

# **How Does It Work?**

## **The Internet.**

### **Beginning:**

Statistic “Research shows that we now spend 2 minutes, 42 seconds making love and a whopping 22 minutes, 30 seconds at least surfing the internet every day”.

### **Narration-(Introduction)**

The internet is a worldwide phenomenon which is part of our everyday lives now but how does it work and how did it start? This documentary will explain the infrastructure and technology behind what makes the internet work to give a basic understanding.

### **Narration-(How does it work)**

The internet works on the principle of computer networks, cooperating with each other to exchange data using a common software standard and using existing telephone wires and over 250,000km of intercontinental submarine fibre optic cables spanning the globe and many thousands of communication satellites orbiting the globe that the internet uses.

### **Narration-(Internet Addresses)**

Each computer connected to the internet must have a unique address which are in the form of 4 sets of numbers and must be a number from 0 to 225. This is known as an IP Address (Internet Protocol).

Connecting through an ISP (Internet Service Provider e.g. Karoo, Virgin, BT, etc.) you are assigned a temporary IP address while connected.

### **Narration-(Protocol Stacks)**

Computers communicate on the internet via Protocol Stacks and better known as TCP/IP (Transmission Control Protocol Layer/Internet Protocol Layer) which is usually built in to the computer's operating System (e.g. Windows, Unix).

### **Narration-(Packets)**

Data sent over the internet would go through the Protocol Stack Layers and broken down then sent as smaller manageable chunks of data known as packets and made whole when received.

### **Narration-(Networking Infrastructure)**

The data sent over the internet will travel from your computer to your modem and through the phone network to the local ISP modem pool then to the local ISP Port Server and then to an ISP's Back bone. The data will travel through several routers and backbones, dedicated lines and networks until it finds the destination and computer for the data.

## **Narration-(Internet Infrastructure)**

The Internet Backbone is made up of many large networks which interconnect with each other and know as NSPs (Network Service Providers e.g. UUNET, CerfNet). NSPs are required to connect to three NAPs (Network Access Points) NSPs also connect at MAEs (Metropolitan Area Exchanges).

## **Narration-(The Internet Routing Hierarchy)**

A packet arrives at a router and is checked for the IP address put there by the IP protocol layer on the originating computer. The router checks its routing table and if network containing the IP address is found, the packet is sent to that network. If the network containing the IP address is not found, then the router sends the packet usually up to the backbone hierarchy to the next router which hopefully will know where to send the packet. If it does not, again the packet is routed upwards until it reaches a NSP backbone. The routers connected to the NSP backbones hold the largest routing tables and here the packet will be routed to the correct backbone, where it will begin its journey 'downward' through smaller and smaller networks until it finds its destination

## **Narration-(Domain Names and Address Resolution)**

The DNS (Domain Name Servers) is a distributed database which keeps track of computer's names and their corresponding IP addresses on the Internet. A DNS server does not contain the entire database, only a subset of it. If a DNS server does not contain the domain name requested by another computer, the DNS server re-directs the requesting computer to another DNS server.

The computer requesting a name resolution will be re-directed 'up' the hierarchy until a DNS server is found that can resolve the domain name in the request

## **Narration-(HTTP and the World Wide Web)**

One of the most commonly used services on the Internet is the WWW (World Wide Web). The application protocol that makes the web work is HTTP (Hypertext Transfer Protocol). HTTP is the text based protocol that web browsers and web servers use to communicate with each other over the Internet. Web browsers send requests to web servers for web elements such as web pages and images. After the request is serviced by a server, the connection between Web browser and server across the Internet is disconnected. Before an HTTP request can be made by a Web browser, a new connection must be made to the server.

## **Narration-(SMTP and Electronic Mail)**

Another commonly used service on the Internet is electronic mail. E-mail uses an application level protocol called SMTP (Simple Mail Transfer Protocol). SMTP is also a text based protocol, but unlike HTTP, SMTP is connection oriented. The mail client (Microsoft Outlook etc.) opens a connection to its default mail server. The mail server transmits a message to identify itself and the mail client will transmit an SMTP HELLO command to which the server will respond with a250 OK message.

Depending on whether the client is checking mail or sending mail the appropriate SMTP commands will be sent to the server which will respond accordingly. The requests and responses will continue until the client sends and SMTP QUIT command then the server will say goodbye and connection is closed.

## **Narration-(Transmission Control Protocol)**

TCP (Transmission Control Protocol) is in the application layer in the protocol stack. TCP is responsible for routing application protocols to the correct application on the destination computer and port numbers are used to do this. Ports are on separate channels on a computer which enable a user to surf the internet while reading an email and this is because the two applications use different port numbers. When sending data packets TCP adds a header containing a port number of the application the data packet needs to be sent to. When TCP receives data packets it strips the header from the data packet and reconstructs it if necessary and sends it to the correct application using the port number. The application that uses TCP must first connect before exchange data; it is reliable because for every packet received, an acknowledgement is sent to the sender to confirm delivery.

## **Narration-(Internet Protocol)**

IP (Internet Protocol) is also in the application layer in the protocol stack. IP is responsible for sending and route of packets to other computers. IP adds its own header with IP addresses of the sending and receiving computer to a data packet and then transmitted across the internet.

## **Narration-(Close)**

For the internet to become what it is today there had to be an advancement of technology in the 1960s. The first realisation was in 1969 by ARPA (Advanced Research Projects Agency) was the humble beginnings and the work of Lawrence Roberts and Paul Baran. We will cover this History of the Internet in part two of our documentary.

## **End**

“In the time it has taken you to watch this documentary statistics show you could have made love”.