

Workshop on GCC Internals

GCC Research Group

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Understanding A Retargetable Compiler Framework

- What is the compilation model?
- What are the retargetability issues in the model?
- Use the findings to meet the following goals
 - ▶ Machine descriptions should be as simple as possible, perhaps only ISA should be required
 - ▶ Machine descriptions should not affect the quality of code generated



Problems with GCC = Opportunities of Research

- Documentation which bridges the gap between the conceptual structure and the implementation is almost non-existent.

No answer to questions like “Why is something the way it is?” at conceptual level.

- Machines descriptions
 - ▶ are complex and ill-structured (verbose, repetitive, too detailed) both at the semantic and syntactic level
 - ▶ influence the quality of code generation



Some of Our Work

- Document the conceptual structure and its influence on the implementation
- Identify the influences on the machine descriptions
- Explore the ways of systematically building machine descriptions
 - ▶ Short term goal: Systematic development within the current form
 - ▶ Long term goal: Alternative specifications which can be translated to the current form
- Build support tools for the current specifications

Syntax checkers, consistency checkers, syntax directed editors



Coverage of the Workshop

- GCC compilation model and its influence on GCC architecture
- Abstractions in machine descriptions
- Systematic development of machine descriptions
- Writing data flow analysers on Gimple IR



Coverage of the Workshop: GCC Architecture

- Given a single source, single target compilation process
 - Evolve retargetability issues
 - Using defined IRs that lower the level of the program to the target
- to create a multiple source, multiple target compilation model
- Should bridge the gap between theory and practice by evolving a conceptual structure and relating it to the implementation

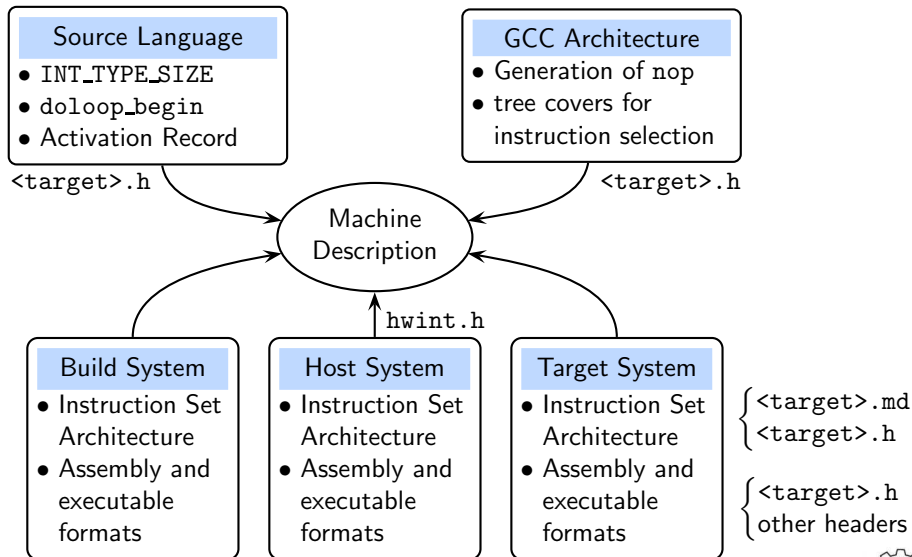


Coverage of the Workshop: Systematic Development of Machine Descriptions

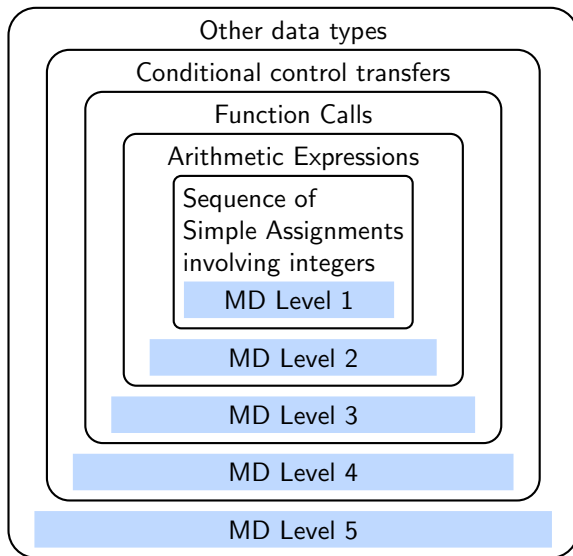
- Discover the abstractions which machine descriptions capture
- Segregate the humongously large information
- Our approach:
 - ▶ Define different levels of source language
 - ▶ Identify the minimal information required in the machine description to support each level
- Interesting observations
 - ▶ It is the increment in the source language which results in understandable increments in machine descriptions rather than the increment in the target architecture.
 - ▶ If the levels are identified properly, the increments in machine descriptions are monotonic.



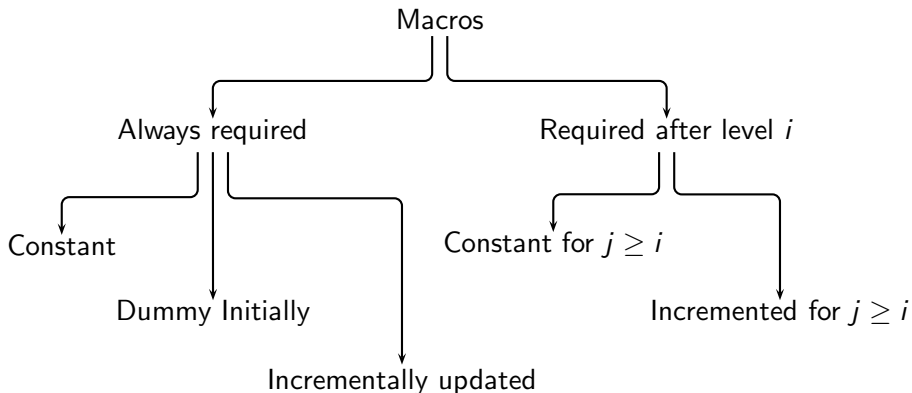
Examples of Influences on the Machine Descriptions



Systematic Development of Machine Descriptions



GCC MD Macros at Various Levels



More Details

<http://www.cse.iitb.ac.in/~uday/gcc-workshop>

