Creating a GIS data model for IT infrastructure management - A pilot project at the Potchefstroom campus of the North-West University.

C.B. Bester

20232144

Dissertation submitted in fulfilment of the requirements for the degree *Master of Science* at the Potchefstroom campus of the North-West University

Supervisor: **Mr. T.C. de Klerk**

November 2011

Abstract

The need for the implementation of a spatial information management system in the telecommunication sector has been the focus point of numerous studies (Halfawy *et al.,* 2002; Meehan, 2007; Turkstra *et al.,* 2003; Barbu & Cumblidge, 2002; Cai, 2002; French & Jia, 2007). Telecommunications infrastructure, including computer networks, can create complex networks, which has to be managed and maintained. A spatial information management tool is needed to store the spatial and non-spatial information at a central point, while accurately displaying the data visually. Due to the fact that a large quantity of a computer network's infrastructure is located indoors, it is essential for the information management tool to represent the network elements indoors as well as outdoors.

A Geographical Information System (GIS) offers numerous benefits such as a central storage environment for all the spatial and non-spatial data, data validation measures, analysis options as well as accurate visual representation of the spatial data. The aim of this study is to determine to what extent GIS software can be implemented in order to manage, analyze and visually illustrate an IT-network between buildings as well as inside of buildings on a campus. In order to achieve this aim, the study will present a pilot data model representing the computer network for a part of the Potchefstroom campus of the North West University.

The data model will be able to perform various analysis methods on the feature attributes, as well as the network. In order to accurately display the infrastructure inside a building on multiple levels, the spatial features will be viewed in a three-dimensional environment. The study concludes by describing to what extent a GIS implementation can be applied for a computer network in terms of its data storage and management abilities; its visual representation capabilities and analysis potential.

Opsomming

Die vraag na die implementering van ‘n ruimtelike informasie bestuurs sisteem in die telekommunikasie sektor is die fokus punt van verskeie studies (Halfawy *et al.,* 2002; Meehan, 2007; Turkstra *et al.,* 2003; Barbu & Cumblidge, 2002; Cai, 2002; French & Jia, 2007). Telekommunikasie infrastruktuur, insluitend rekenaar netwerke, kan ingewikkelde netwerke to gevolg hê wat noukeurig bestuur en onderhou moet word. ‘n Ruimtelike inligtings bestuurs sisteem is benodig om die ruimtelike- sowel as nie-ruimtelike informasie op ‘n sentrale plek te stoor. Die ruimtelike data moet ook visueël akkuraat voorgestel word. Omdat die meerderheid van ‘n rekenaar lokale netwerk se infrastruktuur binne in geboue voorkom, is dit noodsaaklik dat die informasie bestuurs sisteem die netwerk binnehuis sowel as buite geboue moet kan voorstel.

‘n Geografiese inligtings sisteem (GIS) bied talle voordele insluitend ‘n sentrale storings fasiliteit vir die ruimtelike data en die tabelle. ‘n GIS bied ook data valideerings reëls, data analise en akkurate visuele verteenwoordiging van die informasie. Die doel van die studie is om vas te stel tot watter mate GIS sagteware instaat is om die rekenaar netwerk van ‘n kampus te bestuur, aniliseer en visualiseer, binnehuis sowel as buite geboue. Om die doel van die studie te bereik sal ‘n loods data model ontwikkel word vir ‘n gedeelte van die Potchefstroom kampus van die Noordwes Universiteit.

Die data model sal in staat wees om verskeie analise metodes op die infrastruktuur se eienskappe sowel as die netwerk toe te pas. Die ruimtelike elemente sal in ‘n drie-dimensionele omgewing voorgestel word om die meervoudige vlakke van geboue beter te illustreer. Die studie bereik ‘n konklusie deur die visuele illustrasie-, bestuurs-, storings-, en analiseerings vermoë van ‘n GIS vir ‘n rekenaar netwerk te beskryf.

Acknowledgements

- I would like to thank the Lord for the opportunity to complete this study, as well all the other numerous blessings in my life.
- A huge gratitude goes out to my supervisor, Mr. T.C. de Klerk for his excellent guidance, as well as his skill to detect the slightest mistake or inadequacy. Without him this study would not have been possible.
- The insight offered by Mr. P. Buys from the University's Department of Information and Communication Technology was of utmost importance to the success of the study.
- The data that was provided Mr. L. Venter, as well as the University's Department of Technical Services was paramount to the development of the data model.
- I would like to thank Linda Bester, Thys Bester, Nadine Bester and Adéle van Zyl for their continuing support, love and patience.
- Finally I would like to thank my two friends and colleagues Dawie Maree and Armand du Toit for their insight and assistance.

Index

List of Figures

List of Tables