

# FABRIC Educational Materials

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## Tutorial: Round Trip Time and Window Size effect on TCP

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### Introduction

The goal of the this tutorial is is to understand how delay and the size of a window can affect data loss.

### Running the Tutorial

- The tutorial has three Jupyter notebooks and one folder:
  - **CreateSlice.ipynb**: Creates the FABRIC slice/topology needed for this tutorial
  - **RTT\_Window\_Size.ipynb**: Configures the IPv4/IPv6 network address, installs tools needed and then begins the TCP effects tutorial
- To run the tutorial:
  - Login to the FABRIC Portal and JupyterHub
    - Login to the [FABRIC Portal](#)
    - Login/connect to the [FABRIC JupyterHub](#)
  - Download the latest copy of the tutorials from GitHub
    - Open a terminal in JupyterHub by clicking the "Terminal" tile under "Other" in the Launcher tab
    - In the terminal window, type the following commands to download (pull) the latest version of the set of tutorials from Github

```
mkdir teaching-materials
cd teaching-materials
git clone https://github.com/fabric-testbed/teaching-materials.git
```

- Run the Tutorial Notebooks
  - In the left-hand column of JupyterHub, navigate to the RTT and Window Size on TCP tutorial
  - Open and execute the CreateSlice.ipynb notebook
  - Then open and execute the steps on RTT\_Window\_Size.ipynb

### Overview of the Notebooks in this Tutorial

#### Create Slice Notebook

- In this notebook you will request a slice that contains two nodes (Client and Server) and one Layer-2 networks (LAN) with the following configurations:

```
Client <-> LAN 1 <-> Server
```

- Each node should have the following requirements:
  - NIC\_Basic model
  - "default\_ubuntu\_20" image
  - 1 cores
  - 2 ram
  - 10 disk space
- To successfully run this notebook you should only need to run the code blocks in order from top to bottom
- **Notes:** If your slice creation fails you can just try to specify a site in the second code block run them again. (you can get a site from "https://portal.fabric-testbed.net/" by looking at the map, use the name **outside** of the parenthesis and make sure the site chosen is up)

## RTT Window Size Notebook

- To successfully run this notebook you need to run the code blocks first (*Retrieve Slice*) and then follow the steps in (*Guided Experiment*):
  - Retrieve Slice: This step is not required but it will allow you to easily access the nodes in the slice you will use for the experiment.
  - Guided Experiment: This is the Experiment, To complete this section just follow the provided instructions to complete the exercise.
  - Assignment: you will run different alterations of the same experiment with different window and RTT sizes, then you will make inferences based on the figures created, after you will answer some questions. Lastly you will delete the slice to clear resources you used.
  - **Notes:** In the case the slice fails to delete please examine the experiment tab on the fabric portal and delete the corresponding slice if it was not already deleted

## Additional Information

- FABRIC Learn Website: If you encounter problems, questions, or suggestions, please navigate to the FABRIC Knowledge Base at <https://learn.fabric-testbed.net/>
- FABRIC Teaching Material Github: <https://github.com/fabric-testbed/teaching-materials>
- This assignment was originally written for the GENI network (<https://www.cs.unc.edu/Research/geni/geniEdu/04-TcpDelayWinSize.html>), but has been converted to run in FABRIC.