Improving Digital Infrastructure: Very High Capacity Network Development

Closing Presentation

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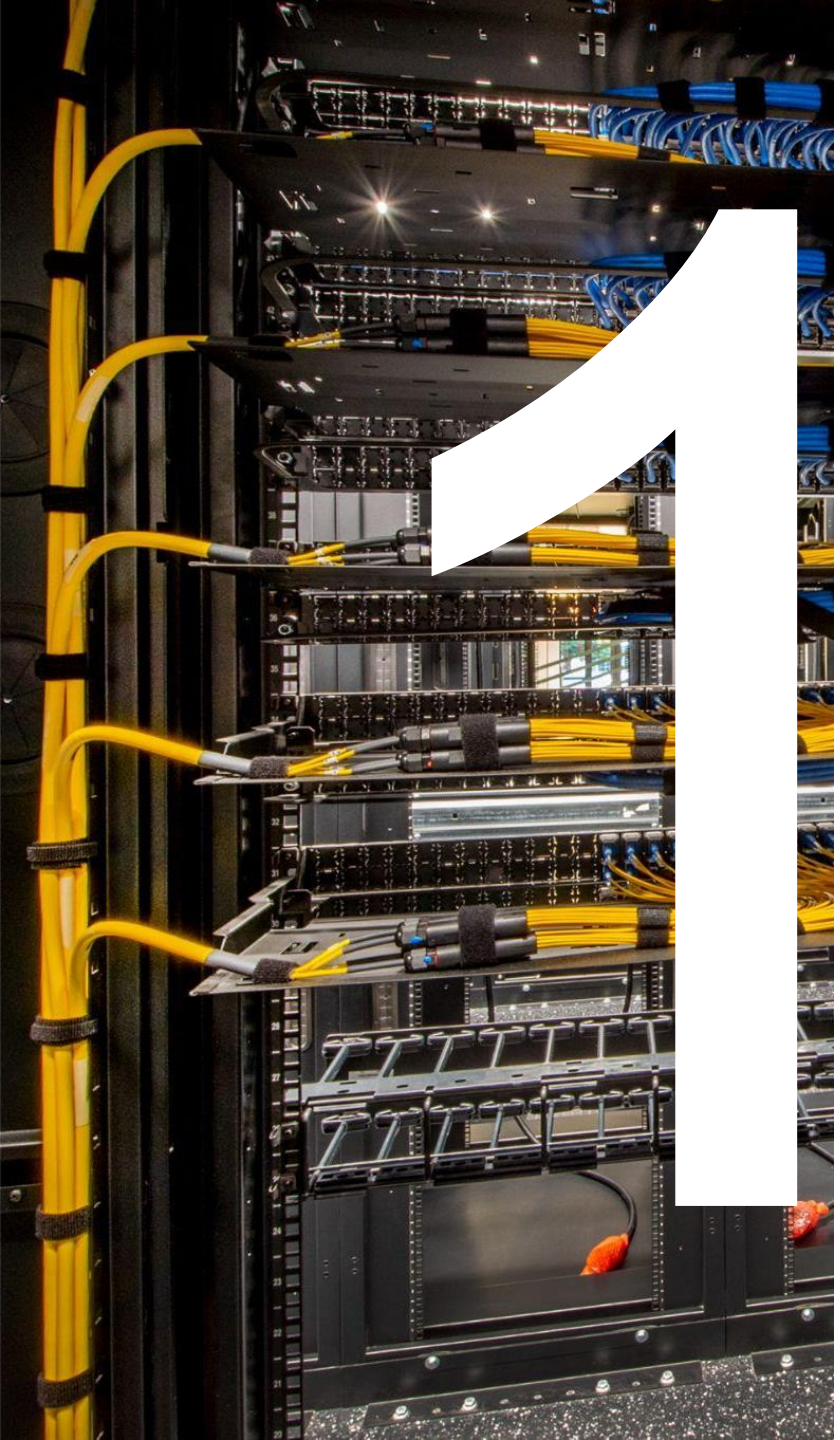
Agenda

1. Project Overview
2. Analysis of data traffic until 2030
3. Handbook on the design of VHCN support
4. Analysis of public support for VHCN access
5. Recommendations and Roadmap
6. Key Issues in the European Agenda of Electronic Communications Development



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Project Overview

List of Deliverables

1. **Deliverable 1: Inception Report**
2. **Deliverable 2: Analytical report on the expected data volumes transported within and via VHCN up to the year 2030, including the data aggregation influence**
3. **Deliverable 3: Handbook for designing the support of VHCN in the context of technology neutrality**
4. **Deliverable 4: Analytical report on the current system of public support for networking access to VHCN for all relevant users of Internet connection services in the Czech Republic**
5. **Deliverable 5: Recommendations and roadmap**
6. **Deliverable 6: Report on key issues in the European agenda of electronic communications development**

Challenges To Be Tackled

Technical issues

- Easement prices applied to operators, IRU
- Wholesale access
- Building regulations and time demanding bureaucracy
- Absence of database of investment plans financed from public funds or private investors
- Legacy of public support to develop the digital infrastructure - mapping, white areas etc.
- VHCN technical parameters assessment (speed, latency)

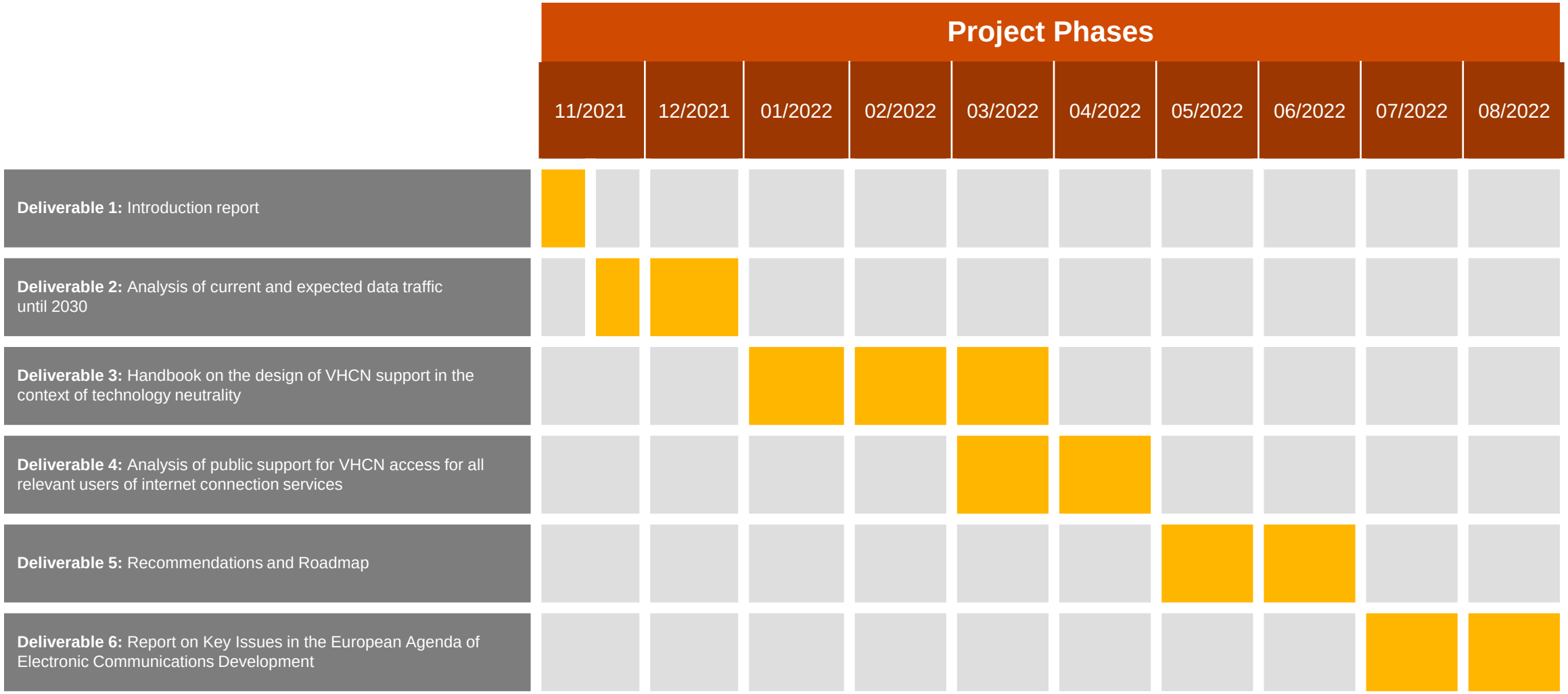
Commercial issues

- Gaps identification and quantification
- Large amount of small providers without capacities for strategic development, role of the incumbent
- Commercial disadvantage of systematic building of complete infrastructure in smaller residential units
- Current dominance of wireless networks in the Czech Republic (28.5% of all subscriptions)

Support issues

- Complexity of state aid rules and the steering documentation (GBER, RRF, BEREC)
- Legal compliance reg. financial support for broadband incl. Financial instruments
- Non-financial support options
- Obligation to share the supported infrastructure with other providers
- Support for specific targets - backhaul, socio-economic drivers, in non-white regions etc.

Project Timeline

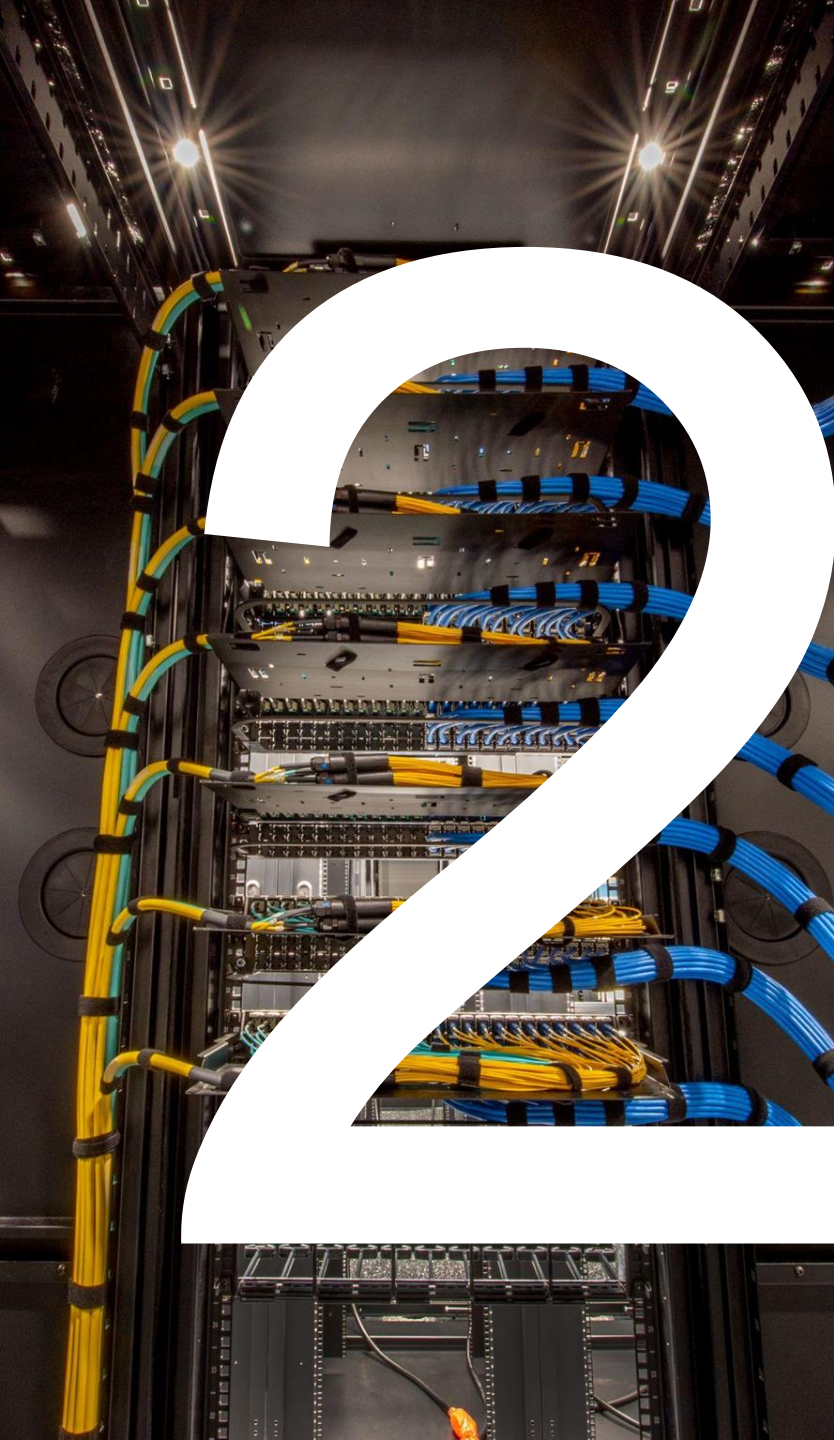


Project Achievements

- ✓ 6 reports delivered covering all the Project deliverables
- ✓ No risk incidents occurred
- ✓ A project conference held with almost 100 on-site and on-line participants, including deputy ministers, Czech Telecommunication Office and sector representatives
- ✓ Call for proposals open to cover white areas
  - Key parameters of the discussed with the sector representatives in offline meeting (wholesale access, selection criterions, SME support)
- ✓ State aid notification support for backhaul (now waiting for amended GBER)
- ✓ New initiatives support - Workgroup to measure parameters of VHCN connections

To be further developed

- Backhaul support grant call
- Household, businesses and socio-economic actors connection to VHCN in black areas
- Vouchers utilization
- Non-financial support improvement
- Legal changes



Deliverable 2: Analysis of current and expected data traffic until 2030

As per the official project instruction several adjustment were made to uplift the potential of suport for MPO

Deliverable 2: Analytical report on the expected data volumes transported within and via VHCN up to the year 2030, including the data aggregation influence

The contractor shall conduct a thorough analysis of the data volumes projected to be needed in the Czech Republic from the moment of the commencement of the contract to the year 2030.

The report should include, inter alia, the following elements:

- Analysis of the average volume of data downloaded/uploaded by the average residential customer (per one apartment connection) on the network per day (by types of networks, like VHCN vs. NGA, FTTH vs. XDSL, CATV vs. Wireless, etc., by data direction down/up, type of traffic like cloud computing, TV, etc.). This should be provided as regards the overall aggregates as well as, separately, for traffic peak hours. It should include the outlook to 2030. Such data would be available by monitoring system archive files of the bigger operators.
- Description of the expected changes of user behaviour over time considering their experience with changes in available network capacity.
- Description of specifics per average connection in the socio-economic drivers (especially schools, hospitals, government offices) and SOHO (Small Office/Home Office) subjects.
    - Including for customers connected by LTE mobile data connection (as an alternative to services at a fixed location).
    - Including for customers connected by 5G mobile data connection at a fixed location, when available.
- Prediction of the expected growth of the data volume download/upload until 2030 in the EU – similar to the CISCO outlook prepared yearly for US, including estimation of service quality (speed, delay, jitter).
- Prediction of the degree of convergence or a substitution of mobile and fixed networks in the target period, in order to provide an estimate of whether and to what extent (e.g. also with regard to the above estimates of downloaded data, etc.) services at a fixed location will be provided via mobile networks (5G).
- Prediction of the opportunities or challenges (such as certain new services) that may significantly affect the growth of data consumption or data generation by residential consumers, as well as in the socio-economic field.
- Overview of the data aggregation influence on different types of infrastructure.
- Evaluation of the resilience of various types of network infrastructures against traffic congestion and the possibility of their reconfiguration or increasing their capacity.
- Estimation of requirements for availability and reliability of services of a certain quality within individual technologies and solutions available on them.

The forecast and the deliverable accounted for the following key aspects of the market to maximize deliverable quality

The deliverable and the forecast included the following key factors that impact the overall future connectivity needs of Czech republic:

Technology

Key shift compared with NGA study from 2019

- **Data aggregation** different technology dependent on user behaviour and other aspects
- **Technological evolution**
- **Existence of networks (technologies)** in the future
- **Convergence possibilities**

Market trends

Will be validated through the yearly Internet study (GT CZ)

- **Description of trends** (peak, average, forecast)
- **Application data demands changes** (4k video, larger download files etc.)
- **New emerging user trends,** increase in the use of applications (8K, VR)
- Trends in internet use of **socioeconomic actors**

Demand (Forecasting)

Expecting several operator inputs

- **Definition of users** (demographic segmentation)
- **Definition of typical households** (combining different user types)
- **AS-IS data consumption and demand**
- **TO-BE forecast** - Average costumer future consumption

In the future (1-2 months) we expect verification of the model against:

- The data provided by the operators, especially for the values of peak, traffic and tariff distribution
- Results of a survey of Internet use in households
- Discussion with the academic sector on the topic of technology and especially the features of wireless technology

Forecast development – model procedure and division of subchapters

Methodology – First of all, the forecast approach is described together with the basic assumptions similar to such made in ja the WIK study (comparability of results is achieved)

Data bandwidth of applications – Based on the analysis of trends, the assumption of data intensity of individual applications with development in 2025 and 2030 was created

User profiles – User profiles were defined similarly as in the WIK study (comparability) and their description of characteristics was taken over and applied to the Czech population

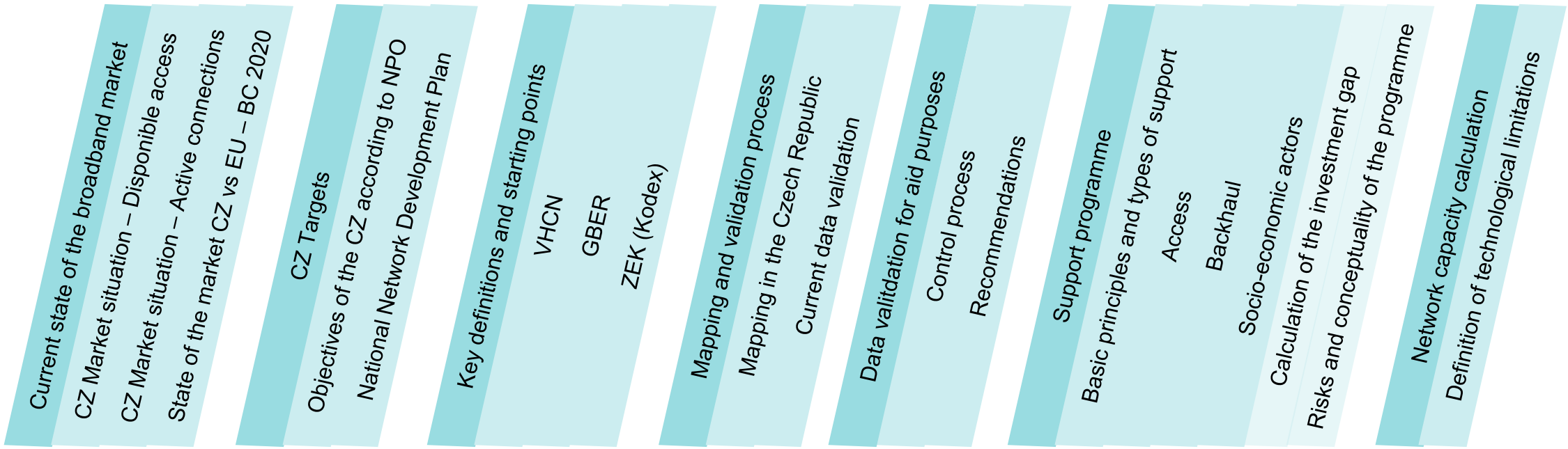
Consumption allocation – Individual Internet usage was assigned to the defined users and thus their data consumption at the peak, including the daily time of application usage

Traffic aggregation – Population analysis subsequently made it possible to aggregate all types of users into individual households, and with it the peak of demand per households

Final forecast for 2030

Deliverable 3: Handbook on the design of VHCN support in the context of technology neutrality

Deliverable 3 document structure reflects needs and ToR



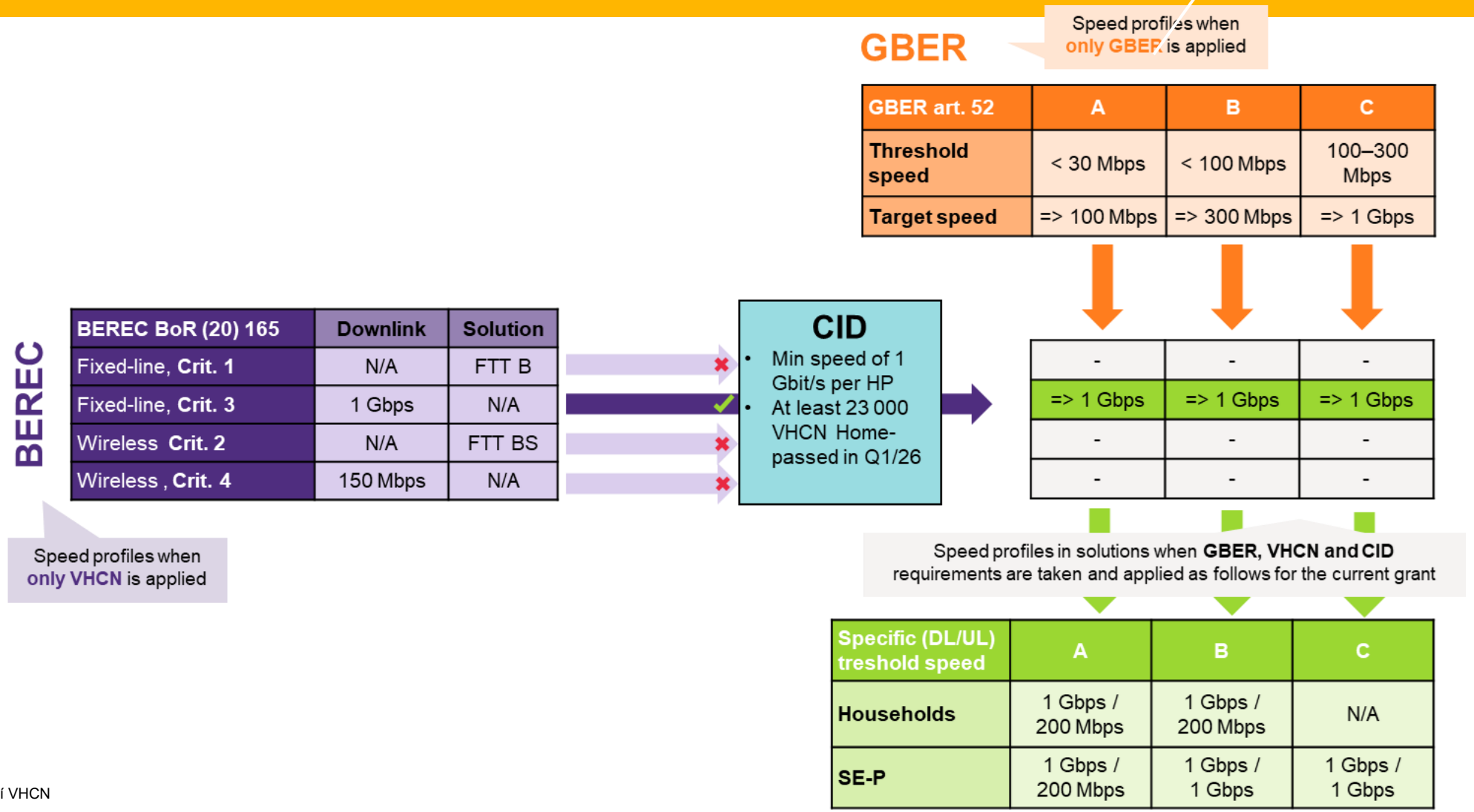
All relevant key areas for full understanding of the support schemes was discussed in the handbook and analysed

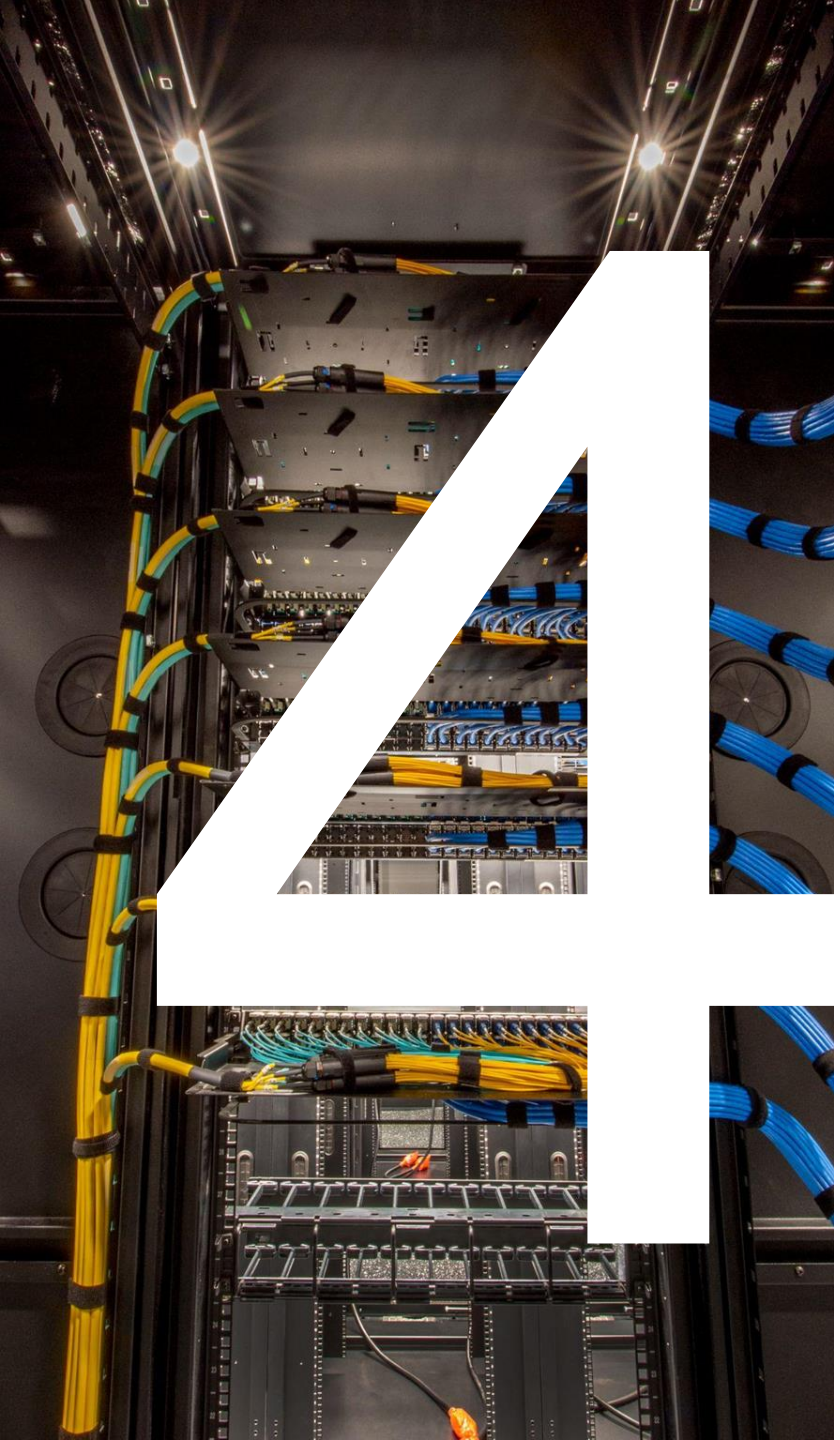
Areas of analysis

- **Access network –** Analysis of state aid on access networks
- **Backhaul network –** Analysis of state aid on backhaul networks
- **Indirect aid –** Alternative ways of support and their impact on subsidies
- **Socioeconomic drivers –** Defining ways of supporting institutions
- **Network economics –** Analyzing costs of construction and profitability

Within the relevant chapters, a possible quantification of both the investment gap and the potential impact within the defined risks and the proposal for their mitigation were carried out.
We look at three types of state support and provided recommendations on how to maximize their effectiveness.

RRF Support Scheme





Deliverable 4: Analysis of public support for VHCN access for all relevant users of internet connection services

Deliverable 4 Goal
According to the RfS

The contractor shall produce an analytical report, including a gap analysis, of the current system of public support for access to VHCN.

The report should include, inter alia, the following elements:

- Analysis of all forms of support of the VHCN internet access networks development.
- Analysis of the impact of the GBER amendment on the current possibilities of public support in the area of the Internet access development. By doing so, the contractor shall:
  - Distinguish public support by end-user category (household, socio-economic partners and commercial users).
  - Analyse, describe and unify the possibilities of ensuring access to internet through the VHCN network for different ways of financing of the socioeconomic partners.
- Analysis of various possibilities of using the IRU to ensure internet access connectivity of different players:
  - to increase the productivity/efficiency of the use of investment funds both on the part of the IRU user and on the part of the IRU provider,
  - to motivate investors to increase their level of investment,
  - to reduce the time for building networks.

Comparative Analysis:
EU Member States VHCN Implementation

	Austria Broadband Austria 2030	**Croatia** National Broadband Plan	**Germany** Mobile Communications Mecklenburg-Western Pomerania	**Spain** Extension of Broadband Scheme
Supported technologies	Wired networks, in combination with wireless technology	Access networks only	Passive parts of the infrastructure	Passive parts of the infrastructure
Supported parts of networks	NGA, seldom NGN	Passive technological infrastructure	Mobile networks / internet min. 4G	NGA access networks only
Type of Aid	Direct grant	RRF & ERDF	Regional state budget	RRF, ERDF & national public funds
Aid Eligibility	**Areas without access** or demonstrably planned network construction; Selected areas with the offer of only one provider	**White** areas where there are no and will demonstrably not be networks on a purely commercial broadband network	The aid is intended **only for the FMI**, which oversees the operational activities of the measure and acts as a project management company for the State	**White** areas of NGA that do not have / will not have NGA operator coverage; **Gray** areas of NGA, where one network exists / is planned over the next three years

State Aid for VHCN Development

Market Gap Analysis

In defining of VHCN networks, we came across several definitions from various sources of legislature that all needed to be taken into account in the calls for proposals to support the construction of electronic communications networks. These were: **BEREC**, **RRF**, **GBER** and **Czech National Plan for the Development of the VHCN**

The gap identified in accordance with these definitions was used as the baseline for the quantification of the aid that needed to be provided. Taking into account other the specifics of the Czech wired connectivity market the real investment gap is estimated at **380,000 households** (237,000 addresses) at around **11.5 CZK billion** (ie approx. EUR 332 million).

Recommendation

The market for fixed access to electronic communications networks is highly competitive in Czecia. The Czech Republic is one of the countries where (according to DESI data) prices for the wired connections are some of the lowest.

As the biggest obstacle to the VHCN development it was identified that the **aid intensity** for selected regions in Czechia **may not be sufficient** to motivate the private sector to implement VHCN networks. In the regions with a market failure situation where no infrastructure is available with download speeds greater than 30 Mbps or 100 Mbps, it is appropriate to i**ncrease the aid intensity from 75% to 80% and possibly even more**.

IRU Usage Possibilities in Czechia

Legal Aspect

The term IRU is based on Anglo-Saxon law and by default Czech legislation does not recognize an indefeasible rights of use. The right of use is normally transferred on the basis of a lease agreement, or other contractual types (with regard to the nature of the thing and the (non) validity of the obligation).

Accounting Codification Aspect

In order for the right to be reported as a fixed asset, its service life must be longer than 1 year and the value usually higher than CZK 80,000. If the above assumptions are met, expenditures on long-term lease of a part of the network / infrastructure in the form of an IRU according to the international accounting standards IFRS can be considered eligible for drawing public support.

Eligibility for State Aid

The costs of long-term lease of part of the network, or physical infrastructure, in the form of a “indefeasible lease” (IRU) may be eligible for public support, provided that the necessary preconditions are met, which are summarized below:

- The IRU contract shows all the features of an asset - i.e. originated in the past, brings economic benefits, is valuable and its usability is longer than one year.
- The IRU contract is classified as a purchase of a right of use, not a lease within the meaning of the Civil Code.

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Deliverable 5: Recommendations and Roadmap

Deliverable 5 Goal
According to the RfS

The contractor shall develop recommendations and a roadmap for their implementation concerning the opportunities embedded in state aid support, grants and financial instruments for the development of the digital infrastructure in the Czech Republic.

Critical elements in the recommendations and roadmap are, inter alia:

- Recommendations of aid schemes (European/national) to be used as of 2021 – and a review of relevant options:
  - Recommendations of possible forms of support for building connectivity for schools and other socio-economic entities in the Czech Republic.
  - Recommendations on the best ways to ensure the realisation of the expensive connections to buildings and apartments in so-called black areas where it is not possible, under the current rules, to support the construction of the entire access network from public funds.
- Recommendations on the best ways to support the development of backbone networks in rural areas where current infrastructure is unable to ensure that the growth of transmission capacity requirements is met in the near future and determine the conditions for this support in the light of the ongoing notifications.
- Recommendations on the best ways to:
  - increase the productivity/efficiency of the use of investment funds both on the part of the IRU user and on the part of the IRU provider,
  - motivate and incite investors to increase their level of investment,
  - reduce the time for building networks.

Recommendations Provided for the Future Call

Social-economic Actors & Black Areas Coverage

As part of this Deliverable we have provided recommendations on how to draft the call to enable the best possible solutions to drawing support for the Socio-economic Actors (schools, hospitals etc.) and to cover the gaps than can be found in black areas, which are typically excluded from the “traditional” sources of support due to various circumstances.

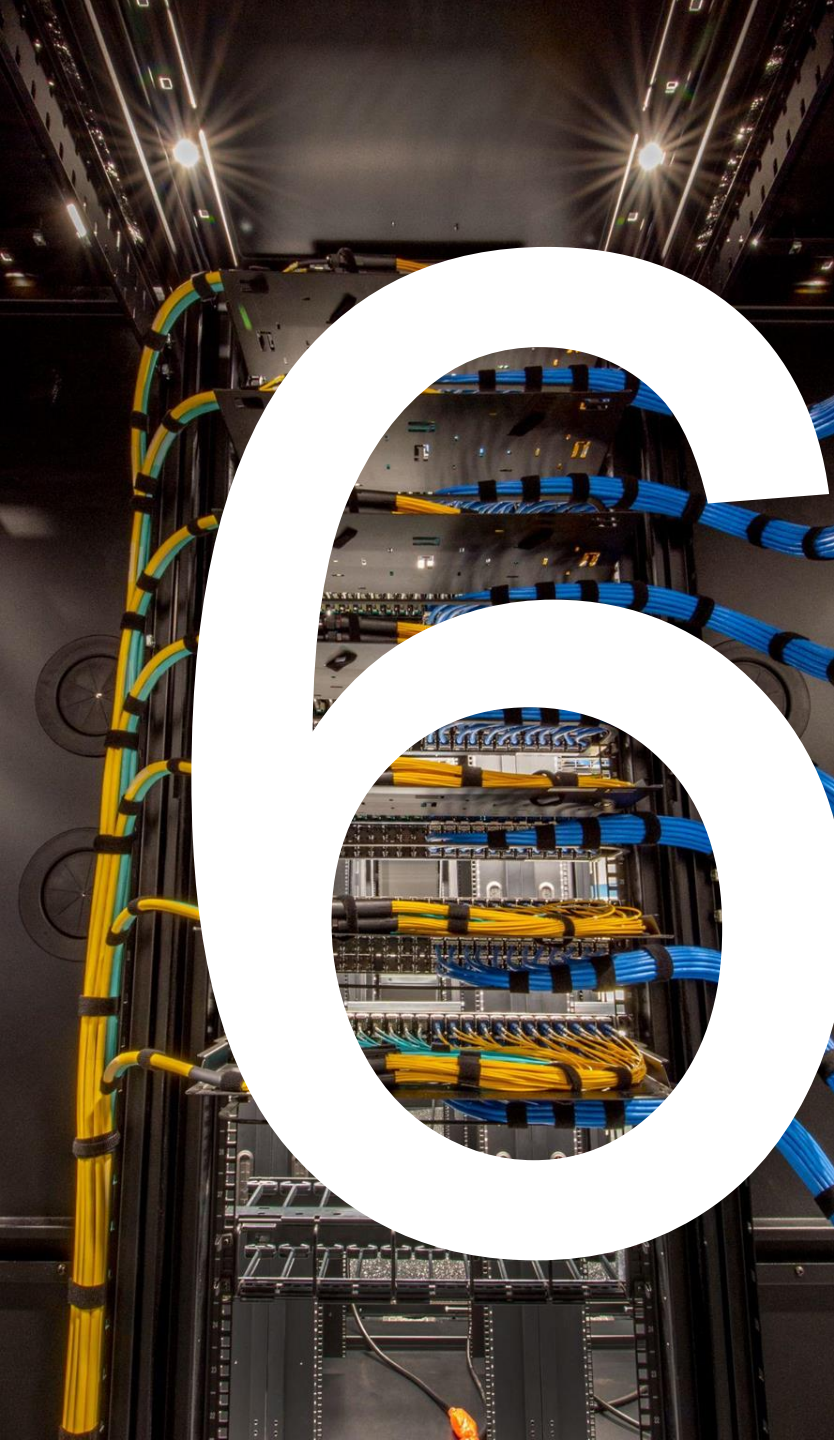
EU Member States Experience

A thorough analysis of the solutions implemented to develop the VHCN networks in the Member States in recent years was conducted (Austria, Greece, Poland, Hungary, Spain, Germany, Croatia, Slovakia). Three major approaches of setting up calls for the state aid were identified:

- Schemes according to the current wording of Article 52 GBER
- Notification of aid
- Application of financial instruments

Implementation of Financial Instruments

Additional ways of implementation of financial instruments were analyzed, including both foreign experience, as well as currently available opportunities offered by the EU Institutions, such as: subsidies from the Operational programmes, low-interest loans from the national banks, EIB loans, grants, PPPs and state bonds .



Deliverable 6: Report on Key Issues in the European Agenda of Electronic Communications Development

Assignment Overview

Description of the Deliverable Outcomes

Key issues in the European agenda of electronic communications development

Report, which shall provide a concise and detailed overview of:

- The current state of the European market of electronic communications.
- Current legislative and non-legislative EU initiatives affecting electronic communications (inter alia the revision of the 2014/61/EU Directive, broadband cost reduction directive, Action Plan for the development of mobile networks of 5G and 6G, the regulation on the protection of privacy in electronic communication, ePrivacy Regulation, GBER, others as and when relevant).

1 A key part of the report consists of the amendment of the **Broadband Cost Reduction Directive** in Czechia to improve the efficiency of the line constructions coordination. Ministry required **Regulation Impact Assessment (RIA)** on this legal amendment and necessary data sets from the sector to specify the proposal.

Legislation shortcomings identified:

- No records of upcoming or planned constructions available for private investors
- Lack of reciprocity in the field of line constructions
- Missing legally binding model for an efficient and feasible coordination of line constructions (not only infrastructure of electronic communications)
- Limited access to investment intentions of other players etc.

Suggested measure will bring a positive impact on faster introduction of high-speed internet in Czech regions and subsequently an acceleration of digitization in general.

Amendment of the GBER Regulation No 651/2014 - Article 52

2 The 2022 amendment reacts mainly on the technical progress in the field electronic communication networks, especially download and upload speeds increased, definition of step change was improved etc. It precises the Article content and definition, e.g. internet speed, substantial investments definition. It also brings more flexibility so the defined time period, e.g. for monitoring of the planned investments, is not strictly stated anymore but it is replaced by the collocation ‘relevant time period’.

Regulation Impact Assessment

Current situation in the field of line construction sites is very difficult to coordinate, and for that reason the constructions are becoming more expensive and time-consuming at the same time. In addition to reducing costs and accelerating the construction of infrastructure, the use of construction coordination also brings positive effects on the quality of public space, because thanks to their use, the site does not need to be excavated repeatedly and the public space will be less affected by construction activities.

Required Structure of the Regulation Impact Assessment

- Current Legal Status Description
- Relevant Subjects Identification
- Desired Status Description
- Risk Analysis
- Possible Solutions Proposal
  - Data on buildings and construction plans will be stored in the digital technical map of the region
  - the Act On The Line Construction Site Amendment
  - A Balance Between the Efficiency of the Planning Process and Protecting Sensitive Data
  - In-time Data
  - Data completeness and reliability
- Costs and Benefits Identification
- Cost Assessment of the Designed Options
- Ranking and Selection of the Most Suitable Solution
- Recommended Version Implementation and Enforcement
- Regulatory Effectiveness Review

Desired Impact

The update will reduce the number of constructions by coordinating the activities of the investors, scope and number of excavation works, which will positively influence the traffic flow and the quality of public space. It will speed up the construction process and reduce the costs of the broadband infrastructure construction.

Background Information And Data Delivered

Statistical Data

Ministry required necessary information and data sets to adjust the amendment proposal of the Acts 194/2017 Coll. (Cost Reduction Act), Construction Act No. 283/2021 Coll. and other related acts.

Following data was delivered in cooperation with the Czech Statistical Office and regional building offices:

- Amount of building permits procedures in CR (matrix regions x months)
- Time series of building permits development (months, years)
- Categorization of the procedures (residential, non-residential)
- Line constructions building permit procedures
- Categorization of line construction building permit procedures (transport, other lines)
- Costs of the investments in line construction projects

Cities Best Practice

2 cities (Karlovy Vary, Písek) interviewed to get the insight information from the current best practice reg. coordination of the line constructions.

Focus on (1) cooperation between the city and private entities; (2) coordination of private investment projects.

Companies interviewed

Similar to experience of the cities PWC interviewed companies operating a line infrastructure (internet operators and energy providers) to get insight information about the best and bad practice in coordination reg. Line constructions (esp. excavation costs sharing).

List of Used Abbreviations

BEREC	Body of European Regulators for Electronic Communications
ERDF	European Regional Development Fund
GBER	General Block Exemption Regulation
IRU	Indefeasible rights of use
NGA	Next-generation access
NGN	Next-generation network
PPP	Public–private partnership
RIA	Regulation Impact Assessment
RRF	Recovery and Resilience Facility
SME	Small and medium-sized enterprises
VHCN	Very High Capacity Network