Towards the development of a VSDG compiler

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Wild-cat session

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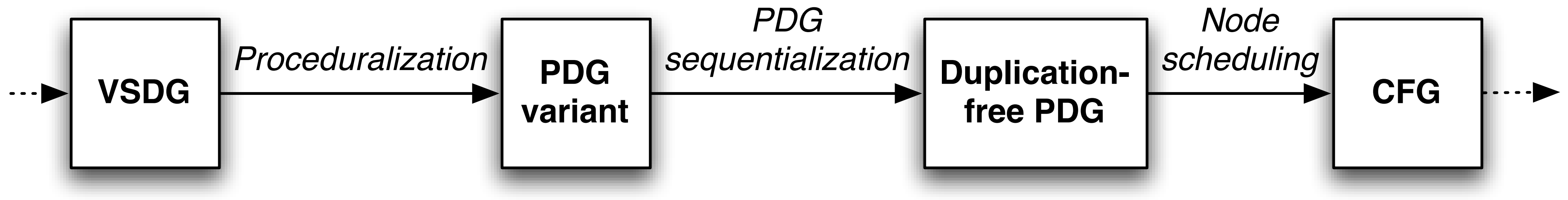
Hello

- I’m 6 months into my PhD
- All ideas are subject to change(!)
- Purpose to stimulate ideas and discussion

Value State Dependence Graph

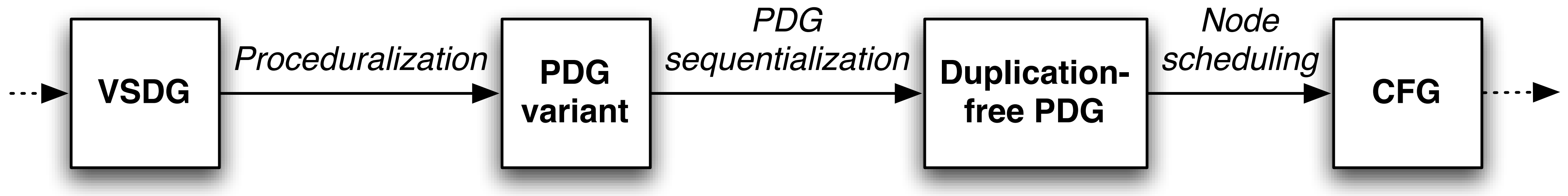
- A very interesting structure
- Original ideas and implementation by Johnson [2004]
- Theoretical exploration by Lawrence [2007]
- New implementation [2011?]

Sequentialization

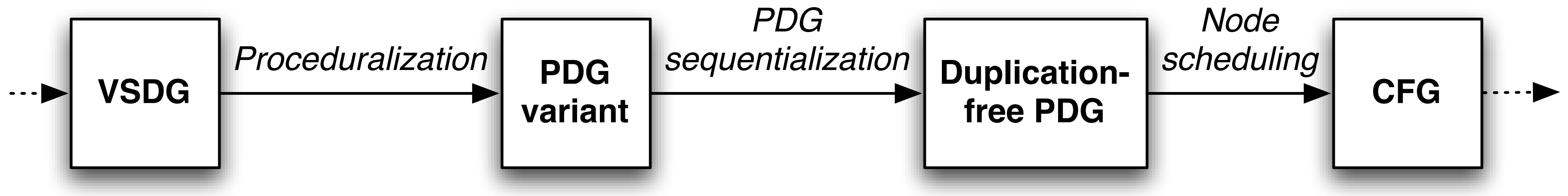


- Generating code straight from VSDG hard
- Gradual restoration of control information
- Lots of opportunity for optimizations

Phase order revisited



- Which optimizations belong where?
- Possibility that certain VSDG transformations become antagonistic to this process



Is there any other way this can be done?

Representing loops

- Recall loops were interpreted as infinite nets
- Need some kind of fix-point notation or possibly lambda style
- Still unsure about this

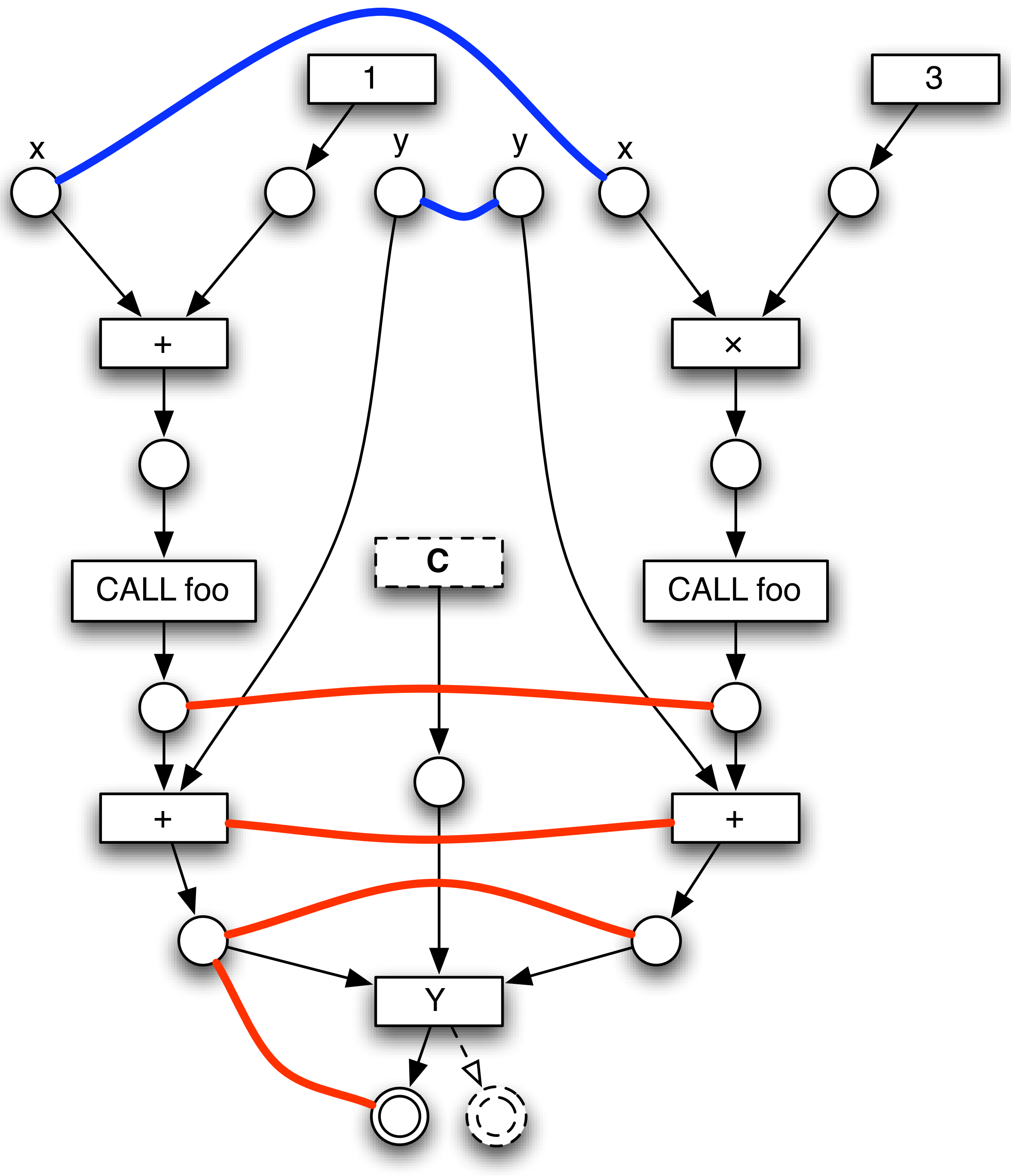
PDG variant: RVSDG

- Conjecture by Lawrence
- “Equivalent” to the PDG
- Sharing edges (history and future)
- No infinite loops - recursive calls
- But no construction algorithm.

```
if(C)
  y+foo(x+1);
else
  y+foo(x*3);
```

🟦 Reuse-sharing edge

🟥 Tail-sharing edge



Where did all the code go?

- VDG: "we are currently implementing..."
- Johnson's compiler lacks modularity and now contains out of date ideas
- Lawrence's work purely theoretical
- An implementation would be nice!

Thesis approach

- LLVM IR as input
- Code generator approach depends on time
- Plethora of possible interesting optimizations and RVSDG exploration
- Benchmark new VSDG ideas against "real" compilers and Johnson's approach
- ...plus some other ideas

Register edges in the RVSDG

- Less constraining than pre-coloring
- More constraining than affinity edges
- Does this push towards NP-Complete or not?

Parallelism

- The VSDG is a very loosely constrained graph
- Partitioning this to exploit parallelism?

Thanks!

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- VSDG
- Compiler front-ends (maybe)
- Compilers/optimizations in general