

IMPLEMENTATION OF PROTOCOL STACKS

V. Gaspes¹, Y. Wang¹, P-A. Wiberg²

1. Centre for Research on Embedded Systems, Halmstad University, SE-301 18 Halmstad, Sweden

2. Free2Move, SE-302 48 Halmstad, Sweden

IPS is a project addressing programming protocol stacks for embedded systems. It is a collaboration between Halmstad University and free2move in the context of CERES --- center for research on embedded systems. The goal of the project is to produce software tools that facilitate the implementation of protocol stacks

1. Background and Motivation

We find the need for such tools in the fact that many companies are re-implementing well-known infrastructure protocols as well as implementing new application protocols. There are many well known techniques to do a good job in these implementations in order to avoid a number of bottlenecks. However, these techniques, that come from a number of disciplines, are not always easy to understand or to implement. Tools that automate the use of these techniques are a way of providing infrastructure that make these techniques more available for new applications.

2. Problem

Implementing protocol stacks is tedious, error-prone and time-consuming. It is even more so when targeting small embedded systems, which usually have additional, non-functional constraints. Thus, implementations have to minimize energy consumption, memory usage as well as other computation resources. In order to improve on time-to-market, scalability, maintainability and product evolution, even development time and programming methodology are relevant.

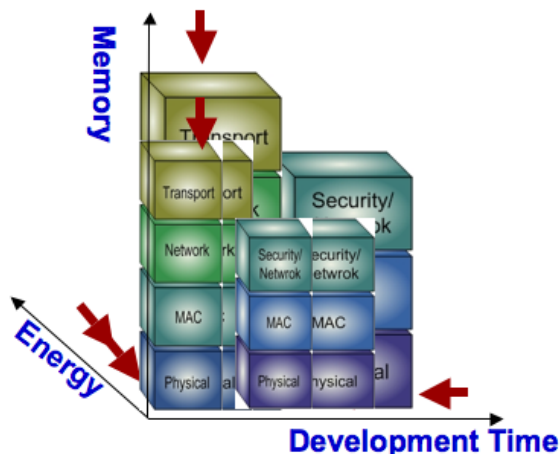


Figure 1. Software development challenges related to protocol stacks for embedded systems.

3. Approach

We propose to design a domain specific language to facilitate protocol stack implementations targeting

resource constrained embedded systems. Code will be compiled into C and have correctness, efficiency and maintainability in focus. We address the protocol stack as a whole to enable cross-layer optimizations and address resource utilization via a suitable runtime system.

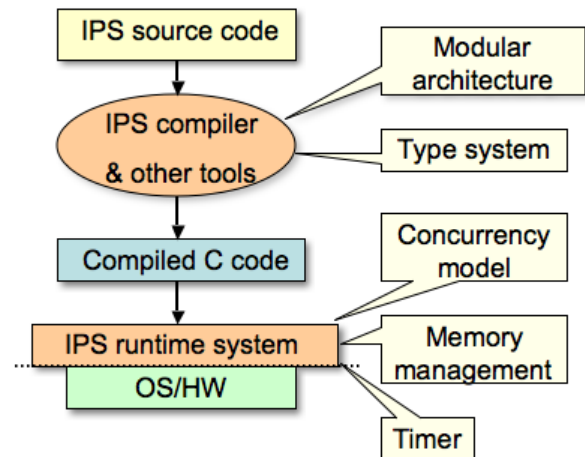


Figure 2. A language based approach.

4. Results

To the moment we have a tool for generating packet transformers from packet specifications. We are currently testing the system and preparing two conference papers to be submitted to SenSys 2008 and ICFP 2008.

PARTNERS AND STATUS

Industrial Partner: Free2Move

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The project extends through August 2006 – August 2009.

Project leader is Veronica Gaspes.

Results from the project will form part of the PhD thesis of Yan Wang.

PUBLICATIONS

Y. Wang, "IPS: Implementation of Protocol Stacks for Embedded Systems" *SenSys 2007, Doctoral Colloquium*, Sydney, Australia, November 6-9, 2007.