



NETZALLIANZ
DIGITALES
DEUTSCHLAND



Federal Ministry
of Transport and
Digital Infrastructure

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Gigabit Initiative for Germany

Initiative of the Network Alliance to roll out
converged gigabit-ready networks by 2025

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1.

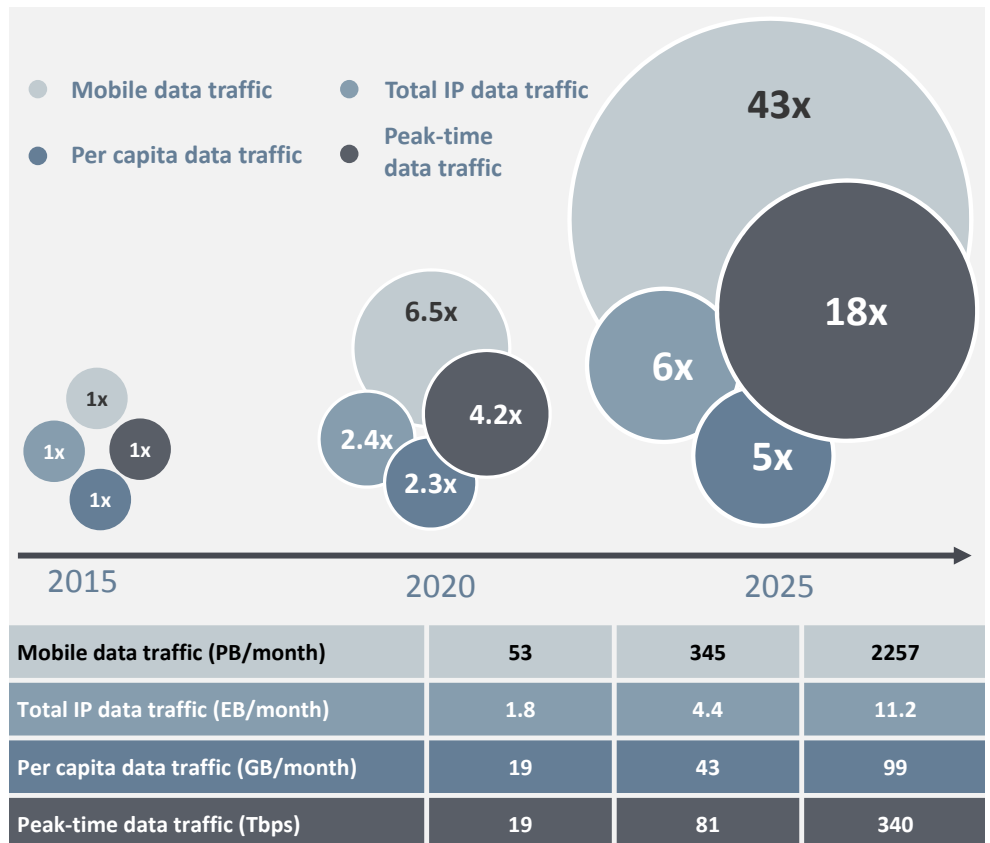
Germany’s way towards the gigabit society

► The Network Alliance for a Digital Germany is an initiative of Federal Minister Alexander Dobrindt that is comprised of representatives from the telecommunications industry and politics and aims at developing the infrastructure required for using gigabit applications in Germany by the end of 2025. This common position on a highly interconnected economy and society will be defined in the *Gigabit Germany initiative for the future*.

The gigabit society represents an advanced information society where every aspect of life is characterized by information and communications technology. People, machines, things and processes will be able to connect seamlessly to each other. The public and companies will be able to use diverse applications in their everyday lives independent of the location which, from a present-day perspective, might still seem futuristic. The network infrastructures of the gigabit society must allow for the transport of volumes of data that will see a massive increase. In the connection segment, transfer rates of one to several Gbit/s will be required.

Fig. 1:
Estimate of the development of data traffic in Germany between 2015 and 2025

Source: Fraunhofer FOKUS, 2016, Netzinfrastrukturen für die Gigabit-Gesellschaft



What is more, it is primarily the industrial use of the internet that will present numerous new challenges to the networks. In the future, there will be billions of objects, sensors or machines that communicate with each other. The consumer internet will be enlarged to an industry internet. Industrial and intelligent interconnections present different challenges in terms of network connectivity, capacity and service quality to those of digital consumer communication.

For example, fields of application such as industry 4.0 and automated and connected driving, first and foremost, require that data can be exchanged between machines reliably and in real time; applications in the fields of media and education, in contrast, are less time-sensitive, but require very high bandwidth for ultra high definition video streaming and 360° virtual reality applications. Infrastructures that meet these diverging requirements and can be upgraded accordingly are referred to as **converged gigabit-ready networks**.

Tab. 1:
Requirements of digital applications in terms of different performance parameters of gigabit networks (ordinal scale: 1 = low, 6 = high)

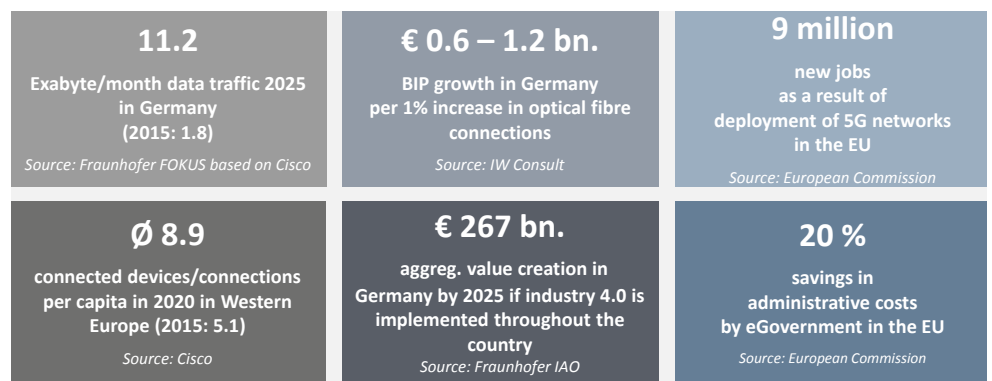
Source: Fraunhofer FOKUS, 2016, Netzinfrastrukturen für die Gigabitgesellschaft

Performance category	Performance parameters	Media	Automotive	Health	Industry	Public administration	Education	Energy
Connectivity	Availability	4	6	5	6	5	4	5
	Mobility	4	5	4	2	4	2	3
Capacity	Concentration of supported end devices	5	3	3	3	3	3	3
	Intensity of communication	6	5	3	5	3	4	3
Quality of Service (QoS)	Latency	3	5	4	5	4	3	4
	Uplink bandwidth	3	5	6	5	6	4	5
	Downlink bandwidth	5	4	6	4	6	4	3
	Jitter	3	5	4	5	4	3	4
	Packet loss	2	4	4	6	4	3	3

The economic potential inherent in applications which are realized based on gigabit networks has been proved by a number of studies. To develop this gigabit applications market and provide ideal framework conditions, a massive deployment of optical fibres is required, irrespective of the connection technology that is used in the individual case.

Only if the fibre infrastructure is expanded significantly up to a fixed-line or wireless switch or at least as close as possible or required to the end user, will it be possible to make many product, service or applications available in a sustainable manner. Against the background of the digital transformation of society and economy, these digital infrastructures will become crucial strategic location factors. They facilitate innovation, competitiveness, employment and sustainable economic growth in Germany and in Europe. Numerous studies confirm this.

Abb. 2:
Gigabit networks as
drivers of digital growth



The **Gigabit Germany initiative for the future** defines how the Federal Government and the industry want to advance the deployment of converged gigabit-ready networks in Germany in a targeted manner. In the framework of this initiative for the future, the essential milestones for deploying the networks, for activities of the telecommunications industry and for key support measures of the Federal Government are presented.

However, the way towards the gigabit society cannot be considered at a purely national level. For this reason, the Gigabit Germany initiative for the future takes up the **European objectives** in the field of gigabit connectivity as well as the legislative proposals on this basis. The objective of comprehensive gigabit connectivity takes centre stage also at a European level.

The proposal for a Directive establishing the European Electronic Communications Code (“EECC”) provides that, in order to create a legal framework in the field of telecommunications at a European level that is fit for the future, another objective with the same importance (broad-based availability and use of data connections with very high capacities) is added to the present regulatory objectives of promoting competitiveness and the internal market as well as protecting end users. The Network Alliance generally supports such an objective to create a high level of connectivity. It is therefore plain that the efforts to establish very powerful networks – be it landline or mobile connections – must be advanced at high pressure and by making use of competitive dynamics.

2.

Schedule for the deployment of gigabit networks by 2025

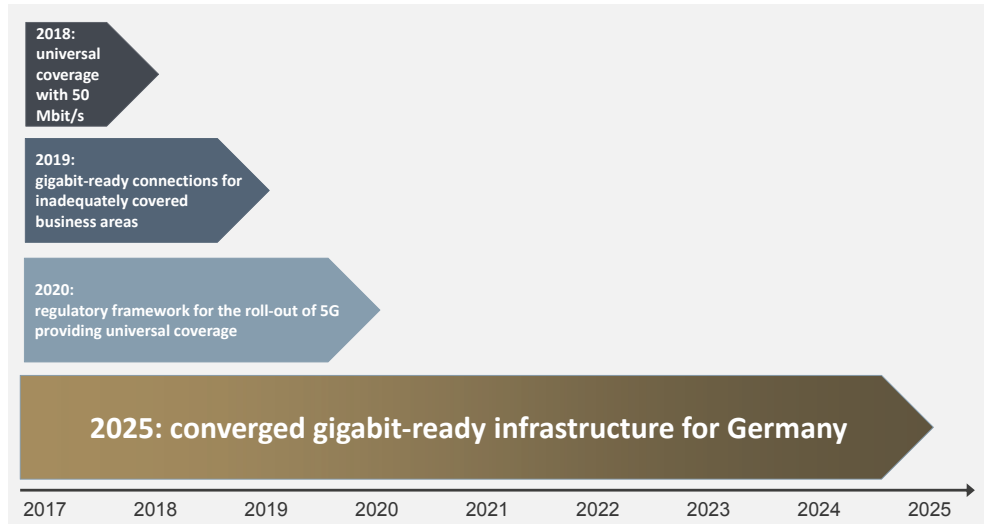
For the transition to the gigabit society by the middle of the next decade to become a success and make Germany with its digital infrastructure rise to the ranks of a global leader, an unprecedented effort in the field of infrastructure is required. The members of the Network Alliance have accepted this challenge and move forward on the way to a gigabit society in four phases:

- **Phase 1:**
In a first step, the objective of nationwide coverage with at least **50 Mbit/s for all households** is to be achieved **by the end of 2018**. Already today, gigabit connections are realized in the context of many deployment projects. In the future, new residential areas will be connected with FTTB/H in accordance with the provisions of the Bill on the Facilitation of the Deployment of Digital High-Speed Networks (DigiNetzG).
- **Phase 2:**
We want to provide **poorly served business parks exclusively with fibre connections by the end of 2019** and also use the special funding programme for business parks of the Federal Government for this purpose. As set out in the DigiNetzG, new business parks will be provided with optical fibres right from the start.
- **Phase 3:**
We want to **lay the foundations for nationwide 5G rollout by the end of 2020**. The regulatory authority makes sure that required frequency ranges will be available also in the future.
- **Phase 4:**
We want to establish a **converged gigabit-ready infrastructure in Germany by the end of 2025**. We are promoting the gigabit society. The term “gigabit society” describes a highly interconnected society. Its digital infrastructure is comprised of a differentiated combination of intelligent networks, bandwidth, real-time availability, security, energy efficiency and other performance parameters. The main focus is on the flexible availability of the infrastructure to the members of the gigabit society depending on their needs and applications. We are developing a suitable **technical, financial and legal framework** for the gigabit society including an **effective support framework**. Amongst other things, we will establish a **5G network**, in particular to provide capacities for all relevant **transport routes**.

In the following, specific initial measures of the Federal Government and the partners of the Network Alliance are presented which will ensure that the milestones are reached.

Fig. 3:
Four phases of deployment for converged gigabit-ready networks in Germany

Source: Federal Ministry of Transport and Digital Infrastructure



3.

Measures of the Gigabit Germany initiative for the future

The Network Alliance has developed four packages of measures to advance the deployment of gigabit-ready networks in Germany by 2025:

- I. Increasing the readiness to invest in gigabit networks
- II. Exploiting synergies created by the Bill on the Facilitation of the Deployment of Digital High-Speed Networks (DigiNetzG)
- III. Promoting gigabit networks
- IV. Supporting the deployment of 5G networks

We must not hesitate in advancing the deployment of gigabit-ready optical fibre networks. First and foremost, it is necessary to create incentives for additional investment in the networks from competing private companies. Therefore, the Federal Government will create an environment where telecommunications companies can increase their investment in line with demand. Cooperations can make an additional contribution to advancing the deployment of gigabit networks.

Moreover, synergy potentials that arise from the DigiNetzG need to be exploited systematically, and the DigiNetzG needs to be regularly reviewed to identify adaptation and improvement potentials.

Finally, there are areas where the deployment of new networks is not achieved by competition alone. Here, funding and other support measures are required.

In parallel, the setting-up of mobile communications networks of the fifth generation is supported with an extensive package of measures.

Increasing the readiness to invest in gigabit networks

In order to achieve the objective of nationwide coverage with at least 50 Mbit/s by the end of 2018, the companies involved in the Network Alliance for a Digital Germany invested 8 billion euros per year in broadband deployment in 2015 and 2016 alone.

In order to further improve the readiness to invest in the market-driven deployment, the Federal Government will take the initiative and improve the corresponding legal-regulatory as well as financial framework conditions. This happens on the basis of the principles of competition in the fields of infrastructure, services and investment.

The regulatory framework conditions will be largely influenced by the plans for a new legal framework in the field of telecommunications at the level of the European Union. In general, the Network Alliance welcomes the objective of the European Commission to thereby improve the framework conditions for private-sector investment in the upgrading of the network. It is important that a level playing field be created for all providers.

The Federal Ministry of Transport and Digital Infrastructure advocates for the right regulatory course to be set at the European level to strengthen investment in converged gigabit-ready networks in Germany in the best way possible. Already today, the Ministry is giving impetus to stimulate demand for gigabit connections in Germany.

Moreover, the companies involved in the Network Alliance would like to have the possibility to make OTT services contribute to network costs in an appropriate manner.



Demonstrating the benefits of gigabit networks to commercial users

Investment of telecommunications companies in networks is increased if the demand for gigabit connections rises at an early stage. Therefore, market-driven demand and, in particular, commercial demand needs to be stimulated. For this to happen, customers must be convinced of the usefulness of gigabit-ready broadband connections. Applications that can be realized on the basis of gigabit-ready networks need to be made visible and tangible for the people.

With the information campaign *Breitband@Mittelstand*, the usefulness of gigabit networks can be illustrated for companies. A joint roadshow of the Federal Ministry of Transport and Digital Infrastructure and the German Chambers of Industry and Commerce provides information on foreseeable scenarios for the digital applications of tomorrow to small and medium-sized companies as well as to municipal policymakers all over Germany. Experts of the Federal Government's Broadband Office will hold workshops for this purpose in regional chambers of industry and commerce, centres of excellence of the federal states, technology parks, business parks as well as at innovative companies and will present specific examples of digitalization as well as funding options until December 2017.

This facilitates timely confrontation with the potential inherent in digitalization as well as with the requirements to be met by digital infrastructures.

▶ **Cooperations can improve the prospects of deployment projects**

Cooperations of various kinds (for example operator and rental models, regional network companies, joint ventures or wholesale/buy models) can make a contribution to improving the economic viability of regional networks and speeding up the upgrading of the network. Therefore, the German state welcomes cooperations in principle. Models of cooperations that have already been established in Germany show the right path.

The Federal Government currently examines whether additional innovative models of co-operation as well as the proposals in the draft code of a regulatory framework to support co-operative investment in networks are suited to advance the private-sector driven deployment of converged gigabit-ready networks in Germany. The impact made on competition as well as other regulatory implications are particularly relevant in this regard.

▶ **Making increased use of access to passive infrastructures**

The massive roll-out of optical fibres, which is considered necessary for realizing the gigabit society, requires making use of all passive infrastructures that are available to reduce the high costs of deployment as much as possible. To this end, the Federal Government has brought the DigiNetzG on the way (cf. Section 3.2). The code proposal of the European Commission for a new legal framework in the field of telecommunications increases this focus on making use of passive infrastructures to deploy optical fibres.

▶ **Mobilising more private funds**

During the ongoing low-interest phase, many investors are looking for new investment opportunities. We would like to use this potential for the gigabit infrastructure: Apart from the possibility to raise capital on the stock exchange (bond and equity issuance), private sector capital is to be used to a greater extent, for example to bring deployment projects by means of direct equity investments in gigabit infrastructures on the way.

This requires bringing investors and projects together and pointing out possible measures for an extended profitable deployment. The Federal Ministry of Transport and Digital Infrastructure will sound out the possibilities for increasing investment in gigabit networks – not least within the framework of an investors' conference – in a timely manner.

Exploiting synergies created by the Bill on the Facilitation of the Deployment of Digital High-Speed Networks (DigiNetzG)

The decisive factor with regard to the deployment of gigabit networks is realizing as many gigabit connections as possible with the invested funds. Synergies can be exploited, in particular, with regard to cost-intensive civil engineering works to deploy optical fibres and can increase the effect of investment on broadband coverage significantly. These synergies are created by the co-use of supply infrastructures and conduit capacities to deploy optical fibres as well as by installing optic fibres during road construction works or when residential or commercial areas are newly built.



DigiNetzG bringing about significant cost savings in civil engineering

To make this possible throughout Germany, the Federal Government created the corresponding legal bases in November 2016 with the Bill on the Facilitation of the Deployment of Digital High-Speed Networks (DigiNetzG). The bill, which was prepared by the Federal Ministry of Transport and Digital Infrastructure and for which the Ministry had the lead responsibility, entered into force on 10 November 2016 and has redefined the framework conditions for a faster and more cost-effective deployment of optical fibres in particular.

Key requirements of the DigiNetzG

- **Obligation for deployment:**

When a publicly funded transport project has an initial planned duration of more than eight weeks, public authorities responsible for construction and maintenance need to make sure that optical fibres are installed in line with demand. When areas are developed for building new houses, municipalities always need to make sure that also suitable passive network infrastructures with optical fibres are installed.

As the upgrading of networks does not stop at plot boundaries, the bill also specifies requirements for newly constructed buildings and buildings which undergo extensive renovation work. With the entry into force of the DigiNetzG, multi-family houses and housing complexes are to be equipped with passive network infrastructures with high-speed capabilities up to the network termination point, and residential units need to dispose of corresponding access points. As a consequence of the automatic character of this legal measure, the number of gigabit connections in Germany will increase in the long term.

- **Co-use rights:**

The DigiNetzG ensures that, in the future, it will be mandatory to make the existing and planned infrastructure of public supply networks as well as all transport services including railway infrastructures, roads and waterways, ports and airfields available for broadband deployment in return for a co-use charge. This includes below ground energy networks such as electricity, gas, district heating and waste water systems, but also above ground supporting structures such as electricity pylons, street lamps and traffic light as well as the corresponding manholes, cable ducts and distribution boards. To date, taking account of the deployment of optical fibres was not possible at all or only to a limited extent for the majority of these infrastructures.

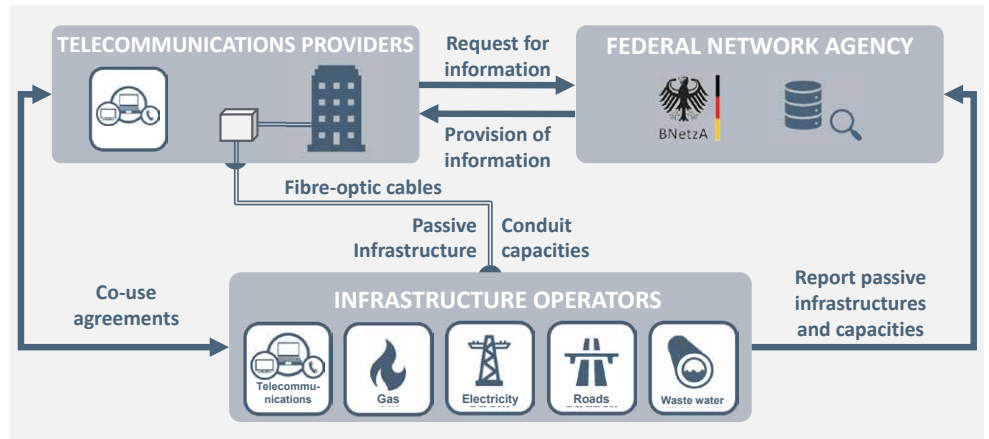
- Competitive access of all providers to existing building infrastructures was also improved by the Bill in terms of greater freedom of choice and participation of end users: As a rule, network operators are entitled to co-use of network infrastructures in buildings in return for a charge, provided that a duplication of network infrastructures is technically impossible or economically inefficient and existing supply is not jeopardized or restricted by the co-use. **Entitlement to co-deployment:** What is more, the DigiNetzG requires the public sector to provide upon request complete information on planned road construction or road reconstruction works so that telecommunications companies can file applications for coordination of the construction works with the objective of installing optical fibre conduits at the same time.
- **Short authorization periods:**
With the entry into force of the DigiNetzG, an authorization period of three months applies for construction works, starting with the date of the filing of the complete application. This streamlines the time between the planning and execution of works considerably, for example with regard to the installation of conduits or the erection of mobile communications antennae.

► **Establishing a central point of information**

In order to make it possible for companies and municipalities involved in the deployment to get an overview of the exploitable synergies, **a central point of information is established with the Federal Network Agency**. Shortly, the Infrastructure Atlas, which is already being kept by the Agency, will also feature information on all passive network infrastructures of utility companies above or below ground that are covered by the Bill. Furthermore, transparency with regard to the availability of conduit capacities is to be improved. Utility companies are called upon to submit corresponding information on the location, use and ownership of infrastructures on a regular basis to the Federal Network Agency. For example, this would make it possible for companies to take account of available infrastructures directly in their planning efforts. Funded infrastructures are explicitly shown as such in the Infrastructure Atlas.

Fig. 4:
Application of the
DigiNetzG in practice

Source: Federal Ministry of Transport
and Digital Infrastructure



► Support implementation of the DigiNetzG

For the Bill on the Facilitation of the Deployment of Digital High-Speed Networks (DigiNetzG) to have an effect as quickly as possible, it is necessary to develop the structures provided for in the bill and reconcile the interests of telecommunications network operators and public supply networks operators (including telecommunications networks) on the basis of the new bill.

The Federal Ministry of Transport and Digital Infrastructure will provide information on the possibilities of the DigiNetzG and will initiate the measures required to implement the bill, for example in the field of standardization. To this end, in particular the following instruments will be used:

- **Technological recommendations:**

The Federal Ministry of Transport and Digital Infrastructure has established a working group that is comprised of representatives of the federal states, the local government associations and the telecommunications sector to develop the recommendations for action, checklists, material concepts and guidelines for exercising discretionary powers for the practical implementation of the DigiNetzG. Moreover, the Federal Ministry of Transport and Digital Infrastructure is committed to speeding up the standardization that is required for the use of cost-effective alternative deployment methods and improve the recognized state of the art of technology.

- **Best Practice examples:**

The Federal Ministry of Transport and Digital Infrastructure supports the application of the DigiNetzG by default with information material and events as well as best practice examples of the Federal Government's Broadband Office. In addition, the Federal Ministry of Transport and Digital Infrastructure will monitor the implementation of the bill on a continuous basis in order to take timely corrective action, if required.

- **Aids on drafting contracts:**

The Federal Network Agency will facilitate the negotiation process between the public sector, suppliers and network operators by publishing standard offers for the co-use of supply infrastructures and will possibly also provide guidance on cost calculations for the co-use and co-deployment of optical fibres.

- **Facilitation of infrastructure planning:**

The Infrastructure Atlas will be adapted to the new opportunities of the DigiNetzG in a timely manner. Moreover, in the medium to long term an analysis of whether and to what extent the mapping of co-usable infrastructures can be made accessible in the context of the existing broadband deployment via a single platform will be carried out. Poorly served localities with special demands (e.g. stations, schools and other educational establishments, public administrations or business parks) are shown in the Broadband Atlas down to the individual building. Moreover, efforts are undertaken to identify best practice approaches in the infrastructure inventories of other countries.

- **Cost-effective deployment methods:**

Installing cables just below or above ground can make a contribution in rural regions outside built-up areas, in particular, to rounding up the deployment of optical fibres. The DigiNetzG provides municipalities with greater scope for decision-making and planning. As regards permissions already granted, the contribution of existing pylons used for deployment should be accounted for in an appropriate manner.

The ongoing and newly initiated funding measures are already making a specific contribution to the deployment of gigabit networks in Germany.

Nationwide deployment of NGA networks supported by federal funding programme

Where the deployment in poorly served areas is not driven by the market, the Federal Government supports the deployment as part of a federal funding programme with currently 4 billion euros. The funds were offered in four calls for proposals between November 2015 and February 2017. During the first three calls for proposals, all in all 370 applications for the funding of infrastructure projects were filed. The number of municipalities and districts that have taken advantage of the offer of planning and advice support is even greater: Since November 2015, already approximately 2200 applications have been received. Experience to date allows concluding that approximately 10 billion euros are generated with the federal funding programme in areas where there will be no expansion by private sector companies in the foreseeable future due to the lack of economic efficiency. A positive by-product is that municipalities which deal with the issue of broadband deployment more intensively also realize a greater share of commercial deployment projects. The funding projects already pave the way to the gigabit society: 94 percent of funds for infrastructure improvement flow into the expansion of optical fibre. The vast majority of funded connections from the first two calls is realized by means of FTTB/H networks. The Federal Ministry of Transport and Digital Infrastructure will carry out an extensive evaluation of the broadband funding programme of the Federal Government during the phase of implementation and will publish the results. This includes also a transparent summary of the distribution of funds by region, recipients, models and infrastructures.

Special funding programme for business areas taking companies to the gigabit age

Already today, companies, in particular, require reliable broadband connections with high up- and downstream data rates. For this reason, the Special Programme for Business Parks of the Federal Government was set up. It provides funds for optical fibres to business parks or industrial areas as well as to harbours which have been poorly served to date and where it is unlikely that powerful internet connections will be provided by the market in the future. 350 million euros are made available in the framework of the broadband funding programme for this. In contrast with the general broadband funding programme, conditions for access are simplified: Funds are awarded without assessment based on a scoring in a first-come-first-serve-process.

With this programme, we support symmetric broadband coverage of 1 Gbit/sec. According to the programme, it is required that at least 80 percent of land owners in the funding region agree to the installation of fibre to the building and make a contribution of 2000 euros each. In return, they are provided with highly efficient optical fibre connections on their plots of land right up to the buildings. Apart from connecting individual companies, free Wi-Fi is provided in all publicly accessible spaces of business parks. The rate of funding generally amounts to 50 percent of eligible costs. The maximum amount per project is 1 million euros. The federal funding programme can be combined with federal state funding programmes.

This shows that the special programme is already tailored specifically to the gigabit objective of the Federal Government and makes a contribution to providing companies in business parks swiftly with future-proof broadband connections. The design of the funding programme is evaluated on a regular basis.

 **Clear focus on the implementation of funding projects in line with demand**

In the framework of broadband funding, the companies of the Network Alliance are contributing to complementing private deployments in a meaningful manner by publicly funded projects and to clearly defining poorly served areas for this purpose. For this reason, they take part in the enquiry of commercial interests when funding projects are planned. After an application for funding has been submitted by the municipality, they generally refrain from making any partial efforts until deployment begins. This makes it possible to implement the funding projects that were calculated on the basis of the enquiry of commercial interests.

In addition to the measures that have already been initiated, the Federal Government will launch further measures to make a substantial contribution to the deployment of gigabit networks.

 **Advancing the funding framework of EU state aid law for gigabit deployment**

EU state aid law, inter alia the threshold, must be designed in a way that allows for the funding of gigabit networks in the future. It must include a possibility to provide funds for connecting mobile radio locations with optical fibres in the context of the 5G rollout that is not uncompetitive.

 **Developing the support framework for the 2025 gigabit society further**

The national support framework is part of an overall concept and will have sufficient resources to make a substantial contribution to the deployment of converged gigabit-ready networks. **The aim of the Federal Ministry of Transport and Digital Infrastructure is to sustain the investment in digital infrastructure made by the Federal Government from 2018 on at 10 percent of federal net investment. Very specifically, this means that, from 2018 on, federal funds totalling around 3 billion euros will be made available each year.**

It is the common objective of the Network Alliance to have the companies and the Federal Government jointly **invest 100 billion euros in the upgrading of the networks between 2014 and 2023** in order to realize converged gigabit-ready networks by 2025.

► **Developing the funding approach in a targeted manner further**

The present support framework promotes a technology mix. Where there is no deployment by the private sector, the new support framework will be based on the present approach and will develop this approach further in a targeted manner. The Federal Ministry of Transport and Digital Infrastructure will seek academic assistance on this issue.

When developing the new support framework, three elements need to be accounted for:

1. In poorly served regions where, to date, no funded projects have been realized and where there is no private-sector deployment, funding gigabit network deployments must be possible also in the future.
2. Business parks without optical fibre connections which are excluded from the obligational access criteria of the DigiNetzG or where access is provided by the market are eligible for funds for the expansion of gigabit networks.
3. Gigabit connectivity is to be realized by 2025 also in areas which, despite having seen funded deployment efforts, still do not have gigabit networks. Providing socio-economic drivers with access to converged gigabit-ready networks in a target manner can be of great importance in terms of the upgrading of the existing network infrastructure. The Network Alliance is considering how this aspect can be accounted for in the context of the development of the support framework. From the point of view of the Network Alliance, socio-economic drivers include:
 - a) a high-performance 5G mobile radio infrastructure along important transport routes as a basis for automated and connected driving in sparsely populated areas, in particular, where an expansion of the backhaul network cannot be realized on part of the private sector;
 - b) small and medium-sized companies;
 - c) education and research facilities in cooperation with the Initiative for Digitalization of the Federal Ministry of Education and Research;
 - d) public sector and health-care institutions as well as major drivers of digitalization in Germany.

► **Identifying spatial infrastructure needs for a comprehensive 5G coverage**

The Federal Ministry of Transport and Digital Infrastructure has commissioned a study to identify the infrastructures suited for achieving comprehensive 5G connectivity. Interactions between the provision of 5G sites with optical fibre access and the deployment of gigabit-ready networks are taken into consideration. For a sustainable deployment of gigabit networks it is therefore recommended to include the requirements of all technologies. In order to strengthen the basis of decision-making for further political action, we will determine by way of example for spaces with different structures where optical fibre infrastructures are required so that future applications can be served with the required quality. It is to be investigated for different application scenarios which capacities are required with regard to passive infrastructures and optical fibre lines in order to create sustainable networks in the long run. The study is to show the nationwide need for investment, if possible, or otherwise at least that of the model regions.

► **Setting dimensioning requirements for funded infrastructures**

The new gigabit infrastructures need to be designed in a way that allows as many end users as possible to benefit from the positive funding effect. In individual cases, this means that passive infrastructures need to be adequately dimensioned so that all termination points in buildings and applications in the funding area or along the funded routes which are required today or in the future can be realized also at a later date at any time at low costs on part of private sector actors.

A uniform dimensioning concept is currently being developed for this purpose together with network operators and the federal states. On this basis, a network is created which can be upgraded on a modular basis and which can be perfectly connected to other network areas and future deployment projects.

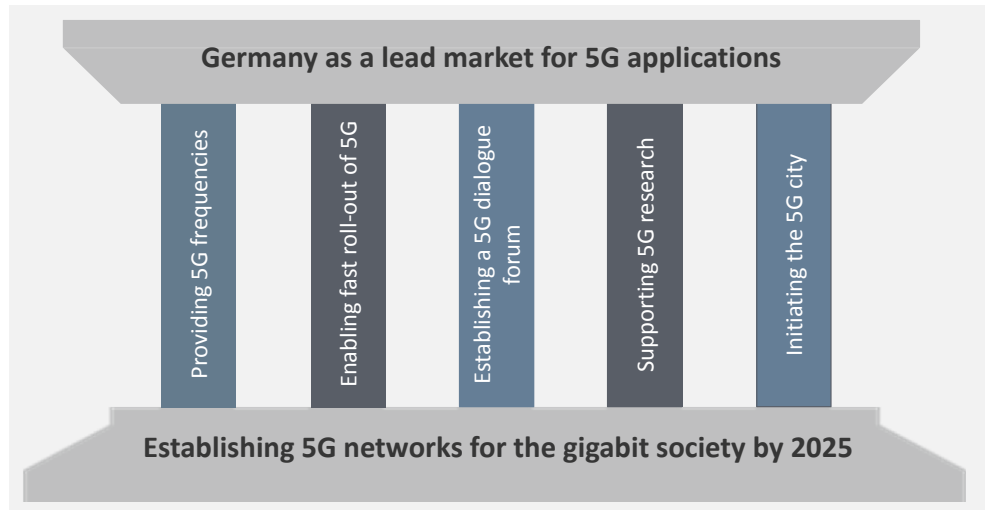
Many digital applications of the future need radio-based mobile gigabit networks that are available nationwide and offer the required performance. The fifth mobile radio standard 5G, which is currently undergoing a process of standardization, is the key technology to realize such networks. Moreover, the establishment of 5G networks will result in a high degree of convergence of mobile and fixed land-line networks on the basis of software-aided overall architectures. Therefore, 5G technologies and fixed-line infrastructures need to be considered in close connection. For this reason, the deployment of 5G networks in Germany represents a core pillar of the Gigabit Germany initiative for the future.

In order to be able to use the gigabit data rates that 5G allows for, it is not only necessary to make considerable investments in radio technology, but also in optical fibre technology so that in cities, in particular, the densification of networks for small-scale mobile communication cells is being facilitated.

- ▶ **5G Initiative for Germany ensuring deployment of 5G networks in Germany**
With the 5G Initiative for Germany, the Federal Government has developed a framework for action to support the expansion of 5G networks in Germany by 2025 in the best way possible and position Germany as lead market for 5G applications.

Fig. 5:
Objectives and measures
of the 5G Initiative for
Germany

Source: Federal Ministry of Transport
and Digital Infrastructure



The 5G Initiative of the Federal Government is based on 5 columns:

1. Making available frequencies:

Mobile communication and the rapidly growing number of connected machines (e.g. automated and connected driving, industry 4.0) increase the demands placed on capacity, bandwidth, availability and latency of digital radio infrastructures. To meet these demands and provide supply in rural areas as well as for high-capacity applications, sufficient and suitable radio frequencies are required. Already today, the Federal Government makes available test frequencies based on needs in all areas that are relevant for 5G. The Federal Government will design the upcoming procedures for making frequencies available so that 5G can be introduced on the market in Germany as fast as possible. In addition, the Federal Government will define an appropriate regulatory framework for the efficient commercial exploitation of the technology that creates the required certainty for companies in terms of investment and planning and ensures a competitive rollout and operation of 5G networks.

2. Enabling swift commercial rollout of 5G:

To facilitate the swift commercial roll-out, future funding measures will support the deployment of 5G networks in accordance with coverage obligations and state aid law. **The objective is to establish a 5G network by 2025 at the latest, in particular to provide capacities for all relevant transport routes.**

3. Establishing a 5G dialogue forum:

The introduction of the 5G technology is not only relevant for the telecommunications industry, but also for the application sectors. They need to get involved in the standardization and research process in a timely manner. The Federal Ministry of Transport and Digital Infrastructure supports this process with the 5G dialogue forum. The objective of the measure is to make the relevant sectors and vertical industries aware of the technological and economic potentials of the new generation of mobile radio, establish contact platforms for 5G application development and advance the early implementation of these applications in companies. The first events staged address the perspectives in the automobile, logistics and health care sectors.

4. Supporting 5G research:

There are many locations in Germany where fundamental and applied research on 5G is carried out in the framework of European and international activities. To carry out 5G research efficiently, it is important that research activities are coordinated and linked up. For this purpose, the Federal Ministry of Transport and Digital Infrastructure and the Federal Ministry of Education and Research will systematically register the ongoing and planned research projects and will identify cluster and cooperation opportunities. Moreover, the transfer of research findings to all relevant stakeholders (among others, the 5G research community, standardization bodies and vertical industries) is supported. The objective is to take account of the research findings while developing international standards.

5. Initiating the 5G city:

In order to demonstrate the capabilities of 5G also for intelligently linking-up our cities, the Federal Ministry of Transport and Digital Infrastructure will start a competition with the aim of finding [Germany's 5G City](#).

GDP	Gross Domestic Product
BMBF	Federal Ministry of Education and Research
BMVI	Federal Ministry of Transport and Digital Infrastructure
DigiNetzG	Bill on the Facilitation of the Deployment of Digital High-Speed Networks
EB	Exabyte
FTTB	Fiber-to-the-Building
FTTH	Fiber-to-the-Home
GB	Gigabyte
Gbit/s	Gigabits per second
IHK	Chamber of Industry and Commerce
IoT	Internet of Things
IP	Internet protocol
Mbit/s	Megabits per second
NGA	Next Generation Access
PB	Petabyte
QoS	Quality of Service
Tbps	Terabits per second

(As at: March 2017)

The Federal Government has established the issue of broadband deployment as a key responsibility at the Federal Ministry of Transport and Digital Infrastructure. In March 2014, the Ministry initiated the Network Alliance for a Digital Germany to progress the upgrading of networks in Germany as fast as possible. This initiative represents an alliance of telecommunications and network companies that are willing to invest and innovate. The Federal Government will advance broadband deployment in Germany together with these companies in a spirit of partnership. In the framework of the Network Alliance, the topics that are relevant to deployment of NGA and gigabit technology in Germany are identified, specific solutions for existing challenges are developed and the implementation of the required measures is supported.

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