



UNIVERSITEIT VAN PRETORIA  
UNIVERSITY OF PRETORIA  
YUNIBESITHI YA PRETORIA

---

# An object oriented model for IPv4/IPv5 network management

COS 236 essay submitted by  
GROUP 3

Group members

Armand Pieterse, 12167844  
Kgomotso Sito, 12243273  
Jimmy Peleha, 12230830  
Azhar Mohungoo, 12239799  
Ndivhuwo Nthambeleni, 10001183

AUGUST 18, 2015

# Contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>Problem Area</b>	<b>2</b>
2.1	Centralized Network management . . . . .	2
2.2	IPv4/IPv6 Coexistence . . . . .	2
2.3	Monitoring and Mapping . . . . .	2
<b>3</b>	<b>Solution to IPv4/IPv6 Trasition</b>	<b>3</b>
3.1	Proposed Management Model . . . . .	3
3.1.1	Monitor . . . . .	3
3.1.2	Collector . . . . .	3
3.1.3	OOD (Distributed Object Oriented Database) . . . . .	3
<b>4</b>	<b>Your section name</b>	<b>4</b>
<b>5</b>	<b>Relevance of database systems in COS 326 and business organisations.</b>	<b>5</b>
<b>6</b>	<b>Your section name</b>	<b>6</b>
<b>7</b>	<b>Conclusion</b>	<b>7</b>

# 1 Introduction

In world of rapidly developing technologies a centralized architecture that IPv4 uses is no longer sufficient. Flexibility, reliability and scalability are key to moving forward. A distributed object oriented network management model has been proposed to accommodate the transition from IPv4 to IPv6. The passage outlines the key concepts of such a transition and explores the components that are used to achieve this.

## 2 Problem Area

### 2.1 Centralized Network management

As it currently stands the traditional centralized network management can't meet the need of network management any more. This is because of the rapid development of network technology, which require the network model to be more flexible, scalable and reliable. [2]

### 2.2 IPv4/IPv6 Coexistence

Since the remaining IPv4 address space is very limited, it is necessary for IPv4 and IPv6 to coexist and eventually to be completely replaced by IPv6. This means there is a transitioning phase currently running. The problem with this being that most network carriers have different technologies prepared for this transition. This provides a problem of diversity and complexity.

### 2.3 Monitoring and Mapping

Currently it is critical to monitor resources available, such as disk space, CPU load and how long a web page will take to download. This challenge is meeting this requirement. Object to relational mapping becomes an issue when there are many different types of objects that needs to be mapped, there will need to be a better way of mapping, considering the challenges and complexity of transitioning that lies ahead.

## 3 Solution to IPv4/IPv6 Transition

### 3.1 Proposed Management Model

There is a proposed database management model to cope with the coexistence of IPv4 and IPv6. This entails a distributed object-oriented database and hierarchical network management architecture. It mainly comprises of three particular components, namely, the Monitor, Collector and Distributed Object- Oriented Database. These basically provide an infrastructure for different IPv4/IPv6 configurations and abstracts the dependence on the underlying architecture. Also incorporated into the this management model is the REST architecture and the Perspective Broker protocol. [4]

#### 3.1.1 Monitor

Basically, the Monitor simultaneously listens on IPv4 and IPv6 connections. Therefore facilitating effective management of purely IPv4, IPv6 and dual stacks without any extensive overhead. This is achieved through a number of components that, together, compose the Monitor. These are the modeling module, performance collecting module, SNMP/SSH channel module, events module and user interface. The user interface. The monitor can be found below the Distributed Object-Oriented Database and above the Collector on the proposed hierarchy of components that form the management model. It is therefore effectively a link between the two.

#### 3.1.2 Collector

A collector is a device responsible for collecting a devices network information using SMTP and SSH channels in an IPv4/v6 framework. As the collector is located directly under the monitor from the proposed hierarchy, this implies that the collector is managed by the monitor, only receiving refined configuration information and requests from the monitor through the relay module of the collector. The collector stores performance data in a local relational database RRD (Round Robin Database), and is therefore always available for use on the monitors request. The collector is said to also have the functionality of preventing attacks on a network, it supposedly does this by attracting and trapping degenerate attempts to penetrate the network. [1]

#### 3.1.3 OOD (Distributed Object Oriented Database)

The OOD in this IPv4/v6 topology is used by the monitors to store the devices objects and classes that have been abstracted from the configuration data retrieved from the collectors. The monitors do this by connecting to the OOD servers through OOD clients in each monitor instance. Using OOD clients prevents any local OOD faults from affecting the actual OOD server. The reason for using OOD in this scenario is to simplify relational mapping of the managed devices as well as the sharing thereof.

## 4 Your section name

## **5 Relevance of database systems in COS 326 and business organisations.**

The IPv4/IPv6 network management model makes use of an Object-Oriented Database (OODB) which was taught in this module, COS 326. The concept of an object oriented database, is that it stores objects instead of data. It encapsulates combinations of data structures together with associated functions. Because of this, arbitrary data types can be stored within the "database." The OODB makes use of a management system (OODBMS) that provides data integration, overall control, and DBMS support facilities for all types of objects. Additionally, it emphasises the necessary characteristics to support large, shared, persistent object stores; which include efficient processing over large secondary storage organisations, concurrency control, recovery facilities, and efficient processing of set-oriented requests also known as queries. [3]

## 6 Your section name

## 7 Conclusion

The proposed management model is well-thought and effectively abstracts any potential complexities by using a Distributed Object-Oriented Database approach as opposed to a Centralized approach. This has proven to give the prototype flexible, reliable and scalable in the complex IPv4/IPv6 network environments. This separation of concerns successfully solves the problem of the co-existence of the IPv4 and IPv6 protocols and minimizes the complexity of this consensus.



## References

- [1] F. Baker. Ipv4 and ipv6 greynets. 2010.
- [2] Chenyue Duan. Object-oriented ipv4/ipv6, distributed network management model, 2010. URL: <http://ieeexplore.ieee.org/xpl/articleDetails.jsp?tp=&arnumber=5705087>.
- [3] Frank Manola. Applications of object-oriented database technology in knowledge-based integrated information systems\*, 1989. URL: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.47.5898&rep=rep1&type=pdf>.
- [4] Zhao Qin and Ma Yan. An object-oriented model for ipv4/ipv6 network management. *The Journal of China Universities of Posts and Telecommunications*, 17:89–92, 2010.