

Bonus paper:
**Apex: Extending Android Permission Model
and Enforcement with User-defined Runtime
Constraints**

Mohammad Nauman, Sohail Khan, Xinwen Zhang

accepted as a short paper to ASIACCS 2010
(but this is based on the full version)

Motivation

- Android takes a simple approach to permissions
 - SEND_SMS allows unlimited usage of SMS
 - no way to pick and choose which perms an app gets
 - no way to revoke permissions after the fact

Example Apex Policies

```
mms_count_allow("edu.ringlet.Ringlet" as Ringlet,  
                "android.permission.SEND_SMS" as MMS):  
  Ringlet.sentMms <= 5 ^  
  Ringlet.lastUsedDay = System.CurrentDay  
    → permit(Ringlet, MMS);  
  Ringlet.sentMms' = Ringlet.sentMms + 1;  
  
mms_count_deny("edu.ringlet.Ringlet" as Ringlet,  
               "android.permission.SEND_SMS" as MMS):  
  Ringlet.sentMms > 5 ^  
  Ringlet.lastUsedDay = System.CurrentDay  
    → deny(Ringlet, MMS);  
  
reset_mms_count("edu.ringlet.Ringlet" as Ringlet,  
                "android.permission.SEND_SMS" as MMS):  
  Ringlet.lastUsedDay != System.CurrentDay  
    → permit(Ringlet, MMS);  
  Ringlet.lastUsedDay' = System.CurrentDay;  
  Ringlet.sentMms' = 1;
```

```
deny_gps("edu.ringlet.Ringlet" as Ringlet,  
         "android.permission.ACCESS_FINE_LOCATION" as GPS):  
  System.CurrentTime > 1700 ∨ System.CurrentTime < 0900  
    → deny(Ringlet, GPS);
```

```
restrict_internet("edu.ringlet.Ringlet" as Ringlet,  
                  "android.permission.INTERNET" as Net):  
  true → deny(Ringlet, Net);
```

Figure 2: Example Apex Policies

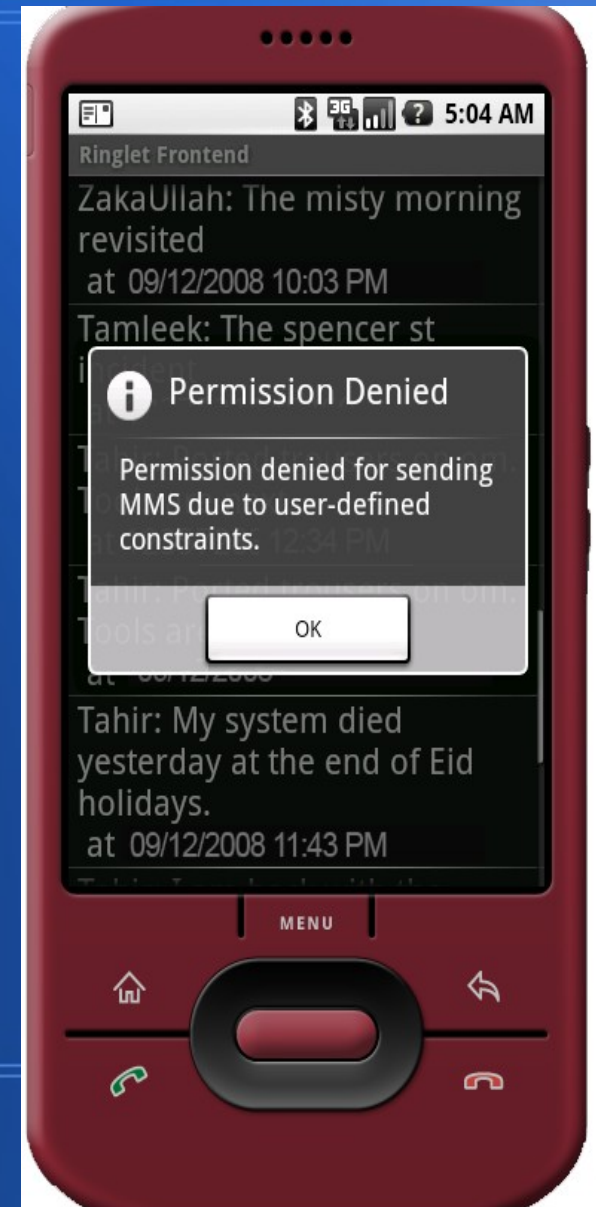
Examples, cont.

```
<Policies TargetUid="10029">
  <Policy Effect="Permit">
    <Permission>android.permission.SEND_SMS</Permission>
    <Constraint CombiningAlgorithm="edu:android:apex:ALL">
      <Expression FunctionID="edu:android:apex:less-than-equal">
        <ApplicationAttribute AttributeName="sentMms" default="0">
          <Constant>5</Constant>
        </ApplicationAttribute>
      </Expression>
      <Expression FunctionID="edu:android:apex:date-equal">
        <ApplicationAttribute AttributeName="lastUsedDay"
          default="eval(day(System.CurrentDate) - 1)">
          <SystemAttribute AttributeName="CurrentDate">
            </SystemAttribute>
          </ApplicationAttribute>
        </Expression>
      </Expression>
    </Constraint>
    <Updates>
      <Update TargetAttribute="sentMms">
        <Expression FunctionID="edu:android:apex:add">
          <ApplicationAttribute AttributeName="sentMms" default="0">
            <Constant>1</Constant>
          </ApplicationAttribute>
        </Expression>
      </Update>
    </Updates>
  </Policy>
  <Policy> ... </Policy>
</Policies>
```

Figure 4: XML Representation of an Apex Policy

Runtime policy enforcement

- Apex informs the user when it blocks an access



Runtime policy enforcement, cont.

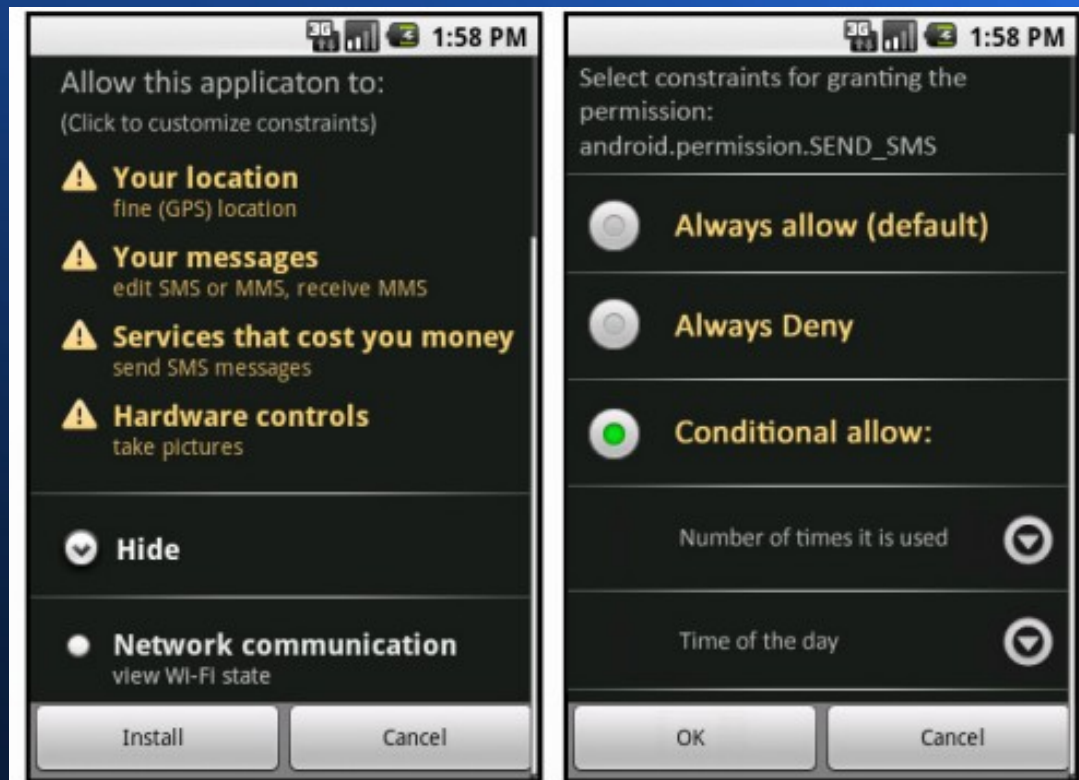


Figure 6: Poly Installation Interface: By clicking on a permission, the user can deny or impose constraints on that permission while still granting all others.

