What they are doing with my smart phone?

Android and Database

- Users are NOT provided enough information about apps when they install them
- Many sensitive data is stored in database (e.g., images, call log, contact, browser history, etc)
- Apps can access public or other apps private DBs via content provider or via direct queries

AQUA

- To provide more information about app – DB interactions, we are developing AQUA
- AQUA is built on top of dedexer, a dex code de-compiler
- Model dex instructions
- Use dataflow analysis
- Build CFGs and propagate values on string in the CFGs
- Extract approx. SQL queries and DBs that are used in apps

Example code

Java code

```java
1. void stringAppend(int param)
2. {
3.    String q1 = "select * from tab1 where "
4.    String qr = null;
5.    if(param == 0){
6.        qr = q1 + " col1 = 1 ";
7.    }
8.}
```

Dex Instruction models

```java
1. Int a = 0;
2. String b = ""
3. while(a<10){
4. ...
5. ...
6. ...
7. }
```

Example SQL

```sql
Select * from tab1 where col = 1
```

Results

- Ran AQUA on top 50 apps on Market
- Identified about 2,400 queries
- Public DBs were used about 570 times
- Average memory use was about 58MB/app
- Average execution time was about 50s/app

Future work

- Research on DB sharing between apps via content providers and via SQLite
- Identify patterns of sensitive data leaks or malicious apps using DBs
- Provide end-users with more detailed information about how apps use private data