

# Theophilus Benson

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## Contact Info

Email: [tab@cs.brown.edu](mailto:tab@cs.brown.edu)

Webpage: <http://www.cs.brown.edu/~tab>

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## Employment

**Assistant Professor**  
Brown University

**Sept 2017-Present**

**Assistant Professor**  
Duke University

**Jul 2013-Aug 2017**

**Post-Doctoral Scholar**  
Princeton University

**Jul 2012-Jul 2013**

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## Education

**University of Wisconsin**, Madison, Wisconsin USA

Ph.D., Computer Science, May 2012

M.S., Computer Science, May 2008

- Dissertation: “New Approaches for Managing Enterprise Networks”
- Advisor: Aditya Akella

**Tufts University**, Medford, Massachusetts USA

B.S., Computer Science, May 2004

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## Honors and Awards

- NSF Career, awarded 2018.
  - Google Faculty Award, awarded 2018.
  - Facebook Faculty Award, awarded 2015, 2016.
  - Yahoo FREP (Faculty Research and Engagement Program), awarded 2014, 2015.
  - Yahoo ACE (Academic Career Enhancement), awarded 2014.
  - Best paper, IMC 2010.
  - Top ranked paper (fast tracked to CCR), SIGCOMM WREN 2009.
  - IBM Research fellowship, awarded 2009-2010.
  - IBM Research PhD Assistantship, awarded 2009.
  - IBM Bravo Award, awarded 2009.
  - AOF Fellowship, Univ. of Wisconsin, awarded 2006 and 2011.
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## Publications

1. **DeepConfig: Automating Data Center Network Topologies Management with Machine Learning.**  
Saim Salman, Chris Streiffer, Huan Chen, Theophilus Benson, and Asim Kadav  
In Proc. of NetAIM 2018.
2. **MP-HULA: Multipath Congestion Aware Load-Balancing using Programmable Data Planes.**  
Cristian Hernandez, Andreas J. Kassler, Theophilus A. Benson, and Gergely Pongrcz  
In Proc. of NetCompute 2018.
3. **InspectorGadget: Inferring Network Protocol Configuration for Web Services.**  
Usama Naseer and Theophilus Benson  
In Proc. of InternetQoE 2018.
4. **Hermes: Providing Tight Control over High-Performance SDN Switches.**  
Huan Chen and Theophilus Benson  
In Proc. of CoNext 2017.

5. **Sounding the Bell for Improving Internet (of Things) Security.**  
Balakrishnan Chandrasekaran and Theophilus Benson  
In Proc. of IoT S&P 2017.
6. **A Call to Arms for Tackling the Unexpected Implications of SDN Controller Enhancements.**  
Theophilus Benson  
In Proc. of ApNet 2017.
7. **ConfigTron: Tackling network diversity with heterogenous configurations.**  
Usama Naseer and Theophilus Benson  
In Proc. of HotCloud 2017.
8. **Dapper: Data Plane Performance Diagnosis of TCP.**  
Mojgan Ghasemi, Theophilus Benson and Jennifer Rexford  
In Proc. of SoSR 2017.
9. **The Case for Making Tight Control Plane Latency Guarantees in SDN Switches.**  
Huan Chen and Theophilus Benson  
In Proc. of SoSR 2017.
10. **A First Look at Bugs in OpenStack.**  
Washington Garcia and Theophilus Benson  
In Proc. of CAN 2016.
11. **A View from the Other Side: Understanding Mobile Phone Characteristics in the Developing World.**  
Sohaib Ahmad, Abdul Lateef Haamid, Zafar Ayyub Qazi, Zhenyu Zhou,  
Theophilus Benson and Ihsan Ayyub Qazi  
In Proc. of IMC 2016.
12. **Performance Characterization of a Commercial Video Streaming Service.**  
Mojgan Ghasemi, Partha Kanuparth, Ahmed Mansy, Theophilus Benson and Jennifer Rexford  
In Proc. of IMC 2016.
13. **FOCUS: Function Offloading from a Controller to Utilize Switch Power.**  
Ji Yang, Zhenyu Zhou, Theophilus Benson and Xiaowei Yang, Xin Wu and Chengchen Hu  
In Proc. of NFV-SDN 2016.
14. **SFC-Checker: Checking the Correct Forwarding Behavior of Service Function Chaining.**  
Brendan Tschaen, Ying Zhang, Theophilus Benson, Sujata Banerjee, Jeongkeun Lee and Joon-Myung Kang  
In Proc. of NFV-SDN 2016.
15. **Picocenter: Supporting long-lived, mostly-idle applications in cloud environments.**  
Liang Zhang, James Litton, Frank Cangialosi, Theophilus Benson, Dave Levin and Alan Mislove  
In Proc. of EuroSys 2016.
16. **Isolating and Tolerating SDN Application Failures with LegoSDN.**  
Balakrishnan Chandrasekaran, Brendan Tschaen and Theophilus Benson  
In Proc. of SOSR 2016.
17. **Dynamic Prioritization of Traffic in Home Networks.**  
Ilker Nadi Bozkurt, Yilun Zhou and Theophilus Benson  
In Proc. of SOSR 2016.
18. **Programming Slick Network Functions.**  
Bilal Anwer, Theophilus Benson, Dave Levin, and Nick Feamster  
In Proc. of SOSR 2015.

19. **A Universal Approach to Data Center Network Design.**  
Aditya Akella, Theophilus Benson, Balakrishnan Chandrasekaran,  
Cheng Huang, Bruce Maggs, and David Maltz  
In Proc. of International Conference on Distributed Computing and Networks (ICDCN) 2015.
20. **Dynamic Prioritization of Traffic in Home Networks.**  
Ilker Nadi Bozkurt , Yilun Zhou and Theophilus Benson  
In Proc. CoNEXT Student Workshop 2015.
21. **Destroying Networks for Fun (and Profit).**  
Nick Shelly, Brendan Tschaen, Tyco-Kaus , Michael Chang, Theophilus Benson and Laurent Vanbever  
In Proc. ACM Workshop on Hot Topics in Networks (HotNets) 2015.
22. **Towards a Safe Playground for HTTPS and Middleboxes with QoS2.**  
Zhenyu Zhou and Theophilus Benson  
In Proc. of ACM SIGCOMM Workshop on Hot Topics in Middleboxes 2015 (HotMiddleboxes) 2015.
23. **Tolerating SDN Application Failures with LegoSDN.**  
Balakrishnan Chandrasekaran, Theophilus Benson  
In Proc. ACM Workshop on Hot Topics in Networks (HotNets) 2014  
Appeared earlier In Proc. of ACM HotSDN 2014 as a Poster
24. **ProActive Routing in Scalable Data Centers with PARIS**  
Durshyant Arora, Theophilus Benson, Jennifer Rexford  
In Proc. Workshop on Distributed Cloud Computing (DCC) 2014
25. **Real-time diagnosis of TCP performance in clouds**  
Mojgan Ghasemi, Theophilus Benson, Jennifer Rexford  
In Proc. CoNEXT Student Workshop 2013
26. **A Slick Control Plane for Network Middleboxes**  
Bilal Anwer, Theophilus Benson, Nick Feamster, Dave Levin, Jennifer Rexford  
In Proc. of ACM HotSDN 2013 (Poster), and In Proc. of ONS 2013
27. **HotSwap: Correct and Efficient Controller Upgrades for Software-Defined Networks**  
Laurent Vanbever, Joshua Reich, Theophilus Benson, Nate Foster and Jennifer Rexford  
In Proc. of ACM HotSDN 2013
28. **Challenges in Unifying Control of Middlebox Traversals and Functionality**  
Aaron Gember, Theophilus Benson, and Aditya Akella.  
In Proc. of LADIS 2012
29. **A First Look at Problems in the Cloud**  
Theophilus Benson, Sambit Sahu, Aditya Akella and Anees Shaikh.  
In Proc. of USENIX HotCloud 2010.
30. **The Case for Fine-Grained Traffic Engineering in Data Centers**  
Theophilus Benson, Ashok Anand, Aditya Akella and Ming Zhang.  
In Proc. of USENIX INM/WREN 2009.
31. **The Evolution of Network Configuration: A Tale of Two Campuses**  
Hyojoon Kim, Theophilus Benson, Aditya Akella and Nick Feamster.  
In Proc. of ACM IMC 2011.
32. **Demystifying Configuration Challenges and Trade-Offs in Network-based ISP Services**  
Theophilus Benson, Aditya Akella and Aman Shaikh.  
In Proc. of ACM SIGCOMM 2011.

33. **Network Traffic Characteristics of Data Centers in the Wild**  
Theophilus Benson, Aditya Akella and David Maltz.  
In Proc. of ACM IMC 2010.
34. **Understanding Data Center Traffic Characteristics**  
Theophilus Benson, Ashok Anand, Aditya Akella and Ming Zhang.  
In Proc. of IMC 2010.
35. **Mining Policies from Enterprise Network Configuration**  
Theophilus Benson, Aditya Akella and David Maltz.  
In Proc. of ACM IMC 2009.
36. **Unraveling the Complexity of Network Management**  
Theophilus Benson, Aditya Akella and David Maltz.  
In Proc. of USENIX NSDI 2009.

#### Posters

1. **ShadowP4: Building and Testing Modular Programs.**  
Peng Zheng, Theophilus Benson and Chengchen Hu.  
In Proc. of SIGCOMM 2018.
2. **Delorean: Using Time Travel to Avoid Bugs and Failures in SDN Applications.**  
Zhenyu Zhou, Theophilus Benson, Marco Canini and Balakrishnan Chandrasekaran.  
In Proc. of SoSR 2017.
3. **FOCUS: Function Offloading from a Controller to Utilize Switch Power.**  
Ji Yang, Zhenyu Zhou, Theophilus Benson and Xiaowei Yang, Xin Wu and Chengchen Hu  
In Proc. of NSDI 2016.
4. **Picocenter: Supporting long-lived, mostly-idle applications in cloud environments.**  
Liang Zhang, Frank Cangialosi, Theophilus Benson, Dave Levin and Alan Mislove.  
In Proc. of SoCC 2015.
5. **Towards a Safe Playground for HTTPS and Middleboxes with QoS2.**  
Zhenyu Zhou and Theophilus Benson.  
In Proc. of NSDI 2015.
6. **CloudSSI: revisiting SSI in cloud era**  
Mansoor Alicherry, Ashok Anand, Shoban Preeth Chandrabose and Theophilus Benson.  
In Proc. of SoCC 2014.
7. **Harmony: coordinating network, compute, and storage in software-defined clouds.**  
Robert Grandl, Yizheng Chen, Junaid Khalid, Suli Yang, Ashok Anand, Theophilus Benson and Aditya Akella.  
In Proc. of SoCC 2013.
8. **Phoenix: A system for automatically reconfiguring networks.**  
Theophilus Benson, Aditya Akella and David Maltz.  
In Proc. of USENIX NSDI 2009.

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#### Grants and Gifts External Funded Grants:

- **2018-2023** NSF Small Award (IoT Security), PI, \$500K.
- **2018-2023** NSF Small Award (Data-driven Performance), co-PI, \$500K.
- **2018-2023** NSF CAREER Award, PI, \$500K.
- **2018-2019** Google Faculty Award, \$50K.
- **2016-2017** Facebook Faculty Award, \$30K.
- **2015-2016** Facebook Faculty Award, \$30K.
- **2015-2016** Yahoo Faculty Research Proposal, PI, \$29K.

- **2014-2015** Google Cloud Resource Usage Grant, \$10K.
- **2014-2018** NSF Medium, PI, Towards Finer-grained Cloud Computing, \$399,650K.
- **2014-2015** Yahoo Faculty Research Proposal, PI, \$30K.
- **2014** Equipment Gift from Yahoo, estimated \$50K
- **2014** Gift from Facebook, \$25K
- **2014-2015** Yahoo Academic Career Enhancement, \$10K.

Internal Funding and Gifts:

- **2018-2019** Brown Salomon, PI.
- **2014-2017** Duke Bass Connections, PI, “Distance-based, Executive- style Degree Completion Program for Ghanaian Nurse Anesthetists”, interdisciplinary team developing an online distance-based degree completion program for Ghanaian nurse anesthetists without internet connections.

Service Activities

Organizing committee member for:

- **2018:** Technical Program Chair for SIGCOMM Workshop on IoT S&P, Technical Program Chair for CoNEXT, Technical Program Chair for ANCS, Technical Program Chair for HSPR, Travel Grants Chair, Technical Program Chair for SIGCOMM SecSoN Workshop.
- **2017:** Technical Program Chair for CCS Workshop on IoT S&P , SoCC Poster and Demo Co-Chair, SoSR Publicity Chair.
- **2016:** Co-Editor for IJNM (Special Issue on SDN and NFV for Flexible Management), Co-Editor for IEEE Internet Computing (NFV Special Issue).
- **2015:** HotMiddleboxes Technical Program Chair, SIGCOMM Publicity Co-Chair, LISA Research Committee, CoNext Student Workshop Co-Chair.
- **2014:** CoNEXT Travel Grant Co-Chair, LISA Research Committee.
- **2013:** ITC Publicity Co-Chair.

Program committee member for:

- **2018:** SIGCOMM, SoSR, ICDCS, USENIX ATC, SIGCOMM Workshop on NetCompute, APNet.
- **2017:** SIGCOMM, IMC, HotCloud, SIGCOMM Workshop on HotContainers, ITC (Future Internet Architectures), IEEE Networking, SoCC, SoSR Poster and Demo.
- **2016:** Usenix ATC, CoNext, INFOCOM, SIGCOMM, ANCS, HotMiddleboxes, ICDCS, SoSR, IMC, Richard Tapia Scholarship Committee, CAN.
- **2015:** ANCS, SoSR, Workshop on Cross-Cloud, LISA, ICNP, ONUG Research Track, DCC.
- **2014:** NSF Cloud, IMC, CoNEXT, SOCC, HotCloud, LISA, SIGCOMM Posters/Demos, ANCS, ICWA, INFOCOM Workshop on Cross-Cloud.
- **2013:** IMC, SOCC, HotCloud, NSDI Posters/Demos, RSDA.

Tutorials:

- Configuration, Management and Enablement in a Software Defined Platform.
  - **2014:** IEEE NOMS Tutorial Session.

Duke Campus Involvement:

- **2014-Present:** Student Organization Advisor for *Duke Stop Motion*.

Mentorship Activities:

- **Summer 2015:** StreetCoders @ Facebook.
- **2014-Present:** Semester Faculty Round Tables with Delta Sigma Theta.

Invited Talks

*A case for Management Abstractions for Programmable Data Planes.*

- BigSwitch, Santa Clara, CA. Jul 2018
- Huawei Data Center Summit, Madison, WI. Jul 2018

- Huawei Resiliency Workshop, Santa Clara, WI. Jun 2018

*A Data-driven Approach to Turbo Charging the Internet.*

- InternetQoE, Vienna, Austria. Jul 2018
- Facebook, Menlo Park, CA. Jun 2018
- AT&T Research, Bedminster, NJ. May 2018

*Failure as a First Class Entity of SDNs.*

- IBM Research, Bangalore, India. Jun 2016
- MSR India, Bangalore, India. Jun 2016
- Huawei Networking Summit, Princeton, NJ. Dec 2015
- ATT Research. Dec 2015
- Tufts University. Dec 2015
- University of North Carolina, Chapel Hill. Nov 2015

*Commoditizing Software Defined Networks.*

- VMWare Labs. Aug 2015
- HP Labs. Jul 2015
- ONUG - Research Track May 2015

*Large Scale Systems Research from a Fish Bowl.*

- Keynote ICNP Phd Forum. Oct 2014

*Managing Software Defined Networks.*

- IBM Research. Jun 2014
- NEC Labs. Jun 2014

*Slick: A control plane for network middleboxes.*

- Raytheon BBN. Jul 2013

*Demystifying and Controlling the Performance of Data Center Networks.*

- CAARMS 20 (Princeton, NJ). Jun 2014
- Yahoo! Performance Summit. Feb 2014
- DIMACS Workshop on Algorithms for Green Data Storage. Dec 2013
- Facebook (Hosted by Guohui Wang). Aug 2013
- CloudTech3. Oct 2012
- University of California, Berkeley (AMPLab Seminar). Apr 2011

*Peeking into the Cloud.*

- Clouds10 Workshop. Nov 2010

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Classes Taught	<ul style="list-style-type: none"> <li>• CPS 512/ECE 514: Computer Networks and Distributed Systems: Advanced Networking. Fall 2015</li> <li>• CPS 356: Computer Network Architecture. Spr 2015</li> <li>• CPS 590-04: Software Defined-Networking. Fall 2014</li> <li>• CPS 512/ECE 514: Computer Networks and Distributed Systems: Advanced Networking. Spr 2014</li> <li>• CPS 590-04: Rethinking Networking Paradigms for Cloud Computing and Big Data Analytics: Infrastructure for Big Data. Fall 2013</li> </ul>	
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Professional Experience	<p><b>Facebook</b>, Menlo Park, California USA</p> <p><i>Web Performance Consultant; Summer</i></p>	<b>2015</b>
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**Yahoo Research**, Sunnyvale, California USA  
*Data Center Performance Consultant* **2014-2017**

**AT&T Research; Visiting Researcher**, Florham Park, New Jersey USA  
*Researcher; Spring Intern* **2011**

**Microsoft Research**, Redmond, Washington USA  
*Researcher; Summer Intern* **2008**

**IBM Research**, Hawthorne, New York USA  
*Researcher; Summer Intern* **2007-2009**