**RASPBERRY PI CLUSTER REQUIREMENT DOCUMENT**

**As part of the Academic Curriculum of Software Engineering**

**By:**

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**Executive Summary**

**Project Overview:**

In this project, the primary aim is to build a network of four Raspberry Pi and implement on different parallel computing platforms such as MPI, OpenMP and CUDA.

Raspberry Pi is a series of small single board computers developed in the United Kingdom by the Raspberry Pi Foundation. Due to the Raspberry Pi's small size and low cost, it makes a good alternative to building a cluster in the cloud on Amazon, or similar providers which can be expensive or using desktop PC's.

Raspberry Pi supports multi-core processors which makes it easier to implement parallel-based programming on a single machine.

**Purpose of the Project:**

Parallel Computing is a type of computation in which many calculations or the execution of processes are carried out simultaneously. Here the larger problems can often be divided into smaller ones and solved parallelly to increase performance of the system.

In this project, aim is to parallelly compute through Raspberry Pi model and achieve higher performance.

**Hardware Requirements**

* Four Raspberry Pi Model 3 Boards preferred with 512 MB RAM
* HDMI Capable or VGA Monitor with appropriate adaptor
* Heat Sinks
* Nylon Standoffs
* Power Cables
* RJ45 Network Cables
* Power Hub
* Network Switch
* Desktop/Laptop
* USB keyboard
* USB mouse
* Two SD cards that are compatible with the Raspberry Pi
* Flash Drive

**Software Requirements**

**Functional Requirements:**

* Installations: Raspbian Operating System
* Drivers: BerryBoot
* Internet Connection
* Registering Device MAC Address on school Servers for remote access
* Establishing SSH connection with all four Raspberry Pi boards
* Making sure all four boards are updated to the latest version of Raspbian Operating System and copy it to all four SD Cards, one for each of Raspberry Pi Boards.
* Allocating IP addresses to each node.
* Install MPI, OpenMP on all boards.
* Install compilers such as gcc, g++, java, python on all boards.
* Install editors such as emacs, vim, pico on all boards.
* Flash Drive which acts as a common storage and resides on the board which is being a Server.
* Enhancing the performance of the application through visualization

**Non-Functional Requirements:**

* **Look and Feel Requirements:** Improving Graphic User Interface with more user-friendly options.
* **Scalability and Performance:** Possible to create a huge network of Pi boards which in turn will boost up performance
* **Operational Requirements:** Failure of one Pi board in the cluster should not affect the performance of the other nodes in the cluster.
* **Maintainability and Portability:** Can install any type of OS as it is platform independent. Also, physically small which makes it portable and handy.
* **Security Requirement:** Having authentication for each of the Pi boards so that only authorized users can access the system.
* **Safety Requirements:** Having a power stabilizer so that there is no voltage fluctuation and avoiding short circuits.

**Product Description**

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| **Yellow Pi:**  Hostname: YellowSE2018  Password: Yellowpi  Ethernet address: b8:27:eb:eb:bd:72  Wireless address: b8:27:eb:be:e8:27  IP Address: 10.100.0.197  Disk Size: 48% used | **Blue Pi:**  Hostname: BlueSE2018  Password: Bluepi  Ethernet address: b8:27:eb:42:08:b8  Wireless address: b8:27:eb:17:5d:ed  IP Address: 10.100.0.196  Disk Size: 33% used |
| **Red Pi:**  Hostname: RedSE2018  Password: Redpi  Ethernet address: b8:27:eb:25:94:95  Wireless address: b8:27:eb:70:c1:c0  IP Address: 10.100.0.140  Disk Size: 37% used | **Green Pi:**  Hostname: GreenSE2018  Password: Greenpi  Ethernet address: b8:27:eb:4f:94:ba  Wireless address: b8:27:eb:1a:c1:ef  IP Address: 10.100.0.188  Disk Size: 37% used |