Bahador Bakhshi

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Amirkabir University of Technology
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Fields of Interest

- Computer Networks including "Software Defined Networking (SDN)," "Network Function Virtualization (NFV)", "Green Networking", and "IoT"

- Computer Science including "Machine Learning," "Optimization," and "Performance Evaluation"

Education

Ph.D. in Computer Engineering

- January 2006–March 2011, *Amirkabir University of Technology*, Tehran, Iran,
  - Supervisor: Dr. Siavash Khorsandi

- October 1, 2009–March 31, 2010 Visiting Researcher at ANTLab, *Politecnico di Milano*, Milan, Italy
  - Supervisor: Prof. Antonio Capone

- Dissertation: "Joint QoS Routing and Channel Assignment in Multi-Channel Multi-Radio Wireless Mesh Networks"
  - MILP formulation of the joint QoS routing and channel assignment in MC-MR WMNs
  - Efficient routing and channel assignment algorithm(s) in MC-MR WMNs
  - Performance bound of QoS-aware data networks via multi-dimensional Markov chain modeling and statistical max-min fair approximation of QoS routing algorithm under greedy CAC policy
  - Performance and fairness evaluation of dynamic channel assignment algorithms in WMNs

M.Sc. in Computer Engineering

- September 2003–November 2005, *Amirkabir University of Technology*, Tehran, Iran
  - Supervisor: Dr. Babak Sadeghiyan

- Major in Computer Architecture

- Thesis: "Timing Attack on Digital Signature Standard (DSS)"
  - Extracting private key via statistical analysis of running time of DSS implemented in an embedded environment

B.Sc. in Computer Engineering

- September 1999–September 2003, *Sharif University of Technology*, Tehran, Iran
  - Supervisor: Dr. Amirhossein Jahangir

- Major in Hardware Engineering

- Thesis: "Design and Implementation of USB Ethernet NIC"

Publications

Journal Papers

- Ali Zamani, **Bahador Bakhshi**, Saeed Sharifian, "*An Efficient Load Balancing Approach for Service Function Chain Mapping,*" Computer & Electrical Engineering journal, DOI: 10.1016/B978-1-55860-335-6.50028-3

- Behrooz Farkiani, **Bahador Bakhshi**, S. Ali MirHassani, "*A Fast Near-Optimal Approach for Energy Aware SFC Deployment,*" Transactions on Network and Service Management, DOI: 10.1109/TNSM.2019.2944023

- Behrooz Farkiani, **Bahador Bakhshi**, and S. Ali MirHassani, "*Stochastic virtual network embedding via accelerated Benders decomposition,*" Future Generation Computer Systems 94 (2019): 199-213.

- Narges, Arastouie, Masoud Sabaei, and **Bahador Bakhshi**, "*Near-Optimal Online Routing in Opportunistic Networks,*" International Journal of Communication Systems 32.3 (2019): 38-63.

- Mohammad Khaksar Haghani, **Bahador Bakhshi**, Antonio Capone, "*Multi-Objective Embedding of Software-Defined Virtual Networks,*" Computer Communications 129 (2018): 32-42.

- Amir Esmaeili, **Bahador Bakhshi**, "*A New BGP-based Load Distribution Approach in Geographically Distributed Data Centers,*" IJECE 16.1 (2018): 71-78. (Farsi)

- Seyed Iman PourEmami, **Bahador Bakhshi**, "*On the Trade-off between Power-Efficiency and Blocking Probability in Fault-Tolerant WDM Networks,*" Journal of Network and Computer Application 58 (2015): 255-266.

- **Bahador Bakhshi**, Siavash Khorsandi, "*A Novel Approach for the Performance Bound of QoS-aware Data Networks Under Greedy CAC Policy,*" Elsevier Performance Evaluation 70.2 (2013): 90-113.

- **Bahador Bakhshi**, Siavash Khorsandi, "*On the Performance and Fairness of Dynamic Channel Allocation in Wireless Mesh Networks,*" International Journal of Communication Systems 26.3 (2013): 293-314.

- **Bahador Bakhshi**, Siavash Khorsandi, "*Complexity and Design of QoS Routing Algorithms in Wireless Mesh Networks,*" Computer Communications 34.14 (2011): 1722-1737.

- **Bahador Bakhshi**, Siavash Khorsandi, Antonio Capone, "*On-line Joint QoS Routing and Channel Assignment in Multi-Channel Multi-Radio Wireless Mesh Networks,*" Computer Communications 34.11 (2011): 1342-1360.

- **Bahador Bakhshi**, Babak Sadeghiyan, "*Timing Attack against Blakley's Modular Multiplication Algorithm,*" JCSE, Vol. 4, No. 3, 2006. (Farsi)

Conference Papers

- Jerico Moeyersons, Behrooz Farkiani, **Bahador Bakhshi**, Seyyed Ali Mirhassani, Tim Wauters, Bruno Volckaert and Filip De Turck, "*Enabling Emergency Flow Prioritization in SDN Networks,*" CNSM, 2019

- Fatemeh Yaghoubpour, **Bahador Bakhshi**, "*Optimal delay-aware service function chaining in NFV,*" ICEE, 2019

- Pegah Torkamandi, Sivash Khorsandi, **Bahador Bakhshi**, "*Availability Aware SFC embedding in NFV: A Clustering Approach,*" ICEE, 2019

- Farnoosh Sattari, **Bahador Bakhshi**, "*Modeling and Performance Evaluation of Distributed Multi-Controller Software Defined Networks,*" CSICC, 2017. (Farsi)

- Ehsan Mohammadpour, **Bahador Bakhshi**, "*RLA-ENAR: A Realistic Near-Optimal Energy-Aware Routing,*" IEEE SoftCOM, 2016.

- Roya Razmnoush, **Bahador Bakhshi**, "*Green Traffic Engineering in SDN,*" ICEE, 2016.

- **Bahador Bakhshi**, Antonio Capone, Siavash Khorsandi, "*QoS Driven Channel Assignment in Multi-Channel Multi-Radio Wireless Mesh Networks,*" IEEE ICCS, 2010.

- **Bahador Bakhshi**, Siavash Khorsandi, "*Node Connectivity Analysis in Multi-Hop Wireless Networks,*" IEEE WCNC, 2010.

- **Bahador Bakhshi**, Siavash Khorsandi, "*The Impact of Optimal Multipath Routing on the Performance of Wireless Mesh Networks,*" CSICC, 2009. (Farsi)

- **Bahador Bakhshi**, Siavash Khorsandi, "*A Maximum Fair Bandwidth Approach for Channel Assignment in Wireless Mesh Networks,*" IEEE WCNC, 2008.

- Hamed Janzadeh, Kaveh Fayazbakhsh, **Bahador Bakhshi**, Mehdi Dehghan, "*A Novel Incentive-Based and Hardware-Independent Cooperation Mechanism for MANETs,*" IEEE WCNC, 2008.

- Siavash Khorsandi, **Bahador Bakhshi**, "*Local Multi-Commodity Based Traffic Engineering in MPLS Using LSP Rerouting,*" CSICC, 2008. (Farsi)

- Sajjad Moradi, **Bahador Bakhshi**, Siavash Khorsandi, "*Improvement on Concentrator Location Problem in Access Network Design using Growing Neural Network,*" CSICC, 2007. (Farsi)

- **Bahador Bakhshi**, Babak Sadeghiyan, "*A Timing Attack on Blakley's Modular Multiplication algorithm, and Applications to DSA,*" ACNS, 2007.

- **Bahador Bakhshi**, Babak Sadeghiyan, "*Timing Analysis of Blakley's Modular Multiplication algorithm,*" CSICC, 2006. (Farsi)

- **Bahador Bakhshi**, Babak Sadeghiyan, "*Timing Attack Resistant Hardware Implementation of Digital Signature Standard,*" CSICC, 2006. (Farsi)

Working and Submitted Journal Papers

- Behrooz Farkiani, **Bahador Bakhshi**, Seyyed Ali Mirhassani, Tim Wauters, Bruno Volckaert and Filip De Turck, "*Prioritized Deployment of Dynamic Service Function Chains,*" submitted to Transactions on Networking

- Ali Zamani, **Bahador Bakhshi**, Saeed Sharifian, "*An Efficient Load Balancing Approach for Service Function Chain Mapping,*" submitted to Computer and Electronic Engineering Journal

- Amir Esmaeili, **Bahador Bakhshi**, "*DDoS Mitigation in Geographically Distributed Data Centers based on BGP,*" under preparation

- Fatemeh Seifi, **Bahador Bakhshi**, "*Segment Based Path Protection in Elastic Optical Networks via Lagrangian Relaxation,*" under preparation

- Fatemeh Yaghoubpour, **Bahador Bakhshi**, "*Delay-Constrained SFC Deployment in NFV,*" under preparation

- Parham Alvani, **Bahador Bakhshi**, "*Joint SFC and VFNM deployment in NFV*", under preparation

Technical Reports

- **Bahador Bakhshi**, Antonio Capone, Siavash Khorsandi, "*QoS Driven Dynamic Channel Assignment in Multi-Channel Multi-Radio Wireless Mesh Networks,*" Amirkabir University of Technology, 2010.

- **Bahador Bakhshi**, Siavash Khorsandi, "*On the Complexity of Bandwidth Constrained Routing in Wireless Mesh Networks,*" Amirkabir University of Technology, 2008.

- **Bahador Bakhshi**, "*Survey on Hardware based IP-table lookup,*" Amirkabir University of Technology, 2003. (Farsi)

- **Bahador Bakhshi**, "*Survey on Grid Computing Security,*" Amirkabir University of Technology, 2004. (Farsi)

- **Bahador Bakhshi**, "*RTLinux: A Real-time Version of Linux,*" Sharif University of Technology, 2001. (Farsi)

Graduate Students Supervision

Current Ph.D. Students

- Behrooz Farkiani, "*Resource Allocation in NFV,*" September 2015–Present
- Reyhaneh Tahani, "*Deep Learning Based Resource Allocation for Ultra-Reliable Low-Latency Communication,*" September 2016–Present
- Fatemeh Seifi, *TBD*, September 2018–Present
- Parham Alvani, *TBD*, September 2019–Present

Graduated Master Students

- Iman Pouremami, "*Fault-Tolerant Design and routing of Green Networks,*" 2014
- Zeynab Anbiaye, "*Energy efficient channel assignment and routing in multi-channel multi-radio wireless mesh networks,*" 2014
- Mohammad Khaksar, "*Optimized Virtual Networks Embedding in Software-Defined Networks Substrates,*" 2015
- Roya Razmnoosh, "*Energy-Efficient Online Routing of Flows for IP Networks*," 2015
- Ehsan Mohammadpour, "*Routing in Green Networks Based on Traffic-Aware Power Model*," 2016
- Farnoosh Sattari, "*Modeling and Performance Evaluation of Software-Defined Networks with Hierarchical Multi-Controller,*" 2016
- Amir Esmaili, "*A New Approach for Traffic Load Balancing in Geographically Distributed Data Centers,*" 2016
- Mina Godsi, "*Online Virtual Networks Embedding in Software-Defined Networks,*" 2017
- Fatemeh Yaghoubpour, "*QoS Provision in Service Function Chaining in Network Function Virtualization,*" 2018
- Parham Alvani, "*Joint SFC Deployment and Manager Placement in NFV,*" 2019

Teaching

- **Optimization Theory with Network Applications**
  - Graduate course
  - CE Dept., Amirkabir University of Technology, Fall semesters 2012–2018
  - Ranked **4 out of ~34** MS courses of CE Dept. in 2015,2016, and 2017 fall semesters
  - Course Page: `ceit.aut.ac.ir/~bakhshis/ON/`
  - Topics:
    - Theory of Unconstrained, Convex, Linear Programming, and Integer Linear Programming
    - Modeling languages and solvers
    - Networking problem formulation

- **Network Management**
  - Graduate course
  - CE Dept., Amirkabir University of Technology, Spring semesters 2012–2018
  - Ranked **7 out of ~34** MS courses of CE Dept. in 2014, and 2015 spring semesters
  - Course Page: `ceit.aut.ac.ir/~bakhshis/NM/`
  - Topics:
    - Dimensions and Layers of network management

- Network management protocols: SNMP, syslog, IPFIX/Netflow, Netconf
- Network management functions: Fault, Configuration, Accounting, Performance and Security
- Network management frameworks: TMF Frameworx (eTOM, TAM, SID)
- Network management in next generation (SDN/NFV based) networks

- **Web Programming**
  - Undergraduate course
  - CE Dept., Amirkabir University of Technology Fall & Spring semesters 2011–2019
  - Ranked **2-5 out of ~45** BS courses of CE Dept. in 2014–2019 fall & spring semesters
  - Course Page: `ceit.aut.ac.ir/~bakhshis/IE/`
  - Topics:
    - HTTP protocol
    - Client side: HTML(5), CSS(3), JavaScript, JSON, XML, Ajax, jQuery
    - Server side: CGI, PHP
    - Web application architectures: MVC, Multi-Layer/Tier, Microservices

- **Introduction to Programming**
  - Undergraduate course
  - CE Dept., Amirkabir University of Technology, Fall semesters 2011–2019
  - Mathematics Dept., Amirkabir University of Technology, Spring 2011, Fall 2010, Spring 2008, and Fall 2007
  - Ranked **1-2 out of ~45** BS courses of CE Dept. in 2014–2019 semesters
  - Course Page: `ceit.aut.ac.ir/~bakhshis/c/`
  - Topics:
    - Computer Hardware and Software architecture
    - Problem solving by computer
    - Programming in C

- **NS-2 Simulator**
  - Graduate crash course
  - CE Dept., Amirkabir University of Technology, Fall 2010
  - Course Page: `ceit.aut.ac.ir/~bakhshis/ns-2/`
  - Topics:
    - NS-2 software architecture
    - TCL & OTcl
    - Wired and Wireless network simulation
    - Extending NS-2

- **Linux Kernel**
  - Workshop
  - CE Dept., Amirkabir University of Technology, 2013–2016, and 2018
  - Topics:
    - Kernel architecture
    - User-space interfaces of kernel
    - Installing a new kernel
    - Kernel modules development

- **Introduction to Linux**
  - Undergraduate crash course

- ♦ CE Dept., Amirkabir University of Technology, Fall 2005–2008
- ♦ Course Page: `ceit.aut.ac.ir/~bakhshis/linux`
- ♦ Topics:
  - ▪ Basic concepts
  - ▪ File management
  - ▪ Process management
  - ▪ Shell scripting & Programming
  - ▪ Networking

- **Introduction to Discrete Optimization**
  - ♦ Graduate crash course
  - ♦ Iran Telecommunication Research Center (ITRC), Summer 2010
  - ♦ Topics:
    - ▪ Theory of integer programming
    - ▪ Complexity of integer programming
    - ▪ Algorithms and solver for integer programming

Work Experience & Industrial Projects

- ❖ **01/03/2012–Present, Computer Engineering Dep. Amirkabir University of Technology**
- ♦ Assistant Professor
- ♦ Member of Computer Network Group

- ➢ **Head and Manager of IoT Platform Project**
  - Developing a general purpose IoT platform
  - Designing scalable system based on microservices architecture using the container technology
  - Supporting LoRa WAN and LAN connectivity
  - Implementing by the state-of-the-art technologies: *Docker*, *Kubernetes*, *Go*, *Laravel*, and *React*

- ➢ **Manager of Telecom Fraud Management and Clearing House Project**
  - Consulting and supervising of CDR & CRM gathering from major telecom operators of Iran
  - Consulting and supervising on implementing Telecom Fraud Management System
    - o Bypass/SIMbox fraud
    - o SIM cloning fraud
  - Consulting and supervising on implementing Telecom Clearing House
    - o Inter-connect clearing
    - o Roaming clearing

- ➢ **Manager of SDN/NFV Project**
  - Research on SND and NFV features
  - Designing network architecture based on SDN and NFV
  - Prototyping NFV lab using OpenStack and Open Baton

- ➢ **Technical Manager of IMS Project**
  - Research on IMS architecture
  - Prototyping IMS network using Open IMS Core
  - Scalability improvement of IMS architecture

❖ **01/04/2010–30/02/2012, Fava Pars**

♦ Head of Network Security Team

♦ Senior Member of Network Management Team

♦ Senior Network Consultant

♦ Project Manager

➢ **National IP/MPLS Network Project**

- Security of Service Provider Networks (Data, Control, Management plane security)
  o Requirement analysis and preparing RFP
  o Tender for vendor selecting
  o Finalizing LoM
- OSS design based on eTOM
- Vendor acceptance test in collaboration with EANTC (European Advanced Networking Test Center)
  o Preparing and finalizing ATPs (Acceptance Test Procedures)
  o Conducting test in Huawei R&D center

➢ **TCI NTN (Next Generation Network) Project**

- PSTN to NGN transformation strategies for TCI (Telecommunication Company of Iran)
- NGN/IMS network design in collaboration with KT (Korea Telecom)

➢ **TCI iNMS (Integrated Network Management System) Project**

- AS-IS analysis of existing Telecom OSS
- NOC & Trouble Ticket System design in collaboration with KT (Korea Telecom)

❖ **01/04/2005–30/08/2009, SiNA Microelectronics Inc.**

♦ Head of Software Development Team

♦ Project & Product Manager

♦ Embedded System Software Engineer

➢ **VoIP Gateway Project**

- VoIP solution (SIP & RTP protocols)
- PSTN to VoIP gateway
- Hardening operating system

➢ **SOHO Gateway Project**

- Porting Linux kernel on SPARC-based custom processor
- Linux kernel hardware accelerators
- IPsec VPN
- Linux stateful firewall
- BusyBox filesystem

➢ **SNMP Based Radio Management Platform Project**

- Embedded Linux development for ARM processor
- Linux device drivers, including SMBus, SPI and Ethernet
- SNMP agent and MIB development

- Custom management interfaces in embedded system

❖ **07/2003–10/2004, Asre Danesh Afzar (ADA)**

♦ Network Security Engineer

➤ **National DNS-Cache Project**

- Netapp Caching Devices
- Netscreen Firewall, GlobalPro management Software
- Cisco IDS, CiscoWorks management software

➤ **National Commerce Ministry Project**

- Cisco Routers
- Cisco PIX Firewalls
- Cisco Switches
- Cisco IDS

Professional Services

- Reviewer of Computer Communications, Computer Networks, Applied Mathematical Modelling, IEEE Communications Letters, International Journal of Communication Systems, and Iranian Electrical and Computer Engineering journals
- Reviewer of CSICC 2018, ICEE 2017, ICEE 2015, CSICC 2015, IST2014, ICEE 2014, CSICC 2013, CNDS 2013, IEEE VTC 2011 conferences

Technical Skills

- Computer networks technologies, theories, tools, and protocols (Expert)
- Network management architecture, standards, and tools (Expert)
- Networking protocols: TCP/IP, IPSec, RIP, OpenFlow, HTTP, DNS, HTTPS, SMTP, SNMP, IPFIX, NetConf, Syslog, IMAP (Expert)
- Optimization tool sets: scip, zimpl, AMPL, CPLEX (Expert)
- C Programming (Expert)
- Linux kernel programming, administration and scripting (Professional)
- Embedded system software development (Professional)
- IoT protocols: LoRaWAN, RPL, CoAP, MQTT, Websocket, JSON, IoTivity (Professional)
- Software architecture: microservices, multi-layer, MVC, multi-tier, publish-subscribe (Professional)
- Cisco Switches/Routers, Firewalls, and IDS (Professional)
- Ansible (Professional)
- Server administration: Apache, Bind, OpenSSH, SendMail (Upper-Intermediate)
- Web Development: HTML(5), CSS(3), JavaScript, jQuery, JSON, XML, PHP (Upper-Intermediate)
- Machine Learning tool sets: Scikit, Keras, TensorFlow (Intermediate)
- Virtualization technologies: Docker, K8S, Docker Swarm (Intermediate)
- Python, and Java Programming (Intermediate)