DATABASE SPECIFICATIONS

Group Presentation and Project,

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ITMD 321: Data Modeling and Applications

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Revision Sheet

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Rev. 1	11/27/20	Initial publication of specifications

Database Specifications Authorization Memorandum

I have carefully assessed the Database Specifications for the Global Terrorism Database (GTD). This document has been completed in accordance with the requirements of the HUD System Development Methodology.

MANAGEMENT CERTIFICATION - Please check the appropriate statement.

___X__ The document is accepted.

_____ The document is not accepted.

We fully accept the changes as needed improvements and authorize initiation of work to proceed. Based on our authority and judgment, the continued operation of this system is authorized.

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DATABASE SPECIFICATIONS

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1.0 GENERAL INFORMATION

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1.1 Purpose

The purpose of the Database Specifications is to provide database architecture, design, configuration, controls, and administrative information for primary stakeholders, IT development, and database support personnel.

1.2 Scope

The scope of the Database Specifications as it relates to the ITMD 321 Group Presentation and Project are:

- Describe database architecture & design
- Describe database administrative information
- Describe database security controls

1.3 System Overview

The GTD is a database downloaded from the National Consortium for the Study of Terrorism and Responses to Terrorism. It serves as a sample database for the ITMD 321 group project to demonstrate effective database documentation and security control practices.

- Responsible organization: ITMD 321 group members Greg Eure, Muhammed Zahid, Calvin Ton, Junyan Liu, Estefania Lopez
- System name: GroupProj
- System code: Github link: https://github.com/SQLGROUPPROJ/SQLPROJ
- System Category: general support system - provides general database functionality to demonstrate documentation and security controls
- Operational status: Operational
- System environment: any operating system running MySQL

1.4 Project References

The below references were used in preparation for this document:

- Group Presentation and Project Assignment Guidance document
- Database Security Project Guidance sample document
- HUD Database Specifications 15145 document

1.5 Acronyms and Abbreviations

- GTD: Global Terrorism Database
- ITMD: Information Technology & Management & Development
- POC: Points of Organizational Contact

- HUD: Housing and Urban Development
- DBMS: Database Management System
- QA: Quality Assurance
- SQL: Structured Query Language

1.6 Points of Contact

1.6.1 Information

List of POCs for informational and troubleshooting purposes:

- Architecture POC: Greg Eure, email: geure@hawk.iit.edu
- Infrastructure POC: Muhammed Zahid, email: mzahid3@hawk.iit.edu
- Helpdesk POC: Calvin Ton, email: cton@hawk.iit.edu
- Development POC: Junyan Liu, email: jliu192@hawk.iit.edu
- Operations POC: Estefania Lopez, email: elopez17@hawk.iit.edu

1.6.2 Coordination

List of organizations that require coordination between the project and its specific support function:

- (Hardware Team) Server Procurement (on-premise or cloud provisioning, includes server and data storage): Schedule: week 1
- (Server Team) Operating System Installation and Configuration: Schedule: week 2
- (DBMS Team) DBMS Installation and Configuration: Schedule: week 3
- (DBMS Team) Database GTD Installation and Configuration: Schedule: week 4
- (Development Team) Database testing: Schedule: week 5
- (Security Team) Database security checking and system audit: week 6
- (QA Team) Rigorous system testing and sign-off: week 7

1.6.3 Additional Points of Contact

Additional points of contact are included in section 3.1.

1.6.4 Data Owners

See section 1.6.1.

2.0 DATABASE IDENTIFICATION AND DESCRIPTION

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2.1 Naming Conventions

Discuss the logical and physical naming standards and conventions.

2.2 Database Identification

Identify the names or labels by which the database may be uniquely identified. Specify the code name, tag, or label by which each database table or file may be uniquely identified.

Database name:

- GroupProj

Tables:

- Afghanistan
- Albania
- Algeria
- Angola
- Argentina
- Armenia
- Australia
- Austria
- Azerbaijan
- Bahrain
- Bangladesh
- Belgium
- Bolivia
- Brazil
- Bulgaria
- BurkinaFaso
- Burundi
- Cameroon
- Canada
- Chili
- Incidents

2.3 Systems Using the Database

No other systems will use the GroupProj database. This is a demonstration database only, as documented in this guide.

2.4 Relationship to Other Databases

The GroupProj database will not supersede or interface with other databases.

2.5 Schema Information

Describe the overall structure in the schema or other global definition of the database.

The GropProj is a schema which holds the information of terror attacks that happened between 2016 to 2018. There are a total of 21 tables in the schema, 20 of those tables correspond to a different country and contain 33 attributes listing information such as motive, attack type, weapons used and other pieces of useful information regarding terror attacks. The remaining table is a collection of all incidents and contains 2 attributes, incident_id and test_id.

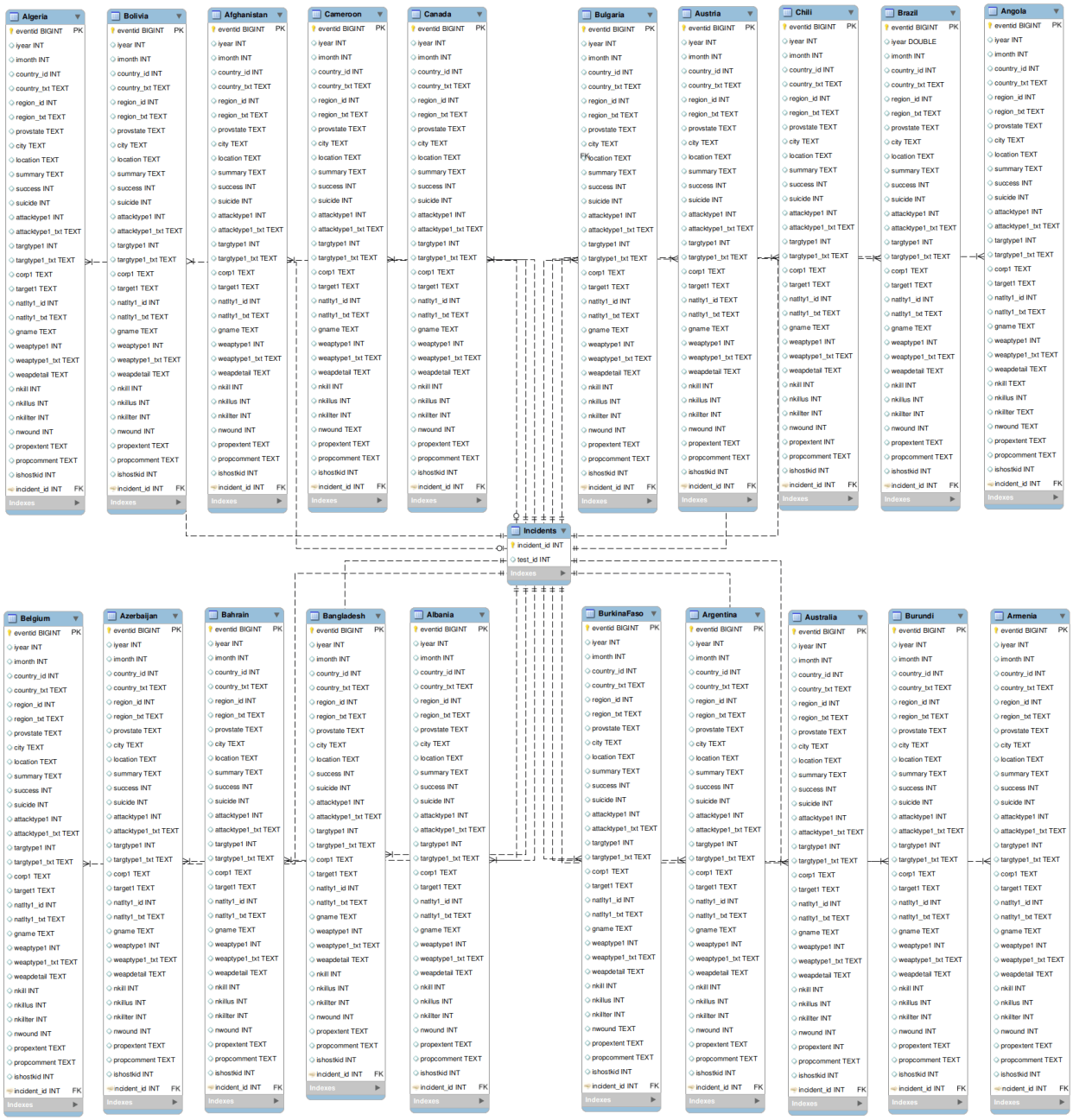
2.5.1 Description

Describe the schema and each sub-schema of the system including name, file type and name, data description language, access control keys, concurrence locking, data name mapping, overall partition/file limitations and controls, redefinition and access path restrictions and any other limitations or restrictions.

The GroupProj schema was used to design our system. Our system connects all tables using the ‘incidence’ tables on incident_id. In order to create our system we used DDL commands such as CREATE, DROP and ALTER. Our system has 4 distinct roles: administrator, end user, client and testing.
The schema GroupProj doesn’t have any sub-schema

2.5.2 Physical Design

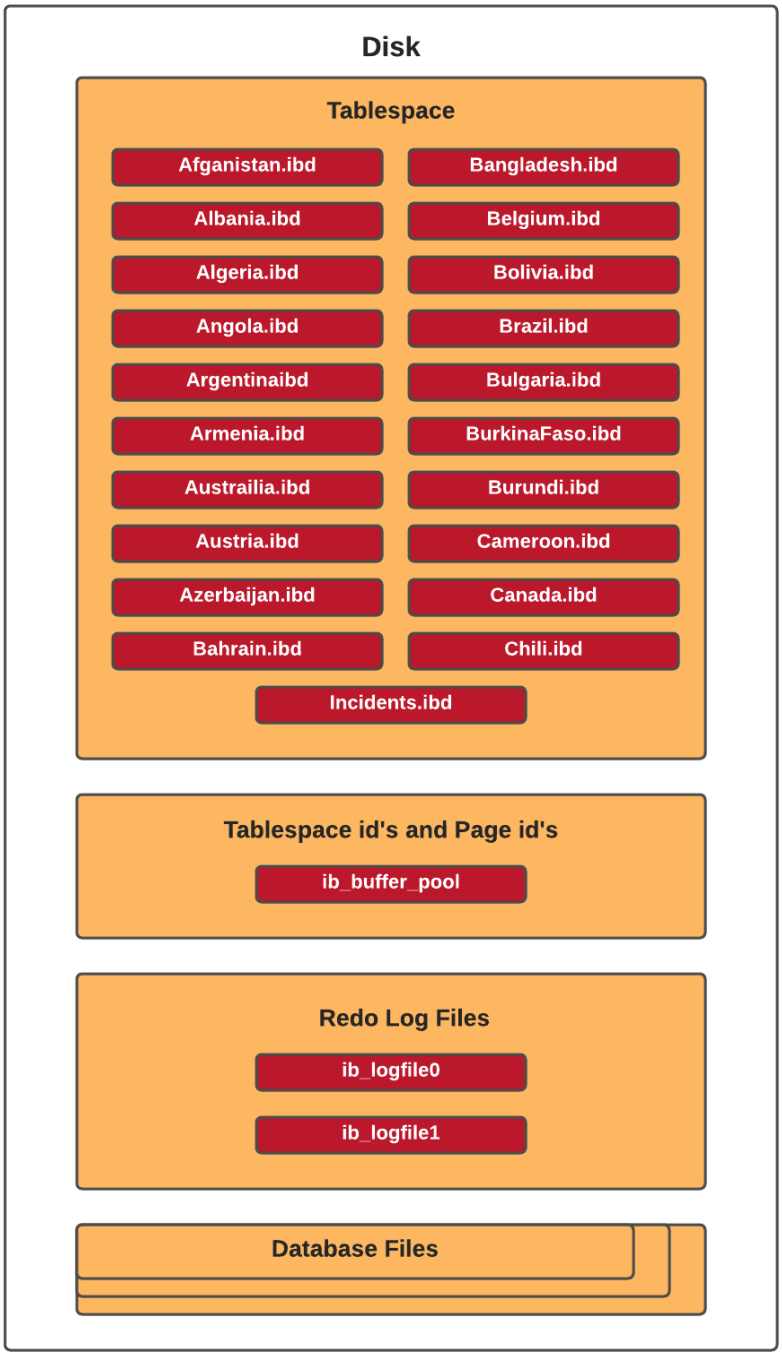
Graphically depict the physical design of the database.



2.5.3 Physical Structure

Describe and depict in a graphic representation the physical structure (partitions, files, indexes, pointers) and the logical components of the database. Identify the criteria required to achieve operating efficiency.

The DBMS resides on the filesystem in the /var/lib/mysql directory. The database resides on the filesystem in the /var/lib/mysql/GroupProj directory. There are no partitions or pointers. There are at least 3 indexes per table, consisting of the primary key index, the foreign key index, and an eventid index.



2.6 Data Dictionary

Reference the data dictionary and attach it as an appendix to this document.

	Field Name	Data Type	Description
2	eventid	BIGINT	Event Id Auto incremented
3	iyear	INT	Year event took place in
4	imonth	INT	Month event took place in
5	country_id	INT	Country id event took place in
6	country_txt	TEXT	Country Name event took place in
7	region_id	INT	Region Id where event took place in
8	region_txt	TEXT	Region text where event took place in
9	provstate	TEXT	State where event took place in
10	city	TEXT	City Where event took place in
11	location	TEXT	Exact Location of the event
12	summary	TEXT	summary of the event
13	success	INT	Was it successful
14	suicide	INT	any sucide
15	attacktype1	INT	what type of attach
16	attacktype1_tx	TEXT	exaplaning what type of attach
17	targtype1	INT	Who was the target
18	targtype1_txt	TEXT	exaplaning the target
19	corp1	TEXT	Corp who handled the event
20	target1	TEXT	who was the target
21	natity1_id	INT	Nationality ID
22	natity1_txt	TEXT	Nationality Text
23	gname	TEXT	Org Name
24	weaptype1	INT	Weapon type id
25	weaptype1_txt	TEXT	Weapon type text
26	weapdetail	TEXT	Explaining the weapon
27	nkill	INT	no killed in the event
28	nkillus	INT	no killer
29	nkilter	INT	no of the kill
30	nowound	INT	no wounded
31	propextent	TEXT	property damage
32	propcomment	TEXT	property damage explaining
33	ishostkid	INT	is the host kid
34	incident_id	INT	incident id

2.7 Special Instructions

Identify instructions to be followed by personnel who will contribute to the generation of the database and who will use it for testing and operational purposes. Such instructions may include:

There are no specific instructions

3.0 DATABASE ADMINISTRATIVE INFORMATION

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3.1 Responsibility

Identify the organizations and personnel responsible for the following database administrative functions: database administrator, system administrator, and security administrator. Describe specific administration skill requirements.

Database administrator organization: DBMS Services
DBMS Services responsible personnel: Muhammed Zahid
Database administrator required skills:

- Knowledge of database queries
- Knowledge of database theory
- Knowledge of database design
- Knowledge about the RDBMS itself, e.g. Microsoft SQL Server or MySQL
- Knowledge of structured query language (SQL), e.g. SQL/PSM or Transact-SQL
- General understanding of distributed computing architectures, e.g. Client–server model
- General understanding of operating system, e.g. Windows or Linux
- General understanding of storage technologies and networking
- General understanding of routine maintenance, recovery, and handling failover of a database

System Administrator organization: Operations Services
Operations Services responsible personnel: Estefania Lopez
System Administrator required skills:

- Problem-Solving and Administration
- Networking
- Cloud
- Automation and Scripting, including HTML, JavaScript, Go, Bash, Python, and Node.js
- Security and Monitoring
- Account Access Management
- IoT/Mobile Device Management
- Hardware Management
- SQL

Security Administrator organization: Security Management

Security Management responsible personnel: Calvin Ton

Security Administrator required skills:

- Defending systems against unauthorized access, modification and/or destruction
- Scanning and assessing network for vulnerabilities
- Monitoring network traffic for unusual activity
- Configuring and supporting security tools such as firewalls, anti-virus software and patch management systems

- Implementing network security policies, application security, access control and corporate data safeguards
- Training fellow employees in security awareness and procedures
- Developing and updating business continuity and disaster recovery protocols

3.2 System Information

Document the Database Management System configuration, hardware configuration, database software utilities, and any support software used:

DMBS configuration: MySQL Server installation on test environment with mysql_secure_installation script execution
Hardware configuration: Test environment running on virtual machine with 2 cpu's, 4Gb RAM, and 32Gb disk, with Ubuntu linux installed
Database software utilities: MySQL Workbench installed on test environment

3.2.1 Database Management System (DBMS) Configuration

Identify the vendor, version or release date and targeted hardware for the DBMS. Describe any restrictions on the initialization and use of the DBMS to support any intended distributed processing.

The targeted hardware can be any x86-based commodity hardware, including dedicated or virtualized environments. No restrictions are identified.

3.2.2 Hardware Configuration

Identify the hardware configurations on which the database will reside.

No strict hardware configurations are required, but the test system is running 2 vcpu's, 4 Gb memory, and 32 Gb disk.

3.2.3 Database Software Utilities

List and reference the documentation of any DBMS utility software available to support the use or maintenance of the database.

DBMS support: https://dev.mysql.com/doc/
MySQL Workbench support: https://dev.mysql.com/doc/workbench/en/wb-intro.html

3.2.4 Support Software Available for Maintaining Database

Describe all support software, including the operating system, directly related to the database, including name, version, function, and major operating characteristics. Cite documentation by title, number, and appropriate sections. Examples of such software include database management systems, query language, report writers, storage allocation software, database loading software programs, and file processing programs, and data cleaning software.

Operating System: Ubuntu, version 20.04.01 LTS, function: database server
DBMS System: MySQL Community Server, version 8.0.22, function: DBMS server
Tool: MySQL Workbench, version 8.0.22, function: MySQL support tool

Query Language: structured query language (SQL)

3.2.5 Security

Describe the use and management of integrity and access controls that apply to all database components such as schema, sub-schema, partitions or physical files, records or tables, sets or relations, and data elements.

The database shall be secured initially by executing the mysql_secure_installation script provided by MySQL. Additionally, the following roles shall be granted as specified to database GroupProj:

- database_administrator
- user
- client
- testing

These roles may be created by executing these sql commands:

```
CREATE ROLE database_administrator;
CREATE USER 'GlobalProj_admin'@'localhost' IDENTIFIED BY '<password>';
GRANT SELECT, INSERT, UPDATE, DELETE ON globalproj.* TO database_administrator;
GRANT database_administrator TO 'GlobalProj_admin'@'localhost';
CREATE ROLE end_user;
CREATE USER 'GlobalProj_user'@'localhost' IDENTIFIED BY '<password>';
GRANT end_user TO 'GlobalProj_user'@'localhost';
GRANT SELECT, INSERT, UPDATE ON globalproj.* TO end_user;
CREATE ROLE client;
CREATE USER 'GlobalProj_client'@'localhost' IDENTIFIED BY '<password>';
GRANT client TO 'GlobalProj_client'@'localhost';
GRANT SELECT ON globalproj.* TO client;
CREATE ROLE testing;
CREATE USER 'GlobalProj_testing'@'localhost' IDENTIFIED BY '<password>';
GRANT SELECT, UPDATE ON globalproj.* TO testing;
GRANT testing TO 'GlobalProj_testing'@'localhost';
```

*** where <password> is the actual password ***

The database instance shall also be secured in a manner consistent and compliant with NIST 800-53. All relevant controls shall be documented in separate control documents (defined below), along with respective test case results.

NIST 800-53 Control Description		
Control Number	**Control Description**	**Control Enforcement Procedure**
AC-7	Unsuccessful Login Attempts	NIST AC-7 Control Document
AU-2	Audit Events	NIST AU-2 Control Document

CM-10	Software Usage Restrictions	NIST CM-10 Control Document
IA-6	Authenticator Feedback	NIST IA-6 Control Document
SA-2	Allocation of Resources	NIST SA-2 Control Document
SC-5	Denial of Service Protection	NIST SC-5 Control Document
SI-3	Malicious Code Protection	NIST SI-3 Control Document
AC-2	Account Management	NIST AC-2 Control Document
AC-5	Separation of Duties	NIST AC-5 Control Document
AT-3	Role-Based Security Training	NIST AT-3 Control Document
AU-3	Content of Audit Records	NIST AU-3 Control Document
CM-6	Configuration Settings	NIST CM-6 Control Document
AU-8	Session Audit	NIST AU-8 Control Document
AC-8	System Use Notification	NIST AC-8 Control Document
PE-15	Water Damage Protection	NIST PE-15 Control Document
CA-5	Plan of Action and Milestones	NIST CA-5 Control Document
CP-9	Information System Backup	NIST CP-9 Control Document
CP-10	Information System Recover & Reconstitution	NIST CP-10 Control Document
CM-2	Baseline Configuration	NIST CM-2 Control Document
MP-2	Media Access	NIST MP-2 Control Document

PE-8	Visitor Access Records	NIST PE-8 Control Document
AC-14	Permitted Actions Without Identification or Authentication	NIST AC-14 Control Document
AC-17	Remote Access	NIST AC-17 Control Document
AC-22	Publicly Accessible Content	NIST AC-22 Control Document
SA-3	System Development Life Cycle	NIST SA-3 Control Document
IR-4	Incident Handling	NIST IR-4 Control Document
SC-7	Boundary Protection	NIST SC-7 Control Document
AC-3	Access Enforcement	NIST AC-3 Control Document
AC-20	Use of External Information System	NIST AC-20 Control Document
AT-4	Security Training Record	NIST AT-4 Control Document
CM-11	User-Installed Software	NIST CM-11 Control Document
IR-5	Incident Monitoring	NIST IR-5 Control Document
PS-7	Third-Party Personnel Security	NIST PS-7 Control Document
PS-6	Access Agreements	NIST PS-6 Control Document
PL-4	Rules of Behavior	NIST PL-4 Control Document
PE-13	Fire Protection	NIST PE-13 Control Document

3.3 Storage Requirements

Describe the storage device. Provide sizing formulas for determining the storage required to support the database content and associated software. Estimate the internal and peripheral storage requirements. Identify multiple storage requirements for distributed processing.

The storage device can be any internal or external storage that is recognized and mounted by the operating system. Minimum recommended storage for the operating system is 10 Gb. Minimum required storage for installation of MySQL is 300 Mb (minimum recommended is 1 Gb). Minimum required storage for the GroupProj database is 15Mb. For distributed processing, multiply these requirements by the number of servers to be added to the resource cluster.

3.4 Recovery

Describe the methodology for reestablishment or recreation of the necessary data schema and system support files.

Regular system back-ups are recommended, in which case system restore will be an option for complete recovery. Optionally, database exports should be performed as a secondary back-up option. Full database exports should be performed within MySQL Server or MySQL Workbench, and kept on a separate and independent system. In case recreation of the database is necessary, a fresh installation of MySQL Community Server and MySQL Workbench can be performed, followed by importing the latest export of the GroupProj database.

3.5 Partition/File Information

3.5.1 Content

Describe the content of each partition/file, listing the records it contains and explaining the purpose.

The GroupProj database is not partitioned. The database is contained under the file directory /var/lib/mysql/GroupProj. Files in this directory are associated with the defined tables in the database:

- Afghanistan.ibd
- Albania.ibd
- Algeria.ibd
- Angola.ibd
- Argentina.ibd
- Armenia.ibd
- Australia.ibd
- Austria.ibd
- Azerbaijan.ibd
- Bahrain.ibd
- Bangladesh.ibd
- Belgium.ibd
- Bolivia.ibd
- Brazil.ibd
- Bulgaria.ibd
- BurkinaFaso.ibd
- Burundi.ibd
- Cameroon.ibd

- Canada.ibd
- Chili.ibd
- Incidents.ibd

3.5.2 Description

Describe the design and format of each partition/file, including name, type, code, mapping, limitations and controls, access procedures, and mechanisms.

The file names are listed in section 3.5.1. There is no unique type, code, mapping, limitation, or mechanism. All controls and access procedures are handled by the operating system (for file/directory access) or MySQL (for database, table, data access)

3.5.3 Partition/File Interdependencies

Identify the interdependencies of each partition/file in the database.

All identified files (as listed in section 3.5.1) are dependent on file incidents.ibd, as all other tables have foreign key relationships with the primary key in this file. See section 2 for detailed database architecture.

3.6 Database Interfaces

Provide a description of the interfaces with other application software including these of other operational capabilities and from other organizations. For each interface, specify the following information:

The GlobalProj database doesn't have any interfaces with other application software not defined in this document.

3.6.1 Description of Operational Implications

Describe operational implications of data transfer, including security considerations.

N/A

3.6.2 Description of Data Transfer Requirements

Describe data transfer requirements to and from the software, including data content, format, sequence, and any conversion issues.

N/A

3.6.3 Description of Formats of Data

Describe formats of data for both the sending and receiving systems, including the data item names, codes, or abbreviations that are to be interchanged, as well as any units of measure/conversion issues.

N/A

3.7 Error Handling

Describe those system error handling routines and procedures that are available during execution of database software.

Error handling is performed inherently by the MySQL DBMS software. No custom or proprietary error handling routines or procedures are implemented.