2.1 'ShiftingBottleneck' Edge Selection Heuristics

The 'ShiftingBottleneck' optimizer has four heuristics. The decision which one to use is randomized. Each heuristic tries to provide a list of potential swaps.

- Machine Block Start

  This heuristic tries to break up the beginnings of bad blocks. It looks for:

  - Points where the critical path changes to a different Machine.
  - The critical path additionally stays on this Machine for at least one more Task.
  - The first two Tasks are from different Jobs.
  - One this Machine no swap at a previous point.

  If this is fulfilled the two Tasks qualify as a swap target.

  For the schedule in Figure 14, the following lists would be proposed as swap targets:
  [Machine 7: 1 and 2; Machine 1: 2 and 3; Machine 2: 4 and 5; Machine 5:8 and 9]

- Block Reorder

  This heuristic tries to reorder elements in a large contiguous block. It looks for:

  - A continuous sequence of Task on the same Machine, all on the critical path.
  - Excluding the consecutive elements of the same Job.
  - No swap has been selected for the Machine.

  The heuristic then randomly selects at most one swap for each Machine.

  For the schedule in Figure 14, the following lists would be proposed as swap targets:
  [Machine 1: one in range 2 to 7; Machine 2: one in 4 to 8; Machine 5: one in 8 to 10]

- Improve Machine

  This heuristic walks along the critical path and checks the following for each Task:

  - The previous swap was for a different Job.
  - There are two consecutive Task from the same Job.
  - The critical path changes from one Machine to another.
  - The first Task has a valid predecessor on the Machine.

  For the schedule in Figure 14, the following lists would be proposed as swap targets:
  [Machine 7: 1 and 2; Machine 1: 6 and 7; Machine 2: 7 and 8; Machine 5: 9 and 10]

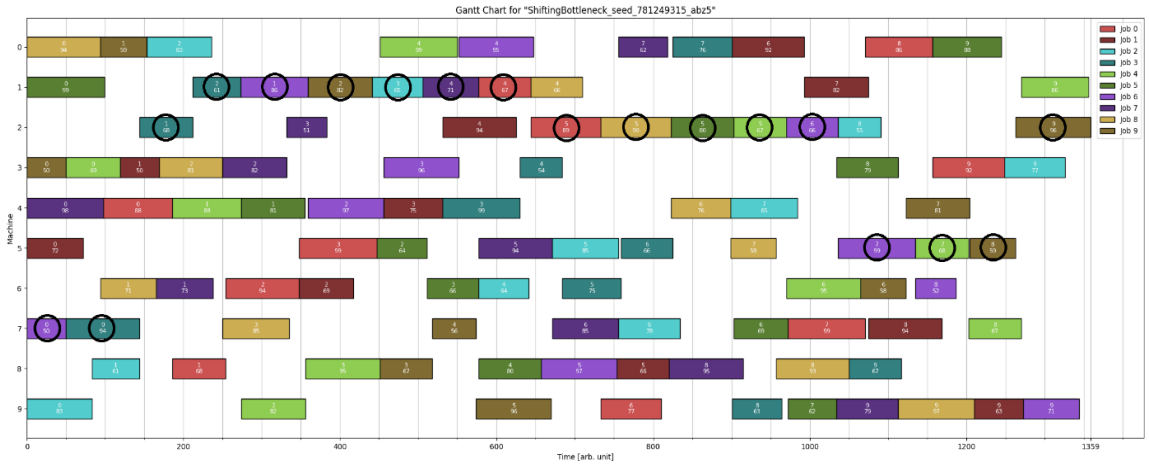

Figure 1: Schedule of abz5 after 200 iterations of 'ShiftingBottleneck', with a critical path highlighted.