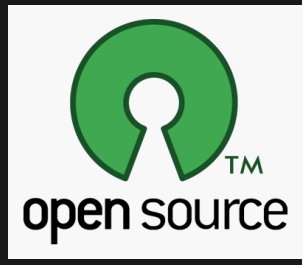
Bacula

The leading Opensource Backup Solution

OpenSource Project



Bacula is a network backup solution, designed for
***BSD, Linux, Mac OS X, Unix and Windows** systems.

Original project goals were to:

- backup any client from a Palm to a mainframe computer
- provide "**Enterprise**" features similar to the largest commercial applications
- assure data compatibility for 30 years
- use a Free and Open Source (GPL v2) license

Project History

Bacula = Backup + Dracula

- January 2000 – Project started
- 14 April 2002 – First release to Source Forge (version 1.16)
- 29 June 2006 – Release 1.38.11
- January 2007 – Release 2.0.0
- August 2007 – Release 2.2.0 (current 2.2.8)
- ...

Downloads 670,013 all versions 4.2 TB

Introduction

Do you do backups?

- No
- Yes, I did one last month
- Yes, tarballs every week
- Sometimes I rsync ...
- Yes, CDs every week
- I use custom scripts

Problems:

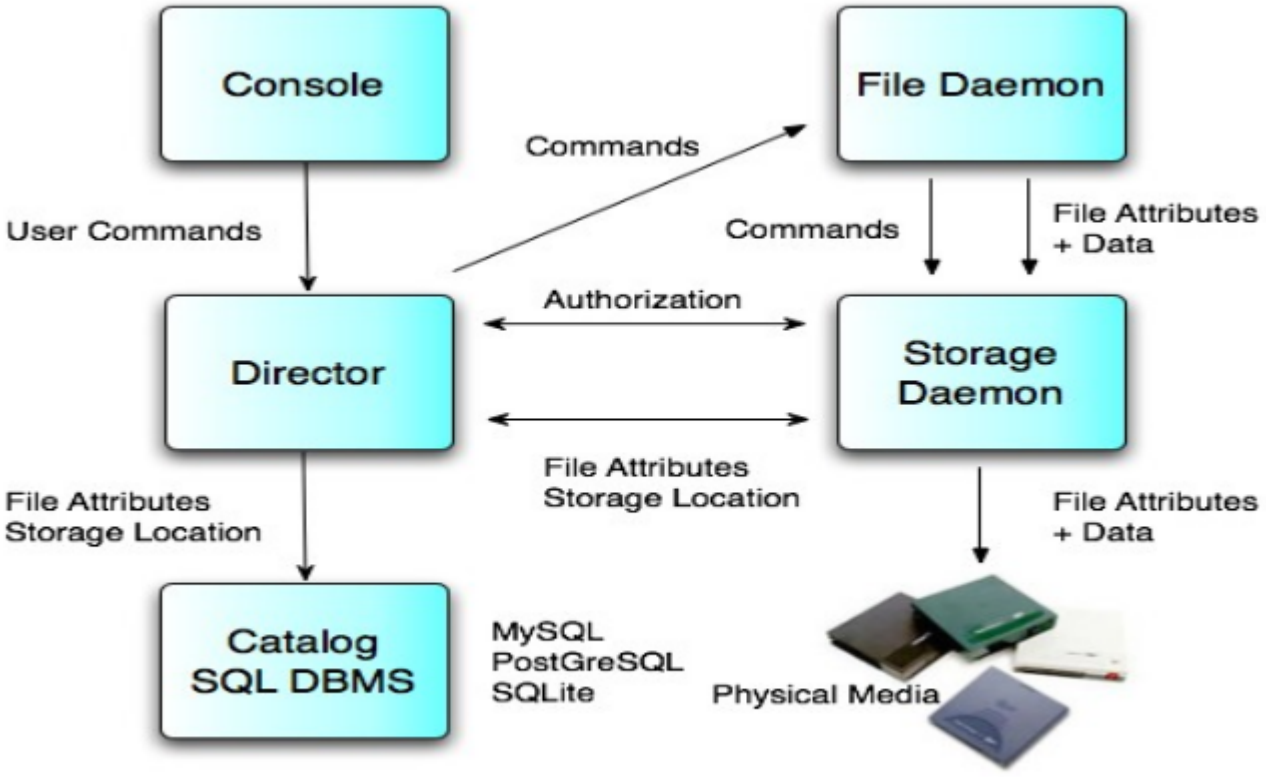
- How do you find the files you need to restore?
- How do you restore to a point in time?
- What is on what medium?
- How do you handle 2000 machines?
- Government regulations

Introduction

Bacula to the rescue:

- Open Source (GPLv2)
- Centrally managed
- Network backup/restore
- Many platforms (*BSD, Linux, Mac OS X, Unix Win32, ...)
- Different media (Tape, disk, USB, CD/DVD)
- Reliable
- Knows what was backed up when and where
- Allows restoring files you want (Catalog + GUI)
- Restores to a point in time
- Scales to handle 10,000 machines

Five Main Components



The Five Bacula Components

- Control and administration for everything is **centralized**
- Basic unit is a Job (one client, one set of files, ...)
- Schedules, initiates and supervises all Jobs
- Maintains the catalog (SQL **database**)
- Typically one Director except in very large shops

- Does file backup, restore and verification requested by Director
- Installed on each machine as a service (daemon)
- Communicates over network with Director and Storage daemon
- **Needs access** to all files to be backed up (root, SYSTEM)
- Typically multiple File daemons per Director; one for each machine

- Reads and writes data to the physical medium
- Disk, **Tape**, CD/DVD, USB, ...
- Accepts orders and authorization from the Director
- Accepts and returns data to/from File daemons (FD)
- Sends file storage location to Director -> Catalog
- Typically one per Director but with multiple devices

The Five Bacula Components

- Allows user or administrator to **control Bacula**
- Communicates with Director via network
- **Start jobs**, review Job output, query/modify catalog
- **Consoles** available
  - TTY (bconsole)
  - bat a Qt 4 (GUI) – most comprehensive
  - wxWidgets (GUI) – Linux, Unix, Win32
  - Gnome (GUI) – deprecated
  - Several web interfaces (bweb is most comprehensive)

- Restricted consoles permit users to restore their own files
- Only component not written by Bacula team
- SQL database (**MySQL**, PostgreSQL, or SQLite) - unique
- Tracks Jobs run, Volumes used, File locations, ...
- Permits **rapid restores**
- Allows inquiry of when and where files were backed up
- Old data automatically pruned by Director
- Supports **multiple databases** for scaling

Features

- A **central server** and catalog with distributed backup
- All components communicate via the network.
- Internal scheduler for automatic and simultaneous job execution with **priorities**.
- Interactive restore with many options, for example:
  - current backup (most common)
  - prior backup of time and date
  - list of files/directories to restore
  - restore by JobId

- Simple administration with **consoles** (command line, GUI, and **web**)
- Labeled Volumes, to prevent accidental overwriting
- Support for ANSI / IBM labels
- Machine independent Volume data format - extensible
- Support for Unicode on Win32; UTF-8 on Unix
- Rescue CDROM for “bare metal” recovery (very complicated)

Bacula - Hardware Features

- Backups can span multiple volumes
- **Multiple backups** (jobs, clients, OSes) per volume
- Supports most tape drives with configurable Device resources
- Support for multiple drive autochangers (libraries)
- Supports tape barcode readers
- Extensive Pool and Volume library management
- Rapid **restoration of individual files** (one user reported 4 to 6
- hours with tar and 3 to 4 minutes with Bacula!).

Bacula - Security Feaures

- Daemon authorization with CRAM--MD5
- Director and Storage daemon can be **run non--root**
- **MD5, SHA1, ... signatures** for each file
- CRC checksum for each Volume block
- Restricted consoles and tray-monitors
- Communications **(TLS) encryption**
- Data (PKI) encryption
- Tripwire like intrusion detection (Verify)

Bacula - Jobs
who, what, where, when

Jobs are the basic unifying structure

- Name – unique name (who)
- Type – what to do: backup, Backup, Migrate, Admin, Restore
- Level – level of detail of type: Full, Differential, Incremental
- FileSet – what to files to backup
- Client – where to get the files (machine name)
- Storage – where to put the files (which hardware)
- Pool – which set of Volumes (tapes, disk) to use
- Schedule – when to do it

Bacula - Director Configuration File

```
Director {
  Name = bacula-dir
  Query File = “/usr/local/etc/query.sql”
  Working Directory = “/var/bacula”
  PID Directory = “/var/run”
  Maximum Concurrent Jobs = 20
  Password = “secret”
  Messages = Standard
}
```

Bacula - Director Configuration File

```
Job {           #  who, what, where, when
        Name = “Music”
        Type = Backup
        Client = bcli
        FileSet = “Full Set”
        Storage = File
        Schedule = “Weekly”
        Pool = Standard
        Messages = Standard
        Write Bootstrap = “/var/bacula/bcli.bsr”
}
```

Bacula - Director Configuration File

```
Client {
  Name = bcli
  Address = 10.0.0.1
  Catalog = MyCatalog
  Password = “secret--bcli”
  File Retention = 30 days
  Job Retention = 6 months
  AutoPrune = yes
  Maximum Concurrent Jobs = 20
}
```

Bacula Configuration - Fileset

- **Include/Exclude** files and/or directories
- Regex or wildcard for file/directory name selection
- **Compression** using similar selection criteria
- Which filesystem types to backup
- Backup OS Access Control List data (permissions)
- Sparse file handling
- **Signature** (MD5, SHA1, ...)

Bacula Configuration - Fileset

```
FileSet {
  Name = “Full Set”
  Include {
        Options {
        signature=SHA1;
        regex = ".*\.bak$";
        exclude = yes
        }
        File = /
        File = /usr
        File = /var
  }
  Exclude {
        File = /proc;   File = /tmp; File = /sys; File = /.journal
  }
}
```

Bacula Configuration - Schedule

```
Schedule {
  Name = “Weekly”
  Run = Level=Full 1st sun at 2:05
  Run = Level=Differential 2nd--5th sun at 2:05
  Run = Level=Incremental mon--sat at 2:05
}
```

Total directives per resource:

Director=27 Client=21 Storage=21 Job=60 Schedule=3, Device=52, ...

Bacula Configuration - Storage

```
Device {
   Name = File
   Archive Device = /var/bacula/backups
   Device Type = File   # Directory, DVD, FIFO, Tape
   Media Type = File
   Label Media = yes
   Random Access = yes
   ...
}
```

Bacula Configuration - Storage

```
AutoChanger {
   Name = LTO-Changer
   Device = Drive-0, Drive-1
   Changer Device = /dev/sg0
  ...
}
Device {
   Name = Drive-0
   Archive Device = /dev/nst0
   Device Type = Tape          # DVD, File, FIFO
   Media Type = LTO-2
   Autochanger = yes
   ...
}
```

Real Installation

- 53TB, 150,000,000 files, 90 clients, **Linux**
- 40TB, 40,000,000 files, 30 clients, **Solaris**
- LTO-3 libraries with several drives
- Large libraries with 100's of tape slots
- Libraries and drives connected with **FC SAN**
- 20GB, 200,000 files, 1 client, Linux disk and tape

Project Development

Project development

Site : http://www.bacula.org/

Development style:

- SourceForge project
- Developer's guide with code style guidelines
- Developer SVN access. Currently 16 developers may commit
- Patches and commits reviewed by **K. Sibbald**
- Code tested using a regression test suite
- Email list for developers (bacula-devel)

License:

- **GPL** 2 copyright assigned to FSFE.
- Freedom Task Force (FTF)

Resources

For users and system administrators

Manual: http://www.bacula.org/en/rel-manual/index.html

OS and Hardware compatibility lists (in manual)

Bugs reports: http://bugs.bacula.org/

Email support list: bacula-users@lists.sourceforge.net

For developers

Docs: http://www.bacula.org/en/developers/index.html

Email list: bacula-devel@lists.sourceforge.net,
bacula-commits@lists.sourceforge.net

SVN at Source Forge

Credits

Thanks

Dan Langille who created the original presentation

Karl Cunningham who updated it

This presentation draws heavily on their work

A .pdf copy of this presentation can be found at:

http://www.bacula.org -> Presentations -> ...

Many Thanks!

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