

Analyzing TCP Congestion Window

Spoken Tutorial Project

<https://spoken-tutorial.org>

National Mission on Education through ICT

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VIT Chennai

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Learning Objectives

In this tutorial, we will learn to



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In this tutorial, we will learn to

- ▶ **Create a TCP socket with TCP Reno congestion control**



Learning Objectives

In this tutorial, we will learn to

- ▶ Create a TCP socket with TCP Reno congestion control
- ▶ Track changes in congestion window size



Learning Objectives

In this tutorial, we will learn to

- ▶ Create a TCP socket with TCP Reno congestion control
- ▶ Track changes in congestion window size
- ▶ Plot the change in congestion window against time



System Requirements

To record this tutorial, I am using



System Requirements

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► **Ubuntu Linux 22.04 OS**



System Requirements

To record this tutorial, I am using

▶ **Ubuntu Linux 22.04 OS**

▶ **ns-3.38**



Pre-requisites

To follow this tutorial

- ▶ You must have basic knowledge of Linux and ns-3 software



Pre-requisites

To follow this tutorial

- ▶ You must have basic knowledge of Linux and ns-3 software
- ▶ For pre-requisite Linux and ns-3 tutorials, please visit <https://www.spoken-tutorial.org/>



Code Files

- The files used in this tutorial are provided in the Code files link



Code Files

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- ▶ Please download and extract the files

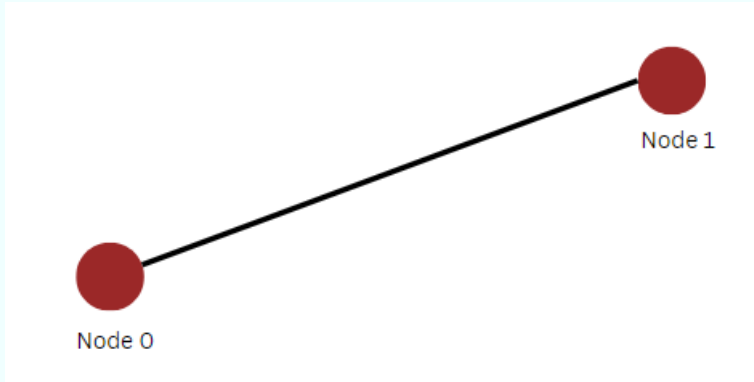


Code Files

- ▶ The files used in this tutorial are provided in the Code files link
- ▶ Please download and extract the files
- ▶ Make a copy and then use them while practicing



Network Topology



Classes and Methods

- The `RateErrorModel` class object determines and flags lost or errored packets



Classes and Methods

- ▶ The **RateErrorModel** class object determines and flags lost or errored packets
- ▶ The **CreateObject** method of the **Object** base class creates an object by type



Tutorial App

- We shall be using a pre-coded application file, `tutorial-app.cc` in this tutorial



Tutorial App

- ▶ We shall be using a pre-coded application file, `tutorial-app.cc` in this tutorial
- ▶ The application instance sends packets to the server node continuously



Trace Sources

- ▶ This program uses the CongestionWindow trace source



Trace Sources

- ▶ This program uses the **CongestionWindow** trace source
- ▶ It tracks the changes in the congestion window size



Summary

In this tutorial, we have learnt to

- ▶ Create a TCP socket with TCP Reno congestion control
- ▶ Track changes in congestion window size
- ▶ Plot the change in congestion window against time



Assignment

As an assignment, please do the following

- ▶ **Write an ns-3 program**
- ▶ **The program should have a CSMA network with 6 nodes**
- ▶ **Send packets from node 2 to node 5**



Assignment

- ▶ Trace the changes in the congestion window size
- ▶ Plot the changes using gnuplot

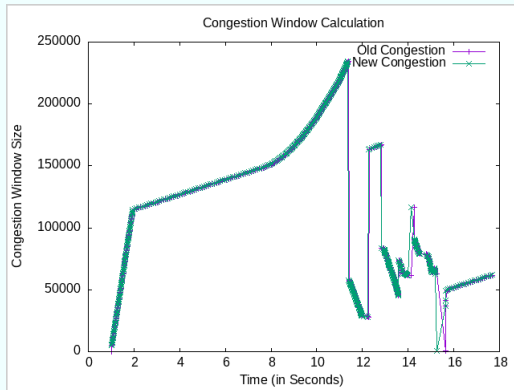


Assignment - Observation

```
17.2448: 58960--> 59496  
17.3411: 59496--> 60032  
17.4298: 60032--> 60568  
17.5182: 60568--> 61104  
17.6129: 61104--> 61640  
17.6998: 61640--> 62176
```



Assignment - Observation



About the Spoken Tutorial Project

- ▶ Watch the video available at http://spoken-tutorial.org/What_is_a_Spoken_Tutorial
- ▶ It summarises the Spoken Tutorial project
- ▶ If you do not have good bandwidth, you can download and watch it



Spoken Tutorial Workshops

The Spoken Tutorial Project Team

- ▶ Conducts workshops using spoken tutorials
- ▶ Gives certificates to those who pass an online test
- ▶ For more details, please write to contact@spoken-tutorial.org



Answers for THIS spoken tutorial

- ▶ Questions in THIS Spoken Tutorial?
- ▶ Visit <https://forums.spoken-tutorial.org>
- ▶ Choose the minute and second where you have the question
- ▶ Explain your question briefly
- ▶ The Spoken Tutorial project will ensure an answer
- ▶ You will have to register to ask questions



- ▶ For any general or technical questions on ns-3, visit the FOSSEE forum and post your question

<https://forums.fossee.in/>



Acknowledgement

- ▶ **Spoken Tutorial Project was established by the Ministry of Education, Government of India.**



Acknowledgement

- ▶ We thank Dr.Moyukh Laha from IIT Kharagpur for his domain support
- ▶ We would also like to thank Dr. R. Radha, Dr. X. Anita, and Dr. T. Subbulakshmi from VIT, Chennai for their support



Thank you

- ▶ **This is Josiga, a FOSSEE Summer fellow 2023, IIT Bombay signing off**

