# Course Project
# Satellite Network Emulation or Simulation

- **Project Registration** (<span style="color:red">**deadline is March 23 11:59PM.**</span>)

  - Register Here

- **Project Submission** (<span style="color:red">**deadline is April 14 11:59PM.**</span>)

  - email to azahran@eece.cu.edu.eg
  - Format: PDF
  - Email Subject: SAT-REPORT-Gx, where x is a group number assigned to you.

## Contents

# 1 Objective

- The objective of the project is to expose the students to the impact of of different system protocols/parameters on the performance of satellite broadband networks.

# 2 Expected Output

- A Technical report

  - Cover page (should contain a table including names of the team members, section and BN for each one)
  - Main content: you should write the content yourself
    * maximum 2 page of text (i.e. the report could be 5 pages but the text cover only approx. two pages at maximum,
    * single line space,
    * font-size min 10pt and max 12pt, and
    * 2.5cm margins
  - Appendix (for developed code/scripts)

- The report should contain the following sections

  - Simulation/Emulation Setup including description of your setup and the experimentation procedure

– Result section including

  * figures and your comments on the obtained figures

- The report is expected to contain at least two figures showing a key performance index (KPI) y-axis plotted versus some parameter variations in the x-axis. x-axis may be a change in the system parameter or a selected set of protocols.

  – Examples of the KPIs include

    * average system throughput: amount of transmitted data over a specific duration
    * average packet delay: the delay the packet take from the source to the destination.
    * Page load time: the average time to load a web-page at a client

  – Examples for the x-axis could be

    * end-to-end link delay
    * frame error rate of the link
    * BER of the link
    * number of users or parallel sessions
    * number of objects in a web-page.
    * Protocol versions (e.g. TCP Reno, TCP Reno with SACK, TCP Westwood) **(bonus)**

# 3  Implementation

## 3.1  Simulation Track

- The minimum simulated network would include two nodes connected with a link representing the satellite link.

- you define a traffic scenario and attach them to these nodes or any additional nodes

- Use randomly generated scenarios (e.g. randomly generated file sizes)

- Using non-standard traffic sources such as Pack-mime is preferable

- the results are typically collected from trace files.

## 3.2  Emulation Track

- The main difference here is that you will be using two real nodes (computers) directly connected to each other.

  – you will have to make manual address configuration for these nodes.
  – use traffic control (tc) commands in linux. Specifically, tc commands in linux a satellite link can be emulated using two computers to as client and server machines.
  – real applications (e.g. Firefox as a client and apache as a web-server) may be used to send and receive data. Also artificial traffic generator can be used as well.

- the results are typically collected using a packet sniffer such as Wireshark/tcpdump.

## 3.3  Results

- The results should be analyzed to produce the KPI figures.

- the figures can be typically plotted using any graphical representation tool such as gnuplot and Matlab/Octave.

  – the figures should be properly labeled (x-axis and y-axis) including units.

- Data commentary: for every figure you should provide

  – what does this figure plot.

- what is the general trend
- Analyze the result and explain why this result is obtained and whether it expected or not and/or technically sounds or not.
- Your comment should be based on your understanding for the tested protocol.