



将 Tizen 移植到流行参考手机

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Thundersoft 高级副总裁



顶级项目

Tizen 开放移植

最流行参考设计上最开放且最强大的移动操作系统



TIZEN v2.2



QRD 8916

- * 1.2Ghz Quad Core
- * 5" FWVGA
- * 1G Memory, 8G Flash
- * LTE
- * Dual SIM Dual Active



10 款免费的 Tizen QRD 设备， 只需提出问题或做出贡献

提出问题



为顶级项目贡献
才智



历史概览

- 2005: Maemo (诺基亚)
- **2006: Midinux (RedFlag)**
- **2007: Moblin (英特尔)**
- **2008: 领先移动操作系统提供商 Thundersoft 创立**
- 2010: MeeGo (诺基亚、英特尔、其他主要的硬件和软件公司)
- 2010: Bada (三星: 旨在减少对 Android 的依赖)
- 2011: 诺基亚放弃了 MeeGo (重点发展 Windows Phone)
- 2011: 英特尔和其他支持者相继放弃了 MeeGo
- 2011: LiMo 4 (LiMo 基金会 - 三星参与了 EFL 项目合作)
- (Carsten Haitzler = Rasterman)
- **2011: 英特尔加入 LiMo, 后者被更名为 Tizen**
- 2012: LiMo 基金会更名为 Tizen 联盟
- 2012: 三星计划将 Bada 和 Tizen 进行合并



ThunderSoft MeeGo

TIZEN

2007

2008

2009

2010

2011

2012

2013

2014

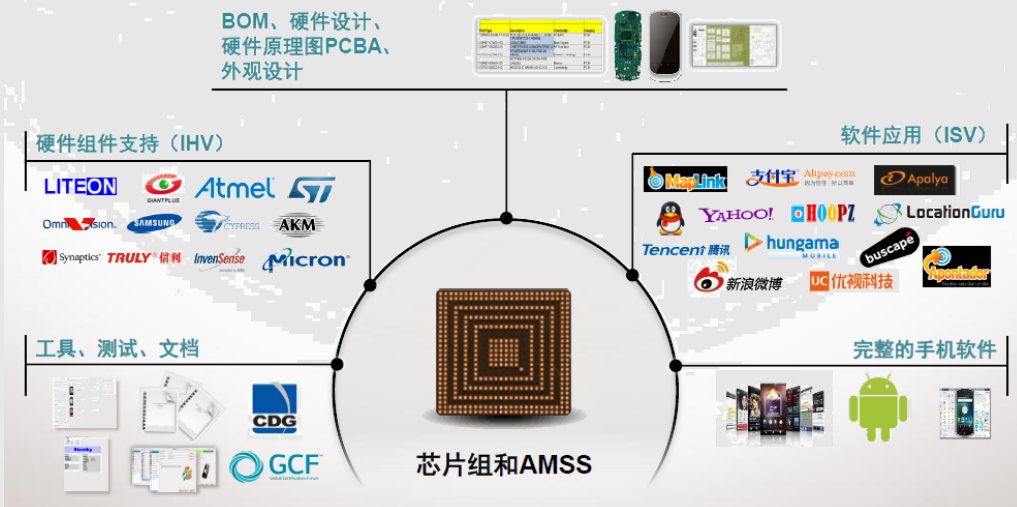


MID Midinux 团队在 1997 年北京 IDF 上

TIZEN™ DEVELOPER SUMMIT
2014 SHANGHAI
TIZEN 开发者峰会 (上海)

QRD 是什么?

“高通参考设计 (QRD) 整合了技术创新、优化设计、硬件/软件生态系统、工厂/开发工具等，能够为设备厂商提供交钥匙解决方案，帮助他们在更广泛的市场更经济高效、更快速地发布产品。”



Nokia X



小米
Note



Coolpad
5951



联想
Yoga Tablet
10



TCL
M812



联想
A380t



海信
U958



Little Cilly
LA3

Tizen 为何会配置在 QRD 上?

- 支持畅快编辑程序
- 我们已将 Ubuntu 和 FirefoxOS 移植到 QRD 上
- 最流行的交钥匙解决方案上最开放且最强大的操作系统
- OEM/OEM、运营商等相关方可获得更多选择



移植路线图



移植准备

- QRD 8916 设备
- Qualcomm BSP
- Tizen 开发环境
- 来自Tizen 社区的支持
- 来自高通的支持

关键特性



- MSM8916 1.2Ghz 四核 支持双 SIM / 双活动 (Dual Active)
- CT 的衍生配置 (需最少的努力) 图形处理器:
- Adreno 306 (400 MHz)
- 快速充电 1.0
- USB 主机模式支持 NFC
- 语言翻译 (12-15 种语言)
- 支持 1080p 编码@ 30fps

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Service Time:
9:00AM-6:00PM (GMT+08:00)
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24-hour hotline:
+86-15910509237
Email:
qrd-sales@thundersoft.com for sales issues
technical-support@thundersoft.com for post-sales service

Qualcomm Reference Design

Qualcomm Reference Design (QRD), is designed as a series of reference design engineering prototype for smart phone. QRD is designed to streamline the rapid market introduction of Android™ smart phones at lower development costs — drawing on the technical innovation and product quality. QRD offers you tools to help bring your product to market faster — including testing and acceptance readiness for leading regional and operator requirements, a comprehensive ecosystem of third-party providers, and easy customization options that allow you to save engineering costs and focus your development efforts on differentiation. QRD positions you to compete more effectively.

QRD 7x27A & QRD 8x25 & QRD 8x25Q & QRD 8x30 Tablet & QRD8930 Smartphone, are sold by Thundersoft which is the sole exclusive sale agency in China, can be ordered and purchased directly online.

	QRD8916 DSDS: C + G 2-4-2 Half-Board Key Features • MSM8916 1.2Ghz Quad Core • Dual SIM / Dual Active...
	QRD8930 TD-LTE(SGL TE&CSFB) Attributes Dimensions: 8.9mm CS: July '13 High Level Specifications MSM8930, WTR1605L, WCD9304, WCN3660A, PM8038, QSC1215...
	QRD8x12 DSDS: TD S S (option for T+G)

高级规格

- MSM8916、WTR1605L、PM8916、WCN3620、QCA1990
- RF360 - QFE2320、QFE2340、QFE2101
- 天线调谐器 - QFE1520/QFE1550 Android 4.4 KitKat
- 配置
- CT 4 模式: 1xSRLTE, DSDS C + G 5.0 英寸 FWVGA
- 多点触控 LCD 摄像头: 5MP + 2MP
- LED flash
- 8GB eMMC, 8Gb LPDDR3 (eMCP) [533 MHz]
- MicroSD (最高支持 64GB) 3.5 毫米立体声耳机插孔
- 连接功能 -
- WiFi 802.11 b/g/n/BT/FM (WCN3620)
- NFC (QCA 1990)
- GPS: AGPS/GLONASS/BEIDOU 传感器
- 光/近距离/Accel 快速充电 1.0 - SMB1360 USB2.0 (microUSB)。USB OTG
- 2-4-2 Half-board PCB, 具有 3.0 密耳轨迹 (mil trace)

•
•
•

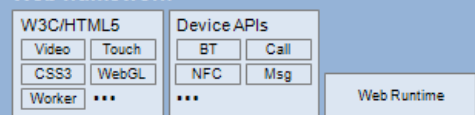
架构：Tizen 与 Android

组件	Tizen	Android
工具链	variant arm-linux-gcc	variant arm-linux-gcc
构建系统	GBS	Google Android Make System
内核	标准的 Linux 内核	修改的 Linux 内核
驱动程序	标准驱动程序	标准驱动程序
HAL	tizen hal based input dev	android hal based input dev
Init	SystemD	Init
C Lib	glibc	Bionic
音频	Alsa	TinyAlsa
摄像头	V4l2	QC V4l2
多媒体系统	Gstreamer	Stagefright
窗口系统	X-Window/Wayland	SurfaceFlinger
应用框架	AUL/Web 运行时	Java
应用运行时	本地/Web 运行时	Dalvik
Wifi	wpa_supplicant	WCNSS
BT	BlueZ	BlueDroid/BlueZ
图形	EFL/OpenGL ES	Skia/OpenGL ES
安全性	类似的沙盒模型	需要许可

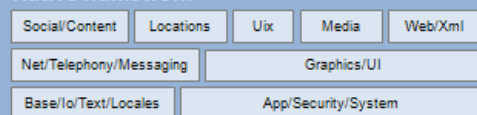
Web applications

Native applications

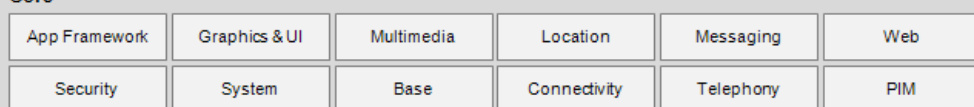
Web framework



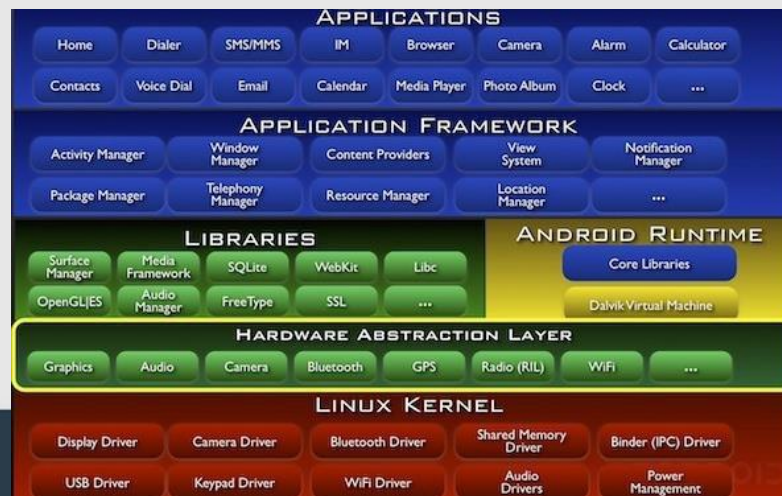
Native framework



Core



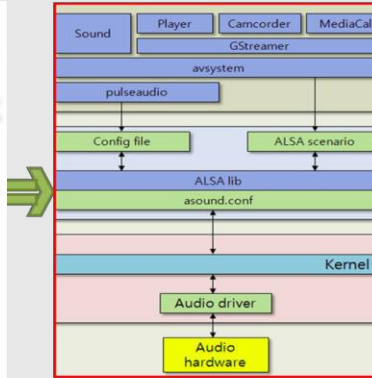
Linux kernel and device drivers



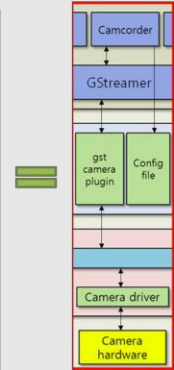
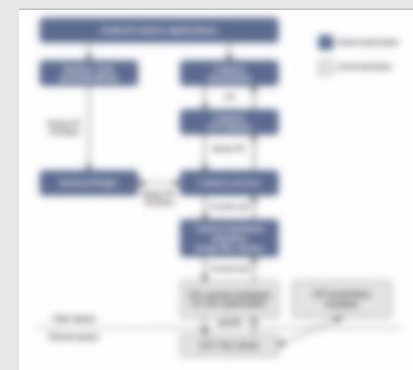
架构：Tizen 与 Qualcomm Android



QRD Android Audio



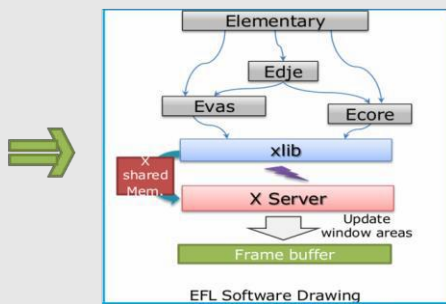
Tizen Standard Audio



==



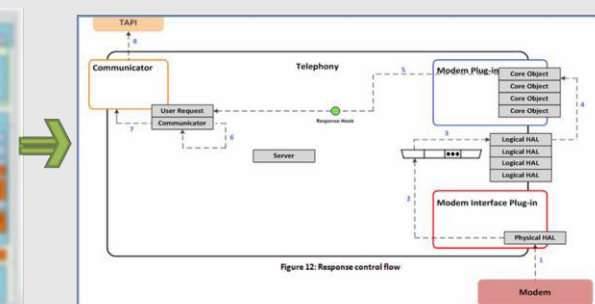
QRD Android Framebuffer



Tizen Standard Framebuffer



QRD Android Telephony

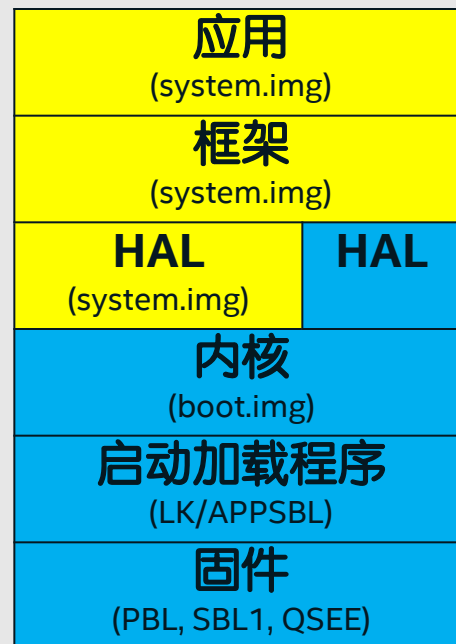


Tizen Telephony

移植策略

- 选项 1：使用 kexec 对设备进行多重启动
- 选项 2：先启动 Android，再 chroot 至 Tizen
- 选项 3：完全系统擦除和安装

调制解调器



应用核心

调制解调器核心

构建软件包

- GBS – Git 构建系统

Linux

- 设置构建环境
- 安装依赖软件包
(Dependent Package)
- 尽享依赖的乐趣

Android

- 跨构建环境
- Makefile 规则
- 自动依赖创建
- 软件包构建 + 映像构建



依赖校正

pkgmgr-info.spec | 1... x

192.168.33.81/tizen2/#/c/27/1/packaging/pkgmgr-info.spec

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All | My | Differences | Projects | Groups | Plugins | Documentation |
Side-by-Side | Unified | Commit Message | Preferences | Patch Sets | Files

Wu Hua <wuhua0721@thundersoft.com> | Settings | Sign Out

status:merged

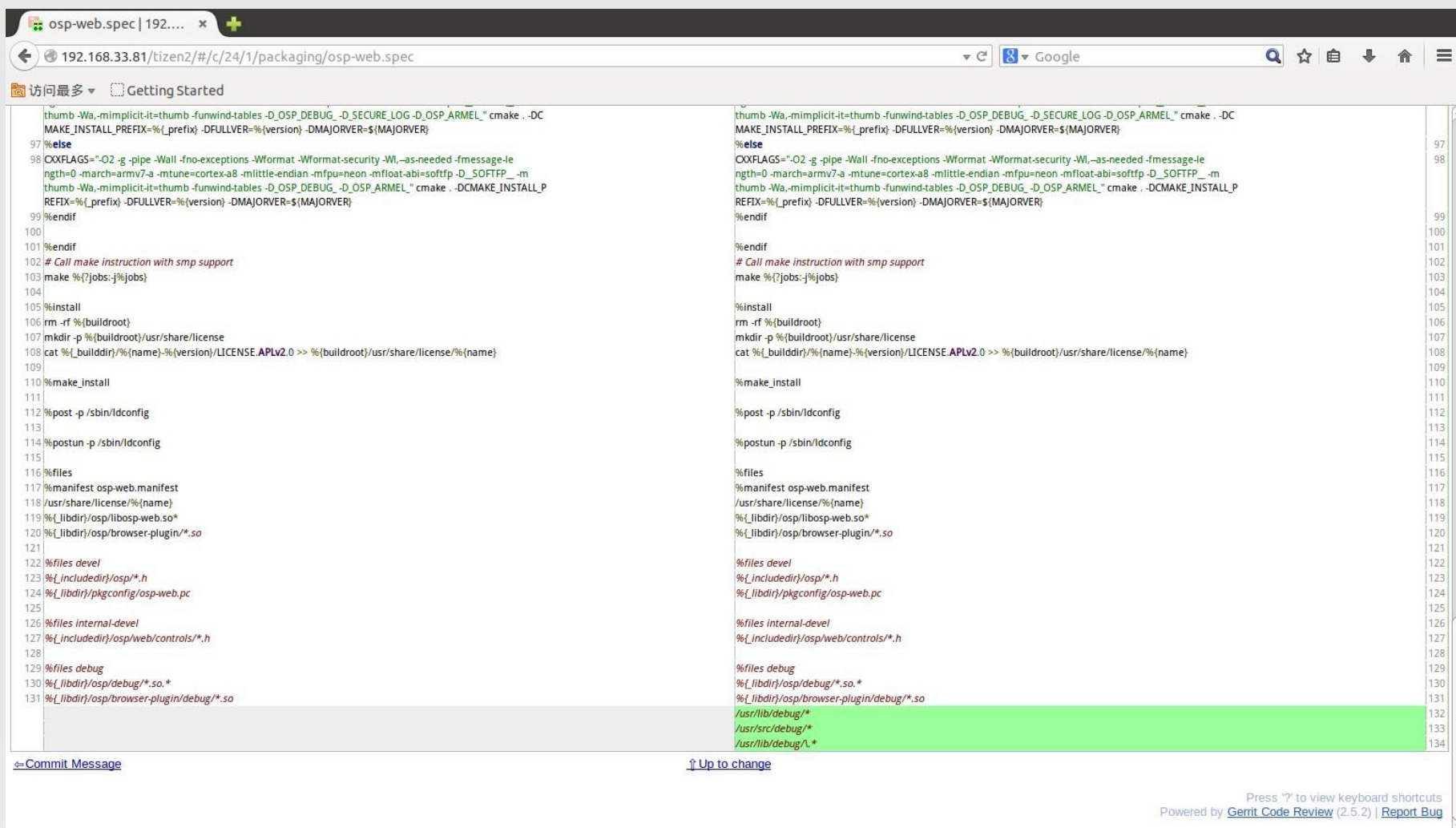
packaging/pkgmgr-info.spec

Reviewed & next →

⇐ CMakeLists.txt Up to change pkgmgr-info.c ⇒

Patch Set Base 1	Patch Set 1
1 Name: pkgmgr-info	Name: pkgmgr-info
2 Summary: Package Manager information api for package	Summary: Package Manager information api for package
3 Version: 0.0.144	Version: 0.0.144
4 Release: 1	Release: 1
5 Group: Application Framework/Package Management	Group: Application Framework/Package Management
6 License: Apache-2.0	License: Apache-2.0
7 Source0: %{name}-%{version}.tar.gz	Source0: %{name}-%{version}.tar.gz
8 BuildRequires: cmake	BuildRequires: cmake
9 BuildRequires: pkgconfig(dialog)	BuildRequires: pkgconfig(dialog)
10 BuildRequires: pkgconfig(vconf)	BuildRequires: pkgconfig(vconf)
11 BuildRequires: pkgconfig(sqlite3)	BuildRequires: pkgconfig(sqlite3)
12 BuildRequires: pkgconfig(db-util)	BuildRequires: pkgconfig(db-util)
13 BuildRequires: pkgconfig(libxml-2.0)	BuildRequires: pkgconfig(libxml-2.0)
14 BuildRequires: pkgconfig(dbus-1)	BuildRequires: pkgconfig(dbus-1)
15 BuildRequires: pkgconfig(dbus-glib-1)	BuildRequires: pkgconfig(dbus-glib-1)
16 BuildRequires: pkgconfig(deviced)	
17	
18 %description	%description
19 Package Manager information api for packaging	Package Manager information api for packaging
20	
21 %package devel	%package devel
22 Summary: Package Manager information api (devel)	Summary: Package Manager information api (devel)
23 Group: Development/Libraries	Group: Development/Libraries
24 Requires: %{name} = %{version}-%{release}	Requires: %{name} = %{version}-%{release}
25 %description devel	%description devel
26 Package Manager information api (devel)	Package Manager information api (devel)
27	
28 %package parser	%package parser
29 Summary: Library for manifest parser	Summary: Library for manifest parser
30 Group: Application Framework/Package Management	Group: Application Framework/Package Management
31 Requires: %{name} = %{version}-%{release}	Requires: %{name} = %{version}-%{release}
32	
33 %description parser	%description parser
34 Library for manifest parser	Library for manifest parser
35	
36 %package parser-devel	%package parser-devel
37 Summary: Dev package for libpkgmgr-parser	Summary: Dev package for libpkgmgr-parser
38 Group: Development/Libraries	Group: Development/Libraries
39 Requires: %{name} = %{version}-%{release}	Requires: %{name} = %{version}-%{release}

安装文件校正



路径校正

CMakeLists.txt | 192... * +

192.168.33.81/tizen2/#/c/25/1/privacy-popup/CMakeLists.txt

访问最多 ▾ Getting Started

Patch Set: Base 1

Patch Set: 1

```
1 INCLUDE(FindPkgConfig)
2 pkg_check_modules(privacy-popup_pkg
3   REQUIRED
4   ecore-x
5   ui-gadget-1
6   dlog
7   appcore-efl
8   privacy-manager-client
9   pkgmgr-info
10 )
11 SET (this_target tizenpvn00.privacy-popup)
12 SET (manifest_target privacy-popup.xml)
13
14 SET(SRCS
15   src/privacy-popup.c
16 )
17
18 INCLUDE_DIRECTORIES(${privacy-popup_pkg_INCLUDE_DIRS})
19 INCLUDE_DIRECTORIES(.inc)
20
21
22 FIND_PROGRAM(UNAME NAMES uname)
23 EXEC_PROGRAM("${UNAME}" ARGS "-m" OUTPUT_VARIABLE "ARCH")
24
25 IF("${ARCH}" STREQUAL "arm")
26   ADD_DEFINITIONS("-DTARGET")
27   MESSAGE("add -DTARGET")
28 ENDIF("${ARCH}" STREQUAL "arm")
29
30 MESSAGE("CMAKE_INSTALL_PREFIX: ${CMAKE_INSTALL_PREFIX}")
31
32 ADD_EXECUTABLE(${this_target} ${SRCS})
33
34 ADD_DEPENDENCIES(${this_target} privacy-manager-client)
35 TARGET_LINK_LIBRARIES(${this_target} ${privacy-popup_pkg_LDFLAGS} ${privacy-popup_pkg_LIBRARIES})
36
37 INSTALL(TARGETS
38   ${this_target}
39   DESTINATION
40     /usr/bin/
41 )
42 INSTALL(FILES ${CMAKE_SOURCE_DIR}/packaging/${manifest_target} DESTINATION /usr/share/packages)
```

[Commit Message](#)

[Up to change](#)

Press ? to view keyboard shortcuts
Powered by [Gerrit Code Review](#) (2.5.2) | [Report Bug](#)

GBS 适用于 Good .gbs.conf

- 多线程构建?
- 需排除什么软件包?

```
general
tmpdir=/var/tmp/
profile = profile.tizen2.2
work_dir=.

[repo.tizen2.2_arm]
url=${work_dir}/pre-built/toolchain-arm/

[repo.tizen2.2_x86]
url=${work_dir}/pre-built/toolchain-x86/

[profile.tizen2.2]
repos=repo.tizen2.2_arm, repo.tizen2.2_x86
buildconf=${work_dir}/scm/meta/build-config/build.conf

#exclude_packages=gcc,cmake,libva,python-magic,nss

exclude_packages=bash,bzip2-libs,c-ares,cmake,coreutils,diffutils,eglibc,elfutils-libelf,elfutils-libs,elfutils,fdupes,file,findutils,gawk,gmp,gzip,libacl,libattr,libcap,libcurl,libfile,libgcc,liblua,libstdc++,make,mpc,mpfr,ncurses-libs,nodejs,nspr,nss-softoken-freebl,nss,openssl,patch,popt,rpm-build,rpm-libs,rpm,sed,sqlite,tar,xz-libs,zlib,binutils,gcc

exclude_packages=gcc,cmake,libva,python-magic,nss
```

映像构建

- MIC msm8916_32.ks
- make_ext4fs
 - # sudo make_ext4fs -s -l 1140000000 platform.simg /media/xxx/platform

```
# *-mic2-options*- -f loop --pack-to=@NAME@.tar.gz *-mic2-options*-
```

```
#  
# Do not Edit!Generated by:  
# kickstarter.py  
#
```

```
lang en_US.UTF-8 keyboard us  
timezone --utc America/Los_Angeles  
# ROOT fs partition  
part / --size=3000 --ondisk mmcblk0p --fstype=ext4 --label=platform  
# DATA partition  
part /opt/ --size=3000 --ondisk mmcblk0p --fstype=ext4 --label=data  
# UMS partition  
part /opt/usr/ --size=3000 --ondisk mmcblk0p --fstype=ext4 --label=ums
```

```
...
```

```
repo --name=Tizen-main --baseurl=http://download.tizen.org/releases/2.2/tizen-2.2/repos/tizen-main/armv7l/packages/ --save --ssl_verify=no --priority=99 repo --name=Tizen-base --baseurl=http://download.tizen.org/releases/2.2/tizen-2.2/repos/tizen-base/armv7l/packages/ --save --ssl_verify=no --priority=99 repo --name=local --baseurl=file:///home/wuhua/GBS-ROOT/local/repos/tizen2.2/armv7l --priority=1
```

```
...
```

```
--- a/ext4_utils/make_ext4fs.c  
+++ b/ext4_utils/make_ext4fs.c  
@@ -164,6 +164,8 @@ static u32 build_directory_structure(const char  
*full_path, const char *dir_path  
dentries[i].size = stat.st_size;  
dentries[i].mode = stat.st_mode &  
(S_ISUID|S_ISGID|S_ISVTX|S_IRWXU|S_IRWXG|S_IRWXO);  
dentries[i].mtime = stat.st_mtime;  
+ dentries[i].uid = stat.st_uid;  
+ dentries[i].gid = stat.st_gid; uint64_t capabilities;  
if (fs_config_func != NULL) {  
#ifdef ANDROID  
@@ -242,7 +244,9 @@ static u32 build_directory_structure(const char  
*full_path, const char *dir_path  
inode = make_directory(dir_inode, entries, dentries, dirs);
```

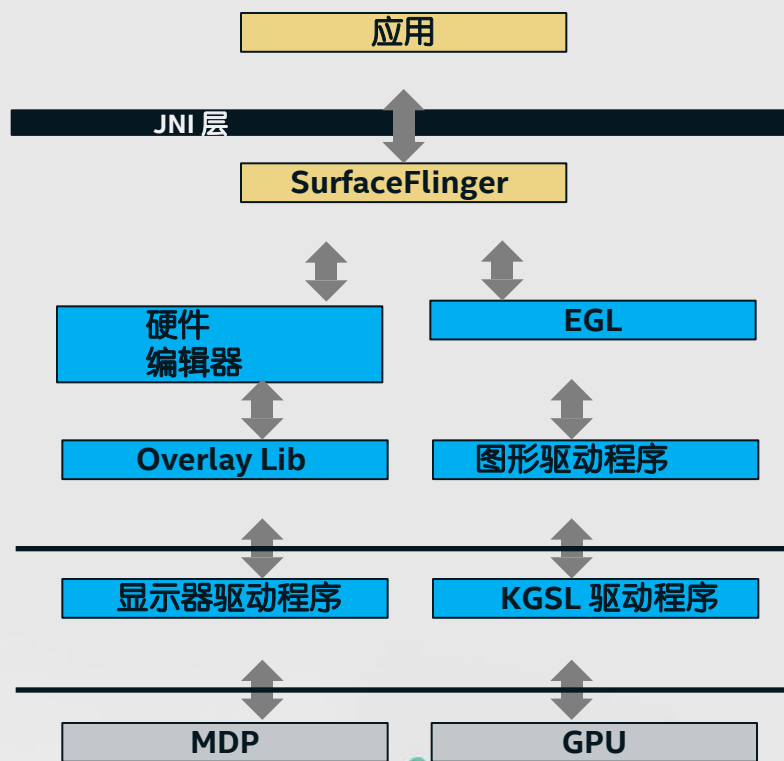
```
for (i = 0; i < entries; i++) {  
- if (dentries[i].file_type == EXT4_FT_REG_FILE) { if ((dentries[i].file_type ==  
+ EXT4_FT_REG_FILE) ||  
+ (dentries[i].file_type == EXT4_FT_CHRDEV) || (dentries[i].file_type ==  
+ EXT4_FT_BLKDEV)) {  
entry_inode = make_file(dentries[i].full_path,  
dentries[i].size);  
} else if (dentries[i].file_type == EXT4_FT_DIR) {  
char *subdir_full_path = NULL;
```

Msm8916_32.ks

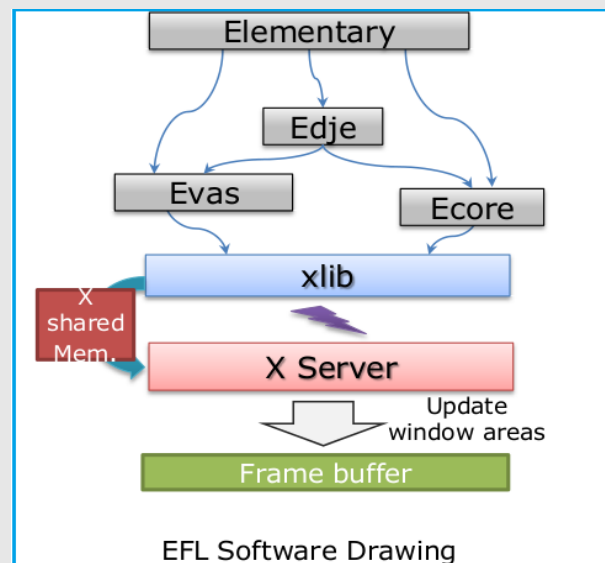
make_ext4fs

显示器

- QRD 仅支持叠加和 OpenGL/ES
- 帧缓冲区启用以支持 Xwindows
- aRGB (Tizen) 与 RGBa (高通)



```
if (mdss_fb_alloc_fbmem(mfd)) {  
    » if (mdss_fb_alloc_fb_ion_memory(mfd))  
    » » pr_warn("unable to allocate fb memory in fb register\n");  
    » »  
}
```



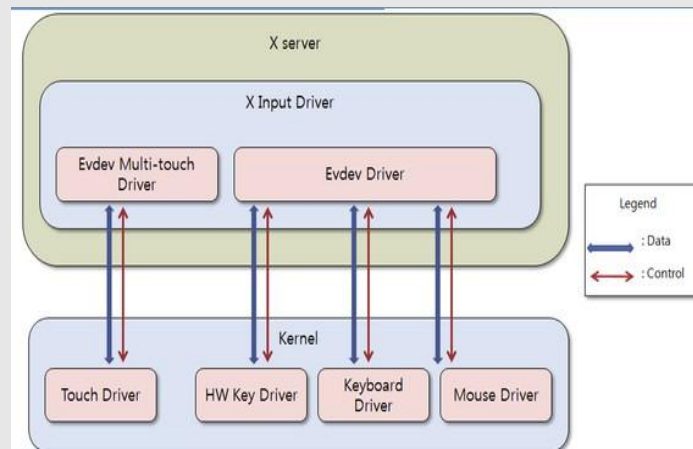
触控板

- 高通：触控事件和虚拟键事件使用相同的界面 (/dev/eventX)
- Tizen：触控事件和虚拟键事件使用不同的界面发送

```
#ifdef FT5X06_VIRTUAL_KEY
input_key_dev = input_allocate_device();
if (!input_key_dev) {
    dev_err(&client->dev, "failed to allocate input key device\n");
    return -ENOMEM;
}

input_key_dev->name = "ft5x06_ts_kbd";
input_key_dev->id.bustype = BUS_I2C;
input_key_dev->dev.parent = &client->dev;
```

```
#ifdef FT5X06_VIRTUAL_KEY
» » if (status == FT_TOUCH_DOWN || status == FT_TOUCH_CONTACT) {
» » » if ((x == 0x78) && (y == 0x384) && (menudown == 0)) {
» » » » menudown = 1;
» » » » input_report_key(input_key_dev, KEY_PHONE, 1);
» » » » update_key_input=true;
» » » » }
» » » if ((x == 0xf0) && (y == 0x384) && (homedown == 0)) {
» » » » homedown = 1;
» » » » input_report_key(input_key_dev, KEY_MENU, 1);
» » » » update_key_input=true;
» » » }
» » }
```

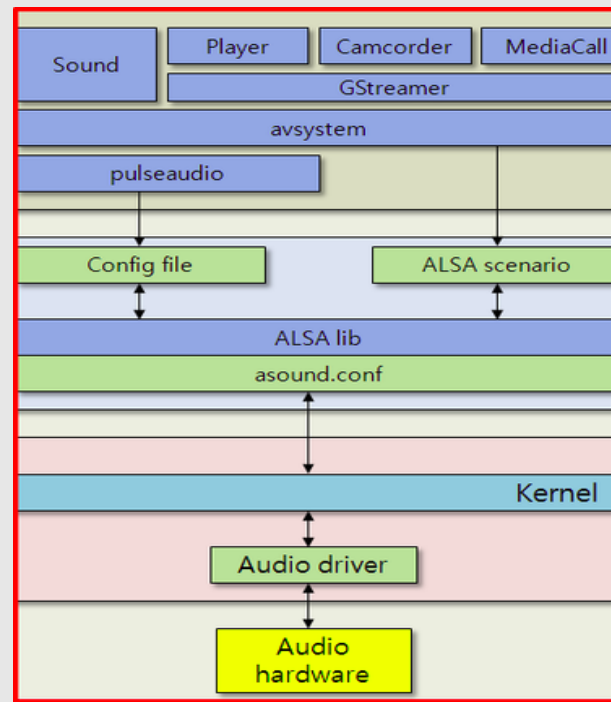
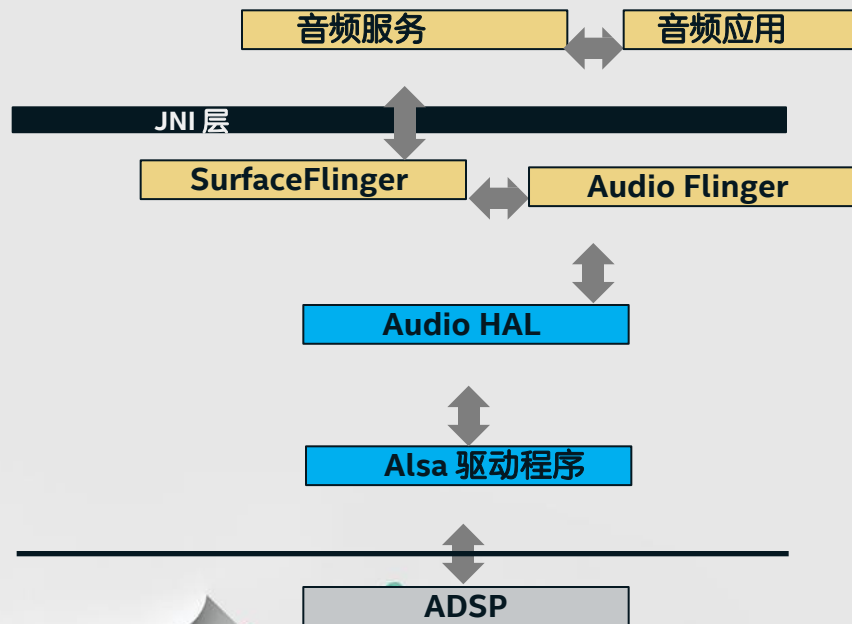


音频

- 音频和调制解调器

- 在 8916 中, 需启用调制解调器以支持音频功能 (DSP)
- 需要启动 ueventd 以创建设备节点 (如 /dev/smd0 Run rmt_storage),
- 初始化调制解调器

- TinyAlsa 与 ALSA



在 Tizen 上运行 Android 服务

- 链接程序和加载程序不同
- 运行 Android “初始化” 和 systemD
- 引入必要的服务
- 在 Tizen 中使用 Android lib

<https://github.com/libhybris>

	Tizen	Android
加载程序	Ld-linux.so	链接程序
动态 Lib 搜索路径	/user/lib/osp /usr/lib /lib	/vendor/lib /system/lib
典型的动态 Lib	# ldd bash /usr/lib/libsys-assert.so /lib/libdl.so.2 /lib/libgcc_s.so.1 /lib/libc.so.6 /lib/ld-linux.so.3 /lib/libunwind.so.8 \	# ldd rild liblog.so libcutils.so libril.so libdl.so libc.so libstdc++.so libm.so

```
static soinfo* solist = &libdl_info;
static soinfo* sonext = &libdl_info;
static soinfo* somain; /* main process, always the one after libdl_info */

static const char* const gSoPaths[] = { "/vendor/lib",
"/system/lib",
NULL
};

static char gLdPathsBuffer[LDPATH_BUFSIZE]; static const char*
gLdPaths[LDPATH_MAX + 1];

static char gLdPreloadsBuffer[LDPRELOAD_BUFSIZE]; static const char*
gLdPreloadNames[LDPRELOAD_MAX + 1];
```

linker.cpp

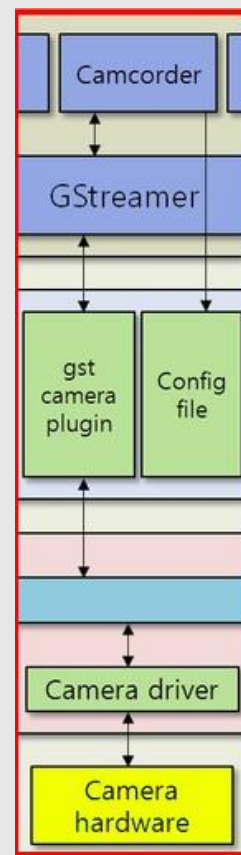
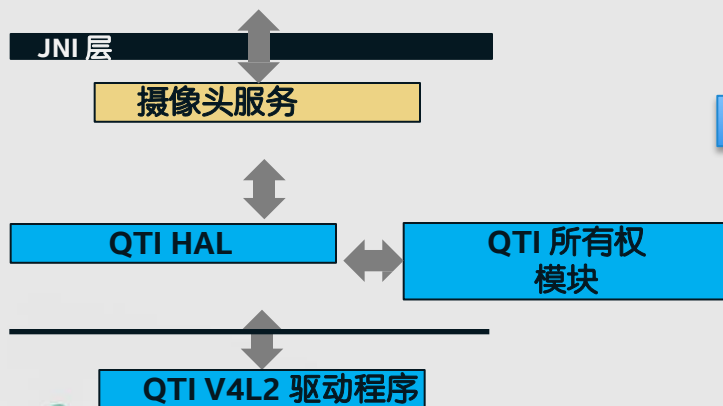
```
EGLBoolean eglInitialize(EGLDisplay dpy, EGLint *major, EGLint *minor)
{
    EGL_DLSYM(&_eglInitialize, "eglInitialize");
    return (*_eglInitialize)(dpy, major, minor);
}

void *android_dlopen(const char *filename, int flag)
{
    soinfo *ret;

    pthread_mutex_lock(&dl_lock); ret = find_library(filename); if (unlikely(ret ==
NULL)) {
        set_dlerror(DL_ERR_CANNOT_LOAD_LIBRARY);
    } else {
        call_constructors_recursive(ret); ret->refcount++;
    }
    pthread_mutex_unlock(&dl_lock); return ret;
}
```

摄像头

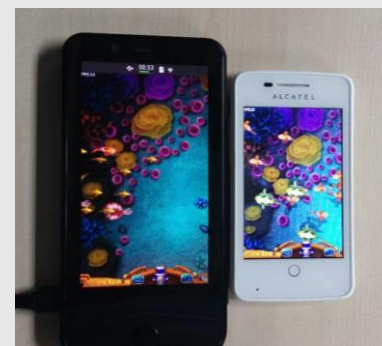
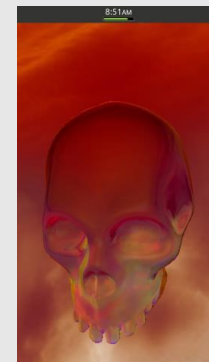
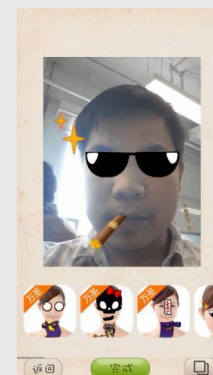
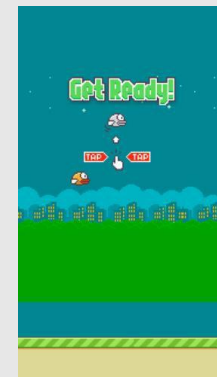
- QTI V4L2 与标准 V4L2
- 用户空间内的摄像头驱动程序
 - m-qcamera-daemon
 - Liboemcamera.so
 - libmmcamera2_stats_modules.so (3A lib)
 - libmmcamera2_sensor_modules.so (sensor related lib)
 - libmmcamera2_pproc_modules.so (Post-processing lib)
 - libmmcamera2_imgproc_modules.so (Images related lib)



Web 应用移植

- Tizen web 应用与 FirefoxOS 应用
 - Web API, 设备 API, 封装, Syntax 等

	Tizen	FirefoxOS
Web 引擎	webkit2	gecko
Javascript 引擎	JavaScript 核心	Spider monkey
Web 渲染	Cairo	Skia
应用声明	config.xml (xml 格式)	manifest.webapp (json 格式)
“const” 支持	否	是
蓝牙 API	非标准	非标准
环境光 传感器 API	非标准 (通过 传感器管理器)	W3C
WebFM	否	是
警报器	非标准 (警报器管理器)	W3C
简单的推送 API	不支持	不支持



497 Tizen 2.2	434 Android 4.4.3	473 Firefox Mobile 30
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后续步骤

- 发布源代码
- EGL
- 电话
- WiFi
- 面向摄像头的 Gstreamer 插件
- 传感器

资源

- 从 Tizen 到 Android
 - http://events.linuxfoundation.org/sites/events/files/als13_dupuis_tizen.pdf
- Tizen 移植指南
 - https://wiki.tizen.org/wiki/Porting_Guide
- 将 Tizen 移植到全志 A10 上
 - <https://github.com/leon-anavi/tizen-sunxi>
- Linux 配置在 Snapdragon 上
 - <https://www.codeaurora.org/projects/all-active-projects/qc-linux>
 - <http://releases.linaro.org/latest/ubuntu/ifc6410>

问答



- www.thundersoft.com
- store.thundersoft.com
- zoupc@thundersoft.com



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开发者
峰会
2014



SHAN GHAI

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	设备 API 支持 (共 56)	不支持	支持		HTML 得分
Tizen	56	18	38	0.678571429	497
Firefox	56	26	30	0.535714286	473