


OPS-9: Fun with Virtualization
John Harlow




OPS-9: Fun With Virtualization

VM When you need more than
REALITY can offer

John Harlow
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About John Harlow

- Unix user since 1982
- Progress® developer since 1984
- Linux Desktop and Server user since 1995
- VMware® user since earliest beta in 1999
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About BravePoint

- **IT Services Company**
 - Founded in January 1987
 - 100+ employees
 - Training, Consulting, Development, Support
- **Focus on:**
 - Progress Software technologies
 - .Net™
 - MFG/PRO and Manufacturing
 - Managed Database Services
 - Business Intelligence

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Virtualization at BravePoint

- Our Financials, Domain Controller and Web Server run in VMs
- Most Development/Test Servers run as Virtual Machines in a VMware Server Farm
- Mac/Linux users use desktop VMs to run Windows and Linux Apps
- Support Desk and Developers use desktop VMs to deal with conflicting customer VPNs
- 24x7 DBA group uses VM server to manage customer connectivity
- Production systems D/R is also done via VMs
- Training Desktops are all VMs

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Desktop Virtualization Demo



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Disclaimer

- We are focused only on a few X86 solutions.
- This topic is a moving target
 - Especially licensing...

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Agenda

- Intro to Virtualization
- Benefits of Virtualization
- Types of Virtualization
- Virtualization Products
- Desktop Virtualization
- Server Virtualization
- Virtualization Guidelines

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Survey: Who Uses Virtualization?

- Flavor
 - VMware
 - MS Virtual PC/Server/Hyper-V
 - Parallels
 - XEN®
 - Others.....
- Deployment
 - Development/Test
 - Training
 - Production
 - D/R

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What is Virtualization


- **Definition**

Virtualization is an abstract layer that decouples the physical hardware from the operating system to deliver greater IT resource utilization and flexibility.
- Introduced in the 1960's to allow partitioning of large mainframe computers

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Benefits of Virtualization

- **Partitioning**
 - Multiple applications, operating systems and environments can be supported in a single physical system
 - Allows computing resources to be treated as a uniform pool for allocation
 - Decouples systems and software from hardware and simplifies hardware scalability

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Benefits of Virtualization

- Isolation
 - VM is completely isolated from the host machine and other VMs.
 - Reboot or crash of a VM shouldn't affect other VMs.
 - Data is not shared between VMs
 - Applications can only communicate over configured network connections.

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Benefits of Virtualization

- Encapsulation
 - Complete VMs typically exist in 1 or 2 files
 - easily backed up, copied, or moved.
 - The 'hardware' of the VM is standardized
 - compatibility is guaranteed.
 - Upgrades/changes in the real hardware are generally transparent to the VM

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Emulation -vs- Virtualization

- **Emulation**
 - Provides the functionality of a target processor completely in software
- **Virtualization**
 - Takes physical processor(s) and partitions them into multiple contexts - all of which run directly in the processor.

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Pure Emulation

- **Biggest Plus:**
 - Any processor can be emulated
 - Emulators are usually portable
- **Biggest Minus:**
 - Almost always is very slow
 - Most rarely even approached 50% of native system speed
- **Examples**
 - MS Virtual PC(PPC Mac), Bochs, Rosetta

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Major Types of Virtualization

- Terminology and Definitions
- Product examples
- Comparisons
- Pros and Cons

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Single Kernel Image

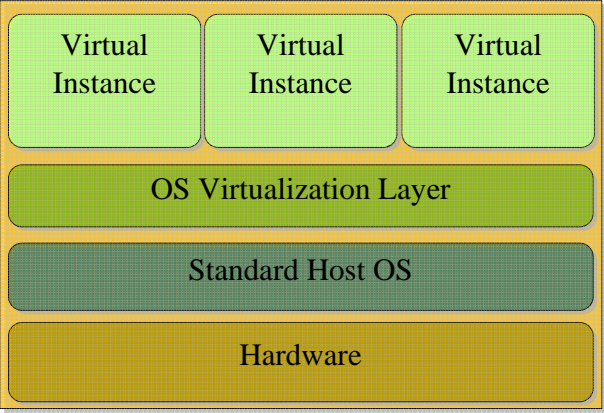
- Multiple running instances of a single OS.
- Each instance runs in its own container.
- Very Fast
 - no hardware emulation is required.
- Less flexible
 - only 1 OS can run in all instances.

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Single Kernel Image



The diagram illustrates the Single Kernel Image architecture. It shows three Virtual Instances (green boxes) running on top of an OS Virtualization Layer (green box). This layer sits on a Standard Host OS (dark green box), which in turn runs on Hardware (yellow box). A woman in a white shirt is visible in the background on the left side of the slide.

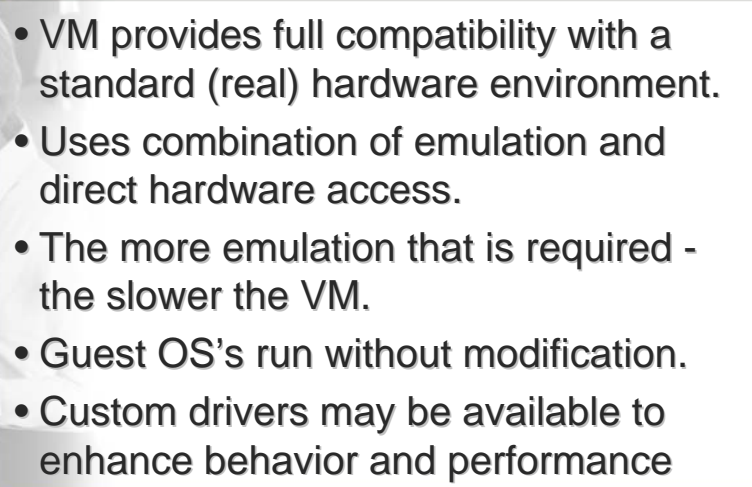
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Full Virtualization

- VM provides full compatibility with a standard (real) hardware environment.
- Uses combination of emulation and direct hardware access.
- The more emulation that is required - the slower the VM.
- Guest OS's run without modification.
- Custom drivers may be available to enhance behavior and performance



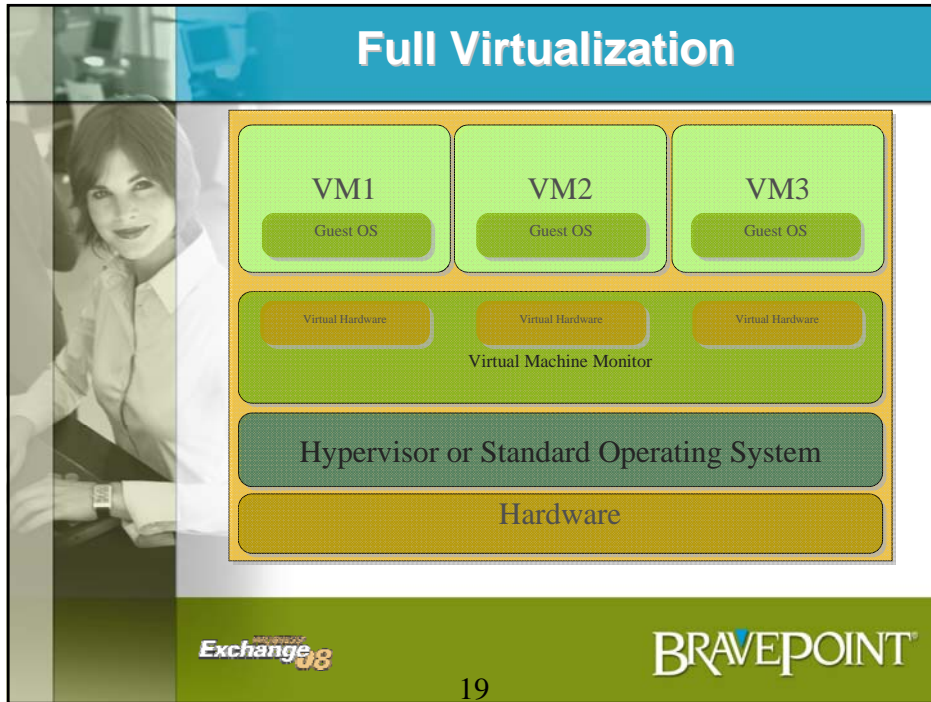
The diagram for Full Virtualization shows a list of characteristics on the right side of the slide. A woman in a white shirt is visible in the background on the left side of the slide.

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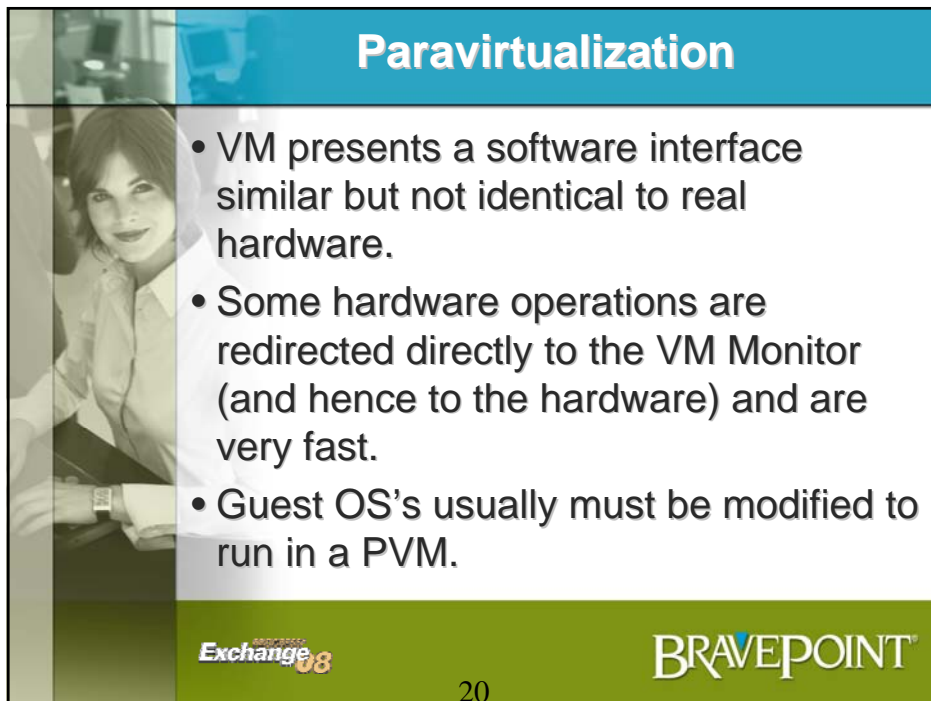
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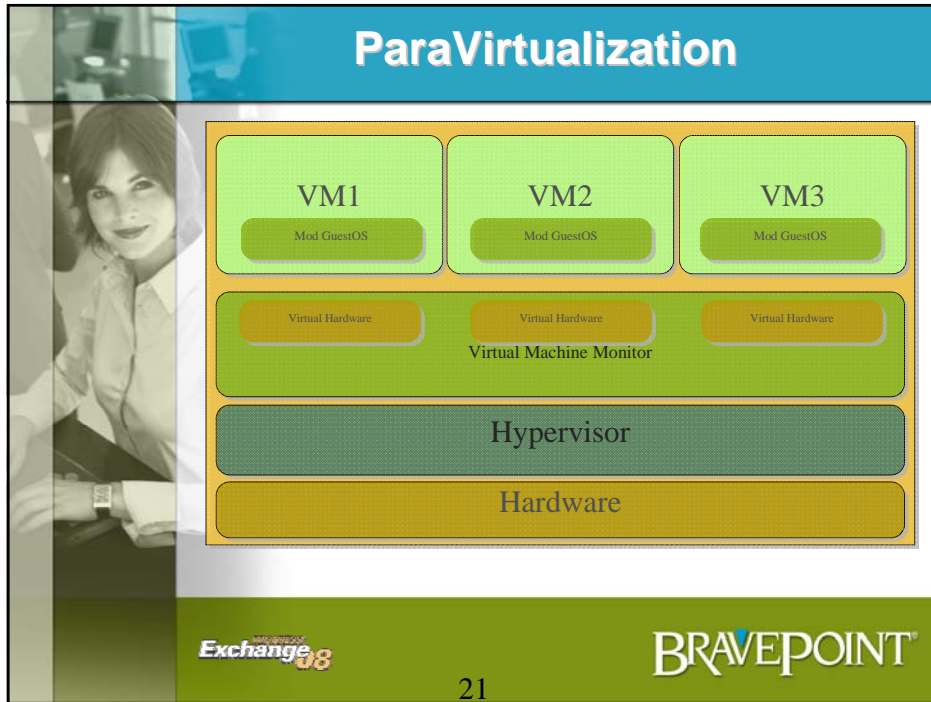


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- The slide titled 'Virtualization Products' lists the following categories and features:
- Categories
 - Typical Features
 - Desktop Products
 - Server Products
- The slide includes a woman's image on the left and logos for Exchange 2008 and BRAVEPOINT at the bottom.
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Categories of VM Products

- Desktop
 - Workstation oriented product
 - Least sophisticated management tools
 - Focus on desktop integration
- Server
 - Designed to run server OS's
 - Good remote configuration and admin tools
- Enterprise
 - Server Features...plus...
 - HA Features
 - Migrate running VMs
 - Load Balancing
 - Failover Capabilities
 - Support for complex storage and backup requirements

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Typical VM Features

- Memory (amount)
- Number of CPUs
- Virtual Hard Drives
 - Preallocated or Growing
 - vSCSI and/or vIDE
 - Shrinkable/Growable
- Floppy/CD-ROM/DVD
 - File or Device

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Typical Features

- Networking
 - Multiple Cards
 - NAT, Host-Only and Bridged
- USB Devices
- Workstation Features
 - Sound
 - Clipboard Integration
 - Shared Folders
 - 3D Video
 - Native Embedding of Windows
 - Parallels Coherence and VMware Unity

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Desktop Products


- VMware Workstation
 - Win/Lin/Mac Host
- Parallels
 - Win/Lin/Mac Host
- MS Virtual PC
 - Win Host Only
- All run various guest OS's
- Most supply drivers for some guest OS's

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Desktop Virtualization at BravePoint

- Remote Support
 - Coexistence of Multiple VPNs in a single PC
 - Centralized Support Systems
 - BravePoint MDBA Support Server:
 - Supporting 30-50 customers
 - Each with separate VPN and access requirements
 - Too many VMs to store in each consultants notebook
 - Better security for VMs, less exposure

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Using Desktop Virtualization

- Development
 - Newer/Other OS's
 - Many of our developers run OSX or Linux as their desktop OS
 - Contain entire development environment
 - Linux server and Windows client for example
 - Testing
 - Multiple incompatible environments (IE6 and IE7 for example)

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Using Desktop Virtualization

- Training
 - Each training environment exists as a separate VM
 - Backups of each VM are stored on each training system
 - Allows easy setup/restore of a class
 - Create each environment once and copy to other systems
 - Ideal for dealing with mixed mode applications

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Desktop OS Licensing Issues



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Desktop OS Licensing Issues

- Primarily impacts MS clients.
 - Very little definitive information on the web.
 - Vista™ EULA originally prohibited virtualization of Vista Home products.
 - In January 2008 that was relaxed:
Use with Virtualization Technologies. Instead of using the software directly on the licensed device, you may install and use the software within only one virtual (or otherwise emulated) hardware system on the licensed device. When used in a virtualized environment, content protected by digital rights management technology, BitLocker or any full volume disk drive encryption technology may not be as secure as protected content not in a virtualized environment. You should comply with all domestic and international laws that apply to such protected content.

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Desktop OS Licensing Issues

- No Licensing issues for Open Source Linux Operating Systems
- Apple OS X Desktop OS is not licensable in a VM environment

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OpenEdge Licensing in a VM

- Licensing varies based on Model
 - There are several different OpenEdge license models
 - Different license models have different implications when deployed in a virtualized environment
 - Consult your ISV or your Progress Sales person about your particular situation

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Server Products


- VMware
 - Server (Free, requires Linux or MS host OS)
 - Leopard Server (Pricing unknown, Requires OSX 10.5 Server Host)
 - ESX (Enterprise Class, Expensive, Hypervisor, bare-metal)
- Xen
 - 3.0 (Free, Open Source, included with RedHat Enterprise 5.)
- OpenVZ
 - Linux only (Free, OS Level Virtualization, Open Source)
- MS
 - Virtual Server (Free, requires MS host)
 - Hyper-V (Low Cost, sort of bare-metal, SMB product)

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MS Hyper-V

- Latest VM product from MS
 - Part of Server 2008
- Runs (sort of) bare metal
 - Kernel is a subset of Windows Server 2008
 - 64 Bit CPUs only
- Client support
 - MS Server 2003 & 2008
 - Vista and XP
 - SuSE Enterprise 10
 - No RedHat
- Target market is SMB, not Enterprise
 - No load balancing or hot moving of VMs

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VMWare Server Infrastructure

- Suite built upon VMware ESX
 - VMware DRS
 - Distributed Resource Manager
 - VMware Motion
 - Live VM Migration between nodes
 - VMware HA
 - High Availability
 - Detects node failures and migrates and restarts VMS
 - VMware Consolidated Backup
 - VMware Storage VMotion
 - Live SAN migration
 - VMware Update Manager

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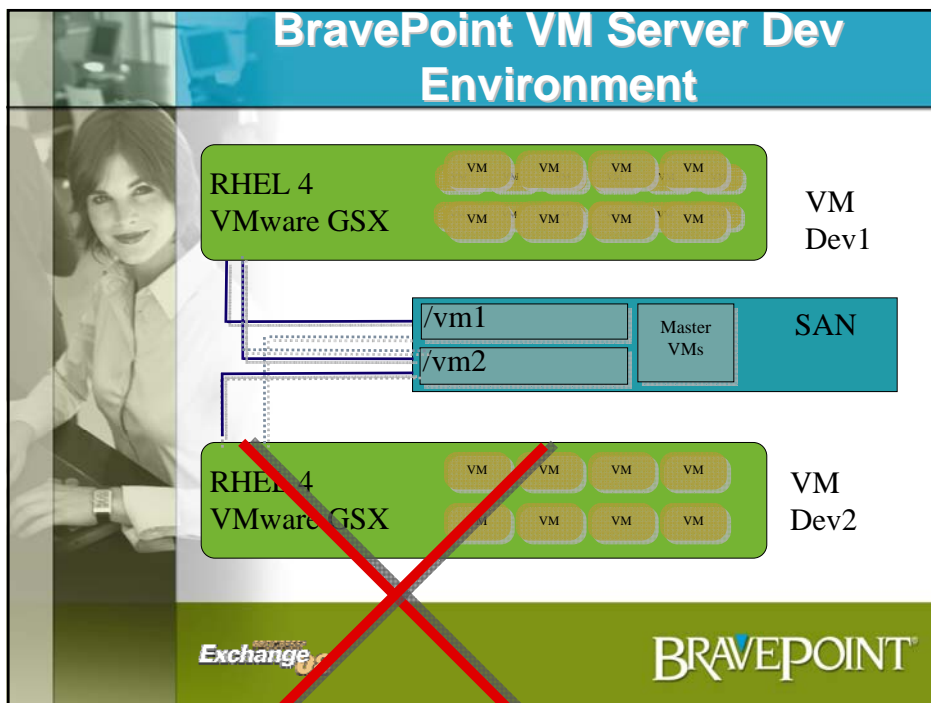
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Using Server Virtualization

- Maximize use of server resources
- Rapidly stand up additional servers
- Higher Availability
- Easy way to test upgrades/changes
- Simplify Migrations to new servers
- Security
- Remote Access Support (telecommuting)
- Save space/costs/Admin Time

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Other VM Utilities

- Tools to migrate real systems to VMs
 - VMware Converter
 - Parallels Transporter
 - MS systems only
- Tools to migrate existing VMs
 - VMware Virtual Machine Importer
 - Parallels Sysprep
- Other tools
 - Xen tools, Xen-shell (xen-tools.org)

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What is OE Performance Like in a VM?

- EULAs often restrict benchmark publication.
- Don't expect VM to perform at 100% the level of the host system.
- I've done some relatively simple benchmarks using the ATM and a 50 user load.
- YMMV

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VM Overhead

- Why are VM's generally slower than the real system?
- There is a lot of overhead, particularly in the area of memory management
- Overcommitting memory is common
 - Transparent Page Sharing
 - Memory Ballooning
- Translating device layer calls

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Some Guidelines

- Assume that a VM will perform at no more than 60% the power of the real server
- The VM will generally need less memory than a real system
- Don't consider a VM for production with more than 100 users
- Don't overcommit memory on an OpenEdge production system

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Real World Experiences

- 80 User Character UI Progress V9.1c Application on RHEL 4
- Ran acceptably in a real 32 bit linux server with 2 2.8 GHz cores
- Moved into a virtualized server with 2 vCPUs (system has 4x4 2.8Ghz cores)
- Performance with 2 vCPUs was poor
- Upgraded VM to 4 vCPUs and performance was acceptable
- Site is now on 10.1B and RHEL 5 and performance is still acceptable

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Questions

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