Quick, Easy and Accurate Linux Deployment Under z/VM

SHARE - Baltimore

August 17, 2006

Session 9275

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Agenda

- Manual deployment of Linux under z/VM
- Automated deployment
- Deploying software updates
- Using VSWITCHes and multiple network interfaces

Who is Rocket Software?

- 300+ person software development firm based in Newton, MA
- Development labs in
  - Berkeley, CA
  - Austin, TX
  - Bentonville, AR
  - Warwick, UK
  - Paris, France
  - Chelyabinsk, Russia
  - Beijing, China

- Extensive portfolio of Enterprise Infrastructure Management products
  - Business Intelligence
  - Database
  - Security & Identity
  - Network Discovery & Mgmt
  - zSeries Systems Mgmt
  - Storage
  - Telecom & OSS
  - Application Development
  - Windows & Linux Tools

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What Do People Need To Do?

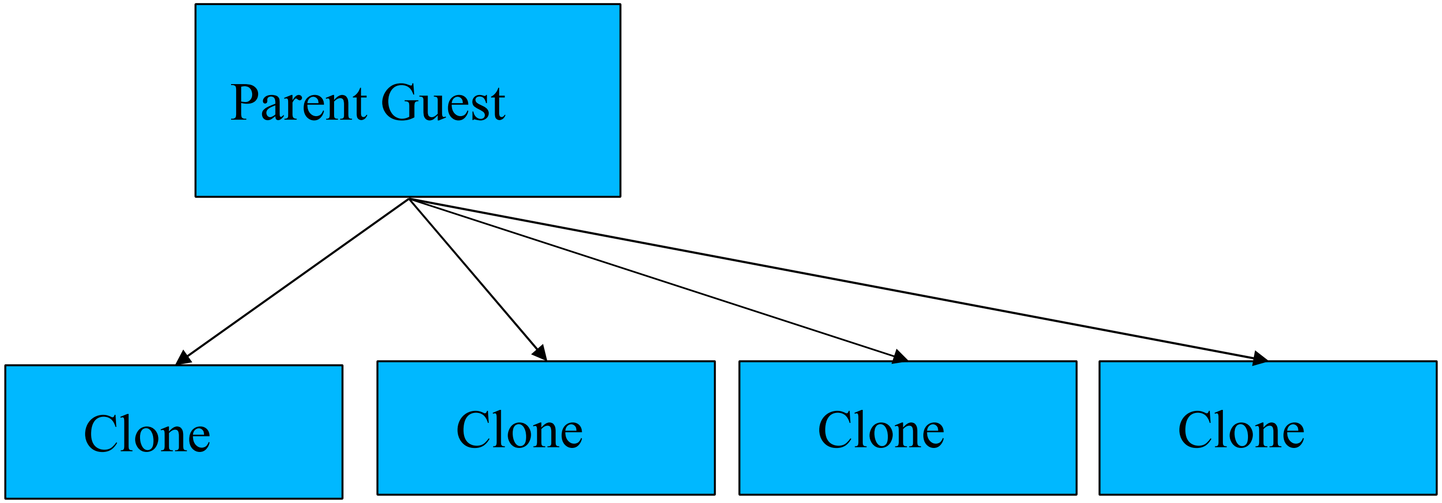
- Create many Linux guests when they are needed
- Destroy Linux guests when they are not needed
- Create copies of systems for testing new software
- Configure guests for different purposes
- Deploy applications
- Apply software updates
- Maintain everything forever

What Do People Not Want To Do?

- Become a Linux expert if you're not one
- Become a z/VM expert if you're not one
- Wade through a 300-page RedBook
- Take months to get it all done

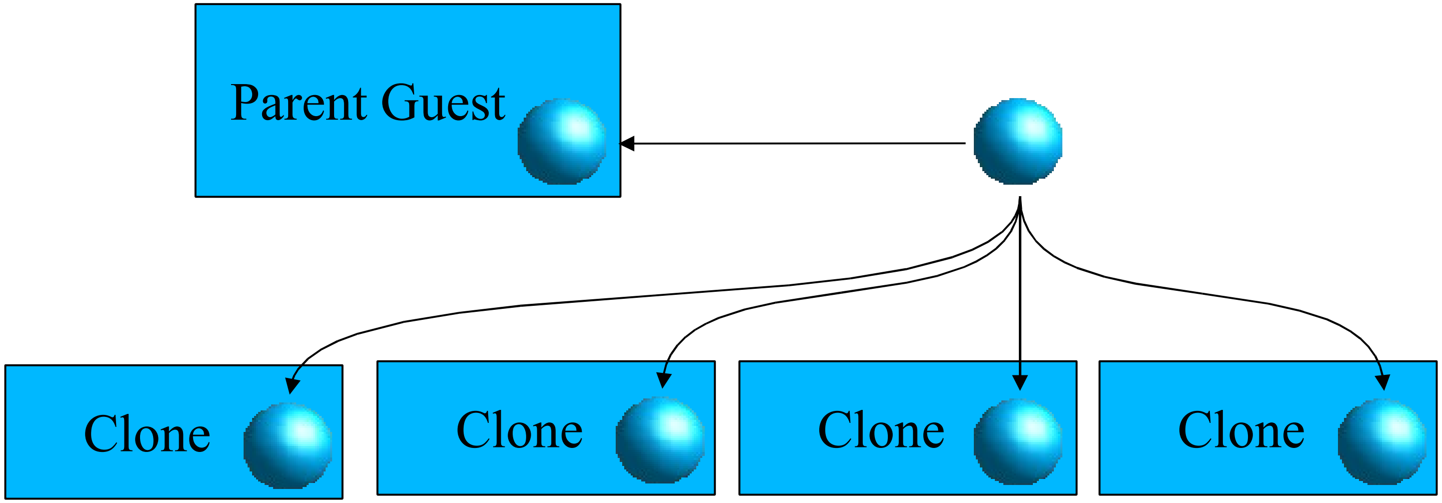
Manual Deployment: Cloning

- Makes exact copies of existing system
- All clones have same filesystem structure
- Manually allocates guests, DASD and network interfaces
- Done ad hoc by z/VM admin using some scripts
- Takes several hours



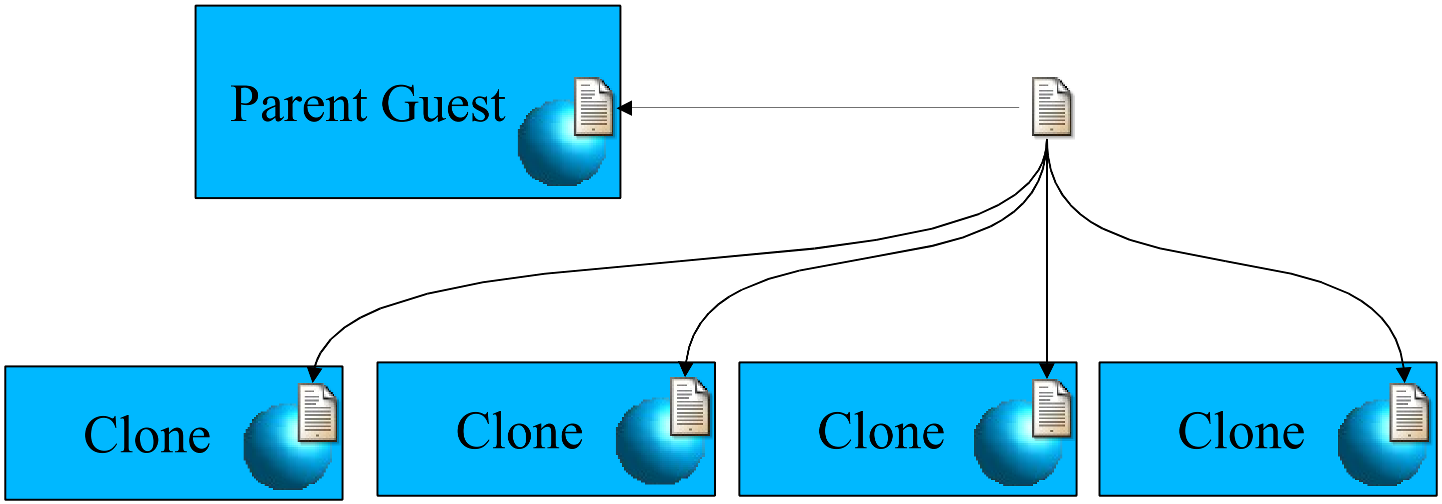
Manual Deployment: Provisioning

- Installs software on clones
- Run by Linux sysadm
- Takes several hours
- Sometimes configures software too



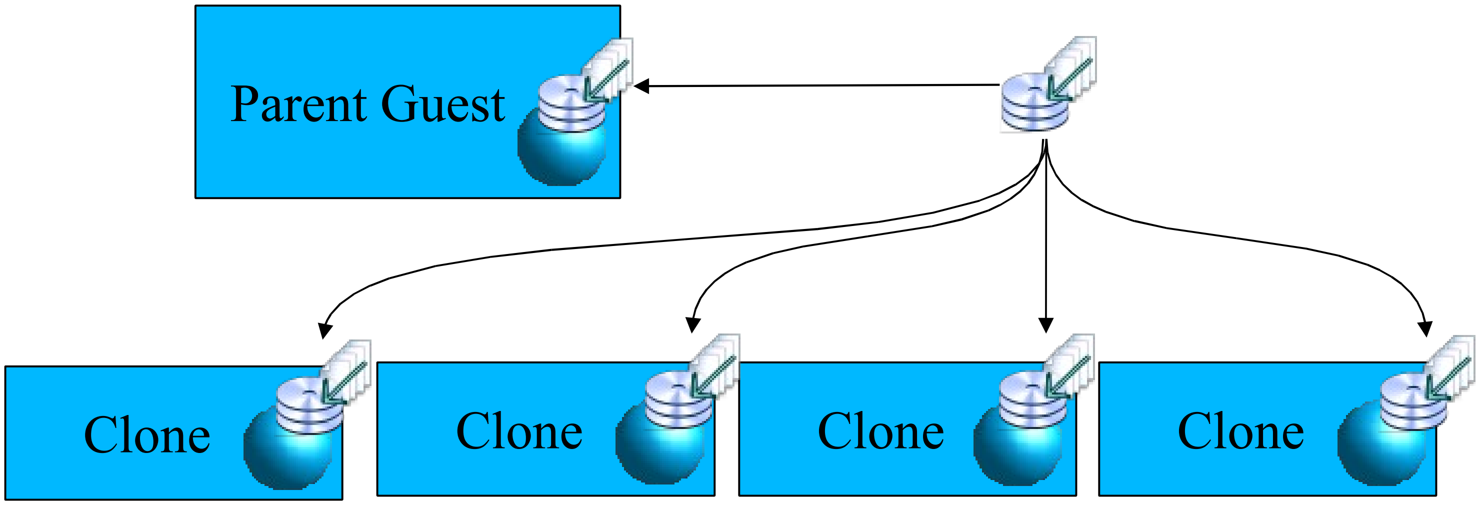
Manual Deployment: Configuration

- Manually configuring each Linux clone
- Copying identical configurations to each clone
- Using various cluster tools



Manual Deployment: Software Updates

- Run installation process on each clone
- Possibly reconfigure new software on each clone
- Some installers require a GUI



How Can I Automate This?

- Any complex task should be automated
- Avoid procedural mistakes
- Capture process knowledge in software
- Save time, avoid repetitive tasks
- Reduce your cognitive load

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Automated Deployment: Terminology

- Instance: An automatically deployed Linux guest
- Configuration: Rules describing how to build an instance
- Template: Shareable subsets of configuration rules
- Base System: Original installation used to manage deployments
- Filesystem Snapshot: Copy of base system shared by instances
- Groups: Organize instances into a hierarchy

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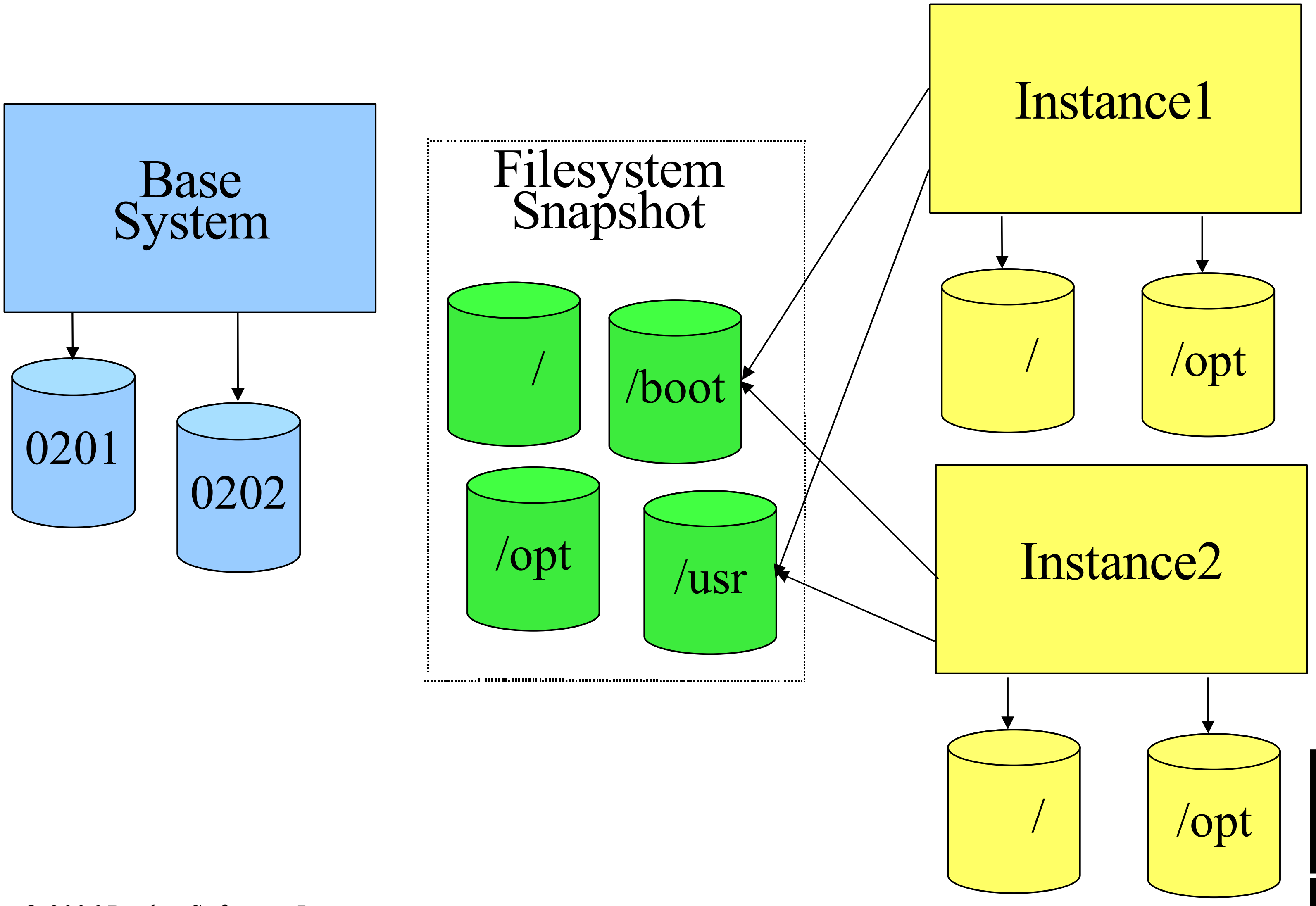
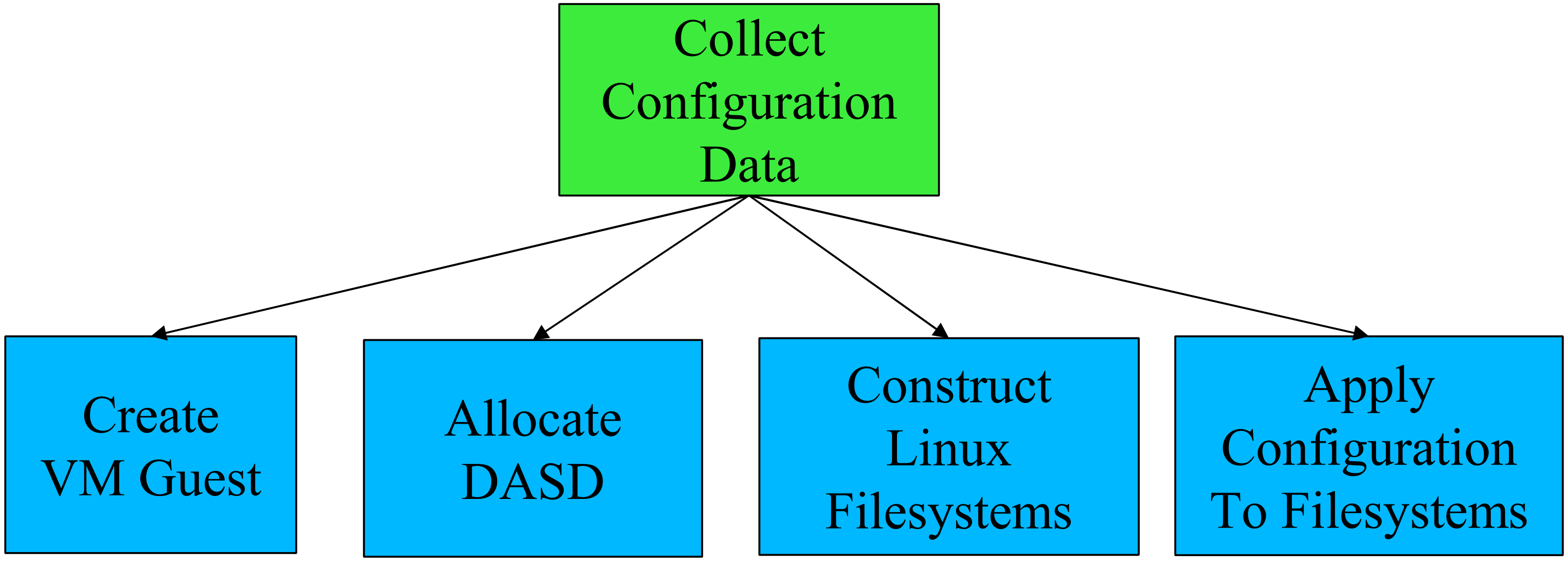
Sharing DASD between Instances



Automated Deployment: Process

- Create a Filesystem Snapshot of the Base System
- Define a Configuration suited to your purposes
- Create and start an Instance using that Configuration
- Copy the Configuration to make Clones



Collect Configuration Data
Create VM Guest
Allocate DASD
Construct Linux Filesystems
Apply Configuration To Filesystems

Automated Deployment: Components

- Base System: A guest with Linux installed into it
  - All Linux software is copied from this guest
  - Provisioning Expert application is installed here
  - Stores all configurations and other data
  - Creates web-based graphical interface
- VM service machine: A guest for resource management
  - Manages VM resources
  - Defines guests
  - Allocates DASD from a defined pool
  - Uses DIRMAINT API to alter the directory
  - Uses ESM (eg RACF) to control resource access
  - Dynamic linking/detaching of DASD
  - z/VM admin controls all resources
  - Used only by the Base System, not by Instances

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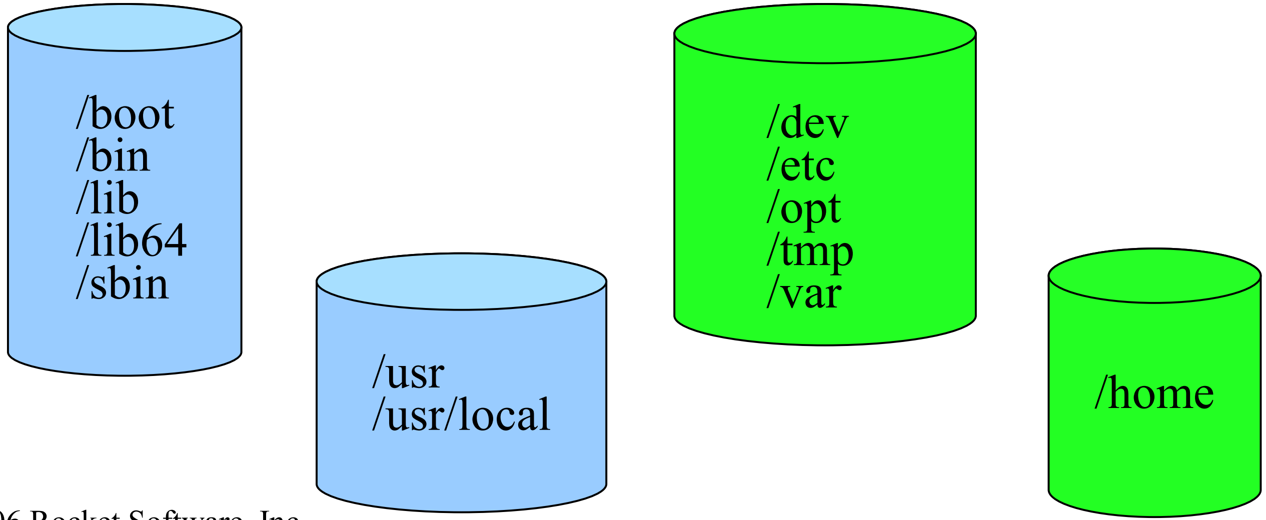
Under the Covers: Filesystem Snapshots

- A Filesystem Snapshot is a collection of DASD extents
- Allows for Shared and Instance-specific filesystems
- Defines structure of Linux filesystems for Instances
- Multiple snapshots allows for versioning
- Does not depend on distro's installation process



Under the Covers: Snapshot Layouts

- Describe structure of filesystem tree
- Defines default filesystem types, mount points and options
- Specifies which Base System files are copied into a snapshot, and where they should be placed.
- Says which files are shared (read-only) or not (writeable)
- Can split up directories, making some files writeable and others read-only
- Can arrange for parts of a filesystem to be bind-mounted into other filesystems

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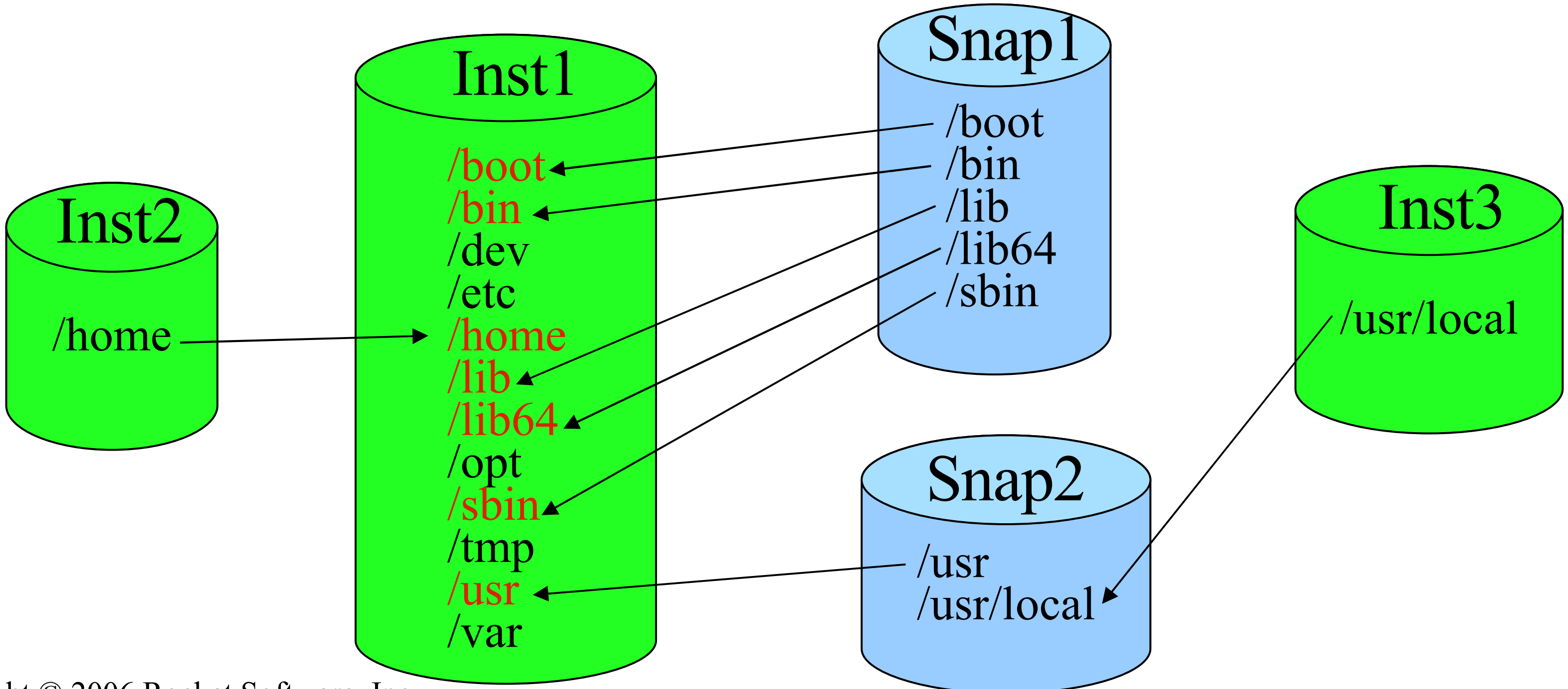
Under the Covers: Bind-Mounting

- Allows arbitrary divisions of the Linux directory structure
  - Snap1 contains all system software
  - Snap2 contains all usr software
  - Inst1 contains /dev, /etc, /opt, /tmp and /var; is instance's root
  - Inst2 contains empty space for home directories
  - Inst3 overrides part of /usr, making more space available in /usr/local



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Filesystem Snapshot Creation

- Determine sizes of filesystems defined by Layout
- Account for filesystem overhead
- Allocate DASD extents for each filesystem
- Format, partition and make filesystems on new DASD
- Mount new DASD onto base system
- Copy files onto new DASD following Layout rules
- Unmount the new DASD

Automated Deployment: Configuration

- Define how you want the instance to be set up
  - Hardware configuration
  - Software configuration
- Example: an NFS Server
- Explicit Configuration:
  - Specify Instance name
  - Set root password
  - Select a Filesystem Snapshot
  - Export a directory
- Implicit Configuration:
  - Assignment of IP addresses
  - Create a default route
  - Set up the root user account
  - Start NFS daemons

Automated Deployment: Create and Start

Steps to Create an Instance:

- Define a new guest
- Allocate Instance-specific DASD, owned by that guest
- Copy Instance-specific data from Snapshot to new DASD
- Bind-mount DASD onto the base system
- Run configuration scripts on the new DASD
    - Writes /etc/fstab
    - Defines network interface(s)
    - …
- Run mkinitrd and zipl on the new DASD
- Unmount the new DASD

Steps to Start an Instance:

- IPL the new guest
- Wait for Instance to respond on network

Extensibility Features

- Application Configuration Scripts
  - Let you automate configuration of your applications
  - It's just a shell script
  - Built on a rich set of common functions
- Instance Configuration Implementation Scripts
  - Allow for distro-specific configuration
  - Built on a rich set of common functions
- XML Schemas
  - Allows adding to configuration language
  - Configure new kinds of things
  - You had better understand XML
- Snapshot Layout Build Instructions
  - Allows for different layouts of snapshots
  - Can divide filesystems in different ways
  - Not for the faint of heart

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Automated Software Updates

- Install new software on the Base System
- Create a new Filesystem Snapshot of the Base System
- Update existing Instances to use the new Snapshot:
  - Stops the Instance, if it is running
  - Detaches old Snapshot's DASD from the instance
  - Links new Snapshot's DASD in its place
  - Mounts Instance-specific DASD on the base system
  - Copies any new files to Instance-specific filesystems
  - Unmounts Instance's DASD
  - Starts the Instance, if it was running

Multiple Network Interfaces

- Uses pre-existing VSWITCHes or CTC
- Data for each network segment is configured by admin
- Assignment of IP addresses is automatic
- Instance configuration is just selecting a network segment
- Default route uses first defined segment

Summary

- Cloning, Provisioning and Configuration is a lot of work
- There is a lot of information to keep track of
- Automation makes it easy to produce different instances
- Uses a high-level configuration language
- Treats virtual hardware and software the same way
- Filesystem Snapshots make software upgrades easier
- And you can back out those upgrades

Quick, Easy and Accurate Linux Deployment Under z/VM

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