INF

FACULTY OF
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Secure Networks for IoT Devices

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Internet of Things (IoT)

- Network of smart objects, to collect and analyze data

Smart Home

home automation: lighting, heating, security, etc.

Assistance

people with disabilities, elderly care

Healthcare

remote health monitoring, emergency notification

Transportation

inter / intra vehicular communication, Smart Cities

Manufacturing

supply chain management, digital control, Smart Grid

- Characteristics: Small-scale devices, sensors, low cost, low energy usage

- Bain predicts IoT market to grow to about $520B in 2021 ($235B in 2017)

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Security of Internet of Things

- **Security** is the biggest concern in adopting IoT technology (especially IoT adoption in enterprises)

- **Threats:**
  - Potential failures and attacks hinder adoption in critical infrastructures with high availability requirements (e.g. transportation or Grid infrastructures)

  - IoT devices often use weak authentication which may facilitate unauthorized access (e.g. smart home, healthcare devices)

  - Use of unencrypted communication may leak privacy-sensitive data (e.g. healthcare)

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SCION: Next-generation Internet Architecture

- Secure by design, most attacks are fundamentally impossible
- Path-aware networking: sender knows packet's path
  - Enables geo-fencing
- Highly available communication
- Multi-path communication
  - Caution: use is highly addictive!
- BGP-free Internet communication
- Better scalability than current Internet
- Improved network operation
  - Higher network utilization
  - Advanced traffic engineering

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SCION Mechanisms to Satisfy IoT Requirements

Key Management	Enable E2E encryption and authentication	DRKey
Controlled / restricted remote access	Prevent exploitation of device vulnerabilities	Hidden path (EPIC)
Guaranteed access for command-and-control	Packet delivery Traffic filtering at high data rates	Multipath in multi-homed environments EQ for guaranteed low-bw packet delivery Lightning Filter for high-speed filtering
Privacy	Complicate traffic analysis	Multipath communication can complicate traffic analysis
Compliance	Geofencing to avoid traffic leakage	Geofencing to avoid traffic leakage

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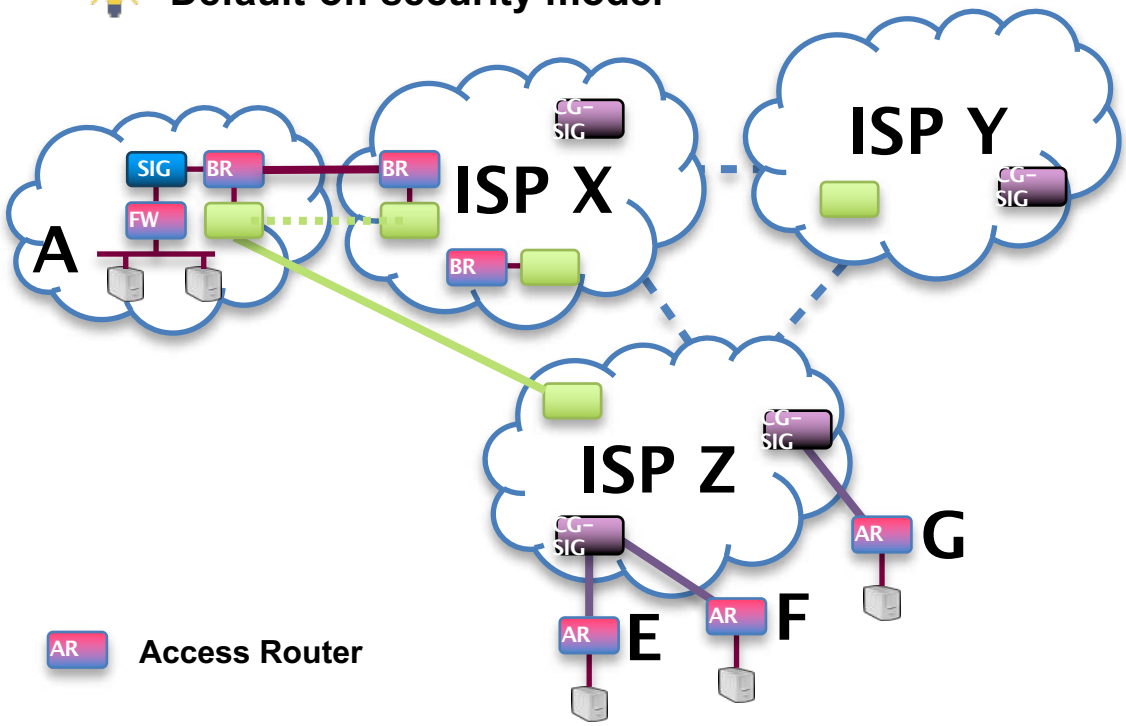
Use Case: Secure Networks for IoT Devices

- Use Hidden Paths
- Default-off security model



Deployment Scenario

- Site A is the monitoring site for IoT devices
- IoT Devices E, F, G are at ISP Z
  - Connected to SCION via CG-SIGs
  - Path Segments to the CG-SIGs are hidden and only given to site A

Benefits

- ✓ Secure network access
  - Only site A can access E, F, G
- ✓ High availability for the IoT network by using CG-SIG

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Thank you for your attention!
Questions?

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Online Resources

- https://www.scion-architecture.net
  - Book, papers, videos, tutorials
- https://www.scionlab.org
  - SCIONLab testbed infrastructure
- https://github.com/scionproto/scion
  - Source code
- https://www.anapaya.net
  - SCION commercialization

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