MOBI Backup (rsync wrapper)

like probably every Linux admin, I eventually came to the point where I felt like it was time to write **M**y **O**wn **B**ackup **I**mplementation as an rsync wrapper to do some backups. This script is in its funcitonality very similar to what rubi does: it creates a new sub-directory with the date of the backup as directory each time the backup is run. every backup directory contains a full backup of the source, but only the difference since the last backup does actually need to be synced. when i say the difference i mean files that have changed.. yes, files, not blocks! so if your 2GB log file gets a new line, 2GB will have to be downloaded. but if your file does not change, it will be hard-linked to the previous backup and therefore nothing needs to be downloaded.

to achieve this, I use rsync's `–link-dst` option.

In most cases, this proves to be simple but still efficient enough, rather than trying block-level incrementals.

One specialty of MOBI, and the main reason for writing this script in the first place, is that it runs multiple backups in parallel. It has sort of its own queue manager to do that. It will take all Job Definitions and put them in the queue and it will then run multiple in parallel. The number of parallel backup processes can be defined by setting the PARALLELPROCS=8 variable in the script. Default is 8.

The advantage of running multiple backup jobs at once is, that you can usually reach a much higher overall throughput with multiple rsyncs running in parallel than running them one after the other because rsync is single threaded and the overhead for ssh and file checking etc. is huge. So it usually makes no sense to wait for one host to complete before backing up a second host.
You could also define multiple backup jobs for the same host but different directories on the host, to increase the speed of large backups.

if you are looking for a solution to speed up an rsync copy process with parallel rsync invocations, take a look at my parallel_rsync article. Sadly the function I wrote there does not help in speeding up incremental backups at all (in contrary, it adds more overhead and hence makes an incremental backup even slower!).

at the end of a successful backup, a rotation is made and old backups are being deleted where appropriate. also a summary email is sent to the admin.

Configuration

to configure, simply edit the lines or add more blocks after the

```
############################################################
### Backup Job Definitions start here  #####################
############################################################
```

comment in the script. some lines above the comment you can find different config options mixed with some code that should not be changed ;).. i know.. usability and such wasn't the main focus here

but instead i wanted to keep everything in a file and as simple as possible to read the code and modify it to your own needs.

the script will write a hidden file named .lastdst to the backup base directory for each backup job. this file always contains the folder name of the sub directory of the last successful backup.

Logs and Debugging

the script writes multiple log files. First of all it writes a new log file for every invocation to /tmp/<date-time>.log. this is a general log which contains information printed by the “queue manager”. It then writes two log files for each backup job it runs. these can be found in the same directory where these backup jobs are stored (defined by BASEDST) again with the start date and time of the job. one ends on `log` the other one ends on `.err`. the `.log` file contains the standard-output of the process and the `err` file contains the standard-error output. so if copying a file failed for example it should be listed in the `err` file.

the script

so here is the script.. use it at your own risk and let me know if you find bugs or have contributions to make. simply send me an email to contact at psuter dot ch.

mobi.sh

```
#!/bin/bash
# (c) Pascal Suter, DALCO AG, 2018. Use at your own risk
# no use without prior permission from DALCO AG
# pascal.suter@dalco.ch
# the latest version and some documentation for this script can be
found on http://wiki.psuter.ch/doku.php?id=mobi_backup
# version 1.1
# replaced ps aux | grep rsync style locking with flock locking to
allow this script to run on servers that use rsync for other stuff as
well :)
# version 1.2
# added eval in front of rsync call to properly evaluate the $OPTIONS
variable contents when running the command
# version 1.3
# moved log from rsyncs stderr to a separate .err file which makes
finding the relevant error messages in the rsync output alot easier

report() {
    LOG=$1
    error=0
    # get all jobs that where started
    jobs=`grep "^Backup of" $LOG | awk '{print $3}'`
    # get all jobs that where successfully completed
    successful_jobs=`grep "^Backup for .* completed successfully" $LOG
```

```
| awk '{print $3,"finished on",$7,$8,$9,$10,$11}'`
    # get all jbos that did not complete
    failed_jobs=`grep "^Backup failed" $LOG | awk '{print $4,"stopped
on",  $15,$16,$17,$18,$19,$20}' | tr -d ",()"`
    # get remainig jobs without status report
    remaining_jobs="$jobs"
    for job in `echo -e "$successful_jobs" | awk '{print $1}'`; do
        remaining_jobs=`echo -e "$remaining_jobs" | sed -e "s/$job$//"`
    done
    for job in `echo -e "$failed_jobs" | awk '{print $1}'`; do
        remaining_jobs=`echo -e "$remaining_jobs" | sed -e "s/$job$//"`
    done
    remaining_jobs=`echo -e "$remaining_jobs" | sed -e '/^$/d'`

    # write a report summary
    echo "################################################"
    echo "Backup report for ${1}"
    echo "################################################"
    if [ "$remaining_jobs" != "" ]; then
        error=1
        echo "================================================ "
        echo "== Jobs in an unknown state (still running?) === "
        echo "================================================ "
        echo -e "$remaining_jobs"
    fi
    if [ "$failed_jobs" != "" ]; then
        error=1
        echo "================================================ "
        echo "== Failed Jobs ================================= "
        echo "================================================ "
        echo -e "$failed_jobs"
    fi
    echo "================================================ "
    echo "== Jobs successfully completed ================= "
    echo "================================================ "
    echo -e "$successful_jobs"
    echo "================================================ "
    echo "== Jobs started ================================ "
    echo "================================================ "
    echo -e "$jobs"
    if [ $error -gt 0 ]; then
        SUBJECT="FAIL"
    else
        SUBJECT="SUCCESS"
    fi
}

rotate() {
    # remove old backups and keep only a certain amount of consecutive
and monthly backups
    # parameters:
```

```
    # arg 1: number of successful consecutive backups to keep (max. 1
per day will be kept,
    #        if there is more than one backup per day, the newest will
be kept, the rest will be deleted
    # arg 2: number of successful monhthly backups to keep
    #        keeps last backup of the month starting on the month befor
the oldest
    #        of the consecutive backups that have been kept back
    # arg 3: directory

    olddir=`pwd`
    numConsec=$1
    numMonthly=$2
    dir="$3"
    if [ $numConsec -lt 1 ]; then
        echo "first argument of rotate() should be number of
consecutive backups to keep. number given was smaller than 1, this must
be a mistake!"
        exit 1
    fi

    if [ ! -d "$dir" ]; then
        echo "the third argument of rotate() should be the backup
directory to clean up. the given directory does not exist"
        exit 1
    fi
    cd "$dir"
    echo "Starting Cleanup Process for `pwd`"

    # get all successful backups
    backups=`grep -l "completed successfully" *.log | sort | sed -e
's/.log$//'`

    # keep the last $numConsec consecutive backups
    keep=`echo "$backups" | awk -F - '{print $1}' | grep -v -P "^\s*$"
| uniq | tail -n $numConsec`

    # check if we even have more than $numConsec backups yet:
    if [ `echo "$backups" | wc -l` -lt $numConsec ]; then
        echo "we do not have enough backups to start deleting yet"
        exit 0
    fi

    # get the oldest of the last $numConsec backups:
    lastdate=`echo "$keep" | head -n 1`
    lastyear=`echo $lastdate | awk -F . '{print $1}'`
    lastmonth=`echo $lastdate | awk -F . '{print $2}'`
    lastday=`echo $lastdate | awk -F . '{print $3}'`

    # calculate the last $numMonthly months to keep:
    month=$lastmonth
```

```
    year=$lastyear
    for i in `seq 1 $numMonthly`; do
         month=`expr $month + 0`
        let month--
        if [ $month -lt 1 ]; then
            month=12
            let year--
        fi
        month=`printf "%02d\n" $month`
        keep=`echo -e "$keep\n$year.$month"`
    done
    keepdates=""
    for i in $keep ; do
        latest=`echo "$backups" | grep "^$i" | tail -n 1`
        keepdates=`echo -e "$keepdates\n$latest"`
    done

    keepdates=`echo "$keepdates" | grep -v -P "^\s*$"`

    delete=`ls *.log | sed -e 's/.log$//' | sort | uniq`
    delbackups=$backups
    for i in $keepdates; do
        delete=`echo "$delete" | grep -v "$i"`
        delbackups=`echo "$delbackups" | grep -v "$i"`
    done

    delbackups=`echo "$delbackups" | grep -v -P "^\s*$"`

    echo "All Backups:"
    echo "$backups"
    echo "================================"
    echo "Backups to delete:"
    echo "$delbackups"
    echo "================================"
    echo "Backups to keep:"
    echo "$keepdates"

    #sanity check before deleting backups: check if enough backups will
be left after deleting everything else
    numBD=`echo "$delbackups" | wc -l`
    numBT=`echo "$backups" | wc -l`
    survivors=`expr $numBT - $numBD`
    if [ $survivors -lt $numConsec ]; then
        echo "ERROR: somehow too many backups would have been deletd,
this should not happen!, aborting"
        exit 1
    else
        echo "$survivors backups will be left after deleting obsolete
backups"
    fi
```

```
    echo "$delete" | xargs -I DDD /bin/bash -c 'echo "deleting DDD*";
rm -rf --one-file-system DDD*'
    echo "cleanup complete for `pwd`"
}

run() {
    echo "Backup of $BACKUPNAME was queud on Position $INTPROCID";
    keepWaiting=1
    while [ $keepWaiting -gt 0 ]; do
        keepWaiting=0
        #check if enough processes that where launched before me  have
finished for me to start my work
        for ((i=1; i<=$(expr $INTPROCID - $PARALLELPROCS); i++)); do
            if [ `grep -c " $i " /dev/shm/backup_finished` -eq 0 ];
then
                keepWaiting=1
            fi
        done
        #echo "waiting patiently to start the backup of $BACKUPNAME
with my ID $INTPROCID"
        sleep 5
    done


    processes=`lsof ${LOCKDIR}/* 2>/dev/null | grep -v flock | grep
backup | awk -F / '{print $NF}' | sort | uniq | wc -l`

    while [ $processes -gt $PARALLELPROCS ]; do
        echo "Waiting for another rsync to complete before I can start
with ${BACKUPNAME}."
        sleep 10
        processes=`lsof ${LOCKDIR}/* 2>/dev/null | grep -v flock | grep
backup | awk -F / '{print $NF}' | sort | uniq | wc -l`
    done

    echo "Starting Backup for ${BACKUPNAME} at `date`" | tee -a
${BASEDST}/${DSTDIR}.log

    mkdir -p ${BASEDST}

    # read the .lastdst file and check if it is either empty (full
backup) or if it contains a valid directory (incremental backup).
    #if it is not empty and the content is not the name of a directory,
the backup will be aborted

    OLDDST="`cat $BASEDST/.lastdst 2>/dev/null`"

    go=1
    if [ -n "$OLDDST" ]; then
        if [ ! -d "${BASEDST}/${OLDDST}" ]; then
            echo "the given last destination $OLDDST does not exist,
```

```
will not proceed with the backup in order to not accidently do a full
backup"
            go=0
        fi
    fi

    if [ $go -eq 1 ]; then
        echo "flock -E 66 -n ${LOCKDIR}/${BACKUPNAME} rsync -aAHXv
${OPTIONS} --relative --delete --numeric-ids --bwlimit=${BWLIMIT} --
progress --link-dest="../${OLDDST}" --one-file-system ${SOURCE}
${BASEDST}/current >> ${BASEDST}/${DSTDIR}.log
2>${BASEDST}/${DSTDIR}.err"
        eval flock -E 66 -n ${LOCKDIR}/${BACKUPNAME} rsync -aAHXv
${OPTIONS} --relative --delete --numeric-ids --bwlimit=${BWLIMIT} --
progress --link-dest="../${OLDDST}" --one-file-system ${SOURCE}
${BASEDST}/current >> ${BASEDST}/${DSTDIR}.log
2>${BASEDST}/${DSTDIR}.err
        ret=$?
    else
        ret=1
    fi

    if [ $ret -eq 0 -o $ret -eq 24 ]; then
        mv ${BASEDST}/current ${BASEDST}/${DSTDIR}
        echo -n ${DSTDIR} > ${BASEDST}/.lastdst
        if [ $ret -eq 0 ]; then
            echo "Backup for ${BACKUPNAME} completed successfully at
`date`"| tee -a ${BASEDST}/${DSTDIR}.log
        else
            echo "Backup for ${BACKUPNAME} completed successfully at
`date` but some files vanished before they could be copied"| tee -a
${BASEDST}/${DSTDIR}.log
        fi
        echo "rotating old backups" | tee -a ${BASEDST}/${DSTDIR}.log
        rotate "$KEEPC" "$KEEPM" "$BASEDST" >> ${BASEDST}/${DSTDIR}.log
        echo "rotation completed at `date`"| tee -a
${BASEDST}/${DSTDIR}.log
    elif [ $ret -eq 66 ]; then
        echo "there are other rsync jobs running for this host,
skipping backup this time" | tee -a ${BASEDST}/${DSTDIR}.log
        echo -n "$INTPROCID " >> /dev/shm/backup_finished
        exit 1;
    else
        echo "Backup failed for ${BACKUPNAME} with errorcode ${ret},
keeping current progress to continue next time (`date`). to debug check
${BASEDST}/${DSTDIR}.err"| tee -a ${BASEDST}/${DSTDIR}.log
    fi

    echo -n "$INTPROCID " >> /dev/shm/backup_finished
    exit
}
```

```
start(){
    mkdir -p ${LOCKDIR} 2>/dev/null
    INTPROCID=`expr $INTPROCID + 1`
    echo "added backup for $BACKUPNAME to the que on position
$INTPROCID" | tee -a $MASTERLOG
    run | tee -a $MASTERLOG &
}

# if "rotate" is given as first argument, simply run a rotation in the
current working directory with default values
if [ "$1" == "rotate" ]; then
    rotate 30 12 "`pwd`"
    exit;
fi

# if "report" is given as first argument, generate a report out of the
master log file that was passed as second argument and exit
if [ "$1" == "report" ]; then
    if [ ! -f "$2"  ]; then
        echo "log file not found. please provide the full path of the
log file as second argument"
        exit 1
    fi
    report $2
    exit
fi

DSTDIR=`date +%Y.%m.%d-%H%M` # always start with `date +%Y.%m.%d... as
this is needed for rotation to work later on!

MASTERLOG="/tmp/`date +%Y.%m.%d-%H%M`.log"
REPORT_RECIPIENTS="root" # separate multiple recipiens with space
REPORT_SUBJECT="Backup Report for `hostname`"

#check if this script is not still running in an old backup
SELF=`basename "$0"`

if [ `ps aux | grep $SELF | grep -v '/bin/sh' | grep -vc grep` -gt 2 ];
then
    echo "another backup is still running, let it finish first" | tee -
a $MASTERLOG
    echo "`ps aux | grep $SELF | grep -v '/bin/sh' | grep -v grep` " |
tee -a $MASTERLOG
    exit 1;
fi

echo -n " " > /dev/shm/backup_finished
INTPROCID=0
PARALLELPROCS=8                  # how many processes (rsync jobs)
should be started in parallel? it makes only sense to set this variable
```

```
once
LOCKDIR=/var/lock/backup            # directory to keep the lock files
which are used to prevent parallel execution of backups on the same
host

#################################################################
### Backup Job Definitions start here  ##########################
#################################################################

BACKUPNAME="myself"                # this name will be used in status
reports, log files and in the backup path, this does not need to be the
hostname to connect to!
SOURCE="localhost:/ localhost:/data"      # source paths (space
separated if multiple paths are to be backed up)
BASEDST="/backup"                                  # base backup dir
KEEPC=30                                             # number of successful
consecutive backups to keep
KEEPM=12                  # number of monthly backups to keep starting
after the oldest consecutive backup
OPTIONS=""                    # additional rsync options like for
example "-e /usr/bin/rsh"
start


BACKUPNAME="remote.server.ch"
SOURCE="root@remote.server.ch:/ root@remote.server.ch:/boot/efi
root@remote.server.ch:/data"            # source paths (space separated
if multiple paths are to be backed up)
BASEDST="/remoteBackups/${BACKUPNAME}"          # base backup dir
KEEPC=30                                             # number of successful
consecutive backups to keep
KEEPM=12                  # number of monthly backups to keep starting
after the oldest consecutive backup
OPTIONS=''                   # additional rsync options like for
example "-e /usr/bin/rsh"
start

#################################################################
### Backup Job Definitions end here  ############################
#################################################################

# wait for all sub processes to finish before the main process can
expire, this allows proper killing of all backups
children=`ps aux | grep "$SELF" | grep -v '/bin/sh' | grep -vc "grep"`
while [ $children -gt 2 ]; do
    sleep 1
    hosts=`lsof ${LOCKDIR}/* 2>/dev/null | grep -v flock | grep backup
| awk -F / '{print $NF}' | sort | uniq | tr "\n" " "`
    echo "still have $children processes, currently backing up $hosts"
    children=`ps aux | grep "$SELF"  | grep -v '/bin/sh' | grep -vc
"grep"`
```

```
done
echo "creating backup Report" | tee -a $MASTERLOG
report $MASTERLOG > /tmp/backupReport.txt
cat /tmp/backupReport.txt | mail -s "$SUBJECT: $REPORT_SUBJECT"
"$REPORT_RECIPIENTS"
rm -f /tmp/backupReport.txt
```

run daily

in order to run the backup daily, run `crontab -e` as user `root` and enter a new line like this one here:

```
00 1 * * * /opt/mobi.sh > /dev/null 2>&1
```

using the redirects of both stdout and stderr to `/dev/null` makes sure you don't receive two emails on every backup where one would come through cron. all the necessary info is logged and the summary is emailaed directly without needing cron to send us any info.

Error due to old flock version

when this script is run on an older linux distribution such as CentOS 6.5 for example, the provided version of flock is too old to know the `-E` option which specifies an exit code in case the lock could not be acquired. in such a situation you can patch the mobi.sh script using this command:

```
sed -i '/-E 66 //' mobi.sh
```

this will make the script work on those systems. however, since now the exit code of flock is 1 when it can't acquire a lock the error message displayed in such a case might be a bit misleading, as it is the same as displayed in case of a syntax error in the rsync call. so keep that in mind when debugging such cases.

Migration from RUBI

Since i was using rubi before on many systems (private and customer systems) I'll provide a quick migration guide for those who want to migrate from rubi to mobi:

1. download the above script and save it to `/opt/backup/backup.sh`
2. edit the script
    1. adjust the REPORT_RECIPIENTS variable as needed
    2. under the `Backup Job Definitions start here` write a new block for every backup.
        1. BACKUPNAME can be set as you like. it will be mentioned in the backup report. Usually coming from RUBI this will be set to the same value as SRCHOST was in RUBI

   2. SOURCE needs to list all directories like SRCPART did, but they need to be prepended by the hostname, so SRCPART=`/ /boot` with SRCHOST=`mysrv` would be migrated into SOURCE=`mysrv:/ mysrv:/boot`
   3. BASEDST can be copy/pasted from rubi 1:1
   4. KEEPC could be set to the same value as KEEPD
3. to go the backup directory for each host and run this command

```
basename $(<lastdst) | tr -d ":" > .lastdst
```

4. remove the “:” in the directory name of the last backup that is written in `lastdst` like so:

```
mv 2018.04.01-00\:09 2018.04.01-0009
```

5. cleanup old log files and `lastdst` file and whatever else there might be laying around in this folder.
6. remember to come back and delete the old backups when it's time. old RUBI backups won't be rotated using mobi, this needs to be done manually. mobi will only include backups into the rotation for which it finds a log file of a successful backup job.

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