



FlexDSP Project and Roadmap

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Flexible Design Methods for DSP Systems (FlexDSP)

- ❑ Research Project in "Future Technologies" of TEKES ELMO Program
 - ❑ Planned for three years
 - 2002 – 2005
 - First Project Year
1.5.2002 – 30.4.2003
 - ❑ Research work carried out at
 - Inst. Digital and Computer Systems, Tampere Univ. Tech.
 - Inst. Software Systems, Tampere Univ. Tech.
 - ❑ Industrial Partners (1st Project Year)
 - Elektrobit
 - Finnish Naval Research Institute
 - Instrumentointi
 - Nokia Mobile Phones
 - Nokia Networks
 - Patria New Technologies
 - Texas Instruments France
 - Vaisala
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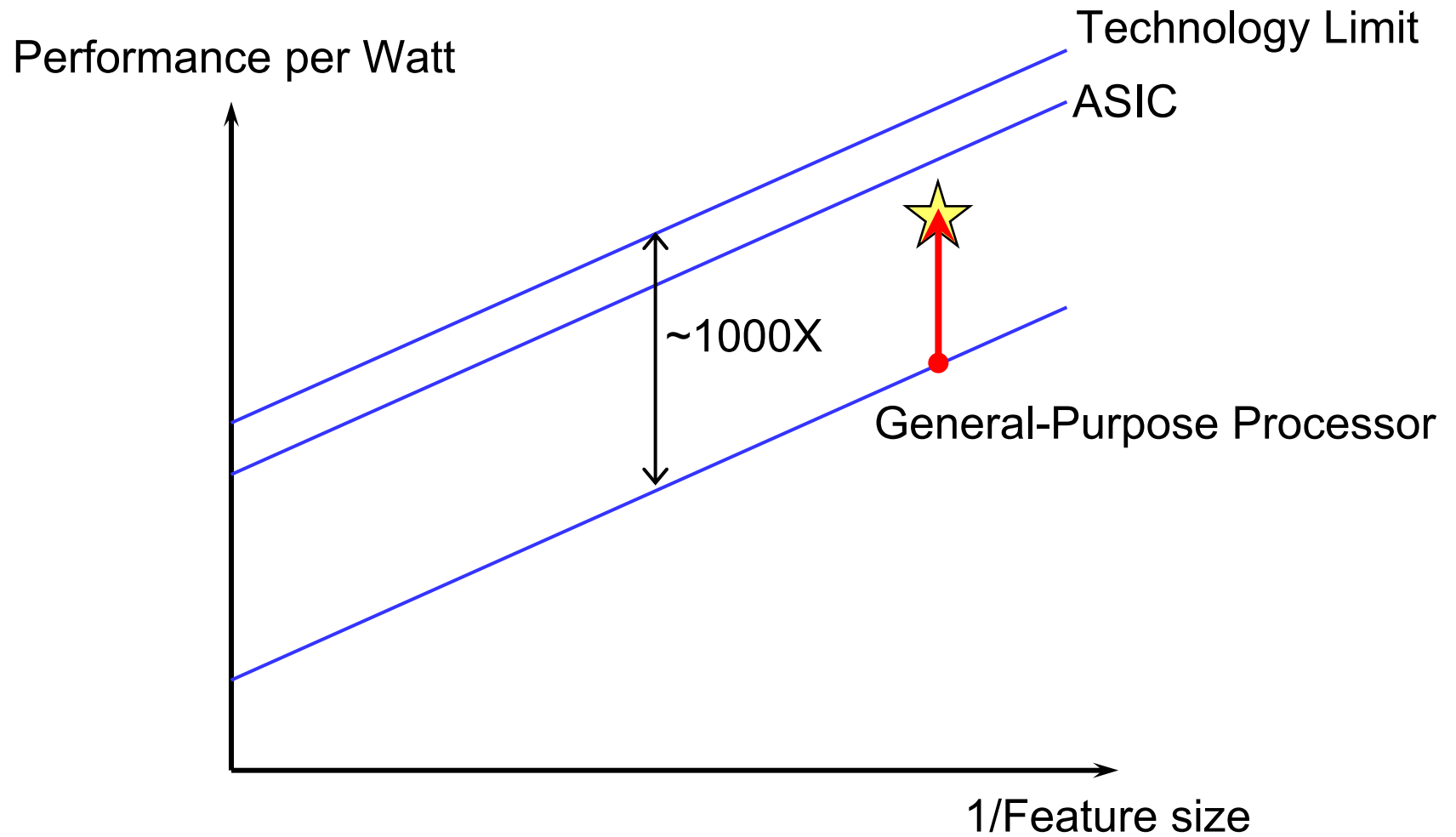


Motivation

- ❑ Programmable processors often used in products using digital signal processing (DSP)
 - Flexibility
 - Ease of verification
 - ❑ Traditionally DSP processor architectures have been developed based on average performance in several benchmark tasks (~100)
 - User applications often contain only subset of total benchmarks
 - ☞ Efficiency can be improved by customizing architecture according to given tasks
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Intrinsic Efficiency





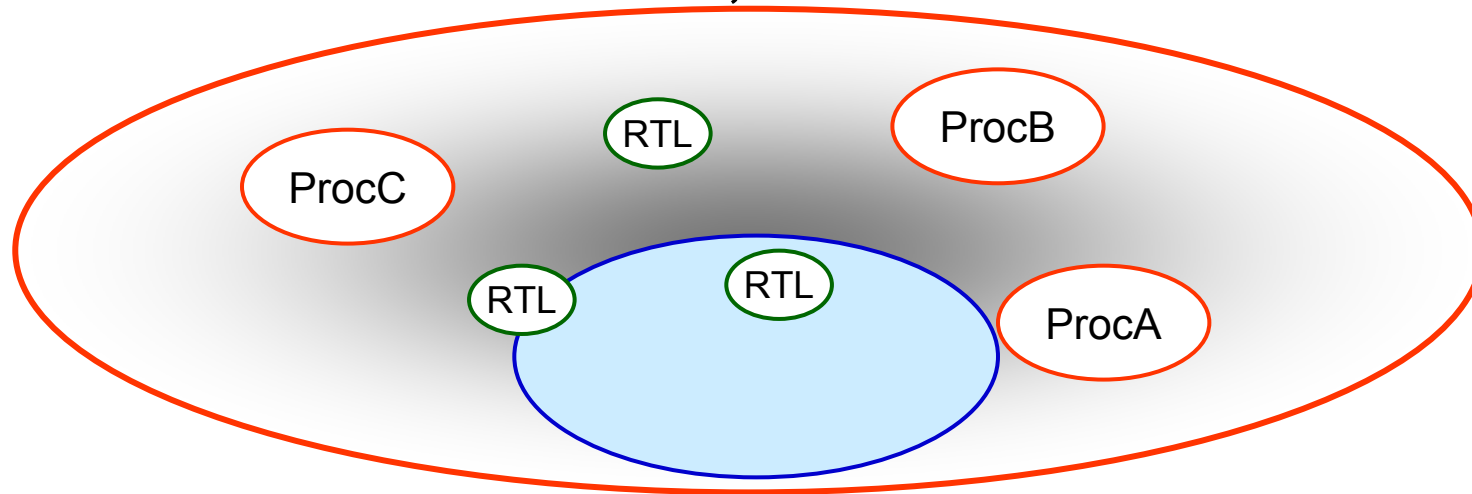
Motivation

- ❑ DSP applications are often hard realtime constrained
 - execution should be deterministic
 - dynamic runtime behaviours should be avoided
 - ☞ Static scheduling lends itself to DSP
 - ❑ Current design complexities call for increase in designer productivity
 - ☞ High level languages should be used
 - ☞ Design space is increasing exponentially
 - ❑ DSP algorithms contain inherent parallelism
 - ☞ Instruction level parallelism should be maximized
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Design Space Exploration

- ❑ Processor based implementation can cover only a small subset of the design space
- ❑ Manual exploration requires
 - a priori knowledge, or
 - huge design effort
- ❑ Automation is needed, even on a subset





FlexDSP: Objectives

- Develop design methodology and tools for DSP applications
 - Flexibility
 - Programmability
 - Customization
 - Fast design space exploration
 - estimates on area, speed, and power consumption
 - Development is based on the results obtained at the MOVE project lead by Prof. Henk Corporaal
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FlexDSP: Objectives

- ❑ Objective is to
 - develop further the MOVE tools and
 - demonstrate the design methodology with company-specific design cases
 - ❑ Improve
 - Design space exploration
 - Architectural framework
 - power consumption
 - ease creation and integration of special function units
 - Support special requirements of DSP tasks
 - General usability (feedback from industry)
 - Integration to commercial design tools
 - ❑ Creation of collaboration network (national, international)
 - Developed tools released into public domain
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FlexDSP: Implementation

- ❑ Architecture development
 - ❑ Tool development
 - ❑ Develop stable enough design environment for architectural research
 - Experiment
 - Analyse different implementation alternatives
 - Adapt to changes in technology
 - interconnection delay cannot not be neglected
 - leakage current is becoming significant
 - ❑ Develop design tools
 - Efficiency
 - performance of implementations
 - Flexibility
 - support various implementation technologies
 - support for extensibilities
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FlexDSP: Coarse Roadmap

□ 1st Project Year

- stability
- processor generator
- schemes for code compression
- power analysis
- special function support

□ 2nd Project Year

- fine grain pattern detection & SFU generation
- FPGA emulation
- variable length decoding units
- compiler strategies

□ 3rd Project Year

- interrupt support
 - clustered TTAs
 - compiled simulation
 - compiler strategies
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Summary

- ❑ Yet another university project
 - commercial quality tools cannot be expected
 - ❑ However, FlexDSP targets to
 - improve the efficiency of implementations
 - develop tools for designers
 - public domain release
 - promote the design method
 - attract research community to use/develop the methodology and tools
 - ❑ There are several topics to be investigated
 - a single research group cannot cover all the aspects, thus there is room for several research groups
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