CrossGrid Installation Guide

SLEUTH-G Application

WP 1.3.2

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Abstract: This is an installation guide for the parallel version of the SLEUTH algorithm developed within the CrossGrid project.

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	Name	Partner	Date	Signature
From	Michał Bluj	INS	Nov 2004	
Verified By				
Approved By				

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1 About the Software

1.1 Introduction

The SLEUTH-G is a grid version of sequential SLEUTH algorithm, developed by B. Knuteson from Fermilab. It can be used for evidence of physics beyond the Standard Model in a quasi-model-independent way. It was used on data collected by Tevatron. Detailed description of the method and results of search at the D0 experiment are described in ref. [1].

SLEUTH is an algorithm of finding regions of excess in HEP experiment's data. The excess is measured in comparison to expected background. The background is simulated experiment data which is based on Standard Model. SLEUTH also quantifies the significance of detected excess. Such fiducial regions are volumes in the space defined by physical variables such as transverse momenta of reconstructed objects. These regions contain some data points and expected numbers of background events. For each region of excess SLEUTH computes the probability, that the expected background fluctuates up to or beyond the level of real data. If this probability is small, then the region is potentially interesting. The probability space is potentially a complicated multidimensional distribution of physics variables and only numerical approximation of the probability is possible. SLEUTH determines it by generating hypothetical similar experiments (HSEs) i.e. by generating the random sets of events according to the background distribution and checking how often they are above expectations in the considered, potentially interesting region.

The application has been implemented using MPICH [3] which is a freely available implementation of Message Passing Interface (MPI) [2]. SLEUTH-G can be built with one of two kinds of MPICH: MPICH-P4 (using ch_p4 device) working on one cluster and grid enabled MPICH-G2 [4](using GlobusToolkit 2 [5] as device).

1.2 Dependencies

There are following software requirements:

- GSL (The GNU Scientific Library) [6]
- ROOT (An object-Oriented Data Analysis Framework) [7]
- MPICH-P4 [3] or/and MPICH-G2 [4]

2 Installation in the CrossGrid testbed

2.1 RPM lists for LCFG

- RPM package contains SLEUTH-G application. SLEUTH can be installed on Worker Nodes (WNs) or on User Interface (UI) and copied into WNs via InputSandbox mechanizm.
    - cg-wp1_3_2-sleuth-*-*
- RPM packages contain libraries required by SLEUTH-G. These RPMs have to be installed on WNs.
    - GSL (The GNU Scientific Library)
      gsl-*-*
      gsl-devel-*-*
    - ROOT (An object-Oriented Data Analysis Framework)
      root-*-* (version 4.00.08 or newer)
    - MPICH-P4 or/and MPICH-G2
      mpich-p4-*-*
      mpich-g2-*-*

2.2 Profile modifications for LCFG

No any profile modifications for LCFG is required.

2.3 Manual post installation steps

No any post installation step is required.

3 Manual installation

3.1 Download

The RPM package with SLEUTH-G and source code can be downloaded from central CrossGrid repository at FZK (gridportal.fzk.de). Installation details can be found below.

3.2 Installation from RPM

- Download RPM package cg-wp1_3_2-sleuth-*-*.i386.rpm (where *-* stands for version)
  from URL http://gridportal.fzk.de/distribution/crossgrid/autobuild/i386-rh7.3-gcc-3.2.2/wp1/RPMS

  ```
  $ wget http://gridportal.fzk.de/distribution/crossgrid/ \
    autobuild/i386-rh7.3-gcc-3.2.2/wp1/RPMS/cg-wp1_3_2-sleuth-*-*.i386.rpm
  ```

- Install RPM package

  ```
  $ rpm -Uvh cg-wp1_3_2-sleuth-*-*.i386.rpm
  ```

  The default location is /opt/cg can be changed with rpm –prefix option

3.3 Installation from source

3.3.1 Downloading the source code

There are two ways downloading the source code from the CrossGrid repository at FZK:

- Downloading and extracting from tar archive

  ```
  $ wget  http://gridportal.fzk.de/distribution/crossgrid/ \
    crossgrid/wp1/cg-wp1_3_2-sleuth-*.tar.gz
  $ gunzip cg-wp1_3_2-sleuth-*.tar.gz
  $ tar cg-wp1_3_2-sleuth-*.tar
  ```

  where * stands for version number.

- Downlading from CVS repository

  ```
  $ export CVS_RSH=ssh
  $ export CVSROOT=:ext:anoncvs@gridportal.fzk.de/cvs/crossgrid
  $ cvs -z3 co -d SRC_DIR crossgrid/wp1/wp1_3-hep/wp1_3_2-sleuth
  ```

  where SRC_DIR is directory where source will be downloaded.

3.3.2 Building

To build SLEUTH-G you have to have autotools installed in your machine.

Build time dependencies

There are following build time dependencies:

- gcc (The GNU C/C++ Compiler)
- GSL (The GNU Scientific Library)
- ROOT (An object-Oriented Data Analysis Framework) version 4.00.08 or newer
- MPICH-P4 or/and MPICH-G2

3.3.3 Compilation

To compile the source code you should preform following steps:

```
$ ./autogen.sh
$ ./configure
$ make
```

3.3.4 Installation

To put the executable into a prticular directory CG_PATH/bin (e.g. CG_PATH=/opt/cg) you can execute:

```
$ make install prefix=/opt/cg
```

3.4 Configuration

No any configuration is required.

4 Contact Information and Credits

5 EDG License Agreement

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Bibliography

[1] B. Abbott *et al.* [D0 Collaboration], "Search for new physics in e muon X data at D0 using SLEUTH: A quasi model independent search strategy for new physics," Phys. Rev. D **62** (2000)

[2] MPI: A Message-Passing Interface Standard, Message Passing Interface Forum, 5 May 1994 http://www-unix-mcs.anl.gov/mpi/standard.html

[3] MPICH. http://www-unix-mcs.anl.gov/mpi/mpich

[4] N. Karonis, B. Toonen and I. Foster, "MPICH-G2: A Grid-Enabled Implementation of the Message Passing Interface", Journal of Parallel and Distributed Computing (JPDC), Vol. 63, No. 5, May 2003.

[5] The Globus Project. http://www.globus.org

[6] GSL: The GNU Scientific Library. http://www.gnu.org/software/gsl

[7] ROOT: An object-Oriented Data Analysis Framework http://root.cern.ch