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AL AKHAWAYN UNIVERSITY

School of Science and Engineering

Futures Integration Project: Expanding NtsBourse Database Capabilities for Modern Trading

<NT-SOFT Technology, Casablanca>

Submitted in

<Fall 2024>

by

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Student's name and signature:

Salma Ennouaimi

Expanding NtsBourse Database Capabilities for Modern Trading

Internship Report

Student Statement:

This internship report summarizes my contributions to enhancing the capacity of the NtsBourse database by integrating the Futures trading capability, focusing on the integration of Futures trading functionalities and further improving the performance of the overall system.

Salma Ennouaimi

Approved by the Supervisor

Dr. Violetta-Cavalli Sforza

Acknowledgments

I would like to thank several people and entities for their support throughout my internship. Foremost is Dr. Violetta Cavalli-Sforza, who was very much involved in guiding me during my internship at NT Soft.

I owe a great debt of thanks to my company supervisor, Mr. Hakim Aziz, whose mentorship and expertise in computer science and finance helped me expand my perspective and have left me with some invaluable skills that will undoubtedly benefit me in the future.

To my parents, your unwavering support, encouragement, and belief in my abilities have been my pillar of strength throughout this journey. Your sacrifices and leadership have made me who I am today; I shall always be thankful for your love and support.

Last but not least, I want to thank both Al Akhawayn University and NT Soft, for giving me the opportunity to apply the knowledge coming from my background study in a real-life scenario. It enriched my learning and prepared me for future career challenges.

Abstract in English

This internship report details a few experiences and learnings while working as an intern at NT-SOFT Technology, Casablanca, as part of my studies in Computer Science at Al Akhawayn University. The report covers various aspects of my internship, including the company where I was interning and details about the nature of the internship. My project aimed to develop a database management system for NT-SOFT's Future "Marché à Terme" through the use of Agile project management methodologies. I utilized tools such as SQL Server Management Studio and Draw.io that facilitated the tasks. The report also throws light on the methodologies used, the work done, and the lessons learned both technically and personally. The internship was very useful, with practical experience improving my understanding in respect to working in a professional environment.

Key Words:

Database Management, Agile Project Management, SQL Server Management Studio, Computer Science, Professional Experience, Future contracts

Abstract in French

Ce rapport de stage d'été suit mon expérience et mon apprentissage acquis à la suite de mon stage chez NT Soft Technology à Casablanca, un stage de mise en œuvre pour mon diplôme en informatique à l'Université Al Akhawayn. Le rapport aborde des points tels que l'origine de l'entreprise, la description de mon stage et le projet sur lequel j'ai travaillé. Ma mission était de concevoir un système de gestion de base de données pour le futur marché à terme de NT-SOFT à l'aide des pratiques de gestion de projet agile. Pour effectuer cela, j'ai utilisé des outils qui comprenaient SQL Server Management Studio et Draw.io. Le rapport explique les méthodologies utilisées, le travail terminé, ainsi que l'apprentissage technique et personnel. Cet aspect pratique m'a apporté de lnamebreuses expériences, et j'ai pu en apprendre davantage sur la pratique du travail en tant que professionnel.

Mots Clés :

NT-SOFT Technology, Stage, Gestion de base de données, Gestion de projet Agile, SQL Server Management Studio, Expérience professionnelle, Marché à Term

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1. Introduction

My internship at NtSoft was a defining period of my academic career and helped me to convert theorotical knowledge into skills that can be applied in a dynamic and progressive workplace. At a leading company in financial services, NtSoft, I was actively involved in the integration of a new feature, the Futures contract, into the existing NtsBourse system. A project very critical to enhancing the platform's capabilities. In that position, my ultimate responsibility entailed designing, implementing and optimizing database structures for efficient management, with a particular emphasis on a wide array of financial instruments.

Throughout this internship, I deepened my expertise in SQL and database management, solving real challenges that required analytical, and problem-solving skills using SQL and database management. Working together with experienced professionals, I have been able to secure valuable insights into best practices in the realm of financial technology, particularly in the process of exposure to risk management or regulatory compliance issues. This experience not only helped to firm up my technical skill set but also contributed to personal and professional growth in no small measure, ensuring that all other barriers could easily be overcome in an ever-changing environment of financial services

2. Internship Background

I am majoring in Computer Science with a specialization in Big Data Analytics, but I have not yet taken the courses specific to my specialization. To gain relevant experience, I decided to work on a Database Management project during my internship at NT Soft since it is the closest field to my studies. This internship provided a practical application of my academic learnings and offered a hands-on approach on how to work in a professional environment. Also, the environment of the internship was very helpful since every employee in the company was willing to offer help.

2.1. The Company

NT Soft, one of the leading IT services companies in Morocco, focuses on developing adapted solutions for the stock exchange, insurance, and pharmaceutical industries. Having more than 25 years in these sectors, in 2023, it has become the solution provider for law firms as well. NT Soft is committed to providing made-to-measure IT solutions that simplify the daily operations of its clients.

The company has established a strong reputation through its expertise, mastery of IT techniques, commitment to quality, and keeping promises, earning the trust of more than 300 across Morocco and Africa. NT Soft is a proactive, reliable, and responsive company instilled with values that guarantee their solutions are always on the cutting edge, sound, and sturdy.

NT Soft has built a strong portfolio of satisfied clients and successful projects over its 25-year history. Some of their references include Sanlam, CDG Capital, Capital Trust, BOA Capital, Attijari Intermediation, Atlas Capital group, Allianz, BMCI, etc.

2.2. The Nature of the Internship

The internship that I had the opportunity to undertake was project-based; hence, providing a hands-on and immersive experience. It stretched for two months during summer, requiring a full-time commitment for 8 hours a day, 5 days of the week.

Since it was project-based, specific goals and tasks were given to me rather than routine, day-to-day operations. As a result, the internship allowed me to be part of a meaningful project related to the company's objectives. Which came with its own set of challenges and learning opportunities that empowered me to apply the theoretical knowledge into the practical scenario. During this period, I had the opportunity to participate in different phases of the project development process—planning, implementation, and review.

3. Problem Statement

Due to the increasing demand for efficient processes in financial instruments, such as Futures, Nt-Soft felt the need for empowerment in its NtsBourse software with the addition of a certain module dedicated to handling Futures contracts. The inability of the present system to support contracts for Futures resulted in cost inefficiency in dealing with sophisticated financial processes such as order executions, transaction management, calculation of margins, and settlement operations. This gap did present various risks such as possibilities of errors, delays, and even failing to meet regulatory standards, which could affect the reliability and competitiveness of the platform at large.

Another reason why the system could not scale appropriately and respond to the evolving market demand was that there were no automated workflows for Futures. A robust solution, therefore, had to be applied in the management of financial derivatives efficiently, where positions are correctly monitored, risks are appropriately tracked, and transactions processed in time.

4. Project Specifications

The objective of this project was to integrate Futures contract into the NtsBourse system, which aims at increasing the capacity of this platform to handle a wide range of financial instruments. It is essential for enriching the functions of the system to make the latter a more versatile and attractive solution for brokerage firms. Major tasks included the following:

- **Analyzing the existing database schema:** Identifying areas of enhancement are needed to efficiently process the Futures contracts so that the system updates the position correctly and reports on related risks.
- **Design and implement new database tables and entities:** Creating the database structure that will store information about Futures and key functionality such as collateral and margin management and tracking the hedging of positions.
- **Design and implementation of CRUD optimization:** Creating stored procedures for Create, Read, Update, and Delete to manage the lifecycle of contracts of Futures. Consequently, the procedures were designed to manage orders, transactions, margins, and settlements to allow smooth exchange with Clearing Members and Direct Clients.
- **Update the NtsBourse application interface:** Modifying the interface to accommodate the management of orders with type Futures intuitively easy for the end-user to view detailed information or insert new orders or produce reports for timely information exchange.

- **Ensuring compliance with business rules:** Enforcing constraints on values, functional dependencies, and data integrity to ensure that business rules successfully comply, including proper risk management practices flowing out of monitoring open positions and correctly managing margins and collateral for each contract.

Upon completion of these, the system would be able to handle Futures contracts and become an efficient and reliable tool for brokerage firms to manage and hedge risks by realizing compliance with business rules and regulatory requirements.

5. Steeple Analysis

A STEEPLE analysis was conducted to understand the wider implications of integrating the Futures with the NtsBourse;

- **Social:** It will allow users to manage their contracts about futures effectively and thereby increasing their productivity with a minimal margin of error, which would improve user experience.
- **Technological**: To make the software better, advanced database administration techniques like normalization, functional dependencies, and stored procedures were required in combination with delphi, which is an interactive and efficient programming environment for speedy and easy creation of applications.
- **Economic:** The efficiency of the system will reduce times of transactions, cutting down operational costs for Nt-Soft.
- **Environmental:** The project has utilized the infrastructure pertaining to hardware and software already available, thus it has not used any extra resources. Hence, it is also viable ecologically.
- **Political:** Integration of futures must comply with financial regulations and standards set by governing bodies to avoid legal implications.
- **Legal:** The project performs regulatory functions needed for financial transactions to keep the business safe from potential litigation or fines.
- **Ethical:** Through the design, the client information is stored in a place where privacy laws and ethical standards are maintained over the management of that data.

6. Internship Plan

In this section, we will explore the "Future" project, focusing on its database. We will outline the project objectives and describe the agile project management methodology employed. Additionally, the tools and technologies used will be discussed, such as SQL Server Management Studio and Draw.io. This section will also cover the analysis, design, implementation, and testing phases of the project, and summarize the time allocated to each task throughout the internship.

6.1. Project Background

The project on which I was working on during my internship was called "Future." Most of my work was on the database side. A *future contract* is a commitment negotiated between two parties to buy or sell a predefined amount of an underlying asset at a pre-specified date and price. These contracts are derivative products whose price depends on the evolution of the cash prices of the underlying asset.

These, therefore, are important contracts to manage risks against future price changes in the indices. By locking a price for some future transaction today, investors in the futures market can protect their positions against unwanted price movements and exploit market gain opportunities.

For a better understanding of the project, it is crucial to understand the following concepts first:

- Stock-Index Futures contracts: A contract where the underlying asset is an index.
- Margin: Consists of the initial margin (Initial Margin) and the variation margin (Variation Margin).
- Trading Member (banks or brokerage firms): A legal entity authorized to trade financial futures instruments.
- Clearing Member (banks): A legal entity authorized to clear financial futures instruments.
- Management firm (SGMAT): The firm managing the futures market.
- Clearing House (CCP): The firm responsible for clearing on the financial futures market.

6.2. Project Objectives

The primary objective of integrating futures Contracts into NtsBourse is to expand the platform's capabilities, allowing brokerage firms to manage a broader range of financial instruments. This integration aims to enhance the system's functionality, making it a more versatile and attractive solution for clients.

To ensure solid risk management practices, our project will focus on the following key objectives:

- Recording of positions
- Monitoring of open positions and associated risks
- Management of collateral and margins
- Exchanges with the clearing member (timelines and exchanged information)
- Exchanges with direct clients
- Hedging of positions
- Reporting such as position tracking reports, margin and collateral reports, individual risk tracking reports, etc.

6.3. Methodology of Work

The work I did during my internship included an agile project management methodology that involved continuous customer engagement. We had to take feedback and modify the direction of our project accordingly. It ensured timely and relevant responses throughout the project's life cycle by maintaining close contact with the needs and expectations of the customers.

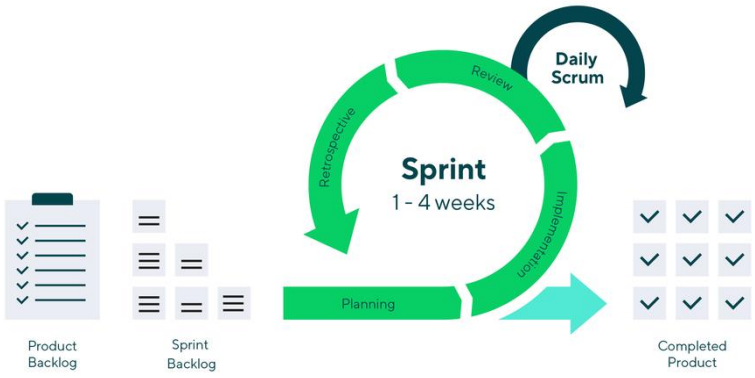


Figure 1: Agile Project Management Methodology Cycle

As it is shown in figure 1, the agile methodology consists of several key components:

Product Backlog: We maintained a comprehensive list of all desired tasks and features, prioritized based on their importance and impact.

Sprint Backlog For each sprint, we selected a subset of items from the product backlog, focusing on the most critical tasks to be completed within the sprint timeframe.

Sprint: Our project followed a time-boxed sprint cycle of 2 weeks, which included several phases:

- Planning: At the start of each sprint, the team gathered to decide on the specific tasks to be accomplished.
- Daily Scrum: Every day, we held a brief meeting to discuss our progress, address any obstacles, and plan our tasks for the day.
- Implementation: During this phase, we executed the tasks as planned, working collaboratively to achieve the sprint goals.
- Review: At the end of each sprint, we conducted a review session where the team demonstrated the completed work.
- Retrospective: Finally, we held a retrospective meeting to discuss what went well and identify areas for improvement.

Completed Product: At the end of each sprint, we delivered a completed product increment, which was then reviewed and potentially improved in subsequent sprints.

6.4. Tools and Technologies Used

Throughout this project, I relied heavily on SQL Server Management Studio 20 (SSMS). SSMS is a comprehensive tool provided by Microsoft for managing SQL Server databases. It offers a graphical interface for database administrators and developers to manage databases, configure security, perform backups, and write and execute SQL queries.

To draw diagrams, I used Draw.io which is a web-based diagramming tool that allows users to create, edit, and share a wide variety of diagrams, such as flowcharts, network diagrams, UML diagrams, and more.

Additionally, I used Delphi in the development for enhancing the user interface of the ntsBourse application. Delphi is a very interactive and efficient programming environment for speedy and easy creation of applications.

6.5. Work Performed

6.5.1. Analysis

NT Soft has an already existing system 'NtsBourse'. It is a comprehensive front-to-back management system tailored for brokerage firms. It automates the entire order and transaction management process from order entry to trade confirmation in real-time. This includes instantaneous updates for market events and real-time impact on order book actions such as issuance, modification, cancellation, and execution.

Figure 2: NtsBourse Software

The goal of this project is to incorporate futures into the NtsBourse Database. The initialization of any project naturally follows the study of an existing system. Currently, NtsBourse supports trading only some values such as actions and obligations. The process in NtsBourse goes as follow: the clients place buy or sell orders through their brokerage firms, specifying the stock symbol, quantity of the order, type of order-i.e., market or limit, and price through their brokerage firms. These orders are fed to the NtsBourse system using a certain order management interface. Thereafter, it inspects the order for validity on various parameters such as available funds, stock availability, and conformation against the rules of trading. Validated orders are then transmitted to the relevant stock exchange for execution. The system reports market events and order status in real time, updating clients on changes. At execution, the system sends trade confirmations, invokes settlement processes, and updates client portfolios to reflect this. The whole end-to-end process assists in accurate and timely transactions within the security trading ecosystem of NtsBourse.

Future trading integration will introduce a new set of added processes to the existing system, NtsBourse. Each client will be required to open a separate futures trading account, CMAT, which the trading member will be responsible for maintaining the details related to the balance and transaction history. Each client will send requests to open positions in the future market by placing orders with their brokerage firms, which need to be processed over NtsBourse. This system shall manage the initial margin requirements, fees, and calculation of risk by sending orders for execution through an Order Management System. Each executed order will result in a transaction, causing the opening of a position account that is associated with collateral, coverage, and settlement accounts. The system should communicate daily value updates, including communications with the clients of their position, margins, and variations. This will also be used for the settlement of fees, transferring of funds through the FIX protocol together with the Post Trade Gateway, always showing proper status of transactions. This will, therefore, enhance the integration to add value to NtsBourse by allowing it to support futures trading while still maintaining the efficiency and reliability of the existing system.

To integrate the futures market in the NtsBourse system, a comprehensive analysis of the existing and new database tables had to be performed. Adding the futures market did not change the table Values, which keeps tracking the current values as before. The *ValuesType* table is extended, however, with a new attribute, Future, indicating whether a certain value refers to the corresponding futures; it can take values 'Y' and 'N'.

The following are the new tables that are to be introduced: *UnderlyingAsset*, *Indexes*, and *IndexesHist*. The *UnderlyingAsset* table is of utmost importance in maintaining underlying assets and will provide a structured path to connect those assets with their respective future contract. The Indices table is priceless in terms of maintaining different market indices and always having updated correct information available for trading decisions.

6.5.2. Design

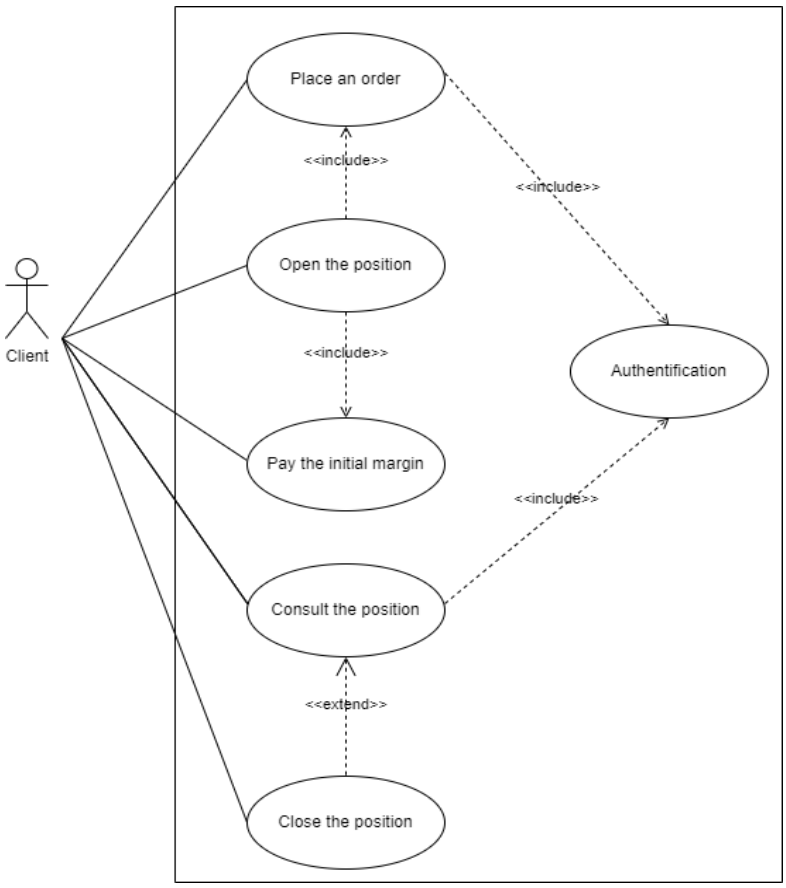


Figure 3: Use Case Diagram

This use case diagram contains the relations between the user (client) and the NTsBourse system. The main interactions include placing an order, opening a position, paying the initial margin, consulting the position, and closing the position. These interactions represent the principal actions that a customer can take within the system. Further, the authentication is shown as a necessary action, which means that secure and authorized access should be present at different stages of the procedure so that only authenticated clients can perform these critical actions.

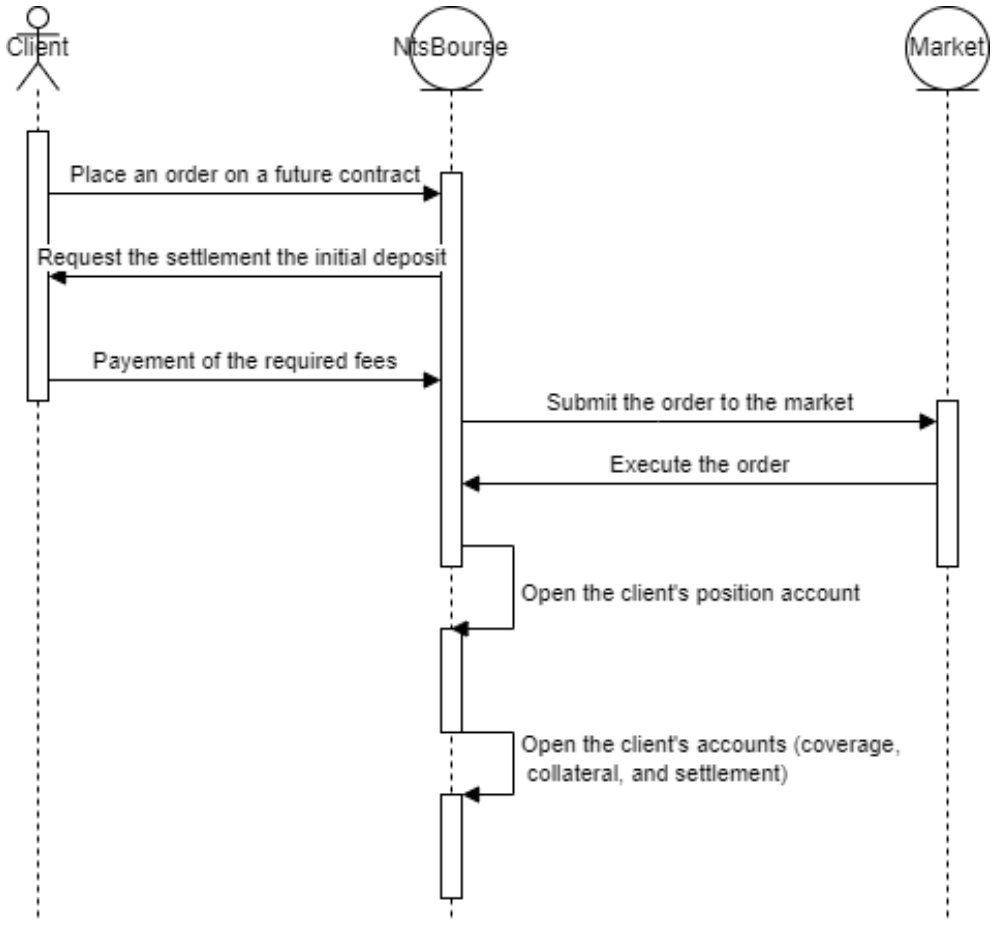


Figure 4: Sequence Diagram for Opening a Position

This is a sequence diagram explaining the step-by-step process flow between the client, the NTsBourse system, and the market. It starts with the client making an order on a future Contract. NTsBourse requests the initial deposit to be settled, whereupon the client pays the fees necessary. The system sends the order to the market, which carries out the order. On successful processing, the NTsBourse system opens the client's position account and then creates the associated accounts for the cover, collateral, and settlement. This transactional flow in the

following diagram shows the succession of operations that should occur to open a position within the NTsBourse system.

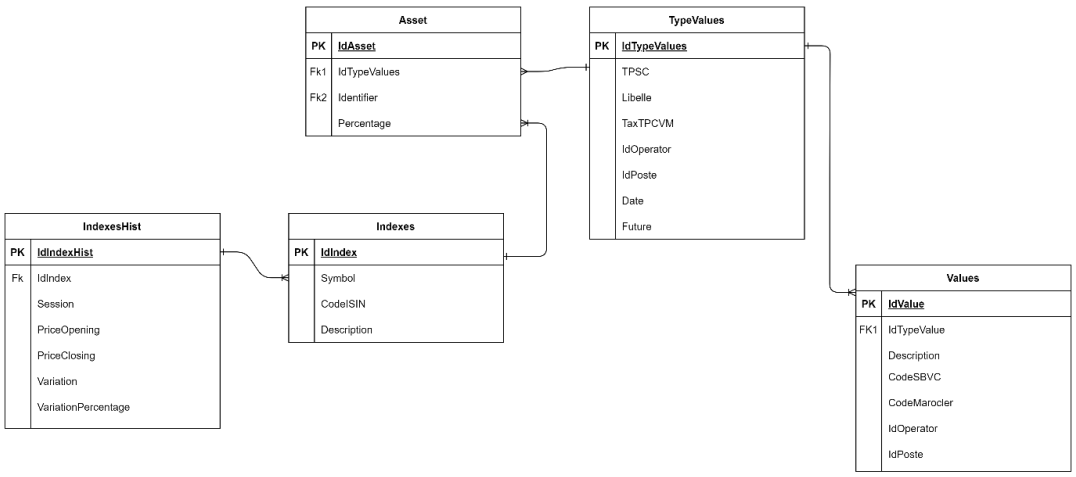


Figure 5: Initial physical model

6.6. Static Analysis

The aim of static analysis is to present the data and their elementary properties as well as the different functional dependencies and the set of constraints, namely value constraints, multiplicity constraints and contextual constraints.

The approach followed was to carefully analyze the topic of the project using the documents provided by the client, take notes, and ask questions to my company supervisor to obtain a coherent result in the end and ensure that all specifications would be met. In the absence of clarity, the group jointly decided the best decision to make.

6.6.1. Identification of properties

To identify the different properties of the project, it was first necessary to extract information from the clients' specifications. We thus obtained the following set of data:

Futures Contract: A futures contract is a commitment negotiated between two parties to buy or sell a specific quantity of an underlying asset on a predetermined date and price. For this, I extracted all the attributes that identify a Contract:

{*IdContract, IdAssest, IdCotation,, ContractType, Quantity, ExpDate, InitialPrice, CurrentPrice, Position, Statuss*}

Underlying Asset: An underlying asset is an asset or a financial instrument on which a derivative contract, such as a futures contract, is based on and whose value influences that of the derivative. The attributes related to this term are the following:

{*IdAsset, IdTypeValues, Identifier, Percentage*}

After the execution of an order, we get a transaction. Which is an exchange or financial transaction between two parties that involves a transfer of value, goods or services. The associated attributes for order and transaction respectively are:

{IdOrder, AccountId, IdContract, DateOrder, Quantity, Status, Sens, Price}

{IdTransaction, AccountId, IdContract, DateTransaction, Sens, Status, Quantity, price}

All the transactions are then stored in the transaction history with the following attributes:

{IdHistTrans, IdTransaction, DateHist, DescriptionHist}

A trading member can either have a client account for its clients or a House account for themselves, to make investments and open positions. Therefore, we conclude that there are two types of account each one with their respective attributes:

{AccountId, AccountType, Solde}

{IdClient, AccountId, Lname, Fname, Adress, Email}

{IdHouse, AccountId, DepartementName, InfoContact}

A stock exchange listing is the current price at which a futures contract is offered or traded in the market. Its corresponding attributes are:

{IdCotation, TypeCotation, PasCotation}

There are two types of margins in the Future market (Initial Margin, Variation Margin). Therefore, the attributes associated with the term Margin are:

{IdMargin, IdContract, InitialMargin, VariationMargin, DateMargin}

6.6.2. Functional dependencies

After carefully analyzing the given information and extracting all the important attributes. The next step is to identify the functional dependencies between these attributes. This can be used to optimize database design and will help us create a more efficient and reliable data structure.

A functional dependency is a relationship between two sets of attributes within a database. Specifically, an attribute or a set of attributes uniquely determines another attribute or set of attributes. Let's take the case of Actif_SousJacent. Since IdAsset is unique, knowing the IdAsset allows us to uniquely determine the corresponding asset symbol, label, and threshold values. This leads us to the following functional dependency:

IdAsset → IdTypeValues, Identifier, Percentage

And doing the same thing with all attributes, I extracted the following attributes:

- IdContract → IdAsset, IdCotation, ContractType, Quantity, ExpDate, InitialPrice, CurrentPrice, Position, Status
- IdAsset → IdTypeValues, Identifier, Percentage
- IdTransaction → AccountId, IdContract, DateTransaction, Sens, Status, Quantity, price
- IdOrder → AccountId, IdContract, DateOrder, Quantity, Status, Sens, Price
- AccountId → AccountType, Solde
- IdClient → Lname, Fname, Adress, Email
- IdHouse → DepartementName, InfoContact
- IdSettlement → IdTransaction, SettlementDate, SettlementAmount
- IdHistTrans → IdTransaction, DateHist, DescriptionHist
- IdCotation → TypeCotation, PasCotation
- IdHistContract → IdContract, DateHist, DescriptionHist
- IdTax → DescriptionTax, Amount
- IdCommission → DescriptionCom, Amount
- IdMargin → IdContract, InitialMargin, VariationMargin, DateMargin
- IdDetTransaction → IdTransaction, Details
- IdDetOrder → IdOrder, Details

- IdSession → SessName, Timing

6.6.3. Value constraints

Another important step is to identify the value constraints for the attributes. In fact, some attributes have specific value limitations defined in the specifications, which must be respected during database implementation. These are the value constraints that we collected:

- For IdContract : Quantity > 0, InitialPrice > 0, CurrentPrice > 0, Status ∈ {BUY, SELL}
- For IdAsset: Quantity > 0
- For IdTransaction : Quantity > 0, price > 0
- For Contract: Quantity > 0, price > 0, Status ∈ {BUY, SELL}
- For AccountId: Solde > 0, Ext(IdClient) ∪ Ext(IdHouse) ⊆ Ext(AccountId)
- For IdTax: Amount > 0
- For IdCommission: Amount > 0

6.6.4. Entity-relationship diagram

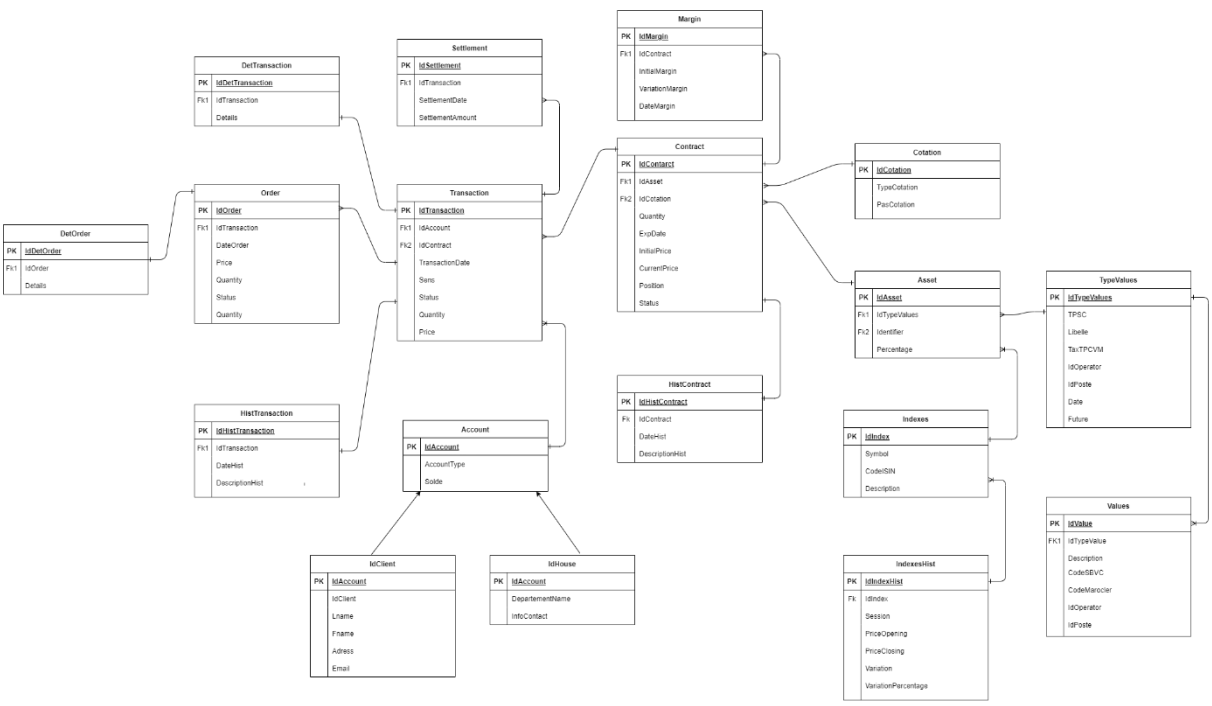


Figure 6: Entity-relationship diagram

6.6.5. Conversion to relational

6.6.5.1. Simple entities

Simple entities are the entities that are not dependent on other entities for their identity. These are the simple entities in our database scheme:

- **Asset** (**IdAsset**, IdTypeValues, Identifier, Percentage)
- **Account** (**IdAccount**, AccountType, Solde)
- **Cotation** (**IdCotation**, TypeCotation, PasCotation)
- **Tax** (**IdTax**, DescriptionTax, Amount)
- **Commission** (**IdCommission**, DescriptionCom, Amount)

- **SessionTrading (IdSession,** SessName, Schedule)

6.6.5.2. Dependent entities

Dependent entities can not exist on their own and that are dependent on other entities for their identity. These are the dependent entities in our database scheme:

- **Contract** (**IdContract**, IdAssest, IdCotation, TypeContract, Quantity, ExpDate, InitialPrice, CurrentPrice, Position, Status)
- **Transaction** (**IdTransaction**, IdAccount, IdContract, DateTransaction, Sens, status, Quantitiy, price)
- **Order** (**IdOrder**, IdAccount, IdContract, DateOrder, Quantity, status, Sens, price)
- **HistTransaction** (**IdHistTrans**, IdTransaction, DateHist, DescriptionHist)
- **WaitingOrders** (**IdOrdersWaiting**, IdOrder, Date)
- **HistContract** (**IdHistContract**, IdContract, DateHist, DescriptionHist)
- **Margin** (**IdMargin**, IdContract, InitialMargin, VariationMargin, DateMargin)
- **DetTransaction** (**IdDetTransaction**, IdTransaction, Details)
- **DetOrder** (**IdDetOrder**, IdOrder, Details)

6.6.5.2. Subtypes of entities

Subtypes are entities that inherit attributes and relationships from a more general entity. These are the subtypes entities in our database scheme, they inherit from the Account entity:

- **AccountClient** (**IdClient**, IdAccount, Fname, Lname, Adress, Email)
- **AccountHouse** (**IdHouse,** IdAccount, DepartementName, InfoContact)

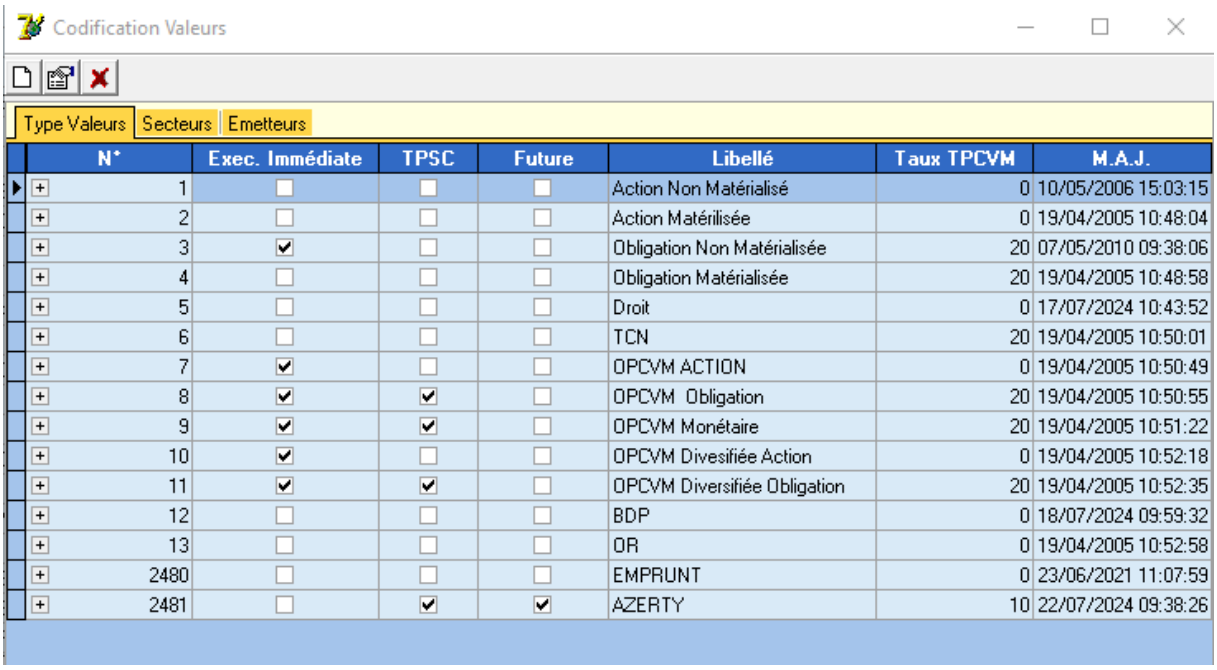
6.6.6. Implementation

The integration of the physical model of the futures contract in NtsBourse will include the following steps:

The new tables need to first be integrated into the system, which means they must be imported into the existing database schema for predefined tables regarding the contracts of Futures.

After the creation of tables, CRUD (Create, Read, Update, Delete) stored procedures will be created. The stored procedure allows one to perform the respective operation on data of the futures contract. In this case, the Create operation will involve inserting new records into the Futures table, Read-retrieve the data of the futures contracts based on certain criteria, Update - modify the existing records, and Delete- remove the records from the table.

The next step consists of updating the NtsBourse application in Delphi for handling Futures. First, the modifications will focus on the interface by adding new parts to include the management of the Futures contracts. The application should receive input from forms or dialog boxes and provide visualization regarding the details of the futures contracts. In the design, Delphi components used are TEdit, TButton, and TGrid. Besides that, it uses the call to CRUD stored procedures with the objective of performing actions upon the data of the futures contract.



N°	Exec. Immédiate	TPSC	Future	Libellé	Taux TPCVM	M.A.J.
1	☐	☐	☐	Action Non Matérialisé	0	10/05/2006 15:03:15
2	☐	☐	☐	Action Matérilisée	0	19/04/2005 10:48:04
3	☑	☐	☐	Obligation Non Matérialisée	20	07/05/2010 09:38:06
4	☐	☐	☐	Obligation Matérialisée	20	19/04/2005 10:48:58
5	☐	☐	☐	Droit	0	17/07/2024 10:43:52
6	☐	☐	☐	TCN	20	19/04/2005 10:50:01
7	☑	☐	☐	OPCVM ACTION	0	19/04/2005 10:50:49
8	☑	☑	☐	OPCVM Obligation	20	19/04/2005 10:50:55
9	☑	☑	☐	OPCVM Monétaire	20	19/04/2005 10:51:22
10	☑	☐	☐	OPCVM Divesifiée Action	0	19/04/2005 10:52:18
11	☑	☑	☐	OPCVM Diversifiée Obligation	20	19/04/2005 10:52:35
12	☐	☐	☐	BDP	0	18/07/2024 09:59:32
13	☐	☐	☐	OR	0	19/04/2005 10:52:58
2480	☐	☐	☐	EMPRUNT	0	23/06/2021 11:07:59
2481	☐	☑	☑	AZERTY	10	22/07/2024 09:38:26

Figure 7: NtsBourse Software Interface: Inclusion of Futures into ValuesType

Figure 6 is a screenshot of the NtsBourse software user interface where various financial instruments are encoded. The table as shown in the interface is a list of different types of values with their attributes. Each of these rows represents a different type of financial instrument, distinguished by its number (N°). The following table demonstrates a looking "Future" column-in this, the futures contracts are integrated with the NtsBourse software. It lets users differentially mark which type of financial instrument each one is and then deal with them appropriately.

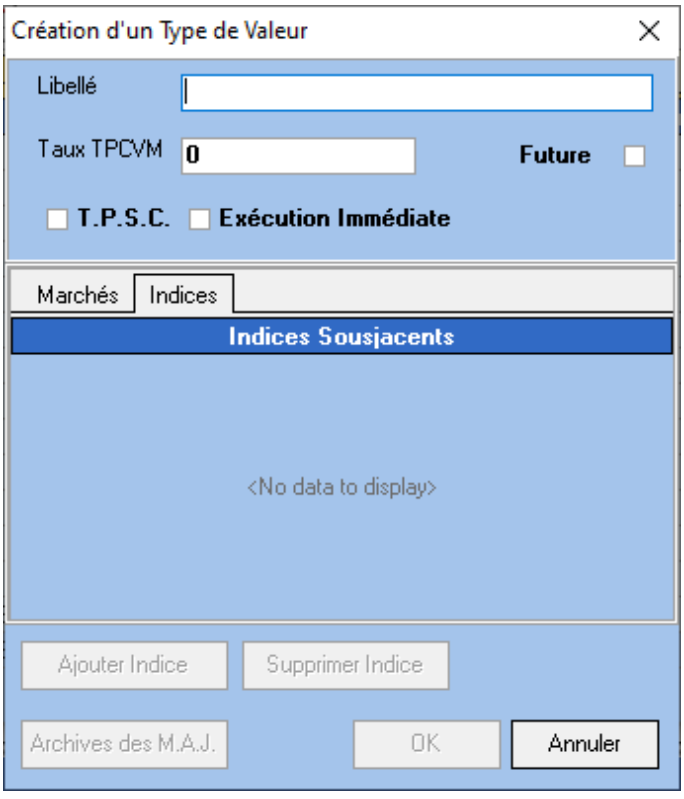


Figure 8: Insert, Modify, and Delete Indexes

6.7. Time Spent in Each Task

During my internship, I allocated time to various tasks to ensure a thorough understanding and effective execution of the project. The structured timeline helped me manage my responsibilities efficiently and develop the necessary skills progressively.

I began with a one-week period focused on practicing the basics of SQL. using Microsoft SQL Server Management Studio. This involved creating databases, functions, triggers, and stored procedures, as well as determining primary keys and foreign keys before inserting data into tables. This initial phase was designed by my company supervisor aimed to test my competencies before starting on the main project.

After that, I spent 5 days studying the system that already existed at NtsBourse. That was quite useful to understand what its functionalities and limitations are, which was important for integrating the Futures contracts.

Next, I spent the following 3 weeks in analysis and design. I read the documentation provided about the project in three days. During this step, I developed diagrams and an initial physical model; identified entities, attributes, and relationships. It was a very important precept in the understanding of the needs for this project.

The last portion of my internship was dedicated to the database implementation. It involved applying knowledge and skills learnt within the first weeks to effectively design and manage the database for the said project.

Figure 9: Task Schedule Chart

7. Simulations, Results, and Interpretation

7.1. Achievements

Throughout the project, various achievements were recorded, more so on the analysis performed on the integration of Futures contract into the NtsBourse system.

- **In-depth Analysis of Already Existing Systems:** Conducted an in-depth analysis of the present scheme of the database and the workflow being followed by NtsBourse and identified points to be modified. This will form the base for further development.
- **Value Constraints and Functional Dependencies:** Several functional dependencies and value constraints have been identified, which ensure accuracy and integrity. These findings are very important for database design optimization and will support the reliability of future operations that concern Futures.
- **Recommendations for Database Improvements:** Provided comprehensive recommendation for new tables and database entities needed to manage Futures contracts. Recommendation also contained some useful insights on how inclusions of this sort will ease operation and refine the whole system's functionality.
- **Future Integrations:** My analytical work has produced a list of results and documentation that the company can easily use for any future integration of the Futures features. This sets the basis necessary to start future development phases with clarity and direction.

7.2. The Effects on the Company

The results of my analysis have significant implications for the company:

- **Smarter Operational Efficiency:** The insights gained from the analysis is done to automate a lot of processes and hence reduce manual errors in handling the Futures contracts. This, in turn, will result in smoother operations within the NtsBourse system.
- **Strategic Regulatory Compliance:** The documented analysis outlines how the integration aligns with relevant financial regulations and shall position the company to meet compliance challenges head-on.
- **Informed Decision-Making:** The comprehensive results will give the management all the details required to formulate strategic decisions on just how the company needs to incorporate the Futures contracts. The informed approach provides the possibility of effective response to market demands that the company has.
- **Future Development Pathway:** The result of my analysis forms the basis on which future improvements to be made on the NtsBourse system. The company is thus better positioned to make future integrations, ensuring that the platform remains competitive and responsive to emerging market needs.

8. Learning Strategies

8.1. Technical Concepts

In my internship, I furthered my knowledge in several important technical areas, including:

- **Database Design and SQL:** I started designing and optimizing various database structures on my own. I focused on developing functional dependencies that would keep the data intact, which included correct CRUD operations. These indeed allowed me to understand relational database management better and how important it is to retrieve and manage data efficiently.
- **Financial Systems:** I gained a deep insight of the futures Contract and its management within financial systems. The experience has helped me not only in understanding more of the available financial instruments but also provided me with insights about how the financial markets work. I explored in great detail future trading and all its intricacies with regard to margin necessities and management of risk, further enabling me to evaluate market dynamics.
- **User-Friendly Interface:** Even though Delphi was not my main priority, I learned much about the principles of user interface design. In financial applications, I learned how crucial usability is in enhancing user experience. By understanding the significance of intuitive design, I could appreciate how effective user interfaces contribute to operational efficiency cum user satisfaction.

8.2. Personal Learnings

My internship, along with strengthening my technical skills, has been a turning point for significant personal growth in several key areas of my life:

- **Analytical Problem-Solving**: I refined my ability to solve complex problems through structured analysis and iterative design. This approach has involved refinement of my problem-solving analytical skilss. Further, such an approach has enhanced my decision-making capabilities by endowing me to break down

undesirably complex issues into manageable parts to take on a more systematic and effective mindset toward problem-solving.

- **Time Management:** I developed and implemented suitable strategies for tasks' prioritizing, as well as managing my time efficiently. Surely this enabled me to deliver the projects on time with the same deadline and making sure that my productivity was at a higher level. I learned to balance demands against each other and allocate my time wisely, which will be of invaluable in my future life.
- **Teamwork and Communication:** My interaction with supervisors and team members significantly helped me to develop the requisite teamwork and communication skills that are vital in every form of professional life. From the collaborative experience, I realized that diverse minds always help in reaching project goals as well as the essence of open dialogue and constructive feedback. I also learned how to effectively share ideas, listening to people, and adapting my communication style to suit various opinions, which impacts positively on the group dynamic.

Conclusion in English

My internship with NT-SOFT Technology proved has been really valuable, as it significantly enhanced my academic knowledge by adding a realistic, professional aspect to it. Being involved in the futures contract database gave me a great opportunity to connect theory with real-life practice by applying what I learned in class to real-world problems. This experience helped me to develop proficiency in SQL, database design, and project management, and also gave insight into how complex it is to manage financial instruments.

My project supervisors, Dr. Violetta Cavalli-Sforza and Mr. Hakim Aziz have been vital in my growth; I have been supported and guided throughout these precious two months. Their mentorship helped me to develop not only technical competencies but also a sense of confidence and professionalism that will stay with me in all future pursuits.

The experience has really let me understand the entire financial technology landscape and how important it is in today's economy. I also feel very privileged to have been given the opportunity to work on a meaningful project with some real-world implications. The learned lessons and attained skills during this internship will surely affect my future career path by enabling me to navigate the challenges of the industry with competence and assurance.

Conclusion in French

Mon stage chez NT-SOFT Technology a été une expérience enrichissante qui a beaucoup contribué à mes études académiques et m'a également offert une première expérience professionnelle utile. Le travail que j'ai fait sur le projet de gestion de base de données pour l'avenir du « Marché à Terme » m'a donné l'occasion de mettre la théorie en pratique en améliorant mes compétences en SQL, en conception de bases de données et en gestion de projet. Je suis très reconnaissant envers le Dr Violetta Cavalli-Sforza et M. Hakim Aziz pour tout ce que j'ai appris d'eux ; leur soutien et leur mentorat m'ont beaucoup aidé. Ce stage a amélioré mes compétences techniques, mais il m'a aussi doté de la confiance nécessaire pour travailler dans un environnement professionnel. Je remercie les opportunités et tout ce que j'ai appris ; cela me servira sûrement dans ma carrière.

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