ECE 571 – Advanced Microprocessor-Based Design Lecture 32

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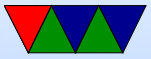
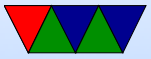
Announcements

- HW #11 will be a GPU reading
- Project status due Monday
  Topic, plus related work
- Related: never pay for an academic paper
  - No one involved with the paper ever sees that money
  - Also the UMaine library pays a lot of money to subscribe to the papers, so access them through the library website



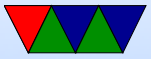
Reading of the Articles



ARM Article

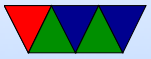
Apple Announces The Apple Silicon M1: Ditching x86 – What to Expect, Based on A14 by Andrei Frumusanu

`https://www.anandtech.com/show/16226/apple-silicon-m1-a14-deep-dive`



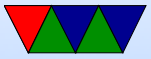
Background

- 4 big cores
- 4 efficiency cores
- 8 GPU cores
- 16 billion transistors, 5nm node
- DRAM on package
- 12MB cache
- Rosetta

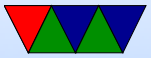


Page 2 – Microarchitecture

- 8-wide decode
- x86 can't be as wide due to CISC
- 630 deep ROB (huge! much bigger than x86, zen3=256, intel 352)
- 4 simple ALUs, 2 comlpex (with mul), dedicated div
- two branches per cycle
- good FPU, NEON, 4FADD and 4FMUL per cycle (3/4 latency)
- quadruple throughput of old intel/amd

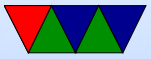


- FP pipes same except only one seems to have division, reciprocal, or square root
- 150 outstanding loads/106 outstanding stores
- Large TLB: 256 L1, 3072L2. Increase? iPhone has 16k pages but backwards compat on desktop 4k
- 192kB instruction cache
- Large and fast L2 (8MB)
- 16MB L3



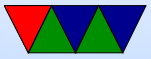
Page 3 – Mobile Performance

- First 5nm chip on market
- Good power usage
- Better “efficient” cores



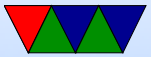
Page 4 – Mobile to Mac

- Extremely competitive with x86 designs, even Zen3
- Apple increase speed of chips 3x since 2005
- Impressive increase graph



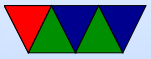
Page 5 – Shooting for the Stars

- Impressive power use
- 18W vs 40W for typical x86 laptop chip
- Don't foget about the GPU



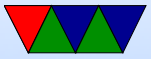
Things not in Article

- Also has some sort of machine-learning chip
- Memory on-die so limited to 16GB for first generation, people grumpy as that's step back from existing laptops



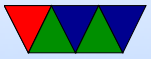
Intel Ice Lake / Sunny Cove

Generation	Name	tech		Year
-	Conroe/Merom	65nm	Tock	2006
-	Penryn	45nm	Tick	2007
1	Nehalem	45nm	Tock	2008
1	Westmere	32nm	Tick	2010
2	Sandy Bridge	32nm	Tock	2011
3	Ivy Bridge	22nm	Tick	2012
4	Haswell	22nm	Tock	2013
5	Broadwell	14nm	Tick	2014
6	Skylake	14nm	Tock	2015
7	Kaby Lake	14nm	Tock	2016
8/9	CoffeeLake	14nm	Tock	2017
9	CannonLake (mobile,rare)	10nm	Tick	2018
10	IceLake/SunnyCove	10nm+	?	2019
11	RocketLake			2020



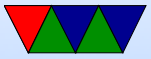
Comet Lake Article

https://www.anandtech.com/show/15785/the-intel-comet-lake-review-skylake-we-go-again The Intel Comet Lake Core i9-10900K, i7-10700K, i5-10600K CPU Review: Skylake We Go Again by Dr. Ian Cutress



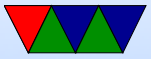
Page 1 – Comet Lake

- 14nm skylake again?
- 32 new processor models
- K/KF/F/T/ no suffix, saying whether overclockable, have integrated graphics, TDP, etc
- PCIe 3.0 link
- Turbo Boost
  - Base: guaranteed freq when not at thermal limit
  - All-core turbo – freq if all cores under load
  - Turbo Boost 2.0 – freq each core can reach when



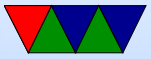
running alone

- Turbo boost 3.0 – freq when in max turbo mode
- Themal Velocity Boost – boost can get when under temp
- TVB All-core
- Favored Core – turbo boost on cores with best DVFS performance
- So you might get 5.3GHz or 5.2GHz or 4.8GHz or 3.7GHz depending



Page 2,3,4 – Comet Lake

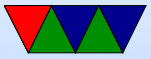
- New LGA1200 socket (1200 pins)
- Spectre and Meltdown fixes
- Die thinning – thiin the die for better thermal
- Can disable hyperthreading per-core rather than per-package
- 2.5GB Ethernet, WiFi 6.0
- 10 or 6 cores. How are chips 8 or 4?
- 250W Turbo for 56 seconds? (125W normal)



Intel Rocket Lake Article

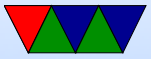
https://www.anandtech.com/show/16205/intels-11th-gen-core-rocket-lake-detailed-ice-lake-core-with-x

Intel's 11th Gen Core Rocket Lake Detailed: Ice Lake Core with Xe Graphics by Dr. Ian Cutress



Page 1 – Rocket Lake

- First quarter 2021
- Motherboard compatible with Comet Lake
- Rocket Lake-S (Cypress Cove arch)
- Sunny vs Cypress a bit confusing. Very similar. Sunny is 10nm, Cypress is back-ported to 14nm
- Digression on the weird idea of backporting to an older process
- Tiger Lake Graphcis $X^e - LP$
- AVX-512



- IPC boost?
- 125W, Turbo boost of 250W
- PCIe 4.0 finally
- DDR4-3200
- Fancier graphics