



# S-38.180 – Quality of Service in the Internet

Exercise 3: Differentiated Services  
Based on Timo Viipuri's material  
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# Exercise Framework

- § *DiffServ-capable operator network* providing differentiated services for customers
- § Configurable *PHB-profiles* in core and edge routers
  - Through policing, scheduling and queue management
- § Customers using *applications* with different QoS requirements
  - Mapped to appropriate service classes



## Goals of the Exercise

- § To see how well different *applications* operate using DiffServ mechanisms
  - By experimenting with various PHB-profile configurations
- § To *identify PHB configurations* that best meet technical and economic goals
- § To discover *possible problems* in DiffServ mechanisms



# Assignment

§ Exercise consists of two parts:

- ***Simulation***

- Run the simulations
- Analyze the results

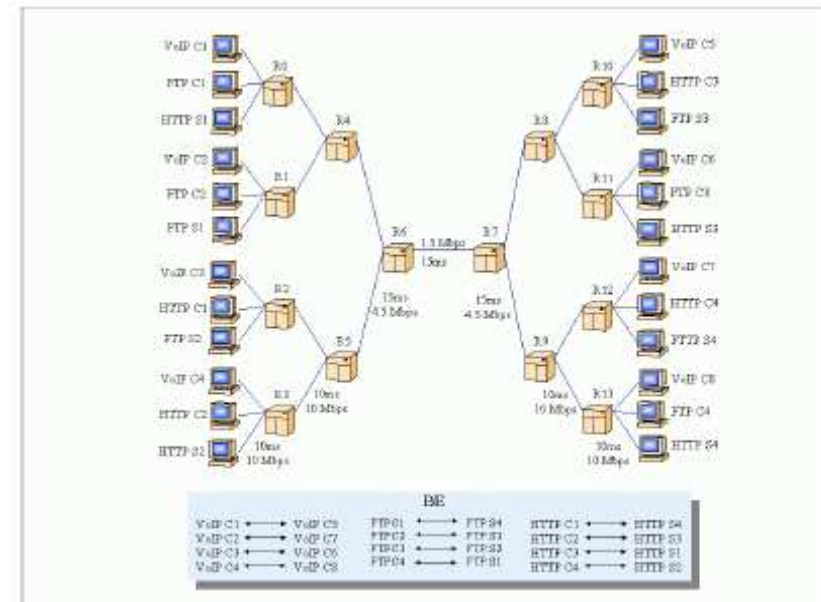
- ***Report***

- Evaluate problems and possibilities of DiffServ
- Base your analysis on simulation results, not only on your general knowledge about DiffServ

§ ***Note:*** Tasks should not be divided within a pair, you must take part in simulation, analysis and writing the report

# Simulation Topology

- § Symmetrical topology with one bottleneck
- § Same amount of clients and servers on both sides of the network (VoIP, FTP, HTTP)





# Simulation Scenarios

## § *Five scenarios*

- In each scenario, every communication pair is assigned to a certain *PHB-class*
  - BE, AF, EF
- *PHB behaviors remain the same* among scenarios but PHB-class for a communication pair varies
  - Results in *different distributions of BE, AF and EF* classes among the communication pairs



# Simulation Scripts

- § *Download* the package *ex3\_scripts.tar.gz* from the course webpage
- § *Unzip* the package in your working directory
  - All necessary scripts will automatically go to the following new directories
    - 1\_BE\_BE\_BE
    - 2\_EF\_BE\_AF
    - 3\_EF\_AF\_BE\_mixed
    - 4\_EF\_AF\_BE\_uneven
    - 5\_BE\_AF\_EF



# Simulation Scripts

- § Five TCL-scripts will be provided in each directory:
- *diffnet.tcl*: controlling and running simulations
  - *2q2p.tcl*: configuring PHB-profiles
  - *peer\_setup.tcl*: configuring traffic sources
  - *topology.tcl*: setting up topology
  - *monitoring.tcl*: monitoring related procedures
- § Don't modify these scripts!
- Familiarize yourself with the code and run





# Simulation Analysis

§ *Record* from each scenario

- Throughput
- Average packet delay
- Packet loss ratio

§ These statistics can be obtained by sourcing *stats.scr* and *stats\_ext.scr* files

- *.scr* files use *.awk* files to compute statistics
- Remember to remove unnecessary *.mon* files after analysis to save quota



# Simulation Analysis

§ In the analysis, pay attention to following questions:

- What was the *application performance* in each scenario and why?
- Could the scenarios be *applied to real networks*?
  - What would be the motivation for such a scenario?



# Report

§ ***Based on your observations*** from the simulations

- Discuss the ***pros and cons*** of DiffServ from ISP's and customer's point of view
- Take into account both ***technical*** and ***economic*** approach

§ ***Material***

- Lectures
- Timo Viipuri's DiffServ documentation in course web-page
- Internet

§ ***Length:*** 1-2 pages



# Handout Requirements

§ Deadline: December xxx, at 16 o'clock

- However, it is recommended to return the exercise before the next exercise session

§ Grading:

- Excellent/Good/Satisfactory/Fail

§ Returning the report:

- By e-mail (in pdf) to: [jmanti3@netlab.tkk.fi](mailto:jmanti3@netlab.tkk.fi)
- In the course locker in G-wing, second floor