Embedded software environment for a frugal smartphone

Required Education Level: Master’s degree (or equivalent)
Professional Experience: No prior professional experience required.

Position description

Context. The SmolPhone project is a research-action initiative in the field of frugal computing. Practically, it aims to design a type of low-tech smartphone with a one-week battery life. The goal is not to optimize a conventional smartphone but rather to reconsider usual design choices in mobile computing. The project aims to serve as a research ground for low-tech and frugal computing. For more information, see https://inria.hal.science/hal-04156447 and https://inria.hal.science/hal-04589322.

Objective. The objective at the end of the 24 month long contract is to have an embedded software environment integrating the classic applications of a personal assistant (phone, messaging, calendar, email, web, notepad) that can run on embedded hardware with very limited capabilities. To achieve this, the recruited individual will need to assemble a dedicated software environment, then build the target applications in this environment.

The aim is not to design a marketable product but to create an experimental platform that will serve as a foundation for future research in frugal computing at the Inria institute, addressing some of the societal challenges expected in the coming years.

Assigned Mission
The first mission will consist of establishing a development environment for graphical applications that can run on microcontrollers with only a few hundred kilobytes of memory. The Rust language will be used, relying on the Slint graphics library, which offers a superset of what we need. A mechanism for delegating control to the application coprocessor will also need to be integrated, based on an existing prototype.

The second mission will be to create the expected applications of a 2000s smartphone: telephony, SMS, shared calendar and address book, notepad, podcasts, emails, markdown viewer, epub reader, etc. The developed applications are not intended to be original but to demonstrate the suitability of the chosen development environment.

If time permits, the third mission will aim to establish a distributed infrastructure around the SmolPhone. A Matrix bridge will allow converting instant messaging into a single protocol, for which an appropriate client will be implemented on the microcontroller side. The developed infrastructure should allow sending control SMS to the SmolPhone to remotely reactivate mobile data. Creating an HTML5 rendering proxy is initially a research task not included in the engineer position’s scope.

The recruited individual will also need to participate in writing scientific articles presenting the completed environment, in collaboration.

Collaborations. The candidate will work in a small academic team of scientists and engineers, experts in the domains of distributed systems, micro-architecture, compilation, embedded systems and frugal computing. Another fix-term engineer is recruited to design the hardware on which the developed applications are expected to run.

General information
- Theme: Frugal computing
- Location/City: Rennes
- Inria center: CRI Rennes - Bretagne Atlantique

Recruiters (first.last@inria.fr)
- Martin Quinson (MACELLAN Inria Team)
- Simon Rokicki (TARAN Inria Team)

About Inria
Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, usually in collaboration with academic partners, involve over 3,500 scientists tackling digital challenges, often at the intersection of other disciplines. The institute draws on diverse talents across more than forty different professions. 900 support staff contribute to the emergence and growth of scientific and entrepreneurial projects that impact the world. Inria collaborates with numerous companies and has supported the creation of over 180 start-ups. The institute thus strives to address the challenges of the digital transformation of science, society, and the economy.

Key to Success
This engineering position is aimed, among others, at engineers specialized in software engineering or embedded software. Feeling comfortable in an academic research environment, enjoying learning, exploring, interacting, and listening are essential qualities for succeeding in this role.

Application Instructions
Security Clearance: This position may be assigned to a restricted zone (ZRR), as defined in decree no. 2011-1425 related to the protection of the nation’s scientific and technical potential (PPST). Access authorization to such a zone is granted by the head of the establishment, following favorable ministerial advice, as defined in the decree of July 3, 2012, related to the PPST. A negative ministerial opinion for a position assigned to a ZRR would result in the cancellation of the recruitment.

Recruitment Policy: As part of its diversity policy, all Inria positions are open to people with disabilities.

Note: Application files (CV + cover letter) must be sent by email to the recruiters before August 30, 2024.
Activities

Main Activities.
• Design and implementation in collaboration with project members.
• Software development of the environment and applications.
• Testing and modifying until the developments are validated.
• Writing documentation for future contributors.
• Setting up and administering a supporting distributed infrastructure running on Android, adapting existing tools.

Complementary Activities.
• Writing the weekly progress report.
• Participating in weekly group meetings.
• Contributing to the writing of scientific articles.

Skills and Experience
The expected level of experience is that of a newly graduated engineer without specific professional experience.

Technical Skills and Required Level.
• Software engineering and systems design: good level
• Development of embedded applications: good level
• Development in a low-level language such as C, C++, or Rust: good level. No prior experience in Rust is required, but the candidate should have a willingness to learn this language.
• Participation in an open research environment: experience appreciated

Languages.
• French or English as the working language (candidate’s choice).
• Written English for reading literature and writing documentation and scientific articles.

Interpersonal Skills.
• Autonomous, responsive and adaptable
• Good communication with colleagues to collaborate, seek help, and present project progress

Benefits
• Subsidized meals
• Partial reimbursement of public transportation costs
• Leave: 7 weeks of annual leave + 10 days of RTT (based on full-time) + possibility of exceptional leave (e.g., sick children, moving)
• Possibility of telecommuting (after six months of service) and flexible working hours
• Professional equipment available (videoconferencing, loan of IT equipment, etc.)
• Social, cultural, and sports benefits (Inria Social Welfare Association)
• Access to professional training
• Health insurance