

Making Android run on time

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Outline

Java e Android real-time

Java

- Problematiche e soluzioni

- FijiVM

Android

- Problematiche

- Isolamento di una CPU

RTDroid

Java e Android per real-time?



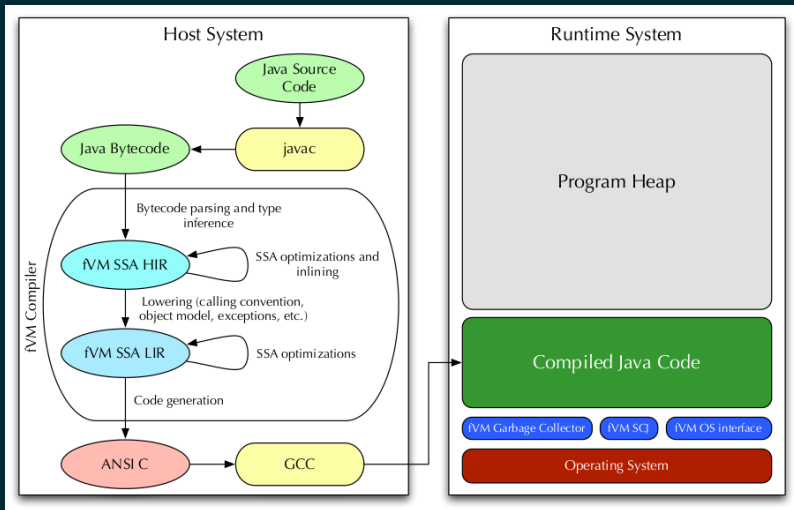
Limitazioni di Java real-time

- ▶ Scheduling
 - Nessun utilizzo delle priorità
- ▶ Garbage collection
 - Politica Stopping the world
 - Ritardi non quantificabili
- ▶ Caricamento dinamico delle classi
 - Latenza variabile e non quantificabile
- ▶ Compilazione Just in time
 - Distanza elevata tra BCET e WCET

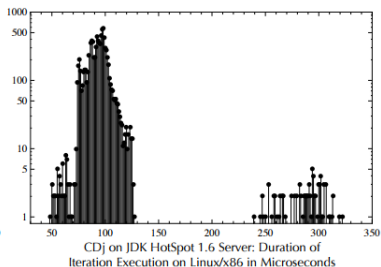
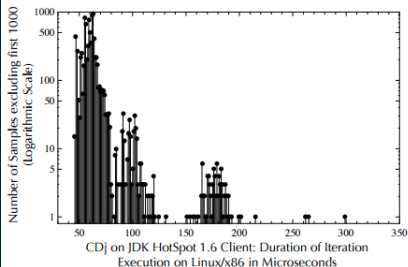
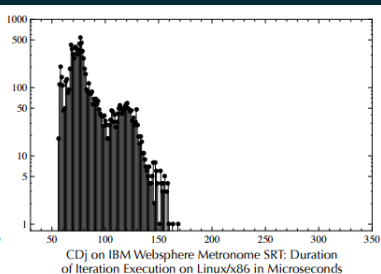
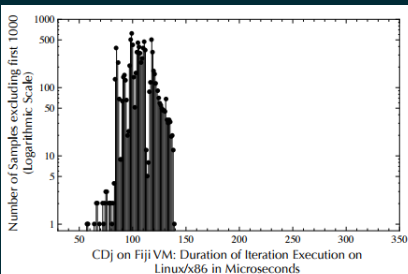
Real-Time specification for Java e altre soluzioni

- ▶ Scheduling
 - Utilizzo reale delle priorità
 - Basic Priority Inheritance Protocol
 - Ceiling Priority Protocol (opzionale)
 - Asynchronous event handling
- ▶ Gestione della memoria
 - Scoped
 - Immortal
- ▶ Compilazione Ahead of time
 - Maggiore prevedibilità

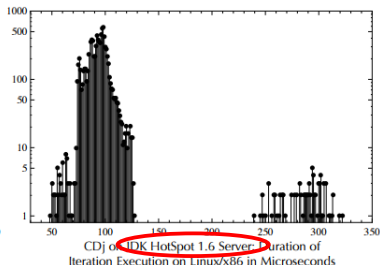
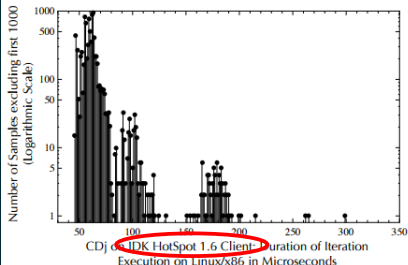
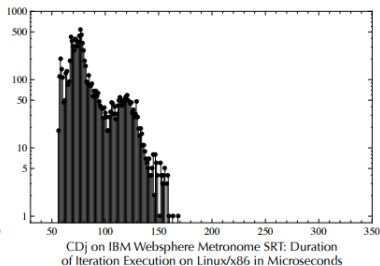
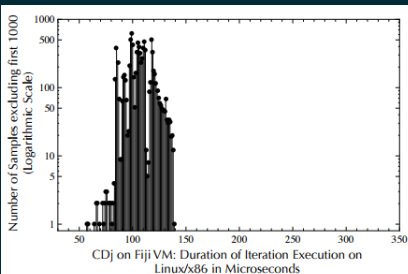
Fiji Virtual Machine



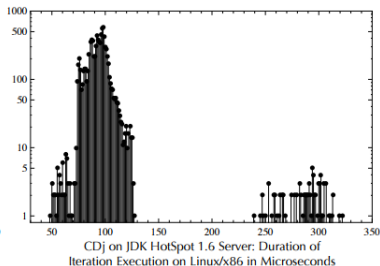
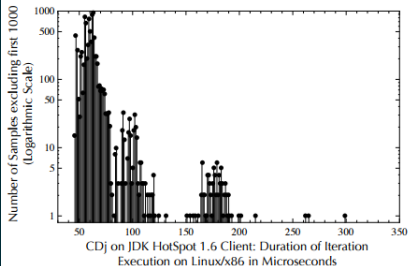
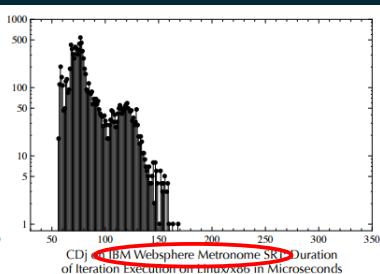
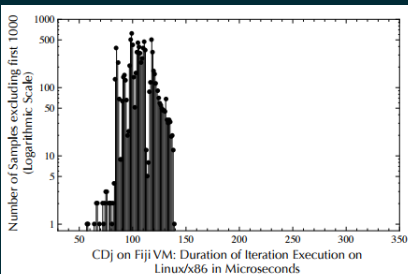
Fiji Prestazioni



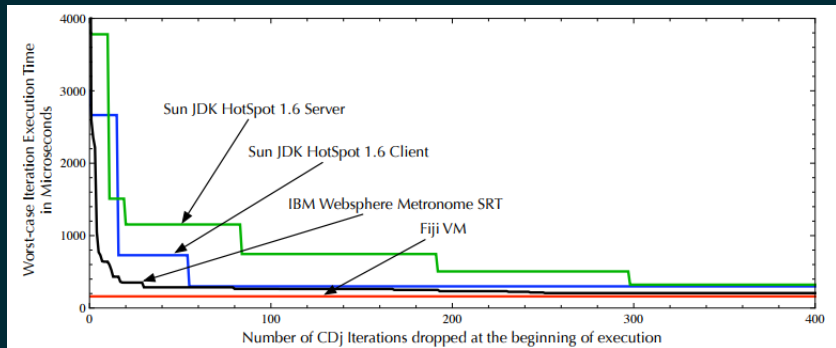
Fiji Prestazioni



Fiji Prestazioni



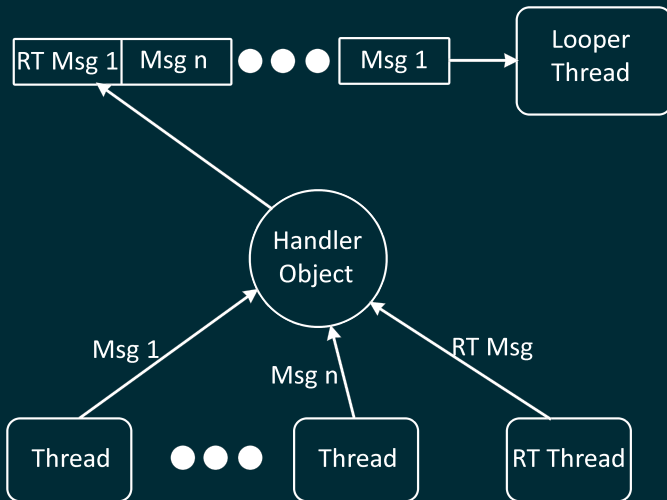
Fiji Prestazioni



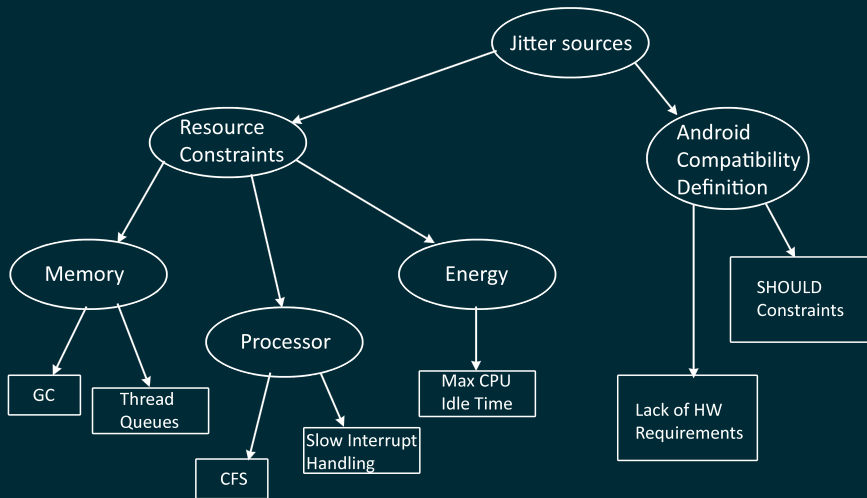
Limitazioni di Android real-time

- ▶ Garbage collection
 - Aggressiva
 - Stopping the world
- ▶ Scheduler
 - Completely Fair Scheduler
- ▶ Framework Android
 - Scambio di messaggi
 - ▶ Handler e Looper
 - Servizi di sistema
 - ▶ AlarmManager
 - ▶ SensorManager

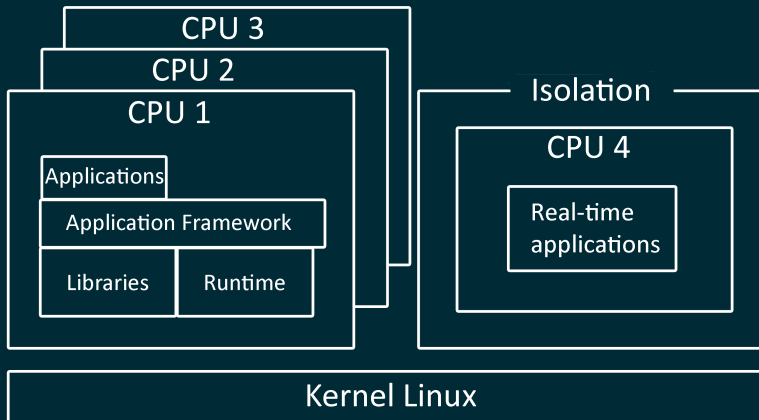
Handler e Looper



Fonti di jitter



Isolamento di una CPU





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Grazie per l'attenzione

Domande?



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