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Virtualization – methodologies, strategies and experiences

Part 2

Virtualization – methodologies, strategies and experiences

- What can we do with virtual systems?
- Demonstration: Akimbi Slingshot (now VMWare Lab Manager)
- What's the next step?

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Administrivia

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  Versions of the presentation will be available at:
  http://www.cs.uwaterloo.ca/~trg/public/toc.php

What can we do with virtual systems?

- Some interesting uses for virtual systems:
- Software distributions:
  - For complex software, instead of receiving a set of installation media, receive a VM image of a ready-to-run product
  - For guest OSes and “big” applications
- Teaching labs & standard computing platforms
  - Install a completely stock host OS, then run a carefully-crafted guest OS
  - Users never interact with the host OS, only the guest
  - User files stored outside the virtual system (e.g. network-based)

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What can we do with virtual systems?

- Platforms for special-purpose applications
  - Instead of installing software on the user's platform, give the user the complete platform with the application pre-installed
  - Create a different VM for each application
  - Users choose the VM that is appropriate to the task
  - User authentication and file storage is elsewhere

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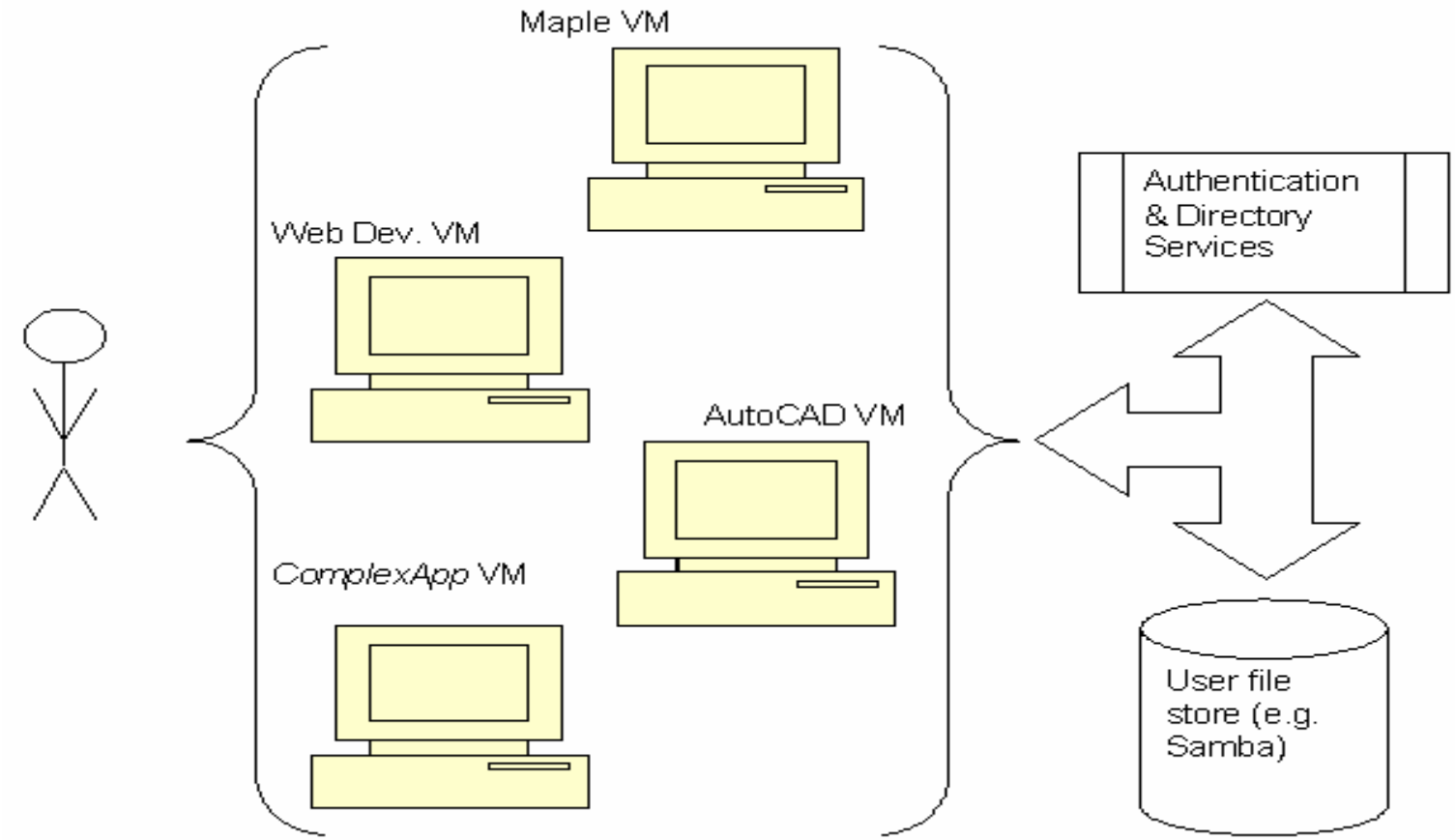
What can we do with virtual systems?



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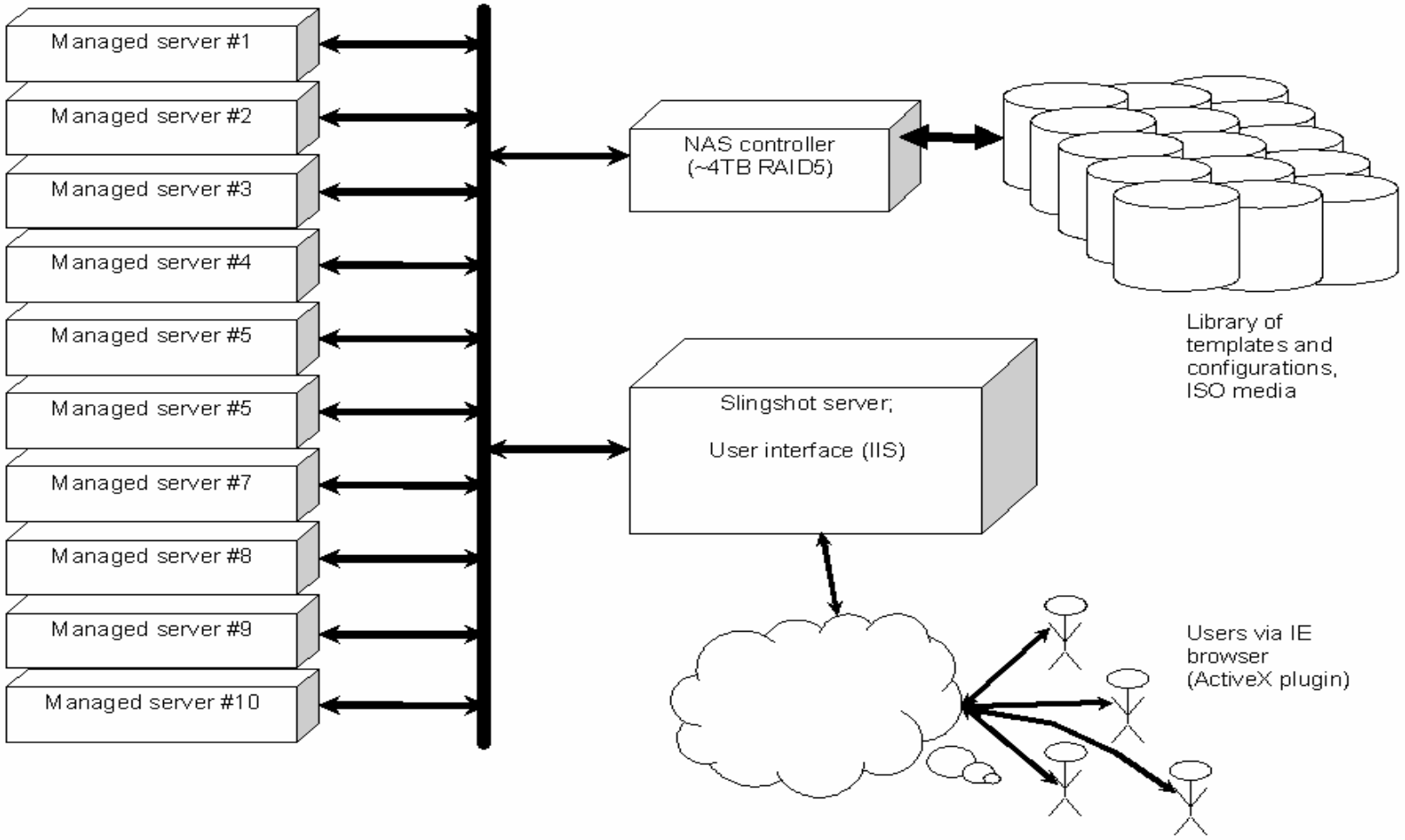
Demonstration

- Akimbi Slingshot (now VMware Lab Manager):
  - SCS Tetherless Computing Lab; for network simulation
  - Management system for controlling sets of virtual systems – presents a high-level abstraction called *configurations*
  - Exploits the programming API for VMware ESX (prior to VMware acquisition, also worked with Microsoft Virtual Server – demo will be of the Akimbi MS VS version)
  - Supports multiple users who can share virtual systems
  - Consists of a management server and a set of worker systems that host virtual machine (*managed servers*)

Demonstration



Demonstration

- Akimbi Slingshot management server:
  - Create virtual system templates and configurations and store them in a shareable library
  - Deploy configurations across managed systems completely transparently to the end user
  - Manager handles IP addressing, NATting, firewalling
  - Running configurations can be “snapshotted”, suspended, stored, restarted, shared
  - Users interact only with the management server, which brokers all interactions with the virtual guests
  - Currently requires IE (uses ActiveX controls to display VM consoles)

Demonstration

- Script:
  - Log into system
  - Look at a two-VM configuration (details)
  - Generate some workload
  - Resume the suspended VM
  - Remote Desktop into a VM, log in
  - Add another VM to the configuration, and deploy it
  - Create a VM template
  - Deploy to bare machine
  - Install an OS (start – won’t complete this)
  - Log in as administrator to look at system management

What's next: a vision for computing

- Disclaimer
- This is a personal opinion and extrapolation and in **no way whatsoever** represents anything even vaguely or remotely associated with the University of Waterloo, the Cheriton School of Computer Science or any official policies thereof
- This discussion is given from the perspective of requirements of Computer Science teaching and research, but I believe many of the ideas are applicable in other disciplines and environments

A vision for computing

- UW-SCS teaching facilities require packaging applications to fit into the available OS environment.
  - The environment varies, from single-user Macs to multi-user Solaris & Linux
- Instead of packaging applications for an OS and bringing students to the computer & OS, package the virtual OS around the application and give it to the student
  - *bring the computer to the student, not the student to the computer*
- Requires personal workstations conforming to a minimal standard – capable of running a VM

A vision for computing

- Examples:
  - First-year CS students need a Java environment that has a specific set of tools and underlying OS environment
  - Upper-year students requires specific tools on a course-by-course basis – some work better in Windows, or Linux, or Solaris or a customized OS kernel
  - Grad students use one OS environment for their own work, but have TA responsibilities for other environments
- The only standard required is the virtual system platform technology

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A vision for computing

- So imagine:
  - Students have personal systems running any host OS they want as long as it can run the VM
  - Enrolling in a course automatically grants access to any required virtual system images defined for the course
  - OS images are acquired and used, and can be refreshed and replaced trivially
  - Personal data is not stored permanently in the VM images, so there is requirement for infrastructure to provide a globally-accessible file-store – off-campus access will be required

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A vision for computing

- User advantages:
  - Use any platform for general computing – the need to conform to a mandated platform is mostly eliminated
  - No requirements to acquire, install, configure or maintain application packages
  - Ultimate portability – like taking the “lab computer” with you
  - Coursework is independent of personal work
  - Potential to increase diversity and exposure to different computing environments

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A vision for computing

- Infrastructure advantages:
  - Possible reduction of software licencing fees – user community size is constrained to enrolled students
  - Reduces or eliminates the need for general-purpose labs and multi-use systems
  - Focus on infrastructure: networking, file-stores and directory services
  - VM images can be created by faculty or staff, tested, tuned and adjusted independently – no more “version conflicts” or forced updates of packages to meet pre-requisites

Summary

- Virtualization is an old idea that presents new and interesting opportunities
- There are many virtualization products available of differing technologies and sophistication
- Virtualized environments can reduce costs, improve reliability and resource management, simplify management
- A new way to use virtualization: visionary or hallucinogenic? ☺