## 1.1 background

For more than a century, telecommunication around the world followed a traditional model, a national monopoly owned or controlled by country, centrally managed and providing a common public network, by their very nature and classic way, these networks provide a small numbers of standards and nationwide services carefully planned, methodologically executed, and universally distributed. This was exactly the case of modern telecommunication sector, in Sudan, where Sudatel, a state company, dominated the market for more than ten years through a lease term monopoly agreement. However, by the end of Sudatel's monopoly agreement several telecommunication companies entered the market. There appeared the need to regulate the relationships between the different operators, regulate the business and protect the customers' rights.[1]

Interconnection is defined by the International Telecommunication Union (ITU) as "commercial and technical arrangement under that service providers connect their equipment, network and service to enable customers to have access to the customer's services and networks of the other service providers", that means subscribers connect to other through different networks . [2]

From year, 2004, the government liberalized the telecommunication market and immediately two more companies (Bashartel and Canartel, MTN and Sudatel (Sudani)) will become operational. Under such competitive market situation, the absence of an Interconnection agreement will lead to more problems and conflicts between these companies. There is a real need for powerful Interconnection agreements between the companies. The NTC role is to oblige and supervise the companies put in force such agreements.

Seen the multiple and complex situation caused by the absence of an Interconnection agreement and in case of any conflict between the two companies, it is not at all clear how they are going to address it. Usually it is the role of the National Telecommunication Corporation (NTC) to device Mechanisms and rules that govern the inter-relationship between the telecommunication operators. These rules and mechanisms suffer from lack of enough monitored evidences which can be used as witness during the judgment of conflicts[1]

The aim liberalization of the telecom sector in context is to ensure that service is provided to greater number of people at low, affordable costs. Effective competition is the most appropriate way of achieving these goals. Therefore the new entrants should not be unreasonably hampered through a lack of network infrastructure of their own. Hence, care must be taken to ensure that interconnection charges encourage efficiency, effective competition, and improvements in product and service quality. In summary, interconnection charges should be at a level commensurate with the true economic cost of providing the service, including an adequate return on investment. A carrier owns an essential facility if the others cannot duplicate with reasonable costs such an infrastructure. In telecommunications and energy networks, the access to subscribers is such a facility. In particular, the local loop in telecommunications and the distribution network for are bottlenecks through which competitors have to pass. The joint use of an infrastructure by competing operators thus raises the issue of access conditions. A limited access at high prices may curb the development of competition and new services.

The most traditional form of Interconnection has been the Parallel or cooperative Interconnection .In that arrangement, dominant carriers link up with carriers similarly dominant in other regions. Their relation is that of partners and 2-way corresponding, they jointly extend network externalities to their customers and often raise their prices in a joint maximization strategy.

The Telecommunication market is expanding rapidly in Sudan. New operators are entering the market. This implies the new interconnection technology that we proposed IP interconnection and transfer to NGN networks.

## 1.2. Problem Statement

Since the term interconnection deals with commercial and technical arrangement, interconnection charges should encourage efficiency, effective competition, and improvements in product and service quality.

In Sudan the current system of interconnection (which is based on TDM )facing so many problems that operators involve on it. The most challenges are related to the technical problems , such as lack of Synchronization , efficient signaling , adaptive routing , and traffic forecasting. In addition n to the existence of congestion during the peak hours.

Also the current interconnection mechanism does not support flexible network protection and safety, agreement for all services, and others commercial issues such as charging, billing and pricing.

## 1.3. Objectives

The objectives of this research are:

- To study and select an optimum technical interconnection in Sudanese telecommunications networks which recover most of the weaknesses and challenges in current technical interconnection.
- To investigate the impact of Mobile Number Portability (MNP) to Economic cost of telecommunications companies.
- To ensure infrastructure sharing in telecommunication part.

The overall objectives of the study are to provide a theoretical, practical and operational plan of an optimum interconnection technology as well as the encourage to use MNP in the Sudanese telecommunication networks.

**1.4. Approach**

In order to realise the above objective the study followed the standard research methodology of: literature review; data and information collection; and analysis and interpretation of the results. Operational data was taken from Sudatel traffic measurement system. Additional data was collected different departments of Sudatel and Zain, particularly the existing interconnection design.

A spreadsheet data processing devised for handling and analysing the traffic data in order to identify the technical problem that affects the success of interconnect services.

This research relates to the Interconnection Planning Process and the need to contribute to finding solutions to the technical and engineering high operational efficiency bear large capacities of telephone traffic Interconnection provide more consistent and realistic assessments of costs associated with list of projects, to insure more timely completion of project studies within the list, and to achieve greater transparency into the Interconnection Process. Difficulties in these areas, are due to issues that faces the Regulators in working within the existing rules which is tied to the existing interconnections technology. The close relationship between the interconnection rules and technologies leads to delay in technology transfer.

This study aims to complete transfer of Technology of interconnection between telecommunications companies in Sudan to the next generation network and uses of Internet protocol in interconnection, also the impact of the telecommunications companies from the application transformation project number Mobile Number Portability (MNP) from one of the telecommunications companies to the other in terms of economic cost.

## 1.5. Thesis Layout

The output of relevant literature review is presented in chapter two. In particular, information on technical interconnection agreements is summarised, Chapter three presents the migration interconnection to internet protocol technique. It includes the weakness of TDM interconnection and proposed interconnection features, The impact of Mobile Number Portability is present in chapter four. The economic impacts of Infrastructures sharing and co-allocation presented in chapter4 also.
the conclusion and references is present in chapter five.

## 1.6 Research Scope:

The scope of this work is limited to study the interconnection from an operator point of view, also it focuses on comparison between the existing system and proposed system of interconnection technically and working according to the ITU recommendations. Study also the impact of Mobile Number Portability (MNP), to economic cost of telecommunications operators.
The IP Interconnection Working Party was established to consider industry Standards for IP Interconnection; it revised its project scope to concentrate on producing technical standard and completing an industry technical trial.