Summer Bootcamp 2021

Introduction to Computer Science

Lecture 3 (Part I)

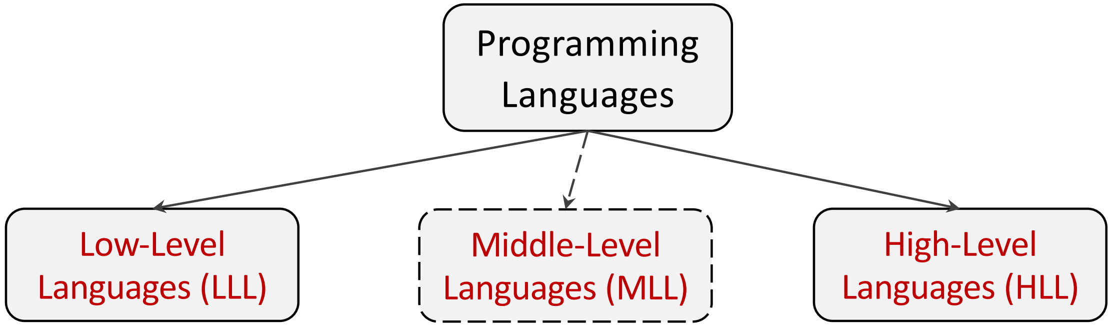
Classification of Programming Languages (Cont.)

Artem Burmyakov

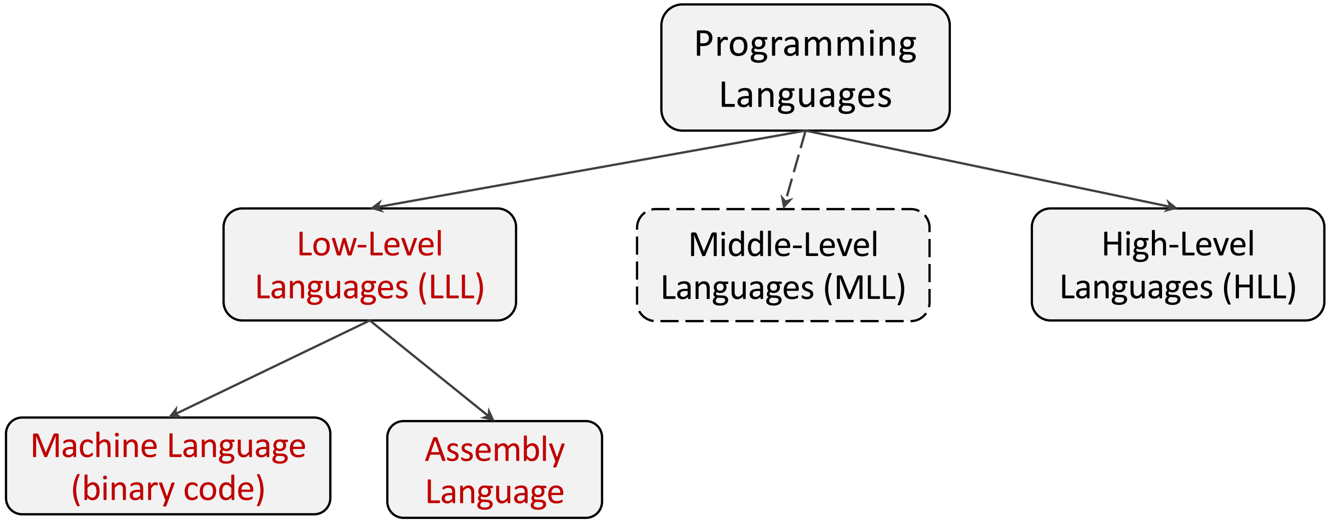
August 04, 2021

INNOPOLIS UNIVERSITY

Classification of Programming Languages


Programming Languages
Low-Level Languages (LLL)
Middle-Level Languages (MLL)
High-Level Languages (HLL)

Classification of Programming Languages



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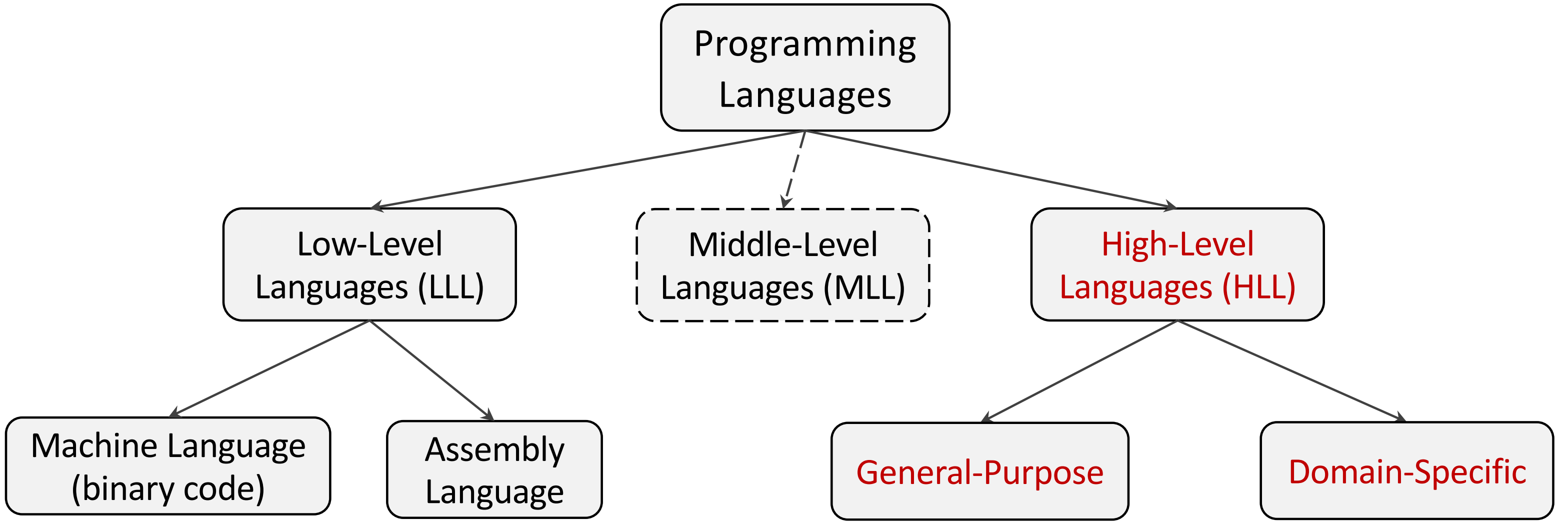
Machine Language (binary code)

Assembly Language

Classification of Programming Languages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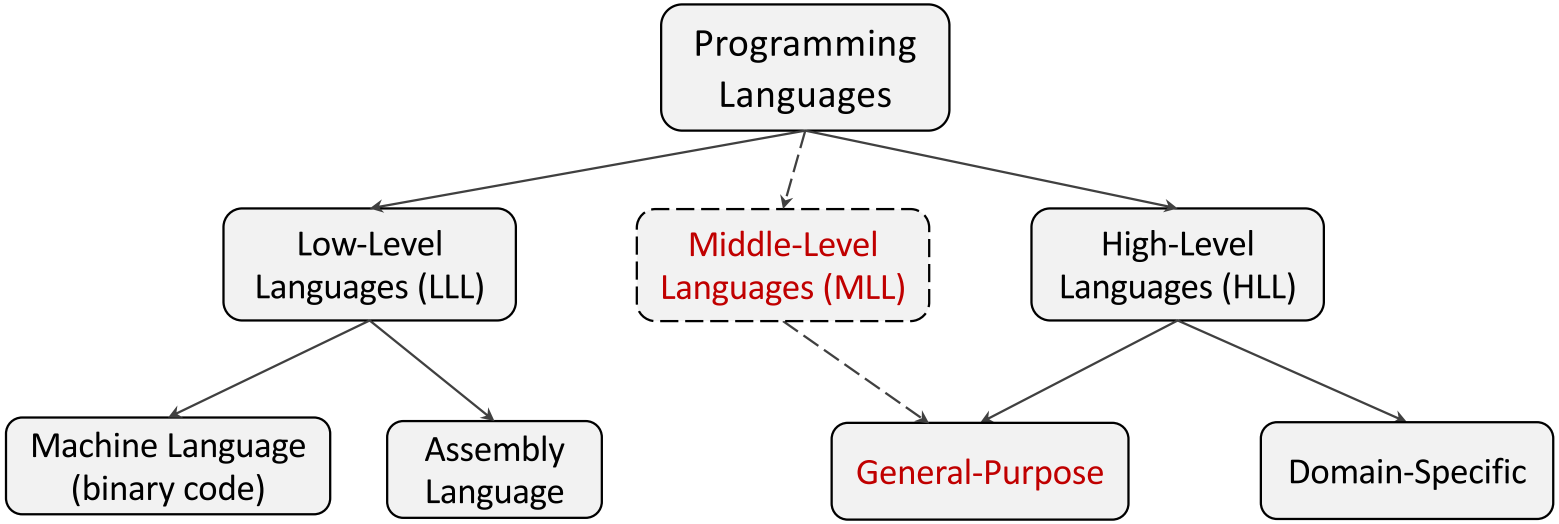
Machine Language (binary code)
Assembly Language
General-Purpose
Domain-Specific

Classification of Programming Languages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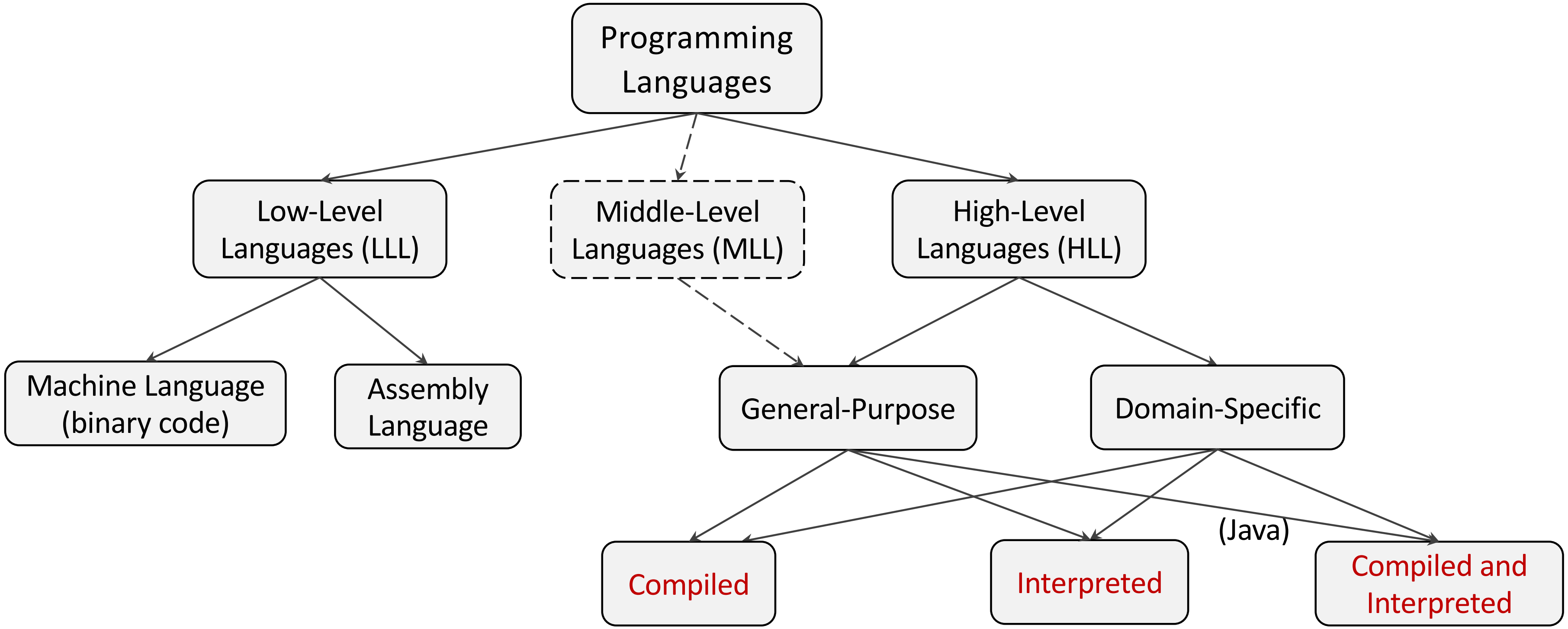

Programming Languages

Low-Level Languages (LLL)

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Machine Language (binary code)

Assembly Language

General-Purpose

Domain-Specific

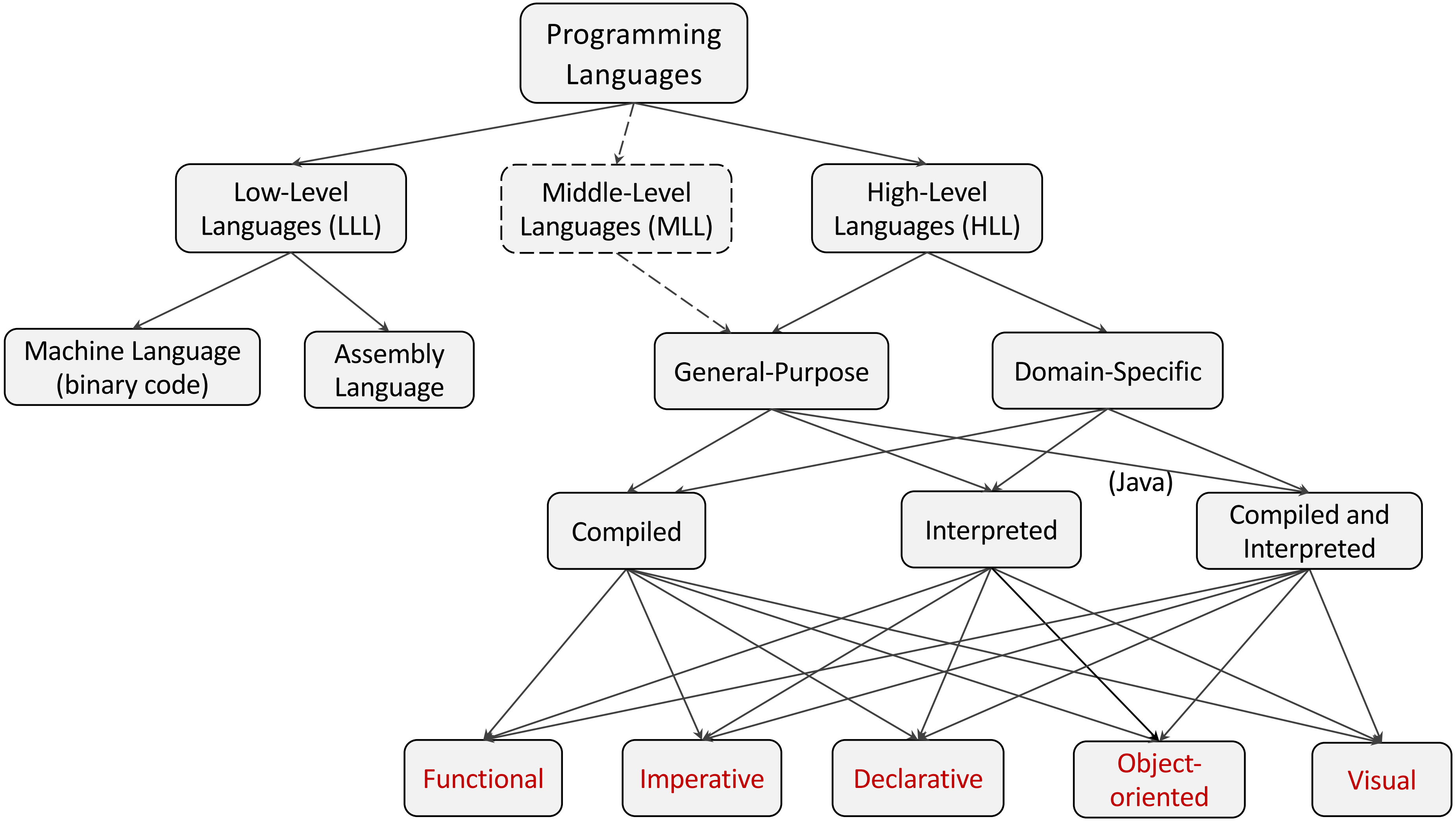
Compiled

Interpreted

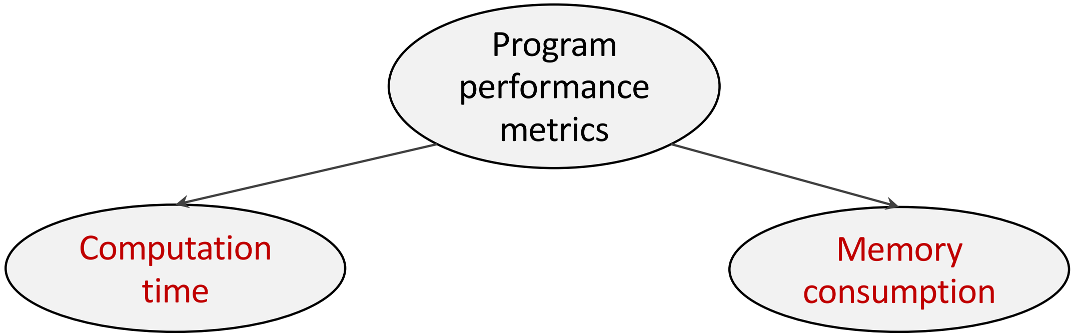
(Java)

Compiled and Interpreted

Classification of Programming Languages



Performance Characteristics of a Computer Program



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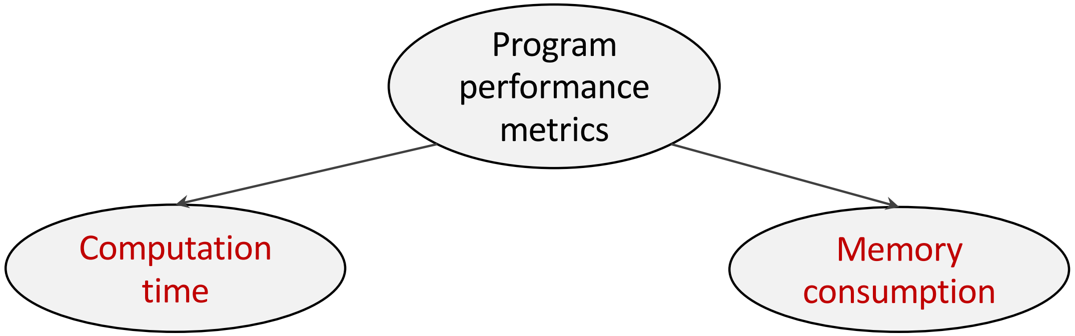

Note: Frequently there is a trade-off between runtime and memory consumption:

You can speed up program execution by allocating more memory to it

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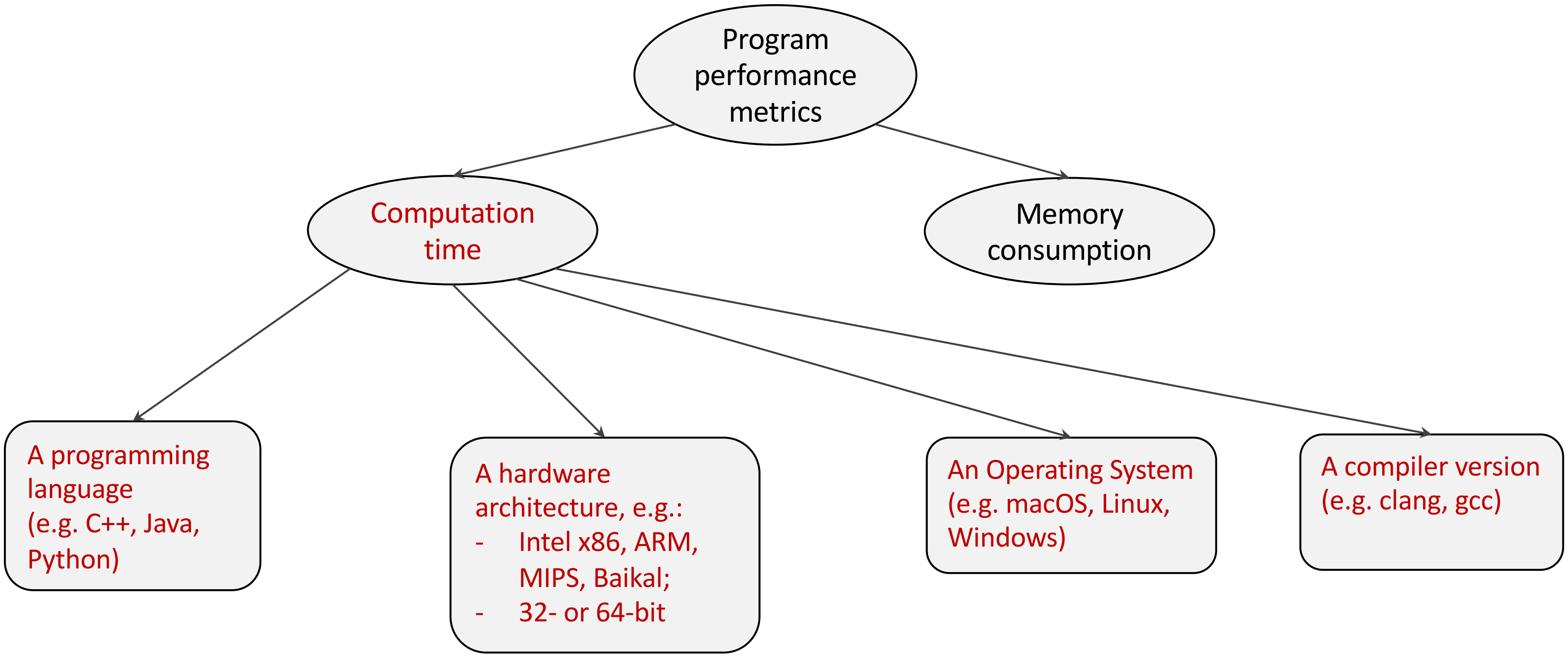

Program performance metrics

Computation time

Memory consumption

A programming language (e.g. C++, Java, Python)

A hardware architecture, e.g.:

- Intel x86, ARM, MIPS, Baikal;
- 32- or 64-bit

An Operating System (e.g. macOS, Linux, Windows)

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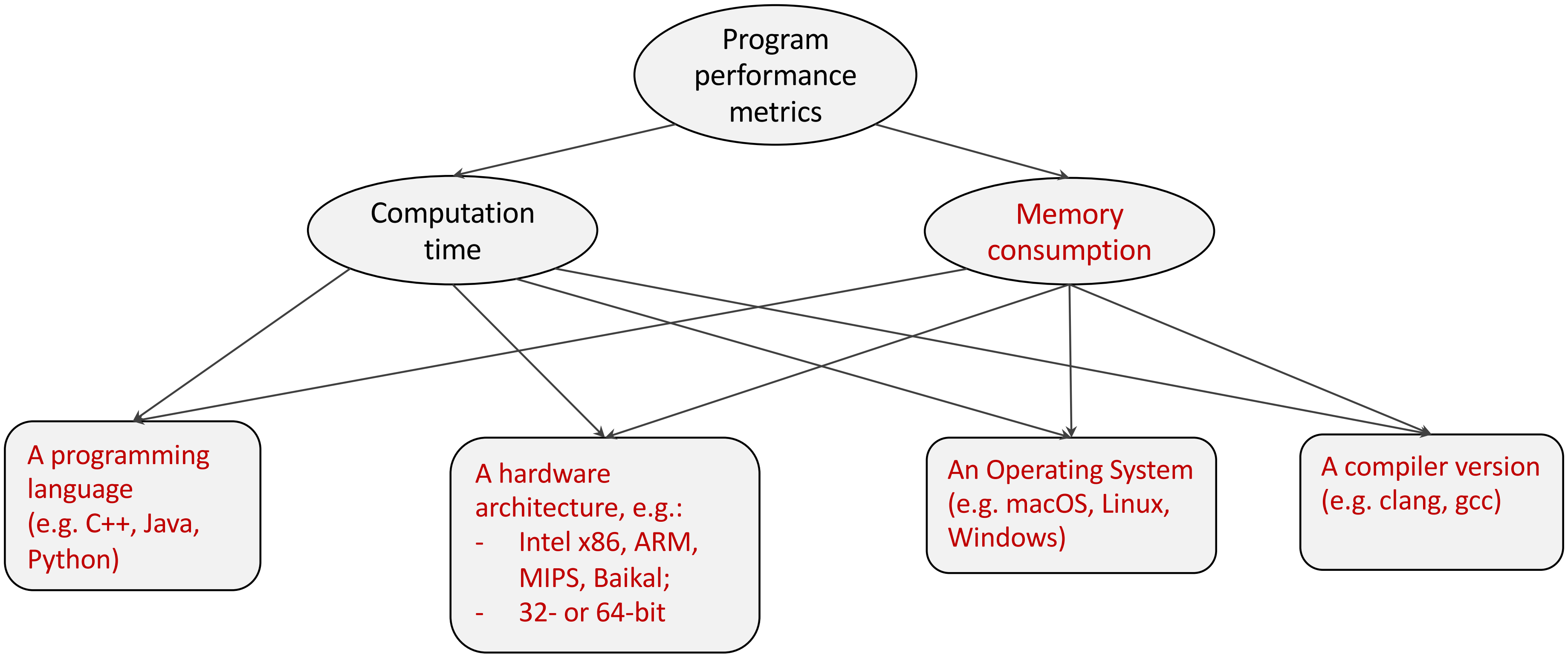
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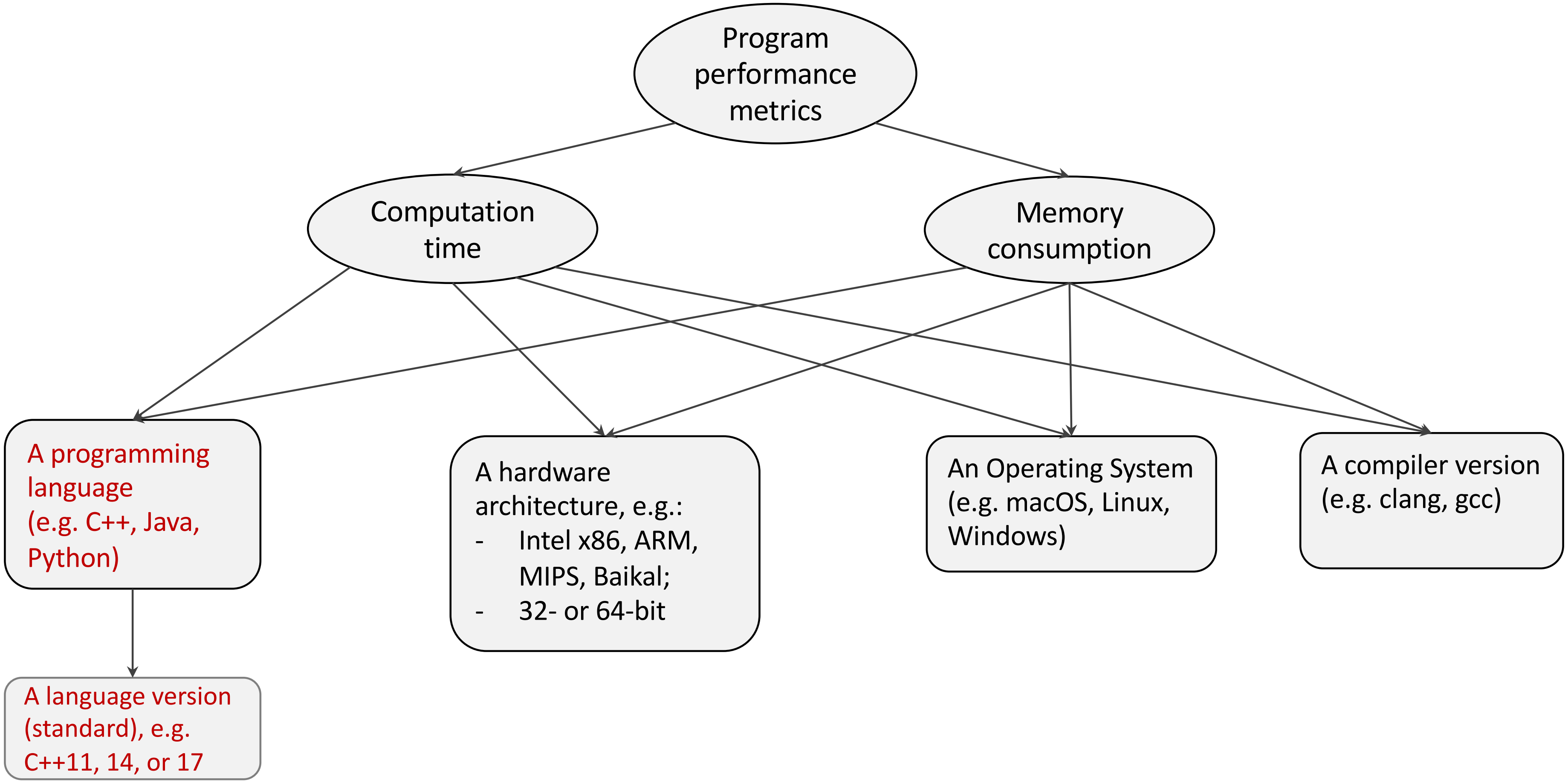
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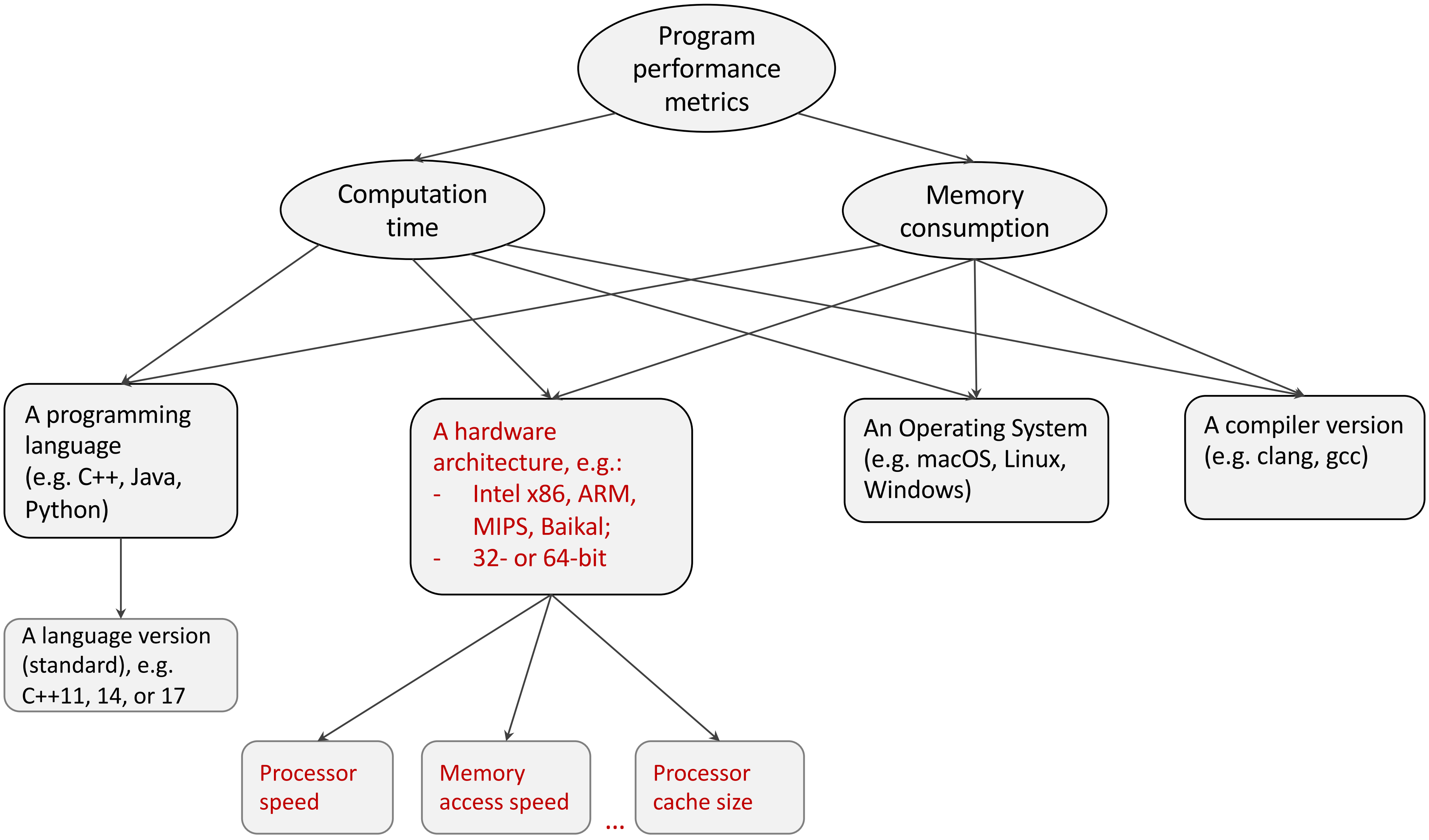

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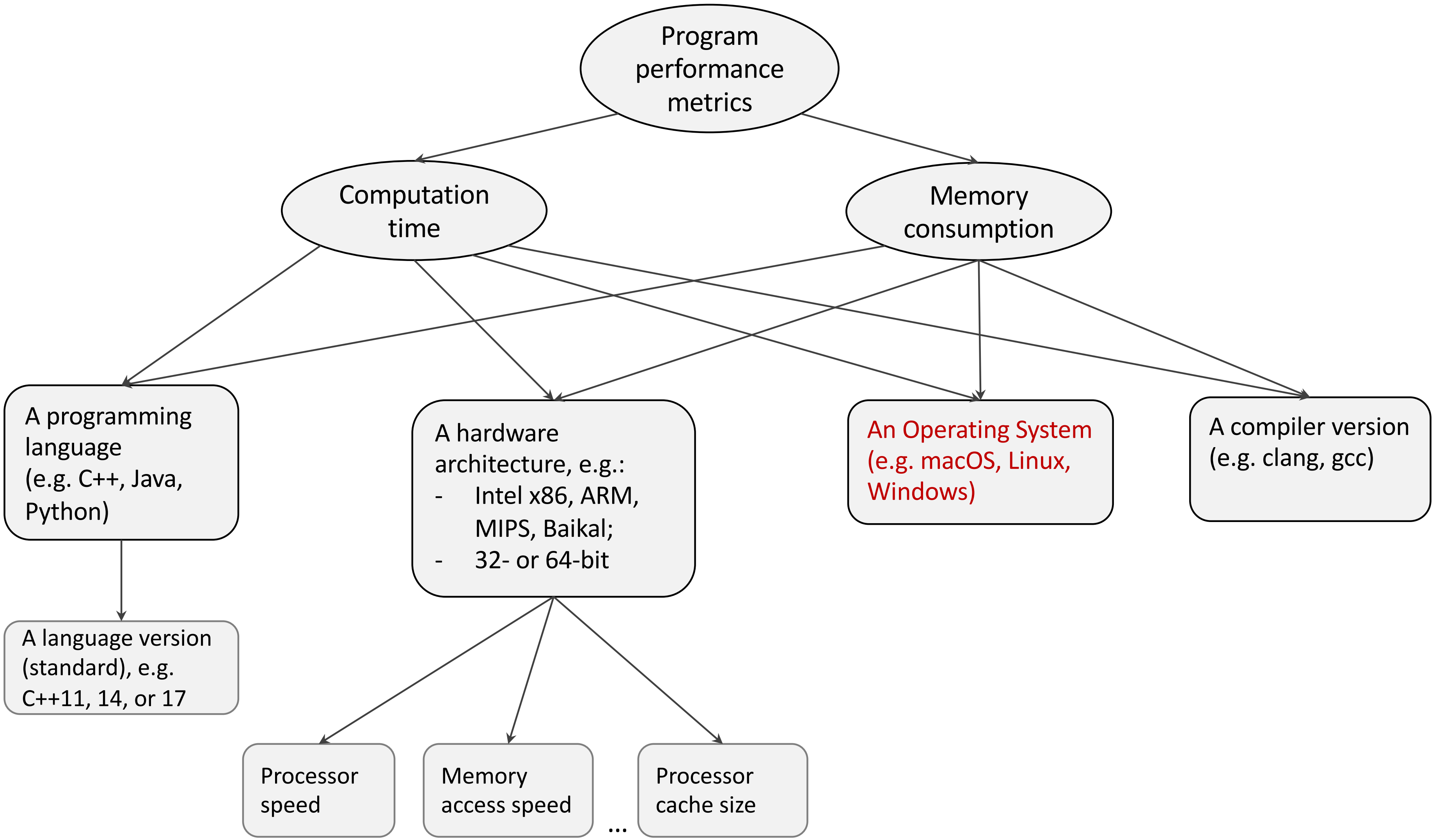
Processor speed
Memory access speed
…
Processor cache size

Performance Characteristics of a Computer Program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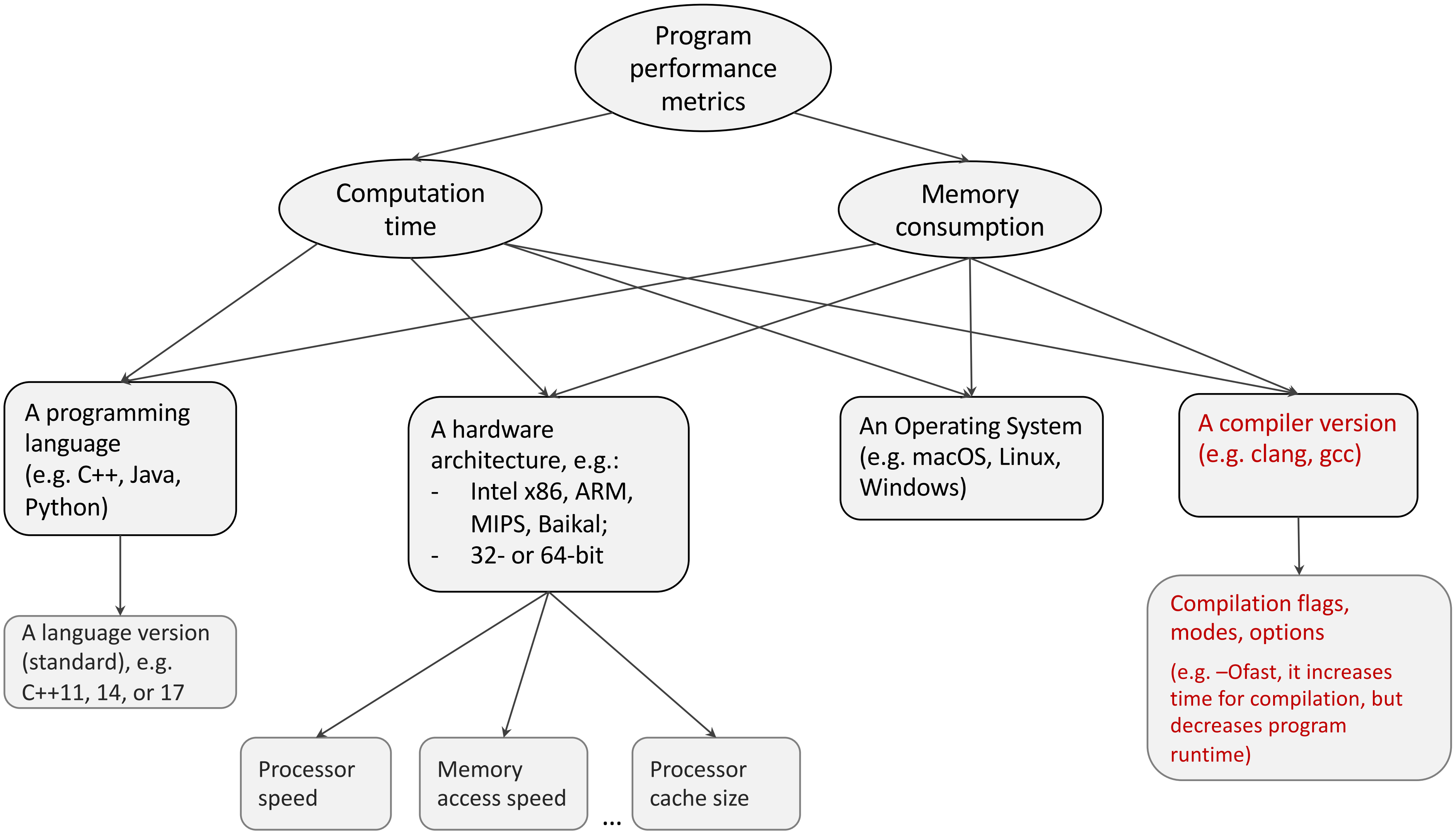

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Compilation flags, modes, options

(e.g. –Ofast, it increases time for compilation, but decreases program runtime)

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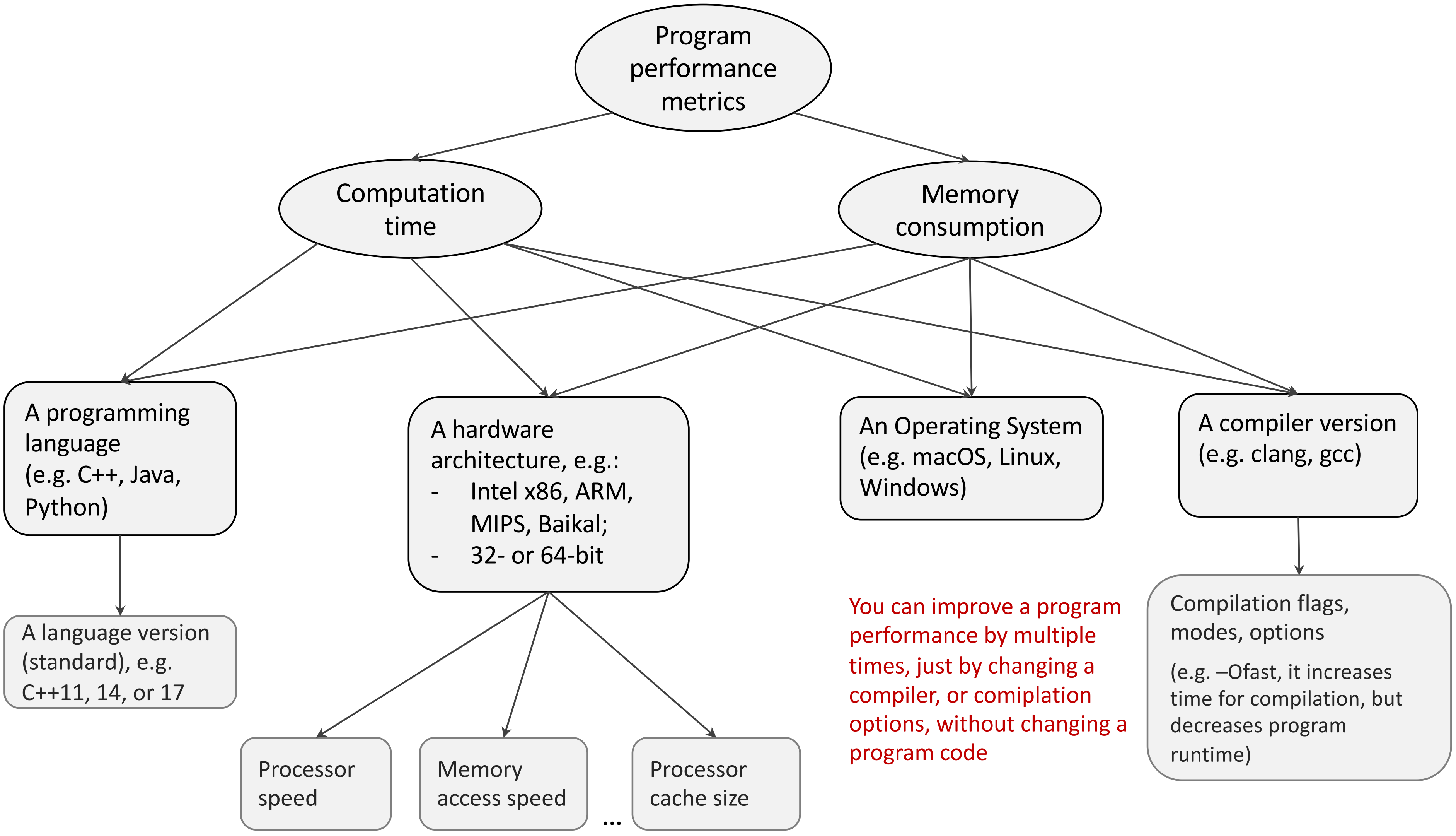

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You can improve a program performance by multiple times, just by changing a compiler, or comiplation options, without changing a program code

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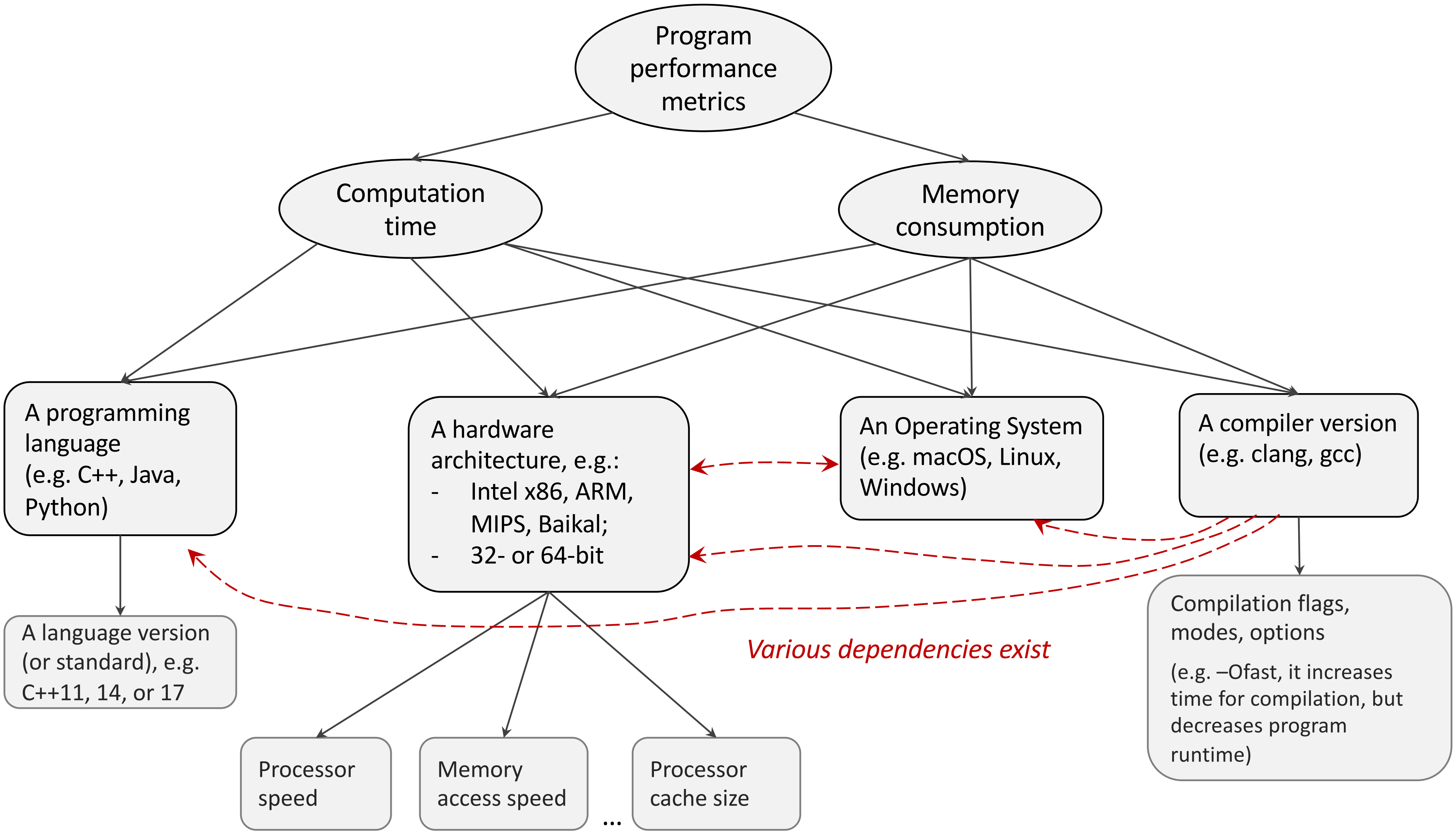

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Various dependencies exist

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Primary objective			

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Code Length	~1.5 less than for Java	Huge code in size	~3-4 times less than for Java