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 <u>all circumstances</u>, **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 <u>hybrid SDN/legacy mode</u> 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 <u>network slicing techniques (e.g., FlowVisor)</u> 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, Ning Han, 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