

Genealogy Protocol Ethnicity Cultural and Multi-Partner Context Aware: Data Model and Architecture

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Abstract- In many worldwide countries, memories of beloved people that passed away and their family relationships are achieved mainly through genealogy applications. To well capture the memorial needs and habits of people, the genealogy trees should offer relevant aspects of people traditions. For example, in Asian, Africa, or Muslim countries a male person may have many wives and a woman may have during her life duration many partners. Another relevant and cultural aspect is the ethnic connection. In Africa countries, citizens of a given country that have the same cultural ethnicity, create ethnic groups to achieve common activities (development, funeral, marriages, births, education). In many popular genealogy applications () lack those services Also, when the number nodes of a family tree grow considerably, it becomes difficult to navigate through a genealogy tree. Current genealogy applications are not offering tree navigation services to visualize the tree per windows by reassigning the root node by a selected ancestor node and continue to explore the ancestor or to navigate by selecting an ancestor on a given tree level. In this paper, a genealogy protocol is defined and covers the multi-partners relation, family group and ethnic group identification, tree navigation by reassigning temporary the root person node, tree navigation by selecting a node at a specific tree level, handling of nodes redundancy, keep information of a beloved and deceased person in a multi-media format (text, audio and video) and maintain social groups of enrolled persons per family group, ethnic group debates help achieving family tree holes and collecting great quality of information. The paper describes the proposed genealogy protocol as well as its data model and architecture.

Keywords: Genealogy, Protocol, Multi-Partners, Ethnic, Root Reset/Reassignment, Social groups, Data model and Architecture.

I. INTRODUCTION

Current popular genealogy applications offer great set of data and services as DNA that help to connect family trees of people living in different countries and continents. Meanwhile, those genealogy applications do not consider cultural, traditions and social complexities of some communities in Africa, Asia, North or South America, Europe, Oceania, Islands (Caribbean) or Muslim people. Those missing aspects make it difficult for some or potential clients to retrieve the willing data and services they may like to exploit as:

- Navigating in a family tree based on the selected spouse in case of a multi-partner relation;
- Discover an ancestor using different media types as text, audio and video;
- Easy navigation on family trees per tree level or changing a family tree visibility windows;

- Improve the information quality of the family trees by creating family and ethnic social groups to debate on ancestors' data.

The preservation of family history and ancestral traditions is a major challenge in the contemporary African context. In Africa, people are identifying themselves using two main notions: Family group and Ethnic group. Another limitation of the current genealogy is the non-consideration of multi unions of a person during his/her life being.

In this project, we examine in depth the specific challenges encountered during the digitalization process of African genealogical traditions. Conventional genealogy systems often fail to capture the richness of extended family relationships, coexisting matrilineal and patrilineal lineage systems, and the importance of ethnic groups in defining family identity. Our approach offers a holistic solution that respects and preserves

these cultural nuances while providing the benefits of modern technology.

This research presents the development and implementation of an innovative genealogy system, specifically designed to meet the unique needs of African communities. The developed system backbone technologies are web, mobile, service oriented architecture, object oriented, relational database, interoperability protocol and database inter-connectivity protocol.

The proposed architecture is based on 25 interconnected database tables, managing in a sophisticated way the complex relationships between individuals, families, ethnic groups, and marriage structures. The system natively supports multiple unions, extended kinship relations, and multiple cultural affiliations, which are essential characteristics of traditional African societies.

Other added values of this architecture are an ancestor lookup by providing the ancestor tree level, the node redundancy discovery and solution, the integration of multimedia functionalities allows the preservation of oral testimonies, a central element of African cultural transmission. The oral consideration transforms family trees into living cultural archives that maintain the authenticity of traditions while enjoying the benefits of digitalization.

The current document is structured as follows: after the introduction, the motivations are presented. Then, the problem description and objectives are explained. After that, current genealogy trees and their limitations are described, followed by the solution approach. Next, the proposed genealogy tree protocol, its associated data model, and the architecture solution are explained. Finally, the future research on this topic and conclusion are presented.

II. MOTIVATIONS

The main motivation for this research stems from the critical observation of the gaps that exist in contemporary genealogy systems when applied to the African context. Current business solutions, such as MyHeritage, FamilySearch, or Ancestry (Yvette

Hoitink, 2015), are primarily designed according to nuclear family models of Western country. Thus, neglecting the extended family structures that predominate in Africa. In case the genealogy tree does not have ethnic or family groups incorporate, African family people may not recognize themselves in the identification of someone.

The scope of this research encompasses the development of a comprehensive architecture capable of handling African cultural specificities. The system developed takes into account polygamous family structures, where an individual can have several spouses simultaneously, an accepted and legal social reality in many African societies. This complexity requires sophisticated data modeling, capable of managing multiple marital relationships without creating conflicts or ambiguities in genealogical representation.

The project also extends to the management of ethnic groups and cultural affiliations. In Africa, ethnicity plays a crucial role in defining family and social identity. The system developed integrates this dimension through a hierarchical modelling of ethnic groups, associated with specific countries and subdivided into distinct family groups. This approach allows for a faithful representation of the continent's cultural diversity, while maintaining genealogical consistency. In many existing genealogy systems, there is not allow client in case of different point of views on the same tree, to handle and maintain the concerned tree coherence. In this project, the issue will be assigned to a respected elder with extensive knowledge of the family's development. This elder will lead a discussion in a private social media group with all impacted participants and then update the tree with the appropriate information.

The technical scope of the project includes the implementation of a sophisticated user management system, with granular permission levels allowing family collaboration in the construction of family trees. The system supports different types of clients (Standard and Premium) with specific permissions, as well as an administration system that allows the management of ethnic and family groups by authorized users.

Contrary to the existing solution, the developed architecture also incorporates advanced multimedia features, allowing the attachment of photos, videos, and audio recordings to individual profiles. This multimedia capacity is particularly relevant in the African context, where oral tradition plays a central role in the transmission of family history. The system thus allows the digital preservation of oral testimonies, family histories, and precious visual documents.

The international dimension of the project is also significant. The system natively supports the management of geographically dispersed families, a common reality due to historical and contemporary migrations. The modeling includes detailed location information, allowing family movements to be traced across countries and continents.

The current genealogy system does not allow the precise ancestors research. People will be making ancestors research using the tree level to obtain a quick and precise information about their ancestors.

The social impact of this research extends beyond simple genealogical documentation. By creating a technological tool that respects and values African traditions, this project contributes to the preservation of cultural identity in a context of increasing globalization. The system facilitates the intergenerational transmission of traditional knowledge, allowing younger African generations, whether living on the continent or in the diaspora, to maintain links with their cultural heritage.

III. LITERATURE REVIEWS

More recent literature on genealogy are classified in four categories: family history and genealogy versus historical and social science perspectives, genetic and forensic genealogy, computational and theoretical genealogy, and ongoing thematic and journal development.

Family History and Genealogy in Historical and Social Science Perspectives

The author (Reher, 2024) examines the current state of family history research within history and social

sciences, noting a decline in output and discussing the need for reintegration of disciplinary methods to understand changing family structures and research priorities.

The authors (Shan & Luther, 2024) made a qualitative human-computer interaction study based on interviews with genealogists, analyze how technology supports research practices, collaboration, and learning. Their approach contrasts with the amateur and expert methods and emphasizes the role of digital systems in education and professionalization of genealogy.

The authors (Shaw et al, 2024) in the paper, original empirical research using social media data to assess public attitudes toward investigative genetic genealogy, highlight how public discourse reflects ethics, privacy concerns, and the use of genetic DNA data in family history research. In their article, the authors show how DNA testing reshapes identities and challenges traditional archival-based family history narratives through biological evidence.

Genetic and Forensic Genealogy

The review article (Mengge Wang et al, 2024) details how next-generation sequencing and genomic resources expand pedigree tracing and kinship inference in forensic investigations, discussing implications for solving cold cases and ethical limitations of FIGG. The paper (Ngozi Aleke and Mohamed Trigui, 2024) describes how digital forensic techniques address legal and ethical challenges in forensic genetic genealogy, including privacy and human rights considerations associated with the forensic use of genealogical DNA data. Systematic review (Yanchen Liu et al, 2024) article maps the development of kinship analysis literature, showing trends, geographic distribution, and methodological shifts in genetic and analytical genealogy.

Computational / Theoretical Genealogy

The computational paper (Kasimir Schulz et al, 2025) introduces a method or process from genealogy modeling to classifying machine learning architectures, demonstrating a signature-based approach to identify structural lineages in

computational graphs (broadening the use of the genealogy concept beyond biological/historical contexts). The authors (Joe Yuichiro Wakano et al, 2025) use population models to study how cultural traits propagate through genealogical structures, linking genealogical length dynamics to trait transmission across generations.

Ongoing Thematic and Journal Developments

The peer-reviewed open access journal Genealogy continues to publish multidisciplinary research on genealogical narratives and methods. Recent and upcoming issues include articles on naming practices among diasporic communities (Akumjika Chikamma Michael et al, 2026), heraldic memory and genealogical consciousness (Joanna Brzegowy, 2025), and thematic special issues on ancestral histories through genetic genealogy and qualitative methods for intergenerational memory (Jacklyn M. Dahlquist MPH et al, 2025).

Ongoing special issues (Emma L. Shaw et al, 2024) reflect current research trends: qualitative methodologies in genealogical research and genetic genealogy frameworks, indicating growing interest in methodological innovation and interdisciplinary integration.

Current Genealogy Tree Limitation For Africa Context

An in-depth analysis of contemporary genealogy systems reveals major structural limitations that compromise their effectiveness in the African context. These limitations are not merely technical, but reflect deep-rooted cultural biases in the design of these systems.

Inadequate Modeling of Matrimonial Structures

Most contemporary genealogy systems adopt a binary conception of marriage, in which each individual can be linked to only one spouse at a time. This model, rooted in Western legal norms, fails to accommodate polygynous marriage practices widely accepted in many African societies. Consequently, such systems are unable to accurately represent extended family structures or capture the social significance of plural marriages.

Simplistic Representation of Parent-Child Relationships

Conventional genealogy models assume a direct biological link between a child and two parents. This approach disregards cultural realities such as informal adoption, community-based child rearing, and social kinship, which are integral to African family organization. The lack of flexibility in representing multiple or non-biological parental roles results in incomplete genealogical documentation.

Marginalization of Ethnic and Cultural Identity

Many existing platforms treat ethnicity as an optional attribute or omit it entirely. However, in African societies, ethnic identity is central to lineage construction, influencing naming patterns, inheritance customs, and inter-family alliances. The absence of structured ethnic representation limits the cultural authenticity of genealogical data.

Absence of Family Governance Representation

Traditional African families often include recognized figures of authority, elders, lineage heads, or family mediators, who play critical roles in decision-making and historical preservation. Current genealogy systems, primarily designed for Western nuclear families, lack mechanisms to represent these social hierarchies and governance structures, resulting in a loss of important relational and historical context.

Inadequate Documentation of End-of-Life Practices

African traditions emphasize rituals of passage, commemorations, and ancestral remembrance as integral components of family history. Most genealogy platforms limit end-of-life data to death dates and locations, neglecting the rich cultural dimensions associated with funerary and memorial practices.

IV. CHALLENGES AND OBJECTIVES

Challenges

This research project aims to solve 7 main challenges: multi-partners' relationship, family group and ethnic group traceability, smooth navigation on complex family trees using tree level, smooth

navigation on complex family trees by reassigning the root node, multimedia family trees, improve family tree collected data through social group per family group or ethnic group, and designed relevant statistics.

Multi-partners' relationship

Some countries allow a married person to have more than one partner or spouse at the time. Taking in account this complex relationship in a family tree is challenging. In a family tree, the root person is allowed to add partner in case they are in relationship (marriage, got a child with a partner). The partners are selectable in the family tree. A partner change in a family tree updates the subsequent parent nodes by taking in account the selected partner.

Family and ethnic groups traceability

In Africa and some other countries, the identification of an individual goes beyond the direct parents (father and mother). It is important in those cultures, to list as much as you can the ancestors of your genealogy tree. Each ancestor has a bound family group and ethnic group.

Tree level smooth navigation

When a family tree extends beyond 6 generations, the navigation on the tree becomes very as the number of ancestor nodes considering a selected partner explodes exponentially to more than $2^{(2*6)}=2^{12}=4096$ nodes, in case all ancestor nodes are filled. This is a huge number, making it confusing for node selection and lecture. In this project this challenge aims to be solved using the genealogy tree level as input parameter to filter the eligible subset nodes.

Root reassignment smooth navigation

To improve the nodes visualization when a user navigates in a family tree, the idea is to reset the root person using an ancestor node and then, change or update the active window of visualization.

Multimedia data

Reasons to conduct some studies on our ancestors are multiple. In some cases, pictures or written, documents of beloved ones are sufficient.

Meanwhile dynamic characters' traits show more some similarities (same voice, same attitude, same walks) with some descendent. Even if Biology signature is not covered in the current project research, it is important to notice that, in case DNA is captured a family tree may be bound to an unknown genealogy tree based on strong similarities.

Improve information quality through social groups

It is very difficult to maintain alone a good information quality in a family tree. Team work is one aspect that should be explored to increase a genealogy tree information quality, Motivation in a team work is an essential factor that will be exploited to constitute a team. In their article (Sara Huston et al) , the authors suggest that the social media communication may improve the quality, meanwhile do not consider using the cultural similarities for group creation.

Relevant statistics

Statistics increase the family trees attraction and provide relevant numbers for the analysis. Using family group and ethnic group, we defined great related statistics and we discovered some others were pertinence have been found. Below are some statistics that are defined and designed:

- Find persons Per Family Group with some additional filters as genre or person name,
- Find persons Per Ethnic Group with some additional filters as genre or person name,
- Count distinct persons Per Family Group with some additional filters as genre or person name,
- Count distinct persons Per Ethnic Group with some additional filters as genre or person name,
- Find names variance,
- Find persons per family tree,
- Death Average age per family tree
- number of children per couple
- number of children without father
- number of children without mother
- Number of fathers with children
- Number of mothers with children
- Number of fathers without children
- Number of mothers without children

- Family group percentage distribution of a given person
- Ethnic percentage distribution of a given person

Objectives

The main objective of this research are:

- Define a genealogy protocol that takes in account the challenges listed in the previous section;
- Design the data model that supports the proposed genealogy protocol
- Define an appropriated architecture that sustain the protocol implementation

V. SOLUTION APPROACHES

Given the complexity of African genealogical realities, this research takes a comprehensive approach that combines technical, cultural, and social dimensions. The approach chosen is based on several complementary areas: the gradual selection of ethnic and family groups, the consideration of multiple unions and complex marital structures, the optimization of ancestor research across different levels of the tree, and the integration of audio and video media to preserve stories, testimonies, and local languages.

Selection of ethnic and family groups

The process begins with selecting the country in question. This first step is essential, as it allows the search to be framed and avoids any ambiguity. Once the country has been selected, the system analyzes the available data and identifies all the ethnic groups directly associated with it. These groups are then displayed in a clear and organized manner to facilitate navigation and understanding for the user. For each ethnic group listed, the system performs a more detailed analysis: it determines and presents the major family groups associated with it.

This additional step provides greater accuracy and allows for a better understanding of the social and cultural structure specific to the country being studied. The user thus obtains a hierarchical view, from the country to the families, via the ethnic groups, which guarantees greater accuracy in the identification and classification of information.

Thanks to this progressive method, the selection of ethnic and family groups becomes a rigorous and detailed process, ensuring optimal reliability of results.

Management of multiple and complex unions

The system also takes into account polygamy and other forms of complex family unions. Users can associate several spouses with the same person in the family tree, specifying the date of the union and the corresponding validation date for each one.

This feature accurately reflects African social and family realities, where multiple unions are an integral part of certain structures. It thus avoids the simplifications often imposed by traditional Western models, offering a more complete, nuanced representation that is adapted to local cultural contexts.

Searching for ancestors

The search for ancestors is carried out by browsing through the different levels of the family tree. The user begins by entering the name of the person they are looking for, then selects the level at which they wish to focus their search. Once these criteria have been defined, the system facilitates navigation through the tree, allowing users to find the corresponding ancestors more quickly. This step-by-step approach makes consultation more intuitive and efficient, while providing greater visibility of family links within the tree.

Integration of audio and video archives

The system offers the possibility of enriching the information relating to each person by adding audio and video presentations. This feature allows not only factual data to be preserved, but also living accounts, testimonies, and memories passed down by the ancestors themselves or by their descendants.

Thanks to these recordings, family histories are preserved in their authenticity and oral dimension. It also contributes to the preservation of ethnic languages, often threatened with extinction, by allowing future generations to hear the voices and languages of their ancestors directly. In this way, the family tree is not limited to a simple visual

representation of family ties, but becomes a true cultural and memorial heritage.

Cultural Genealogy Protocol (CGP) diagram

VI. PROPOSED GENEALOGY TREE PROTOCOL

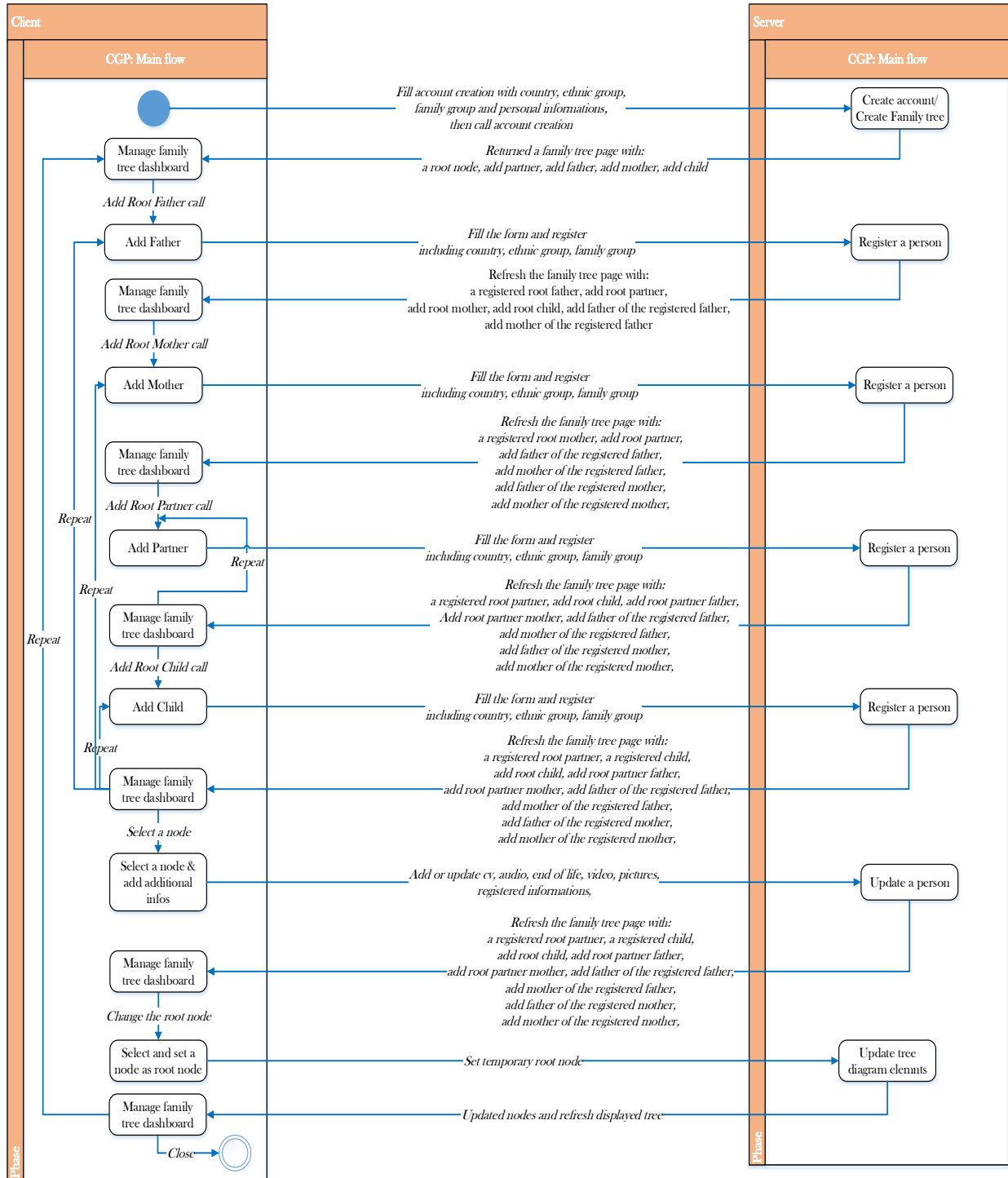


Figure 1: Tree Creation-Main flow Process

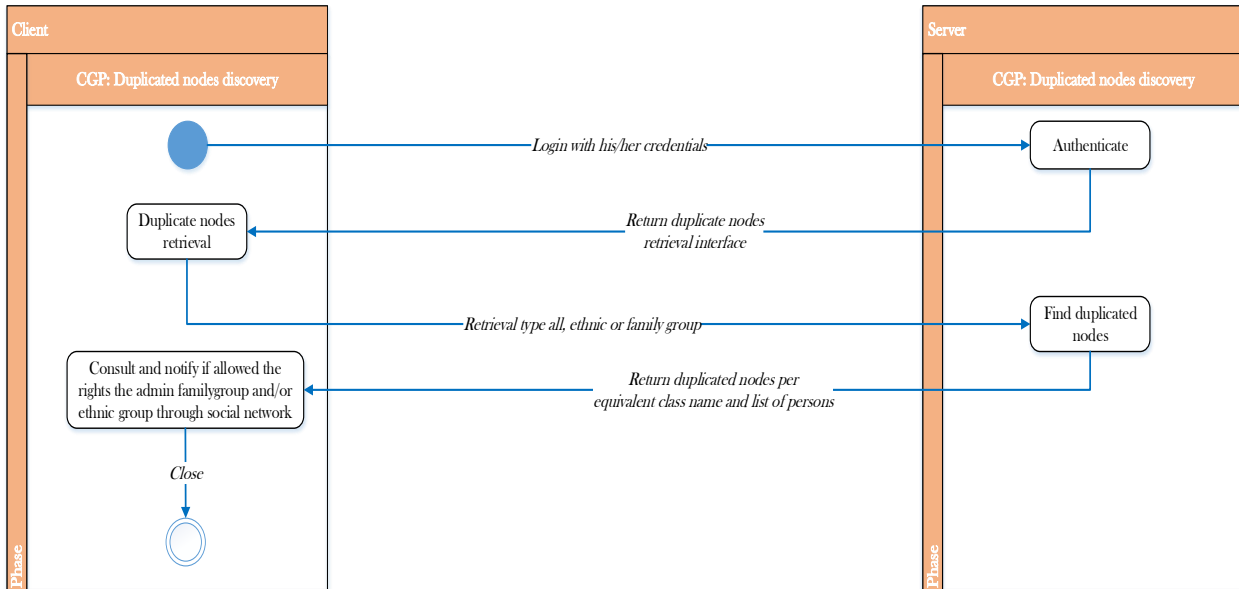


Figure 2: Duplicated Nodes Discovery Process

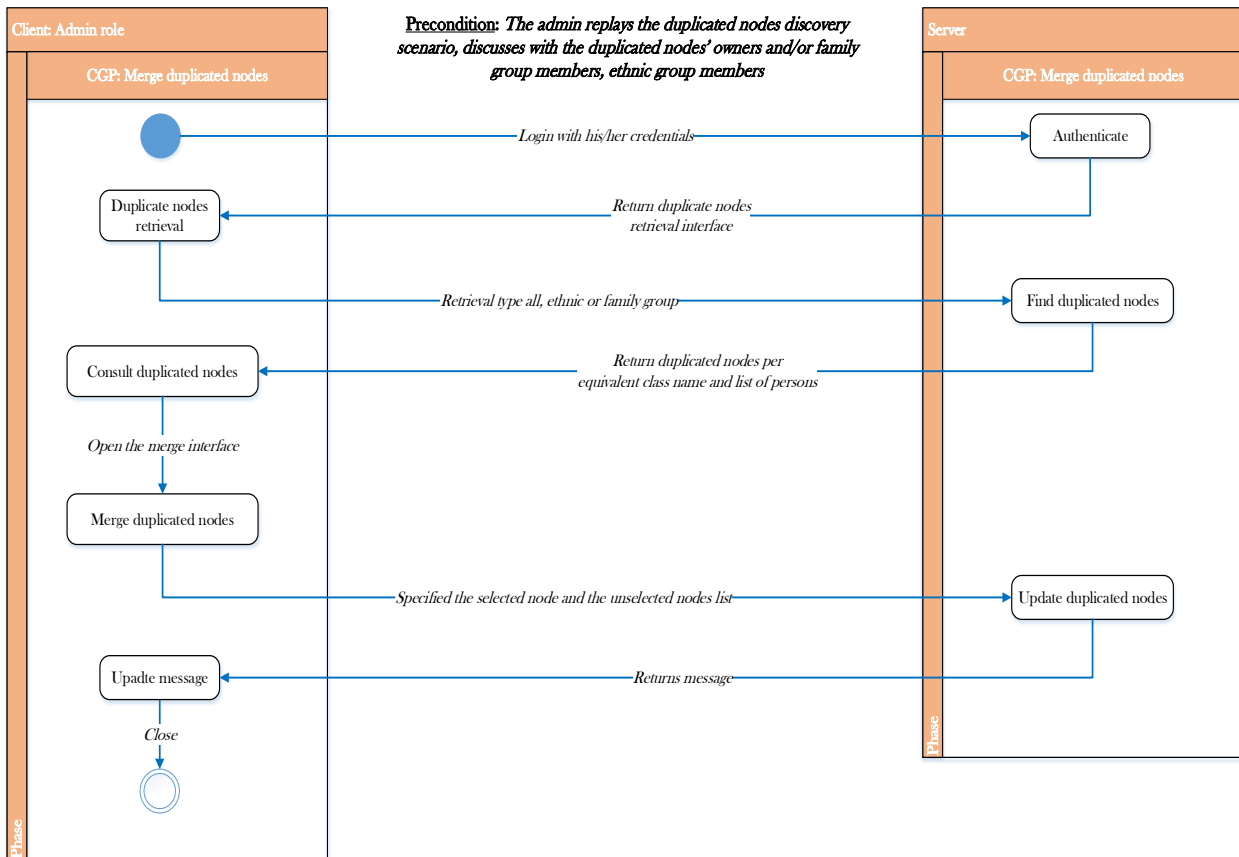


Figure 3: Duplicated Nodes Merge Process

Cultural Genealogy Protocol (CGP) Description

• Family Tree Creation-Main Flow Process

The tree creation process is the main flow of the Cultural Genealogy Protocol (CGP). The main actors in this process are: a client and the application system (Server). A client is a person that has an account in the application and rights to achieve certain activities including a family tree creation.

The Family Tree Creation Process works as follow:

1. A client requests an account creation or family tree creation by filling an account creation form with the information as country, family group filiation, ethnic group filiation of his mother and other personal attributes. Then he/she submits the filled form to the application server.
2. The application server verifies the conformity of the received data and then creates a new account with family tree name matching the person attributes. The application server returns the built family tree with one filled node which is the root person node and four unfilled nodes that must be completed.
 - The first unfilled node is the father of the root person. The unfilled father node has "Add the father" title link. When a user hits the link he/she is requested to fill the creation form of the concerned father.
 - The second unfilled node is the mother of the root person. The unfilled mother node has "Add the mother" title link. When a user hits the link he/she is requested to fill the creation form of the concerned mother.
 - The third unfilled node is a partner of the root person. The unfilled partner node has "Add a partner" title link. When a user hits the link, he/she is requested to fill the creation form of the concerned partner.
 - The fourth unfilled node is a child of the root person. The unfilled child node has "Add a child" title link. When a user hits the link he/she is requested to fill the creation form of the concerned child.
3. In case the client selects to add his/her father, the father creation form is filled with similar information as the account creation except the

username/password and then submit to the application server.

4. The application server verifies the submitted information and refresh the client dashboard interface. Additional nodes are added:

- An unfilled father node of the root person father with "Add the father" title link,
- An unfilled mother node of the root person father with "Add the mother" title link.

5. In case the client selects to add his/her mother, the mother creation form is filled with similar information as the account creation except the username/password and then submit to the application server.

6. The application server verifies the submitted information and refresh the client dashboard interface. Additional nodes are added:

- An unfilled father node of the root person mother with "Add the father" title link,
- An unfilled mother node of the root person mother with "Add the mother" title link.

7. In case the client selects to add his/her partner, the partner creation form is filled with similar information as the account creation except the username/password and then submit to the application server.

8. The application server verifies the submitted information and refresh the client dashboard interface. An additional node is added:

- An unfilled father node of the selected root partner mother with "Add the father" title link,
- An unfilled mother node of the selected root partner mother with "Add the mother" title link.
- An unfilled partner node of the root person with "Add a partner" title link.

9. In case the client selects to add his/her child, the child creation form is filled with similar information as the account creation except the username/password and then submit to the application server.

10. The application server verifies the submitted information and refresh the client dashboard interface. An additional node is added:

- An unfilled child node of the root person with "Add a child" title link.

11. From his/her dashboard, the client can continue to select and fill any unfilled node (ancestor root/partner father, ancestor root/partner mother, new partner or new child) with relevant information, then submit to the application server for registration purpose.

12. The application server verifies the submitted information and refreshes the client dashboard interface. Additional nodes are added. Depending of the action:

- An unfilled father node (in case of an ancestor root/partner father or ancestor root/partner mother),
- An unfilled mother node (in case of an ancestor root/partner father or ancestor root/partner mother),
- An unfilled partner node of the root person with "Add a partner" title link,
- An unfilled child node of the root person with "Add a child" title link.

13. From his/her dashboard, the client can continue by selecting a filled node and provide additional information as a CV or Resume, the end of life information, pictures, audio, video, testimonials, highest diplomas, then submit to the application server for update purpose.

14. The application server verifies the submitted information and refreshes the client dashboard interface.

15. From his/her dashboard, the client can continue by changing the navigation visual window. To achieve this, he/she selects a node that will be used as a temporary root node.

16. The application server verifies the submitted information and refreshes the client dashboard interface with the updated nodes and new visual window of the displayed family tree.

17. From his/her dashboard, the client can repeat any from step 3 to 16 or stop the process

18. From his/her dashboard, the client can stop the process.

Duplicated Nodes Discovery Process

The duplicated nodes discovery process is an important flow diagram of the Cultural Genealogy Protocol (CGP). The main actors in this process are: a client and the application system (Server). A client

is a person that has an account in the application and rights to achieve certain activities including a family tree creation.

The Duplicated Nodes Discovery Process works as follow:

1. The client login in the application server by filling the authentication form and submitting his credentials (username/password) to the application server.
2. The application server returns the family tree dashboard to the client.
3. The client opens and fills the duplicated nodes retrieval form by selecting either per family group (provide the information), ethnic group (provide the info) or all. Then submit the requested data to the application server.
4. The application server looks at the duplicated by running a method that classifies retrieved nodes per equivalent classes. Then returns the found duplicated nodes to the client.
5. The client consults the received nodes that are duplicated. And then, he informs the administrators of the concerned family groups or ethnic groups about the issue. This interaction is done through the social network group associated to each family or ethnic group.

Duplicated Nodes Merge Process

The duplicated nodes merge process is an important flow diagram of the Cultural Genealogy Protocol (CGP). The main actors in this process are: an administrator and the application system (Server). An administrator is a person that has an account in the application and rights to achieve manage family groups and ethnic groups conflicts.

This process precondition is: The admin replays the duplicated nodes discovery scenario, discusses with the duplicated nodes' owners and/or family group members, ethnic group members to find the selectable that will be used to marge all other duplicated nodes.

The Duplicated Nodes Merge Process works as follow:

1. The administrator login in the application server by filling the authentication form and submitting

- his credentials (username/password) to the application server.
- The application server returns the family tree dashboard to the client.
 - The administrator opens and fills the duplicated nodes retrieval form by selecting either per family group (provide the information), ethnic group (provide the info) or all. Then submit the requested data to the application server.
 - The application server looks at the duplicated nodes by running a method that classifies retrieved nodes per equivalent class. Then returns the found duplicated nodes to the administrator.
 - The administrator consults the received nodes that are duplicated. And then, he opens the merge interface. From there he/she specifies the selected node and the unselected nodes list. Then submit those data to the applications server.
 - The application server calls the update duplicated nodes method and changes the node ID of the unselected nodes to the node ID of the selected node. Then returns a message of the communication result.
 - The admin receives the message; if the change has been made, he can close the process.

VII. DATA MODEL

Data Models are described based on subjects: Account, Person, Known Unions, Cultural aspects, End of Life, Enrollment and Transaction.

Account Data Model

The account data model is articulated on four main entities: Account, Client, ClientType and Person.

- The Account contains information related to the login credentials.
- The Client has details relative to the account owner.
- The ClientType helps to classify the client as Temporary, Standard, VIP, or Admin.
- The Person has all information about an individual and his relationship.

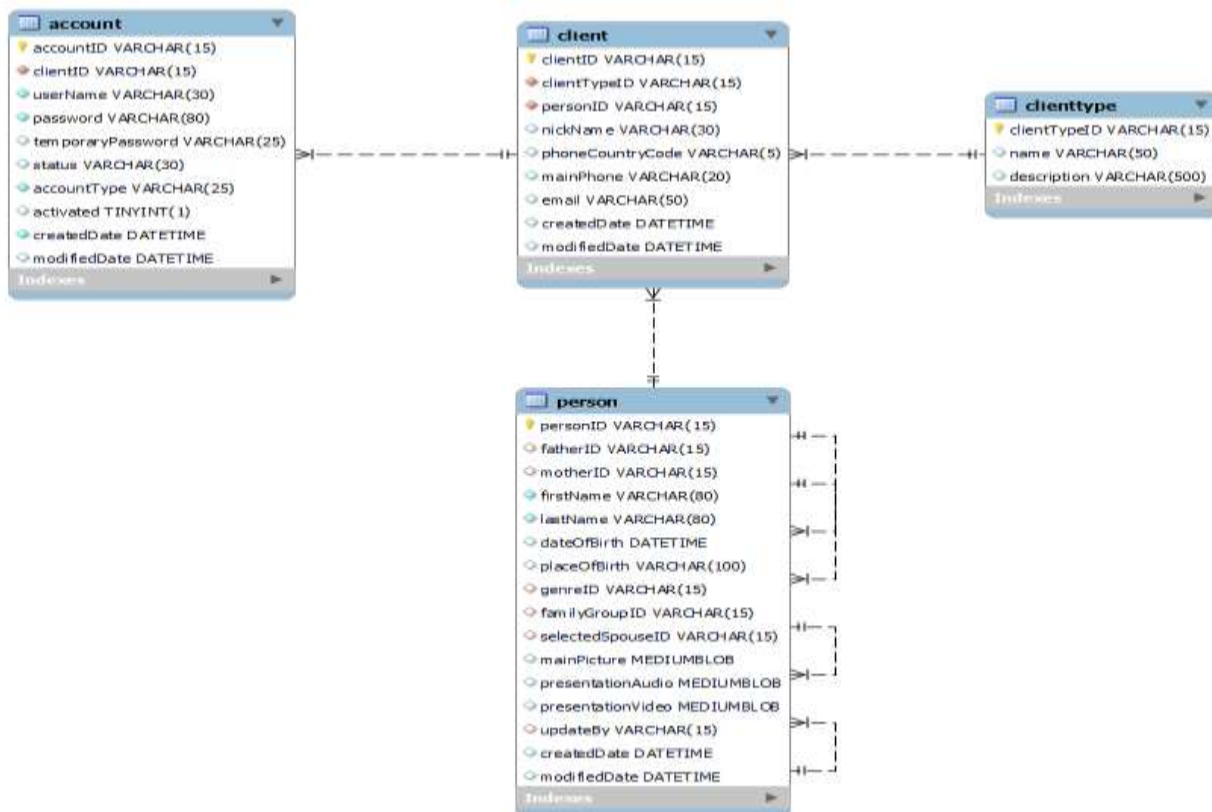


Figure 3: Account Data Mode

Person Data Model

The person data model is articulated on five main entities: Person, PersonResume, PersonDiploma, PersonPicture and Genre.

The PersonResume, PersonDiploma, PersonPicture and Genre tables act as entities that extend the Person entity definition.

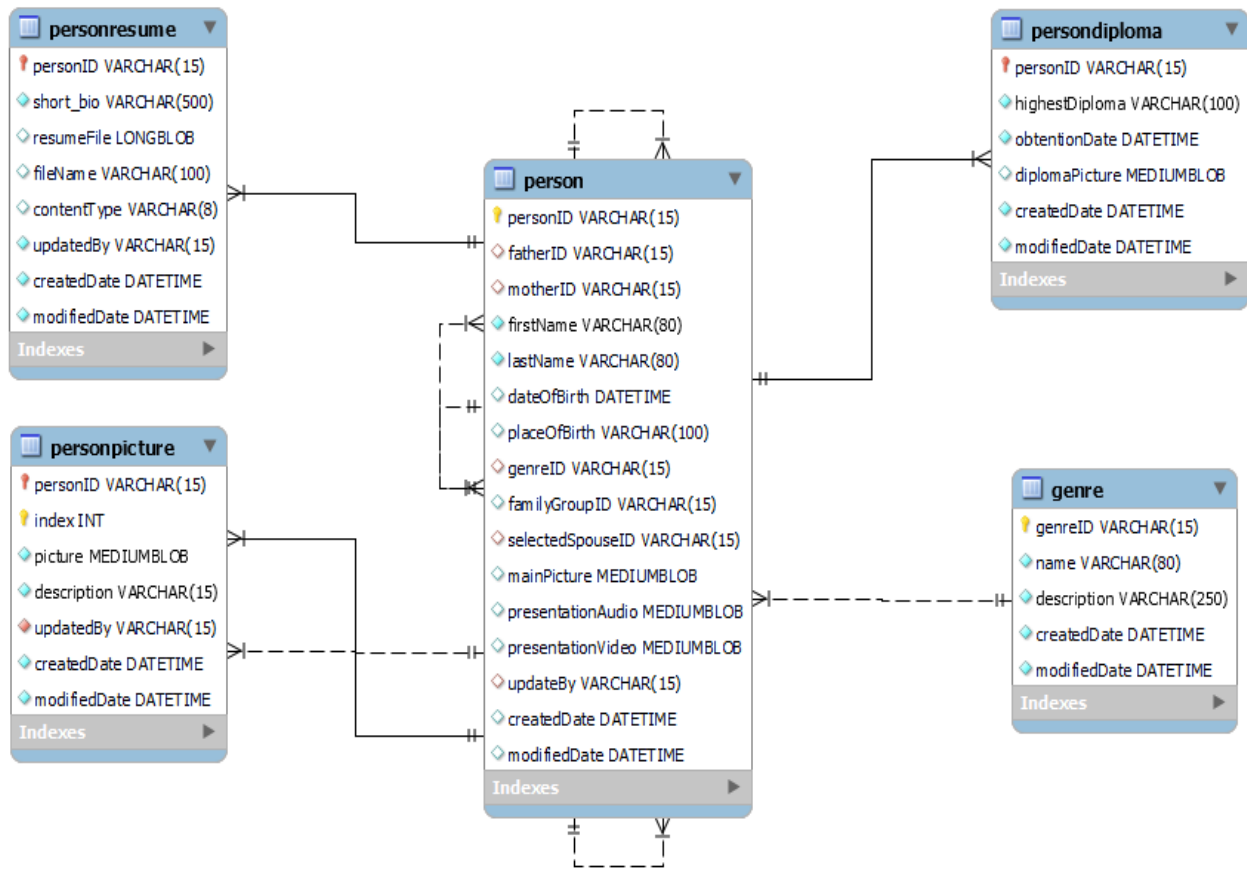


Figure 4: Person Data Model

Known Unions Data Model

The known unions data model is articulated on two main entities: Person and KnownUnions.

The KnownUnions uses a compound attributes wifelD and husbandID that act as the primary key of the entity. The entity keeps information on couple that are or were legally married traditionally or legally. The KnownUnions entity possess rich attributes that are highly relevant for statistics analysis as the number of children, the number of boys or the number of girls.

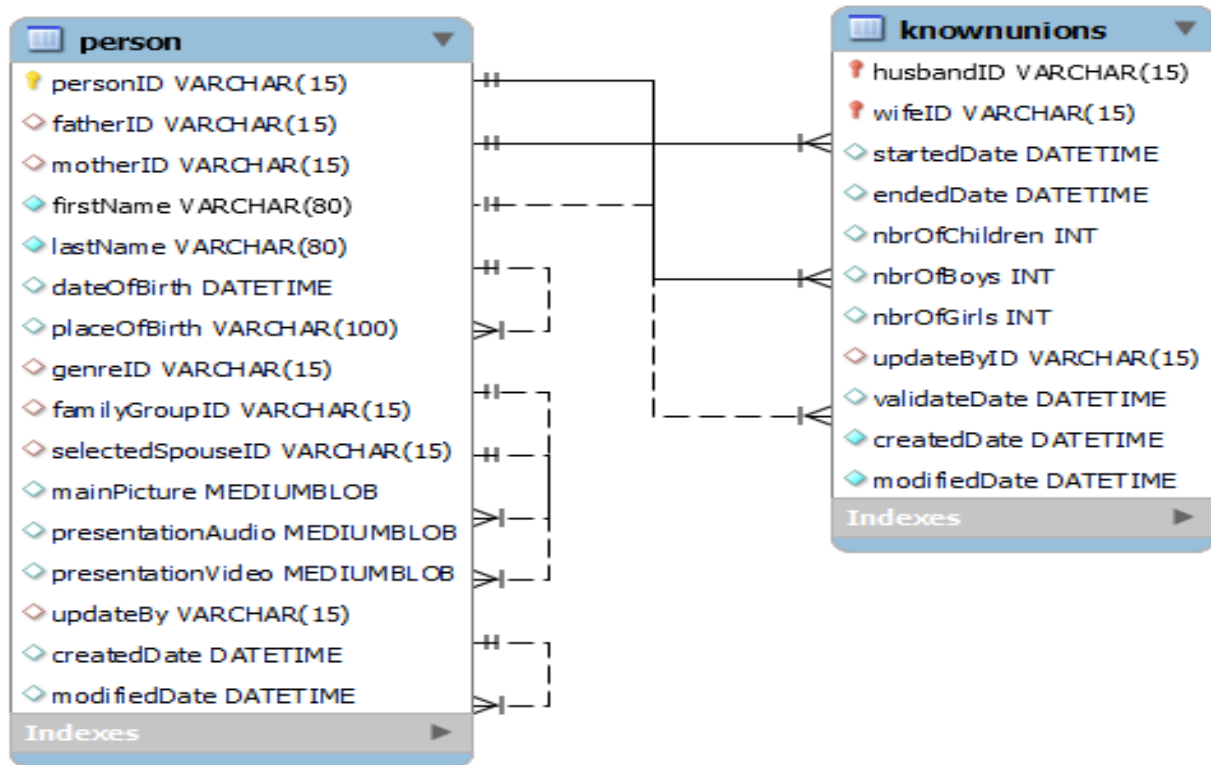


Figure 5: Known Unions Data Model

End of Life Data Model

The known unions data model is articulated on two main entities: Person and EndofLife.

The EndofLife entity a Person specialization entity. It records information related to the death of a registered Person. It keeps useful information as testimonial video and details about the end of life of a given person.

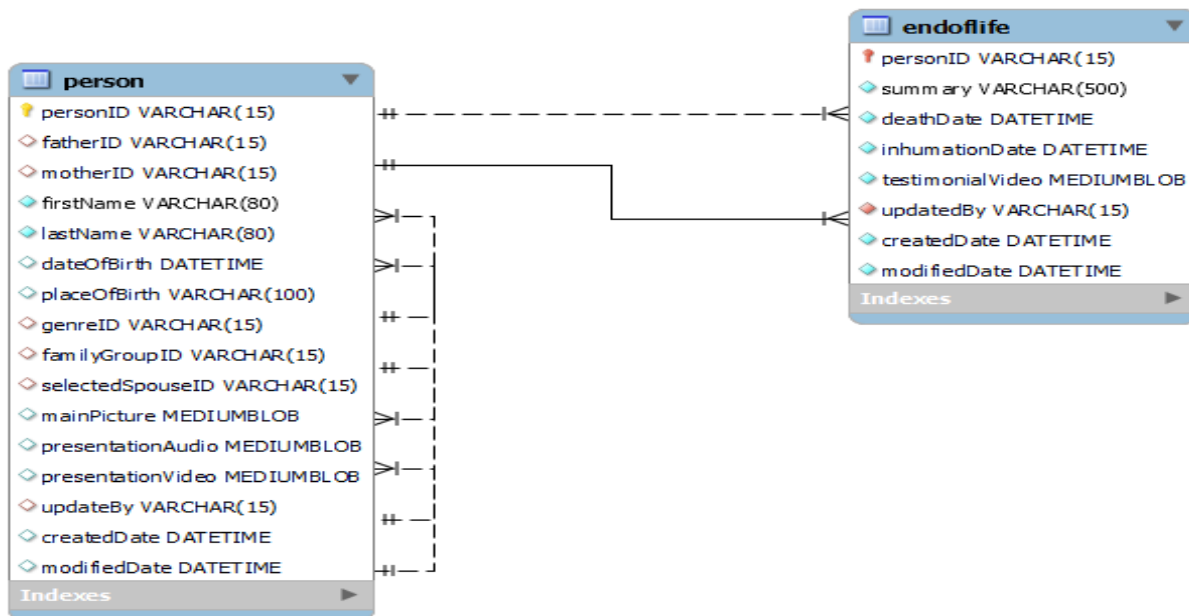


Figure 6: End of Life Data Model

Cultural Data Model

The cultural data model is articulated on five main entities: Person, FamilyTree, FamilyGroup, EthnicGroup and Country.

The Country entity provides the cultural filiation country of registered person. It is bound to the EthnicGroup entity which the highest hierarchical level of the cultural identity for sub-Saharan Africa country. The familyGroup is the finest cultural filiation after the closest core family. The familyTree entity is the closest core family filiation.

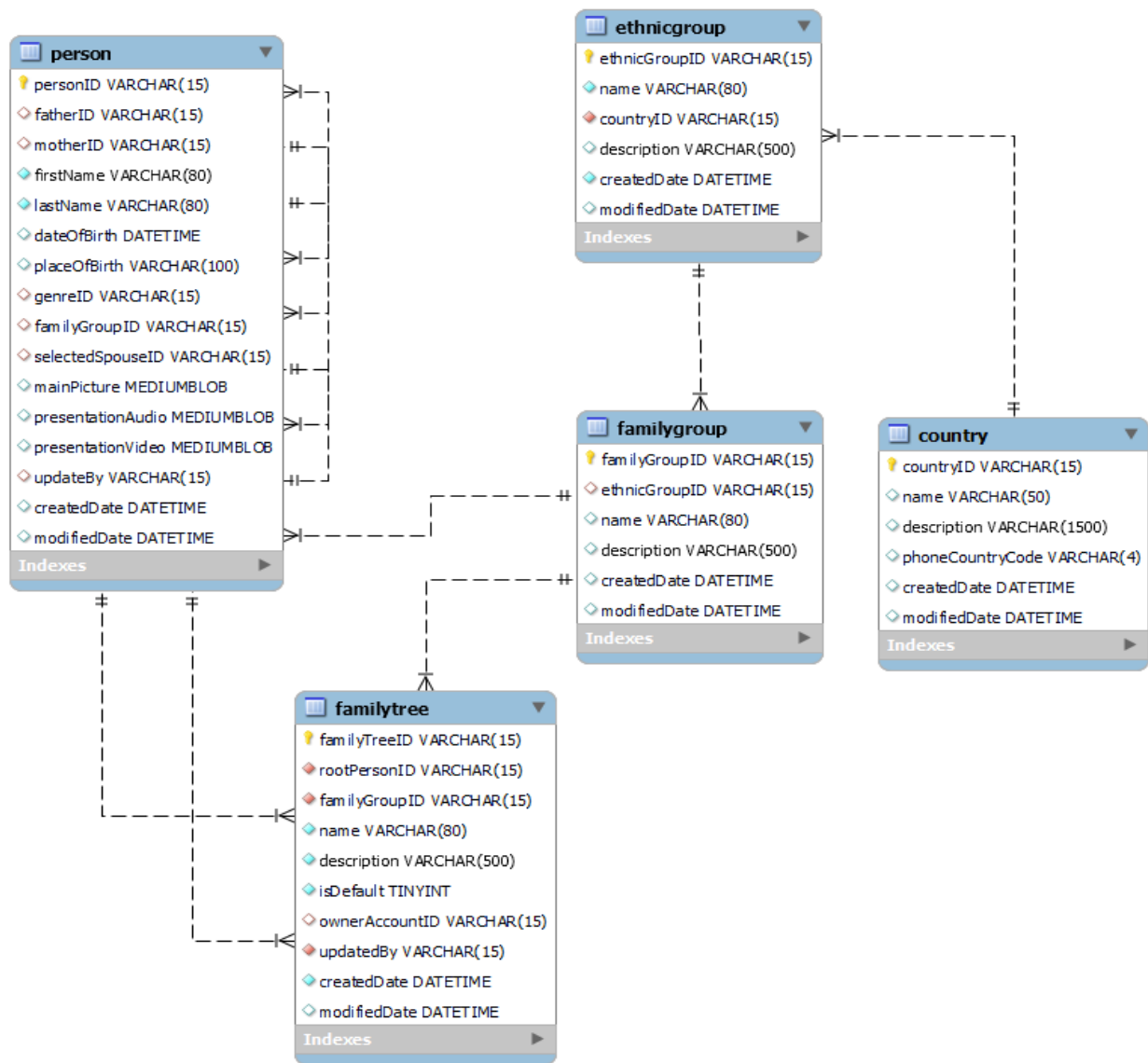


Figure 7: Cultural Data Model

Enrollment Data Model

The enrollment data model is articulated on five main entities: Enrollment, Client; Payment, PaymentMethod and LicenceType.

The Enrollment materializes Client that moves from limited aspects of a free access account to a privileged account. With a successful payment of an enrollment, the client gets access to more services (large number of nodes to create, statistics displayed in the dashboard, a license to use full set of services, modify nodes on other family trees that belong to the same family group or ethnic group).

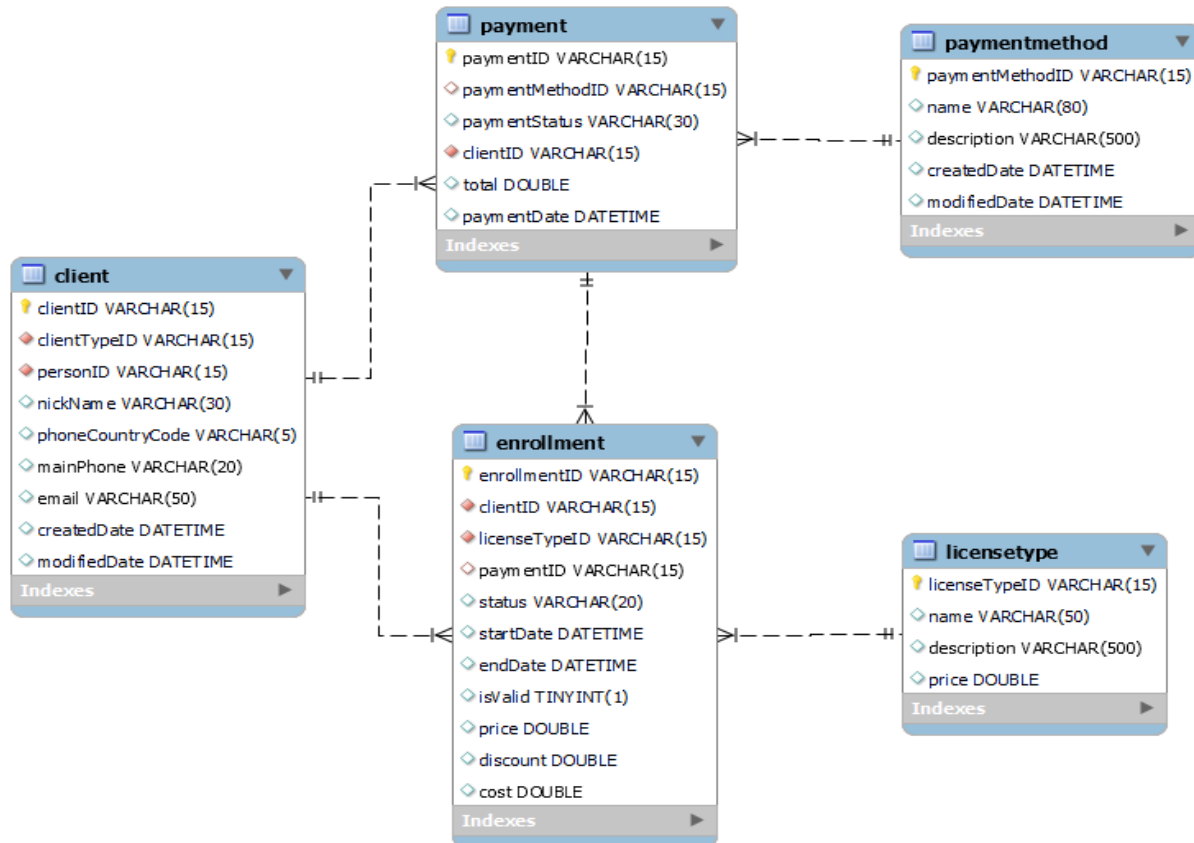


Figure 8: Enrollment Data Model

Transaction Data Model

The transaction data model is articulated on five main entities: Transaction, Client; Payment, MobilePhone and MobileOperator.

The Transaction entity captures any type of financial transaction using mobile payment, credit card payment or manual payment. Client entity contains information of the person that initiates the payment. The payment entity contains payment amount and payment method. The MobilePhone and MobileOperator entities provide the mobile money information on the who or the transaction owner and the mobile network operator.

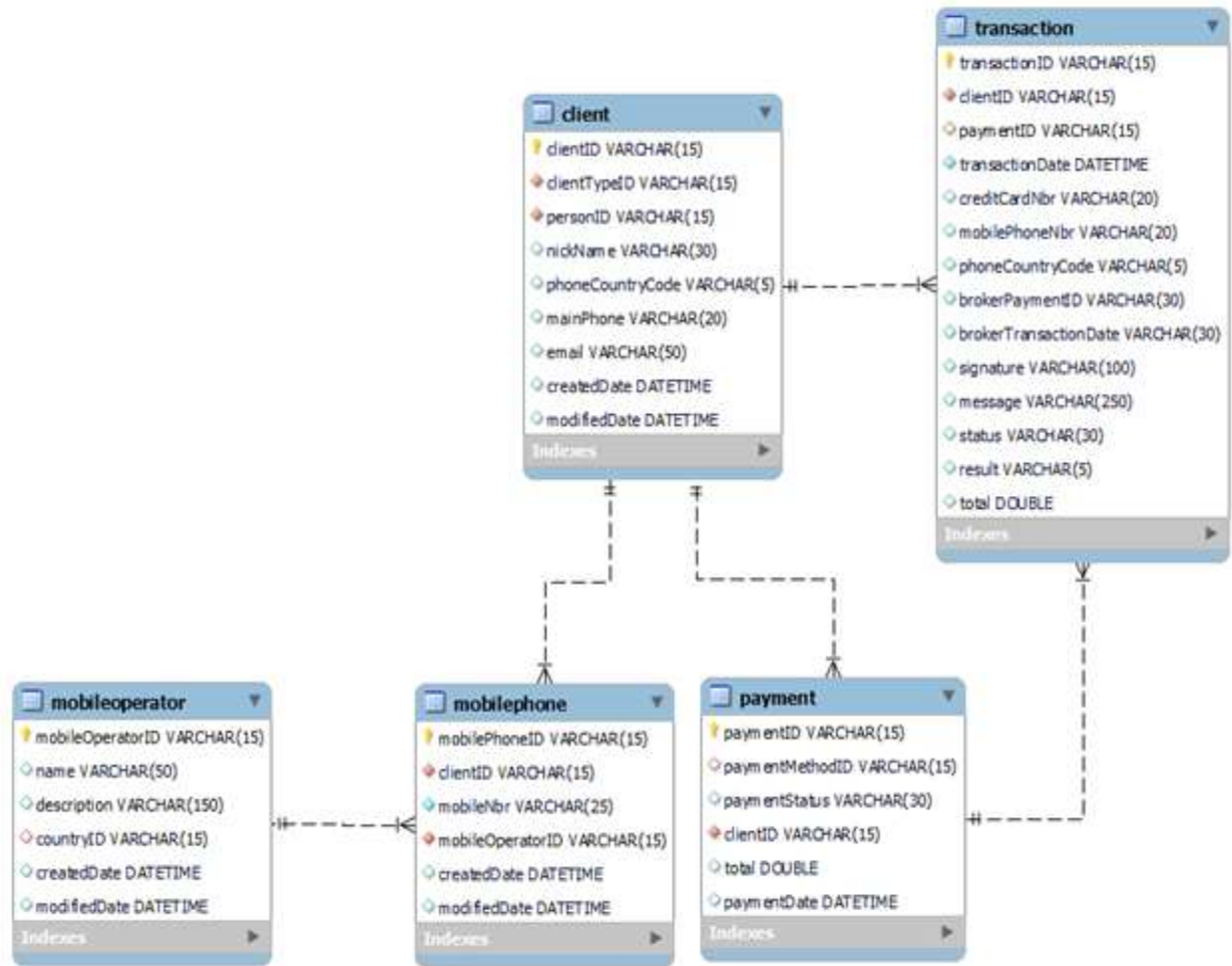


Figure 9: Transaction Data Model

Access Rights Administration Data Model

The access rights administration data model is articulated on seven main entities: FamilyTree, FamilyGroup, EthnicGroup, AdminFamilyTree, AdminFamilyGroup, AdminEthnicGroup and FamilyTreeAccessRights.

The FamilyTree entity contains the genealogy tree information of the root person. The FamilyGroup entity is a group of family trees until a given genealogy level. In some families, the first level of their cultural identification level 10 or more. The EthnicGroup entity is a cultural identification just before a country identification. The ethnic group identification does not have a known genealogy level limit (a possible association is the migration dates in a given country). The FamilyTreeAccessRights entity allows a specific family tree that belongs to given family group FG and to an ethnic group EG to have access rights (edit, read, remove) on family trees that belong to the FG and EG.

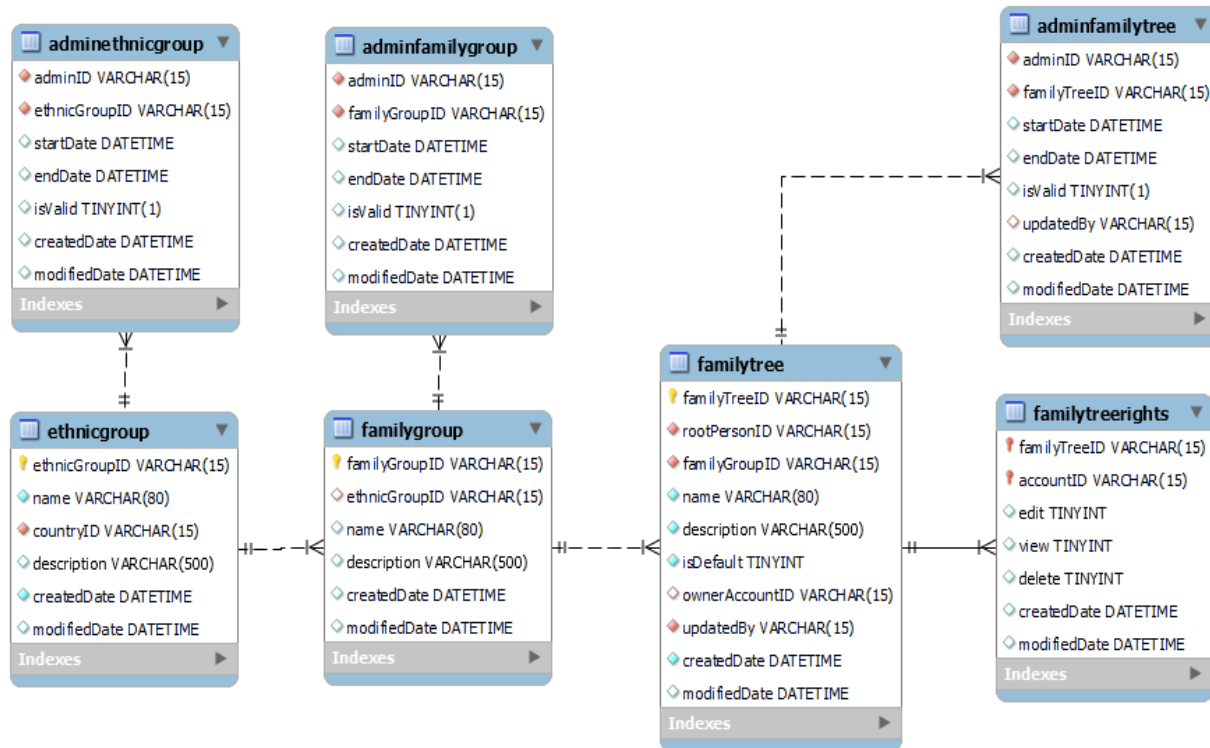


Figure 10: Access Rights Administration Data Model

VIII. NEXT WORKS

The next paper will focus on the CGP implementation and its architecture aspect. The CGP implementation will describe in details how the development has been achieved, show the web page design, and metrics used to conduct the tests and publish obtained results.

The Architecture offers two channels of the presentation layer implementation. In the first option consists to provide the full implementation of web or mobile devices interaction with the genealogy system. The other option consists to use the genealogy system as a middleware system with its published API.

IX. CONCLUSION

In this paper, a cultural genealogy protocol (CGP) has been defined and described. Its main goal is to add and maintain cultural aspects people habits or tradition in the genealogy family trees. In many

countries, the cultural identities are very important for various reasons (similarities, voice, images, videos). Those values must be integrated in a genealogy tree to visualize in a static or dynamic manner their ancestors. Other aspects as the multi-partners have taken in account to follow the biology characteristics of an individual. People or family trees may discover forgotten children or parents by building a clean genealogy with less node redundancy.

The protocol offers to clients a convivial navigation through the genealogy tree visualization. The solution takes in account the exponential nodes growing, and propose the resetting of the root node with an ancestor node (moving forward). The client can reload at any time the original family tree. Another option offered, consists to provide the target ancestor level and the application will return all ancestors that are registered at the given genealogy level.

The paper shows as well the CGP data model with family tree access rights administration. The access

rights service increases the CGP information quality as it allows to generate private social groups that share same cultural goals, the family group and the ethnic group. The groups communication through social network discuss on adding new nodes, finding and correcting the redundant nodes, or updating the node information. The multi-partner data model and cultural data model are also explained.

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