



# SSFN – a SCION ISD in Switzerland

Secure Swiss Finance Network SCION use case

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# SIX – Who we are

SIX operates the Swiss Financial Infrastructure:

- Swiss Stock Exchange (Listing & Trading)
- Financial Information (Reference & Market Data, Indices)
- Securities Services (Central Security Depository, Central Counterparty, Clearing & Settlement)
- Banking Services (Billing & Payment Services, Debit & Mobile Services, ATM Services)
  
- Interbank services are provided by a private network operated by commercial telco providers
- SIX maintains connections to other banks pan-Europe and in other markets globally

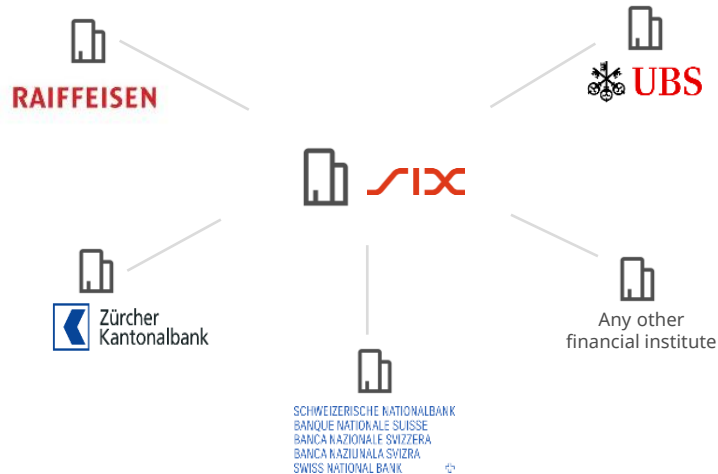
# Business and Technical Requirements for a new Interbank Network

- Trends and Challenges
  - Real-Time systems such as the Swiss payments system and other critical infrastructures form the strong core for the financial system and must have strongest possible protection
  - Increasing reliance on public networks – the Internet – for communications between financial institutions, bank branches and infrastructures
  - Vulnerability of data in transport is a risk (e.g., due to denial of service or man in the middle attacks)
  - Current solutions to address risks are inflexible and costly
- Requirements for a new Interbank Network
  - A secure and resilient communication network for payments and other critical infrastructures
  - Protection against cyber risks: enforceable governance and boundaries
  - Trust in the network – know the location / path of data in transit
  - Flexible communication between participants: any-to-any architecture instead of (virtual) point-to-point connections
  - Delivered by the financial community and telecom providers – no change in business model

# SSFN – A Secure and Resilient Communication Network for Interbank traffic

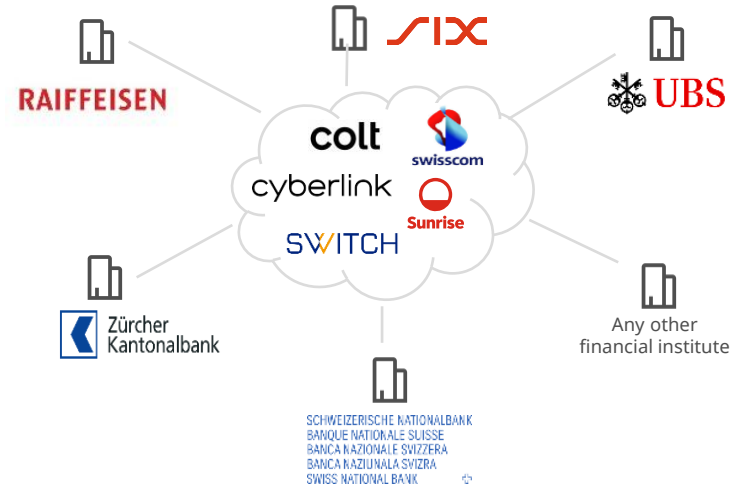
## Today

Centralized «Hub and Spoke» architecture



## Vision

Community-based, «any-to-any», Internet-like architecture



# Why SCION?

- Before starting, a thorough analysis was started
  - Comparison between different new Internet technologies was done
  - Alternatively, replacing MPLS by another MPLS network was considered
  - SD-WAN was briefly discussed, but is not suited for a multi-provider, multi-product, multi-customer market
- SCION promised to meet the requirements
- SCION had already achieved a high level of maturity in productive use (Swiss National Bank, Swiss Government)
- There was already a close collaboration between SIX and ETH, where SCION was originally researched and developed

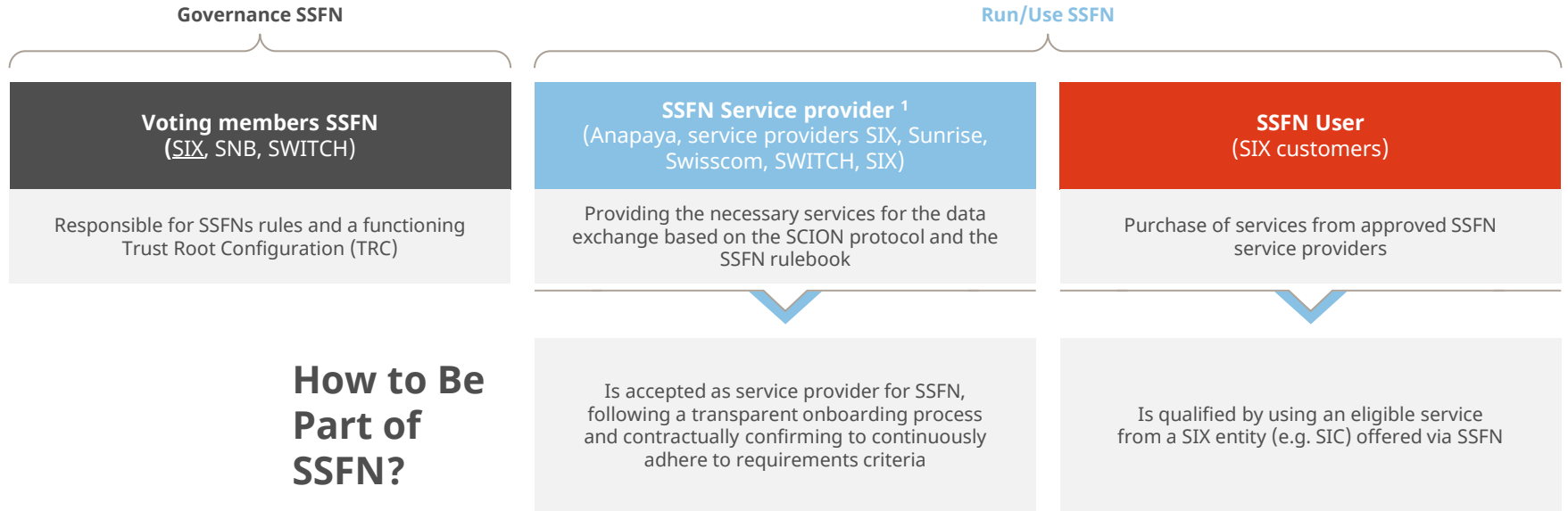
# What is different in using SCION compared to other technologies?

- SCION allows for local, user-centric, enforceable governance
- Governance can be split from actual operations; the governance parties don't need to be identical to those who operate the network
- ISD concept allows for complete isolation of trust
- Multiple operations models can be implemented, it allows for various business models

# The Governance of SSFN Defines the Rules & Regulations of SSFN – Service Providers Must Qualify

## Basic characteristic of SSFN

Regulated interaction between users and service providers (with rules defined by the governance and influenceable by users and service providers), but decentralized like the Internet.



# TRC Creation and Maintenance

- From research perspective, TRC creation and life cycle is well established and well documented (see SCION Control-Plane PKI draft RFC , <https://datatracker.ietf.org/doc/draft-dekater-scion-pki/>)
- In practice, key and TRC creation ceremonies must be designed according to ISD requirements
- In a multi-party governed ISD virtual TRC ceremonies have proved to be effective and viable
- Elements in the TRC:
  - ISD ID
  - Purpose
  - Core and authoritative participants (ASes)
  - Validity period
  - Voting Quorum
  - Certificates (CA root, regular and sensitive voting)
  - Some other parameters



# TRC Creation and Maintenance

ISD ID



Purpose / Description



Voting Quorum



Core and authoritative participants (ASes)



Certificates (CA root, regular and sensitive voting)



Validity period



```
anapaya@trc-hosted: /opt/trc-ceremony-20231026
isd = 70
description = ""\"ISD 70 bildet die Grundlage für SSFN, das Secure Swiss Finance Network.
Kurzbeschreibung des SSFN ISD

1. SSFN ist ein Kommunikationsservice für den Schweizer Finanzplatz.
2. SSFN ermöglicht einen vom Internet getrennten Austausch von Daten unter den Nutzern, jedoch mit I
3. Die SSFN-Governance (Voting Member) regelt, welche Partei SSFN nutzen (z.B. Bank) bzw. Dienstleis
4. Die Datenübermittlung wird von verschiedenen Carriern erbracht, mit von den Carriern definierten
5. SSFN ist unabhängig von der Anwendung bzw. Applikation, welche SSFN nutzt und bietet keine Versch

Die Regeln des SSFN sind im SSFN Reglement festgehalten und sind von allen SSFN Teilnehmern (Nutzer,
serial_version = 3
base_version = 1
voting_quorum = 2
votes = [1, 3, 6]
core_as'es = ["559", "3303", "6730"]
authoritative_as'es = ["559", "3303", "6730"]
cert_files = [
    "snb/sensitive-voting.crt",
    "snb/regular-voting.crt",
    "six/sensitive-voting.crt",
    "six/regular-voting.crt",
    "six/cp-root.crt",
    "switch/sensitive-voting.crt",
    "switch/regular-voting.crt",
    "switch/cp-root.crt",
]
no_trust_reset = false
grace_period = "15d"

[validity]
not_before = 1700006400 # 2023-11-15 00:00:00 UTC
validity = "395d"
```

# TRC Creation and Maintenance

- The process is basically to:
  - Collect and verify required material (CA root certificates, Sensitive and Regular Voting Certificates)
  - Agree on required parameters (as indicated above)
  - Generate payload (object container)
  - Sign by authoritative parties, verify signatures and content
  - Combine signatures and create final TRC container

```
anapaya@trc-host: /opt/trc-ceremony-20231026
anapaya@trc-host:~/opt/trc-ceremony-20231026$ scion-pki trc payload --predecessor ISD70-B1-S2.trc --out ISD70-B1-S3.pld.der --template ISD70-B1-S3.toml
Generating payload for TRC update.

required signatures:
- type: vote
  common name: SIX Regular Voting Certificate
  serial number: 37 F4 66 80 3D 1F E3 6F 77 CE 4C 42 73 D1 56 C3 0F DA D1 CD
- type: vote
  common name: SNB Regular Voting Certificate
  serial number: 37 92 22 59 3F 56 9E 78 3B A9 4A 63 9A 76 FA DC 01 1A 40 8E
- type: vote
  common name: SWITCH Regular Voting Certificate
  serial number: 22 A8 4F 13 12 EA 3B 55 8C 51 F5 47 3A D9 F3 E9 7E 23 D4 C6

Successfully created payload at ISD70-B1-S3.pld.der
anapaya@trc-host:~/opt/trc-ceremony-20231026$
```

# TRC Creation and Maintenance

- SSFN ISD TRC has been first created in November 2021
- Validity period was set to 395 days
- It was renewed successfully in 2022 and 2023
- Dissemination in the SSFN ISD is seamless

```
Select anapaya@trc-host: /opt/trc-ceremony-20231026
serial_number: 7A 99 D3 EB 1A 31 8E 88 2C 1B 2A 14 C8 16 F3 C4 AA B1 7B DA
validity:
  not_before: 2021-11-01T00:00:00Z
  not_after: 2026-11-01T00:00:00Z
index: 5
- type: regular-voting
  common_name: SWITCH Regular Voting Certificate
  isd_as: 70-559
  serial_number: 22 A8 4F 13 12 EA 3B 55 8C 51 F5 47 3A D9 F3 E9 7E 23 D4 C6
  validity:
    not_before: 2021-11-01T00:00:00Z
    not_after: 2026-11-01T00:00:00Z
  index: 6
- type: cp-root
  common_name: SWITCH SSFN CP Root CA
  isd_as: 70-559
  serial_number: 6C 97 5E 0B 71 77 30 61 47 B0 73 51 3A B2 F6 BB 51 26 C4 B5
  validity:
    not_before: 2021-11-01T00:00:00Z
    not_after: 2032-11-01T00:00:00Z
  index: 7
anapaya@trc-host: /opt/trc-ceremony-20231026$ sha256sum ISD70-B1-S3.pld.der
ba17195d0348759a3465b21346b88738d84744e892b0c18bfff6bbba31f1578aa ISD70-B1-S3.pld.der
anapaya@trc-host: /opt/trc-ceremony-20231026$ mv switch/ISD-B1-S3.regular.vote.der switch/ISD70-B1-S3.regular.vote.trc
anapaya@trc-host: /opt/trc-ceremony-20231026$ sha256sum snb/ISD70-B1-S3.regular.vote.trc
3dcf274e19e413facb1815db5ef86ab882d175fafdb51c0eb59cea2fa24133fa snb/ISD70-B1-S3.regular.vote.trc
anapaya@trc-host: /opt/trc-ceremony-20231026$ sha256sum switch/ISD70-B1-S3.regular.vote.trc
59d1a30c2595bc758d34a7aa1838930159e21e8dc2fb76be771c4ea18ca63b9a switch/ISD70-B1-S3.regular.vote.trc
anapaya@trc-host: /opt/trc-ceremony-20231026$ sha256sum six/ISD70-B1-S3.regular.vote.trc
b0378fcd4b9d43bc346dc8059e5294a2716c71899cf36f3f491e9df47e1128c9 six/ISD70-B1-S3.regular.vote.trc
anapaya@trc-host: /opt/trc-ceremony-20231026$ scion-pki trc combine -p ISD70-B1-S3.pld.der \
> six/ISD70-B1-S3.regular.vote.trc \
> snb/ISD70-B1-S3.regular.vote.trc \
> switch/ISD70-B1-S3.regular.vote.trc \
> -o ISD70-B1-S3.trc
Successfully combined TRC at ISD70-B1-S3.trc
anapaya@trc-host: /opt/trc-ceremony-20231026$ scion-pki trc verify --anchor ISD70-B1-S2.trc ISD70-B1-S3.trc
Verified TRC successfully: ISD70-B1-S3
anapaya@trc-host: /opt/trc-ceremony-20231026$
```

# Challenges / How could IETF help?

- Lack of adoption
  - Although SSFN is a completely functional and flawlessly operating network, it is but a lighthouse implementation
  - None of the bigger network software companies picked up SCION implementation so far
  - None of the bigger ISP's showing interest in deploying SCION so far
- Lack of operational authorities (e.g., numbering) / global governance → addressed by SCION Association
- Lack of standardization → can be addressed at IETF
- There will be more work at IETF needed
  - Continuing work on Internet drafts towards RFC's
  - Aligning with other work
  - Exploring more options

# Contact & Resources

## Contact

SIX Group Services Ltd  
Hardturmstrasse 201  
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Switzerland

[www.six-group.com](http://www.six-group.com)

## Resources

SSFN:

[www.six-group.com/ssfn](http://www.six-group.com/ssfn)

SCION:

<https://www.scion.org/>

<https://www.scion-architecture.net/>