Rockbuild
a build farm for open source projects

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Background: Rockbox

• A firmware project for mp3 players
• 68 different players
• 4 binaries per player
• 5 cross-compilers
• 100+ committers
Building

How many targets do you build before you commit?

- Changes easily affect more targets than expected
- *Nobody* builds everything
Effects

- Popular targets work well
- Semi-popular get fixed regularly
- Unusual targets are mostly broken
Unacceptable!

Devs need to know if their change breaks a target build.
Obvious solution #1

Nightly builds
Obvious solution #1

Nightly builds

Problem: Not fine-grained enough.
Obvious solution #2

A script to easily compile all targets.
Obvious solution #2

A script to easily compile all targets.

Problem: 2-3 hour build time.
Obvious solution #3

Get a powerful server to build after commit.
Obvious solution #3

Get a powerful server to build after commit.

Problem: It still takes >1 hour.
Obvious solution #3

Get a powerful server to build after commit.

Problem: It still takes >1 hour.

Problem 2: Devs go away before build is done.
We need more power!

- One machine is not enough
- Buying more servers is expensive
- What to do?
Volunteer build farm
Volunteer machines

Challenges:

• Intermittent availability
• Firewalls & NATs
• Low tolerance for complexity
• Varying performance & capabilities
• Low bandwidth
The simple build client

- No pre-registration
- No remote login
- Support any targets/compilers you like
- Come and go whenever you like
- You can be behind firewall & NAT
- Client is updated automatically
- Runs nice and selectable # of cores
The not-so-simple server

- Support a varying number of clients
- ...all running at different speeds
- ...supporting different subsets of targets
- ...and which may disappear at any time
- And finish quickly, please!
Distribution of work
Work planning

• Every target build has a “weight”
• Every client has an avg speed
• New clients are benchmarked using lightest builds
• Every client gets as much work as it can complete in time
Round time

- The weight of all work is known
- The speed of all clients is known
- weight / speed = time
Making a plan

- Work is in chunks, not liquid. There will be gaps.
- Iterate over clients, starting with the slowest. Assign as much work as they can complete in time.
- If all work doesn't fit, increase total round time and try again.
Reality ruins the plan

- Clients will disappear
- New clients will connect
- Clients won't perform as expected

= We need to be adaptive
Two build phases

- Phase 1: Cooperative phase
- Phase 2: Competitive phase
Cooperative phase

- Clients that finish their scheduled work are assigned unstarted builds from other clients.
- If a client disconnects, its work is marked as unassigned and picked up by other clients.
- If no client can build a target, it is dropped from the round.
Competitive phase
a.k.a “speculative”

- Clients start building targets other clients already build.
- This avoids getting delayed by an unexpectedly slow client.
Uploading

- When a client finishes a target, it forks an upload process and asks for next build job.

- This reduces upload speed as a performance factor. Only the last build in each round is affected.
Example

atom270 = Atom N270 = 43 pts/sec
lillebror1 = Core i3 540 = 1089 pts/sec
(Factor 25 speed difference)
Build reports

Commit 97c1dc0 in rockbox by Michael Giacomelli: Enable logdiskf for all device targets, but not bootloaders or application.

01:12 <CIA-138> 97c1dc0 build result: 6 errors, 9 warnings (Michael Giacomelli committed)
Build logs

archosrecorder, revision 42a725f

Goto problem: 1

Built by hex-gevaerts

Build Command: ../tools/configure --target=archosrecorder --ram=2 --type=n && make zip
Using temporary directory /tmp
Platform set to archosrecorder
Memory size selected: 2 MB
[...
OBJCOPY compressed.bin
make[1]: Leaving directory `/home/fg/rockbox/buildclient/rockbox/firmware/decompressor'
error: firmware image is 205278 bytes while max size is 204800!
make: *** `/home/fg/rockbox/buildclient/rockbox/build-archosrecorder/ajbrec.ajz' Error 255
Build Failure: No 'rockbox.zip' was produced.
Performance statistics

Build client stats, revision 7fda692
For these 213 builds, the following 36 build clients participated:

This build round took 151 seconds.
Total client speed was 25897 points/second, which in ideal conditions would complete the round in 105 seconds.
Effective round speed was 18174 points/second, making us 70% efficient.
Performance statistics

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Bad clients

- Automatic temporary ban on client failure.
- Manual permanent ban
Security

- Unauthenticated build clients
- Auto-updated client code
- Not for building releases!
Who uses Rockbuild?

- Only Rockbox so far
- Recently made generic
- Not marketed
Other build systems

- distcc
  - distributes the building file-by-file
  - best suited for local clusters
- buildbot, hudson, continuum
  - static list of build clients
  - no client performance matching
- samba & postgresql custom farms
  - no commit builds
Thank you!

http://rockbuild.haxx.se

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