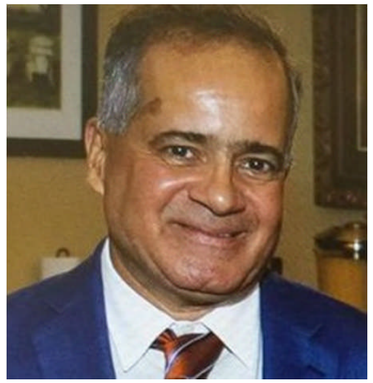
Internet 2025

Internet and Future Networking

CONTRIBUTORS

Lisbon
March 2025



Moderator

Prof. Dr. Dirceu Cavendish, Kyushu Institute of Technology, Japan

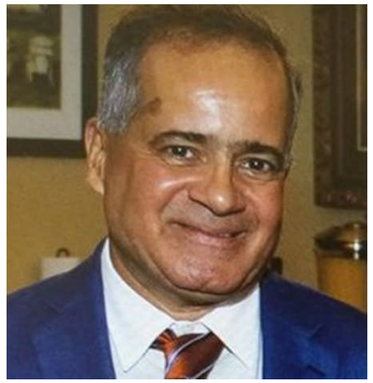
Panelists

Prof. Dr. Oliver Michler, Technical University Dresden, Germany
Dr. Jacek Plesnar, ABB, Poland

Prof. Dr. Philippe Martinet, INRIA Sophia Antipolis, France
Dr. Martin Zinner, Technische Universität Dresden, Germany

Chair Position

Lisbon
March 2025



→ Internet Evolution

→ Adaptibility: Withstand network protocols changes gratiously

→Reliability: Prevent regional areas from blackouts

→ Trust: Networking infrastructure checks/balances

Networking waves (next gen syndrome)

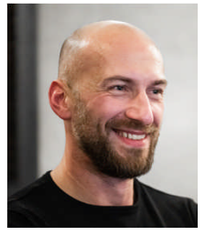
- Connectivity, scaling and protocols:
  - Bridges/Routers, networking (bridging/routing) protocols, transport and session protocols.
- Backbone and applications:
  - OTNs: SONET/SDH; (D)WDM
  - World Wide Web, Internet Security (SSL), VoIP, Video streaming
- Fixed and mobile wireless
  - IPV6, wireless access points, 3GPP (2G-5G)
- Network Verticals (slice and dice)
  - Industrial, (sensor, medical) IoT
  - LEOs, DTNs

Internet Wishlist

- Adaptability
  - Access links: WiFi/Cellular/Satellite
  - Security: post quantum computing authentication/encryption (FIPS-203,204,205)
- Resiliency
  - Jan.2025: Taiwan/HK international undersea cable cut.
  - Nov. 2024: Baltic Sea cables were cut within hours. Lithuanian-Sweden and Finland-Germany affected.
- Trust
  - Equipment BAN: US, Australia, Japan, Taiwan

Panelist Position

Lisboa
2025



Jacek Plesnar
ABB CTC
Kraków,
Poland

- **Cybersecurity and Quantum-Safe Networks**
  - It seems quantum based cryptoanalysis is not real threat yet due to technical challenges when it comes to quantum computing. How long will it last?
  - Maybe there are some revolutionary discoveries in Math area which are bigger danger than quantum computation?
  - Recently Microsoft announced Majorana 1 with new approach (topological qbits) – will it bring some new threats to current day available cryptography?
  - There are already released standards for PQC (Post Quantum Cryptography). Is it time to start using them?
  - For traditional encryption we use dozens of years of experience in Math area which allows us to avoid some traps. Are we ready with math concepts used in PQC?
  - Could it be that quantum computers will never be as good as we hope or may no suit to problems like cryptoanalysis?
- **Web3**
  - Having in mind there is blockchain heavily involved – how do we cope with scalability and performance issues of this technology?

Panelist Position

Lisbon
March 2025

- Internet and Future Networking ⇒ Classification, Rules and Services / SOTA
  - Performance: Bandwith / Availability / Robustness / Resilience
  - Application: Home / Industry / Business / Tourismen / Multimedia / …
  - Location: Stationary / Portabel / Mobil
  - Topology: Router / Switch / Gateway / Software Defined Network
  - Coverage: Wide Area Network / Local Area Network / Piconet
  - Carrier: Twisted Pair, Fiber Optics, Polymer Fiber Optics, Powerline, Radio Frequency
  - … ?

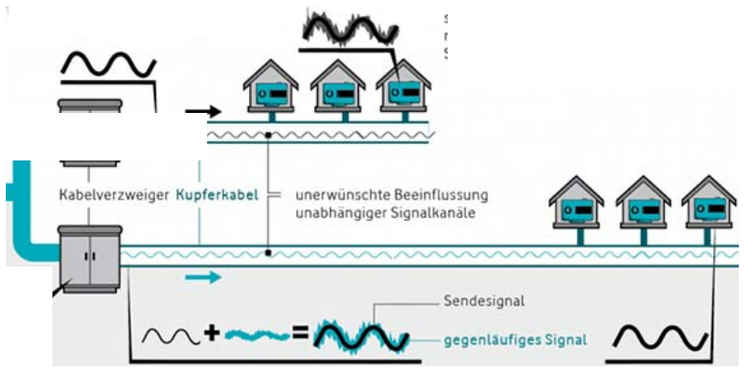
Oliver Michler
TU Dresden,
Institute of Traffic Telematics

Panelist Position

Lisbon
March 2025

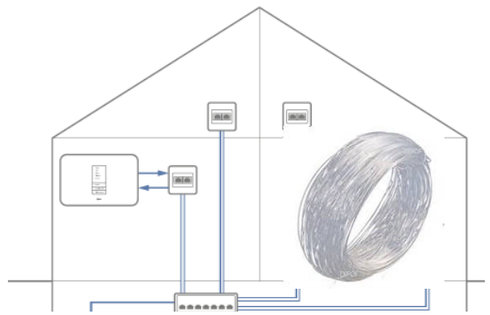
- **Internet and Future Networking ⇒ here: DSL- and Fiber in the Home with economic access, high data rate and new services**

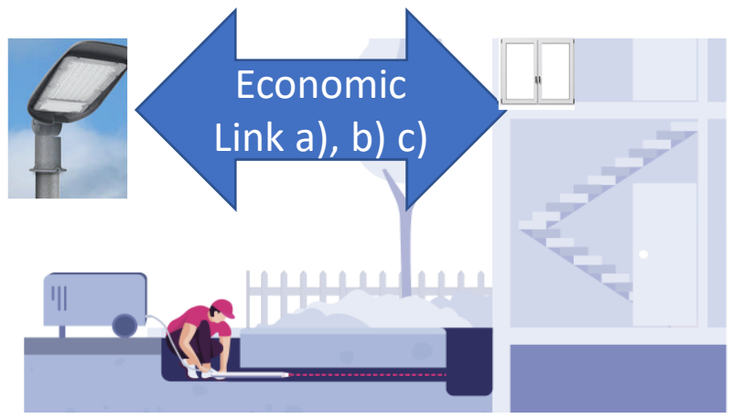
  - **DSL – Innovation: Vectoring with Interference correction**
    ⇒ contrary signals



  - **Fiber optic – Innovation (1): New access possibilities**
    ⇒ Air versus earth installation

    a) 5G Mobil radio / Campus network
    b) Directional radio link / mmWave
    c) IR or LED-LiFi / Optical Comm.



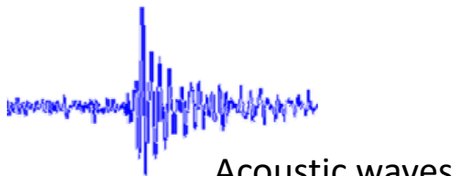


  - **Fiber optic – Innovation (2): In-house polymer fibers**
    ⇒ cost-effective, flexible, unremarkable

Panelist Position

Lisbon
March 2025

- **Internet and Future Networking ⇒ here: DSL- and Fiber in the Home with economic access, high data rate and new services**
  - **Fiber optic – Innovation (3): Acoustic Sensing for Home State Detection**
    ⇒ software defined, Infrastructure efficient, AI suitable

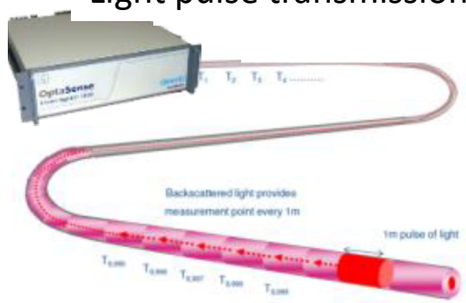


Acoustic waves from the environment

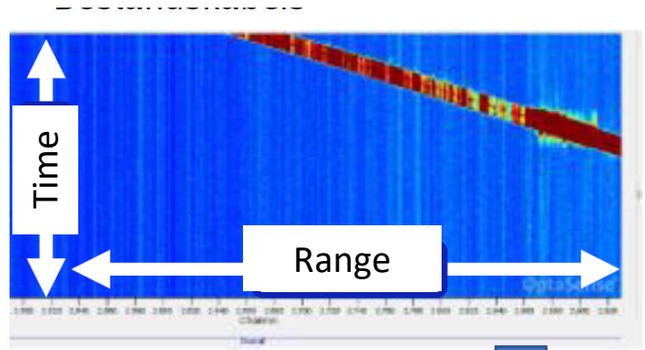
Fibre Optic line

Measure

Light pulse transmission



Analyse



- People in the room (light agent)
- Open window (heating control)
- Glass breakage (security alarm)
- Baby phone (Cry monitoring)
- …

Source:www.alamy.com/

Acoustic landmarks

AI-based evaluation

Panel #4

Lisbon
March 2025

- **Internet and Future Networking** ***(Next-Generation Internet Architectures, 6G and Future, Wireless Technologies, AI-Driven Autonomous Networking, Cybersecurity and Quantum-Safe Networks, Edge Computing and Decentralized Infrastructure, Metaverse, Web3, and Immersive Networking, etc.)***
  - **”Network architecture” is commonly used to describe a set of abstract principles for the technical design of protocols and mechanisms for computer communication.**
    - **The design of today's Internet technology was guided by an Internet architecture that was**
    - **developed in the 1970s.**
    - **Much of the coherence of the original architecture is being lost in a patchwork of technical ornaments, each intended to satisfy a particular new requirements.**
  - **Key Features of Next-Generation Networking,**
    - **a) Software-Defined Networking (SDN),**
    - **b) Network Function Virtualization (NFV),**
    - **c) Cloud Computing,**
    - **d) Artificial Intelligence and Machine Learning,**
    - **e) Security and Threat Mitigation,**
    - **f) Orchestration and Automation, and**
    - **g) Interoperability and Standardization**

Martin Zinner
Technische Universität Dresden

https://groups.csail.mit.edu/ana/Publications/DevelopingaNextGenerationInternetArchitecture.pdf
https://duplocloud.com/7-key-features-of-next-generation-networking/

- **Intelligent Internet Architecture: Opportunities and Challenges**
  - The explosive growth in the number of Internet users and applications requires continuous optimisation of services provided by the Internet, such as deterministic security, high throughput, and low latency.
  - However, these problems that the Internet architecture solves are also increasingly complex.
- Evolution of Internet architecture toward artificial intelligence (AI)
  - has achieved remarkable results (for example intelligent algorithms to detect malicious traffic, which is more effective against unknown attacks).
  - Dearning (DL) or deep neural networks (DNNs), have obvious advantages in complex problems, they require sufficient data and computing resources.
  - Partial devices (e.g., routers and switches) in the existing Internet, cannot provide the corresponding resources.
- The existing Internet architecture
  - requires the evolution of hardware foundation, software services and intelligent algorithms to support intelligence.
  - backward compatibility

https://kalgod.github.io/pdf/Network22-Collaboration.pdf

Output highlights

<post Panel>