

# Make life easier for Big Data users on ARM

- Our efforts and future plans



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Who we ARE?



# Who we ARE

- Computing OpenSource Ecosystem Dept. of Huawei Cloud & AI BG;
- Goal: Enrich OpenSource software ecosystem around ARM based datacenters;
- Scope: OS, Libraries, Cloud & Virtualization, Storage, Big Data, DB, Web etc.
- Methodology:
  - Identify and fix gaps for leading opensource projects to run on ARM platform – make them able to be running on ARM platform;
  - Introducing/enabling and maintain continue integration(CIs) and tests on ARM platform for leading opensource projects – provide continuously tests on ARM platform, make ARM first citizen in the project development workflow;
  - Pushing opensource communities provide releases for ARM platform and docs about how to run it correctly – make our users life easier;
  - Proposing patches to upstream that makes software run on ARM platform better – make ARM datacenters more competitive;

# Who we ARE



- Sheng Liu
- Big Data
- [liusheng2048@gmail.com](mailto:liusheng2048@gmail.com)



- Bo Zhao
- Database
- ARM resource contact for Apache Infra
- [bzhaojyathousand@gmail.com](mailto:bzhaojyathousand@gmail.com)



- Zhenyu Zheng
- Virtualization, Cloud & container
- [zheng.zhenyu@outlook.com](mailto:zheng.zhenyu@outlook.com)

What Are the CHALLENGES?

# What are the CHALLENGES?

- ARM has been a second-class citizen
- Lack of interests to work on ARM
- Dependencies does not support ARM well
- Project leaders and developers does not understand ARM and ARM platform well

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What we have DONE?





# What we have DONE – prestart:

- Donated Resources:
  - Builds.apache.org:
    - <https://issues.apache.org/jira/browse/INFRA-19369>
    - <https://builds.apache.org/computer/arm2/>
    - <https://builds.apache.org/computer/arm3/>
  - Berkeley AmpLab:
    - <https://amplab.cs.berkeley.edu/jenkins/computer/spark-am-vm>
  - Openlab CI platform
    - <https://openlabtesting.org/>
    - <http://status.openlabtesting.org/nodes>
    - Big thanks to LDC
  - Raw machines directly to projects:
    - MariaDB ■ RocksDB ■ X265
    - Jbosh ■ LiteTBD

# What we have DONE:

- Setup CIs:
  - Big Data:
    - Hadoop: <https://builds.apache.org/view/H-L/view/Hadoop/job/Hadoop-qbt-linux-ARM-trunk/>
    - Spark: <https://amplab.cs.berkeley.edu/jenkins/label/spark-arm/>
    - Hbase: <https://builds.apache.org/view/H-L/view/HBase/job/HBase-Nightly-ARM/>
    - Hive: <https://builds.apache.org/view/H-L/view/Hive/job/Hive-linux-ARM-trunk/>
    - Flink: <http://status.openlabtesting.org/project/apache/flink>
  - Database:
    - MariaDB: <https://buildbot.mariadb.org/#/console>
  - Web
    - Tomcat: <https://github.com/apache/tomcat/blob/master/.travis.yml>
    - Memcached: <https://github.com/memcached/memcached/blob/master/.travis.yml>
    - Apache Httpd: <https://github.com/haproxy/haproxy/blob/master/.travis.yml>
    - Haproxy: <https://github.com/apache/httpd/blob/trunk/.travis.yml>

# What we have DONE – Big Data:

- Identify and Fixing gaps:
  - Dependencies that does not support ARM well:
    - Protobuf v2.5.0 – Has support in higher version [1]
    - Netty-all-4.1.27.Final – Does not have support but still maintained [2]
    - Leveldb-jni – Does not have support and not actively maintained [3]
    - PhantomJS – Does not have support and not actively maintained and only used in few tests
  - Different behaviors on Aarch64 and X86:
    - Oracle JDK has made some changes to java.lang.math, so that on x86, it will have better performance, but causing inaccuracy problem, and result is different with Aarch64 – fixed by using java.lang.strictMath(<https://github.com/apache/spark/pull/25186>, <https://github.com/apache/spark/pull/25279>)
  - Existing hidden problems in tests:
    - Hadoop YARN CSI tests uses too long dir for unix domain exceed the UNIX\_PATH\_MAX limit – <https://github.com/apache/hadoop/pull/1771>

[1] <https://issues.apache.org/jira/browse/HADOOP-13363> <https://github.com/apache/hbase/pull/959> <https://issues.apache.org/jira/browse/HIVE-21939>

[2] <https://github.com/netty/netty/pull/9804>

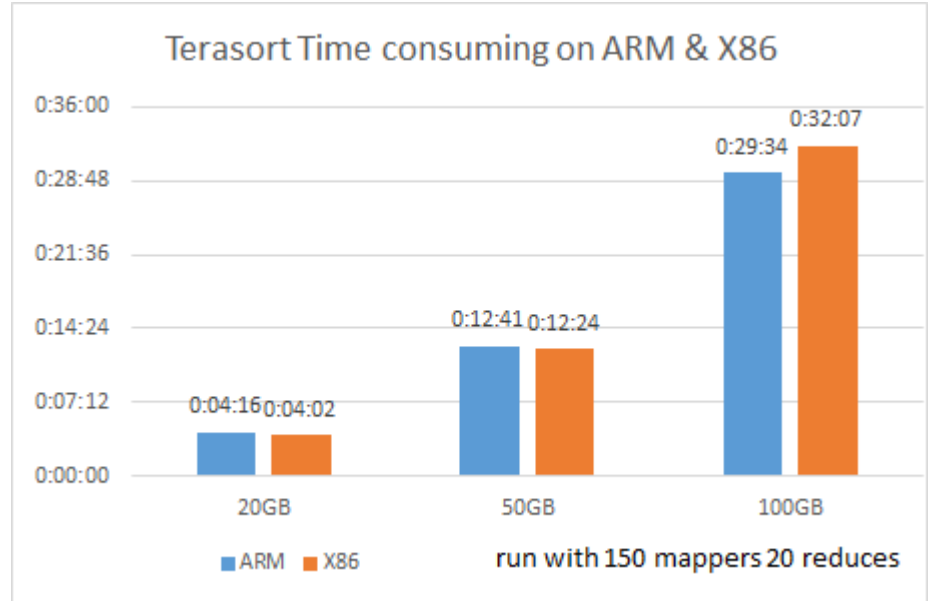
[3] <https://github.com/apache/spark/pull/26636>

# What we have DONE – Big Data:

- Performance testing: run Terasort on ARM & x86 servers
- Hadoop has provided an example package includes 3 MapReduce applications:
- TeraGen is a map/reduce program to generate the data.
- TeraSort samples the input data and uses map/reduce to sort the data into a total order.
- TeraValidate is a map/reduce program that validates the output is sorted.

## Testing Environment info:

- 3 nodes Hadoop cluster
- 8 vCPU 16GB Memory per node



# What we have DONE – Libraries:

- Basic Libraries:
  - **GNU/Glibc:** Optimized strcpy/strlen/strnlen/memchr/memset **5+%~20+% gain**
  - **GNU/Gzip:** CRC optimized / unrolling / prefetching **6+%~80+% gain**
  - **x265:** Assembly aarch64 support **10+% gain**
  - **ISA-I:** Erasure code aarch64 support
  - **Hyperscan:** aarch64 adoption **30+% gain**
  - (WIP) **Snappy:** unrolling / branch prediction / prefetching about **3-10% gain**
  - (WIP) **zstd:** prefetching / member ordering / alignment about **5-10% gain**
- Tool chain:
  - **AvxToNeon:** Convert AVX instructions to Neon instructions.
- More Information:

See Kunpeng compute github repo: [github.com/kunpengcompute](https://github.com/kunpengcompute)

What we are DOING?



# What we are DOING – Database:

- Preparation for ARM CI:
  - Percona - Trying to donate ARM resource to Percona community
  - Greenplum - Get the agreement about ARM CI, discuss and draft the ARM CI  
<https://groups.google.com/a/greenplum.org/forum/#!topic/gpdb-dev/gJbZrOvLHv0>
  - MongoDB - Get reasearch that there is a periodic test, to run the regression test and ARM package release.  
<https://jira.mongodb.org/browse/SERVER-45923>
  - Mysql - There is ARM releases for mysql, but there is only a CentOS 8 package.
- Working on ARM packages release:
  - MariaDB - The previous release already includes arm packages. And Community wants to release the arm packages in the latest version too. <https://jira.mariadb.org/browse/MDEV-21432>
  - Postgresql - Plan to donate ARM VM to community for supporting ARM package release.  
<https://www.postgresql.org/message-id/flat/20200313090537.GA2216066%40msg.df7cb.de#2dad7bff41fc23b96199ff92239a0627>

# What we are DOING – Database:

## Optimization for ARM on Database:

- Mysql <https://bugs.mysql.com/bug.php?id=98248>
- cacheline alignment for ARM(WIP) - make use of the ARM hardware advantages
- crc32 (PLAN) - make use of the ARM hardware
- trx\_sys lock split (PLAN) - improve performance in parallel cases



# What we are DOING – Big Data:

- Hadoop:
  - ARM release package discussion: <https://www.mail-archive.com/common-dev@hadoop.apache.org/msg31896.html>
  - performance testing and improvement
  - NVDIMM support in Hadoop: <https://issues.apache.org/jira/browse/HDFS-15025>
  - SM4 support in Hadoop: <https://issues.apache.org/jira/browse/HDFS-15098>
- Impala ARM CI support:
  - issues: <https://issues.apache.org/jira/browse/IMPALA-9376>
  - patches: <https://gerrit.cloudera.org/#/q/owner:%22huangtianhua+%253Chuangtianhua223%2540gmail.com%253E%22>
- Kudu ARM CI support:
  - issues: <https://issues.apache.org/jira/browse/KUDU-3007>
  - patches: <https://gerrit.cloudera.org/#/c/14964/>
- Storm ARM CI support
  - issue: <https://issues.apache.org/jira/browse/STORM-3401>
  - upgrade the rocksdbjni dependency <https://issues.apache.org/jira/browse/STORM-3599>

# What we are DOING – Virtualization&Cloud:

Identify gaps between Aarch64 and other arch:

- Compare from LOC:
  - X86 CPU driver: 3454 LOC
  - PPC64 CPU driver: 824 LOC
  - ARM CPU driver: 254 LOC
  
- Compare from features:
  - virsh capabilities missing
  - CPU compare missing

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Talk to the communities:

very welcome, but a lot has to be done from both software and hardware side

# What we are GOING to DO:

- Enrich OpenSource software ecosystem for ARM based datacenters is a long-term job.
- Join our slack for further info:
  - [https://join.slack.com/t/armserverecosystem/shared\\_invite/enQtOTE0MDMxOTc0MTY0LTBiMTdkZWVhMjZmYzI2ZWVmYWUxMTU1YTcxY2NIZWViOGM5YTY4YzkwZDU3M2ZiZWUxMDQzMmU0NGY5YmFiYWY](https://join.slack.com/t/armserverecosystem/shared_invite/enQtOTE0MDMxOTc0MTY0LTBiMTdkZWVhMjZmYzI2ZWVmYWUxMTU1YTcxY2NIZWViOGM5YTY4YzkwZDU3M2ZiZWUxMDQzMmU0NGY5YmFiYWY)





# Thank you

Accelerating deployment in the Arm Ecosystem

