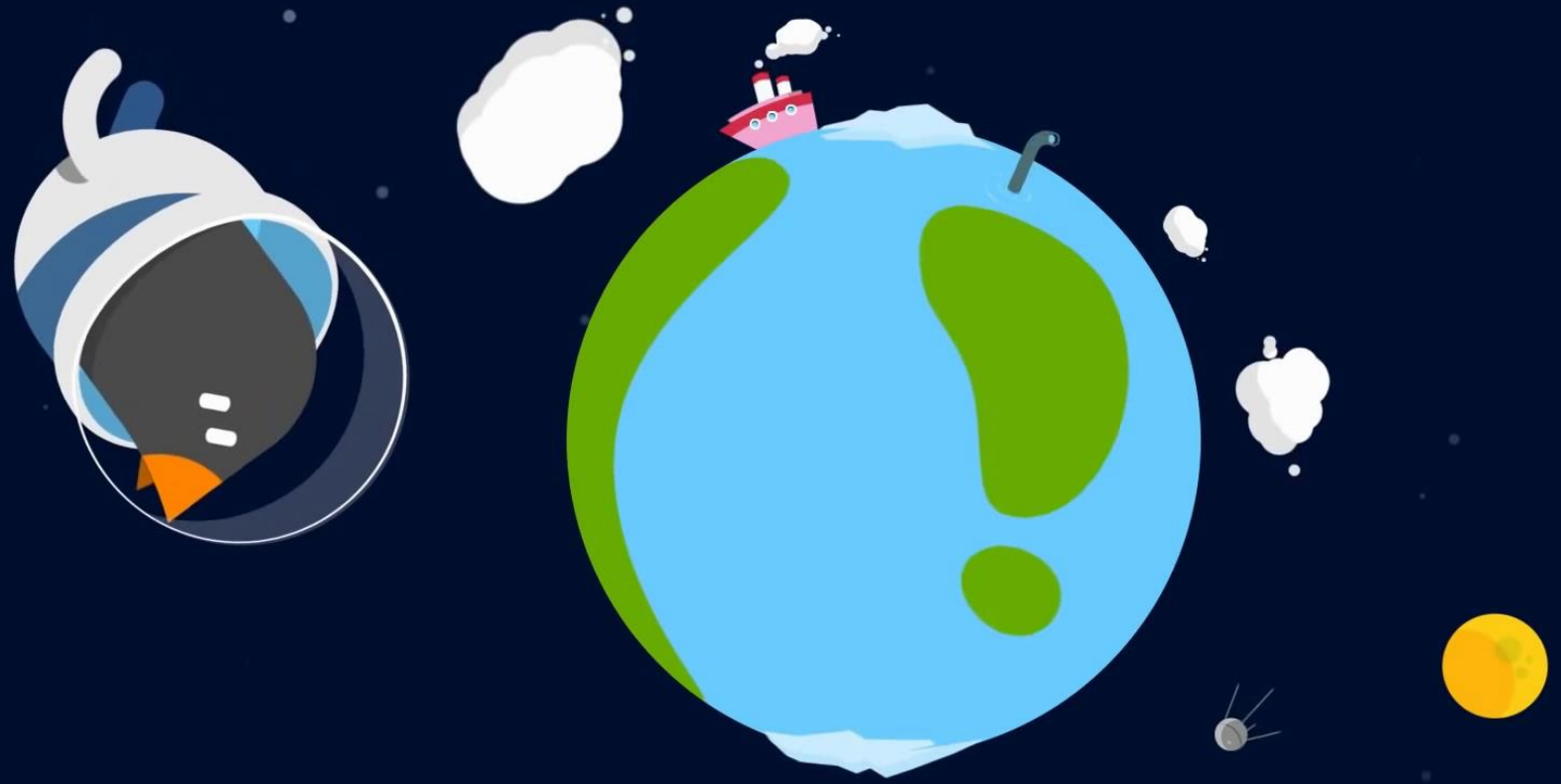
webOS Open Source Edition:
Native service/app 개발 환경



발표자 – 고석하 선임 연구원

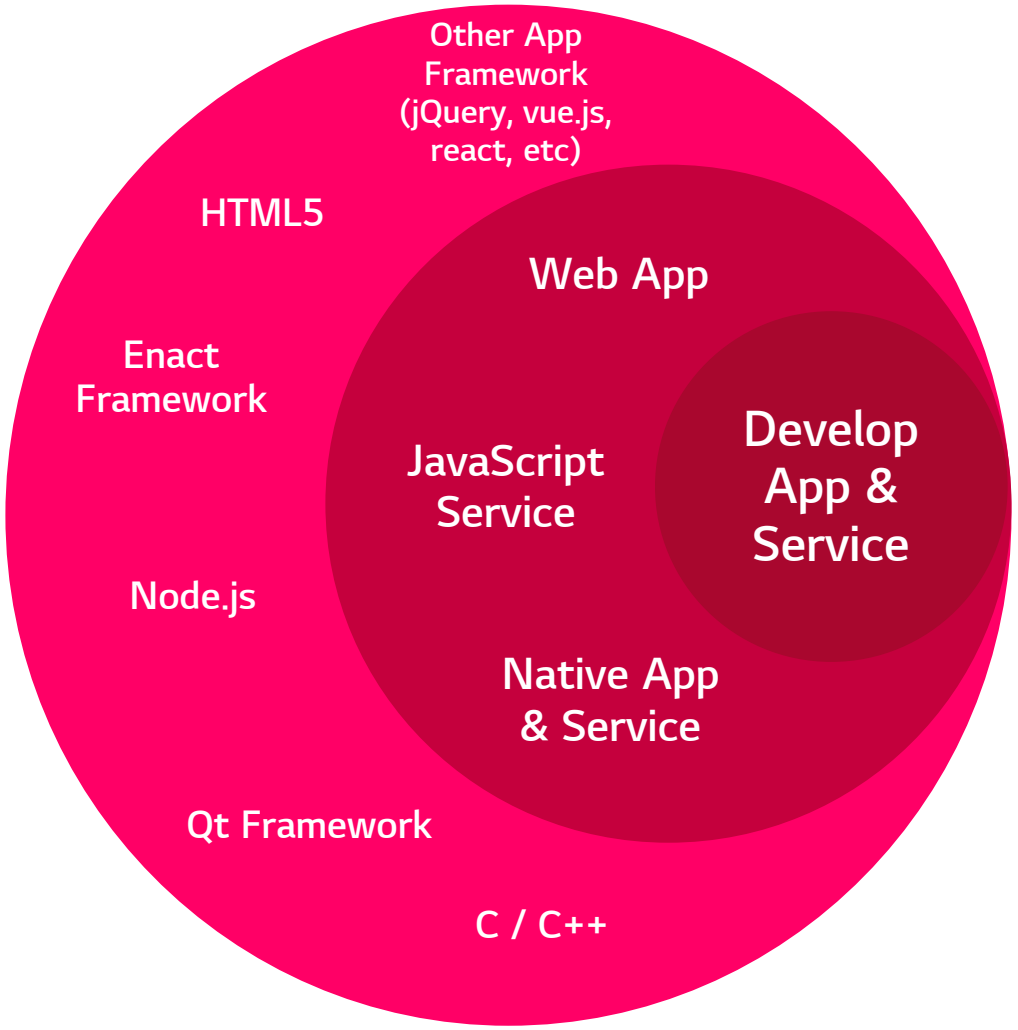
- STB 개발
- webOS 개발
  - SDK
  - Platform integration
- sh.ko@lge.com

webOS
Open Source Edition

Background

webOS
Open Source Edition

Development framework



- service / application
  - Service: Application 혹은 다른 service의 요청에 대해 응답
  - system bus (luna bus)를 통해 통신하는 것은 동일
  - UI의 존재 유무
  - 서로 다른 Life cycle 관리 정책
- built-in / installable
  - Platform 에 미리 탑재되는지
  - Store 등에 의해 install되는지
- http://webososse.org
  - Luna bus와의 연결, API 접근 권한 설정
  - Built-in
    - native/node.js service
    - QML apps
    - Application
    - Build tool (Bitbake)에 대한 예제
  - Installable web application

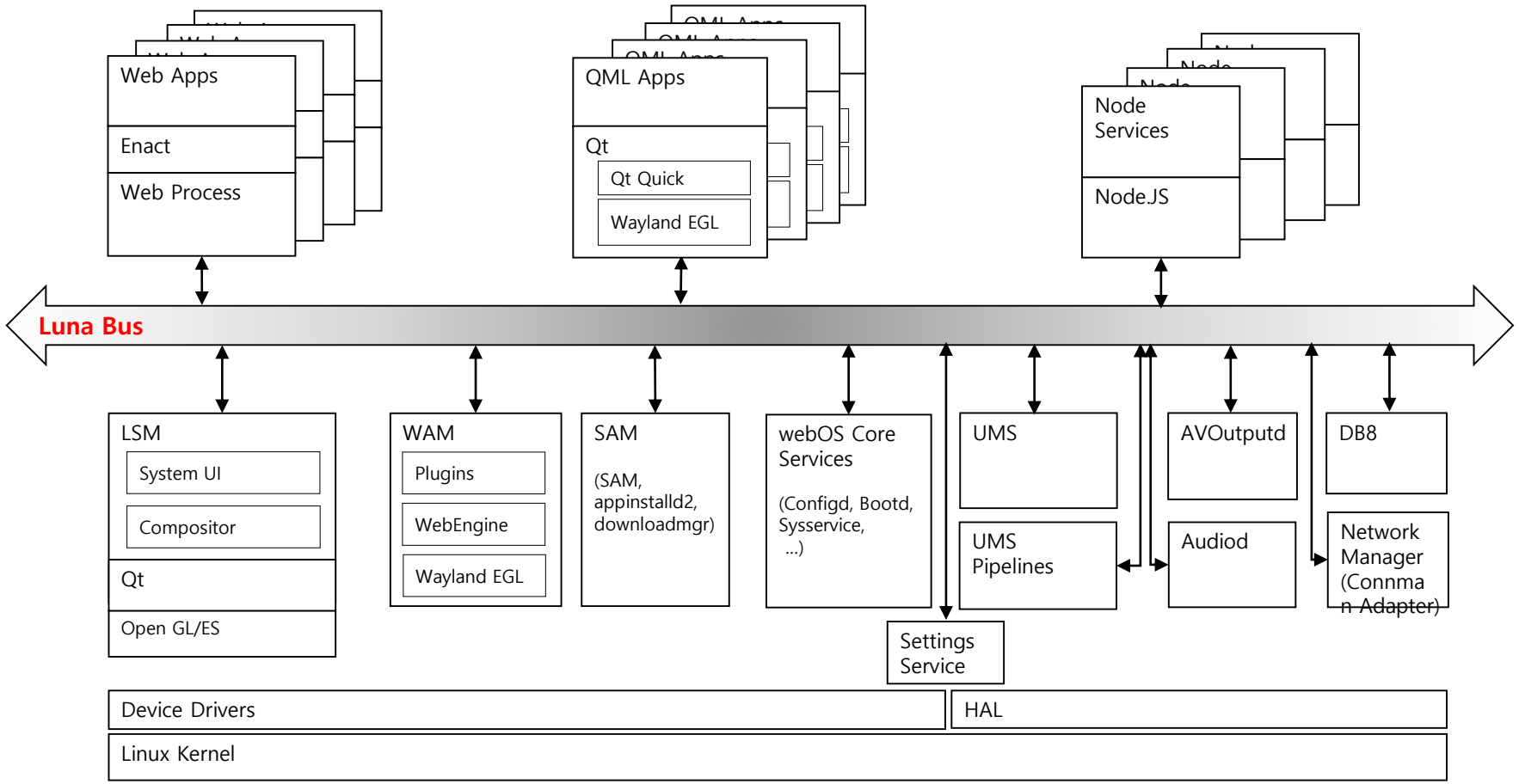
webOS Open Source Edition

그래서 오늘은...

- Installable
  - Native app (Qt)
  - Native service (Qt, C/C++, etc)
    - Only support “dynamic service” which is launched by luna request.
- How to make NDK
  - Libs & headers
  - Toolchain, other tools...
- webOS CLI
  - For packaging & installation

- 그래서 코드 자체를 다루지는 않습니다. ☺

Luna Bus



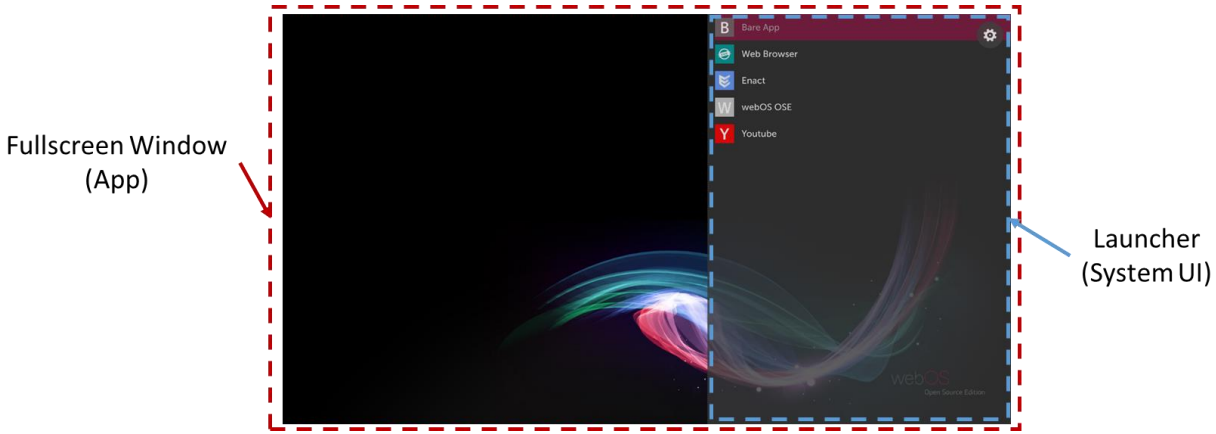
- LSM: Luna Surface Manager
- SAM: System & Application Manager
- WAM: Web Application Manager
- http://webosose.org/develop/sdk-tools/ls-monitor/

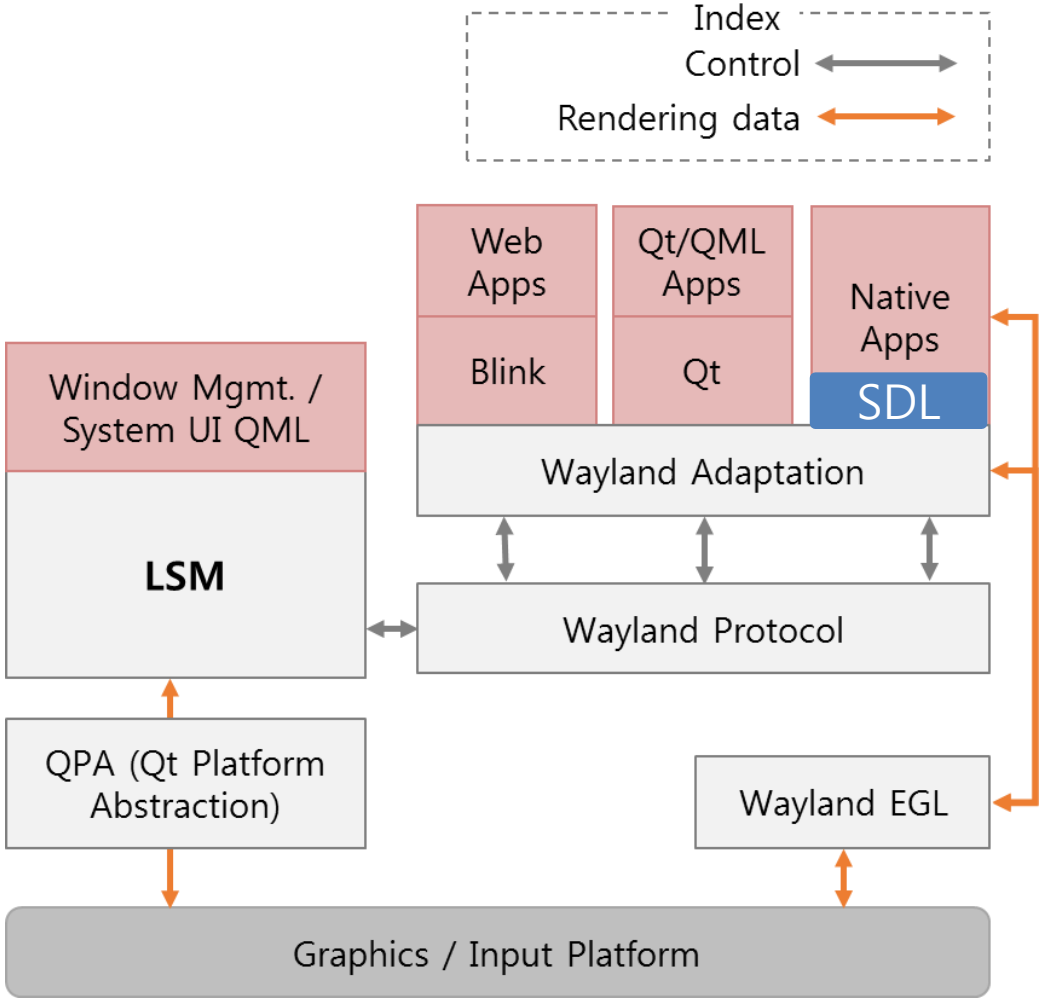
```
luna://com.webos.applicationManager/launch '{"id":"bareapp"}'
{
  "returnValue": true
}
```

webOS Open Source Edition

LSM

- Window management
- Input event routing
- Input method support
- Composition among App windows and System UI elements





webOS
Open Source Edition

Native Development Kit

webOS
Open Source Edition

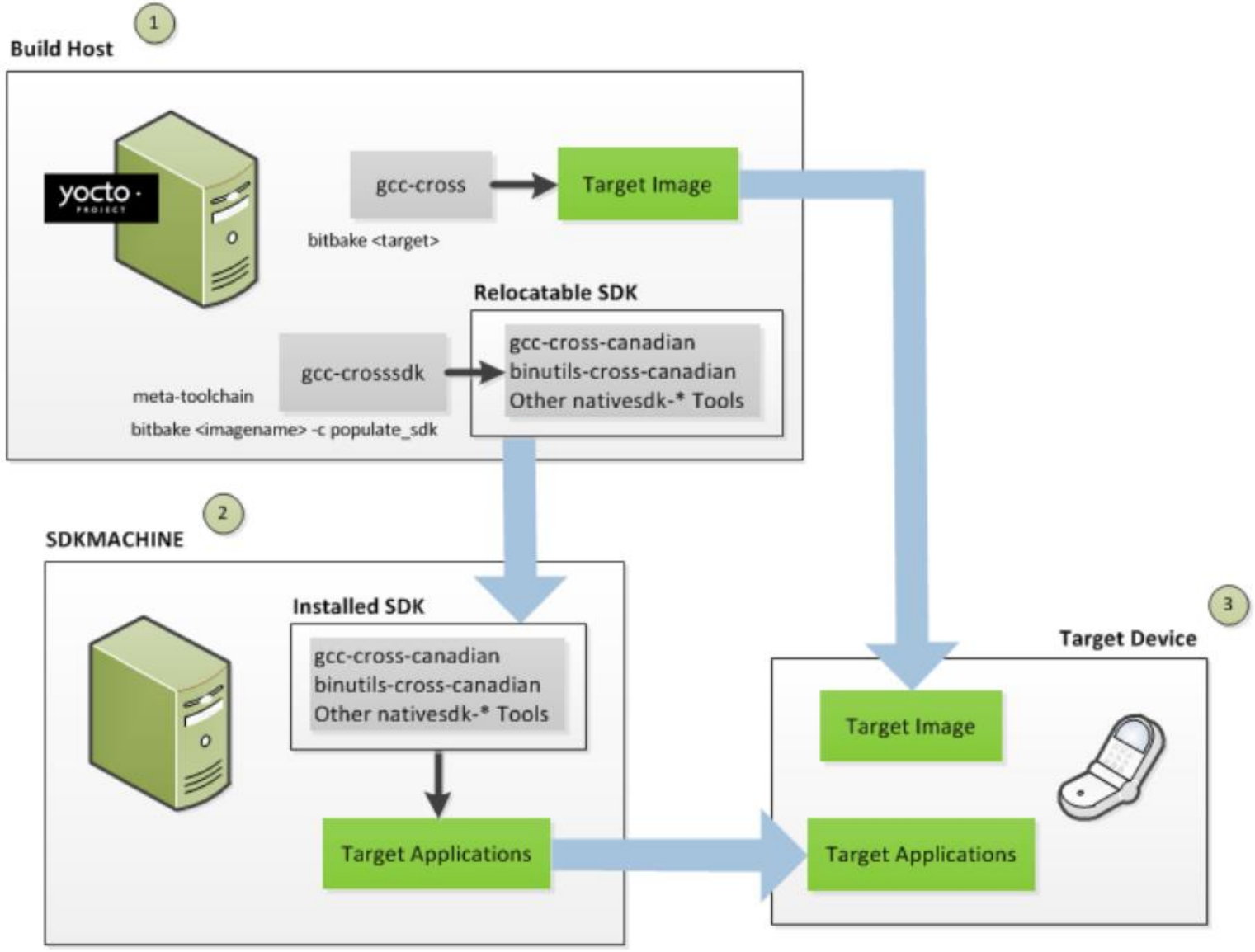
Development Environment

- Yocto
- OpenEmbedded
  - **Bitbake**
    - Powerful and flexible build engine
    - Determines dependencies and schedules tasks

Metadata – structured collection of "recipes" which tell Bitbake what to build

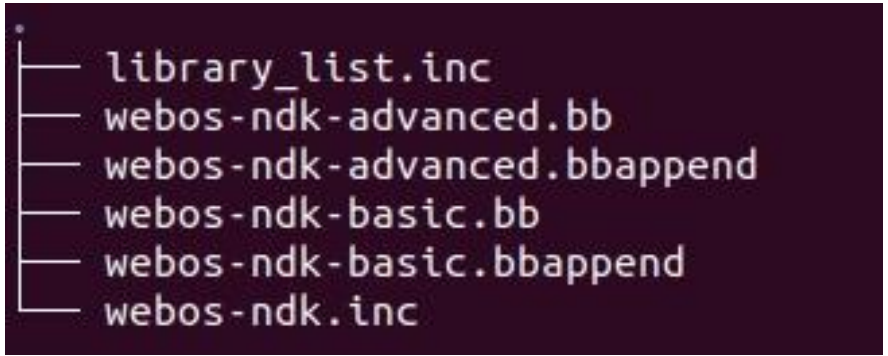
OE Cross Toolchain Generation

https://www.yoctoproject.org/docs/2.2/ref-manual/ref-manual.html#cross-development-toolchain-generation



Generate NDK Using OE

- **bitbake webos-image-devel –c populate_sdk**
  - Target image webos-image-devel 에 포함되는 모든 sysroot
  - + toolchain 등을 생성하는 populate_sdk라는 task를 실행. (oe-core)
- **bitbake meta-toolchain-qt5**
  - Qt 개발 환경을 위한 library들과 Qt tools
  - 내부적으로 populate_sdk_qt5 (populate_sdk를 상속)를 수행하게 되어 있음.
- **Make your own recipes for NDK.**
  - Specific libraries, Toolchain, Samples, Docs, webOS CLI etc



Generate NDK Using OE

- **Modify existing one**
  - bitbake webos-image-devel –c populate_sdk
  - + bitbake meta-toolchain-qt5

```
index a47a5d8..56da3a2 100644
--- a/meta-webos/recipes-core/images/webos-image-devel.bb
+++ b/meta-webos/recipes-core/images/webos-image-devel.bb
@@ -20,5 +20,6 @@ IMAGE_FEATURES += "ptest-pkgs"
 IMAGE_FEATURES += "webos-test"

 inherit webos_image
+inherit populate_sdk_qt5

 IMAGE_ROOTFS_EXTRA_SPACE = "524288"
```

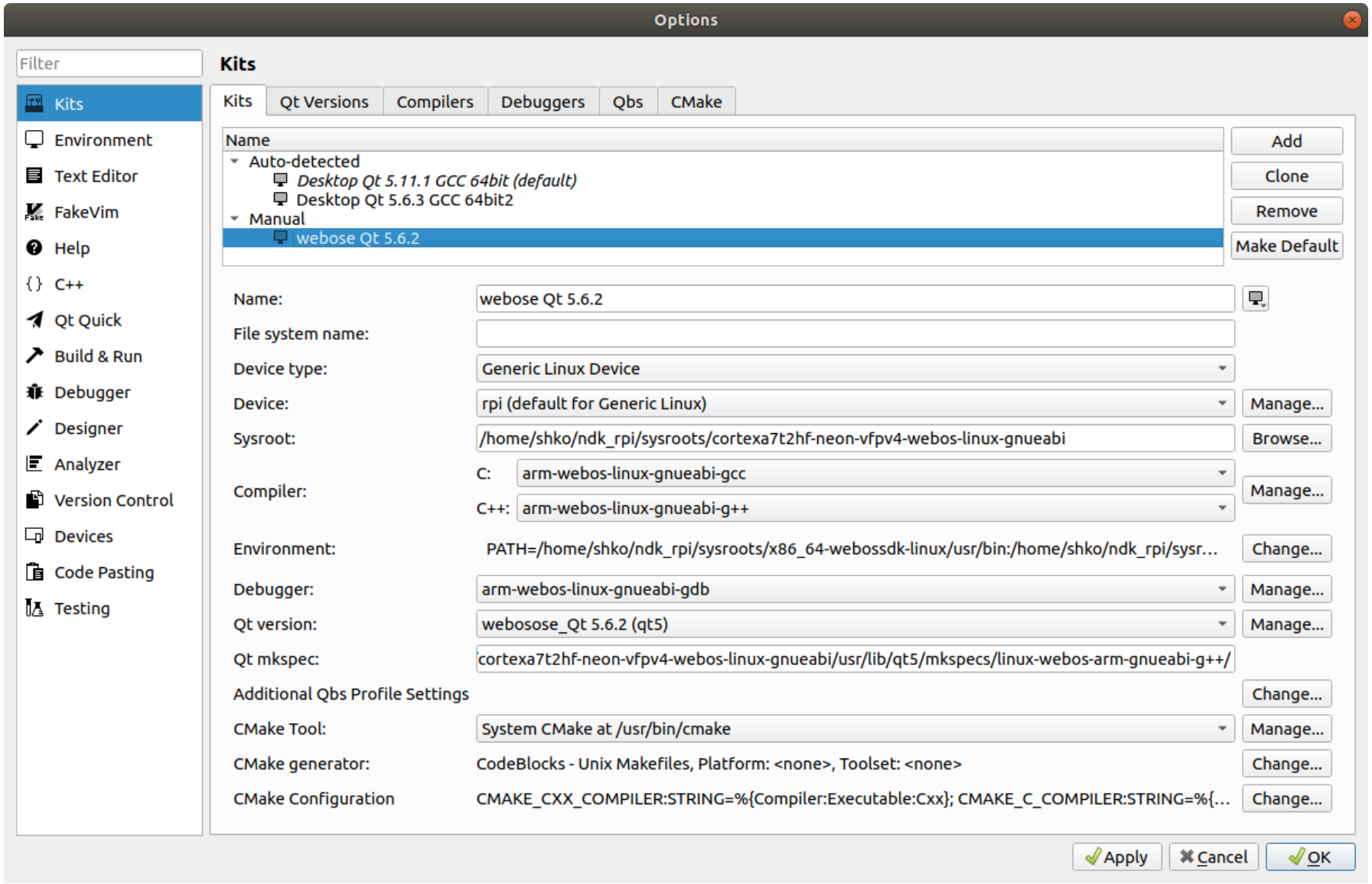
Github PR

- https://github.com/openembedded/openembedded-core/pull/35
  - wayland-scanner 추가 위해 ${@bb.utils.contains('DISTRO_FEATURES', 'wayland', 'nativesdk-wayland-dev', '', d)} 추가
- https://github.com/webososе/meta-webososе/pull/6
  - webos-image-devel.bb 에 inherit populate_sdk_qt5 추가
  - packagegroup-qt5-toolchain-target 에서 blacklist된 모듈들 제거하여 meta-webososе에 override
  - Meta-webososе의 webos-recipe-blacklist-world.inc에서 packagegroup-qt5-toolchain-target가 blacklist 된 것을 제거.
  - nativesdk-packagegroup-qt5-toolchain-host.bb 의 RDEPENDS에 nativesdk-perl-modules ₩ 추가하여 meta-webososе에 override
- https://github.com/meta-qt5/meta-qt5/pull/87
  - nativesdk-packagegroup-qt5-toolchain-host.bb 의 RDEPENDS에 nativesdk-perl-modules ₩ 추가
- build fail on Ubuntu 18.04 (compatibility issue with glibc 2.27)
  - http://forum.webososе.org/t/webos-prerequisite-and-make-errors-raspbian-9-4/206/10

Contents of NDK

- whole sysroot libs, headers, package config files etc
  - luna-service2, PmLog, omxil, ...
  - Qt 5.6.2 libs(core, GUI, multimedia, network, qml, quick, wayland)
- GCC 6.2.0 (C++14 support), binutils, other tools ...
- Linux environment variable setup file for cross compile
  - CC, CXX, CFLAGS, LDFLAGS, PKG_CONFIG_PATH .....
- Qt tools (mkspecs, qmake, moc, uic, rcc, ...)

Qt creator: Kit



webOS
Open Source Edition

Example

Example

- app / app + service
  - service 단독 설치는 불가.
- Service ID는 app id의 subdomain
  - com.example.native
  - com.example.native.service

Native service

- 소스 작성 부분은 built-in service와 동일
  - http://webososе.org/develop/native-services/develop-configure-native-services/
  - Luna bus registration
- 다만, ls2 conf, role, API permission 등 파일 불필요.
  - appinstalld가 자동 생성
- systemd unit configuration 파일 불필요
  - Installable의 경우 static service 지원하지 않음.

Native service

- services.json file for packaging
  - http://webosose.org/develop/configuration-files/services-json/
  - engine: “native” for native service. If missing, node.js service.
  - executable: executable file name

```
sh.ko@sdk03:~/examples$ cat ./com.example.native.service/services.json
{
        "id" : "com.example.native.service",
        "description":"native service template",
        "engine":"native",
        "executable":"nativeservice",
        "services": [ {
                "name": "com.example.native.service",
                "description": "native service"
        }]
}
```

Native app

- appinfo.json file for packaging
  - http://webosose.org/develop/configuration-files/appinfo-json/
  - type: “native”for native app
  - main: executable file name

```
sh.ko@sdk03:~/examples$ cat ./com.example.native/appinfo.json
{
    "id": "com.example.native",
    "version": "0.1.0",
    "vendor": "My Company",
    "type": "native",
    "main": "nativeqt",
    "title": "Native qt App",
    "icon": "icon.png"
}
```

Native app

- Luna bus, SAM, LSM 에 각각 등록을 해야 하는가?

합니다.

```
// for luna bus
LSHandle* handle = nullptr;
LSRegister("com.example.native", &handle, &lserror);

// for SAM
LSCall(handle,
        "luna://com.webos.service.applicationmanager/registerNativeApp",
        "{}",
        registerNativeAppCallback,
        NULL,
        NULL,
        &lserror);

// for LSM
QApplication::platformNativeInterface()->setWindowProperty(window->handle(),
        QStringLiteral("appId"),
        QStringLiteral("com.example.native"));
```

packaging & installation

- packaging

```
.
├── com.example.native
│   ├── appinfo.json
│   ├── build
│   ├── CMakeLists.txt
│   ├── com.example.native.pro
│   ├── icon.png
│   ├── include
│   ├── pkg
│   ├── README.md
│   └── src
└── com.example.native.service
    ├── build
    ├── CMakeLists.txt
    ├── pkg
    ├── README.md
    ├── services.json
    └── src

9 directories, 8 files
sh.ko@sdk03:~/examples$ ares-package ./com.example.native/pkg/ ./com.example.native.service/pkg/
Creating package com.example.native_0.1.0_arm.ipk in /home/sh.ko/examples
Success
```

- installtion 과정은 web app 과 동일
  - http://webosose.org/develop/web-app-dev/external-web-apps/building-your-first-web-app/

Forum

ABOUT webOS

QUESTIONS

ANSWERS

all categories

+ New Topic

Topic	Category	Users	Replies	Views	Activity
Roadmap of WebOS OSE	Platform Development		7	929	5h
Pre-built images available			7	731	9h
Are there any good webOS OSE app development tutorials out there?	App Development		8	95	3d
Top Reasons Why Should Learn Linux			0	36	9d
Com.webos.service.db/merge documentation error?	Platform Development		1	53	9d
Com.webos.service.filecache documentation error?	Platform Development		0	49	10d
Support Picture-in-Picture			1	54	12d
GPIO interface	App Development		5	138	13d

Appendix

무엇을 원하는가

Platform 개발자

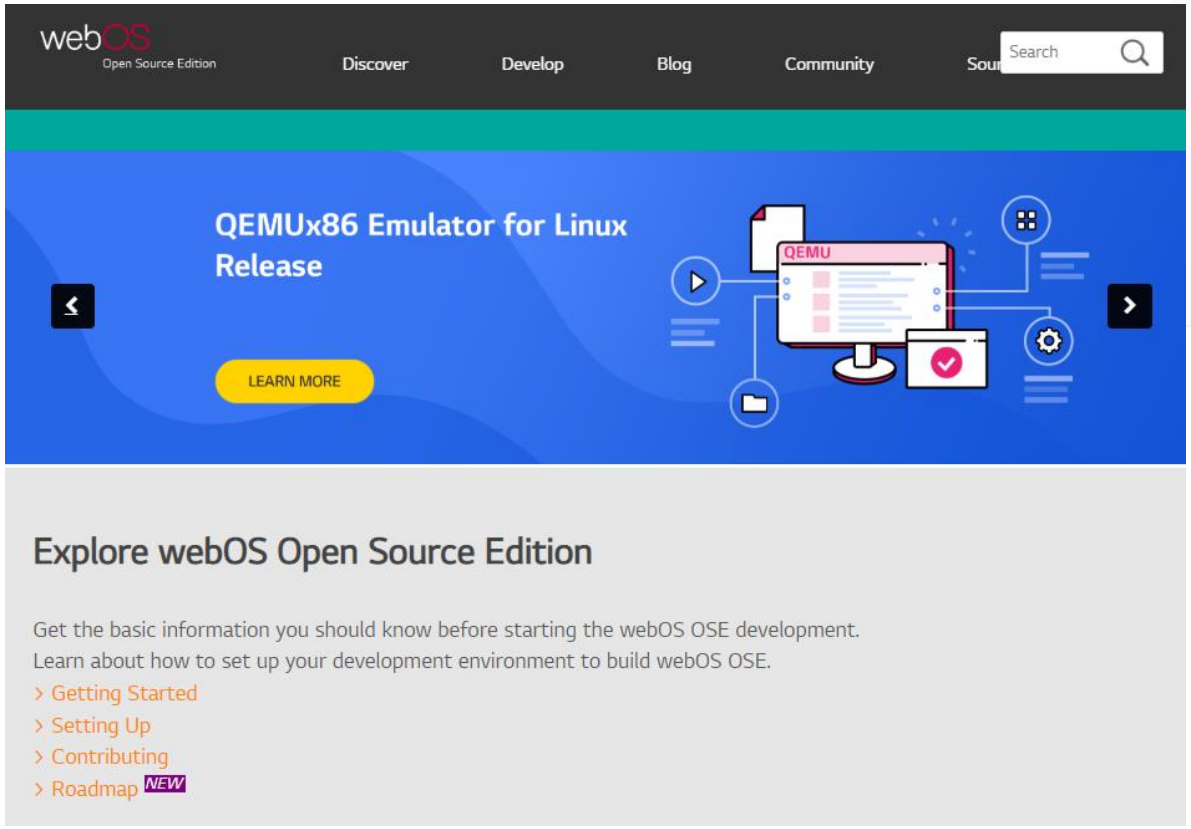
- Build framework, BSP bring up, GST/OMX... , DRM/KMS, webOS core components, sandbox, built-in apps ...

App 개발자

- Communication bus, App framework, APIs, SDK ...

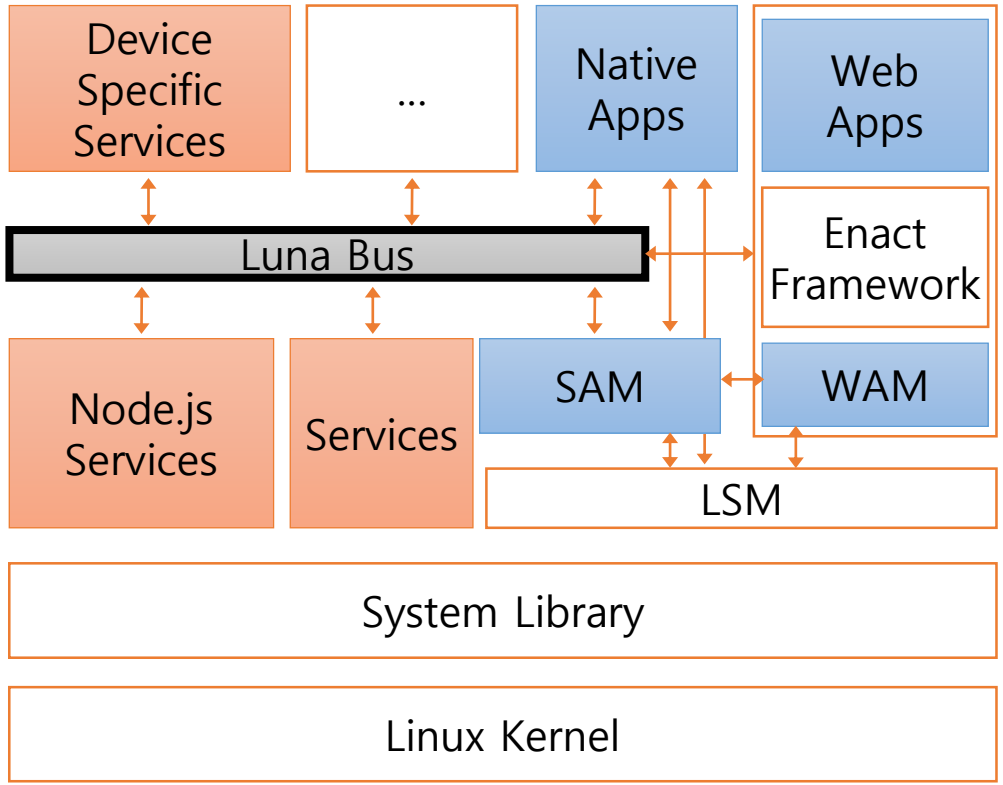
Developer Site & GitHub

- http://webososse.org/
- https://github.com/webososse



webOS
Open Source Edition

Luna Bus




```
luna://com.webos.applicationManager/launch '{"id":"bareapp"}'
{
  "returnValue": true
}
```

- http://webosose.org
  - Build tool (Bitbake)에 대한 이해
  - Luna bus와의 연결
  - API 접근 권한 설정 등

조립의 시대 bitbake

- https://www.yoctoproject.org/docs/
- https://www.yoctoproject.org/docs/2.2/ref-manual/ref-manual.html
- http://layers.openembedded.org/layerindex
- http://git.yoctoproject.org/

Pros

- Easy maintenance for the meta file: .bb, .bbappend
- ext, ext3, tar, jffs, ...,
- ipk, dpkg, rpm
- git, svn, cvs, ...

Cons

- Learning curve
- Slow performance
- •Large storage space consumption

Meta layers

- https://github.com/webososе/build-webos/blob/master/weboslayers.py

```
# github.com/openembedded repositories are read-only mirrors of the authoritative
# repositories on git.openembedded.org
webos_layers = [
('bitbake',                  -1, 'git://github.com/openembedded/bitbake.git',            'branch=1.32,commit=da85da9', ''),

('meta',                      5, 'git://github.com/openembedded/openembedded-core.git',  'branch=morty,commit=7b7cbba', 'oe-core'),

('meta-oe',                  10, 'git://github.com/openembedded/meta-openembedded.git',  'branch=morty,commit=b40116c', 'meta-oe'),
('meta-multimedia',          11, 'git://github.com/openembedded/meta-openembedded.git',  '', 'meta-oe'),
('meta-networking',          12, 'git://github.com/openembedded/meta-openembedded.git',  '', 'meta-oe'),
('meta-python',              13, 'git://github.com/openembedded/meta-openembedded.git',  '', 'meta-oe'),
('meta-filesystems',         14, 'git://github.com/openembedded/meta-openembedded.git',  '', 'meta-oe'),

('meta-qt5',                 20, 'git://github.com/meta-qt5/meta-qt5.git',               'branch=krogoth,commit=f8584d7', ''),

('meta-webos-backports-2.3', 30, 'git://github.com/webososе/meta-webososе.git',          '', ''),
('meta-webos-backports-2.4', 31, 'git://github.com/webososе/meta-webososе.git',          '', ''),
('meta-webos-backports-2.5', 32, 'git://github.com/webososе/meta-webososе.git',          '', ''),

('meta-webos',               40, 'git://github.com/webososе/meta-webososе.git',          'branch=master,commit=9c31495', ''),

('meta-raspberrypi',         50, 'git://git.yoctoproject.org/meta-raspberrypi',          'branch=morty,commit=2a19226', ''),
('meta-webos-raspberrypi',   51, 'git://github.com/webososе/meta-webososе.git',          '', ''),
]
```

webOS Open Source Edition

Development Environment

Yocto Project

- Open source collaboration project that helps developers create custom Linux-based systems for embedded products, regardless of the hardware architecture

OpenEmbedded

- build framework and cross-compile environment used to create Linux distributions for embedded devices

qmake

```
shko@shko-desktop:~$ qmake -query
QT_SYSROOT:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi
QT_INSTALL_PREFIX:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr
QT_INSTALL_PREFIX/raw:/usr
QT_INSTALL_ARCHDATA:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/lib/qt5
QT_INSTALL_ARCHDATA/raw:/usr/lib/qt5
QT_INSTALL_DATA:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/share/qt5
QT_INSTALL_DATA/raw:/usr/share/qt5
QT_INSTALL_DOCS:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/share/doc/qt5
QT_INSTALL_DOCS/raw:/usr/share/doc/qt5
QT_INSTALL_HEADERS:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/include/qt5
QT_INSTALL_HEADERS/raw:/usr/include/qt5
QT_INSTALL_LIBS:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/lib
QT_INSTALL_LIBS/raw:/usr/lib
QT_INSTALL_LIBEXECS:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/lib/qt5/libexec
QT_INSTALL_LIBEXECS/raw:/usr/lib/qt5/libexec
QT_INSTALL_BINS:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/bin/qt5
QT_INSTALL_BINS/raw:/usr/bin/qt5
QT_INSTALL_TESTS:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/share/qt5/tests
QT_INSTALL_TESTS/raw:/usr/share/qt5/tests
QT_INSTALL_PLUGINS:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/lib/qt5/plugins
QT_INSTALL_PLUGINS/raw:/usr/lib/qt5/plugins
QT_INSTALL_IMPORTS:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/lib/qt5/imports
QT_INSTALL_IMPORTS/raw:/usr/lib/qt5/imports
QT_INSTALL_QML:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/lib/qt5/qml
QT_INSTALL_QML/raw:/usr/lib/qt5/qml
QT_INSTALL_TRANSLATIONS:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/share/qt5/translations
QT_INSTALL_TRANSLATIONS/raw:/usr/share/qt5/translations
QT_INSTALL_CONFIGURATION:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/etc/qt5
QT_INSTALL_CONFIGURATION/raw:/etc/qt5
QT_INSTALL_EXAMPLES:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/share/qt5/examples
QT_INSTALL_EXAMPLES/raw:/usr/share/qt5/examples
QT_INSTALL_DEMOS:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/share/qt5/examples
QT_INSTALL_DEMOS/raw:/usr/share/qt5/examples
QT_HOST_PREFIX:/home/shko/ndk_rpi/sysroots/x86_64-webossdk-linux
QT_HOST_DATA:/home/shko/ndk_rpi/sysroots/cortexa7t2hf-neon-vfpv4-webos-linux-gnueabi/usr/lib/qt5
QT_HOST_BINS:/home/shko/ndk_rpi/sysroots/x86_64-webossdk-linux/usr/bin/qt5
QT_HOST_LIBS:/home/shko/ndk_rpi/sysroots/x86_64-webossdk-linux/usr/lib
QT_EXTERNAL_HOST_BINS:
QMAKE_SPEC:linux-g++
QMAKE_XSPEC:linux-g++
QMAKE_VERSION:3.0
QT_VERSION:5.6.2
```