



SCHLOSS DAGSTUHL
Leibniz-Zentrum für Informatik

Wadern, October 2, 2024

Schloss Dagstuhl:

Greening Networking – towards a carbon emission free Internet

Computer scientists and engineers from 11 countries on 3 continents have come together to reduce the carbon footprint of the future Internet at Schloss Dagstuhl this week.

As climate change triggered by CO₂ emissions dramatically impacts our environment and our everyday life, the Internet has proved a fertile ground for solutions, such as enabling teleworking or teleconferencing to reduce travel emissions. It is also a significant contributor to greenhouse gas emissions, e.g., through its own significant power consumption. It is thus very important to make networks themselves "greener" and devise less carbon-intensive solutions while continuing to meet increasing network traffic demands and service requirements.

Computer scientists and engineers from world-leading universities and international companies, such as Ericsson, NEC, Netflix, Red Hat, and Telefonica came together in a Dagstuhl Seminar on *"Greening Networking: Toward a Net Zero Internet"* at Schloss Dagstuhl – Leibniz Center for Informatics in northern Saarland in Germany, between September 29th and October 2nd, 2024. Organized by leading Internet researchers from the Hong Kong University of Science and Technology (Guangzhou), the University of Oxford, the University of Oslo, and the University of California, Santa Cruz, they met to identify and prioritize the most impactful networking improvements to reduce carbon emission, define action items for a carbon-aware networking research agenda, and foster and facilitate research collaboration in order to reduce carbon emissions and to positively impact climate change.

In addition to pure networking issues, the reserachers also analyzed the impact of larger systems that are built with Internet technologies, such as AI, multimedia streaming, and mobile communication networks. For example, the seminar discussed energy proportionality in networked systems, to allow systems to adapt their energy consumption to actual changes in utilization, so that savings can be achieved in idle times. Such a behavior would require better adaptiveness of applications and network protocols to cost information such as carbon impact. Moreover, networked systems can interact with the power grid in different ways, for example adapting energy consumption to current availability and cost of renewable energy, which can be helpful for joint planning of the power grid and the network, networked-systems, and cloud side, achieving maximum efficiency and savings.

The seminar attendees are working with international research and standardization organizations such as the Internet Engineering Task Force (IETF) and the European Telecommunications Standards Institute (ETSI), and it is expected that the seminar will make contributions to future research and standardization agendas in such organizations to bring the Internet to Net Zero carbon emissions.

Since 1990, Schloss Dagstuhl has been hosting computer scientists in so-called Dagstuhl Seminars. The *Greening Networking: Toward a Net Zero Internet* seminar at the Schloss Dagstuhl – Leibniz-Center for Informatics had 26 experts from 11 countries on 3 continents convene for half a week to live together and work on reducing computer networks' carbon footprint.



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- Alexander Clemm (Los Gatos, US)
- Dirk Kutscher (HKUST – Guangzhou, CN)
- Michael Welzl (University of Oslo, NO)
- Cedric Westphal (Futurewei – Santa Clara, US)
- Noa Zilberman (University of Oxford, GB)

More information about the seminar 24402 – "Greening Networking: Toward a Net Zero Internet" can be found at <https://www.dagstuhl.de/24402>

Background:

During the whole year, Schloss Dagstuhl invites scientists from all over the world to come to northern Saarland in the south west of Germany to debate the newest scientific findings in informatics. More than 3,500 computer scientists from universities, research institutions and industry take part in various scientific events at Dagstuhl each year. Since 2005, Schloss Dagstuhl is a member of the Leibniz Association, which connects 96 leading non-university research institutes and scientific infrastructure facilities all over Germany. Because of their national importance, the federal government and the state governments jointly fund the institutes of the Leibniz Association.

For interviews, reports or shooting footage, please contact:

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