Short Paper:
Experiences on the Implementation of a Cooperative Embedded System Framework

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JTRES 2010, Prague, Czech Republic
August, 19-21, 2010
Agenda

- Context
- What is Android?
- Possible Directions
- Chosen Direction & Challenges
- Conclusion & Future Work
Context

- **CooperatES Framework**
  - QoS-aware framework which aims at facilitating the cooperation between nodes when a particular set of QoS constraints, associated with a service, cannot be satisfied by a single node

- **Why Android?**
  - Increasing relevance of Android in the mobile industry
  - Open-source platform
    - Linux kernel based architecture
  - Possibly a target to ERTS

- The paper presents the motivation and key challenges concerning the implementation of the framework in Android
What is Android?

![Android Architecture Diagram]

- **Applications**
- **Application Framework**
  - **Libraries**
    - **Android Runtime**
      - **Core Libraries**
      - **Dalvik VM**
- **Linux Kernel**
Possible Directions

- OS Level
  - Predictability and Determinism
- VM Level
  - RT Scheduling
  - Bounded Memory Management
- Android Specificities must be implemented

- OS Level
  - Predictability and Determinism
- VM Level
  - Extension of DVK with RTSJ
  - RT Objects
- Release cycles of the platform
Chosen Direction & Challenges

- The first proposed direction is considered the one that causes less impact in the system as a whole
  - Android apps and QoS apps can coexist
- Scheduling operations at OS level
  - Handle each VM with the correct priority is a must
    - Achieved through a mapping mechanism of tasks
- Memory Management
  - Mechanisms to address system resource saving
    - Memory Management Abstraction Layer
    - Single Heap for both VMs
    - Intelligent Garbage Collection mechanism
- Synchronisation Mechanisms (If necessary)
  - Communication between each VM's threads
Conclusion & Future Work

- Android was chosen as a testbed for the CooperatES Framework
  - Potential target for ERT environments
    - Industry would benefit from it
- Not a RT platform out of the box
  - Proposed Directions fill this gap
- Undergoing work
  - Implementation of the framework
    - QoS mechanisms
    - Scheduling
  - Dynamic Memory Management research
Questions?