

«MODELING AND ANALYSIS OF THE TRICKLES PROTOCOL»

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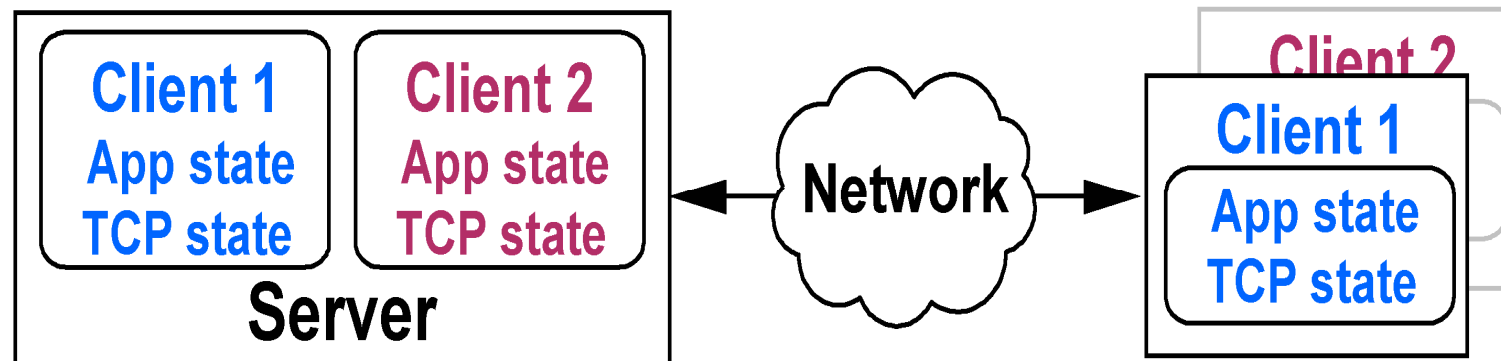
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STATE PLACEMENT IS IMPORTANT

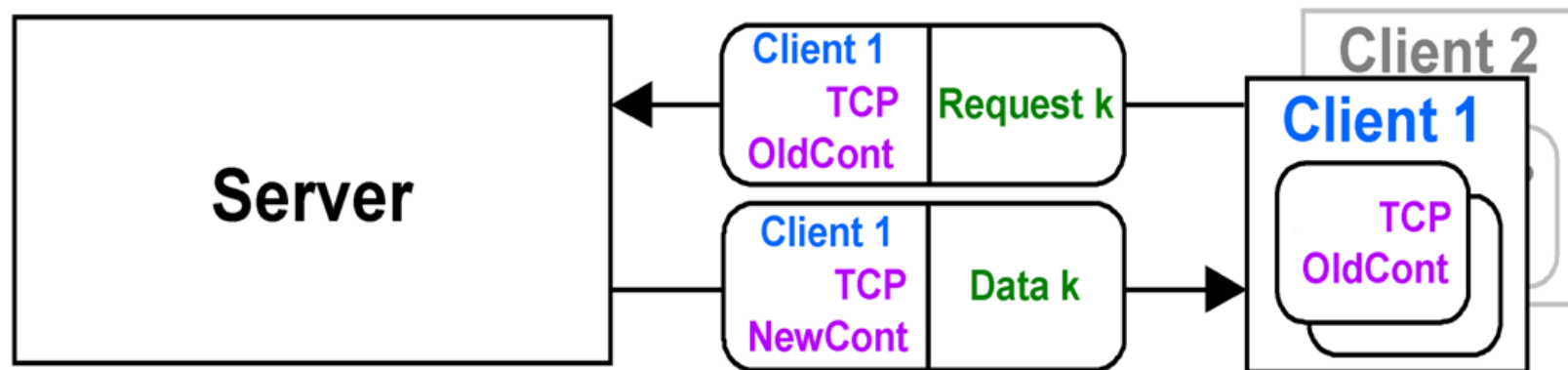
In typical network connection, both servers and clients hold per-connection state

- Requires resources
- Limits number of clients
- Increases vulnerability of server



TRICKLES APPROACH

- Make one end stateless
- Migrate all state to client, recreate state at server via continuations
 - Encapsulate server state
 - Piggyback on request and data packets



NETWORK SIMULATOR (NS2)

C++:

- high performance;
- work with packets on low abstraction model level;
- modifications in ns2 kernel

Tcl/Tk:

- simple syntax
- easily build a simulation scenario
- ability to connect network blocks

Central concept of transport layer protocol modeling is Agent.

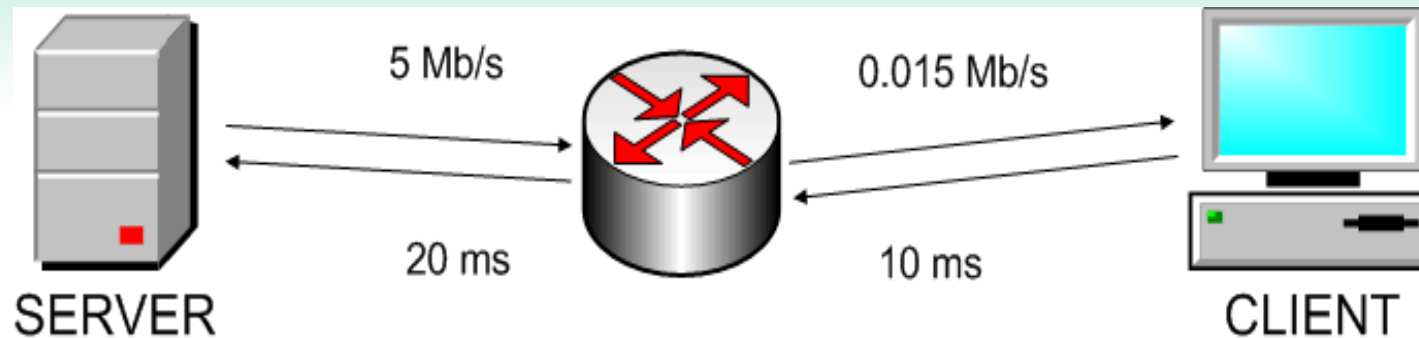


IMPLEMENTATION WORKFLOW OF A NEW PROTOCOL

- Create structures to model a new packet
- Inherit a new Agent class from a standard Agent class and reimplement following methods:
receive()/send() packet, timeout(), command(),
bind() and trace()
- Recompile ns2 kernel



SIMPLE EXPERIMENT IN NS2



```
set ns [new Simulator]
set f [open out.tr w]
$ns trace-all $f
....
set n0 [$ns node]
...
$ns duplex-link $n0 $n1 5Mb 20ms DropTail
$ns duplex-link $n1 $n2 0.015Mb 10ms DropTail
...
$ns at 1.0 "$tclient start"
$ns at 30.0 "finish"
proc finish {} { .....
}
$ns run
```



SIMPLE EXPERIMENT IN NS2

```
.....  
r 9.568355 0 1 TricklesTP 1115 ----- 0 0.0 2.0 24 38  
+ 9.568355 1 2 TricklesTP 1115 ----- 0 0.0 2.0 24 38  
-10.033301 1 2 TricklesTP 1115 ----- 0 0.0 2.0 17 25  
r 10.043301 1 2 TricklesTP 1115 ----- 0 0.0 2.0 16 23  
+ 10.043301 2 1 TricklesTP 127 ----- 0 2.0 0.0 16 39  
- 10.043301 2 1 TricklesTP 127 ----- 0 2.0 0.0 16 39  
r 10.121035 2 1 TricklesTP 127 ----- 0 2.0 0.0 16 39  
+ 10.121035 1 0 TricklesTP 127 ----- 0 2.0 0.0 16 39  
- 10.121035 1 0 TricklesTP 127 ----- 0 2.0 0.0 16 39  
r 10.141238 1 0 TricklesTP 127 ----- 0 2.0 0.0 16 39  
+ 10.141238 0 1 TricklesTP 1115 ----- 0 0.0 2.0 25 40  
- 10.141238 0 1 TricklesTP 1115 ----- 0 0.0 2.0 25 40  
r 10.163022 0 1 TricklesTP 1115 ----- 0 0.0 2.0 25 40  
+ 10.163022 1 2 TricklesTP 1115 ----- 0 0.0 2.0 25 40  
- 10.627968 1 2 TricklesTP 1115 ----- 0 0.0 2.0 18 27  
r 10.637968 1 2 TricklesTP 1115 ----- 0 0.0 2.0 17 25  
.....
```



CONCLUSION

- Distributed state of TCP and its disadvantages
- Trickles approach
- Model in network simulator (ns2)



Thank you for your attention!

