

Backup of VMware Snapshots with Bareos



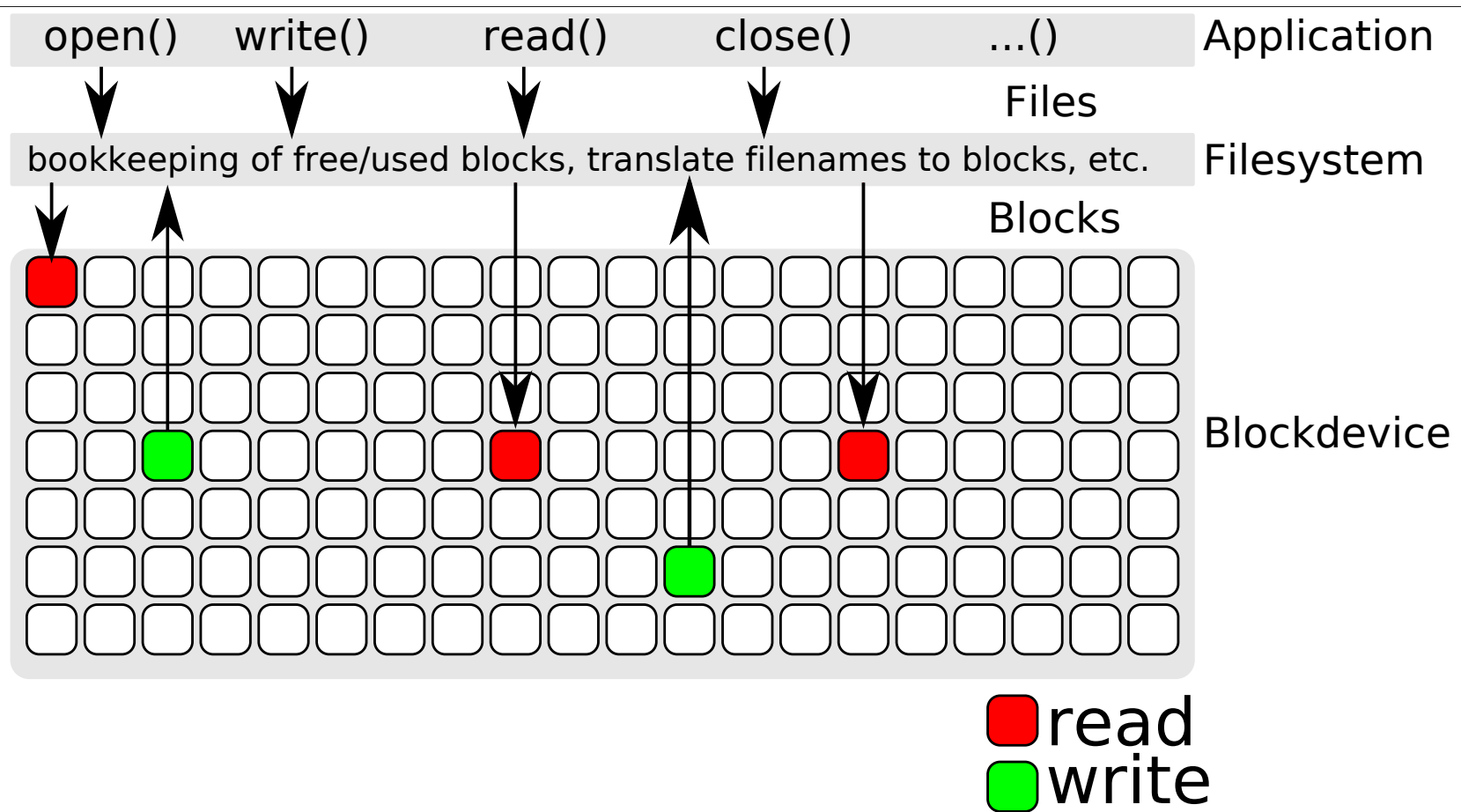
The key technology is Changed Block Tracking.

What have blocks to do with my Backup?

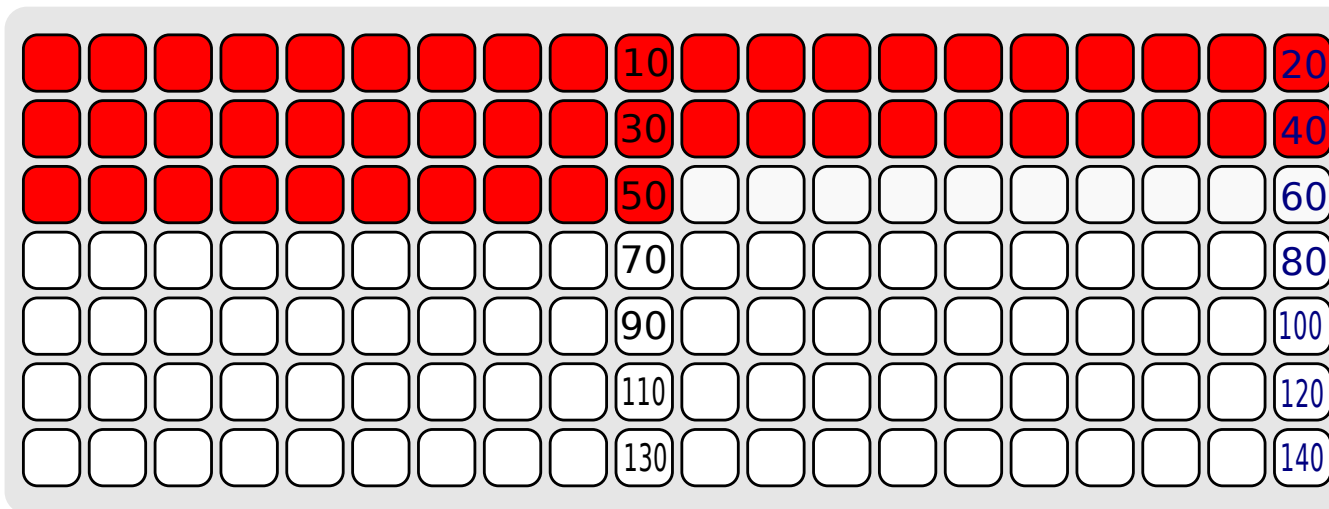
I want to backup files!

filesystem

filesystem translates between files and blocks



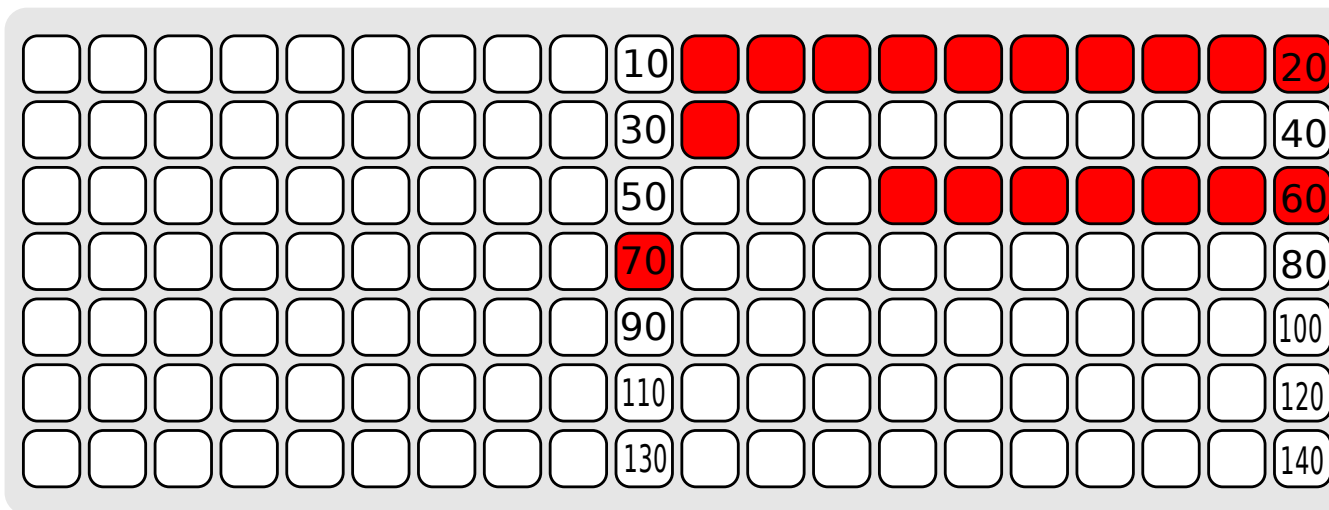
Day one



changed blocks:
1-50

blocks changed
 unchanged

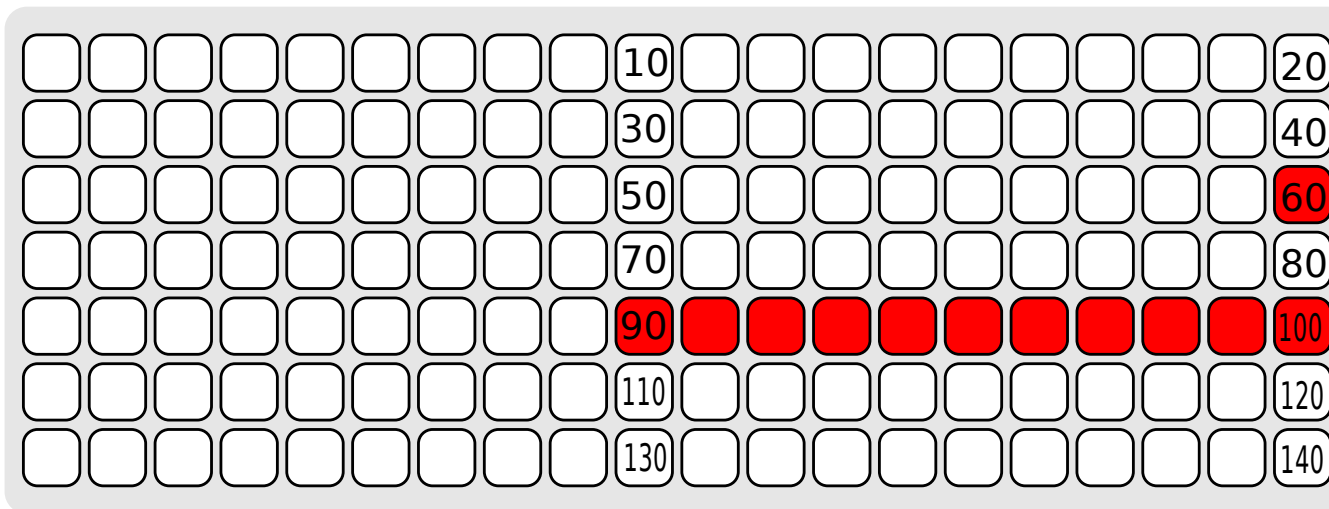
Day two



changed blocks:
11-20
31
54-60
70

blocks ■ changed
 unchanged

Day three



changed blocks:

60
90-100

blocks changed
 unchanged

Blocks backed up

- Day 1: Blocks 1-50
- Day 2: Blocks 11-20, 31, 54-60, 70
- Day 3: Blocks 60, 90-100

Restore of Backup

- Day 1: Blocks 1-50
- Day 2: Blocks 11-20, 31, 54-60, 70
- Day 3: Blocks 60, 90-100
- restore order must match backup order

Changed Block Backup - advantages

- OS-independent
- no backup of never used blocks
- only backup blocks that have changed
- full, inc and diff possible
- much faster as no timestamps have to be checked

How to do CBT in VMware:

Two different APIs are needed to be able to do CBT Backups:

- vSphere API
 - needed to manage vSphere Infrastructure
- VMware vSphere Storage APIs – Data Protection (VADP)
 - needed to do the data transfer itself

excursion: Bareos Python plugin API

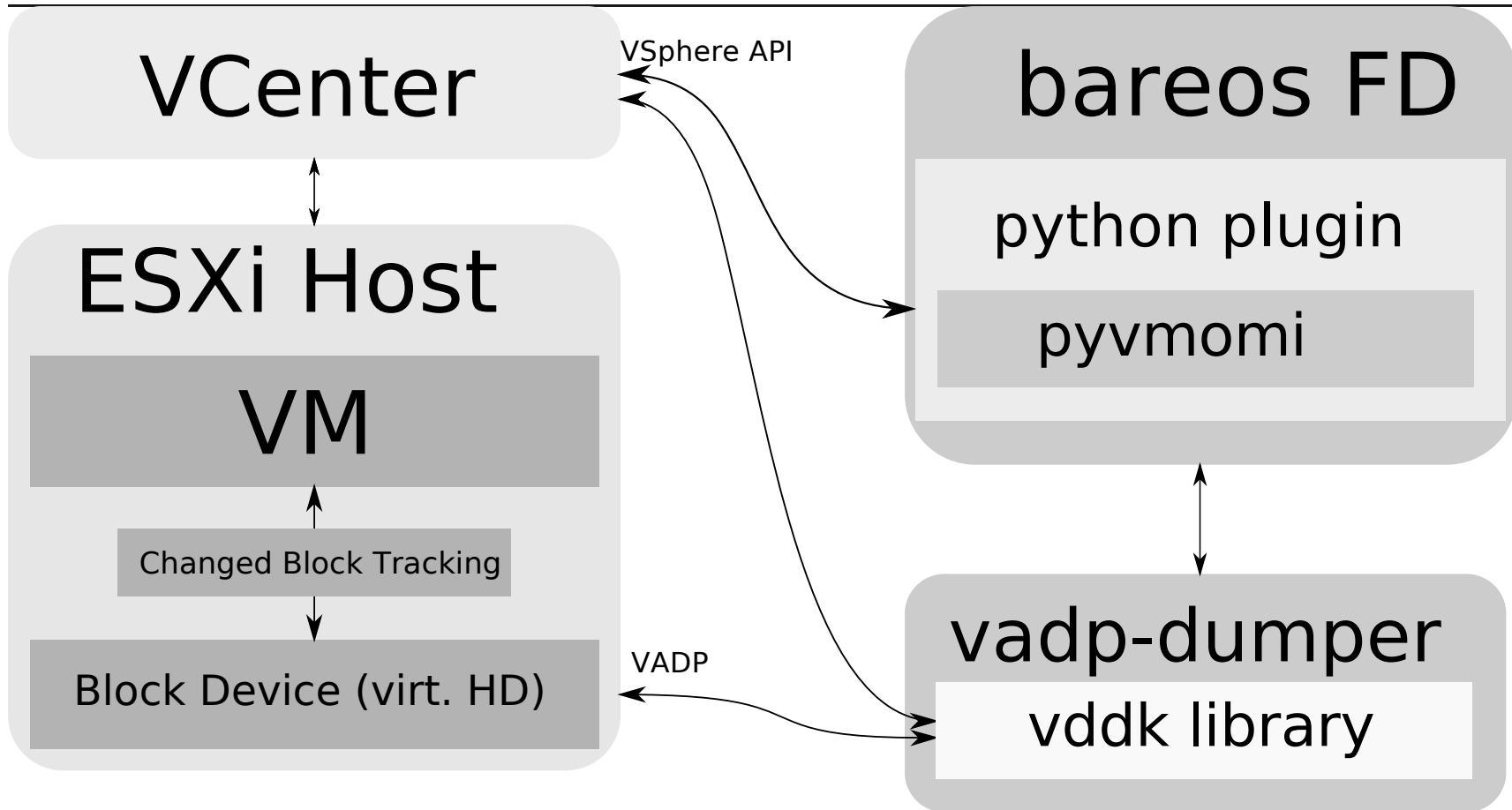
- python-fd plugin loads into filedaemon
- starts own python interpreter
- executes python functions during backup & restore
- full access to plugin API via python

How Bareos connects to VMware APIs:

- vSphere API
 - pyvmomi - VMware vSphere API Python Bindings
- VMware vSphere Storage APIs – Data Protection (VADP)
 - bareos_vadp_dumper
 - developed by Bareos' Marco van Wieringen
 - uses vmware-vix-disklib

Putting everything together

The Big Picture

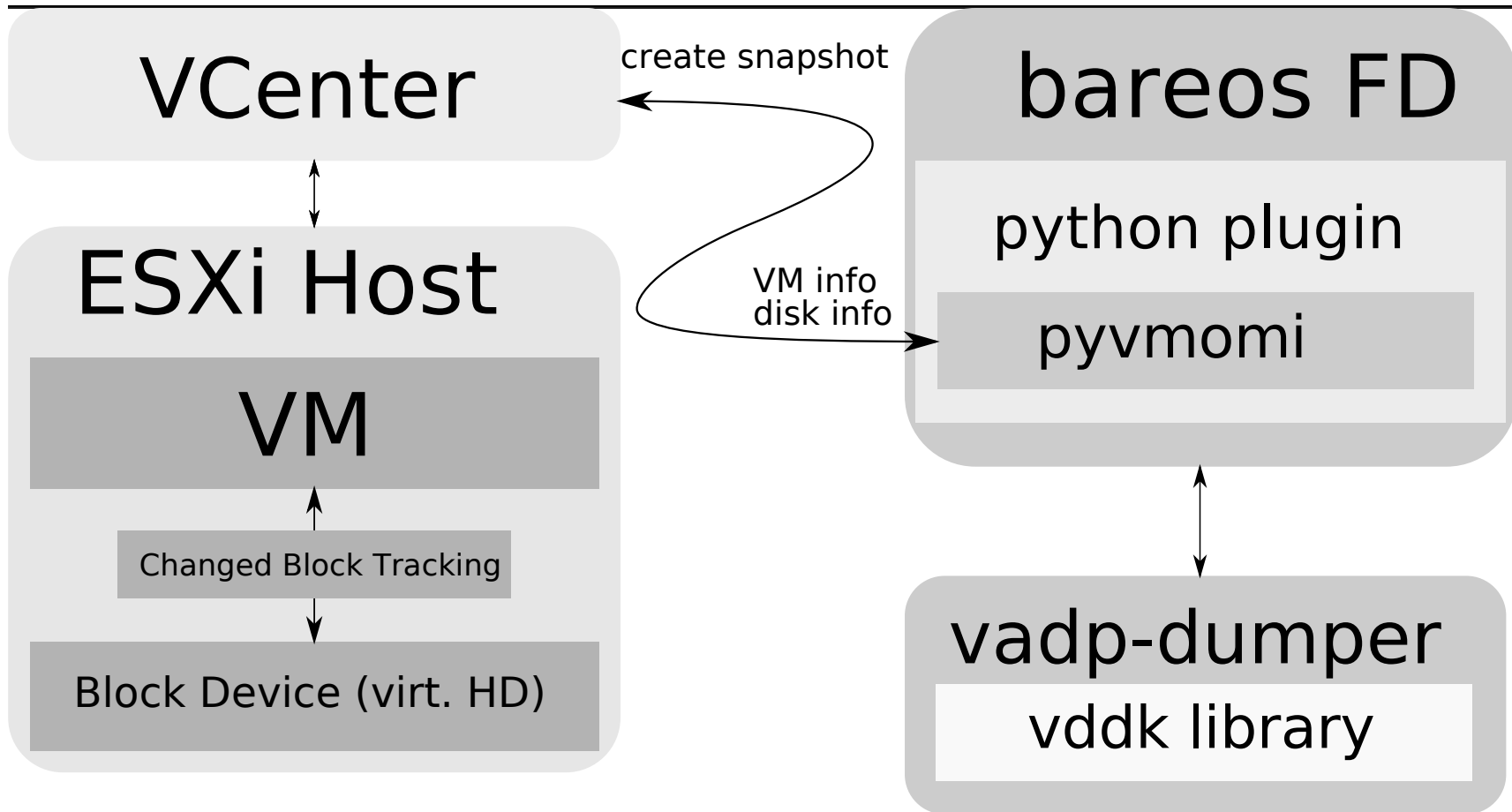


VADP = VMware vSphere Storage APIs - Data Protection

How does a Backup Work? (1)

1. connect to vSphere server via pyvmomi
2. get VM information
3. create VM snapshot
4. query disks of VM

Initiate Backup



VADP = VMware vSphere Storage APIs - Data Protection

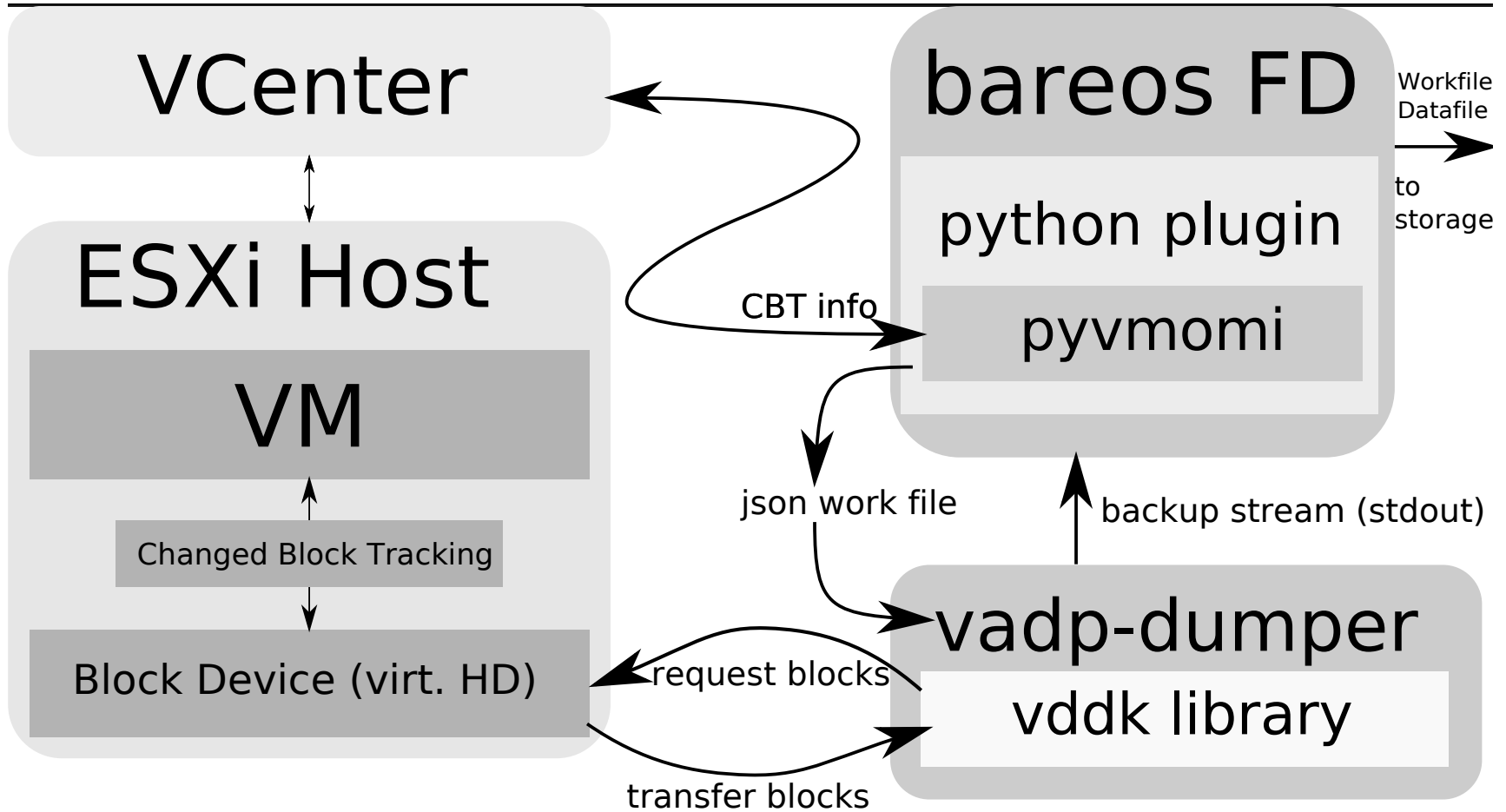
How does a Backup Work? (2)

1. query CBT info (= Changed Block List)
2. create two virtual files
 - json work file with the
 - connection parameters
 - diskinfo
 - CBT data (changed block info)
 - data file that will contain the blocks in self-contained format
3. store .json data in restore object

How does a Backup Work? (3)

1. run "*vadp_dumper dump*" with json workfile
2. *vadp_dumper* connects to VADP
3. read output into data file
4. fetches the CBT blocks
5. writes the blocks to bareos-fd plugin

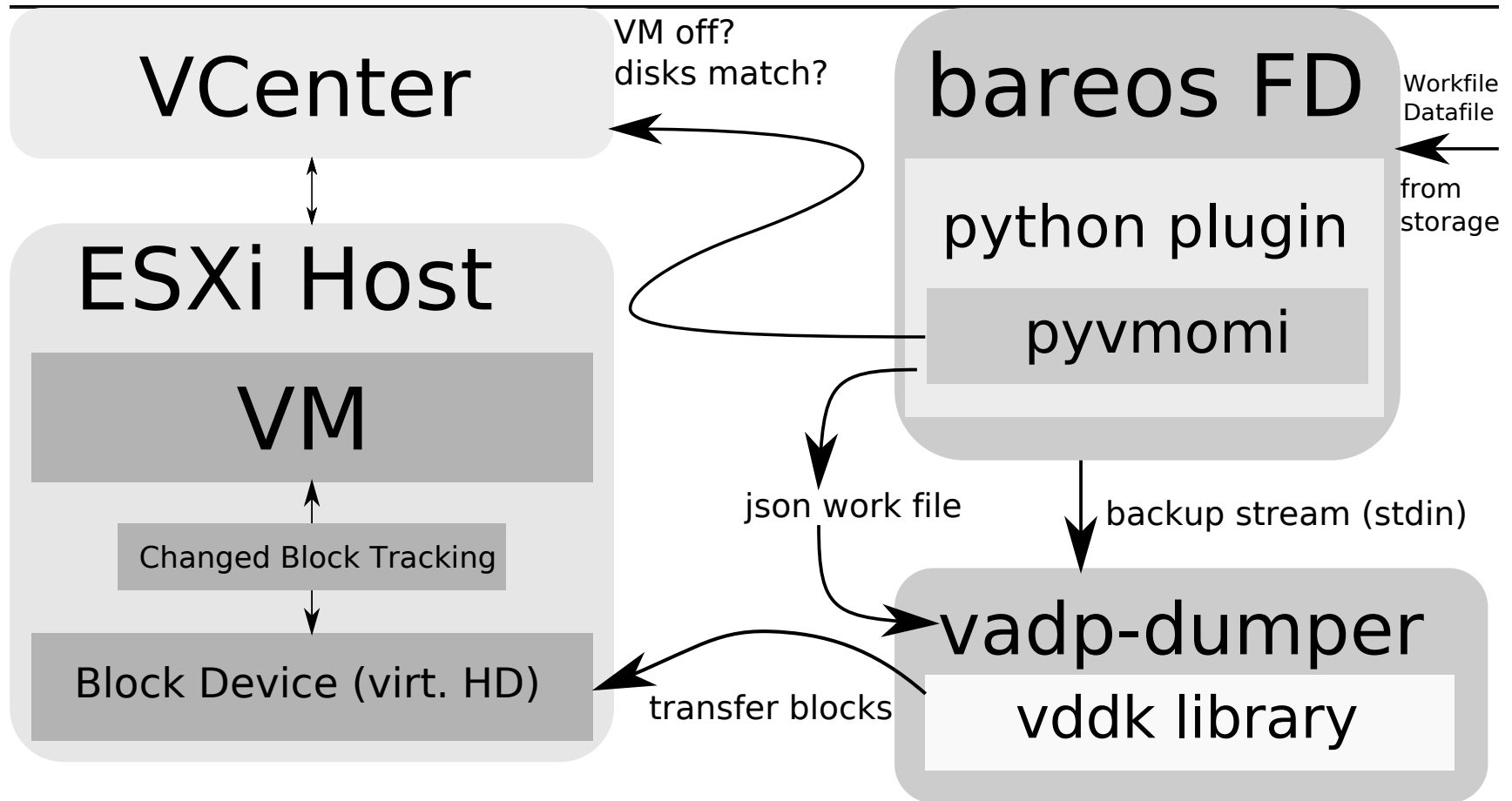
Run Backup



How does a restore work?

1. json workfile is restored as restoreobject first
2. connection to vSphere via pyvmomi
 - check VM is off
 - check disks match
3. run "*vadp_dumper* **restore**" with json workfile
4. *vadp_dumper* connects to VADP
5. backup stream is restored into *vadp_dumper*
6. *vadp_dumper* writes blocks into block device

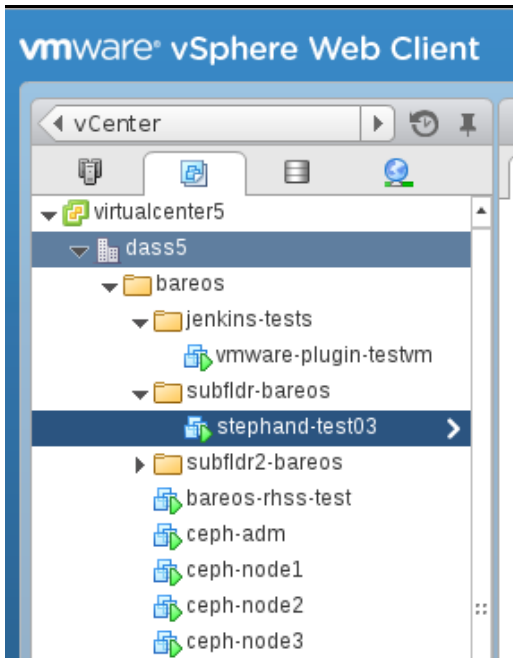
Run Restore



How is it configured in Bareos?

- Fileset with *Plugin=* directive is defined for each VM to Backup
- Parameters are passed to python-fd plugin
- Everything is configured in that call

Plugin configuration



```
Plugin = "py/foob\
module_path=/usr/[...]/plugins/vmware_plugin:\
module_name=bareos-fd-vmware:\
dc=dass5:\
folder=/bareos/subfldr-bareos:\
vmname=stephand-test03:\
vcserver=virtualcenter5.dass-it:\
vcuser=vbakadm@vsphere.local:\
vcpass=vBak.Adm-1234"
```


Full Fileset and Job Configuration

```
FileSet {
  Name = "PyTestSetVmware-test03"
  Include {
    Options {
      signature = MD5
      Compression = LZ4
    }
    Plugin = "python:\
      module_path=/usr/lib64/bareos/plugins/vmware_plugin:\
      module_name=bareos-fd-vmware:\
      dc=dass5:\
      folder=/bareos/subflr-bareos:\
      vmname=stephand-test03:\
      vcserver=virtualcenter5.dass-it:\
      vcuser=vbakadm@vsphere.local:\
      vcpass=vBak.Adm-1234"
  }
}
Job {
  Name = "PyTestVmware3"
  JobDefs = "DefaultJob"
  FileSet = "PyTestSetVmware-test03"
}
```

Demo

- Make Full Backup of VM
- Add Files
- Make incremental Backup
- Remove all files
- Make restore
- Check all files are back

3 testfiles in /data directory of VM

```
gw52:/data # ls -la
```

```
Sep 25 15:44 testfile_2015-09-25_154432_176669929.txt
```

```
Sep 25 15:44 testfile_2015-09-25_154433_347270708.txt
```


```
Sep 25 15:44 testfile_2015-09-25_154434_186187299.txt
```

Run Full Backup Job

```
*run job=PyTestVmware3 level=Full yes  
Using Catalog "MyCatalog"  
Job queued. JobId=484
```

Snapshot is created

The screenshot displays the VMware vSphere Web Client interface. The left-hand navigation pane shows a tree structure of virtual machines under 'virtualcenter5', with 'stephand-test03' selected. The main content area shows the 'Monitor' tab for 'stephand-test03', with the 'Tasks' sub-tab active. A modal window titled 'Manage VM Snapshots for stephand-test03' is open, showing a list of snapshots. The 'BareosTmpSnap' snapshot is selected, and its details are displayed in a table below. The table shows the snapshot's name, description, creation time, disk usage, and console view. The status of the snapshot creation task is 'Completed'.

Name	BareosTmpSnap
Description	Description for BareosTmpSnap
Created	Fri 25 Sep 2015 03:45:20 PM UTC
Disk Usage	1,020.03 MB
Console	

Task Name: Create virtual machine
Status: ✔ Completed
Initiator: VSPHERE.LOCAL...
Target: stephand-test03
Server: virtualcenter5

Related events:
Fri 25 Sep 2015 03:45:20 PM UTC

Job Output

*messages

Start Backup JobId 484, Job=PyTestVmware3.2015-09-25_15.45.12_05

Starting backup of /VMS/dass5/bareos/subflidr-bareos/\

stephand-test03/[ESX5-PS100] stephand-test03/\

stephand-test03.vmdk_CBT.json

Starting backup of /VMS/dass5/bareos/subflidr-bareos/\

stephand-test03/[ESX5-PS100] stephand-test03/\

stephand-test03.vmdk

Elapsed time=00:01:25, Transfer rate=4.567 M Bytes/second

dir JobId 484: Bareos vmw5-bareos-centos6-64-devel-dir 14.2.4 (23Mar15):

JobId:	484
Job:	PyTestVmware3.2015-09-25_15.45.12_05
Backup Level:	Full
FileSet:	"PyTestSetVmware-test03" 2015-09-10 16:44:29
Elapsed time:	1 min 25 secs
FD Files Written:	2
SD Files Written:	2
FD Bytes Written:	388,244,512 (388.2 MB)
SD Bytes Written:	388,246,224 (388.2 MB)
Rate:	4567.6 KB/s
Volume name(s):	Full-0001
Last Volume Bytes:	784,924,409 (784.9 MB)
Termination:	Backup OK

added 4 more testfiles to VM

```
gw52:/data # ls -la
```

```
Sep 25 15:44 testfile_2015-09-25_154432_176669929.txt
```

```
Sep 25 15:44 testfile_2015-09-25_154433_347270708.txt
```

```
Sep 25 15:44 testfile_2015-09-25_154434_186187299.txt
```

```
Sep 25 15:51 testfile_2015-09-25_155157_995441659.txt
```

```
Sep 25 15:51 testfile_2015-09-25_155158_761028556.txt
```

```
Sep 25 15:52 testfile_2015-09-25_155159_535871117.txt
```

```
Sep 25 15:52 testfile_2015-09-25_155200_281914789.txt
```

Run Incremental Job

```
*run job=PyTestVmware3 level=Incremental yes
dir Start Backup JobId 485, Job=PyTestVmware3.2015-09-25_15.51.57_06
fd JobId 485: Starting backup of /VMS/dass5/bareos/subflidr-bareos/\
  stephand-test03/[ESX5-PS100] stephand-test03/\
  stephand-test03.vmdk_CBT.json
fd JobId 485: Starting backup of /VMS/dass5/bareos/subflidr-bareos/\
  stephand-test03/[ESX5-PS100] stephand-test03/\
  stephand-test03.vmdk
25-Sep 15:52 vmw5-bareos-centos6-64-devel-dir JobId 485: Bareos vmw5-bareos-c
entos6-64-devel-dir 14.2.4 (23Mar15):
  Job:                               PyTestVmware3.2015-09-25_15.51.57_06
  Backup Level:                       Incremental, since=2015-09-25 15:45:14
  FD Files Written:                    2
  FD Bytes Written:                   408,859 (408.8 KB)
  Termination:                        Backup OK
```


Remove all testfiles on VM and shutdown

```
gw52:/data # rm -f *  
gw52:/data # sync  
gw52:/data # poweroff
```

Run Restore Job (1)

```
*restore
```

```
Automatically selected Client: vmw5-bareos-centos6-64-devel-fd
```

```
6: PyTestSetVmware-test03
```

```
Select FileSet resource (1-9): 6
```

```
+-----+-----+-----+-----+-----+
| 484 | F | 2 | 388,244,512 | 2015-09-25 15:45:14 |
| 485 | I | 2 | 408,859 | 2015-09-25 15:52:00 |
+-----+-----+-----+-----+-----+
```

```
You have selected the following JobIds: 484,485
```

```
Building directory tree for JobId(s) 484,485 ...
```

```
2 files inserted into the tree.
```

```
cwd is: /
```

```
$ mark *
```

```
2 files marked.
```

```
$ find *
```

```
*/VMS/dass5/bareos/subflr-bareos/stephand-test03/[ESX5-PS100] stephand-test0  
3/\
```

```
stephand-test03.vmdk
```

```
*/VMS/dass5/bareos/subflr-bareos/stephand-test03/[ESX5-PS100] stephand-test0  
3/\
```

```
stephand-test03.vmdk+I+1443189129.621285
```

```
$ done
```

Run Restore Job (2)

JobName: RestoreFiles
Bootstrap: /var/lib/[...]s6-64-devel-dir.restore.1.bsr
Where: /tmp/bareos-restores
Replace: Always
FileSet: Linux All
Backup Client: vmw5-bareos-centos6-64-devel-fd
Restore Client: vmw5-bareos-centos6-64-devel-fd
Format: Native
Storage: File
When: 2015-09-25 15:54:15
Catalog: MyCatalog
Priority: 10
Plugin Options: *None*
OK to run? (yes/mod/no): yes
Job queued. JobId=486

Run Restore Job (3)

```
dir JobId 486: Start Restore Job RestoreFiles.2015-09-25_15.54.19_07
dir JobId 486: Using Device "FileStorage" to read.
sd JobId 486: End of all volumes.
dir JobId 486: Bareos vmw5-bareos-centos6-64-devel-dir 14.2.4 (23Mar15):
  Build OS:          x86_64-unknown-linux-gnu redhat CentOS
  JobId:             486
  Job:               RestoreFiles.2015-09-25_15.54.19_07
  Restore Client:    vmw5-bareos-centos6-64-devel-fd
  Start time:        25-Sep-2015 15:54:21
  End time:          25-Sep-2015 15:55:08
  Elapsed time:      47 secs
  Files Expected:    2
  Files Restored:    2
  Bytes Restored:    1,071,712,520
  Rate:              22802.4 KB/s
  FD Errors:         0
  FD termination status: OK
  SD termination status: OK
  Termination:       Restore OK
```

After restore all files are back

```
gw52:/data # ls -la
Sep 25 15:44 testfile_2015-09-25_154432_176669929.txt
Sep 25 15:44 testfile_2015-09-25_154433_347270708.txt
Sep 25 15:44 testfile_2015-09-25_154434_186187299.txt
Sep 25 15:51 testfile_2015-09-25_155157_995441659.txt
Sep 25 15:51 testfile_2015-09-25_155158_761028556.txt
Sep 25 15:52 testfile_2015-09-25_155159_535871117.txt
Sep 25 15:52 testfile_2015-09-25_155200_281914789.txt
```

Questions?