

# Management and Control of Bandwidth in Computer Networks

Kanu Richmond U., Kuyoro Shade O., Ogunlere Samson. O., and Adegbenjo Aderonke A.

Babcock University  
Nigeria

**Abstract**—The need for good and reliable data transmission within computer network and internet forms the basis for management and control of bandwidth. Without bandwidth management, an application or user will not be able to control all available bandwidth and prevent other applications or users from using the networks. It will be impossible to differentiate between various network traffics, and it will also be difficult to control which user or application has priority on the network. Applications which require specific quantity and quality of service may not be predicted in terms of available bandwidth, thus making some applications run poorly due to improper bandwidth allocation. This work focus on the development of an application to combat the challenges facing easy flow of data transmission problems in network design as organization network evolves. PHP Script, Apache Server and MySQL are the development tools used.

**Keywords**- *bandwidth management, data transmission, computer networks, apache, network design and application*

## I. INTRODUCTION

Computer network refers to interconnection of two or more computers for the purpose of communication, information exchange and resources sharing. Network users are able to share information, files, printers and other resources; send electronic messages and run programs on other computers via the network. Every network has three layers of components - nodes, network software and hardware. Nodes are computers and similar devices connected on a network. Network software consists of computer programs that establish protocols or rules for computers to communicate with one another. Protocols make logical connections between network applications, direct the movement of packets through the physical network, and minimize the possibility of collisions between packets at the same time. Network hardware is made up of the physical components that connect the computers (nodes) together, including network cables and devices that connect all the cables together.

Bandwidth refers to the amount of information that may be transmitted at any given time along a data line. In general, network bandwidth is a bit rate measure of available or consumed data communication resources expressed in bits/second or its multiples (kilobits/s, megabits/s etc.). Networks are capable of carrying many types of services such as voice, data, images, and video. These services have

different requirements in terms of bandwidth, cell loss, delay, etc. In order to maximize the quality of service offered during the period of stress, as viewed by both the network provider and the customer, the following bandwidth challenges are to be considered:

1. Topology design and bandwidth allocation. It is concerned with the ability to dynamically reconfigure a network in order to efficiently benefit from network resources;
2. Flow control and congestion avoidance. Bandwidth management protocols are used to prevent congestion, essentially by accepting or refusing a new-arrival cell;
3. Bandwidth allocation, the most critical challenge, is concerned with successful integration of link capacities through the different types of services. Given that a virtual path is a logical direct link composed of virtual circuits between any two nodes; and
4. Assignment of bandwidth to each virtual path in the network, in order to optimize performance for all users.

Bandwidth Management involves how bandwidth resources are allocated to critical application on a network. It broadly refer to the optimal determination of flow and/or capacity a given traffic load or demand in network. Without bandwidth management, an application or a user will not be able to control all available bandwidth and prevent other applications or users from using the networks. It will be impossible to differentiate between different types of network traffic, and it will also be difficult to control which users or applications have priority on the network. Applications which require specific quantity and quality of service may not be predicted in terms of available bandwidth, thus making some applications run poorly due to improper bandwidth allocation. Bandwidth management works by sorting outbound network traffic into classes by application and service type.

There is an ever-increasing need for network bandwidth. Companies are growing, adding new offices and remote sites, using technologically advanced and powerful applications, and internet usage has exploded in the last decade. Local area networks (LANs) are in need of bandwidth. How much is required depending on individual company and user, and user's requirement can changed unexpectedly and sporadically. Bandwidth can be expensive, and when LANs begin to slow down because of heavier usage, more bandwidth is often required. Corporate networks using intranets for information sharing and web navigation have an increased

demand for bandwidth, but simply adding one more connection or larger connections does not address the bandwidth issues since availability is not always guaranteed.

This work focuses on the development of an application to combat the challenges facing easy flow of data transmission problems in network design as network evolves. This software helps in bandwidth management and efficient bandwidth allocation, which reduces the traffic congestion on the network and regulate the speed of data transfer, thus increasing the profitability of organization. The remaining sections of this work are arranged as follows: Section 2 describes the system design stage, Section 3 presents the implementation and Section 4 gives the conclusion and recommendations.

## II. SYSTEM DESIGN

The current application is wireless-based thus the evolutionary prototyping which allow for gradual development of a system in an environment where the system requirements may change over time was adopted. The following software development tools were employed: MYSQL, PHP, NOTEPAD++, BROWSER and APACHE.

### A. System Description

The system simulates a simple wireless based intranet network environment. It calculates the size of any file that is to be sent over the network. If the file size exceeds the allotted bandwidth by the administrator, the transfer process is terminated. The system also enables an administrator to change the allowed network bandwidth based on preferences. Clients systems are allowed to share and transfer files as long as they are within the allowed bandwidth range. The Network layout, system architecture and the system flowchart are depicted in Figure 1, 2 and 3 respectively.

### B. Database Design

The database for this application comprises 2 tables which are the bandwidth policy table and the Administrator table. The policy table contains vital information about the admin, while the admin consist of information such as the admin\_id, first name, last name, username and password (Table 1 and 2). The entity relationship model (ERD) is depicted in Figure 4.

## III. IMPLEMENTATION

The various modules are integrated together through as single interface. The modules has been packaged and installed on the testing server, each module has some specific requirements but generally certain minimum specifications that are met. The modules has been packaged and installed on the testing server. This application will consist of the following modules:

### A. Login Module

This module (figure 5) enables a registered administrator to login after the user must have provided correct details. It returns an error message if the admin does not enter the correct username and password.

### B. Update Policy Module

This module (figure 6) enables the administrator to change the allocated bandwidth size. Here, the admin is presented with a form field to enter the size. After entering the size, this module displays a success message. If the administrator enters alphabets in the provided form field, an error message will be returned. If the update button is also clicked without entering any data into the form field, an error message is also returned.

### C. The files directory module

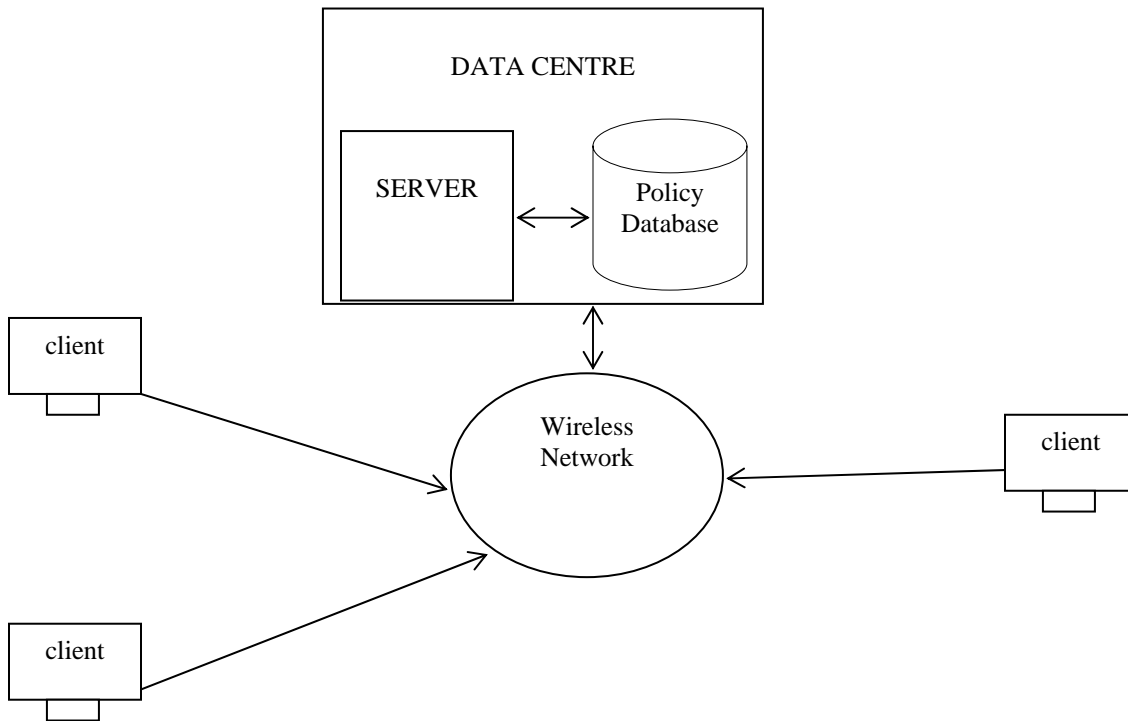
This module (figure 7) shows a list of files on the network available for download. It shows the name of the file and the corresponding size. It also provides a link with which the user can download the file. This is where all users on the network access files to download. All files are loaded in this repository for easy access to users on the network.

### D. Download module

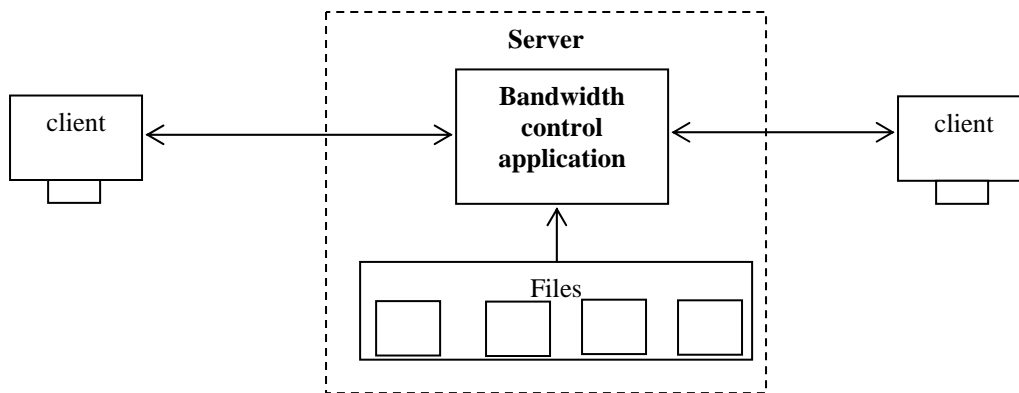
This module requires any third party software for downloading files. Popular ones include Internet download manager, Firefox download manager, download accelerator etc. Depending on the allocated bandwidth, the download manger might download fast or slow. If the allocated bandwidth is high, download is extremely fast and vice versa as depicted in figure 8.

## IV. CONCLUSION AND RECOMMENDATION FOR FURTHER WORK

Nearly all network links are shared by more than one user or application which implies that available bandwidth is shared between all users and all applications. Using bandwidth management to allocate bandwidth to applications or users during peak times can prevent traffic congestion on the network. Temporary network congestions can be improved by using bandwidth management; however if a network is continuously congested, improvement to the link that provide greater capacity is necessary. When bandwidth is bought and controlled, data's and communications are transferred around easily. Networks make it very easy for users that need to send information at a fast pace. This work presents a testable application that combat the challenges facing easy flow of data transmission problems in network design as organization network evolves. Further work improvement on the system is recommended to assist large scale organizations in the management and control of their computer networks bandwidth.



**Figure 1: Network layout of the simulated environment**



**Figure 2: Architecture of the system**

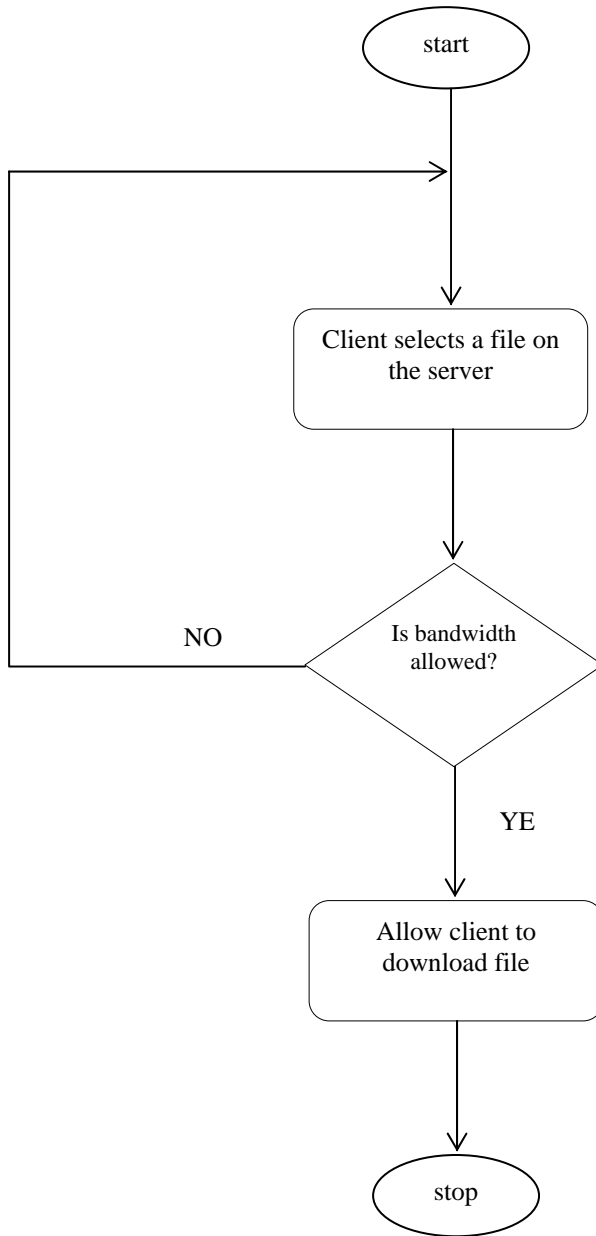


Figure 3 A flowchart of the system

Table 1: The admin table

	Field	Type	Collation	Attributes	Null	Default	Extra
<input type="checkbox"/>	admin_id	mediumint(10)			No		
<input type="checkbox"/>	first_name	varchar(255)	latin1_swedish_ci		No		
<input type="checkbox"/>	last_name	varchar(255)	latin1_swedish_ci		No		
<input type="checkbox"/>	username	varchar(255)	latin1_swedish_ci		No		
<input type="checkbox"/>	password	varchar(255)	latin1_swedish_ci		No		

Table 2 The bandwidth\_policy table

	Field	Type	Collation	Attributes	Null	Default
<input type="checkbox"/>	<b>policy_id</b>	mediumint(10)			No	
<input type="checkbox"/>	<b>policy</b>	varchar(255)	latin1_swedish_ci		No	

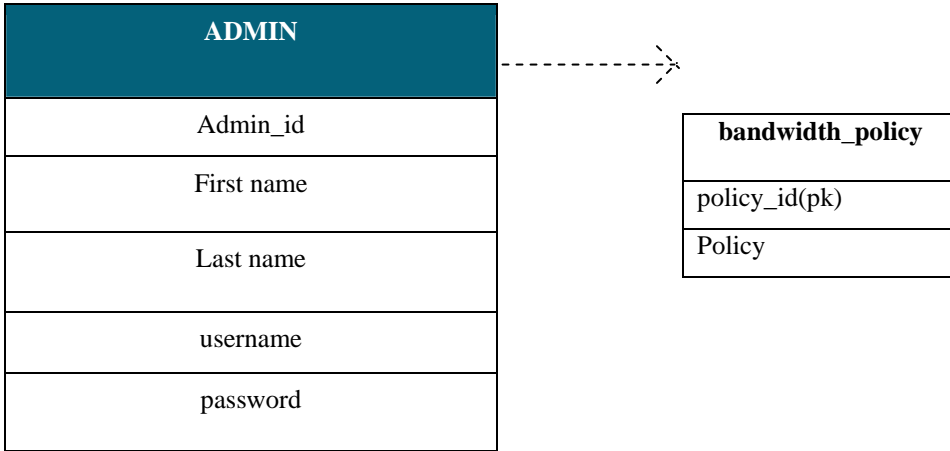


Figure 4 Entity relationship diagram of the system

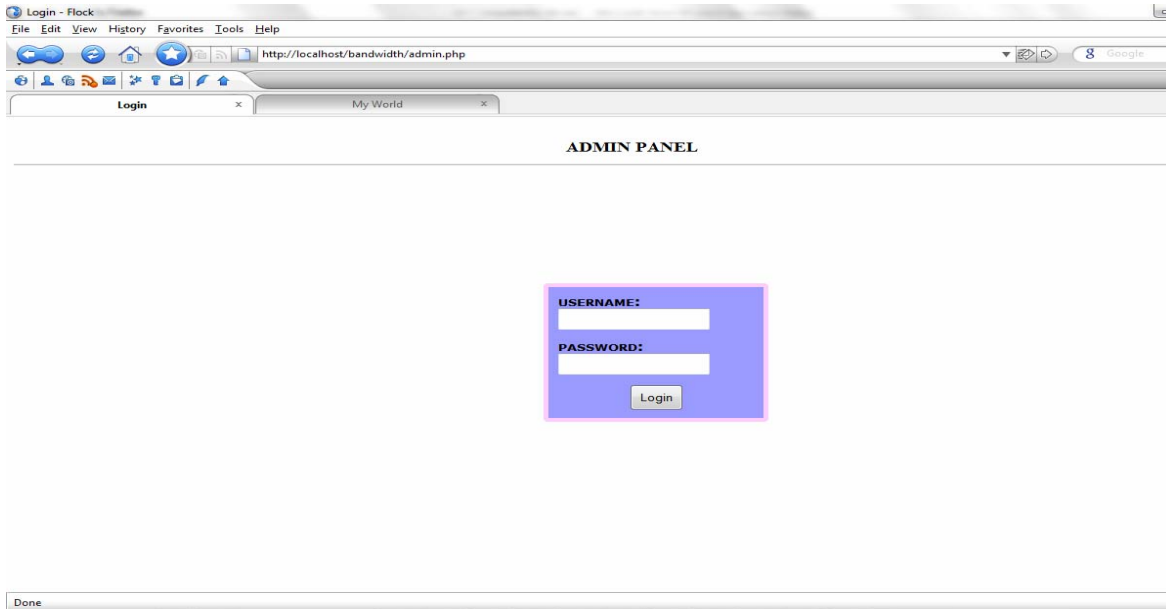
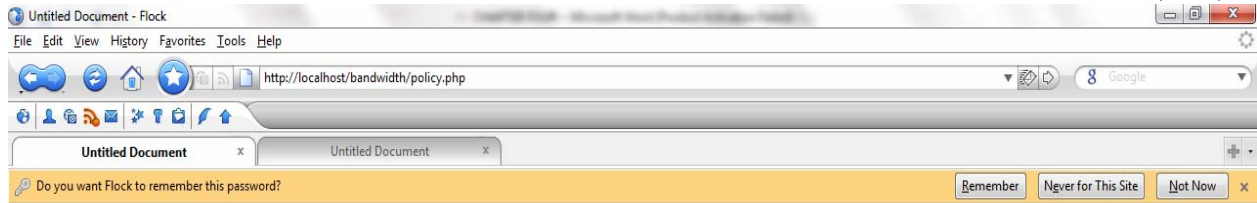


Figure 5 Administrator login module



**UPDATE POLICY**

**ENTER SIZE:**



*Figure 6 Update policy module*



FILENAME	FILESIZE	
▲	8 KB	<a href="#">download</a>
▲▲	4 KB	<a href="#">download</a>
Figurine.m4v	672.03 MB	<a href="#">download</a>
Green Lantern - 2011 - DVDRip - 710MB-sundox-(PURE RG).mkv	709.64 MB	<a href="#">download</a>
Media4down.com_Goss_Gir_s05E02.rmvb	135.87 MB	<a href="#">download</a>
Media4down.com_TVD_s03e08.rmvb	135.03 MB	<a href="#">download</a>
PIRATES OF THE CARR.avi	524.3 MB	<a href="#">download</a>



*Figure 7 Files directory module*

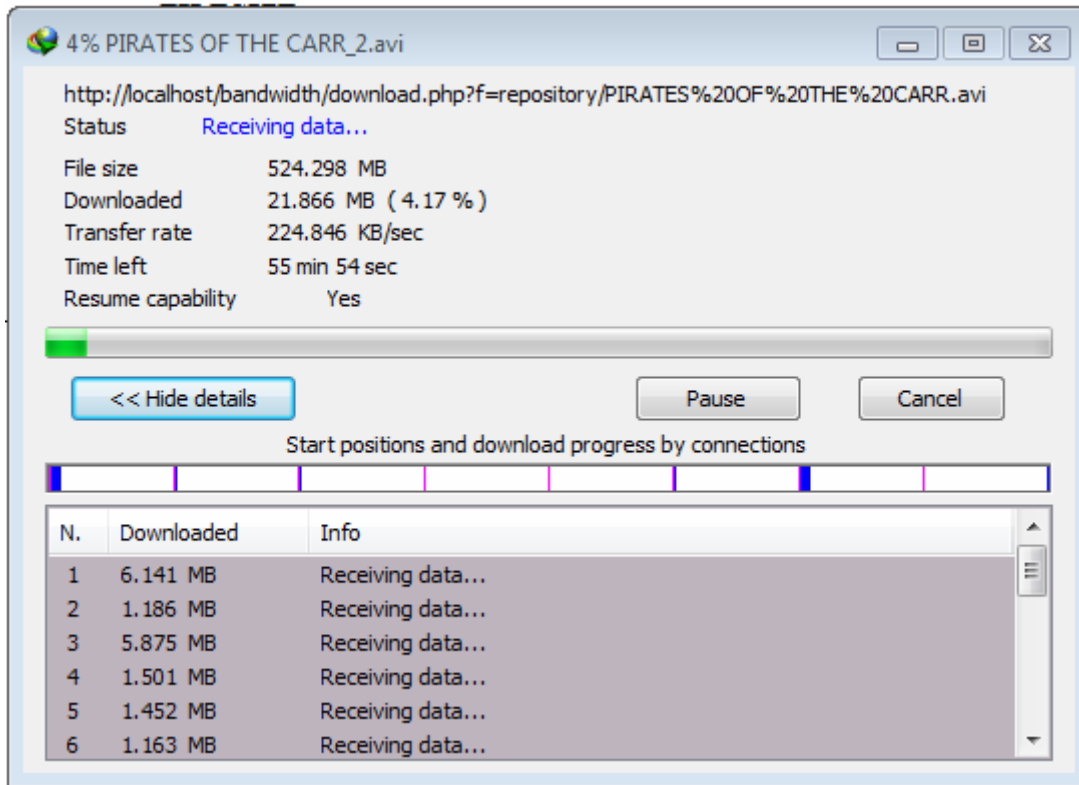


Figure 8 Download module

#### REFERENCES

- [1] Bandwidth overview: benefits of bandwidth management [http://info@3-factor.com/bandwidth/overview\\_benefits.htm](http://info@3-factor.com/bandwidth/overview_benefits.htm)
- [2] Catherine Allen (1992) "Bandwidth control, The Global Journal of Advanced Management Technology, Robin Townsend (London: Global projects Group, 1995). Pp. 193-194 Vol. 2
- [3] Introduction to bandwidth. <http://www.google.com>
- [4] Rodger Jamieson, Greg Stephens and Santosh Kumar (2005), Firewalls and bandwidth management (*IT journal*)
- [5] Douglas Comer (2008), *Computer Networks and Internets*, p. 99 Prentice Hall 2008
- [6] Fred Halsall (1985), *Introduction to Data Communications and Computer Networks*, p. 108, Addison-Wesley.
- [7] Behrouz A. Forouzan, *Data communications and networking*, McGraw-Hill, 2007
- [8] Douglas E. Comer. (1995) *Internetworking with TCP/IP Vol.1: Principles, Protocols, and Architecture*. 4th ed. Upper Saddle River: Prentice Hall.
- [9] Orhan Gemikonakli (2003) "Network Management" <http://www.cs.mdx.ac.uk/staffpages/orhan/csy4061/netman1.htm>
- [10] Tommy K Paul (1994) "Building Network Bandwidth" Network News - The Network Professional Association monthly publication. [http://www.sju.edu/%7Ejhodgson/netw/tp\\_asg4.html](http://www.sju.edu/%7Ejhodgson/netw/tp_asg4.html)
- [11] Bandwidthcontroller.com "Internet sharing guide" <http://bandwidthcontroller.com/internet-sharing.html>
- [12] The Internet Services Company (2002) "Active Bandwidth Management Device" *Networking* <http://www.interchannel.net/product/networking/bandwidth.htm>
- [13] Juniper.net (1999) "Managing Bandwidth from a Large Traffic Source" <http://www.juniper.net/solutions/literature/solutionbriefs/351000.pdf>
- [14] SearchNetworking.com (2001) "Data Transfer Rate" [http://searchnetworking.techtarget.com/sDefinition/0,sid7\\_gci213492,00.html](http://searchnetworking.techtarget.com/sDefinition/0,sid7_gci213492,00.html)
- [15] Cristobal Baray and Kyle Wagner (1999) "Where Do Intelligent Agents Come From?" *ACM Crossroads Student Magazine*. <http://www.acm.org/crossroads/xrds5-4/dumbagents.html>
- [16] BT Exact Technologies (2000) "ISR Agent Research" *Intelligent Agents*. <http://193.113.209.147/projects/agents.htm>