



# SCION Overview

PANRG Interim Meeting

1 June 2022



# Agenda

- Introduction & background
- SCION Overview informational Internet Draft (I-D) - Intention
- SCION in a nutshell
- Why standardize SCION?
- Next steps



# Introduction I: Authors

- Corine de Kater: Technical writer, standardization
- Nicola Rustignoli: Technical outreach, certification & standardization
- Adrian Perrig: Professor of Computer Science, ETH Zürich

We are in the process of launching the [SCION Association](#):

- A non-profit organization bridging the gap between academia & industry
- Promoting global SCION adoption
- Maintaining and expanding SCION open-source code base



# Introduction II: SCION Architecture

- Stands for **S**calability, **C**ontrol, and **I**solation **O**n **N**ext-generation networks
- Is a path-aware next-generation inter-domain architecture
- Offers security and availability by design
- Provides
  - route control,
  - failure isolation,
  - multi-path routing between hosts, and
  - trust information for end-to-end communication



# Background and Motivation

- Started in 2009 to study security of inter-domain routing protocols
- In production use by 7 ISPs, trial deployment by 5 ISPs
- Multiple independent implementations (incl. open source)
- Project involving multiple components and stakeholders
  
- SCION discussed at IETF 113 [side meeting](#)
- Initial informational draft now available:  
<https://datatracker.ietf.org/doc/draft-dekater-panrg-scion-overview/>



# SCION Overview Informational I-D - Intention

- Offering an introduction into SCION and its motivation
- Providing a high-level description of the architecture components
- Building a reference document
- Paving the way for further IETF work

**Not** meant as:

Input for in-depth technical discussions about components & protocol specification

→ For this, other internet drafts will follow (to be discussed):

- Detailed gap analysis
- Authentication & PKI
- Control plane and routing
- Data plane
- Detailed security considerations and implications



# SCION in a Nutshell

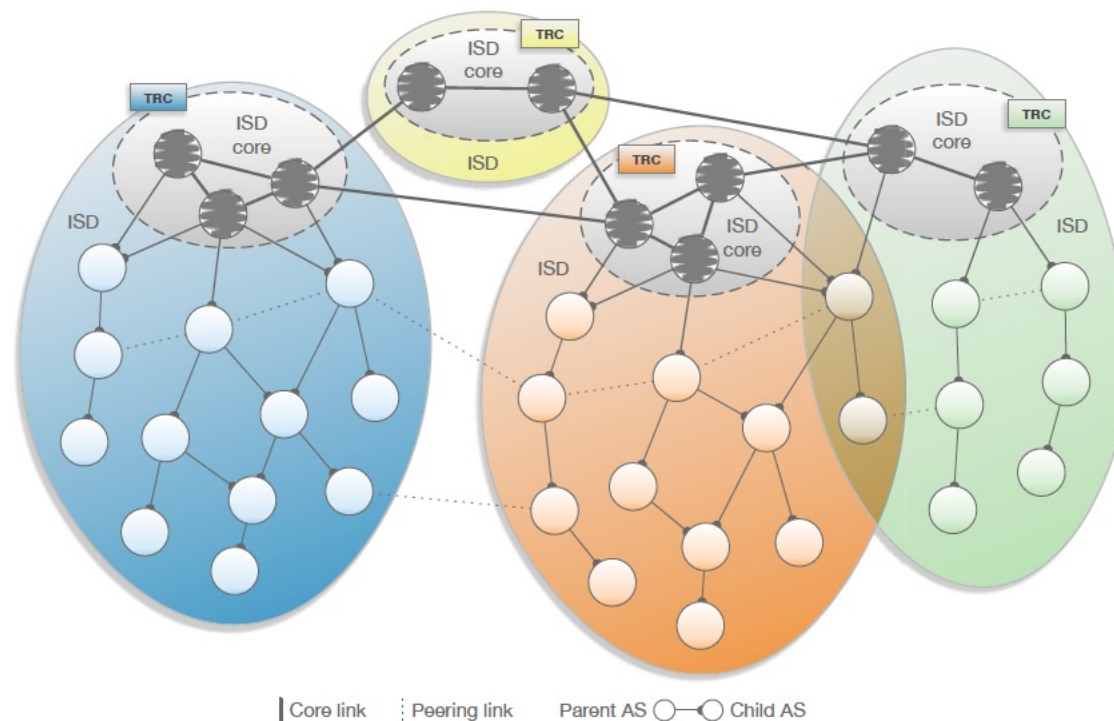
→ Path-based inter-domain network architecture

→ Control plane – routing

- Constructs and disseminates path segments
- Has its own PKI for authentication

→ Data plane – packet forwarding

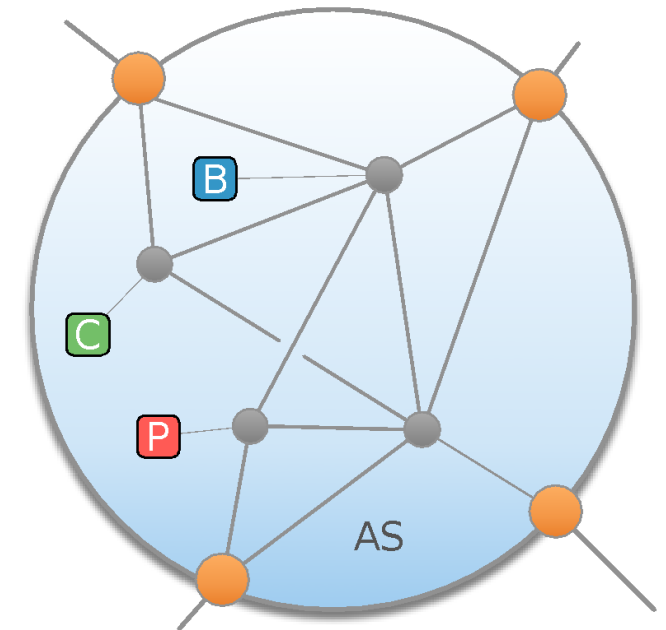
- Combines path segments to paths
- Packets contain path information
- Routers forward packets based on the path information
- Simple routers, stateless operation





# SCION AS

- Core routers are set up at the borders of an ISP
  - to peer with other SCION-enabled networks
  - to collect customer accesses
- No change to the internal network infrastructure of an ISP needed!







# SCION Deployments

- **SPs:** Switzerland, Europe and Asia (and growing)
- **IXPs:** SwissIX offers SCION peering
- **Customers:** Swiss financial institutions, education, government, healthcare
- **NRENs:** SCI-ED: Research network connecting Swiss institutions of the ETH domain
- **R&D:** SCIONLab, a global SCION research testbed:  
<https://www.scionlab.org>



# Why standardize SCION - I

- Emergence of multiple SCION deployments and implementations
- Demanded by early adopters
- Standardization facilitates acceptance of SCION, prevents from “talking past one another”, and ensures interoperability
- To contribute to the discussion on path-aware networking
- SCION fulfils requirements for a successful protocol ([RFC 5218](https://datatracker.ietf.org/doc/rfc5218/)):
  - Incremental deployability
  - Benefits of deployment outweigh the costs
  - Multiple, portable implementations, both open and close source, are possible
  - SCION is already deployed and in use



# Why standardize SCION - II

SCION could help provide answers to questions raised in [RFC 9217](#) (“Current Open Questions in Path-Aware Networking”)

- How do endpoints get access to trustworthy path properties?
  - See also section 2 of the SCION Overview internet draft
- How can endpoints select trustworthy paths?
  - See also section 2 of the internet draft
- How to effectively operate a path-aware network in a path-aware internetwork?
  - See sections 3.1, 3.2, and 3.3 of the internet draft
- How to align the incentives of network operators and end users & manage the transition from current ("path-oblivious") to path-aware networking?
  - See section 3.4 of the internet draft



# SCION Overview Informational I-D - Goal

- Get adopted by the PANRG group
- Get published as informational RFC
- Kick off further IETF work / possible standardization process



# Next Steps

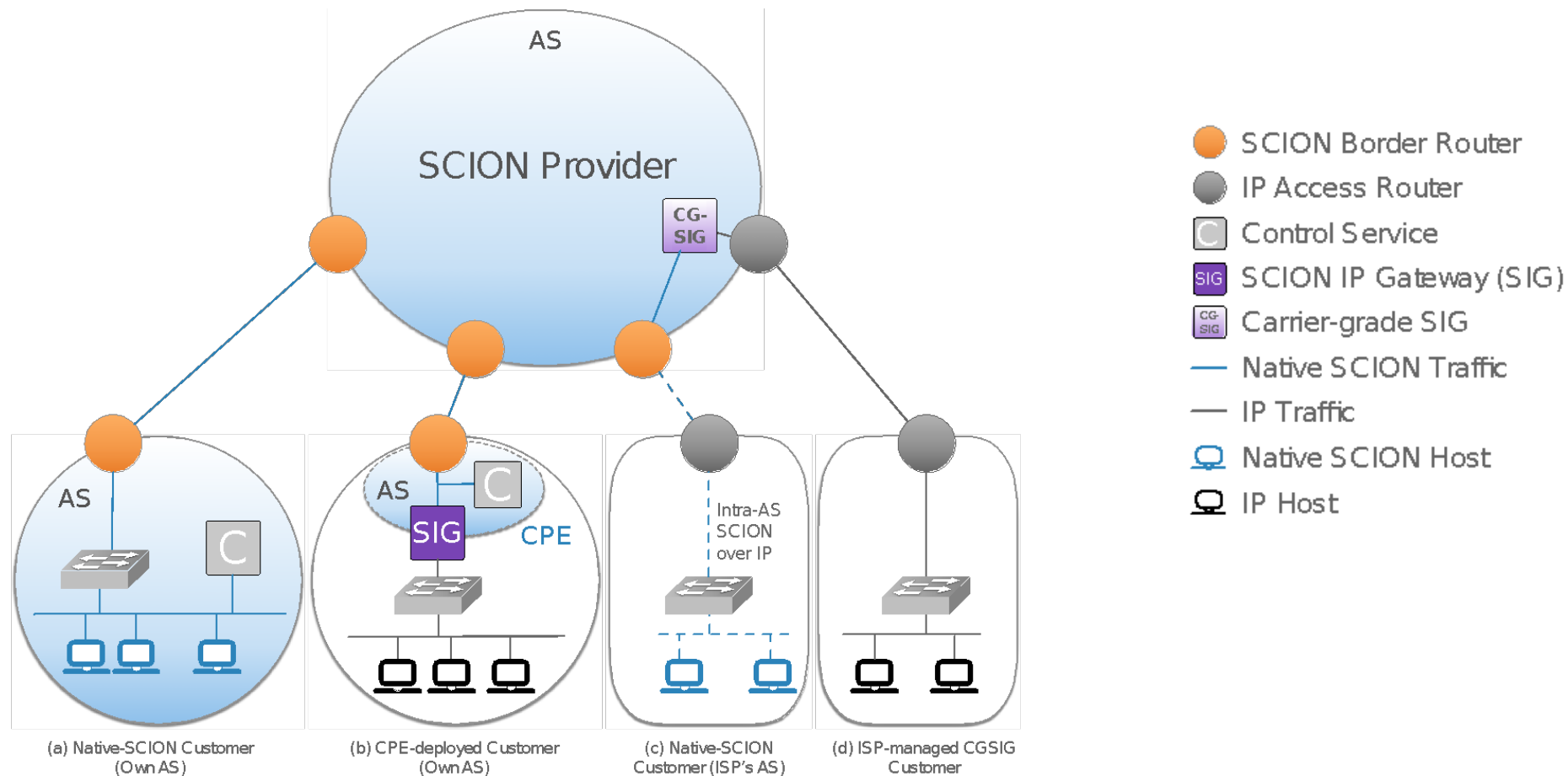
- Address feedback of PANRG interim meeting
- Publish new version of I-D before IETF 114
- Start process of publishing the I-D as RFC
- Start writing the more technical I-Ds
- Decide on way-to-go with SCION at IETF



Thank you for your attention!



# Deployment Model – End Customer

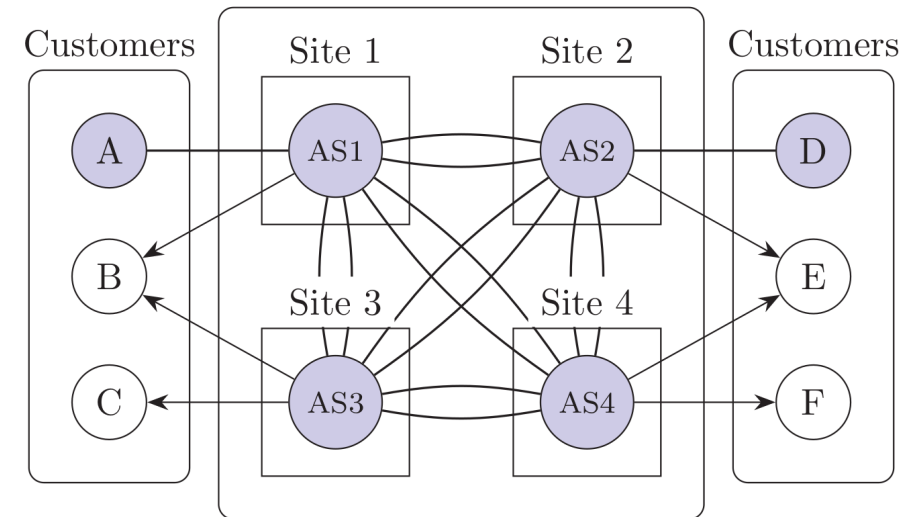




# IXP Deployment

Two IXP deployment models:

- An IXP is treated as a large layer 2 switch between its customer ASes
- An IXP exposes its internal structure by modelling each site as an individual AS





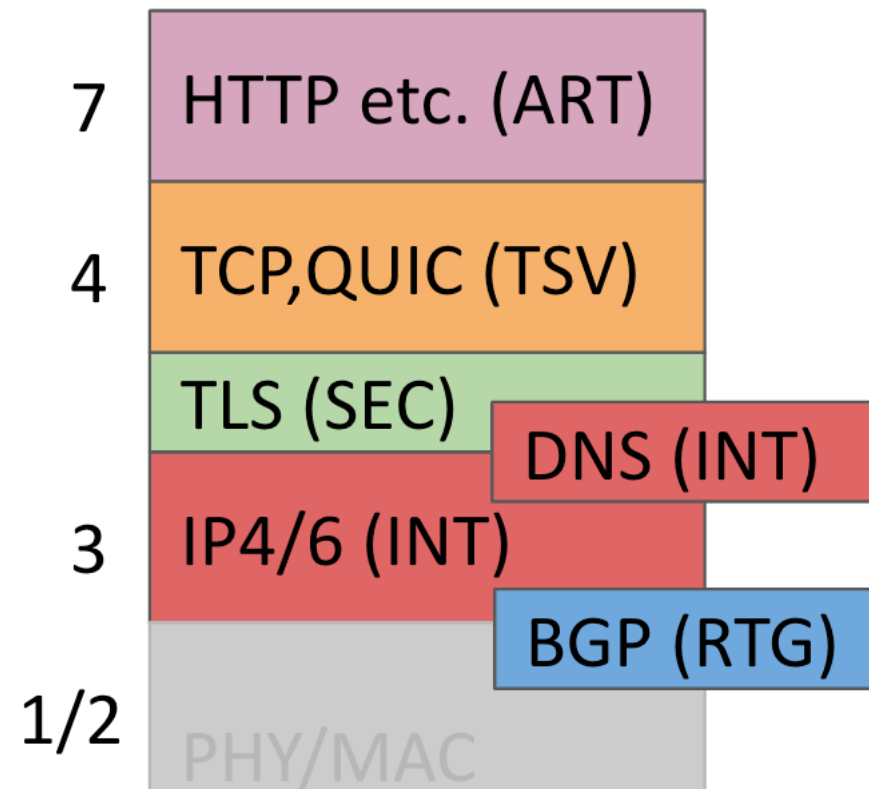


# Next Step: Standardization - Open Questions

The IETF process is good for single protocols that are easy to locate in the stack, because it's organized as layers.

It's trickier for new architectures as a whole:

- SCION data plane is a network-layer protocol (INT)
- SCION control plane is a set of protocols for secure (SEC) routing (RTG)
  - ... and is difficult to separate from the data plane
- SCION PKI and ISDs are security (SEC) architecture
- Multipath over the SCION data plane needs new transport (TSV)
- RHINE is SCION's equivalent to DNS (INT)



*Credit: Brian Trammell*