BEAM

Blacknest Data System (BDS)

System Administration – Version 2.0.4

Project	Blacknest
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Reference	blacknest/bdsSystemAdmin
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1. References

- The BEAM Blacknest support website at: https://portal.beam.ltd.uk/support/blacknest. This provides detailed information on the BDS system and the current AutoDRM, information on alternative AutoDRM implementations and information on data formats.

2. Introduction

This document provides an overview of administrating the Blacknest Data System (BDS).

3. Software Packaging

The BDS software consists of a number of API libraries and a set of applications bother for the server and for client systems. The software is currently packaged in the following RPM modules:

Package	*Description*

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bds-repo	Package to install the yum package repository information
bds	General BDS package, needed by all other packages
bds-server	The main BDS server package. All programs that are neded on a BDS server
bds-autodrm	The BDS Autodrm front end prBdsSystemAdmin.odtogram
bds-web	The BDS Web interface front end program
bds-clients	A set of general BDS client applications
bds-devel	BDS API library include files and bits for developing BDS applications
bds-importScream	The BDS SCREAM data import daemon
bds-doc	BDS local documentation
bds-test	BDS Test system. Includes programs for creating and checking Test MetaData and Test seismic data for a test network and set of test stations.
Utility Libraries	
libgcf2	Gurlap GCF data file access library runtime
libgcf2-devel	Gurlap GCF data file access library development
libmailutils	Email manipulation library runtime
libmailutils-devel	Email manipulation library development
libmseed	SEED data record library
libmailutils-devel	SEED data record library development

All of these packages may be installed on a single BDS server host. Alternatively individual packages may be installed on different hosts. The bds-autodrm package may, for example, be installed on a front end email host and the bds-clients package may be installed on any system that just requires user access to the BDS system

There is a yum repository at: http://portal.beam.ltd.uk/dist/blacknest containing all of these packages. To update the system you can simply use the command “yum update”. After updating the software packages the BDS daemon programs should be restarted.

4. BDS Server Bare Metal Install

This gives the procedure for installing the BDS system on a system designed to be a server.

1. Install the package repository RPM: “rpm -i

http://portal.beam.ltd.uk/dist/blacknest/rhel/6/packages/blacknest-repo-1.0.0-1.beam.el5.i386.rpm”

2. Install BDS components: “yum install bds bds-server bds-clients bds-extras bds-doc bds-test bds-web bds-autodrm bds-importScream bds-importCd”.
3. Configure and start the MySQL server. See the info in the BDS Database section for more details.

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4. Create the initial database (MySQL should be running): “cd /usr/bds/bdsSql; sh createDatabase”. Use the MySQL root password when requested. This will create the database tables and populate them with basic necessary data.
5. Configure the BDS daemons as needed (/etc/bdsServer.conf etc.)
6. Start the BDS system: “/usr/bds/bin/bdsRestart”
7. If required the BDS database can be populated using the bdsImportBlacknestDatabase command.

5. BDS Client Bare Metal Install

This gives the procedure for installing the BDS system on a system designed to run BDS clients.

8. Install the package repository RPM: “rpm -i

http://portal.beam.ltd.uk/dist/blacknest/rhel/6/packages/blacknest-repo-1.0.0-1.beam.el5.i386.rpm”

9. Install the BDS components: “yum install bds bds-clients bds-extras bds-doc”.

6. BDS Server Administration

The BdsServer will likely be running the following, BDS specific, daemons:

- Boapns: This is the BOAP name server daemon. It provides a name to IPAddress, port and service number lookup. It runs using port 12000 by default. It can be restarted using the command “service boapns restart”.
- BdsServer: This is the main BdsServer program. It runs using port 12001 by default. It can be restarted using the command “service bdsServer restart”. There is a configuration file /etc/bdsServer.conf to configure the server.
- BdsAutodrm: This is the DS Autodrm program. It communicates with the BdsServer and currently must be started after the BdsServer. can be restarted using the command “service bdsAutodrm restart”. There is a configuration file /etc/bdsAutodrm.conf to configure the server. This includes the external POP and SNMP servers to use.
- BdsImportScream: This is the SCREAM data import system. It reads and imports files from the Blacknest SCREAM satellite system.

7. BDS Data

The BDS seismic sensor data store can be split across a number of separate file system volumes. The /etc/bdsServer.conf file defines the disk volumes to use. These volumes get filled up in numeric order. The bdsServer parameter, DataStoreMin, defines the minimum number of Gigabytes needed when creating a new data file. It is possible, and recommended, to set these volumes as read only once filled for added data security.

8. BDS DataBase

The BDS system employs a MySQL database to store Seismic MetaData information such as Instrument responses and information on the available Seismic data. It also stores information on the users and is used for queuing user requests for data.

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There is a single database, named **BDS**, that has a number of tables. The **BdsSchema.html** document will describe the prototype Database Schema in detail.

The BDS uses the InnoDB MySQL database engine for storage. This implements a transactional database. By default the MySQL system stores all InnoDB database tables in a single file. It is recommended that the default configuration be changed so that the system stores each table in a separate file. To do this edit the /etc/my.conf file and add the option "innodb_file_per_table" in the "[mysqld]" section and restart the mysql daemon with the "service mysqld restart" command. If this is done before the BDS database is created the transactional database tables will be stored in separate files.

An initial database can be created using the “createDatabase” shell script from within the /usr/bds/bdsSql directory. This will create the database and tables and insert the basic necessary data. The script will request the password form the databases root user to configure the database.

Normally only the **bdsServer** program accesses the database although it obviously is possible to directly access it. The **bdsServer** also provides an API call to directly access the database if required.

The BDS data is in the database BDS on the BdsServer. The BDS database can be accessed using the userid “bds” and password “bds”. This provides read-only access to the database. There is a GUI database viewing tool called “kmysqladmin” available to view the data.

When the BDS system software is updated, there may need to be changes to the database schema. The bds

There is a separate database named BDS_WEB which is solely for use by the PHP BdsWeb interface.

9. Security

The system employs a basic userid/password security scheme. Userids and passwords are sent unencrypted across the internal network. The BDS daemon programs have their own userid/passwords that are stored in plain text in their configuration files. These files are not readable by normal users, but even so the security level is basic.

The system daemon programs run as the user **bds** and group **bdsDatabaseUpdate** program is designed to do this. It will update the schema to the latest version. This program is in the /usr/bds/bdsSql directory.

External data access would be through the BdsAutodrm or BdsWeb interfaces which provides an extra layer of security for Internet access.

9.1. Changing Passwords

The following passwords should be set up for security:

Password	***Description***
MySql database	This should be set in the MySql database and in the /etc/bdsServer.conf file.
Email PPOP server	This should be set on the email server and in /etc/bdsAutodrm.conf.
bdsAutodrm	The BdsAutodrm user should be set in the /etc/bdsAutodrm.conf file and on the BdsServer using the bdsAdminGui program.
bdsWeb	The BdsWeb user should be set in the web config.php file file and on the BdsServer using the bdsAdminGui program.

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bdsBackup	The Backup user
Normal users	Normal user accounts should be setup using the bdsAdminGui program.

9.2. Data Loss Security

The system has been designed to minimise the risk of losing data. All data deletions can only be done by a user with sufficient privileges. All seismic sensor data files are owned by the user bds and protected with read only access.

10. BDS Backup

The BDS system has a mechanism to allow seismic and database data to be backed up in the form of a self-consistent "snapshot", i.e. no changes to the data are allowed to occur while backing up is in progress. There are two APIs to provide this facility.

- **SnapshotPause**: The BDS system can be placed into and out of a Snapshot pause state using the “SnapshotPause” API call. When the BdsServer is commanded to go into the pause state the BdsServer will lock any future write operations and await all current write operations to complete. After this it will make sure all data is synchronised to disk prior to returning from the function call. Following this transition, external programs may make a snapshot of the database and seismic data files. Any subsequent BDS write requests will be blocked until the end of the pause or a timeout that is specified in the configuration files parameter “SnapshotPauseTimeout”. If “SnapshotPauseTimeout” is set to 0, then calls will block indefinitely. If any API call times out an “ErrorTimeout” error will be returned to the client applications. There is also a “SnapshotPuaseAlarm” parameter which will write a message to the system error logs at the time in seconds prescribed if set to a value other than zero. The pause period should be as short as possible to eliminate the likely hood of data loss during import of real-time data. We recommend a maximum time of 120 seconds.
- **ModeSet:** The BDS system can operate in one of two modes: master and slave. When in slave mode the BDS system will not allow writes to seismic data files or the database. Any such API calls made by clients will return the error: “ErrorSlaveMode”. The slave system can however service read requests. The default mode of the BDS system at startup is set by the "Mode" parameter in the configuration file.

These calls can only be made by a user with the “control” group privilege. There is a default user of bdsBackup included for this purpose.

See the bdsServer manual for more information. There is a command line program named: bdsControl, that provides a command line interface to these functions. See the manual on this for more information.

11. Error and Warning logging

The BDS system has an internal error and warning log system. This allows the core BdsServer and any of its client applications to log events. The logs are stored in a log file */var/log/bds/bds.log*, in the database table Logs and possible emailed to a set of administrators.

Each log entry has the following parameters:

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Parameter	*Description*
Time	The time the event occurred
Type	The type of the event. This can be: error,warning,notice or debug.
Priority	A priority level from 0 – lowest to 5 - highest.
SubSystem	The subsystem the event was from. The BdsServer is “BdsServer”
title	Short title describing the event
description	Optional more detailed description

The BDS API has a logAppend() call that client BDS programs can use to add a logging call. The bdsControl program has a “logAppend” command to add a log event from a shell script or other program.

The BdsAdminGui program has a tab to allow the viewing of past log events and adding manual ones.

There are a few parameters configurable in the /etc/bdsServer.conf file that affect logging. These are:

Parameter	*Description*
LogFile	The log file path
LogPriority	Log any event of this priority or higher
LogEmailFromAddress	The email from address when emails are sent
LogEmailAddresses	The list of email addresses to send emails (comma separated)
LogEmailPriority	Send an email on all log events of this priority or higher
LogEmailRepeatTime	On certain events, such as disk space low, the system will normally send one event. This allows the event to be reset after the given number of seconds. If this vale is set to 0 then the event will be sent on each occurrence (normally every 60 seconds)
TestDiskFree	The disk low level limit in GBytes when warning logs are sent
TestMemFree	The disk low level limit in MBytes when warning logs are sent
TestCpuUse	The CPU maximum usage in % when warning logs are sent

The system produces logging events in the following cases, currently:

Event	*Description*
Disk Space	If the disk space available in the BDS stores falls below the amount set in “TestDiskFree” a warning at priority level 4 will be sent.
Memory Free	If the memory available in the BDS stores falls below the amount set in “TestMemFree” a warning at priority level 4 will be sent.
CPU Usage	If the Cpu usage goes above the value set in “TestCpuUse” a warning at priority level 2 will be sent.

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Event	*Description*
BdsServer user	A warning at level 3 is sent on an unknown user or incorrect password
BdsServer Errors	An error at priority 5 is sent in the case of a Snapshot time Alarm
BdsServer notices	A Startup notice is sent at priority level 0 on startup
BdsAutodrm user	A warning at level 3 is sent on an unknown user or incorrect password
BdsImportScream error	A error at level 5 is sent on an import error

Other log events may also occur on certain errors.

The BDS's log file will be auto rotated by the Linux logrotate system. There is a configuration file for this in /etc/logrotate.d/bds.

The Database Logs table will need to be clean occasionally. This can be done within the bdsAdminGui's Logs tab or the “clean” command in the bdsControl program. This will delete all log and changes entries over a year old.

12. Cleaning up Logs and Changes

During operation there are a few database tables that need cleaning periodically. These are the Changes and Logs tables. The BDS program, **bdsControl**, can be run with the “clean” command to do this. This will clean logs and changes that are older than a pre-configured time. A cron job can be added to perform this once per week or as often as required.

The log file /var/log/bds/bds.log will be rotated and cleaned by the logrotate system.

13. BDS Server Hardware

Most of the BDS software will run on a single server. The following gives a basic overview of the hardware configuration. After the system has fully developed we may need to revise the system specification.

Item	*Specification*	*Details*
Processor	Dual Xeon Quad cores	
RAM	2GByte	
Networking	1 or 2 Gigabit Ethernet	
Disk	n x SATA drives	RAID 5 configuration

We recommend the following server platform:

- HP ProLiant DL380 G5

14. Operating System

We recommend one of the following, Linux based, operating systems to run on the server:

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- Redhat Enterprise 5
- CentOS5

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