Step By Step Guide for Using Akaroa2 on PlanetLab

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Introduction

1. The three methods commonly used for validating a theoretical concept are analytical modeling, simulation and experimentation. Akaroa-2 is a tool developed for conducting parallel simulation using MRIP (Multiple Replications in Parallel) approach. PlanetLab is an open platform for developing, deploying and accessing large scale distributed services. The purpose of this manual is to outline procedure for running Akaroa-2 on PlanetLab from Linux machine. It will enable a PlanetLab user to run Akaroa-2 simulation on thousands of worldwide distributed nodes.

What is PlanetLab?

2. PlanetLab is distributed testbed consisting of more then thousand computers located at more than 500 sites in forty different countries. PlanetLab can be used to run experiment related to Future Internet, distributed computing, peer to peer networks etc. Each participating PlanetLab site provides two nodes i.e. Dell servers. Each node is running Virtual Linux operating system. Principal Investigator at each site is allowed to create ten slices. A slice is network wide resource container. Users of this slice can add any number of nodes to a slice depending upon the requirement of experiment. Using PlanetLab, researchers run their experiment, in a real world scenario, on nodes which are thousands of miles apart. Further details about running an experiment on PlanetLab are available at PlanetLab New Zealand website (http://www.planetlabnz.canterbury.ac.nz/).

What is Akaroa-2?

3. Akaroa-2 is designed for running quantitative stochastic discrete-event simulations in parallel on network of Linux workstations. Instead of dividing program into subparts and running on different workstations, it uses MRIP (Multiple Replications in Parallel) approach. Akaroa-2 system consists of four parts Akmaster, Akslave, Akrun and Akgui. Akmaster is central controlling process which controls/coordinates all other processes in Akaroa system. Akslave process is used to initiate a simulation engine on a node. Akrun is used to launch simulation, from command line, after akmaster and all akslave have been started on desired nodes. Akgui can be used to run simulation from graphical user interface. Akmaster collects local estimates from all running akslaves, calculates final global estimate and passes it on to Akrun or Akgui for displaying result. Further details about running Akaroa -2 on local area network are available at Akaroa-2 website (http://www.cosc.canterbury.ac.nz/research/RG/net_sim/simulation_group/akaroa/about.chtml).

Running Akaroa-2 on PlanetLab

4. There are three main steps required to run Akaroa-2 on PlanetLab. First, logging in to required number of PlanetLab nodes from local machine running Linux operating system. Then copying and installing Akaroa-2 on these nodes and finally starting Akmaster and Akslave before initiating Akrun or Akgui command.

Logging into PlanetLab nodes from Local Linux Machine

5. Please ensure that you have valid PlanetLab login as well as a slice assigned to that login i.e. following steps have already been completed :-
    a. Registration of new account with PlanetLab
    b. Verification of account
    c. Approval of account by PI
    d. Generation of Public and Private key pair
    e. Uploading of Public key to PlanetLab site
    f. Creation of new slice by PI and association of your account to it
    g. Addition of nodes to slice by you
    h. Availability of Private key on the local Linux machine being used for logging into PlanetLab nodes
6. Start terminal program on your Linux machine. To connect to a PlanetLab node type following command on terminal:-

    ssh -i Location/Name of private key file –l Slice login name Address of node ssh -i private_key -l Canterbury_slice1 planetlab1.canterbury.ac.nz.
    Repeat above steps for opening connections to desired nodes.

Copying Akaroa-2 to PlanetLab nodes

7. Go to Akaroa-2 website, fill the registration form and download latest copy of Akaroa-2 software for free. The latest version of software is "akaroa-2.7.8.tar".

    *   Use SCP, Secure copy command to copy software to desired PlanetLab nodes. The basic syntax of command is given below :-

        scp file_name username@remotehostname:/some/remote/directory

        For example, if user mike wants to copy a file called **file1.txt** to a directory called **home** in his account on a computer called **nextcomputer.com**, he would enter following command in his own computer:-

        scp file1.txt mike@nextcomputer.com:/home

    *   As all PlanetLab nodes use public key cryptography, it would be important to explicitly define location of secret key file in scp command using i (identity file location) option.

        scp –i /location_private_key file1.txt mike@nextcomputer.com:/home

- The same command has to be repeated for all the nodes on which Akaroa-2 has to be installed. Alternatively, a program with the name of ak_copy is available from Akaroa web site which can be downloaded and used for copying single program to multiple computers. To run this program type the following command:-

  ./ak_copy

- Once the program is started, it will ask for number of nodes on which program is to be copied, name of nodes and name of program to be copied. The names of nodes must be separated by giving single space between them. This program will automatically copy this program on all specified nodes.

Installing Akaroa-2 to PlanetLab nodes

8. All the nodes on PlanetLab come with an operating system loaded with minimum required basic features. Before installing Akaroa-2 on any node, programs like flex, python, tcl, tk, tcl-devel gcc,c++, automake must be installed using yum command.

   - Use following command to install these programs :-

     yum install flex python tcl tk tcl-devel gcc-c++ automake make *.*

     Yum command can only be run under super user privileges. Each user of PlanetLab node can login as super user by simply typing "su" at any time and can then exit from it by typing "exit".

   - After installation of necessary program on each node with yum command, run following commands to install Akaroa-2:-

   - Un-zip Akaroa-2 file by running the following command :-

     tar xvzf akaroa-2.7.8.tar.gz

   - Change to Akaroa-2 directory

     cd akaroa-2.7.8

   - Run configure command under Akaroa-2 directory. Prefix option can be used with configure command to install bin directory at own choice location.

     ./configure

   - If everything goes fine then run following commands:-

make
make install

- Make necessary changes in path to run Akaroa commands.

- The same commands have to be repeated for all the nodes on which Akaroa-2 has to be installed. Alternatively, a program with the name of ak_install is available from Akaroa web site which can be downloaded and used for installing Akaroa-2 in one command. To run this program, change to super user and type following command:-
  ./ak_install

- It will install Akaroa-2 in one command.

Running Akaroa-2 on PlanetLab nodes

9. In order to run Akora-2 on PlanetLab, first start akmaster on main controlling node by giving following command :-

   akmaster –f &

- When akmaster is started it generates two hidden files .akmaster and .akauth. Both these files have to be copied to all nodes where akslaves have to be initiated. These files have to be copied using **scp** command and procedure explained above.

- Next, start akslave on all PlanetLab remote nodes. This can be done using **ssh** command given below :

   ssh   -2   –i   location_of_private_key   -l   remote_name remotehostname.com /path_to_Akaroa-2_bin/akslave &

   Replace remote_name with your username on the remote host, and remotehostname with the name of the remote host. Repeat this command for all the nodes on which akslaves have to be run.

- In order to run Akrun on our local Linux machine, we need two hidden files .akmaster and .akauth. These files are created on the Planet Lab node running Akmaster. These can be copied from that node to local machine using SCP command on our local Linux machine terminal window. The syntax of command to be used is given below :-
  scp -i private_key user_name@remote_host_name:file_name .

- Next start the simulation by giving akrun command given below on PlanetLab controlling node or on your local Linux machine terminal window:-

   akrun -n 2 /path_to_Akaroa-2_program/program name

n is used to denote number of nodes on which simulation is to be run and program's name with complete path should be specified to allow akslave to locate that program. Once simulation is complete, akrun will report back results obtained from akmaster with name of nodes on which simulation was run.

- Alternatively, a program with the name of ak_start_master_slaves and ak_run is available from Akaroa web site which can be downloaded and used for running simulation in one command. To run ak_start_master_slaves, type following command:-
  ./ak_start_master_slaves

- Once the program is started, it will ask for number of nodes on which akslave is to be copied and name of nodes. The names of nodes must be separated by giving single space. This program will first start Akmaster and then repeatedly start akslave program on all specified nodes.
- To run ak_run, type following command:-
  ./ak_run

- Once the program is started, it will ask for number of nodes on which simulation is to be run. This program will then ask for name of program to be run on PlanetLab nodes. This program should be available on all the nodes under Akaroa 2 bin directory. Ak_run will execute this program on PlanetLab nodes and display result. Results of running akmaster at Japan node and akslave at France and China nodes are given below for reference:

  [canterbury_slice1@nis-planet1 ~]$ akrun -n 2
  /home/canterbury_slice1/akaroa-2.7.8/bin/uni

  Simulation ID = 2

  Simulation engine started: host = pl1.pku.edu.cn, pid = 28507

  Simulation engine started: host = onelab09.inria.fr, pid = 29466

| Param	Estimate	Delta	Conf	TotalObs	TransObs
1	0.506812	0.0141745	0.95	1494	249

  #Results obtained using the Akaroa2(c) automatic parallel simulation manager.
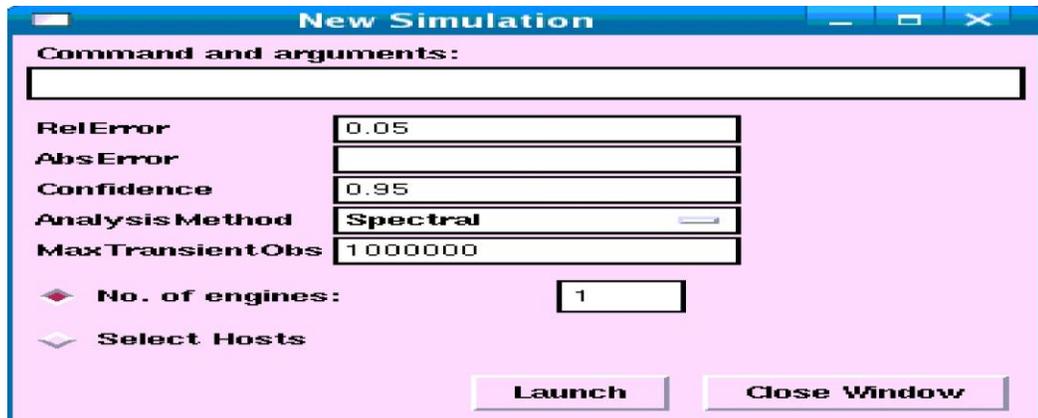
Running Akgui

10. Akgui is used to run simulation using graphical user interface. In order to run Akgui on local Linux machine we need two hidden files .akmaster and .akauth.

These files are created on the Planet Lab node running Akmaster. These can be copied from that node to local machine using SCP command on our local Linux machine terminal window. The syntax of command to be used is given below :-
scp -i private_key user_name@remote_host_name:file_name .
After copying file from PlanetLab node running Akmaster type Akgui command on terminal. It will open Akgui window shown below.
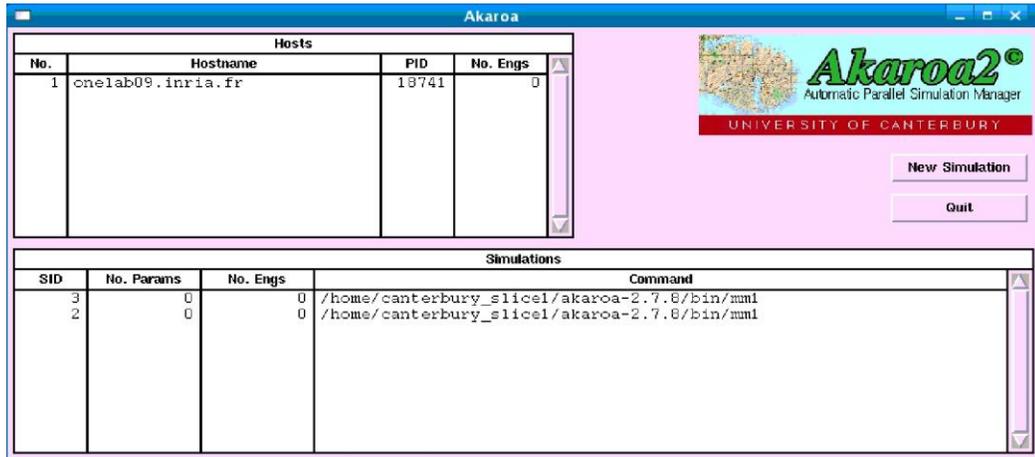
This windows shows list of slaves on PlanetLab and simulations already run by Akmaster. Click on new simulation button to start new simulation. It will open another window shown below:-

Use this window to specify parameters for new simulation like name of program to be executed, number of nodes/hosts, number of engines on a host/node etc. Click on launch to start simulation.

Conclusion

11. Running Akaroa-2 on PlanetLab will open new opportunities for researchers. It will enable them to run complicated stochastic simulation programs on large number of machines distributed worldwide from their home or office PC.