Supporting a Hadoop Cluster with IT Stock

Floriane Le Floch - Arthur Busser - Paul Dennetiere

December 17, 2016

Summary

Part I

Introduction

Part II

Our solution

We want to make unused computers available for an Hadoop Cluster. In order to do that, we want to check at regular intervals if a computer is used or not (i.e. is in sleep mode). Our goal is to dynamically adding sleeping computer to the cluster, in order to make more ressources available. In order to achieve this, we will have to ensure several things. This part will deals with the general structure, and what this structure induces for the cluster and added computers.

Chapter 1

Setting up DataNodes on an unused computers

First we will have to make the computer we want to add able to communicate with the Master (NameNode). We have several options to achieve this :

- Virtualization
- Use only linux distribution
- Application containers

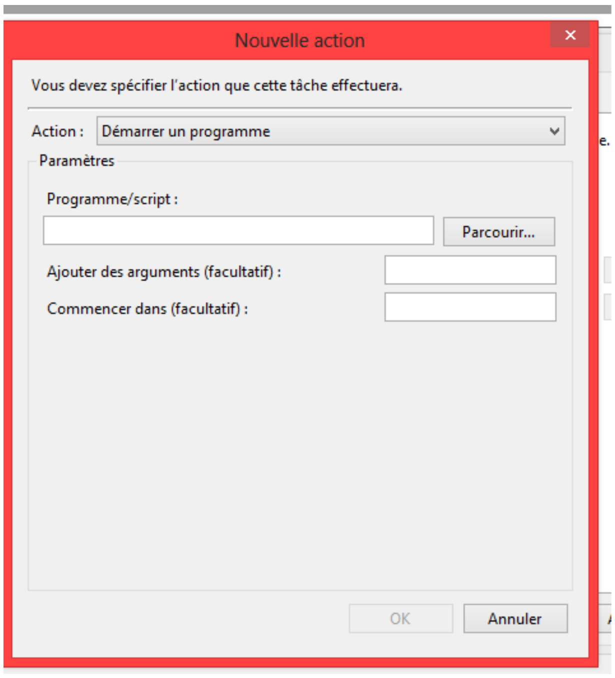
Only using linux distributions will greatly impact the interest of this project, so it's clearly not a solution. Virtualization doesn't seem good either, because of its need of ressources, and the general weight of those solutions. That's why we will use an Application Container : Docker.

1.1 Docker

Docker define itself as :

> "Docker containers wrap up a piece of software in a complete filesystem that contains everything it needs to run: code, runtime, system tools, system libraries – anything you can install on a server. This guarantees that it will always run the same, regardless of the environment it is running in."

Therefore by using Docker we will be able to use a linux application on every operating system encountered in the company. Moreover, by doing a snapshot of a running configuration, Docker allows us to deploy a solution very easily, and with a good velocity. Finally, the global strategy is to have a "Slave Image" for Docker : Every computer of the company will have Docker installed on it, and will start Docker application every time the computer goes in sleep mode (we can easily do this through a C# script, running in background, checking the sleep mode, and launching Docker application, or even using TaskLauncher included in Microsoft's OS).


Nouvelle action

Vous devez spécifier l'action que cette tâche effectuera.

Action : Démarrer un programme

Paramètres

Programme/script :

Ajouter des arguments (facultatif) :

Commencer dans (facultatif) :

Figure 1.1: Screen of Microsoft's Task Launcher

1.2 Configuration

We supposed that a "classical Hadoop cluster" is already configured (meaning we do not install a full cluster). So our goal is to provide Hadoop slave service on the computer, and to make it communicate with the Master. We will first create an image of a running configuration. Such images are already available on Docker's Hub (Docker's image sharing website), but we will assume that we can't get such images : The first thing to do is to create a linux distributions image, a Debian for example. After that we install Hadoop slave service on this Debian.

- Creating Hadoop user and password :

```
useradd hadoop
passwd hadoop
```

- Install Slave service on all slave by running on Master :

```
# su hadoop
$ cd /opt/hadoop
$ scp -r hadoop hadoop-slave-1:/opt/hadoop
$ scp -r hadoop hadoop-slave-2:/opt/hadoop
```

- Setup Password less connectivity from master to new slave.

```
mkdir -p $HOME/.ssh
chmod 700 $HOME/.ssh
ssh-keygen -t rsa -P '' -f $HOME/.ssh/id_rsa
cat $HOME/.ssh/id_rsa.pub >> $HOME/.ssh/authorized_keys
chmod 644 $HOME/.ssh/authorized_keys
scp $HOME/.ssh/id_rsa.pub hadoop@IPPATH:/home/hadoop/
```

Where IPPATH is the IP address of the new node. And make the same thing on the slaves, in order to exchange ssh keys between master and slaves.

- Then set a Hostname on new slaves in /etc/sysconfig/network :

  ```
  NETWORKING=yes
  HOSTNAME=slaveX.in
  ```

  Where X is the node Id (arbitrary setted, but unique)

- Run on every new slave the following, to make changes effective :

  ```
  hostname slaveX.in
  ```

- Update /etc/hosts on all machines of the cluster with the following lines:

  ```
  IPPATH slaveX.in slaveX
  ```

By using this configuration we are able to dynamically add a data node to an existing cluster. The only point of failure is on IP addresses : every node should have a different one, and use it in order to have a functionnal network, however, this IP address can be found on the host.

Finally, the new slave have to start HDFS by using this command :

```
./bin/hadoop-daemon.sh start datanode
```

This last command will have to be execute every time the docker application get started.

1.3 Conclusion

In conclusion, docker is a tool (application container) that will allow us to run hadoop on pretty much every system, and moreover allow us to have a configuration routine that pratically does not differ from a machine to another. By porting this solution on every computer of the company, we can assume that every computers going in sleep mode, and having a docker image configured like above, will connect to the master, and be part of the Hadoop cluster.

However we can easily imagine that many difficulties will come up, and we will discuss them in the following chapter.

Part III

Difficulties that we expect to encounter

Chapter 2

Redundancy Problems

2.1 What we expect to happen

Because of bla bla blabla bla blabla bla blabla bla blabla bla blabla bla blabla bla blabla bla blabla bla blabla bla blabla bla bla