Creating new Tizen profiles using the Yocto Project

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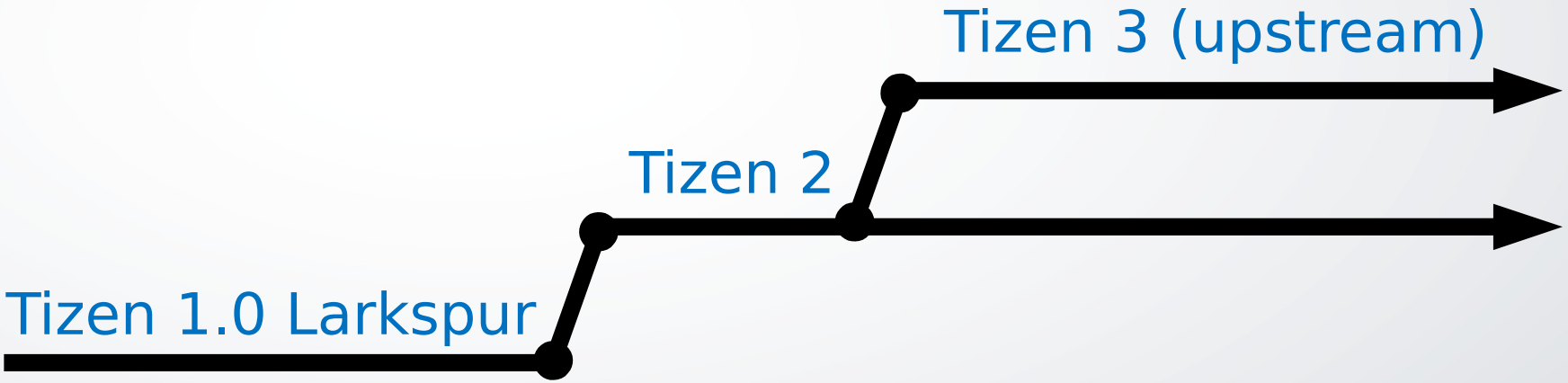
Overview

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

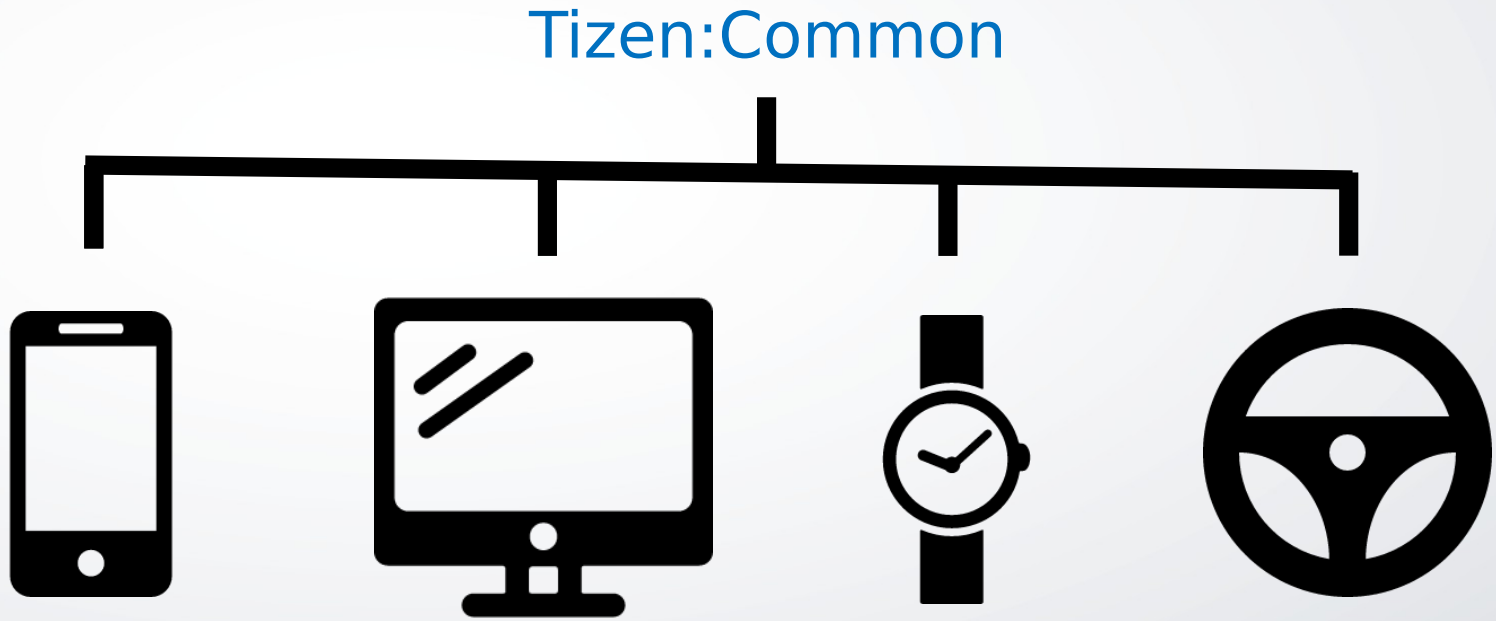
Tizen

- 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.

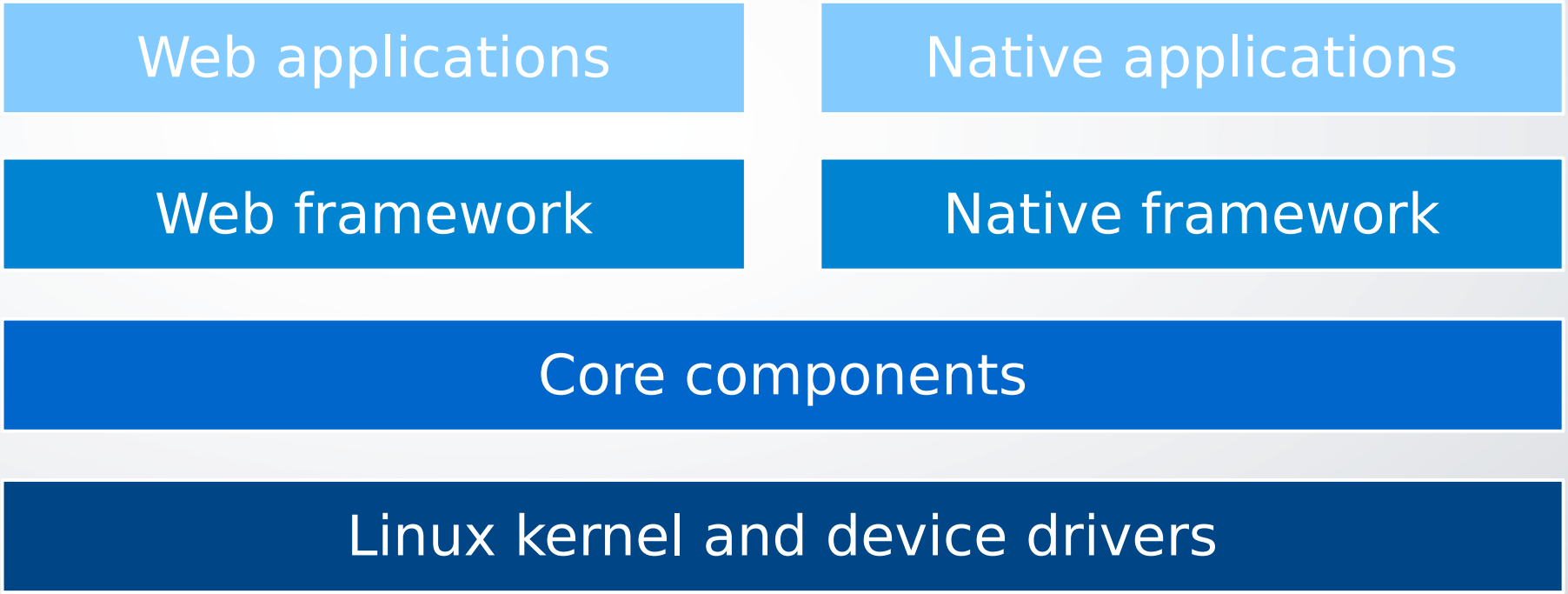
Tizen Versions



Tizen 3 Profiles

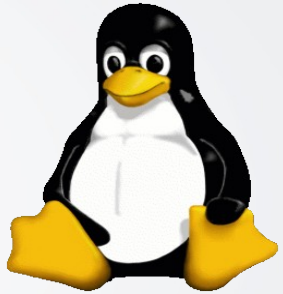


Tizen Architecture



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

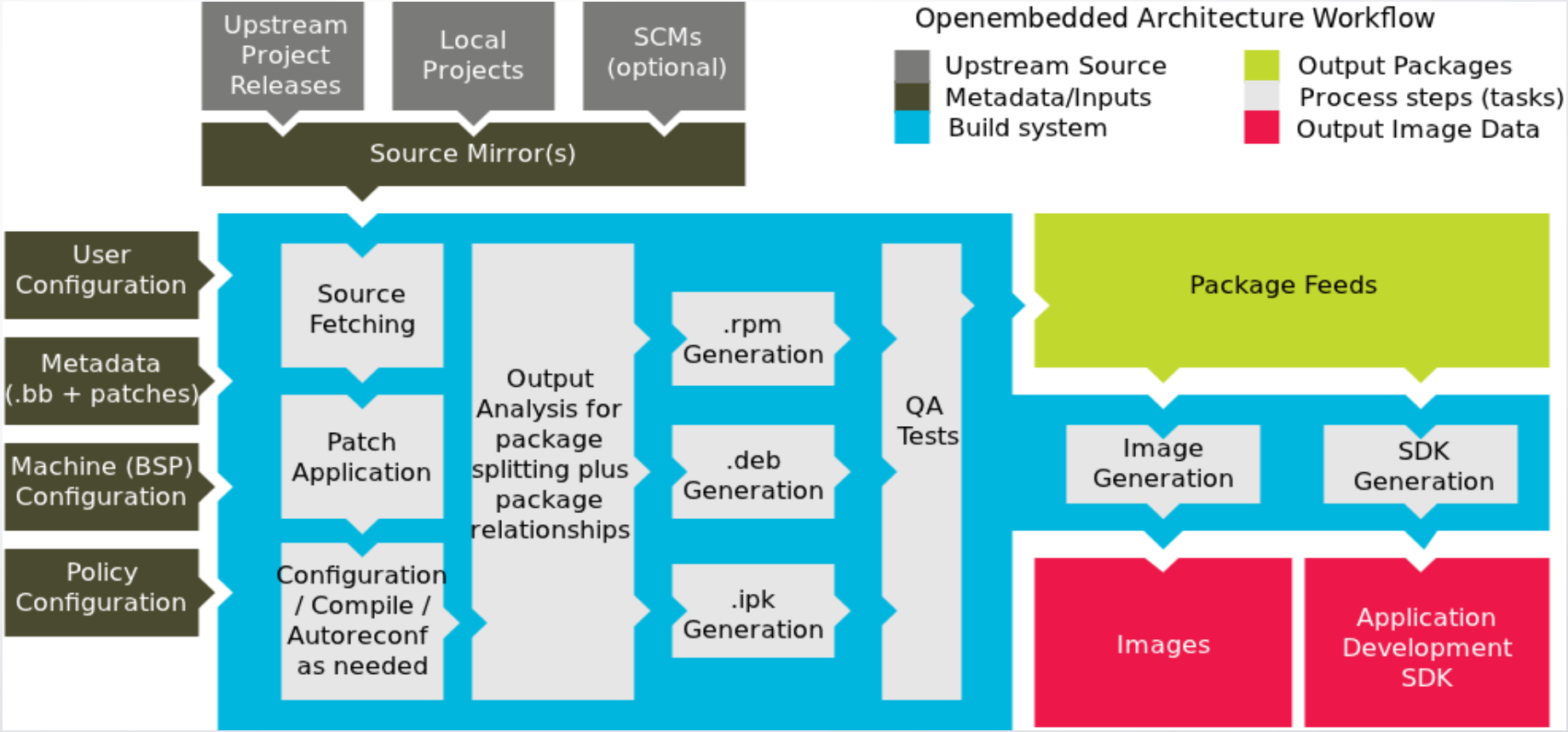


Image courtesy of the Yocto Project official documentation

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
- http://blogs.s-osg.org/tizen-on-rpi2/

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

```
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

```
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:

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

- Add new files, for example:

```
FILESEXTRAPATHS_prepend := "{THISDIR}/${PN}:${PV}:"
SRC_URI += "file://my.conf"
do_install_append() {
 install -m 644 ${WORKDIR}/my.conf ${D}${sysconfdir}
}
```

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

```
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

```
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

Contributing to Tizen on Yocto (1/2)

- 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)
- 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