CN-SIM: A qualitative comparison of PAUSE, BCN(0,0), and BCN-Max

Davide Bergamasco

Objective

- Compare from a purely qualitative standpoint the following mechanisms:

  Pause

  Pause + BCN(0,0)

  Pause + BCN-Max

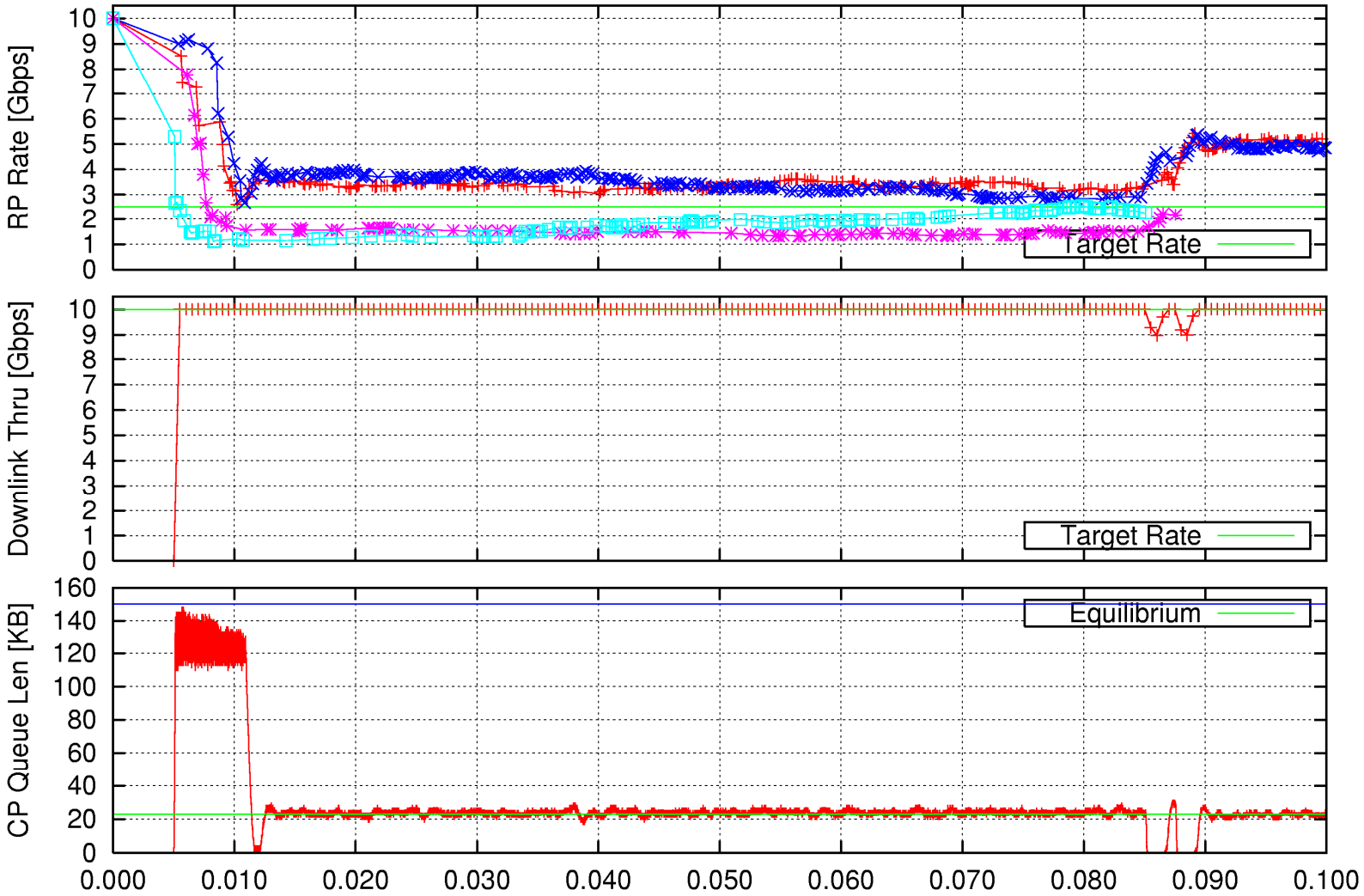
- Simulation Environment

  Topology, workload, configuration, and parameters as per Baseline Simulation Scenario

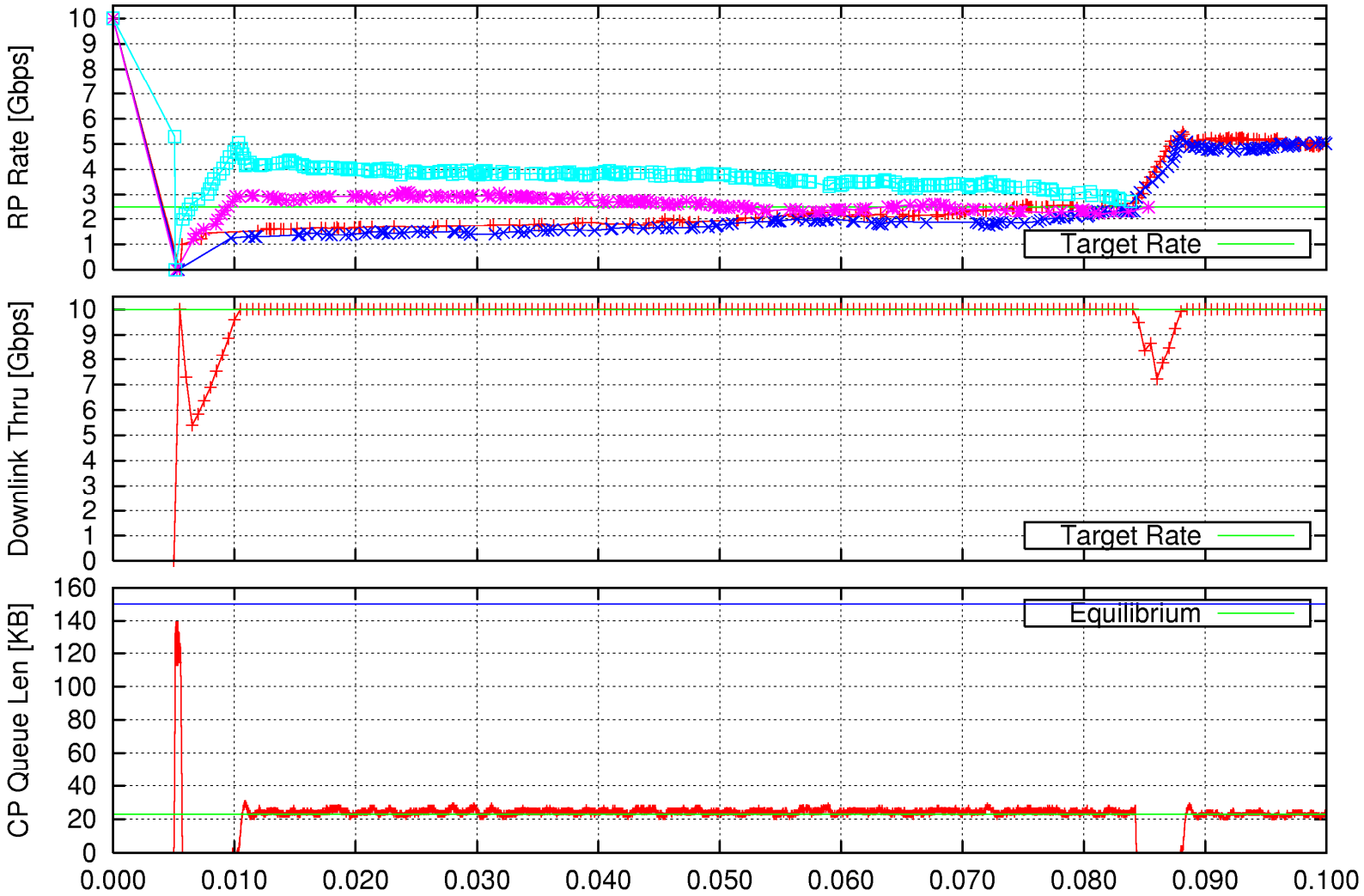
Pause and Pause + BCN(0,0)

- Both mechanisms have already been defined and studied in the Baseline Simulation Scenario
- Simulation results are repeated in this document for ease of comparison

Pause


RP Rate [Gbps]
Target Rate
Downlink Thru [Gbps]
Target Rate
CP Queue Len [KB]
Equilibrium
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
0.080
0.090
0.100

Pause + BCN(0,0)

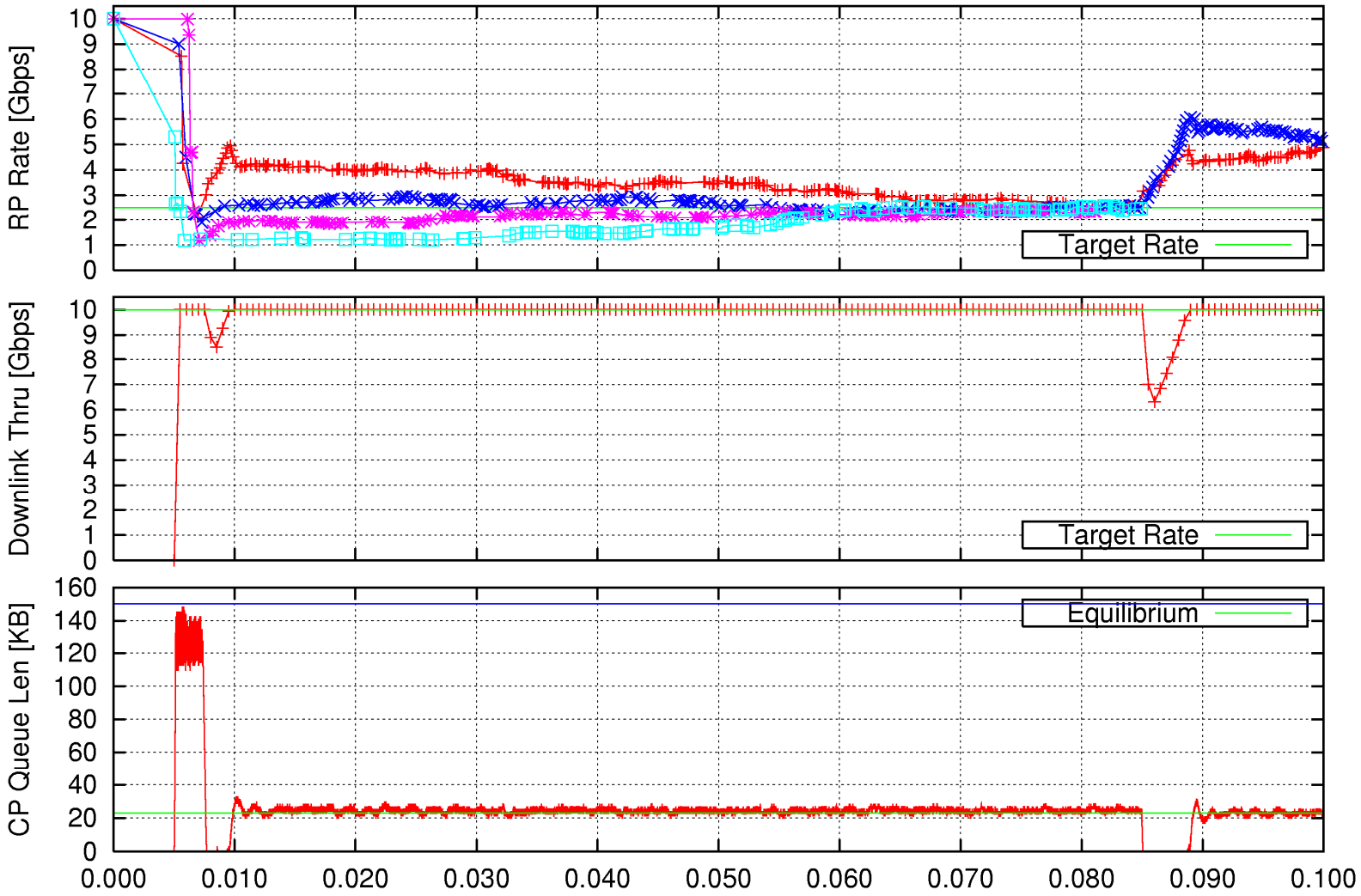

RP Rate [Gbps]
Target Rate
Downlink Thru [Gbps]
Target Rate
CP Queue Len [KB]
Equilibrium
0.000
0.010
0.020
0.030
0.040
0.050
0.060
0.070
0.080
0.090
0.100

BCN-Max (Maximum negative feedback)

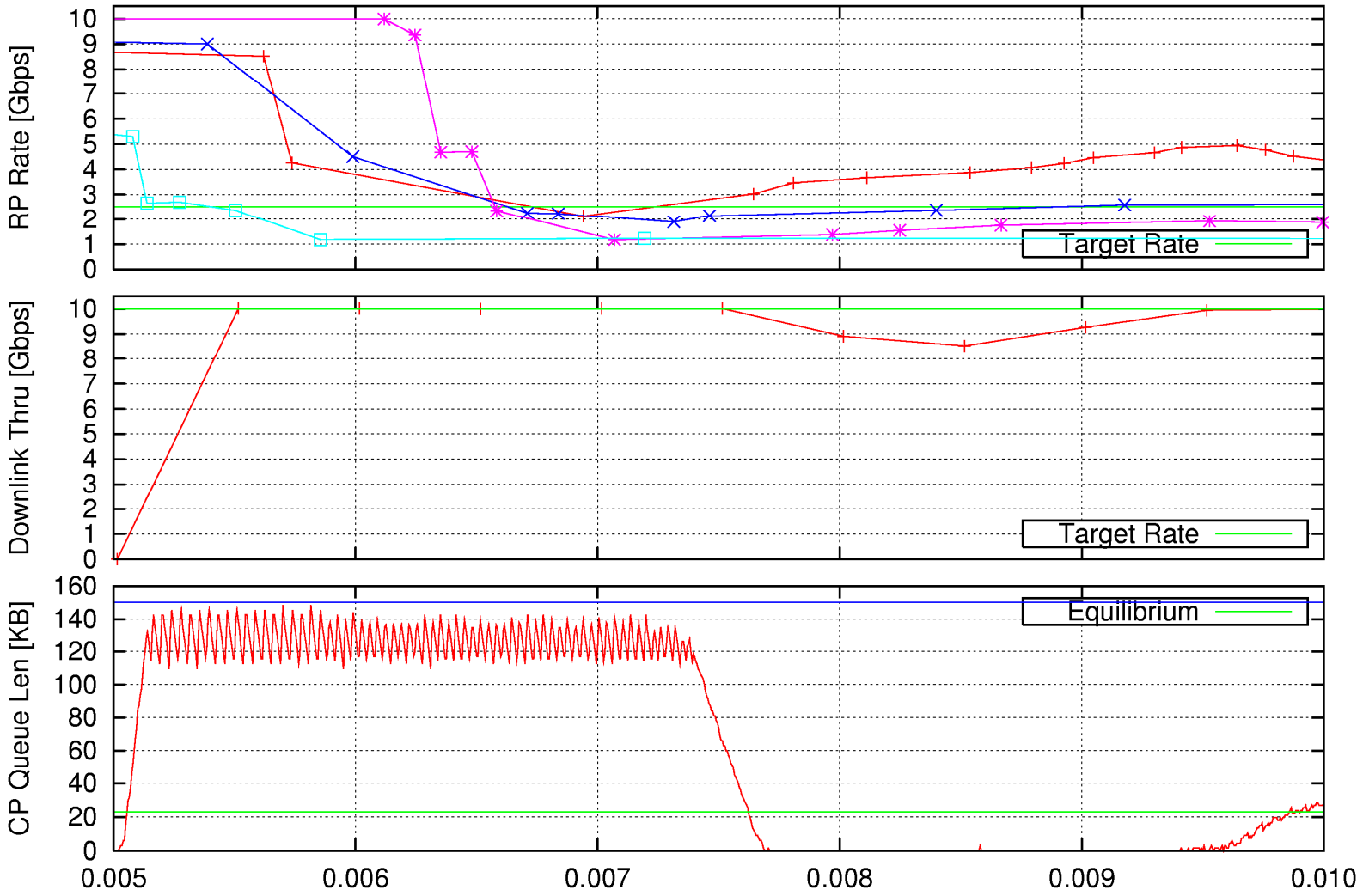
- Two flavors of BCN-Max
  1) When pause is asserted, turn any BCN(x,y) generated into the maximum negative feedback BCN(Qeq, 2*Qeq)
  2) Just like BCN(0,0) (i.e., trigger based on Qsc), but instead of sending BCN(0,0) send BCN(Qeq, 2*Qeq)
- Settings

  BCN(0,0) disabled

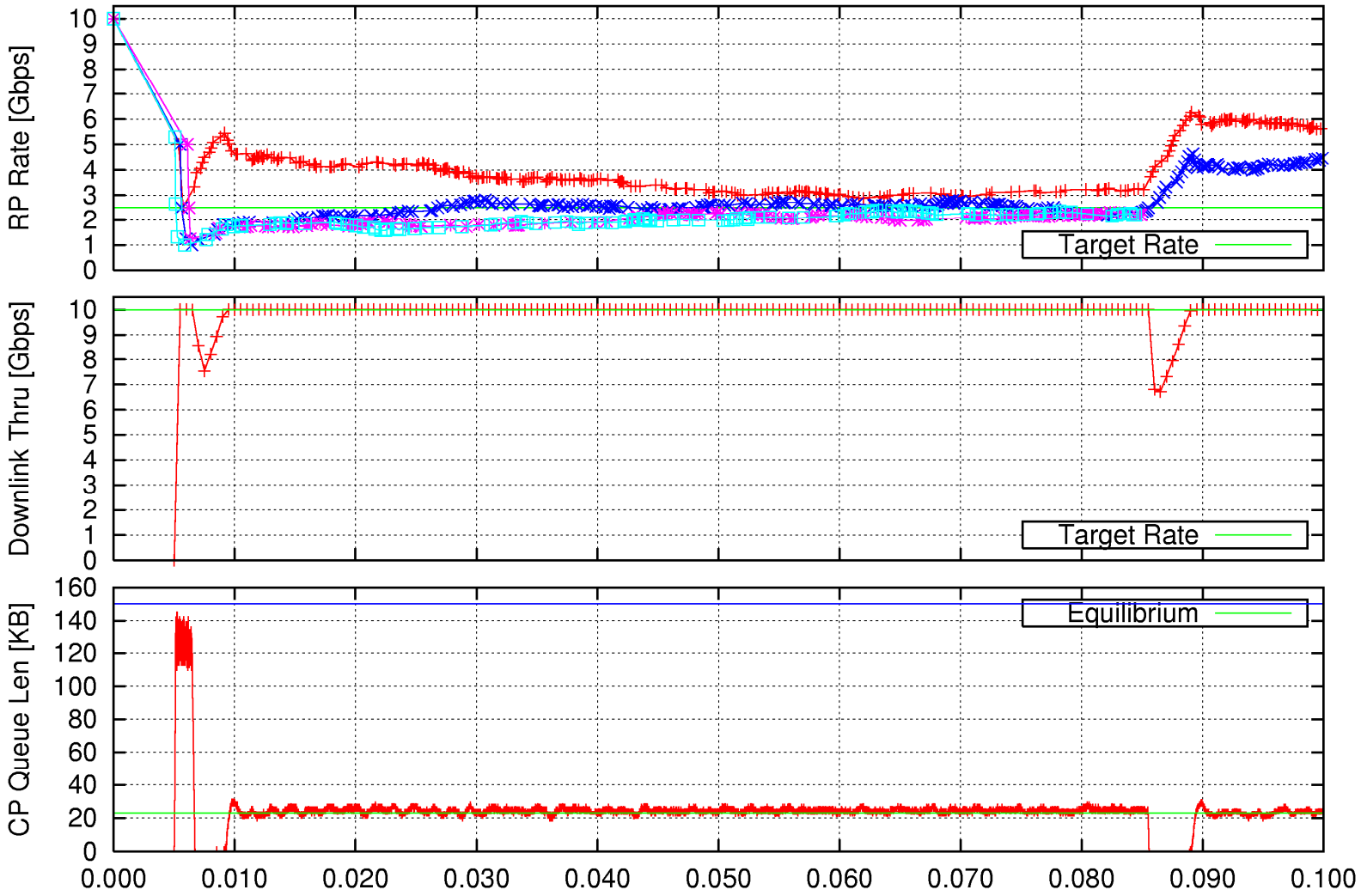
BCN-Max #1 (Pause-based)



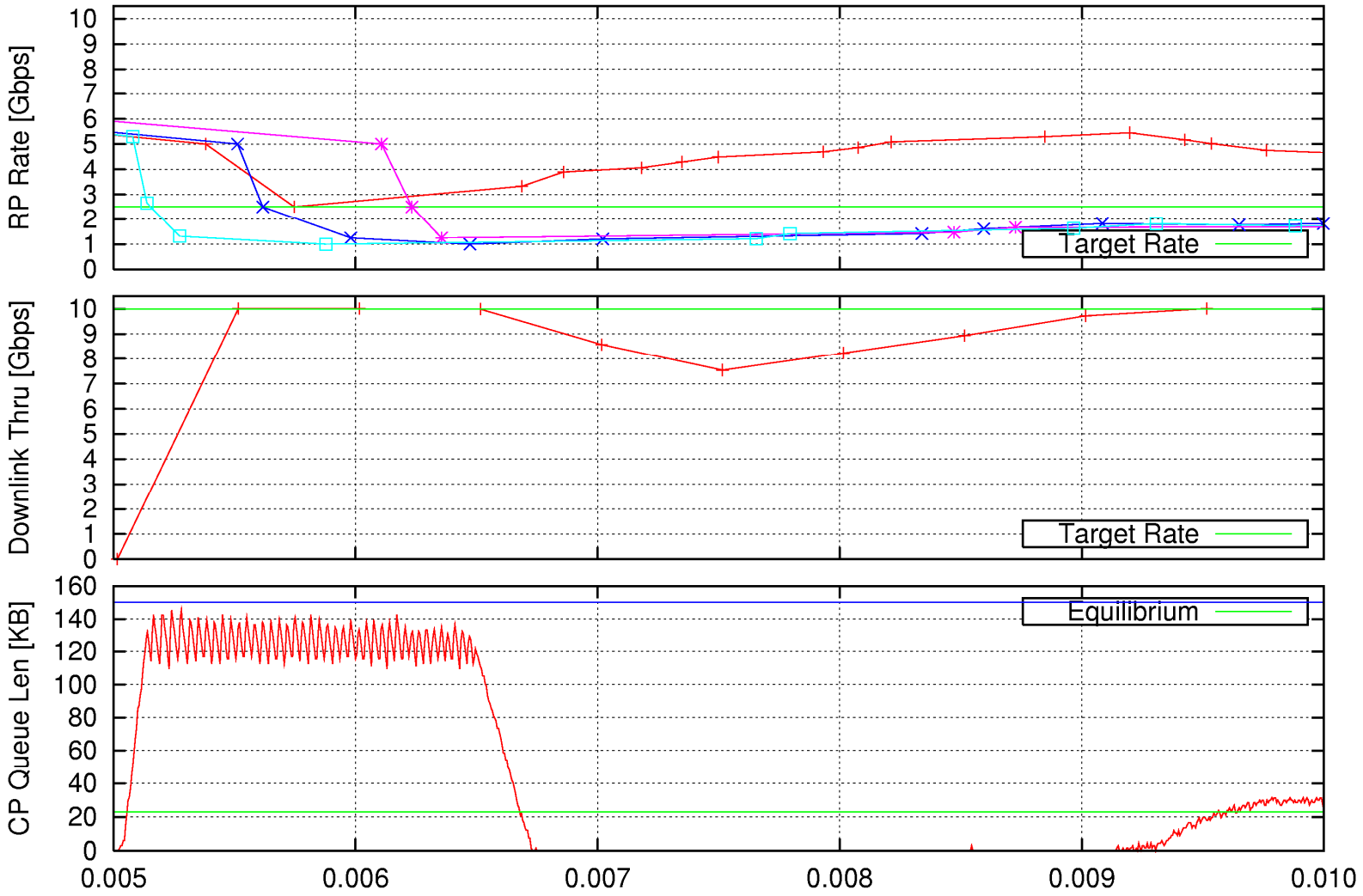
BCN-Max #1 (Pause-based)



BCN-Max #2 (Qsc-based)



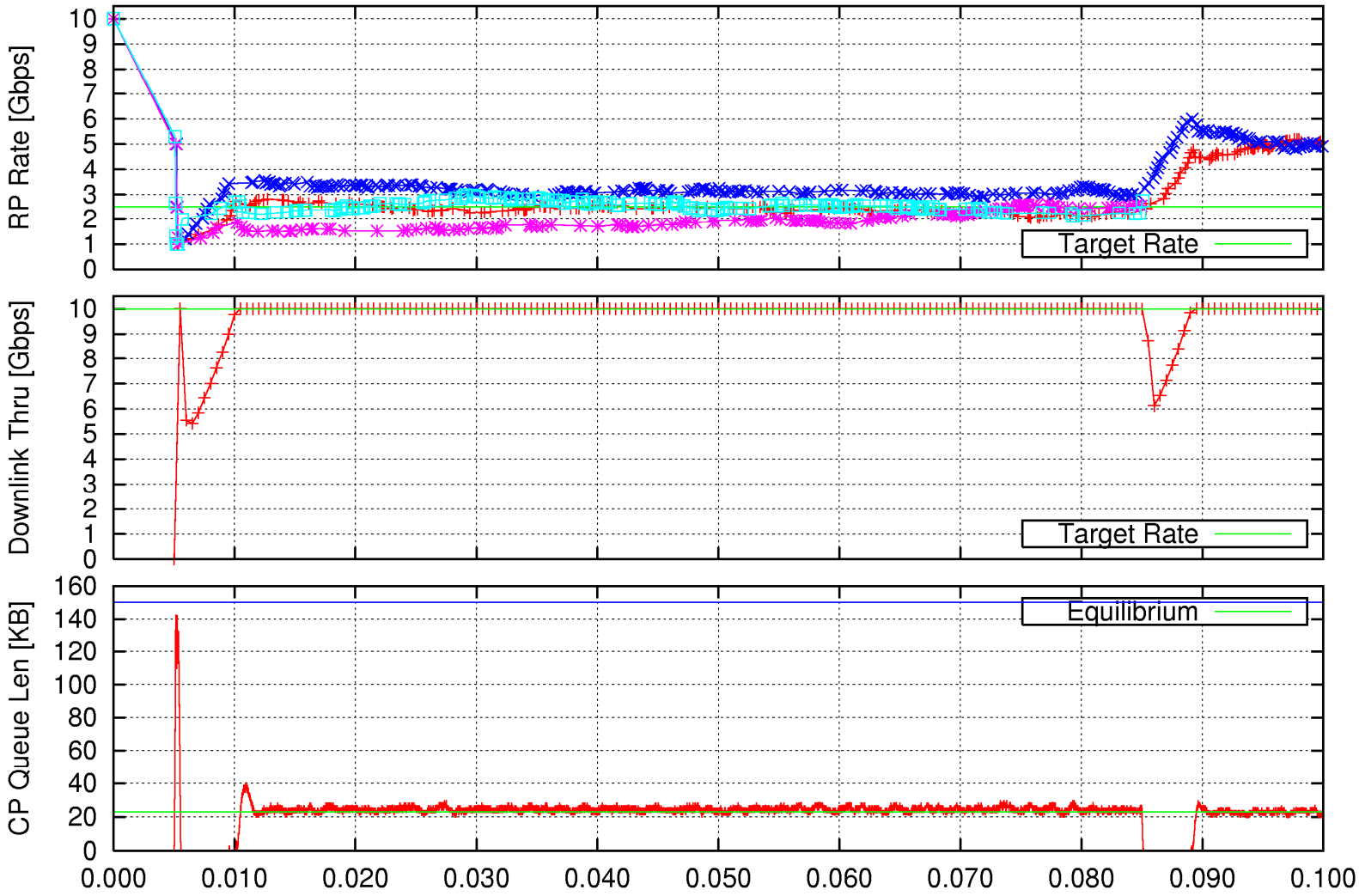
BCN-Max #2 (Qsc-based)



Speeding up positive transient response

- Even with BCN-Max response to positive transients still seems a bit slow
- This is due to the fixed (and low) sampling rate
- What if the sampling rate is increased during BCN-Max generation?
- Let's try to reduce the sampling interval by a scale factor *S* (e.g. 8) when Qlen > Qsc

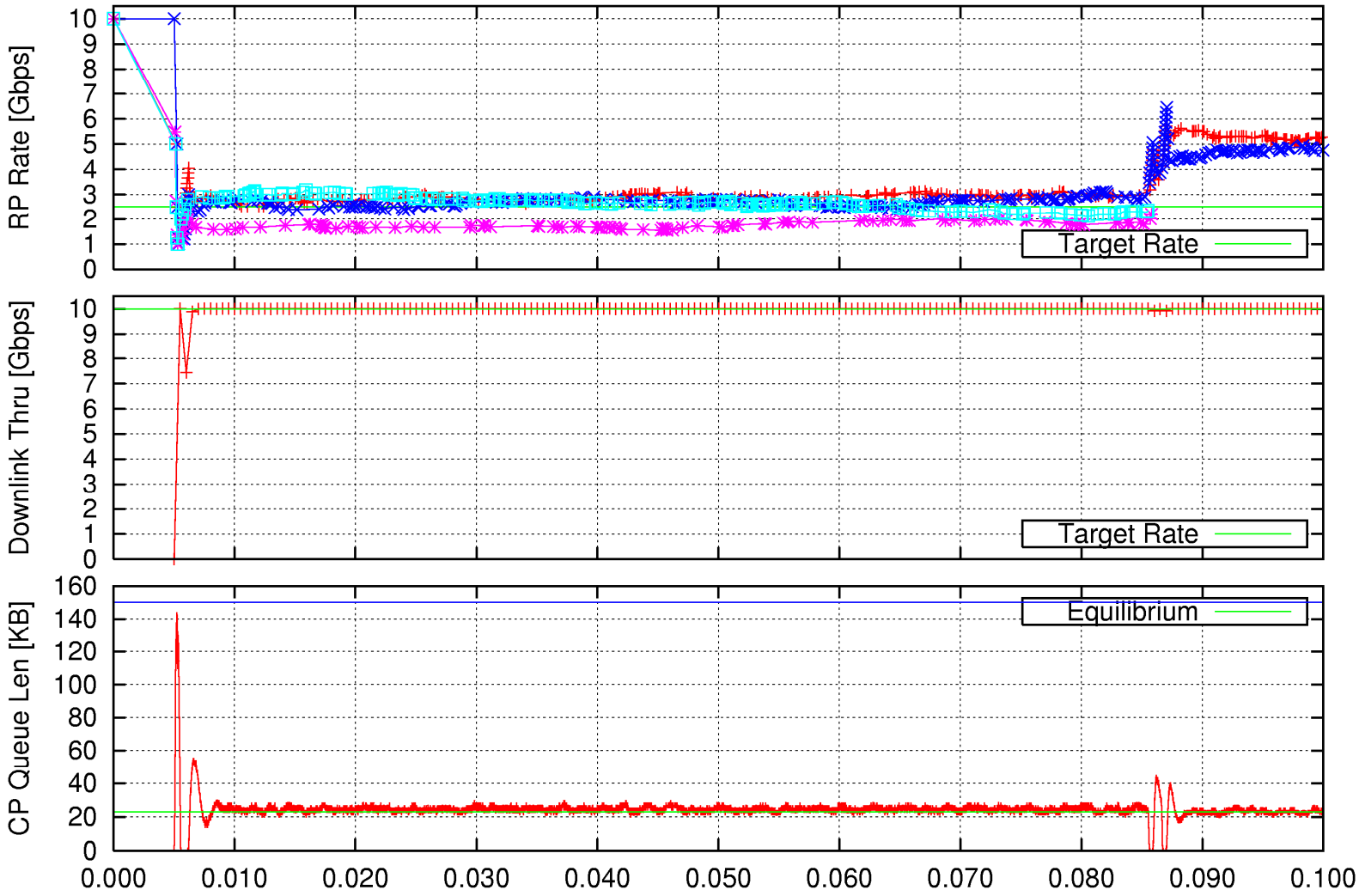
BCN-Max + Over-sampling if Qlen>Qsc



Speeding up negative transient response

- We have sped up the response to the positive edge of a transient
- Throughput suffers because the response to the negative edge of a transient is not as fast
- Let's try to increase the sampling rate by the same amount also when Qlen == 0

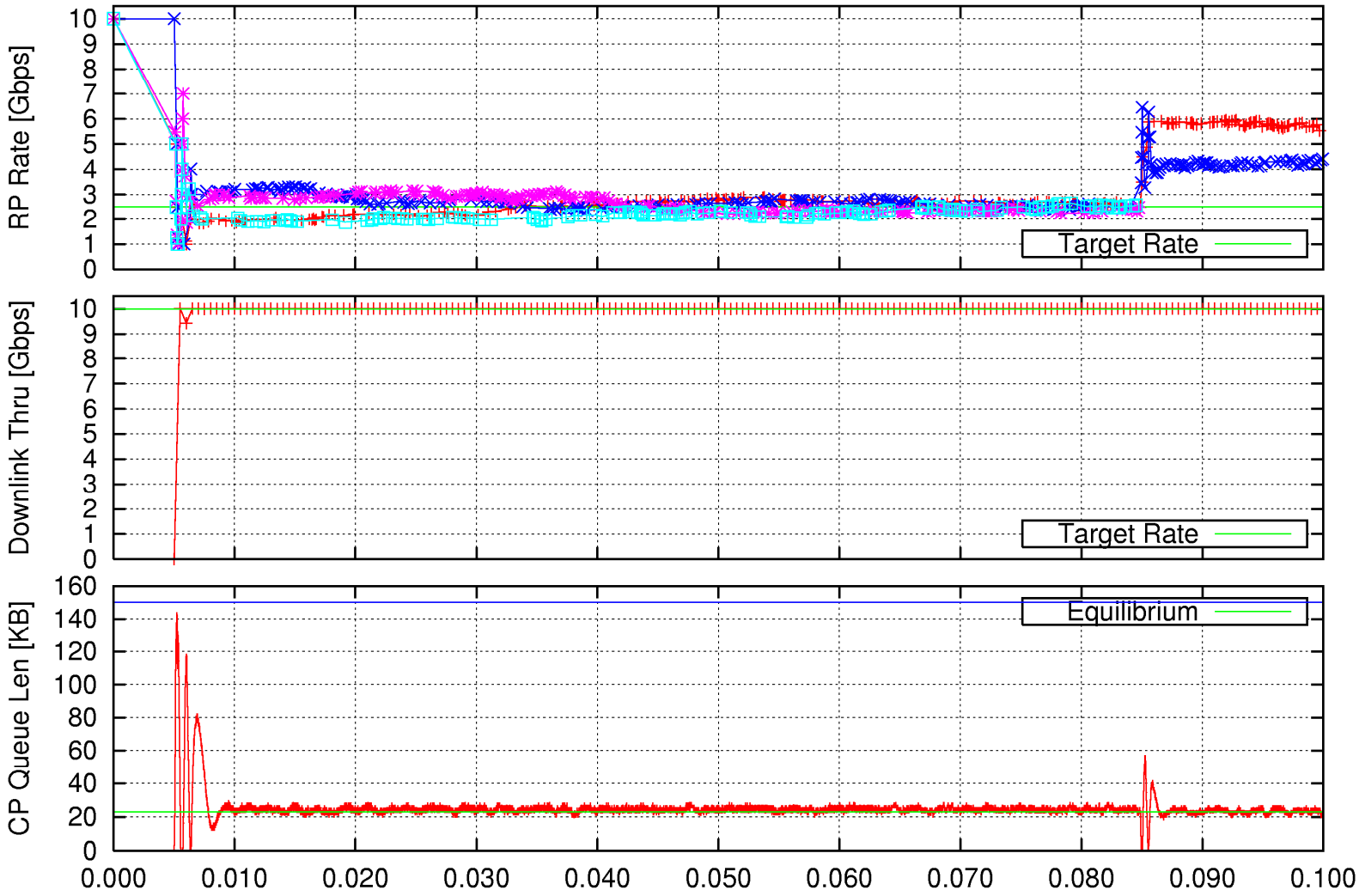
BCN-Max + Over-sampling if Qlen>Qsc or Qlen == 0



Speeding up transient response further

- Now we have sped up the response to both positive and negative transients
- Let's try to make the system symmetrical by introducing BCN+Max
- When Qlen == 0 turn any BCN(x,y) into BCN(-Qeq, -2*Qeq), i.e., the maximum positive feedback

BCN-Max + BCN+Max + Over-sampling if Qlen>Qsc or Qlen == 0



Conclusions

- BCN-Max based on Qsc shows a better and more consistent behavior than BCN-Max based on Pause assertion
- Transient responsiveness can be improved by increasing sampling rate during transient
- Don’t discount BCN(0,0) yet!
  - There may be situations where it is the only viable solution

CISCO