13—Language Processing

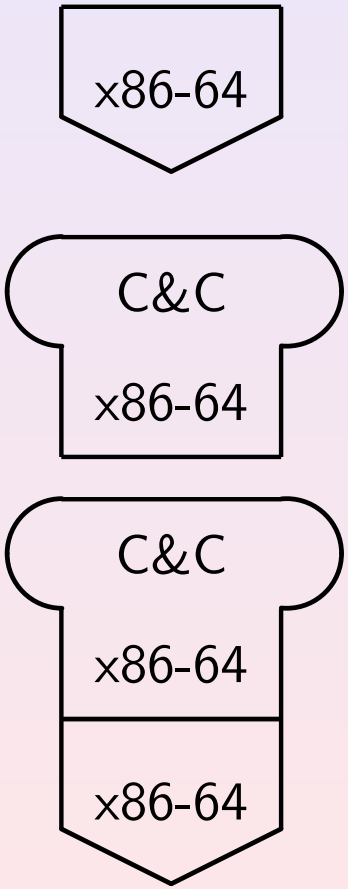
CS1101S: Programming Methodology

Martin Henz

October 5, 2012

Generated on Friday 5 October, 2012, 09:50

T-Diagrams

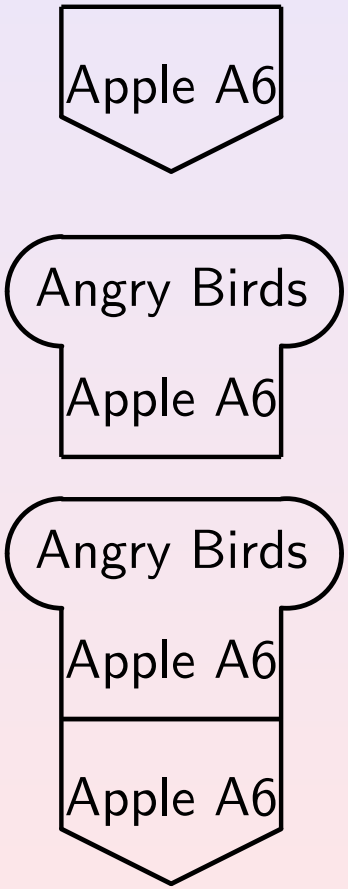


x86-64 Processor

Program "C&C" (x86-64 code)

"C&C" running on x86-64

Running an app on iPhone 5



Apple A6, the processor of iPhone 5

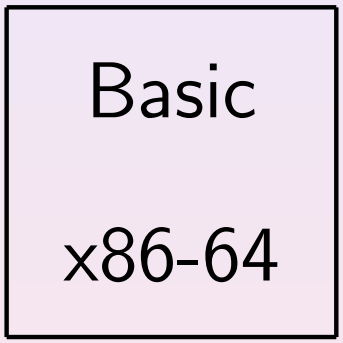
Program "Angry Birds" (A6 build)

"Angry Birds" running on iPhone 5

Interpreter

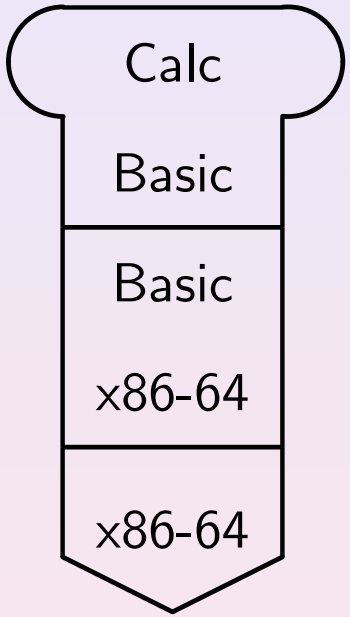
- Interpreter is program that executes another program
- The interpreter's *source language* is the language in which the interpreter is written
- The interpreter's *target language* is the language in which the programs are written which the interpreter can execute

Interpreters



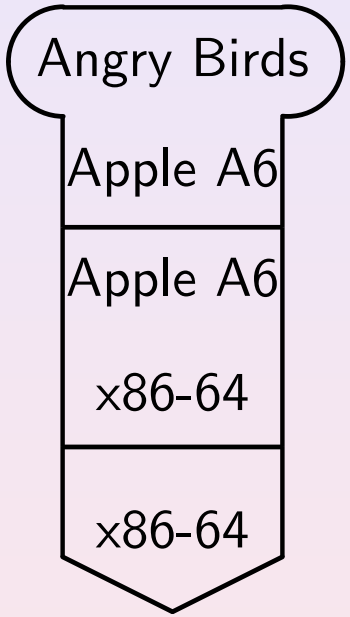
Interpreter for Basic, written in x86-64 machine code

Interpreting a Program



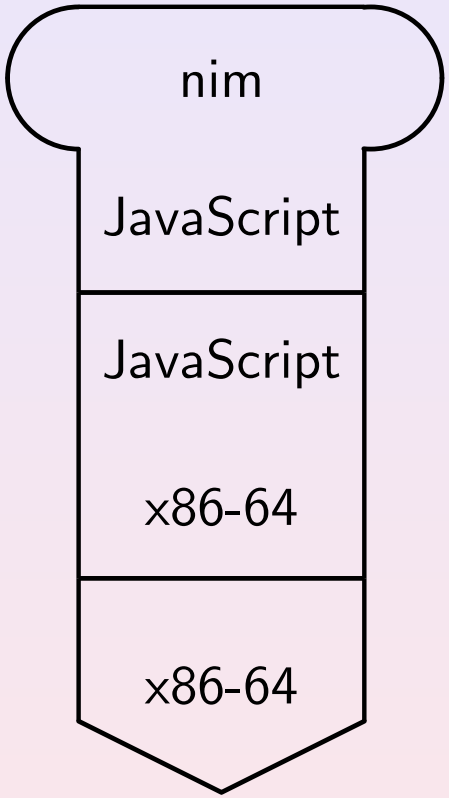
Basic program "Calc"
running on x86-64 using interpretation

Hardware Emulation



"Angry Birds" app running on a PC using hardware emulation

Running JavaScript on Firefox

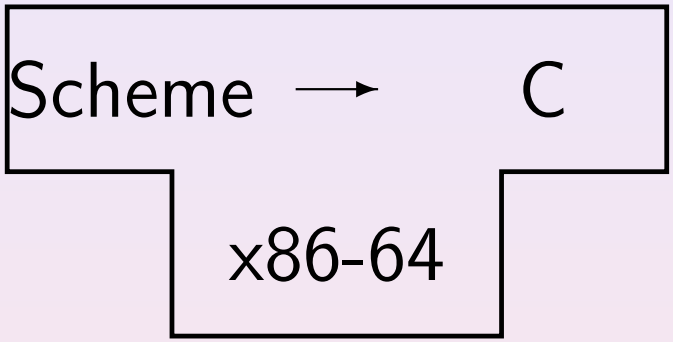


The browser acts as an interpreter for JavaScript.

Translators

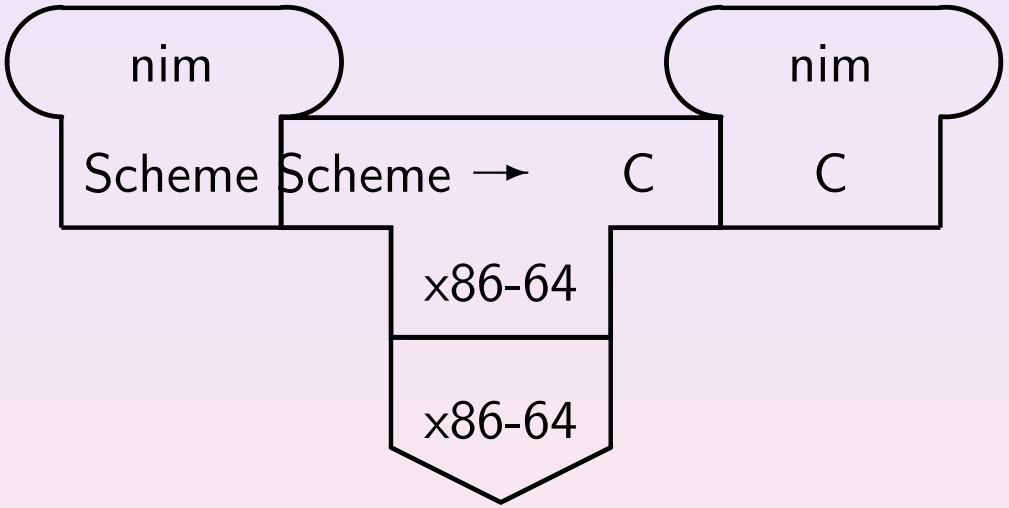
- Translator translates from one language—the *from-language*—to another language—the *to-language*
- Compiler translates from "high-level" language to "low-level" language

T-Diagram of Translator



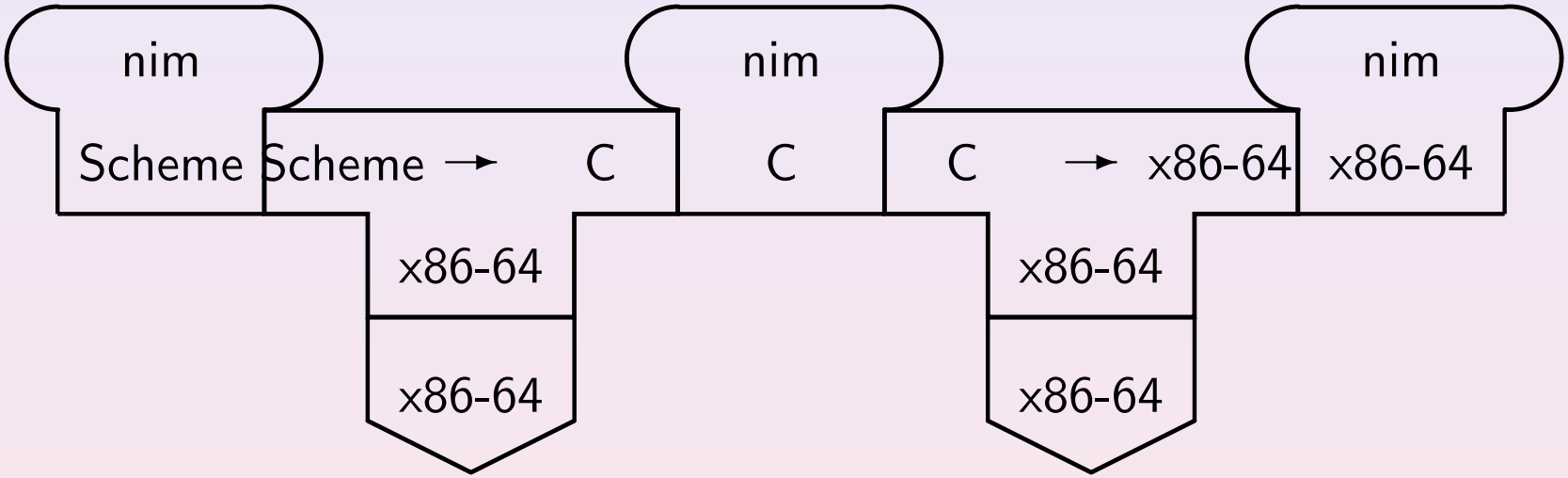
Scheme-to-C compiler written in x86-64 machine code

Compilation



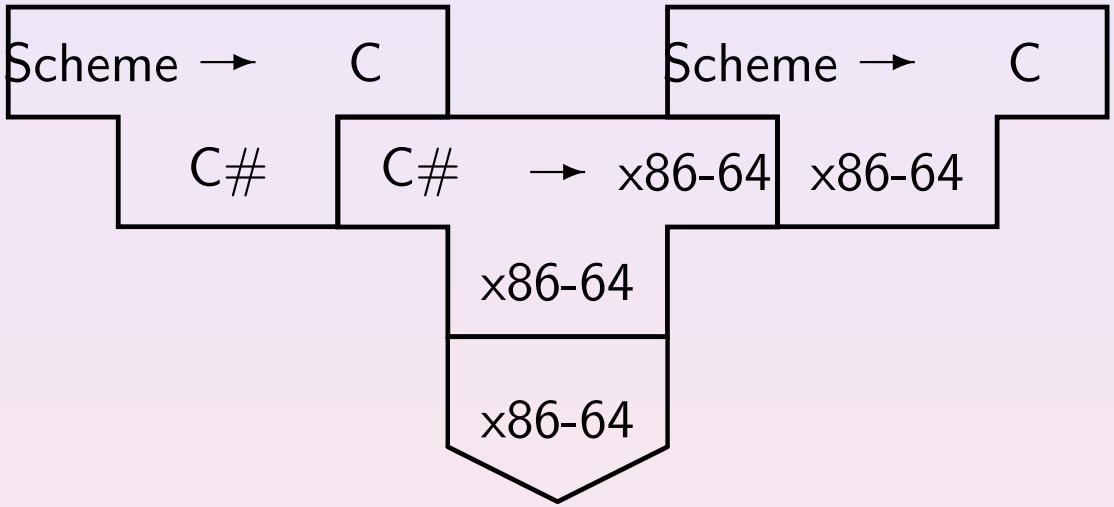
Compiling "nim" from Scheme to C

Two-stage Compilation



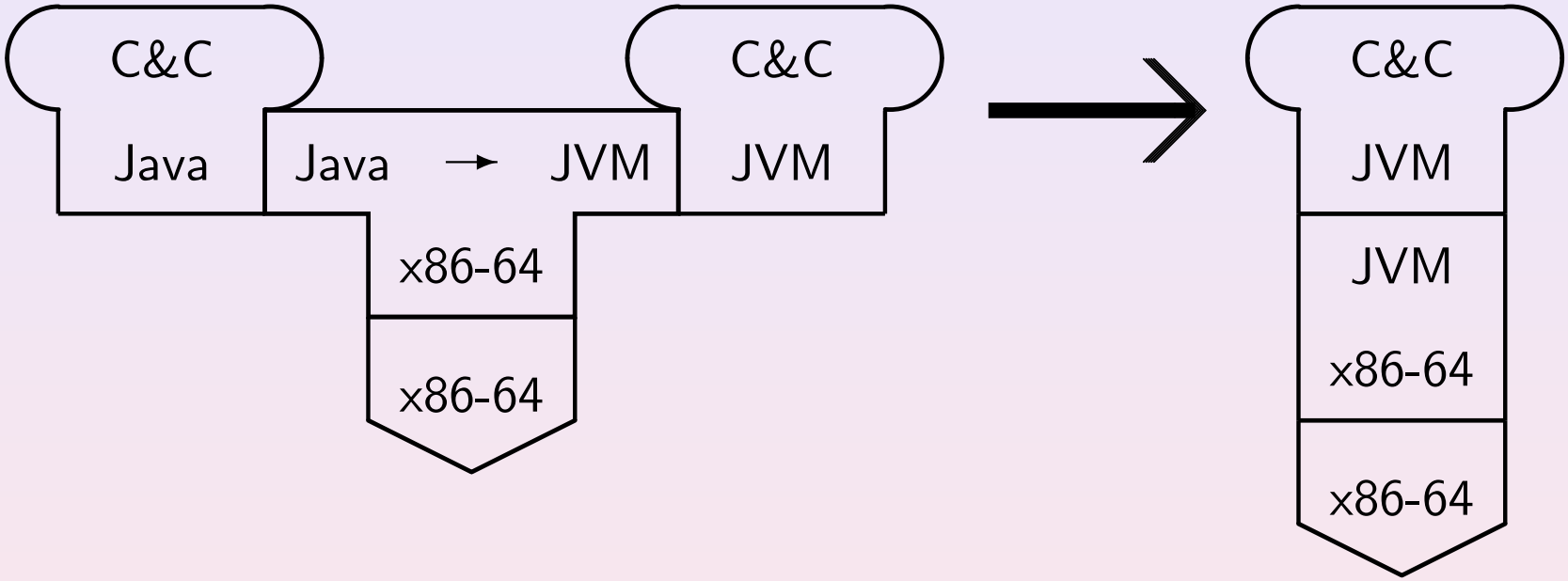
Compiling "nim" from Scheme to C to x86-64 machine code

Compiling a Compiler



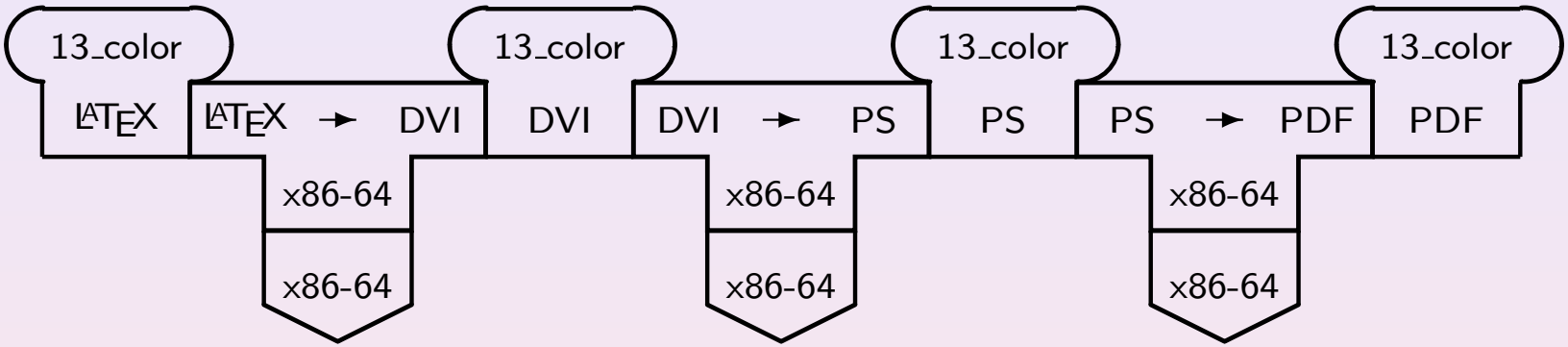
Compiling a Scheme-to-C compiler from C# to x86-64 machine code

Typical Execution of Java Programs



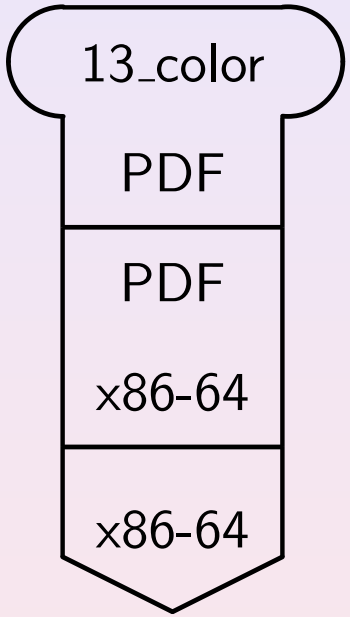
Compiling "C&C" from Java to JVM code, and running the JVM code on a JVM running on an x86-64

Excursion: Making these Slides



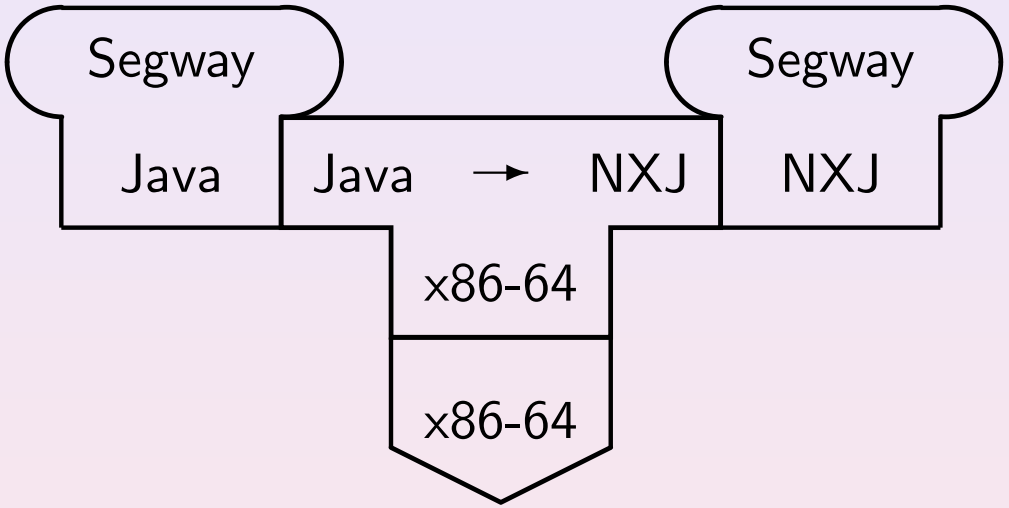
Compiling these slides
from LaTeX to DVI to PostScript to PDF on x86-64

Excursion: Viewing these Slides



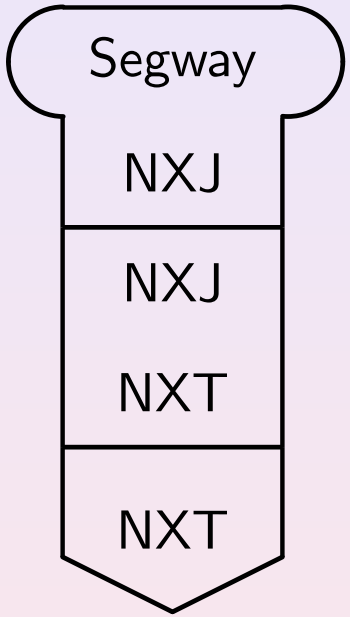
Viewing the slides on a PC

The "Usual" way to use leJOS



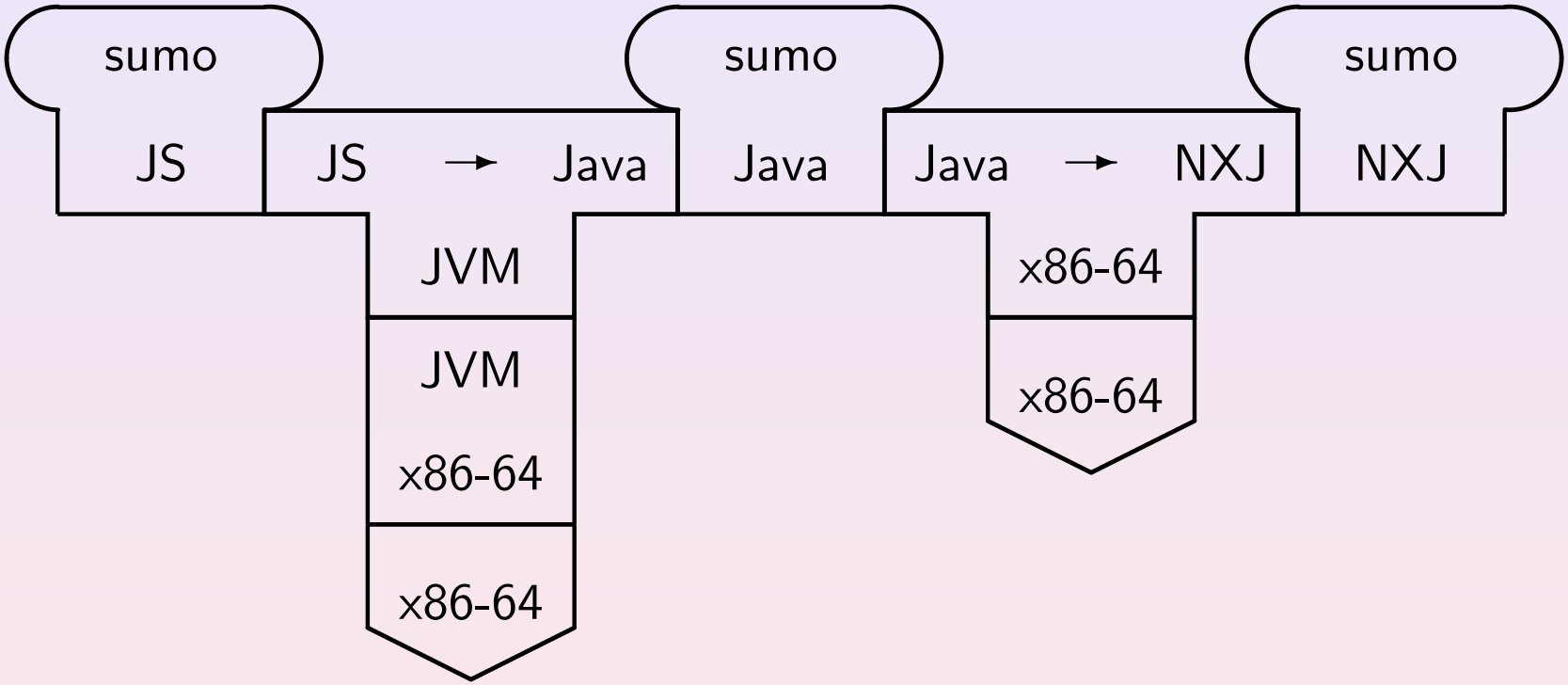
Compiling "Segway" from Java to NXJ

Running NXJ Programs on Brick



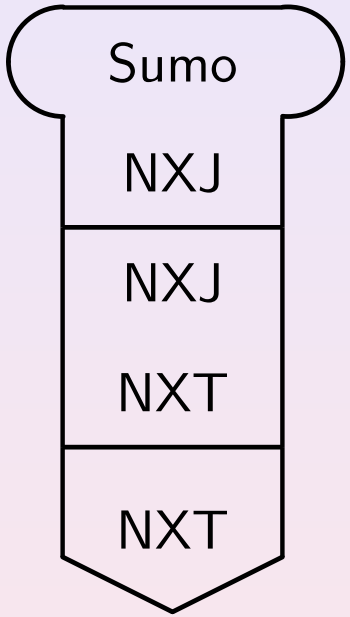
NXJ program "Segway"
running on NXT brick using NXJ

Compiling sumo



Compiling "sumo" from JavaScript to Java to NXJ code

Running sumo



NXJ program "sumo"
running on NXT using NXJ runtime system

Summary: Language Processing

- Components:
  programs, translators, interpreters, machines
- T-diagrams
- Combination of interpretation
  and compilation is common
- Interpretation and compilation
  are ubiquitous in computing
- Robot contest is making use of
  interpreters and compilers