



A thin MIPS hypervisor for embedded systems

A master thesis project at the Secure Systems Group

Background

Embedded systems are being used more and more and can be found nearly everywhere in our modern life. Unfortunately, security issues are often ignored during development of such systems. Virtualization techniques allow one to add a secondary layer of software to existing systems, which can be used to provide the missing security services such as isolation and monitoring.

SICS is currently working on a virtualization solution, a so called hypervisor, that runs on embedded platforms based on the ARM architecture. With this master thesis we would like to investigate the feasibility of a similar hypervisor for the MIPS architecture.

Objectives

The MIPS architecture includes a memory protection unit (MMU) with a very flexible page table layout. The main objective of this thesis is to study the MMU, its various components (e.g. segments, ASID support, TLB) and examine different configurations and data structures for managing the protected pages in an efficient manner in a hypervisor.

In total, the thesis consists of the following items:

- A study of the modern MIPS architecture, including the hypervisor support,
- Design of a minimal hypervisor for MIPS,
- Analysis of security and performance aspects,
- Prototype implementation and a demonstration using the OVP simulated MIPS platform by Imperas,
- A written rapport.

Competence

We are looking for **one or two** bright MSc students in **Lund or Kista (Stockholm)** who meet the following requirements:

- Basic knowledge in C and assembly (advanced knowledge is a plus)
- Knowledge in operating system architectures, preferably the MINIX and L4 microkernels
- Good spoken and written English

Applications

Applications should include a brief personal letter, your CV with your education, professional experience and specific skills and recent grades. In your application, make sure to give examples of previous programming or other projects that you consider relevant for the position.

Candidates are encouraged to send in their application as soon as possible, in paper form or via e-mail. Suitable applicants will be interviewed as applications are received.

About SICS

Swedish Institute of Computer Science (SICS) is a leading research institute for applied computer science in Sweden. The main office is situated in Kista outside Stockholm and there are smaller offices in Uppsala, Västerås, and Lund. SICS employs approx. 120 researchers, including 45 PhDs, and hosts another 30 researchers from KTH, consultants and students working on their thesis.

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