Modernize Embedded Linux Software Development Tools to Achieve Development Anywhere

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Agenda

• What are the requirements
• Toaster project
• Eclipse IDE on non-Linux platforms
The Yocto Project Pillars

- Build System: bitbake
- Contents: OE-Core, Metadata layers, BSPs
- Developer Experience: Eclipse plug-in, HOB
Continuous Improving
Current Usage model

• Single user with Linux as development host environment
Challenges

Better support collaboration among engineers
Able to run and access build out from internet

Support non-Linux based development hosts
Toaster Project

- **Limitation with current Hob**
  - GTK based which is outdated by all means

- **A new web application based project**
  - Fully benefit from latest web technology offerings:
    - modernized look and feel
    - front-end interface via browser achieve platform independent
    - Robust web application frameworks

- **Based on design works from professional design firm and in-house design expert**
  - Feature roadmap, usage flow and user interfaces
Toaster Roadmap and Implementation Approach

• Freeway First
  • Needs to be at an advanced stage of maturity to be able to constructively engaging new users to Yocto Project which is unrealistic for the first incarnation
  • Initial iterations will focus on use cases relevant to existing Yocto Project users. This allows to lay the foundation, deliver values to user and attract community contribution early on

• Inside-Out
  • Core capabilities – specifying & running builds and conducting image analysis are implemented, refined and stabilized first.
  • Roll out additional features, e.g. project support for collaboration, public Toaster, etc.
Toaster Roadmap Overview

Overview Diagram

<table>
<thead>
<tr>
<th>Stage</th>
<th>ONE</th>
<th>TWO</th>
<th>THREE</th>
<th>FOUR</th>
<th>FIVE</th>
<th>SIX</th>
<th>SEVEN</th>
<th>EIGHT</th>
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<tr>
<td>5.10</td>
<td>Create Public Web Hub Account</td>
<td>TARGET</td>
<td>MINIMAL</td>
<td>TARGET</td>
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<td>5.11</td>
<td>Manage PWH Account</td>
<td>MINIMAL</td>
<td>TARGET</td>
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<td>5.20</td>
<td>Create Build</td>
<td>MINIMAL</td>
<td>TARGET</td>
<td>MINIMAL</td>
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<td>5.25</td>
<td>Export Project</td>
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<td>Gather Build Metrics</td>
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<td>MINIMAL</td>
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<td>Error Messaging</td>
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<td>TARGET</td>
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<td>Finding/Viewing Builds</td>
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<td>Install Single-User Web Hub</td>
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<td>5.50</td>
<td>Administering Accounts</td>
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<th>Extend</th>
<th>Enhance</th>
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<tbody>
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<td>Objectives</td>
<td>Lack of Help Docs</td>
<td>Team Wide Help Docs</td>
<td>Achieve Target TOT 1.2.3.4</td>
<td>Publicize Help Docs</td>
<td>Support testing of Team Help docs</td>
<td>Easily migrate to new help text</td>
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Toaster General Design

- Enhanced bitbake for better support client/server model
  - server resides in memory after start
  - Improved XMLRPC interface
- DSI as a new UI connect, listen and process events from the server
- The data store is defined as Django ORM and queried via Django relational query language which encapsulates the real implementation. The default is sqlite3
- REST APIs are defined to allow searching the data store
Early Access To Toaster

- **Wiki page**: [https://wiki.yoctoproject.org/wiki/Toaster](https://wiki.yoctoproject.org/wiki/Toaster)
- **Code**: [http://git.yoctoproject.org/cgit/cgit.cgi/poky-contrib/?h=webhob-poky/master](http://git.yoctoproject.org/cgit/cgit.cgi/poky-contrib/?h=webhob-poky/master)
Running Toaster

- **Setup build environment:**
  
  ```
  $ source oe-init-build-env
  ```

- **Build history enabled in conf/local.conf**
  
  - INHERIT += “buildhistory”
  - BUILDHISTORY_COMMIT = “1”
Running Toaster (2)

- **Start toaster server**
  
  `$ Source toaster start`
Running Toaster (3)

- Running a build

```bash
$ Bitbake core-image-minimal
```

```
jzhang@jzhang-ThinkPad-X230:~/toaster/build$ bitbake core-image-minimal
Successful start.
jzhang@jzhang-ThinkPad-X230:~/toaster/build$ bitbake core-image-minimal
```

```
NOTE: Resolving any missing task queue dependencies
```

```
Build Configuration:
BB_VERSION   = "1.20.0"
BUILD_SYS    = "x86_64-linux"
TARGET_SYS   = "qemux86"  
def: qemu:  
TARGET_FPU   = "m32 1586"
TUNE_FEATURES = "(noarch):f5896b40cde9a7ebeb7428f8792dd063cd095bfb"
```

```
NOTE: Preparing runqueue
NOTE: Executing SetScene Tasks
NOTE: Executing RunQueue Tasks
WARNING: Failed to fetch URL ftp://ftp.oss.org/pkg/lib/uuid/uuid-1.6.2.tar.gz, attempting MIRRORS if available
WARNING: Failed to fetch URL http://zlib.net/plgz/plgz-2.3.tar.gz, attempting MIRRORS if available
WARNING: Failed to fetch URL http://www.apache.org/dist/subversion/subversion-1.7.10.tar.bz2, attempting MIRRORS if available
WARNING: Failed to fetch URL http://downloads.sourceforge.net/project/libpng/libpng16/1.6.3/libpng-1.6.3.tar.xz, attempting MIRRORS if available
NOTE: validating kernel config, see log.do_kernel_configcheck for details
NOTE: Tasks Summary: Attempted 1584 tasks of which 255 didn't need to be rerun and all succeeded.
```
Example Simple Interface

Toaster - Builds

Outcome  Started On  Completed On  Target  Machine  Time          Errors  Warnings  Output  Log  Bitbake Version  Build Name
Succeeded Oct. 15, 2013, 9:38 p.m. Oct. 15, 2013, 10:33 p.m. core-image-minimal gemux86 0:54:59.185599 0:None

4:
Failed to fetch URL ftp://ftp.ossp.org/pkg/lib/uuid/uuid-1.6.2.tar.gz, attempting MIRRORS if available
Failed to fetch URL http://zlib.net/pigz/pigz-2.3.tar.gz, attempting MIRRORS if available
Failed to fetch URL http://www.apache.org/dist/subversion/subversion-1.7.10.tar.bz2, attempting MIRRORS if available
Failed to fetch URL http://downloads.sourceforge.net/project/libpng/libpng16/1.6.3/libpng-1.6.3.tar.xz, attempting MIRRORS if available

About Toaster | Yocto Project
What’s Next

• Initial release for early trial is targeted for 1\textsuperscript{st} week of Nov.
  • Supported bitbake changes
  • Toaster backend framework
  • REST APIs

• Define feature deliveries for 1.6 based on the usage scenarios with the “inside-out” approach with frontend support
Eclipse IDE on non-Linux Platforms

- Remove the barrier that embedded Linux development must be on a Linux platforms:
  - Corporate IT setup
  - Developer personal preference

- Fundamental building blocks
  - Java network URI class encapsulates key URI information:
    - host, port, path, scheme, etc.
  - Eclipse Target Management (TM) project’s Remote System Explore(RSE) framework various pluggable remote resource subsystems:
    - Remote files subsystem, Shell, Process, Terminal, etc.
Eclipse Community Prototypes

- **Eclipse CDT (C/C++ Development Tooling)**
  - Has the capability to create a project on remote location
  - Can’t do configuration for autotool based project
  - Can’t build

- **Eclipse Parallel Tools Project (PTP) Remote Development Tools (RDT) feature**
  - Aims at provides a framework and reference implementation that facilitates using a local IDE to perform development tasks on another, remote machine
  - Cumbersome to setup, not stable, no autotools support, not follow CDT model
Yocto Project Eclipse Plug-in Changes

- **Code refactor and created common remote.util plugin**
  - facilitates remote operations using RSE remote file, shell, process and terminal subsystems

- **Made contributions to upstream**
  - Fixed deadlock situation
  - Allows asynchronous operation which makes remote operation more robust

- **Replace IPath based location specification with URI**
  - IPath only allows local file system access
Yocto Project Eclipse Plug-in Changes (cont)

• Add remote location specification to project template and preference setup

• Able to create bitbake commander project and ADT project that extend cdt autotool based project remotely
  • Modified the code by changing some of IPath usage to be LocationURI based.
  • The remote projects still need to be created on Linux machines

1  build can only run on Linux platforms
2  cross toolchain and sysroot also requires Linux environment
 Remaining Challenges – System Development

• **To run Yocto Build against bitbake commander project**
  • Either via build appliance virtual machine that runs on the same non-Linux platform
  • Or still need to access the remote Linux machine

• **Till Toaster is ready that allows to run the build via web browser**
Remaining Challenges – Application Development

- Remote Yocto Project autotool projects cross compilation needs to happen on the remote Linux host.
- The core implementation of CDT build call stack, e.g. CommonBuilder, BuildRunHelper and ManagedBuidManager are tightly coupled with the usage of IPath.
Remaining Challenges – Application Development (2)

• For switching to use URI based location,
  Option 1: change the overall CDT code base
  It is not supported by the CDT upstream

  Option 2: fork the CDT implementation
  • Only make needed changes to support our usage model,
  • Route the call via the customized builder registration/extension.
  • Long term maintenance and sync issues with upstream CDT
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Thank you for your participation!