

Do-it-yourself datacenter - case Tampere University of Technology (TUT)



Tampere University of Technology

- Founded in 1965
- 10000 students
- 2000 staff





Tampere University of Technology

~160 km up North from Helsinki







Data centers at TUT

- Two independent main facilities
 - Total capacity ~550 kW
- Few smaller computer rooms of ~10-20 kW





Data centers at TUT

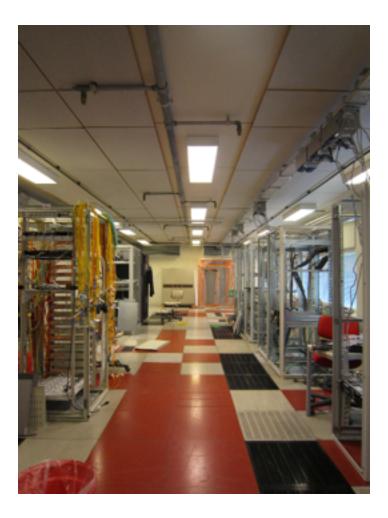
 Secondary data center (~200 kW) was build in 2010





Old computer room

- Build in 1978
- CRACs were replaced in 2004
- CRACs had problems with cooling
 - Oil and refrigerant leakages



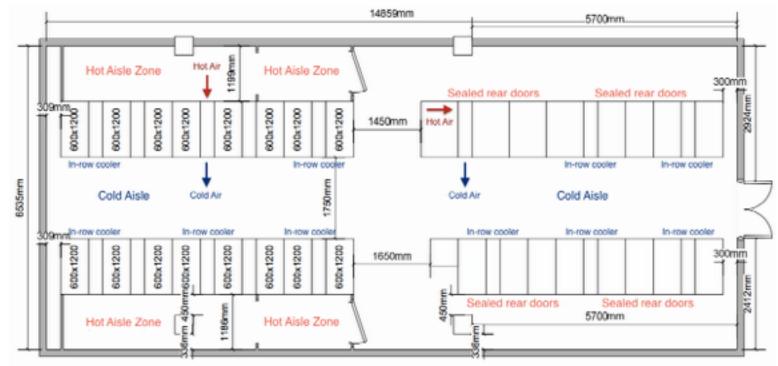


- A storage room was converted into a data center
- Design started in Feb 2013
- Construction work started in Apr 2013
- Ready in March 2014
- Project cost ~1 Meur





 Cooling is based on cold/hot aisles with in-row cooling





- Total capacity
 - 32 x 42 U racks
 - ~350 kW
- Currently ~20 kW used
- Cold aisle temperature is 27 C degrees





- Cooling is done with free cooling and with compressor chillers
- Free cooling PUE can be as low as 1.07 and compr. cooling PUE as low as 1.2

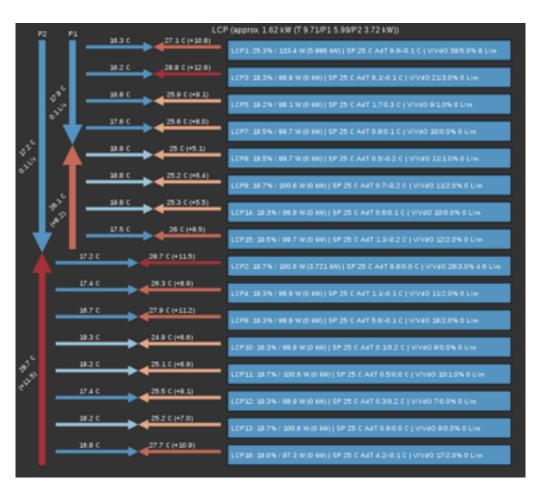






Tweaks

- Tuning in-row coolers reduced their power usage by 8x
- Temperature of water/refrigerant is increased in favor of free cooling

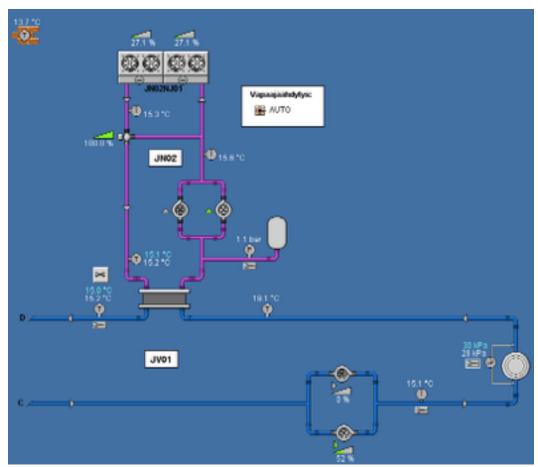




Problems

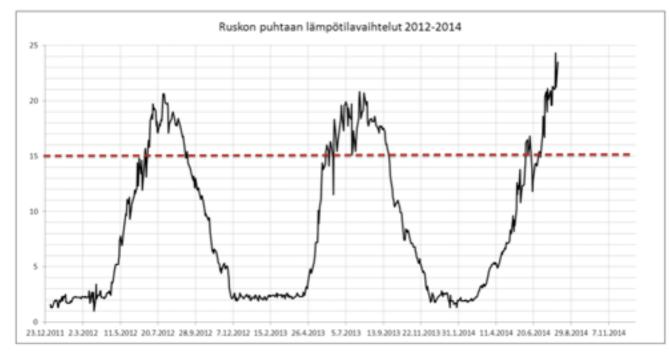
- Low PUE can be achieved only with high loads
 - Target 12 kk avg.
 PUE is 1.2
- UPS increases PUE by 0.1-0.2
 - HPC servers
 have off-line UPS
- Getting data out from the automation system was a bit of a challenge





Problems

• During summers, temperature of water used for emergency cooling rises :(





Thank You

Temperatures													
Fee: 10700	25.2 C		25.1.5		200	29.8.5		274.0	38.7 C	38.2 C	35.7 C	34.8 C	32.0 0
feer middle	21 + C		29.2 C		21.3 C			28.4 0	94.9 C	28.0 C	94.8 C	26.7 C	22.4 C
Pare 119	2112	23.7 C	23.5 C	21.4 C	2110	942.0	30.2 0	28.2 C	31.8 C	9623	31.810	31.10	34.8 0
	1012		100	10	100	1.07.8	835	1012	1071		1072		101
Prenting	894	2010	312 (25.0 €	894	2015	362.0	24.4.4	3474	31.8 C	2473	20.9 (2010
From middle	821		29.2 4		253.0	201			29.4 4	274	2433	2011	
Post Later	2344		2474		310	242.0		24.31	2474	244	24.11	20.0 1	23 F C
		Cold Aia	ia Co	ld Aisla	Cold A	iala (Cold Aisle	Cold	Aisle	Cold Air	ie Co	M Aisle	
Providentian	24.9 C		2423		29.2.4	24.7 C		242.0	2444	28.5 C	25.8 C	26.5 C	23.8 K
Puer el tida	-		29.2.5		23.9 C	29.9 C		214.5	214 C	21.5 C	311	28.8 1	23.5 C
Panting	2112	2111	24.43	214.5	2110	28.3 C	28.1.0	28.8.5	24.14	2115	2110	27.3 C	2111
	1011		1000	821	105	LCPS	•10	107	101		LCPS		1074
fee 19	2555	844	2554	244	834	844	211	201	28.4 C	28.0 C	27.1.6	263.0	26.14
Rear middle	321		824		314	811		2010	28.2 4	2110	2111	26.5.5	2023
Tea lotan			-		212.6	-		2010	28.4 C	28.2.4	21. C	21.1 1	2111

