



FACULTY OF
COMPUTER SCIENCE

Secure Smart Home / IoT Use Case and Beyond

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Systems Lab (NetSys)

2.5 years ago...

- ❖ The first (and smallest) SCION AS on Odroid-C1 (ARM) receiving beacons from ZKB AS on 31/03/2017



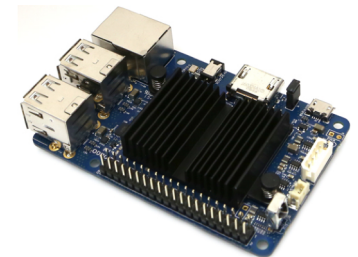
Secure Internet of Things (IoT) with SCION

- ❖ IoT: Network of smart objects, to collect and analyze data
- ❖ Applications: Smart home, Healthcare, Transportation, Manufacturing, etc.
- ❖ Bain predicts IoT market to grow to about \$520B in 2021 (\$235B in 2017)

❖ **Security** is the biggest concern in adopting IoT technology

❖ **Securing IoT Use Cases with SCION:**

- Critical infrastructures like transportation or Grid infrastructures require high availability → can be met by SCION despite potential failures and attacks
- Unauthorized access to IoT devices due to weak authentication (e.g. smart home, healthcare devices) can be prevented by hiding paths
- Path control ensures that privacy sensitive data like in healthcare stays within selected areas



❖ **Compelling Smart Home IoT Use Case**

- Highly available infrastructure to report burglar / fire → achieves resilience with fast Internet and cellular failover, even in case of power outages

Software Package Creation for SCION

- ❖ Initiated by Martin Koppehel at OVGU Magdeburg
- ❖ Binary packages of the SCION provided for amd64, i386, arm, arm64
- ❖ Packages available in .deb format → enables installation of SCION as a simple “`apt install scionlab`”
- ❖ Reduces installation time of SCION to 90 seconds on RaspberryPi 3 (10-fold speedup)
- ❖ SCION packages integrated into SCIONLab:
<https://packages.netsec.inf.ethz.ch/debian/>



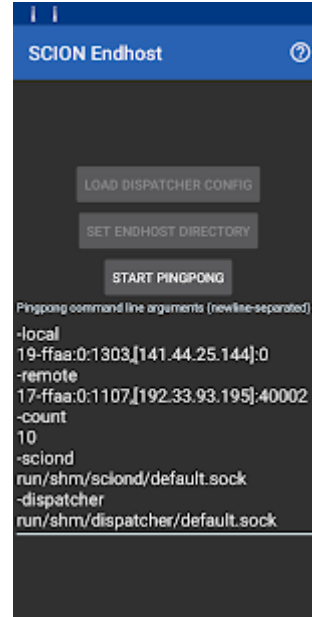
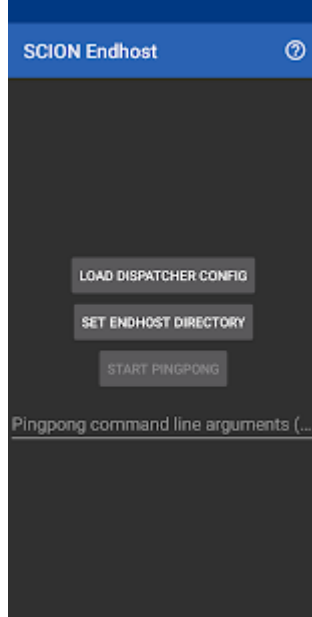
```

hausheer@ubuntu: ~
hausheer@ubuntu:~$ dpkg -l | grep scion
ii  scion-apps-bwtester      0.9.3      amd64      SCION Bandwidth Tester
ii  scion-beacon-server     1.0.6      amd64      SCION Beacon Server
ii  scion-border-router     1.0.5      amd64      SCION Border Router
ii  scion-certificate-server 1.0.6      amd64      SCION Certificate Server
ii  scion-daemon            1.0.6      amd64      SCION Daemon
ii  scion-dispatcher       1.0.5      amd64      SCION Dispatcher
ii  scion-path-server       1.0.6      amd64      SCION Path Server
ii  scion-systemd-wrapper   1.0.2      amd64      SCION systemd wrapper
ii  scion-tools             1.0.3      amd64      SCION Tools
ii  scionlab                1.0.9      amd64      SCIONLab
hausheer@ubuntu:~$
  
```

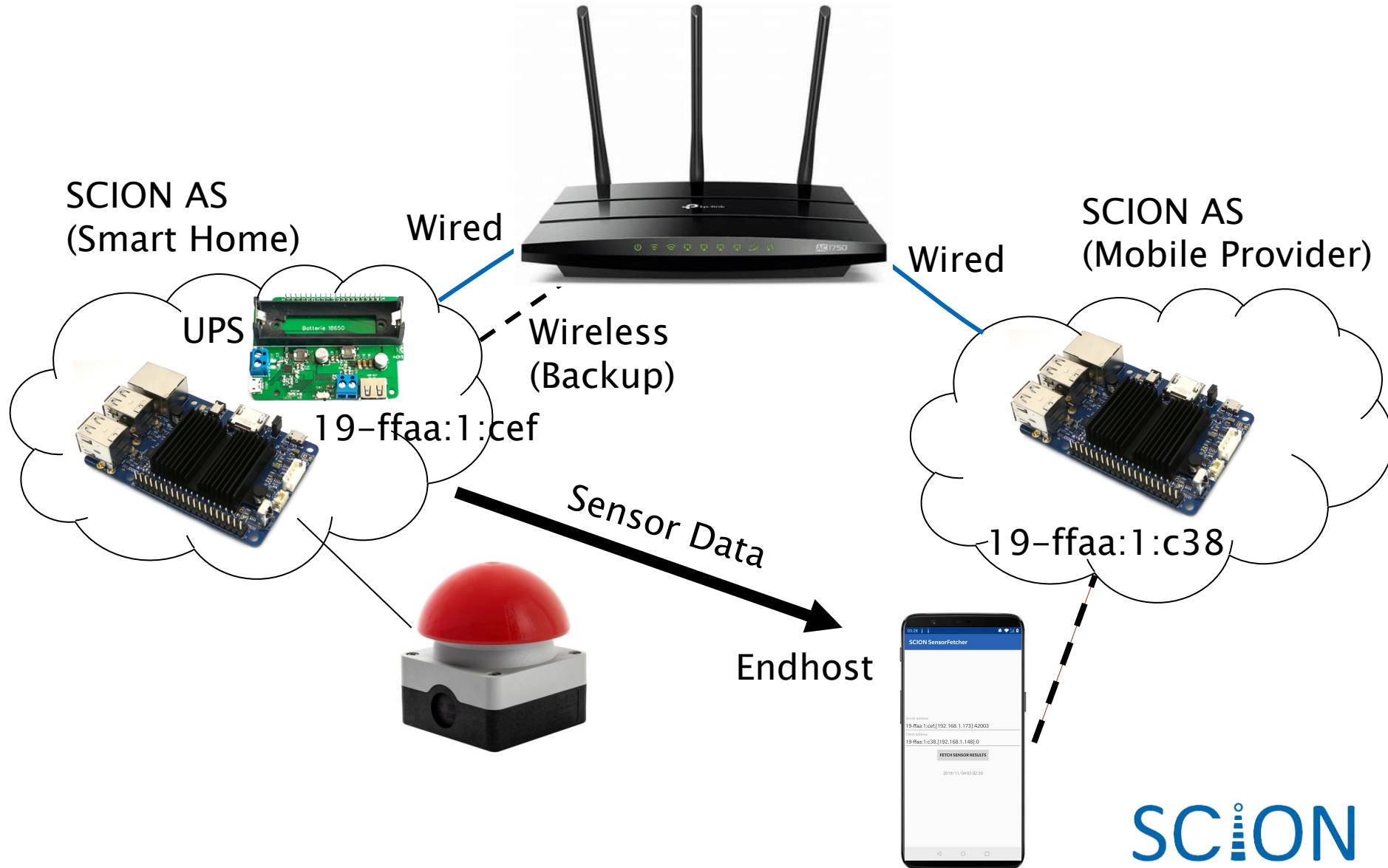
SCION Android App

 android 

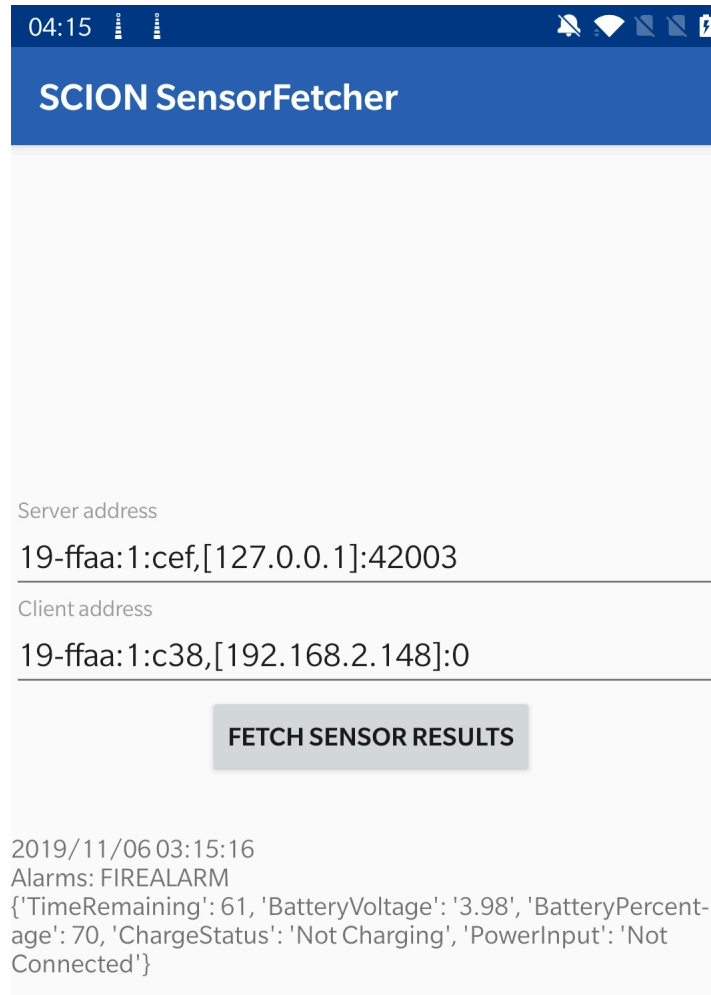
- ❖ SCION endhost and sensorfetcher app ported to Android
- ❖ Endhost can be connected to an existing SCION AS
- ❖ Implemented by Vera Clemens and Tom Kranz at OVGU Magdeburg
- ❖ SCION apps can be installed directly from the Google Play Store:
 - <https://play.google.com/store/apps/details?id=org.scionlab.endhost>
 - <https://play.google.com/store/apps/details?id=org.scionlab.sensorfetcher>




IoT Demo Setup



SCION SensorFetcher



04:15

SCION SensorFetcher

Server address
19-ffaa:1:cef,[127.0.0.1]:42003

Client address
19-ffaa:1:c38,[192.168.2.148]:0

FETCH SENSOR RESULTS

2019/11/06 03:15:16
Alarms: FIREALARM
{'TimeRemaining': 61, 'BatteryVoltage': '3.98', 'BatteryPercentage': 70, 'ChargeStatus': 'Not Charging', 'PowerInput': 'Not Connected'}

SCION: Other Ongoing Projects @ OVGU Magdeburg

- ❖ Deployment and Evaluation of the SCION Secure Internet Architecture on Fed4FIRE+ Testbeds
- ❖ Deployment of SCION over the EU GEANT Topology
- ❖ Deployment of SCION on Internet Exchange Points
- ❖ Design and Implementation of User-based Attachment Points in the SCIONLab Coordinator
- ❖ Machine-Learning based Performance Prediction in SCION
- ❖ Design and Implementation of Video Streaming over SCION
- ❖ Incentive Mechanisms for Secure Future Networks (credit system)
- ❖ Monitoring Mechanisms for Multi-path Communication



FED4FIRE
FEDERATION FOR FIRE PLUS



\$ SCION

SCION

One more thing... SCION-Swarm

- ❖ SCION-Swarm: Leverage path-awareness and multipath features of SCION to enable a fast and scalable content search and lookup
 - Find suitable paths to achieve a low search delay
 - Increase throughput of content lookup through multi-path connections
- ❖ Funded through NGIO Discovery Fund, established by NLnet (with support from the EU's Next Generation Internet programme)
- ❖ Joint work with Leopold Ryll, Martin Koppehel

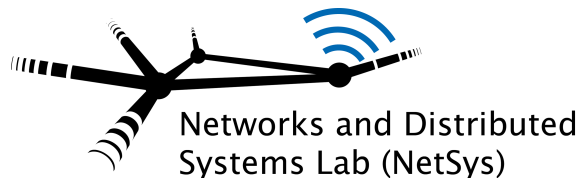


```

martin@torrent1 -> # we will download a torrent from IP and seed it to scion
martin@torrent1 -> ./torrent-bin 'magnet:?xt=urn:btih:B4VDVX7IFYOJFM4QZXFKSQ6NY00T5P6
sdm=debian-10.1.0-amd64-netinst.iso' -seed -scion -localScionAddr='19-ffaa:1:c3f,[127.0
0.0.1]:42424'
martin@torrent-2 -> # in this window, we will download the torrent over scion, no IP i
nvolved
martin@torrent-2 -> ./torrent-bin 'magnet:?xt=urn:btih:B4VDVX7IFYOJFM4QZXFKSQ6NY00T5P6
X6dn=debian-10.1.0-amd64-netinst.iso' -scion -peerScionAddrList='19-ffaa:1:c3f,[127.0
0.1]:42424' -localScionAddr='19-ffaa:1:c3f,[127.0.0.1]:42424' -scionOnly # note the s
cionOnly flag
  
```

Thank you for your attention! Questions?

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SCION

