SLP Straight-Line Code Vectorizer

- Superword Level Parallelism [Larsen PLDI'00]
- GCC and LLVM implementations are based on Bottom-Up SLP
- SLP and the loop-vectorizer complement each other:
  - Unroll loop and vectorize with SLP
  - Even if loop-vectorizer fails, SLP could partly succeed
- It is missing features present in the Loop vectorizer (e.g., Interleaved Loads, Predication)
  - Usually run SLP after the Loop Vectorizer

SLP is usually good enough

```
long tmp1, tmp2, A[], B[], C[], D[], E[];
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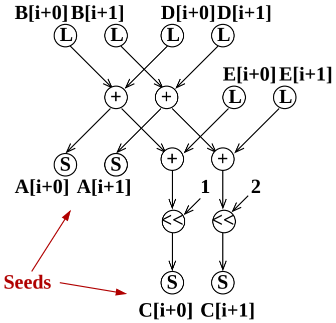

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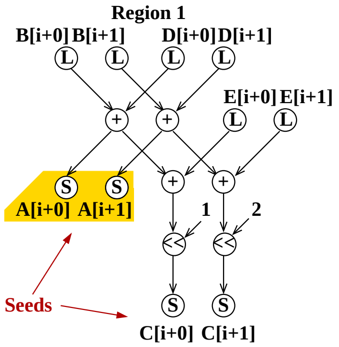

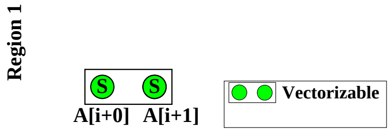

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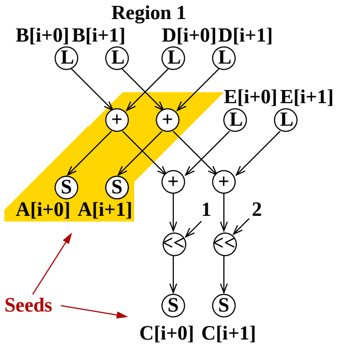

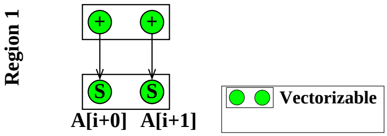

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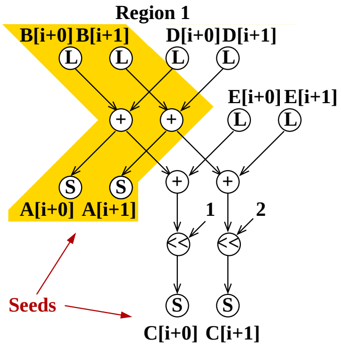

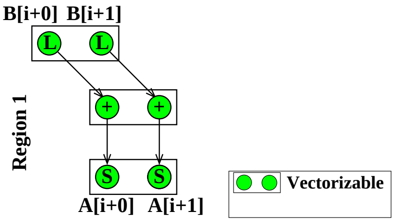

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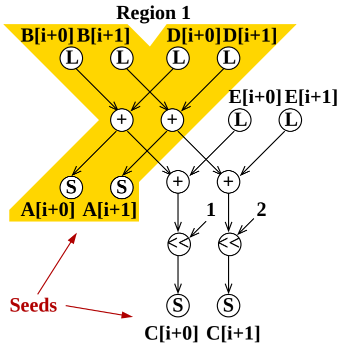

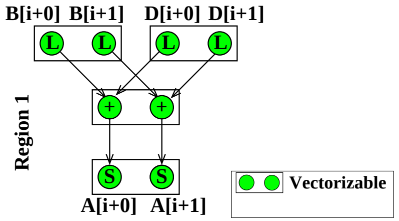

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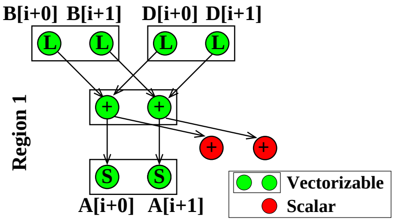

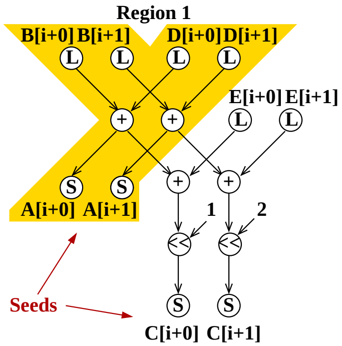

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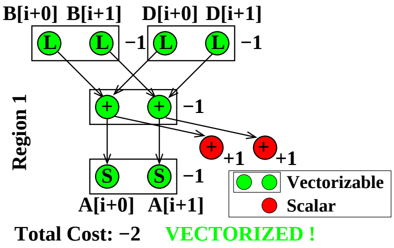
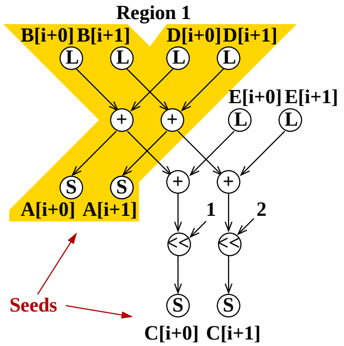


Total Cost: −2 VECTORIZED !



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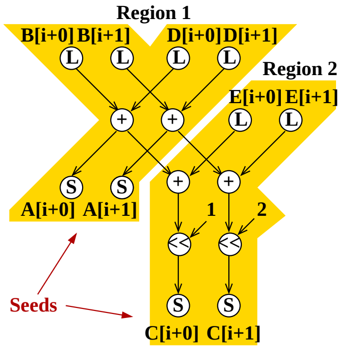

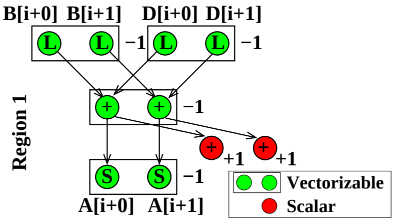

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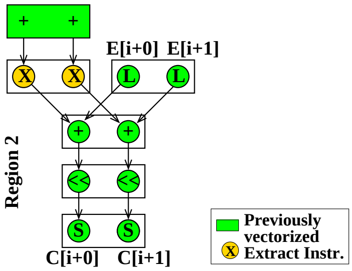

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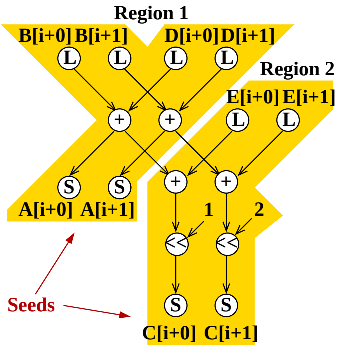

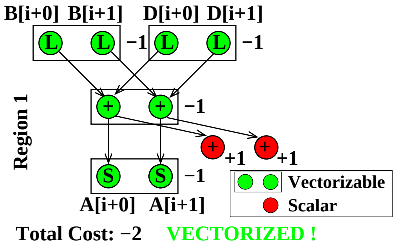

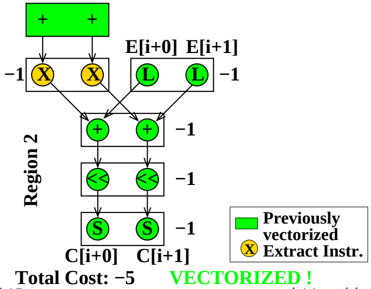

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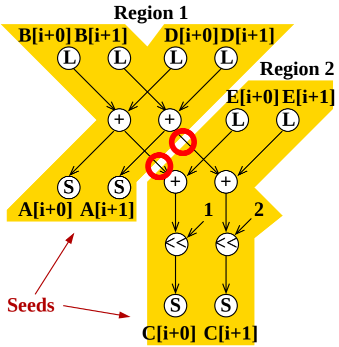

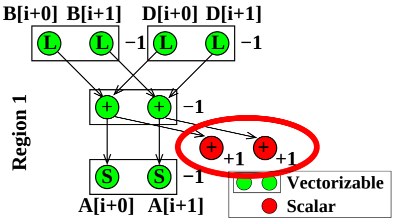

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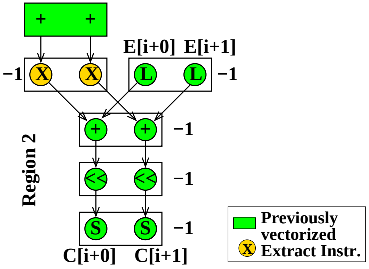

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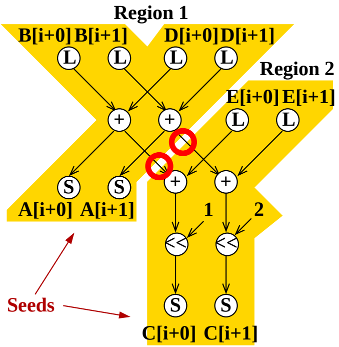
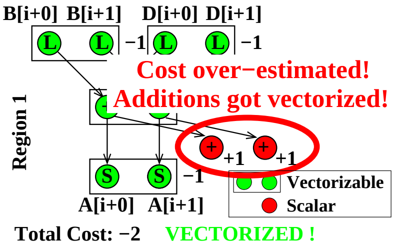
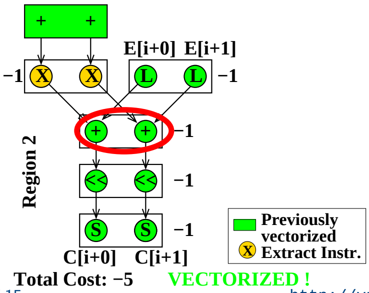


Region 1
B[i+0] B[i+1]
D[i+0] D[i+1]
Region 2
E[i+0] E[i+1]
1
2
A[i+0] A[i+1]
C[i+0] C[i+1]
Seeds



B[i+0] B[i+1]
D[i+0] D[i+1]
−1
−1
Cost over−estimated!
Additions got vectorized!
Region 1
+1
+1
−1
A[i+0] A[i+1]
Vectorizable
Scalar
Total Cost: −2
VECTORIZED !



E[i+0] E[i+1]
−1
−1
−1
−1
−1
Region 2
C[i+0] C[i+1]
Previously vectorized
Extract Instr.
Total Cost: −5
VECTORIZED !