



With 2019 getting smaller in our rearview mirror, we would like to take a quick look at our main achievements and thank you for your continuous and valuable contributions throughout the last year. Over the past year, we made accomplishments in further improving the security and efficiency of SCION, and expanded the research across the project, ranging from satellite networks to formal verification.

The SCION day in November rounded out the year by bringing experts from academia and the industry together in joint discussions about the future of Internet security. In presentations and panel discussions, SCION was presented as a solution to bring back trust to the Internet through its unique design of path-aware networking and isolation domains. In 2020, we continue to expand the research and development / deployment envelope, with particular focus on the SCI-ED project, SCION applications, formal verification, and documentation through a fully revised SCION book to be published by the end of the year.

HIGHLIGHTS FROM SCION DAY

Over 120 people attended our first SCION Day on 6 November 2019. The day brought both academia and the industry closer together with participants from different industries (e.g., including panel participants from ABB, Axpo WZ Systems Blockchain Trust Solutions AG, Detecon, SIDN, SIX, SNB, Sunrise, Swisscom, Switch), all contributing to the day with interesting discussions. Link to videos and slides:

https://www.scion-architecture.net/pages/scion_day/

RESEARCH

Satellite Networking

Satellite constellation networks are one of the most recent and exciting developments in networking. Renewed interest in this area has been sparked by an unprecedented wave of investment to develop and deploy a new generation of constellations. These are composed of thousands of small satellites, orbiting the Earth at low altitude. The first revolution promised by these networks is to bring Internet connectivity at broadband speed to the most remote corners of the globe.

But this is not the only advantage this new breed of constellations can provide. Since satellites are very close to the surface of the globe, relaying signals to Space and back on Earth is much faster than with “traditional” geostationary satellites. As a matter of fact,

communicating over satellite networks will be even faster than terrestrial optic fibers for medium to long distances. At the Network Security group, we are studying new solutions to exploit the full untapped potential of next-generation satellite networks.

The results of our explorations have been published in two recent papers. The first looks at the challenges and opportunities that arise when satellite networks are integrated in the terrestrial routing fabric [HotNets'18]. The second—appearing in ACM Computer Communication Review, January 2020—proposes new designs to enable interdomain routing with satellite constellations. Our results show how SCION can be beneficial in this setting, as the inherent diversity of the satellite and terrestrial paths can be exploited using end-host path control and multipath routing.

Internet Backbones in Space.

Giacomo Giuliari, Tobias Klenze, Markus Legner, David Basin, Adrian Perrig and Ankit Singla.

In SIGCOMM Computer Communication Review, 50(1), 2020.

<https://netsec.ethz.ch/publications/papers/ccr-ibis-2020.pdf>

Single/multipath SCION Socket

Over the past decade, large Internet firms have been reducing network latency and improving performance through a variety of infrastructural investments, for instance by deploying fiber, building out CDNs, collocating data and compute, and even resorting to private backbones. The industry is now furthermore improving end-to-end performance by optimizing the upper protocol layers HTTP/TLS/UDP, resulting in the QUIC protocol.

The only part that has largely withstood optimization so far is the network layer. Here, SCION can optimize the inter-domain routing and provide improved forwarding paths, path awareness, and multipath communication.

To show the potential of this approach, we designed and implemented an application library that can switch between SCION paths, reacting to changes in the network conditions. The path change is transparent to the application and to the QUIC connection running on top of the SCION path, only the congestion window of QUIC needs to be reset when changing paths due to congestion control and inter-flow fairness reasons.

We ran experiments simulating the congestion of a network link, showing the reaction of the application library to the change in link latency and the switch to a faster alternative path, without affecting the application and the QUIC connection. Open questions are how clients and servers can co-optimize path selection and how network mobility and multi-homing can be improved with this approach.

Over the course of the year, we will continue to work in these directions to bring the advantages of SCION multipath communication even to multipath-unaware applications.

The source for the modified socket library is available on a Github repository:
https://github.com/FR4NK-W/scion-apps/tree/mpsquic_lean_unbundle
The experiments were run using a Netropy N61 WAN emulator from Apposite.

RECENT EVENTS

Adrian Perrig gave a presentation at the Next Generation Networking for Science meeting in Geneva on 15 January, talking about high-speed file transfer with SCION:

<https://wiki.geant.org/display/SIGNGN/4th+SIG-NGN+Meeting>

Talk slides: <https://www.scion-architecture.net/pdf/talks/SIG-NGI-CERN-2020.pdf>

Kamila Součková and Mateusz Kowalski gave a talk about SCION at the FOSDEM conference. Read here to learn how SCION improves security, availability and performance of the current Internet and how you can start using it today.

<https://fosdem.org/2020/schedule/event/scion/>

Talk slides: <https://www.scion-architecture.net/pdf/talks/SCION-at-FOSDEM-2020.pdf>

Adrian Perrig gave a talk at the Swiss Cyber Security Days in Fribourg. His talk was about "A scalable and secure global communication Infrastructure".

<https://swisscybersecuritydays.ch/en/>

Talk slides: <https://www.scion-architecture.net/pdf/talks/Freiburg-cybersecurity-2020.pdf>

Jonghoon Kwon presented at the @NDSSSymposium on February 25th a new Research paper: **SVLAN: Secure & Scalable Network Virtualization**.

Talk slides:

https://www.scion-architecture.net/pdf/talks/NDSS2020_SVLAN_KWON_final.pdf

Research paper: https://netsec.ethz.ch/publications/papers/ndss2020_svlan.pdf

Thanks for your support and stay tuned for further updates!

The SCION team