Make it Snappery
Remote Snapshots with Samba and Snapper

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What is snapper?

- Tool to manage filesystem snapshots
- Supports Btrfs, ext4 and thin-provisioned LVM
- Creation
    - Manual
    - Timeline
    - Application triggered
- Automatic cleanup
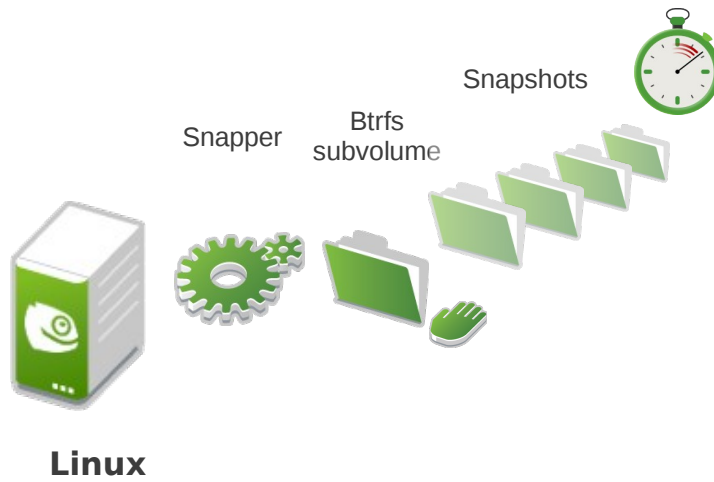- Command line tool and GUI

What is snapper?

- One configuration per subvolume

- Metadata per snapshot:

    – Time and date

    – Description

    – Userdata (key-value pairs)

- Compare snapshots

- Revert file changes

D-Bus interface for snapper

- Snapper split into client and server
    - Started on demand by dbus-daemon

- Allows non-root users to work with snapshots
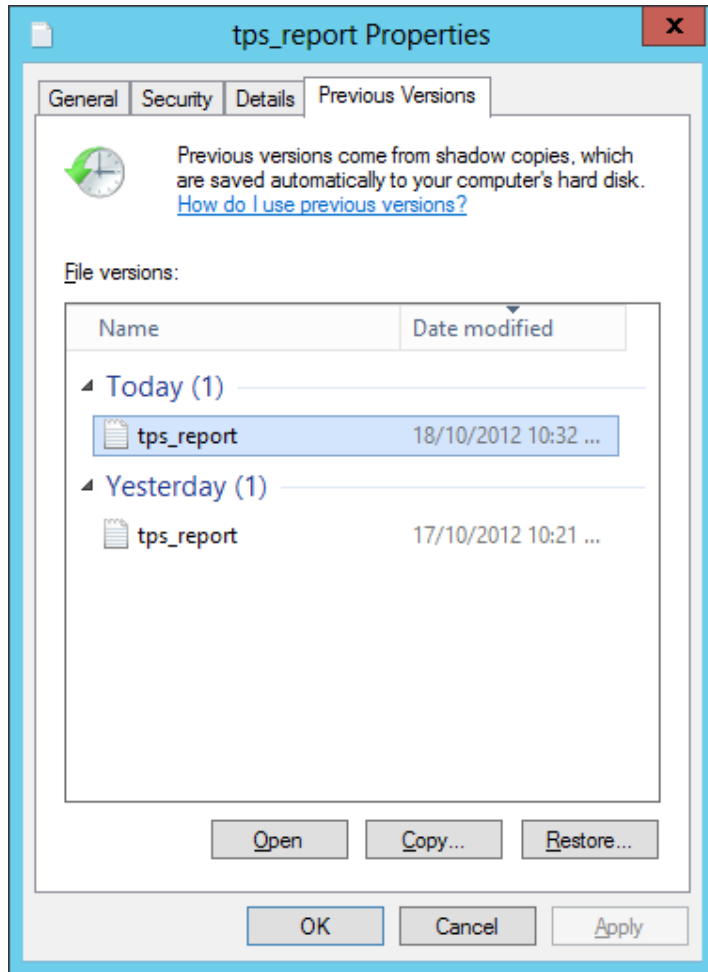   - Access based on Unix user and group

Snapper Demo

- Server = SLES11SP2

Benefits for Samba

- Previous versions in Explorer

- Remote management via File Server Remote VSS Protocol (FSRVP)

Previous Versions

- Client query via IOCTL
  - FSCTL_SRV_ENUM_SNAPS
  - @GMT token list response
  - Only displays versions with differing modification times

- Access using @GMT or timewarp token with path

File Share Shadow Copies
Introduction

- File Server Remote VSS Protocol

  – MS-FSRVP new with Windows Server 2012

  – DCE/RPC requests via \pipe\FssagentRpc

- Clients can manage shadow copies remotely

  – Determine which shares may be shadow copied

  – Request creation

  – Request exposure as a new share

File Share Shadow Copies
Windows

- Volume Shadow Copy Service (VSS) ecosystem

    - Application consistent shadow-copies for backup

    - VSS aware applications

        - Flush caches to disk prior to snapshot

- Microsoft File Server Shadow Copy Agent Service

    - diskshadow.exe

    - System Center Data Protection Manager (DPM)

File Share Shadow Copies
Samba FSRVP Server Implementation

- Fssd forked on start-up

    - Handles all FSRVP requests

- Snapshot requests propagated to VFS

    - Check whether path supports shadow copies

    - Asynchronous create/delete shadow copy requests

- Shadow copy shares defined in the registry

    - Clone of base share definition

File Share Shadow Copies
Samba FSRVP Server Implementation

- vfs_snapper
  - Manages snapshots via Snapper D-Bus interface
  - Presents snapshots as previous versions in Explorer
    - @GMT tokens mapped to snapshot paths

- vfs_shell_snap
  - Shell script hooks for snapshot creation and deletion

- vfs_btrfs
  - Raw Btrfs IOCTLs

FSRVP Server Demo

- Server = Samba with FSRVP changes
- Client = Windows Server 2012

Implementation State
Client and Server

- Client support and IDL upstream

- Potential improvements
    - DCE/RPC PDU double unmarshalling
    - Caching of snapper responses to avoid D-Bus round-trip
    - Asynchronous D-Bus requests
    - FSRVP state timeouts
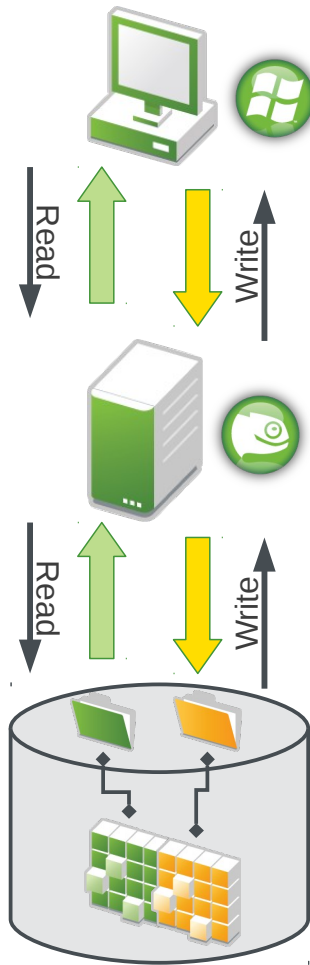   - Snapper support for read-write snapshots

Implementation State
Test suite

- Selftest "faked" snapshots
  - vfs_shell_snap hooks for snapshot creation and deletion
  - Map to copy and delete

- Improved coverage
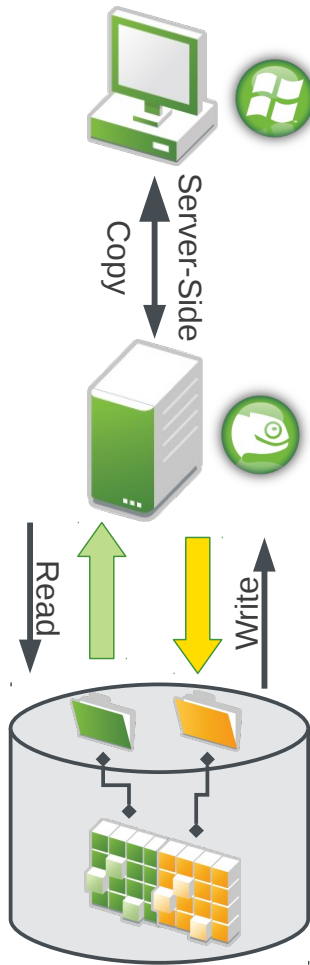 - Snapshot enumeration FSCTL
  - FSRVP server and client
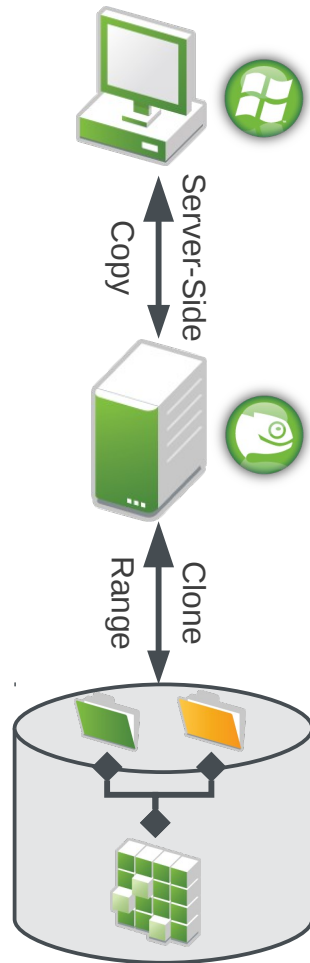
Traditional Copy

- File data takes disk and network round-trips

- Duplicate data stored on disk

Server-Side Copy

- Network round-trip avoided

- Server copies file data locally

- Duplicate data stored on disk

Btrfs Enhanced Server-Side Copy

Server-Side Copy

Range Clone

- Data avoids network **and** disk round-trips
- No duplication of file data
- Ideal for hypervisor based workloads

Questions?

Code: https://github.com/openSUSE/snapper
            http://git.samba.org/?p=ddiss/samba.git

Slides: http://www.samba.org/~ddiss/

Thank you.

References

- Demonstrated Samba code

  – git://git.samba.org/ddiss/samba.git async_fsrvp_srv_wip_xp2013

- MS-FSRVP documentation

  – http://msdn.microsoft.com/us-en/library/hh554852.aspx

- SNIA SDC 2011 - Advancements in backup - Molly Brown

  – http://www.snia.org/sites/default/files2/SDC2011/presentations/tuesday/Molly Brown_Advancements_In_Backup.pdf

- Btrfs Wiki

  – btrfs.wiki.kernel.org

- I Can't Believe This is Butter! A tour of btrfs by Avi Miller

  – http://www.youtube.com/watch?v=hxWuaozpe2I

References

- WS8 Beta Storage Availability White Paper
  - http://download.microsoft.com/download/6/7/6/676CCB32-8ECC-4793-A698-68D0AFD2F1A9/WS8%20Beta%20Storage%20and%20Availability%20White%20Paper.pdf

- Offline Deduplication for Btrfs
  - http://thread.gmane.org/gmane.comp.file-systems.btrfs/8448

- Snapper
  - http://snapper.io/

FSRVP Client Demo

- Server = Windows Server 2012
- Client = Samba rpcclient

Scenario 2: Integration of Apache with Active Directory

Apache

mod_kerb_auth

SLES 11 SP2

Role:
    Member server
AD:
    ad.demo.lan
Hostname:
    interop04

/

/secure

Active Directory (LDAP)

Kerberos

Windows 2008 R2

Role:
    AD Domain Controller
AD domain name:
    ad.demo.lan
NT-style domain name: INTEROP
Hostname:
    win200864

Firefox

Internet Explorer

Windows 7 (win764.ad.demo.lan)

Prototype Samba implementation of "Recovery Point"
Demo

- Automatic snapshots by Snapper
- Previous versions of "test.txt" in Explorer
- File "test.txt" is changed
- File "test.txt" is created