UNIVERSITY OF ENGINEERING & MANAGEMENT, KOLKATA

Course Name : Compiler Design

Prof. Sankhadeep Chatterjee

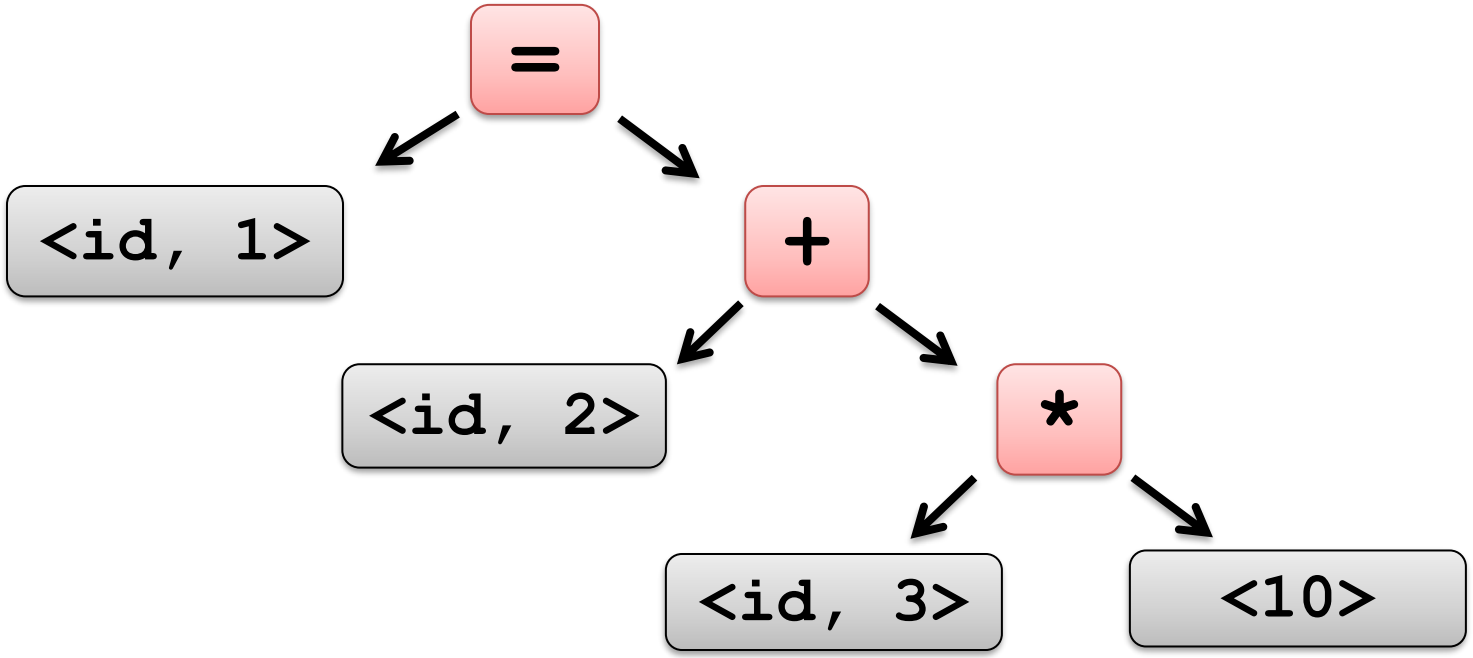
Intermediate Code Generator

- Intermediate Code Generator coverts the unambiguous parse tree to an intermediate machine dependent representation.
- There can be different ways of representations
- Three-address code is one such representation.

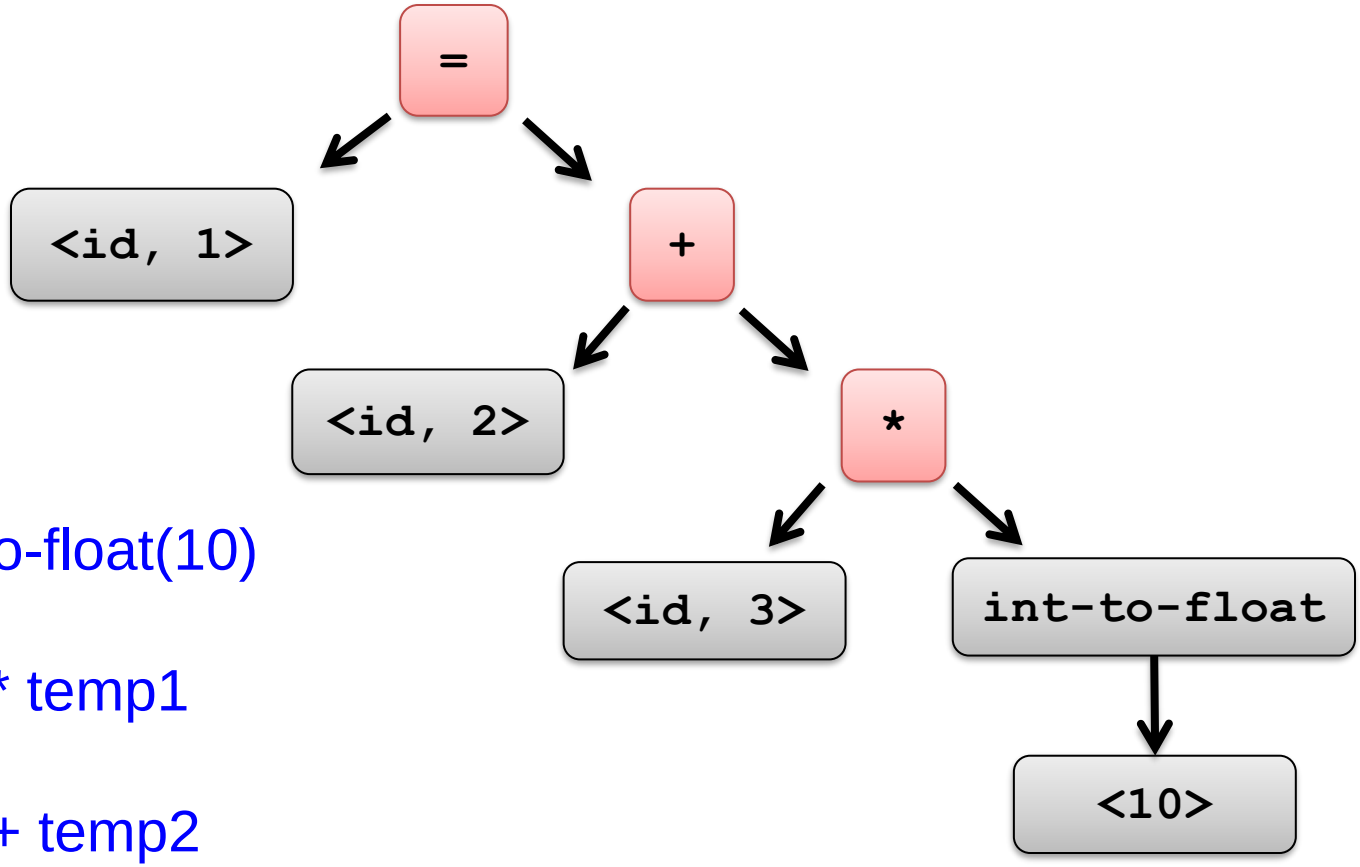
Intermediate Code Generator

- Input character stream : **a = b + c * 10**
- Token Stream :

<id, 1> <=> <id, 2> <+> <id, 3> <*> <10>



Intermediate Code Generator



temp1 := int-to-float(10)

temp2 := id3 * temp1

temp3 := id2 + temp2

id1 := temp3

Code Optimization

- Automatically modify programs so that they
  - Run faster
  - Use less resources (memory, registers, space, fewer fetches etc.)
- Some common optimizations
  - Common sub-expression elimination
  - Dead code elimination , etc.

Code Optimization

After Intermediate Code Generation	After Code Optimization
temp1 := int-to-float(10)	temp1 := id3 * int-to-float(10)
temp2 := id3 * temp1	id1 := temp1 + id2
temp3 := id2 + temp2	
id1 := temp3	

Code Generation

- **Abstractions at the source level**

  identifiers, operators, expressions, statements, conditionals, iteration, functions (user defined, system defined or libraries)
- **Abstraction at the target level**

  memory locations, registers, stack, opcodes, addressing modes, system libraries, interface to the operating systems
- Code generation is mapping from source level abstractions to target machine abstractions

Code Generation

- Map identifiers to locations (memory/storage allocation)
- Explicate variable accesses (change identifier reference to relocatable/absolute address
- Map source operators to opcodes or a sequence of opcodes

Code Generation

- Convert conditionals and iterations to a test/jump or compare instructions
- Layout parameter passing protocols: locations for parameters, return values, layout of activations frame etc.
- Interface calls to library, runtime system, operating systems

Code Generation

Optimized Code

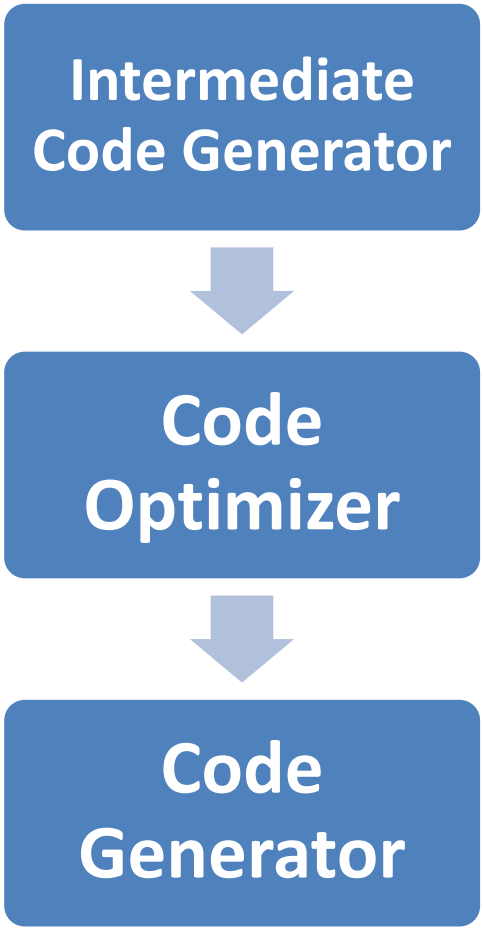
```
temp1 := id3 * int-to-float(10)

id1 := temp1 + id2
```

Target Assembly Level Code

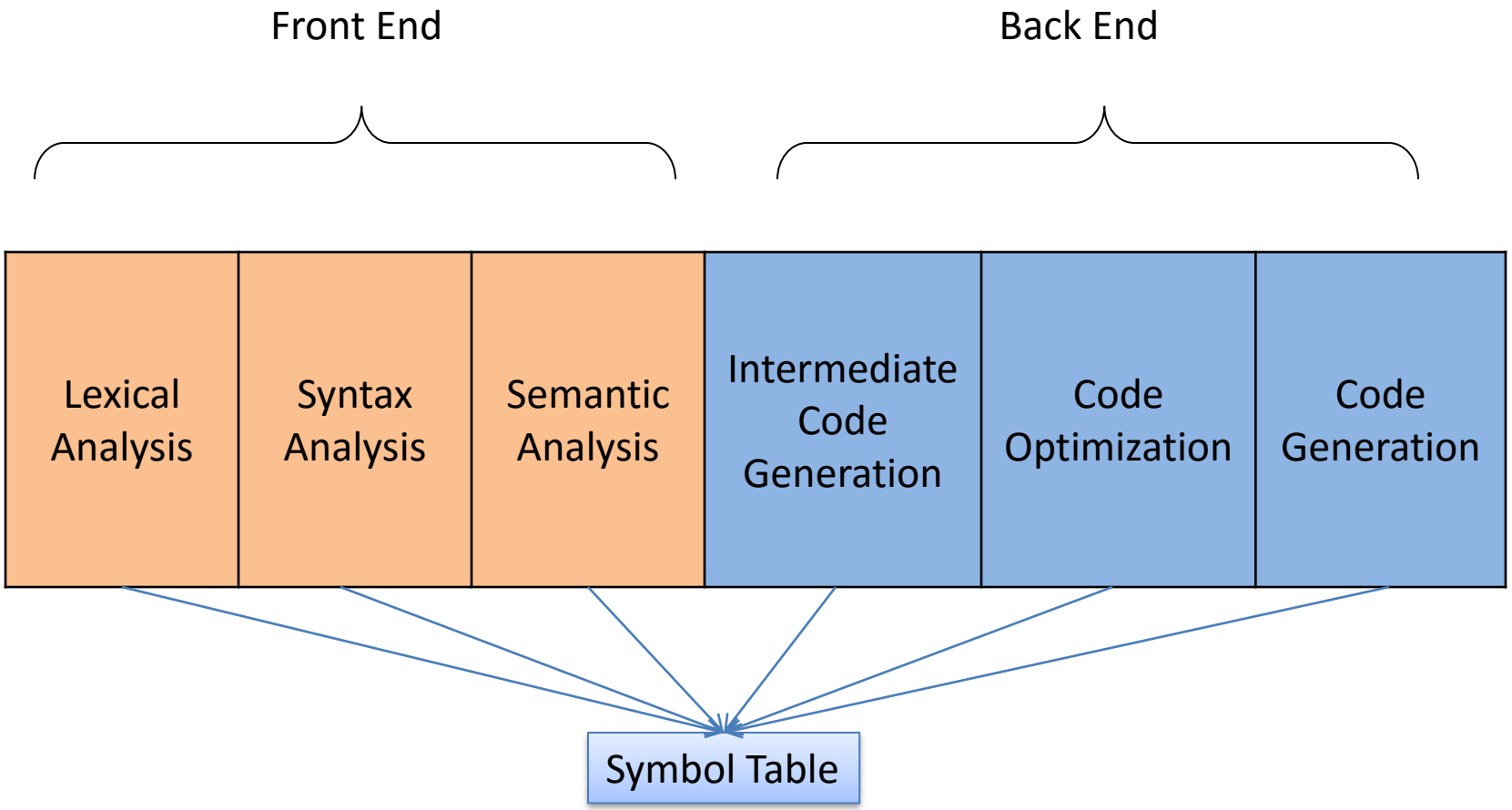
```
LDF     R2,     id3
MULF    R2,     R2,     #10.0
LDF     R1,     id2
ADDF    R1,     R1,     R2
STF     id1,    R1
```

Compilation Phases

- Back End Compilation
- Machine Dependent



Full Picture



UEM
UNIVERSITY OF ENGINEERING & MANAGEMENT
श्रद्धावान लभते ज्ञानम्
Good Education, Good Jobs

Thank You