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Backing up Cloud Servers, and Remote Storage

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What are we going to cover?

- Servers and Storage in the Cloud need backup

- Service provider backup is good, but you need more

- What types of backups?
  - work-in-progress
  - archiving closed dockets
  - real-time synchro for two live locations

Build vs. Buy

- rsync vs. . . .
  - Sync software (e.g., Synchronize Pro)
  - Time Machine
  - CrashPlan (and others)

- If off the shelf options meet all requirements, then by all means use something the off the shelf

- If in a complex situation, or you don't want the overhead of more software, then customize

Automation vs. User Interaction

- Choose the level of automation vs. user interaction
  - Automatic: Cron/launchd
  - Convenient: Password-built-in applet
  - Security: Password-required applet

- How safe is your process from outsiders potentially disrupting or hijacking it?
  - Don't store passwords in clear text
  - Limit your backup servers to only allow specific IPs or users to send data to specific locations
  - Consider security (including at rest) at all times

Automation vs. User Interaction

- Automation comes with increased risk of…
  - Simple mistakes having dire side effects
  - Not noticing ineffective or unacceptable output from otherwise successfully executed tasks

- User interaction has risk of people not doing what they committed to do, or inconsistent execution

- Lesser of two evils; choose and manage

Command Line Primer

- Construction of a command:
  - command
  - options & switches
  - source and target

- Capitalization matters (case sensitivity)

- Read and understand the tools, using man pages

- Choose your text editor carefully, so that you don't insert syntax error generating formatting
  - nano / pico, vi, etc…

- Version and compatibility of tools

rsync

- Does a "differential" backup where only the chunks of files that are different are transferred

- Extremely efficient for copying large trees of files when only a few modifications have been made

- Generally not as effective for binary files (such as DMGs, zip files, etc) because these tend to change the entire file if something inside is different

- Works locally and to remote servers (can work over SSH if remote server doesn't have rsync installed)

rsync in OS X

- Default OS X version is old and deprecated: 2.6.9

- Current rsync version is 3.1.2

- As of 10.11 El Capitan, /usr/bin/rsync cannot be replaced or modified (due to SIP)
  - … and it's still 2.6.9

Obtaining Updated rsync

- Download new rsync to /usr/local/bin/rsync:

  ```
  curl -O http://rsync.samba.org/ftp/rsync/
  rsync-3.1.2.tar.gz
  tar -xzvf rsync-3.1.2.tar.gz
  rm rsync-3.1.2.tar.gz
  cd rsync-3.1.2
  ./prepare-source
  ./configure
  make
  sudo make install
  ```

- Compare:
  ```
  /usr/local/bin/rsync --version
  /usr/bin/rsync --version
  ```

man rsync

```
NAME
    rsync - faster, flexible replacement for rcp

SYNOPSIS
    rsync [OPTION]... SRC [SRC]... DEST
    rsync [OPTION]... SRC [SRC]... [USER@]HOST:DEST
    rsync [OPTION]... SRC [SRC]... [USER@]HOST::DEST
    rsync [OPTION]... SRC [SRC]... rsync://[USER@]HOST[:PORT]/DEST
    rsync [OPTION]... SRC
    rsync [OPTION]... [USER@]HOST:SRC [DEST]
    rsync [OPTION]... [USER@]HOST::SRC [DEST]
    rsync [OPTION]... rsync://[USER@]HOST[:PORT]/SRC [DEST]
```

Common rsync options

- **-P**: show partial progress bar

- **-h**: human-readable numbers

- **-a**: "archive" mode copies nearly everything as-is

- **-v**: verbosity

- **-z**: compression

- `rsync` **`-Phavz`** `source dest`
  - Shows progress, human readable file sizes, copies mostly everything, shows every file being copied, and compresses for lower bandwidth

Basic rsync usage

- `rsync -a SOURCE DESTINATION`

- `rsync -a /path/to/source /path/to/dest`
  - Will copy the folder "source" to "dest"

- `rsync -a source username@destination:/path/to/server/folder/`

Classic rsync

- Copy content of "files" to destination on server:

```
rsync -avz  /path/to/files/  user:password-
if-you-want-saved@host:/path/to/target/
```

- Copy folder "source" to server as "dest", showing progress in human readable format:

```
rsync -Phavz /path/to/source user@host:/path/
to/dest
```

Power of Script

- The real power comes with stringing multiple commands together

- Allows for no (or, a specific) dark-time between task #1 completing and the beginning of task #2

- Allows for the accurate repetition of task *n*, for as many boring times as you need it to be done

Reminder: Good Habits

- When scripting, use some form of version mgmt
  - name/number your scripts as you develop them
  - keeping light notes about what each version adds
  - source control - upload to GitHub or BitBucket

- Output should help you track version usage
  - have your script create/embed a header line in any output files, quoting the script version

- Alternatively … Breadcrumbs
  - Have scripts create (or check for, causing different outcomes) hidden 'breadcrumb' files (empty, but fixed name starts with a period)

Reminder: Good Habits

- Add or change as few things as possible (1 or 2) when editing or building a script, lest you break A while building B

- Consider embedding occasional screen output lines through your script, to provide some critical feedback if your script hangs or fails midway through

- Use version/source control frequently so you can always revert to previous revisions, especially if making big changes

"touch"

- `touch /path/of/interest/.last_rsync_time`

- Will either create (or modify the last modified time stamp on) the specified file

- Can be used to mark files to backup on next run

Choices

- When choosing how to best protect the source data, consider the behavior of it.

- How fast does it change, vs. how long do you need it to stay still?

- Remember: It's not about backup, it's about restore
  - Is the restore going to be accurate and useable?

Think like a Photographer

- You want to create a perfect "image" of the dataset

- Think about photographing a large, active park

- While you use iPhone's panoramic panning, people walk across your pan.
  - if walking L to R, you now end up with the same person in the picture 3 or 4 times
  - if walking the other way, you might end up with just a sliver of them, or an unrecognizable blur

Files Blur Too

- Same effect will occur with active files, such as:
  - large PST files or databases
  - log files
  - large media files

- If the index you captured at block 1 is out of date before you're at block n, then the restored file may very well not work

- Solution: always use application-aware tools or commands to 'dump' a database or shadow file, then backup that flat / static file.

Real Examples

- MySQL / PostgreSQL is a good example of this "blur"

- Live log files are another example

- File-based backups like CrashPlan, Time Machine, or sync applications won't generally handle this properly; requires use of application-aware plugins

MySQL: Backing it up

Backup every day, keep for a week

```bash
#!/bin/bash

# Clean up older backups, anything older than 7 days
find /Users/backup/ -mtime +7 -delete

# Get all databases
DUMPNAME=/Users/backup/fulldump-`date "+%Y%m%d"`.sql
/usr/bin/mysqldump -u root --
password="paswordgoeshere" --all-databases > $
{DUMPNAME}
ln -sf ${DUMPNAME} /Users/backup/latest-fulldump.sql
```

And, the rest of the site?

```
# Get the site
SITENAME=/Users/backup/www_site-`date "+%Y%m
%d"`.tar.gz
tar czvf ${SITENAME} /Library/WebServer/Documents/
db.companydomain.com
ln -sf ${SITENAME} /Users/backup/latest-site.tar.gz

# Get local configs
USRLOCALNAME=/backup/usr_local-`date "+%Y%m%d"`.tar.gz
tar czvf ${USRLOCALNAME} /usr/local
ln -sf ${USRLOCALNAME} /backup/latest-usrlocal.tar.gz
```

Behavior at Both Ends

- Identifying the desired behavior at the source … and the target
  - Example: Move the daily backups to a weekly set

- Use pattern (regex) matching and how to select the right source data

- Beware of the rogue loop with the best of intentions but the simplest of syntax errors

- Test regex filter syntax in a non-destructive way

Moving data as part of a persisting workflow

- You may want to script moving data at source, or destination
  - Example: Move some data in a source path, while leaving others (move out files older than 30 days)

- Do you want to MOVE files (remove from source) vs. COPY (leave at source)?

- Do you want to segregate or notate files at the source, if choosing to leave them on the volume (move into a 'processed' folder, or change filename)?

Example: Moving Older Files

Moving files that are more than 180 days (only) from one location to another.

```
# Create list of affected files -- find all the
files that are 180 days ago or more
$ find . -type f -ctime +180 -print > ${TMPLIST}

# Sync to the other box (need to define variables)
#    {EXCH_USER}  ${EXCH_HOST}    ${TARGET_DIR}
$ rsync -avz --files-from=${TMPLIST} ./ $
{EXCH_USER}@${EXCH_HOST}:${TARGET_DIR}/

# Delete after successful sync
# Dangerous -- be careful
$ cat ${TMPLIST}|xargs rm -f
```

rsync's Clean Up Flags

Another way to do the clean up is to use rsync's built-in clean up flags such as:

```
-e  flags of interest...
   --remove-source-files    sender removes synchronized files (non-dir)
   --delete                 delete extraneous files from dest dirs
   --delete-before          receiver deletes before transfer (default)
   --delete-during          receiver deletes during xfer, not before
   --delete-after           receiver deletes after transfer, not before
   --delete-excluded        also delete excluded files from dest dirs
```

rsync's Clean Up Flags

So, if you want to **move** data from one machine to another, you might use:

```
rsync -avz -e --remove-source-files  --delete-after
/path/to/backupfiles      user:password-if-you-want-it-
saved@host:/path/to/targetbackupfiles
```

Excluding Files

- Sometimes, there are files you don't want:
  - OS Specific files (e.g., `.DS_STORE`)
  - Installation specific (e.g., configuration paths)
  - Temp or Cache files
  - Source control files (.git, .hg)

- rsync flags to the rescue, exclude any file with 'dir1':
  ```
  rsync --exclude 'dir1'
  ```

- 6 rsync Examples to Exclude Files and Folders
  ```
  http://www.thegeekstuff.com/2011/01/rsync-
  exclude-files-and-folders/
  ```

Additional Considerations

- Outcome / confirmation and documentation of a script's completion

- Add logging?

- Do you want to append a date/time stamped summary line to a fixed-path log file?

- Add reporting or notification?

- Do you want the script to email you?

Real Examples

- Kerio Example:
  - Backing up a live server
  - Having an easy fail over, albeit a manual lever

- Web Server (e.g., WordPress)
  - Backing up a live server
  - Database, Files, Config

Scripting the Total Solution

- Automating rsync and mysql

- Scheduling (cron or whatever)

- Logs

- Notifications and issues

- Email a report

Trust, but Verify

- Now that you've built a script or application to move the data, you're not wrong to want to trust it. That's not a bad thing - but trust AND VERIFY.

- Take the time for periodic validation that you can successfully recover from the hypothetical threat that you seek protection from

- Establish what 'normal' behavior looks like (time to run, size of output, etc.) and determine how you'll detect off-nominal developments

- TEST A FULL RESTORE!

Test, before going live

- Test regex filter syntax in a non-destructive way

- Regex Testing Tools
  - http://regexr.com
  - http://ryanswanson.com/regexp/#start
  - http://www.regexpal.com

- Additional Regex tools:
  - http://www.cheatography.com/davechild/cheat-sheets/regular-expressions/
  - http://regexlib.com/CheatSheet.aspx
  - http://www.virtuosimedia.com/dev/php/37-tested-php-perl-and-javascript-regular-expressions
  - http://code.tutsplus.com/tutorials/8-regular-expressions-you-should-know--net-6149

Incremental and Differential

- Incremental destination file
  - Monday: Full backup
  - Tuesday: all changes between M and T
  - Wed: all changes between T and W
  - Thurs: all changes between W and Th.

- Differential destination file
  - Monday: Full
  - Tues: all changes between M and T
  - Wed: all changes between M and W
  - Thur: all changes between M and Th.

Incremental vs. Differential

- Incremental allows one restore from the date of latest incremental to get everything.

- Differential requires you restore Monday then Tues then Wed then Thurs.

Questions?

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