Antonio Ken Iannillo
Dependability Assessment of Mobile Computing Systems

Tutor: prof. Domenico Cotroneo

XXX Cycle - First Year Presentation

Background

- Master Science degree:
  - cum laude in "Ingegneria Informatica" at University of Naples Federico II

- Type of Fellowship:
  - P.O.R. F.S.E.

- DIETI group:
  - MobiLab

- Cooperation:
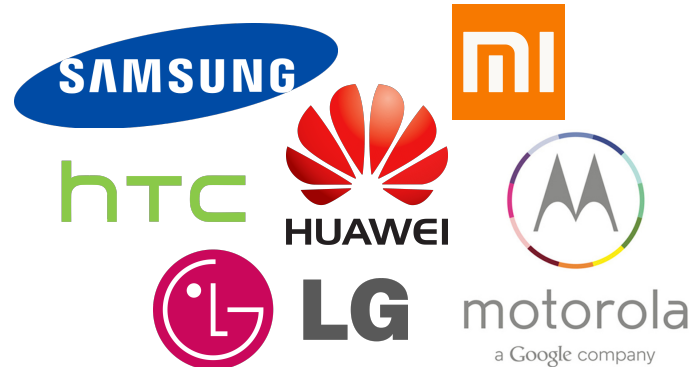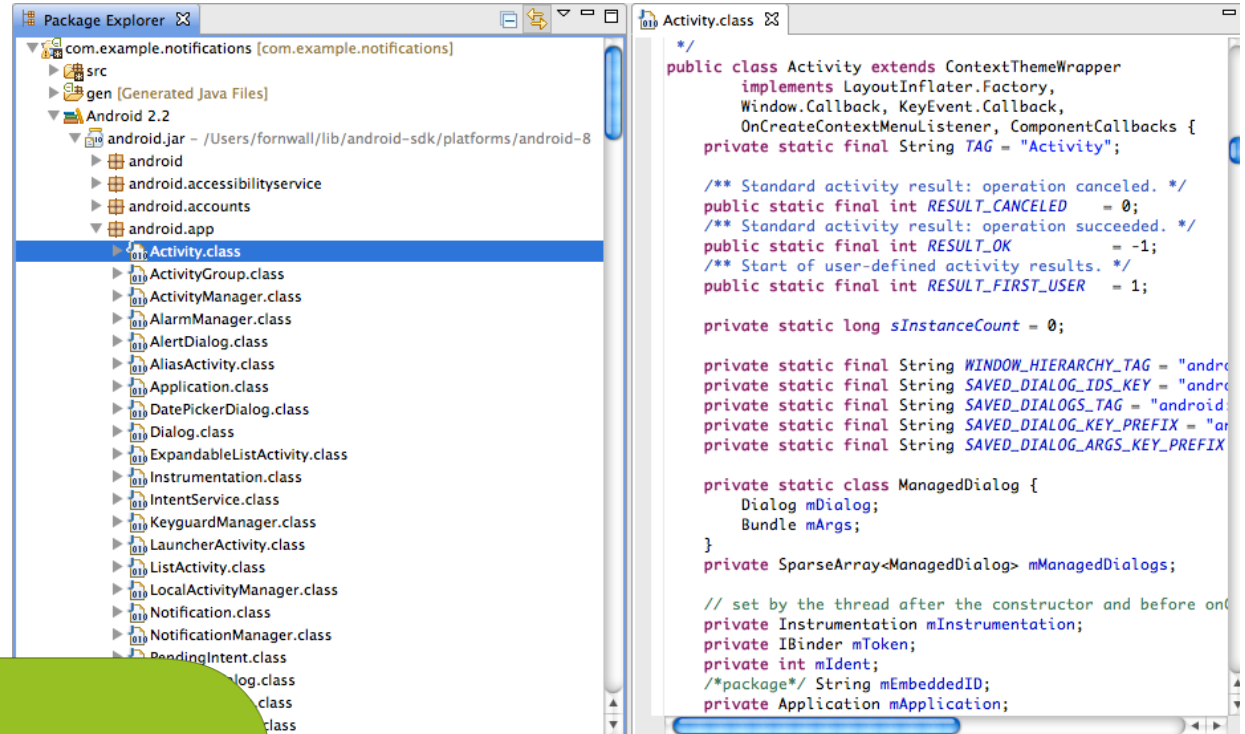 - Critiware s.r.l.
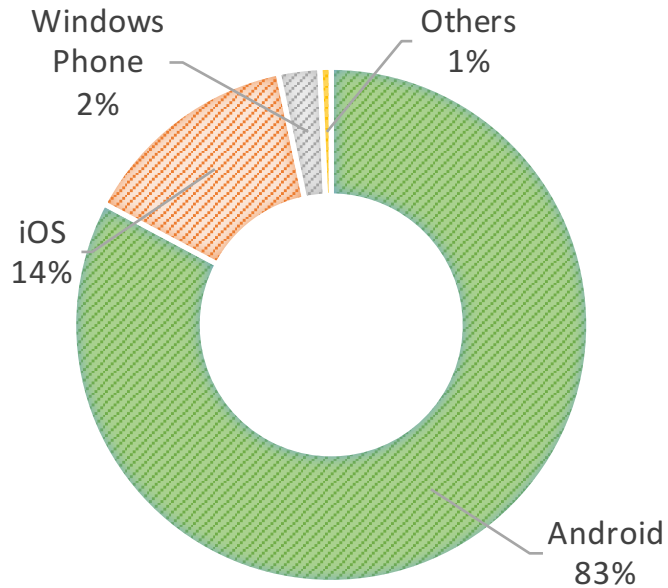
Mobile devices and us

The Internet of Things

HOW CAN A MANUFACTURER ASSESS THE DEPENDABILITY OF ITS MOBILE DEVICES?

Antonio Ken Iannillo

3

Android

Others 1%

Windows Phone 2%

iOS 14%

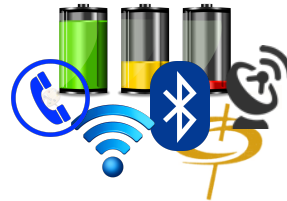Android 83%

Android Fault Injection Testing

Workload
- Application in use
- Active services
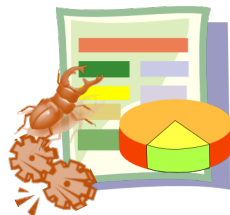- User input to the device

Contextload
- State of the device
- Input from the environment

Faultload
- Library of actual hardware/software fault to emulate

DEPENDABILITY ASSESSMENT

PASS
Android is tolerant to the fault in that context

FAILED
Android cannot handle the fault in that context

- Failure type (did the system or app fail? Crash or freeze?)
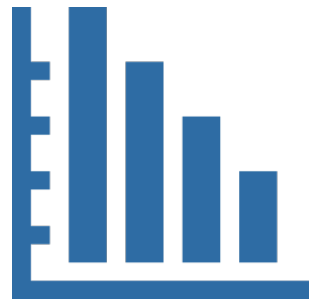- Fault propagation (what are the weak components?)

Research Activity

- Collect failure data from actual devices thanks to a monitoring app
- AndroMoniTo campaign

- Collect failure data from publicly available bug repositories
- Semi-automated extraction of robustness bugs

- Fault Model for the faultload
- Workload and contextload information

FAULT INJECTION FRAMEWORK

FAULT INJECTION TEST EXECUTION

Products – Conference Papers

- "**Improving Usability of Fault Injection**" – Cotroneo, D.; De Simone, L. ; Iannillo, A.K. ; Lanzaro, A. ; Natella, R.
Published in: *Software Reliability Engineering Workshops (ISSREW), 2014 IEEE International Symposium on*
Date of Conference: 3-6 November 2014

- "**Network Function Virtualization: Challenges and Directions for Reliability Assurance**" – Cotroneo, D.; De Simone, L.; Iannillo, A.K.; Lanzaro, A.; Natella, R.
Published in: *Software Reliability Engineering Workshops (ISSREW), 2014 IEEE International Symposium on*
Date of Conference: 3-6 November 2014

- "**Dependability Evaluation and Benchmarking of Network Function Virtualization Infrastructures**" – Cotroneo, D.; De Simone, L.; Iannillo, A.K.; Lanzaro, A.; Natella, R.
Published in: *Network Softwarization (NetSoft), 2015 1st IEEE Conference on*
Date of Conference: 13-17 April 2015
BEST PAPER AWARD

- "**The Software Aging and Rejuvenation Repository**" – Cotroneo, D.; Iannillo, A.K.; Natella, R.; Pietrantuono, R.; Russo, S.
To be published in: *Software Reliability Engineering Workshops (ISSREW), 2014 IEEE International Symposium on*
Date of Conference: 2-5 November 2015

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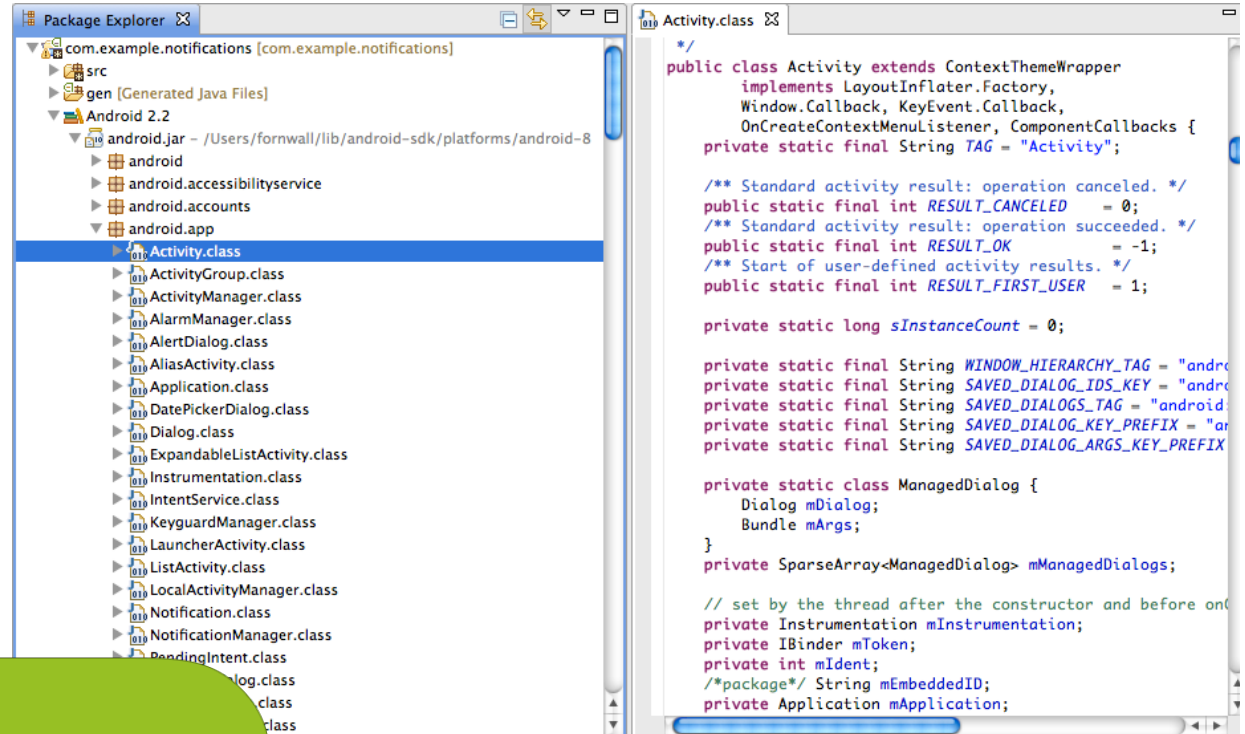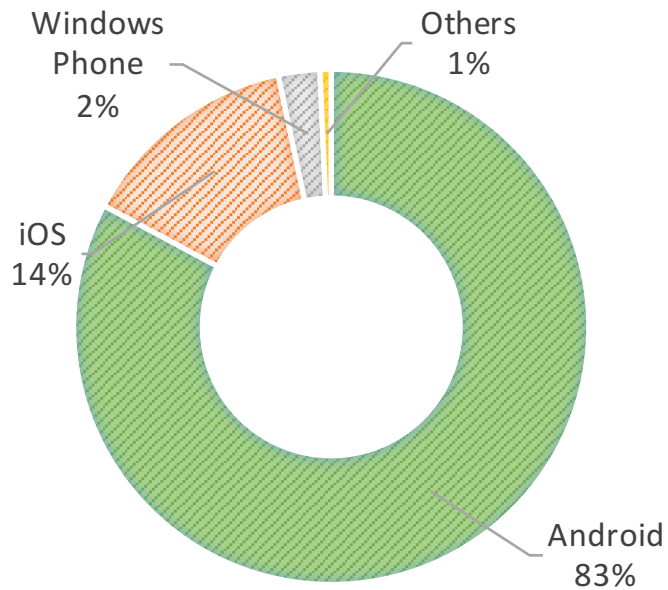| Bimonthly Period	Credits year 1								Credits year 2								Credits year 3								Total
	Estimated	1 nov-dec 2014	2 jan-feb 2015	3 mar-apr 2015	4 may-jun 2015	5 jul-aug 2015	6 sep-oct 2015	Summary	Estimated	1 nov-dec 2015	2 jan-feb 2016	3 mar-apr 2016	4 may-jun 2016	5 jul-aug 2016	6 sep-oct 2016	Summary	Estimated	1 nov-dec 2016	2 jan-feb 2017	3 mar-apr 2017	4 may-jun 2017	5 jul-aug 2017	6 sep-oct 2017	Summary	Total
Modules	20	0	3	3	13	0	0	**19**	10							0	0							0	19
Seminars	5	0,5	0,7	1	3	0	0	**5,2**	5							0	0							0	5,2
Research	35	10	8	6	6	10	8	**48**	45							0	60							0	48
	60	10,5	11,7	10	22	10	8	**72,2**	60	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	72,2

www.mobilab.unina.it/android_en.html

ANDROMONITO

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MONITORING ANDROID FAILURES

Android

Windows Phone 2%
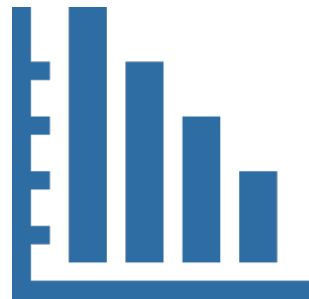
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iOS 14%

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DEPENDABILITY THREATS

Research Activity

- Failure Monitoring Tool
- Actual failures, with environment and configuration info
- AndroMoniTo campaign

- Extraction of robustness faults from bug reports
- The components affected by robustness bugs
- The failures caused by robustness bugs

- Fault Model
- Component Fault Distribution
- Workload condition
- Environment condition

FAULT INJECTION

Dependability and its threats

- Dependability is the ability to deliver service that can be justifiably trusted

- Dependability is the ability of a system to avoid service failures

- The threats to dependability are:
    - Fault: something wrong in the software or hardware that activates an error (static);
    - Error: the deviation from the correct internal state (dynamic);
    - Failure: the manifestation of errors at the external interfaces (perceived by the user)

Fault Injection Testing

- Deliberately inject faults into the software in order to understand how the system behaves in presence of faults

- Dependability assessment:
  - How dependable is the system?
  - How can we enhance fault-tolerant mechanisms?

- Need to inject representative faults