

Itus: An Implicit Authentication Framework for Android

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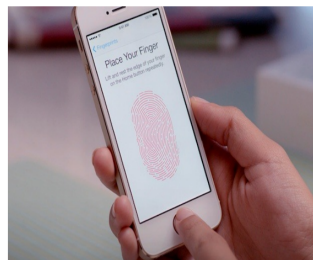
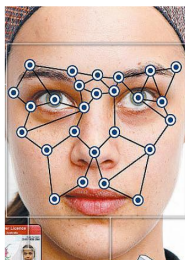
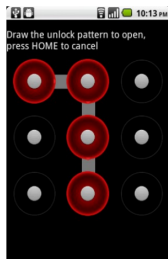
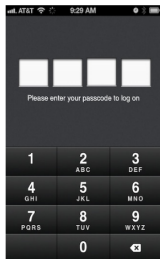
MobiCom 2014

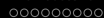


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Why Implicit Authentication?

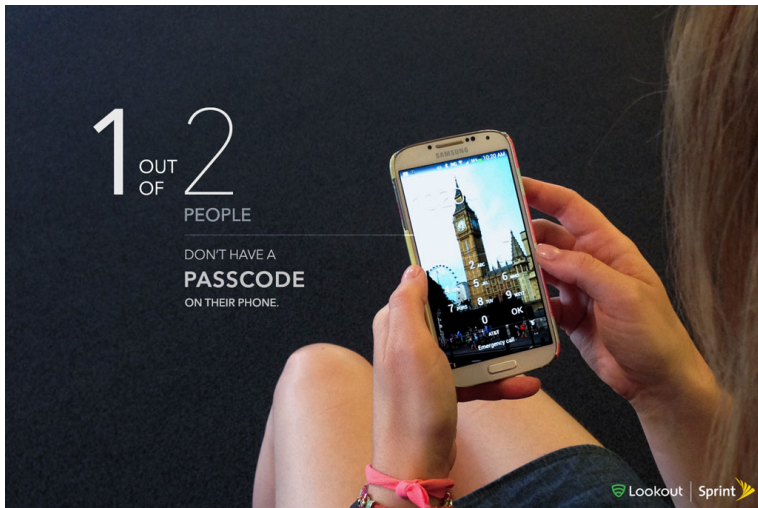




Why Implicit Authentication?



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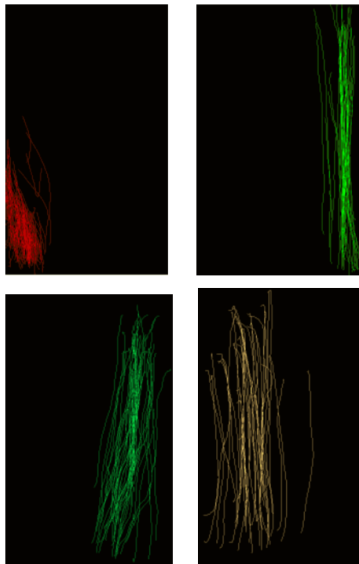


1 OUT OF 2
PEOPLE

DON'T HAVE A
PASSCODE
ON THEIR PHONE.

Lookout | Sprint

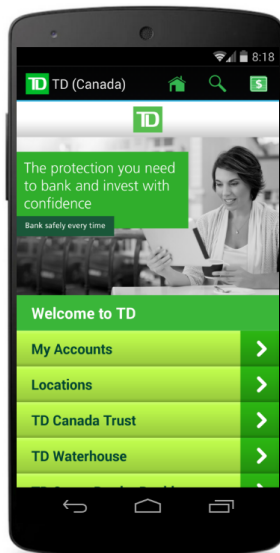
Why Implicit Authentication?



Itus

- **Itus** is an implicit authentication (IA) framework for Android
- For app developers:
 - Add IA to existing apps by changing as few as two lines of code
 - Get customized recommendations for IA schemes and configuration, based on the behaviour of the app
 - Fine-tune parameters and behaviour using expert knowledge
- For IA researchers and developers:
 - Test proposals on real apps without constant re-engineering
 - Easily extend Itus to include new machine learning algorithms, feature sets, parameterizations, etc.
 - Able to distribute standalone extensions independently

App-specific functionality



For App Developers

Easy to use

```
122 public class MainActivity extends SecureActivity
123     implements IToolbarsContainer, OnTouchListener,
124     IDownloadEventsListener {
125
126     @Override
127     public void onCreate(Bundle savedInstanceState) {
128         super.onCreate(savedInstanceState);
129         INSTANCE = this;
130         /*create an Instance of Touchalytics classifier
131          * & start the Itus thread*/
132         (new Touchalytics()).start();
```

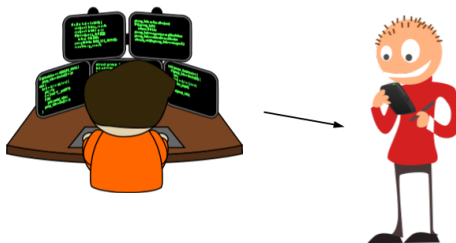
Configurable

```
126 @Override
127 public void onCreate(Bundle savedInstanceState) {
128     super.onCreate(savedInstanceState);
129     INSTANCE = this;
130
131     /*Configure & launch Itus*/
132     Itus itus = new Itus(this);
133     String [] featureList = {"Start X", "Start Y",
134                             "Average Velocity", "Interstroke Time"};
135     Classifier svm = new SVMClassifier(
136         featureList.length, "negative_instances");
137     svm.setFeatureScaling(true);
138
139     Measurement touch = new Touch();
140     touch.setFeatureList(featureList);
141     itus.useMeasurement(touch);
142     itus.setTrainingSize(100);
143     itus.useClassifier(svm);
144     itus.start();
```

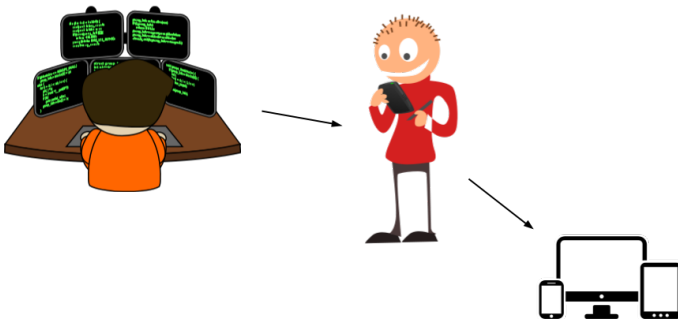
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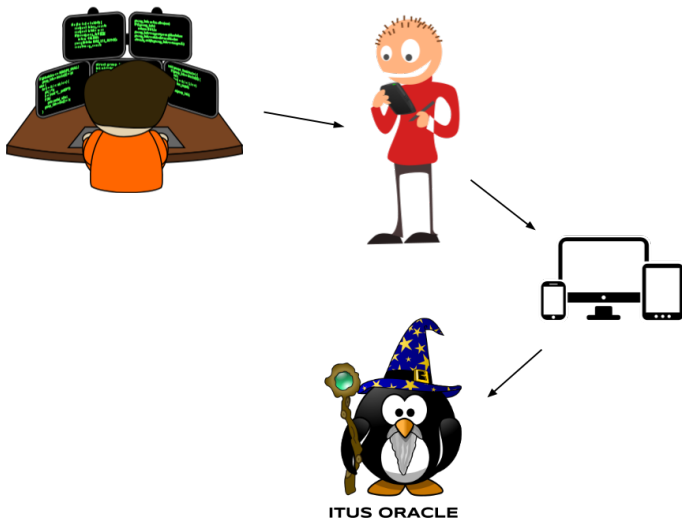
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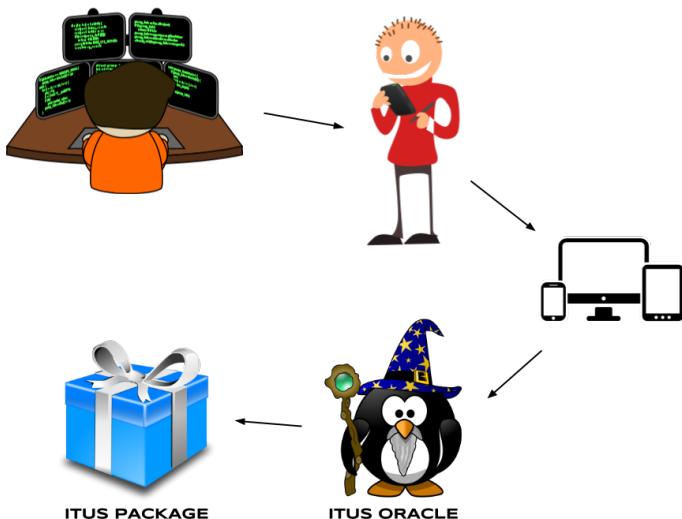
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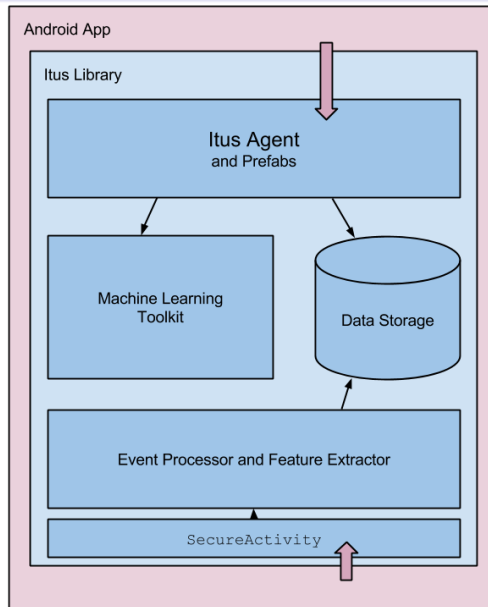


Customized



For Researchers and IA Developers

Architecture



Prefabs

- Prefabs are pre-configured instances of the Itus Agent
- ...can specify classifiers, feature subsets, parameters, etc.
- ...allow an app developer to pick a prefab and go

Machine Learning Toolkit

- Contains **Classifier** objects, each implementing a single machine learning algorithm
- Developers implement only **train** and **classify** methods in order to add new algorithms

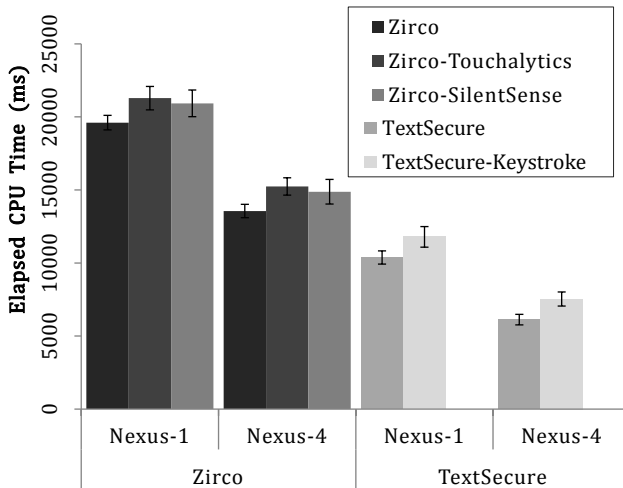
Event Processor

- Developers create **Measurement** classes (e.g. Touch, Keystroke, Movement)
- User input events are centrally managed and delivered by a Dispatcher object
- Measurement objects only need to process input data into a numeric feature vector

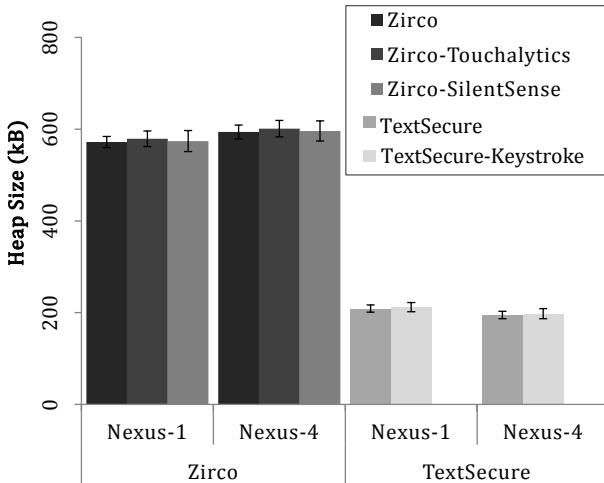
Performance

- Created three Itus Prefabs using different machine learning algorithms and feature sets
 - Touch-based, movement-based, and keystroke-based
- Added to two open-source Android apps
 - Zirco web browser and TextSecure SMS messenger
- Measured library overhead in terms of CPU, memory, and battery

CPU Overhead



Memory Overhead



Also in the paper:

- Implementation details
- Detailed explanation of developer workflows
- More performance evaluation
 - Broken down by initialization, feature extraction, training, and classification
- Links to code repository

Conclusion

Itus is an application-level implicit authentication framework for Android that is:

- easy** can be deployed by developers with minimal LoC
- extensible** subcomponents can be improved iteratively
- flexible** support for application-specific functionality
- fast** minimal, *tuneable* performance overhead

<https://crysp.uwaterloo.ca/software/itus/>