

how green is tex

some thoughts

bachotex 2023 meeting

Introduction

- tex can sometimes be demanding
- this means that users want fast machines
- powerful computers often have a higher baseline usage
- tex services / compile farms spend much time idling
- server rooms often need to be cooled
- usage has to compete with background media usage (music, web, zoom)
- energy prices went through the roof in 2022
- green energy is not always available (at night, hopefully idling)
- we can use solar power during the day (but need some margin)
- we have to take very long term usage into account

1 servers

2 farm

3 solar

Engines

- the size of the code base
- dependencies on other systems (libraries)
- compilation by experts or users (dependency)

1 `luatex` code base

2 `luametateX` code base

3 `texlive` installation

4 `context` installation

Deployment

- archives (many copies)
- installation (bandwidth, 5-10GB vs 0.3GB)
- updating (deltas)
- maintenance (teamwork)

Hardware

- costs (future machines)
- lifetime (compare to cars)
- processor, disk, memory
- runtime (not faster)

Running

- format files (concept)
- initialization (initial, successive)
- resources (fonts, patterns, styles, sources, images)
- local vs remote access (file servers)
- change in usage (web, local, often, occasional)

A recent engine

- independent code base
- optimizing memory access
- accept single core
- assume caching in memory
- optimize critical scanning
- identify bottlenecks
- prevent push back
- etc

Infrastructure

- reuse hardware
- accept less redundancy
- aim for low power
- energy neutral

Calculation

days	pages	runs	cycles	seconds	pps	idling	kwh	euros	comment
300	350	10	2	10	35.0	0	0.833	0.42	luametatex manual
300	200	50	3	15	13.3	0	9.375	4.69	m4all maintenance
100	400	20	4	30	13.3	200	1755.333	877.67	m4all server
100	400	20	4	30	13.3	20	178.533	89.27	idem laptop
365	80	15000	2	5	16.0	200	2512.417	1256.21	nightly reports
365	80	15000	2	5	16.0	20	935.617	467.81	idem laptop

price per kwh: 0.50