Tizen Input Service Framework Overview

Ji-hoon Lee
Samsung Electronics

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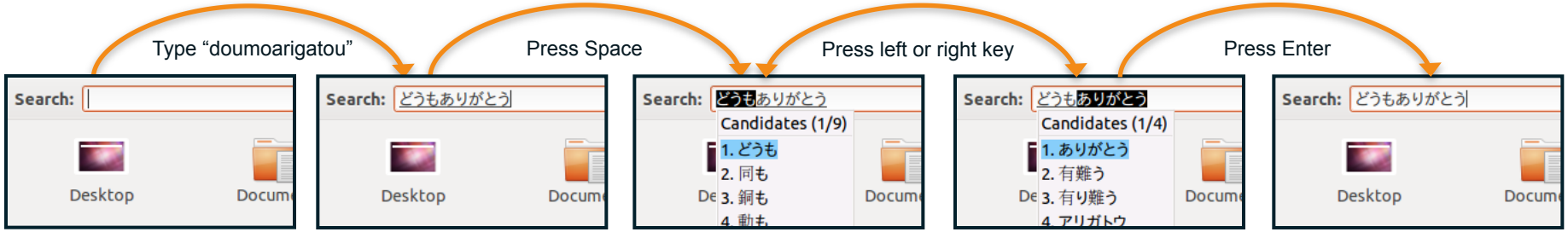
Introduction to Input Service Framework

What Is Input Service Framework?

- **Provides text input-related services**
- **Plays major role in:**
  - Multilingual text input support
  - Text input support for devices without physical keyboard

Multilingual Text Input

- **Some languages need complex processing when typing text**
- **Support for the following is needed:**
  - Pre-edit strings : Strings that have not been fixed
  - Commit strings : Strings that are finalized and being appended
  - Candidate window : Window that lists and lets you to select among the possible conversions



Input Service Framework Basics

- **Based on open source SCIM 1.4.7**
  - SCIM = Smart Common Input Method
  - Client/Server architecture
  - Dynamically loadable plug-in module support
  - Provides a simple and powerful programming interface
  - Widely used in many Linux distributions
- **Added support for mobile devices**
  - Application-side interface for interacting with S/W keyboard engines
  - S/W keyboard engine-side interface for full-featured text input services

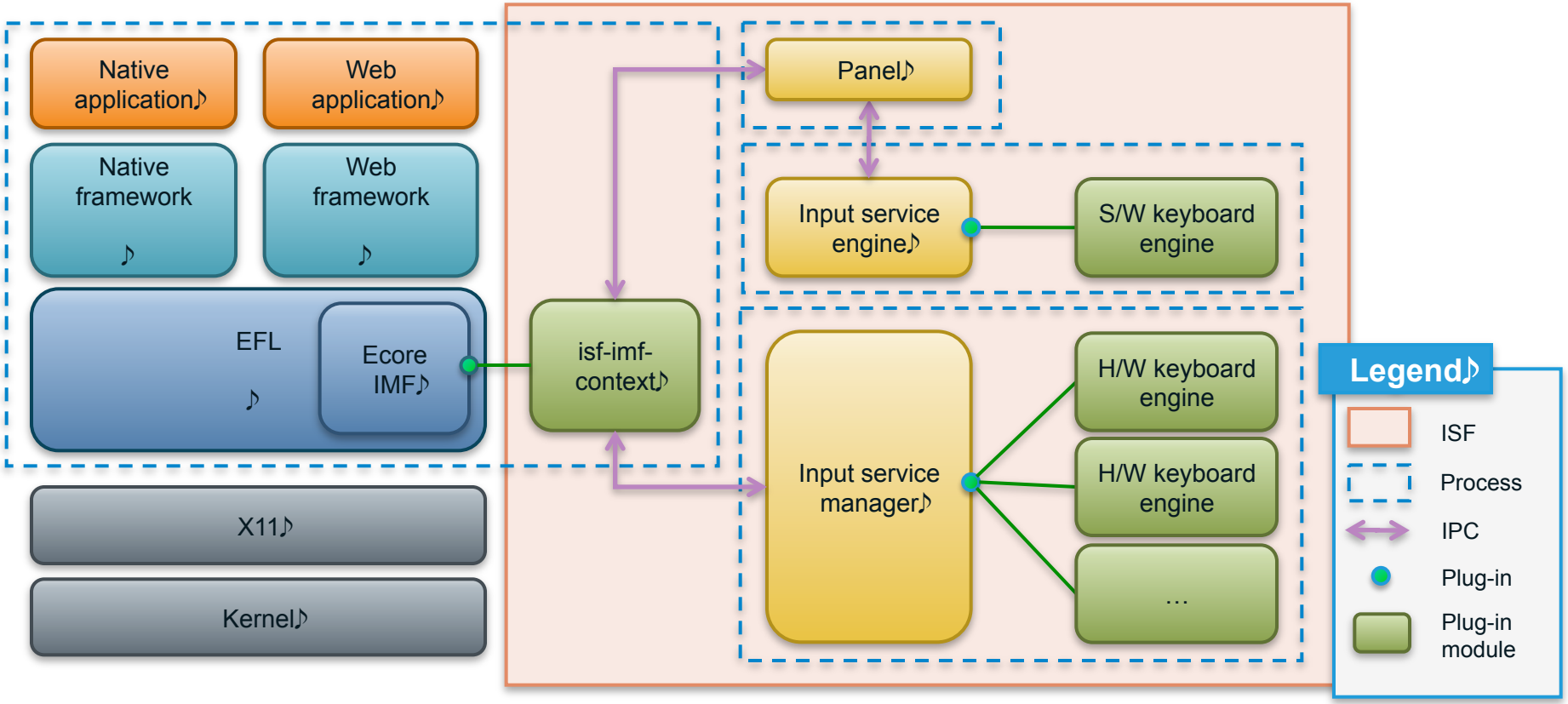
Benefits of Using Open Source SCIM

- Powered by open source keyboard engines
- Tizen keyboard supports 40+ languages including CJK languages, without any language-specific code
- Korean language XML layout example of the Tizen keyboard:

```
<row x="4" y="10">
    <key use_magnifier="true" longkey_magnifier="true" long_key_value="1" multitouch_type="settle_previous">
      <label>
        <rec shift="off" multi="0">ㅂ</rec>
        <rec shift="on" multi="0">ㅃ</rec>
        <rec shift="loc" multi="0">ㅃ</rec>
        <rec multi="1">1</rec>
      </label>
      <key_value>
        <rec auto_upper="true">q</rec>
      </key_value>
    </key>
```

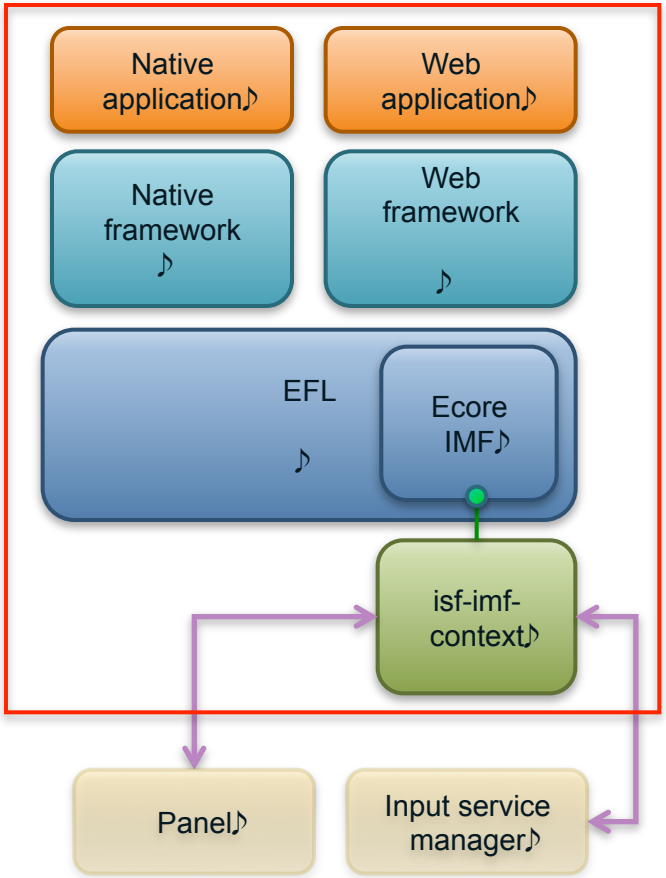
Architecture and Event Flow

Architecture Diagram



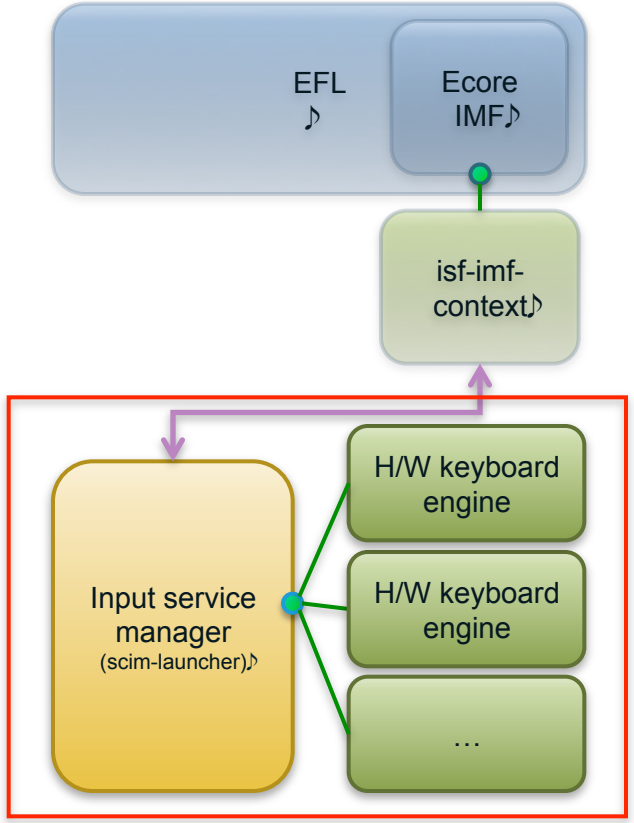
Ecore_IMF

- Interface for interacting with the input service framework
- isf-imf-context: plug-in module connecting the Ecore_IMF interface and input service framework



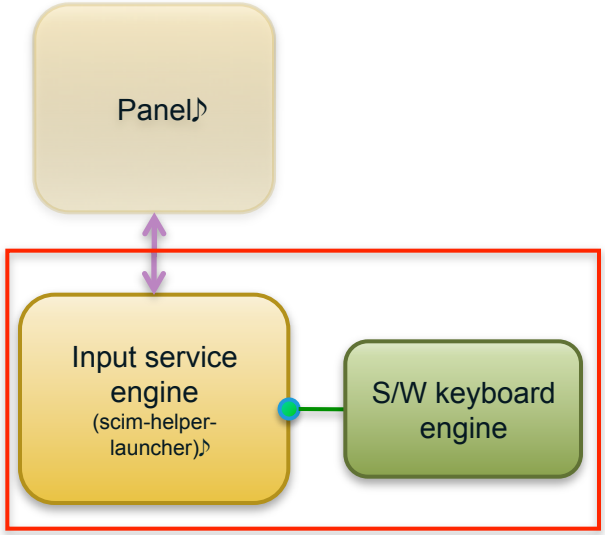
Input Service Manager

- **Process handling H/W key events**
- **Loads all available H/W keyboard engines, and requests the currently selected one to handle the given key event generated by the H/W keyboard**



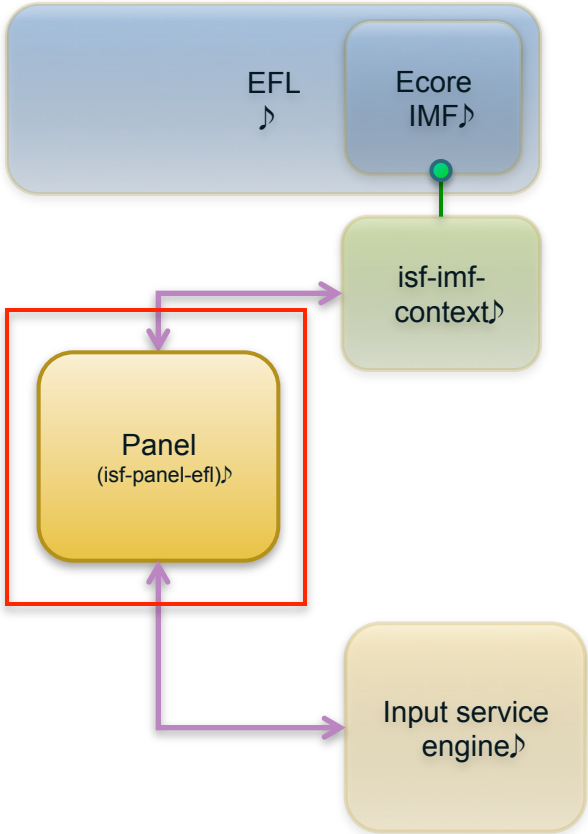
Input Service Engine

- Process that loads the S/W keyboard engine
- The S/W keyboard engine does not necessarily have to be an actual keyboard (handwriting module, Wi-Fi text receiver)
- Existing input service engine process is terminated and a new process is launched every time a different S/W keyboard engine is selected



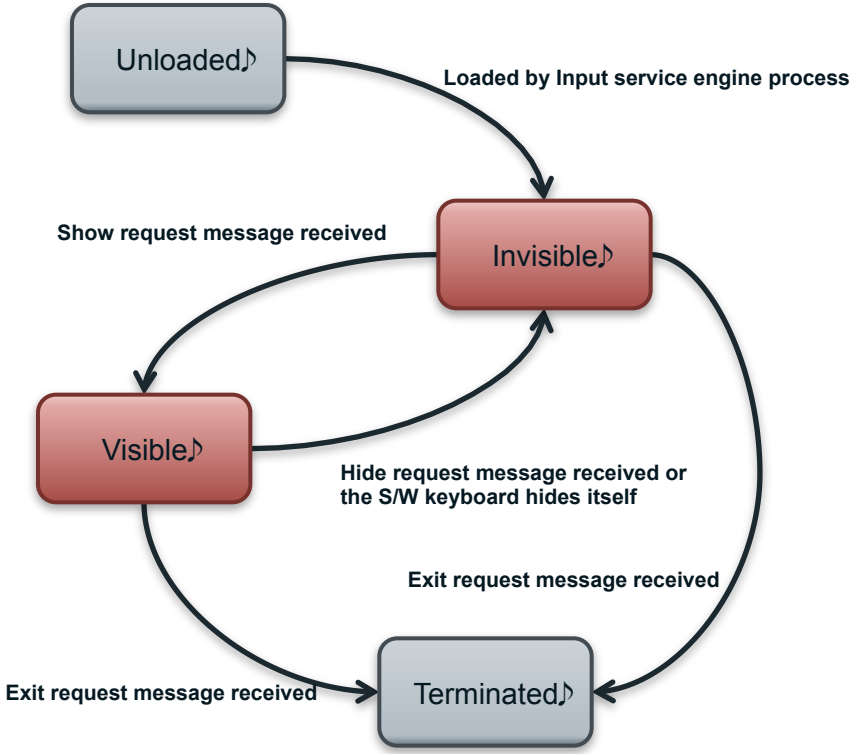
Panel

- Mediator between an application and input service engine
- When an application requests something to an input service engine, the panel receives the event and delivers it to the currently selected input service engine
- UI representation module of input service framework (such as candidate window)

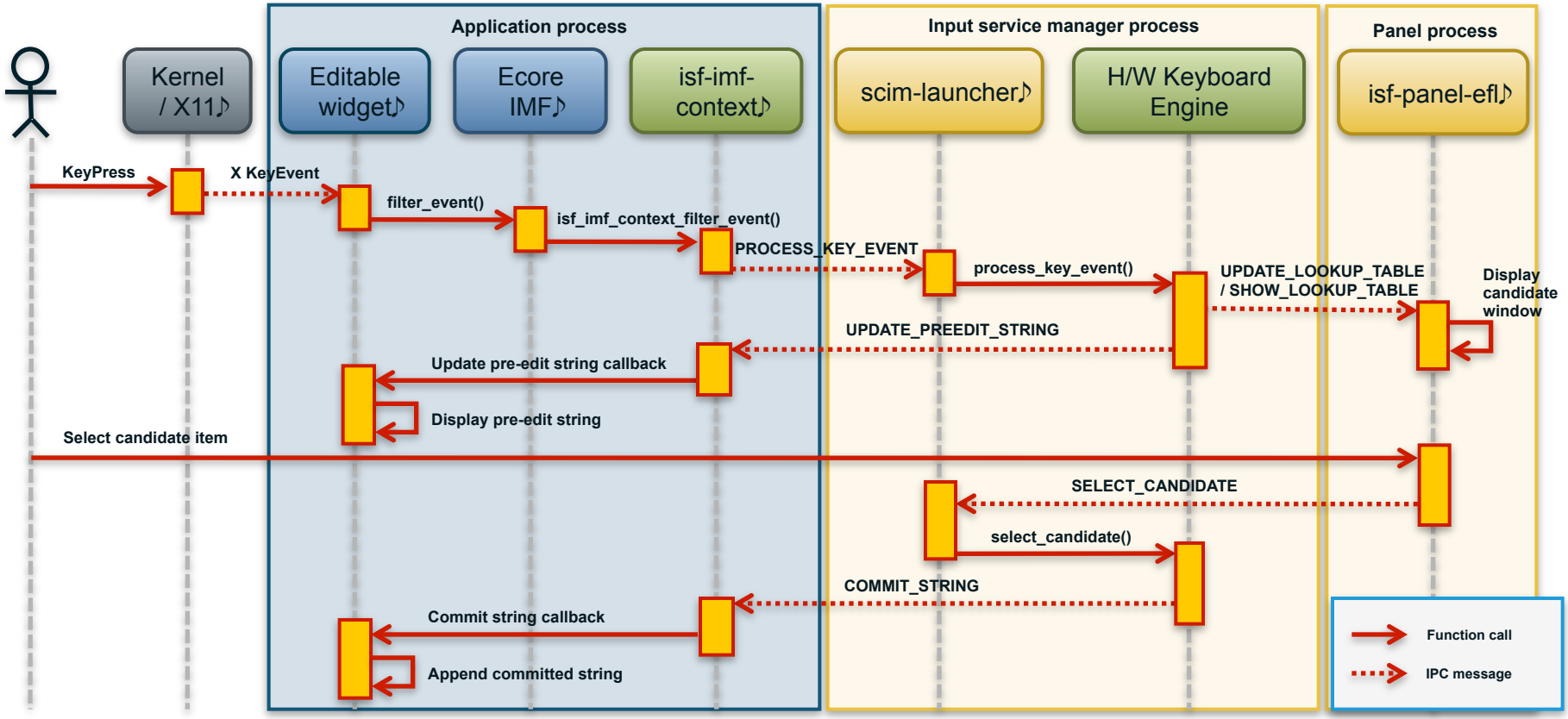


S/W Keyboard Engine Life-cycle

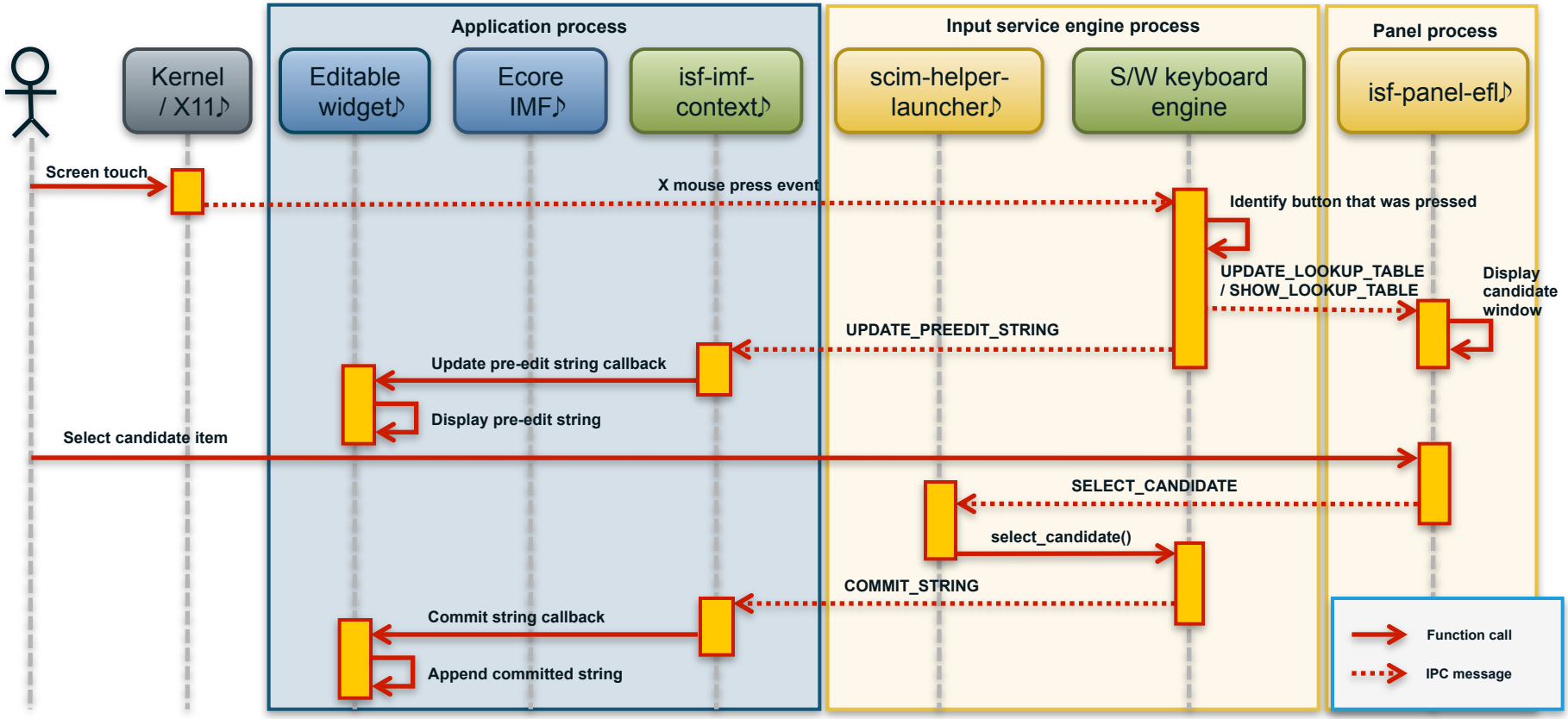
- **Input service engine process launched when:**
  - System starts
  - S/W keyboard engine is selected
- **Exit request message received when:**
  - H/W keyboard is attached
  - S/W keyboard engine is unselected



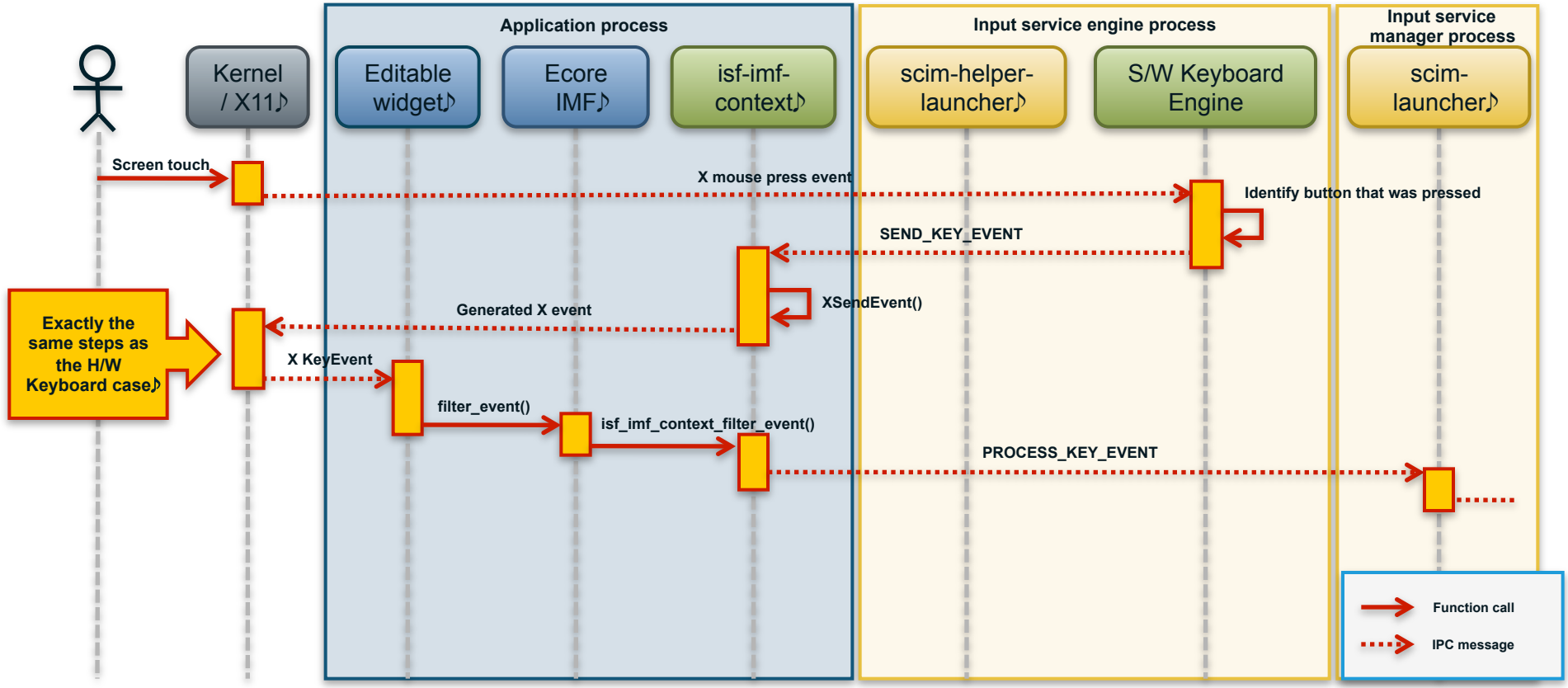
Event Flow – H/W Keyboard

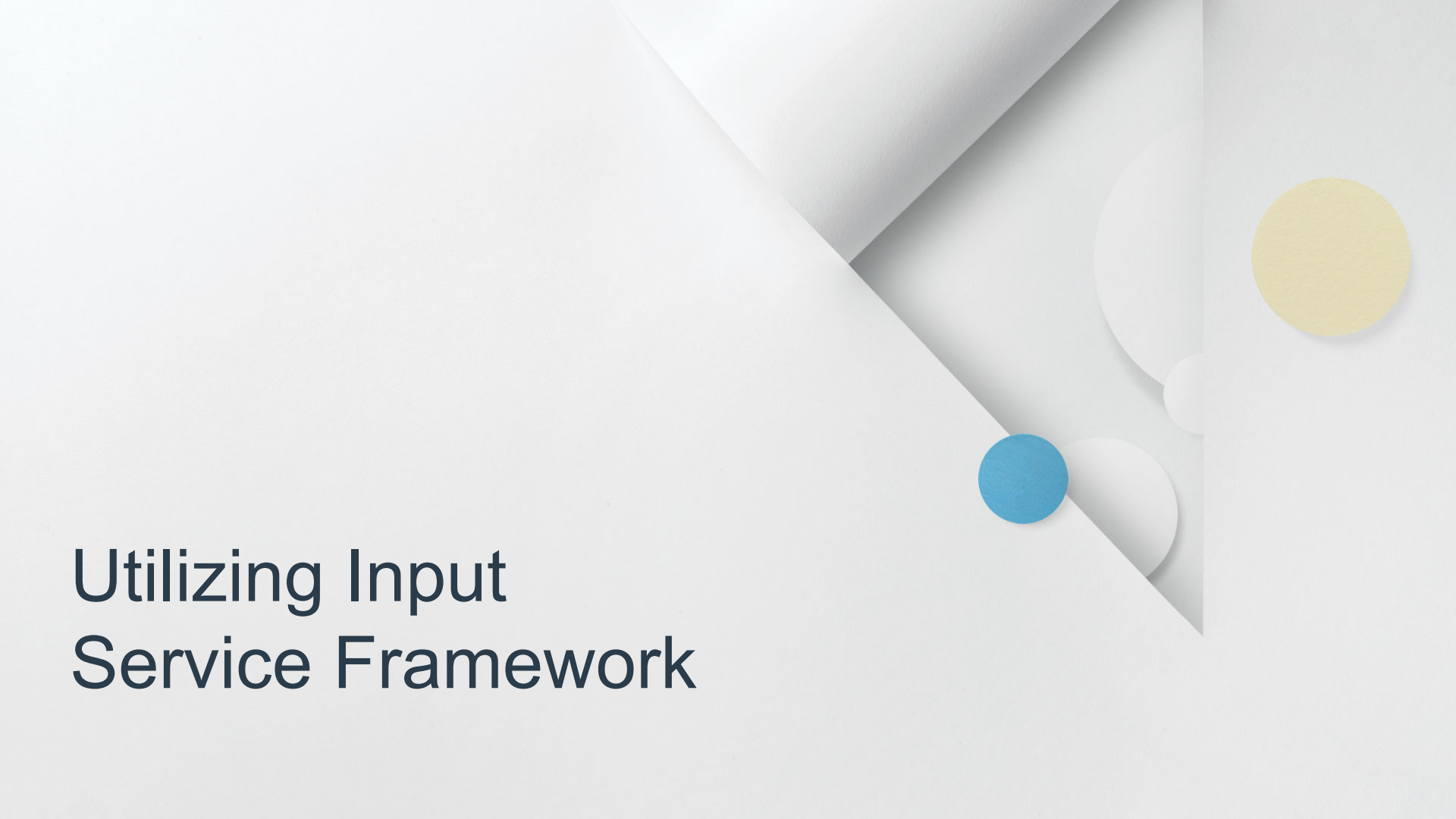


Event Flow – S/W Keyboard



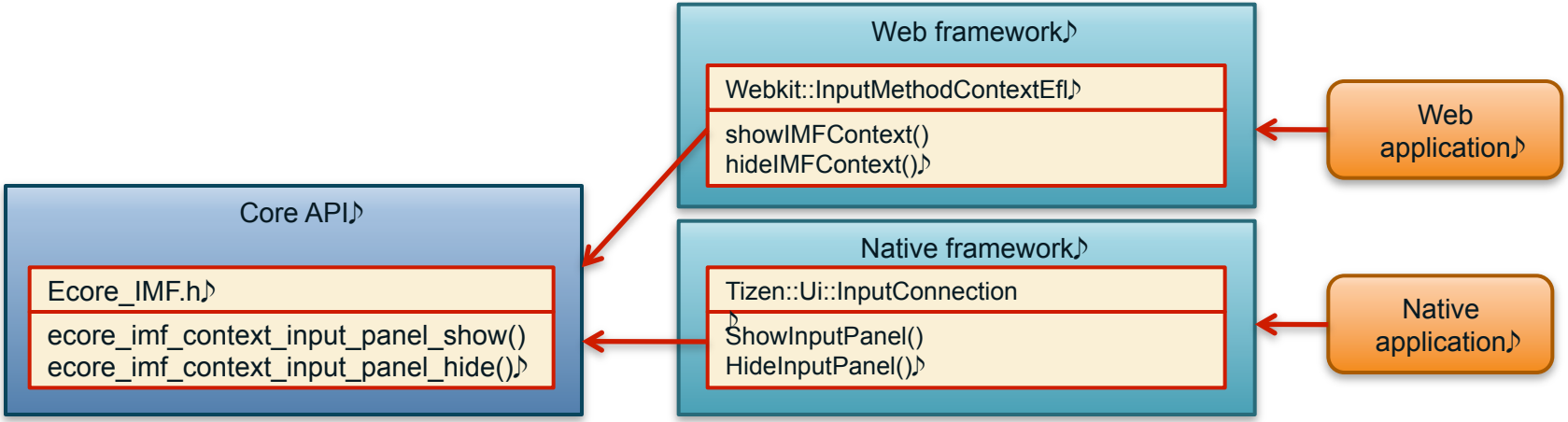
Event Flow – Dummy S/W Keyboard




Utilizing Input
Service Framework

Application Side Core APIs (1/5)

- Core API provides the common interface for both native and Web applications
- Native and Web frameworks have their own mappings for using Core APIs



Application Side Core APIs (2/5)

- Show and hide S/W keyboard
- Handle commit and pre-edit strings

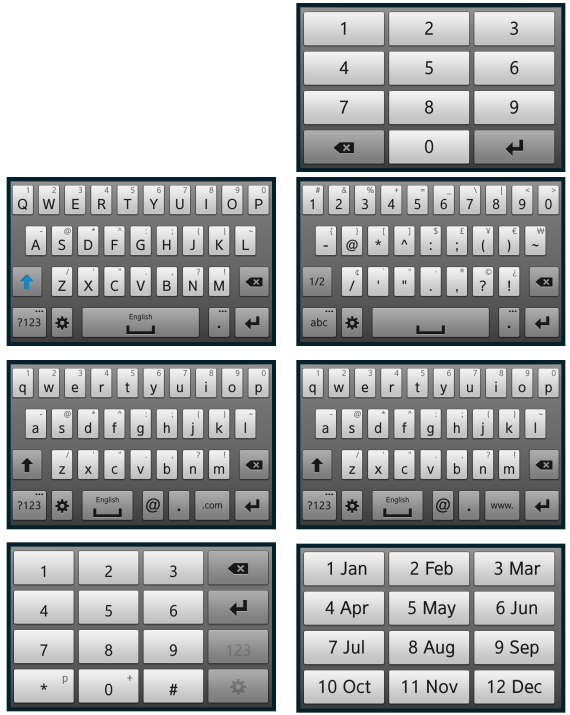
```
static Eina_Bool _preedit_cb (void *data, int type, void *event)
{
    ecore_imf_context_preedit_string_get (imf_context, &preedit_string, &len);
    printf ("entry get preedit string: %s", preedit_string);
    return ECORE_CALLBACK_RENEW;
}
static Eina_Bool _commit_cb (void *data, int type, void *event)
{
    Ecore_IMF_Event_Commit *ev = (Ecore_IMF_Event_Commit *) event;
    printf ("entry get commit string: %s", (char *)(ev->str));
    return ECORE_CALLBACK_RENEW;
}
ecore_event_handler_add (ECORE_IMF_EVENT_PREEDIT_CHANGED, _preedit_cb, NULL);
ecore_event_handler_add (ECORE_IMF_EVENT_COMMIT, _commit_cb, NULL);

ecore_imf_context_input_panel_show (imf_context);
ecore_imf_context_input_panel_hide (imf_context);
```

Application Side Core APIs (3/5)

- **Layouts and variations**

Layouts
NORMAL
NUMBER
EMAIL
URL
PHONENUMBER
IP
MONTH
NUMBERONLY

Variations
NUMBERONLY_NORMAL
NUMBERONLY_SIGNED
NUMBERONLY_DECIMAL
NUMBERONLY_SIGNED_ AND_DECIMAL




```
ecore_imf_context_input_panel_layout_set(imf_context,
    ECORE_IMF_INPUT_PANEL_LAYOUT_EMAIL);
```

Application Side Core APIs (4/5)

- Auto-scrolling, status callbacks
- Auto-capitalization

```
static void _input_panel_state_cb (void *data, Ecore_IMF_Context *ctx, int value) {
    if (value == ECORE_IMF_INPUT_PANEL_STATE_SHOW) {
        printf ("[%s] Input panel is shown. ctx : %p\n", __func__, ctx);
    } else if (value == ECORE_IMF_INPUT_PANEL_STATE_HIDE) {
        printf ("[%s] Input panel is hidden. ctx : %p\n", __func__, ctx);
    }
}
static void _input_panel_resize_cb (void *data, Ecore_IMF_Context *ctx, int value) {
    ecore_imf_context_input_panel_geometry_get (ctx, &x, &y, &w, &h);
    printf ("[%s] x : %d, y : %d, w : %d, h : %d\n", __func__, x, y, w, h);
}
ecore_imf_context_input_panel_event_callback_add (ic,
    ECORE_IMF_INPUT_PANEL_STATE_EVENT, _input_panel_state_cb, NULL);
ecore_imf_context_input_panel_event_callback_add (ic,
    ECORE_IMF_INPUT_PANEL_GEOMETRY_EVENT, _input_panel_resize_cb, NULL);

ecore_imf_context_autocapital_type_set (ic, ECORE_IMF_AUTOCAPITAL_TYPE_SENTENCE);
```

Application Side Core APIs (5/5)

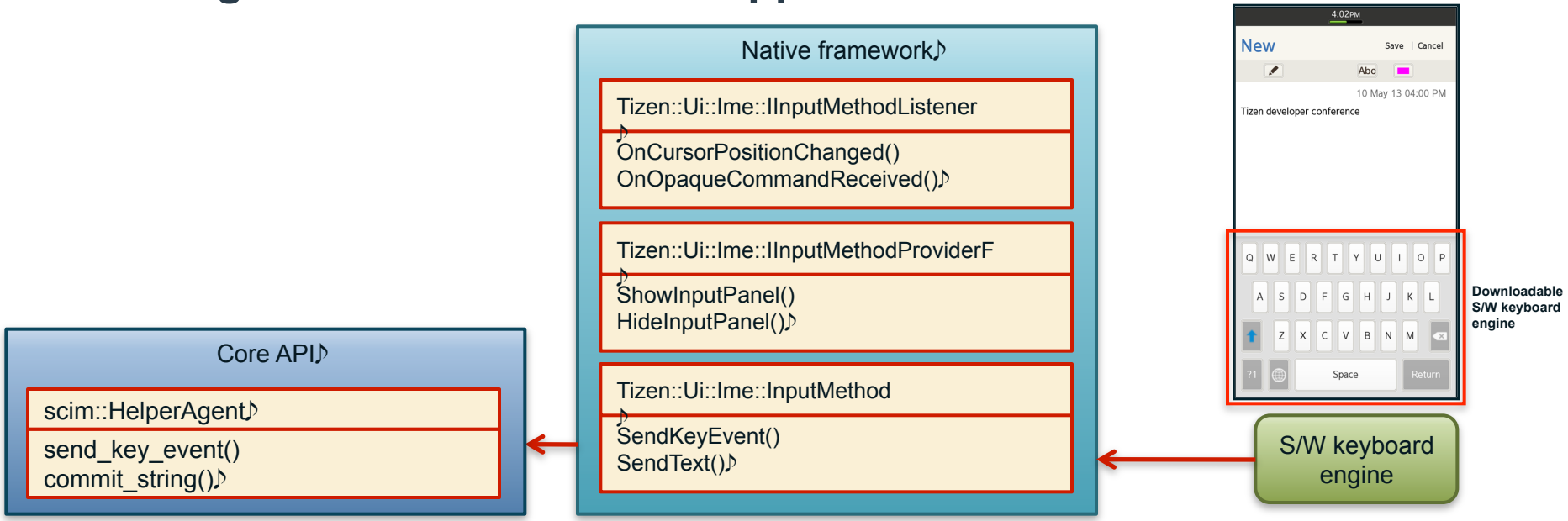
- **Return key types, enabling, and disabling**


```
ecore_imf_context_input_panel_return_key_type_set(imf_context,
    ECORE_IMF_INPUT_PANEL_RETURN_KEY_TYPE_GO);
ecore_imf_context_input_panel_return_key_disabled_set(imf_context,
    EINA_TRUE);
```

Return Key Types
DEFAULT
DONE
GO
JOIN
LOGIN
NEXT
SEARCH
SEND
SIGNIN

Input Service Engine Side Core APIs (1/5)

- **Downloadable S/W keyboard engines can be developed by using native APIs that are mapped to Core APIs**



Input Service Engine Side Core APIs (2/5)

- **Send key events**
  - send_key_event() works as if a H/W key was pressed
  - Since a H/W key press event accompanies release event, it is better to send key release event right after key press events

```
KeyEvent key_press (SCIM_KEY_A, SCIM_KEY_NullMask);
KeyEvent key_release (SCIM_KEY_A, SCIM_KEY_ReleaseMask);
helper_agent.send_key_event (-1, "", key_press);
helper_agent.send_key_event (-1, "", key_release);


SCIM_KEY_NullMask       = 0,            /**< Key press event without modifier key. */
SCIM_KEY_ShiftMask      = (1<<0),       /**< The Shift key is pressed down */
SCIM_KEY_CapsLockMask   = (1<<1),       /**< The CapsLock key is pressed down */
SCIM_KEY_ControlMask    = (1<<2),       /**< The Control key is pressed down */
SCIM_KEY_AltMask        = (1<<3),       /**< The Alt  key is pressed down */
...
SCIM_KEY_ReleaseMask    = (1<<15),      /**< It's a key release event */
SCIM_KEY_AllMasks       = 0xC0FF        /**< All valid Masks */
```

Input Service Engine Side Core APIs (3/5)

- **Forward key events**
  - In some cases, keys must not be translated by H/W keyboard engines, but forwarded instead of sending them
- **Send commit strings**
  - Even the result is the same, it is better to send key events than commit strings for characters in ASCII code range, since some applications rely on key events

```
KeyEvent key_press (SCIM_KEY_A, SCIM_KEY_NullMask);
KeyEvent key_release (SCIM_KEY_A, SCIM_KEY_ReleaseMask);
helper_agent.forward_key_event (-1, "", key_press);
helper_agent.forward_key_event (-1, "", key_release);

commit_string (-1, "", "Sample String");
```

Input Service Engine Side Core APIs (4/5)

- **Updating pre-edit strings**
  - We can show and hide current pre-edit string after updating it
  - Pre-edit strings have their attributes, to distinguish their conversion state
  - Pre-edit string has its own cursor and we can update the position of it

```
scim::AttributeList attrs;
scim::WideString str(L"abcd");
attrs.push_back (scim::Attribute (0, 2, scim::SCIM_ATTR_DECORATE, scim::SCIM_ATTR_DECORATE_UNDERLINE));
attrs.push_back (scim::Attribute (2, 2, scim::SCIM_ATTR_DECORATE, scim::SCIM_ATTR_DECORATE_HIGHLIGHT));
helper_agent.update_preedit_string(-1, "", str, attrs);
helper_agent.update_preedit_caret(3);

enum AttributeType
{
    SCIM_ATTR_NONE,          ///< No attribute.
    SCIM_ATTR_DECORATE,      ///< A decorate attribute, eg. underline etc.
    SCIM_ATTR_FOREGROUND,    ///< A foreground color attribute, in RGB format.
    SCIM_ATTR_BACKGROUND     ///< A background color attribute, in RGB format.
};
```

Input Service Engine Side Core APIs (5/5)

- **Dealing with a candidate window**
  - Updating the content of the candidate window
  - Show and hide candidate window
  - Expand and contract the candidate window
  - Set candidate window style

```
helper_agent.set_candidate_style(ONE_LINE_CANDIDATE, FIXED_CANDIDATE_WINDOW);

std::vector<scim::WideString> labels;
scim::CommonLookupTable table;
labels.push_back(scim::WideString(L"1"));
labels.push_back(scim::WideString(L"2"));
table.set_candidate_labels(labels);
table.append_candidate(scim::WideString(L"item1"));
table.append_candidate(scim::WideString(L"item2"));
helper_agent.update_candidate_string(table);

helper_agent.show_candidate_string();
helper_agent.expand_candidate();
```

And More…

- **We are still incorporating the features of Core APIs into the Native framework**
- **For the Core API header files, see :**
  - https://review.tizen.org/git/?p=framework/uifw/ecore.git;a=blob;f=src/lib/ecore_imf/Ecore_IMF.h
  - https://review.tizen.org/git/?p=framework/uifw/isf.git;a=blob;f=ism/src/scim_helper.h

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