Songshi Dou

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Education

- **Beijing Institute of Technology** — Beijing, China
  Master of Control Engineering (Supervisor: Prof. Zehua Guo) — *Sept. 2019 - Present*
- **North China Electric Power University** — Beijing, China
  Bachelor of Automation — *Sept. 2015 - Jul. 2019*

Research Experiences

- **Path Programmability Recovery in SD-WANs under Multiple Controller Failures**
  - **Descriptions:** We propose to improve the path programmability in SD-WANs under multiple controller failures.
    (1) For all circumstances, **Matchmaker** is proposed to adaptively adjust the control cost of offline switches based on the limited control resource by changing the paths of flows to realize proper offline switches remapping.
    (2) If hybrid SDN/legacy mode is supported, **RetroFlow+** can be used to recover the flow programmability and achieve low communication overhead by intelligently configuring a set of selected offline switches working under the legacy routing mode; **ProgrammabilityMedic** recovers programmability by fine-grainedly selecting a routing mode for each offline flow at each offline switch to fit the given control resource from active controllers.
    (3) If network slicing techniques (e.g., FlowVisor) are supported, **ProgrammabilityGuardian** is exhibited to recover all offline flows with the similar path programmability with fine-grained flow-level mappings.
  - **Status:** Three papers have been accepted by *IEEE ICDCS'21*, *IEEE/ACM IWQoS'20*, and *Elsevier Computer Networks*. Two papers are under major revision by *IEEE/ACM TON* and *IEEE Systems Journal*. One paper is under review by *IEEE/ACM TON*.
- **Traffic Engineering in SD-WANs with Scalable Routing**
  - **Descriptions:** We propose **HybridFlow** to achieve a good load balancing performance using a single controller with low control overhead, which mainly employs two techniques: hybrid routing and crucial flow rerouting. Hybrid routing gives us opportunities to reduce the processing load of the controller by routing flows with the hybrid SDN/legacy mode, while crucial flow rerouting dynamically identifies and reroutes crucial flows which have great impact on network performance.
  - **Status:** HybridFlow has been accepted by *IEEE TCOM*.

Journal Papers

- **Songshi Dou**, Guochun Miao, Zehua Guo, Chao Yao, Weiran Wu, and Yuanqing Xia, "Matchmaker: Maintaining Network Programmability for Software-Defined WANs under Multiple Controller Failures", *Elsevier Computer Networks*, 2021, vol. 192, p. 108045. **(SCI JCR: Q1, IF: 4.474)** [pdf]
- Zehua Guo, **Songshi Dou**, Yi Wang, Sen Liu, Wendi Feng, and Yang Xu, "HybridFlow: Achieving Load Balancing in Software-Defined WANs with Scalable Routing", *IEEE Transactions on Communications*, 2021. **(SCI JCR: Q1, IF: 5.083)** [pdf]

Conference and Workshop Papers

- **Songshi Dou**, Zehua Guo, and Yuanqing Xia, "ProgrammabilityMedic: Predictable Path Programmability Recovery under Multiple Controller Failures in SD-WANs", *IEEE International Conference on Distributed Computing Systems 2021 (ICDCS'21)*. **(Accept Ratio: 97/489=19.8%)** [pdf]
- Zehua Guo, **Songshi Dou**, and Wenchao Jiang, "Improving the Path Programmability for Software-Defined WANs under Multiple Controller Failures", *IEEE/ACM International Symposium on Quality of Service 2020 (IWQoS'20)*. **(Accept Ratio: 44/147=29.9%)** [pdf]
- Yijun Sun, Zehua Guo, **Songshi Dou**, and Yuanqing Xia, "Video Quality and Popularity-aware Video Caching in Content Delivery Networks", *IEEE International Conference on Web Services 2021 (ICWS'21)*.

Work In Progress

- Zehua Guo, **Songshi Dou**, Sen Liu, Wendi Feng, Wenchao Jiang, Yang Xu, and Zhi-Li Zhang, "Maintaining Control Resiliency and Flow Programmability in Software-Defined WANs During Controller Failures", *IEEE/ACM Transactions on Networking*, Major Revision. **(SCI JCR: Q1, IF: 3.560)**
- **Songshi Dou**, Zehua Guo, Li Qi, Yang Li, and Chao Yao, "Critical Programmability-aware Controller Placement and Switch-Controller Mapping in SD-WANs", *IEEE Systems Journal*, Major Revision. **(IF: 3.931)**
- Zehua Guo, **Songshi Dou**, and Wenchao Jiang, "Towards Improved Path Programmability Recovery for Software-Defined WANs under Multiple Controller Failures", *IEEE/ACM Transactions on Networking*, Under Review. **(SCI JCR: Q1, IF: 3.560)**

- Zehua Guo, Haoran Ni, **Songshi Dou**, Chao Yao, and Thar Baker, "Network Coding-based Resilient Routing for Maintaining Data Security and Availability in Software-Defined Networks", *Elsevier Journal of Network and Computer Applications*, Under Review. **(SCI JCR: Q1, IF: 6.281)**

Patents

- Zehua Guo, **Songshi Dou**, "Optimizing Flow Programmability under Multiple Controller Failures in Software-Defined Networks", Chinese Patent, ZL202010544094.4.
- Zehua Guo, Penghao Sun, **Songshi Dou**, Yutian Zhang, Han Ning, and Yuanqing Xia, "Deep Reinforcement Learning-based Data Center Network Energy Management and Quality of Service Optimization Method", Chinese Patent, ZL202010308862.6.

Projects

- **National Science Foundation of China, Main Participant** — Beijing, China
  Research on the Path Programmability Recovery of Software-Defined Wide Area Networks during Multiple Controller Failures — *Jan. 2021 - Present*
- **BIT Research Fund Program for Young Scholars, Main Participant** — Beijing, China
  Enabling Resiliency Control of Software-Defined Networks — *Jul. 2019 - Present*

Honors and Awards

- **USENIX Student Grant**, USENIX — *2021*
- **ICDCS 2021 Student Registration Award**, IEEE Computer Society TCDP — *2021*
- **CNCC 2020 Student Registration Award**, China Computer Federation (CCF) — *2020*
- **Third Prize of China Post-Graduate Mathematical Contest in Modeling**, China — *2020*
- **Excellent Master Student Scholarship Award**, Beijing Institute of Technology — *2019*
- **Bachelor Student Scholarship Award**, North China Electric Power University — *2015, 2016, 2017*

Talks and Presentations

- **IEEE International Conference on Distributed Computing Systems 2021** [slides] — Online
  ProgrammabilityMedic: Predictable Path Programmability Recovery under Multiple Controller Failures in SD-WANs — *Jul. 2021*
- **IEEE/ACM International Symposium on Quality of Service 2020** [slides] — Online
  Improving the Path Programmability for Software-Defined WANs under Multiple Controller Failures — *Jun. 2020*

Languages

- IELTS: 7 (L: 7.5; R: 8.0; W: 6.5; S: 6.0)
- CET-6: 552

Skills

- Programming: Python; C-programming; Matlab; VB
- Tools: LaTeX; Linux; SDN theory