



List-Based Scheduling in High Level Synthesis

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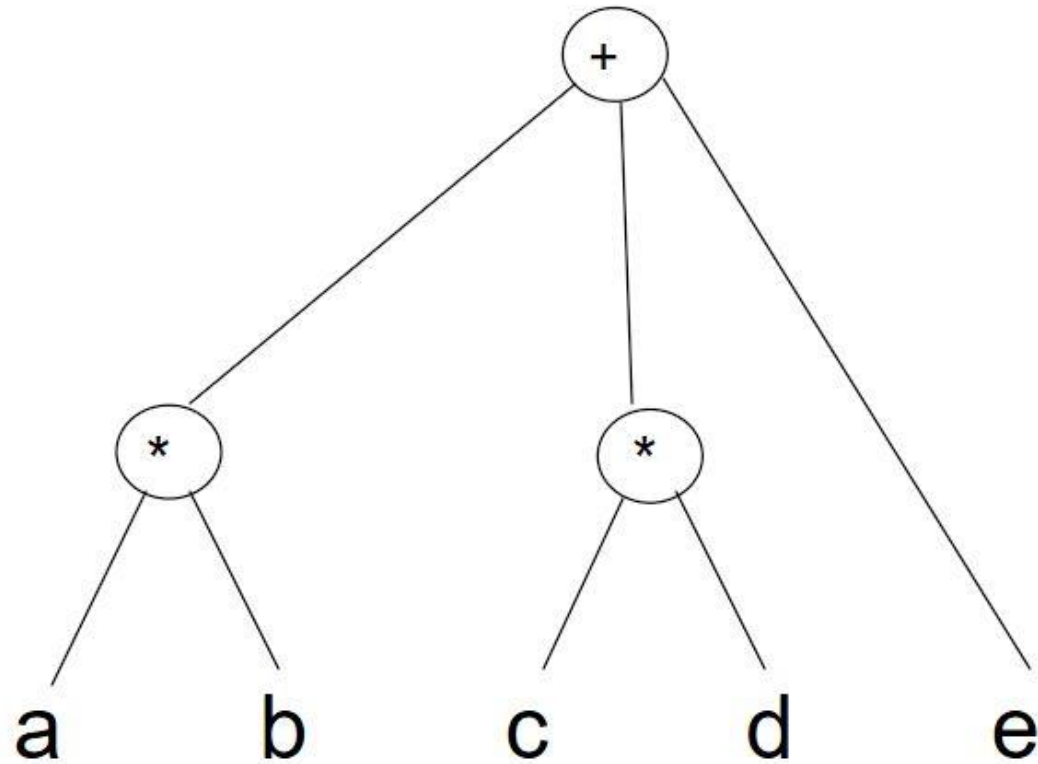
Motivation

- No first system prototype works out perfectly
- Constant changes of aspects in development
- Hardware first and Software next
- Typical design flow is time consuming
- High Level Synthesis solution with different steps
- Scheduling as an important step

High Level Synthesis (HLS)

- Processes high level language into Hardware description language (HDL)
- Creation of Control Data Flow Graph (CDFG)
- Scheduling of CDFG
- Allocation
- Binding

$$X = a * b + c * d + e$$



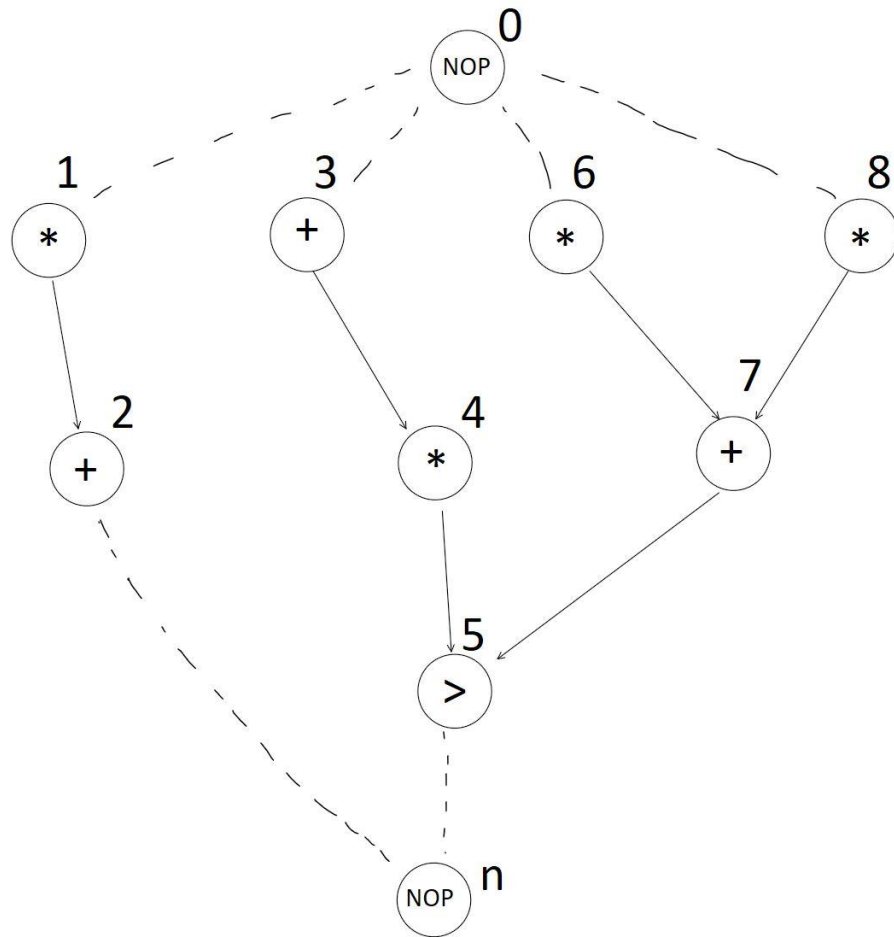
Conversion Example

Scheduling

- Determination of the start of each task in the sequencing graph
- Taking into account resource and design constraints
- Assigning resources to needed computations
- Two types of scheduling algorithms:
 1. Exact algorithms
 2. Heuristic algorithms

List-Based Scheduling

- Heuristic type of scheduling that solves resource constraint problems
- Extension of Hu's algorithm
- Works according to a priority list
- Vertices are labeled with a weight
- Most urgent operations are scheduled first

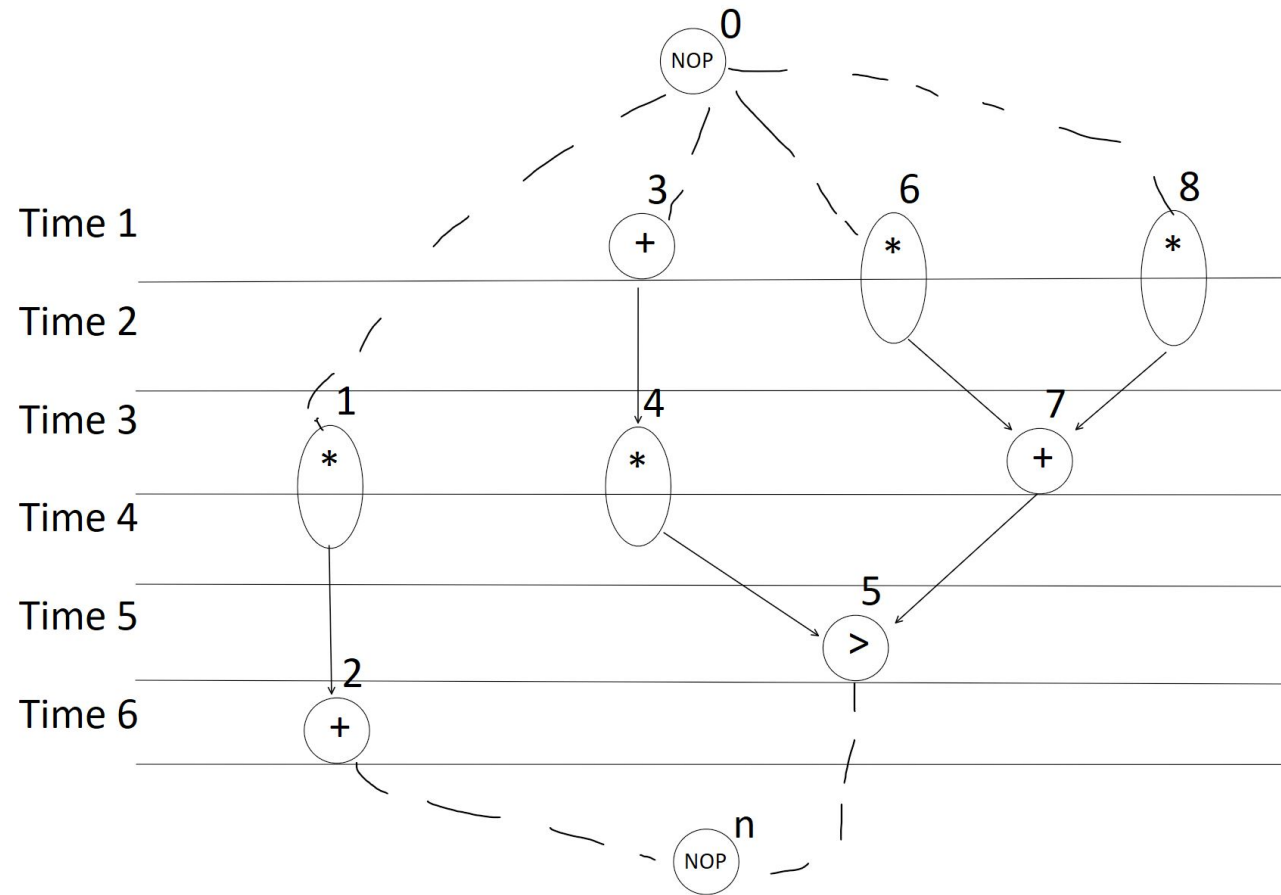


Example of a
CFG ready to
be scheduled

Operation		
Multiply	ALU	Start time
{v6,v8}	v3	1
----	----	2
{v1,v4}	v7	3
----	----	4
----	v5	5
----	v2	6

Priority list for
the CDFG

Resulting Graph with timing of operations



Summary

HLS is a powerful tool for engineers and designers

List based scheduling:
simple but efficient algorithm

Does not find absolute
optimal scheduling solution

Mostly sufficient and less
time consuming