Conclusions of 11th CEF networks workshop

On the 18 th and 19th of April, 2023, 46 representatives from research networking institutions from nearly all continents met to discuss their experience in designing, promoting and operating innovative and progressive Customer Empowered Fibre (CEF) Networks, and they managed to formulate major guidelines for further research and experimental development in networking. The host of the meeting was the CESNET association and presentations selected by CESNET covered many interesting new developments in research networks worldwide.

The presentations were focused on **building, upgrading network lighting and** also **fibre base**. The aspect of **flexibility, efficiency** and especially **sustainability** has been found as **very important**. Many networks use lighting with **flexible spectrum allocation** also lighted by **multiple transmission systems in one network**.

As a **key differentiator** from commercial network operators and organisations the **support of advanced users and applications** has been identified.

Time and frequency transfers have been addressed often in different way. In some networks they are becoming regular service supported by NOC. Remote **distributed sensing** also takes place over research fibres. The **quantum applications (quantum key distribution, entanglement, metrology, etc.)** are already handled in participant networks and longer term intention to be usable over shared fibre has been addressed. Cooperation in this field has been proposed. Available spectrum to accommodate all data and these services has been other important topics.

Presentations are available at: https://www.cesnet.cz/events/cef2023/?lang=en

Recommendations of 11th CEF networks workshop

Participants appreciated the presentations of 11th CEF Networks workshop and:

- recommended organisation of next CEF Networks workshop

- recommended R&E Networks and experimental facilities to:

- provide R&E Networks services as worldwide instrument supporting research and cooperation in various fields of science and upgrading competitiveness of research and innovation teams
- gain and maintain access to all layers of their network, including fibre and photonics
- be prepared to and request **openness on optical layer**. It can bring savings in optical network (avoiding vendor lock-in), decrease dependency on vendors road-maps and allow network development of innovative and advanced services.
- **utilize multi-domain spectrum sharing/alien waves** as it represents **an opportunity**. However it needs cooperation, collaboration and commercial and/or contractual issues are complicated still
- CBFs are very useful still, yet to be upgraded to actual technology speeds.
- enlarge and support **user group of services not available on the market**, e.g. in field of metrology, sensing and quantum technologies. Ensure also new or experimental applications are supported in R&E Networks
- **collaborate** with **vendors** on **scientific** and pilot projects.
- follow and contribute, if possible, in global initiatives opening networking (e.g. Telecom Infra Project, Open Networking Foundation,…)
- **collaborate** actively with **new projects** and provide information on how R&E Networks can help and provide new services
- internal and shared laboratories represent advantages and should be supported and developed