From Click to Checkout: Simulating the
Energy Cost of JustEat

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A Simulated Day (cont.).

Phase	Time	Per-user RPS($r_u(t)$)	Concurrency	Mix (CPU/FILE)
Morning	06:00–10:30	0.2–1	2	1.0/0.0
Lunch	10:30–13:30	1–3	6	0.75/0.25
Afternoon	13:30–17:30	0.5–2	4	0.90/0.10
Dinner	17:30–20:30	1–3	8	0.65/0.35
Late	20:30–24:00	0.2–4	4	0.90/0.10
Night	00:00–06:00	0–1	2	1.0/0.0

- **/work/cpu**: lightweight JSON parsing + app logic
- **/work/files**: phase-specific file count/size to emulate image/file transfer.

$$N(t) = \text{concurrency} \times r_u(t)$$

JIT Flags

- Default tiered: *Interp → C1 → C2*

- -Xint: No JIT; everything interpreted

- -XX:-TieredCompilation: C2-only

- -XX:+TieredCompilation -XX:TieredStopAtLevel=1: C1-only

- -XX:CompileThreshold=1000: Compile sooner

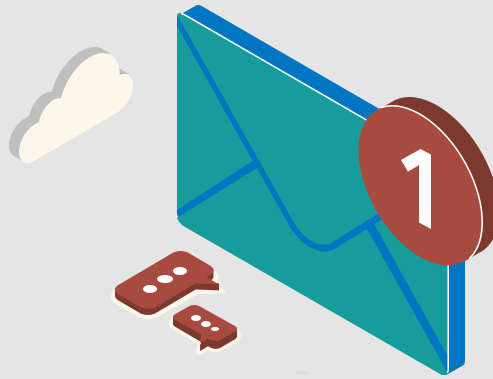- -Xms1g –Xmx1g: Stable heap

Experiments run for 24 minutes using the same daily profile

Environmental Impact Analysis

System Boundary

Backend Services

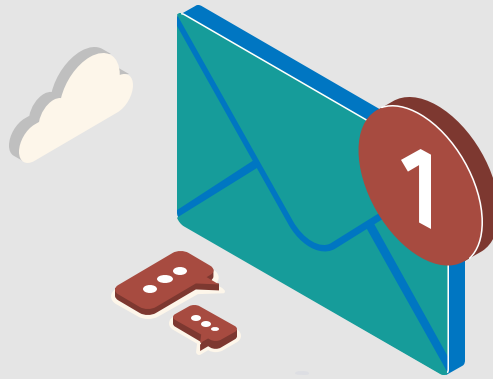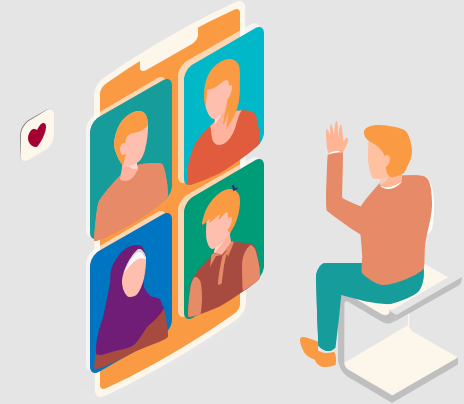Associated Infrastructure

Third-party

System Boundary Excluded

Logistics

End User Devices

Hardware Lifecycle

Power Usage Efficiency

Grid Carbon Intensity

Total Energy Usage

Results

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Results

Table 2.3: Energy per time phase (J) over 24 minutes and totals; yearly energy is scaled from 24 minutes to 1 year

Config	Night	Morning	Lunch	Afternoon	Dinner	Late	Total (J)	Total (Wh)	Year (kWh)
Baseline	203.42	66.87	149.12	104.93	200.85	226.32	980.00	0.272	5.962
Interpreter-only	200.07	197.32	219.06	582.09	338.08	316.70	2194.77	0.610	13.352
C1-only	50.03	21.72	118.93	77.84	183.06	205.76	675.10	0.188	4.107
C2-only	213.74	216.98	231.82	131.05	204.42	225.35	1307.09	0.363	7.951
Compile sooner	22.78	15.55	109.50	54.89	177.81	171.66	563.44	0.157	3.428
Stable heap	23.25	16.25	109.41	52.11	178.99	169.29	559.81	0.156	3.406

Relative differences

Config	Night	Morning	Lunch	Afternoon	Dinner	Late	Total
Baseline	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Interpreter-only	-1.65%	+195.0%	+46.9%	+454.9%	+68.3%	+39.9%	+124.0%
C1-only	-75.4%	-67.5%	-20.2%	-25.8%	-8.9%	-9.1%	-31.1%
C2-only	+5.1%	+224.6%	+55.5%	+24.9%	+1.8%	-0.4%	+33.4%
Compile sooner	**-88.8%**	**-76.7%**	**-26.6%**	-47.7%	**-11.5%**	-24.2%	-42.5%
Stable heap	-88.6%	-75.7%	**-26.6%**	**-50.3%**	-10.8%	**-25.2%**	**-42.8%**

Sensitivity Analysis

Carbon Intensity
of Electricity

Server Power
Consumption
Profile

Parameter 1: Carbon Intensity

- Assumptions

  1. It is assumed that with the 20 countries JustEat operates in, while local behaviour is different, overall they cancel each other out, resulting in a uniform distribution.

  2. It is assumed the energy consumption within a 24 hour span is identical to the rest of the year.

- Consequence

  - Extremely sensitive to Assumption 1

  - More geo-located (per-local) data is needed for more accurate results

Parameter 2: Server Power Consumption

- Assumptions
  1. It is assumed that most of the workload is caused by placing orders; and other factors are negligible further defined in the system boundary.
  2. It is assumed the energy consumption within a 24 hour span is identical to the rest of the year.
  3. On anecdotal evidence, it is assumed that most order activity is after 16:00, while before 16:00 there is hardly any order activity at all as most restaurants don't allow it before that time.
  4. On anecdotal evidence, the assumption is that hotspot order activity is on Fridays, Saturdays and Sundays.

- Consequence: Idle draw is ignored which impact is significant as assumptions only focus on when it is active.

Questions?

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