It's not an embedded Linux distribution –
It creates a custom one for you.

Delivering Predictability: The Yocto Project Autobuilder, Automated Sanity Testing, License Collection, and Build Statistics Tracking

Elizabeth Flanagan
Intel Corporation
April 11, 2011

Being proactive about code quality

- Reproducible builds
- Identify bugs and fix early and often
- Reduce time needed for code stabilization
- Avoid integration headaches
- Build performance history
- Manage the chaos
- License compliance
- Deep QA Testing

Being proactive about code quality

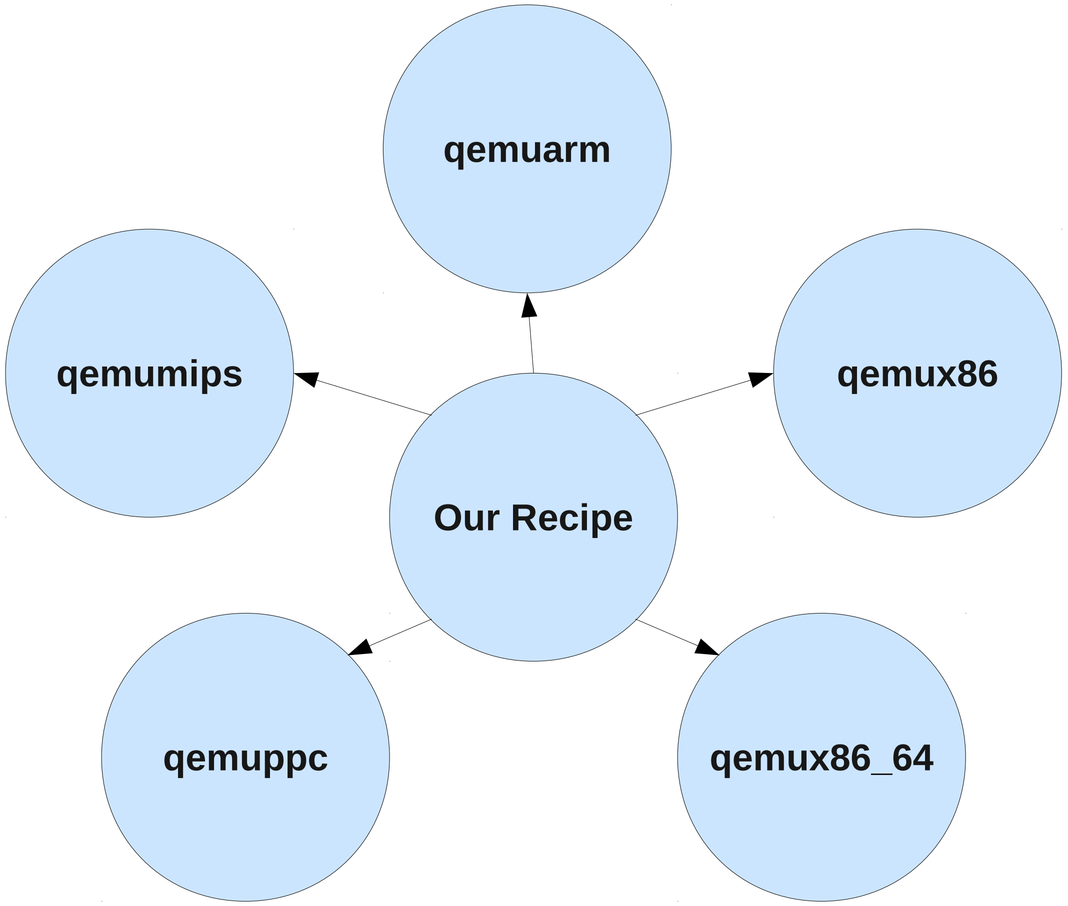
Maximizing your ability to respond to changes in a complex embedded ecosystem.

Being proactive about code quality

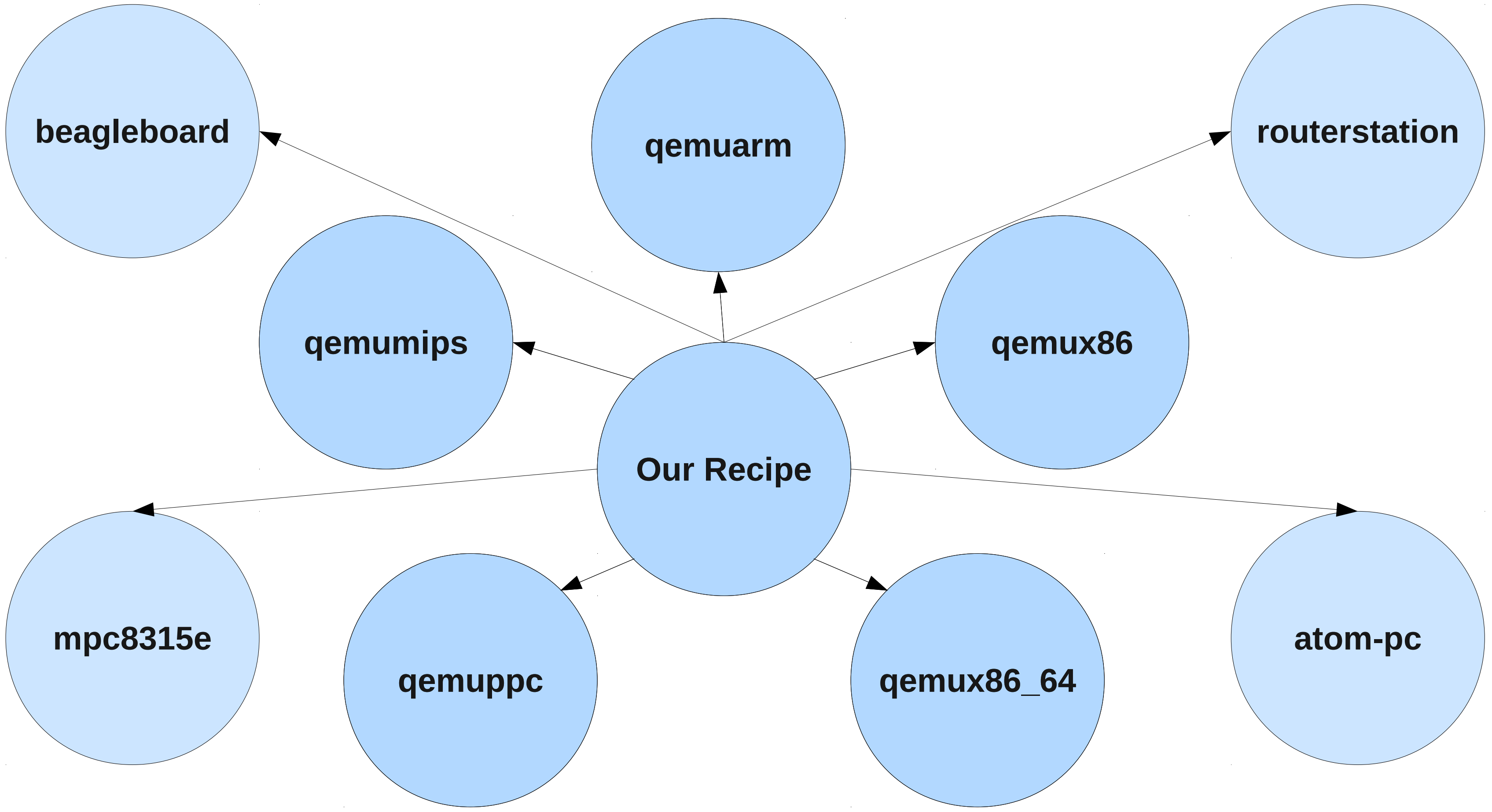
Reduce Software Development Lifecycle Churn.

Complexities

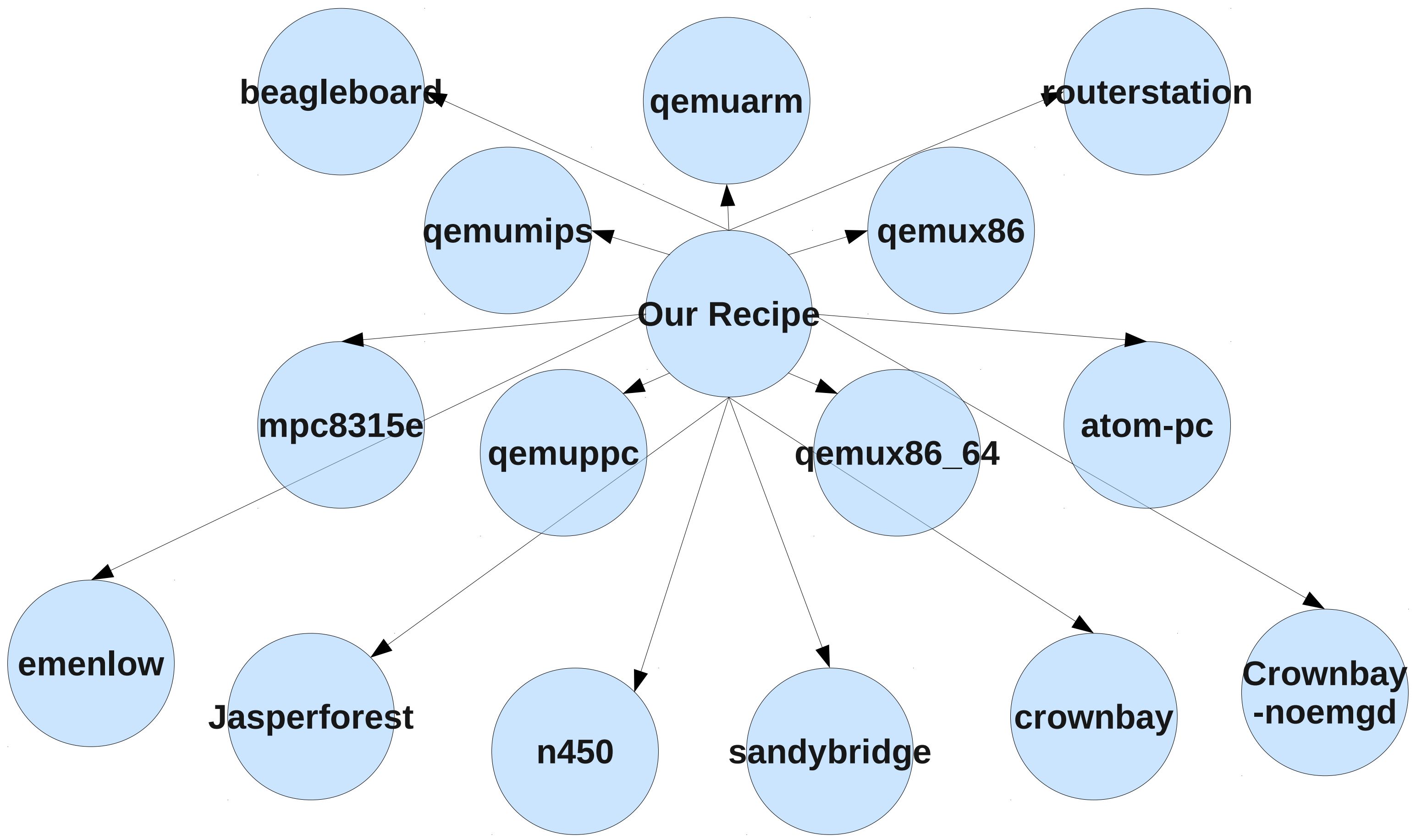
Complexities



Complexities



Complexities



Complexities

- **One recipe**
  - **5 architectures**
  - **4 core BSP**
  - **6 non-core BSPs in meta-intel**
  - **15 x-compiles**
  - **But....**

Complexities

- **One recipe**
  - **16 theoretical different image types per arch * 15 architectures**
    - **Not all arches support all image types**
  - **240 total theoretically possible images**
    - **sato, lsb, sdk....**

Complexities

If we're not proactive about code quality, lots of things can go wrong.....

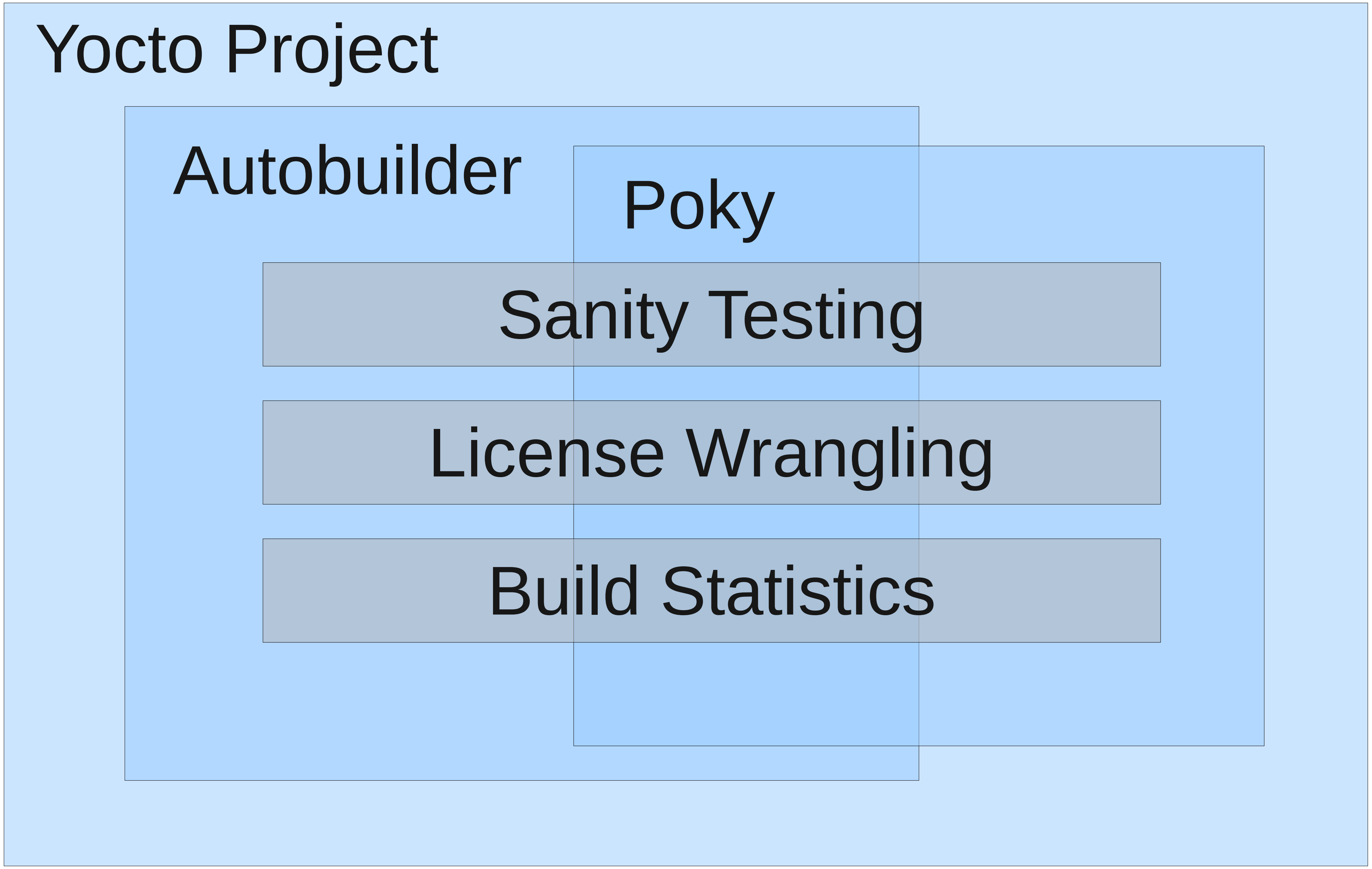
Complexities

It's only going to get more complex

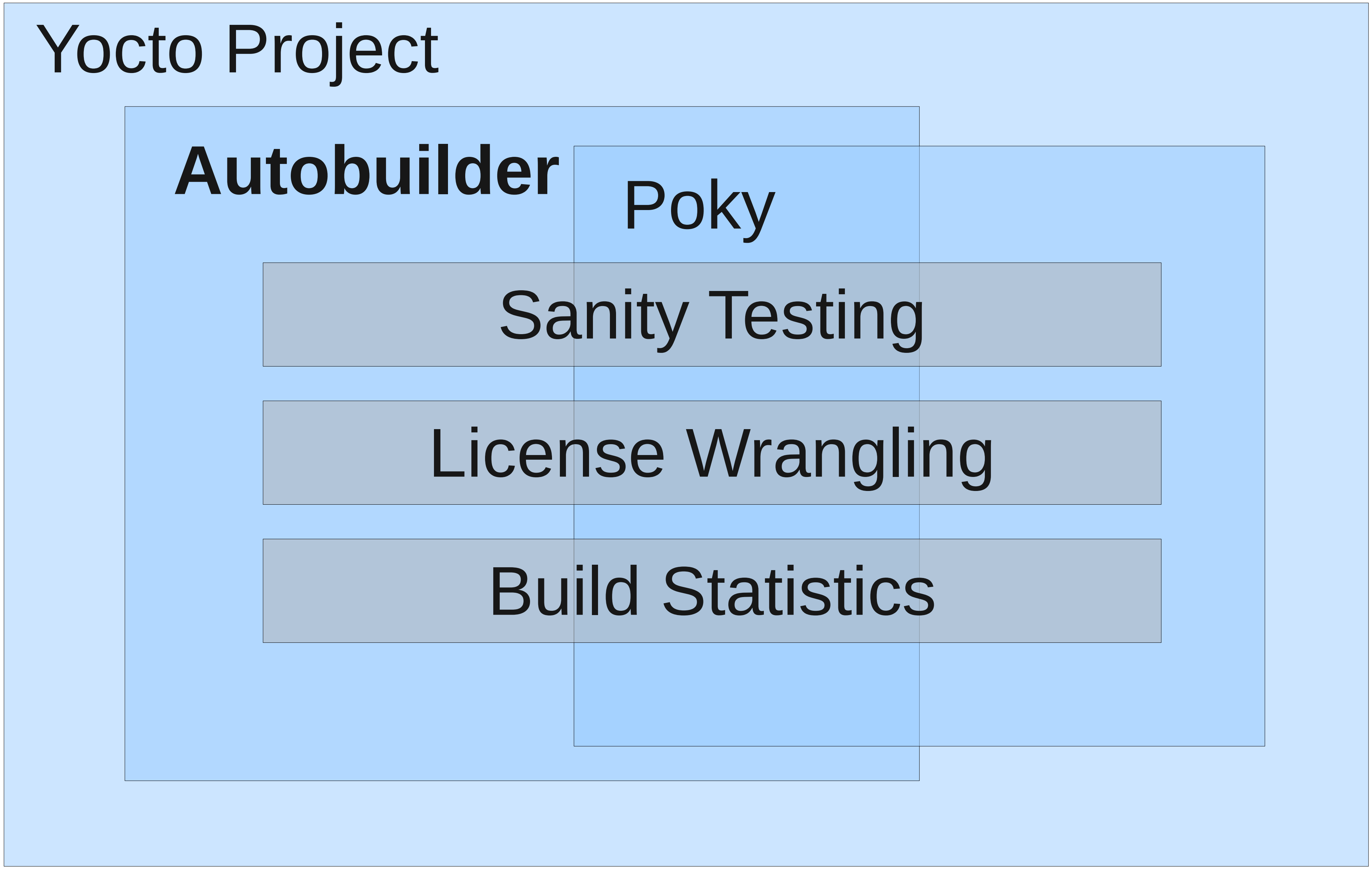
What we need

- Reproducible builds
- Basic QA
- License tracking
- Finding the pain points

Delivering Predictability



Delivering Predictability



Autobuilders

- Production Autobuilders
  - Quickly respond to a fast changing code base
  - Avoid “Works on my machine”-itis
  - Find race conditions
  - Find host dependent issues
  - Find bad commits
  - Help bisect build failures
  - Help find dependency chain breakage

Autobuilders

- Developer Autobuilders
  - Test cross-compilation before commit
  - Production style builds
  - Small OS footprint
  - Build what you want to build

Autobuilders

- Yocto autobuilder
  - buildbot based
  - git://git.yoctoproject.org/poky-autobuilder.git
  - Setup in under 5 minutes!

Autobuilders

- Prerequisites:
  - Python 2.6
  - python-twisted
  - python-jinja2
  - python-twisted-mail
  - sqllite

Autobuilders

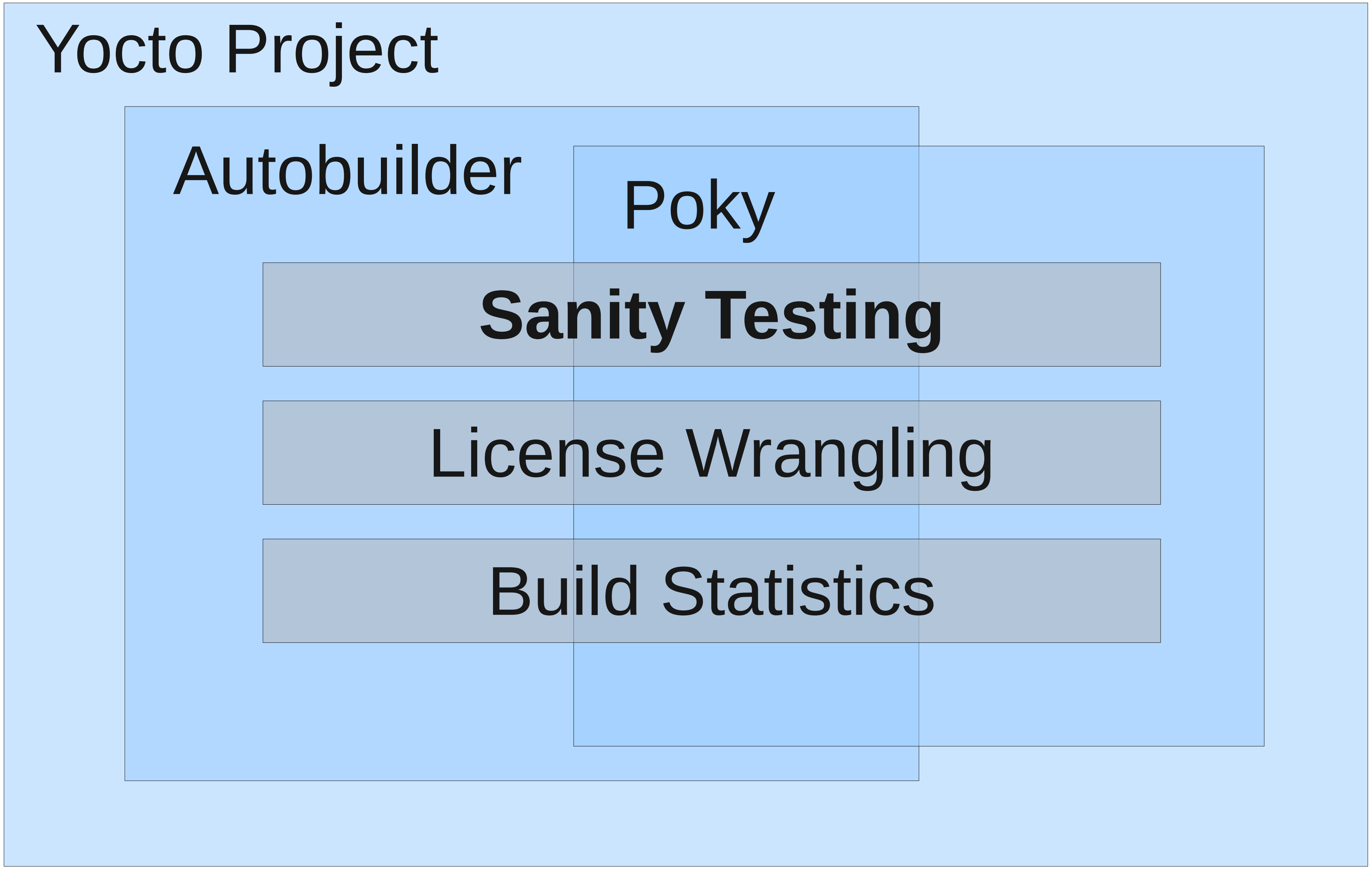
- Comes with
  - Basic pokyABConfig.py
  - Helper scripts
  - Easy Installer

Set up your own!

```
cd ~
git clone git://git.yoctoproject.org/poky-autobuilder.git
cd poky-autobuilder
./scripts/poky-setup-autobuilder both
source ~/.profile;
cd ../poky-master; make start
cd ../poky-slave; make start
```

Live Demo

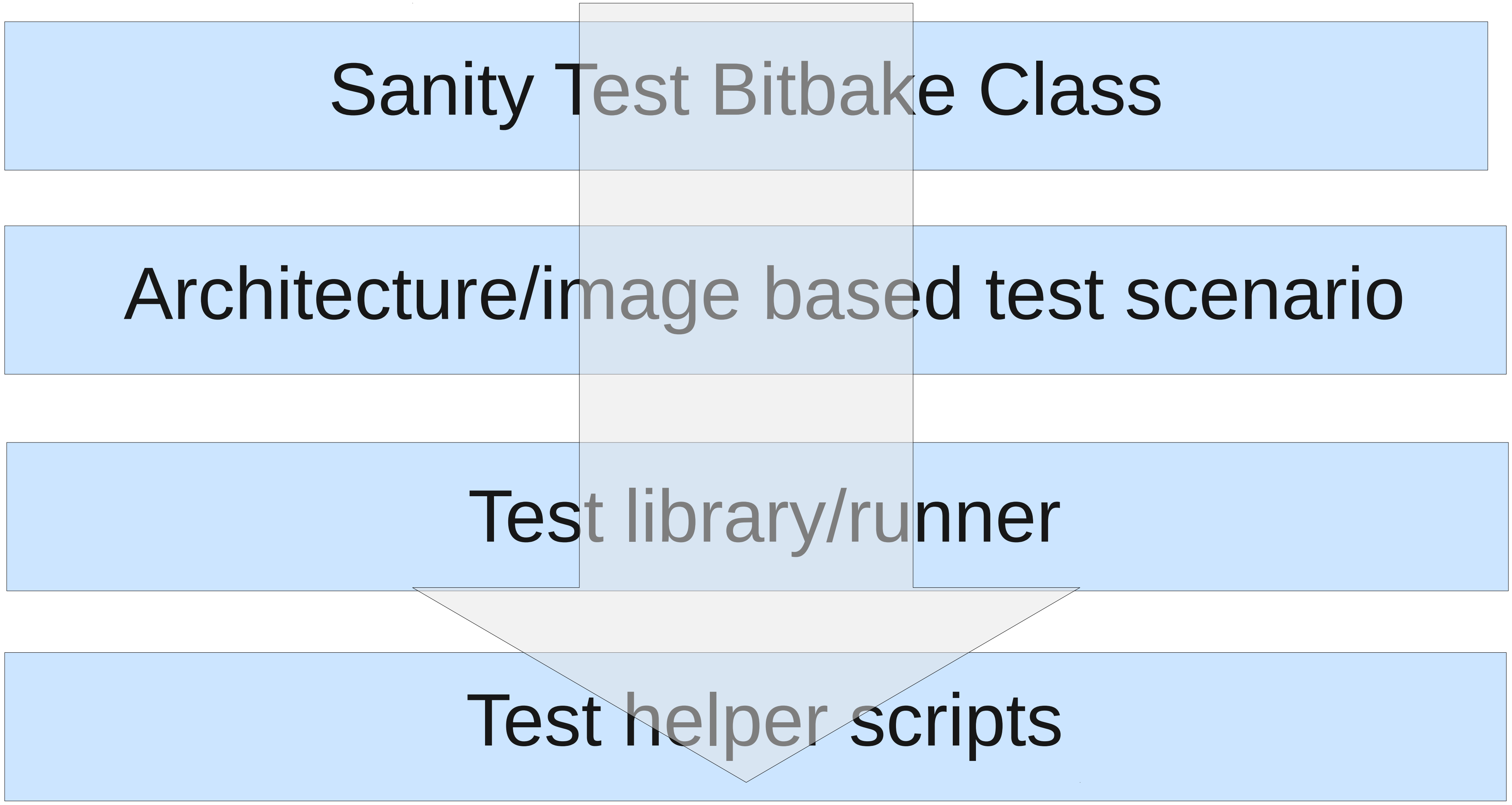
Delivering Predictability



Sanity Testing

- Extensible
- Frees up QA resources
- Reproducible smoke testing
- Multiarch/multiimage scenarios
- Can run automatically post build via local.conf
- Or via an autobuilder

Sanity Testing


Sanity Test Bitbake Class
Architecture/image based test scenario
Test library/runner
Test helper scripts

Sanity Testing

meta/classes/imagetest-qemu.bbclass

scripts/qemuimage-tests/scenario/${ARCH}/*

scripts/qemuimage-testlib and runners

scripts/qemuimage-tests/{sanity|tools}/*

Sanity Testing

- Test suite
  - Architecture and image based scenarios
  - Very easy to add already existing tests

Sanity Testing

sanity ssh
sanity scp
sanity dmesg
sanity zypper_help
sanity zypper_search
sanity rpm_query
sanity connman
sanity shutdown

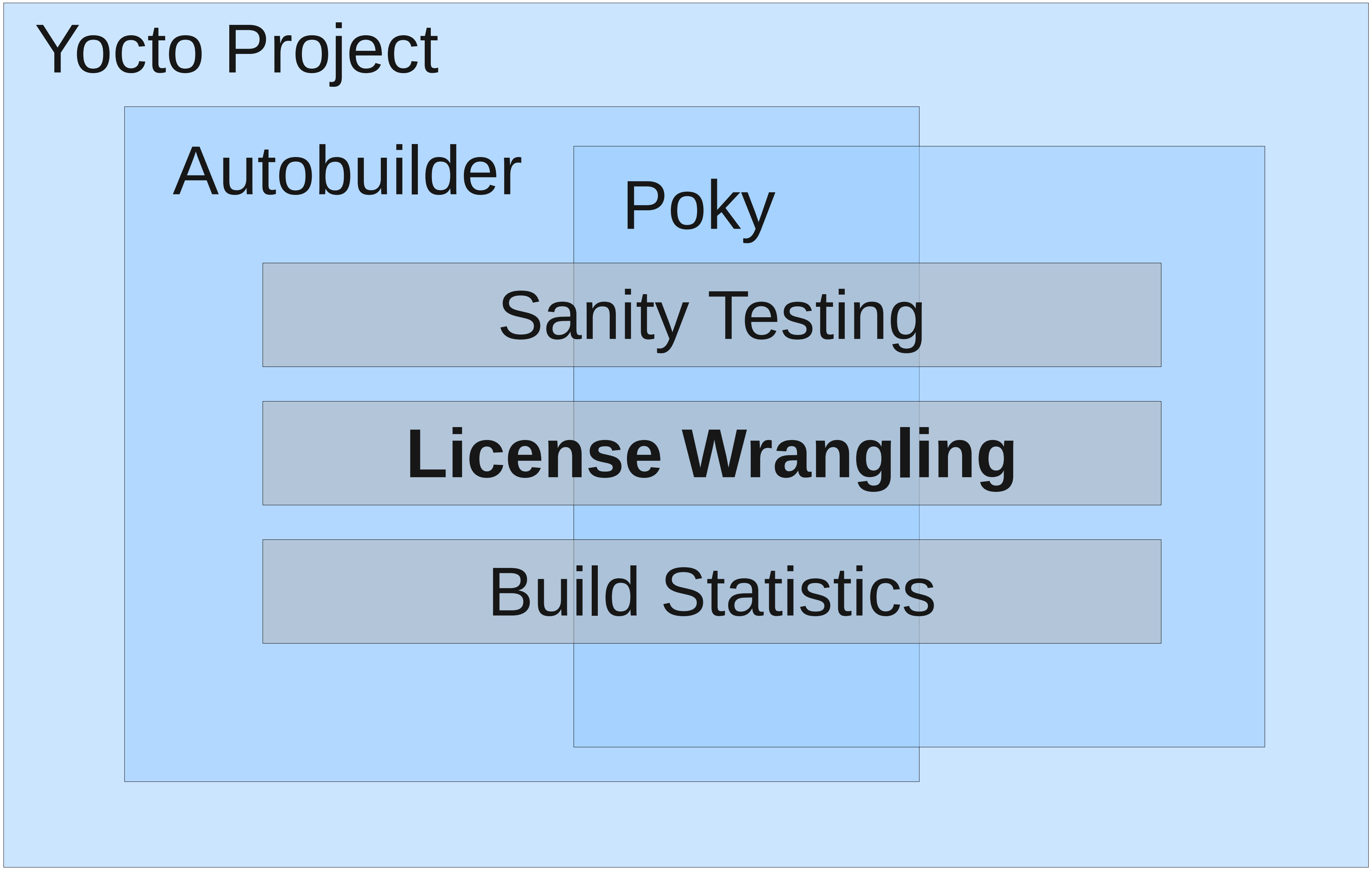
Sanity Testing

- Tests
  - bash/expect based test scripts
  - called via test runners in scripts/sanity
  - Tests stored in qemuimage-testlib
    - More secure to create tap devs with poky-gen-tapdevs.

Sanity Testing

- Gotchas:
  - QEMU user NOPASSWD
  - More secure to create tap devs with poky-gen-tapdevs.
  - For headless, see wiki docs:
    https://wiki.pokylinux.org/wiki/Enabling_Automation_Test_in_Poky

Delivering Predictability



License Wrangling

- Verify image compatibility to required license type
  - non-GPLv3
- Provides an entire package directory tree
  - Actual licenses
  - Generics.
- Helps maintain license compliance

License Wrangling

Recipe contains:

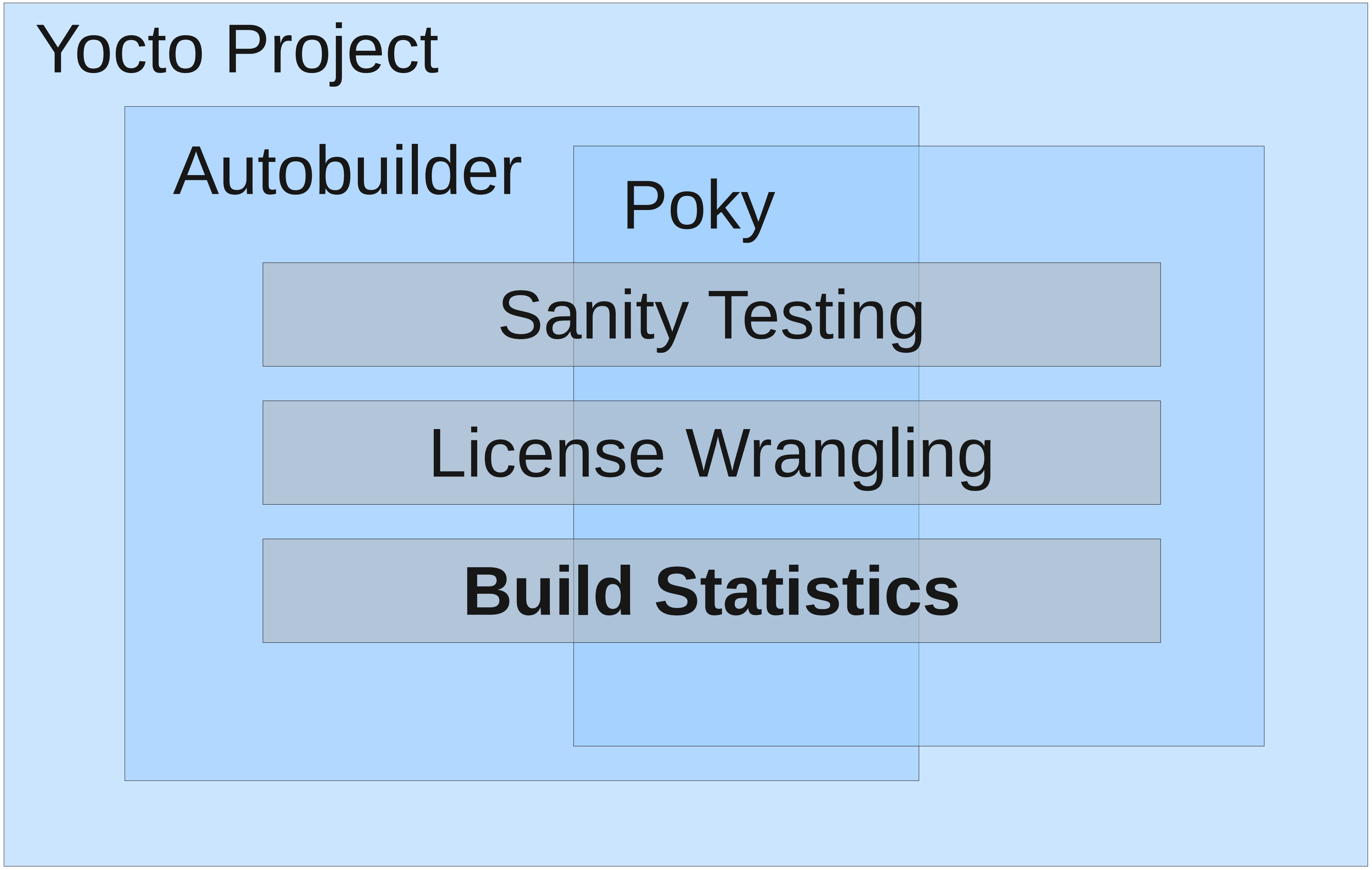
- LICENSE
  - Tells license.bbclass the common license type
  - Symlink from license wrangling output to a generic
- LIC_FILES_CHECKSUM
  - License file URI
  - Checksum
  - Where we get the specific license

License Wrangling

License are found in:

${POKYBASE}/build/tmp/deploy/images/licenses

Delivering Predictability



Build Statistics

Build level:

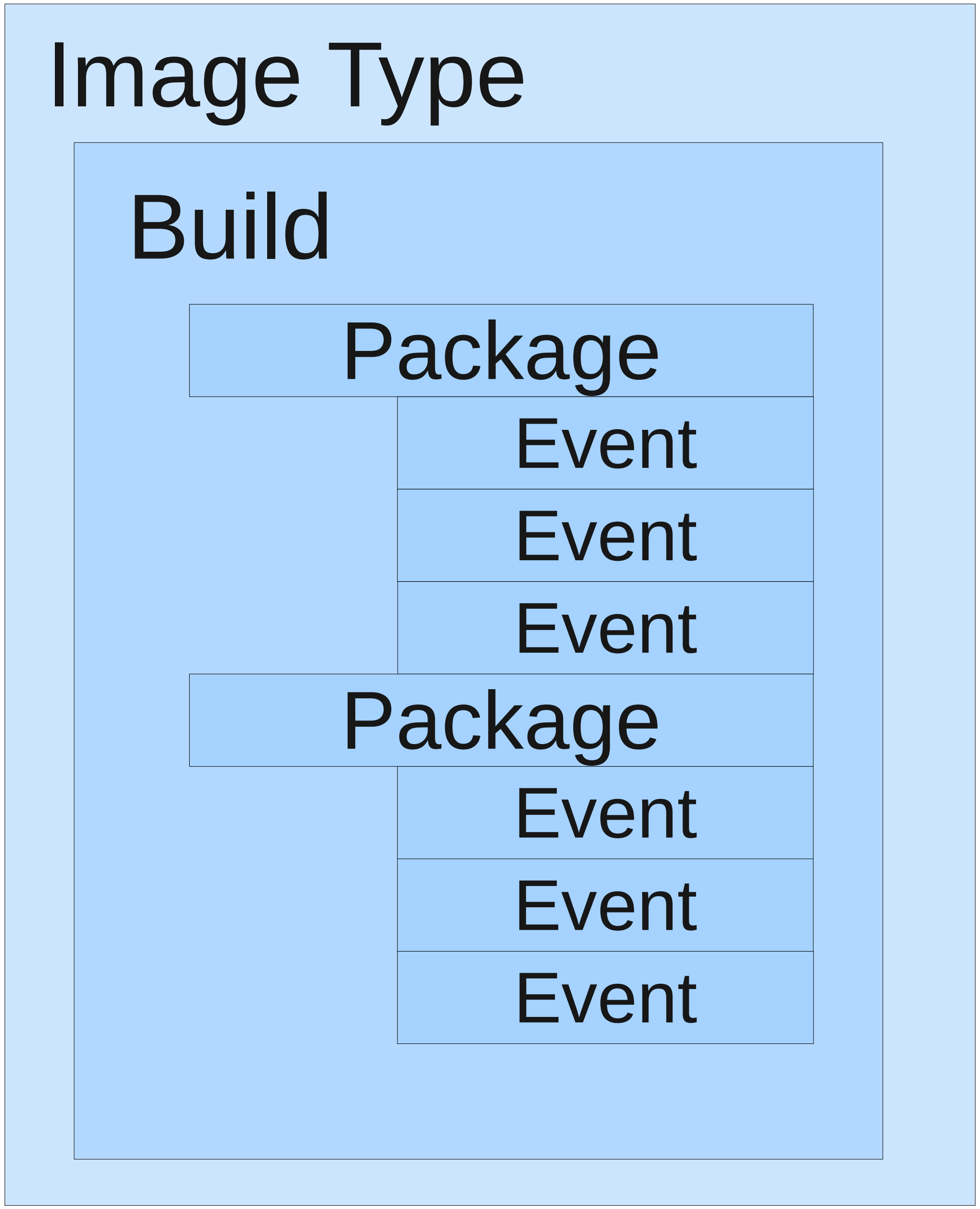
- Host info
- Elapsed build time
- CPU usage
- Build failure information

Build Statistics

Package level:

- List of events triggered
- Elapsed event time
- CPU usage
- Event failure information

Build Statistics



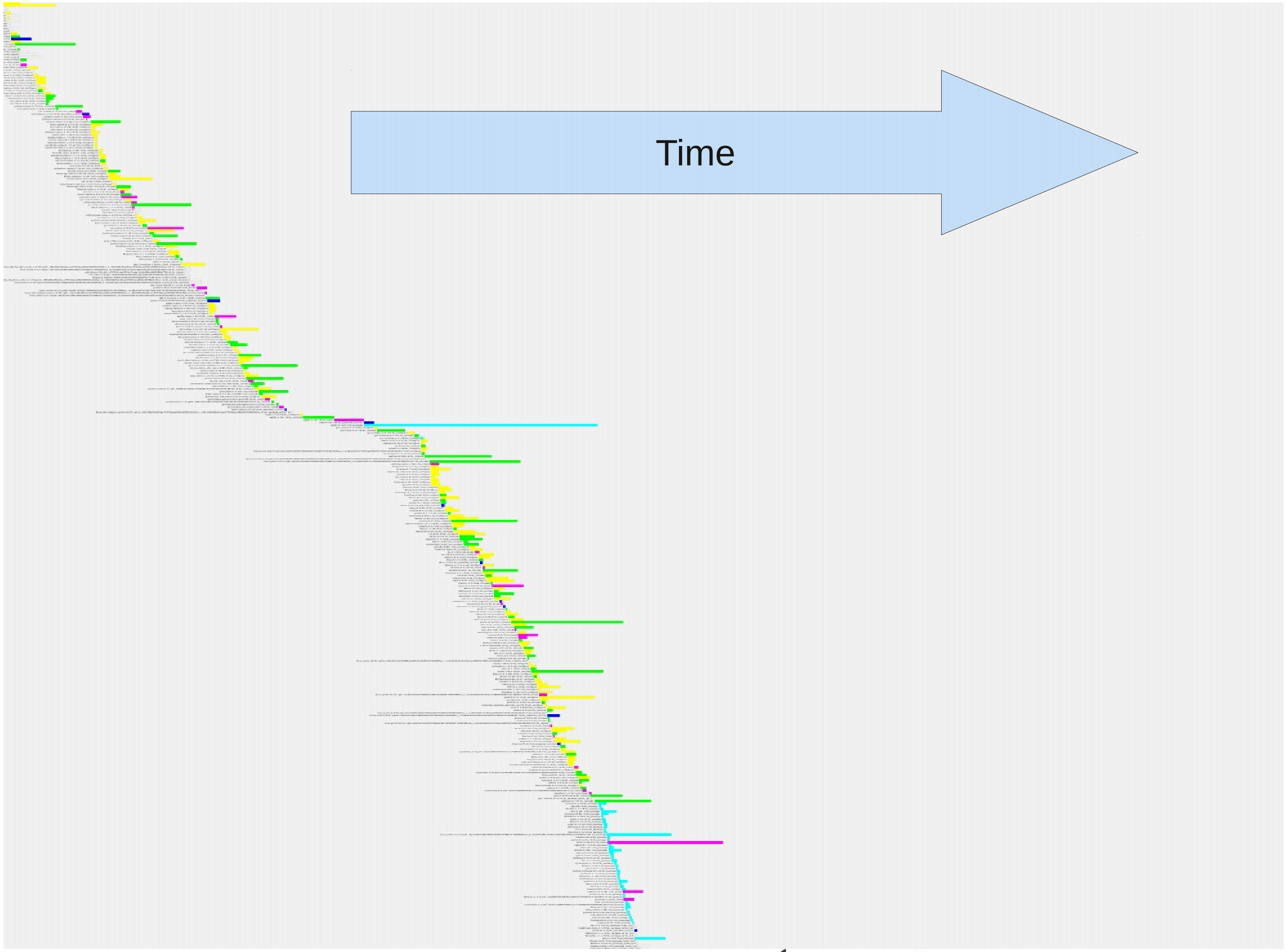
```
build/tmp/deploy/images/licenses/:
poky-image-minimal-qemux86
`-- 201103251310
    |-- build_stats
    |-- autoconf-native-2.65-r2
    |   |-- do_compile
    |   |-- do_configure
    |   |-- do_fetch
    |   |-- do_install
    |   |-- do_patch
    |   |-- do_populate_sysroot
    |   |-- do_setscene
    |   `-- do_unpack
    |-- automake-native-1.11.1-r1
    |   |-- do_compile
    |   |-- do_configure
    |   |-- do_fetch
    |   |-- do_install
    |   |-- do_patch
    |   |-- do_populate_sysroot
    |   |-- do_setscene
    |   `-- do_unpack
```

Build Statistics

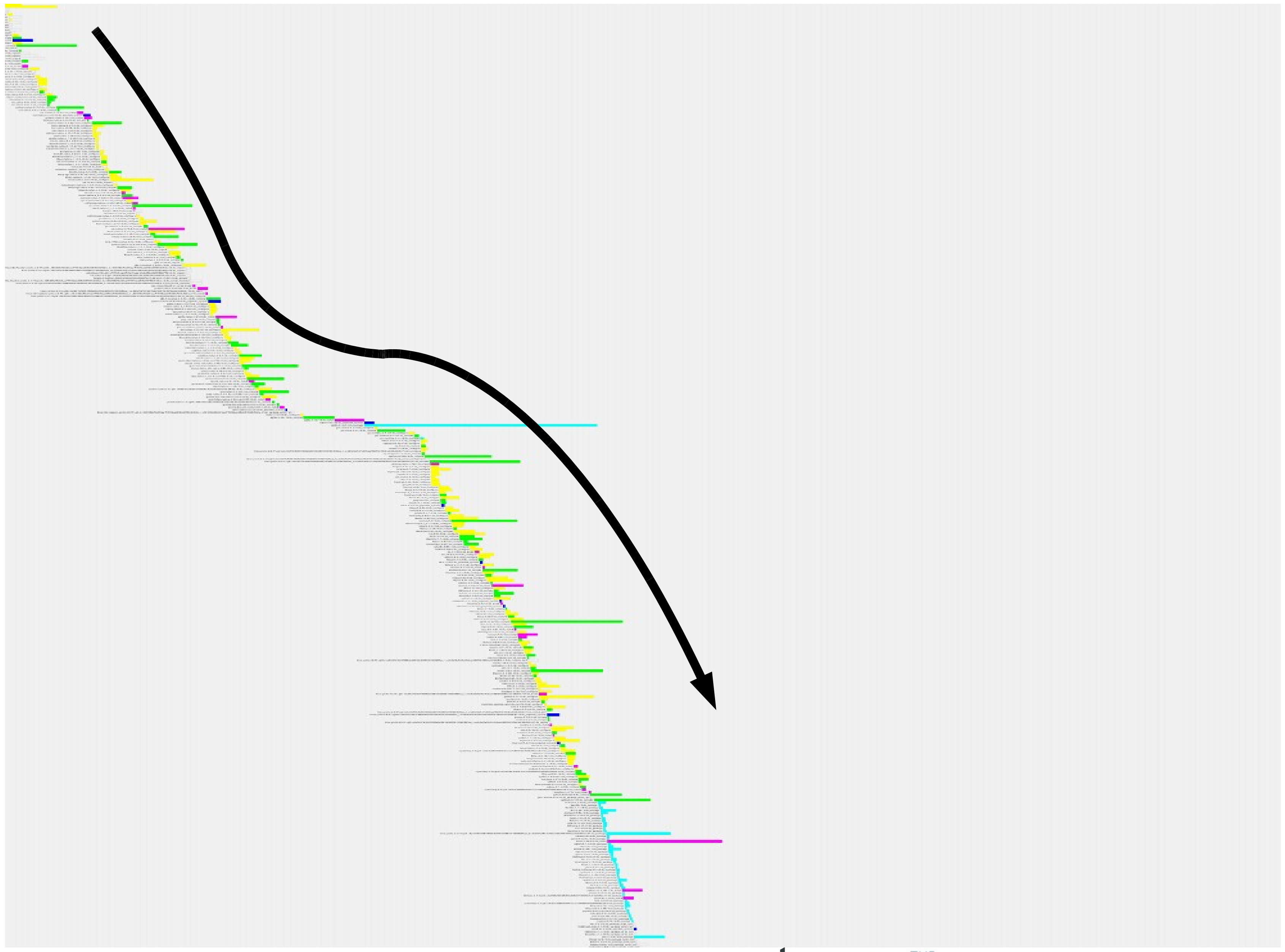
Gives us:

- Performance indicators
- Track down issues
  - CPU/Dependancy/IO bound
- Visualize your build performance
  - Patch to pybootchart

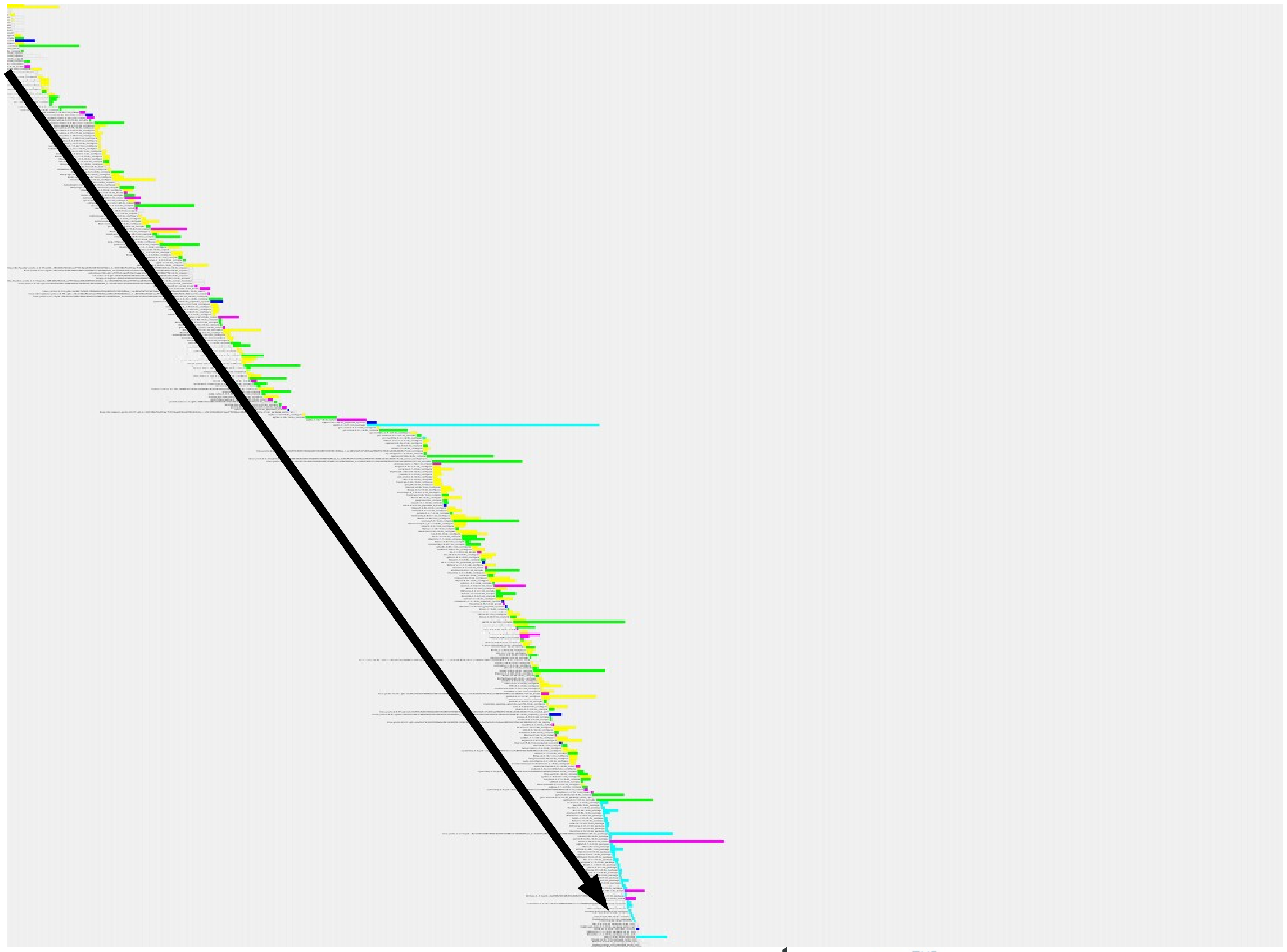
Build Statistics Visualization



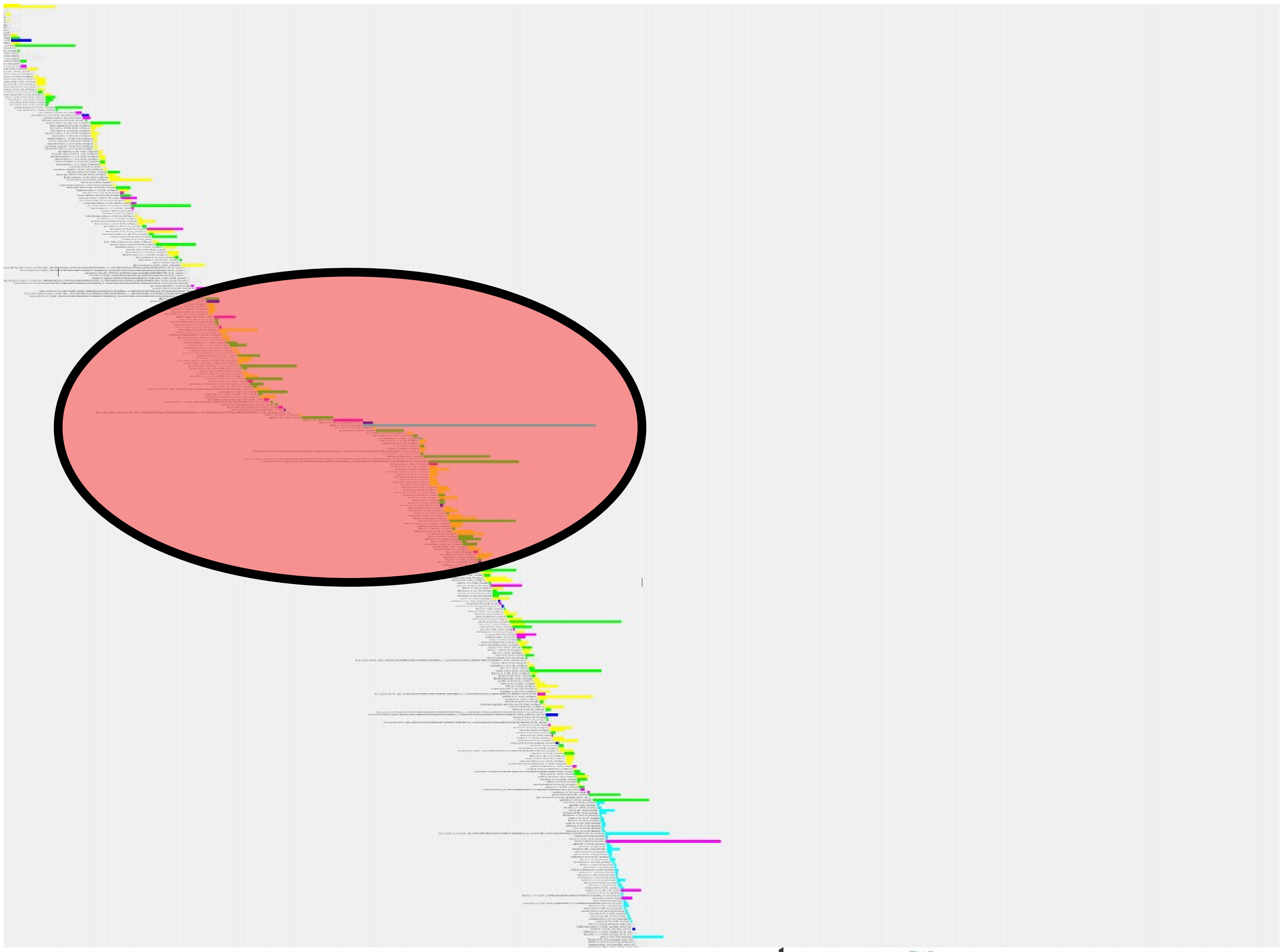
Build Statistics Visualization



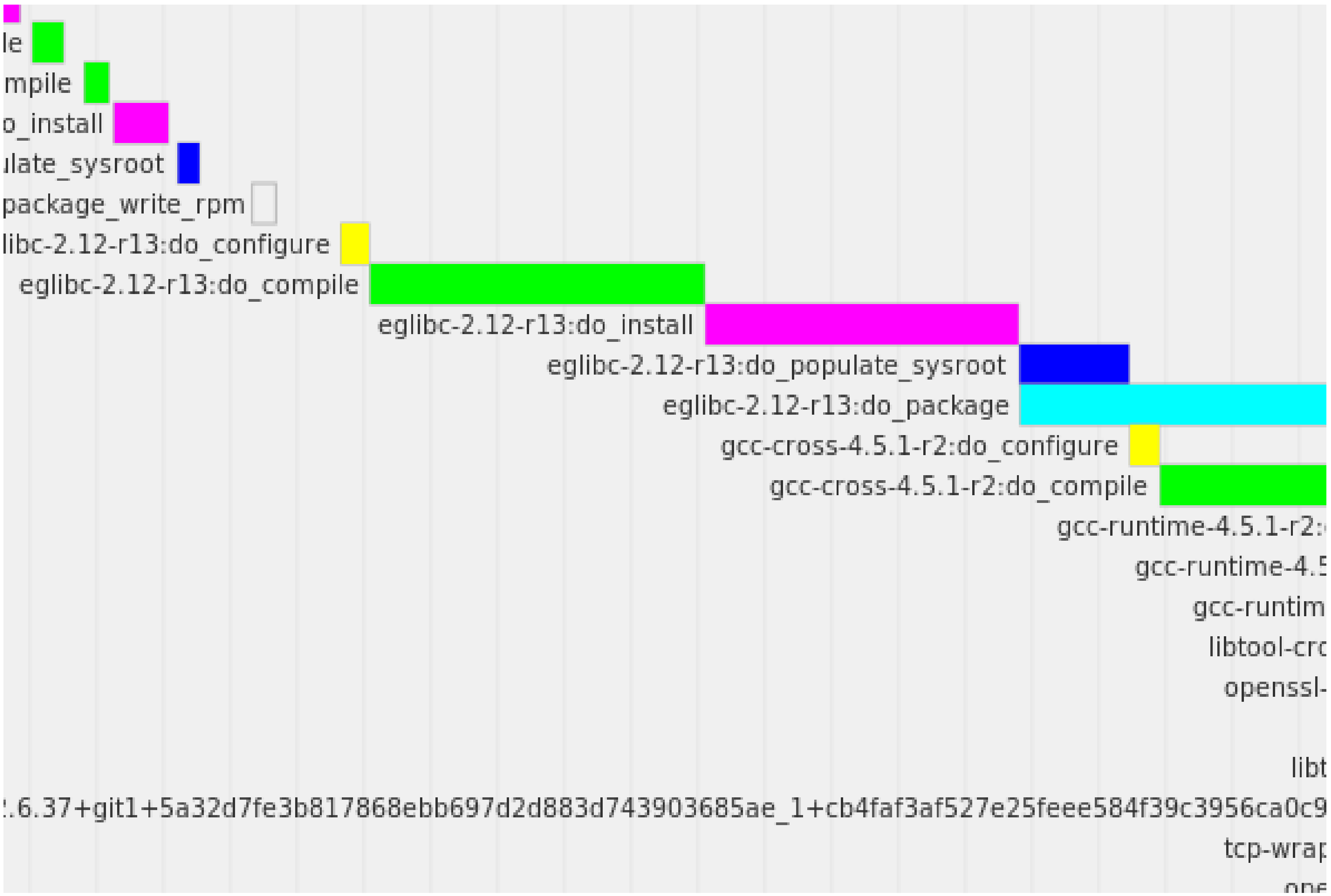
Build Statistics Visualization



Build Statistics Visualization



Build Statistics Visualization



Where do we go from here?

Where do we go from here?

Autobuilder:

- Meta-targets
- Helper script integration into main config
- Continuous integration

Where do we go from here?

License tracking:

- More generic license files
- Better LICENSE field parsing

Where do we go from here?

Build Statistics:

- Collect even more data.
  - Image size w/o free space.
- Better data visualization.
  - Web based

Production autobuilder

Resources

- http://www.yoctoproject.org
- http://git.yoctoproject.org/cgit/cgit.cgi/poky-autobuilder/
- http://autobuilder.yoctoproject.org
- pybootchartgui patch for build statistics
- https://wiki.pokylinux.org/wiki/Enabling_Automation_Test_in_Poky

Legal Information

intel®

Leap ahead™