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Unique Sense: A Smart Computing Prototype 3

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***Abstract*: Technological development and growth create demands on various computing solutions for diversified problems across all the domains. Research initiation project named Unique sense intense to find an alternate frugal computing solution to satisfy the computing demands in emerging technology which can adopt for different eco system. This research work is continuity of unique sense proto type 1 and unique sense prototype 2 for investigate the possibility of deliverance and compatibility to deal the big data problem along with Fault tolerance and reliable process and to deliver solution to the next phase of prolonging GPU supporting kits with RISC computing architecture for various computing requirements and real-time needs.**

It is capable to deliver provisions for high level data management and parallel processing. The smart features and capacity of multi-level parallel working enables customization of mechanism dynamically, environment friendly and also reusable for next generation demands.

***Keywords* : Computing, Smart Computing, Prototype, Unique Sense 3, Bigdata Analytics, ARM.**

I. INTRODUCTION

Today modern science delivers different forms of computing such as Mainframes, HPC, Cloud, etc. However, most of them exclusively created for some specific purpose. Therefore, they are adopting those for every fields and nature of Business. The primitive objective of this work is to design a novel computing model which has future prospects on computational demands and needs. The system focuses towards multi-disciplinary of the problem and economic level of organization. Which includes dynamic environment unlike the HPC system lacks to support in dynamic infrastructure at an affordable price. Extend to that to deliver not only Eco-friendly solution towards silicon-valley also ensures that it should blossom the technological era everywhere to construct the digital world which is economic friendly. Data are significant for the requirements and demands in future systems. The growth in terms is observed since daily.

The definitions for big data are given by many companies have different kinds of description about the Big Data and there is no perfect and standard description over a time period for big data.[5]. In this modern era, the data extends in the numerous dimensions based on the Business model and requirement, as a result origination of V's in defining Bigdata. The major V's discussed over a period of time includes Variety, Volume, Veracity, Value, Velocity, and so on. As per Accenture Analytic Survey, more than 1000 respondents from the companies which implemented Big data in their business that are operating across 7 major industries and headquarters across 19 countries .The companies that failed to implement big data were not taken into account in the results[5].

A data shows users of about 92% are completely happy with the outcomes out of their business of around , 94% of users reported that their business implementations met their needs and outcomes, 89% of users believe that revolutionization of Big data will happen as same as the way internet did. The 92% a majority of users reported that they are completely satisfied with the outcomes of business and 94% of users believe that business needs are met because of big data implementation. Based on the needs and demands of this civic need we initiate this research to provide better computing to with low power multi Block infrastructure.

For analysing Bigdata from multiple Dimension one such common needs. In addition, it should support for common demands and computing needs in day-to-day life. To satisfying those, the below mentioned technologies stack deployed to deliver computing solution in Frugal manner.

A. Hadoop

Hadoop is the well-known Apache's opensource framework delivers solution for managing bigdata and parallel processing from its technology HDFS and Map reduce.

B. Ubuntu 15.04

Ubuntu 15.04 (Vivid Vervet) core on Debian's unstable branch of Linux version 3.4.42-BPI-M3-Kernel. This version identified as compatible for deploying JVM and Hadoop 1.1.2[23].

C. Allwinner A83T

The deployed computer core is low power mobile application processor A83T which uses the cutting-edge 28nm fabrication process bundled with HMP, can support heterogeneous multi-processing.

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II. PROBLEM STATEMENT

This Unique sense 3 smart computing prototype is third initiation of this research work in the process of delivering the smart computing Technology. Even IOT and other technology emerges during the time this research work first initiated.

Unique sense research is the contribution towards stabilizing the new form of computing for providing solution to the emerging demands in scientific and industrial needs. The previous deployment where trialed on series of Raspberry pi foundation[8] computer chip. This research work is deployed on something diverged from the previous family. Also stacked above on Shenzhen SINOVOIP Co. Ltd. Component.

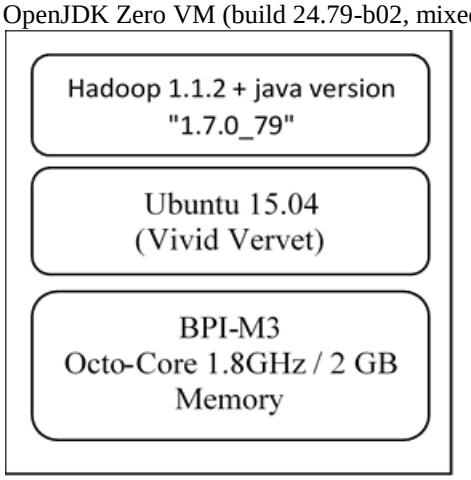
III. UNIQUE SENSE 3: STACK ARCHITECTURE

The Unique sense 3 consist of stack of Technologies a overview in the fig.1 wrapped together to achieve parallel processing, and fault tolerance in lightweight architecture. In general ARM processors[20] are lightweight, and fast execution on small applications and vector information. In such a way this work is initiated to analyze the stability and performance of Bigdata stack build on the top of Allwinner A83T ARM Cortex-A7 based BPI-M3.

A. Stack

Stack consists of three important phases wrapped together to carefully to achieve Big data provisioning and individual computing. This is a node of cluster trial ability to virtualize the infra for parallel processing. The first phase, infra phase is BPI-M3 with the technical specification given in Table 1 and processing capability given in Table 2 Is one of the well-known alternates for Raspberry pi series used in Unique sense 1 and Unique sense 2 research works respectively[19][22][21]. Phase 2 is Operating system Ubuntu 15.04 deployed for the compatibility of the system on the top of it final phase as Java 1.7.0_79 is deployed with below mentioning environment is achieved along with Hadoop 1.1.2 is deployed to get distributed file system and for MapReduce driven.

java version "1.7.0_79"
OpenJDK Runtime Environment (IcedTea 2.5.6) (7u79-2.5.6-0ubuntu1.15.04.1)
OpenJDK Zero VM (build 24.79-b02, mixed mode)



Technology Stack of Unique Sense

B. BPI-M3 Specification

The BPI-M3 is the alternate computer trialed for this research work with heterogeneous multiprocessing capability, and power consuming octa-core processor. This machine also have memory of 2 GB and PowerVR SGX544MP1· Comply with OpenGL ES 2.0, OpenCL 1.x, DX 9.3 Graphical processing unit. It provides additive support for vector processing in general. Compared with existing Unique sense 1 and Unique Sense 2 this architecture is powerful in the processing capability, memory, and GPU with more additional features. So Unique sense 3 research work carried out on this single boar computer environment. Also, it's detailed technical information mentioned in table 1.

Table- I: Specifications of BPI-M3

Chip	Allwinner A83T ARM Cortex-A7
CPU	A83T ARM Cortex-A7 octa-core,512 KB L1 cache 1 MB L2 cache
GPU	PowerVR SGX544MP1· Comply with OpenGL ES 2.0, OpenCL 1.x, DX 9.3
Memory	2GB LPDDR3 with 733MHz(shared with GPU)
Ethernet	10/100/1000Mbps Ethernet (Realtek RTL8211E/D)
WiFi	WiFi 802.11 b/g/n (AP 6212 module on board)
USB	2 USB 2.0 host, 1 USB 2.0 OTG
Video Output	Supports multi-channel HD display: HDMI 1.4 (Type A - full),MIPI Display Serial Interface (DSI) for raw LCD panels,1.4 HDMI resolutions from 640×480 to 1920×1200
Audio Output	HDMI, analog audio (via 3.5 mm TRRS jack), I2S audio (also potentially for audio input)
On-board Storage	MicroSD (TF) card,SATA2.0(up to 2TB - USB-to-SATA: GL830), eMMC 8G on board (option：16/32/64G)
Size	92mm×60mm
GPIO	40-pin *GPIO*

Especially this Computing environment have Byte order of Little Endian it. In general, it delivers parallelism which makes performance better in little endian. Also, has 8 core processors and Thread, core and Max/Min CPU clock speed mentioned in Table 2 to shown Its computing capability better.

Table 2 : Computing Capability

Architecture:	armv7l
Byte Order:	Little Endian
CPU(s):	8
On-line CPU(s) list:	0-7
Thread(s) per core:	1
Core(s) per socket:	4
Socket(s):	2
CPU max MHz:	2016.0000
CPU min MHz:	480.0000

IV. RESULT AND DISCUSSION

After the successful configuration and deployment of Stack as mentioned in the figure 1. The configuration, HDFS creation, SSH establishments where enabled with in the architecture as same as the procedure followed in unique sense 1 and unique sense 2[19][21][22][14].

The MapReduce program loaded with Hadoop 1.1.2 is executed on the stack configuration of Figure 1. To find Pi value The task has been happen in cluster of virtual machine deployed inside the configured single node cluster and the result is shown below

```
hduser@BPiM3:/usr/local/hadoop$ hadoop  jar hadoop-examples-1.1.2.jar pi  5 50
Number of Maps  = 5
Samples per Map = 50
Wrote input for Map #0
Wrote input for Map #1
Wrote input for Map #2
Wrote input for Map #3
Wrote input for Map #4
Starting Job
19/05/29 12:29:20 INFO mapred.FileInputFormat: Total input paths to process : 5
19/05/29 12:29:22 INFO mapred.JobClient: Running job: job_201905291227_0001
19/05/29 12:29:23 INFO mapred.JobClient:  map 0% reduce 0%
19/05/29 12:29:49 INFO mapred.JobClient:  map 40% reduce 0%
19/05/29 12:30:08 INFO mapred.JobClient:  map 80% reduce 0%
19/05/29 12:30:14 INFO mapred.JobClient:  map 80% reduce 26%
19/05/29 12:30:23 INFO mapred.JobClient:  map 100% reduce 26%
19/05/29 12:30:28 INFO mapred.JobClient:  map 100% reduce 100%
19/05/29 12:30:33 INFO mapred.JobClient: Job complete: job_201905291227_0001
19/05/29 12:30:33 INFO mapred.JobClient: Counters: 30
19/05/29 12:30:33 INFO mapred.JobClient:   Job Counters
19/05/29 12:30:33 INFO mapred.JobClient:     Launched reduce tasks=1
19/05/29 12:30:33 INFO mapred.JobClient:     SLOTS_MILLIS_MAPS=93549
19/05/29 12:30:33 INFO mapred.JobClient:     Total time spent by all reduces waiting after reserving
slots (ms)=0
19/05/29 12:30:33 INFO mapred.JobClient:     Total time spent by all maps waiting after reserving
slots (ms)=0
19/05/29 12:30:33 INFO mapred.JobClient:     Launched map tasks=5
19/05/29 12:30:33 INFO mapred.JobClient:     Data-local map tasks=5
19/05/29 12:30:33 INFO mapred.JobClient:     SLOTS_MILLIS_REDUCES=38131
19/05/29 12:30:33 INFO mapred.JobClient:   File Input Format Counters
19/05/29 12:30:33 INFO mapred.JobClient:     Bytes Read=590
19/05/29 12:30:33 INFO mapred.JobClient:   File Output Format Counters
19/05/29 12:30:33 INFO mapred.JobClient:     Bytes Written=97
19/05/29 12:30:33 INFO mapred.JobClient:   FileSystemCounters
19/05/29 12:30:33 INFO mapred.JobClient:     FILE_BYTES_READ=116
19/05/29 12:30:33 INFO mapred.JobClient:     HDFS_BYTES_READ=1210
19/05/29 12:30:33 INFO mapred.JobClient:     FILE_BYTES_WRITTEN=305385
19/05/29 12:30:33 INFO mapred.JobClient:     HDFS_BYTES_WRITTEN=215
19/05/29 12:30:33 INFO mapred.JobClient:   Map-Reduce Framework
19/05/29 12:30:33 INFO mapred.JobClient:     Map output materialized bytes=140
19/05/29 12:30:33 INFO mapred.JobClient:     Map input records=5
19/05/29 12:30:33 INFO mapred.JobClient:     Reduce shuffle bytes=140
19/05/29 12:30:33 INFO mapred.JobClient:     Spilled Records=20
19/05/29 12:30:33 INFO mapred.JobClient:     Map output bytes=90
19/05/29 12:30:33 INFO mapred.JobClient:     Total committed heap usage (bytes)=642011136
19/05/29 12:30:33 INFO mapred.JobClient:     CPU time spent (ms)=21570
19/05/29 12:30:33 INFO mapred.JobClient:     Map input bytes=120
19/05/29 12:30:33 INFO mapred.JobClient:     SPLIT_RAW_BYTES=620
19/05/29 12:30:33 INFO mapred.JobClient:     Combine input records=0
19/05/29 12:30:33 INFO mapred.JobClient:     Reduce input records=10
19/05/29 12:30:33 INFO mapred.JobClient:     Reduce input groups=10
19/05/29 12:30:33 INFO mapred.JobClient:     Combine output records=0
19/05/29 12:30:33 INFO mapred.JobClient:     Physical memory (bytes) snapshot=717266944
19/05/29 12:30:33 INFO mapred.JobClient:     Reduce output records=0
19/05/29 12:30:33 INFO mapred.JobClient:     Virtual memory (bytes) snapshot=2225287168
```

Fig. 1. Pi job Output of Unique sense 3

```
19/05/29 12:30:33 INFO mapred.JobClient:     Map output records=10
Job Finished in 73.589 seconds
Estimated value of Pi is 3.16800000000000000000
hduser@BPiM3:/usr/local/hadoop$
```

Fig. 2. Continuation Output of Unique sense 3

Figure 2 & Figure 3 is the successful execution and output of Pi job in A83T ARM Cortex-A7. During the execution job has been mapped in to 5 tasks and executed parallely. Totally system consumed 73.589 sec approx. to finish this task. Even the CPU spent for the process is 21750(ms). Without tweaking or overclocking the above execution time is achieved.

V. CONCLUSION

This Research work investigates the configuration and deployment of Stack for achieving the single node cluster on ARM Architecture for trialing the environment for big data provisioning. The above result, has positive and negative factors to consider. The positive factor the system works well as expected and deliver better result than Unique sense 1. So, it delivers more hope to continuing this work further positive as a part of the smart computing technology prototyping. Also, delivers performance lag as a negative side of when compare with Unique sense 2. The obtained positive results and execution delivers more hope, and new research opportunity, explorations and the negative phase delivers the factor that even a lot of fine tunings opportunities avail in this work to do it in the future.

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Mr. Vijaykumar Selvam, is working on smart computing and Big Data Analytics. His educational background includes Master of Philosophy, Master of Computer Applications, Bachelor of Computer Science, Post Graduate Diploma in Information and Communication Laws, and Postgraduate Diploma in NGO Management from reputed institutions/universities of India. In additive to that, he has obtained more than 300 international certificates on various courses. He has to his credit more than 60 + research publications in various reputed International/National journals and conference, 3 Patents, Datasets and has authored 3+ Books. He is also a reviewer for various international journals and reviewed more than 1000 Articles.

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