

Simulation and emulation of network congestion based on NS2

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Abstract

NS2 network is the use of simulation methods and general process. With NS2 network simulator we study congestion control strategy of the NCS, point out three main situation, the simulation conclusions, give the choice of methods to Congestion control algorithm parameters.

Keywords

Network simulation Network simulator Congestion Control.

1. Introduction

As network technology, communication technology and integrated circuit technology, meter machine control technology is increasingly concentrated on performance for network-based control system (Networked Control Systems: NCS), NCS is characterized by information between the various components of the control system exchanged through the network. Comparing technical issues faced the traditional computer control to the fundamental problems on NCS, including network-induced delay, losing object input / output of a single package and multiple-packet transmission, and network packet, the fundamental reason is the generation of network congestion [1].

It is based on this consideration. We use multi-protocol network simulator NS2 (Network Simulator V2.0), network congestion situation on the NCS simulates to design precise, complex algorithms, purposing to achieve the simulation topology, nodes, links, etc. various components and parameters easily and quickly configured , laying the foundation for the NCS in-depth study.

2. NS2 network simulation method

Using NS2 network simulation method and general process: Before the simulation, analysis and simulation first relates to which level. NS2 simulation divides into two levels; one is based on Otcl programming level, using the existed network elements implement on NS2 simulation, NS2 itself without the need for any modification, just write Otcl script; another level is based on the C++ programming and Otcl level, If the NS without the required network elements, it is necessary first of all to extend Ns, add the network elements you need. This requires the use of splitting the object model, adding a new C ++ classes and Otcl classes, then writing Otcl script. The simulation process shown in Figure 1.

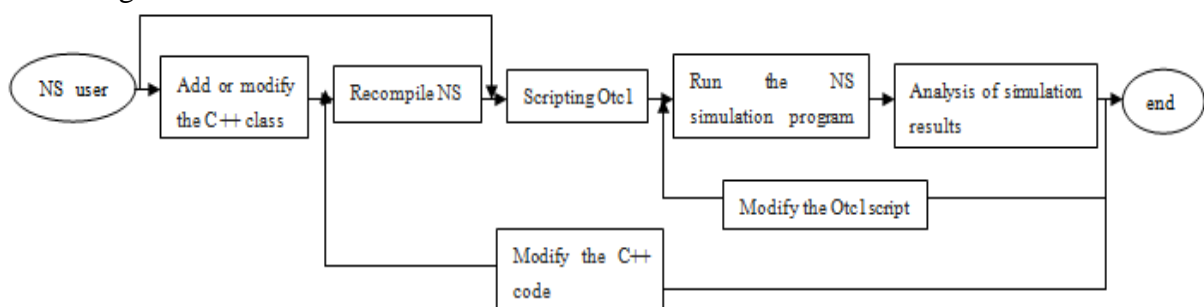


Figure 1 NS2 simulation process

Meet the requirements above, then the step of carrying out simulations are roughly as follows:

(1) Otcl starts writing scripts. First configuring the simulated network topology, then we can determine the basic characteristics of the link, such as delay, bandwidth and loss strategies and so on.

- (2) Establish protocol agents, including the remote device protocol binding and communication traffic model established.
- (3) Configuration parameters traffic model to determine the distribution of traffic on the network.
- (4) Set Trace object. Trace object is able to put a particular type of event occurs during the simulation recorded in the Trace file. NS2 by Trace file to hold the entire simulation process. After the simulation is completed, the user can analyze the study of Trace files.
- (5) Preparation of other secondary processes, setting the simulation end time, now Otcl scripting is completed.
- (6) Interpreted by NS2 just wrote the Otcl script.
- (7) Trace files are analysed, obtaining the useful data. Nam and other tools can also be used to watch network simulation is running.
- (8) Regulation configuration topologies and traffic models, re-simulation process is described above.

3. Simulation

This paper studies the RED on a single bottleneck router is running. In addition to the communication time infinity beyond, in order to more realistic simulation of network traffic, router simulation also introduced short-term http flow disturbances. These http stream generated by the NS2 simulator http module. Http affect flow generated by these very short, but it introduces noise in the queue. If the target control system is in the presence of such short-term disturbances utilizing the full bandwidth.

3.1 Experiment 1

In the first experiment uses the queue of 60 ftp data streams and 180 http data stream together constituted [2]. Link bandwidth of 15Mb/s, data flow propagation delay range unified 160-240ms. To make queuing delay queue control range is 50-70ms, this simulation in the average packet size is setting upper and lower limits of the column length of 250 and 200 respectively on the basis of 500 Bytes. Average weights and use of default values ns2. The maximum cache size is 800 packets. Set in the gentle RED parameter is "on". Instantaneous queue length shown in Figure 2 (ordinate Queue Size (packets) for the queue length, will not be explained later). Queues observing oscillation characteristics, you can find it often reach zero. It can be explained that he was not able to take full advantage of the link bandwidth. The introduction of a relatively large jitter on such a large shocks is round-trip packet transmission time.

RED default parameters

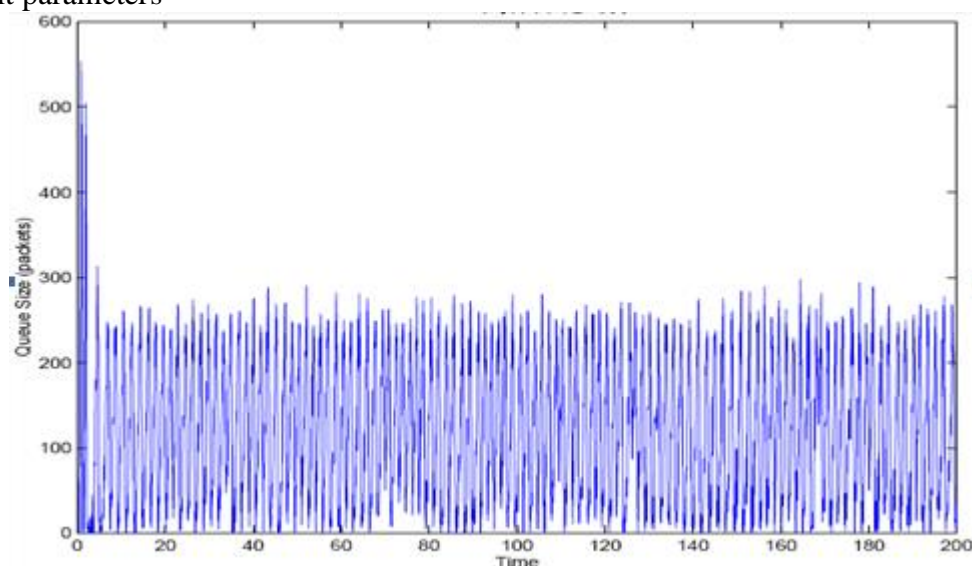


Figure 2 instantaneous queue length Experiment 1

3.2 Experiment 2

Experiment 2 study relative stability of the design. Experiments designed to stabilize the basis of, but a quarter of the round-trip time data streams doubled. The simulation results shown in Figure 3. As can be seen from the figure, the system remains stable, and increasing the local data flow to and from the time and did not cause a big impact on the system.

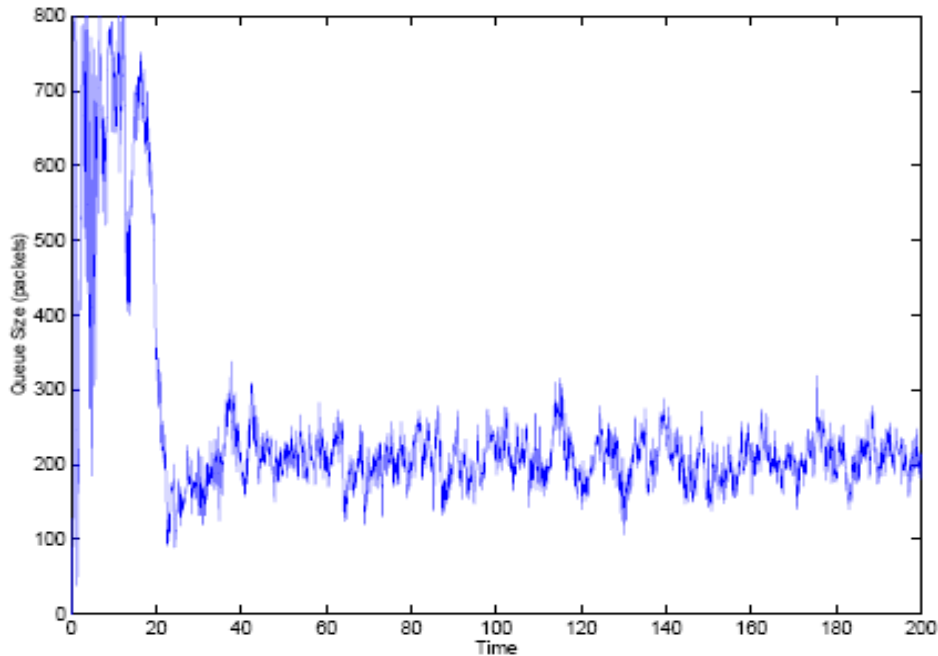


Figure 3 instantaneous queue length Experiment 2

3.3 Experiment 3

In Experiment 3, the round-trip time doubling all data streams, such systems have a very low round-trip time, while it is unstable, as shown in Figure 4.

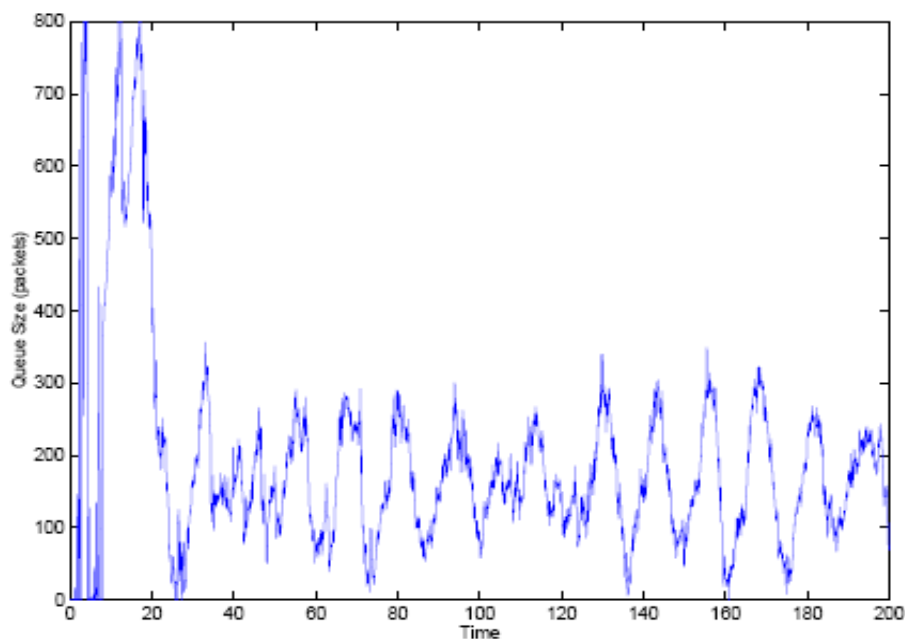


Figure 4 instantaneous queue length Experiment 3

4. Conclusion

From the control theory point of view to study the congestion control algorithm parameters selection. Application of existing TCP and RED model dynamic model as the basis for research. By

linearization technique to the inherent nonlinear model into a linear system, and then using the classical control theory analyze. All text nonlinear analysis through NS2 network simulator simulation.

Reference

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