

A decorative border at the top of the slide featuring a repeating pattern of colorful, irregular geometric shapes in shades of red, green, yellow, and cyan.

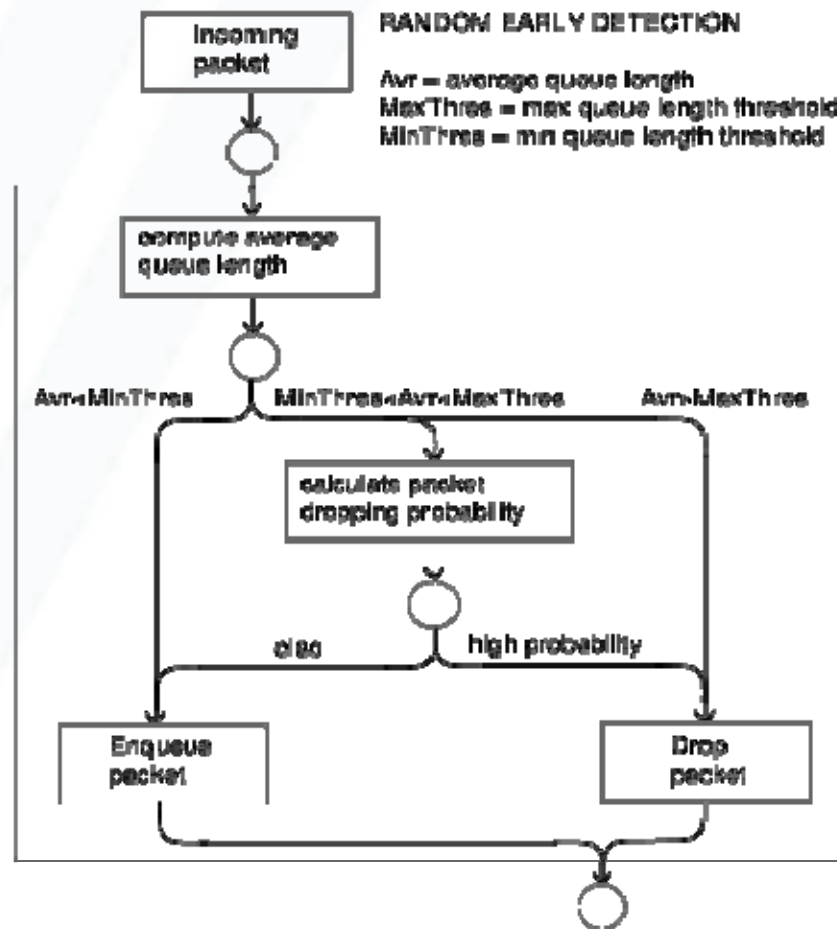
# **ITU-T Kaleidoscope Conference Innovations in NGN**

## **Token-Based Congestion Control: Achieving Fair Resource Allocations in P2P Networks**

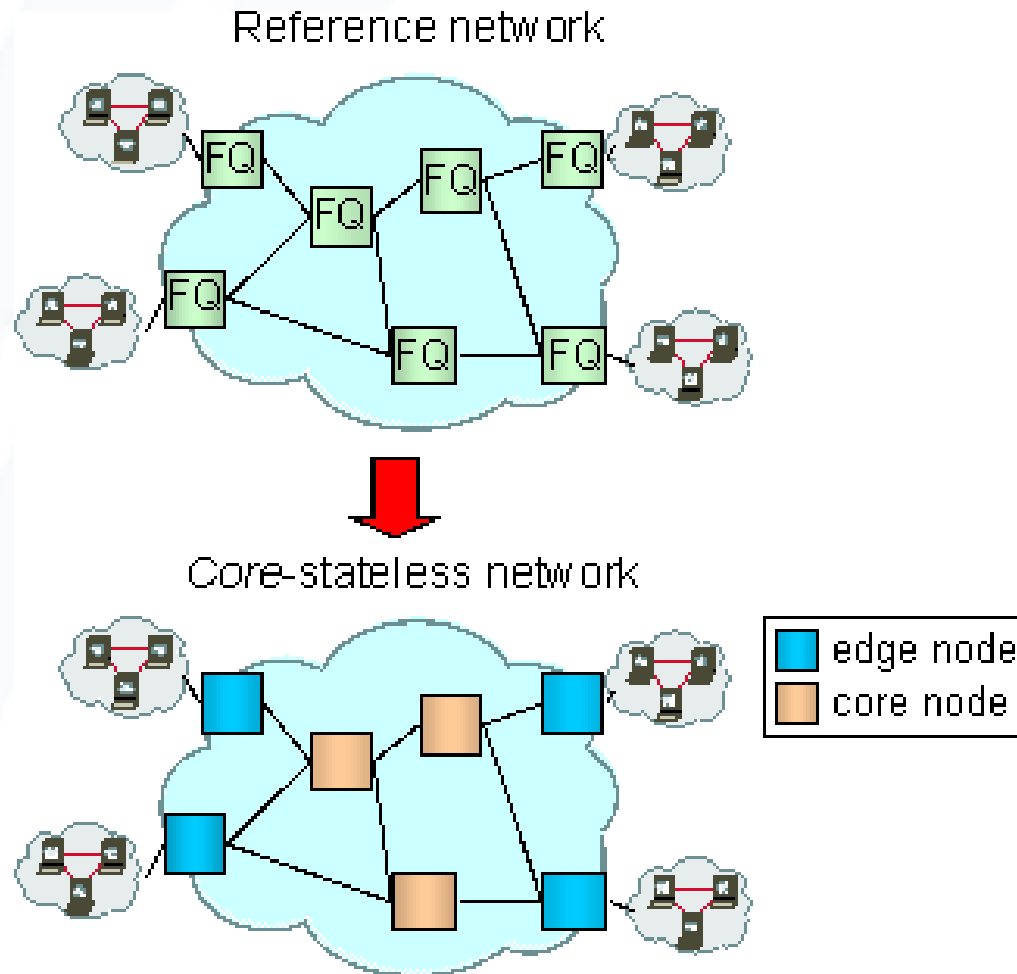
*Zhiqiang Shi*  
**Institute of Software  
Chinese Academy of Sciences**

A decorative border at the bottom of the slide, identical to the one at the top, featuring a repeating pattern of colorful, irregular geometric shapes in shades of red, green, yellow, and cyan.

# Random Early Detection

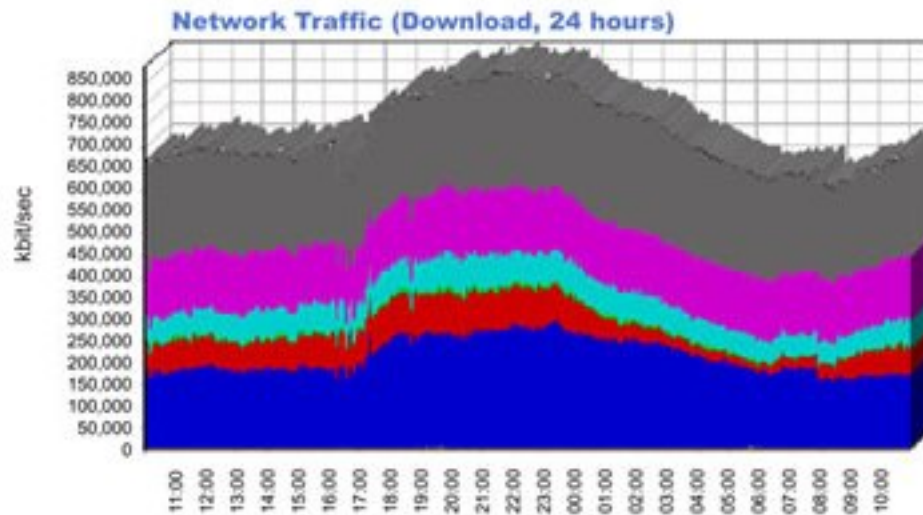
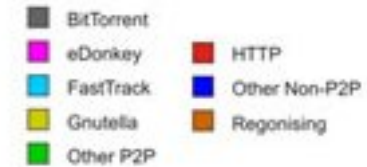


# Core-Stateless Fair Queueing



# CacheLogic, 2004

- Peer-to-Peer is the single largest consumer of data on ISP's networks
- Peer-to-Peer traffic significantly outweighs web traffic
- Peer-to-Peer traffic is continuing to grow

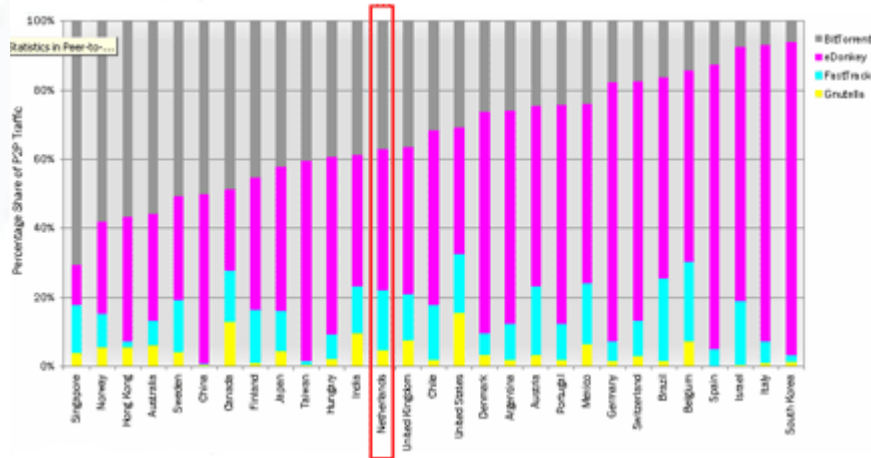
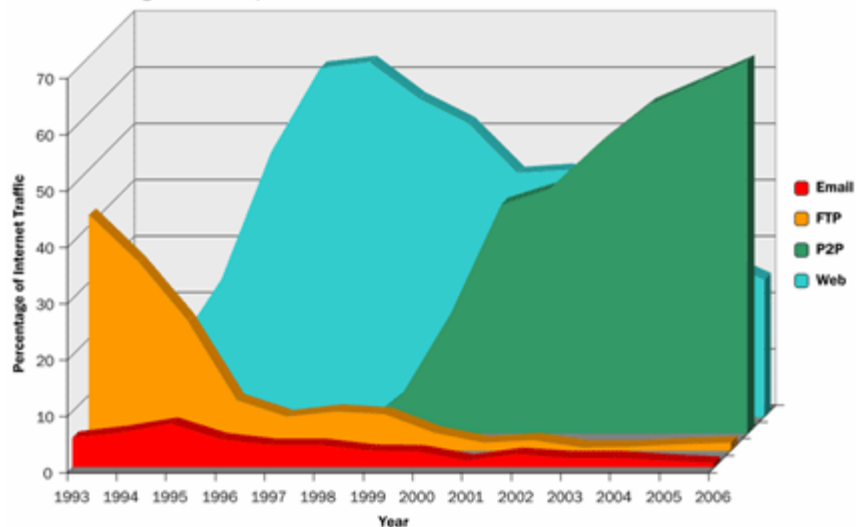


Source | StreamSight 510 deployed in a Tier 1 ISP

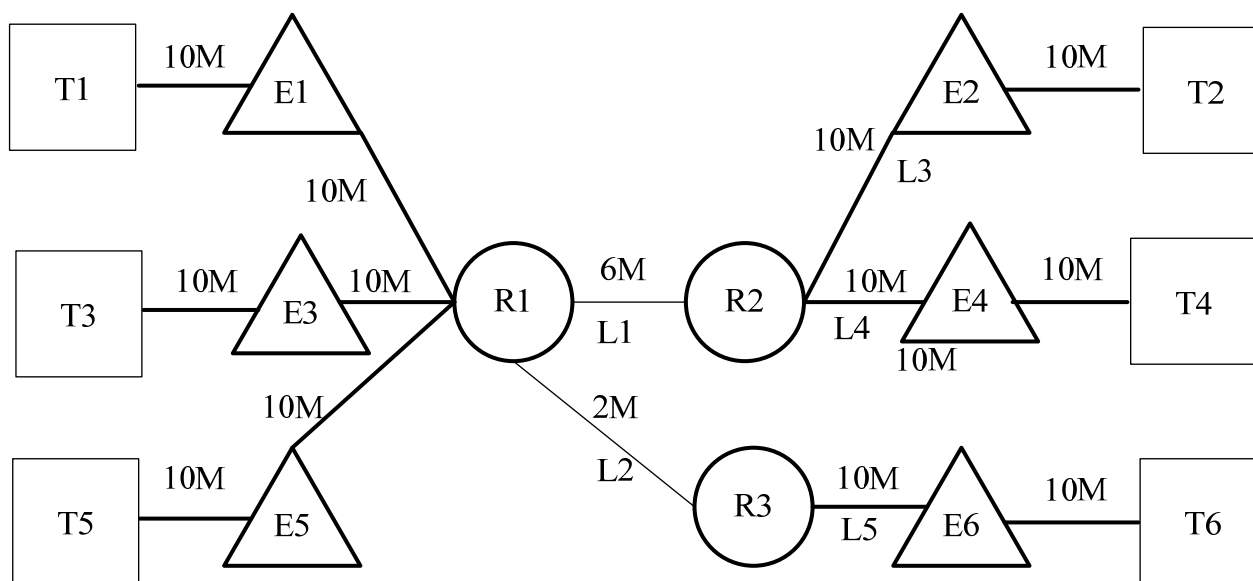


# P2P Traffic in 2005

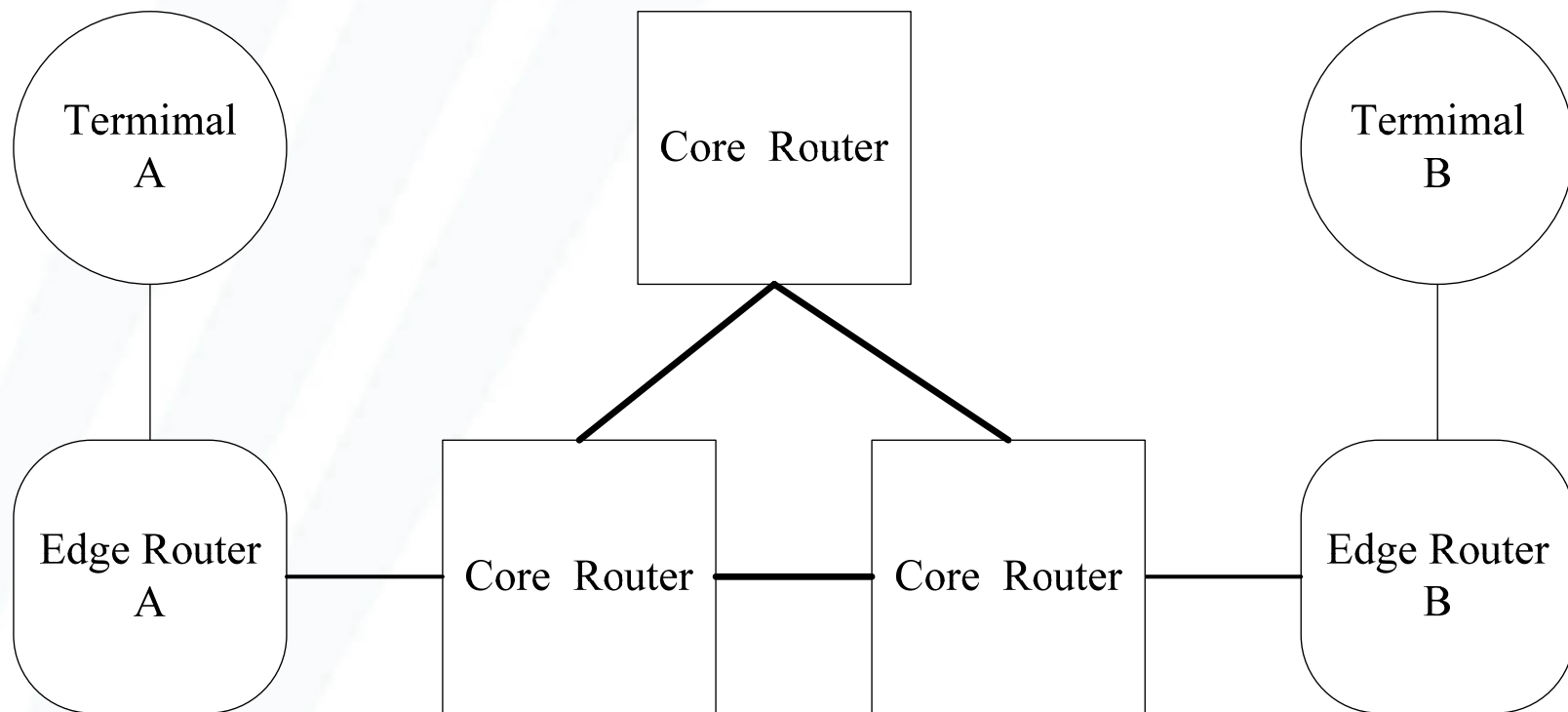
CacheLogic Research | Internet Protocol Trends 1993 to 2006



# The Fair Defect of CSFQ



# The Architecture of TBCC



# The Intelligent Terminal

## Terminal

The Transport Layer

The Internet Layer

The Congestion-  
Information Database

Congestion Item

source address

destination address

host\_tkpath

host\_tkback

sent  
Packet

Received  
Packet

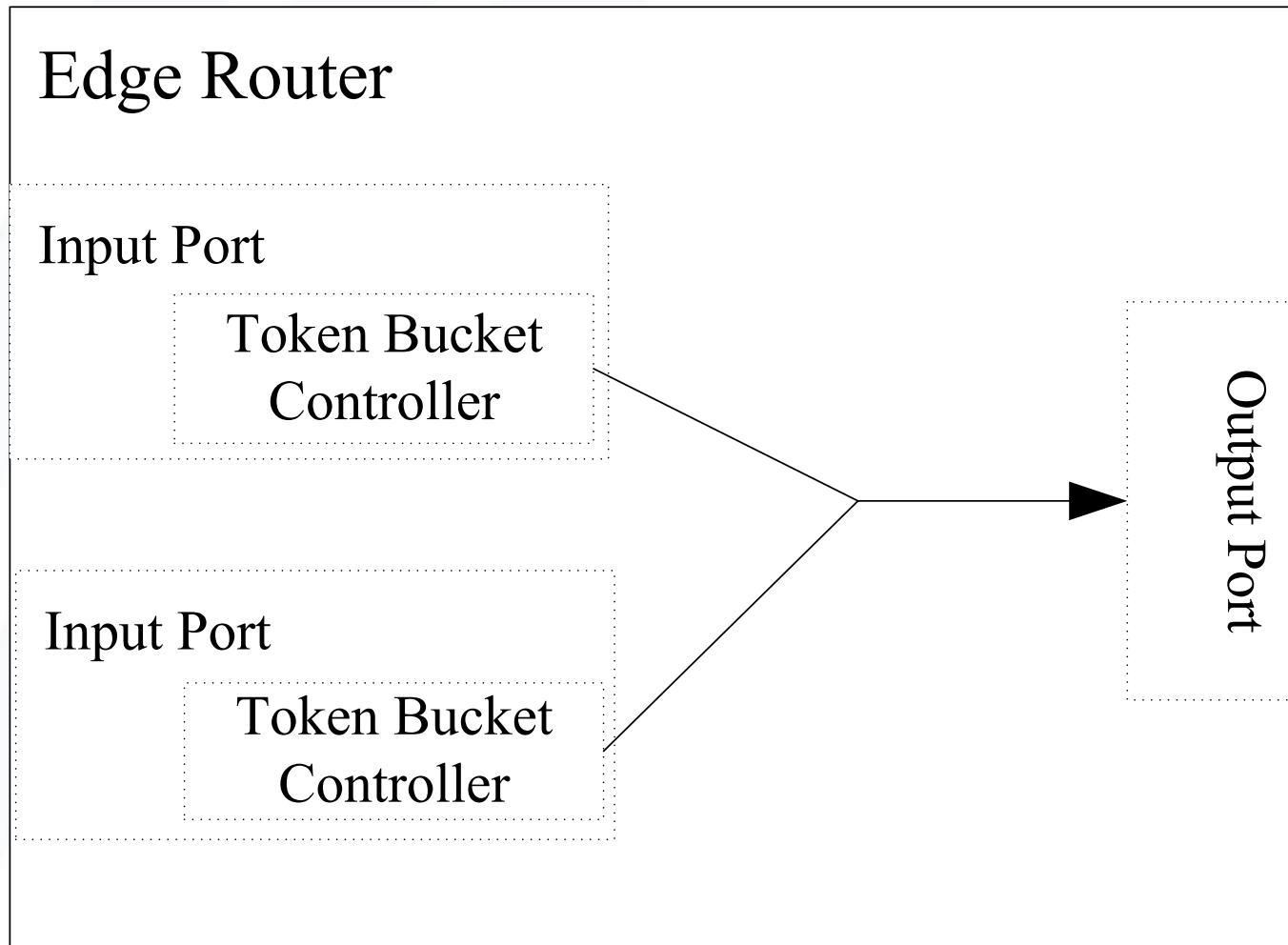
The Host-to-Network Layer

Token Bucket Shaper

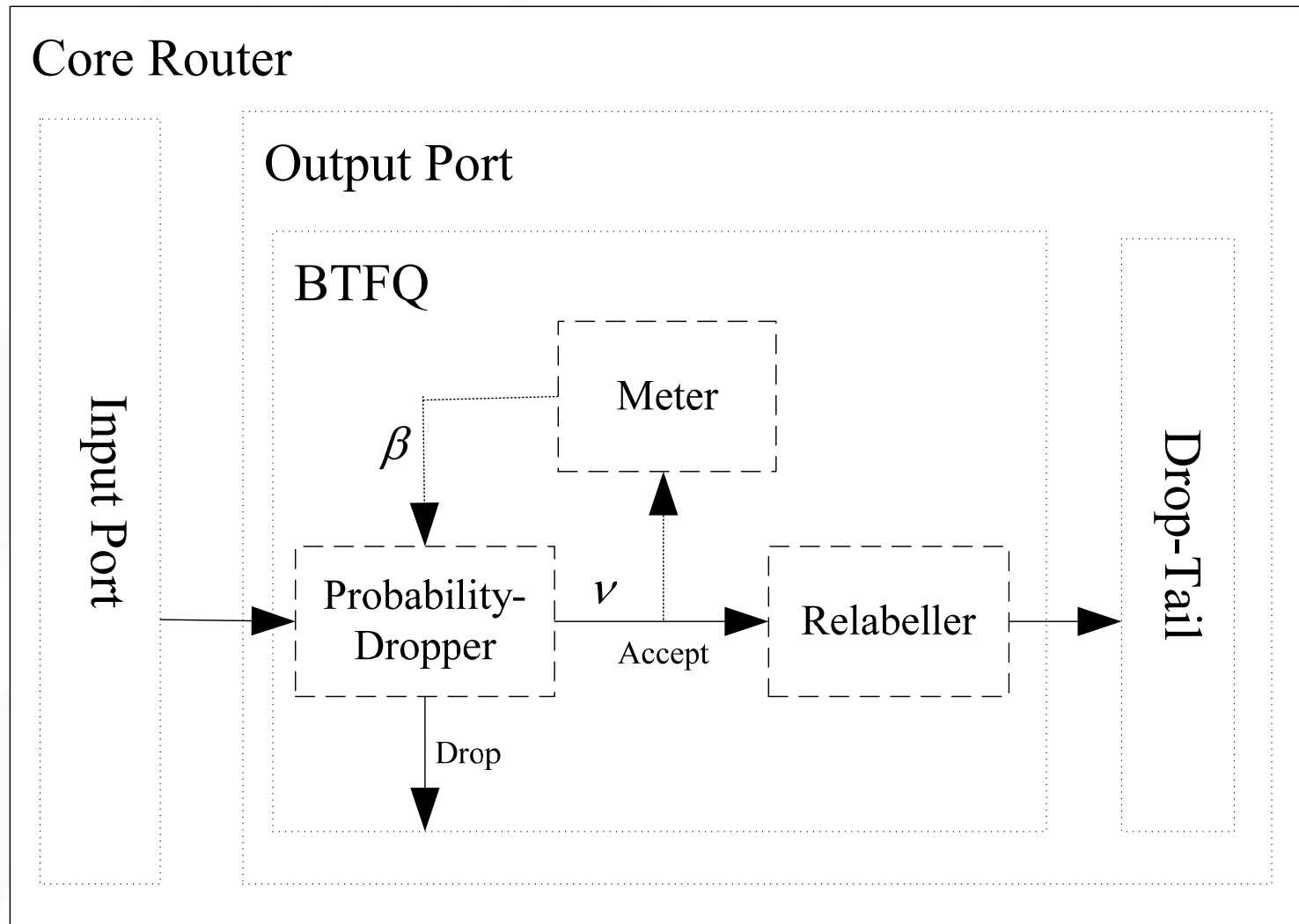




# The Edge Router



# The Core Router



- The fair drop probability *prob*

$$prob = 1 - \omega \times \gamma / \beta$$

- The updating algorithm of congestion level

$$\beta' = \beta * v / S$$



- For a flow with limited access token resource, there is an unique optimal solution to label the Token-Level of sent packet for achieving best throughput, which is equal to the *tkback* in the back-channel.
- For a Bit-Torrent application with limited access resource, it can achieve better throughput, but do not hurt the performance of networks.

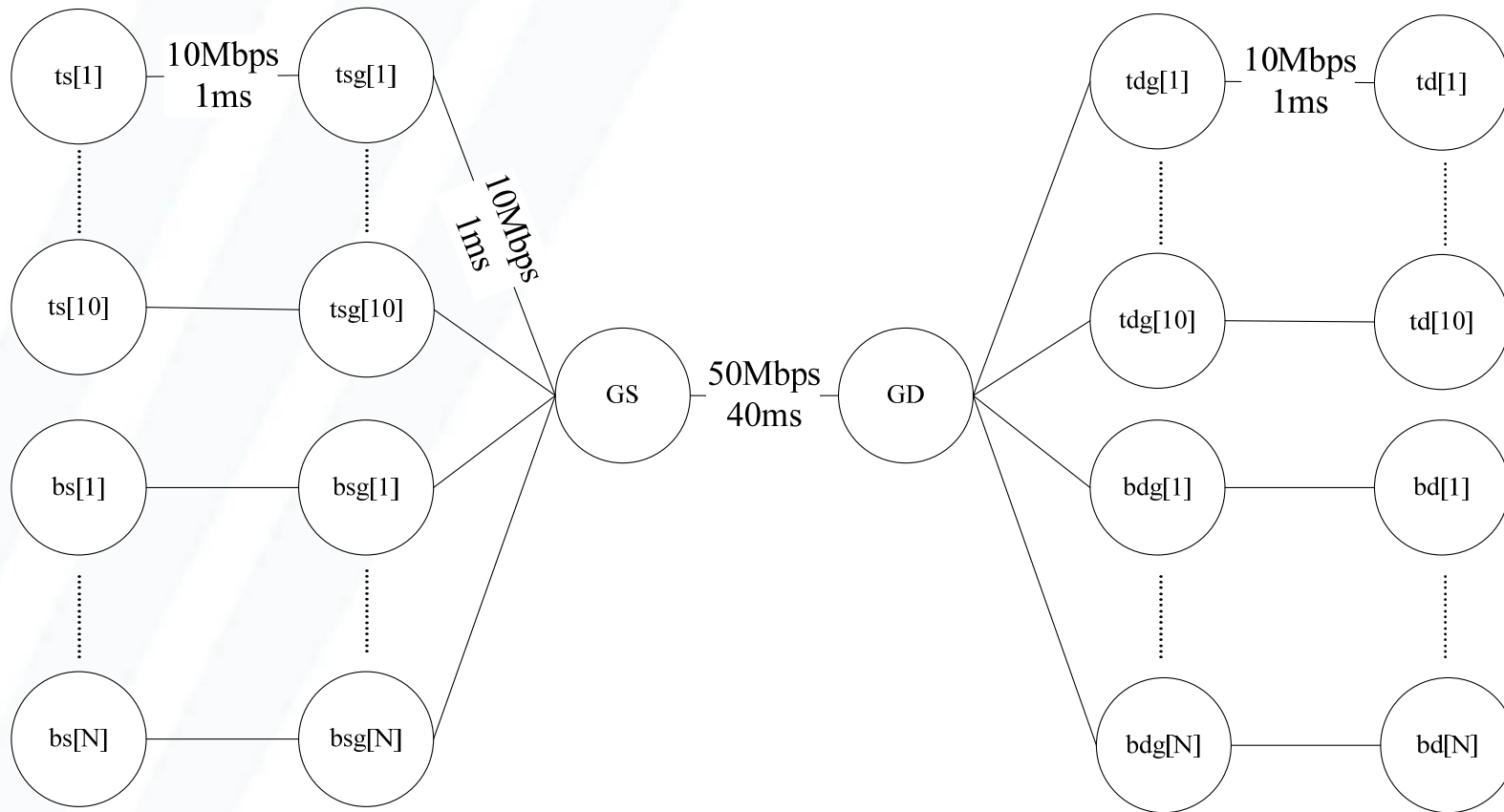


# The Comparison of CSFQ & TBCC

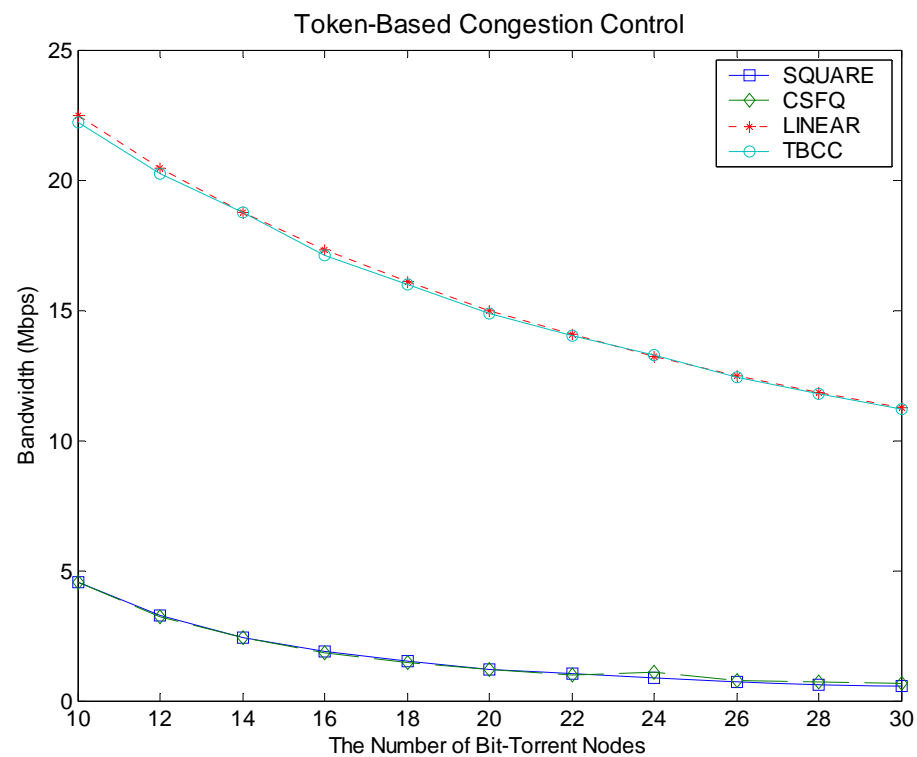
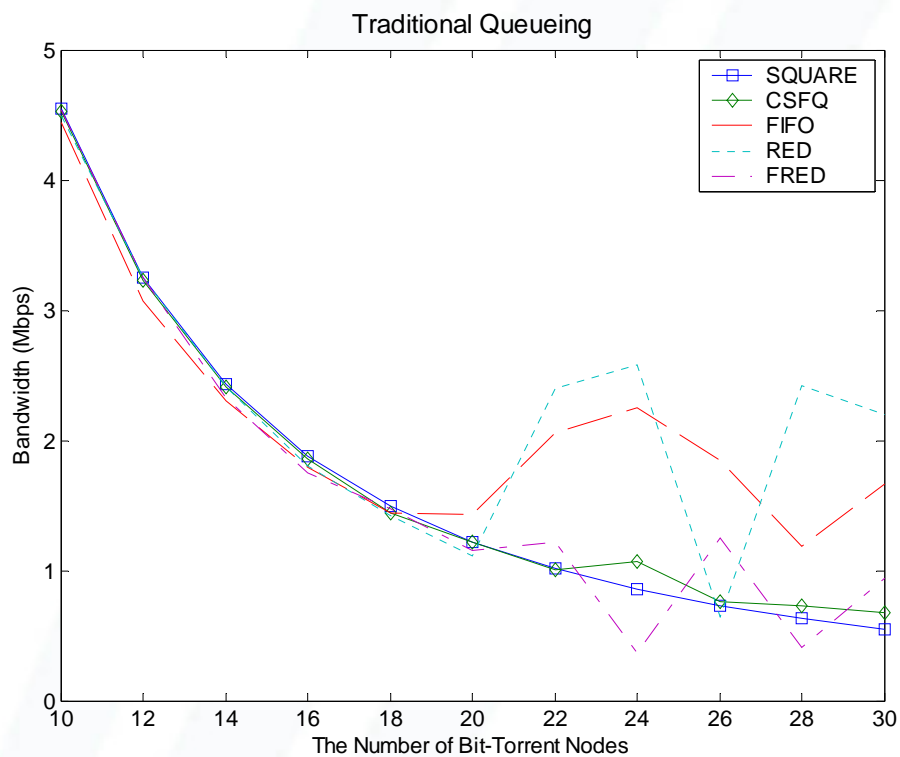
Device	CSFQ	TBCC
Intelligent Terminal	—	Label Shape
Edge Router	Classify Measure Label	Police
Core Router	Measure Drop Relabel	Measure Drop Relabel



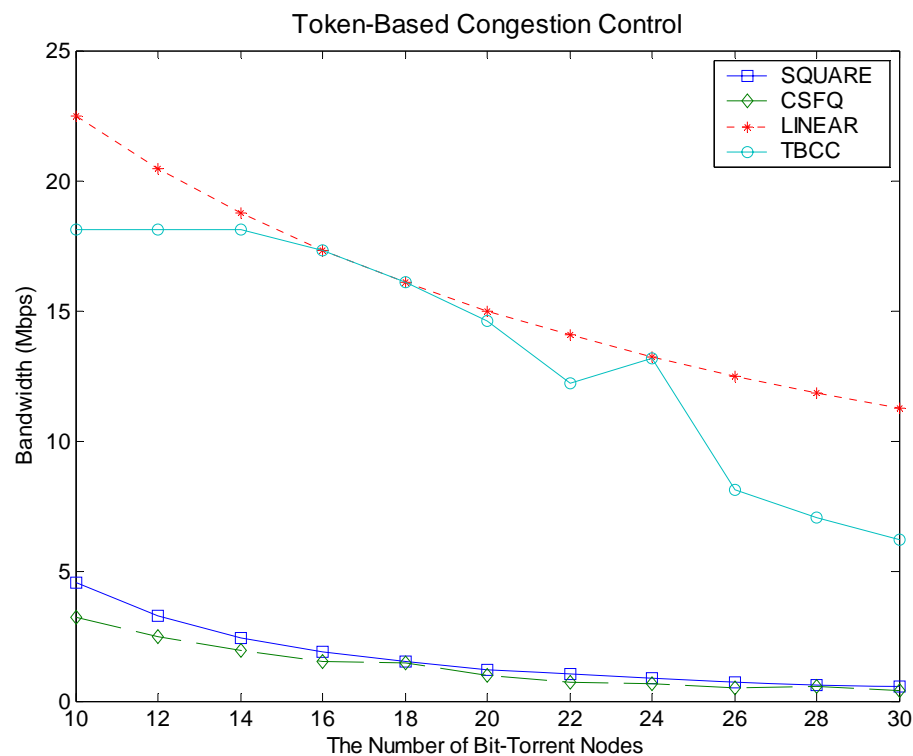
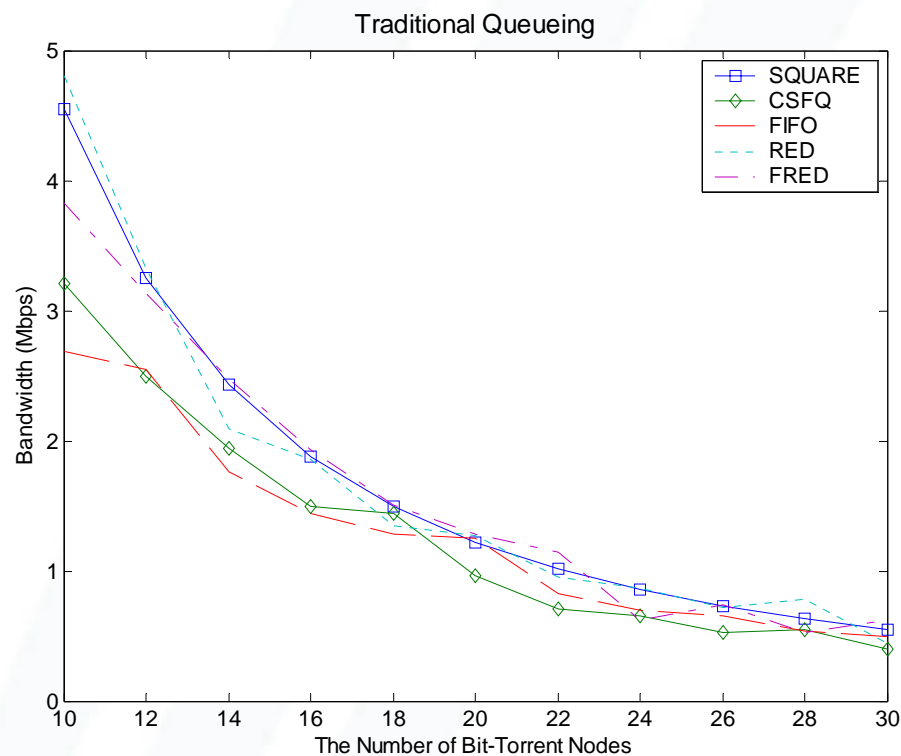
# The Topology of Simulation



# Simulator Results Based on UDP



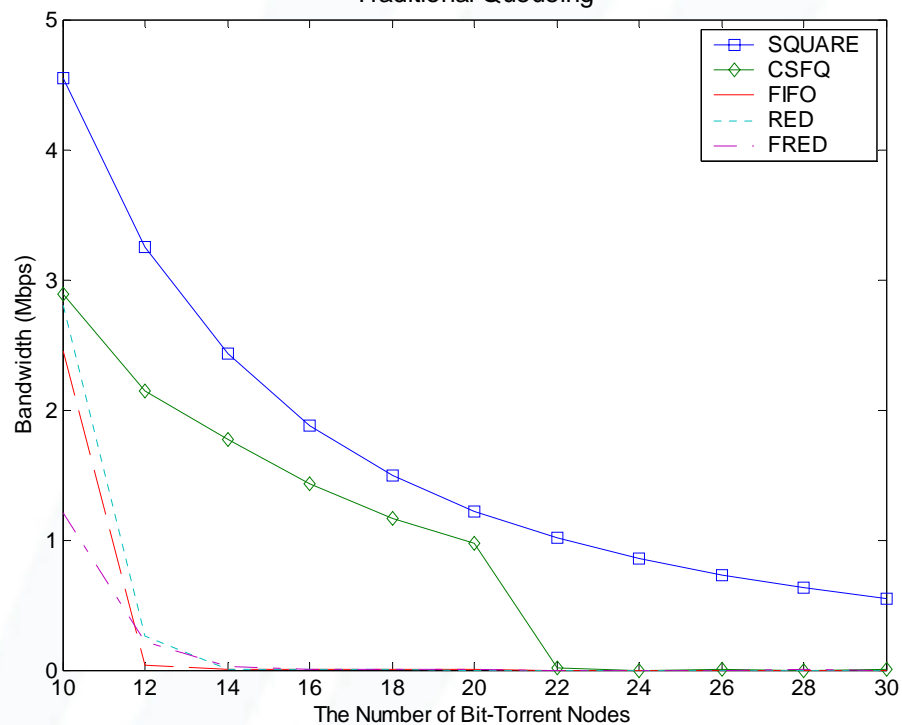
# Simulator Results Based on TCP



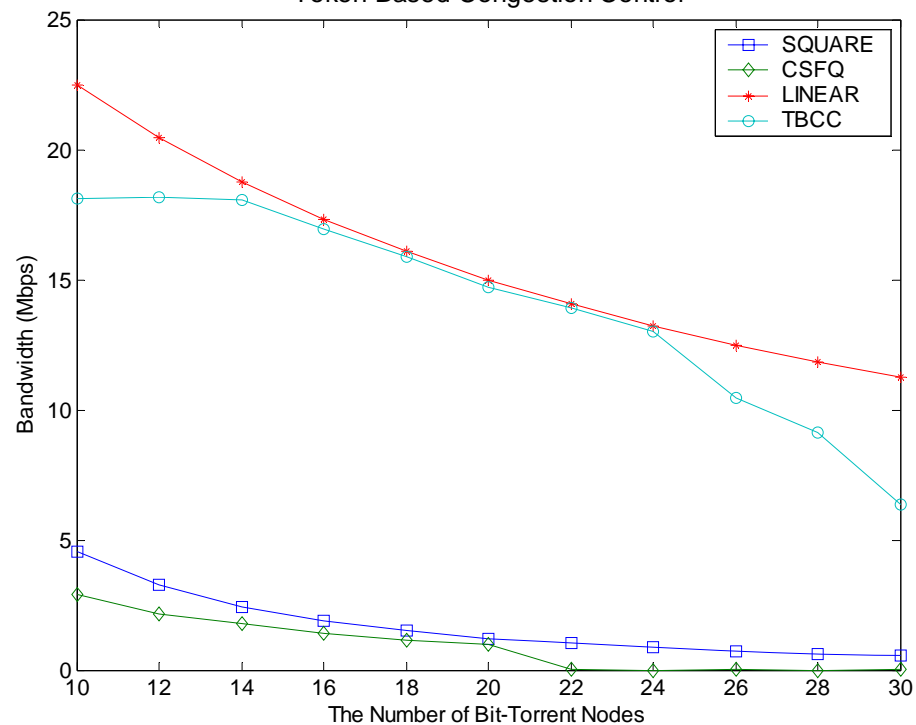


# Simulator Results Based on TCP & UDP

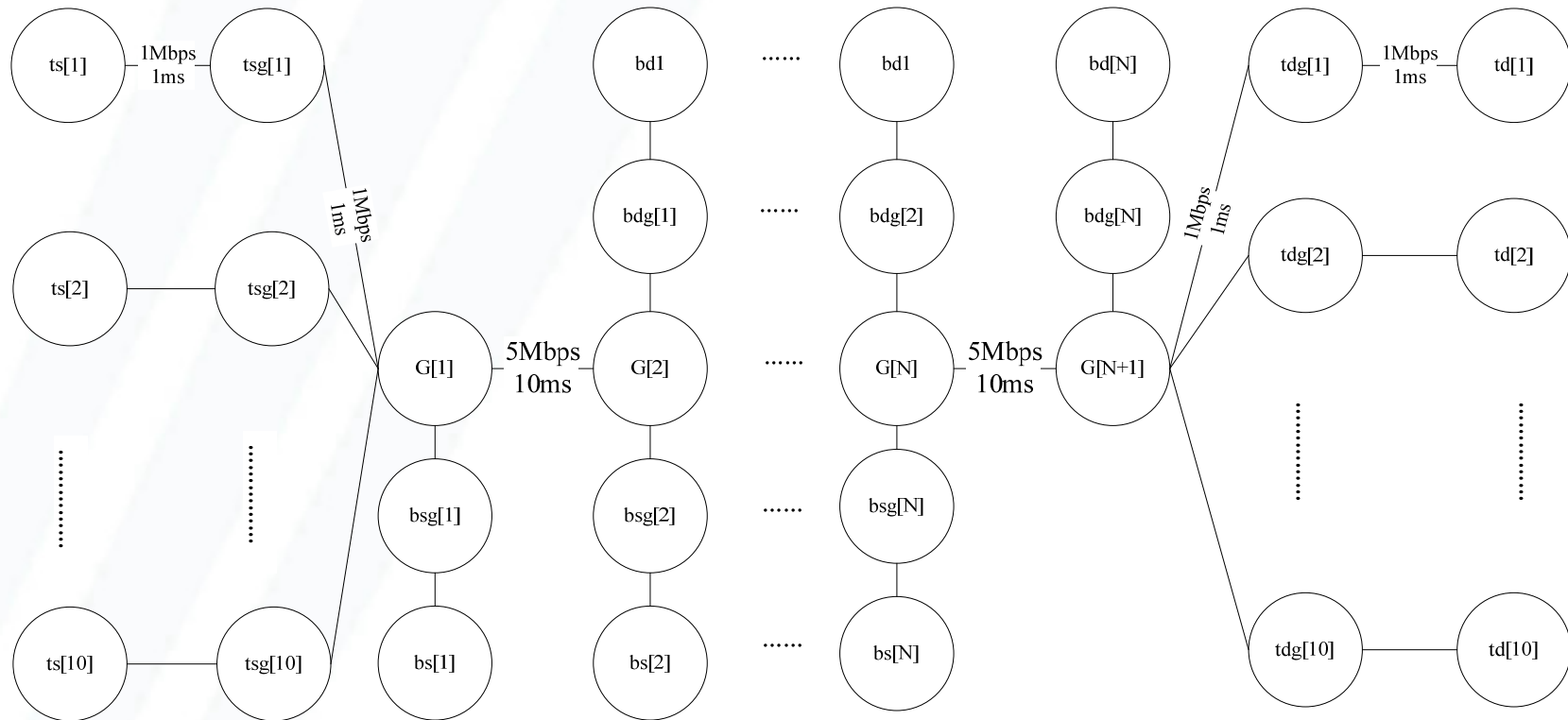
### Traditional Queueing



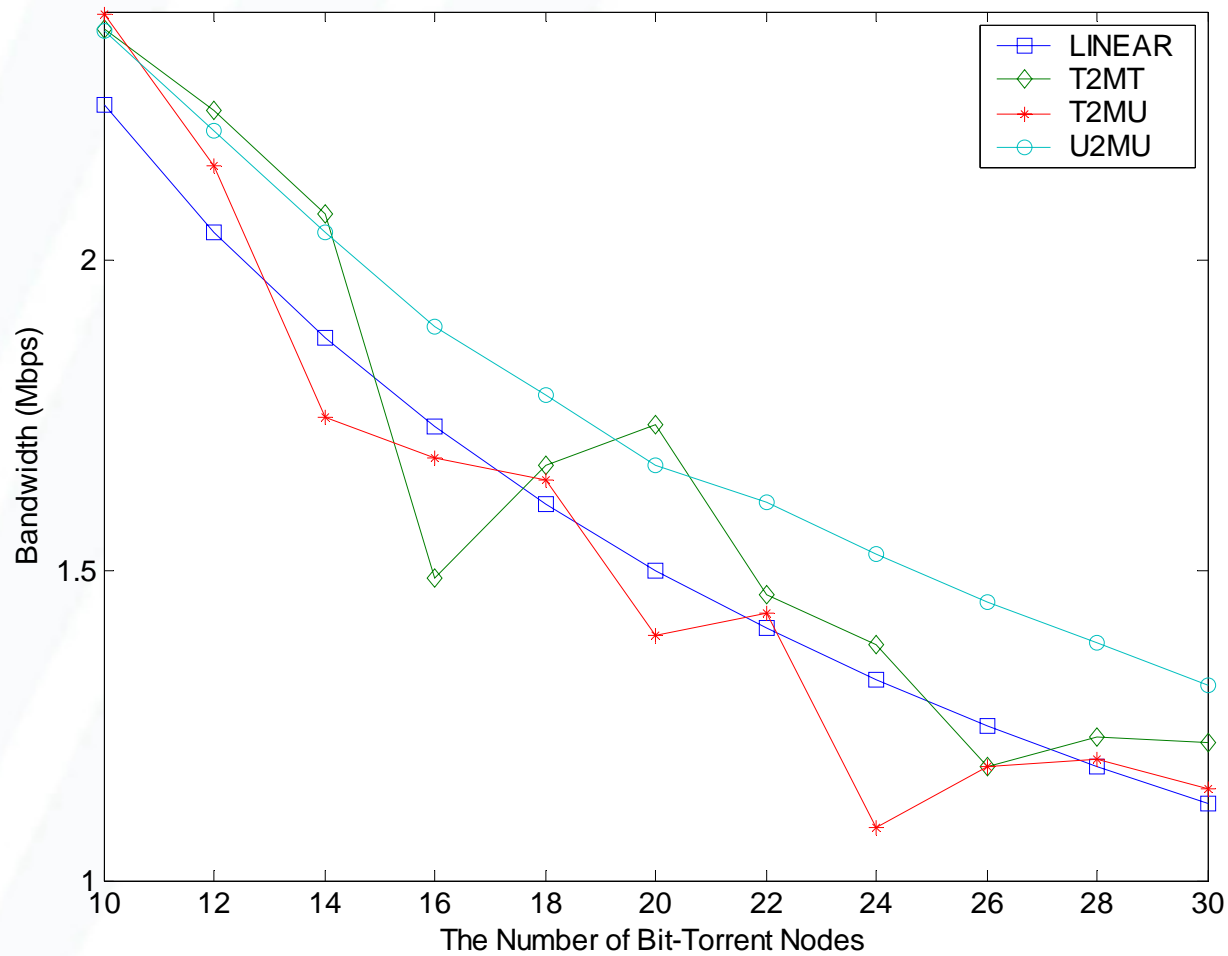
### Token-Based Congestion Control



# Multiple Congestion Links



### Token-Based Congestion Control



THANKS

