Creating new Tizen profiles using the Yocto Project

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Overview

- Tizen Profiles
- The Yocto Project
- Building Tizen on Yocto
- Creating new meta layers and recipes for Tizen
- Contributing to Tizen on Yocto
Tizen

- Open source Linux-based software platform
- Project of the Linux foundation
- Compatible with ARM and Intel architectures
- Excellent HTML5 and web apps support
- Suitable of all device areas: mobile, wearable, embedded, IVI, IoT, etc.
Tizen Versions

- Tizen 1.0 Larkspur
- Tizen 2
- Tizen 3 (upstream)
Tizen 3 Profiles

Tizen:Common

Mobile  TV  Wearable  IVI
Tizen 3 Key Features and Core Components

- Linux kernel 3.14 LTS (or newer)
- Security: SMACK and Cynara
- Systemd
- Wayland & Weston
- Crosswalk web runtime
- EFL
- RPM
Crosswalk

- Open source web runtime for all Tizen 3 profile based on Tizen:Common
- Up to date version of Blink and Chromium
- Up to date JavaScript APIs based on the web standards
- Tizen specific JavaScript APIs
- https://crosswalk-project.org/
How to Build Tizen 3?

- Git Build System (GBS)
- Tizen on Yocto

System requirements:
- Intel Core i7 CPU (or better)
- 8GB RAM (or more)
- GNU/Linux distribution
The Yocto Project

• Open source collaborative project for creating custom Linux-based systems for embedded devices.
• Based on the OpenEmbedded build framework
• Project of the Linux Foundation

Getting started:
• https://www.yoctoproject.org/
• https://www.yoctoproject.org/documentation
Advantages of the Yocto Project

- Represents a whole GNU/Linux distribution as a simple and easy to extend configuration
- Existing Board Support Packages (BSP) for various architectures and numerous devices
- De facto industry standard for automotive, embedded devices, and Internet of Things (IoT)
- Large community
Yocto Project Development Environment

Image courtesy of the Yocto Project official documentation
Releases of the Yocto Project

- Yocto Project 2.0 Jethro (expected release date 30 Oct)
- Yocto Project 1.8 Fido
- Yocto Project 1.7 Dizzy (used by Tizen on Yocto)
- Yocto Project 1.6 Daisy
- Yocto Project 1.5 Dora
- Yocto Project 1.4 Dylan
Tizen on Yocto Project

● Project which aims at building Tizen images using the tools provided by the Yocto Project
● Provides Tizen distribution layer (meta-tizen) for Yocto/OpenEmbedded
● Maintainers: Mauro Carvalho Chehab, Leon Anavi

Getting started:

● https://wiki.tizen.org/wiki/Build_Tizen_with_Yocto_Project
● https://wiki.tizen.org/wiki/Tizen_on_Yocto_Project
Tizen on Yocto Supported Devices

Supported single board computers:
- MinnowBoard MAX
- Raspberry Pi 2 http://git.s-osg.org/tizen-distro.git/
- HummingBoard https://github.com/konsulko/tizen-distro
- Easy porting to other ARM and Intel devices

Useful links:
- https://wiki.tizen.org/wiki/MinnowMax
- https://wiki.tizen.org/wiki/HummingBoard
Building Tizen on Yocto (1/3)

- Download tizen-distro
  
  ```
  git clone git://review.tizen.org/scm/bb/tizen-distro
cd tizen-distro
  ```

- Download meta layers with additional board support packages (BSP)

- Initialize build environment
  
  ```
  source ./tizen-common-init-build-env build-common
  ```
Building Tizen on Yocto (2/3)

• Configure conf/local.conf

```plaintext
MACHINE ??= "intel-corei7-64"
PARALLEL_MAKE ?= "-j 8"
BB_NUMBER_THREADS ?= "8"
...
```

• Add BSP meta layers to conf/bblayers.conf
Building Tizen on Yocto (3/3)

- Build an image
  
  ```bash
  bitbake tizen-common-core-image-crosswalk-dev
  ```

- Get some coffee...

- Grab the generated image from tmp-glibc/deploy/images/${MACHINE}
Bitbake Cheat Sheet

- Check value of a variable in a recipe
  ```
  bitbake tizen-common-core-image-crosswalk -e | grep ^ROOTFS_PKGMANAGE
  ```

- Check recipe version
  ```
  bitbake -s | grep crosswalk
  ```

- Build a package or an image
  ```
  bitbake foo
  ```

- Clean up
  ```
  bitbake -c clean foo
  ```

- Recompile if the source has been changed
  ```
  bitbake -c compile foo
  ```

- Output dependency tree in graphviz format
  ```
  bitbake -g tizen-common-core-image-crosswalk
  ```
Adding Packages to Tizen Image

- Append packages, for example ofono and ofono-test, to image by adding the following command to `conf/local.conf` or the image's recipe:

```
IMAGE_INSTALL_append = " ofono ofono-test "
```
Runtime Package Management (1/2)

• Setup package feed on the build machine

```
sudo apt-get install apache2
sudo mkdir /var/www/html/tizen/
sudo ln -s ~/tizen-distro/build/tmp-glibc/deploy/rpm/ /var/www/html/tizen/
bitbake package-index
```
Runtime Package Management (2/2)

- Setup channels of the smart package manager on the Tizen device and manage packages

  smart channel --add tizen-all type=rpm-md baseurl=http://<server>/tizen/rpm/all/
  smart update
  smart install <package_name>

- More information and examples:
  https://wiki.tizen.org/wiki/Runtime_package_management_in_Tizen_on_Yocto_with_Smart
Creating New Meta Layer (1/2)

• Create new meta layer using script yocto-layer

./scripts/yocto-layer create newprofile
Please enter the layer priority you'd like to use for the layer: [default: 6]
Would you like to have an example recipe created? (y/n) [default: n]
Would you like to have an example bbappend file created? (y/n) [default: n]

New layer created in meta-newprofile.

Don't forget to add it to your BBLAYERS (for details see meta-newprofile\README).
Creating New Meta Layer (2/2)

- Add meta data to the new layer
- Add the new layer to conf/bblayers.conf
Extending a Recipe

- Append instructions at the end of existing recipe in .bbappend file
- Apply a patch, for example:

```bash
FILESEXTARPATHS_prepend := "${THISDIR}/${PN}:${PV}:"
SRC_URI += "file://mypatch.patch"

do_install_append() {
    install -m 644 ${WORKDIR}/my.conf ${D}${sysconfdir}
}
```

- Add new files, for example:

```bash
FILESEXTARPATHS_prepend := "${THISDIR}/${PN}:${PV}:"
SRC_URI += "file://my.conf"
```
## Writing a New Recipe

- Create new recipe with name that matches the format:
  ```
  <basename>_<version>.bb
  ```

- Use and modify the following skeleton recipe:
  ```
  SUMMARY = ""
  HOMEPAGE = ""
  LICENSE = ""
  LIC_FILES_CHKSUM = ""
  SRC_URI = ""
  SRC_URI[md5sum] = ""
  SRC_URI[sha256sum] = ""
  S = "${WORKDIR}/${PN}${PV}"
  inherit <stuff>
  ```

- Store path to the recipe at layer's conf/layer.conf
HTML5 Application Management in Tizen 3

- Install wgt file
  ```
  pkgcmd -i -t wgt -p <wgt file> -q
  ```

- List installed HTML5 applications (per user)
  ```
  app_launcher -l
  ```

- Launch HTML5 application in Crosswalk
  ```
  app_launcher -s <Application ID>
  ```

- Kill running HTML5 application
  ```
  app_launcher -k <Application ID>
  ```

- Uninstall application
  ```
  pkgcmd -u -q -n <package>
  ```
Creating New Recipe for HTML5 App (1/2)

- Develop HTML5 Tizen app with icon.png & config.xml
- Create new recipe and reimplement do_install

```bash
do_install() {
    cd ${S}
    rm -rf ${D}
    mkdir -p ${D}
    mkdir -p ${D}/opt/usr/apps/.preinstallWidgets
    mkdir -p ${D}${prefix}/share/apps/Common/icons
    zip -r ${D}/opt/usr/apps/.preinstallWidgets/hello.wgt css icon.png config.xml index.html README.txt
}
```

- Ship wgt file

```bash
hello_files = ""
hello_files += "'/opt/usr/apps/.preinstallWidgets/hello.wgt"
```
Creating New Recipe for HTML5 App (2/2)

- Create script that installs hello.wgt using pkgcmd
- Create oneshot systemd service that launches the install script at first boot of the device and removes itself upon successful completion of the script
- Create recipe that provides the install script and the systemd service
Tizen-distro uses combo-layer script

git://git.tizen.org/scm/bb/tizen-distro

Tizen-distro layers: bitbake, openembedded-core, meta-openembedded, meta-qt5, meta-tizen

Meta-tizen

git://git.tizen.org/scm/bb/meta-tizen
Contributing to Tizen on Yocto (2/2)

- Git (revision control system)
  https://review.tizen.org/gerrit/
- Gerrit (web-based code review tool)
  https://review.tizen.org/gerrit/
- JIRA
  https://bugs.tizen.org/
- Step by step instructions for contributors
  https://wiki.tizen.org/wiki/How_to_contribute_to_Tizen_on_Yocto_Project
Thank you!

Questions?

Slides (license: CC BY-SA 3.0)
http://www.slideshare.net/leonanavi/creating-new-tizen-profiles-using-the-yocto-project

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