Framboisine: A mini-cluster solution for the Southern Countries

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The Framboisine project is aimed at providing low-cost solution for cluster computing for Southern Countries as well as portable solutions for bioinformatics training. In that respect, we tested and validated solutions based on Single-Board Computers, such as the RaspBerry Pi, working on ARM processors. The idea is to combine such SBC to obtain 2000 U$D clusters comprising a master node and 10 slaves, as well as storage and networking. Three prototypes exist (using Rpi, CubieTruck and OlinuXino-A20Lime2) and are deployed to Southern partners for in situ validations.

Framboisine Purpose

The aim of the project is to propose a methodology to assemble mini-clusters for HPC (hightroughput Computing) using SingleBoard Computers (SBC). Those ultra-compact machines (credit cards sized) are based on cell phone processors (ARM) with computing capacity up to Quadricore CPUs with 2Go RAM. The chassis is performed using Lego@Technics devices.
Such machines can be used for :

- Formation/Teaching in foreign Countries
- For research program locally perfomed by our parterns.

Advantages of the solution

- A low cost solution (less than 2000$ for a 10 nodes cluster)
- No Internet access needed
- A low power supply needed (5V for each card)
- High Resistance to humidity and heat
- Cards can be easily replaced, added or purchased via the Internet
- LegoTechnic chassis : no tools required, no electricity conductanc, humididty and heat resistant, and available worldwilde
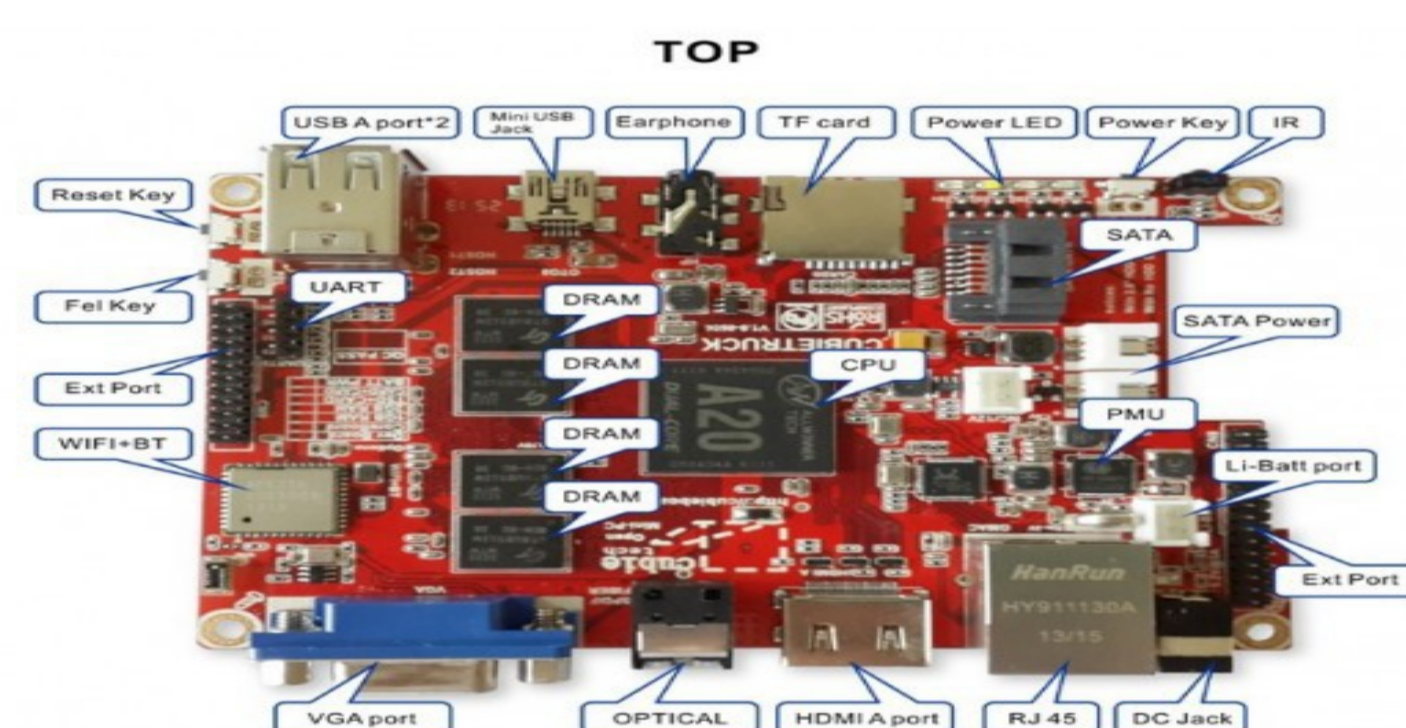
3 Types of cards

Raspberry

- 512 Mo RAM
- ARM1176JZF-S core
- 4 usb ports
- HDMI Port
- storage : micro SD
- Cost : 40$
- OS : Raspbian

Cubietruck

- 2 Go DDR3 RAM
- Allwinner A20 dual core Cortex-A7 processor
- 2 usb ports
- Wifi and bluetooth wireless connection
- HDMI and VGA Port
- storage : NAND, microSD, SATA 2.0
- Cost : 112$
- OS : Cubian

Olinuxino-A20Lime2

- 1 Go DDR3 RAM
- Allwinner A20dual core Cortex-A7 processor
- 2 usb ports
- Wifi and bluetooth wireless connection
- HDMI Port
- storage : microSD, SATA 2.0
- Cost : 50$
- OS :

Technical overview

OS :
A linux OS is installed on all the cards.
A image is created for the master and another for the nodes.
The image is then deployed to created a new node or a new master.

Network :
The master is the head of the cluster it is used to schedule and redirect jobs with the slurm software towards the nodes.
The master and each node are connected together on a same private network thanks to switchs and RJ45 wires.

Power supply :
The cards are powered thanks to two 8 ports USB switches.
USB and network switch are powered via a normal plug

Storage :
A USB hard drive or a nas can be used to share data between the cards via nfs
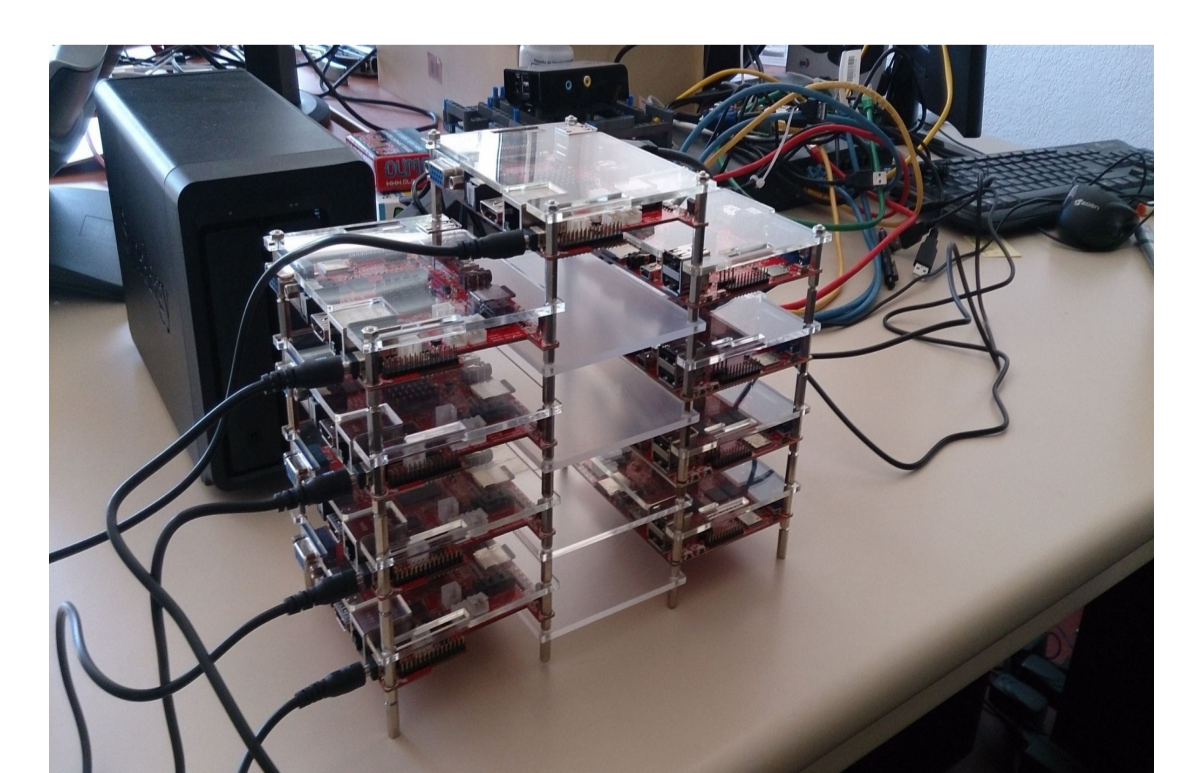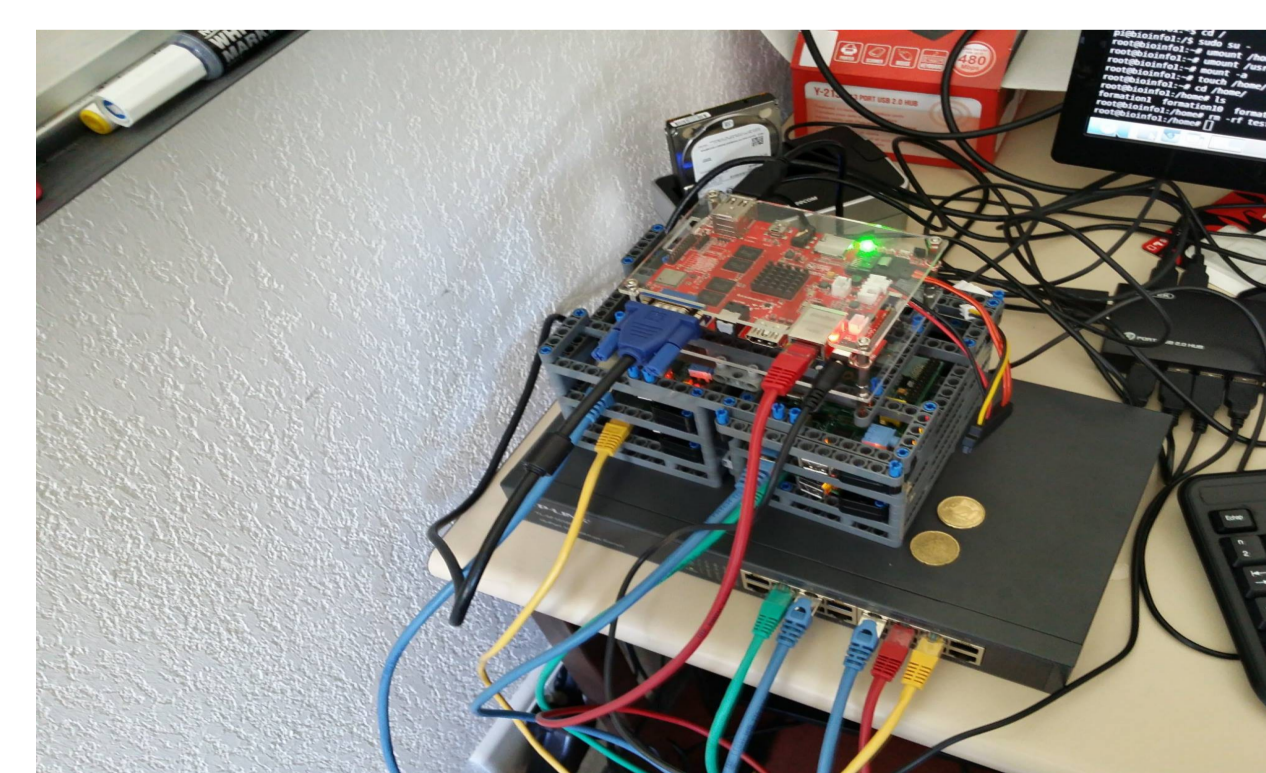
What is next ?

These 3 clusters will be installed in 3 Southern Countries and OS administrator formations will be provided.
A installation guide will be provided as well.
64bits card will be available soon on the market.

Mini-cluster assembly methodology could be developped with other types of card including 64bits processors cards. This technology could be used in various scientific program such as ecology, genomic, astronomy etc..