International Journal of Scientific and Technical Advancements
ISSN: 2454-1532

Time Series Forecasting of Bandwidth Requirements of GCET Campus

Simmi Dutta[1], Hiteshwar[2]
[1, 2]Department of Computer Engineering, Government College of Engineering and Technology, Jammu, J&K, India
Email address: [1]simmi_dutta@rediffmail.com, [2]ihiteshwar@gmail.com

***Abstract*—**In this paper we describe a time series model for forecasting bandwidth requirements of GCET Jammu campus. This model is capable of predicting the bandwidth requirements in normal day to day usage scenario.

***Keywords*—**Time series; forcasting; behaviour analysis; computer networks.

I. INTRODUCTION

What amount of bandwidth will be required in future for a particular network? This is the question in the mind of a network administrator wile designing the network and reserving the bandwidth. While more better is general rule in case of network speeds it's both non-economical as well as poor in terms of design to go this way. Our model removes the uncertainty by accurately predicting the future values of the bandwidth requirements.

Our model uses historical time series data available with the college collected on Cyberoam UTM to generate a regression model to forecast the future values of the bandwidth. The Cyberoam UTM is the gateway device being used at GCET. It records all the traffic that passes through it and provides information in CSV format. In this model we used its LAN to WAN (internet) usage reports to forecast the values.

II. SYSTEM OVERVIEW

The general approach for the forecasting model is as follows

1. Data gathering
2. Data sanitisation
3. Forecast modelling
4. Value prediction

The overall process consists of two parts. First, the gathering of historical data and second the prediction model that trains and predicts the values of future.

The model uses linear regression and moving average with deseasonalization of data to predict the values and suppressing any minor deviations from the general pattern in the data for smoother and near accurate results.

III. DATA GATHERING

This step involves gathering of traffic data of the WAN port of Cyberoam UTM of 3 months. The data was recorded with time quantum of 1 hour between each reading. The data was then exported into a csv file to be fed into our forecasting model.

IV. DATA SANITISATION

In this step the data is cleaned in the sense any irregularities are filtered out that may have crept into the data while recording it. Like bandwidth cannot be negative, or cannot be greater than 100mbps. Further, the data values are rounded off up to two decimal places for uniformity and reducing computational complexity.

V. FORECASTING MODEL

This is the main step in the whole process here the model is trained on previous values and future value is predicted.

We find the forecasted value by applying the mathematical model in form of a trend equation as follows:

$$X' = l + m\,t$$

Where,

$$m = \frac{n\sum tX - (\sum X)(\sum t)}{n\sum t^2 - (\sum t)^2}$$

$$l = \frac{\sum X}{n} - b\left(\frac{\sum t}{n}\right)$$

Here,

X' = predicted bandwidth at time
l= value of X when t = 0
m = is average change in bandwidth over period of time

The data values are substituted into the above formula to get the value X' that is predicted value of bandwidth. The computation is fairly simple and uses a univariate time series model with time being a constant rate variable and bandwidth being a dynamic variable.

VI. RESULTS

The prediction model gave results with a gross error of ±3.88%. For example when queried about the bandwidth requirements of 17 August, 2015 at 9:00 pm the model predicted the value of 75.91 mbps, whereas the actual value recorded at that time later was 74.49 mbps.

VII. ISSUES

The main issue with model is it can't predict the bandwidth demands in case of some unprecedented events. For example the bandwidth requirements shoot up to much higher levels in case say, a result is declared or a popular event is being broadcasted online etc.

Simmi Dutta and Hiteshwar, "Time series forecasting of bandwidth requirements of GCET campus", *Journal of Scientific and Technical Advancements*, Volume 1, Issue 3, pp. 253-254, 2015.

ISSN: 2454-1532

VIII. FUTURE WORK

In future we want to create a universal system that can predict the bandwidth demand of any organisation. We also want to incorporate a system that can respond to unprecedented demands that may arise in future by providing an interface that can analyse real-time web usage and incorporate its effects into bandwidth forecast. To smooth the findings moving averages and sessional index method may be incorporated into the system to predict more accurately.

REFERENCES

[1] Time series available: https://en.wikipedia.org/wiki/Time_series
[2] Linear regression available: https://en.wikipedia.org/wiki/Linear_regression
[3] Cyberoam UTM available: http://www.cyberoam.com/utm.html

Simmi Dutta and Hiteshwar, "Time series forecasting of bandwidth requirements of GCET campus", *Journal of Scientific and Technical Advancements*, Volume 1, Issue 3, pp. 253-254, 2015.