ARMY RESEARCH LABORATORY

Installing the ARL Phrase Book Android Application and Configuring its Dependencies

by Michael H Lee

ARL-TN-0664 **February 2015**

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14. ABSTRACT
The Phrase Book is a simple Android application developed by the US Army Research Laboratory for looking up domain-specific phrases in different languages (e.g., Dari, Pashto) and their corresponding English translations. The application contains several third-party applications, which add additional steps to the installation process. Due to these dependencies, the installation is not as simple as installing a typical Android app. This report describes the process of installing the Phrase Book application on an Android device and configuring several additional applications required by the Phrase Book.

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1. Introduction

In 2012, the US Army Research Laboratory (ARL) developed an Android app called the Medical Phrase Book to serve as a bilingual English-Dari glossary of more than 6000 technical medical terms.[1] Since then, new enhancements (e.g., Pashto texts, military terms, additional Dari terms, etc.) were added to the Phrase Book app. In addition, third-party apps (e.g., Carnegie Mellon University's [CMU] Festival Light Dari Text-to-Speech [TTS] Engine, the Dari/Pashto soft keyboard[2]) were integrated into the Phrase Book for additional capability.

Typically, when one installs an Android app, it is as simple as going to the Google Play Store, selecting an app, and clicking on the "Install" button. After a few seconds, the selected app is installed and ready for use. Unfortunately, the same simple installation process cannot be used to install the Phrase Book, because it is not a self-contained app (i.e., it has several dependencies not included as part of the standard installation process). This means that additional apps must be downloaded, installed, and configured by the user prior to using the Phrase Book. For example, the Phrase Book depends on the Dari soft keyboard in order for the user to type Dari phrases, and the configured Dari TTS engine is needed before synthesizing a Dari text into Dari speech. This report documents everything that needs to be prepared and configured on the device before the Phrase Book app can function as intended.

This report is targeted at developers and users with the basic knowledge and understanding needed to install an Android app from a given Application Package (APK) installation file. Currently, the Phrase Book app (and other ARL-developed Android apps mentioned in this report) is only available directly from ARL[3] as an APK file. Users will need the ability to install an app from a standard APK before proceeding. The background on the APK files and the steps for installing an APK are not included in this report.

This report does include the steps required to install a fully working Phrase Book on a fresh out-of-the box Android device, specifically 2012 Asus Nexus 7 tablet. For ARL, the Phrase Book app is typically installed on a brand-new Android device. This report assumes the user is capable of installing from a similar starting point.

2. Initializing a New Android Device Out-of-the-Box (Optional)

An Android device fresh out-of-the-box must be initialized with Google before it can access any Google services (e.g., Google's app store) (Fig. 1). The steps to activate a device are very straightforward. This section describes the activation process and informs the user what information needs to be prepared before proceeding with the activation. Users working with an

existing Android device do not need to follow these initialization instructions and can skip to Section 3. The following screen shots and instructions apply to a 2012 Nexus 7 tablet, which came installed with Android 4.2.1. Users with differing devices or operating system versions may find their steps slightly different than described.

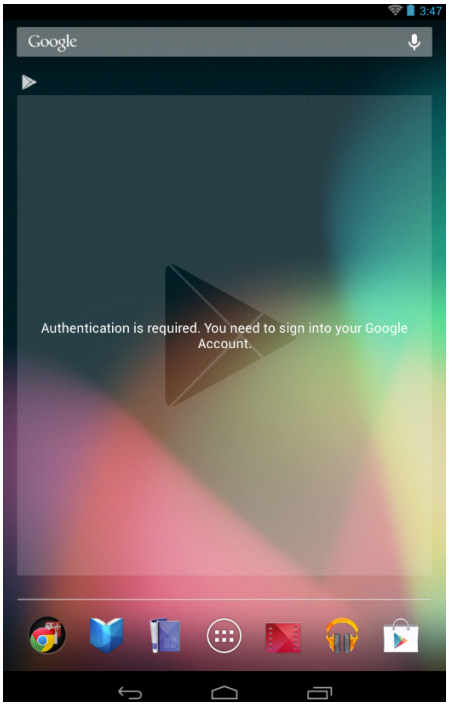

Fig. 1 Initial screen of a new unactivated Android device

1. Power on the device and connect it to a local WiFi connection. Once connected to the Internet, return to the home screen.
2. Click on the center of the screen. The device asks the user to create a new Google account or login with an existing Google account credentials. For official use, it is recommended to create a new account. Click on “New” to create a new Google account (Fig. 2).

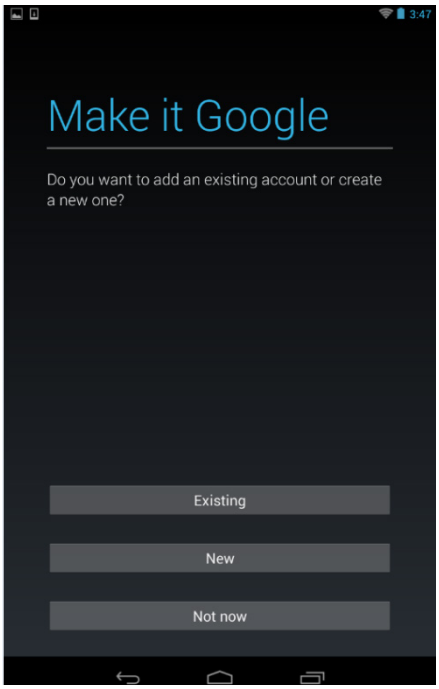

Fig. 2 Request for Google account credentials

3. In the subsequent pages, the device asks for first name, last name, username (i.e., email address), and password. Enter each information item in the appropriate textbox. (Fig. 3). The username selected is the Google email address associated with the new account. Google requires a minimum of 8 characters for the password, and the device will inform the user whether the password is weak or strong.

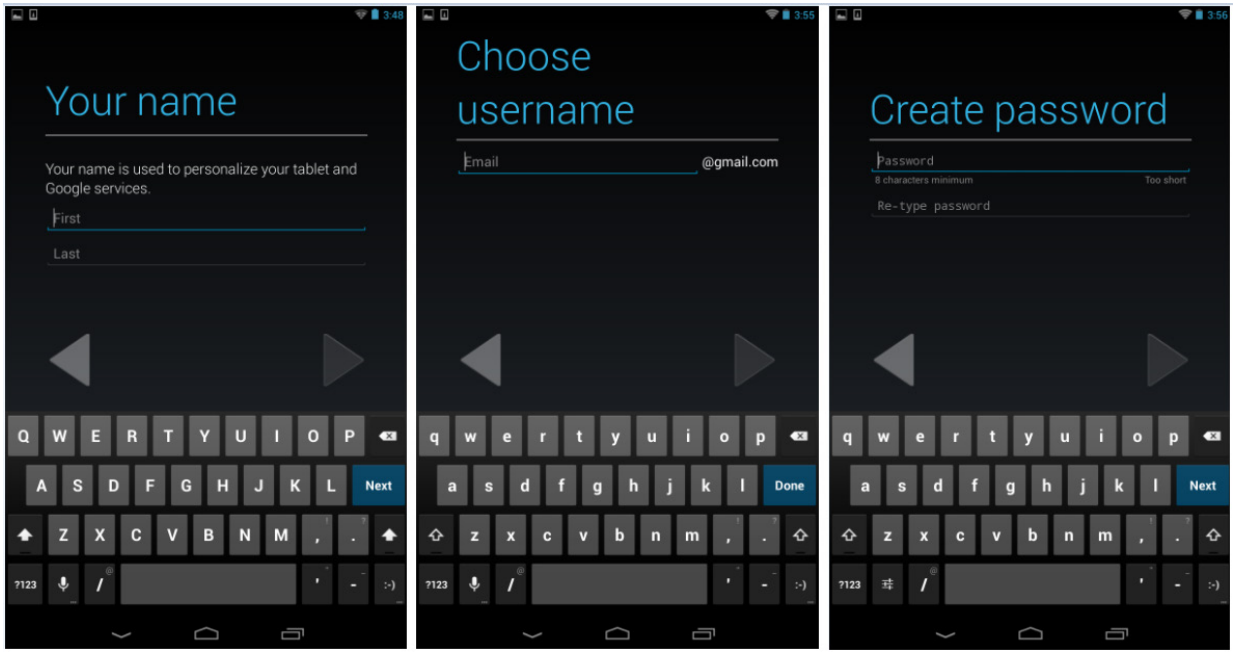

Fig. 3 Creating a new Google account on a 2012 Nexus 7 tablet

4. As a security measure, Google asks the user to choose a security question and an email address to send a verification response if the user forgets the password. Choose a security question (e.g., “First phone number?”, “First teacher’s name?”, etc.) from the drop-down list and type the answer to the question. Also, enter an email address where Google should send email instructions on how to reset the account password (Fig. 4).

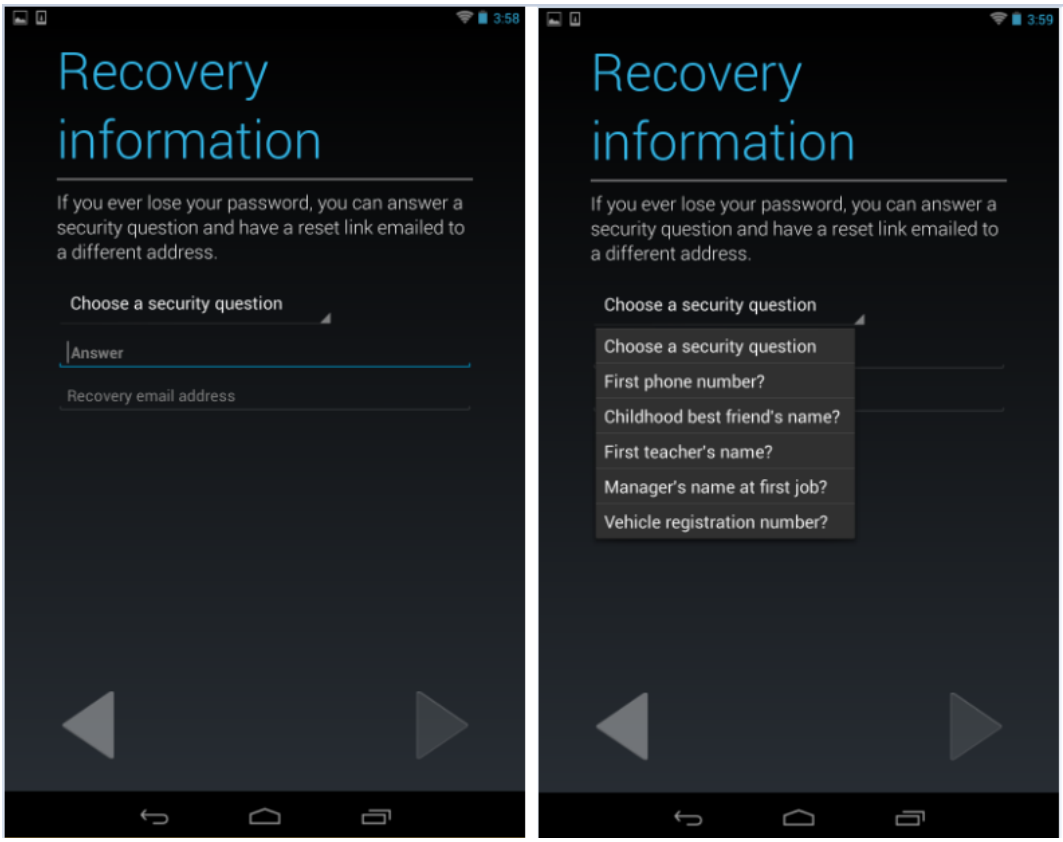

Fig. 4 Selecting a security question and recovery email address

5. When asked to join Google+ (Google’s social media service), click on “Not now” (Fig. 5).

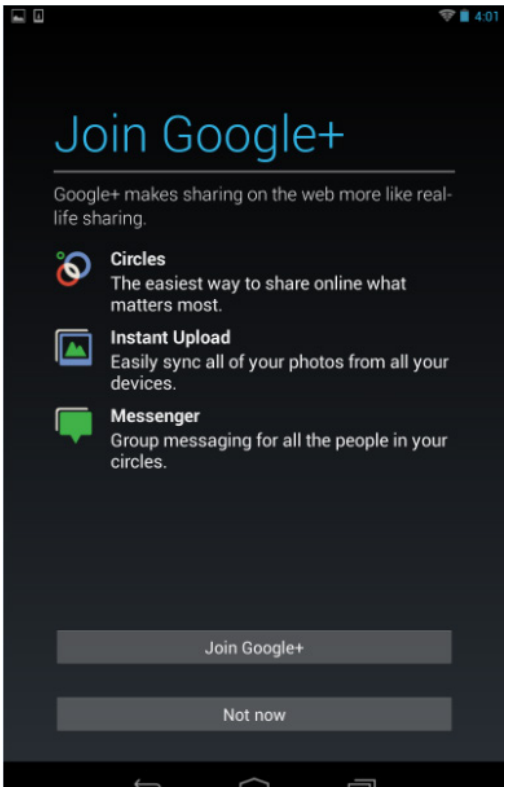

Fig. 5 Click on “Not now” when asked to join Google+

6. Account creation is now complete. Do not enable the checkboxes for “Turn on web history” or “Keep me up to date with news and offers from Google Play.” Finally, the device asks the user to type an obfuscated text displayed on the screen. A confirmation message is displayed (Fig. 6). The device is now activated.

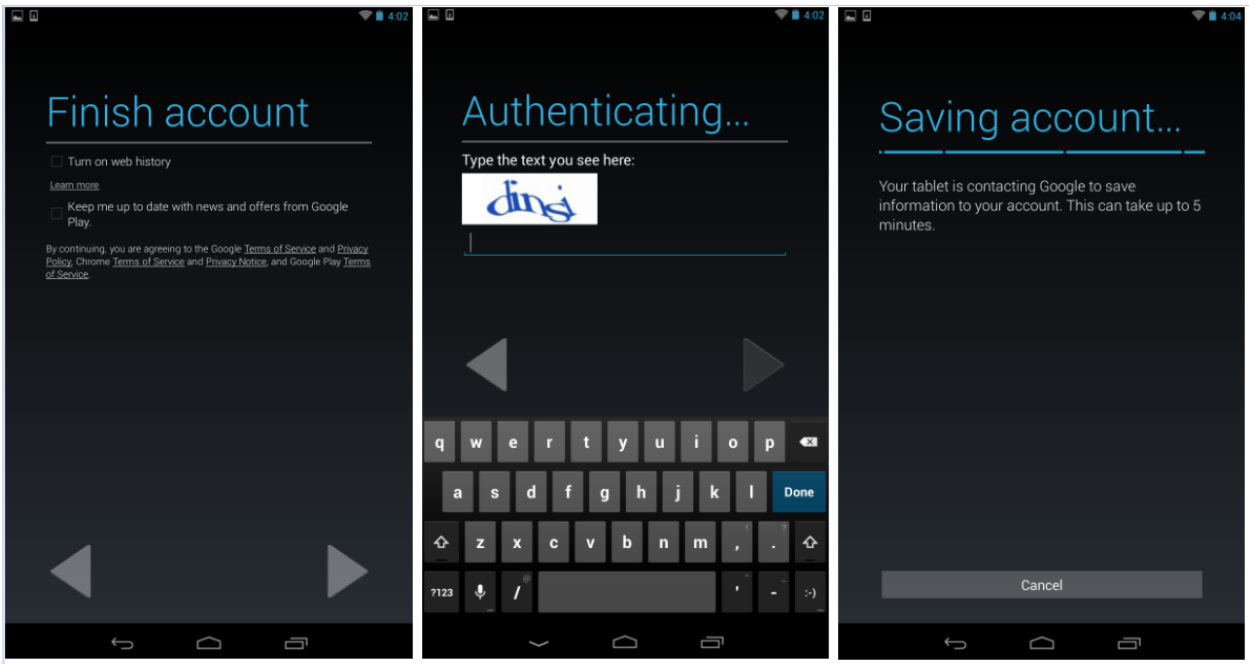

Fig. 6 Completing Google account on the device

7. After a few minutes, the user is automatically notified to update the system (Fig. 7). Alternatively, the user can manually check for system update by going to the following:

   Settings > About Tablet > System Updates > Check now

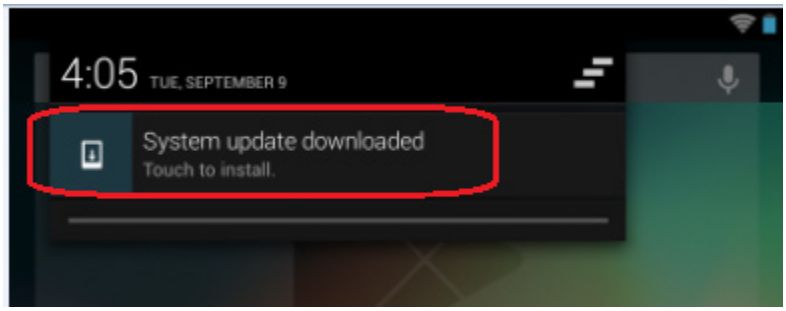

Fig. 7 System update notification

Follow the onscreen instructions to update the system. Each firmware upgrade takes approximately 5–0 min. The installation process reboots the device. Once the system update is complete, it returns to the device home screen. Depending on when the device was manufactured, it may need to update its firmware multiple times (Fig. 8). As of September 2014, the latest available update was Android 4.4.4. The 2012 Nexus tablet used in this report required 4 system updates:

1. Android 4.3 System Update
2. Android 4.4.2 System Update

3. Android 4.4.3 System Update
4. Android 4.4.4 System Update

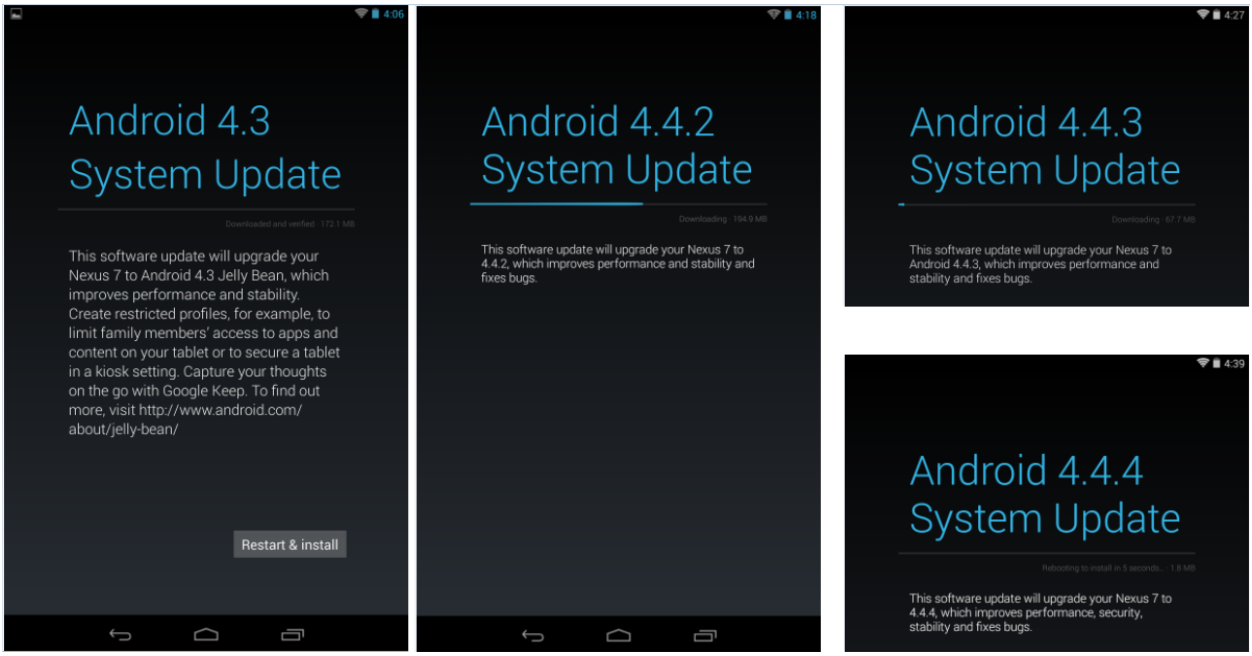

Fig. 8 Android system updates

8. Manually verify the device has the latest version of the firmware by going to the following:

   Settings > About Tablet > System Updates > Check now

If the device is up to date, the device displays "Your system is up to date" (Fig. 9).

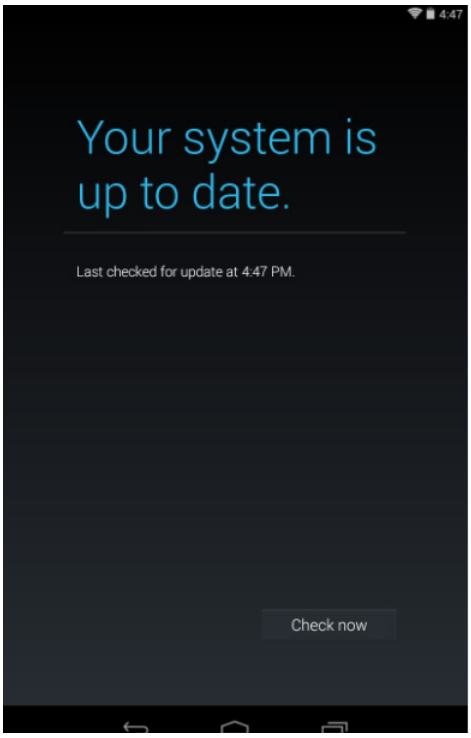

Fig. 9 Up-to-date device confirmation

3. Enabling Developer Mode

An Android device is capable of entering into a “Developer Mode,” which allow users more flexibility in how the device operates (e.g., universal serial bus [USB] debugging, Process Stats, etc.). A completely new device does not start in Developer Mode. The Developer Mode is intentionally hidden by Google to protect unaware users from enabling features that may degrade system performance or open the device to potential vulnerability risks. The user can check if the device is unlocked and capable of Developer Mode by viewing the Settings page. If there is a label titled “Developer options,” then the device is capable of entering into Developer Mode (Fig. 10). However, if there is no label titled “Developer options” in the Settings page (Fig. 11), then the user needs to manually unlock the Developer Mode on the device.

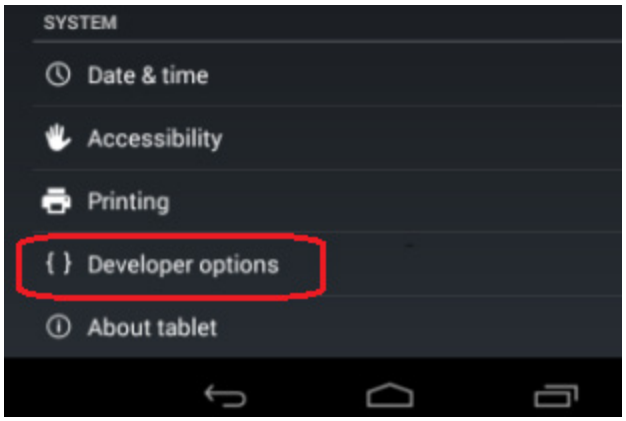

Fig. 10 Android device with Developer Mode unlocked

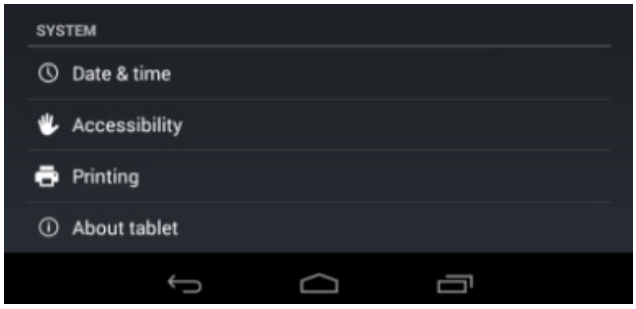

Fig. 11 Android device with Developer Mode locked/hidden

Follow these steps to unlock Developer Mode on a 2012 Nexus 7 Android device (these steps may vary depending on model of the Android device):

1. Enter the Setting page -> About tablet
2. Locate the label titled “Build number”
3. Click on the “Build number” label 7 times.

If Developer Mode activation is successful, the device displays the message “You are now a developer!” on the screen and lists a label titled “Developer options” in the Settings page (Fig. 12).

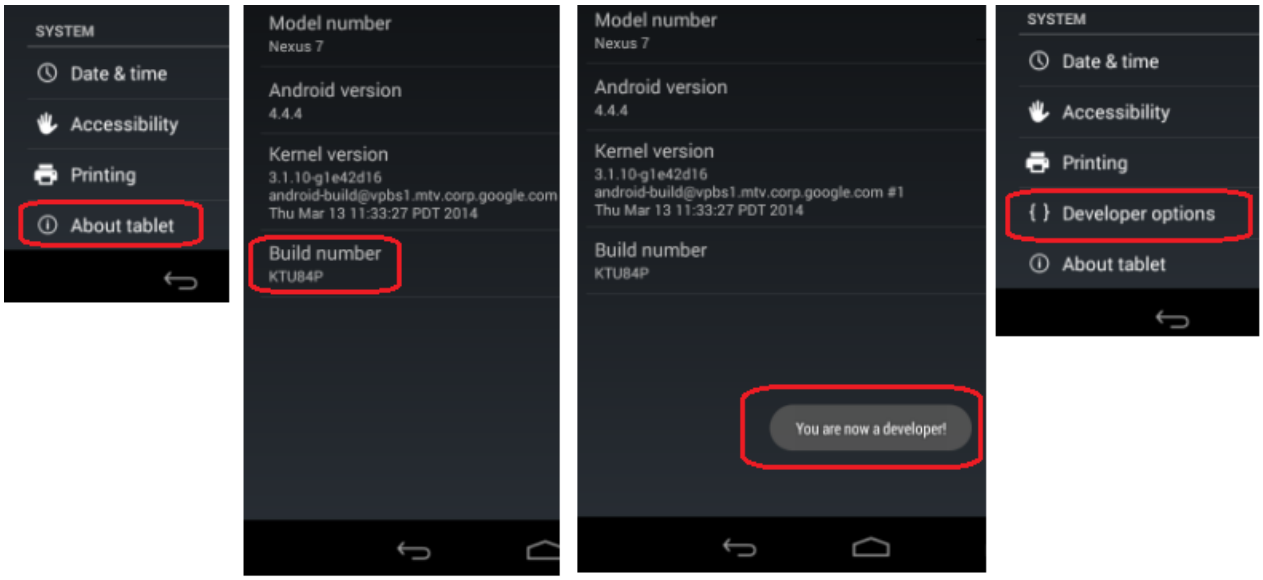

Fig. 12 Unlocking Developer Mode on a 2012 Nexus 7 tablet

Some useful Developer options include the following:

- Stay awake
- USB debugging

4. Installing Apps from the Google App Store

As mentioned earlier, the Phrase Book app uses 2 third-party apps from the Google Play Store, Google's app store. The Google Play Store is accessible by clicking on the white shopping bag icon with the label titled "Play Store" (Fig. 13). Follow the instructions below to find and install the required app and an optional app.

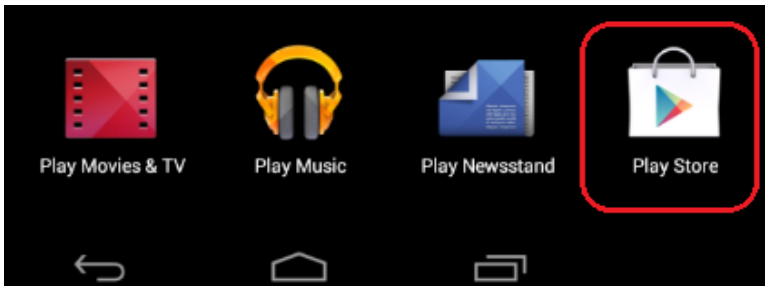

Fig. 13 Google Play Store icon

1. In the Google Play Store search box, search for the phrase "AnySoftKeyboard." As the user is typing the phrase, the drop-down list will automatically update with matching results

(Fig. 14). AnySoftKeyboard is a very popular Android keyboard framework. Click on "INSTALL" to install AnySoftKeyboard to the device (Fig. 15). When the device asks for permission to install, click on "ACCEPT".

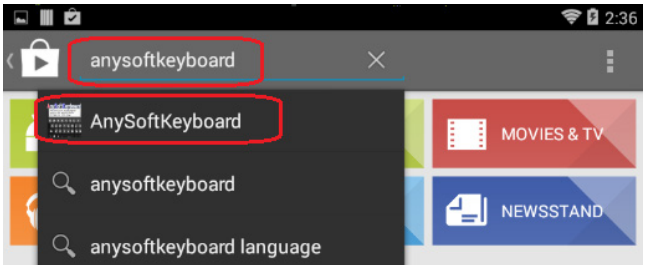

Fig. 14 Searching for "AnySoftKeyboard"

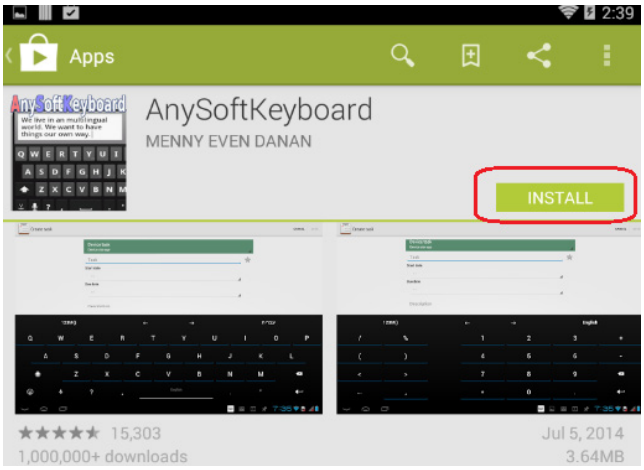

Fig. 15 Install AnySoftKeyboard

2. Users are also recommended to install an optional app called "ES File Explorer File Manager" (Fig. 16). ES File Explorer File Manager is akin to Windows Explorer on the Windows operating system; it is a useful utility to view, manipulate, and open files on the device. A file system browsing app is useful when configuring the Dari TTS engine later in this report.

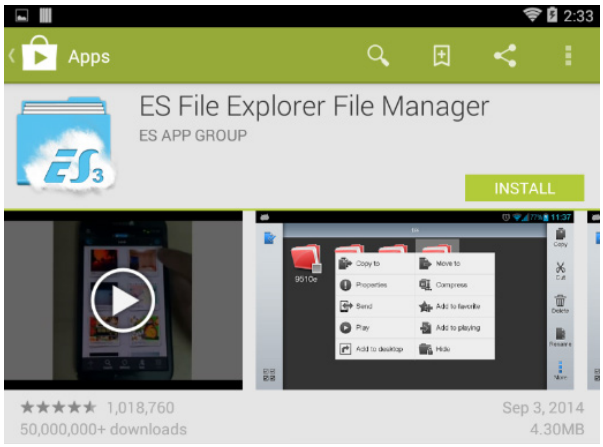

Fig. 16 Install ES File Explorer File Manager (optional)

5. Enabling AnySoftKeyboard as the Default Keyboard

Installing AnySoftKeyboard does not affect the default settings for the device keyboard. The user must manually enable AnySoftKeyboard as the default keyboard from the device Settings page. Navigate to the following:

Settings > Language & input

The Language & input page allows the user to enable installed keyboards and select a default keyboard (and TTS engines). Under the "KEYBOARD & INPUT METHODS" section is a list of available keyboards currently installed on the device. Locate "AnySoftKeyboard" and enable it by clicking on the checkbox. When the checkbox is enabled, a warning message appears. Click "OK" on the warning message (Fig. 17). AnySoftKeyboard is now enabled.

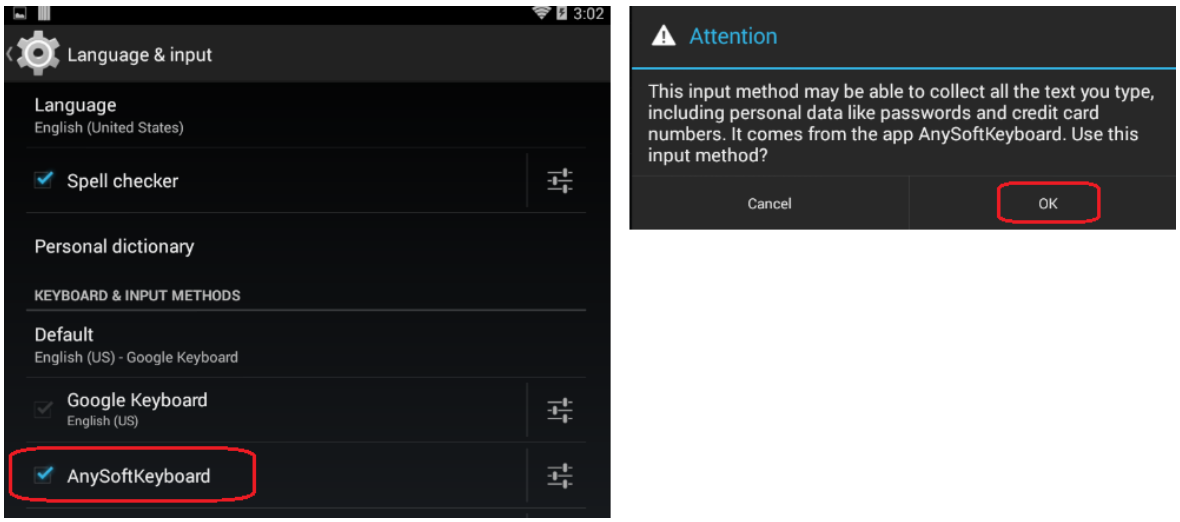

Fig. 17 Enable AnySoftKeyboard in the device Settings page

Next, the device needs to be configured to elevate AnySoftKeyboard as the default keyboard (instead of the Google Keyboard). In the Language & input page, locate the KEYBOARD & INPUT METHODS section and click on the bar labeled “Default”. Note that the currently selected default keyboard is indicated under the “Default” label (Fig. 18). When the new dialog box titled “Choose input method” appears (Fig. 19), select “AnySoftKeyboard” from the list of choices. The “Default” label will now indicate AnySoftKeyboard as the default keyboard (Fig. 20).

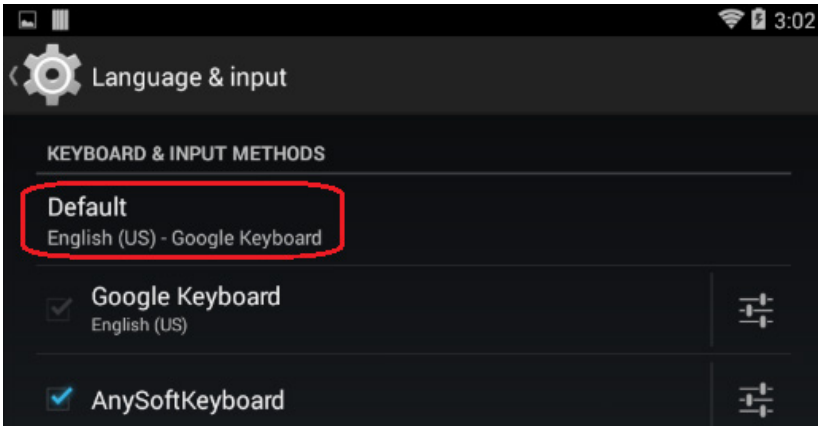

Fig. 18 Default keyboard indicator

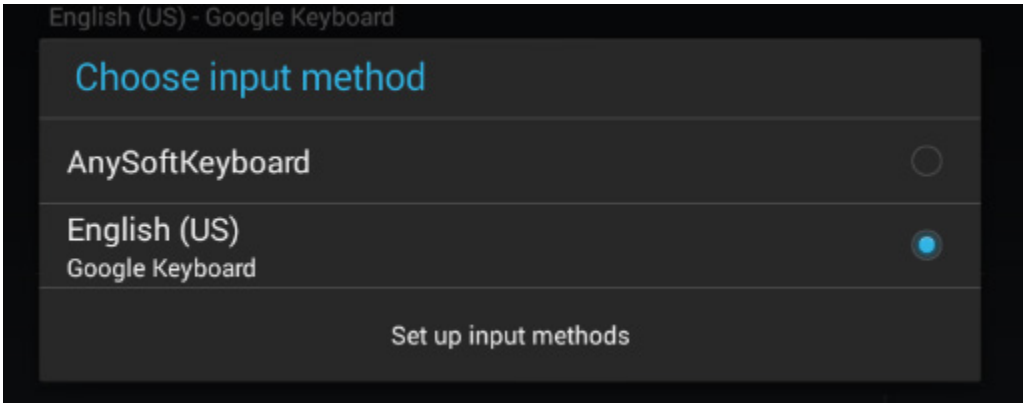

Fig. 19 “Choose input method” dialog box

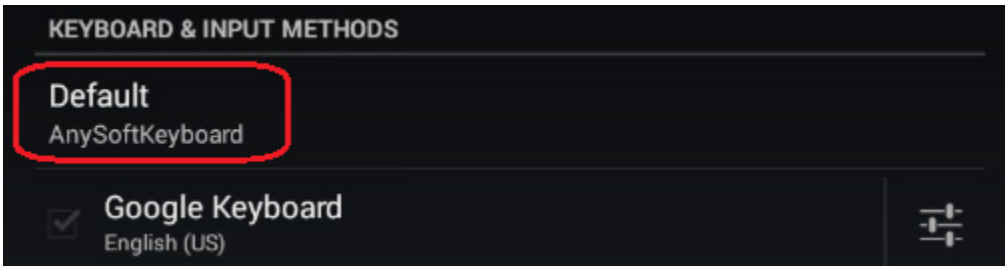

Fig. 20 AnySoftKeyboard selected as the default keyboard

AnySoftKeyboard is now enabled and set up as the default keyboard. When the device cursor is placed in any textbox, a standard English AnySoftKeyboard now appears instead of the out-of-the-box Google keyboard (Fig. 21). Please refer to the AnySoftKeyboard documentation for specific usage and feature information.

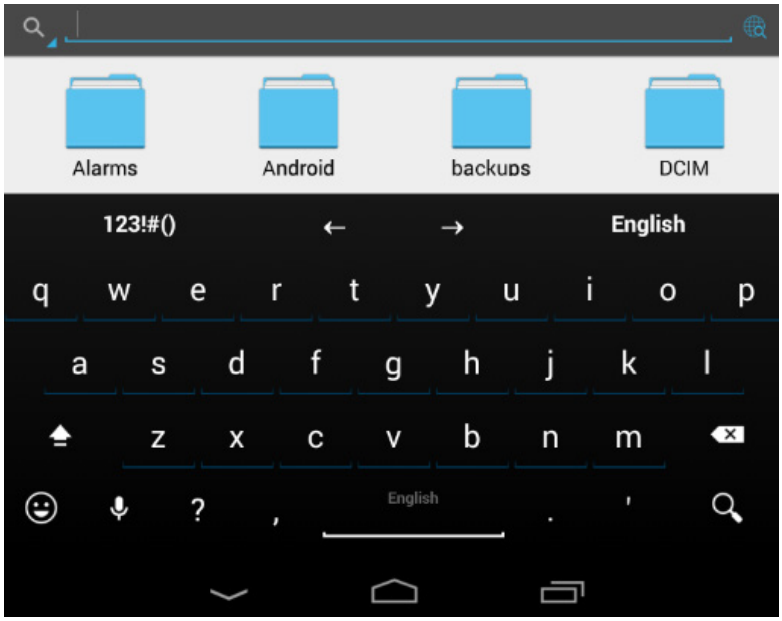

Fig. 21 Standard English AnySoftKeyboard

6. Installing Apps from ARL

As mentioned earlier, please contact ARL to acquire the additional required apps. Currently, ARL provides 3 apps (as APK files):

- Dari and Pashto AnySoftKeyboards. Delivered as a 94-KB AnySoftKeyboardLanguagePackPashto.apk.
- Festival Lite (Flite) TTS Engine and Dari speech module. Delivered as a 14-MB FliteEngine.apk.
- Flite[4] is a TTS Engine developed by Carnegie Mellon University. Please contact Dr Alan Black[5] for more details on Flite.
- Phrase Book. Delivered as a 73-MB DomainTranslator.apk. Note that in this report the app name “Domain Translator” is synonymous with “Phrase Book”.

The most common way to install APK files is by using utility software called Android Debug Bridge (ADB). Details on the operation of the ADB utility is outside the scope of this report; please refer to the ADB documentation for instructions on specific features.

1. Install AnySoftKeyboardLanguagePackPashto.apk by running the following command:

```
adb.exe install c:\Temp\AnySoftKeyboardLanguagePackPashto.apk
```

The console displays the progress of the installation as well as a success/failure message (Fig. 22). Installing this app does not add a new icon to the list of apps on the device, because this app is actually an add-on to AnySoftKeyboard.

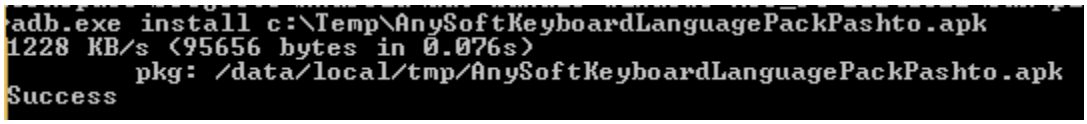

Fig. 22 Installing AnySoftKeyboardLanguagePackPashto.apk

2. Install FliteEngine.apk by running the following command:

```
adb.exe install c:\Temp\FliteEngine.apk
```

The console displays the progress of the installation as well as a success/failure message (Fig. 23). Installing this app does add a new icon labeled “Flite” to the list of apps on the device (Fig. 24).

Fig. 23 Installing FliteEngine.apk

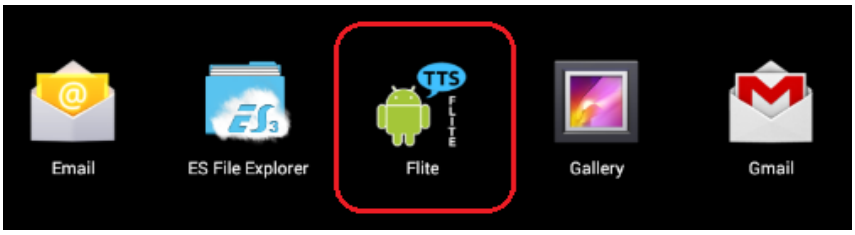

Fig. 24 Flite app icon

3. Install DomainTranslator.apk by running the following command:

```
adb.exe install c:\Temp\DomainTranslator.apk
```

The console displays the progress of the installation as well as a success/failure message (Fig. 25). Due to the relatively large size of this app, it will take approximately 1 min to complete the installation. Installing this app adds a new icon labeled “ARL Domain Translator” to the list of apps on the device (Fig. 26).

```
>adb.exe install c:\Temp\DomainTranslator.apk
1292 KB/s (74951170 bytes in 56.608s)
        pkg: /data/local/tmp/DomainTranslator.apk
Success
```

Fig. 25 Installing DomainTranslator.apk

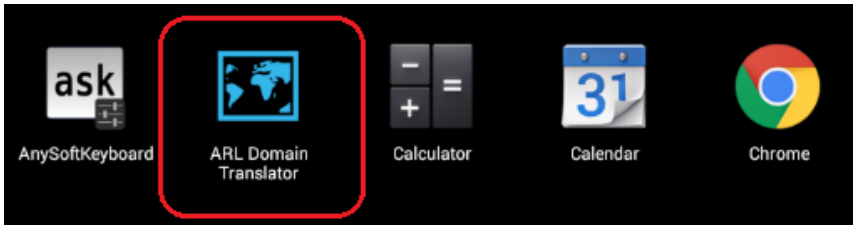

Fig. 26 ARL Domain Translator app icon

7. Configuring ARL Apps

A few of the ARL-provided apps (installed in Section 6) need to be enabled or configured before they are functional.

7.1 Enabling AnySoftKeyboardLanguagePackPashto.apk.

AnySoftKeyboardLanguagePackPashto.apk installs Dari and Pashto keyboards on the device, but they must be manually enabled. Locate the Any Soft Keyboard keyboards selection page by navigating to the following:

List of apps > AnySoftKeyboard > “Go to Settings” link > “Keyboards” bar (Fig. 27)

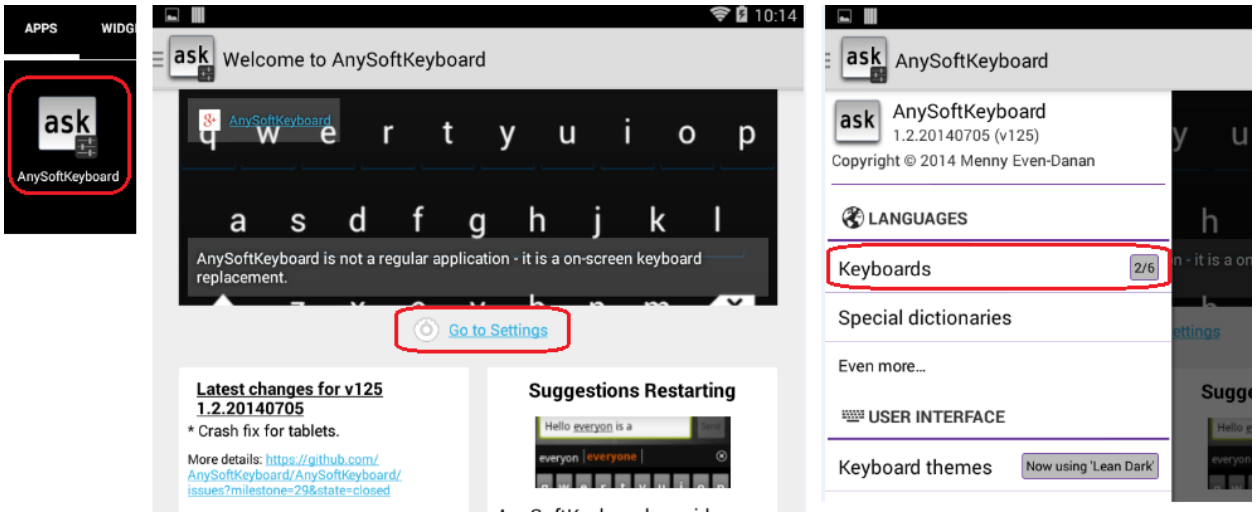

Fig. 27 Navigating to AnySoftKeyboard keyboards selection page

The keyboards selection page lists all available keyboards installed on the device. Locate and click on the checkbox labeled “Pashto keyboard” and “Dari keyboard” (Fig. 28). Pashto and Dari keyboards are now enabled and are available when AnySoftKeyboard is displayed on screen. Also, be sure at least 1 English keyboard is enabled.

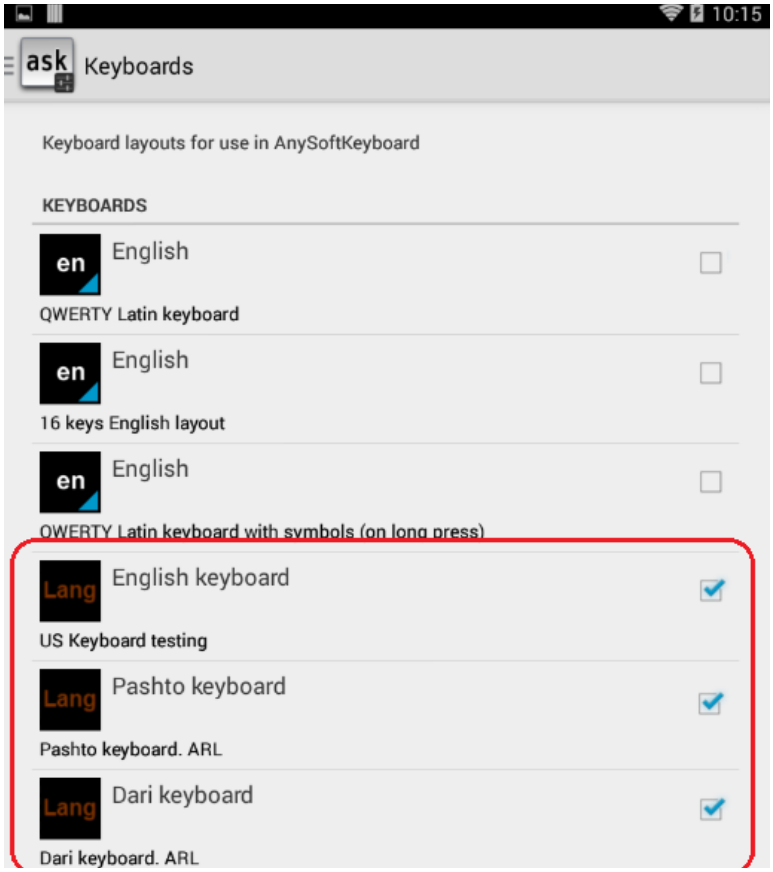

Fig. 28 Enabling Pashto and Dari keyboards

7.2 Configuring FliteEngine.apk and Enabling Dari TTS

FliteEngine.apk includes the Flite TTS engine for Android[6] and the Dari TTS module for Flite. The Flite Android Engine does not contain any voice libraries out-of-the-box, and each voice must be downloaded separately. Therefore, Flite is not able to initially process any TTS requests. The easiest way to get started is by allowing Flite to download few English voice libraries from the Internet. Be sure to verify that the device is connected to the Internet before continuing. Locate the Flite Voice Management page by navigating to the following (Fig. 29):

List of apps > Flite > Manage Voices

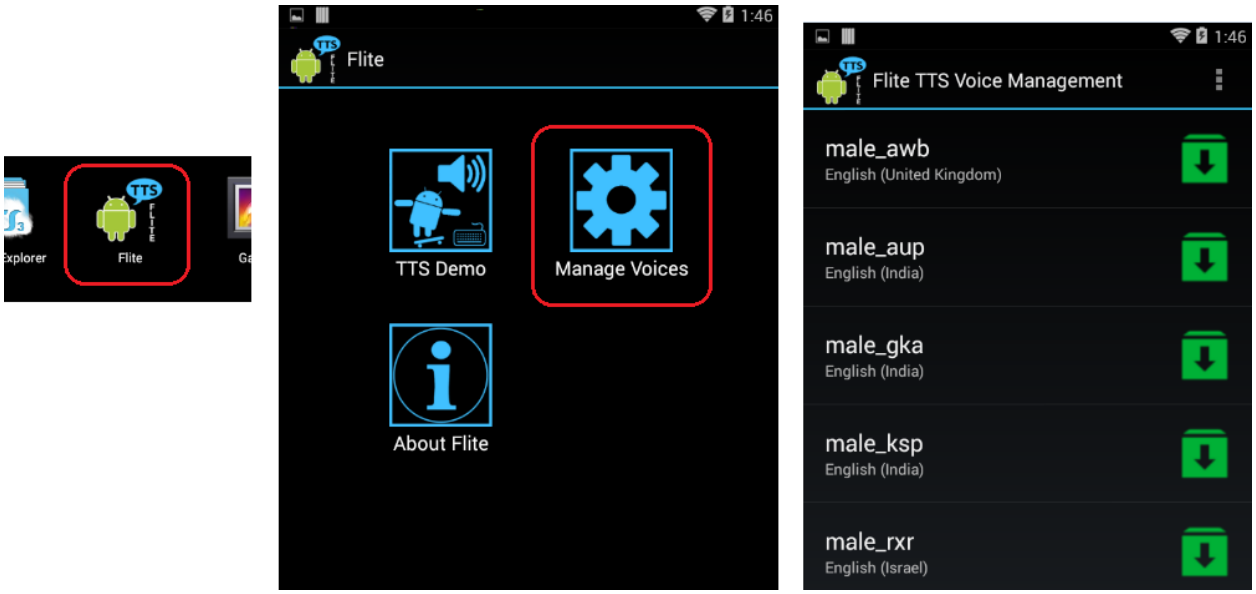

Fig. 29 Navigating to the Flite Voice Management page

The Voice Management page lists all voice libraries available for download. Currently, only English voice libraries are available. The Dari voice library mentioned in this report must be installed manually. The purpose of this step is to automatically allow Flite to create the required file and folder structures on the device. Otherwise, the user must create the file and folder structures manually.

Click on any or all desired English voice libraries to install on the device. For example, click on "male_bdl" and "male_rms" to download 2 English male voice libraries. Once the voice library is downloaded, the green icon changes to a red trash bin icon, indicating that the voice library is now installed on the device (Fig. 30).

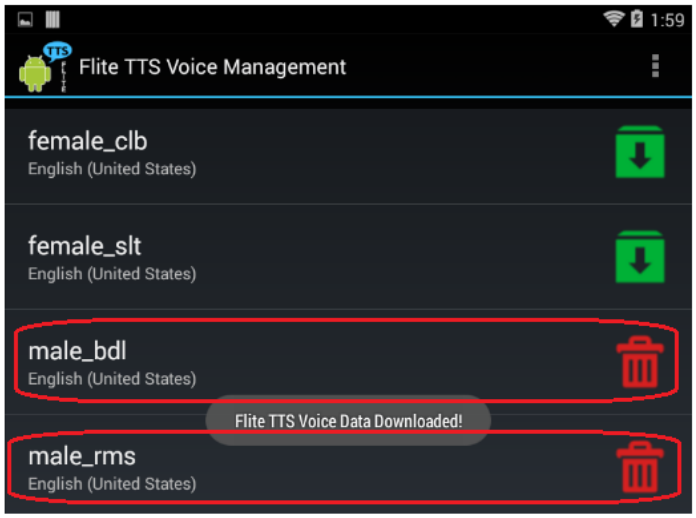

Fig. 30 Downloading English voices from the Flite Voice Management page

Allowing the Flite TTS Voice Manager to download a voice library creates voice manifest file and folder structure on the device. Use a folder browsing app (e.g., ES File Explorer) to browse to the external storage folder. The exact path of the external storage may differ from device to device. On a 2012 Nexus 7 tablet, the external storage path is "/sdcard". Verify that the voice manifest file exists in the following (Fig. 31):

<EXT_STORAGE>/flite-data/cg/voices-20120731.list

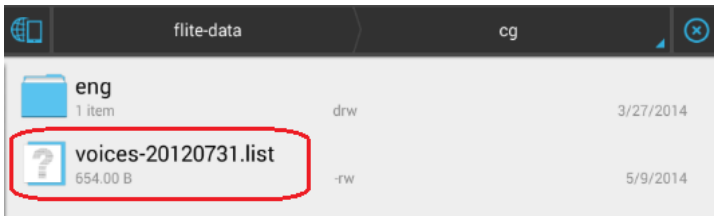

Fig. 31 Path to the Flite voice manifest file

This text file contains all information about the list of downloadable voices (e.g., Language, Country, Variant, MD5 checksum, etc.). This information is what Flite uses to list the voice libraries in the Flite Voice Management page.

Verify that the voice libraries downloaded exist in the external storage:

<EXT_STORAGE>/flite-data/cg/eng/USA/male_bdl.cg.flitevox
<EXT_STORAGE>/flite-data/cg/eng/USA/male_rms.cg.flitevox

At this point, Flite and its components are verified. Now the Dari TTS voice library must be enabled. Unlike the English voices that were downloaded in the previous step, the Dari voice library does not need to be downloaded, because it is already included in FliteEngine.apk. The Dari voice library was integrated into the Flite app when ARL generated the FliteEngine.apk file. However, the Flite voice manifest file must be manually edited to enable the Dari voice library.

1. Use a file editing app (e.g., ES File Explorer) to open the voice manifest file (i.e., <EXT_STORAGE>/flite-data/cg/voices-20120731.list).
2. Copy the line that defines the "male_rms English (United States)" voice and paste it at the end of the file. On the line that was just pasted, replace the string "male_rms" with "dari_cg3". Save and close the file. Both "male_rms" and "dari_cg3" will share the same MD5 hash value (Fig. 32).

Fig. 32 Add an entry for "dari_cg3"

3. Use a folder browsing app to go to the folder where the English voice libraries (e.g., male_rms.cg.flitevox) were downloaded. Copy "male_rms.cg.flitevox" and save it as "dari_cg3.cg.flitevox" (Fig. 33).

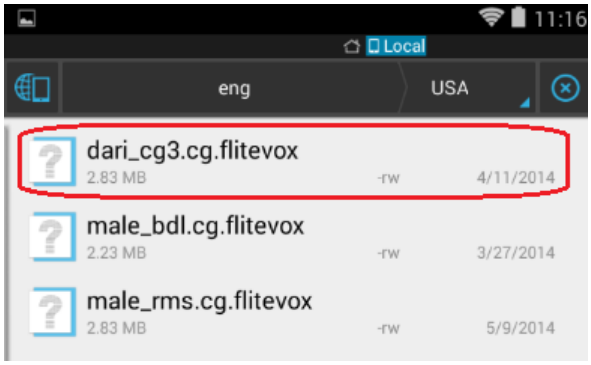

Fig. 33 Copy "male_rms.cg.flitevox" and save as "dari_cg3.cg.flitevox"

As observed, "dari_cg3.cg.flitevox" is merely a placeholder. The real data model of the Dari TTS module is integrated in FliteEngine.apk. More details on why this was necessary is described in an ARL technical note *Migrating Dari Clustergen Flite Text-to-Speech Voice from Desktop to Android*.[7] Dari TTS voice is now enabled. The Flite Voice Management page lists "dari_cg3" at the bottom and displays the red trash bin icon to indicate Dari is an available voice on the device (Fig. 34). Note that Management page shows "English (United States)" associated with "dari_cg3". This is a side effect of using "male_rms" English voice as a source of the Dari surrogate Flitevox file. The English indicator can be safely ignored.

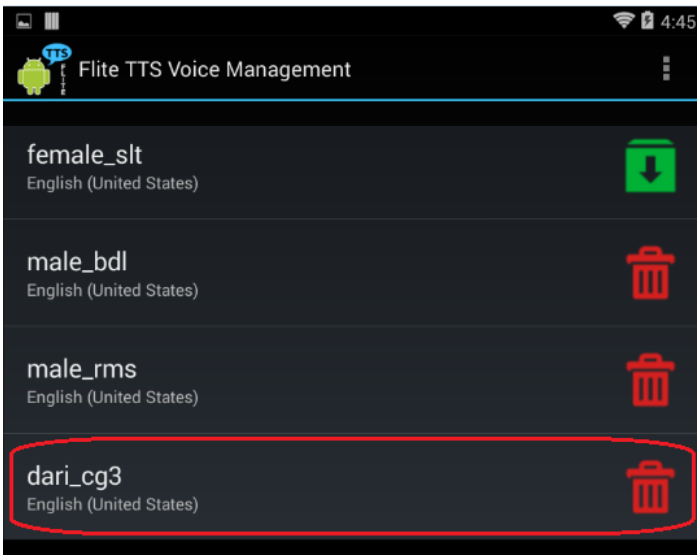

Fig. 34 Dari listed as a selectable voice in the Flite TTS Voice Management page

Finally, in order to invoke the Flite Dari voice, the device's default TTS engine must be set to "Flite TTS Engine". Update the device's TTS settings page by navigating to the following:

Device Settings > Language & input > Test-to-speech output > PREFERRED ENGINE

Then simply select "Flite TTS Engine" from the list of choices to set it as the default TTS engine (Fig. 35).

To set a default voice for the Flite TTS Engine, click on the slider icon on the right side of the "Flite TTS Engine" label, and then select any available English voice under the Language section (Fig. 36).

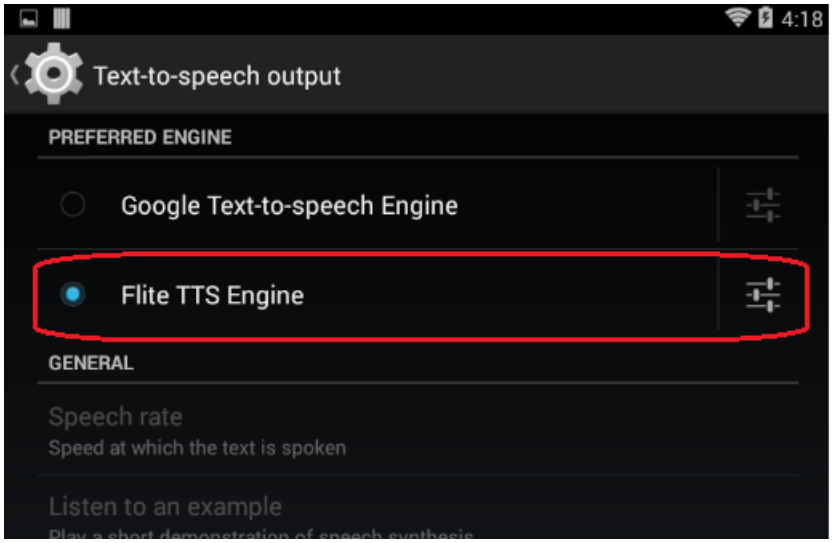

Fig. 35 Device's preferred TTS engine settings page

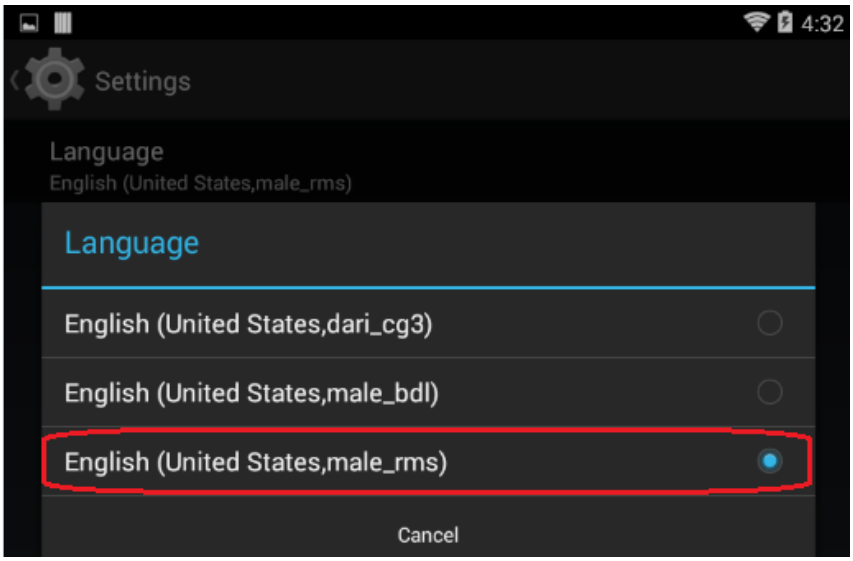

Fig. 36 Setting a default language and voice for the Flite TTS Engine

8. Placing App Icons to the Home Page (Optional)

The installation of the ARL Phrase Book app is now complete. The Phrase Book app is launched by clicking on the icon labeled “ARL Domain Translator”. On a fresh Android device, the main home screen is occupied by a large Google app. To save time accessing the Phrase Book and its associated apps, users are recommended to clear the home page and place frequently used apps on the home page (Fig. 37).

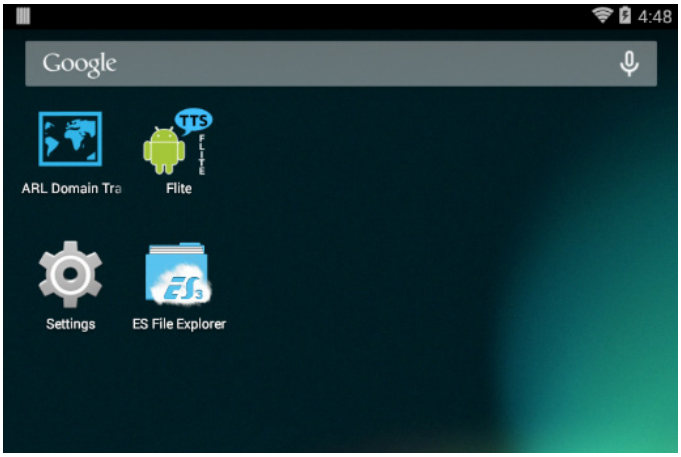

Fig. 37 Reorganized home page

9. Conclusion

This report described all the steps required to initialize a new Android device, and acquire and install the ARL Phrase Book app. Unfortunately, installing the Phrase Book app is not as easy as installing any other apps found in the Google Play Store. The installation process involves many steps due to dependencies on other apps. Exacerbating the lengthy installation is that a few apps (including the Phrase Book) require installing an APK file. The scope of this report is limited to the installation process of the Phrase Book and its dependent apps, and does not describe features and usage instructions of the Phrase Book app or its associated apps.

10. References

1. Winkler R, Metu S, LaRocca S, Jahed G. English-to-dari and dari-to-english medical phrasebook android application software system documentation, Adelphi (MD): US Army Research Laboratory (US); 2012. Report No.: ARL-TR-5975.
2. Lee M. Portable android dari and pashto soft keyboard, Adelphi (MD): US Army Research Laboratory (US); 2013. Report No.: ARL-TN-0560.
3. Email address for ARL Android apps: Michael.h.lee.civ@mail.mil.
4. Flite 1.5.6. download page. http://tts.speech.cs.cmu.edu/aup/distr/android/flite-1.5.6-current.tar.bz2 (accessed September 2014).
5. Email address for Dr Alan Black: awb@cs.cmu.edu.
6. Flite TTS Engine for Android description page. https://github.com/happyalu/Flite-TTS-Engine-for-Android/#introduction (accessed September 2014).
7. Lee M. Migrating dari clustergen flite text-to-speech voice from desktop to android, Adelphi (MD): US Army Research Laboratory (US); 2014. Report No.: ARL-TN-0632.

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