



Programmation Android

I. Introduction



Plan

- 1 Introduction
- 2 La plate-forme Android
- 3 Programmation Android
- 4 Hello World avec Android Studio
- 5 Hello World en ligne de commande
- 6 Édition du projet avec Android Studio
- 7 Exécution du projet



Application mobile

► [wikipédia](#)

Caractéristiques

- Cible : **appareil électronique mobile** (smartphone, tablette, etc.)
- **Contexte logiciel** :
 - **non connecté** : agenda, baladeur, ...
 - **localisé** : navigation **GPS**, travaux géolocalisés (e.g. photographie)
 - **connecté** : tout **Internet**... avec un contexte mobile !
 - ...
- **Contexte matériel** :
 - **ressources plus faibles** : CPU / RAM / DD / ROM
 - ⇒ la **consommation** des ressources doit être **minimale**
 - ⇒ **Résolutions d'affichage hétéroclites** ⇒ **GUI adaptative**
 - ...



Application mobile

Principaux OS

- **Android** (Google) : Linux, version 8.1 (décembre 2017)
- **BlackBerry OS, QNX** : Unix (arrêté en 2015)
- **iOS** (Apple) noyau hybride XNU : Mach(libre) + BSD (Unix)
- **Ubuntu Touch** (Canonical) : Linux (arrêté en avril 2017)
- **Windows 10 mobile** (Microsoft) (arrêté en octobre 2017)
- **Tizen** (*Linux Foundation*), supporté par Samsung (montres connectées)
- **Firefox OS** (Mozilla Corporation) : Linux (arrêté en 2015)
- [▶ plus d'information](#)



Android

Origine

- Initialement un OS pour appareil photo
- Acheté par Google en 2005
- [▶ Wikipédia](#)



Diffusion

Google I/O, mai 2017



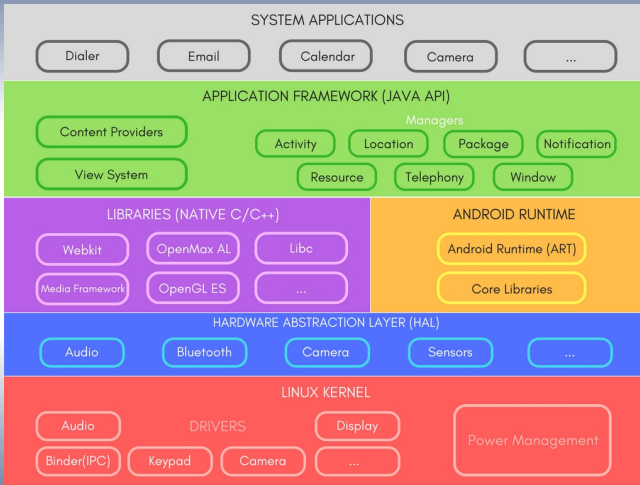


Répartition des différentes versions (accès au **Play Store**)

► Statistiques



Architecture globale





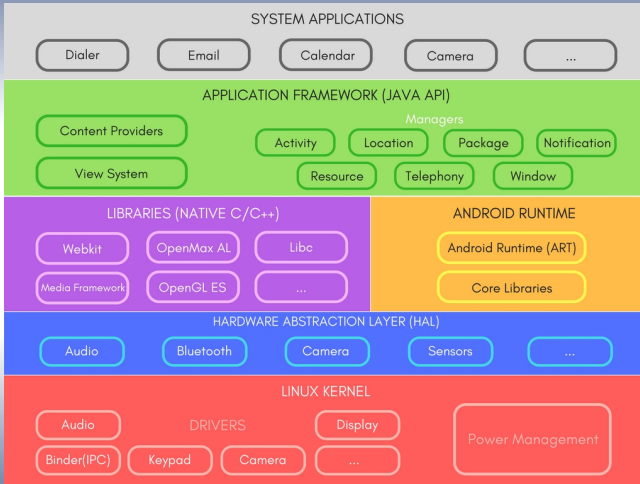
Libraries

Librairies C/C++ libres ⇒

- **Surface Manager** : affichage 2D/3D
- **Media Framework** : codecs basés sur librairie OpenCORE
- **SQLite** : moteur de base de données relationnelle
- **OpenGL|ES** : implémentation OpenGL pour l'embarqué
- **FreeType** : rendu bitmap de polices vectorielles
- **WebKit** : moteur de rendu de pages Web
- **SGL** : moteur graphique 2D
- **SSL** : communications réseaux sécurisées
- **libc** : dérivé de la librairie C (BSD) pour l'embarqué (Bionic libc)



Architecture : Application Framework





Application framework 1/2

Modules ⇒

- **Content Providers** : gestion de l'accès aux données (appli et autres applis)
- **View System** : gestion des composants graphiques et des événements utilisateurs liés
- **Activity Manager** : cycle de vie et navigation entre applications
- **Location Manager** : accès aux fonctions de localisation



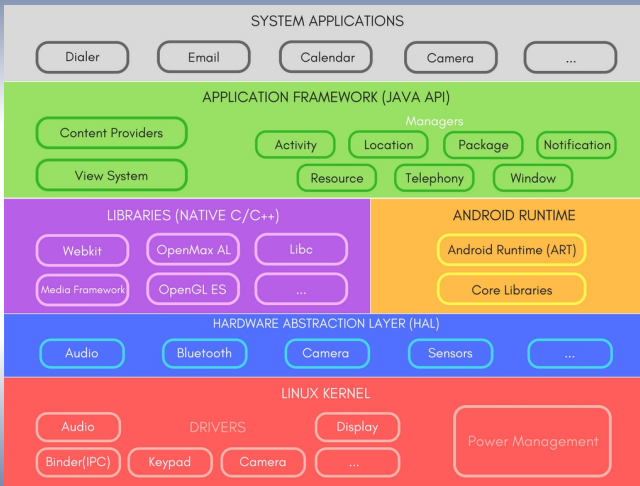
Application framework 2/2

Modules ⇒

- **Package Manager** : accès aux API tierces installées
- **Notification Manager** : gestion du système de notifications
- **Resource Manager** : gestion des ressources (images, définition des layouts, etc.)
- **Telephony Manager** : accès aux services de téléphonie
- **Window Manager** : gestion GUI (z-ordered, mise en page, etc.)

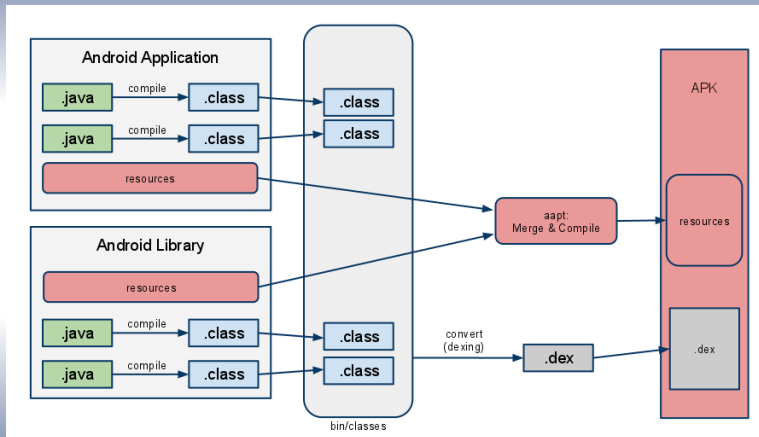


Architecture : Android Runtime





Construction d'un APK





Prérequis

Créer une application Android :

Connaissances Techniques

- Android (runtime + framework) ⇒ **POO + Java**

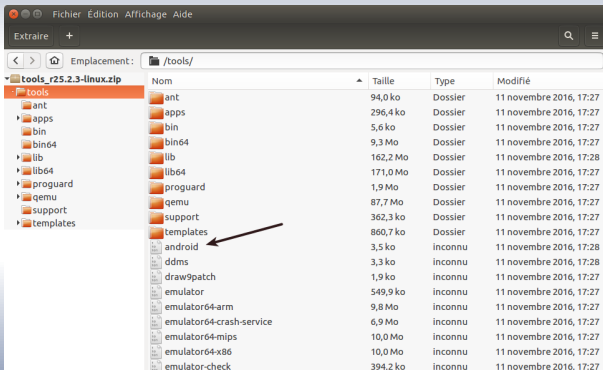
Outils logiciels

- **Java Runtime Environment (JRE) pour exécuter les outils Android**
- **Android SDK** [▶ téléchargement](#)
- **Android Virtual Device Manager (AVD), contenu dans le Android SDK**
- un IDE



Android SDK : téléchargement

décompression dans un répertoire, e.g. Android-sdk.
SDK_PATH dans la suite)



Lancement du SDK manager : **SDK_PATH/tools/android** (sans argument)



Le SDK Manager : tools

SDK Path: /home/fab/Android/android-sdk

Packages

Name	API	Rev.	Status
Tools			
Android SDK Tools		25.2.5	Installed
Android SDK Platform-tools		25.0.3	Not installed
Android SDK Build-tools		25.0.2	Not installed
Android SDK Build-tools		25.0.1	Not installed
Android SDK Build-tools		25	Not installed
Android SDK Build-tools		24.0.3	Not installed
Android SDK Build-tools		24.0.2	Not installed
Android SDK Build-tools		24.0.1	Not installed
Android SDK Build-tools		24	Not installed
Android SDK Build-tools		23.0.3	Not installed
Android SDK Build-tools		23.0.2	Not installed
Android SDK Build-tools		23.0.1	Not installed
Android SDK Build-tools		22.0.1	Not installed
Android SDK Build-tools		21.1.2	Not installed
Android SDK Build-tools		20	Not installed
Android SDK Build-tools		19.1	Not installed
Android 7.1.1 (API 25)			
Android 7.0 (API 24)			
Android 6.0 (API 23)			
Android 5.1.1 (API 22)			

Show: Updates/New Installed Select **New or Updates**

Obsolete **Deselect All**

Install 6 packages...
Delete packages...

Done loading packages.



Le SDK Manager : Android APIs

Name	API	Rev.	Status
Tools			
Android SDK Tools		25.2.5	Installed
Android SDK Platform-tools		25.0.3	Not installed
Android SDK Build-tools		25.0.2	Not installed
Android SDK Build-tools		25.0.1	Not installed
Android SDK Build-tools		25	Not installed
Android SDK Build-tools		24.0.3	Not installed
Android SDK Build-tools		24.0.2	Not installed
Android SDK Build-tools		24.0.1	Not installed
Android SDK Build-tools		24	Not installed
Android SDK Build-tools		23.0.3	Not installed
Android SDK Build-tools		23.0.2	Not installed
Android SDK Build-tools		23.0.1	Not installed
Android SDK Build-tools		22.0.1	Not installed
Android SDK Build-tools		21.1.2	Not installed
Android SDK Build-tools		20	Not installed
Android SDK Build-tools		19.1	Not installed
Android 7.1.1 (API 25)			
Android 7.0 (API 24)			
Android 6.0 (API 23)			
Android 5.1.1 (API 22)			

Show: Updates/New Installed Obsolete [Select New or Updates](#) [Deselect All](#)

[Install 6 packages...](#) [Delete packages...](#)

Done loading packages.



Le SDK Manager : Extras

Package Manager Tools

SDK Path: /home/fab/Android/android-sdk

Packages

Name	API	Rev.	Status
Android 4.0.3 (API 15)			
Android 4.0 (API 14)			
Android 3.2 (API 13)			
Android 3.1 (API 12)			
Android 3.0 (API 11)			
Android 2.3.3 (API 10)			
Android 2.3.1 (API 9)			
Android 2.2 (API 8)			
Android 2.1 (API 7)			
Extras			
Android Support Repository		41	<input type="checkbox"/> Not installed
Android Auto Desktop Head Unit emulator		1.1	<input type="checkbox"/> Not installed
Google Play services		38	<input type="checkbox"/> Not installed
Google Repository		42	<input type="checkbox"/> Not installed
Google Play APK Expansion library		1	<input type="checkbox"/> Not installed
Google Play Licensing Library		1	<input type="checkbox"/> Not installed
Google Play Billing Library		5	<input type="checkbox"/> Not installed
Android Auto API Simulators		1	<input type="checkbox"/> Not installed
Google USB Driver		11	<input checked="" type="checkbox"/> Not compatible with Linux
Google Web Driver		2	<input type="checkbox"/> Not installed
Intel x86 Emulator Accelerator (HAXM installer)		6.0.5	<input checked="" type="checkbox"/> Not compatible with Linux











Show: Updates/New Installed Select New or Updates

Obsolete [Deselect All](#)

Done loading packages.



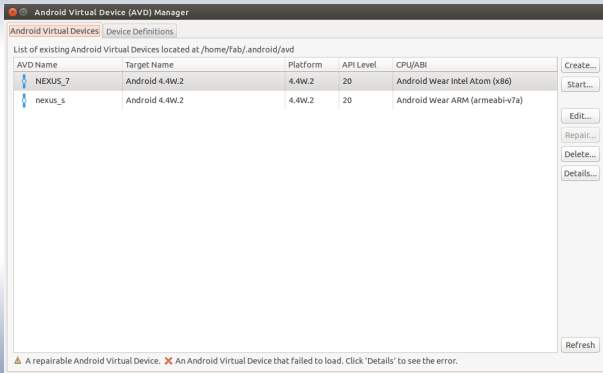
SDK_PATH/ après téléchargement (plusieurs Go)

 add-ons 3 éléments	 build-tools 2 éléments	 docs 44 éléments
 extras 1 élément	 platforms 3 éléments	 platform-tools 10 éléments
 samples 3 éléments	 sources 3 éléments	 system-images 3 éléments
 tools 27 éléments		



Android Virtual Device Manager (AVD)

Lancement AVD : **SDK_PATH/tools/android avd**





Outils requis

IDE pour programmer une application Android :

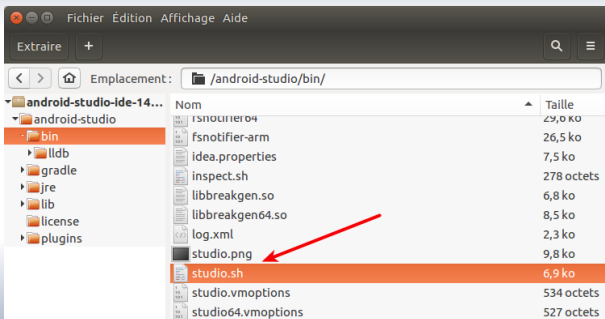
2 solutions :

- Eclipse avec le plugin **Andmore** : [▶ taper android dans le marketplace d'Eclipse](#)
- Android Studio (supporté par Google) : [▶ https://developer.android.com/studio](https://developer.android.com/studio)



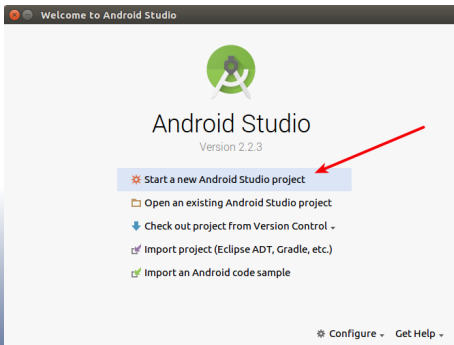
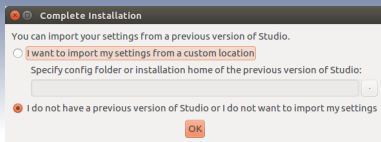
Android Studio

Contenu de l'archive (téléchargera tout le reste : tools, sdk, etc.)





Android Studio





New project : 1. caractéristiques principales

Create New Project

New Project
Android Studio

Configure your new project

Application name: HelloWorld

Company Domain: iut.montpellier.fr

Package name: fr.montpellier.iut.helloworld [Edit](#)

Include C++ Support

Project location: /home/fab/AndroidStudioProjects/HelloWorld

Previous Next Cancel Finish



2. Sélection de l'API Minimum

Create New Project

Target Android Devices

Select the form factors your app will run on

Different platforms may require separate SDKs

Phone and Tablet

Minimum SDK: API 15: Android 4.0.3 (IceCreamSandwich)

Lower API levels target more devices, but have fewer features available.
By targeting API 15 and later, your app will run on approximately **97,4%** of the devices that are active on the Google Play Store.
[Help me choose](#)

Wear

Minimum SDK: API 21: Android 5.0 (Lollipop)

TV

Minimum SDK: API 21: Android 5.0 (Lollipop)

Android Auto

Glass

Minimum SDK: Glass Development Kit Preview (API 19)

Previous Next Cancel Finish



2. Sélection de l'API Minimum

Android Platform/API Version Distribution

ANDROID PLATFORM VERSION	API LEVEL	CUMULATIVE DISTRIBUTION
2.3 Gingerbread	10	
4.0 Ice Cream Sandwich	15	97,4%
4.1 Jelly Bean	16	95,2%
4.2 Jelly Bean	17	87,4%
4.3 Jelly Bean	18	76,9%
4.4 KitKat	19	73,9%
5.0 Lollipop	21	40,5%
5.1 Lollipop	22	24,1%
6.0 Marshmallow	23	4,7%

Ice Cream Sandwich

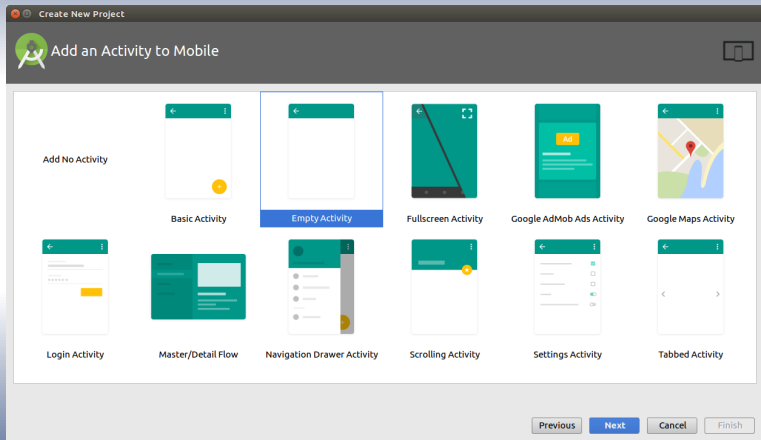
- Contacts Provider**
 - Social APIs
 - User profile
 - Invite intent
 - Large photos
- Calendar Provider**
 - Calendar APIs
 - Event intents
- Voicemail Provider**
 - Add voicemails to the device
- Multimedia**
 - Media effects for images and videos
 - Remote control client
 - Improved media player
- Camera**
 - Face detection
 - Focus and metering areas
 - Continuous auto focus
 - Camera broadcast intents
- Connectivity**
 - Android Beam for NDEF push with NFC
 - Wi-Fi P2P connections
 - Bluetooth health profile
 - Network usage and controls
- Accessibility**
 - Explore-by-touch mode
 - Accessibility for views
 - Accessibility services
 - Improved text-to-speech engine support
- User Interface**
 - Spell checker services
 - Improved action bar
 - Grid layout
 - Texture view
 - Switch widget
 - Improved popup menus
 - System themes
 - Controls for system UI visibility
 - Hover event support
 - Hardware acceleration for all windows
- Enterprise**
 - VPN services
 - Device policies
 - Certificate management
- Device Sensors**
 - Improved sensors
 - Temperature sensor
 - Humidity sensor

<https://developer.android.com/about/versions/android-4.0.html>

OK Cancel



3. Choix de l'activité héritée : Empty Activity (hello world)





4. Paramétrage des noms de fichiers

Create New Project

Customize the Activity

Creates a new empty activity

Activity Name: MainActivity

Generate Layout File

Layout Name: activity_main

Backwards Compatibility (AppCompat)

Empty Activity

The name of the activity class to create

Previous Next Cancel Finish



5. Vue globale

The screenshot shows the Android Studio IDE with the following components:

- Project Explorer (Left):** Shows the project structure for 'HelloWorld'. The 'Main' activity is selected, showing its package path: `fr.montpellier.iut.helloworld`.
- Code Editor (Center):** Displays the `MainActivity.java` file. The code is as follows:

```
package fr.montpellier.iut.helloworld;

import android.app.Activity;
import android.os.Bundle;

public class MainActivity extends Activity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }
}
```
- Terminal (Bottom):** Shows the message: "Enable smart keyboard internationalization for Studio.: We have found o... 1:1 LF: UTF-8 : Context: <no context>".



Création d'un projet en ligne de commande

\$ android list targets (API disponibles), ./sdkmanager

```
Fab@beltegeuse:~/tmp$ android list targets
Available Android targets:
-----
id: 1 or "android-19"
  Name: Android 4.4.2
  Type: Platform
  API level: 19
  Revision: 4
  Skins: HVGA, QVGA, WQVGA400, WQVGA432, MSVGA, MVGA800 (default), MVGA854, WXGA720, WXGA800, WXGA800-7in
  Tag/ABIS : default/armeabi-v7a, default/x86
-----
id: 2 or "android-20"
  Name: Android 4.4W.2
  Type: Platform
  API level: 20
  Revision: 2
  Skins: HVGA, QVGA, WQVGA400, WQVGA432, MSVGA, MVGA800 (default), MVGA854, WXGA720, WXGA800, WXGA800-7in, AndroidWearRound, A
  Tag/ABIS : android-wear/armeabi-v7a, android-wear/x86
-----
id: 3 or "android-21"
  Name: Android 5.0.1
  Type: Platform
  API level: 21
  Revision: 2
  Skins: HVGA, QVGA, WQVGA400, WQVGA432, MSVGA, MVGA800 (default), MVGA854, WXGA720, WXGA800, WXGA800-7in
  Tag/ABIS : android-tv/armeabi-v7a, android-tv/x86, default/armeabi-v7a, default/x86, default/x86_64
-----
id: 4 or "Google Inc.:Google APIs:19"
  Name: Google APIs
  Type: Add-On
  Vendor: Google Inc.
  Revision: 9
  Description: Android + Google APIs
  Based on Android 4.4.2 (API level 19)
  Libraries:
    * com.google.android.media.effects (effects.jar)
      Collection of video effects
    * com.android.future.usb.accessory (usb.jar)
      API for USB Accessories
    * com.google.android.maps (maps.jar)
      API for Google Maps
  Skins: HVGA, QVGA, WQVGA400, WQVGA432, MSVGA, MVGA800 (default), MVGA854, WXGA720, WXGA800, WXGA800-7in
  Tag/ABIS : default/armeabi-v7a
-----
```



Création du projet

```
fab@beltegeuse: ~/tmp
fab@beltegeuse:~$ android create project --target 4 --name HelloWorld --path ./HelloWorld --activity MainActivity --package fr.lut.hello
Created project directory: ./HelloWorld
Created directory /home/fab/tmp/HelloWorld/src/fr/lut/hello
Added file ./HelloWorld/src/fr/lut/hello/MainActivity.java
Created directory /home/fab/tmp/HelloWorld/res
Created directory /home/fab/tmp/HelloWorld/bin
Created directory /home/fab/tmp/HelloWorld/libs
Created directory /home/fab/tmp/HelloWorld/res/values
Added file ./HelloWorld/res/values/strings.xml
Created directory /home/fab/tmp/HelloWorld/res/layout
Added file ./HelloWorld/res/layout/main.xml
Created directory /home/fab/tmp/HelloWorld/res/drawable-xhdpi
Created directory /home/fab/tmp/HelloWorld/res/drawable-hdpi
Created directory /home/fab/tmp/HelloWorld/res/drawable-mdpi
Created directory /home/fab/tmp/HelloWorld/res/drawable-ldpi
Added file ./HelloWorld/AndroidManifest.xml
Added file ./HelloWorld/build.xml
Added file ./HelloWorld/proguard-project.txt
fab@beltegeuse:~/tmp$
```




Contenu du projet

Dossier App

- **build/** : fichiers générés
- **libs/** : bibliothèques additionnelles
- **src/** : intégralité des sources pour le développement (appli + tests)



Contenu du projet

Dossier App/src/

- **androidTest/** : tests de l'application dans l'environnement android
- **test/** : tests internes à l'application
- **main** : sources de l'application
 - **main/java** : sources Java, e.g. la classe qui lance l'activité
 - **main/res** : les ressources de l'application
 - **drawable-(h)(m)(l)dpi/** images dans différentes résolutions
 - **layout/** GUI design général
 - **values/** valeurs des variables
 - **menu/** définition des menus
- **main/AndroidManifest.xml** : description et éléments-clés de l'application (nom, activité principale, intents, etc.)



./app/src/main/AndroidManifest.xml : description

```
activity_main.xml  main.tex  strings.xml  HelloWorld Manifest  ⌵
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
  package="fr.iutmontp.helloworld"
  android:versionCode="1"
  android:versionName="1.0" >

  <uses-sdk
    android:minSdkVersion="8"
    android:targetSdkVersion="21" />

  <application
    android:allowBackup="true"
    android:icon="@drawable/ic_launcher"
    android:label="@string/app_name"
    android:theme="@style/AppTheme" >
    <activity
      android:name=".MainActivity"
      android:label="@string/app_name" >
      <intent-filter>
        <action android:name="android.intent.action.MAIN" />

        <category android:name="android.intent.category.LAUNCHER" />
      </intent-filter>
    </activity>
  </application>

</manifest>
```



Éditeur pour les fichiers manifest

Android Manifest

Manifest General Attributes

Defines general information about the AndroidManifest.xml

Package:

Version code:

Version name:

Shared user id:

Shared user label:

Install location:

Manifest Extras

- Uses Sdk

Attributes for Uses Sdk

The tag describes the SDK features that the containing package must be running on to operate correctly.

Min SDK version:

Target SDK version:

Max SDK version:

Exporting

To export the application for distribution, you have the following options:

- Use the [Export Wizard](#) to export and sign an APK
- [Export an unsigned APK](#) and sign it manually

Links

The content of the Android Manifest is made up of three sections. You can also edit the XML directly.

- [Application](#): Activities, intent filters, providers, services and receivers.
- [Permission](#): Permissions defined and permissions used.
- [Instrumentation](#): Instrumentation defined.
- [XML Source](#): Directly edit the AndroidManifest.xml file.
- [Documentation](#): Documentation from the Android SDK For AndroidManifest.xml

Manifest | Application | Permissions | Instrumentation | AndroidManifest.xml



.../res/layout/activity_main.xml : disposition GUI

activity_main.xml

```
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingBottom="@dimen/activity_vertical_margin"
    android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    tools:context="com.example.fr.iutmontp.helloworld.MainActivity" >

    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="@string/hello_world" />

</RelativeLayout>
```



Éditeur de layout (*text mode*)

The screenshot displays the Android Studio interface. The main editor shows the XML code for `activity_main.xml` in text mode. The code defines a `RelativeLayout` containing a `TextView` with the text "Hello World!". The XML code is as follows:

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:id="@+id/activity_main"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingBottom="16dp"
    android:paddingLeft="16dp"
    android:paddingRight="16dp"
    android:paddingTop="16dp"
    tools:context="fr.montpellier.iut.helloworld.MainActivity">
    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Hello World!" />
</RelativeLayout>
```

The preview window on the right shows a mobile device screen with the text "HelloWorld" at the top and "Hello World!" in the center. The status bar at the top of the preview shows the time as 6:00. The bottom of the preview shows the standard Android navigation bar with back, home, and recent apps buttons.



Éditeur de layout (*design mode*)

The screenshot shows the Android Studio interface in Design Mode. The main workspace displays a mobile device screen with a 'Hello World' app. A red box highlights the 'Hello World' text on the screen, with a red arrow pointing to the 'TextView' widget in the Palette. Another red arrow points from the 'TextView' widget in the Palette to the 'TextView' widget in the Component Tree. A third red arrow points from the 'TextView' widget in the Component Tree to the 'layout_width' property in the Properties panel. The Properties panel shows the following values:

- layout_width: wrap_content
- layout_height: wrap_content
- Text: Hello World!
- contentDescrip...:
- textAppearan...: Holo.Light.Small

The Component Tree shows the following structure:

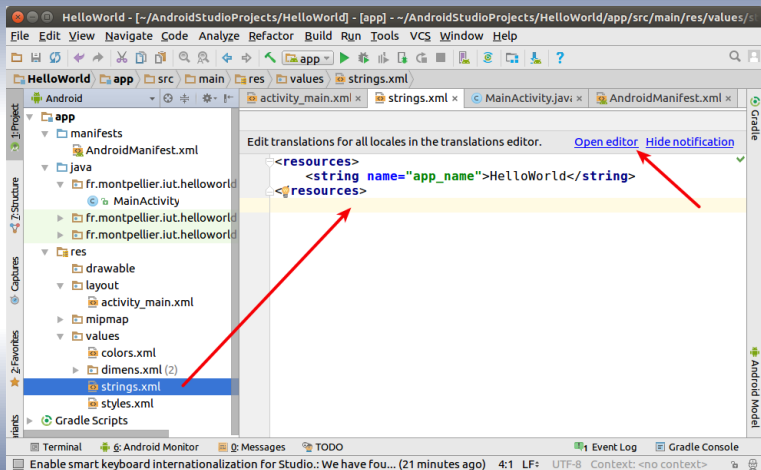
- activity_main (RelativeLayout)
 - TextView "Hello World"

The Palette shows the following widgets:

- TextView
- Button
- ToggleButton
- CheckBox
- RadioButton
- CheckedTextView
- Spinner
- ProgressBar (Large)
- ProgressBar (Small)
- ProgressBar (Horizontal)
- SeekBar
- SeekBar (Discrete)
- QuickContactBadge
- RatingBar
- Switch
- Space
- Text Fields (EditText)
 - Plain Text
 - Password
 - Password (Numeric)
 - Email
 - Phone



strings.xml : valeurs des variables





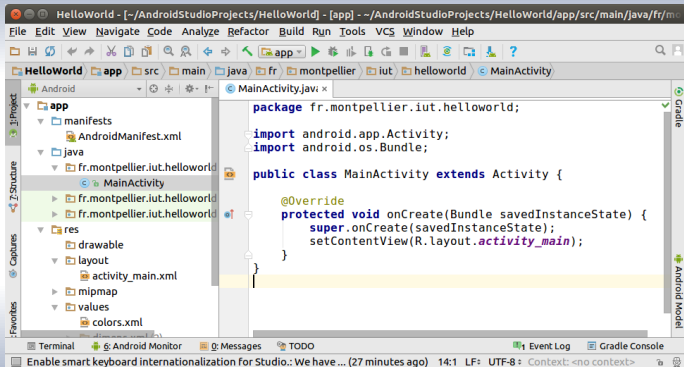
Éditeur pour *strings.xml*

The screenshot shows the Android Studio interface with the Translations Editor open. The editor displays a table with the following columns: Key, Default Value, and Untr... (Untranslated). A single row is visible with the key 'app_name' and the default value 'HelloWorld'. The 'Untr...' column contains a checkbox. Below the table, there are input fields for 'Key:', 'Default Value:', and 'Translation:'. The interface also shows a project tree on the left, a toolbar at the top, and a status bar at the bottom.

Key	Default Value	Untr...
app_name	HelloWorld	<input type="checkbox"/>



/src/.../MainActivity.java : activité



The screenshot shows the Android Studio interface with the MainActivity.java file open. The code is as follows:

```
package fr.montpellier.iut.helloworld;

import android.app.Activity;
import android.os.Bundle;

public class MainActivity extends Activity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }
}
```

The interface includes a toolbar at the top, a project structure view on the left, and a status bar at the bottom with system information like time (14:1) and locale (UTF-8).



/build/.../R.java : définition d'identifiants

```
Fichier  Édition  Affichage  Rechercher  Outils  Documents  Aide
Ouvrir  [+]  Enregistrer

/* AUTO-GENERATED FILE. DO NOT MODIFY.
 *
 * This class was automatically generated by the
 * aapt tool from the resource data it found. It
 * should not be modified by hand.
 */
package fr.montpellier.iut.helloworld;

public final class R {
    public static final class attr {
    }
    public static final class color {
        public static final int colorAccent=0x7f050000;
        public static final int colorPrimary=0x7f050001;
        public static final int colorPrimaryDark=0x7f050002;
    }
    public static final class dimen {
        public static final int activity_horizontal_margin=0x7f040000;
        public static final int activity_vertical_margin=0x7f040001;
    }
    public static final class id {
        public static final int activity_main=0x7f080000;
    }
    public static final class layout {
        public static final int activity_main=0x7f030000;
    }
}
```



Exécution sur un vrai dispositif

Mise en place du dispositif pour le développement

- connexion usb : [▶ drivers windows](#) [▶ configuration linux](#)
- sous linux, la commande **lsusb** liste les connexions usb
[▶ plus d'information](#)
- activation *USB debugging* sur le dispositif :
Settings > Developer options
à partir de Android 4.2 : Settings > About phone (7 tappes successives).



Exécution du projet

Toolbar icons: Run (highlighted with a yellow circle and a red arrow pointing to the 'Run' button), Stop, Refresh, etc.

Project Name: HelloWorld Manifest | main.tex

Android Device Chooser

Select a device with min API level 8.

Choose a running Android device

Serial Number	AVD Name	Target	Debug	State
haier-konnect_350-0123456789A	N/A	✓ 4.4.2		Online

Launch a new Android Virtual Device

AVD Name	Target Name	Platform	API Level	CPU/ABI	
NEXUS_7	Android 4.4W.2	4.4W.2	20	Android Wear Intel Atom (x86)	Start...
nexus_s	Android 4.4W.2	4.4W.2	20	Android Wear ARM (armeabi-v7a)	Details...

Buttons: Refresh, Manager...

Use same device for future launches

Buttons: Cancel, OK



Exécution en ligne de commande

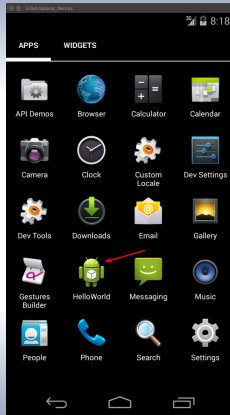
```
fab@beltegeuse: ~/tmp/HelloWorld
fab@beltegeuse:~/tmp/HelloWorld$ ant debug
Buildfile: /home/fab/tmp/HelloWorld/build.xml
```

Compilation OK ⇒ Déploiement :

```
fab@beltegeuse: ~/tmp/HelloWorld
fab@beltegeuse:~/tmp/HelloWorld$ adb install -r bin/HelloWorld-debug.apk
515 KB/s (37526 bytes in 0.071s)
  pkg: /data/local/tmp/HelloWorld-debug.apk
Success
fab@beltegeuse:~/tmp/HelloWorld$
```



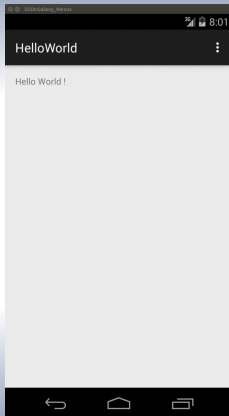
Une fois déployée





Exécution du projet

Résultat →





Exécution sur un émulateur : outil AVD

Dans un terminal : `$ android avd`

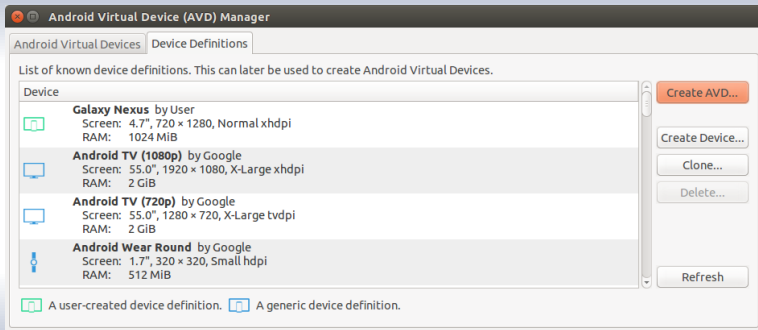
The screenshot shows the 'Android Virtual Device (AVD) Manager' window. It has two tabs: 'Android Virtual Devices' and 'Device Definitions'. The 'Android Virtual Devices' tab is active, displaying a list of existing virtual devices located at `/home/fab/.android/avd`. The list contains three entries:

AVD Name	Target Name	Platform	API Level	CPU/ABI	
Galaxy_Nexus	Android 4.4.2	4.4.2	19	Intel Atom (x86)	Create... Start...
Nexus_7S	Android 4.4.2	4.4.2	19	Intel Atom (x86)	
AVD_for_Android_	Android 4.4W.2	4.4W.2	20	Android Wear Intel Atom (x86)	Edit... Repair... Delete... Details... Refresh

At the bottom of the window, there is a legend: A repairable Android Virtual Device. An Android Virtual Device that failed to load. Click 'Details' to see the error.



Définition déjà présentes





Création d'une AVD

▶ en ligne de commande

Create new Android Virtual Device (AVD)

AVD Name:

Device:

Target:

CPU/ABI:

Keyboard: Hardware keyboard present

Skin:

Front Camera:

Back Camera:

Memory Options: RAM: VM Heap:

Internal Storage: MiB

SD Card: Size: MiB
 File: Browse...

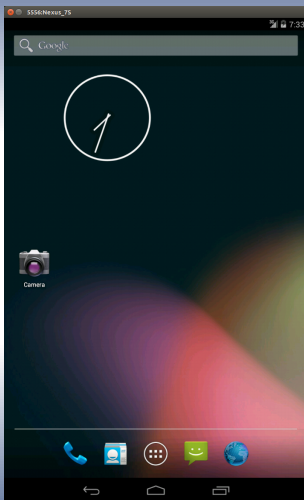
Emulation Options: Snapshot Use Host GPU

Override the existing AVD with the same name

Cancel OK

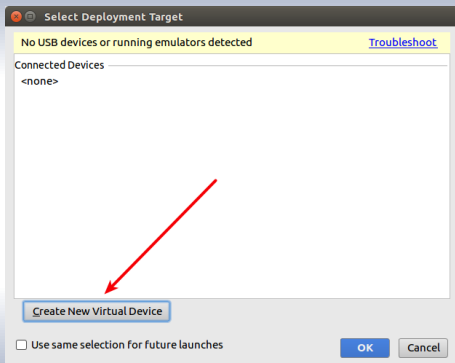


Start →





Sous Android Studio





Sous Android Studio

Virtual Device Configuration

Select Hardware
Android Studio

Choose a device definition

Category	Name	Size	Resolution	Density	
TV	Nexus 5	4,0"	480x800	hdpi	
	Nexus One	3,7"	480x800	hdpi	
Wear	Nexus 6P	5,7"	1440x2560	560dpi	
	Nexus 6	5,96"	1440x2560	560dpi	
Phone	Nexus 5X	5,2"	1080x1920	420dpi	
	Nexus 5	4,95"	1080x1920	xxhdpi	
	Nexus 4	4,7"	768x1280	xhdpi	
	Galaxy Nexus	4,65"	720x1280	xhdpi	
	5.4" FWVGA	5,4"	480x854	mdpi	
	5.1" WVGA	5,1"	480x800	mdpi	
	4.7" WXGA	4,7"	720x1280	xhdpi	
	4.65" 720p (Galaxy Nex...	4,65"	720x1280	xhdpi	
	Tablet				

Search:

Nexus 5

Size: normal
Ratio: long
Density: 420dpi

Buttons: New Hardware Profile, Import Hardware Profiles, Clone Device...

Navigation: Previous, Next, Cancel, Finish, Help



Sous Android Studio

Virtual Device Configuration

System Image
Android Studio

Select a system image

Recommended	x86 images	Other Images	
Release Name	API Level	ABI	Target
Nougat	25	x86_64	Android 7.1.1 [with Google APIs]
Nougat	25	x86	Android 7.1.1 [with Google APIs]
Nougat Download	24	x86_64	Android 7.0 [with Google APIs]
Nougat Download	24	x86	Android 7.0 [with Google APIs]
Marshmallow Download	23	x86	Android 6.0 [with Google APIs]
Marshmallow Download	23	x86_64	Android 6.0 [with Google APIs]
Lollipop Download	22	x86	Android 5.1 [with Google APIs]
Lollipop Download	22	x86_64	Android 5.1 [with Google APIs]

Nougat

API Level
25

Android
7.1.1

Android Open Source Project

System Image
x86_64

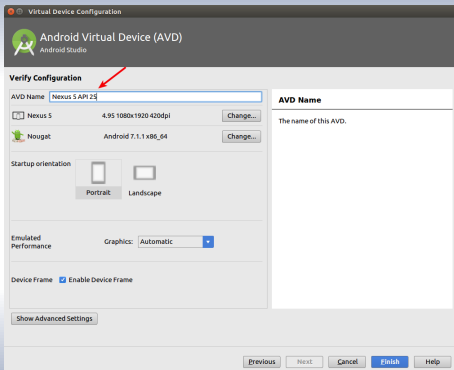
These images are recommended because they run the fastest and include support for Google APIs

Questions on API level?
See the [API level distribution chart](#)

Previous **Next** Cancel Finish Help

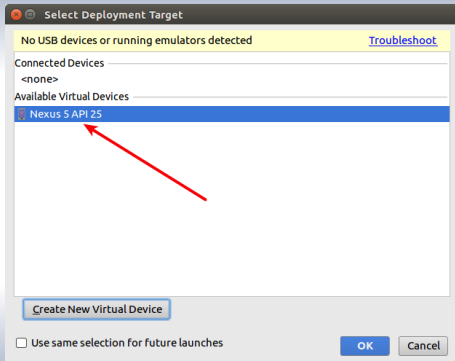


Sous Android Studio





Sous Android Studio





Sous Eclipse :

Android Device Chooser

Select a device with min API level 8.

Choose a running Android device

Serial Number	AVD Name	Target	Debug	State
haier-konnect_350-0123456789A	N/A	✓ 4.4.2		Online
Galaxy_Nexus [emulator-5554]	Galaxy_Nexus	✓ Android 4.4.2	Yes	Online

Launch a new Android Virtual Device

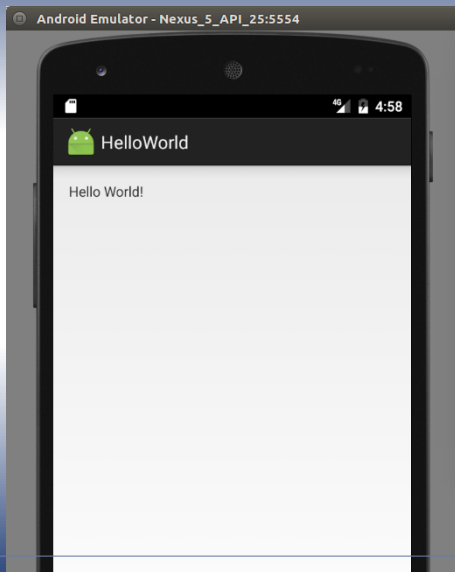
AVD Name	Target Name	Platform	API Level	CPU/ABI
Galaxy_Nexus	Android 4.4.2	4.4.2	19	Intel Atom (x86)
Nexus_7	Android 4.4.2	4.4.2	19	Intel Atom (x86)
AVD_for_Android	Android 4.4W.2	4.4W.2	20	Android Wear Intel Atom (x86)

Use same device for future launches

Buttons: Start..., Details..., Refresh, Manager..., Cancel, OK

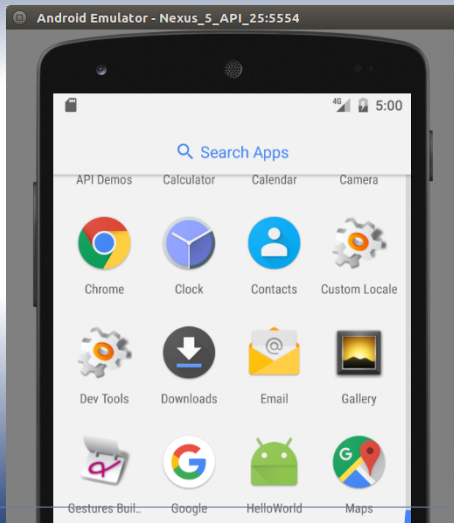


Exécution





L'application est maintenant disponible sur la cible (virtuelle ou non)





Résumé global

- La technologie Android :
 - Noyau Linux
 - Programmation Java
- Programmation Android
 - des outils pour le développement : SDK manager / AVD / un IDE.
 - une structure de projet standardisée (manifest, src, res, etc.)
 - des dispositifs pour le déploiement (virtuels et réels)

Ce cours reprend largement les tutoriaux en ligne proposés par Google : [▶ Android developers](#)



Création d'un projet avec Eclipse

File → New → Android Application Project →

New Android Application

Creates a new Android Application

Application Name:

Project Name:

Package Name:

Minimum Required SDK:

Target SDK:

Compile With:

Theme:

The package name must be a unique identifier for your application. It is typically not shown to users, but it *must* stay the same for the lifetime of your application; it is how multiple versions of the same application are considered the "same app". This is typically the reverse domain name of your organization plus one or more



Paramétrage

New Android Application

Configure Project

Create custom launcher icon

Create activity

Mark this project as a library

Create Project in Workspace

Location:

Working sets

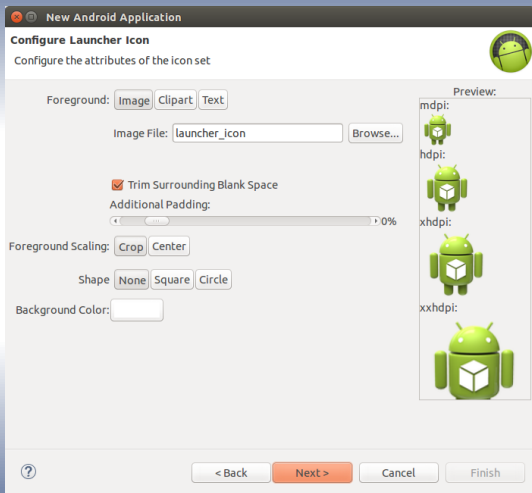
Add project to working sets

Working sets:



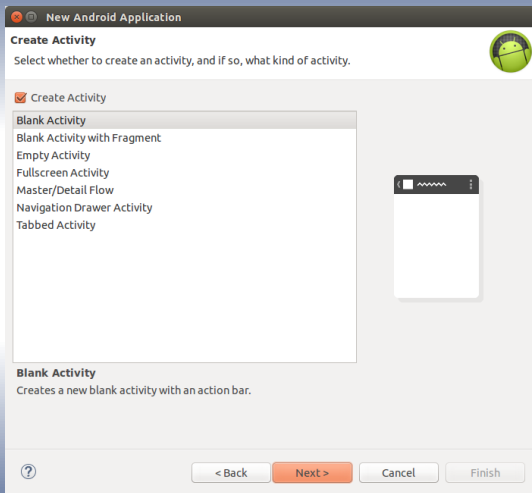
Paramétrage : Icon

▶ plus d'information



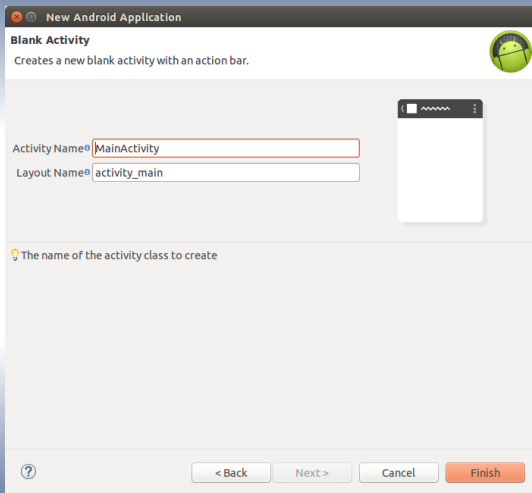


Paramétrage : Blank Activity (hello world)





Paramétrage





Résultat

