Samba and Btrfs

A Snapshot of Progress

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Overview

- Btrfs
- Snapper
- Samba Enhancements
  - Transparent Compression
  - Server-Side Copy
  - Snapshots
    - Previous File Versions
    - Remote Share Snapshots
- Configuration via YaST®

Btrfs and Snapper

Btrfs

- Next generation filesystem for Linux
- Resilient
  - Checksumming of data and meta-data
- Integrated redundancy
  - Multi-device support (mirrors and stripes)
- Snapshots
  - File range (clone) or subvolume granularity
- Transparent compression
- De-duplication

Snapper

- Separate utility for managing Btrfs snapshots
  - Timeline, application or user initiated
  - Stores associated metadata
- Compare and revert changes
- Authorization
  - Non-root snapshot access and manipulation

Samba Enhancements

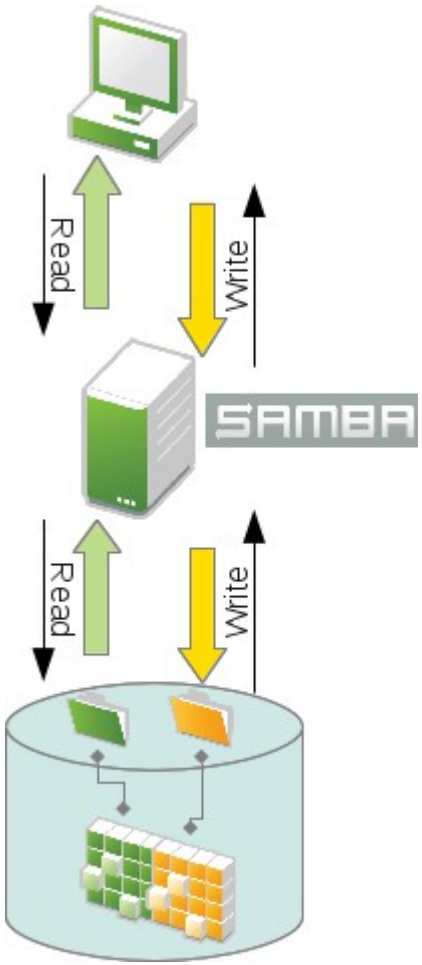
Samba

Btrfs Integration

- SMB protocol can expose Btrfs features to clients
  - Server-Side Copies
    - Copy-chunk
  - Snapshots
    - Previous File Versions
    - File Server Remote VSS Protocol (FSRVP)
  - Compression
    - File and directory attribute manipulation

- Windows Explorer can expose these features to users

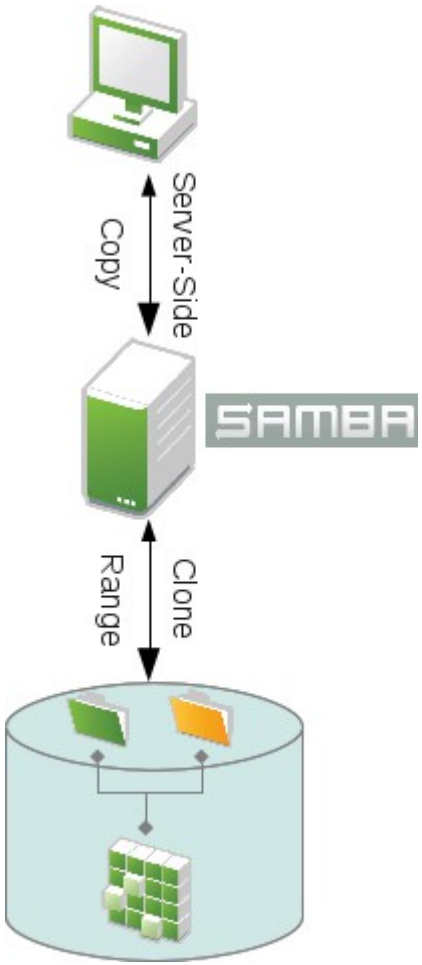
Traditional Copy



- Client reads and writes back file data
- Suboptimal performance
  - File data traverses network and disk
- Poor utilization
  - Duplicate data stored on disk
- Significant impact on copy-heavy workloads, e.g:
  - Virtual machine libraries
  - Video editing
  - Home folders

Server-Side Copy

Samba + Btrfs



- FSCTL_SRV_COPYCHUNK sent over the wire
  - Avoids network round-trip of file data done by a traditional copy
- Samba's *btrfs* VFS module translates the request into a BTRFS_IOC_CLONE_RANGE ioctl
  - Avoids disk round trip of file data
  - No duplication of file data on disk

Server-Side Copy

Samba + Btrfs

- Dependent on client support
  - Windows Explorer in Windows 8 and Windows Server 2012
  - Robocopy in Windows 7 and Windows Server 2008
  - Linux Kernel CIFS client 3.13.0+
- Constrained by ioctl requirements
  - Btrfs block-size alignment
    - Performs local copy on fallback
    - Network round-trip still avoided
  - Copy-chunk requests only issued within a single share

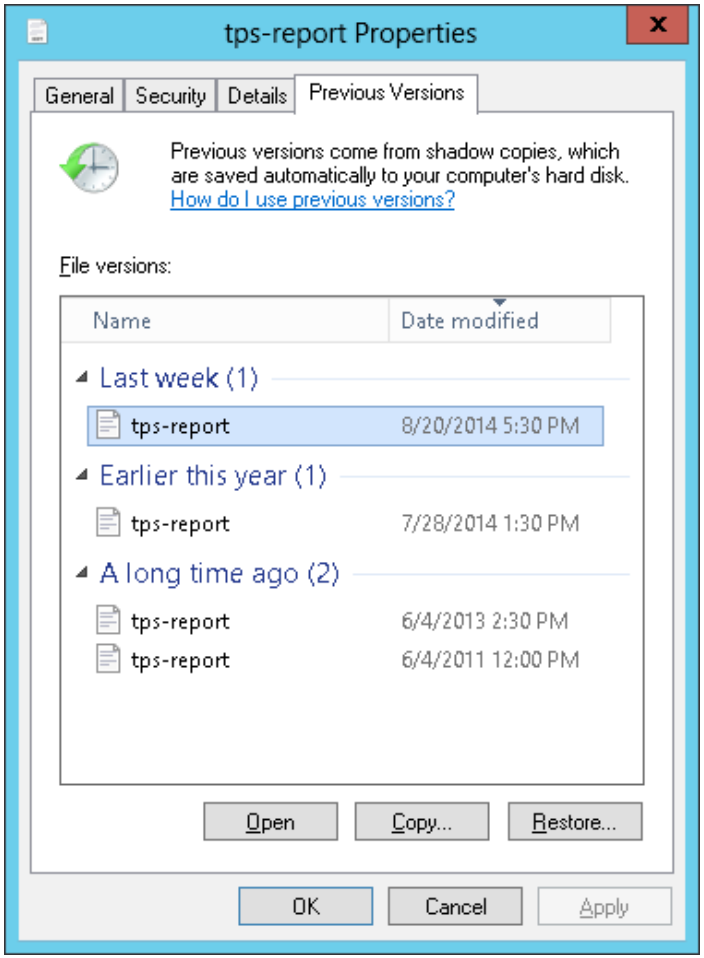
Previous File Versions

Samba + Snapper + Btrfs

- Allow users to view and restore files from snapshots
  - Windows Explorer associates existing paths with matching snapshot paths as Previous Versions
    - Only displays versions with unique modification times
- Configure Snapper to take periodic snapshots of share path
  - Permit users snapshot list and folder traversal access
  - *Enable snapper* Samba VFS module for share

Previous File Versions

Samba + Snapper + Btrfs

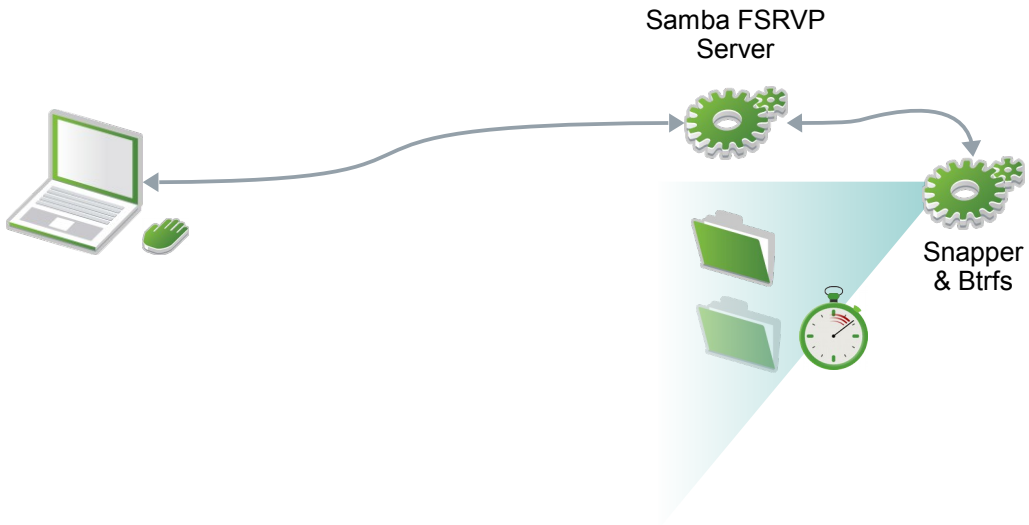


- Expose snapshots via SMB
  - Client enumeration via FSCTL_SRV_ENUM_SNAPS
- Intercept paths that correspond to snapshots
  - CIFS *@GMT* path token
  - SMB2 timewarp (*TWrp*) create tag

Remote Snapshots

Samba + Snapper + Btrfs

- Allow users to remotely manipulate share snapshots
  - Using the File Server Remote VSS Protocol (FSRVP)
  - Create, delete and expose share snapshots



Remote Snapshots

Samba + Snapper + Btrfs

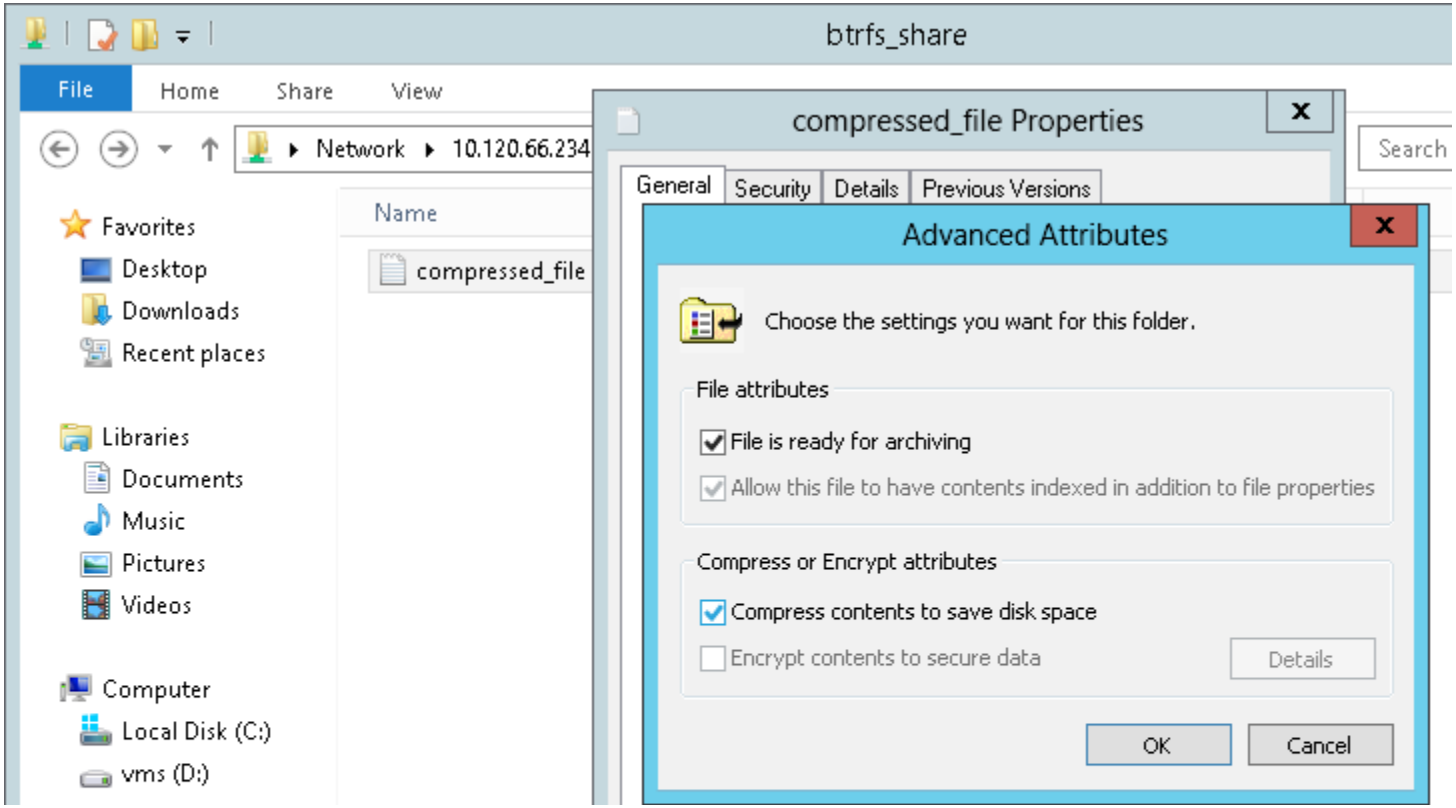
- Enable Samba's *snapper* VFS module and FSRVP server
  - Registry configuration used to expose snapshots as new shares
  - Grant users appropriate permissions

- Clients
  - Remote backup applications
  - Samba rpcclient
  - Windows Diskshadow.exe
  - Microsoft System Center Data Protection Manager

Compression

Samba + Btrfs

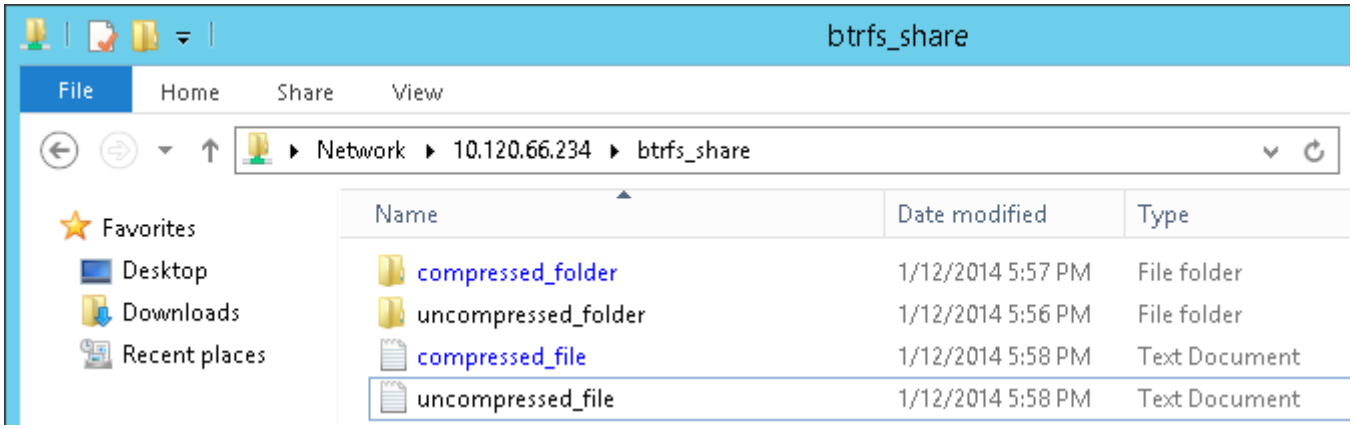
- User flags compression at a file or directory level
  - Files inherit compression flags from parent directory



Compression

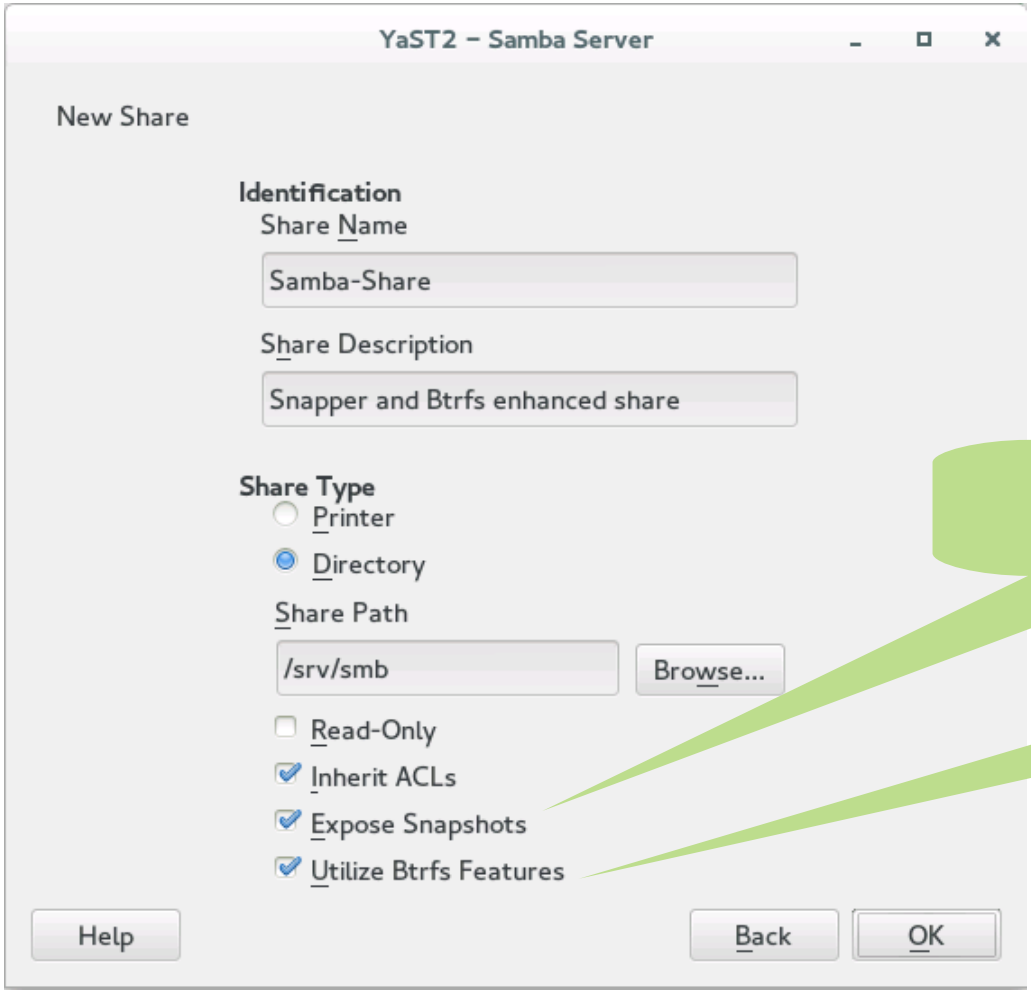
Samba + Btrfs

- FSCTL_SET_COMPRESSION sent over the wire
  - Samba's *btrfs* VFS module translates request into FS_IOC_SETFLAGS ioctl
  - Same for FSCTL_GET_COMPRESSION and FS_IOC_GETFLAGS respectively
- Btrfs compresses and uncompresses data during IO



Configuration

YaST Samba Share Wizard



Enable Snapper Enhancements

Enable Btrfs Enhancements

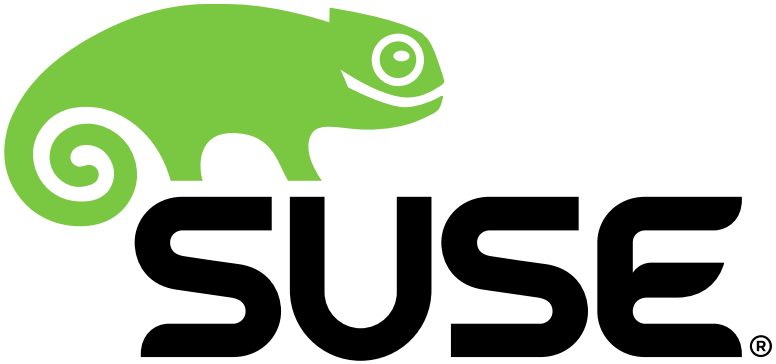
Configuration

YaST Samba Share Wizard

- Check for prerequisites
  - Share path is a Btrfs subvolume
  - Corresponding Snapper configuration
- Samba configured to use appropriate VFS module
- Remote snapshot server must be manually enabled
- Fully documented
  - *vfs_btrfs* and *vfs_snapper* man pages
  - SLES12 Administration Guide

Questions?

Thank you.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