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Do we need a next generation internet?

Victor Reijs (SIDN Labs) and Joeri de Ruiter (SIDN Labs)

Digital, Strategy and Transformation, September 2nd, 2020
www.2STiC.nl

Outline

- *Framing of the topic*
  - *Recorded session:* “50 jaar Internet”: https://www.sidn.nl/50jaarinternet
  - Test question: How many Internets do we have?
- *Interactive session:* Do we need a next generation internet?
  - Group assignment – 15 mins
    Determine what to Keep – Drop – Add – Change
  - Read-out – 10 mins
- Evolution of the Internet: Lessons learned
- Next generation internet: Work in progress
- *Interactive session:* Identifying the stakeholders and their roles
- Shaping the evolution of the internet
- *Open discussion:* The issue of the transition: Possible pathways

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Do we need a next generation internet?

Group assignment – 15 mins:
Determine what to Keep – Drop – Add – Change
Read-out – 10 mins

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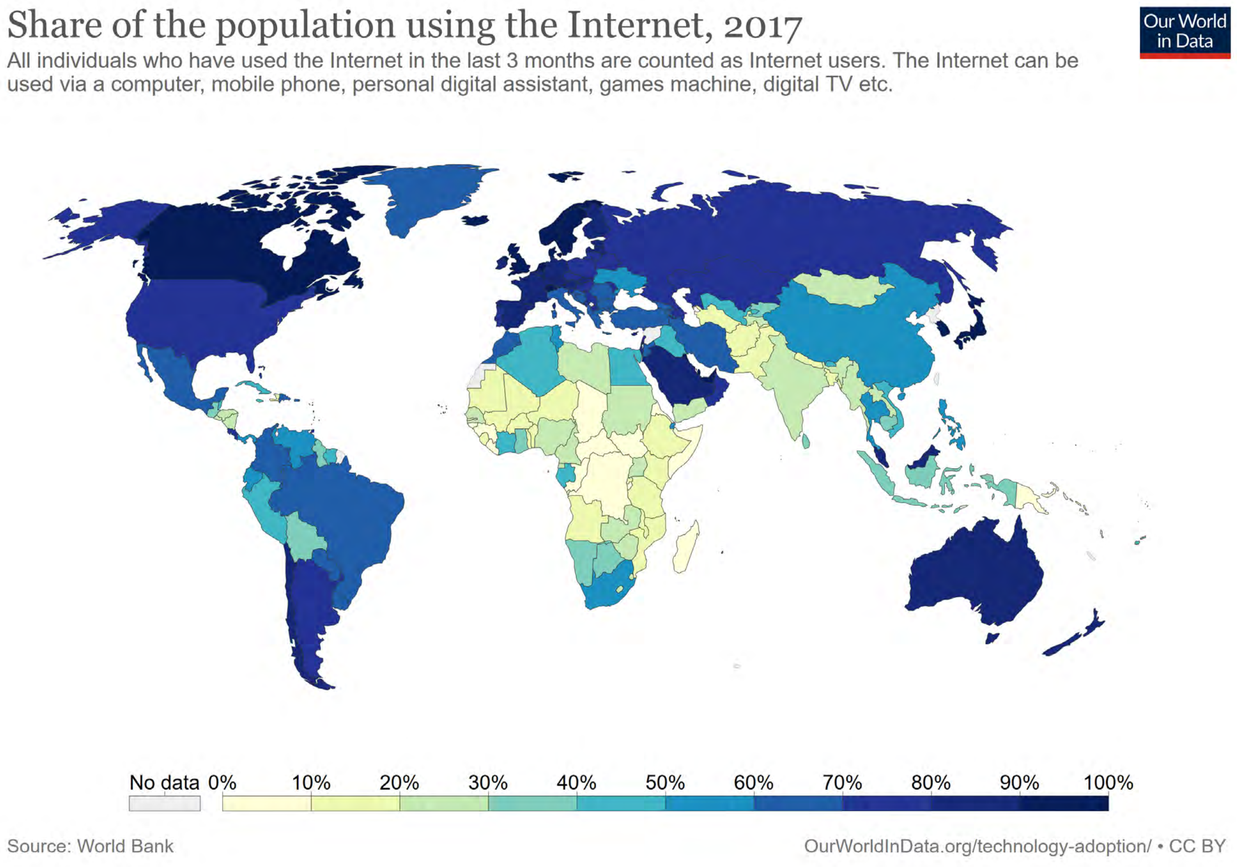
Lessons learned

A wonderful accident

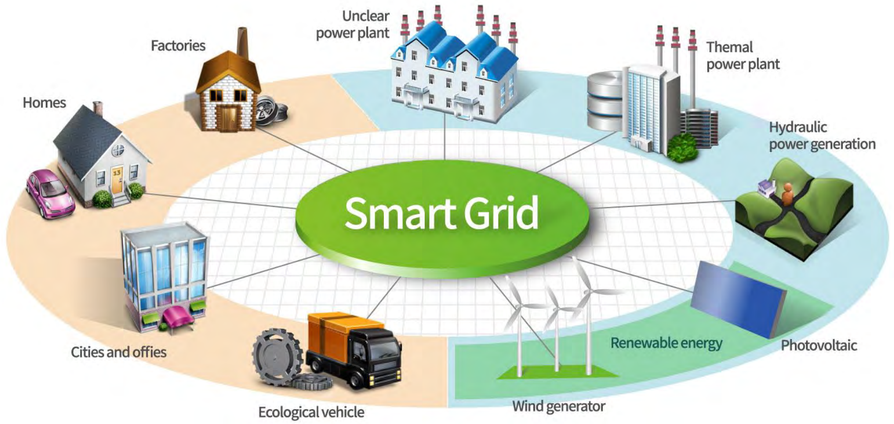


Lessons learnt over 50 years

- The Internet has come a long way: from small computer network to worldwide social environments

Lessons learnt over 50 years

- The Internet has come a long way: from small computer network to worldwide social environments
- Mobility, QoS, scope, security, content delivery and transparency were not really part of initial Internet design



Lessons learnt over 50 years

- The Internet h
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- Mobility, QoS,
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Los Angeles Times

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OPINION

Opinion: 50 years ago, I helped invent the internet. How did it go so wrong?

Scientists inadvertently created the perfect formula for the "dark" side of the internet to spread like a virus by enabling anyone to reach millions of people inexpensively and anonymously. (Rafe Swan / Getty Images/Cultura RF)

By LEONARD KLEINROCK OCT. 29, 2019 | 3 AM

When I was a young scientist working on the fledgling creation that came to be known as the internet, the ethos that defined the culture we were building was characterized by words such as ethical, open, trusted, free, shared. None of us knew

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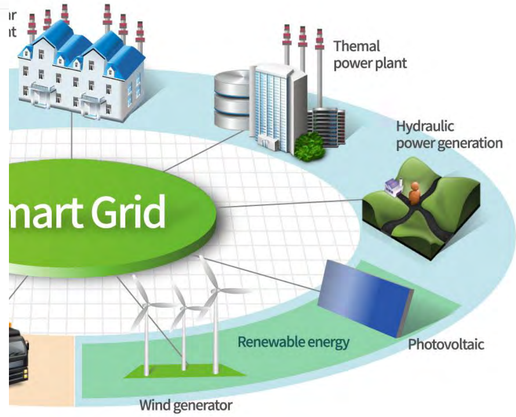

Several approaches

- Add essential functionality to Internet (reactive)
  - Unknow effects of add-ons on security and transparency
  - Important to keep Internet safe and providing compatibility is easy
- Investigate more fundamental approaches (proactive)
  - Include lessons learnt over 50 years
  - Transition is difficult, but easier for niche applications

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Work in progress

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SCION

SCION

- Scalability, Control, and Isolation On Next-generation Networks
- New internet architecture
- Research at Network Security Group, ETH Zurich
- Goal: improve security of inter-domain routing and isolation of compromise
- Scalability and security through Isolation Domains (ISDs)
  - Group of autonomous systems
  - E.g. per country or jurisdiction

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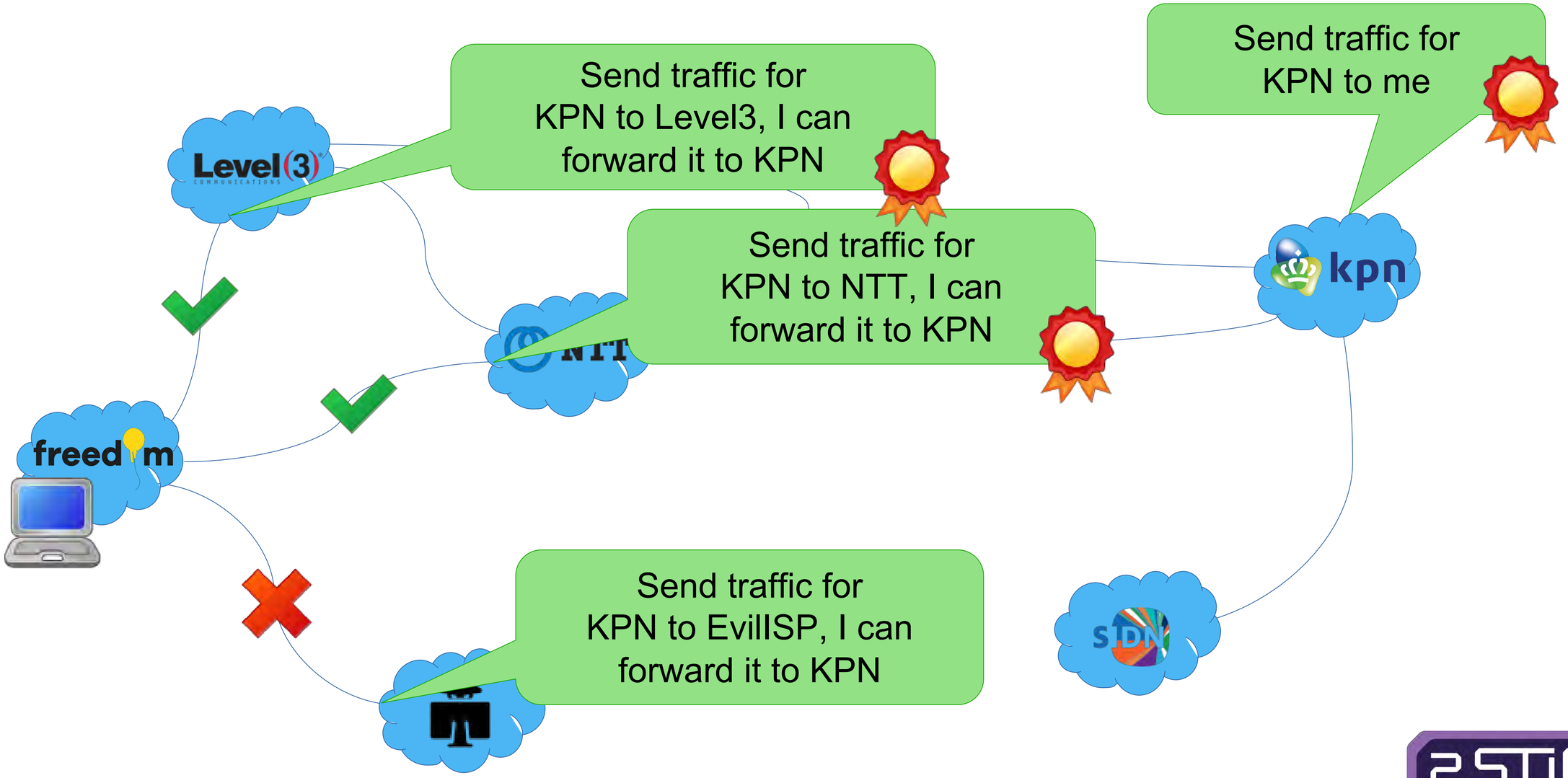
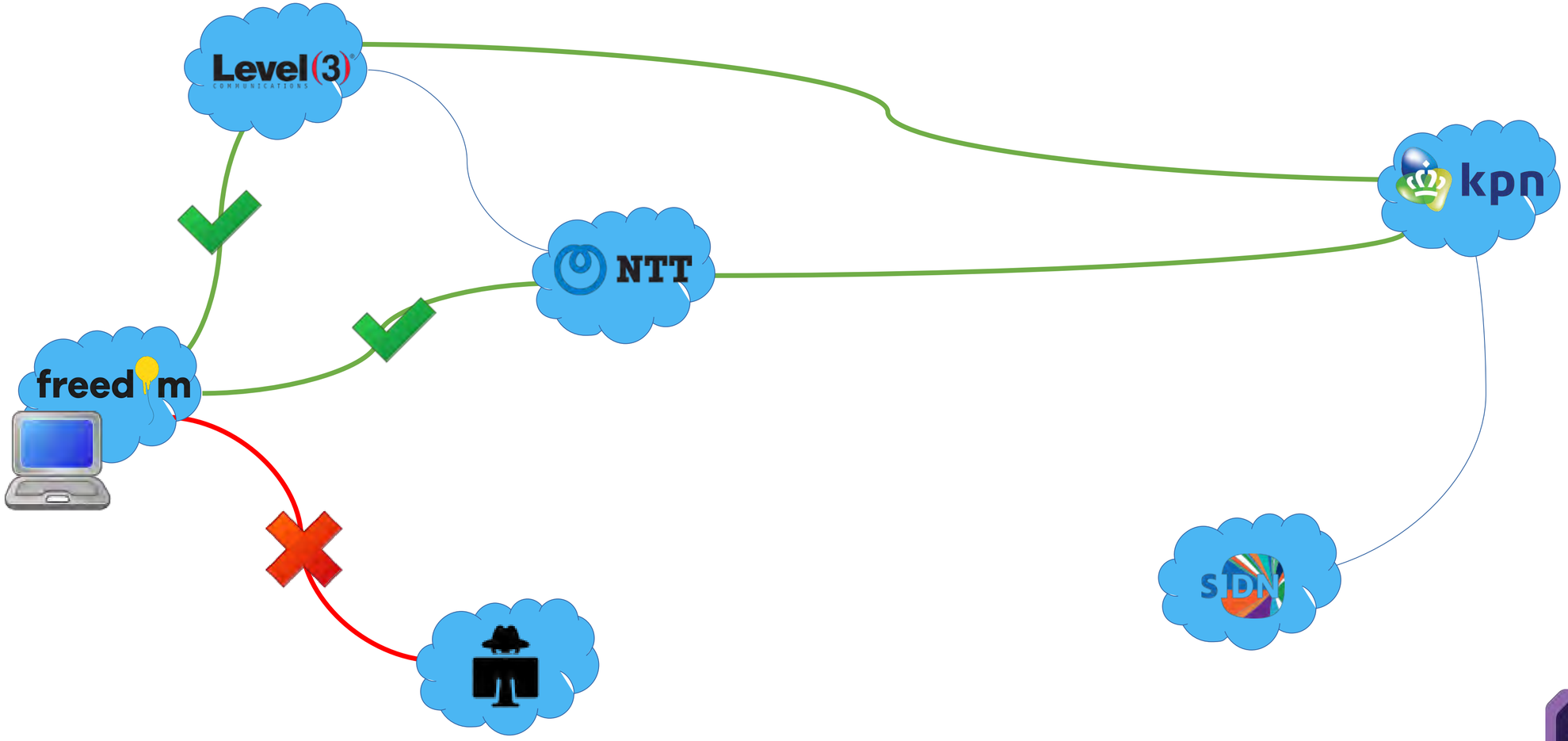
SCION: hijack protection



SCION: hijack protection



SCION

- Security by design
  - Routes authenticated both in control and data plane
- Path-aware networking
  - Sender selects path
  - Enables, for example, geofencing
- Multi-path communication
  - Can be used, for example, for redundancy

SCION in practice

- SCION can be combined with existing internet
  - Open source implementation available
- Commercialised by spin-off company Anapaya Networks
- Swiss inter-banking network
  - Replacement of dedicated network connections
  - 3 Swiss ISPs involved
- Network between universities and research institutes

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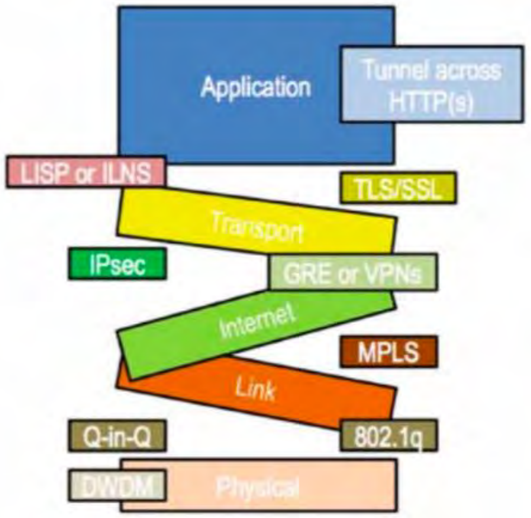
RINA

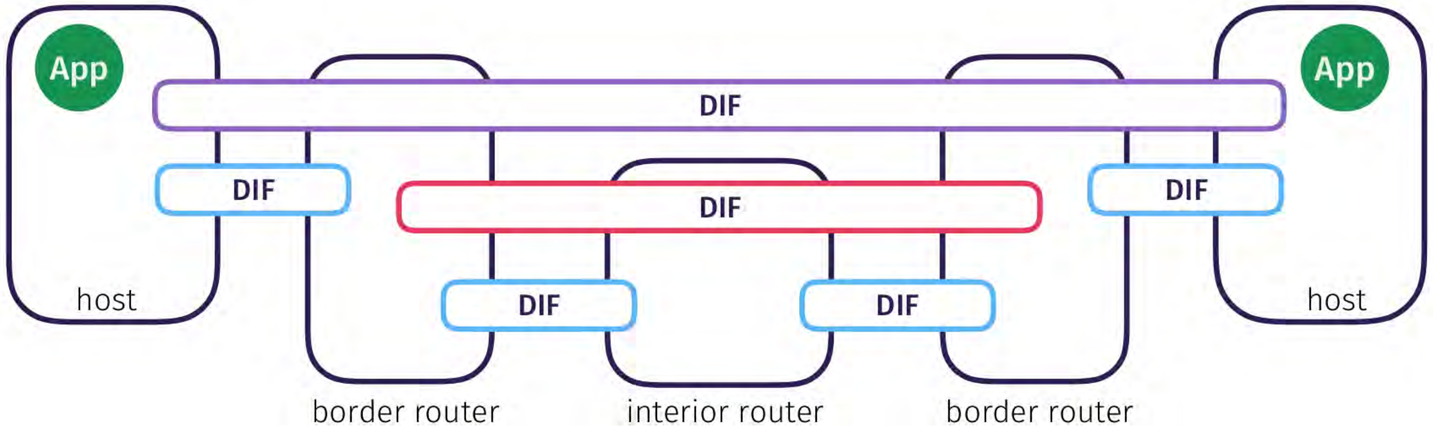
RINA

- Recursive Internetwork Architecture
- Goal: address fundamental problems with a new architecture
  - A framework, not a protocol
  - Provides mechanisms and policies (a toolbox) to network designers
  - Organize repeated functionality across layers
  - Idea is to standardize security, management, congestion
- Redesign internet from scratch

RINA approach

- Limit scope
- Minimize number of protocols
  - Difference in policies offered
- Maximize re-use of functionality
- Use connection that offers the properties needed for your use case
- Can be used in combination with current internet





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Identifying the stakeholders and their roles

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Shaping the evolution of the internet

2STiC programme

Put Dutch and European internet communities in leading position of secure, stable and transparent inter-network communication

amsix

ndix

NLNETLABS

SIDN LABS

SURF

TU Delft

University of Amsterdam

University of Twente.

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Motivations for 2STiC programme

- Emerging & new applications need new security, resilience and transparency requirements
  - More interaction with physical space (e.g., transport, energy grids, drones, remote healthcare procedures, mobility)
  - More insight in and control over who processes user data
- Meet requirements through (multiple) shared internets
  - Applications will increasingly require ubiquitous computing and networking
  - Operating dedicated infrastructures might reduce value for money
- Open programmable network services become commercially available
  - Data plane, control plane and hardware programmability

2STiC approach

- Be a centre of expertise
- Coordinate grant proposals
- Include multi-domain, governance, trust and deployment aspects from the start
- Learn by doing
- Focus on realistic/practical use cases and demonstrators
- Evaluate future internet infrastructures that have active communities with testbeds and use open source principles
- 2STiC testbed

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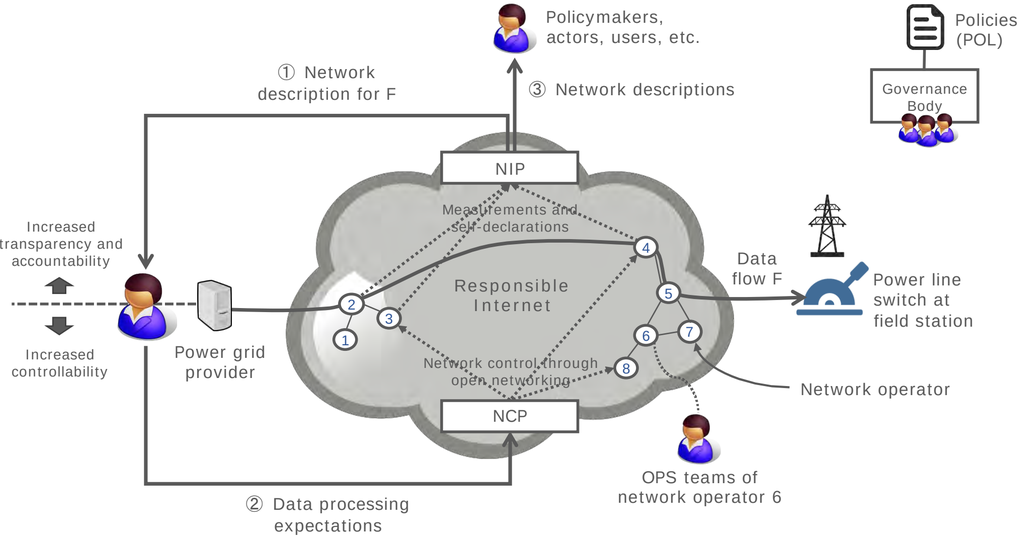
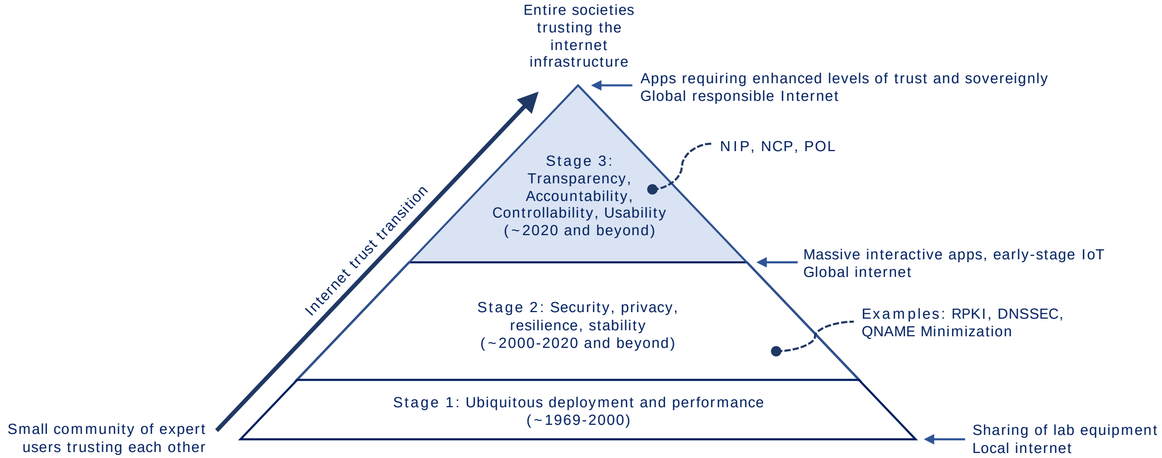
A responsible internet

A Responsible Internet

- Higher degrees of trust and sovereignty by making the Internet more transparent, accountable, controllable at the network-level
- Added value for critical infrastructure operators (e.g., energy grids), policy makers, network operators, citizens, others
- Enables several societal, economic, and scientific breakthroughs because it changes the Internet's 1960s-1970s trust model
- Aligns with similar developments in AI (responsible AI) and cloud services (GAIA-X)





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Roadmap digital future: Public Stack

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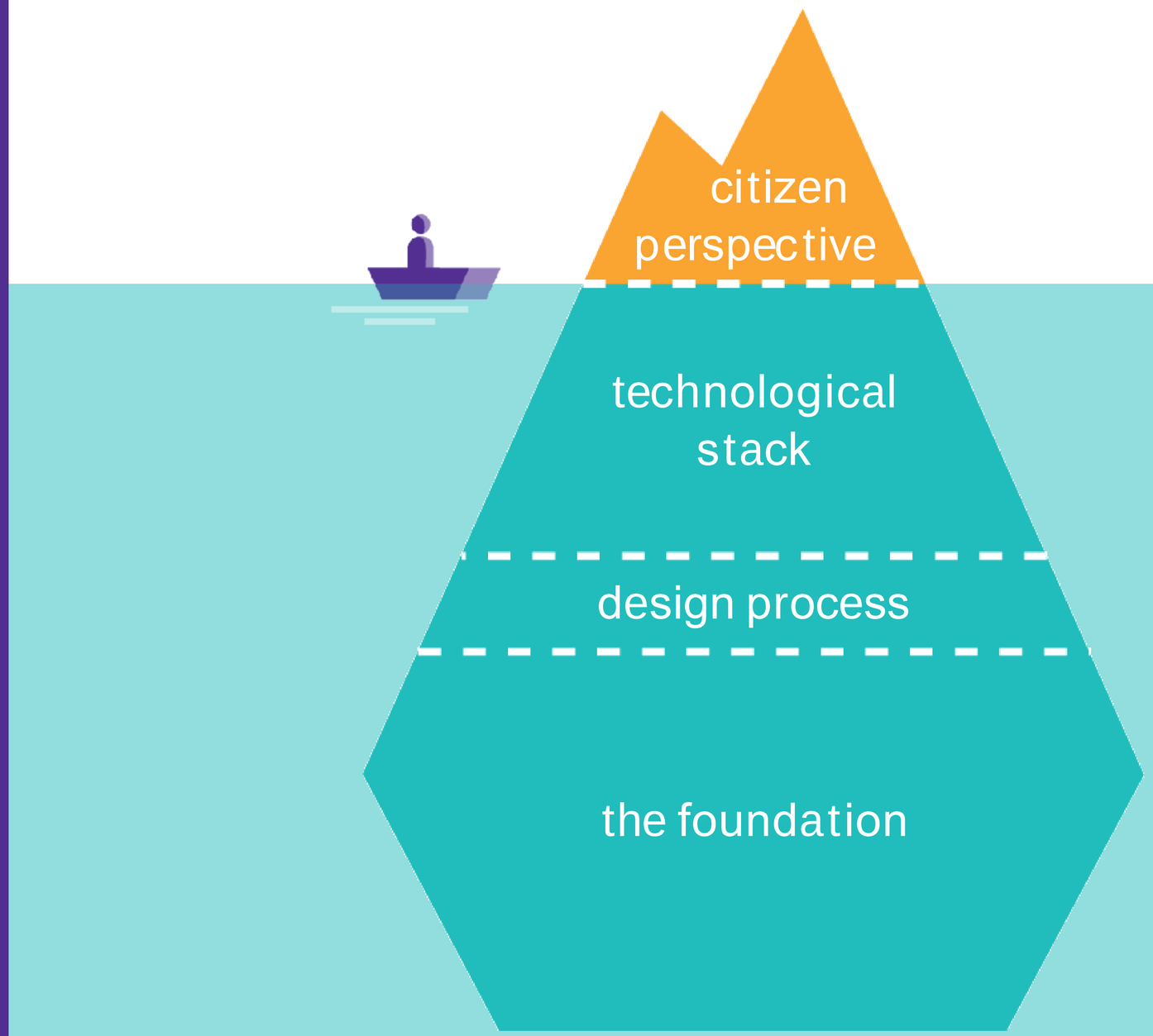
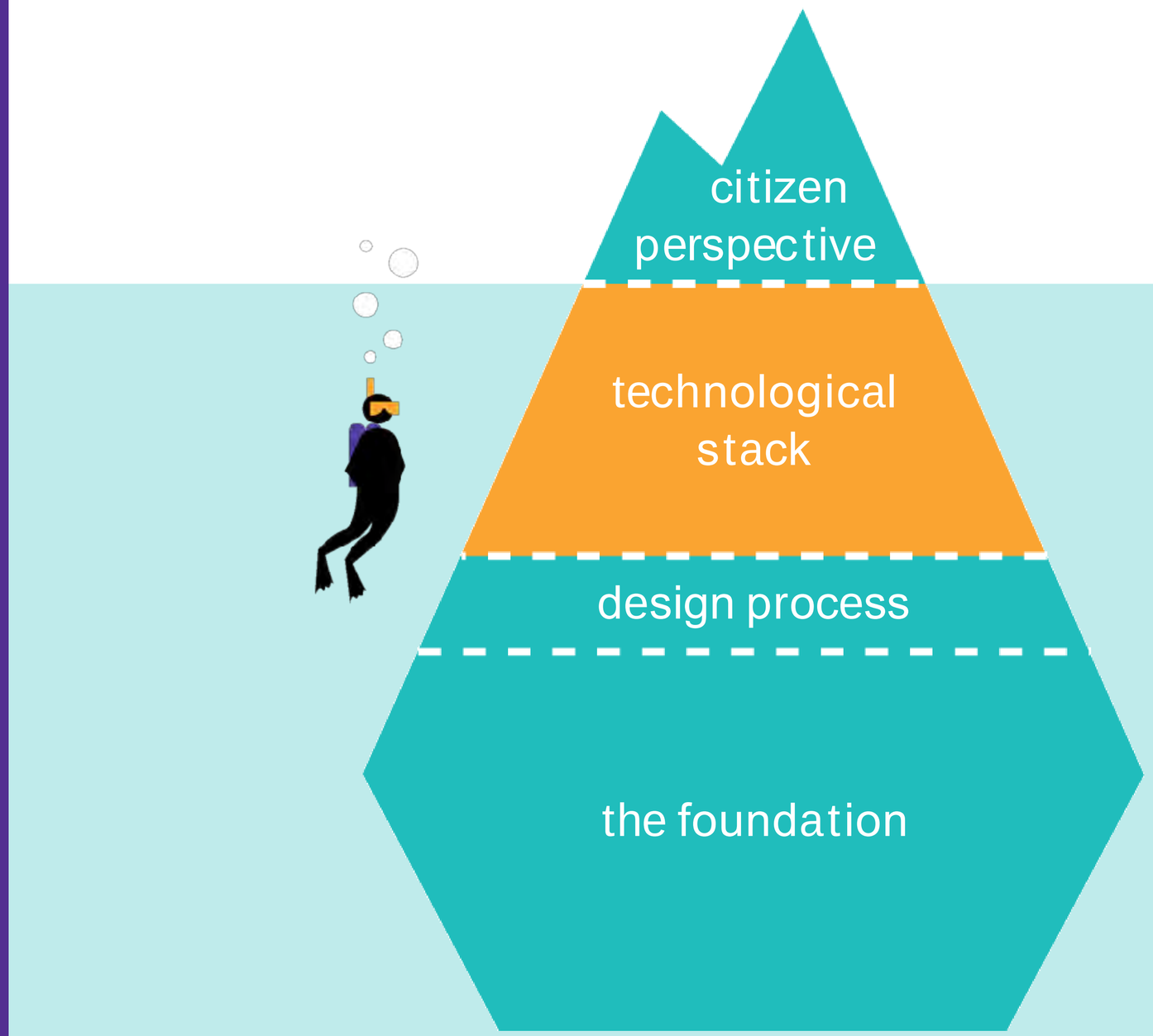
The top of the Public Stack is the citizens' perspective



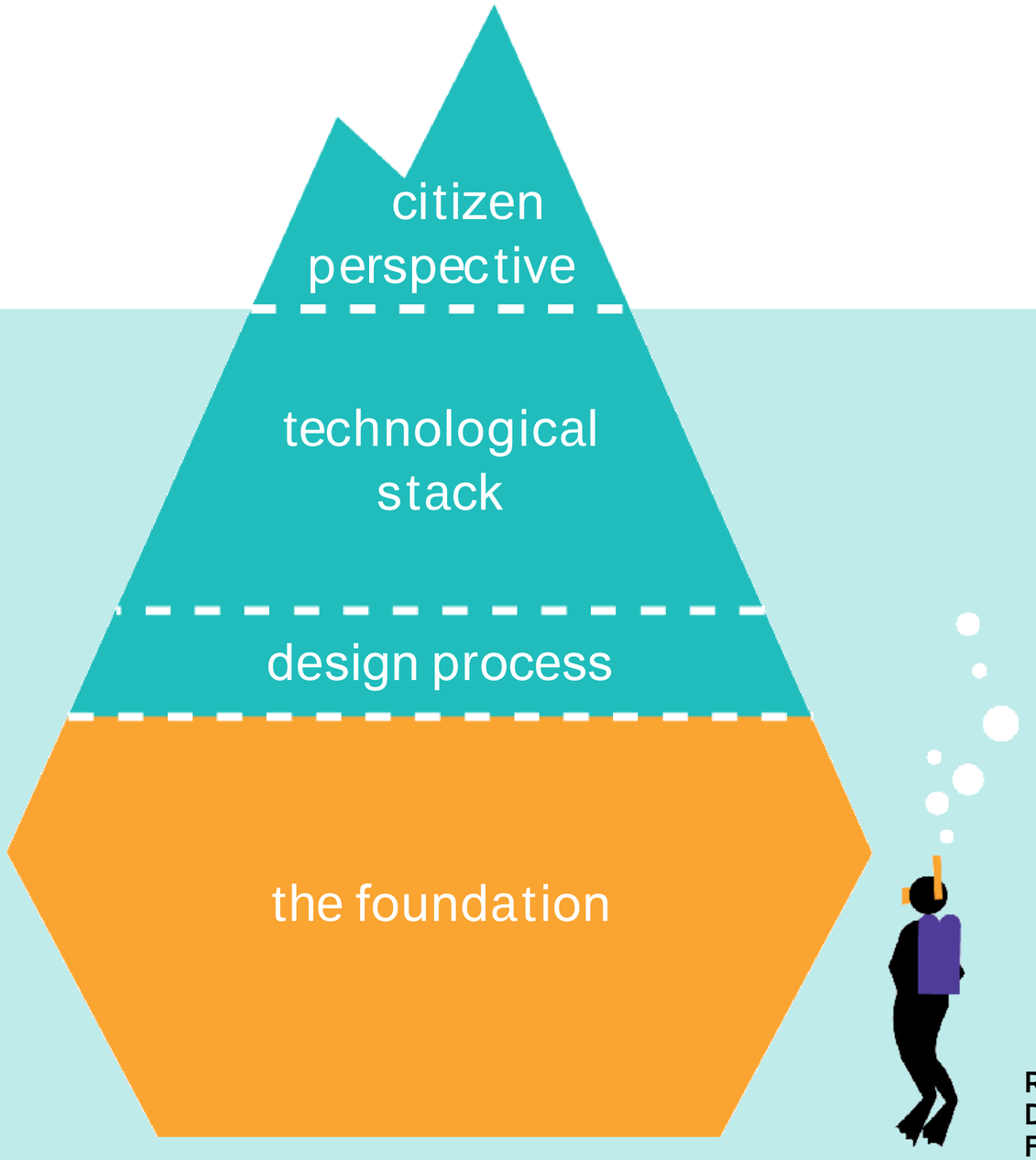
Roadmap Digital Future

Technology is much more than meets the eye



Roadmap Digital Future

The foundation of the Public Stack ensures that the technology stack is inclusive, safe and just



Roadmap Digital Future

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The issue of the transition

Open discussion

Applying our findings

- Talking to various organizations from several sectors: public administration, transport systems, health, energy suppliers, monetary institutes, industrial control systems, mobile sector.
- What scenarios to develop to get experience with those technologies:
  - How do these scenarios perform in practice?
  - Will the results of these scenarios solve your problems?
- Can you think about use case / scenarios / PoC?

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Resources

Resources

- 2STiC Programme and tools; http://www.2STiC.nl/
- Enabling trust in network services through secure, stable, and transparent internets, 2STiC, 2019, https://2stic.nl/enabling-trust-in-network-services-through-secure-stable-and-transparent-internets.html
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- Cyber governance, Huston, G., 2020: https://blog.apnic.net/2020/08/07/opinion-defining-cyber-governance/
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