ENSC 427: COMMUNICATION NETWORKS
SPRING 2019
FINAL PROJECT PRESENTATIONS

Analyzation of Gaming Using Peer to Peer Paradigm

http://www.sfu.ca/~mbin/427project.html

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Team 6

Introduction

- Multiplayer online games require state consistency, responsiveness, reliability, security and persistency
- Facilitates change in number of players and size of packets
- Provides low latency and stability
- Analyze if our P2P architecture fulfills the multiplayer online game requirements
- Demonstrate our results based on Riverbed Modeler simulations

Related Work

Randeep Shahi, Nathan Zavaglia. “Comparison of gaming Client/Server Paradigms: Peer hosting vs Dedicated Server”, 2018, April 9, ENSC 427 Communication Network Spring 2017, team 02

- Compare between Client/Server and P2P
- P2P has advantage on delay

C. Neumann, M. Varvello, N. Prigent and K. Suh, "Challenges in Peer-to-Peer Gaming"*Ccr.sigcomm.org*. [Online]. Available: http://ccr.sigcomm.org/online/files/p2p_gaming.pdf. [Accessed: 25- March- 2019]

- Game state management, even in the presence of peer failures
- Delay, Scalability, Cheating

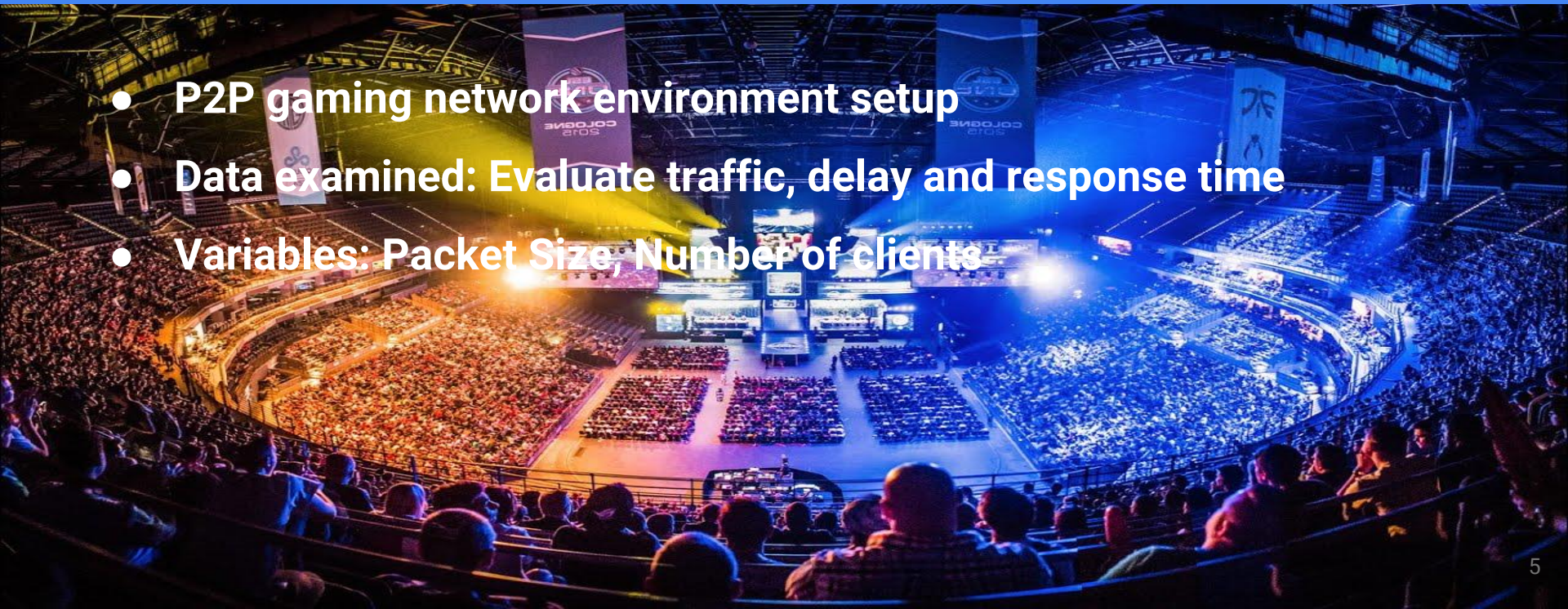
Related Work Cont.

Yang, B. and Garcia-Molina, H. (2019). Designing a Super-Peer Network. [online] Infolab.stanford.edu. Available at: http://infolab.stanford.edu/~byang/pubs/superpeer.pdf [Accessed 26 Mar. 2019].

Super-peer Based P2P System

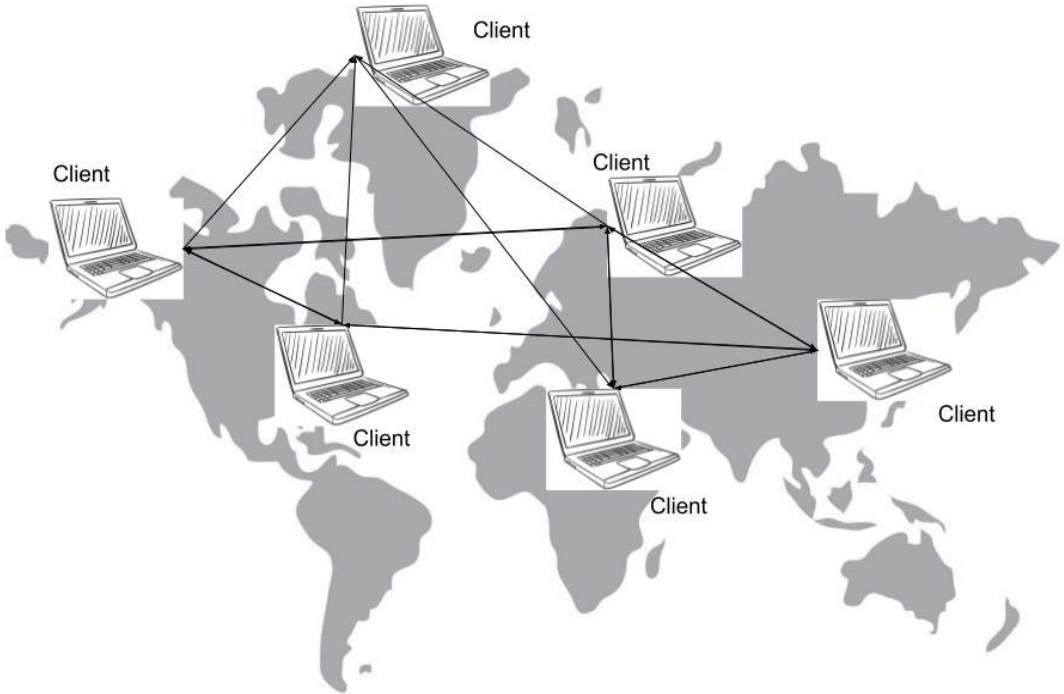
- Cross between pure and hybrid system
- Game space divided into subspaces, fixed or dynamic
- A super-peer is a node that acts as a centralized server to a subset of clients

Problem Description



- P2P gaming network environment setup
- Data examined: Evaluate traffic, delay and response time
- Variables: Packet Size, Number of clients

Overall Design



- More P2P games has been developed recently
- Find out factors which affects P2P's performance
- Simulation performance done in riverbed

Implementation

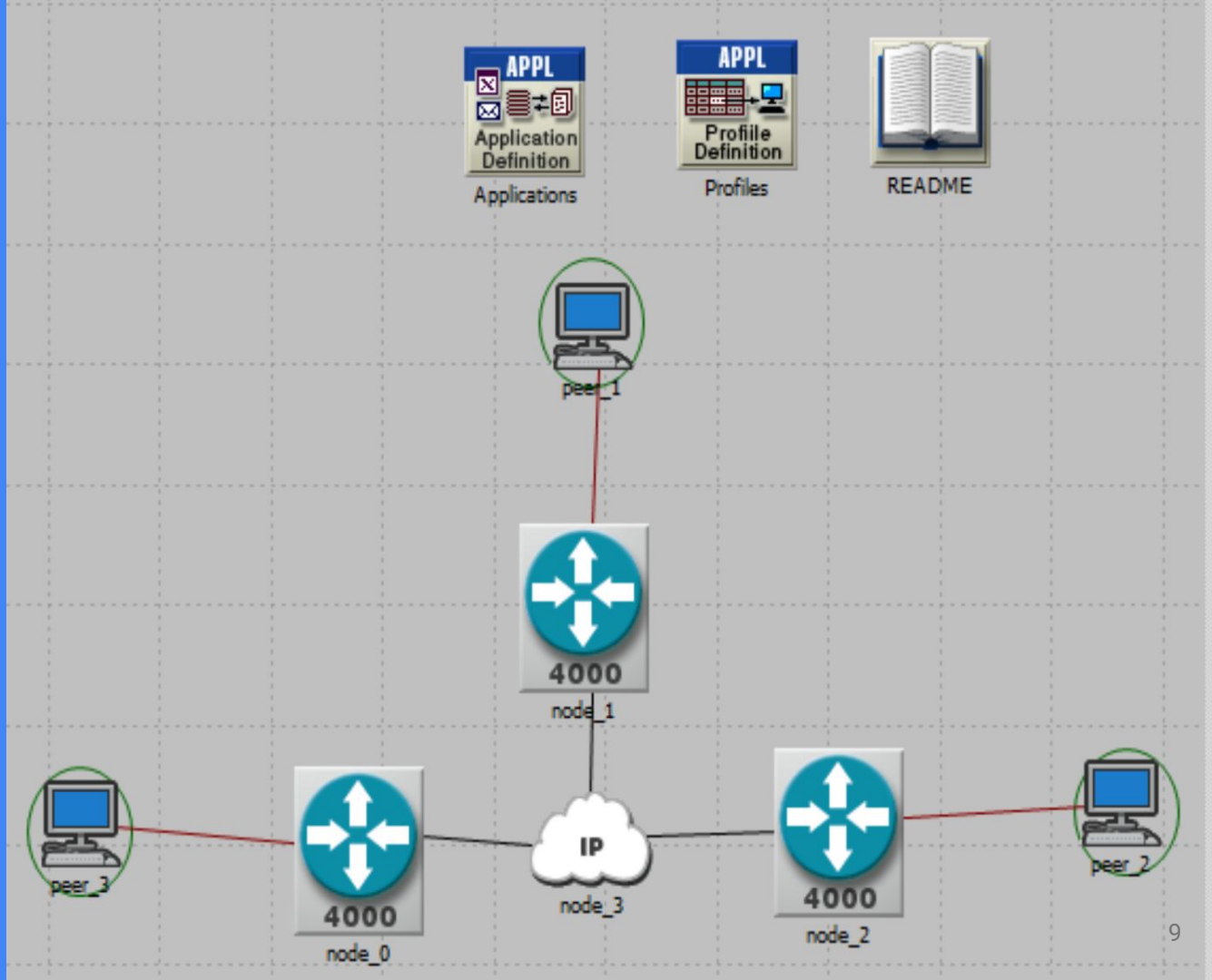
- Using Riverbed Modeler Academic Edition 17.5
- 3 Peers and 3 Routers
- 100BaseT 100 Mbps links between workstations and routers
- PPP_DS3 44.7Mbps links between router and the internet node
- IP32 Cloud node which supports up to 32 serial links

Implementation Cont.

- Implemented three different scenarios
  - First Scenario: normal operation occurs
  - Second Scenario: Increase packet size
  - Third Scenario: more peers joining to the network
- All the scenarios are simulated for 40 minutes

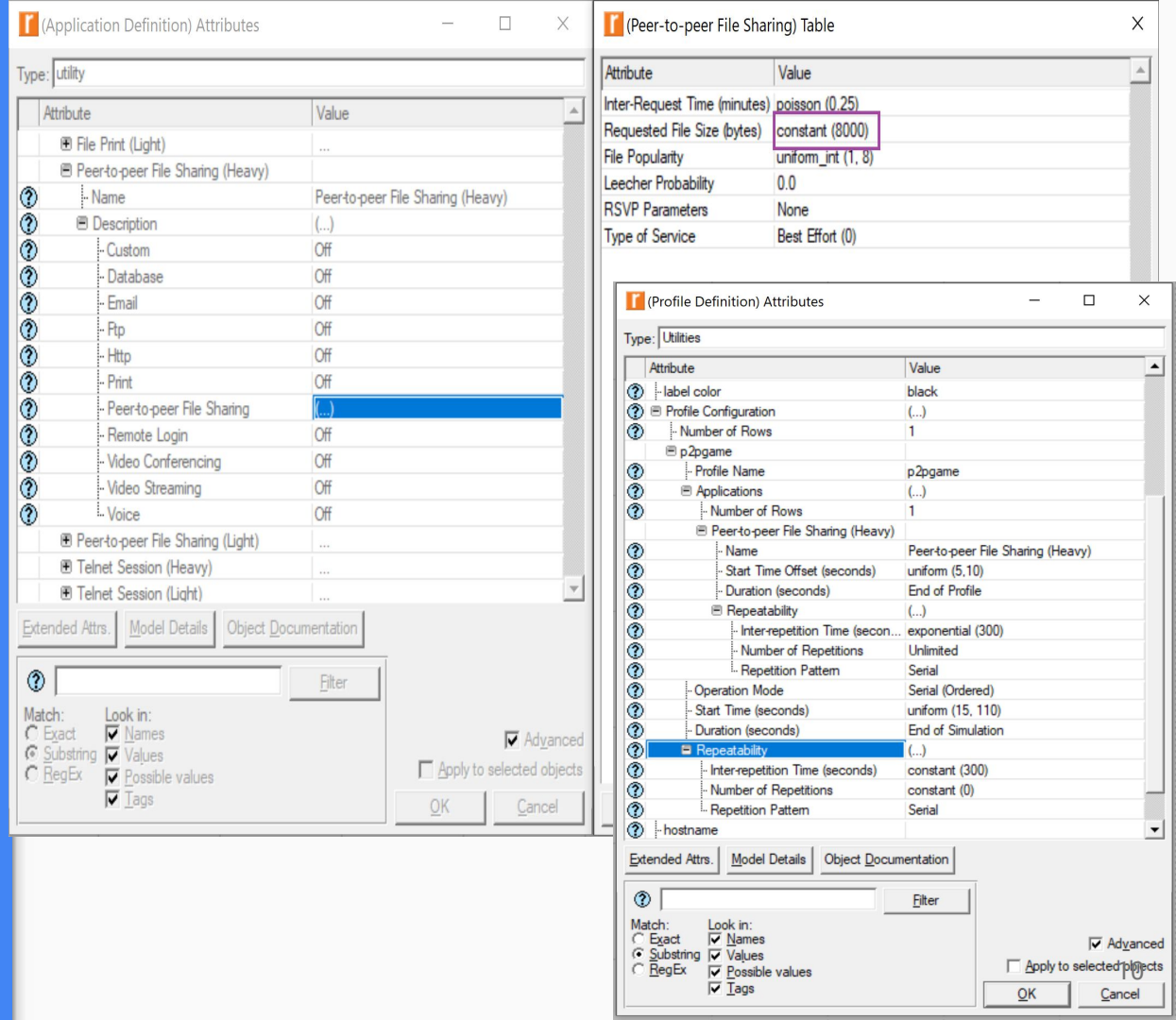
First Scenario

Design Simulation



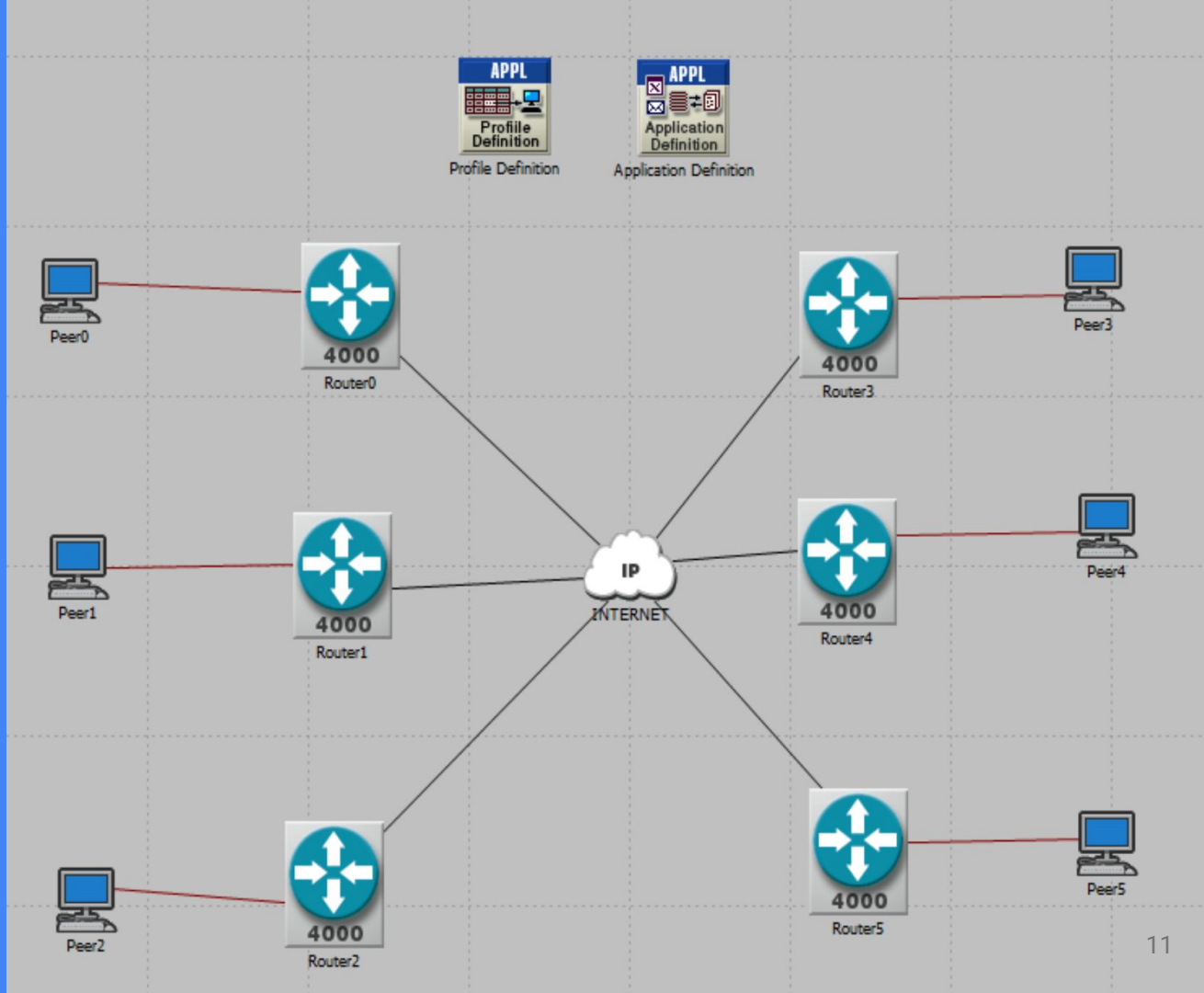
Second Scenario

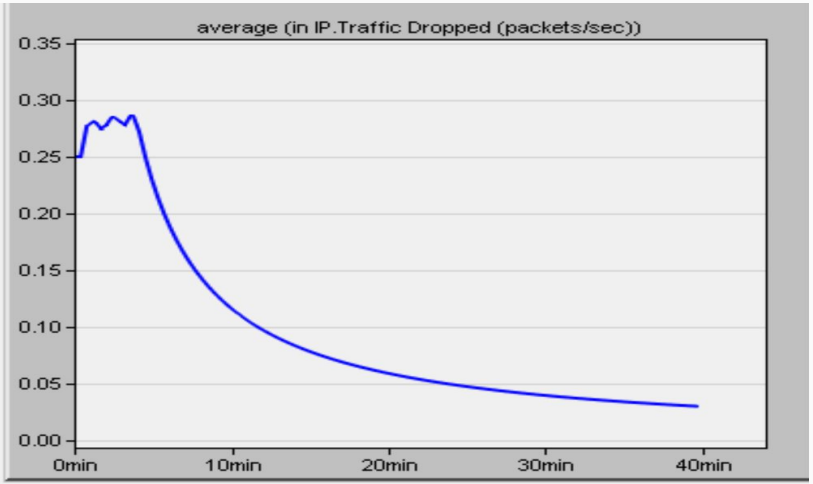
Design Simulation



Third Scenario

Design Simulation




average (in IP.Traffic Dropped (packets/sec))
0.35
0.30
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10min
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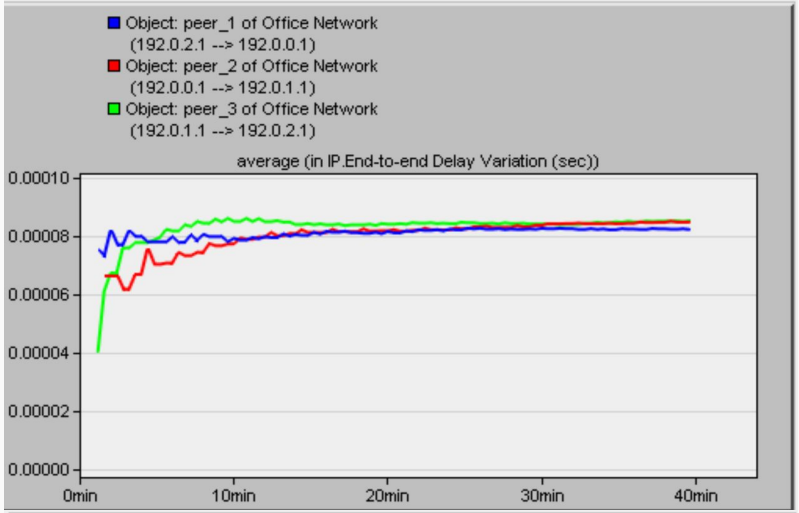
30min
40min


Object: peer_1 of Office Network
(192.0.2.1 --> 192.0.0.1)
Object: peer_2 of Office Network
(192.0.0.1 --> 192.0.1.1)
Object: peer_3 of Office Network
(192.0.1.1 --> 192.0.2.1)
average (in IP.End-to-end Delay Variation (sec))
0.00010
0.00008
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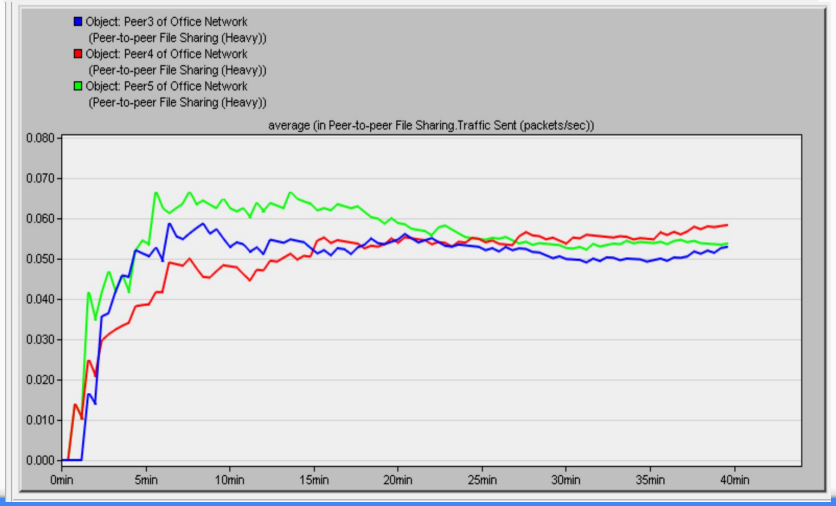
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0.080
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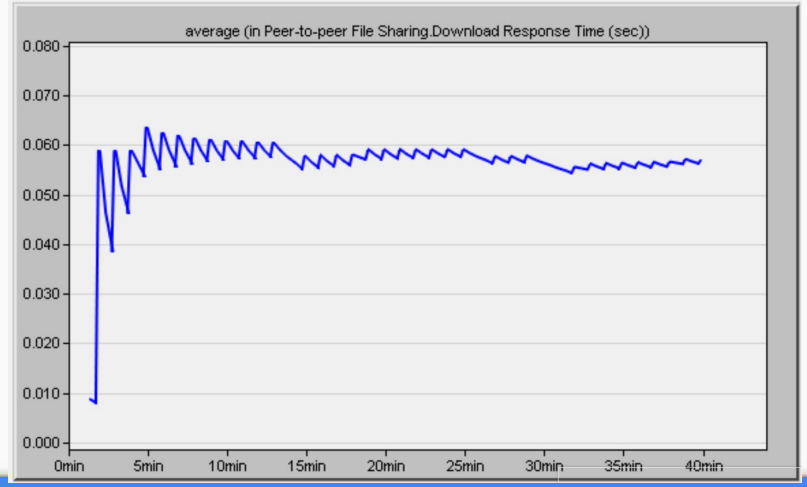
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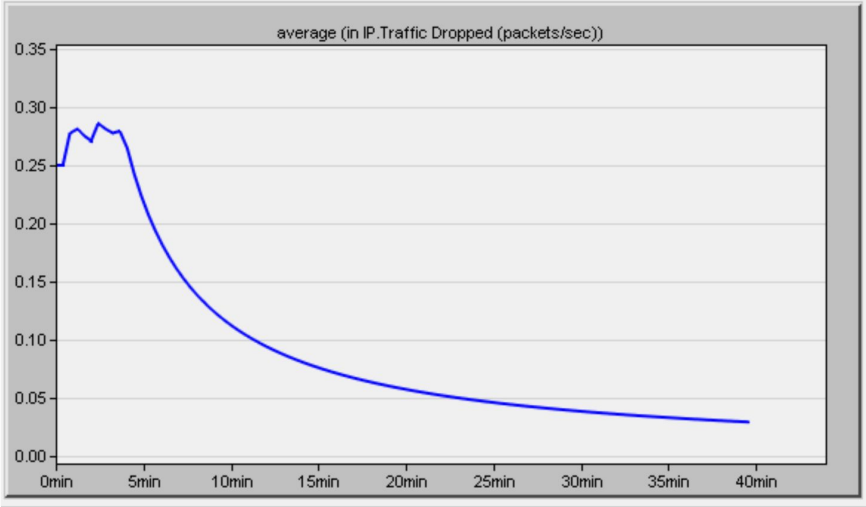
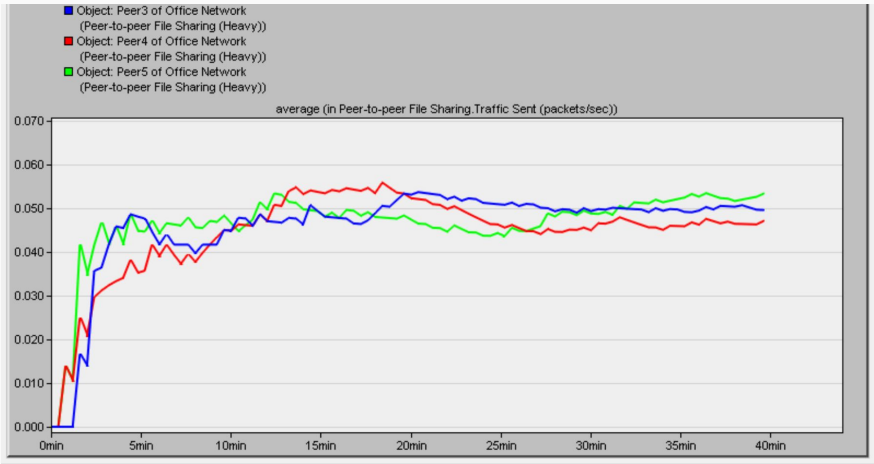
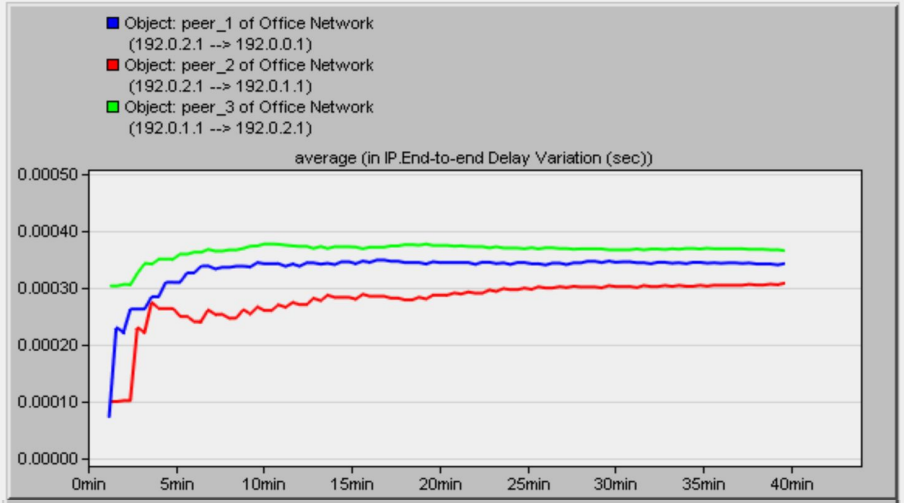
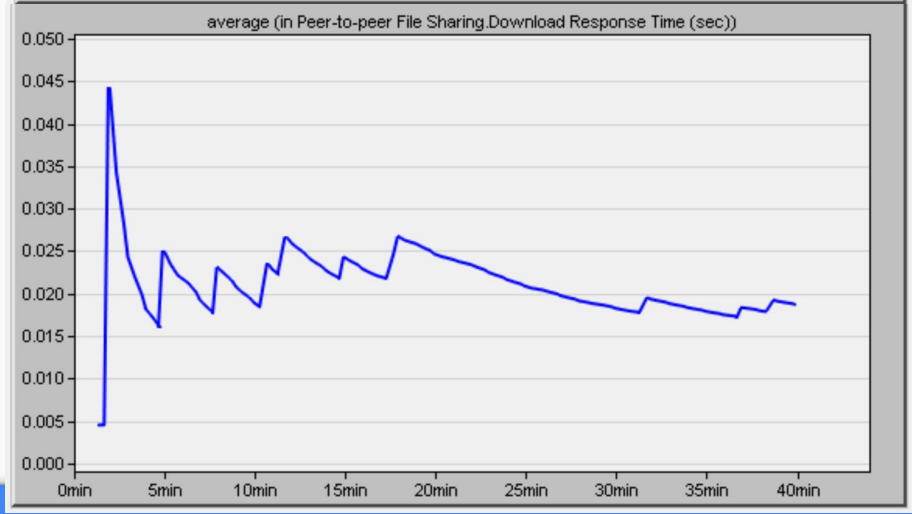






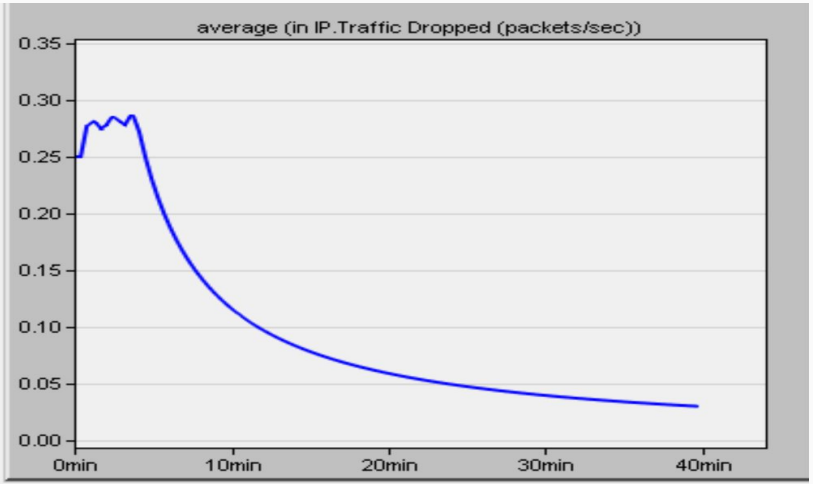


Second Scenario Results

Results & Analysis

Increased packet size 100x

- Packets dropped remained the same
- Doubled end-to-end delay
- Rate of packets sent decreased slightly
- Halved download response time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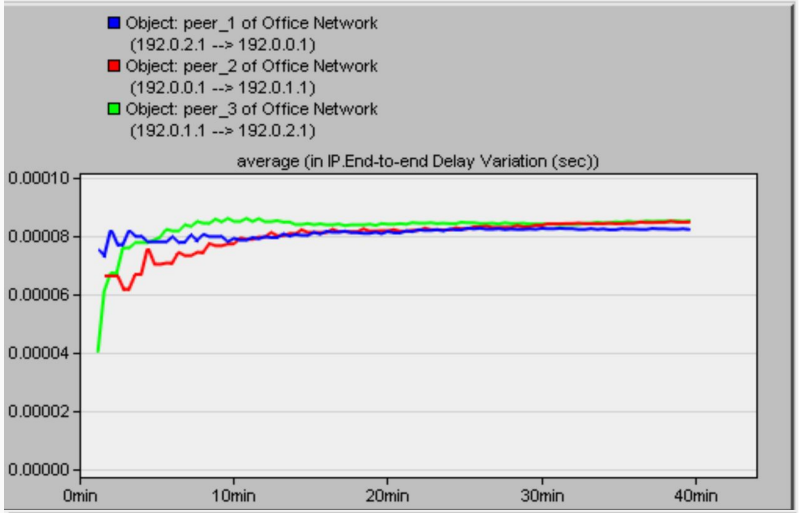
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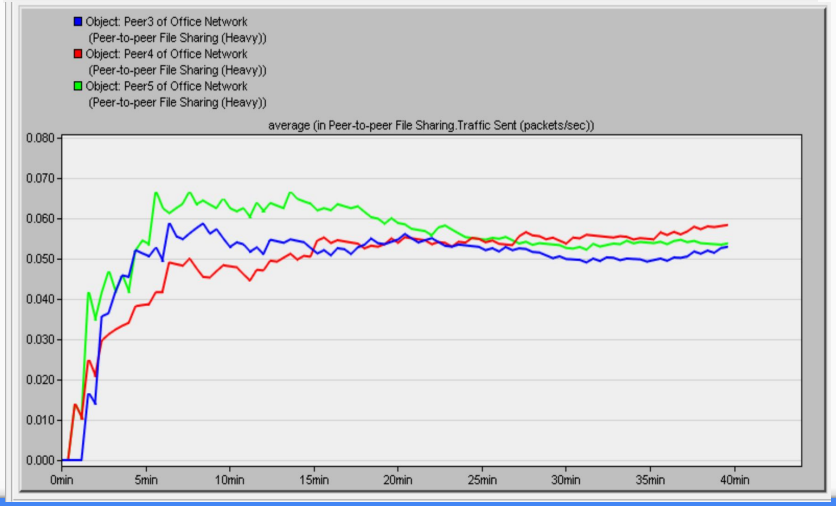
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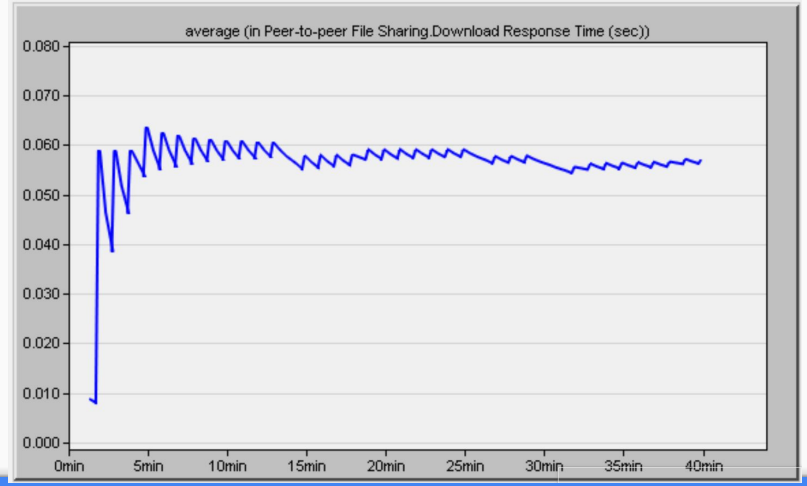
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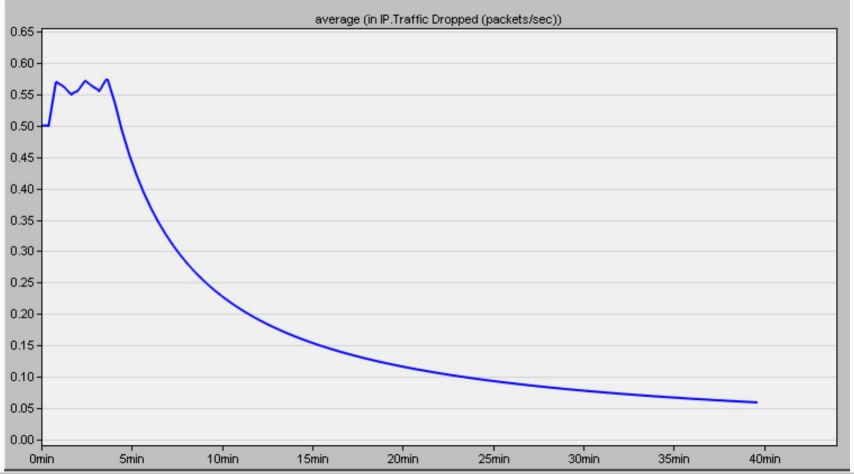

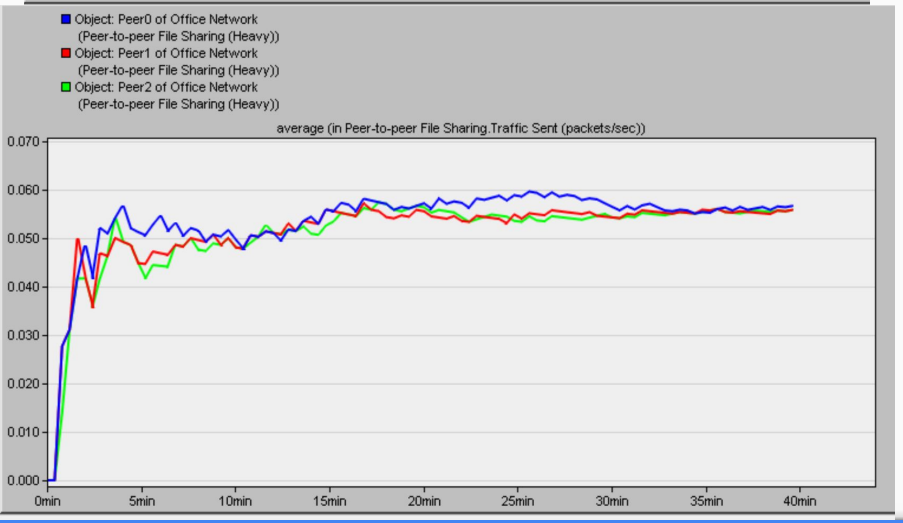

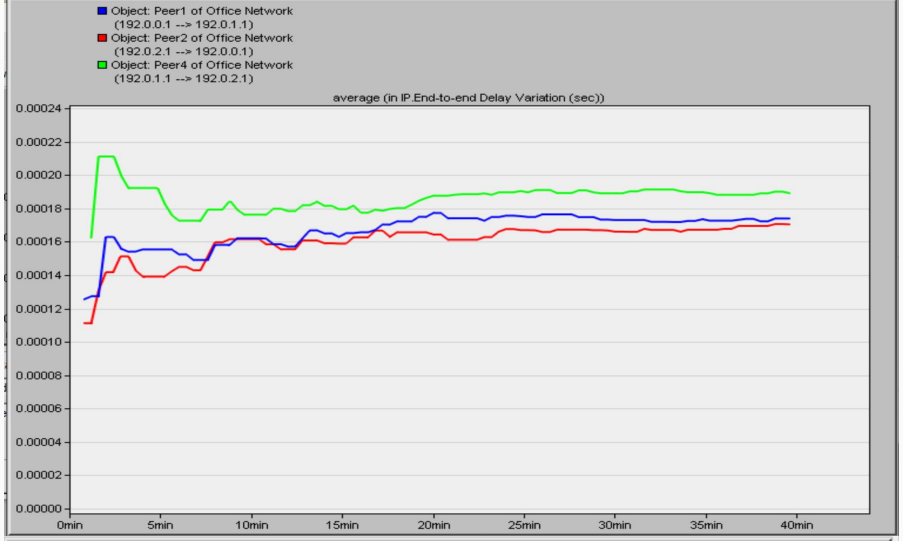

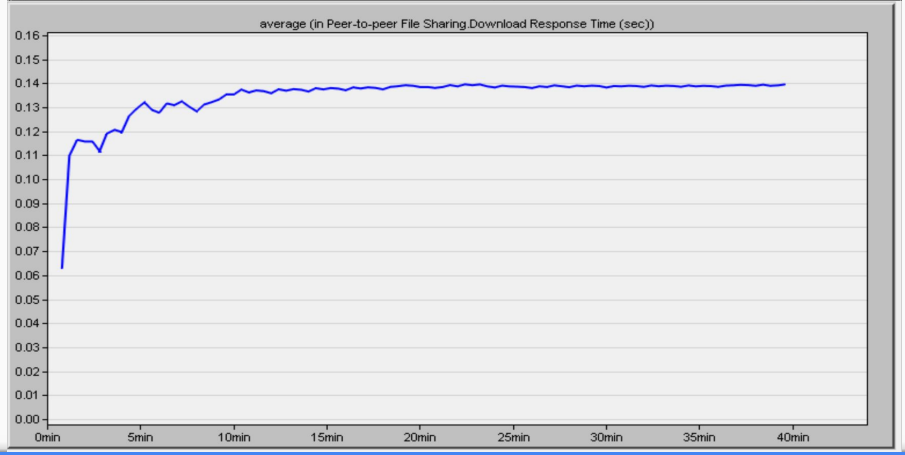

Third Scenario Results

Results & Analysis Cont.

Increased number of clients 2x

- Traffic dropped has doubled
- End-to-end delay increased 300%
- Packets sent per second decreased slightly
- Average download response time doubled

Discussion

According to our peer to peer network simulation, as hosts joining increasing, the rate of packets dropped has doubled, it has a great increase on the end-to-end delay, the traffic sent rate has decreased slightly and average download response time is doubled.

As the packets size increased, it has not negligible impact on the rate of packets dropped, however, the average end-to-end delay were dramatically increased. The traffic sent rate has a slight decrease, but on the download response time, it was halved.

Future Work

- Comparison between different P2P systems such as Pure, Hybrid and Super-peer
- Determine characteristics of performance tradeoffs
- How does varying the capabilities of peers affect the overall performance

References

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[2]C. GauthierDickey, D. Zappala, V. Lo and J. Marr, "Low Latency and Cheat-proof Event Ordering for Peer-to-Peer Games", *delivery.acm.org*, 2019. [Online]. Available: http://delivery.acm.org/10.1145/1010000/1005877/p134-gauthierdickey.pdf?ip=142.58.76.52&id=1005877&acc=ACTIVE%20SERVICE&key=FD0067F557510FFB%2E87ED2FCA0B39BEF5%2E4D4702B0C3E38B35%2E4D4702B0C3E38B35&__acm__=1549665331_278400722e186e645275845f2231b912. [Accessed: 08- Feb- 2019].

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[4]A. Yahyavi and B. Kemme, "Peer-to-peer architectures for massively multiplayer online games", 2013. [Online]. Available: https://www.contrib.andrew.cmu.edu/~ayahyavi/files/Yahyavi-CSUR13-P2PMMOG.pdf. [Accessed: 08- Feb- 2019].

[5]E. Buyukkaya, M. Abdallah and R. Cavagna, "VoroGame: A Hybrid P2P Architecture for Massively Multiplayer Games - IEEE Conference Publication", *Ieeexplore.ieee.org*, 2019. [Online]. Available: https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=4784788. [Accessed: 08- Feb- 2019].

[6]S. Abdulazeez, A. El Rhalibi, M. Merabti and D. Al-Jumeily, "Survey of Solutions for Peer-to-Peer MMOGs", *Researchgate*, 2019. [Online]. Available: https://www.researchgate.net/profile/Sarmad_Abdulazeez/publication/273615262_Survey_of_Solutions_for_Peer-to-Peer_MMOGs/links/55193b030cf273292e70f1a2/Survey-of-Solutions-for-Peer-to-Peer-MMOGs.pdf. [Accessed: 23- Mar- 2019].

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Thank you!