Project Overview

Media applications are becoming more complex; mobile devices are being built with low-power multi-issue mobile processors to manage increasing data and instruction flow. We’re developing an Open Source Optimizing compiler from the LLVM [2] and Zephyr [3] Compiler frameworks so researchers can more easily implement code transformations for low-power Processors.

VPO IR Example

```
File Header:
Mrfdhsu
  m registerSize=4
  m globalSize = 4
  m localSize=4
+ globl main
dmain GLO[1] 0 0

Global Declarations
Architecture Information

Function Definitions:
Function Definition
-fmain
  D10.0,a LOC[0] 2 0 4 0 0
  ur[25]
  s=ST=r[25] ...

Parameter/Local Definitions
Function Calls

Return

-s=[r[2];
- .end main

Function End
```

Current Results

The figure above compares the ratio in execution cycles of our VPO-LLVM compiler to VPO with LCC. On the MiBench Test Suite. Numbers less than 1 indicate performance improvement. The average performance improvement is above 10%.

Open Source

The current version of the project is available for SVN checkout. For more information about downloading this project, visit http://cs.boisestate.edu/~uh/LLVMVPO.htm

Open Source LLVM-VPO Compiler

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Motivation

<table>
<thead>
<tr>
<th>VPO w/ LCC</th>
<th>LLVM w/ Clang</th>
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<tbody>
<tr>
<td>Preferred for machine level Optimizations</td>
<td>Preferred for high level Optimizations</td>
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<tr>
<td>No Support for new language standards</td>
<td>Support for new language standards</td>
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<tr>
<td>Difficult to implement code-expander for new architectures</td>
<td>Difficult to add support for new architectures</td>
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Future Goals

- Build a version for ARM
- Build a version for Static Pipeline Architecture [1]
- Fix known performance issues
- Improve Implementation
  - Use Pseudo-Registers
  - Generate Dead Register Lists
  - Simplify target change process
- Handle More Test Cases

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