

Shihabur Rahman Chowdhury

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EDUCATION	PhD , Computer Science, <i>May 2012 - present</i> David R. Cheriton School of Computer Science, University of Waterloo Average: 92.6% Supervisor: Prof. Raouf Boutaba, David R. Cheriton School of Computer Science University of Waterloo B.Sc. in Computer Science and Engineering , <i>Dec 2004 - October 2009</i> Bangladesh University of Engineering and Technology (BUET) CGPA: 3.93/4.00 Rank: 2nd in a class of 125 Thesis: Algorithms in Bioinformatics Thesis Supervisor: Prof. Masud Hasan, Department of CSE, BUET
EXPERIENCE	Research Intern (RESIST Research Team) JUNE, 2018 - PRESENT INRIA - Nancy Grand Est Nancy, France Research & Teaching Assistant MAY, 2012 - PRESENT David R. Cheriton School of Computer Science University of Waterloo, Canada Software Engineering Intern (Technical Infrastructure) MAY, 2014 - AUG, 2014 Google Inc. Mountain View, CA, USA Summer Research Intern (Services Research) MAY, 2013 - SEPT, 2013 IBM T.J. Watson Research Centre Yorktown Heights, NY, USA Lecturer NOVEMBER 2009 - APRIL 2012 Department of CSE, BUET, Dhaka, Bangladesh
AWARDS AND ACHIEVEMENTS	<ul style="list-style-type: none">• Best Paper Award, IEEE/ACM/IFIP CNSM 2017• Best Paper Runner-up Award, HotPOST 2013 (in conjunction with IEEE ICDCS 2013)• MITACS Globalink Research Award, Mitacs Canada, 2018• UW International Experience Award, University of Waterloo, 2018• Ontario Graduate Scholarship, University of Waterloo, 2018–2019, 2015 – 2016• Ontario Graduate Scholarship - Ross & Muriel Cheriton Graduate Scholarship, University of Waterloo, 2017 – 2018• President's Graduate Scholarship, University of Waterloo, 2017–2019, 2015 – 2016• Graduate Excellence Scholarship in CS, University of Waterloo, 2016 – 2017• GoBell Scholarship, University of Waterloo, 2013 – 2015• Student Travel Grant, IEEE/ACM/IFIP CNSM 2017• Student Travel Grant, IFIP/IEEE IM 2017• Student Travel Grant, IEEE/IFIP NOMS 2016 (not availed), 2014• University Merit Scholarship, BUET, 2005 – 2008• Dean's List Award, BUET, 2005 – 2009• 6th Place, ACM ICPC Regional Programming Contest, Dhaka Site, 2007• 8th Place, ACM ICPC Regional Programming Contest, Dhaka Site, 2006

PUBLICATIONS

Articles in Peer Reviewed Journals and Magazines

- [J9] **Chowdhury, S.R.**, Ayoubi, S., Ahmed, R., Shahriar, N., Boutaba, R., Mitra, J., and Liu, L. Multi-Layer Virtual Network Embedding. *IEEE Transactions on Network and Service Management*. (To appear)
- [J8] Shahriar, N., **Chowdhury, S.R.**, Ahmed, R., Khan, A., Fathi, S., Boutaba, R., Mitra, J., and Liu, L. Virtual Network Survivability through Joint Spare Capacity Allocation and Embedding. *IEEE Journal on Selected Areas in Communications - 2017 Special Issue on Network Softwarization and Enablers*, 36(3): 502–518.
- [J7] Shahriar, N., Ahmed, R., **Chowdhury, S.R.**, Khan, A., Boutaba, R., and Mitra, J. Generalized Recovery from Node Failure in Virtual Network Embedding. *IEEE Transactions on Network and Service Management*, 14(2): 261–274.
- [J6] **Chowdhury, S.R.**, Ahmed, R., Khan, M.M.A., Shahriar, N., Boutaba, R., Mitra, J., and Feng, Z. Dedicated Protection for Survivable Virtual Network Embedding. *IEEE Transactions on Network and Service Management*, 13(4): 913–926.
- [J5] Bari, M.F., **Chowdhury, S.R.**, Ahmed, R., Boutaba, R., and Duarte, O. Orchestrating Virtualized Network Functions. *IEEE Transactions on Network and Service Management*, 13(4): 725–739.
- [J4] Ahmed, R., Bari, M.F., **Chowdhury, S.R.**, Rabbani, M., Boutaba, R., and Mathieu, B. α Route: Routing on Names. *IEEE/ACM Transactions on Networking*, 24(5): 3070–3083.
- [J3] **Chowdhury, S.R.**, Roy, A.R., Shaikh, M., and Daudjee, K. A Taxonomy of Decentralized Online Social Networks. *Peer-to-Peer Networking and Applications, Springer*, 8(3): 367–383.
- [J2] **Chowdhury, S.R.**, Hasan, M.M., Iqbal, S., and Rahman, M.S. Computing a Longest Common Palindromic Subsequence. *Fundamenta Informaticae, IOS Press*, 129(4): 329–340.
- [J1] Bari, M.F., **Chowdhury, S.R.**, Ahmed, R., Boutaba, R., and Mathieu, B. A Survey of naming and routing in Information Centric Networks. *IEEE Communications Magazine*, 50(12) : 44–53.

Articles in Peer Reviewed Conference & Workshop Proceedings

- [C21] Ayoubi, S., **Chowdhury, S.R.**, and Boutaba, R. Breaking Service Function Chains with Khaleesi. *IFIP Networking, 2018*, pp. 64–72.
- [C20] **Chowdhury, S.R.**, Ayoubi, S., Ahmed, R., Shahriar, N., Boutaba, R., Mitra, J., and Liu, L. MULE: Multi-Layer Virtual Network Embedding. *IEEE/ACM/IFIP Conference on Network and Service Management (CNSM), 2017*, pp. 1–9. **[Best Paper Award]**
- [C19] Shahriar, N., **Chowdhury, S.R.**, Sharmin, M., Ahmed, R., Boutaba, R., and Mathieu, B. Availability in P2P based Online Social Networks. *IEEE NSySS 2017*, pp. 1–9.
- [C18] Shahriar, N., **Chowdhury, S.R.**, Ahmed, R., Khan, A., Boutaba, R., Mitra, J., and Liu, L. Joint Backup Capacity Allocation and Embedding for Survivable Virtual Networks. *IFIP Networking Conference 2017*, pp. 1–9.
- [C17] **Chowdhury, S.R.**, Ahmed, R., Shahriar, N., Khan, A., Boutaba, R., Mitra, J., and Liu, L. ReViNE: Reallocation of Virtual Network Embedding to Eliminate Substrate Bottlenecks. *IEEE/IFIP Integrated Network Management Symposium (IM), 2017*, pp. 116–124.
- [C16] Shahriar, N., Ahmed, R., Khan, A., **Chowdhury, S.R.**, Boutaba, R., and Mitra, J. ReNoVatE: Recovery from Node Failure in Virtual Network Embedding. *ACM/IEEE/IFIP Conference on Network and Service Management (CNSM), 2016*, pp. 19–27.
- [C15] Roy, A.R., **Chowdhury, S.R.**, Bari, M.F., Ahmed, R., and Boutaba, R. Emulating an Infrastructure with EASE. *IEEE/ACM/IFIP Conference on Network and Service Management (CNSM), 2016 (Mini-Conference)*, pp. 167–173.
- [C14] **Chowdhury, S.R.**, Ahmed, R., Khan, M.M.A., Shahriar, N., Boutaba, R., Mitra, J., and Zeng, F. Protecting Virtual Networks with DRONE. *IEEE/IFIP Network Operations and Management Symposium (NOMS), 2016*, pp. 78–86. **[Runner-up for Best Paper Award]**
- [C13] Shahriar, N., Ahmed, R., **Chowdhury, S.R.**, Khan, M.M.A., Boutaba, R., Mitra, J., and Zeng, F. Connectivity-aware Virtual Network Embedding. *IFIP Networking Conference 2016*, pp. 46–54.
- [C12] Dolberg, L., François, J., **Chowdhury, S.R.**, Ahmed, R., Boutaba, R., and Engel, T. A Generic Framework to Support Application-Level Flow Management in Software-Defined Networks. *IEEE Conference on Network Softwarization (NefSoft), 2016*, pp. 121–125. (Short paper)

- [C11] Bari, M.F., **Chowdhury, S.R.**, Ahmed, R., and Boutaba, R. nf.io: A File System Abstraction for NFV Orchestration. *IEEE NFV-SDN Conference*, 2015, pp. 135–141.
- [C10] Bari, M.F., **Chowdhury, S.R.**, Ahmed, R., and Boutaba, R. On Orchestrating Virtual Network Functions. *IEEE/ACM/IFIP Conference on Network and Service Management (CNSM)*, 2015, pp. 50–56.
- [C9] Ahmed, R., **Chowdhury, S.R.**, Pokluda, A., Bari, M.F., Boutaba, R., and Mathieu, B. pWeb: A Personal Interface to the World Wide Web. *IFIP Networking Conference*, 2014, pp. 1–9.
- [C8] **Chowdhury, S.R.**, Adam, C., Wu, F., Rofrano, J. and Boutaba, R. Managing the File System from the Kernel. *IEEE/IFIP Network Operations and Management Symposium (NOMS)*, 2014, pp. 1–8.
- [C7] **Chowdhury, S.R.**, Bari, M.F., Ahmed, R., and Boutaba, R. PayLess: A Low Cost Network Monitoring Framework for Software Defined Networks. *IEEE/IFIP Network Operations and Management Symposium (NOMS)*, 2014, pp. 1–9.
- [C6] Bari, M.F., **Chowdhury, S.R.**, Ahmed, R., and Boutaba, R. PolicyCop: An Autonomic QoS Policy Enforcement Framework for Software Defined Networks. In proceedings of *IEEE SDN for Future Network and Services (SDN4FNS)*, 2013, pp. 1–7.
- [C5] Bari, M.F., Roy, A.R., **Chowdhury, S.R.**, Zhang, Q., Zhani, M.F., Ahmed, R., and Boutaba, R. Dynamic Controller Provisioning in Software Defined Networks. *IEEE/ACM/IFIP Conference on Network and Service Management (CNSM)*, 2013, pp. 18–25. **[Runner-up for Best Paper Award]**
- [C4] Shahriar, N., **Chowdhury, S.R.**, Sharmin, M., Ahmed, R., Boutaba, R., and Mathieu, B. Ensuring β -availability in P2P Social Networks. *Workshop on Hot Topics in Peer-to-peer Computing and Online Social Networking, 2013 (IEEE ICDCS 2013 Workshops)*, pp. 150–155. **[Best Paper Runner-up Award]**
- [C3] Ahmed, R., Bari, M.F., **Chowdhury, S.R.**, Rabbani, M., Boutaba, R., and Mathieu, B. α Route: A Name Based Routing Scheme for Information Centric Networks. *IEEE INFOCOM*, 2013, pp. 90–94.
- [C2] **Chowdhury, S.R.**, Iqbal, S., Hasan, M.M., and Rahman, M.S. Computing a Longest Common Palindromic Subsequence. *International Workshop on Combinatorial Algorithms (IWOCA) 2012*, LNCS 7643:219–223.
- [C1] Iqbal, S., **Chowdhury, S.R.**, Hyder, C.S., Vasilakos, A.V., and Wang C. Vehicular Communication: Protocol Design, Testbed Implementation and Performance Analysis. *ACM International Conference on Wireless Communication and Mobile Computing (IWCMC)*, 2009, pp. 410–415.

Patents Granted

- [PG1] Ahmed, R., Mitra, J., **Chowdhury, S.R.**, Shahriar, N., and Boutaba, R. Connectivity-Aware Virtual Network Embedding. US Patent No. 9,813,287, November 2017

Patents Filed

- [P4] Shahriar, N., Khan, A., Ahmed, R., Mitra, J., **Chowdhury, S.R.**, and Boutaba, R. System and Method for Joint Embedding and Backup Provisioning in Virtual Networks. US Patent Application No. 15/650,354, February 2018.
- [P3] Shahriar, N., Mitra, J., **Chowdhury, S.R.**, Ahmed, R., and Boutaba, R. Methods and Systems for Failure Recovery in a Virtual Network Environment. US Patent Application No. 15/267,696, November 2017.
- [P2] **Chowdhury, S.R.**, Ahmed, R., Mitra, J., Shahriar, N., Boutaba, R., and Ayoubi, S. System and Method for Multi-layer Virtual Network Embedding. US Provisional Patent Application No. 62/535,084, June 2017.
- [P1] Ahmed, R., Mitra, J., **Chowdhury, S.R.**, Shahriar, N., and Boutaba, R. Dedicated Protection for Virtual Network Embedding. US Patent Application No. 15/048,411, March 2017.

Book Chapter(s)

- [B1] Dolberg, L., François, J., **Chowdhury, S.R.**, Ahmed, R., Boutaba, R., and Engel, T. Network Configuration and Flow Scheduling for Big Data Applications. *Networking for Big Data*. S. Yu, X. Lin, J. Misić, and X. Shen (editors). pp. 121–138, CRC Press, 2015.

Posters and Demos

- [D1] Bari, M.F., **Chowdhury, S.R.**, Ahmed, R., and Boutaba, R. nf.io: A File System Abstraction for NFV Orchestration. ACM SIGCOMM 2015, London, UK.

Talks

- [T13] Breaking Service Function Chains with Khaleesi. *IFIP Networking, 2018, Zurich, Switzerland.*
[T12] MULE: Multi-Layer Virtual Network Embedding. *IEEE/ACM/IFIP CNSM, 2017, Tokyo, Japan.*
[T11] Joint Backup Capacity Allocation and Embedding for Survivable Virtual Networks. *IFIP Networking, 2017, Stockholm, Sweden.*
[T10] ReViNE: Reallocation of Virtual Network Embedding to Eliminate Substrate Bottlenecks. *IFIP/IEEE IM, 2017, Lisbon, Portugal.*
[T9] Emulating an Infrastructure with EASE. *IEEE/ACM/IFIP CNSM Mini-conf., 2016, Montreal, Canada.*
[T8] Management and Orchestration of Service Function Chains in NFV. *BUET ACM Chapter Talk Series, 2015, Dhaka, Bangladesh (invited).*
[T7] nf.io: A File System Abstraction for NFV Orchestration. *IEEE NFV-SDN Conference 2015, San Francisco, USA.*
[T6] PayLess: A Low Cost Network Monitoring Framework for Software Defined Networks. *IEEE/IFIP NOMS 2014, Krakow, Poland.*
[T5] Managing the Filesystem from the Kernel. *IEEE/IFIP NOMS 2014, Krakow, Poland.*
[T4] Towards Autonomic Management of File Systems. *Services Research Seminar Series, IBM T.J. Watson Research Center, Yorktown Heights, NY, USA.*
[T3] Ensuring β -availability in P2P Social Networks. *HotPOST 2013 workshop, Philadelphia, USA*
[T2] α Route: A Name Based Routing Scheme for Information Centric Networks. *ICN Workshop, Orange Labs, France. June 2013.*
[T1] α Route: A Name Based Routing Scheme for Information Centric Networks. *IEEE INFOCOM 2013, Turin, Italy.*

RESEARCH EXPERIENCES

- Currently working under the supervision of Prof. Raouf Boutaba on the following topics:
 - Network softwarization
 - Elastic optical network virtualization
- Currently working with RESIST research team at INRIA on Software-defined Network monitoring
- Worked with Dr. Khuzaima Daudjee (University of Waterloo) on devising a taxonomy of Decentralized Online Social Networks.
- Worked at Services Research division, IBM TJ Watson Research Centre on autonomic management of file systems.
- Worked with Prof. M. Sohel Rahman (CSE, BUET) on the following topics:
 - Algorithm for variants of sequence alignment problem.

TECHNICAL SKILLS

Language	C/C++, Java, Python, x86 Assembly, PHP, HTML, Bash Script, \LaTeX
API and Frameworks	OpenGL, IBM ILOG CPLEX, Symphony2, Propel, Floodlight Controller
Infrastructure tools	OpenStack, Docker, Libvirt
Database	Oracle 9i/10g, MySQL, SQLite, Cassandra, MongoDB
Simulators	Packet Tracer, Mininet, ns3

PROFESSIONAL ACTIVITIES

- Project review: FONDECYT-CHILE – National Fund for Scientific and Technological Development (Chile)
- Paper review: IEEE Journal on Selected Areas in Communication, ACM/IEEE Transactions on Networking, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Network and Service Management, IEEE Transactions on Cloud Computing, IEEE Transactions on Communications, IEEE Communications Magazine, IEEE Network Magazine, IEEE Access, IEEE Communication Letters, Computer Networks, Computer Communications, PLoS One, IEEE ICDCS 2016, IEEE/ACM/IFIP CNSM 2015/2017, IFIP Networking 2014/2015/2018, IEEE NetSoft 2018, IEEE/IFIP IM 2017, IEEE ICC 2017, IEEE/IFIP NOMS 2014/2016/2018, IEEE NFV-SDN 2016/2017, IEEE CloudNet 2017, IEEE SDN4FNS 2013, IEEE CCGrid 2014, WALCOM 2011.