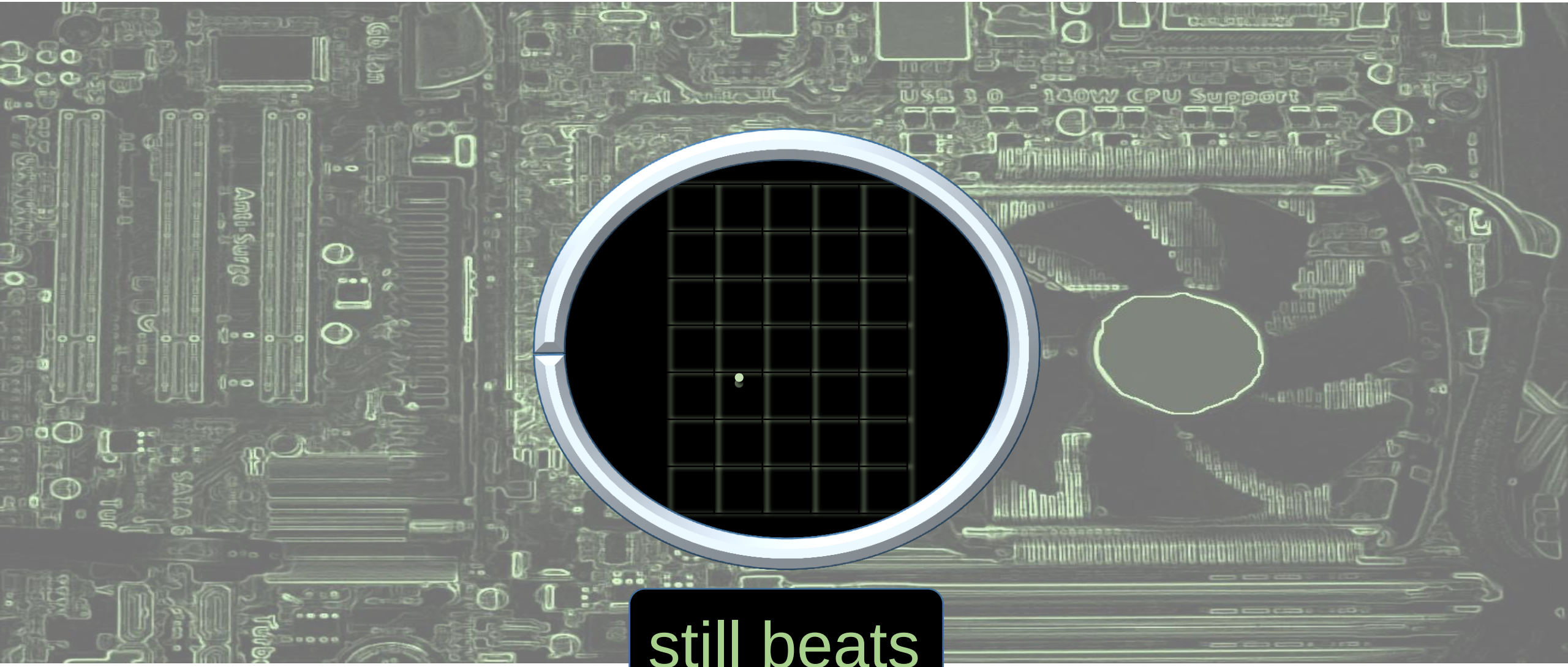

still beats

Sieve of Eratosthenes

1	2	3	~~4~~	5	~~6~~	7	~~8~~	~~9~~	~~10~~

Domande

Pytania

Kérdések

Questions

Fragen

Otázky