

# webOS Flutter SDK 실습

1. 환경 설정
2. custom device 등록
3. 프로젝트 생성
4. 빌드 & 실행
5. webOS App Category

webOS SW개발그룹  
webOS플랫폼코어기술개발팀



본 문서의 강의 내용은 전부 우분투 환경 위에서 작성되었음  
Window나 Mac 사용자들은 docker 등을 활용해 개발 환경을 준비하기 바람



- <https://github.com/LGE-Univ-Sogang/flutter-webos-sdk/blob/main/flutter-webos/README.md>

## Quick Start

---

This guide provides the essential steps to get a Flutter for webOS application running.

### 1. Clone the SDK Repository

---

First, clone the flutter-webos SDK from GitHub.

```
cd flutter-webos-sdk/flutter-webos
```



### 2. Apply home option patch & Installation to Run

---

[Install flutter-webos](#)

### 4. Quick Command

---

Now, prepare your environment and verify the setup.

```
# 1. Check your environment
flutter-webos doctor -v

# 2. Download necessary artifacts
flutter-webos precache -f

# 3. Check for connected devices
flutter-webos devices

# 4. Create a new native webOS app
flutter-webos create --platforms webos --native-app helloworld

# 5. Navigate to your project
cd helloworld

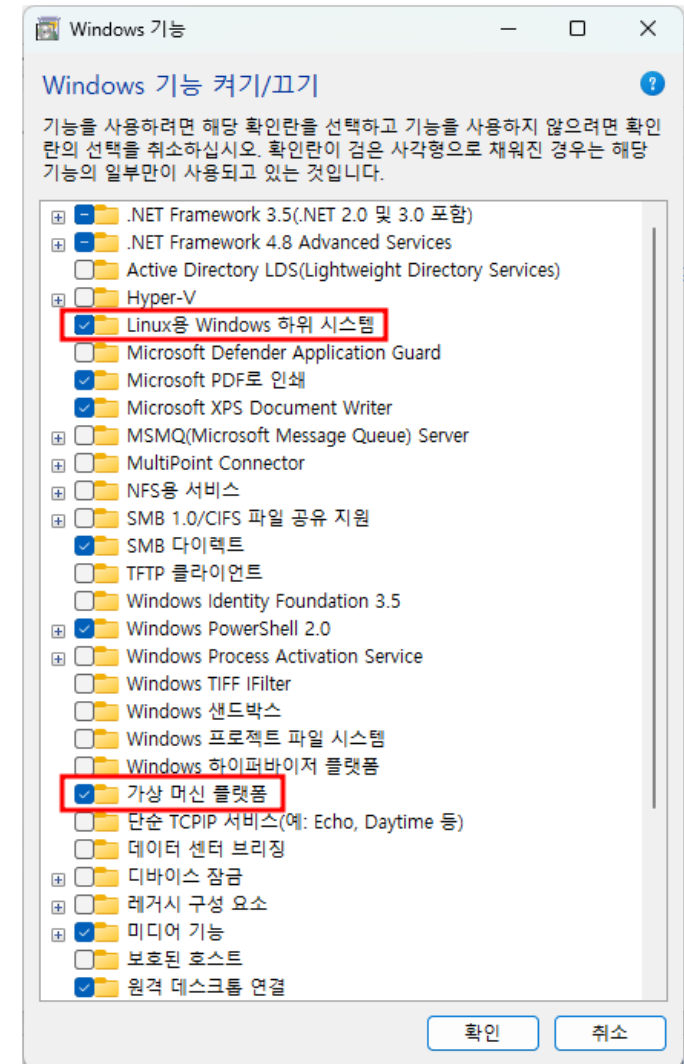
# 6. Build the app package (.ipk)
# If you applied the patch, you can use the --home flag
flutter-webos build webos --ipk --home

# 7. Run the app on your device as debug mode
flutter-webos run --debug -d webos_tv
```



# 환경 설정

- WSL 설치
  - 제어판 → 프로그램 → Windows 기능 켜기/끄기
  - Microsoft Store에서 WSL 설치



# 환경 설정

## Git Setup

Ensure your Git version is **2.23 or higher**.

```
git --version  
# Example output: git version 2.49.0
```



Configure your global Git user settings:

```
git config --global user.name "{Your Name}"  
git config --global user.email "{Your Email}"  
cat ~/.gitconfig
```



## 🔗 1.2. OS-Specific Installation

### For Linux (Ubuntu)

Supported versions: 18.04, 22.04, 24.04.

```
sudo apt-get upgrade -y  
sudo add-apt-repository ppa:git-core/ppa -y  
sudo apt-get update  
sudo apt-get install curl unzip cmake pkg-config file libgtk-3-0 libgtk-3-dev git ninja-build clang git-lfs -y
```



# 환경 설정

- Git clone

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang
$ git clone git@github.com:LGE-Univ-Sogang/flutter-webos-sdk.git
Cloning into 'flutter-webos-sdk'...
Warning: Identity file /root/.ssh/id_rsa not accessible: Permission denied.
remote: Enumerating objects: 1637, done.
remote: Counting objects: 100% (66/66), done.
remote: Compressing objects: 100% (44/44), done.
remote: Total 1637 (delta 26), reused 47 (delta 18), pack-reused 1571 (from 1)
Receiving objects: 100% (1637/1637), 791.57 MiB | 7.37 MiB/s, done.
Resolving deltas: 100% (495/495), done.
```

- Set Path

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang
$ cd flutter-webos-sdk/flutter-webos/
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos(main)
$ export PATH="$PATH:${pwd}/bin"
```

- GitHub personal access token 생성
  - <https://github.com/settings/tokens> 접속

Personal access tokens (classic)

Generate new token ▼

Generate new token ▼

Generate new token

Fine-grained, repo-scoped

Generate new token (classic)

For general use

- GitHub personal access token 생성(Cont')

## New personal access token (classic)

Personal access tokens (classic) function like ordinary OAuth access tokens. They can be used instead of a password for Git over HTTPS, or can be used to [authenticate to the API over Basic Authentication](#).

### Note

sogang-webos-flutter-sdk

What's this token for?

### Expiration

 No expiration ▼

⚠ GitHub strongly recommends that you set an expiration date for your token to help keep your information secure. [Learn more](#)

- |  |  |
|--|--|
| <input type="checkbox"/> admin:ssh_signing_key | Full control of public user SSH signing keys |
| <input type="checkbox"/> write:ssh_signing_key | Write public user SSH signing keys           |
| <input type="checkbox"/> read:ssh_signing_key  | Read public user SSH signing keys            |

Generate token

Cancel

# 환경 설정

- Set URL

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos(main)
$ export WEBOS_ENGINE_BASE_URL="https://[redacted]@raw.githubusercontent.com/LGE-Univ-Sogang/flutter-webos-sdk/main/flutter-webos/releases"
```

- Install SDK

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos(main)
$ cd NDK
```

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/NDK(main)
$ cat webos-ndk-basic-starfish-x86_64-ponytail-14.tar.gz.* | tar -xvzf -
webos-ndk-basic-starfish-x86_64-ponytail-14.sh
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/NDK(main)
$ ./webos-ndk-basic-starfish-x86_64-ponytail-14.sh -y
webOS TV SDK installer version tc18-2023.01-14
=====
The directory "/usr/local/starfish-bdk-x86_64" already contains a SDK for this architecture.
If you continue, existing files will be overwritten! Proceed [y/N]? Y
Extracting SDK...done
Setting it up...done
SDK has been successfully set up and is ready to be used.
Each time you wish to use the SDK in a new shell session, you need to source the environment setup script e.g.
$ . /usr/local/starfish-bdk-x86_64/environment-setup-ca9v1-starfishmllib32-linux-gnueabi
```

- Set NDK Path

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/NDK(main)
$ export WEBOS_FLUTTER_NDK_ENV="/usr/local/starfish-bdk-x86_64/environment-setup-ca9v1-starfishmllib32-linux-gnueabi"
```



# 약관 동의

- 약관 동의

```
wiseun@GS-HQ10-NA10CF6:/mnt/d/linux/sub-module/flutter-term/flutter-webos-sdk(main)
$ flutter-webos --version
=====
NOTICE
=====
This software is intended for educational purposes during the training period and must not be distributed
Do you agree to these terms? (Y/N): _
```



본 소프트웨어는 교육 기간 동안 교육 목적으로 사용되며 배포되어서는 안 됩니다.  
**주의 필요**

# 환경 설정

- Check Version

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/Flutter-webos-sdk(main)
$ flutter-webos --version
Cloning into '/data/project/LGE-Univ-Sogang/Flutter-webos-sdk/flutter-webos/flutter'...
remote: Enumerating objects: 16151, done.
remote: Counting objects: 100% (16151/16151), done.
remote: Compressing objects: 100% (13203/13203), done.
remote: Total 16151 (delta 3488), reused 7449 (delta 2124), pack-reused 0 (from 0)
Receiving objects: 100% (16151/16151), 33.12 MiB | 9.73 MiB/s, done.
Resolving deltas: 100% (3488/3488), done.
HEAD is now at 066982b Revert "Check GTK calls are done on the same thread." (#174604)
remote: Enumerating objects: 207371, done.
remote: Counting objects: 100% (207368/207368), done.
remote: Compressing objects: 100% (84625/84625), done.
remote: Total 201518 (delta 156807), reused 148914 (delta 110544), pack-reused 0 (from 0)
Receiving objects: 100% (201518/201518), 120.20 MiB | 5.18 MiB/s, done.
Resolving deltas: 100% (156807/156807), completed with 4482 local objects.
```

- Run Doctor

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/Flutter-webos-sdk/flutter-webos/NDK(main)
$ flutter-webos doctor -v
fatal: not a git repository: '/data/project/LGE-Univ-Sogang/Flutter-webos-sdk/flutter-webos/.git'

[■] Flutter (Channel [user-branch], 3.22.2, on Ubuntu 20.04.6 LTS 5.15.0-139-generic, locale en_US.UTF-8)
    • Upstream repository git@github.com:LGE-Univ-Sogang/flutter-webos-sdk.git
    • Framework revision 761747bfc5 (1 year, 3 months ago), 2024-06-05 22:15:13 +0200
    • Engine revision edd8546116
    • Dart version 3.4.3
    • DevTools version 2.34.3

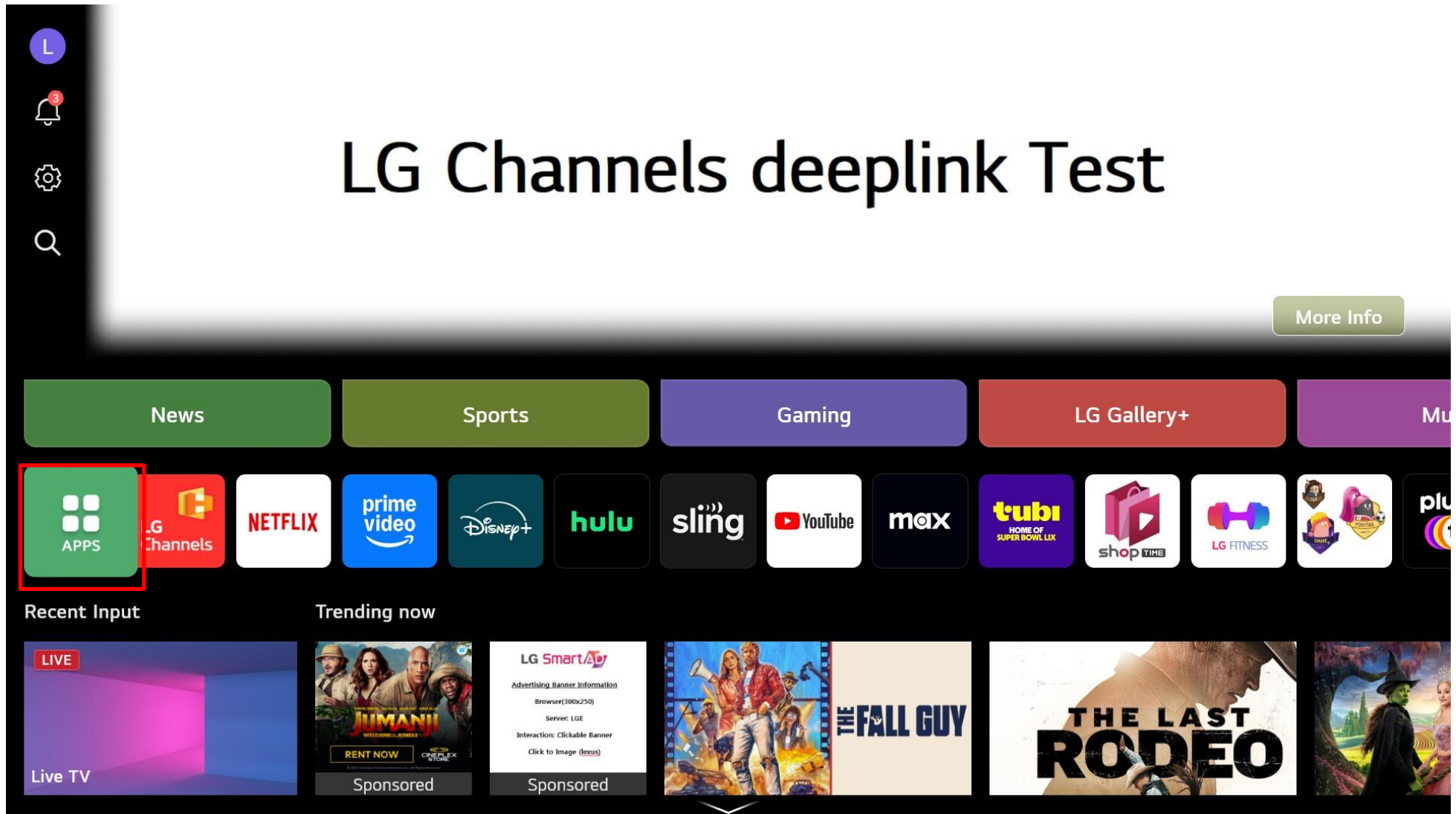
[■] webOS NDK toolchain - develop for webOS (ponytail)
    • clang version 14.0.6 (git://git-mirror.lge.com/github.com/llvm/llvm-project f28c006a5895fc0e329fe15fead81e37457cb1d1)
    • cmake version 3.22.3
    • pkg-config version 0.29.2
```

## 환경 설정

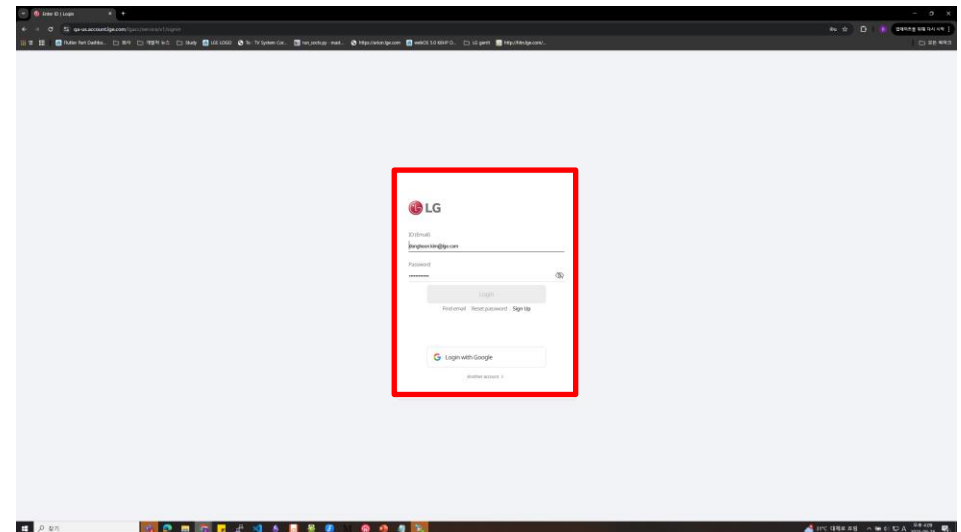
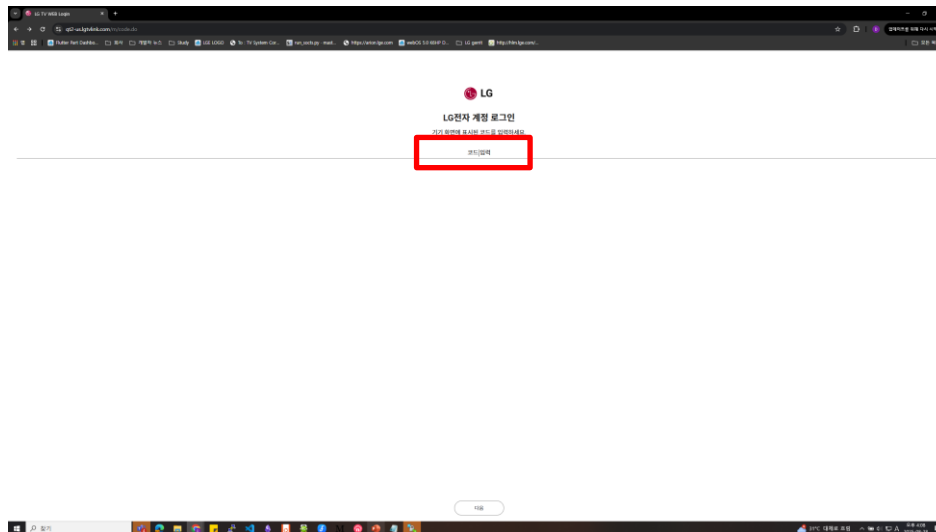
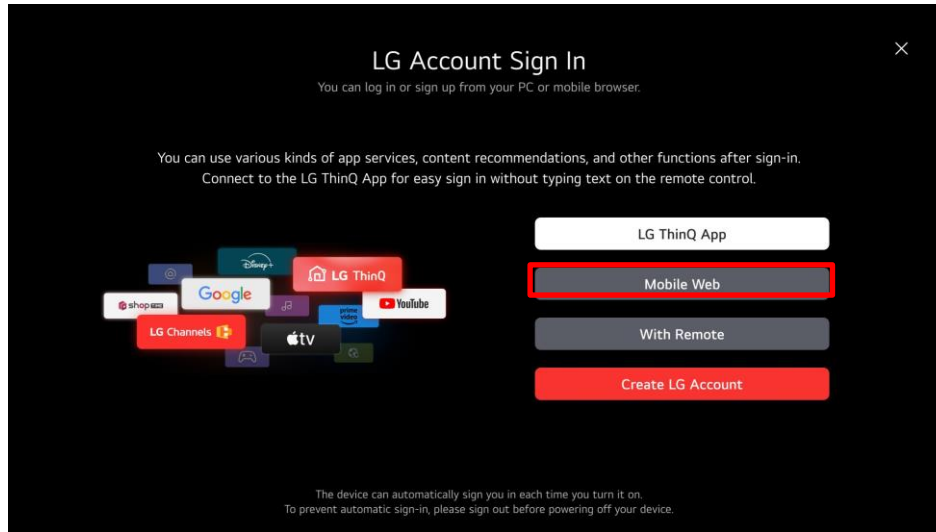
- Pre-cache Artifacts

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk(main)
$ flutter-webos precache
fatal: not a git repository: '/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/.git'
Downloading an artifact that may not be reachable in some environments (e.g. firewalled environments): https://ghp_2dXHcboou
This should not have happened. This is likely a Flutter SDK bug. Please file an issue at https://github.com/flutter/flutter/
Downloading webos-common tools... ■Downloading webos-common tools...
Downloading an artifact that may not be reachable in some environments (e.g. firewalled environments): https://ghp_2dXHcboou
This should not have happened. This is likely a Flutter SDK bug. Please file an issue at https://github.com/flutter/flutter/
Downloading webos-arm-release tools... ■Downloading webos-arm-release tools...
Downloading an artifact that may not be reachable in some environments (e.g. firewalled environments): https://ghp_2dXHcboou
This should not have happened. This is likely a Flutter SDK bug. Please file an issue at https://github.com/flutter/flutter/
Downloading webos-arm-debug tools... ■Downloading webos-arm-debug tools...
Downloading an artifact that may not be reachable in some environments (e.g. firewalled environments): https://ghp_2dXHcboou
This should not have happened. This is likely a Flutter SDK bug. Please file an issue at https://github.com/flutter/flutter/
Downloading webos-arm-profile tools... ■Downloading webos-arm-profile tools...
```

- Developer Mode 설치

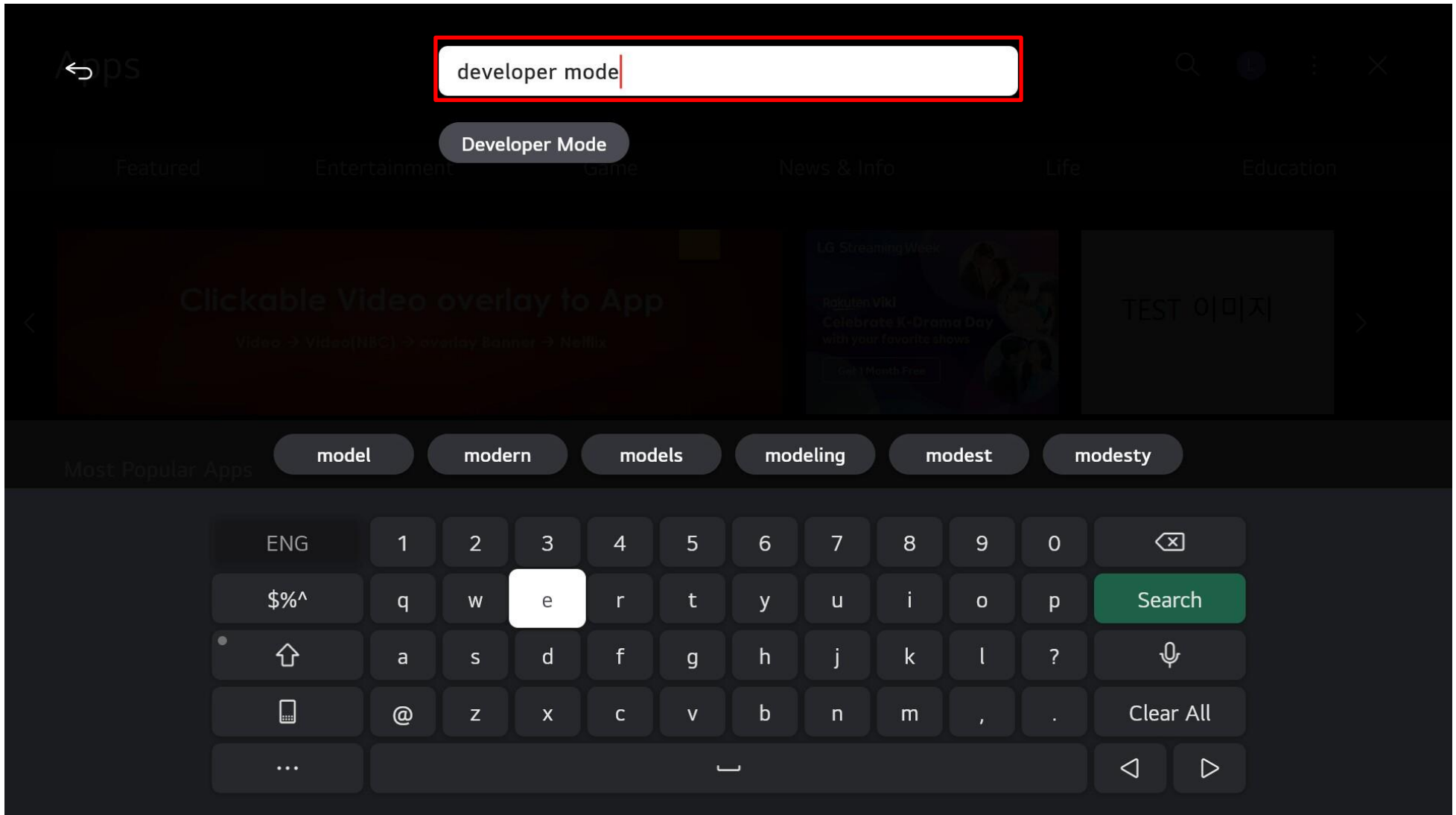


# (참고) 회원 가입



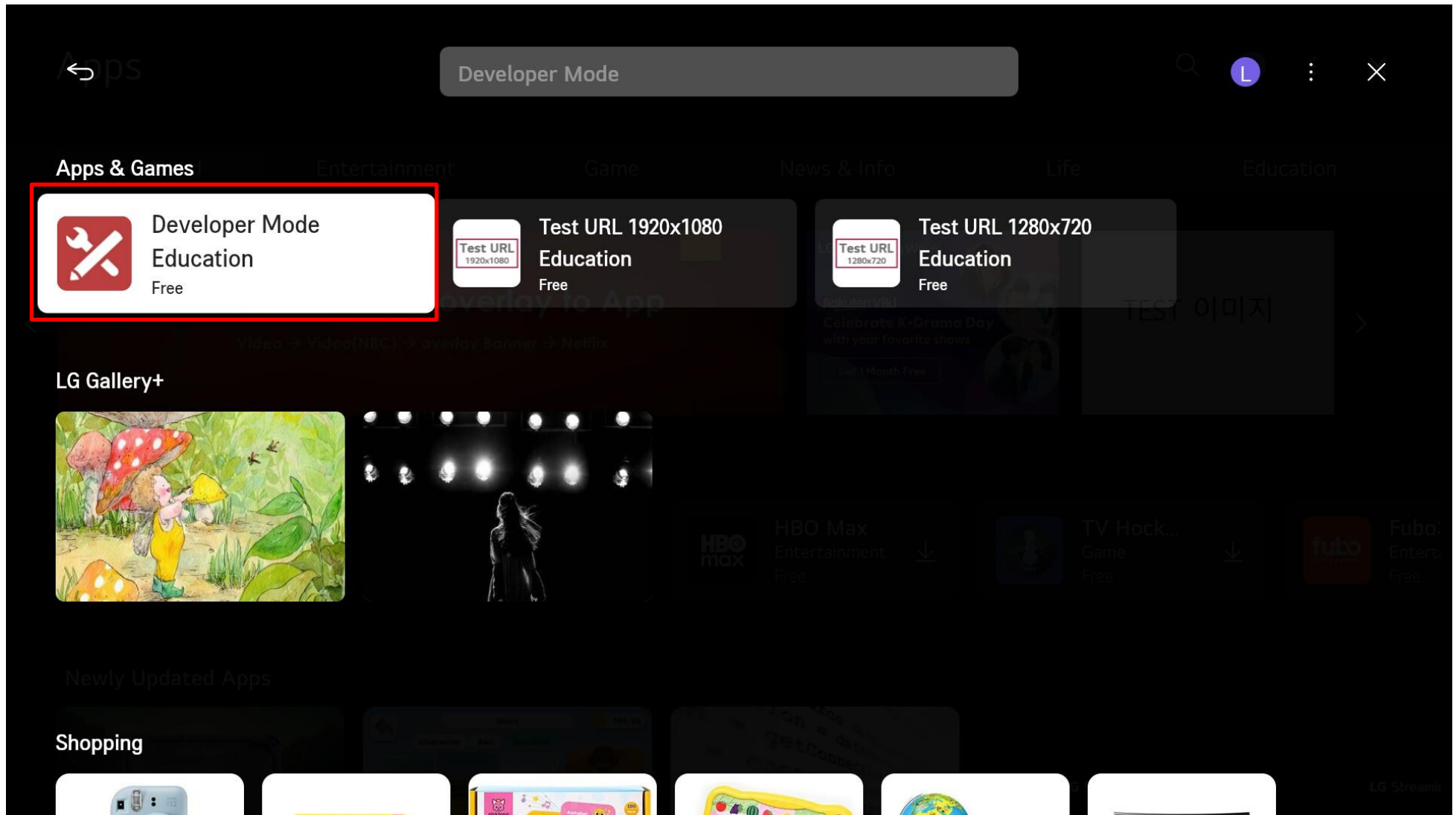
## custom device 등록

- Developer Mode 설치



## custom device 등록

- Developer Mode 설치



## Developer Mode

Enable or disable the Developer Mode on the device



 User ID

 Password

☐ Show password

LOGIN



# (참고) 회원 가입

- <https://forum.webostv.developer.lge.com/>

webOS TV Developer

DISCOVER DEVELOP DISTRIBUTE **COMMUNITY** MORE

SIGN IN

Dear Developers,  
Due to privacy issues, we have not migrated your personal information, such as email address and user name, from the old forum to this new forum. Although you can write and read posts without setting such information on this forum, we recommend you set them before posting a question to get proper updates on your question.  
You can change the personal preferences at **Preferences** after signing in.  
We are sorry for the inconvenience.  
webOS TV Support Team

Categories

Topic	Replies	Views	Activity
<b>Welcome to webOS TV Forum</b> Thank you for visiting webOS TV Forum! You can ask questions, share knowledge, and have discussions with us and other developers about various development topics. You need to sign in to post a question or reply. Read ... read more	0	2.5k	Oct 2024
<b>Prevent Auto Screen Saver Activation Models</b> Web App Development	1	12	1d
<b>Auto Screen Saver Model Filter</b> Web App Development	1	5	2d
<b>WebOS Simulator 2025 Issue - can't open context menu in DevTool</b> SDK	3	41	7d
<b>Stereo-Only for Dolby Vision Video With Multi-Channel Audio in HLS streams</b> Web App Development	29	1.0k	9d
<b>Is a Custom Exit Popup Allowed on webOS TV 5.0 or lower?</b> Web App Development	1	18	10d

**LG Developer Cookies**

LG Developer and its subsites use cookies to offer you a convenient web browsing experience, to suggest personalized ads for you, and to keep improving functions through traffic analysis.  
By clicking on 'ACCEPT ALL', you consent to our use of cookies. Click 'Show Details' to choose whether to accept or disable certain cookies. To find out more, please read our Privacy Policy.

ACCEPT ALL

SHOW DETAILS

- Developer Mode 설치

## Developer Mode

Enable or disable the Developer Mode on the device

---

IP Address (wired) :

IP Address (wireless) :

Passphrase :

Dev Mode Session :

192.168.0.99

disconnected

33389F

999h:56m

Dev Mode Status

Key Server

Clear Cache Data

Extend Session Time

☒

☒

☐

Extend Session Time

## custom device 등록

- Enable the custom devices

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/NDK(main)
$ flutter-webos config --enable-custom-devices
fatal: not a git repository: '/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/.git'
Setting "enable-custom-devices" value to "true".

You may need to restart any open editors for them to read new settings.
```

- Add your TV as a custom device

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/NDK(main)
$ flutter-webos custom-devices add
fatal: not a git repository: '/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/.git'
Please enter the unique id you want to device to have. Must contain only alphanumeric or underscore characters.
(example: webos)
webos
Please enter the user.
(example: root/prisoner, empty for prisoner)
Please enter the hostname or IPv4 address of the device.
(example: 192.168.0.100)
192.168.0.99
Please enter the port number for ssh connection.
(example: 9922, empty for 9922)
would you like to add the custom device to the config now? [Y/n] (empty for default)
Y
Successfully added custom device to config file at "/home/wiseun/.config/flutter/custom_devices.json".
After adding your device, you'll need to get the key file from your webOS TV.
Follow these steps:
  1. Ensure that the key server button in the Developer Mode app on your TV is enabled.
  2. Run the command "flutter-webos custom-devices get-key -d webos" to retrieve the key file from your webOS TV.
  3. Enter the passphrase displayed in the Developer Mode app into the prompt.
For more details, refer to the https://webostv.developer.lge.com/develop/getting-started/developer-mode-app
```

## custom device 등록

- Retrieve the key from your TV

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/NDK(main)
$ flutter-webos custom-devices get-key -d webos
fatal: not a git repository: '/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/.git'
Please enter the passphrase
(example: ABC123)
33389F

Successfully get-key for device webos and updated the config file at "/home/wiseun/.config/flutter/custom_devices.json".
```

# 프로젝트 생성

- Create a Flutter-webOS Project

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/Flutter-webos-sdk(main)
$ Flutter-webos create --platforms webos --native-app helloworld
fatal: not a git repository: '/data/project/LGE-Univ-Sogang/Flutter-webos-sdk/Flutter-webos/.git'
Creating project helloworld...
  helloworld/pubspec.yaml (created)
  helloworld/README.md (created)
  helloworld/lib/main.dart (created)
  helloworld/webos/sysbus/template.perm.json.in (created)
  helloworld/webos/sysbus/README (created)
  helloworld/webos/sysbus/template-tas.role.json.in (created)
  helloworld/webos/sysbus/template-tas.service.in (created)
  helloworld/webos/sysbus/template.role.json.in (created)
  helloworld/webos/sysbus/template-tas.api.json.in (created)
  helloworld/webos/sysbus/template-tas.perm.json.in (created)
  helloworld/webos/sysbus/template.api.json.in (created)
  helloworld/webos/sysbus/run-flutter-service.in (created)
  helloworld/webos/sysbus/template-tas.manifest.json.in (created)
  helloworld/webos/sysbus/template.service.in (created)
  helloworld/webos/sysbus/template.manifest.json.in (created)
  helloworld/webos/.gitignore (created)
  helloworld/webos/webos_service.cmake (created)
  helloworld/webos/meta/Flutter-conf.json (created)
  helloworld/webos/meta/appinfo.json (created)
  helloworld/webos/meta/icon.png (created)
```

# 빌드 & 실행

- App build

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/Flutter-webos-sdk/helloworld(main)
$ flutter-webos build webos --ipk --debug
fatal: not a git repository: '/data/project/LGE-Univ-Sogang/Flutter-webos-sdk/flutter-webos/.git'

Building an webos application with wayland backend in debug mode for arm target... 17.4s
Creating an IPK package for webOS test delevelopment... 4.4s
```

모드	명령어	설명
Debug	flutter-webos build webos --ipk --debug	<ul style="list-style-type: none"> <li>개발 중 디버깅 및 빠른 피드백을 위한 모드</li> <li>디버깅이 가능하나 성능이 낮음</li> </ul>
Profile	flutter-webos build webos --ipk --profile	<ul style="list-style-type: none"> <li>성능 분석 및 최적화를 위한 모드</li> <li>디버깅이 일부 가능하나 성능이 높음</li> </ul>
Release	flutter-webos build webos --ipk --release	<ul style="list-style-type: none"> <li>최종 배포를 위한 모드</li> <li>디버깅이 불가능 하며 성능이 매우 높음</li> </ul>

# 빌드 & 실행

- Install and Run the App

```

wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/helloworld(main)
$ flutter-webos run --debug -d webos
fatal: not a git repository: '/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/.git'
Launching lib/main.dart on webOS in debug mode...
requiredPermissions:
"applications","applications.launcher","applications.operation","settings","system","public","applications.internal"
Uninstalling app com.flutter.app.helloworld on webos... 492ms
Installing app com.flutter.app.helloworld to webos... 8.5s
Launch succeeded helloworld on webos
Syncing files to device webOS... 115ms

Flutter run key commands.
r Hot reload. ■■■■■
R Hot restart.
h List all available interactive commands.
d Detach (terminate "flutter run" but leave application running).
c Clear the screen
q Quit (terminate the application on the device).

A Dart VM Service on webOS is available at: http://127.0.0.1:46829/iP4CdjYbIFM=/
The Flutter DevTools debugger and profiler on webOS is available at:
http://127.0.0.1:9101?uri=http://127.0.0.1:46829/iP4CdjYbIFM=/

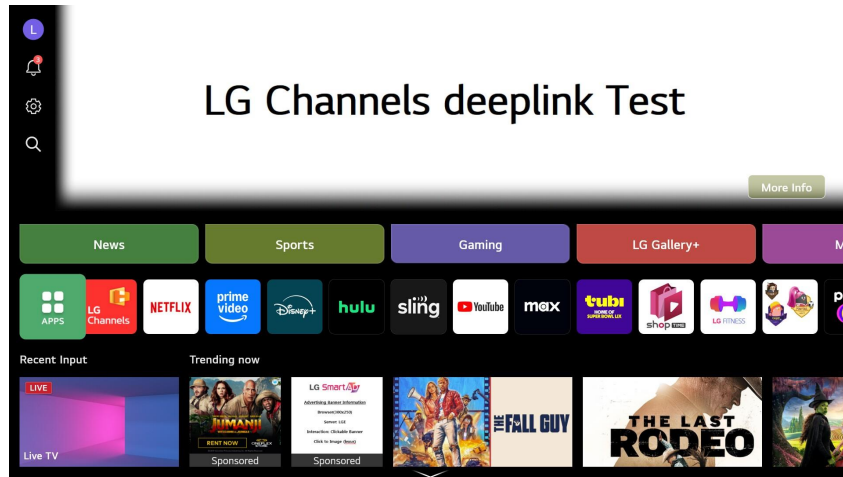
```

Flutter Demo Home Page

You have pushed the button this many times:  
0

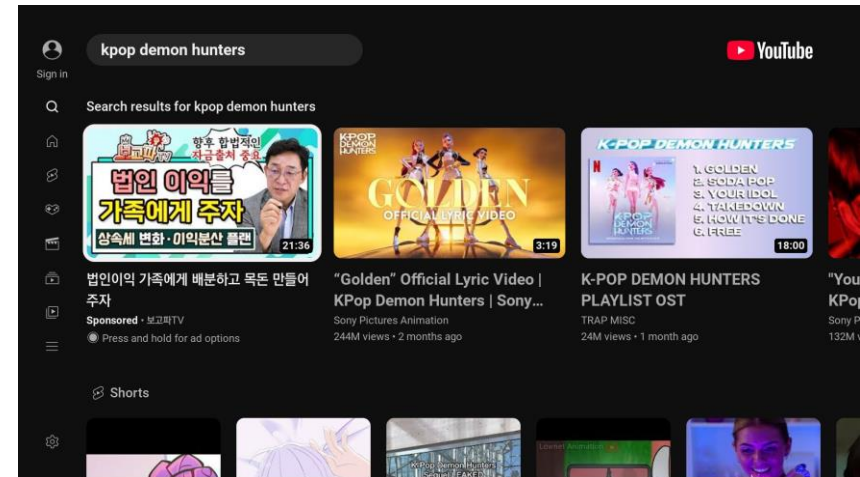
# webOS App Category

- webOS App Category



Home

- webOS의 첫 화면
- Home key mapping



Normal App

- Home에서 실행



## --home 옵션

- flutter-webos clean

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/helloworld(main)
$ flutter-webos clean
fatal: not a git repository: '/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/.git'
Deleting webos/flutter/ephemeral...      10ms
Deleting build...                        54ms
Deleting .dart_tool...                   5ms
```

- flutter-webos build webos --ipk --debug --home

```
wiseun@wiseun-pc:/data/project/LGE-Univ-Sogang/flutter-webos-sdk/helloworld(main)
$ flutter-webos build webos --ipk --debug --home
fatal: not a git repository: '/data/project/LGE-Univ-Sogang/flutter-webos-sdk/flutter-webos/.git'
Resolving dependencies...
Downloading packages...
  async 2.11.0 (2.13.0 available)
  boolean_selector 2.1.1 (2.1.2 available)
  characters 1.3.0 (1.4.1 available)
  clock 1.1.1 (1.1.2 available)
  collection 1.18.0 (1.19.1 available)
```



비정상 동작하는 App을 Home에 설치하는 경우 세트가 비정상 동작을 할 수 있음.  
주의 필요

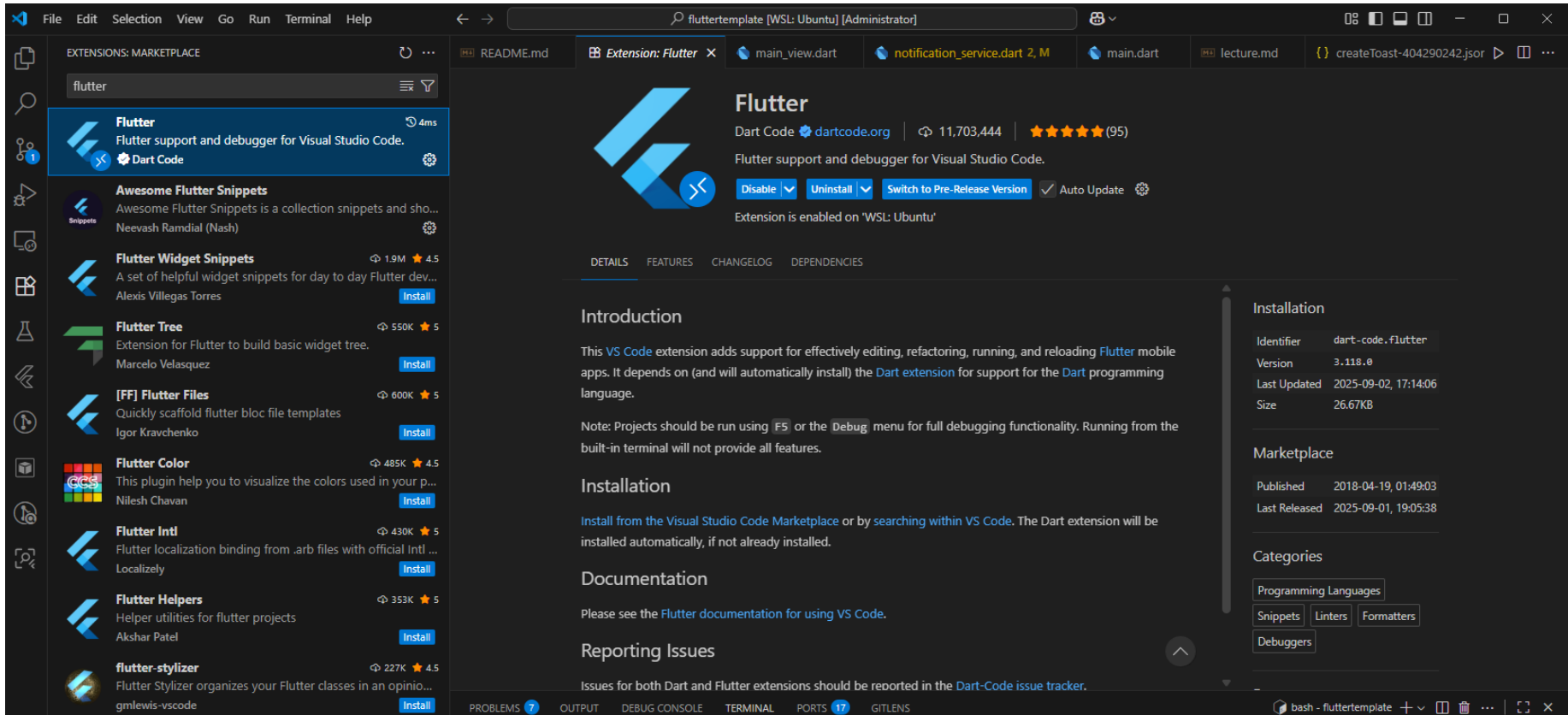
# webOS Flutter 앱 개발 실습

1. VS Code 설정 및 Template 다운로드
2. Flutter app 개발 실습

webOS SW개발그룹  
webOS UX플랫폼개발팀 정정현연구원

# VS Code 설정 및 Template 다운로드

- 기본 설치 VS Code plugin: WSL, Dart, Flutter, Awesome Flutter Sinppets



- 기본 Flutter Template clone  
\$ git clone [https://github.com/LGE-Univ-Sogang/flutter\\_template.git](https://github.com/LGE-Univ-Sogang/flutter_template.git)

# Flutter Template 실습

- Flutter Material Widget 사용하기
- Simple Notifications App 개발하기
- webos\_service\_bridge plug-in을 활용한 luna-call 호출하기
  - One call
  - Subscription
  - Mocking
- local 환경에서 Flutter web을 활용한 디버깅
- video\_player plug-in을 활용한 video 재생하기

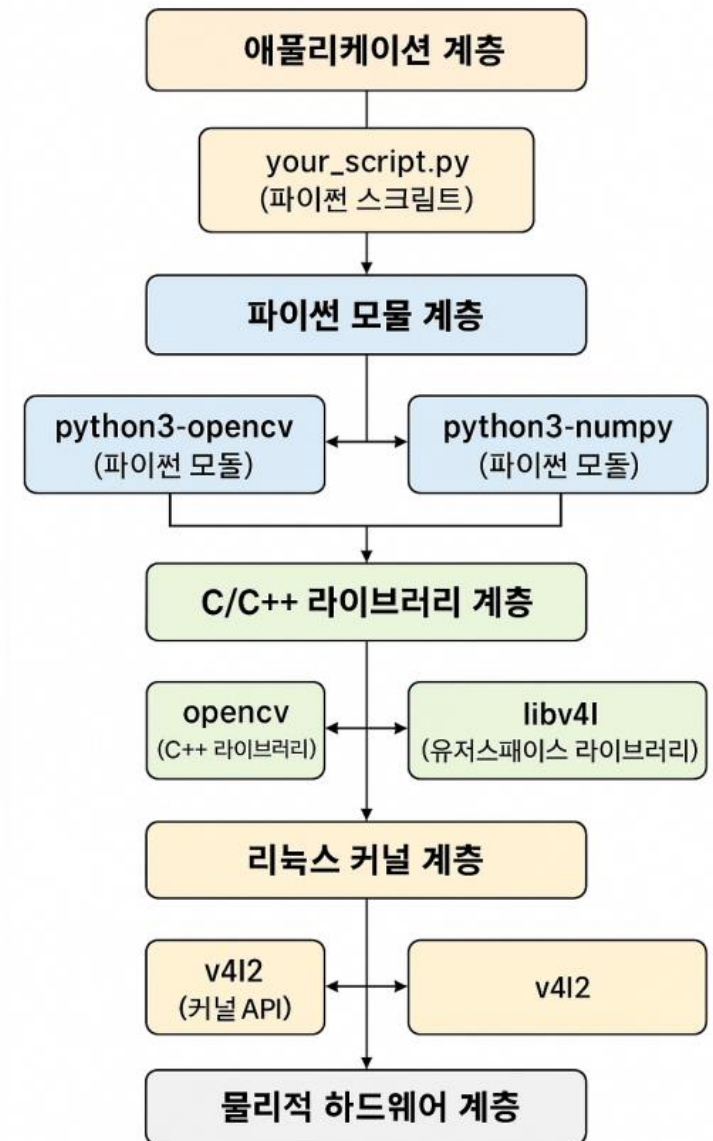
# webOS에서 AI와 Luna API 실습: 개념부터 활용까지

1. webOS에서의 AI 개념 및 활용 사례

2. Luna API를 통한 AI 기능 실습

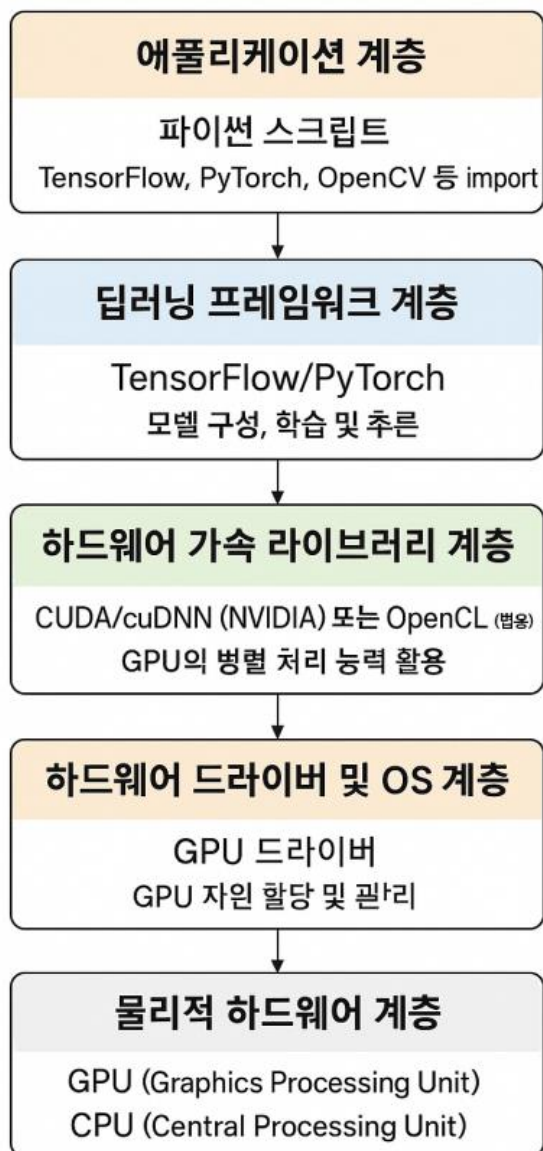
3. 확장 아이디어

## webOS에서의 카메라 사용을 위한 Layer



Python-OpenCV 연동 (Yocto 환경)

## webOS에서 deep learning framework (pytorch)을 지원하려면



딥러닝 계층 구조 (PC/리눅스 환경)

Branch	Recipe
master	python3-pytorch 2.7.1 (this recipe)
walnascar (Yocto Project 5.2)	python3-pytorch 2.7.1
styhhead (Yocto Project 5.1)	python3-pytorch 2.4.1
scarthgap (Yocto Project 5.0)	python3-pytorch 2.4.1
nanbiel (Yocto Project 4.3)	python3-pytorch 2.4.1
mickledore (Yocto Project 4.2)	python3-pytorch 2.4.1

[meta-python-ai](#) / [recipes-python](#) / [pytorch](#) / [python3-pytorch\\_2.4.1.bb](#)


zbosor python3-pytorch: Build with vendored gloo

Code

Blame

302 lines (273 loc) · 15.7 KB

```

1  SUMMARY = "Tensors and Dynamic neural networks in Python with strong GPU acceleration"
2  LICENSE = "MIT"
3  LIC_FILES_CHKSUM = "file://LICENSE;md5=5c853508d63a8090fa952ff1af58217d"
4
5  DEPENDS = " \
6      coreutils-native git-native shaderc-native \
7      python3-cmake-native python3-ninja-native python3-requests-native \
8      python3-six-native python3-astunparse-native \
9      python3-charset-normalizer-native python3-types-dataclasses-native \
10     python3-future-native python3-cffi-native \
11     python3-pyyaml-native python3-pybind11-native \
12     python3-numpy-native python3-typing-extensions-native \
13     sleef glslang gflags zstd \
14 "
15
16  DEPENDS:append:class-target = " \
17      zstd-native glog numactl opencv \
18      opencv-headers virtual/opencv-headers \
19      shaderc spirv-tools mesa \
20      ${@bb.utils.contains('DISTRO_FEATURES', 'vulkan', 'vulkan-headers vulkan-loader', '', d)} \
21      python3-numpy python3-typing-extensions python3-pyyaml \
22      python3-pybind11 python3-pytorch-native \
23  
```

## webOS에서 deep learning framework (tensorflow-lite)을 지원하려면

Branch	Recipe
master	tensorflow-lite 2.19.0 (this recipe)
walnascar (Yocto Project 5.2)	tensorflow-lite 2.19.0
styhead (Yocto Project 5.1)	tensorflow-lite 2.19.0
scarthgap (Yocto Project 5.0)	tensorflow-lite 2.16.1
mickledore (Yocto Project 4.2)	tensorflow-lite 2.12.0
kirkstone (Yocto Project 4.0)	tensorflow-lite 2.10.0



about summary refs log **tree** commit diff stats

path: [root/recipes-framework/tensorflow/tensorflow.inc](#)

blob: 2b0528a132caffffd133243817e9ccf1e2e5ad83 (plain)

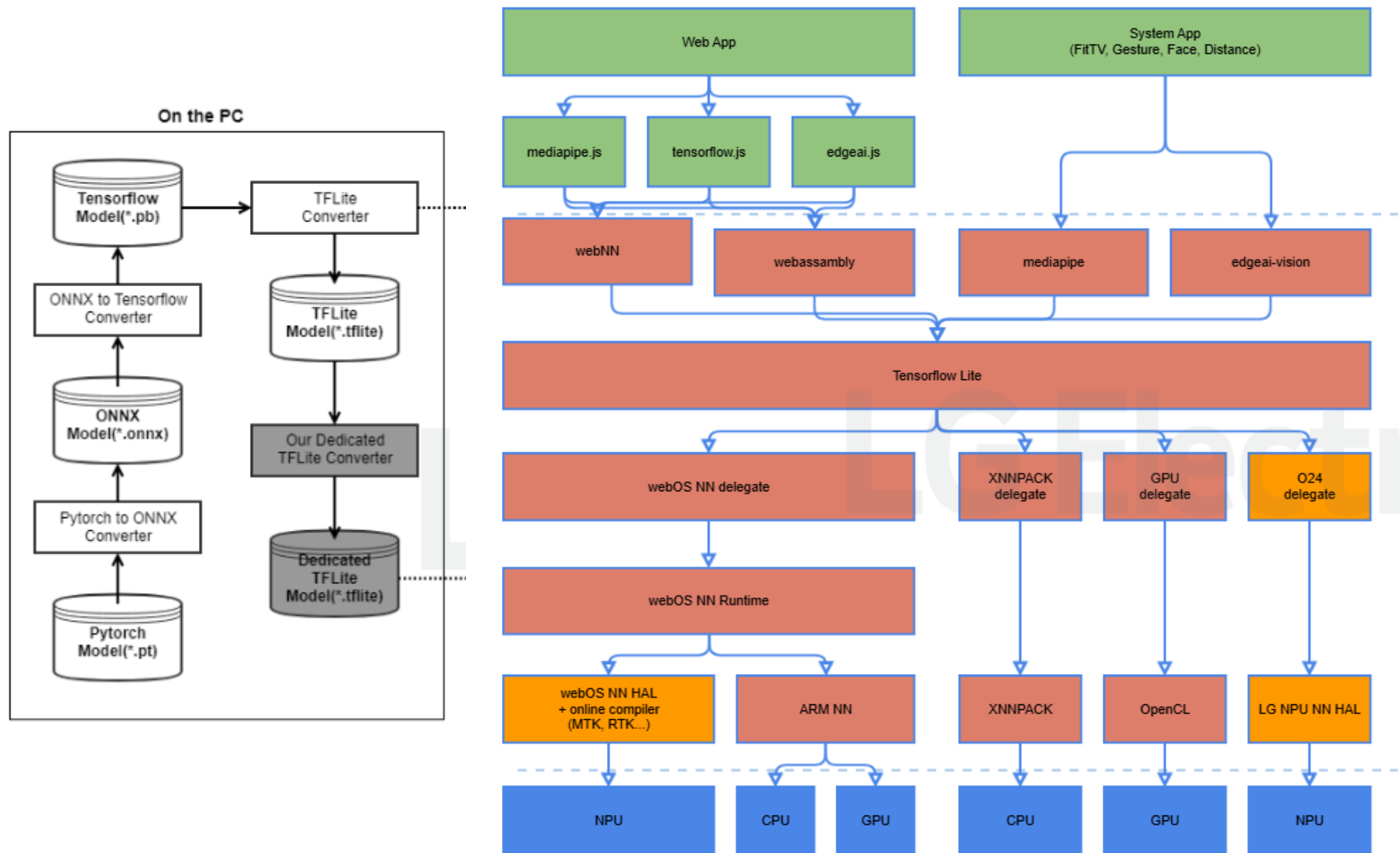
```

1 DESCRIPTION = "TensorFlow C/C++ Libraries"
2 LICENSE = "Apache-2.0"
3 LIC_FILES_CHKSUM = "file://LICENSE;md5=4158a261ca7f2525513e31ba9c50ae98"
4
5 DEPENDS = " \
6     bazel-native \
7     protobuf-native \
8     util-linux-native \
9     patchelf-native \
10    protobuf \
11 "
```

- tensorflow-lite는 C++ 기반으로, 필요한 의존성 패키지가 적어 설치 및 관리가 용이함
- Yocto 환경에서 tensorflow-lite 지원 버전과 DEPENDS 항목만 충족하면 바로 적용 가능
- 복잡한 파이썬 패키지 관리 없이, 효율적으로 딥러닝 기능을 webOS에 도입할 수 있음
- TensorFlow Lite는 NPU 등 하드웨어 가속 지원이 뛰어나, 임베디드 환경에서 효율적으로 동작
- PyTorch에 비해 경량화 및 최적화가 잘 되어 있어, 실시간 AI 서비스에 적합
- webOS에서 NPU 가속을 활용하려면 TensorFlow Lite가 더 유리한 선택



## AI 모델 변환과 webOS 하드웨어 가속 구조



## webOS에서 얼굴인식 모델 활용과 센서 실습

### TFLite 기반 얼굴인식 (부재 센서)

- 실습 목표
  - LUNA API를 활용하여 카메라를 작동시키고, 얼굴 인식 결과값을 확인하는 과정을 실습한다.
- webOS에서는 카메라앱이나 화상회의 사용 시, 얼굴인식 모델을 통해 사람 얼굴을 인식하여 확대하는 기능을 고객에게 제공
- 데이터 및 모델 정보
  - 학습데이터: COCO 데이터셋에서 제공하는 9가지 클래스의 annotation과 이미지에서 검출한 사람 얼굴 annotation을 포함해 총 10가지 클래스의 annotation을 사용
  - YOLO3 계열의 모델 사용

## webOS 얼굴인식 실습: API 호출 및 데이터 처리

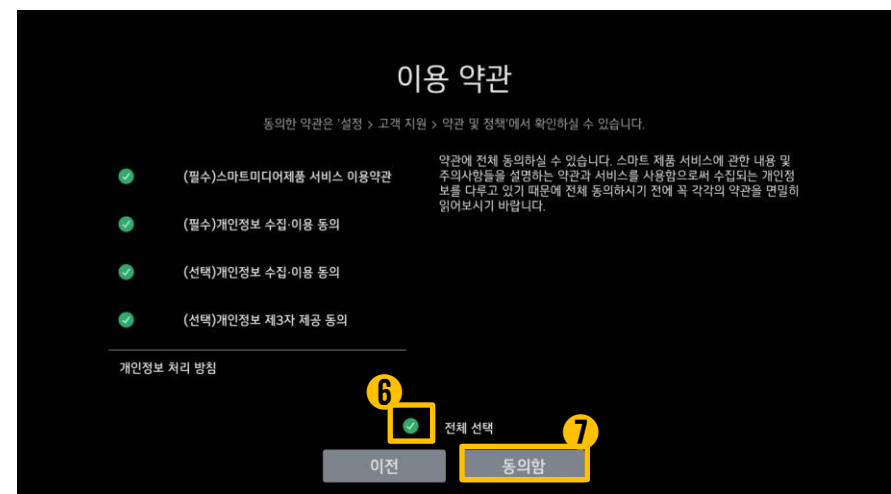
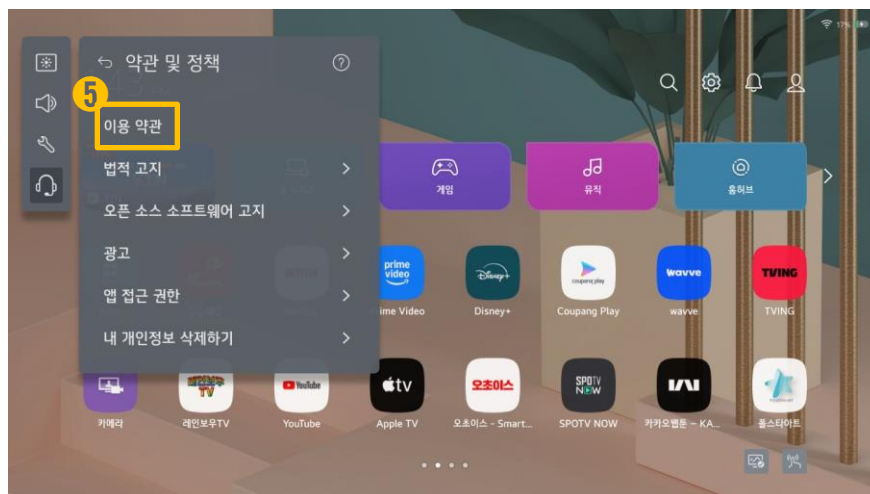
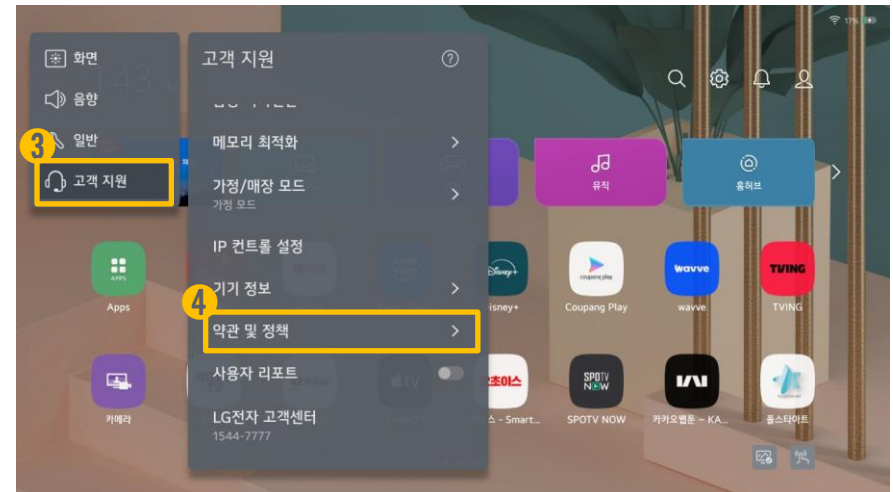
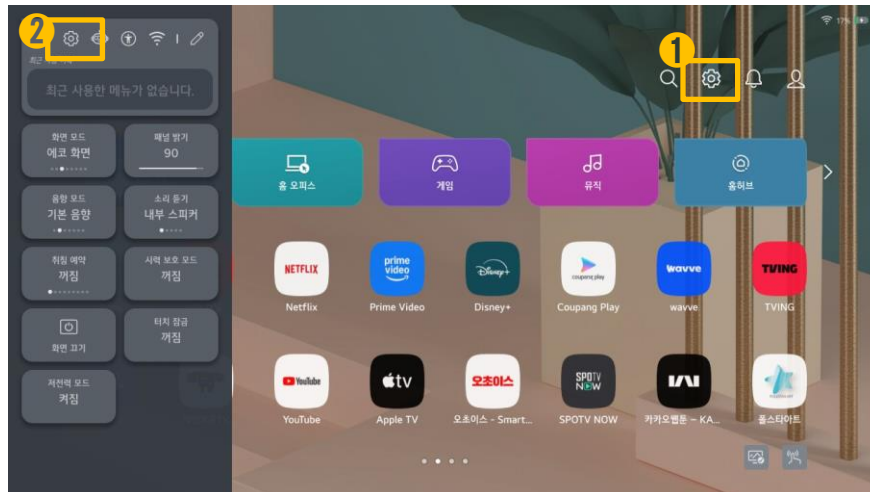
- 사전 준비

- 네트워크 연결 확인

- 약관 동의 진행

:설정(톱니바퀴) → 고객지원 → 약관 및 정책 → 이용 약관 → 전체 선택 → 동의함

- 화면 뒤쪽에 위치한 USB 포트에 카메라 연결



# webOS 얼굴인식 실습: API 호출 및 데이터 처리

## 1. PKG Install

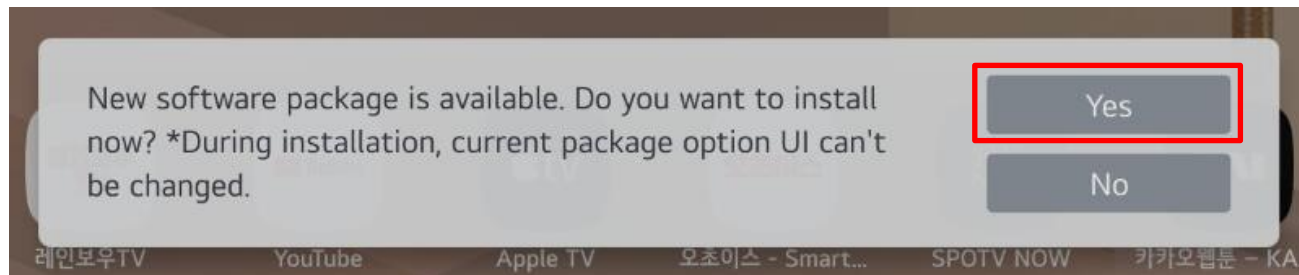
- 모델 사용을 위한 패키지 설치 (최초 1회)
- API

```
luna-send-pub -n 1 -f luna://com.webos.service.aiinferencemanager/installModel  
'{"id":"FACE"}'
```

- 실행 예시

```
root@LGwebOSTV:~# luna-send -n 1 -f luna://com.webos.service.aiinferencemanager/installModel  
'{"id":"FACE"}'  
{  
  "returnValue": true,  
  "id": "FACE"  
}
```

- 호출 후, 화면에 뜨는 팝업에서 yes를 선택할 것



# webOS 얼굴인식 실습: API 호출 및 데이터 처리

## 2. Get Camera List

- TV에 연결되어 사용가능한 카메라 리스트를 반환
- API

```
luna-send-pub -n 1 -f luna://com.webos.service.camera2/getCameraList '{}'
```

- 실행 예시

```
root@LGwebOSTV:~# luna-send -n 1 -f luna://com.webos.service.camera2/getCameraList '{}'  
{  
  "returnValue": true,  
  "deviceList": [  
    {  
      "id": "camera1",  
      "usbPortNum": 1  
    }  
  ]  
}
```

- 사용가능한 카메라가 없는 경우

```
root@LGwebOSTV:~# luna-send -n 1 -f luna://com.webos.service.camera2/getCameraList '{}'  
{  
  "returnValue": true,  
  "deviceList": [  
  ]  
}
```

## webOS 얼굴인식 실습: API 호출 및 데이터 처리

## 3. Set Permission

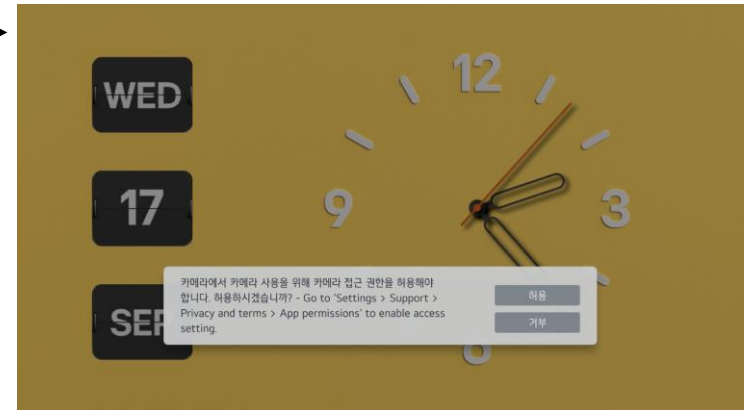
- 특정 애플리케이션이 카메라 서비스를 사용할 수 있도록 권한을 설정함 (최초 1회)
- API

```
luna-send-pub -n 1 -f luna://com.webos.service.camera2/setPermission
'{"appId":"com.webos.app.camera"}'
```

- "appId"의 필요성: 다음 단계에서 카메라를 open할 때, 항상 권한이 부여된 appId를 인자로 받으며 권한이 없으면 open 실패함. 즉, 권한을 받은 앱만 카메라 접근을 허용하기 위한 구현.
- 실행 예시

```
root@LGwebOSTV:~# luna-send -n 1 -f luna://com.webos.service.camera2/setPermission '{"appId":"com.webos.app.camera"}'
{
  "returnValue": true
}
```

- 호출 후, 화면에 뜨는 팝업에서 권한 허용을 선택할 것 →



- 이미 권한이 있는 경우 아래와 같이 반환됨

```
root@LGwebOSTV:~# luna-send -n 1 -f luna://com.webos.service.camera2/setPermission '{"appId":"com.webos.app.camera"}'
{
  "errorText": "There is already permission info in settings",
  "returnValue": false
}
```

## webOS 얼굴인식 실습: API 호출 및 데이터 처리

## 4. Camera Open

- 특정 애플리케이션이 카메라 서비스를 열고 사용할 수 있도록 설정함
- API

```
luna-send-pub -n 1 -f luna://com.webos.service.camera2/open  
'{"appId":"com.webos.app.camera","id":"camera1","mode":"primary"}'
```

- 반환되는 "handle"값은 5, 6번 단계에서 argument로 사용되므로 반드시 확인할 것

- 실행 예시

```
root@LGwebOSTV:~# luna-send -n 1 -f luna://com.webos.service.camera2/open '{"appId":"com.webos.app.ca  
mera","id":"camera1","mode":"primary"}'  
{  
  "returnValue": true,  
  "handle": 9892  
}
```

## 5. Set Format

- 카메라에서 수신하는 데이터의 포맷을 설정함
- API

```
luna-send-pub -n 1 -f luna://com.webos.service.camera2/setFormat  
'{"handle":0000,"params":{"format":"JPEG","fps":30,"height":720,"width":1280}}'
```

- 올바른 handle 값을 입력하지 않으면 에러 발생  
→ '4. Camera Open' 단계에서 반환되는 handle값 확인할 것

- 실행 예시

```
root@LGwebOSTV:~# luna-send -n 1 -f luna://com.webos.service.camera2/setFormat '{"handle":9892,"params":{"format":"JPEG","fps":30,"height":720,"width":1280}}'  
{  
  "returnValue": true  
}
```



# webOS 얼굴인식 실습: API 호출 및 데이터 처리

## 6. Start Preview

- 특정 카메라에 대해 Preview를 시작함
- API

```
luna-send-pub -n 1 -f luna://com.webos.service.camera2/startPreview  
'{"handle":0000,"params":{"source":"0","type":"sharedmemory"}}'
```

- 올바른 handle 값을 입력하지 않으면 에러 발생  
→ '4. Camera Open' 단계에서 반환되는 handle값 확인할 것
- 정상적으로 API가 호출되었다면, 카메라에 노란색 불빛이 들어옴

- 실행 예시

```
root@LGwebOSTV:~# luna-send -n 1 -f luna://com.webos.service.camera2/startPreview '{"handle":9892,"pa  
rams":{"source":"0","type":"sharedmemory"}}'  
{  
  "returnValue": true  
}
```

## 7. Set Solutions

- 특정 카메라에 대해 얼굴인식 기능이 활성화되도록 설정함
- API

```
luna-send-pub -n 1 -f luna://com.webos.service.camera2/setSolutions '{"id":  
"camera1", "solutions": [{"name": "FaceDetection", "params": {"enable": true}}]}'
```

- 실행 예시

```
root@LGwebOSTV:~# luna-send -n 1 -f luna://com.webos.service.camera2/setSolutions '{"id": "camera1",  
"solutions": [{"name": "FaceDetection", "params": {"enable": true}}]}'  
{  
  "returnValue": true  
}
```

## webOS 얼굴인식 실습: API 호출 및 데이터 처리

## 8. Get Event Notification (Solution Results)

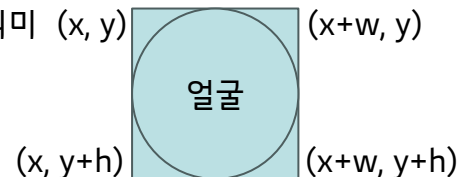
- 특정 카메라에 대한 face detection 결과를 연속적으로(subscribe) 반환함
- API

```
luna-send-pub -i -f luna://com.webos.service.camera2/getEventNotification
'{"subscribe":true, "category":"solution", "id":"camera1", "key":["FaceDetection"]}'
```

- Response

Field	Type	Description		
returnValue	boolean	Indicates success or failure.		
solutions	array •"data" shows the results of face detection.	faces	w	The width of the detected face.
			confidence	The confidence of the result.
			y	The y-coordinate of the detected face.
			h	The height of the detected face.
			x	The x-coordinate of the detected face.
		faceCount		The number of detected faces.

\* (x, y)는 좌측 상단의 좌표를 의미 (x, y) (x+w, y)



## webOS 얼굴인식 실습: API 호출 및 데이터 처리

## 8. Get Event Notification (Solution Results)

- 실행 예시  
→ 카메라에 얼굴을 비추면 아래와 같이 결과 반환됨

```
root@LGwebOSTV:~# luna-send -i -f luna://com
.webos.service.camera2/getEventNotification
'{"subscribe":true, "category":"solution", "
id":"camera1", "key":["FaceDetection"]}'
{
  "subscribed": true,
  "returnValue": true
}
{
  "returnValue": true,
  "solutions": [
    {
      "data": {
        "faces": [
          {
            "w": 303,
            "confidence": 93,
            "y": 103,
            "h": 391,
            "x": 457
          }
        ]
      },
      "faceCount": 1
    },
    {
      "orientation": 270,
      "name": "FaceDetection",
      "timestamp": 1446043154
    }
  ]
}
```

```
{
  "returnValue": true,
  "solutions": [
    {
      "data": {
        "faces": [
          {
            "w": 201,
            "confidence": 62,
            "y": 225,
            "h": 258,
            "x": 423
          },
          {
            "w": 194,
            "confidence": 50,
            "y": 233,
            "h": 239,
            "x": 684
          }
        ]
      },
      "faceCount": 2
    },
    {
      "orientation": 270,
      "name": "FaceDetection",
      "timestamp": 1446279506
    }
  ]
}
```

## 확장 아이디어

- 얼굴이 감지되지 않으면 절전 모드 또는 화면 밝기 자동 조절
- 얼굴 개수(시청자 수)에 따라 환영 메시지, 추천 콘텐츠, 또는 화면 레이아웃 변경
- 1명일 때는 개인화된 첫화면, 2명 이상일 때는 가족/그룹용 UI로 전환
- 얼굴이 여러 개 감지되면 멀티뷰(화면 분할) 기능 활성화
- 시청자 수에 따라 광고, 알림, 또는 안내 메시지의 내용/위치 변경
- 얼굴 개수에 따라 앱 아이콘 크기, 배치, 추천 앱 목록 동적 변경
- 일정 시간 동안 얼굴이 감지되지 않으면 자동으로 화면 꺼짐

