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Enhanced Dynamic Leakage Detection Scheme in CDN Using Anomaly Software Agent System


Ashlesha Kolarkar
Assistant Professor
Department of CSE
Lords Institute of Engineering and Technology.


Boge Sneha
M.Tech Student
Department of CSE
Lords Institute of Engineering and Technology.

ABSTRACT:

We propose an enhanced Dynamic leakage detection scheme in CDN using Anomaly Software Agent system. The primary benefit of an Agent-based Information Leakage Detection system lies in the ability to modify and add detection capabilities, modularize those capabilities, and then conditionally employ such capabilities at the discretion of a central control mechanism (in our system, the Controller Agent). The use of mobile agents as described in this paper, and in general, reduces the per-host administrative complexity as once the initial agent environment is properly installed and configured; all further necessary actions are performed by the agents themselves. Additionally, mobile agents are able to provide unique reporting capabilities that, for the purposes of our research, may benefit the analysis of information leakage and the underlying covert channels through which information has been leaked.

Introduction

Networking is the word basically relating to computers and their connectivity. It is very often used in the world of computers and their use in different connections. The term networking implies the link between two or more computers and their devices, with the vital purpose of sharing the data stored in the computers, with each other. The networks between the computing devices are very common these days due to the launch of various hardware and computer software which aid in making the activity much more convenient to build and use.

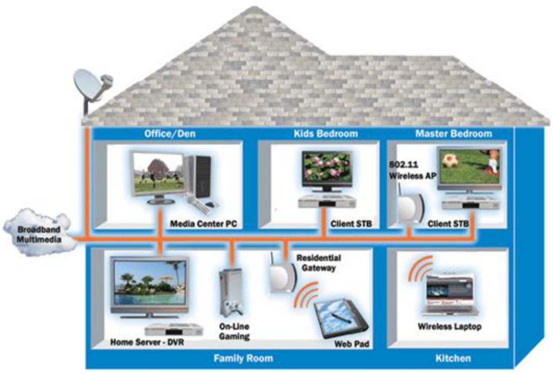

Fig 1.1.1 Structure of Networking between the different computers

General Network Techniques

When computers communicate on a network, they send out data packets without knowing if anyone is listening. Computers in a network all have a connection to the network and that is called to be connected to a network bus. What one computer sends out will reach all the other computers on the local network.

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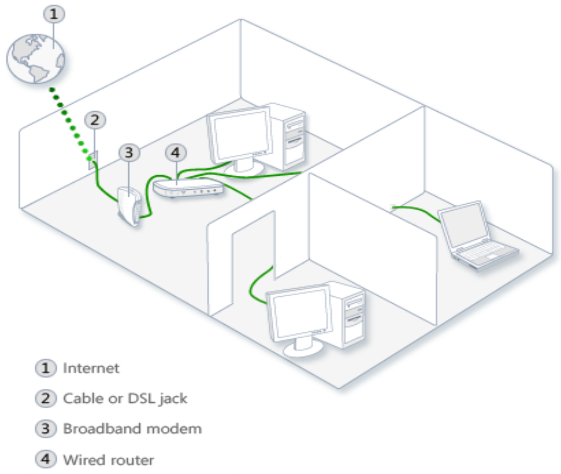

Fig 1.2.1 Networking Functions

Above diagrams show the clear idea about the networking functions

For the different computers to be able to distinguish between each other, every computer has a unique ID called MAC-address (Media Access Control Address). This address is not only unique on your network but unique for all devices that can be hooked up to a network. The MAC-address is tied to the hardware and has nothing to do with IP-addresses. Since all computers on the network receives everything that is sent out from all other computers the MAC-addresses is primarily used by the computers to filter out incoming network traffic that is addressed to the individual computer.

When a computer communicates with another computer on the network, it sends out both the other computers MAC-address and the MAC-address of its own. In that way the receiving computer will not only recognize that this packet is for me but also, who sent this data packet so a return response can be sent to the sender.

On an Ethernet network as described here, all computers hear all network traffic since they are connected to the same bus. This network structure is called multi-drop.

One problem with this network structure is that when you have, let say ten (10) computers on a network and they communicate frequently and due to that they send out their data packets randomly, collisions occur when two or more computers sends data at the same time. When that happens data gets corrupted and has to be resent.

On a network that is heavy loaded even the resent packets collide with other packets and have to be resent again. In reality this soon becomes a bandwidth problem. If several computers communicate with each other at high speed they may not be able to utilize more than 25% of the total network bandwidth since the rest of the bandwidth is used for resending previously corrupted packets. The way to minimize this problem is to use network switches.

Characteristics of Networking:

The following characteristics should be considered in network design and ongoing maintenance:

1) Availability is typically measured in a percentage based on the number of minutes that exist in a year. Therefore, uptime would be the number of minutes the network is available divided by the number of minutes in a year.

2) Cost includes the cost of the network components, their installation, and their ongoing maintenance.

3) Reliability defines the reliability of the network components and the connectivity between them. Mean time between failures (MTBF) is commonly used to measure reliability.

4) Security includes the protection of the network components and the data they contain and/or the data transmitted between them.

5) Speed includes how fast data is transmitted between network end points (the data rate).

6) Scalability defines how well the network can adapt to new growth, including new users, applications, and network components.

7) Topology describes the physical cabling layout and the logical way data moves between components.

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Types of Networks:

Organizations of different structures, sizes, and budgets need different types of networks. Networks can be divided into one of two categories:

1) Peer-to-peer
2) Server-based networks

Network Communications:

- Computer networks use signals to transmit data, and protocols are the languages computers use to communicate.
- Protocols provide a variety of communications services to the computers on the network.
- Local area networks connect computers using a shared, half-duplex, baseband medium, and wide area networks link distant networks.
- Enterprise networks often consist of clients and servers on horizontal segments connected by a common backbone, while peer-to-peer networks consist of a small number of computers on a single LAN.

Project Scope

In this paper, our thesis is that the user-perceived video quality can be significantly improved by accounting for application requirements, and specifically the video distortion experienced by a flow, end-to-end. Typically, the schemes used to encode a video clip can accommodate a certain number of packet losses per frame. However, if the number of lost packets in a frame exceeds a certain threshold, the frame cannot be decoded correctly. A frame loss will result in some amount of distortion. The value of distortion at a hop along the path from the source to the destination depends on the positions of the unrecoverable video frames (simply referred to as frames) in the GOP, at that hop. As one of our main contributions, we construct an analytical model to characterize the dynamic behavior of the process that describes the evolution of frame losses in the GOP (instead of just focusing on a network quality metric such as the packet-loss probability) as video is delivered on an end-to-end path. Specifically, with our model, we capture how the choice of path for an end-to-end flow affects the performance of a flow in terms of video distortion. Our model is built based on a multilayer approach.

Advantages

Our solution to the problem is based on a dynamic programming approach that effectively captures the evolution of the frame-loss process. Minimize routing distortion. Since the loss of the longer I-frames that carry fine-grained information affects the distortion metric more, our approach ensures that these frames are carried on the paths that experience the least congestion; the latter frames in a GOP are sent out on relatively more congested paths. Our routing scheme is optimized for transferring video clips on wireless networks with minimum video distortion.

Objective

Traditional routing metrics designed for wireless networks are application-agnostic. In this paper, we consider a wireless network where the application flows consist of video traffic. From a user perspective, reducing the level of video distortion is critical. We ask the question "Should the routing policies change if the end-to-end video distortion is to be minimized?" Popular link-quality-based routing metrics (such as ETX) do not account for dependence (in terms of congestion) across the links of a path; as a result, they can cause video flows to converge onto a few paths and, thus, cause high video distortion. To account for the evolution of the video frame loss process, we construct an analytical framework to, first, understand and, second, assess the impact of the wireless network on video distortion. The framework allows us to formulate a routing policy for minimizing distortion, based on which we design a protocol for routing video traffic. We find via simulations and tested experiments that our protocol is efficient in reducing video distortion and minimizing the user experience degradation.

Existing System

Different approaches exist in handling such an encoding and transmission. The Multiple Description

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Coding (MDC) technique fragments the initial video clip into a number of sub-streams called descriptions. Standards like the MPEG-4 and the H.264/AVC provide guidelines on how a video clip should be encoded for a transmission over a communication system based on layered coding. Typically, the initial video clip is separated into a sequence of frames of different importance with respect to quality and, hence, different levels of encoding. In another existing model, an analytical framework is developed to model the effects of wireless channel fading on video distortion. In other existing model, the authors examine the effects of packet-loss patterns and specifically the length of error bursts on the distortion of compressed video.

Disadvantages of Existing System

From a user perspective, maintaining a good quality of the transferred video is critical. The video quality is affected by: 1) the distortion due to compression at the source, and 2) the distortion due to both wireless channel induced errors and interference. The model is, however, only valid for single-hop communication. The existing model is used not only for performance evaluation, but also as a guide for deploying video streaming services with end-to-end quality-of-service (QoS) provisioning.

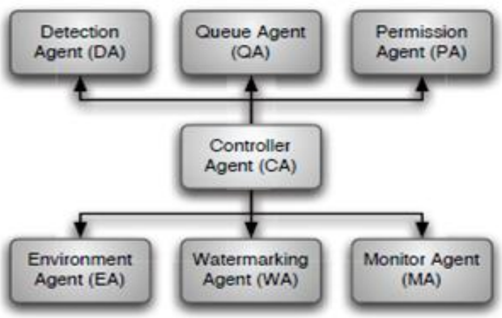
Proposed System

In this paper, our thesis is that the user-perceived video quality can be significantly improved by accounting for application requirements, and specifically the video distortion experienced by a flow, end-to-end. Typically, the schemes used to encode a video clip can accommodate a certain number of packet losses per frame. However, if the number of lost packets in a frame exceeds a certain threshold, the frame cannot be decoded correctly. A frame loss will result in some amount of distortion. The value of distortion at a hop along the path from the source to the destination depends on the positions of the unrecoverable video frames (simply referred to as frames) in the GOP, at that hop. As one of our main contributions, we construct an analytical model to characterize the dynamic behavior of the process that describes the evolution of frame losses in the GOP (instead of just focusing on a network quality metric such as the packet-loss probability) as video is delivered on an end-to-end path. Specifically, with our model, we capture how the choice of path for an end-to-end flow affects the performance of a flow in terms of video distortion. Our model is built based on a multilayer approach.

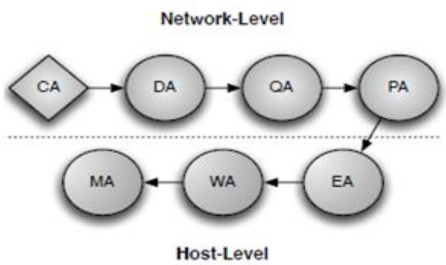
Advantages of Proposed System

Our solution to the problem is based on a dynamic programming approach that effectively captures the evolution of the frame-loss process. Minimize routing distortion. Since the loss of the longer I-frames that carry fine-grained information affects the distortion metric more, our approach ensures that these frames are carried on the paths that experience the least congestion; the latter frames in a GOP are sent out on relatively more congested paths. Our routing scheme is optimized for transferring video clips on wireless networks with minimum video distortion.

System Architecture



PROCESS FLOW OF THE SYSTEM:



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Modules

- Model Formulation
- Video Distortion Model
- Video Distortion Dynamics
- Optimal Routing Policy

Model Formulation

Our analytical model couples the functionality of the physical and MAC layers of the network with the application layer for a video clip that is sent from a source to a destination node. The model for the lower layers computes the packet-loss probability through a set of equations that characterize multiuser interference, physical path conditions, and traffic rates between source–destination pairs in the network. This packet-loss probability is then input to a second model to compute the frame-loss probability and, from that, the corresponding distortion. The value of the distortion at a hop along the path from the source to the destination node depends on the position of the first unrecoverable frame in the GOP.

Video Distortion Model

Our analysis is based on the model for video transmission distortion. The distortion is broken down into source distortion and wireless transmission distortion over a single hop. Instead of focusing on a single hop, we significantly extend the analysis by developing a model that captures the evolution of the transmission distortion along the links of a route from the source node to the destination node. Assuming that the packet losses in different frames in the GOP are independent events (likely if the fading patterns change in between), the transition probabilities for the process, can be computed.

Video Distortion Dynamics

The value of the distortion at hop along the path from the source to the destination node depends on the position of the first unrecoverable frame in the GOP. The value 0 indicates that the first (I-frame) is lost, and therefore the whole GOP is unrecoverable. A value between 1 and denotes that the corresponding P-frame is the first frame in the GOP that cannot be decoded correctly, and the value indicates that no frame has been lost thus far, yielding a distortion. The dynamics of the process and therefore of the video distortion depend on the process.

Optimal Routing Policy

In this module, our objective is to find the path that yields the minimum video transmission distortion between any source and destination. By using the analysis presented, we pose the problem as a stochastic optimal control problem where the control is the selection of the next node to be visited at each intermediate node from the source to the destination.In essence, the MDR routing policy distributes the video frames (and the packets contained therein) across multiple paths and in particular minimizes the interference experienced by the frames that are at the beginning of a GOP (to minimize distortion). The I-frames are longer than other frames. Their loss impacts distortion more, and thus these are transmitted on relatively interference-free paths. The higher protection rendered to I-frames is the key contributing factor in decreasing the distortion with MDR.

RESULTS AND OUTPUT SCREENS

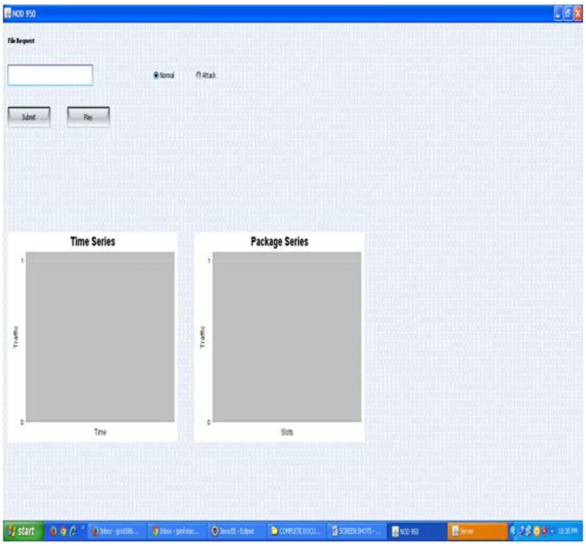

Fig 7.2.1 Node Frame

Node will send the request to the server. There in the place of file request video name should be entered and click submit

Server Frame

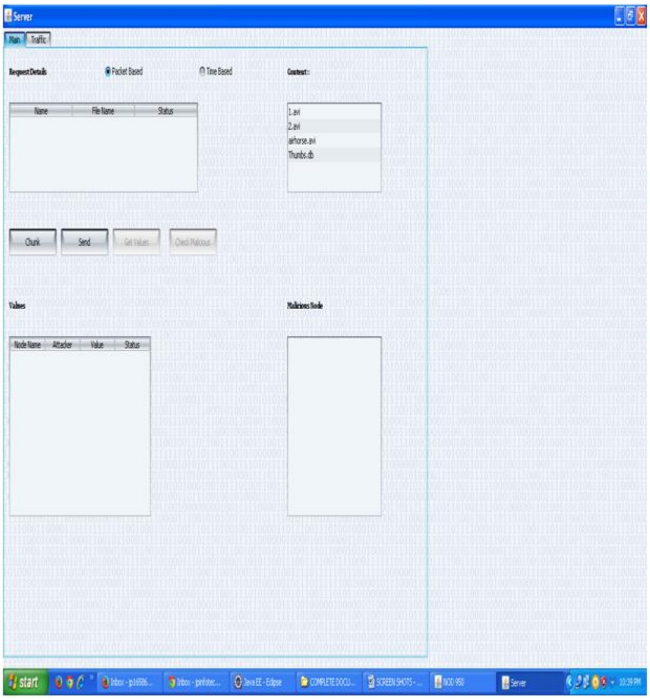

Fig 7.3.1Server Frame

Server will select the video name and chunk the file.Here the file will be divided into the frames

Server Frame With Traffic Signal

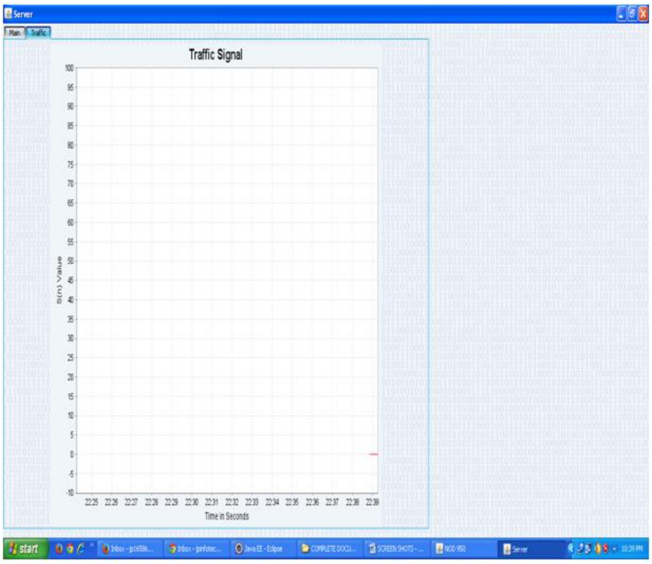

Fig 7.4.1Server Frame With Traffic Signal

The traffic of the different requests from the different nodes that has been approching the server will be shown at the server level

Node Frame For File Request

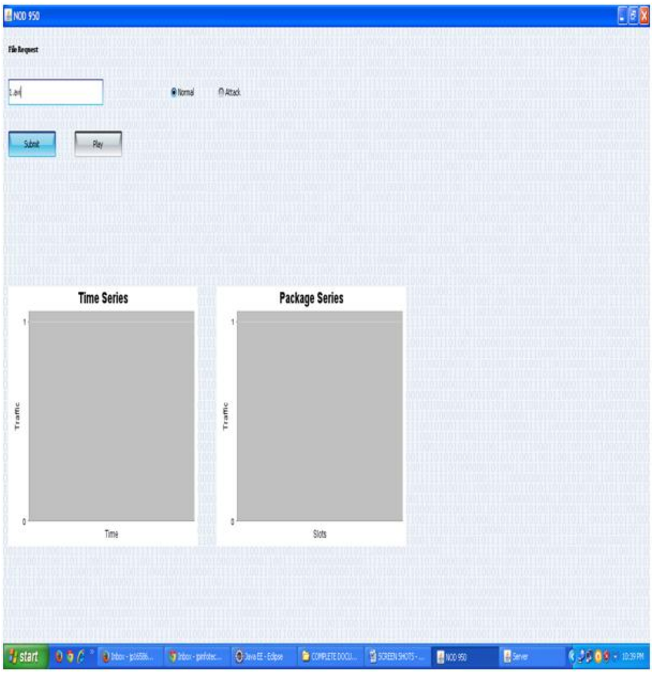

Fig 7.5.1 Node Frame For File Request

Now the node will be sent in the attacker mode to the server

Server Frame for Request Details

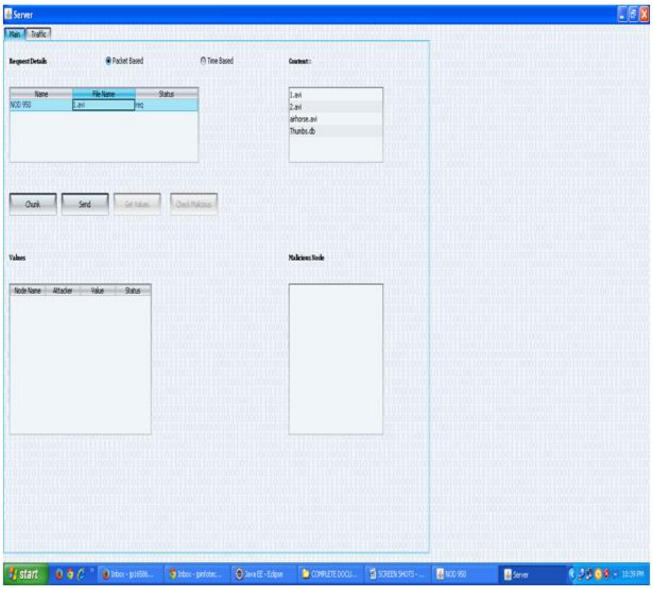

Fig 7.6.1 Server Frame for Request Details

Request has been sent to the server from the node in the attacker mode and we will receive a message saying request has been sent to the server

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Server Frame with Message Chunked Successfully

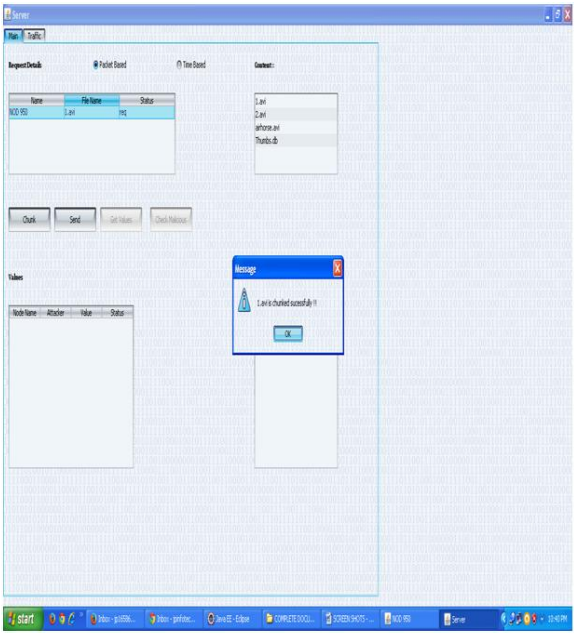

Fig 7.7.1 Server Frame with Message Chunked Successfully

At the server level the node request received from the node has been chunked

Node Frame With Graph

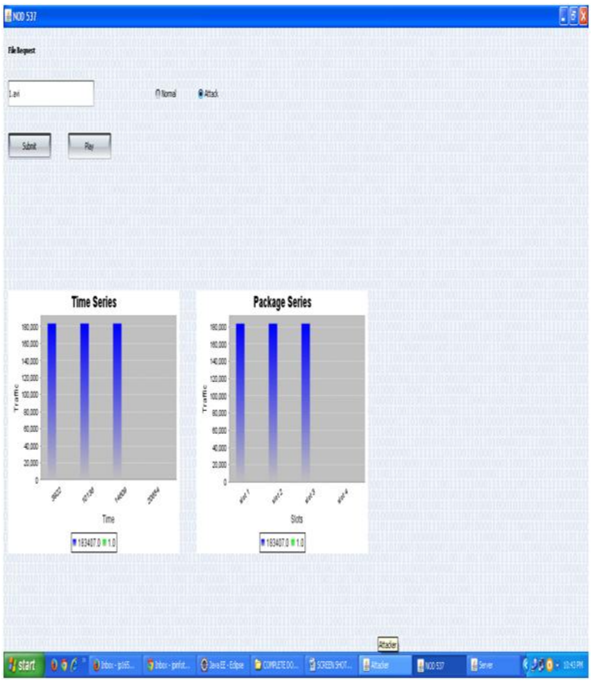

Fig 7.8.1 Node Frame With Graph

Here the node frame with the time series as well as package series will be displayed

Server Frame for the Detection of Malicious Node

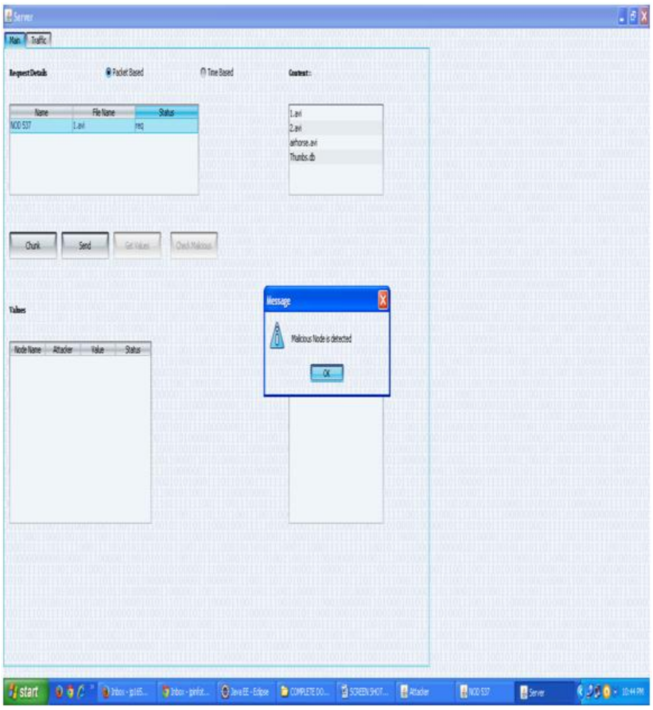

Fig 7.9.1 (i) Server Frame for the Detection of Malicious Node

The malicious node has been detected and its status also showed.

Server frame with return message

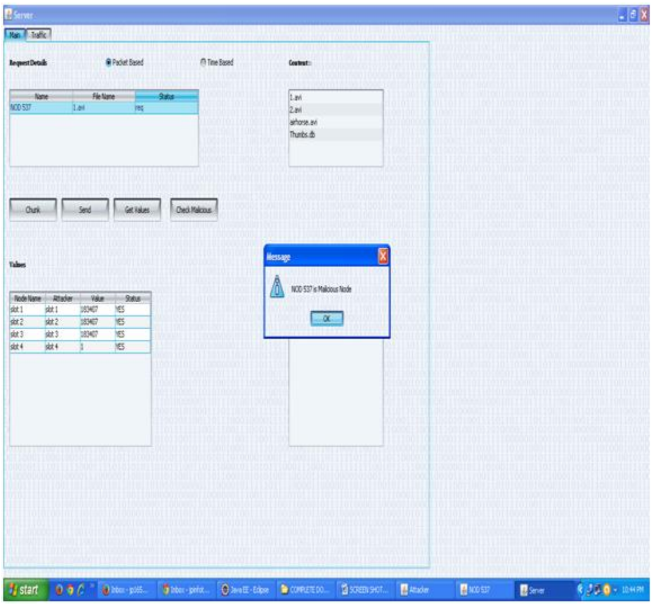

Fig 7.9.2 (ii) Server Frame with Return Message

The details of the malicious node that has been detected is shown here

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CONCLUSION AND FUTURE WORK

In this paper, we argue that a routing policy that is application- aware is likely to provide benefits in terms of user-perceived performance. Specifically, we consider a network that primarily carries video flows. We seek to understand the impact of routing on the end-to-end distortion of video flows. Toward this, we construct an analytical model that ties video distortion to the underlying packet-loss probabilities. Using this model, we find the optimal route (in terms of distortion) between a source and a destination node using a dynamic programming approach. Unlike traditional metrics such as ETX, our approach takes into account correlation across packet losses that influence video distortion. Based on our approach, we design a practical routing scheme that we then evaluate via extensive simulations and testbed experiments. Our simulation study shows that the distortion (in terms of PSNR) is decreased by 20% compared to ETX-based routing. Moreover, the user experience degradation due to increased traffic load in the network is kept to a minimum.Typically, the schemes used to encode a video clip can accommodate a certain number of packet losses per frame. However, if the number of lost packets in a frame exceeds a certain threshold, the frame cannot be decoded correctly. A frame loss will result in some amount of distortion. The value of distortion at a hop along the path from the source to the destination depends on the positions of the unrecoverable video frames (simply referred to as frames) in the GOP, at that hop. As one of our main contributions, we construct an analytical model to characterize the dynamic behavior of the process that describes the evolution of frame losses in the GOP (instead of just focusing on a network quality metric such as the packet-loss probability) as video is delivered on an end-to-end path.

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