About LAVA

- Framework used by Linaro for automated testing
- Extensible web frontend
- Device management and automated deployment
- APIs and command line tools
- Tools for automating test suites on Ubuntu and Android based Linaro builds
- Support for many popular low-cost ARM dev boards
  - beagleXM, Panda, Snowball, Origen, mx51evk, mx53qs...
  - Support for new boards is easy to add
How Linaro Uses LAVA

• Daily automated tests of multiple images and hardware packs on Linaro member hardware
• Automated tests of new kernels/features
• Android continuous integration testing
• Kernel continuous integration testing
• Platform enablement tests
LAVA Architecture

Hardware Components
- Server(s)
- Network infrastructure
- Console servers
- Networked PDUs
- Racks of ARM Boards
LAVA Components

- LAVA Server
- LAVA Dashboard
- LAVA Scheduler
- LAVA Dispatcher
- LAVA Test / LAVA Android Test
LAVA Scheduler

- Primary entry point for test jobs
- Displays current device status and current job status
- Provides XML-RPC API for job submission
- Provides command-line tools for job submission
LAVA Scheduler

- Device Details
- Admin functions for taking boards offline for maintenance
LAVA Scheduler

- Live monitoring of jobs in progress
- Job Cancellation
- Results link (once the job is complete)
LAVA Dispatcher

- Talks to the individual test devices
- Based around running predefined 'actions'
  - Actions do things like deploying images, running tests, and submitting results
  - Actions can take parameters
  - New actions can be added in-tree, or as plugins
- Currently supports Linaro and Android image deployments
- Local board configuration details are stored in config files
  - Inheritance for board type config, specific board config
- Can be used standalone, or kicked off by the scheduler daemon
LAVA Test

• Provides a uniform interface for installing tests, running them, and parsing results
• Test wrappers act as the "glue" between individual test suites and LAVA
• Supports out-of-tree tests for tests that can't be included
• Test parameter defaults can be overridden
• Can be used standalone for convenient local execution

LAVA Android Test

• Provides the Above functionality for Android testing
• Uses ADB to talk to Android devices rather than running locally
LAVA Dashboard

• Storage and retrieval of raw test results and attachments
• Provides XML-RPC API for results submission
• Provides command-line interface to the API

Some Terminology:

• Bundle Stream - A way of organizing related result bundles
• Result Bundle - a set of results submitted after a testing session, can contain multiple test runs, as well as other information about the system where the testing was performed
• Test Run - The results from a single test suite
• Test Case - The individual id and result of a single test within a test run
LAVA Server

• Server framework for LAVA web components
  ◦ Ties together all the previous web components we've discussed
• Extensions can be written to add functionality
• Dashboard and Scheduler are the primary extensions
• Extensions can also be written to do things like special data or results handling (example: Kernel CI results)
Extending LAVA Server

• You can use existing data in other extensions
  ◦ Such as the dashboard or scheduler data
• Add new models for storing new things, or denormalizing existing data
• Create new views for visualizing your data
• Add new features not provided elsewhere
• Extend the xmlrpc API
An example: Android Benchmarks
Android CI Loop

- Linaro android-build system - frontend to Jenkins
- Submit test job to LAVA Scheduler if successful
  - Test results submitted to LAVA Dashboard
Android CI Loop

- JSON view of test results referenced by job id
- Results can be displayed on the android-build summary page
Kernel CI Loop

• Build system rebuilds trees when changes are detected
  ◦ Build results submitted to LAVA Dashboard
• Submit test job to LAVA Scheduler if successful
  ◦ Test results submitted to LAVA Dashboard
• LAVA Kernel CI View consolidates results
Kernel CI Results View
Installing LAVA

$ bzr branch lp:lava-deployment-tool

- Handles deployment of any LAVA component and dependencies
- Uses pypi and virtualenv
- Multiple instances allowed on the same server
- Sets up databases
- Copies everything needed (with dependencies) for offline installs
- Backup/Restore commands
- Upgrades supported
Installing LAVA

$ lava-deployment-tool setup

• Installs virtualenv, pip, uwsgi and other dependencies that will be needed
Installing LAVA

$ lava-development-tool bundle requirements/requirements_latest.txt

• Creates a bundle of software specified in the requirements file
• Also downloads dependencies
• Bundle can be moved to any system and installed later
• Can be used with python package index (pypi) or source repositories
• Can also be downloaded from https://launchpad.net/lava-project/+download
Installing LAVA

$ lava-deployment-tool install myinstance lava.pybundle

• Installs the software downloaded into the bundle
• Creates databases
• Runs migrations

Before configuring your instance we need to ask you a few questions
The defaults are safe so feel free to use them without any changes

Note: it is safe to CTRL-C at this stage!

User account configuration

We need to create a system user for this instance:
System user account configuration

User name:  'lava-test'
User description: 'User for LAVA instance test'

next  - Use the user name as is
edit  - Edit the user name
Please please decide what to do:
Creating an Admin user

• The admin user can access the django admin panel
• give permissions to other users
• add bundle streams, devices, device_types, etc

First, setup the virtual environment:
$ cd /srv/lava/instances/instance_name
$ . bin/activate

Create the user, answer a few questions:
$ lava-server manage createsuperuser
Make a Bundle Stream

- Can be done from either the admin tool, or the command line

```bash
```
Pushing a Test Result

• Normally this would happen as part of your test job

$ lava-dashboard-tool put --dashboard-url=http://localhost/RPC2 example.bundle /anonymous/test/
Getting More Information

Documentation
• lava.readthedocs.org

Source
• http://launchpad.net/lava

Our system
• http://validation.linaro.org

IRC
• #linaro on freenode.net (I'm plars there)

Mailing list
• linaro-validation@lists.linaro.org
• linaro-dev@lists.linaro.org
Backup
Anatomy of a Test Job

{
  "timeout": 18000,
  "actions": [
    {
      "command": "deploy_linaro_image",
      "parameters": {
        "hwpack": "http://snapshots.linaro.org/oneiric/lt-origen-oneiric/20120210/0/images/hwpack/hwpack_linaro-lt-origen_20120210-0_armel_supported.tar.gz",
        "rootfs": "http://snapshots.linaro.org/oneiric/linaro-o-ubuntu-desktop/20120210/0/images/tar/linaro-o-ubuntu-desktop-tar-20120210-0.tar.gz"
      },
      "metadata": {
        "hwpack.build": "0",
        "hwpack.date": "20120210",
        "hwpack.type": "lt-origen-oneiric",
        "rootfs.date": "20120210",
        "rootfs.type": "linaro-o-ubuntu-desktop",
        "rootfs.build": "0"
      }
    },
    {
      "command": "lava_test_install",
      "parameters": {
        "tests": [ "glmemperf"],
        "timeout": 7200
      }
    },
    {
      "command": "boot_linaro_image"
    },
    {
      "command": "lava_test_run",
      "parameters": {
        "test_name": "glmemperf"
      }
    },
    {
      "command": "submit_results",
      "parameters": {
        "stream": "/anonymous/lava-daily/",
        "server": "http://validation.linaro.org/lava-server/RPC2/"
      }
    }
  ],
  "job_name": "lt-origen-oneiric-20120210-0+linaro-o-ubuntu-desktop-20120210-0.tar.gz",
  "device_type": "origen"
}
Anatomy of a Test Job

Deploying a Linaro Image

Optional Metadata
Anatomy of a Test Job

{  "timeout": 18000,
   "actions": [
      {  "command": "deploy_linaro_image",
         "parameters": {
            "hwpack": "http://snapshots.linaro.org/oneiric/lt-origen-oneiric/20120210/0/images/hwpack/hwpack_linaro-lt-origen_20120210-0_armel_supported.tar.gz",
            "rootfs": "http://snapshots.linaro.org/oneiric/linaro-o-ubuntu-desktop/20120210/0/images/tar/linaro-o-ubuntu-desktop-tar-20120210-0.tar.gz"
         },
         "metadata": {
            "hwpack.build": "0",
            "hwpack.date": "20120210",
            "hwpack.type": "lt-origen-oneiric",
            "rootfs.date": "20120210",
            "rootfs.type": "linaro-o-ubuntu-desktop",
            "rootfs.build": "0"
         }
      },
      {  "command": "lava_test_install",
         "parameters": {
            "tests": [ "glmemperf"],
            "timeout": 7200
         }
      },
      {  "command": "boot_linaro_image"
      },
      {  "command": "lava_test_run",
         "parameters": {
            "test_name": "glmemperf"
         }
      },
      {  "command": "submit_results",
         "parameters": {
            "stream": "/anonymous/lava-daily/",
            "server": "http://validation.linaro.org/lava-server/RPC2/
         }
      }
   ],
   "job_name": "lt-origen-oneiric-20120210-0+linaro-o-ubuntu-desktop-20120210-0",
   "device_type": "origen"
}

Install lava-test and setup tests we intend to run
Anatomy of a Test Job

```json
{
    "timeout": 18000,
    "actions": [
        {
            "command": "deploy_linaro_image",
            "parameters": {
                "hwpack": "http://snapshots.linaro.org/oneiric/lt-origen-oneiric/20120210/0/images/hwpack/linaro-lt-origen_20120210-0_armel_supported.tar.gz",
                "rootfs": "http://snapshots.linaro.org/oneiric/linaro-o-ubuntu-desktop/20120210/0/images/tar/linaro-o-ubuntu-desktop-tar-20120210-0.tar.gz"
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                "rootfs.build": "0"
            }
        },
        {
            "command": "lava_test_install",
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            }
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            }
        }
    ],
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    "device_type": "origen"
}
```

Boot into the test image
Anatomy of a Test Job

{
    "timeout": 18000,
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        {
            "command": "deploy_linaro_image",
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                "hwpack": "http://snapshots.linaro.org/oneiric/lt-origen-oneiric/20120210/0/images/hwpack/hwpack_linaro-lt-origen_20120210-0_armel_supported.tar.gz",
                "rootfs": "http://snapshots.linaro.org/oneiric/linaro-o-ubuntu-desktop/20120210/0/images/tar/linaro-o-ubuntu-desktop-tar-20120210-0.tar.gz"
            },
            "metadata": {
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                "hwpack.date": "20120210",
                "hwpack.type": "lt-origen-oneiric",
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                "rootfs.build": "0"
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            "parameters": {
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            }
        }
    ],
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Misc Setup stuff