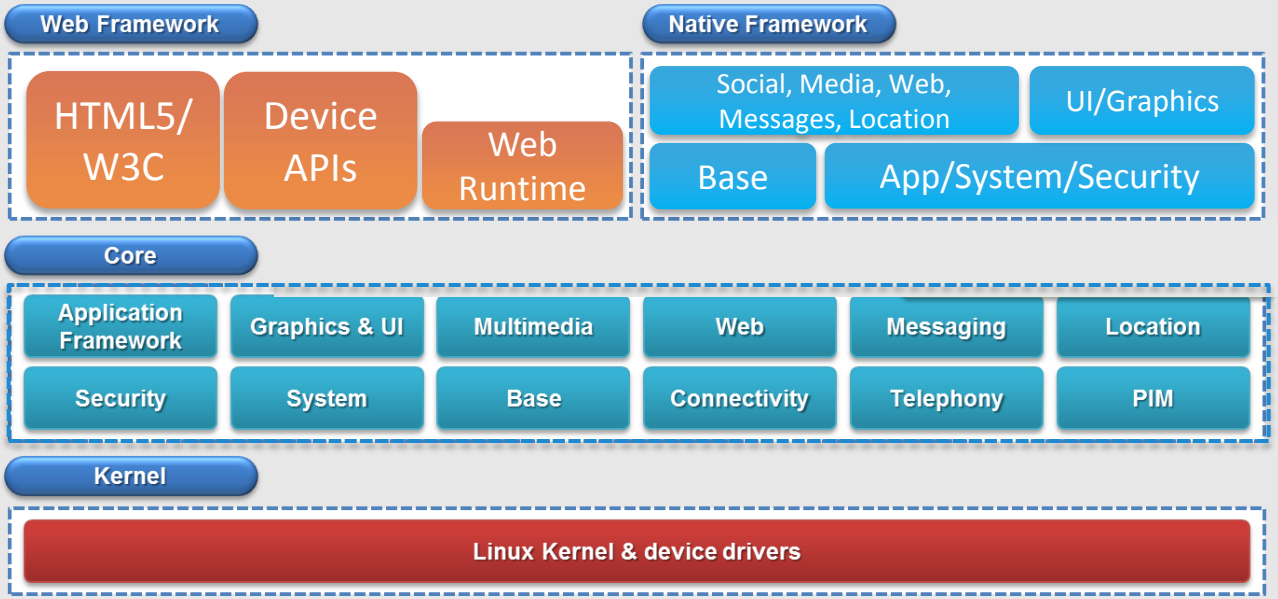
Tizen Core APIs: A Core Framework Layer To Build In-House Applications

Jin-Woo Jeong

TIZEN™ DEVELOPER CONFERENCE 2014 SAN FRANCISCO

Tizen Architecture

Tizen Architecture



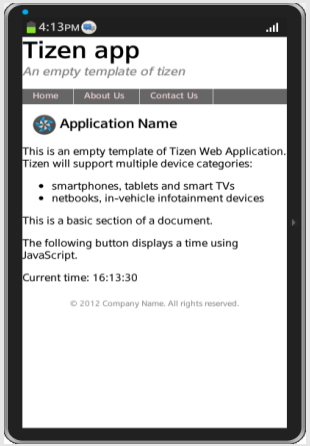
Tizen Architecture | Frameworks

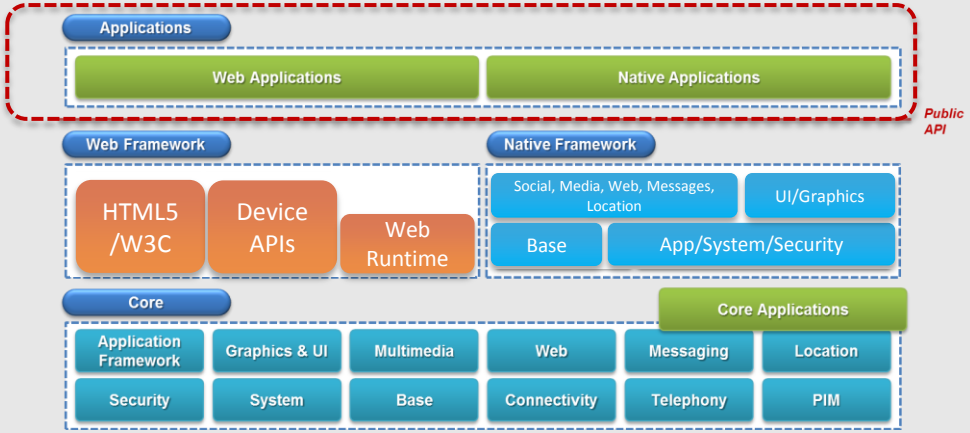
- **Public layers (Web & Native) focus on:**
  - Application development productivity
    - State-of-the-art HTML5/W3C APIs & Web UI framework
    - Full-featured native application development and features
  - Well-documented API references, developer guide, sample codes, and associated tools

- **Core sub-system focuses on:**
  - Providing common functionalities for Web and Native frameworks as an underlying layer
  - Performance optimization

Tizen Architecture | Application Types (1/2)

- **Web and Native applications**
  - Apps using only public APIs to get full support for package installation and upgrade, security, backward compatibility, and so on
  - Many samples apps included in the SDK

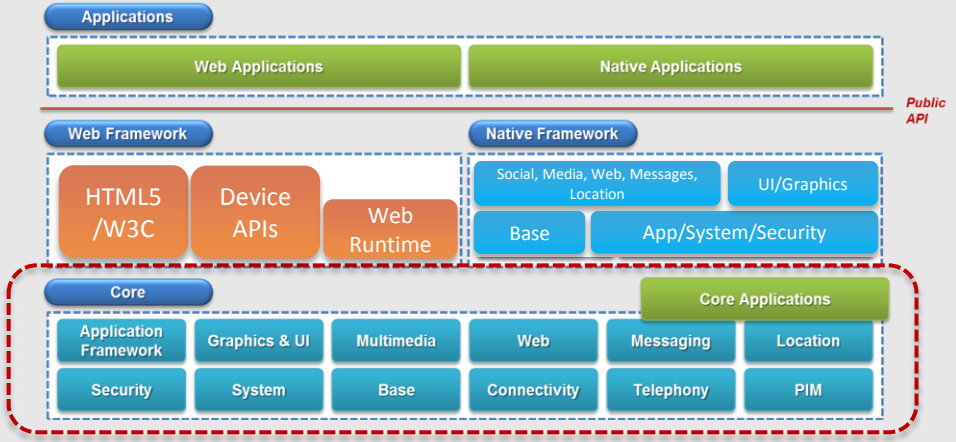




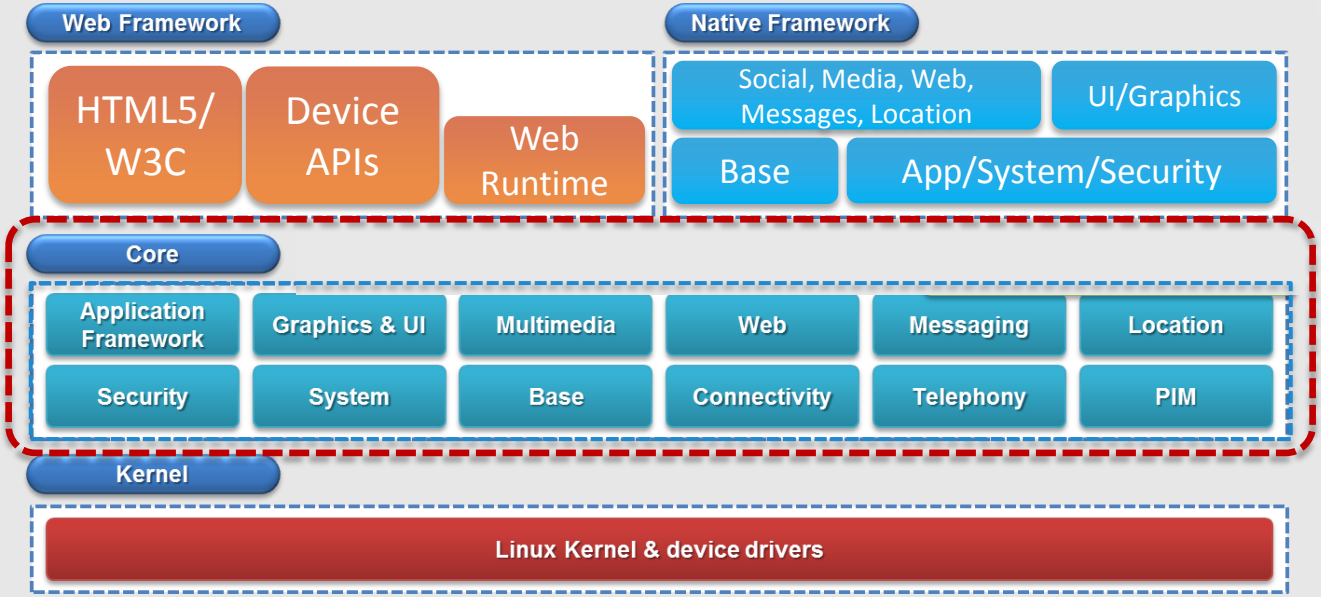
Tizen Architecture | Application Types (2/2)

- **Core applications**
  - Apps using internal APIs to fully utilize device capabilities

- **In-house applications**
  - Pre-loaded Core applications developed by device implementers
  - Call app, Calculator app, Gallery app, Contacts app, etc.



Tizen Architecture | Core Framework & API Layer



Fast,
Light-weight,
Scalable

In-house Applications & Services running smoothly
on any Tizen mobile phones from low-end to high-end!

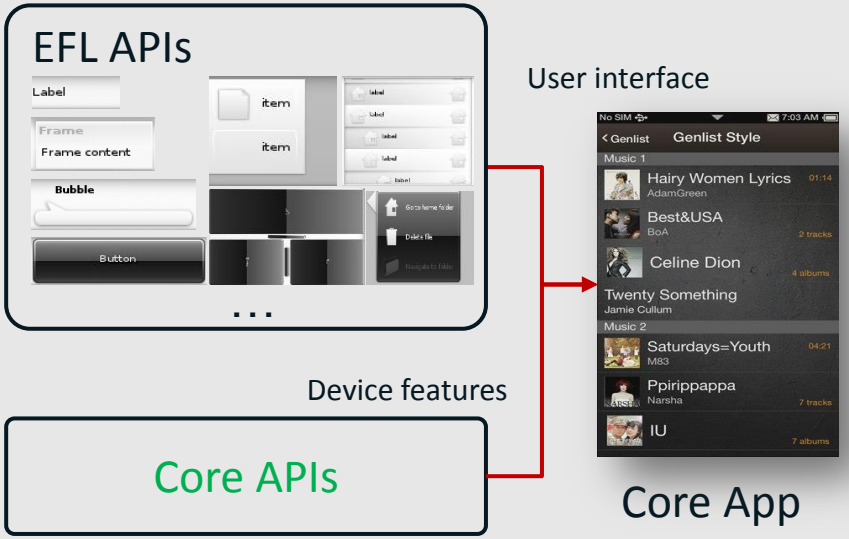
Core Applications

Tizen Architecture | Core Applications - Revisited

- **What is Core Application?**
  - Application written in Core APIs for Tizen
  - Fully utilizes device features

  - User interface:
    - Enlightenment Foundation Libraries (EFL)

  - Device features
    - App framework: application, package, etc.
    - Social: contacts, calendar, etc.
    - Multimedia: image, video, audio, etc.
    - Other device-related features



Tizen Architecture | Core Applications – App Types

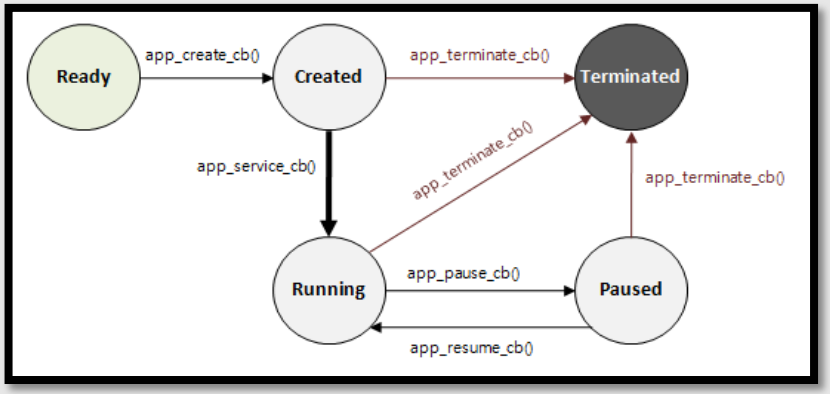
- **UI application**
  - Applications with UI
  - Developed using EFL + Core APIs

- **Service application**
  - Applications without UI
  - Developed using Core APIs

Tizen Architecture | Core Applications – App Lifecycle (1/4)

- **Application states**

State	Description
READY	The application is launched
CREATED	The application starts the main loop
PAUSED	The application is running but invisible to users
RUNNING	The application is running and visible to users
TERMINATED	The application is terminated



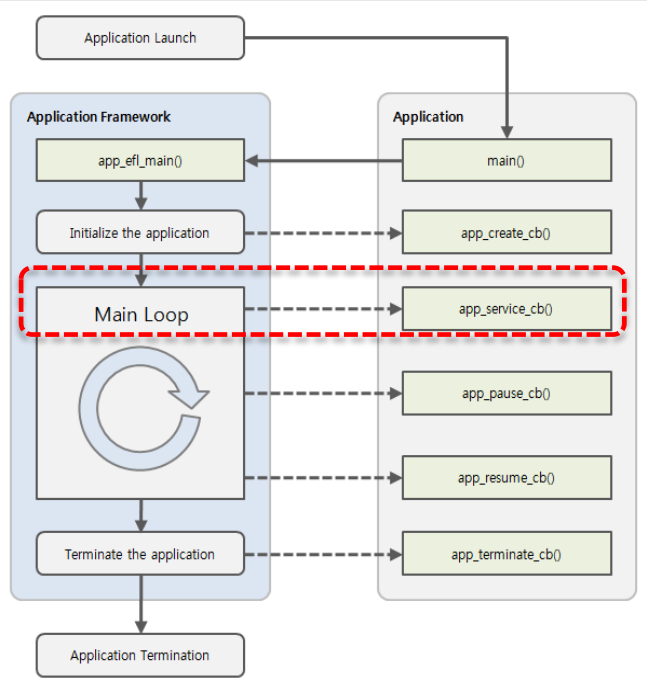
- **State transition callbacks should be provided before starting the loop**

Tizen Architecture | Core Applications – App Lifecycle (2/4)

- **Callbacks regarding App life-cycle**

Callback	Description	Action (Example)
app_create_cb	Hook to take necessary actions before main event loop starts	UI generation code
app_pause_cb	Hook to take necessary actions when application becomes invisible	Releasing memory/resources
app_resume_cb	Hook to take necessary actions when application becomes visible	Re-allocating resources
app_terminate_cb	Hook to take necessary actions when your application is terminating	Release all resources
app_service_cb	Hook to take necessary actions for responding to the launch request	Required action

Tizen Architecture | Core Applications – App Lifecycle (3/4)



- **Who can launch applications?**
  - Users through the application launcher
  - Another application which needs to perform a specific operation (AppControl)

```
static void app_service(service_h service, void *user_data)
{
    struct appdata *ad = (struct appdata *)user_data;
    char *operation;
    char *uri;
    char *mime_type;
    service_get_operation(service, &operation);
    if (!strcmp(operation, SERVICE_OPERATION_VIEW))
    {
        service_get_uri(service, &uri);
        service_get_mime(service, &mime_type);
        if (uri && !strcmp(mime_type, "image/jpg"))
        {
            display_image_file(ad, uri); // display a specific image file
        }
    }
    if (ad->win)
        elm_win_activate(ad->win);
}
```

http://tizen.org/appcontrol/operation/view

Tizen Architecture | Core Applications – App Lifecycle (4/4)

- **Additional callbacks for system events**

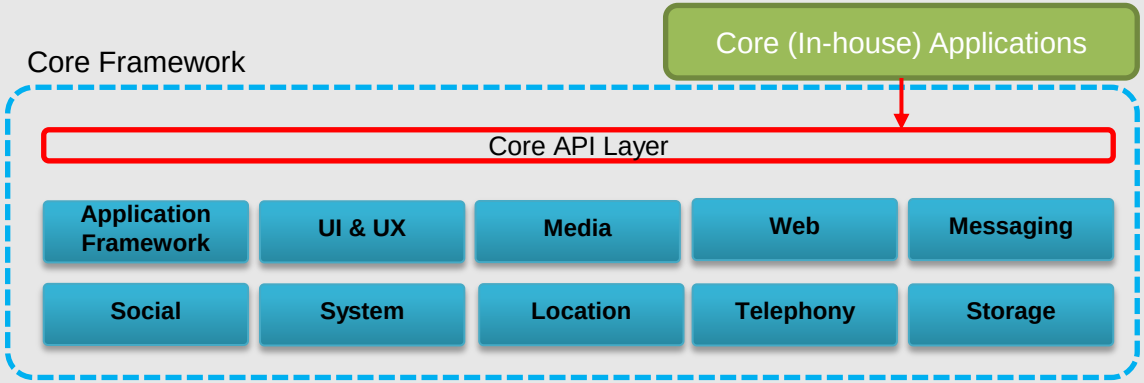
Callback	Description	Action (Example)
app_low_memory_cb	Hook to take necessary actions in low memory situations	Save data into a persistent memory
app_low_battery_cb	Hook to take necessary actions in low battery situations	Stop heavy cpu/power consumption
app_device_orientation_cb	Hook to take necessary actions for handling a device orientation change	Change display orientation
app_langage_changed_cb	Hook to take necessary actions for handling a language change event	Refresh the display with a new language
app_region_format_changed_cb	Hook to take necessary actions for handling a region change event	Update time to reflect the timezone change

Tizen Core APIs: Layout & Details

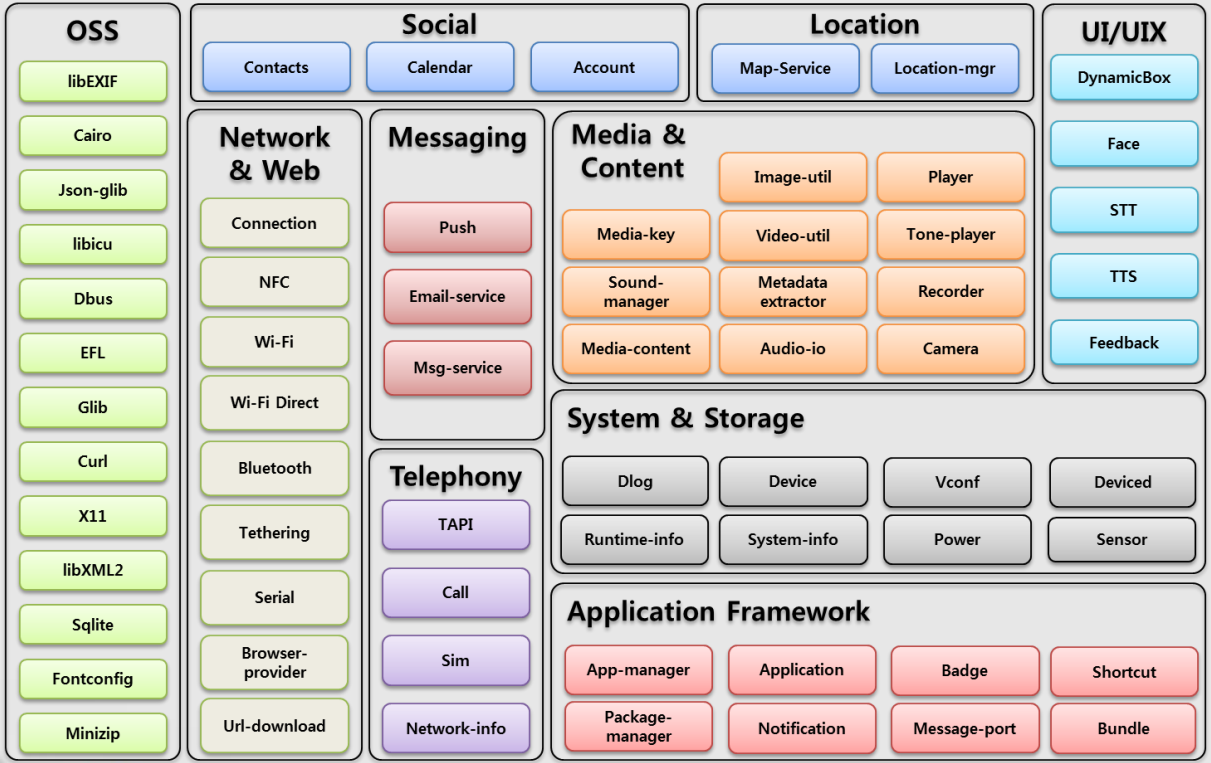
Core API | Definition

- **Selected set of APIs in Core framework**
  - Well-structured set to improve the usability of device features

- **Not all the APIs in core framework are Core APIs**



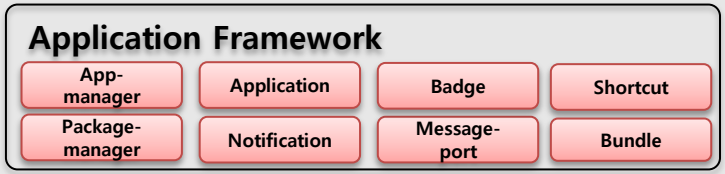
Core API | Domain Layout (1/2)



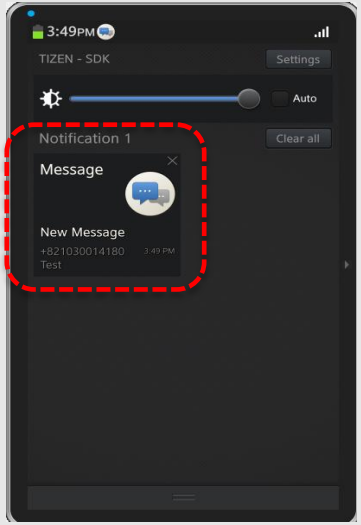
Core API | Domain Layout (2/2)

Namespace	Description
Application Framework	Application management
System & Storage	System & Device management
Network & Web	Network & Connectivity related-features
Telephony	Cellular functionalities
Media & Content	Multimedia data management
Messaging	Messaging service
Social	Private information management
Location	Location-based service
UI & UX	User interface and experience
Open-source Software	Linux-based essential system libraries

Core API | Application Framework



- **Provides**
  - Managing the main event loop of an application, managing application state changes, launching other applications using the package name, URI, or MIME type (Application)
  - Installing / Uninstalling applications (Package manager)
  - Information about applications (Application manager)
  - Managing notifications (Notification)
  - Passing messages between applications (Message-port)
  - “Add to home” feature (Shortcut)



Core API | System & Storage (1/2)

- **Provides system and device management features**
  - Interfaces for accessing devices such as sensors, USB, MMC, battery, CPU, and display (Sensor, System-server, Device)
  - Power management (Power)
  - Getting information about the device (System-info, Runtime-info)
  - System configuration, simple notification (Vconf)
  - Sending log output for debug activities (Dlog)

How long can I use my phone?
Want to know my Tizen version!

Core API | System & Storage (2/2)

- **Runtime-info example : Getting Wi-Fi status**

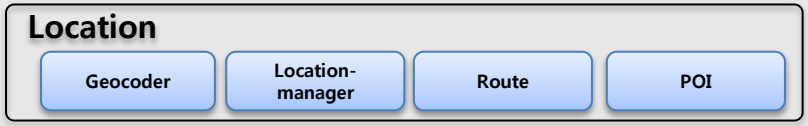
```c
#include <runtime_info.h>
#include <dlog.h>

runtime_info_error_e ret;
int wifi_status = 0;

ret = runtime_info_get_value_int(RUNTIME_INFO_KEY_WIFI_STATUS, &wifi_status);

if (ret == RUNTIME_INFO_ERROR_NONE)
{
    switch(wifi_status)
    {
    case RUNTIME_INFO_WIFI_STATUS_DISABLED:
        LOGI("Wi-Fi is disabled.");
        break;
    case RUNTIME_INFO_WIFI_STATUS_UNCONNECTED:
        LOGI("Wi-Fi is enabled and network connection is not established.");
        break;
    case RUNTIME_INFO_WIFI_STATUS_CONNECTED:
        LOGI("Network connection is established in Wi-Fi network.");
        break;
    default:
        LOGI("Invalid status");
        break;
    }
}
else
{
    LOGE("runtime_info_get_value_int() failed");
}
```

`runtime_info_get_value_int`

Key value to search
(Wi-Fi hotspot enabled, tethering enabled, vibration enabled, and so on)

You can get the current Wi-Fi status !

Core API | Location



- **Provides location-based services (LBS)**
  - Position information, satellite, GPS status (Location-manager)
  - Geocoding service (Geocoder)
    - Converting between geographical coordinates and textual address
  - Searching a point of interest, routes (POI, Route)

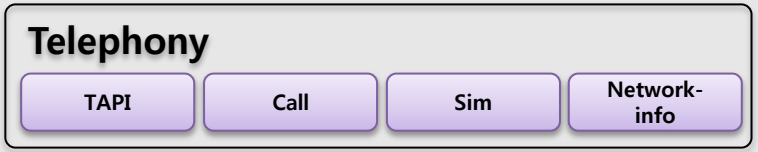
Want to find the slowest route to my wife!

Core API | Network & Web

- **Provides network and connectivity related functionalities**
  - Managing modem data connections (Connection)
  - Managing Bluetooth devices (Bluetooth)
  - Managing near field radio communication (NFC)
  - Managing Wi-Fi, USB, Bluetooth tethering services (Tethering)
  - Managing the serial communication (Serial)
  - Downloading the contents of a URL to the storage (Url-download)

Want to download TDC logo image file!
… using free Wi-Fi around me ☺

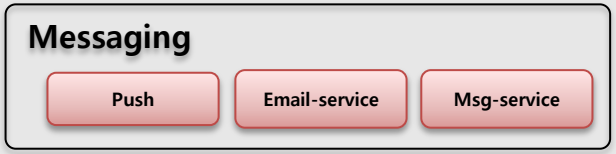
Core API | Telephony



- **Provides cellular functionalities communicating with a modem**
  - Managing call-related information and services (Call & TAPI)
    - Voice call & video call
  - Obtaining information from a SIM card (SIM)
    - Mobile country code (MCC), mobile network code (MNC), service provider name (SPN)
    - SIM card status
  - Accessing the cellular network status information (Network-info)
    - Roaming state, received signal strength indicator (RSSI), network type, service status, etc

Want to know my network type (GSM? UMTS? LTE?)

Core API | Messaging (1/2)



- **Provides messaging services**
  - SMS & MMS related services (Msg-service)
    - Creating, setting properties (recipients, body), and sending messages
    - Searching for messages
    - Registering callbacks for receiving notifications when new incoming messages found
  - Managing E-mails (Email-service)
    - Creating, setting properties (recipients, attachments, etc)of e-mail messages
    - Managing mailboxes, filtering rules
  - Push service (Push)

My girlfriend seems to automatically send this SMS:
“Ok, I will be there soon”

Core API | Messaging (2/2)

- **SMS send example**

1) Create a message

```
static messages_message_h g_sms;

MESSAGES_error_e e;

/*
Create a SMS message
*/
e = messages_create_message(MESSAGES_TYPE_SMS, &g_sms);
if (found_error(MESSAGES_ERROR_NONE, "messages_create_message", e))
    //handle error
```

2) Set recipient's address

```
char my_sms_buddies[] = "[redacted]";

e = messages_add_address(g_sms, my_sms_buddies);
if (e != MESSAGES_ERROR_NONE) {
    LOGE("Failed to add recipient using messages_add_address().");
    return;
}
```

3) Set Text for the message

```
char content[] = "An intruder has been detected in the cookie cupboard.";

MESSAGES_error_e e;

/*
Create a text of the SMS
*/
e = messages_set_text(g_sms, content);
if (found_error(MESSAGES_ERROR_NONE, "messages_set_text", e))
    return;
```

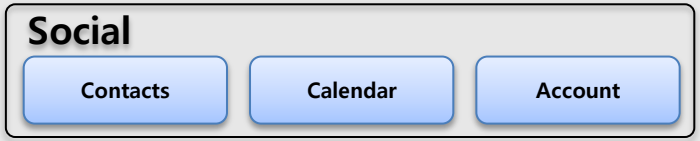
4) Send an SMS

```
e = messages_send_message(svc, g_sms);
if (e != MESSAGES_ERROR_NONE) {
    LOGE("Failed to send an sms message using messages_send_message().");
}
```

Core API | Media & Content

- **Provides**
  - Encoding, decoding, and transforming images (Image-util)
  - Transcoding a media file (Video-util)
  - Recording from the audio device and playing raw audio data (Audio-io, Sound-manager)
  - Playing multimedia contents from a file, network, and memory (Player)
  - Playing the tone and Waveform audio files (Tone-player, Wav-player)
  - Controlling a camera device (Camera)
  - Managing information about media files (Media-content)

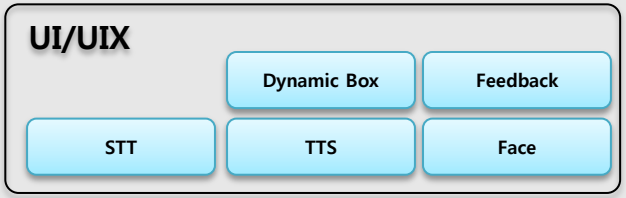
Core API | Social



- **Provides PIM-related services**
  - Managing account information on the device (Account)
  - Managing calendar events and accessing calendar database (Calendar)
    - Insert, update, remove calendar records
    - Searching records with filters
  - Managing contacts and accessing contact database (Contacts)
    - Insert, update, remove contact & group records
    - Searching records with filters
    - Setting display options
    - SIM-related features

It’s safe to record wedding anniversary rather than my birthday

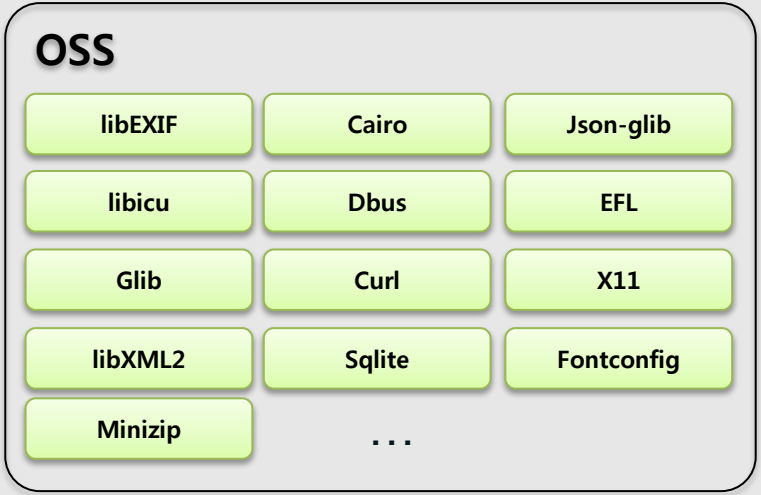
Core API | UI & UX



- **Provides UI features & interaction services**
  - Managing dynamic box (widget) service (Dynamic Box)
  - Playing simple sound and vibration (Feedback)
  - Synthesizing voice from text and playing synthesized sound data (TTS)
  - Recognizing the speech (STT)
  - Detecting and recognizing faces (Face)

Core API | Open Source Software

- **Provides essential system libraries**
  - Graphics
  - Window system
  - Internationalization
  - XML/JSON parsing
  - Database
  - Base utilities
  - …



Core API | API Style (1/2)

- **Naming convention**
  - Function: {Namespace}_{Subject(optional)}_{Verb}_{Object}

```
int camera_get_state(camera_h camera, camera_state_e *state);
int camera_set_capture_format(camera_h camera, camera_pixel_format_e format);
```

  - Callbacks: typedef void (*namespace_actual_name_cb)([event_type event], [event details], void *user_data);

```
typedef void (*app_service_cb) (service_h service, void *user_data);
typedef void (*camera_capture_completed_cb)(void *user_data);
```

Core API | API Style (2/2)

- Data types
  - Handles should have “_h” suffix
  - Enums should have “_e” suffix
  - Structures should have “_s” suffix

```
int camera_get_state(camera_h camera, camera_state_e *state);
int camera_set_capture_format(camera_h camera, camera_pixel_format_e format);
```

- **Return type & values**
  - All core APIs should return an int type error value
  - Common error values are defined in tizen.h
  - Module-specific errors can be defined as enum

Core API | API Specification

- **Core API headers are ready to generate API reference!**

using Doxygen!

```
/**
 * @addtogroup CAPI_APPLICATION_MODULE
 * @{
 */

/**
 * @brief Runs the main loop of application until app_efl_exit() is called
 *
 * @details This function is the main entry point of the Tizen application.
 * The app_create_cb() callback function is called to initialize the application before the main loop of application starts up.
 * After the app_create_cb() callback function returns true, the main loop starts up and the app_service_cb() callback function is subsequently called.
 * If the app_create_cb() callback function returns false, the main loop doesn't start up and app_terminate_cb() callback function is called
 *
 * @param [in] argc The argument count
 * @param [in] argv The argument vector
 * @param [in] callback The set of callback functions to handle application events
 * @param [in] user_data The user data to be passed to the callback functions
 *
 * @return 0 on success, otherwise a negative error value.
 * @retval #APP_ERROR_NONE Successful
 * @retval #APP_ERROR_INVALID_PARAMETER Invalid parameter
 * @retval #APP_ERROR_INVALID_CONTEXT The application is illegally launched, not launched by the launch system.
 * @retval #APP_ERROR_ALREADY_RUNNING The main loop already starts
 *
 * @see app_create_cb()
 * @see app_terminate_cb()
 * @see app_pause_cb()
 * @see app_resume_cb()
 * @see app_service_cb()
 * @see app_low_memory_cb()
 * @see app_low_battery_cb()
 * @see app_device_orientation_cb()
 * @see app_language_changed_cb()
 * @see app_region_format_changed_cb()
 * @see app_efl_exit()
 * @see #app_event_callback_s
 */
int app_efl_main(int *argc, char ***argv, app_event_callback_s *callback, void *user_data);
```

Module grouping

Brief introduction

Detailed information

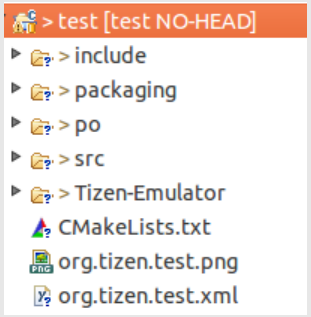
Required parameters

Return values

Related APIs

How to Build/Install Core-Applications?

- **Core application follows RPM packaging**
  - GBS build



- **Platform SDK supports building EFL applications**

Q & A

- **Thanks for listening!**


TIZEN™
DEVELOPER
CONFERENCE
2014
SAN FRANCISCO