Proof that
the Energy efficiency of best effort task when Interactive and Best Effort are scheduled together **is different to** the DELTA energy of the hole system

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

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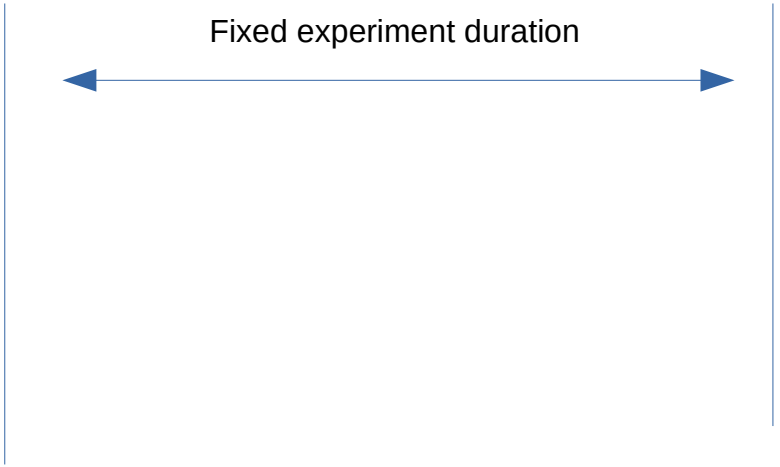
workload_of_Interactive_tasks

Energy_of_Interactive_tasks



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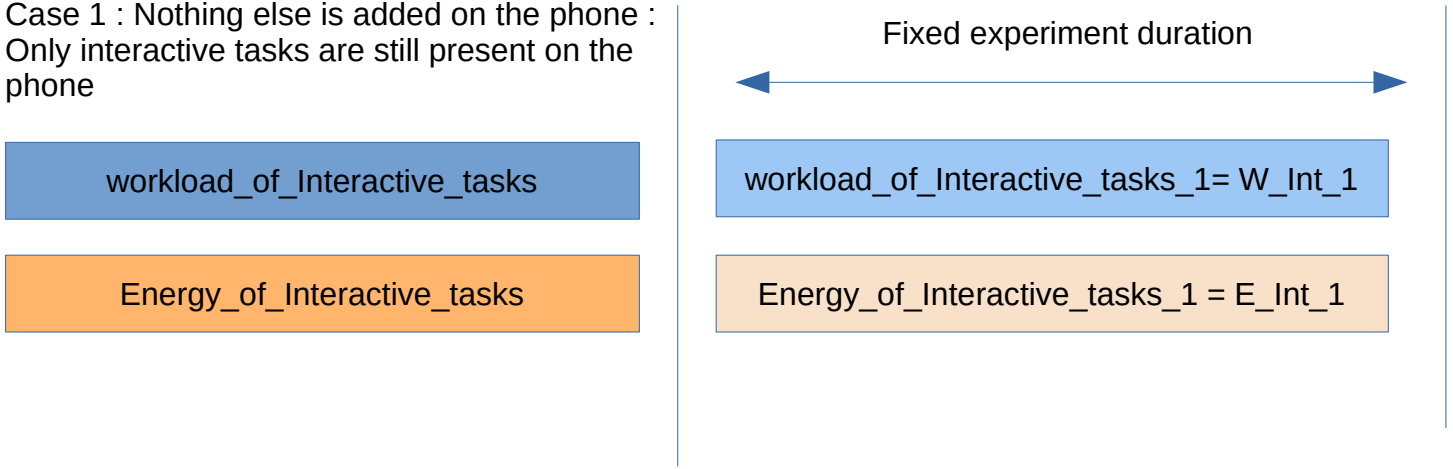

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

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workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Fixed experiment duration

workload_of_Interactive_tasks_1= W_Int_1

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

Case 2 : Best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Fixed experiment duration

workload_of_Interactive_tasks_1= W_Int_1

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

Case 2: A best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Interactive_tasks_wokload

Interactive_tasks_Energy

Case 2 : Best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Fixed experiment duration

workload_of_Interactive_tasks_1= W_Int_1

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

Case 2: A best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Interactive_tasks_wokload

Interactive_tasks_Energy

workload_of_Interactive_tasks_2= W_int_2

Energy_of_Interactive_tasks_2 = E_Int_2

Case 2 : Best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Fixed experiment duration

workload_of_Interactive_tasks_1= W_Int_1

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

Case 2: A best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Interactive_tasks_wokload

Interactive_tasks_Energy

Workload_of_Best_effort_task_2 = W_Be_2

Energy_of_Best_effort_tasks_2 = E_Be_2

workload_of_Interactive_tasks_2= W_int_2

Energy_of_Interactive_tasks_2 = E_Int_2

Case 2 : Best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Fixed experiment duration

workload_of_Interactive_tasks_1= W_Int_1

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

Case 2: A best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Interactive_tasks_wokload

Interactive_tasks_Energy

Workload_of_Best_effort_task_2 = W_Be_2

Energy_of_Best_effort_tasks_2 = E_Be_2

workload_of_Interactive_tasks_2= W_int_2

Energy_of_Interactive_tasks_2 = E_Int_2

$$efficiency_{System} = \frac{E_{Inter\,2} + E_{Be\,2}}{W_{Inter\,2} + W_{Be\,2}}$$

Case 2 : Best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Fixed experiment duration

workload_of_Interactive_tasks_1= W_Int_1

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

Case 2: A best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Interactive_tasks_wokload

Interactive_tasks_Energy

Workload_of_Best_effort_task_2 = W_Be_2

Energy_of_Best_effort_tasks_2 = E_Be_2

workload_of_Interactive_tasks_2= W_int_2

Energy_of_Interactive_tasks_2 = E_Int_2

$$efficiency_{System} = \frac{E_{Inter\,2} + E_{Be\,2}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 = \frac{E_{Inter\,2} \times \frac{W_{Inter\,2}}{W_{Inter\,2}} + E_{Be\,2} \times \frac{W_{Be\,2}}{W_{Be\,2}}}{W_{Inter\,2} + W_{Be\,2}}$$

Case 2 : Best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Fixed experiment duration

workload_of_Interactive_tasks_1= W_Int_1

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

Case 2: A best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Interactive_tasks_wokload

Interactive_tasks_Energy

Workload_of_Best_effort_task_2 = W_Be_2

Energy_of_Best_effort_tasks_2 = E_Be_2

workload_of_Interactive_tasks_2= W_int_2

Energy_of_Interactive_tasks_2 = E_Int_2

$$efficiency_{System} = \frac{E_{Inter\,2} + E_{Be\,2}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 = \frac{E_{Inter\,2} \times \frac{W_{Inter\,2}}{W_{Inter\,2}} + E_{Be\,2} \times \frac{W_{Be\,2}}{W_{Be\,2}}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 = \frac{efficiency_{Inter\,2} \times W_{Inter\,2} + efficiency_{Be\,2} \times W_{Be\,2}}{W_{Inter\,2} + W_{Be\,2}}$$

Case 2 : Best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Fixed experiment duration

workload_of_Interactive_tasks_1= W_Int_1

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

Case 2: A best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Interactive_tasks_wokload

Interactive_tasks_Energy

Workload_of_Best_effort_task_2 = W_Be_2

Energy_of_Best_effort_tasks_2 = E_Be_2

workload_of_Interactive_tasks_2= W_int_2

Energy_of_Interactive_tasks_2 = E_Int_2

$$efficiency_{System} = \frac{E_{Inter\,2} + E_{Be\,2}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 = \frac{E_{Inter\,2} \times \frac{W_{Inter\,2}}{W_{Inter\,2}} + E_{Be\,2} \times \frac{W_{Be\,2}}{W_{Be\,2}}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 = \frac{efficiency_{Inter\,2} \times W_{Inter\,2} + efficiency_{Be\,2} \times W_{Be\,2}}{W_{Inter\,2} + W_{Be\,2}}$$

$$efficiency_{ofSystem} = e_2 = efficiency_{Inter\,2} \times \%W_{Inter\,2} + efficiency_{Be2} \times \%W_{Be\,2}$$

Case 2 : Best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Fixed experiment duration

workload_of_Interactive_tasks_1= W_Int_1

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

Case 2: A best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Interactive_tasks_wokload

Interactive_tasks_Energy

Workload_of_Best_effort_task_2 = W_Be_2

Energy_of_Best_effort_tasks_2 = E_Be_2

workload_of_Interactive_tasks_2= W_int_2

Energy_of_Interactive_tasks_2 = E_Int_2

$$efficiency_{System} = \frac{E_{Inter\,2} + E_{Be\,2}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 = \frac{E_{Inter\,2} \times \frac{W_{Inter\,2}}{W_{Inter\,2}} + E_{Be\,2} \times \frac{W_{Be\,2}}{W_{Be\,2}}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 = \frac{efficiency_{Inter\,2} \times W_{Inter\,2} + efficiency_{Be\,2} \times W_{Be\,2}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 - e_1 = efficiency_{Inter\,2} \times \%W_{Inter\,2} + efficiency_{Be\,2} \times \%W_{Be2} - efficiency_{Inter\,1}$$

$$efficiency_{ofSystem} = e_2 = efficiency_{Inter\,2} \times \%W_{Inter\,2} + efficiency_{Be2} \times \%W_{Be\,2}$$

Case 2 : Best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Fixed experiment duration

workload_of_Interactive_tasks_1= W_Int_1

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

Case 2: A best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Interactive_tasks_wokload

Interactive_tasks_Energy

Workload_of_Best_effort_task_2 = W_Be_2

Energy_of_Best_effort_tasks_2 = E_Be_2

workload_of_Interactive_tasks_1= W_int_2

Energy_of_Interactive_tasks_1 = E_Int_2

$$efficiency_{System} = \frac{E_{Inter\,2} + E_{Be\,2}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 = \frac{E_{Inter\,2} \times \frac{W_{Inter\,2}}{W_{Inter\,2}} + E_{Be\,2} \times \frac{W_{Be\,2}}{W_{Be\,2}}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 = \frac{efficiency_{Inter\,2} \times W_{Inter\,2} + efficiency_{Be\,2} \times W_{Be\,2}}{W_{Inter\,2} + W_{Be\,2}}$$

$$e_2 - e_1 = efficiency_{Inter\,2} \times \%W_{Inter\,2} + efficiency_{Be\,2} \times \%W_{Be\,2} - efficiency_{Inter\,1} \neq \frac{E_{Be\,2}}{W_{Be\,2}}$$

$$efficiency_{ofSystem} = e_2 = efficiency_{Inter\,2} \times \%W_{Inter\,2} + efficiency_{Be\,2} \times \%W_{Be\,2}$$

Case 2 (Workload is fixed) : Best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Case 1 : Nothing else is added on the phone : Only interactive tasks are still present on the phone

workload_of_Interactive_tasks

Energy_of_Interactive_tasks

Experiment duration is not fixed

t_inter_1

workload_of_Interactive_tasks = W_Int

Energy_of_Interactive_tasks_1 = E_Int_1

$$efficiency_{System} = e_1 = \frac{E_{Inter\,1}}{W_{Inter\,1}}$$

$$efficiencyE_{inter} = E_{inter\,1}$$

t_inter_2 > t_inter_1

Case 2: A best effort task is added on the phone : interactive tasks and the best effort task are present on the phone

Interactive_tasks_workload

Interactive_tasks_Energy

Workload_of_Best_effort_task = W_Be

Energy_of_Best_effort_tasks_2 = E_Be_2

t_BE_2

workload_of_Interactive_tasks = W_int

Energy_of_Interactive_tasks_2 = E_Int_2

$$e_2 = \frac{efficiency_{Inter\,2} \times W_{Inter} + efficiency_{Be\,2} \times W_{Be}}{W_{Inter} + W_{Be}}$$

$$efficiencyE_{inter} = E_{inter\,2}$$

$$efficiencyE_{Be} = E_{Be\,2}$$

$$Delta_{system\ efficiency} = e_2 - e_1 \neq \frac{E_{inter\,2}}{W_{inter}} - \frac{E_{inter\,1}}{W_{inter}}$$

$$D = efficiency_{Inter\,2} \times \%\, W_{Inter} + efficiency_{Be\,2} \times \%\, W_{Be} - \frac{E_{Inter\,1}}{W_{inter}}$$

Case 3: A best effort task is added on the phone, Interactive is removed

Interactive_tasks_Energy

Interactive_tasks_wrokload

t_BE_3 < t_BE_2

Workload_of_Best_effort_task = W_Be

Energy_of_Best_effort_tasks_3 = E_Be_3

workload_of_Interactive_tasks = 0

Energy_of_Interactive_tasks_3 = 0

$$efficiency_{ofSystem} = e_3 = \frac{E_{be\,3}}{W_{Be3}}$$

$$efficiencyE_{Be} = E_{Be\,3}$$

$$Delta_{system\ efficiencyE} = E_{Be\,2} + E_{inter\,2} - E_{Be3}$$

$$Delta_{Be\ efficiencyE} = E_{Be\,2} - E_{Be_3} \neq Delta_{system\ efficiencyE}$$