DREAM:Lab

ARM Wrestling with x64: A Study of Web and TeraSort Workloads

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Why ARM64 ?

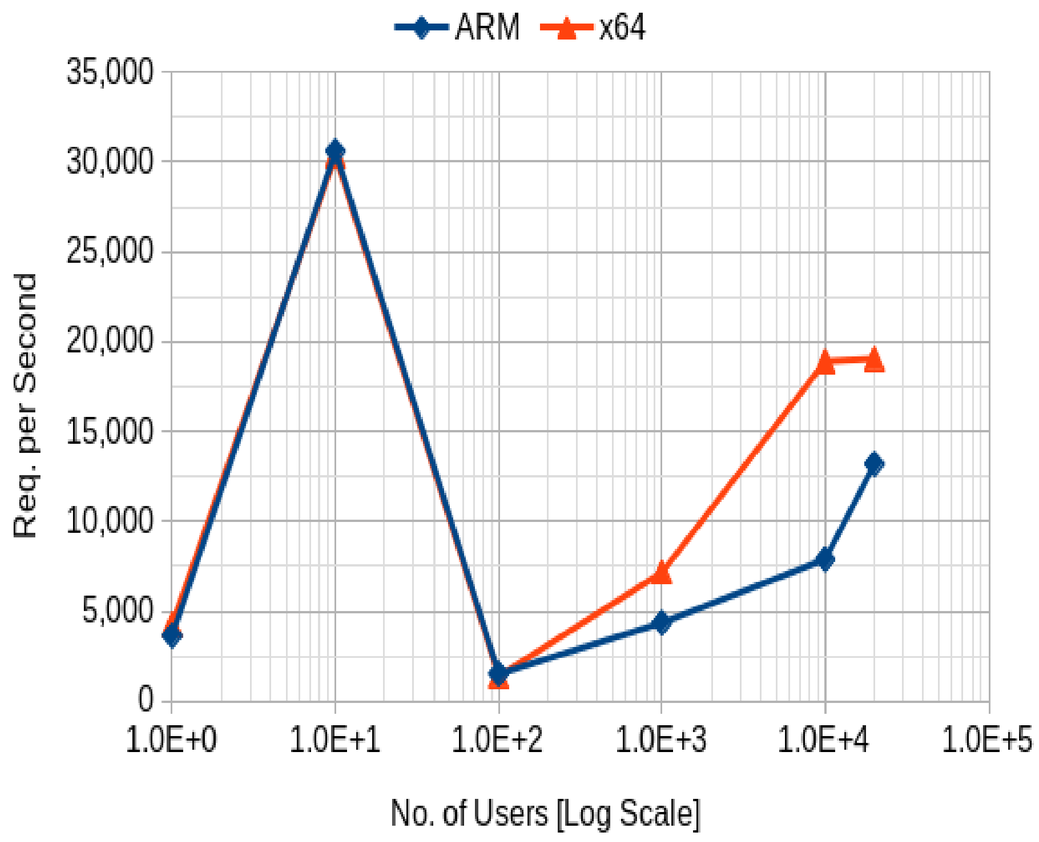
In the last decade, ARM processors have dominated the market due to their energy efficiency. In this age of Cloud data centers and Big Data analytics, the focus is increasingly on power efficient processing, rather than just high performance computing and with ARM having started to make in-roads into server-grade processors, we study its effectiveness in competing with the x64 architecture for web and Big Data applications in the data center

Configuration of ARM64 and x64 nodes

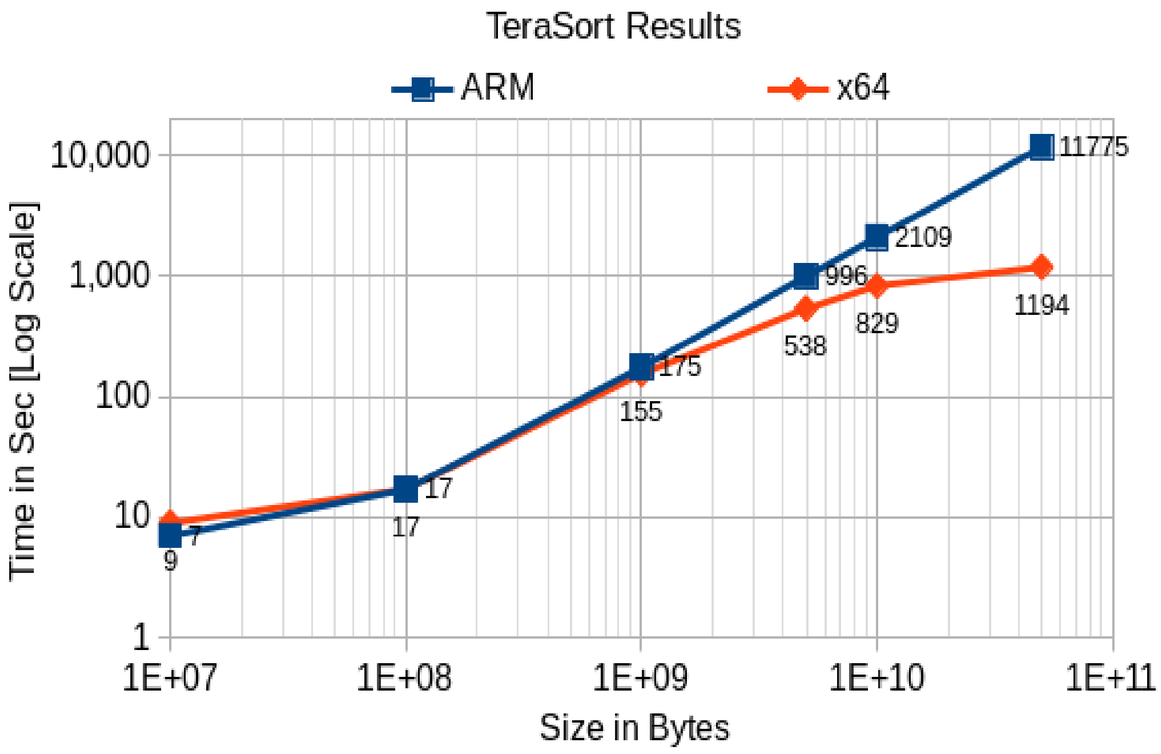
	ARM64	x64
CPU	1 AMD Opteron A1170 processor, 8× ARM64 A57 cores, 2.0 GHz	AMD Opteron 3380 processor, 8× x64 cores, 2.6 GHz
Memory	2×8 GB DDR3 RAM	8×8 GB DDR3 RAM
L2/L3 Cache	4MB/8MB	8MB/8MB
Rated TDP	32W	65W
Disk Storage	1 TB (HDD)	256 GB (SSD)
Swap	512 MB	16 GB
OS	OpenSUSE Tumbleweed	CentOS 7
Linux Version	4.5.4-1-default	3.10.0-229.1.2

ApacheBench http Benchmark

. Both the machines witness a sweet spot initially (10 users) which may be caused because of some cache effect but as we increase the number of users beyond that to 100, there is a sharp drop in the rate supported at about 2000 /sec, and a growth in the rate as the number of users increase. x64 is able to grow to a HTTP request rate of about 19,000 /sec for 10,000 users and flatten out. The ARM server matches the x64's rate until 100 users, after which it has a slower request rate. However, even with 20,000 users, it is able to achieve 70% of the rate supported by x64 at 13,000 /sec.



TeraSort on Apache Hadoop



We execute a TeraSort MapReduce job for data sizes ranging from 0.01 GB–50 GB and observe that the performance of both these nodes is comparable for smaller data sizes till about 1 GB but the difference starts to appear for larger data sets. ARM takes nearly twice as long to sort 5 GB of data and 10× slower for 50 GB of data than x64 server. While the MapReduce workers in both servers are limited to similar heap spaces, the x64 may benefit from a larger memory space for its critical shuffle and sort phases.

Summary: Our research concludes that the ARM systems are capable of giving a respectable computation performance by substantially reducing the power consumption. x64 systems however consistently perform better in cases where high computation strength is required.

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