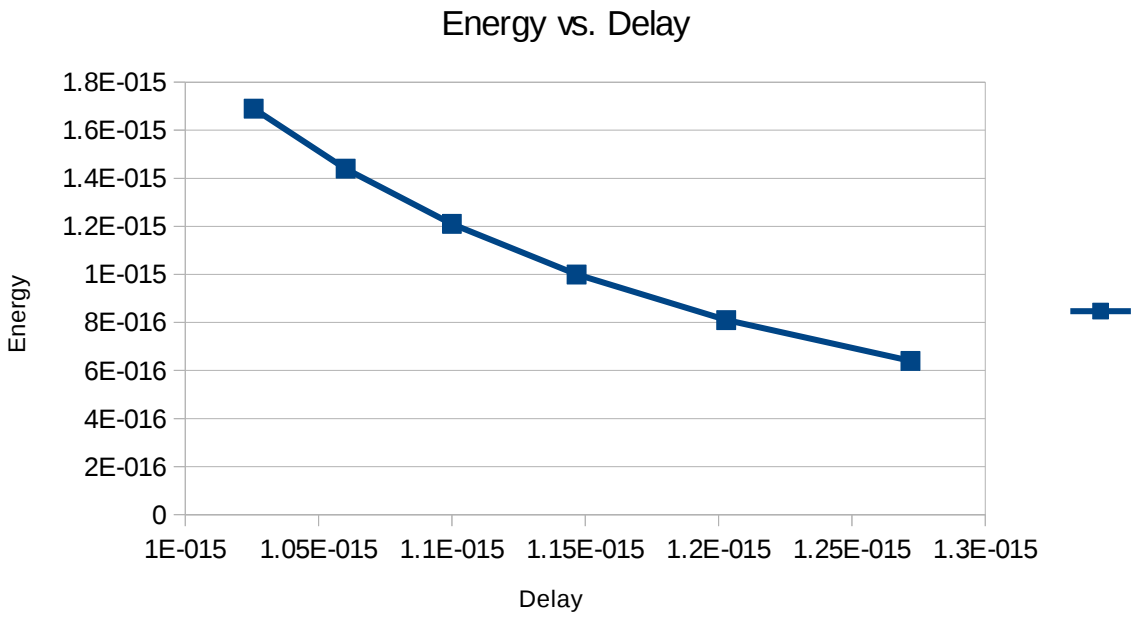
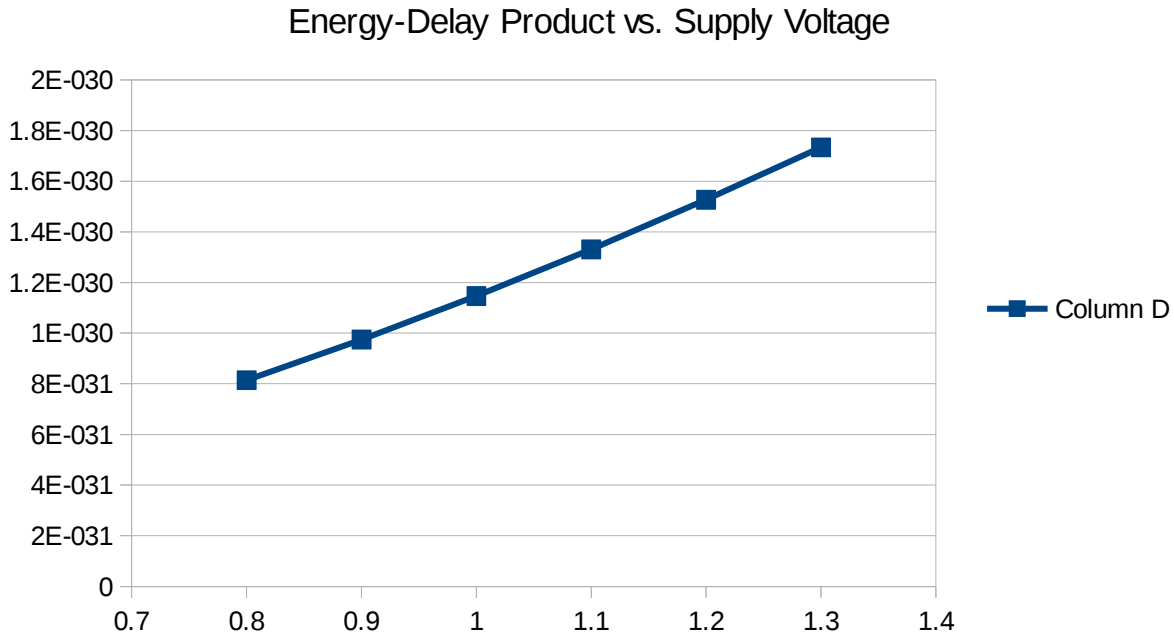
ELEC 466 – Assignment 4
Shaun Aiken, V00838297

1.

vdd	E = cl * vdd^2	D = cl * vdd/(vdd-vt)^gamma	E*D
0.8	6.4E-016	1.27192802068645E-015	8.14034E-031
0.9	8.1E-016	1.20288892499009E-015	9.74340E-031
1	1E-015	1.14679221936466E-015	1.14679E-030
1.1	1.21E-015	1.1E-015	1.331E-030
1.2	1.44E-015	1.06015839165256E-015	1.52663E-030
1.3	1.69E-015	1.025670187749E-015	1.73338E-030

vt	0.1
cl	1E-015
gamma	1.3





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2.

The power required to turn off, remain off, and turn back on must be less than the power required to idle for the same period of time.

3. Answers assume the all processors must use the same V_{dd}

a) $E = C * V_{dd}^2 ((8/8) + (8/8) + (6/8) + (0/8)) = (11/4) * C * V_{dd}^2$ for given schedule

b) Reconfiguring the tasks so that task 3 runs on P1 at t=0, task 5 runs on P2 at t=3, and task 6 runs on P2 at t=8, the energy consumption is unchanged:
$E_{static} = C * V_{dd}^2 ((5/8) + (6/8) + (5/8) + (6/8)) = (11/4) * C * V_{dd}^2$

c) Using the schedule from b), the voltage can be scaled to ¾ of V_{dd}, so the energy is 9/16 (68.75%) of E in part b).
$E_{scaled} = 11/4 * C * (¾ * V_{dd})^2$

d) If all processes are allowed to finish by t=16, then tasks 1, 2, and 6 can be assigned to P1, and tasks 3, 4, and 5 can be assigned to P2. This uses 11/16 time units on each processes, allowing V_{dd} to be scaled by 11/16, giving an energy use of 121/256 (47.27%) of E in part b).
$E_{scaled} = 11/4 * C * (11/16 * V_{dd})^2$

4. Answers assume the all processors must use the same V_{dd}

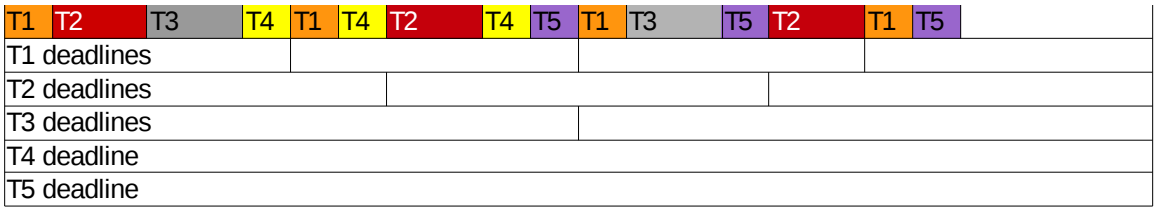
a) $E = C * V_{dd}^2 ((8/8) + (0/8) + (0/8) + (6/8) + (8/8) + (8/8)) = (15/4) * C * V_{dd}^2$ for given schedule

b) Starting task 4 at t=0 on P2, and task 6 at t=6 on P2, P1 will be used 8/16, P2 and P3 will be used 11/16. The energy used will remain the same.

c) Using the following schedule, the voltage can be scaled to 13/16 V_{dd}:
P1 executes: task 2 at t=0, task 4 at t=3; P2 executes: task 3 at t=0, task 6 at t=0; P3 executes: task 1 at t=0, task 5 at t=2.
$E_{scaled} = 15/4 * C * (13/16 * V_{dd})^2$

d) Using the schedule in c), but moving task 5 to t=0, and task 1 to P2 at t=8, energy used is as follows:
$E_{scaled} = 15/4 * C * (11/16 * V_{dd})^2$

5. Unscaled, the given tasks schedule with a meta-period of 120 time units, and the only processor idle time is 20 units from t=100 to t=120. This gives a starting point for scaling at 5/6 V_{dd}.



Scheduling with 5/6 V_{dd}