



PROJECT

DBD281



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FREERK VAN DEN BOS (602074)
MUTSHIDZI NDUVHENI (601781)
BAATILE MAGOPA (602663)
ALEXANDER SOLOMON (601638)

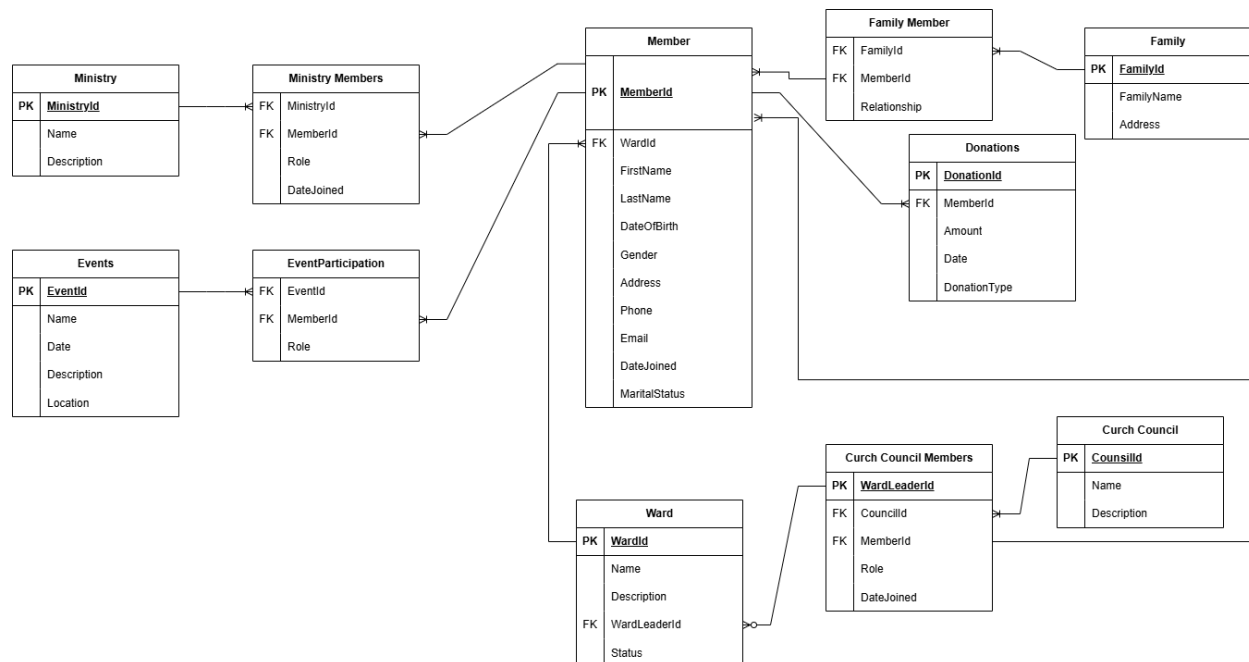
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1.Introduction

The organization we chose for this project is the Nederduitch Hervormde Kerk (NHK) Villieria. The church uses an Excel spreadsheet to keep track of their members. The church can benefit from a database, because it will allow them to easily query the data that is being stored. With their current database the data is not in any normal form and stored in an unstructured manner. This makes it challenging for the database administrator to search the database for specific information regarding the members and finances to name a few. Furthermore, the database administrator has challenges querying data and generating reports for the church to use and updating the members information is a long and tedious process.

2.ERD Diagram



3. Normalization Process

Step 1: Unnormalized Form (UNF)

MemberID	FullName	Address	EventsAttended	MinistriesJoined	Donations (Date, Amount)
1	John Smith	123 Church St	Event1, Event2, Event3	Youth, Worship	(2024-01-01, 500), (2024-03-01, 700)
2	Mary Johnson	456 Peace Ave	Event2, Event4	Women's Ministry	(2024-02-15, 300)

Step 2: First Normal Form (1NF)

- Eliminate repeating groups.
- Ensure each field contains only atomic values.

Member Table

MemberID	FirstName	LastName	Address
1	John	Smith	123 Church St
2	Mary	Johnson	456 Peace Ave

EventParticipation Table

ParticipationID	MemberID	EventName
1	1	Event1
2	1	Event2
3	1	Event3
4	2	Event2

5	2	Event4
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MinistryMembers Table

MinistryMemberID	MemberID	MinistryName
1	1	Youth
2	1	Worship
3	2	Women's Ministry

Donations Table

DonationID	MemberID	DonationDate	Amount
1	1	2024-01-01	500
2	1	2024-03-01	700
3	2	2024-02-15	300

Step 3: Second Normal Form (2NF)

- Remove partial dependencies.
- Separate data into multiple related tables.

Events Table

EventID	EventName
1	Event1
2	Event2
3	Event3
4	Event4

Ministry Table

MinistryID	MinistryName
1	Youth
2	Worship
3	Women's Ministry

Update **EventParticipation** and **MinistryMembers**:

EventParticipation

ParticipationID	MemberID	EventID
1	1	1
2	1	2
3	1	3
4	2	2
5	2	4

MinistryMembers

MinistryMemberID	MemberID	MinistryID
1	1	1
2	1	2
3	2	3

Step 4: Third Normal Form (3NF)

- Remove transitive dependencies.
- Ensure non-key attributes depend only on the primary key.

Since MinistryName, EventName, and MemberName now have their own tables and no non-key field is dependent on another non-key field, the design is in 3NF.

4 Logical Design

Tables and Attributes

Table Name	Attribute	Data Type	Key Type
Members	MemberID	INT	Primary Key
	FirstName	VARCHAR(50)	
	LastName	VARCHAR(50)	
	DateOfBirth	DATE	
	Gender	VARCHAR(10)	
	PhoneNumber	VARCHAR(15)	
	Email	VARCHAR(100)	
	Address	TEXT	
Ministries	MinistryID	INT	Primary Key
	MinistryName	VARCHAR(100)	
	Description	TEXT	
Roles	RoleID	INT	Primary Key
	RoleName	VARCHAR(50)	
	Description	TEXT	
MemberMinistryRoles	MMRoleID	INT	Primary Key
	MemberID	INT	Foreign Key references Members.MemberID
	MinistryID	INT	Foreign Key references Ministries.MinistryID

	<u>RoleID</u>	<u>INT</u>	Foreign Key references <u>Roles.RoleID</u>
	<u>StartDate</u>	<u>DATE</u>	
	<u>EndDate</u>	<u>DATE</u>	
<u>Events</u>	<u>EventID</u>	<u>INT</u>	Primary Key
	<u>EventName</u>	<u>VARCHAR(100)</u>	
	<u>EventDate</u>	<u>DATE</u>	
	<u>Location</u>	<u>VARCHAR(100)</u>	
	<u>Description</u>	<u>TEXT</u>	
<u>EventParticipants</u>	<u>ParticipationID</u>	<u>INT</u>	Primary Key
	<u>EventID</u>	<u>INT</u>	Foreign Key references <u>Events.EventID</u>
	<u>MemberID</u>	<u>INT</u>	Foreign Key references <u>Members.MemberID</u>

5 Physical Design

The physical design for the church database aims to provide a reliable, secure, and scalable solution that supports the day-to-day operations such as managing the members, events, donations, and volunteers. The following outlines the hardware, software, file organization, security, and performance aspects for the proposed database.

Hardware Environment:

Given that the church is small to medium in size and budget, a lightweight yet capable system is needed. There are 2 options for hosting:

- Option 1: Local Server Setup
 - o Processor: Intel i5 (Quad core) or better
 - o Memory (RAM): 8-16 GB
 - o Storage: 256 GB SSD for fast database access
 - o Backup Drive: External HDD with at least 100 GB of space
 - o Network: Stable LAN with firewall protection for security

- Option 2: Cloud Hosting (Recommended)
 - o Using a cloud-based virtual machine on Amazon AWS or Microsoft Azure with similar specs.
 - o Benefits include remote access, automated backups, and easier scalability

Software Environment

- Database Systems: Microsoft SQL Server 2019 (Developer or Standard Edition)
- OS (Operating System): Windows Server 2019 (for local server) or Linux/Windows for cloud instance.
- Management Tools: SQL Server Management Studio.
- Authentication: Mixed Mode (SQL Server and Windows Authentication).

File Organization

- Primary Data File (.mdf): Stores main tables and data structures
- Transaction Log File (.ldf): Records all transactions for recovery purposes
- Optional Secondary File (.ndf): Can be added in the future for performance and size management

All files should be stored in secured directories with restricted access.

Security Measures

- Authentication: Mixed mode (Windows + SQL Server)
- Role-Based Access:
 - o Admins: Full access to all objects
 - o Church staff: Limited to data entry and reporting views
 - o Volunteers: Read-only access to schedules or public info
- Encryption: Sensitive information (e.g., donation amounts) is encrypted
- Trigger-based Logging: Used for tracking important changes like donation records or member info updates.

Performance Considerations

- Indexes are added to frequently queried fields such as MemberID, EventDate, and DonationAmount.
- Normalization is applied to minimize the redundancy and speed up the query processing.
- Stored Procedures are used for repetitive task to improve consistency and performance.
- Scheduled Maintenance: Weekly reindexing, update statistics, and full database backup.

With this design it ensures that the church can maintain accurate records, produce meaningful reports, and scale in the future without a lot of disruptions.