TETRACOM: Technology Transfer in Computing Systems

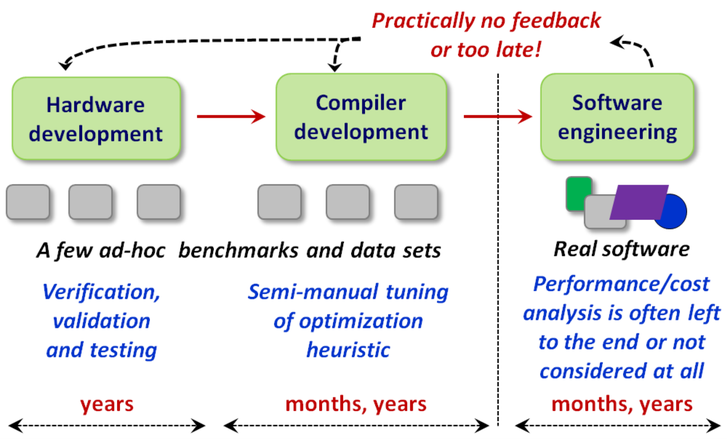
FP7 Coordination and Support Action to fund 50 technology transfer projects (TTP) in computing systems.
This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement n° 609491.

DIVIDITI - Accelerating SW/HW Co-design Using Collective Knowledge and Predictive Analytics

Grigori Fursin and Anton Lokhmotov, DIVIDITI (Cambridge, UK)

TTP Problem

Traditional, ad-hoc and outdated design and optimization methodology



Major industrial challenges

- Ever changing software, hardware and APIs
- Too many design and optimization choices
- Lack of standard experimental methodology
- Lack of representative benchmarks and data sets
- Lack of robust knowledge exchange mechanisms
- Hard to reproduce and trust experimental results

Consequences for hardware/compiler developers

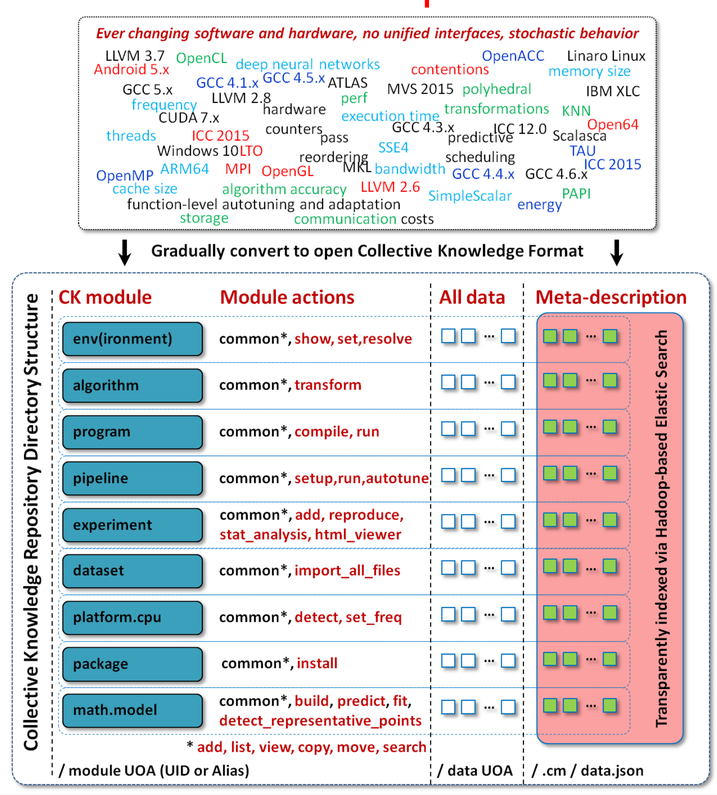
- Design and optimization is ad-hoc, challenging and time consuming
- Increasing time to market and risks, decreasing return on investment

Consequences for software developers and end-users

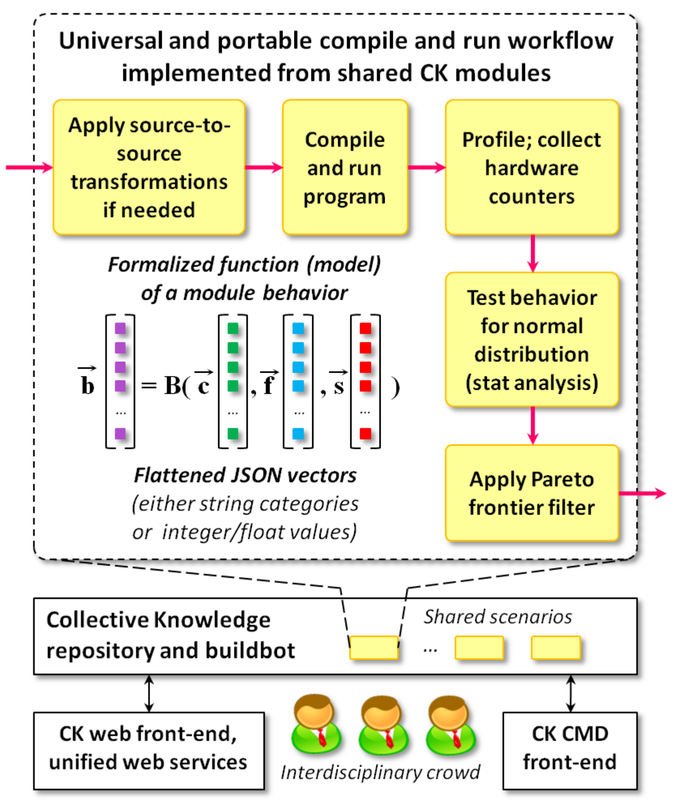
- Spending more time on performance tuning and debugging rather than on innovation
- Running real workloads on inefficient, power hungry and unreliable systems

TTP Solution

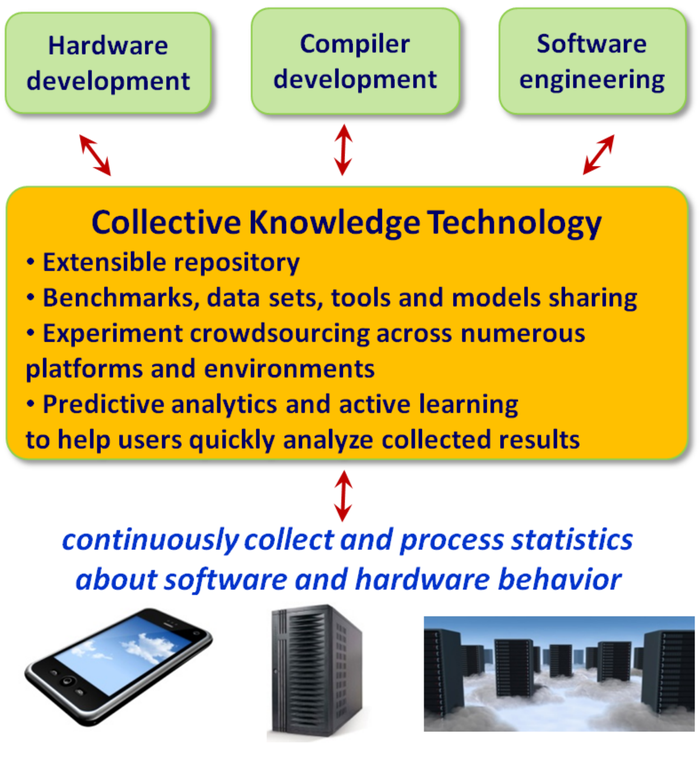
Use Collective Knowledge, an open-source framework for collaborative and reproducible R&D



Quickly prototype ideas from shared components as LEGO ®



Crowd-source benchmarking, testing, optimization and learning across real systems



TTP Impact

Exchange benchmarks, tools and results in open format

- Access a growing number of benchmarks, data sets and tools shared by the community
- Select representative workloads for your needs
- Protect experimental workflows from continuous changes using tool wrappers with unified API
- Unify exchange of results and replay of experiments using extensible JSON format

Customize benchmarking, optimization and co-design workflows

- Reuse our OpenCL/algorithmic/polyhedral/compiler flag multi-objective autotuner (performance/energy/size etc)
- Preserve and share optimization knowledge across closed groups and open communities
- Enable run-time adaptation across realistic workloads using automatically derived decision trees

See live autotuning examples (10x speedups)
cknowledge.org/interactive-report

Accelerate knowledge discovery using predictive analytics

- Quickly detect behavior anomalies and bugs
- Enable fair benchmarking across diverse systems (mobile phones, data centers)
- Reuse and extrapolate continuously accumulated knowledge to predict good optimizations and designs
- Help engineers focus on innovation instead of wasting time on ad-hoc and repetitive experimentation

We help you build faster, more energy efficient and reliable software and hardware!

TTP Facts

Website: **dividiti.com**
Contact: anton@dividiti.com
grigori@dividiti.com
Framework: **cknowledge.org**

Original TETRACOM project: *01/11/2014-30/04/2015 (cTuning foundation and ARM)*
Original TETRACOM contribution: *50,000 EUR*
Released CK (open-source, permissive license): **github.com/ctuning/ck**
Publications: DATE'16 - ***bit.ly/ck-date16*** ; CPC'15 - ***arxiv.org/abs/1506.06256***

DIVIDITI $\frac{d\vec{v}}{dt}$