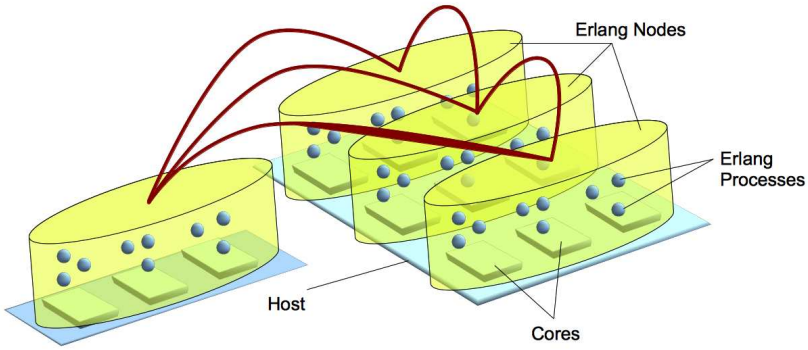
A HIGH-LEVEL PARADIGM FOR RELIABLE LARGE-SCALE SERVER SOFTWARE

RELEASE

RELEASE

Key Innovation

Every eighteen months during the last thirty years has seen the power of the computer that can be built on a silicon chip double – this has now come to a halt. Instead, chip manufacturers build multiple computers – or cores – on each chip: nearly all PCs are now 'dual' or 'quad' core, and the number of cores it is possible to put on each chip is growing exponentially.
Building software for these multicore systems requires radically new software development technologies that can exploit the platform. Instead of programming a single core, the cores have to be programmed to work together in a coordinated way, and in a way that scales with the numbers of cores. Many expect 100,000-core platforms to become commonplace, and the best predictions are that core failures on such an architecture will be common, perhaps one an hour. Hence we require a programming model that is not only highly scalable but also reliable.
The project will develop the first ever scalable concurrency-oriented programming infrastructure and its associated tool set, and hence aims to reduce development times of multicore solutions by 50% while delivering increased reliability.



Contract number

287510

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Project website

www.release-project.eu

Community contribution to the project

2,400,000 Euro

Project start date

01.10.2011

Duration

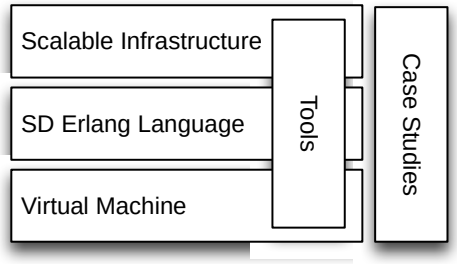
36 months

Technical Approach

Our platform builds on the Erlang language and Open Telecom Platform (OTP) libraries that have concurrency and robustness designed in. Currently Erlang/OTP has inherently scalable

computation and reliability models, but in practice scalability is constrained by aspects of the language, virtual machine and toolset.
The RELEASE consortium will attack these problems at three levels:

- We will evolve the Erlang virtual machine – which implements Erlang on each core – so that it can work effectively in large-scale multicore systems.
- We will also evolve the language to Scalable Distributed (SD) Erlang, and adapt the OTP framework to provide constructs to control how computations are spread across multicore platforms, and coordination patterns to allow SD Erlang to effectively describe computations on large platforms, while preserving performance portability.
- On top of the language and the virtual machine we will develop a scalable Erlang infrastructure to integrate multiple, heterogeneous clusters.



To exploit such large platforms, programmers need to be able to understand how their programs are behaving in practice. We will build tools to enable programmers to profile and visualize their SD Erlang applications; to refactor Erlang programs to run scalably and efficiently under SD Erlang; and to debug SD Erlang systems.

Demonstration and Use

We will demonstrate the effectiveness of the RELEASE approach in two case studies. EDF will port the Sim-Diasca simulation framework to SD Erlang on the Blue Gene parallel computing platform. Erlang Solutions will build a heterogeneous cloud-based continuous integration framework service using SD Erlang and evaluate it with a representative real-world scenario such as an online chat service.

Project partners	Country
Heriot-Watt University	UK
University of Kent	UK
Erlang Solutions Ltd	UK
Ericsson AB	Sweden
Institute of Communication and Computer Systems	Greece
Electricité de France SA (EDF)	France
Uppsala Universitet	Sweden

Scientific, Economic and Societal Impact

The presence of major European industrial players (Ericsson and EDF) in the consortium will enable rapid commercialisation of the project outputs, enhancing European competitiveness in the software development market and ultimately leading to new high technology jobs in Europe. The Erlang Solutions SME will gain 15% additional revenues from marketing two cloud-hosting services developed in the project. Ericsson will exploit the new technology in new products and to move existing products to emerging hardware platforms to maintain their competitive position. EDF will simulate smart energy grids potentially 100 times more accurately than at present, leading to more efficient electricity supply and potentially to lower energy costs.

Key Features

- To improve the programmability of large off-the-shelf architectures by scaling the radical concurrency-oriented programming paradigm.
- To facilitate the development of reliable general purpose systems to exploit 10,000 cores or more.
- To reduce development times by 50% providing state-of-the art tools to profile and control performance on large scale systems.
- To provide case studies of highly concurrent simulation on the Blue Gene platform and a heterogeneous cloud-based continuous integration framework.