Make life easier for Big Data users on ARM
- Our efforts and future plans
Table of Contents

- Who we ARE?
- What are the CHALLENGES?
- What we have DONE?
- What we are DOING?
- What we are going to DO?
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

● Bo Zhao
● Database
● ARM resource contact for Apache Infra
● bzhaojyathousandy@gmail.com

● Zhenyu Zheng
● Virtualization, Cloud & container
● 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

...
What we have DONE?
What we have DONE – prestart:

● Donated Resources:
  ○ Builds.apache.org:
    ■ [https://issues.apache.org/jira/browse/INFRA-19369](https://issues.apache.org/jira/browse/INFRA-19369)
    ■ [https://builds.apache.org/computer/arm2/](https://builds.apache.org/computer/arm2/)
    ■ [https://builds.apache.org/computer/arm3/](https://builds.apache.org/computer/arm3/)
  ○ Berkeley AmpLab:
    ■ [https://amplab.cs.berkeley.edu/jenkins/computer/spark-am-vm](https://amplab.cs.berkeley.edu/jenkins/computer/spark-am-vm)
  ○ Openlab CI platform
    ■ [https://openlabtesting.org/](https://openlabtesting.org/)
    ■ [http://status.openlabtesting.org/nodes](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:
    - Spark: [https://amplab.cs.berkeley.edu/jenkins/label/spark-arm/](https://amplab.cs.berkeley.edu/jenkins/label/spark-arm/)
    - Flink: [http://status.openlabtesting.org/project/apache/flink](http://status.openlabtesting.org/project/apache/flink)
  - Database:
    - MariaDB: [https://buildbot.mariadb.org/#/console](https://buildbot.mariadb.org/#/console)
  - Web
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/25186), [https://github.com/apache/spark/pull/25279](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](https://github.com/apache/hadoop/pull/1771)

[2] [https://github.com/netty/netty/pull/9804](https://github.com/netty/netty/pull/9804)
[3] [https://github.com/apache/spark/pull/26636](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/memrchr/memset 5+%~20+% gain
  - **GNU/Gzip:** CRC optimized / unrolling / prefetching 6+%~80+% gain
  - **x265:** Assembly aarch64 support **10+% gain**
  - **ISA-l:** 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](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](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](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](https://www.postgresql.org/message-id/flat/20200313090537.GA2216066%40msg.df7cb.de#2dad7bff41fc23b96199ff92239a0627)
What we are DOING – Database:

Optimization for ARM on Database:
- 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](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](https://issues.apache.org/jira/browse/HDFS-15025)
  ○ SM4 support in Hadoop: [https://issues.apache.org/jira/browse/HDFS-15098](https://issues.apache.org/jira/browse/HDFS-15098)

● Impala ARM CI support:
  ○ issues: [https://issues.apache.org/jira/browse/IMPALA-9376](https://issues.apache.org/jira/browse/IMPALA-9376)
  ○ patches: [https://gerrit.cloudera.org/#/q/owner:%22huangtianhua+%253Chuangtianhua223%2540gmail.com%253E%22](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](https://issues.apache.org/jira/browse/KUDU-3007)
  ○ patches: [https://gerrit.cloudera.org/#/c/14964/](https://gerrit.cloudera.org/#/c/14964/)

● Storm ARM CI support
  ○ issue: [https://issues.apache.org/jira/browse/STORM-3401](https://issues.apache.org/jira/browse/STORM-3401)
  ○ upgrade the rocksdbjni depdency [https://issues.apache.org/jira/browse/STORM-3599](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

... 

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/enQtOTExMDMxOTc0MTY0LTBiMTdkZWFlMjZmYzI2ZWVmY2UxMTU1YTcX2NhZGViOGM5YTY4YzkwZDU3M2ZiZWUxMDQzNmU0NGY5YmFiYmY
Thank you

Accelerating deployment in the Arm Ecosystem