Cross-platform Development for Sailfish OS and Android: Architectural Patterns and "Dictionary Trainer" Application Case Study

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Introduction

- There are a lot of mobile platforms on the market
- End-user applications should support multiple platforms
- Business applications should provide native interface

Mobile applications development for multiple platforms

- Every popular mobile platform has unique look and feel
- Every platform provides native incompatible tooling
- You might need to use separate teams to develop such solution

Cross-platform Development

Cross-platform development presumes the use of a single technology to develop application for several platforms

- Decreases the time to deliver application to all platforms
- Decreases the number of technologies used
- Does not guarantee the bug-free environment
- Might not provide native look and feel of each platform

Sailfish OS

- Qt framework is the way to develop native application
- Alien Dalvik project allows to run Android applications

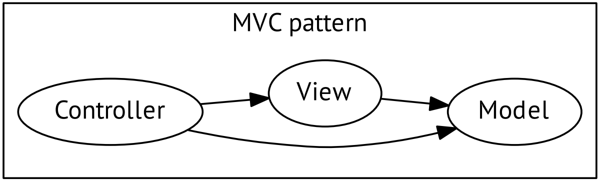
Cross-platform Development using Qt

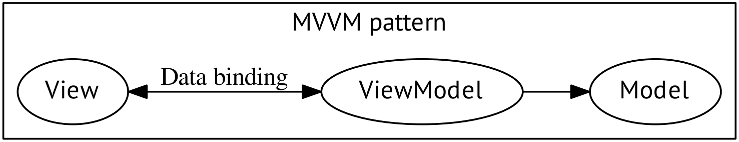
- Qt Quick is a modern way to develop user interface
- Qt provides native look for Android, iOS
- Qt allows rapid development with JavaScript and allows to fine-tune bottle necks with C++
- Native look-and-feel is not only in styling

Choosing an Architecture

- Qt does not force any architectural pattern, but provides tools
- The choice of the architecture affects how much code can be reused across different platforms
- We have considered following candidates: MVC, MVVM, Flux

Brief overview of MVC and MVVM

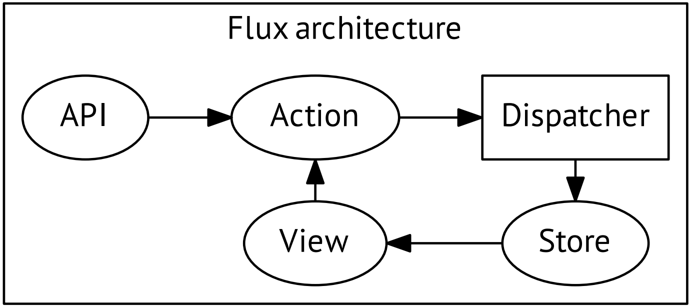




MVVM/MVC Issues

The growth of the application may lead to a growth of connections between views and models that are difficult to track and maintain

Flux architecture overview



- Flux architecture was proposed by Facebook to support development of large web applications using React
- Flux is based on the unidirectional data flow

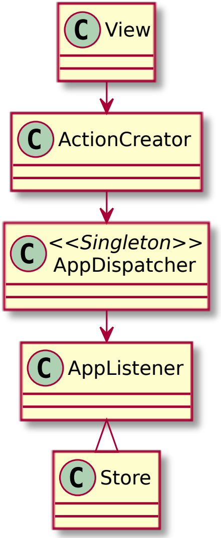
Implementation of Flux

We have used QuickFlux library to implement Flux architecture

- *AppDispatcher* implements *Dispatcher* component and delivers messages
- *AppListener* listens for action notifications
- *ActionCreator* eases creation of actions

In our application

- *View* is responsible for displaying data from stores and invoking actions
- *Store* waits for actions, modifies itself and notifies / manages the *View*



Approach. Handling C++ Code

- C++ handles heavy-duty, non-visual parts
- Qt framework API is already cross-platform

Initialization issue

- Sailfish OS uses *libsailfishapp*
- Android uses standard Qt Framework approach

You should include code for both platforms into the application

```
#if defined(Q_OS_ANDROID)
    // Android-specific code
#else
    // Sailfish OS-specific code
#endif
```

Approach. Handling QML Code

QML code handles both the *View* and *Store*

Store responsibilities

- Manages application data storage
- Manages the navigation

Both platforms provide page stack, but in a different way

```
if(Qt.platform.os === "linux") {
  // Sailfish OS-specific code
} else if(Qt.platform.os === "android") {
  // Android-specific code
}
```

Only *push*, *pop*, *replace* actions handlers are separated

Approach. Handling QML View

- Android and Sailfish OS user interface is quite different
- Android phones provide physical buttons
- Sailfish OS actively uses gestures

It is not possible to provide look and feel only by changing style

Technical differences

- Qt provides Android style for Qt Quick Controls
- Sailfish OS provides Silica to build
- Sailfish OS includes the *Cover* - extra view

Approach. Other files

The project consists not only from application code

- Icons and translations are shared between versions
- Platform-specific files take place in a common project – they are ignored by non-target platform

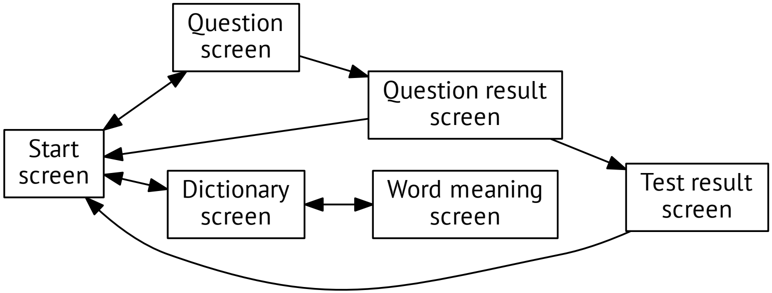
Android-specific resources

- Aplication manifest
- Gradle build scripts
- Keystore

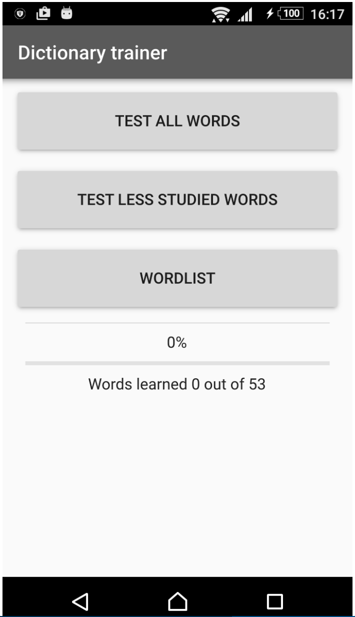
Sailfish OS-specific resources

- Application launch files
- RPM build files (.yaml, and .spec)

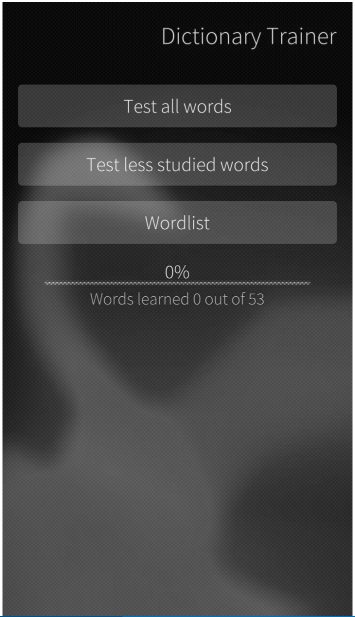
Dictionary Trainer application



Screen examples. Start screen

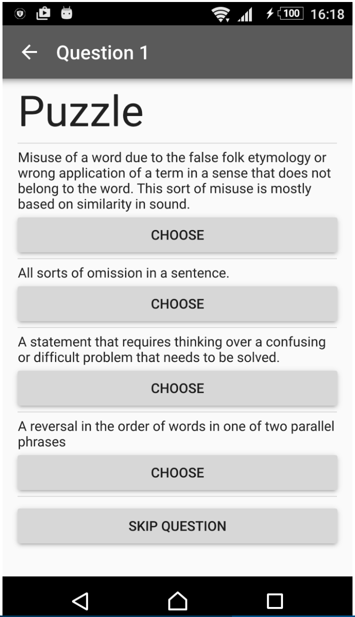


Words learned 0 out of 53



Words learned 0 out of 53

Screen examples. Question screen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Question 1

Puzzle

Misuse of a word due to the false folk etymology or wrong application of a term in a sense that does not belong to the word. This sort of misuse is mostly based on similarity in sound.

CHOOSE

All sorts of omission in a sentence.

CHOOSE

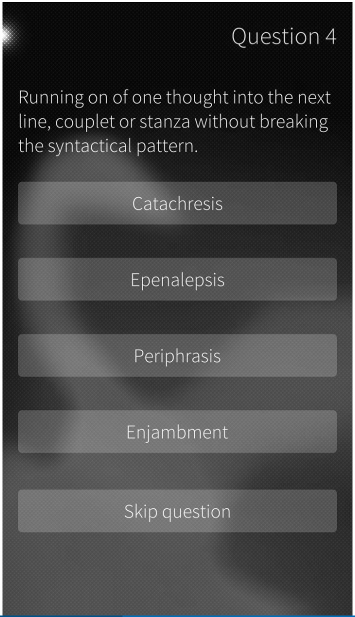
A statement that requires thinking over a confusing or difficult problem that needs to be solved.

CHOOSE

A reversal in the order of words in one of two parallel phrases

CHOOSE

SKIP QUESTION


Question 4

Running on of one thought into the next line, couplet or stanza without breaking the syntactical pattern.

Catachresis

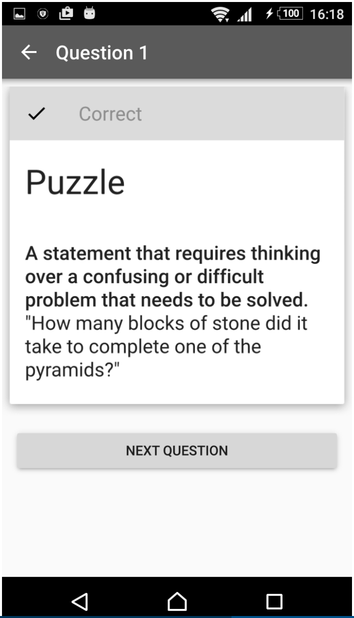
Epenalepsis

Periphrasis

Enjambment

Skip question

Screen examples. Question screen



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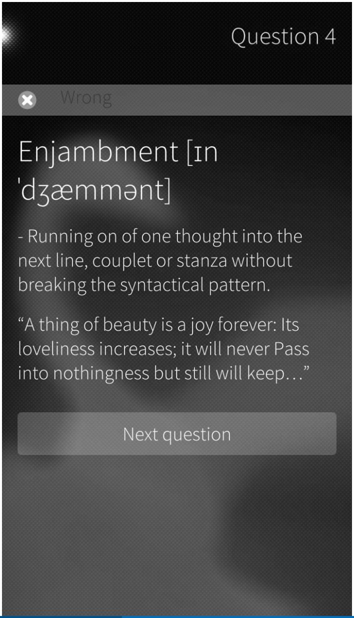
Question 1

✓ Correct

Puzzle

A statement that requires thinking over a confusing or difficult problem that needs to be solved. "How many blocks of stone did it take to complete one of the pyramids?"

NEXT QUESTION



Question 4

Wrong

Enjambment [ɪn 'dʒæmmənt]

- Running on of one thought into the next line, couplet or stanza without breaking the syntactical pattern.

“A thing of beauty is a joy forever: Its loveliness increases; it will never Pass into nothingness but still will keep…”

Next question

Conclusion

- The approach allows to quickly and easily develop applications for Android and Sailfish OS that look and behave natively
- Mostly all platform-specific code vent to the *View* layer
- Even though Sailfish OS allows to launch Android application without making any changes to them, such applications will not look and behave native on Sailfish OS and therefore will lead to a poor user experience
- Moreover, usage of Qt framework allows to compile created applications for other platforms (such as iOS). Therefore, the approach may be extended to support other platforms