



Bareos Overview

www.bareos.org

Agenda

1. What is Bareos / Bareos Features
2. Bareos Architecture
3. Installation
4. Workflow (run jobs, restore)
5. Configuration
6. Plugins
7. Roadmap

What is Bareos?

Bareos

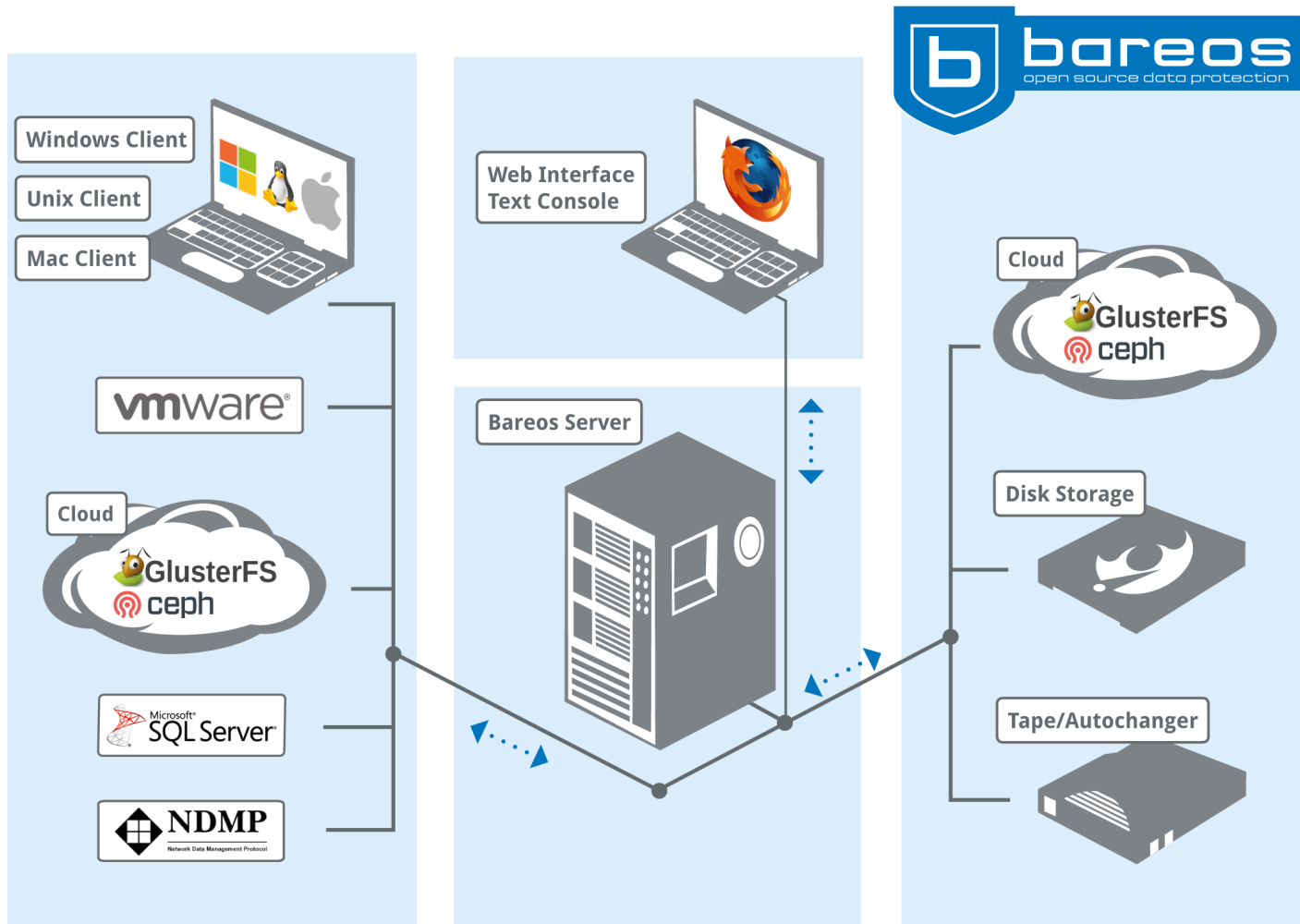
- Network based multi-platform backup solution
- License: AGPL, 100% open source
- <https://github.com/bareos/>
- Core written in C/C++
- Forked from Bacula in 2010
- First release in 2013 (bareos-12.4.3)
- One major release every year
 - current: bareos-16.2.4 (16.2.5 soon)

Multi-platform

Installation packages for

- bareos.org/bareos.com
 - CentOS, Debian, Fedora, openSUSE, RHEL, SLES, Ubuntu, Univention Corporate Server
 - Windows 32/64 bit
 - Mac Client
 - FreeBSD
 - UNIX: AIX, HP-UX, Solaris
- Distributions
 - Arch Linux, Debian, FreeBSD, Gentoo, Ubuntu Universe

Network Backup with Bareos



Features

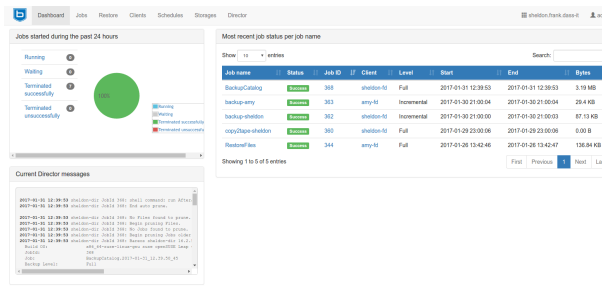
- All common features of a backup solution are supported
- Full, Differential and Incremental backups
- Always Incremental
- Backup Management
 - Volume Management
 - Retention periods
- Flexible Scheduling
- Flexible network setup
 - Director, Storage Daemon, File Daemon

Features

- Different User Interfaces
 - bconsole, bareos-webui (PHP), bat (QT-GUI, deprecated)



```
admin: bconsole - Konsole
Datei Bearbeiten Ansicht Lesezeichen Einstellungen Hilfe
Connecting to Director bareos:9101
1000 OK: bareos-dir Version: 14.3.0 (21 August 2014)
Enter a period to cancel a command.
admin: bconsole
```



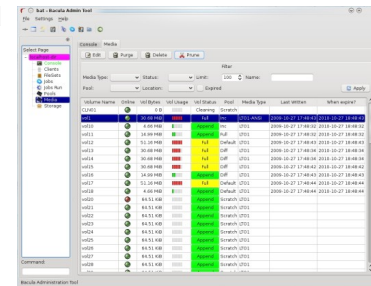
Dashboard Jobs Restore Clients Schedules Storages Director

Jobs started during the past 24 hours

Most recent job status per job name

Job name	Status	Job ID	Client	Level	Start	End	Bytes
BackupCatalog	Success	369	shelby010	Full	2017-01-21 12:29:03	2017-01-21 12:29:03	3.76 KB
BackupArchive	Success	362	any010	Incremental	2017-01-20 21:00:04	2017-01-20 21:00:04	204.19 B
BackupMedia	Success	362	shelby010	Incremental	2017-01-20 21:00:06	2017-01-20 21:00:03	87.13 KB
CopyDataShelby	Success	360	shelby010	Full	2017-01-20 23:00:06	2017-01-20 23:00:06	0.00 B
RestoreFile	Success	344	any010	Full	2017-01-20 13:42:46	2017-01-20 13:42:47	136.94 KB

Showing 1 to 5 of 5 entries



Bareos Administration Tool

Job name	Status	Job ID	Client	Level	Start	End	Bytes
BackupCatalog	Success	369	shelby010	Full	2017-01-21 12:29:03	2017-01-21 12:29:03	3.76 KB
BackupArchive	Success	362	any010	Incremental	2017-01-20 21:00:04	2017-01-20 21:00:04	204.19 B
BackupMedia	Success	362	shelby010	Incremental	2017-01-20 21:00:06	2017-01-20 21:00:03	87.13 KB
CopyDataShelby	Success	360	shelby010	Full	2017-01-20 23:00:06	2017-01-20 23:00:06	0.00 B
RestoreFile	Success	344	any010	Full	2017-01-20 13:42:46	2017-01-20 13:42:47	136.94 KB

Features

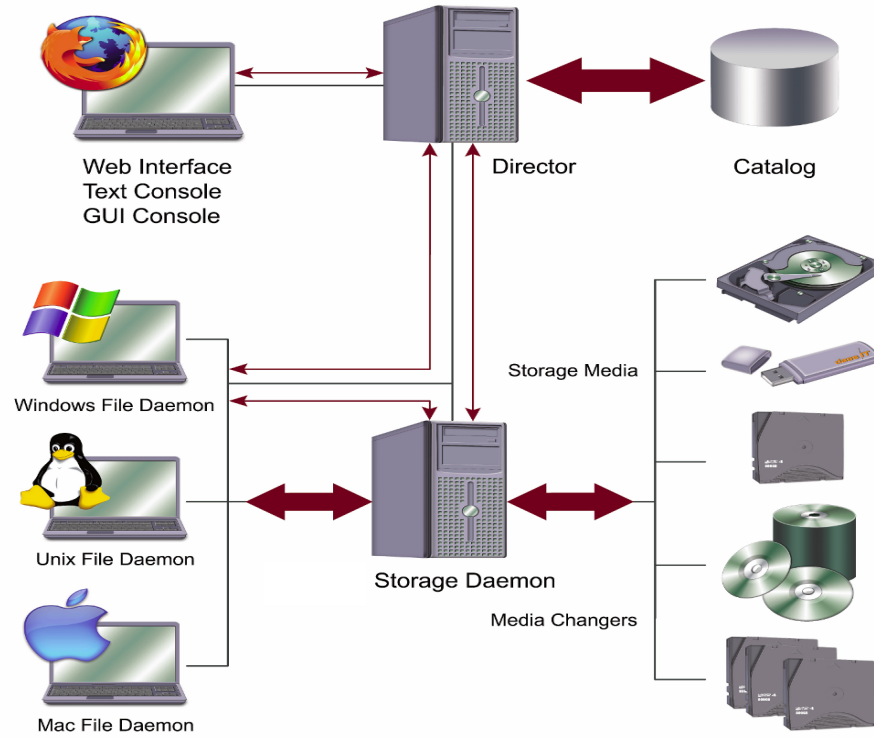
- Security
 - Challenge-response authentication
 - TLS
 - Client: Data Encryption
 - Tape: LTO encryption (hardware, keys stored in Bareos Catalog)
 - Audit Log
 - Secure Erase Command
 - ACLs
 - File Daemon: restricted mode

Features

- API / scripting
- Plugin Support
 - C/C++ and Python plugins
- integration with/in other software
 - e.g. Relax-and-Recover

Bareos Architecture

Bareos Architecture



File Daemon

- Runs on Client Computer
- read, write, verify files
- read, write ACLs, attributes
- make VSS snapshots
- checksum calculation
- compression/encryption
- run scripts
- Plugin interface (C++, Python)



Windows File Daemon



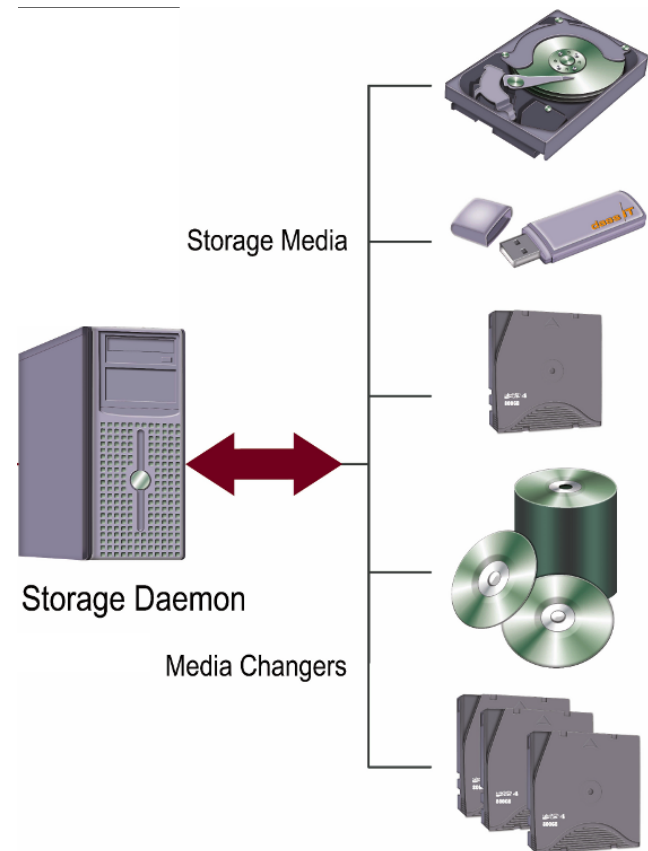
Unix File Daemon



Mac File Daemon

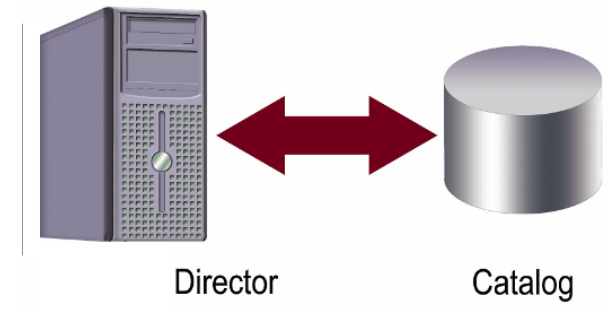
Storage Daemon

- device access (disk, tape, cloud)
- media changer control
- read barcodes labels
- Multiple Storage Daemons
 - run Migration and Copy Jobs on/to multiple locations
- handle media errors
- Plugin interface (C++, Python)



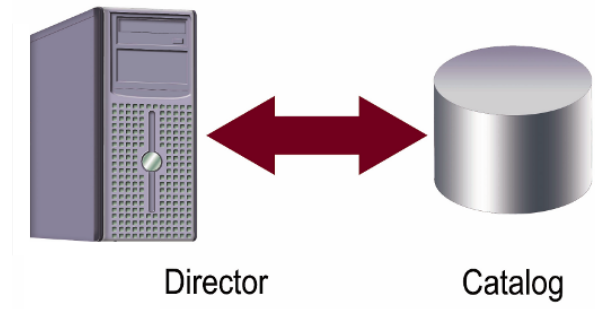
Catalog

- stores information about all files, media, jobs
- PostgreSQL/MySQL/SQLite



Director

- handles catalog
- media and pool handling
- scheduling
- trigger jobs
- backup level
- messages, statistics and reports
- run scripts
- Plugin interface (C++, Python)



Network Connectivity

- Normally:
 - Connection are only made when required.
 - Director connects to SD and FD.
 - Tells the SD that it will receive a connection from the FD soon.
 - Tells the FD to connect to the SD.
- Other options:
 - Passive Client:
 - Director tells SD to connect to FD
 - Client Initiated Connection:
 - FD connects to Director

Installation of Bareos

Installing a Bareos Server

1. Install the database of your choice
2. Add Bareos repository
3. Install Bareos packages, matching your database
4. Prepare the Bareos database table
 - /usr/lib/bareos/scripts/create_bareos_database
 - /usr/lib/bareos/scripts/make_bareos_tables
 - /usr/lib/bareos/scripts/grant_bareos_privileges
5. Start the daemons
 - => Running Backup Server for Self-Backups

Bareos Packages

- <http://download.bareos.org/bareos/release/latest/>
- **bareos**, bareos-bat, bareos-bconsole, bareos-client, bareos-common, bareos-database-common, bareos-database-mysql, **bareos-database-postgresql**, bareos-database-sqlite3, bareos-database-tools, bareos-director, bareos-director-python-plugin, **bareos-filedaemon**, bareos-filedaemon-ceph-plugin, bareos-filedaemon-glusterfs-plugin, bareos-filedaemon-ldap-python-plugin, bareos-filedaemon-python-plugin, bareos-storage, bareos-storage-ceph, bareos-storage-glusterfs, bareos-storage-python-plugin, bareos-storage-tape, bareos-tools, bareos-traymonitor, bareos-vadp-dumper, bareos-vmware-plugin, bareos-vmware-vix-disklib5, **bareos-webui**, libfastlz

Bareos Packages

Private instance of <http://openbuildservice.org/>

Bareos Build Service > Projects > bareos:bareos-16.2 > Status Monitor joergs | Home Project | Logout

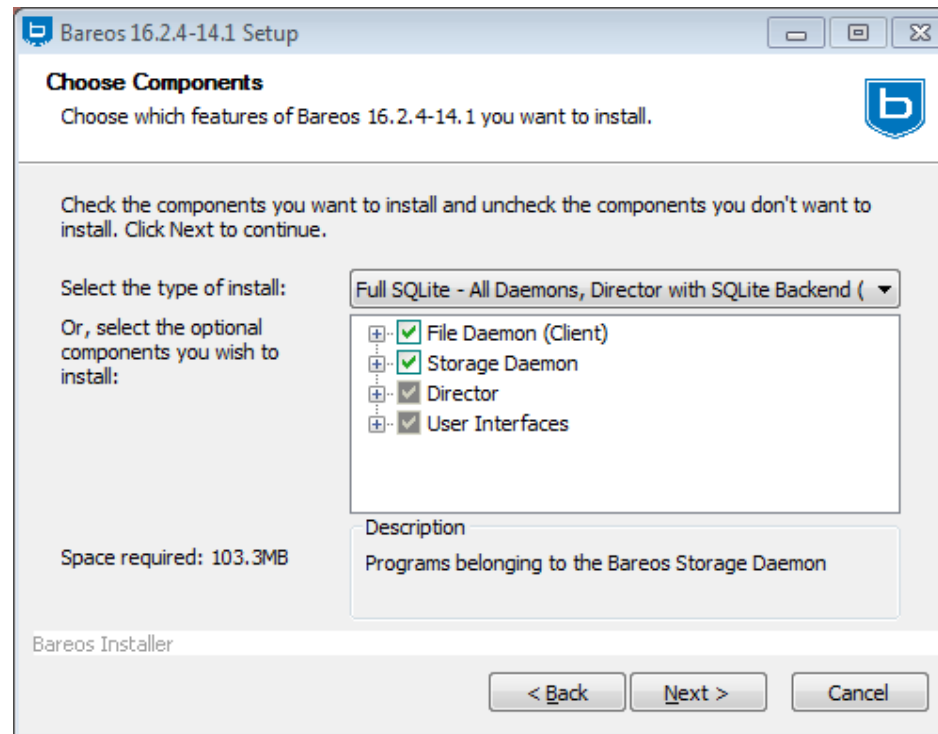
Overview Repositories **Monitor** Requests Users Subprojects Advanced

Filter: Status Packagename: Repository Architecture Last time results:

	CentOS_5		CentOS_6		CentOS_7	Debian_7.0		Debian_8.0		SLE_11_SP4		SLE_12_SP1	win_cross	xUbuntu_12.04		xUbuntu_14.04	
	i586	x86_64	i586	x86_64	x86_64	i586	x86_64	i586	x86_64	i586	x86_64	x86_64	x86_64	i586	x86_64	i586	x86_64
bareos	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded		succeeded	succeeded	succeeded	succeeded
bareos-docs									succeeded								
bareos-vadp-dumper					succeeded				succeeded		succeeded	succeeded					
bareos-vmware-plugin					succeeded				succeeded		succeeded	succeeded					
bareos-vmware-vix-disklib					succeeded				succeeded		succeeded	succeeded					
bareos-webui					succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded		succeeded	succeeded	succeeded	succeeded
libfastlz	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded		succeeded	succeeded	succeeded	succeeded
libjansson	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded		succeeded	succeeded	succeeded	succeeded
lzo	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded	succeeded		succeeded	succeeded	succeeded	succeeded
mingw-debugsrc													succeeded				
mingw32-winbareos													succeeded				
mingw64-winbareos													succeeded				
python-py											succeeded						
python-pyvmomi											succeeded	succeeded					
python-requests											succeeded						
python-six											succeeded						
winbareos-nsi													succeeded				
winbareos-opsi													succeeded				

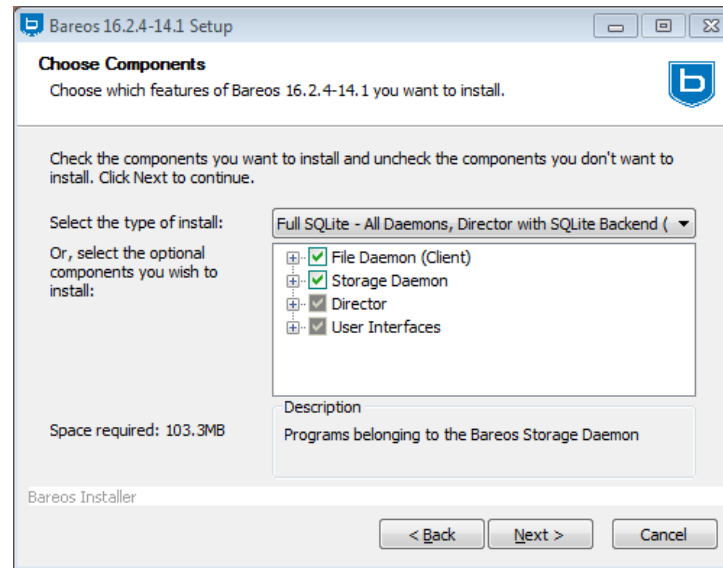
Windows

Windows installer:



- cross-compiled on Linux (<http://openbuildservice.org/>)
- configuration of the Windows Firewall
- silent install options / OPSI packages
- FD, SD and Director can be selected
- debug package also installs sourcecode

Windows Installation



- FD, SD and Director can be selected
- configuration of the Windows Firewall
- silent install options / OPSI packages
- debug package also installs sourcecode
- cross-compiled on Linux
 - <http://openbuildservice.org/>

Workflow

Workflow

bconsole: start job

```
admin@linux:~> bconsole
Connecting to Director bareos:9101
1000 OK: bareos-dir Version: 16.2.4 (01 July 2016)
Enter a period to cancel a command.
*
```

- Interactive Console to a Bareos Director
- TCP connection to the Director
- `help` will list the available commands

Start working

bconsole: start job

```
*run
A job name must be specified.
The defined Job resources are:
  1: backup-bareos-fd
  2: RestoreFiles
  3: CopyToTape
  4: BackupClient1
  5: BackupCatalog
Select Job resource (1-5): 4
```

Workflow

bconsole: start job

```
Run Backup job
JobName: BackupClient1
Level: Incremental
Client: bareos-fd
Format: Native
FileSet: Full Set
Pool: File (From Job resource)
Storage: File (From Job resource)
When: 2017-01-30 16:30:59
Priority: 10
OK to run? (yes/mod/no): yes
Job queued. JobId=3
You have messages.
*
```

Workflow

bconsole: job message

```
*messages
30-Jan 16:31 bareos-dir JobId 3: No prior Full backup Job record found.
30-Jan 16:31 bareos-dir JobId 3: No prior or suitable Full backup
  found in catalog. Doing FULL backup.
30-Jan 16:31 bareos-dir JobId 3: Start Backup JobId 3,
  Job=BackupClient1.2017-01-30_16.31.05_07
30-Jan 16:31 bareos-dir JobId 3: Using Device "FileStorage"
  to write.
30-Jan 16:31 bareos-sd JobId 3: Volume "File-0001" previously
  written, moving to end of data.
30-Jan 16:31 bareos-sd JobId 3: Ready to append to end of
  Volume "File-0001" size=32419543
30-Jan 16:31 bareos-sd JobId 3: Elapsed time=00:00:01, Transfer
  rate=32.38 M Bytes/second
30-Jan 16:31 bareos-dir JobId 3: Bareos bareos-dir 16.2.4 (01Jul16):
  Build OS:                x86_64-suse-linux-gnu suse
  openSUSE Leap 42.1 (x86_64)
  JobId:                    3
```

Workflow

bconsole: start job a second time

```
Run Backup job
JobName: BackupClient1
Level: Incremental
Client: bareos-fd
Format: Native
FileSet: Full Set
Pool: File (From Job resource)
Storage: File (From Job resource)
When: 2017-01-30 16:40:59
Priority: 10
OK to run? (yes/mod/no): yes
Job queued. JobId=4
You have messages.
*
```

Workflow

Bconsole job, second run: incremental

```
*messages
30-Jan 16:41 bareos-dir JobId 4: Start Backup JobId 4, Job=BackupClient1.2017
30-Jan 16:41 bareos-dir JobId 4: Using Device "FileStorage" to write.
30-Jan 16:41 bareos-sd JobId 4: Volume "File-0001" previously written, moving
30-Jan 16:41 bareos-sd JobId 4: Ready to append to end of Volume "File-0001"
30-Jan 16:41 bareos-sd JobId 4: Elapsed time=00:00:01, Transfer rate=0 Bytes
30-Jan 16:41 bareos-dir JobId 4: Bareos bareos-dir 16.2.4 (01Jul16):
  Build OS:          x86_64-suse-linux-gnu suse openSUSE Leap 42.1 (x86_
  JobId:             4
  Job:               BackupClient1.2017-01-30_16.41.45_08
  Backup Level:     Incremental, since=2017-01-30 16:31:08
  Client:           "bareos-fd" 16.2.4 (01Jul16) x86_64-suse-linux-gnu,
  FileSet:         "Full Set" 2017-01-30 16:29:42
  Pool:            "File" (From Job resource)
  Catalog:         "MyCatalog" (From Client resource)
  Storage:         "File" (From Job resource)
  Scheduled time:  30-Jan-2017 16:41:42
  Start time:     30-Jan-2017 16:41:47
```

Workflow

Webui: run

Jobs | localhost-dir - Mozilla Firefox

Bareos Appliance x Jobs | localhost-dir x

localhost/bareos-webui/job/actions/ Search

Dashboard Jobs Restore Clients Schedules Storages Director localhost-dir admin

Show Actions

Job Actions

Show 25 entries Search:

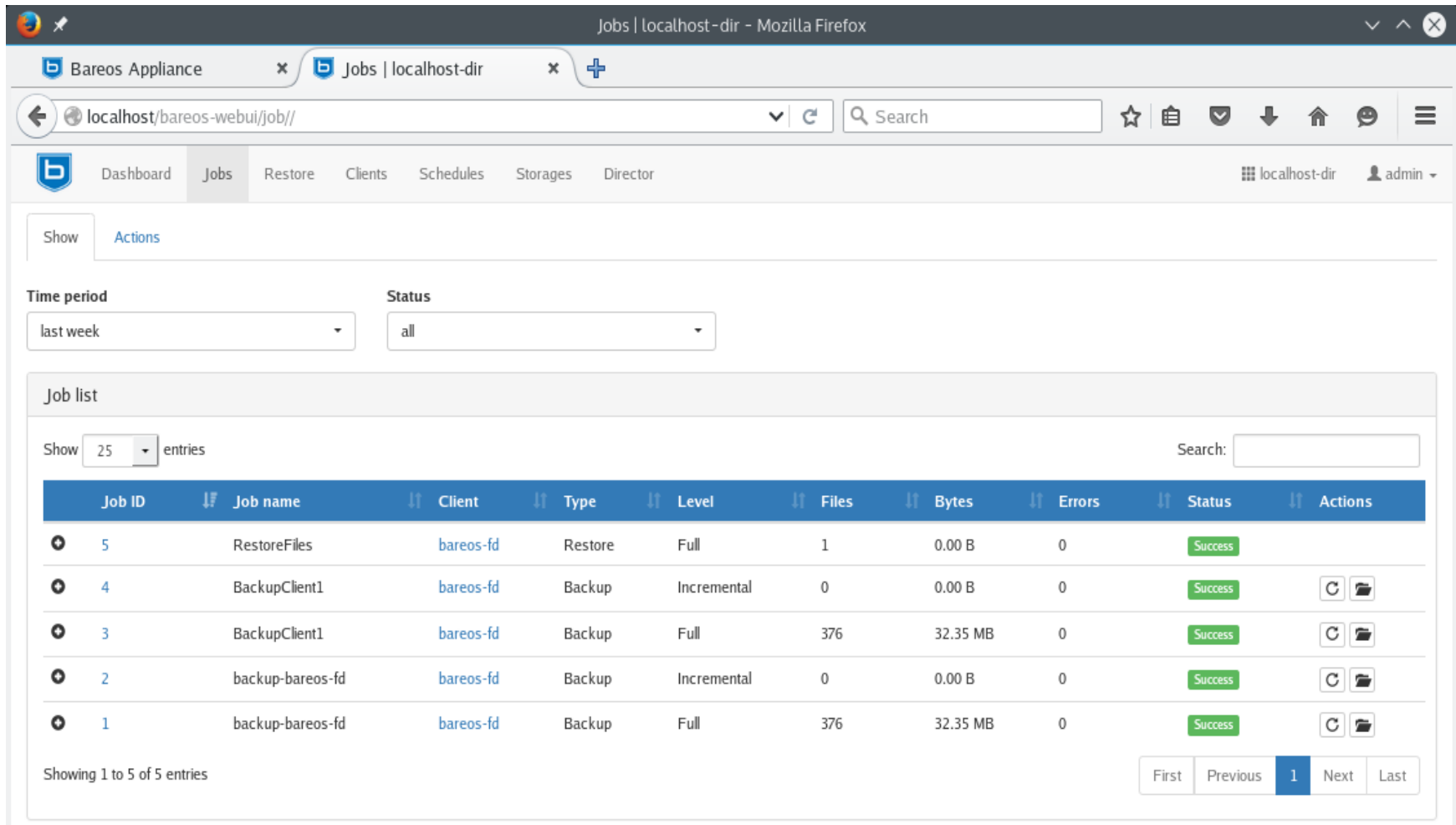
Job name	Status	Actions
backup-bareos-fd	Enabled	▶ ✕
BackupCatalog	Enabled	▶ ✕
BackupClient1	Enabled	▶ ✕
CopyToTape	Enabled	▶ ✕

Showing 1 to 4 of 4 entries

First Previous 1 Next Last

Workflow

Webui: list jobs











The screenshot shows the Bareos Appliance web interface in a Mozilla Firefox browser. The page title is "Jobs | localhost-dir". The browser address bar shows "localhost/bareos-webui/job//". The navigation menu includes "Dashboard", "Jobs", "Restore", "Clients", "Schedules", "Storages", and "Director". The "Jobs" tab is active. Below the navigation, there are filters for "Time period" (set to "last week") and "Status" (set to "all"). The main content area is titled "Job list" and shows a table of jobs. The table has columns for Job ID, Job name, Client, Type, Level, Files, Bytes, Errors, Status, and Actions. There are 5 entries listed, all with a "Success" status. The first entry (Job ID 5) is a "RestoreFiles" job. The other four entries (Job IDs 4, 3, 2, 1) are "Backup" jobs. The "Showing 1 to 5 of 5 entries" text is visible at the bottom left, and a pagination control at the bottom right shows "1" as the current page.

Time period: last week
Status: all

Job list

Show 25 entries Search:

Job ID	Job name	Client	Type	Level	Files	Bytes	Errors	Status	Actions
5	RestoreFiles	bareos-fd	Restore	Full	1	0.00 B	0	Success	
4	BackupClient1	bareos-fd	Backup	Incremental	0	0.00 B	0	Success	 
3	BackupClient1	bareos-fd	Backup	Full	376	32.35 MB	0	Success	 
2	backup-bareos-fd	bareos-fd	Backup	Incremental	0	0.00 B	0	Success	 
1	backup-bareos-fd	bareos-fd	Backup	Full	376	32.35 MB	0	Success	 

Showing 1 to 5 of 5 entries

First Previous 1 Next Last

Workflow

Webui: list joblog

The screenshot shows the Bareos web interface in a Mozilla Firefox browser. The page title is "Job details | localhost-dir". The breadcrumb navigation shows "Dashboard > Jobs > Restore > Clients > Schedules > Storages > Director". The user is logged in as "admin".

The main content area displays a table of job log entries. The table has two columns: "Timestamp" and "Message".

Timestamp	Message
2017-01-30 17:20:45	bareos-sd JobId 5: Ready to read from volume "File-0001" on device "FileStorage" (/var/lib/bareos/storage).
2017-01-30 17:20:45	bareos-sd JobId 5: Forward spacing Volume "File-0001" to file:block 0:32419543.
2017-01-30 17:20:45	bareos-dir JobId 5: Bareos bareos-dir 16.2.4 (01Jul16): Build OS: x86_64-suse-linux-gnu suse openSUSE Leap 42.1 (x86_64) JobId: 5 Job: RestoreFiles.2017-01-30_17.20.42_39 Restore Client: bareos-fd Start time: 30-Jan-2017 17:20:44 End time: 30-Jan-2017 17:20:45 Elapsed time: 1 sec Files Expected: 1 Files Restored: 1 Bytes Restored: 0 Rate: 0.0 KB/s FD Errors: 0 FD termination status: OK SD termination status: OK Termination: Restore OK
2017-01-30 17:20:44	bareos-dir JobId 5: Start Restore Job RestoreFiles.2017-01-30_17.20.42_39
2017-01-30 17:20:44	bareos-dir JobId 5: Using Device "FileStorage" to read.

Showing 1 to 5 of 5 entries

Navigation buttons: First, Previous, 1, Next, Last

Workflow

Webui: restore

The screenshot shows the Bareos Appliance web interface in Mozilla Firefox. The browser address bar shows `localhost/bareos-webui/restore/`. The navigation menu includes Dashboard, Jobs, Restore, Clients, Schedules, Storages, and Director. The user is logged in as 'admin' on the 'localhost-dir' server.

Client: bareos-fd

Backup jobs: (4) 2017-01-30 16:41:47 - BackupClient1 - Inc

Merge all client filesets: Yes

Merge all related jobs to last full backup of selected backup job: Yes

Restore to client: bareos-fd

Restore job: RestoreFiles

Replace files on client: never

Restore location on client: /tmp/bareos-restores/

File selection table:

Name	Size	Date
/	0.00 B	1970-01-01 01:00:00
usr/	0.00 B	1970-01-01 01:00:00
usr/sbin/	12.29 KB	2016-11-16 20:47:51
Check	190 B	2014-09-11 11:42:48
NetworkManager	1.87 MB	2015-10-25 13:31:46
VBoxService	773.12 KB	2015-10-29 20:18:09
a2disflag	8 B	2016-11-16 20:47:13
a2dismod	7 B	2016-11-16 20:47:13
a2enflag	1.29 KB	2015-10-22 11:24:41
a2enmod	1.67 KB	2015-10-22 11:24:41
accessdb	10.82 KB	2015-10-25 14:18:33
addgnupghome	3.13 KB	2015-09-11 10:19:05
addpart	18.8 KB	2015-10-25 06:48:52
agetty	39.9 KB	2015-10-25 06:48:52
apache2-systemd-ask-pass	79 B	2015-10-22 11:24:41
apache2ctl	9 B	2016-11-16 20:47:13
apachectl	3.55 KB	2015-10-22 11:21:52
applygnupgdefaults	2.26 KB	2015-09-11 10:19:05
arpaname	6.34 KB	2015-10-25 13:37:15
arpd	47.95 KB	2015-10-01 07:04:48
arping	22.57 KB	2015-10-25 11:47:41
azureMetaData	13 B	2016-11-16 20:45:59
azuremetadata	5.19 KB	2016-07-04 11:15:09
badblocks	27.23 KB	2015-09-11 10:11:43
bareos-dbcheck	149.24 KB	2016-10-17 18:04:41

Restore: [Restore]

Bareos Configuration

Bareos Configuration

- Configuration is done in config files
- Each daemon has its own config directory
- usually in ***/etc/bareos/[daemon].d/[resource]/*.conf***
 - */etc/bareos/bareos-dir.d/*
 - */etc/bareos/bareos-sd.d/*
 - */etc/bareos/bareos-fd.d/*
- bconsole:
 - */etc/bareos/bconsole.conf*

FileSet: Definition what to backup

```
FileSet {
  Name = "LinuxAll"
  Include {
    Options {
      Signature = MD5
      One FS = No
      FS Type = btrfs
      FS Type = ext4
      FS Type = zfs
    }
    File = /
  }
  Exclude {
    File = /tmp
  }
}
```

FileSet: let client decide, what to backup

```
FileSet {  
  Name = "LinuxClientDefinedList"  
  Include {  
    Options {  
      Signature = MD5  
    }  
    File = "\\X/etc/bareos/backup-paths.list"  
  }  
}
```

\\X => \\< file_path

/etc/bareos/backup-paths.list:

```
/home/adam  
/home/eva
```

Schedule: Definition when to run a backup

```
Schedule {  
  Name = "WeeklyCycle"  
  Run = Full 1st sun at 23:05  
  Run = Differential 2nd-5th sun at 23:05  
  Run = Incremental mon-sat at 23:05  
}
```


Client: Definition of a Client

```
Client {  
  Name = bareos-fd  
  Address = 192.168.0.1  
  Password = "lecCqzgBjxgM0J3+1adiuLzhy0cPGIHrdYMdtGHMbvKX"  
}
```

Job: Definition of a Job

- combines the other resources to a runnable backup job

```
Job {
  Name = "backup-bareos-fd"           # name of this resource
  Client = "bareos-fd"               # what client to backup?
  FileSet = "LinuxAll"               # which files to backup?
  Schedule = "WeeklyCycle"           # when to backup?
  Storage = "File"                   # where to backup?
  Messages = "Standard"              # where to send messages?
  Full Backup Pool = "Full"           # write Full Backups into "Full" Pool
  Differential Backup Pool = "Differential" # write Diff Backups into "Differential"
  Incremental Backup Pool = "Incremental" # write Incr Backups into "Incremental"
  [...]
}
```

Pool: Full

```
Pool {  
  Name = Full  
  Pool Type = Backup  
  Recycle = yes # Bareos can automatically recycle Volumes  
  AutoPrune = yes # Prune expired volumes  
  Volume Retention = 365 days # How long should the Full Backups be kept  
  Maximum Volume Bytes = 50G # Limit Volume size to something reasonable  
  Maximum Volumes = 100 # Limit number of Volumes in Pool  
  Label Format = "Full-" # Volumes will be labeled  
}
```

Pool: Incremental

```
Pool {  
  Name = Incremental  
  Pool Type = Backup  
  Recycle = yes # Bareos can automatically recycle Volumes  
  AutoPrune = yes # Prune expired volumes  
  Volume Retention = 30 days # How long should the Incremental Backup be retained  
  Maximum Volume Bytes = 1G # Limit Volume size to something reasonable  
  Maximum Volumes = 100 # Limit number of Volumes in Pool  
  Label Format = "Incremental-" # Volumes will be labeled  
}
```

Add A Client

- bareos < 16.2: manually
- bareos >= 16.2:
 - client: install bareos-filedaemon
 - server: "configure add client"
 - server: copy generated client configuration to client
 - client: restart bareos-filedaemon

Add A Client

- Client:
 - add Bareos repository
 - install the package bareos-filedaemon
- Server:

```
linux# bconsole
*configure add client name=client2-fd address=192.168.0.2 password=secret
Created resource config file "/etc/bareos/bareos-dir.d/client/client2-fd.conf"
```

- creates
 - /etc/bareos/bareos-dir.d/client/client2-fd.conf
 - /etc/bareos/bareos-dir-export/client/client2-fd/bareos-fd.d/director/bareos-dir.conf
- copy filedaemon configuration to client

```
linux# scp /etc/bareos/bareos-dir-export/client/client2-fd/bareos-fd.d/director/
dir.conf root@client2.example.com:/etc/bareos/bareos-fd.d/director/
```

- Client: restart bareos-filedaemon

Add A Client: Verify

```
*status client=client2-fd
Connecting to Client client2-fd at 192.168.0.2:9102
...

*estimate listing job=BackupClient1 client=client2-fd
Connecting to Client client2-fd at 192.168.0.2:9102
lrwxrwxrwx  1 root    root      7 2016-09-28 23:14:12 /usr/sbin/a
lrwxrwxrwx  1 root    root      7 2016-09-28 23:14:12 /usr/sbin/a
...
```

Add A Job

```
*configure add job name=backup-client2-fd client=client2-fd jobdefs=DefaultJob
Created resource config file "/etc/bareos/bareos-dir.d/job/client2-job.conf"

*status schedule job=backup-client2-fd days=3
...
Date                Schedule                Overrides
=====
Thu 02-Feb-2017 21:00 WeeklyCycle                Level=Incremental
Fri 03-Feb-2017 21:00 WeeklyCycle                Level=Incremental
Sat 04-Feb-2017 21:00 WeeklyCycle                Level=Full
...

*run job=client2-job
Job queued. JobId=256

*wait jobid=256
JobId=256
JobStatus=OK (T)
```


Plugin: Backup using Pipes

- uses a pipe to backup a service
- backup as a virtual file

```
FileSet {
  Name = "postgresql-all"
  Include {
    Options {
      signature = MD5
      compression = gzip
    }
    Plugin = "bpipe:file=/POSTGRESQL/dump.sql:reader=pg_dumpall -U postgres:w"
  }
}
```

Plugin: MySQL / MariaDB

- uses Percona xtrabackup
- Incremental backups (for INNODB tables)
- Hotbackup
- Point-In-Time Recovery

```
FileSet {  
  ...  
  
  Plugin = "python:module_path=/usr/lib64/bareos/plugins:module_name=bareos-fd-  
  ...  
}
```

Plugin: VMware

- VMware Vstorage API support
 - allows backup of VMware virtual machines
 - supports Changed Block Tracking (Incremental backups)
 - only used/changed blocks are backed up/restored

```
FileSet {  
  ...  
  
  Plugin = "python:module_path=/usr/lib64/bareos/plugins/vmware_plugin:module_n  
  ...  
}
```

NDMP support

- Storage systems often provide a NDMP backup interface
 - NetApp, Isilon, ...
- Bareos support NDMP
 - Full and Incremental backups
 - Single File restore

Volume access by native tools

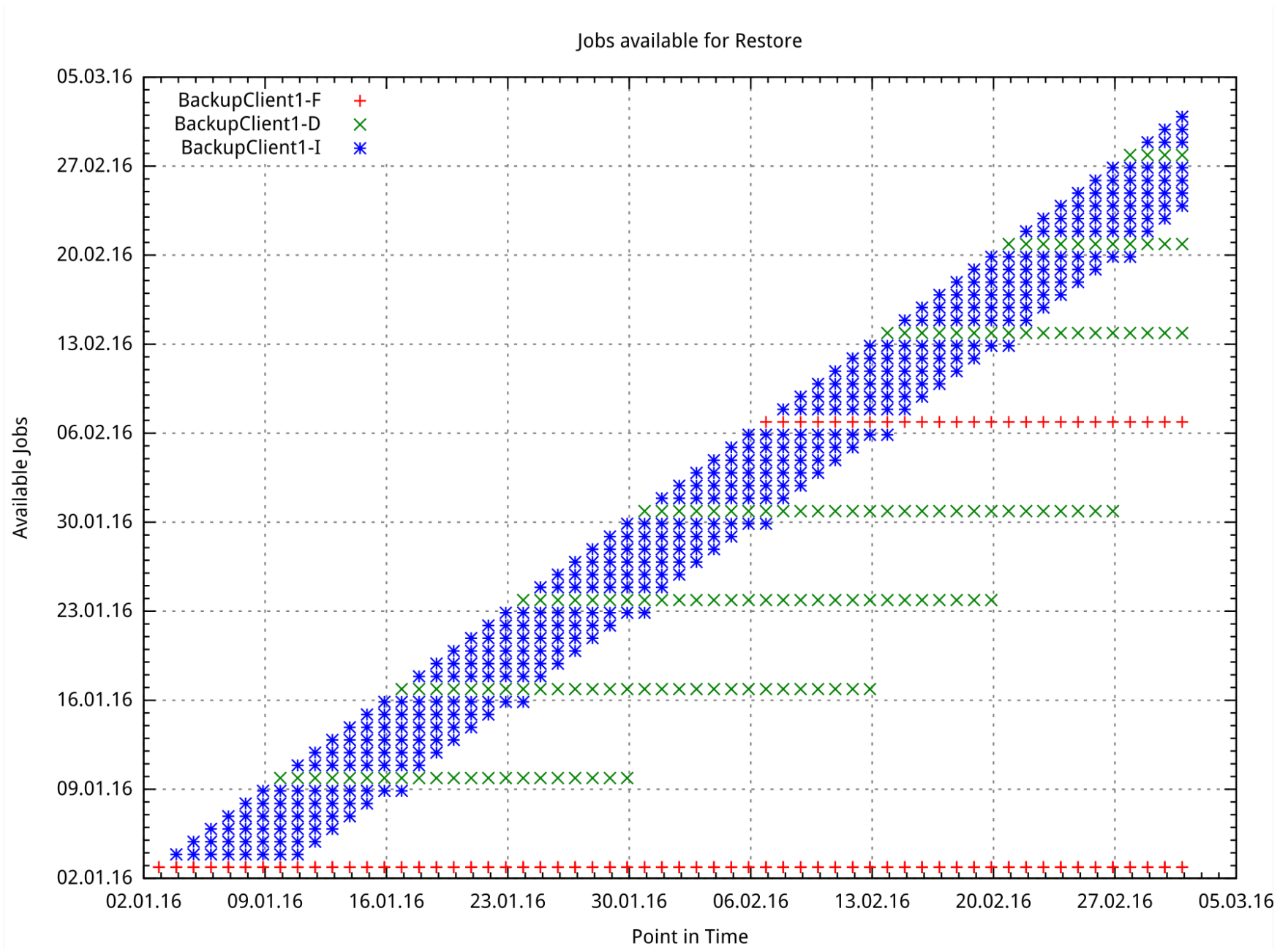
- Access backup data without running Bareos Daemons
- command line tools:
 - bls, bextract, bcopy, bscan, bcrypto

In depth: Always Incremental Backup Scheme

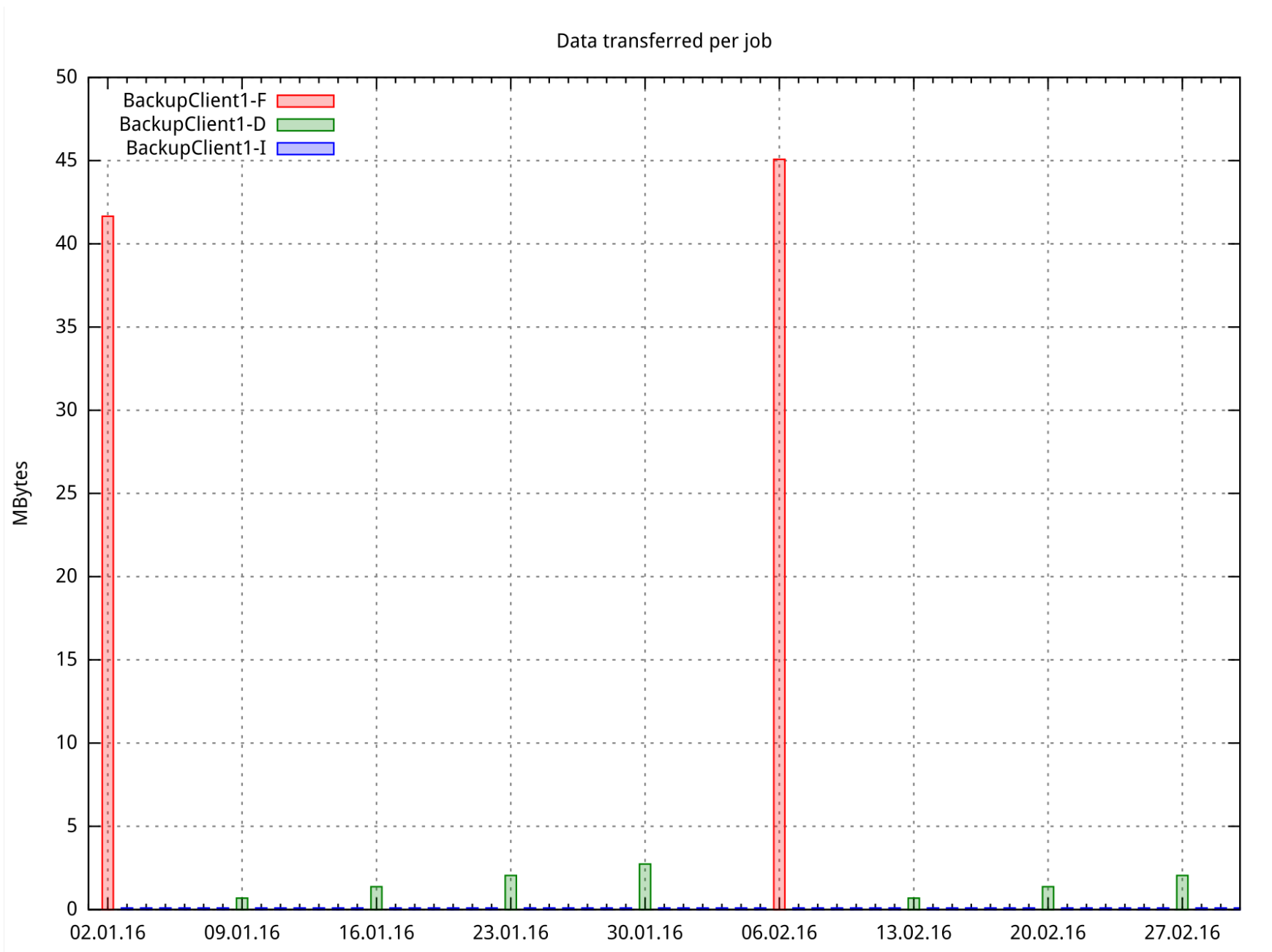
Conventional backup scheme

1. daily incremental backups kept for one week
2. weekly differential backups kept for three weeks
3. monthly full backups kept for half year

Job availability for conventional backup scheme



Data being moved in conventional backup scheme



Problems with conventional backup scheme

1. Full data is copied over the network in regular intervals
2. Identical Data is copied from client multiple times
3. Job history loss caused by retention expiry

always incremental backup scheme

- Basic concept
 - Only changes are copied from the clients - always incremental
 - Existing data from the client is consolidated with the new incremental information (keep history)
 - The consolidation happens without client interaction
 - Minimized number of incrementals is kept to have a defined change history

Two main tasks:

1. Incremental backup job is run every night during the backup window
2. Consolidation job consolidates during the day

How to configure always incremental Backup Job

```
Job {  
  Name = BackupClient1  
  ...  
  Accurate = yes  
  Always Incremental = yes  
  Always Incremental Job Retention = 7 days  
}
```

Consolidation Job

```
Job {  
  Name = "Consolidate"  
  Type = Consolidate  
}
```

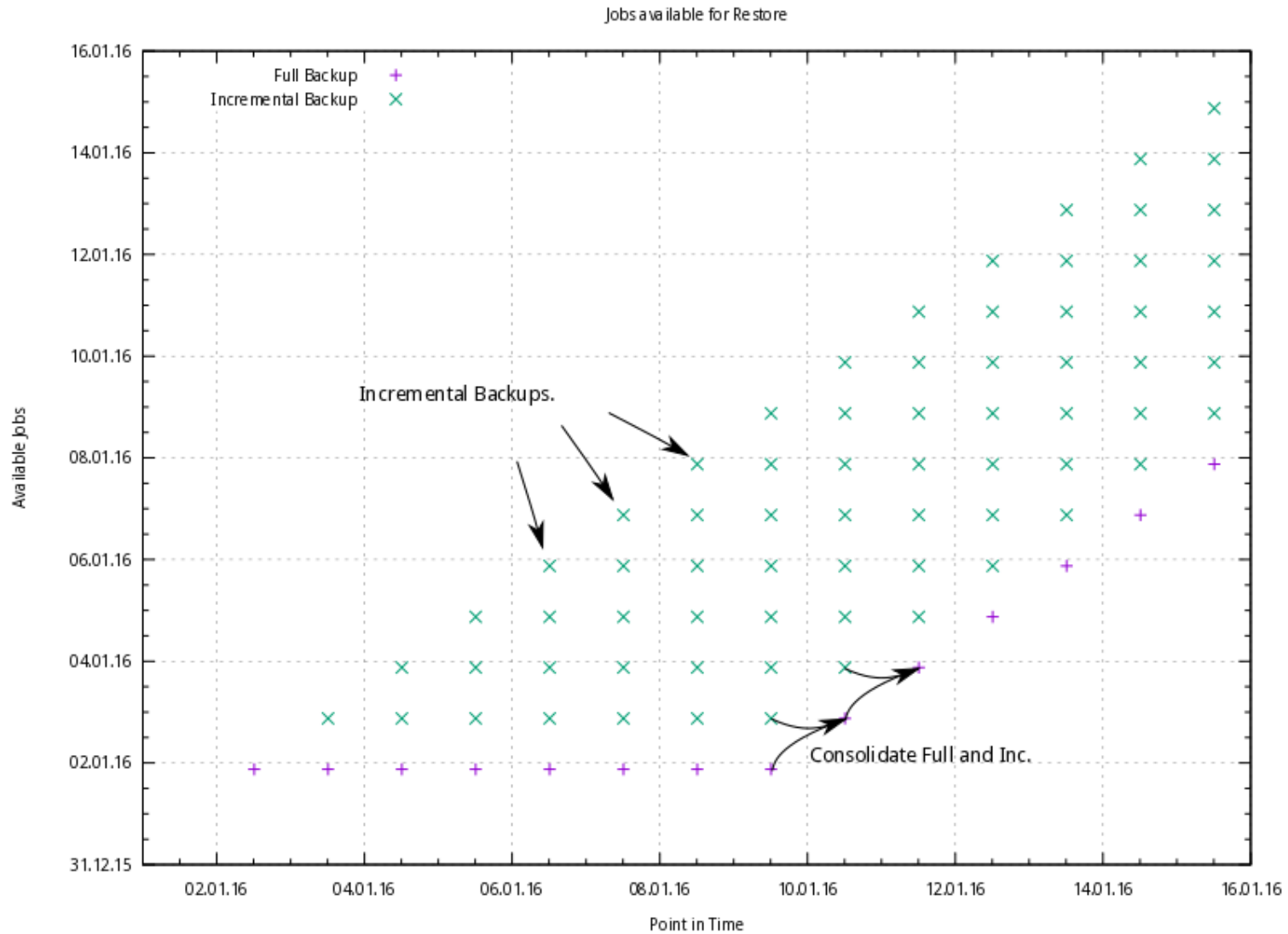
The Backup Job

- runs an incremental backup during the backup window
- *Always Incremental* directives configure behaviour
- *Accurate Backup* to notice file deletion

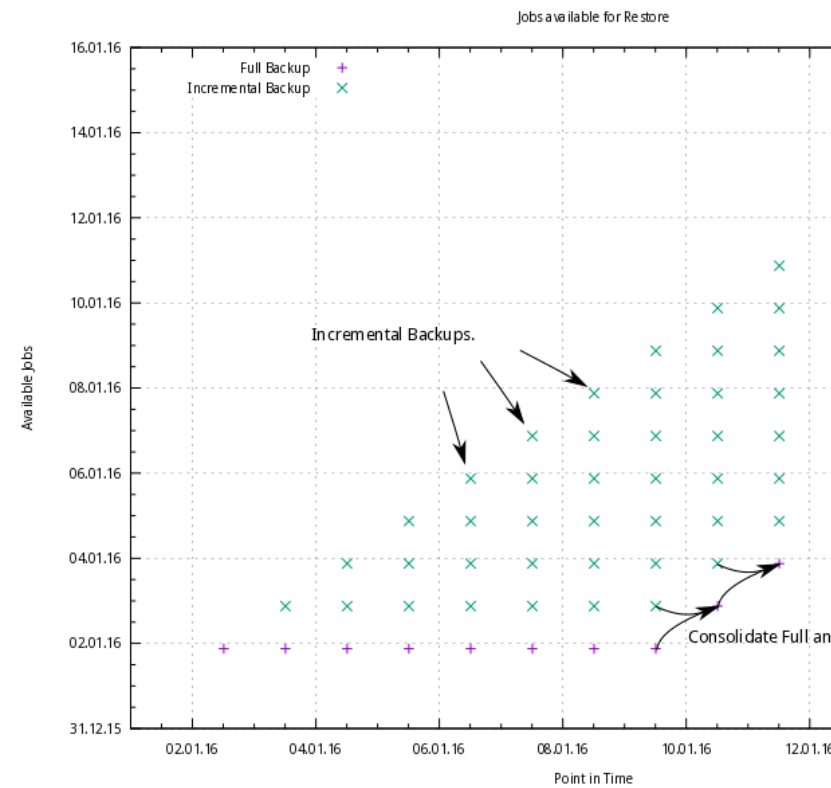
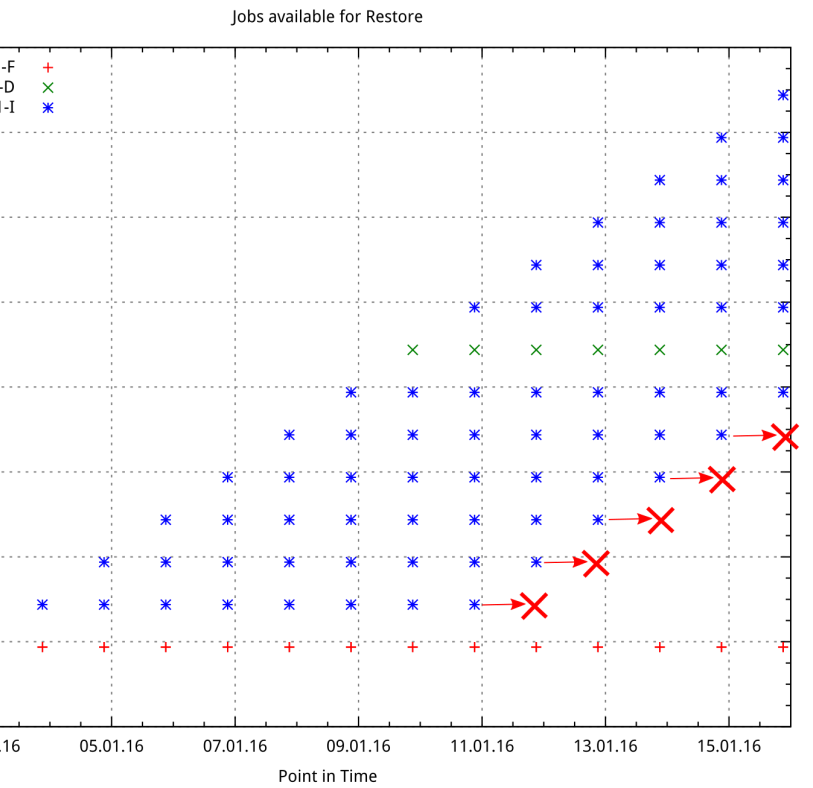
The Consolidation Job

- Loops over all Backup Jobs
- Starts virtual backups according to Always Incremental settings

Job availability with always incremental backup scheme



Job availability compared



Always Incremental Jobdata



Always Incremental Jobdata - Problem

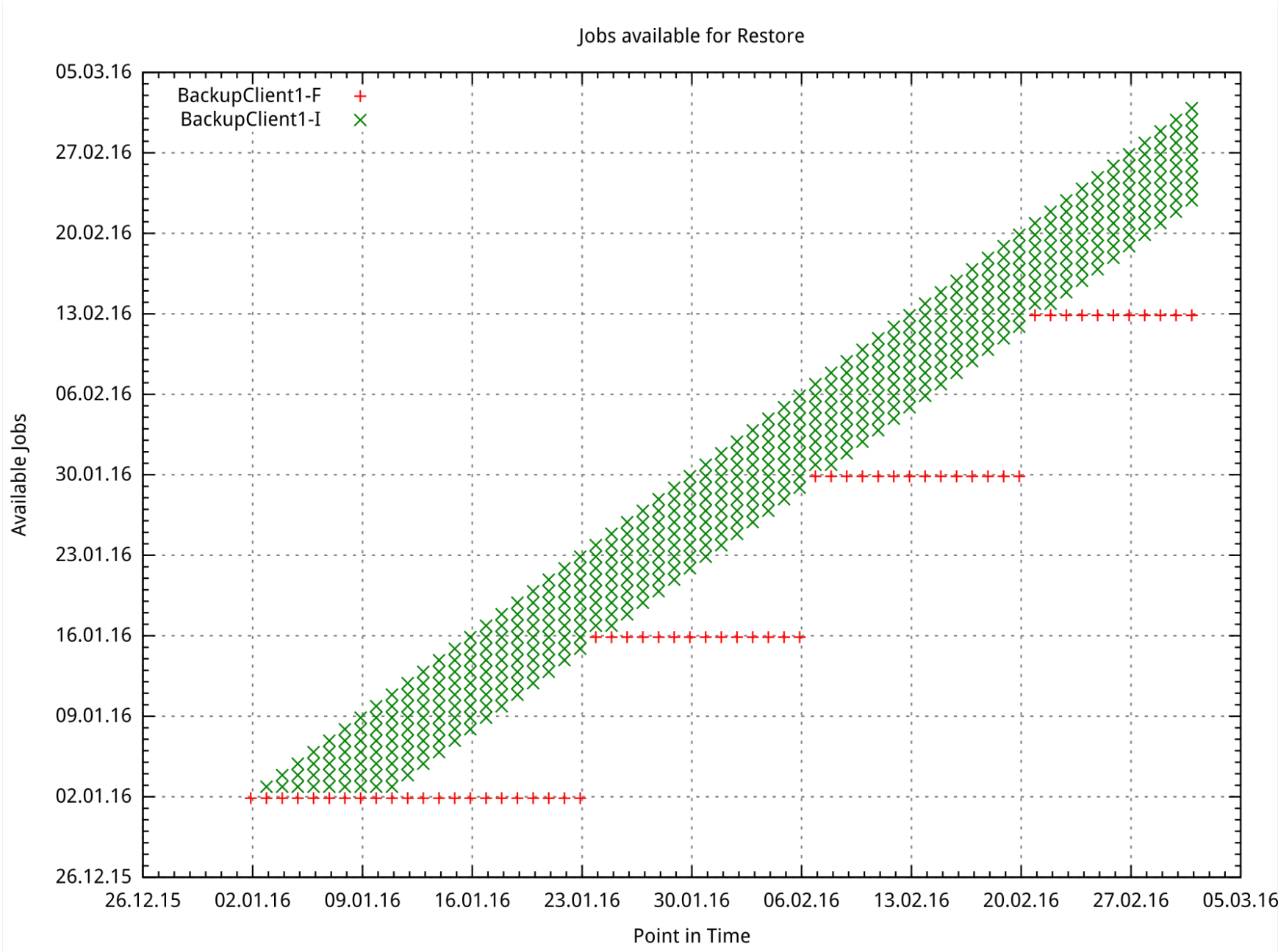
- good: minimal data from the client
- bad: every day the consolidation runs the whole client data is moved during consolidation
- impossible for a large number of clients

Always Incremental Jobdata - Solution

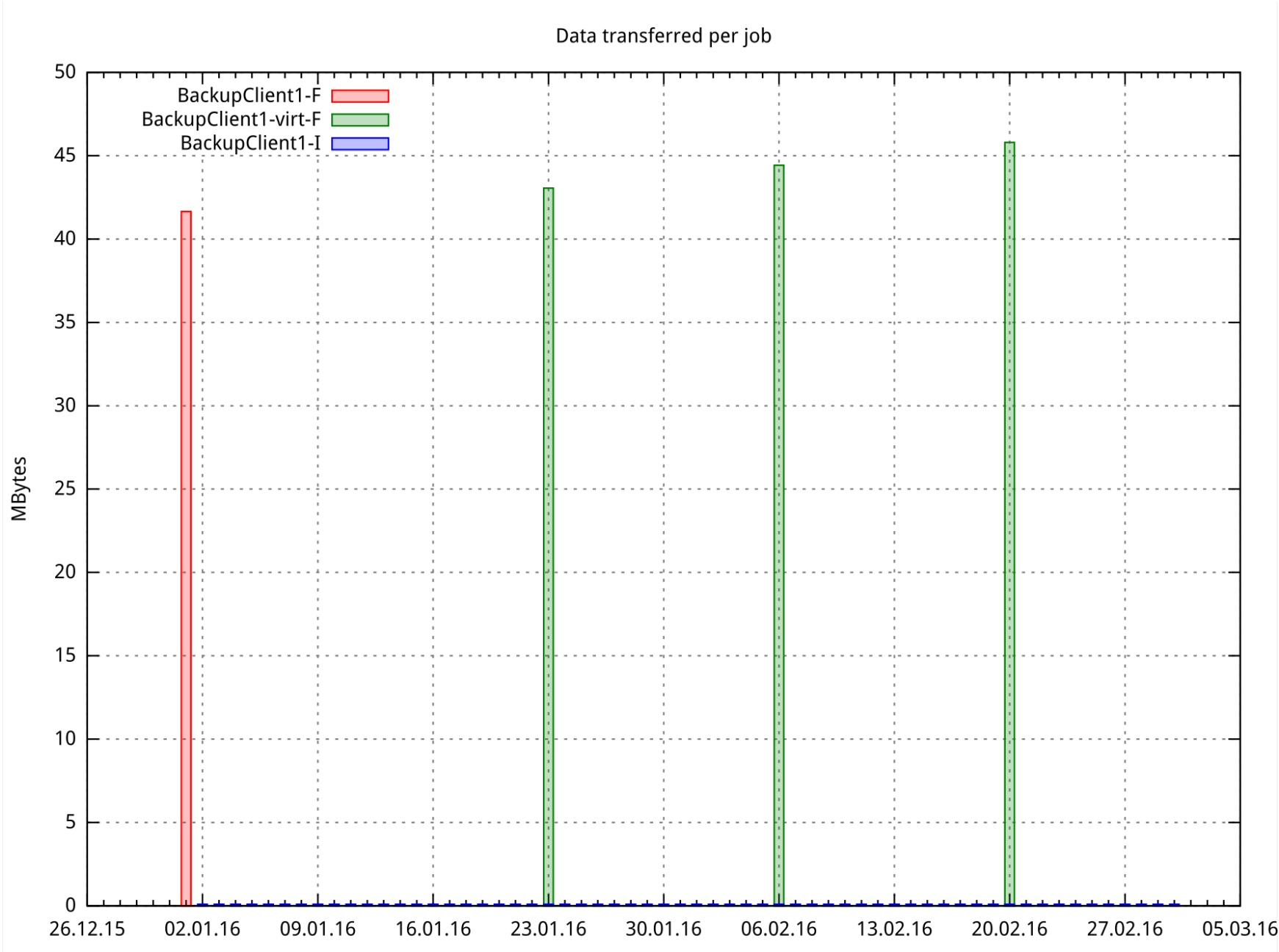
- only consolidate latest incremental during consolidation
- leave the full backup as it is during daily consolidations
- consolidate the full in longer intervals

```
Job {  
  Always Incremental Max Full Age = 21 days  
}
```

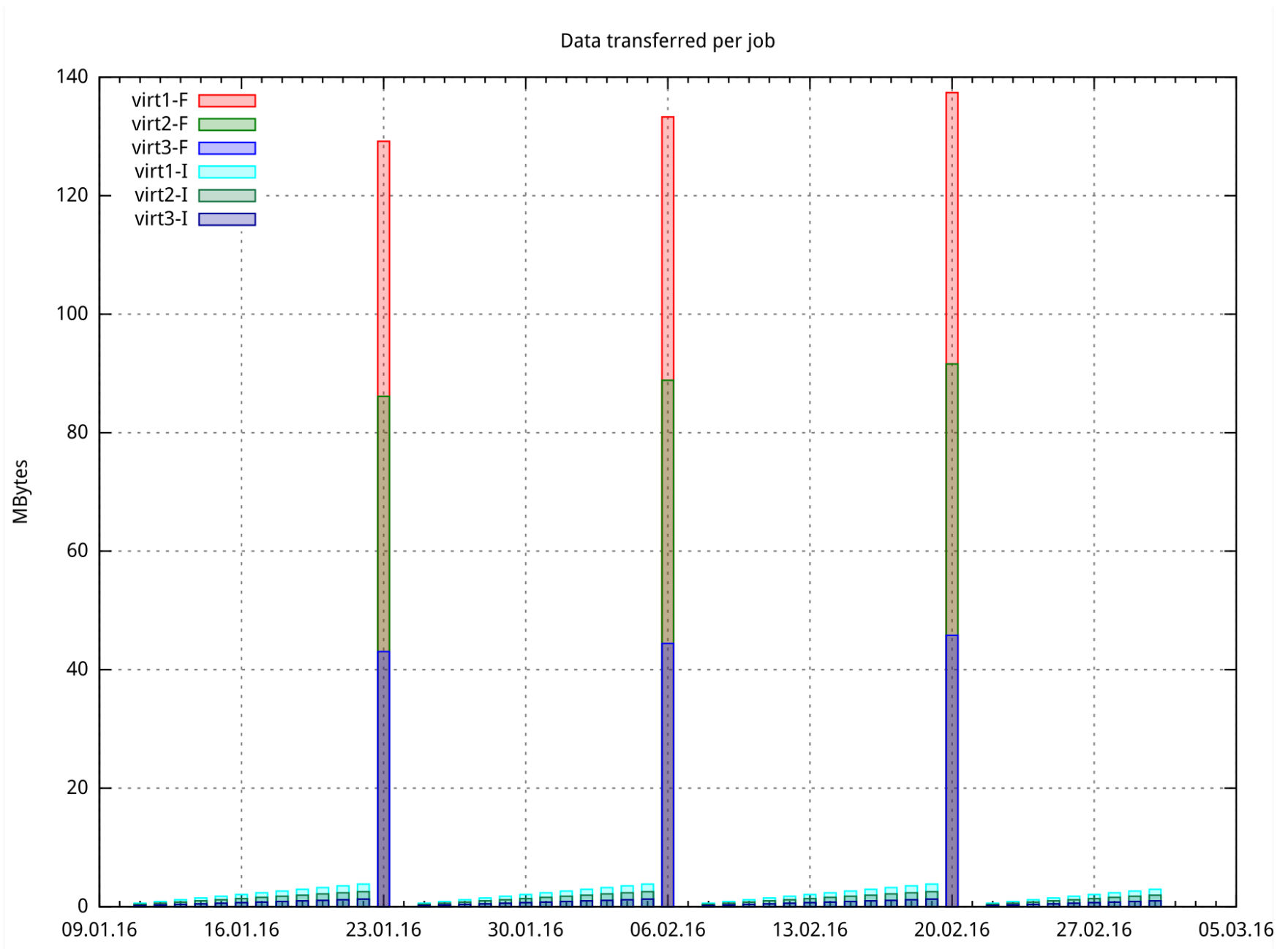
Always Incremental Max Full Age = 21 days



Always Incremental Max Full Age = 21 days



Always Incremental Max Full Age with multiple clients



Always Incremental Max Full Age with multiple clients and
Max Full Consolidations

Always Incremental configuration overview

Backup Job

```
Job {  
  Always Incremental = yes # enabled?  
  Always Incremental Job Retention = 7 days # how long is the job history?  
  Always Incremental Keep Number = 7 # guaranteed number of incs left?  
  Always Incremental Max Full Age = 21 days # if full is older it will be  
                                             # part of the consolidation  
}
```

Consolidation Job

```
Job {  
  Name = "Consolidate"  
  Type = Consolidate  
  Max Full Consolidations = 1 # how many consolidation jobs  
                             # with full included can be started  
}
```

Always Incremental summary

- Only incremental Backups are done from the client
 - Minimal network load
 - Minimal backup time
 - In backup window

Always Incremental summary

- Consolidation is done locally on storage
 - Outside of backup window
 - Very fast as local
 - Existing backups are consolidated into new backups
 - No holes in the backup history
- Defined incremental backup history is always available
- Adequate for File Backup, NOT for plugin Backups

ACL support

- Full multi-tenancy support
- Definitions of rules and roles
- Users can only access and see data according to role access
- Prerequisite for WebUI as self-service-portal for restore

Console ACL configuration

```
Console {  
  Name = user1  
  Password = secret  
  Command ACL = !delete, *all*  
  Catalog ACL = MyCatalog  
  Client ACL = client1-fd, client2-fd  
  FileSet ACL = Linux.*  
  Job ACL = backup-client1, restore-client1, backup-client2  
  Plugin Options ACL = *all*  
  Pool ACL = *all*  
  Schedule ACL = *all*  
  Storage ACL = *all*  
  Where ACL = *all*  
}
```

Console ACL Profiles

```
Profile {
  Name = "webui-admin"
  CommandACL = !.bvfs_clear_cache, !.exit, !.sql
  CommandACL = !configure, !create, !delete, !purge, !prune, !sqlquery, !umou
  CommandACL = *all*
  Job ACL = *all*
  Schedule ACL = *all*
  Catalog ACL = *all*
  Pool ACL = *all*
  Storage ACL = *all*
  Client ACL = *all*
  FileSet ACL = *all*
  Where ACL = *all*
}
```

```
Console {
  Name = user2
  Password = secret
  Profile = "webui-admin"
}
```

Roadmap for Bareos 17.2

- PAM authentication
 - external contribution
 - modification of network handshaking required
 - need carefull testing
- Database performance enhancements
 - filename table denormalization
 - already implemented (customer specific build). Gets integrated as soon as migration process is done.
- python-bareos
 - from bareos-contrib to bareos-core

Roadmap for Bareos 17.2: NDMP

- current status:
 - NDMP backups to Bareos Storage Daemon
 - NDMP Single File restore (thanks to Uni Jena)
- development:
 - NDMP: Backup to storage attached tape-libraries
 - NDMP: Direct Access Restore