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## **1. Introduction**

The **offbat** backup system provides a safe mechanism for **offline** back-up of UFS filesystems to magnetic tape or similar media under SunOS 5 (aka Solaris 2).

Full and incremental backups are supported.

Multi-volume backup is supported, although logging information is per-run, not per-volume, so you may need to maintain your own records regarding which volume of a run contains which filesystem.

Online backup is not supported. **offbat** is ignorant of things like DBMS APIs, mirrored filesystems, trailer runs and the like. If you want online backups, get an online-backup system instead.

### **1.1. New in Version 2.0**

Backup to remote tape drives is now supported. This utilises **rsh(1)** and **rmt(1m)** facilities on the systems involved.

To incorporate this “remote” facility, it has been necessary to change some command-interfaces (this document describes the new ones). To make reading tape-labels and on-tape status-reports easier, the **getlabel** and **getstatus** scripts are now provided.

The only change to the on-tape data format is that the ASCII tape-label and status-reports now include the name of the remote “tape-server” (if any).

### **1.2. Data Sources**

**offbat** only supports back-up of locally mounted UFS filesystems. All other formats of source data are dynamically excluded, including:

- PCFS filesystems (MSDOS diskettes);
- HSFS filesystems (ISO-9660 CDROM);
- NFS, AFS, RFS filesystems (remote filesystems);
- Raw disks, raw disk partitions (VTOC slices), raw metadevices, raw pseudo-disks;
- Other raw devices (eg: tape-drives!).

**NOTE:** only UFS filesystems that are set to “mount-at-boot” are considered. Other UFS filesystems are deliberately excluded. See **vfstab(4)**.

### **1.3. Supported Tape Drives and Controllers**

In actual fact, “support” can only be expressed in terms of a **combination** of drive/bus-interface-controller/device-driver. The informal name for such a triad is “device”.

**offbat** works with any device meeting the following requirements:

#### **1.3.1. End-Of-Tape Detection**

The device must automatically detect the physical end-of-media.

#### **1.3.2. Append-Mode Writes**

The device must allow data to be written at the “end-of-data” position, to append files onto the tape. All known simplex devices allow this.

#### **1.3.3. I/O-Command Interface**

The device must support the **mtio(7)** interface, including the following otherwise optional **ioctl(2)** calls:

MTIOCGET  
 MTIOCTOP for the opcodes MTREWIND, MTEOM, MTFSF, MTNBSF.

**Table 1: Known Good Tape Devices**

Drive	Controller	Medium	Device-Driver
Fujitsu M2444	Xylogics 472	1/2-inch reel	xt (SPARC)
CDC Keystone III	Xylogics 472	1/2-inch reel	xt (SPARC)
Hewlett-Packhard 88780	Xylogics 472	1/2-inch reel	xt (SPARC)
Archive 2150S	SCSI HBA	1/4-inch cartridge	st (SPARC), cmtmp (x86)
Archive Viper	SCSI HBA	1/4-inch cartridge	st (SPARC), cmtmp (x86)
Tandberg Panther	SCSI HBA	1/4-inch cartridge	st (SPARC), cmtmp (x86)
Wangtek 5150EN	SCSI HBA	1/4-inch cartridge	st (SPARC), cmtmp (x86)
Wangtek 5525ES	SCSI HBA	1/4-inch cartridge	st (SPARC), cmtmp (x86)
WangDAT 3100SE	SCSI HBA	4-mm DDS cartridge	st (SPARC), cmtmp (x86)
WangDAT 3200DX <sup>a</sup>	SCSI HBA	4-mm DDS cartridge	st (SPARC), cmtmp (x86)

**Table 1: Known Good Tape Devices**

Drive	Controller	Medium	Device-Driver
Hewlett-Packard Sure-Store (models 2000, 5000, 6000) <sup>a</sup>	SCSI HBA	4-mm DDS-2 cartridge	st (SPARC), cmtmp (x86)
Artecon QIC-525	SCSI HBA	1/4-inch cartridge	st (SPARC), cmtmp (x86)
Artecon QIC-1000	SCSI HBA	1/4-inch cartridge	st (SPARC), cmtmp (x86)
Archive Python	SCSI HBA	4-mm DDS cartridge	st (SPARC), cmtmp (x86)
TDC 4120/4220/4222	SCSI HBA	4-mm DDS cartridge	st (SPARC), cmtmp (x86)
Exabyte 8200	SCSI HBA	8-mm cartridge	st (SPARC), cmtmp (x86)
Exabyte 8500	SCSI HBA	8-mm cartridge	st (SPARC), cmtmp (x86)
Exabyte 8505	SCSI HBA	8-mm cartridge	st (SPARC), cmtmp (x86)
SunDLT	SCSI HBA	DLT cartridge (aka TZ-87)	st (SPARC), cmtmp (x86)

- a. to be able to select low-density or uncompressed recording (eg: for media compatibility with other less-capable drives), you may need to add an entry to the Solaris SCSI-tape device-configuration file, /kernel/drv/st.conf. See the manual-page for **st(4)**. You may also need to set the DIP-switches on the drive.

#### **1.4. Robots, etc.**

The device requirements above preclude the use of those robotic tape-library-units or auto-loaders that require special-purpose access software in addition to the device-driver. Special tape subsystems that provide a traditional drive-access mechanism (ie: that meet the above requirements) should be just fine, but **offbat** will not explicitly take advantage of the special features.

## **2. Contents of Tapes**

All data is written onto the tapes using a block-size of 63 Kb. This has been chosen to be maximally portable between devices and host systems.

Each set of tapes written by a single backup run contains a sequence of raw “files”.

### **2.1. The First File**

The first file is an ASCII “tape-label” describing the backup-run that used this tape. An example tape-label is:

```
dumpall: Mon 15Mar97 11:34 starting backup run
dumpall: Mon 15Mar97 11:34 system name: hiws01
dumpall: Mon 15Mar97 11:34 log file: /etc/backup/offbat/history/1997.03.15.Sat
dumpall: Mon 15Mar97 11:34 tape device: /dev/rmt/0cn on hiws41
dumpall: Mon 15Mar97 11:34 checking tape drive status
dumpall: Mon 15Mar97 11:34 tape drive type: Archive QIC-150 tape drive:
dumpall: Mon 15Mar97 11:34 rewinding tape
dumpall: Mon 15Mar97 11:34 tape I/O blocksize: 63 Kb records
dumpall: Mon 15Mar97 11:34 labelling tape
```

**NOTE:** this file is exactly 63 Kb long. It will usually have a lot of NUL characters at the end.

To see the tape-label, insert the tape into the drive, and enter the following shell-command:

```
/etc/backup/offbat/getlabel <device> <server>
```

- *<server>* is the name or IP address of the system to which the destination tape-drive is attached. If this parameter is omitted, the local system is assumed. If this parameter is specified as a host name, an entry for that host must occur in /etc/hosts because it must be resolvable before any network name-services are running;
- *<device>* is the name used to access the destination tape-device on the server system.

### **2.2. The Last File**

This is an ASCII “status report” of the backup run. This file is written even if the backup-run is interactively cancelled by the operator.

**NOTE:** this file is exactly 63 Kb long. It will usually have a lot of NUL characters at the end.

An example status-report is:

```
dumpall: Mon 15Mar97 17:06 starting backup run
dumpall: Mon 15Mar97 17:06 system name: hiws01
dumpall: Mon 15Mar97 17:06 log file: /etc/backup/offbat/history/1997.03.15.Sat
```

```
dumpall: Mon 15Mar97 17:06 tape device: /dev/rmt/0cn on hiws41
dumpall: Mon 15Mar97 17:06 checking tape drive status
dumpall: Mon 15Mar97 17:06 tape drive type: Archive QIC-150 tape drive:
dumpall: Mon 15Mar97 17:06 rewinding tape
dumpall: Mon 15Mar97 17:06 tape I/O blocksize: 63 Kb records
dumpall: Mon 15Mar97 17:06 labelling tape
dumpall: Mon 15Mar97 17:06 level 1 dump of /: starting
dumpall: Mon 15Mar97 17:06 level 1 dump of /: succeeded
dumpall: Mon 15Mar97 17:06 level 1 dump of /usr: starting
dumpall: Mon 15Mar97 17:06 level 1 dump of /usr: succeeded
dumpall: Mon 15Mar97 17:06 level 1 dump of /var: starting
dumpall: Mon 15Mar97 17:06 warning: cancelled by user
```

Note that in this case, the backup run was cancelled half-way through by the operator.

To see the status report, insert the last tape written by the backup-run into the drive and enter the shell-command:

```
/etc/backup/offbat/getstatus <device> <server>
```

- *<server>* is the name or IP address of the system to which the destination tape-drive is attached. If this parameter is omitted, the local system is assumed. If this parameter is specified as a host name, an entry for that host must occur in */etc/hosts* because it must be resolvable before any network name-services are running;
- *<device>* is the name used to access the destination tape-device on the server system.

### **2.3. The Intervening Files**

Each of these is a backup of a single source filesystem, in **ufsdump(1m)** format. These files may be full (level 0) dumps or incremental (levels 1-9) dumps, depending on the parameters used when the backup run was invoked. The actual dump level for each of these files is recorded in the “status report” on tape (see above).

### **3. Software Installation**

The distribution kit consists of a **tar(1)** archive containing the following files:

offbat	top-level directory
offbat/trigger	Bourne-Shell script to trigger a backup run
offbat/offbat.rc2	Bourne-Shell script to respond to the trigger
offbat/dumpall	Bourne-Shell script to dump UFS filesystems to tape
offbat/getlabel	Bourne-Shell script to show the on-tape "label".
offbat/getstatus	Bourne-Shell script to show the on-tape status-report.
offbat/history	sub-directory for historical log files
offbat/spool	sub-directory for temporary/trigger files
offbat/doc	sub-directory
offbat/doc/guide.doc	this document, in FrameMaker format
offbat/doc/guide.ps	this document, in PostScript format
offbat/doc/guide.pdf	this document, in Adobe Portable Document format

#### **3.1. Installation Steps**

Become the root user, copy **offbat.tar** into **/tmp**, and execute the following shell-commands:

```
mkdir /etc/backup
cd /etc/backup
tar -xvlpf /tmp/offbat.tar
check that the files listed above as part of offbat.tar are present
cp offbat/offbat.rc2 /etc/init.d/offbat
ln /etc/init.d/offbat /etc/rc2.d/S00offbat
```

If you will be backing-up to (or restoring from) a remote system, you will need to configure that remote system to allow Berkeley Remote-Shell access to the *root* user from the (source) system where offbat was installed; see the manual pages for **rsh(1)** and **rlogin(1)**.

**NOTE:** allowing remote-shell access to the *root* user could completely compromise the security of such a remote system, so you should first check that such configuration is suitable for your situation. If not, you will not be able to do backups to tape-drives hosted by that system.

## **4. Operating a Backup Run**

### **4.1. Manual Launch**

Launching a backup run will reboot the system. It is rather antisocial to do this whilst the system is in use. If you really want to launch one, the steps are:

Load a tape into the destination tape-drive. Make sure you have some additional tapes handy, in case the backup requires multiple tapes.

Become the root user on the system to be backed up, then issue the following shell command:

```
/etc/backup/offbat/trigger <dump-level> <device> <server>
```

- *<server>* is the name or IP address of the system to which the destination tape-drive is attached. If this parameter is omitted, the local system is assumed. If this parameter is specified as a host name, an entry for that host must occur in */etc/hosts* because it must be resolvable before any network name-services are running;
- *<device>* is the name used to access the destination tape-device on the server system;
- *<dump-level>* is as described on the manual-page for **ufsdump(1m)**.

Stand back.

### **4.2. Scheduled Launch**

This is similar to the above, except that the run is actually launched by the system job-scheduling daemon, **cron(1m)**.

Instructions for configuring **cron** and **at(1m)** can be found in the SunOS 5.x manuals and/or online documentation.

Briefly, the following command should be run as the *root* user at the desired times:

```
/etc/backup/offbat/trigger <dump-level> <device> <server>
```

- *<server>* is the name or IP address of the system to which the destination tape-drive is attached. If this parameter is omitted, the local system is assumed. If this parameter is specified as a host name, an entry for that host must occur in */etc/hosts* because it must be resolvable before any network name-services are running;
- *<device>* is the name used to access the destination tape-device on the server system;
- *<dump-level>* is as described on the manual-page for **ufsdump(1m)**.

Launching a backup run will reboot the system. It is rather antisocial to do this whilst the system is in use. It is best to schedule such backups to run at night, or at least when you can be



sure that the system is not in use for the duration of the backup.

Initially, you will not know how long a backup run will take, so you should perform a trial run via a manual launch. This will record timing information in the historical log (see below).

**NOTE:** if the first tape is not loaded when the backup run starts, an error-message will be added to the online log and nothing will be backed up. A human must ensure that the appropriate tape is loaded before **cron** launches the run.

### **4.3. Operations after Launch**

First the system will be automatically shutdown, with a request to immediately reboot.

During the reboot sequence, the backup run proper will start.

As the backup proceeds, various status and progress messages are printed on the system console. Copies of the messages are appended to the historical log file.

If **ufsdump** reaches the end of a tape, it will prompt (to the console) for a new tape to be loaded. You can cancel the run at this point by giving a negative response to the prompt.

In fact, once the run has started, you can cancel it at any time by typing the “interrupt” character (usually control-C) on the system console.

If you abort a run, all filesystem dumps already completed are safely preserved on tape.

In all cases, a complete status-log of the run is appended to the end of the final tape, and also to the historical log file.

## **5. Historical Log Files**

For each backup run attempted, an (online) log is recorded that includes:

- The system name.
- The time the run started.
- The time the run finished.
- Whether the run was interactively cancelled (by an operator at the system console).
- The name or IP address of the system hosting the destination tape drive.
- The device-name used to access the tape drive.
- The type of tape drive used (if determinable).
- The I/O blocksize used to write onto the tape.
- The level of each filesystem dump.
- The start and finish times for each filesystem dump attempted.
- The completion status of each filesystem dump attempted (success, cancelled, failed).

These log files are stored in the directory `/etc/backup/offbat/history`. Each log file has a name consisting of the date and time of the run, formatted thus:

- The year, as a four-digit number.
- A dot.
- The month, a two-digit number in the range 01-12.
- Another dot.
- The day-of-month, a two-digit number in the range 01-31.
- Yet another dot.
- The abbreviated day name, three letters starting with an upper-case letter.

Any backup run on a given day will append run-time messages to the appropriate log file. If it is the first run of that day, that log file will be created beforehand.

The advantage of this naming scheme is that the following useful shortcuts can be used:

- To list the log files in increasing chronological order:

```
cd /opt/backup/offbat/history ; ls
```

- To determine the most recent backup run:

```
cd /opt/backup/offbat/history; ls | tail -1 1
```

- To list every day this month when backups have been done:

```
cd /opt/backup/offbat/history ; ls | fgrep `date +%Y.%m`
```

And so on.