



Annual report 2021

Belnet
dedicated connectivity

Contents



4

Belnet,
ready for tomorrow

10

Belnet in practice

12

Belnet in 2021

16

Belgian National
Internet Exchange
(BNIX)

18

Budget
outcome
and accounts

What is Belnet?

276
institutions

815,912
end users

Belnet provides its services exclusively to **276 institutions** that represent more than **816,000 end users**.

since
1993

Belnet is the federal government organization that, since 1993, has been **responsible for the Belgian National Research and Education Network** that provides very high-speed internet access and internet services to universities, high schools, research centres and Belgian government services.

82
employees

Belnet has **82 employees** and is part of the Federal Science Policy.

responsible for
BNIX

Belnet is also **responsible for BNIX**, the Belgian National Internet eXchange for internet service providers, content providers, hosting companies and large private enterprises.

Belnet, ready for tomorrow

With the development of a strategic approach for each customer center, the overhaul of its security strategy and a clear commitment to research network GÉANT and play a part in the design of connectivity solutions for the future that support Belgian and European research, 2021 marked a turning point for Belnet.

2021 was a year of significant change for Belnet that decided to completely overhaul its business model to respond to the specific needs of its customers by launching its transformation programme.

Dirk Haex

*Technical Director (a.i.)
and Co-General Director for Belnet*





“We launched our **“Belnet transformation programme”** in 2021” explains Dirk Haex, co-general director of Belnet. “The specific needs of a university, a research center, a college, or a Federal Scientific Institution (FSI) have changed over the past five years. The same applies to the federal government or the world of telecommunications and the Internet around our Internet exchange point BPIX. It is essential that we equip Belnet and its customers for the challenges of tomorrow. Belnet began this evolution in 2020. In 2021, we mobilized our in-house expertise – in addition to external support – to devise **development strategies** that meet our customers’ requirements and constraints. Numerous colleagues have contributed to this process. Based on a model for co-creation, we organized a series of workshops to analyze the strengths, the weaknesses, the opportunities, and risks every type of customer may be exposed to and gain a better understanding of the trends in their sector”, the co-general director continues.

This work led to the development of distinct approaches tailored to each customer center. We also took account of our customers’ position and tested the results of the exercise on a subset of customers.

Nathalie Pinsart

Community Director (a.i.) and Co-General Director and Administration for Belnet



A new business model to meet our future challenges

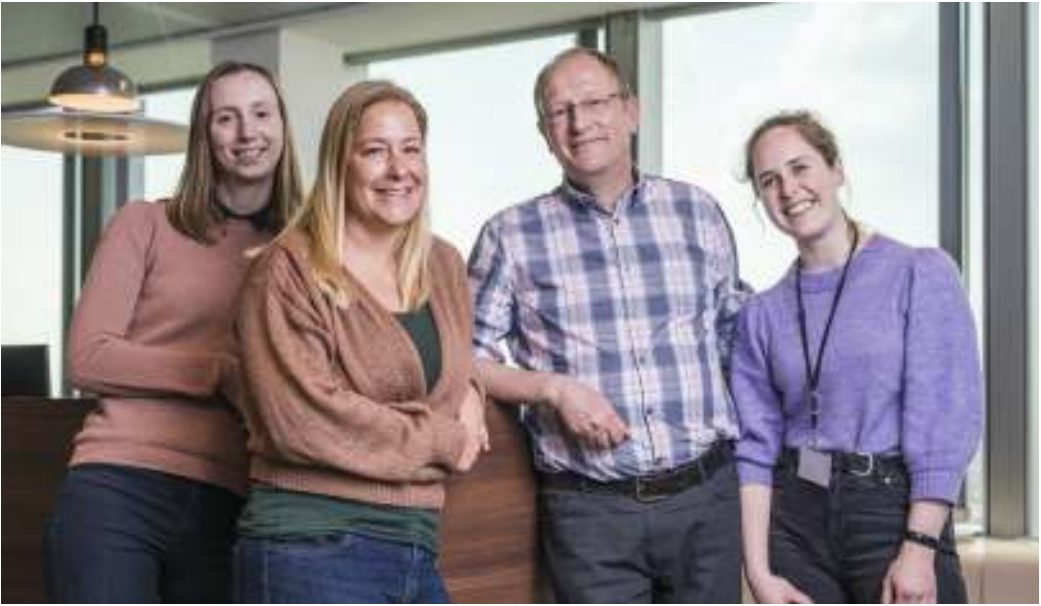
“The federal government must have access to **quality services that meet the most stringent security standards**. But price will always be a determining factor. For the Research and Education (R&E) segment, our approach is based on obtaining a precise picture of their needs, i.e., all the work undertaken in the community boards which began in 2020 and opened up to the colleges in 2021”, explains Nathalie Pinsart, co-general director of Belnet.

When Belnet was created in 1993, the Internet exchange point BPIX was nothing more than a peripheral activity in comparison to the institution’s mission in the world of research, education, and public services. The year 2021 proved to be a game changer. “If we want the Internet exchange point to remain in Belgium and benefit society as a whole, we must develop a **BPIX-specific strategy** and appoint a dedicated Belnet team”, explains Dirk Haex. “That work has now been done. And this new team is now rising to the challenge of creating a tailored and flexible approach to pricing, high value-added services, and a resale model for BPIX”, continues Nathalie Pinsart.

Security first

The continuity of our services was also a key factor for the year 2021. On 3 and 4 May 2021, Belnet became the victim of a major volumetric DDoS (distributed denial-of-service) cyber attack. This type of attack is designed to overwhelm an online service by flooding it with high volumes of requests. It was a major incident that fundamentally changed Belnet’s approach to cyber defense.

“In 2020, we experienced a number of fairly serious incidents and already set about improving the security of our services”, the co-general director recalls. “On 3 and 4 May, Belnet fell victim to the most serious volumetric DDoS attack in its history. We hadn’t yet scaled our platforms and security services to an event of that magnitude”, Dirk Haex recalls. “At the time, we managed the attack with the help of the CCB (Center for Cybersecurity Belgium), our regulator BIPT (Belgian Institute for Postal Services and Telecommunications) and our customers. Priority number one was to resolve the problem as quickly as possible - and I once again would like to thank all our in-house and external teams who worked in close collaboration during that crisis - because given the intelligence with which this attack was carried out, it was clear that we weren’t dealing with a gang of youths working



away in a basement somewhere, but with real cybercrime professionals.”

Even though enhancing our security had always been a priority for Belnet, 2021 marked a change of scale in the tools, teams and investments that were earmarked for this issue.

“As far back as 2016, Belnet already had an attack mitigation service that dealt with distributed denial-of-service (DDoS) attacks. This platform had to be adapted and, at the time of the attack, our defense infrastructure was not up to par” explains Dirk Haex. “That crisis completely transformed our approach to security incidents. Once we had the attack under control, we immediately launched a comprehensive **programme to improve** our service by asking our customers about our communication, the actions taken, the solutions proposed, our responsiveness during the crisis, etc. On that basis we analyzed all our in-house security processes and adjusted our mitigation measures at three levels: communication, processes, and technology. We enhanced our security processes

for our security experts, our service desk, our Network Operations Center (NOC), and our external partners. On the technical service side of things, we now have a **cloud scrubbing center**. In the event of a volumetric attack, this protection system allows us to divert all the traffic to the cloud and to redirect genuine traffic to our customers risk-free to ensure that they are protected. We have adapted our monitoring system and our warning systems: a platform monitors our infrastructures 24h/24. As soon as we detect a pattern of abnormal traffic, we receive an alert, day and night. We have put a **DDoS Dashboard** in place which tells our customers in real time if they may be exposed to a potential attack. At our end, we have a global real-time overview, and every customer has a view on his own situation. We also made significant progress in developing precise specifications to replace the entire current DDoS platform for all our customers; this service is scheduled for BPIX to be up and running by the end of 2022/early 2023”.

2021, a traffic record

In February 2021, Belnet experienced a traffic record on BPIX with a peak of 638 Gigabits per second. Unprecedented.

Intensive Internet use by private individuals increased exponentially during the Covid crisis: working from home, online shopping, video games or streaming have become the norm. The crisis acted as an accelerator in the digital transformation, not only for private individuals, but also for the academic world and the public authorities. Belnet is a key player in Belgium in terms of supporting that evolution and ensuring the continuity of the service, irrespective of its customers' demand for bandwidth.

Belnet manages two key network infrastructures on Belgian territory: on the one hand, a network that is dedicated to research and the academic world and provides research centers, universities, colleges, hospitals, and public services with connectivity services and, on the other hand, BPIX, the Belgian Internet exchange point between access providers and content suppliers.

"Our creed has always been that our platforms should meet the traffic needs of our customers", explains Nathalie Pinsart, co-general director of Belnet. "For the past 30 years, we have been designing and developing them to cope with the

increase in data flows and their transmission speed over time. In 2021, we made significant investments to guarantee the upgradeability of our infrastructure. We took early action to boost capacity in our data centers and completed our PoP (Point of Presence) network to guarantee the world of research data traffic without saturation. For instance, in 2021, we added a UCL-specific PoP (Point of Presence) at its Woluwe site. For the ULB, we installed a PoP in Charleroi in the A6K data center. These developments are the direct result of our co-creation efforts within the community boards that were put in place in our transformation plan mentioned earlier. As far as BPIX is concerned, we are working on replacing the current platform. We need to reinvest for the future, not only to ensure that the streams are always supported, but also to have access to a more sustainable technical infrastructure with new equipment that uses less energy. Our most important investments in 2021 were in equipment that guarantees us the ability to evolve and prepares us for the challenges to come".

Tomorrow, quantum communication

As NREN, Belnet plays a key role in supporting research in Belgium by providing access to the most advanced communication technology capabilities and connectivity in the world. Quantum communication is part of that.



“The quality of our researchers in Belgium is exceptional” explains Dirk Haex. “We are flooded with requests from Belgian researchers who want to use quantum technology for their work and ask us for access to a technical infrastructure that facilitates this. This is why it is essential for us to play a key role in innovative European projects. Belnet is an active member of the European research network GÉANT. We want to be an active partner in the development of QCI (Quantum Communication Infrastructure) projects and QKD (Quantum Key Distribution) systems. In that respect, our contribution to the European research network GÉANT, which numbers 39 partners in Europe, is a strategic one.

We want to position Belnet as a key player in these future projects to guarantee that the Belgian world of research has access to the very best connectivity tools and related services.

This is why, within the new Belnet organization, colleagues have been given the task of identifying the priority areas in terms of innovation. But like everyone else, our resources are limited, and we cannot invest in everything – A.I., 5G, blockchain, Quantum – we have to make choices. And these choices will be based on our privileged dialogue with the Belgian and European world of research within GÉANT. A number of NREs are well under way in this process, and we are doing everything in our power to progress in that direction. This position makes Belnet unique in Belgium. The data flow between Belgium and its 39 GÉANT partners is enormous. These exchanges of data are essential to Belgian research. One example: the IHE [Inter-University Institute for High Energies] in Brussels exchanges enormous amounts of data with the CERν in Geneva via Belnet and the GÉANT network. This Pan-European research network also allows our experts to meet experts from other European countries and enables them to collectively come up with technological solutions tailored to the needs of research.

Another example is the roaming service eduroam every student can make use of: with a unique username and password they receive from their university or college in Belgium, students can connect to the networks of other partner universities and colleges across Europe without having to ask for specific access”.

Belnet, an ambitious player in Belgian Science Policy

“One of the strategic projects we launched in 2021 was renewing the cooperation agreements between Belnet and the Regions”, explains Nathalie Pinsart, co-general director of Belnet. “These cooperation agreements, which were concluded in 2007, allow us to use the Regions’ dark fiber networks in exchange for low-cost connectivity services for the regional universities, colleges, and research centers. These agreements are due to expire in 2022 and must be reviewed and taken a step further. The Regions are looking for new high value-added services that go beyond the Internet which has become a commodity.

Our Secretary of State for Science Policy, Thomas Dermine, also put an ambitious strategy in place that will serve Belspo, the Belgian Federal Science Policy Office, which we are part of, for years to come. Belnet played an active part in the development of this plan by assigning several of our colleagues to the various working groups.”

Dirk Haex concludes:

“Belnet will have an important role to play in Belspo over the next few years and intends to fulfil the ambitions of the new 2022-2024 strategic Federal Science Policy plan.”

Belnet in practice

Our mission

Belnet is the Belgian National Research and Education Network (NREN). It encourages deployment of the knowledge and information society by providing and maintaining high-quality, innovative network infrastructures and associated services to meet the specific needs of higher education, research and public sector administration in Belgium, thanks to its expertise, unique market position and economies of scale.

Our vision

Belnet provides high-bandwidth Internet access and related services to higher education institutions, research centers and administrations. Specifically, Belnet gives them access to (inter)national research networks and value-added services in terms of connectivity, trust, security and mobility.



Our values

Trust

Belnet is a reliable, stable, non-commercial and neutral partner to its customers.

Professionalism

Belnet operates professionally with the required expertise and know-how..

Dedication

Belnet is dedicated to its customers and develops an infrastructure and services adapted to their needs.

Effectiveness

Belnet is an effective, dynamic, high-quality organization.

Our strategic objectives

Operational excellence

Belnet seeks to provide a quality service that its customers can trust.

Security

Information security is a priority and is an essential element of its operating method, services and activities.

Dedicated services

Belnet provides services that meet the specific needs of its customer group.

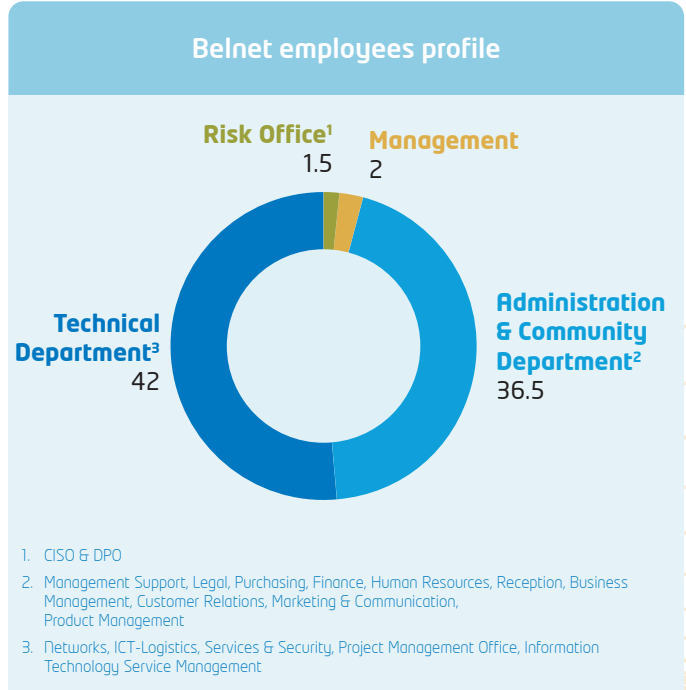
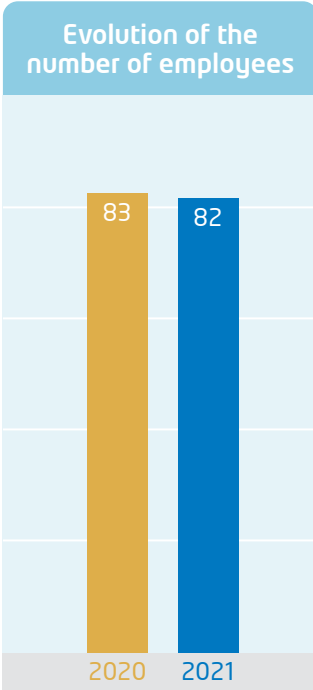
Performing organization

Belnet is a professional, performing organization that is perfectly adapted to fulfilling its mission.

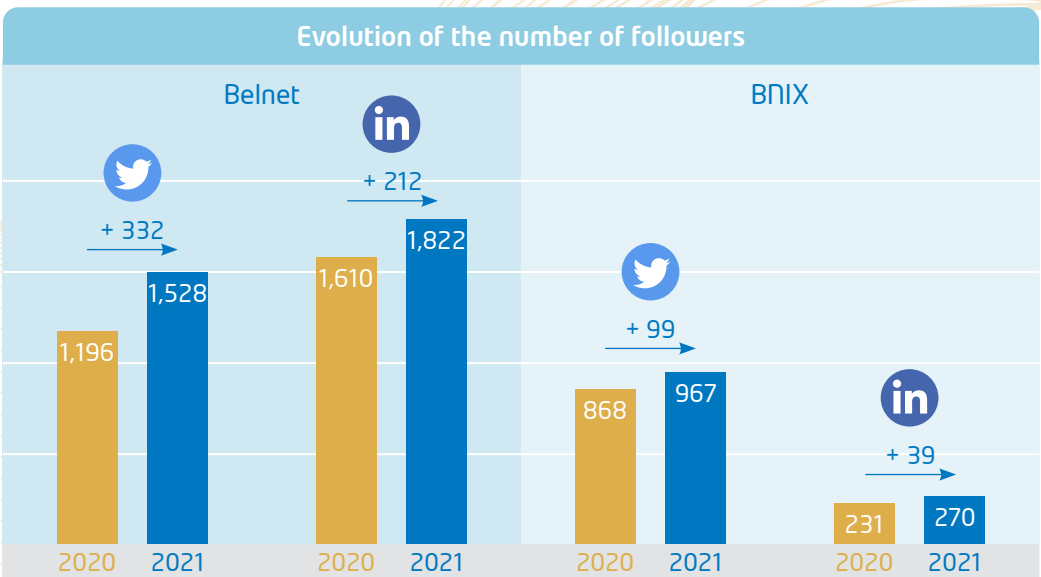


Belnet in 2021

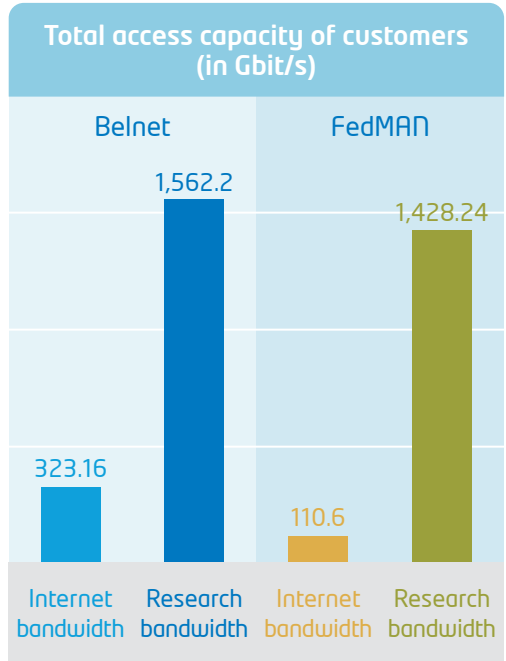
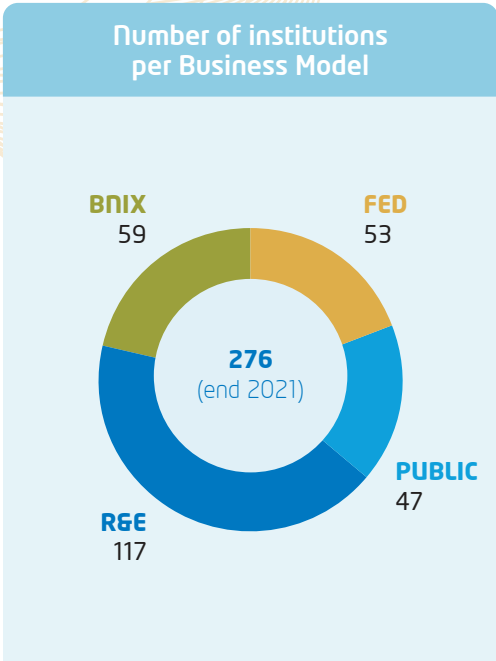
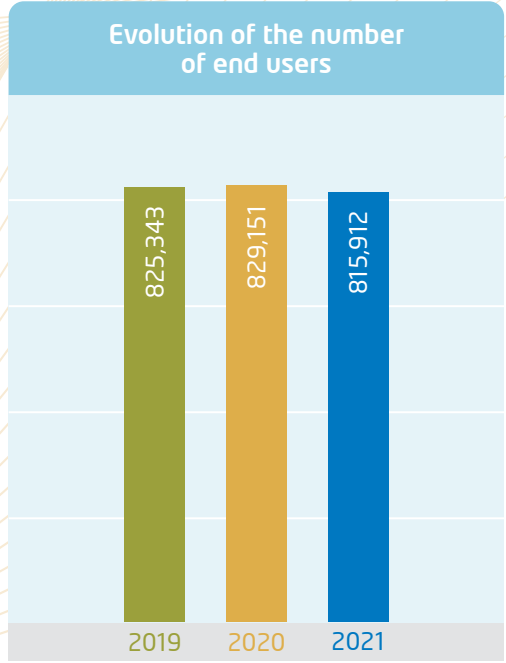
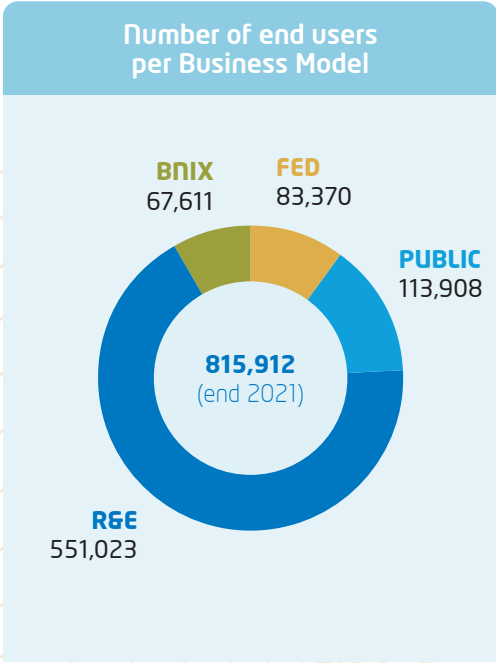
Employees



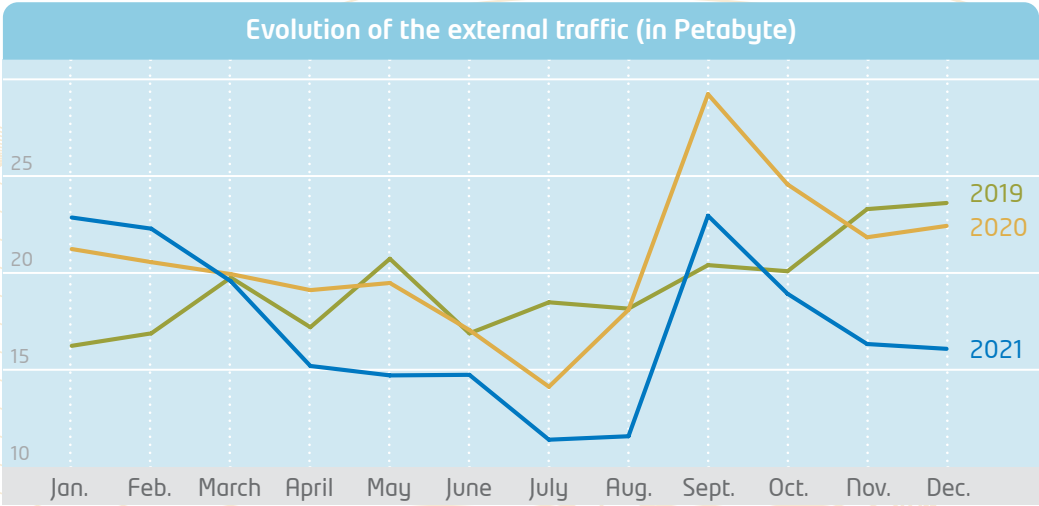
Social networks



Belnet network



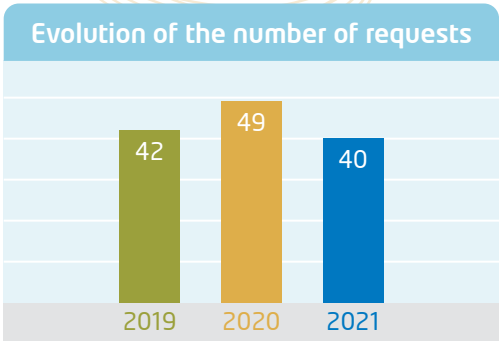
Belnet network



Belnet Leased Line (BLL)

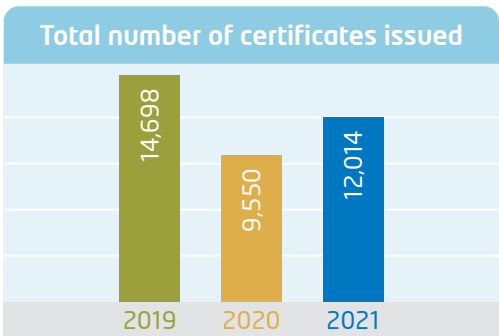
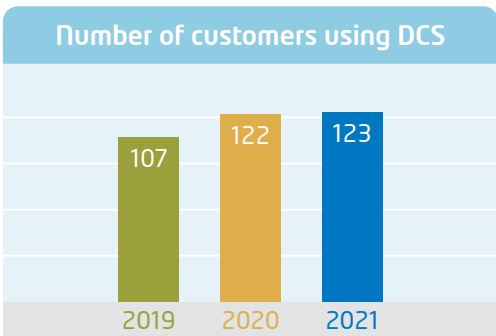
The BLL service allows higher education and research organizations as well as Belgian public services organizations to easily connect to the Belnet network.

Belnet looks for the most suitable leased line to an access port on its network for these organizations and sets up a monitoring system to guarantee high-performance and permanently available connectivity.

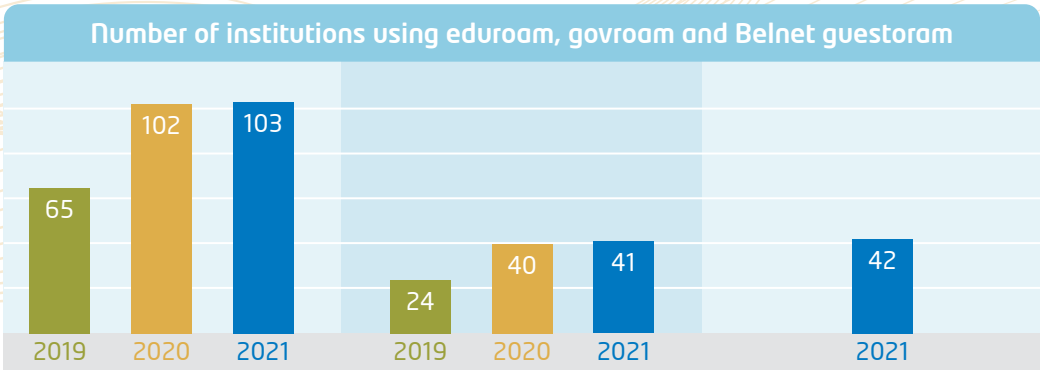


Digital Certificates Service (DCS)

Belnet's DCS offers a wide range of digital certificates that can be simply and securely managed by research or higher education institutions and Belgian public services organizations.



eduroam, govroom and Belnet guestroom



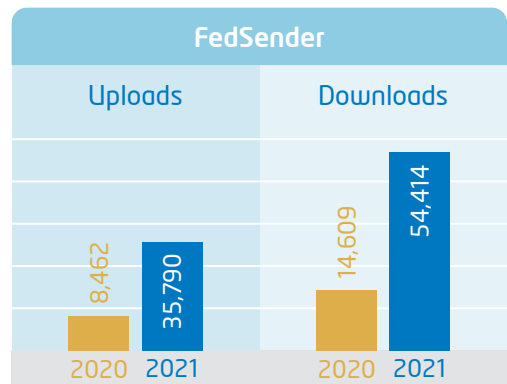
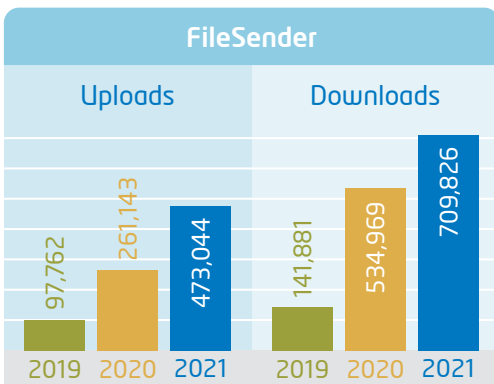
eduroam is a service that provides users at research and higher education institutions with simple, secured access to both their own organization's wireless network and also to the networks of other participating organizations across the whole world.

govroom is a service that allows civil servants to surf securely and wirelessly across all affiliated public services organizations in Belgium.

Belnet guestroom is a solution to provide visitors from higher education or research institutions with a temporary, secure and wireless Internet connection.

FileSender and FedSender

FileSender and FedSender are simple, safe applications for sending very large files.



FileSender can send files up to 5 TB. This service is available free of charge to employees and students of Belgian colleges, universities and research institutions affiliated to Belnet (registration and approval via the Belnet R&E Federation).

FedSender can send files up to 1 TB. It is exclusively intended for public institutions that are members of the FedMAN network and for users of G-Cloud (the state-run community cloud service).

2021: BNIX has set new records

In 2021, Belnet recorded an average data traffic of 224 gigabits per second on the BNIX platform, i.e. a three percent increase on the previous year.

“Despite the unprecedented Internet peaks in 2020, we did not see a drop in Internet traffic during 2021”, explains Stefan Gulinck, Network Architect at Belnet and manager of BNIX. “On the contrary, where BNIX did not cross the 600 gigabit per second mark for the first time until the very end of 2020, by the spring of 2021 this was already the most normal thing in the world. In those months we recorded peaks above

600 Gbit/s on weekdays. By way of comparison: this is equivalent to all the residents of Namur streaming a video in HD at the same time. On 15 February 2021, around noon, the counter even indicated 638 Gbit/s: this was the first time data traffic of this magnitude had been recorded on the Belgian Internet point.”

BNIX acts as a “roundabout” for Belgian Internet traffic where close to 60 participants exchange data. Thanks to BNIX, Internet traffic can quickly and efficiently reach almost every private and professional end user in Belgium on every highway. Given this crucial position, Belnet is currently renewing the entire BNIX platform to accommodate the continuing and steady increase in data flows.



The BNIX platform



3

DATA CENTERS



59

PARTICIPANTS



INFRASTRUCTURE

13.2 Tbps

is the switch capacity.

These are 4x more powerful than the previous ones.

ACTIVE CONNECTIONS: NUMBER AND TYPES

10

100 Gbit/s connections

40

10 Gbit/s connections

10

100 Mbit/s connections

23

1 Gbit/s connections



Budget outcome and accounts

Positive result

1,858,125 €

Services invoiced

8,386,528 €

Allocation

8,894,769 €

Profit and loss account

Reserve fund and investment fund

In 2021, no allocation was made to the investment fund. The fund total was 18,295,000 euro and was estimated to be sufficient for the coming years. The positive result will be added to the net assets of the balance sheet. This investment fund was established to finance future investments based on the multiannual investment and finance plan.

Income

The allocation saw an increase due to an index adjustment and the addition of 300,769 euro for the launch of an external scrubbing against cyber attacks. Consequently, the total allocation amounted to 8,894,769 euro. The total income from invoiced services decreased by 4.2% compared to 2020. This decrease was mainly due to lower revenues from WANFIN and a decrease in revenues from the European Institutions.

Expenditure

Expenses relating to human resources increased in 2021 compared to the previous financial year due to recruitment and slight inflation.

Other expenses have decreased in comparison to 2020. This for both operating resources and investments. For investments, this is partly due to the constitution of a stock in 2020 and a number of investments that were placed in 2021 but, due to delivery problems, will only be delivered and entered in the budget in 2022.

The overall increase in general operating resources is offset in 2021 by a decrease in some expenses for maintenance contracts when renewing a number of network and IT systems and components.

Income statement, in euros

	Financial year 2019	Financial year 2020	Financial year 2021
Expenditure			
Other use of consumer goods and third-party services	9,189,121	9,283,405	9,366,059
Property and other expenditure	912	26	-
Direct and indirect staff pay	5,886,465	6,425,580	6,716,487
Financial depreciation on set-up costs, tangible and intangible assets	1,464,142	1,556,202	1,425,657
Income (expenditure) transfers other than social contributions	186,004	39,980	111,896
Capital losses on existing assets and liabilities	-	-	-
Allowance for reserve fund	-	-	-
Allowance for fund allocated to investment	2,000,000	-	-
Allowance for funds allocated to income	-	-	-
Allowance for provision for risks and expenditure	-	20,000	-
Overall net accounting result	- 696,336	470,579	334,983
Overall total expenditure	18,030,308	17,795,772	17,955,082
Income			
Services invoiced	9,121,040	8,755,087	8,391,412
Interest and other financial income	-	-	-
Exceptional income	-	-	3,884
Income transfers other than taxes and social contributions	8,909,268	9,040,686	8,894,769
Allowances for provisions for future risks and expenses	-	-	-
Allowances for reserve funds	-	-	-
Overall total income	18,030,308	17,795,772	17,290,065

Balance sheet

Investments

There was a decrease in fixed assets in 2021. This was due to the depreciation of existing assets and the delivery of some expected network equipment, scheduled for 2021, but which, due to the scarcity in the market of integrated circuits ('Chips'), will not take place until 2022. As a result, depreciation in 2021 (1,435,579 euro) is higher compared to new investments (464,279 euro).

The depreciations were carried out in accordance with the recommendations of the Commission for the Inventory of State Assets (25% for computer equipment, 20% for rolling stock, and 10% for other investment equipment).

Payables and receivables

Accounts payable within one year to third parties not subject to the General Accounting Plan (GAP) fell back to a lower level as announced last year.

Accounts receivable within one year from third parties not subject to the General Accounting Plan (GAP) continued to increase in 2021. Once again, the increase was attributable to the receivable against the VAT administration.

Balance sheet, in euros

	Financial year 2019	Financial year 2020	Financial year 2021
Assets			
Tangible assets	2,113,809	2,697,313	1,959,771
Debts more than a year old payable by third parties not subject to the GAP	38,492	43,630	34,900
Debts a year old at most payable by third parties not subject to the GAP	797,385	1,916,007	1,969,271
Debts a year old at most payable by third parties subject to the GAP	3,205,608	2,492,753	1,898,364
Certificates and treasury bills	17,193,000	17,193,000	17,193,000
Demand bank accounts and postal orders - cash deposits and stamps	6,674,051	7,548,934	8,898,937
Asset balancing and pending accounts	1,523,225	804,719	758,059
Total assets	31,545,570	32,696,357	32,712,301
Liabilities			
Net assets or net corporate assets or liabilities	9,799,246	10,269,826	10,604,809
Reserve funds	821,888	821,888	821,888
Funds allocated for investment	18,295,000	18,295,000	18,295,000
Funds allocated for income	-	-	-
Provisions for risks and expenditure	-	20,000	20,000
Debts a year old at most payable to third parties not subject to the GAP	2,002,378	2,486,047	2,137,490
Debts a year old at most payable to third parties subject to the GAP	590,837	767,525	798,346
Liabilities balancing and pending accounts	36,222	36,071	34,768
Total liabilities	31,545,570	32,696,357	32,712,301

Budget outcome

The budget outcome was

1,858,125 euro

17,285,182 euro (income)
- 15,427,057 euro (expenditure)

Allocation for operation and other financing

The allocation for 2021 was 8,894,769 euro. This allocation is composed of the standard allocation of 8,594,000 euro, with an additional allocation of 300,769 euro from the interdepartmental provision for implementing external DDoS protection.

Summary of budget accounts

	Financial year 2019	Financial year 2020	Financial year 2021
Expenditure (1000s euros)			
National lines	3,668	3,343	3,069
European lines	752	692	415
Maintenance of network equipment and services	5,342	3,794	3,490
Overhead costs	1,186	1,641	1,449
Wages	5,432	5,664	6,327
Investments	1,013	2,140	676
Allocations to the Reserve Fund	-	-	-
Total	17,393	17,274	15,427
Income (1000s euros)			
Transfers within an institutional group	8,646	8,773	8,895
Extraordinary income	-	-	4
BPIX Belgium	590	640	829
BPIX International	309	224	231
Sale of products and services	8,327	7,889	7,326
Capital transfers from EU institutions	263	267	-
Total	18,136	17,793	17,285

Services offered by Belnet in 2021



Cloud

- Belnet Storage
- GÉANT Cloud Solutions
- Belnet FedSender



Community Support

- Belnet FTP
- Belnet Service Desk
- Belnet Portal



Trust & Security

- Belnet DDoS Mitigation
- Digital Certificates Service
- Belnet Advanced Mail Security
- Belnet Threat Intelligence



Identity, Mobility & Federation

- FileSender
- Belnet RGE Federation
- eduroam
- govroom
- Belnet guestroom
- DMPonline.be
- Orfeo
- viaBel.net



Connectivity & Internet

- Internet connectivity
- Belnet Leased Line
- Belnet Media Transport Service
- Network Time Protocol
- Belnet Cloud Connect - MS AZURE
- DNS Service
- Domain Name Registration
- Fiber Channel
- International connectivity
- Multipoint

Implemented in 2021

- **DMPonline.be** is designed for research institutions in Belgium. The DMPonline.be platform is the perfect tool to help them generate and manage their Data Management Plans with ease.
- **Orfeo** is the institutional open access repository for Federal Science Policy funded research. This repository gives free access to results of scientific research funded by the Belgian Federal Science Policy Office.
- **Belnet Threat Intelligence** offers connected organizations an automatic and proactive reporting service for potential threats and vulnerabilities in their information systems.
- **Multifactor authentication**: access to all Belnet online services will henceforth be available through this secure service.
- **DDoS dashboard and reporting** aims to give users a better overview of DDoS attacks as they occur and allows them to generate their own reports easily.

Being developed

- **“Next generation service desk” project**:
The Belnet Service Desk is the single point of contact for institutions connected to the Belnet network. It is available 24h/24 and 7d/7 for all the questions related to incidents and technical, commercial or administrative information.
- **SOC Project [Security Operation Center]**:
The implementation of a 24/24 SOC, in which experts take immediate action to resolve a security incident as soon as it is detected, is planned for 2022. They work hand in hand with a NOC [Network Operations Center] that takes charge of the operational part of the networks and network-related services.





Editors in chief:

Belnet - Nathalie Pinsart & Dirk Haex

WTC III
Boulevard Simon Bolivar 30 B2
1000 Brussels

Tel.: +32 2 790 33 33

Fax: +32 2 790 33 34

www.belnet.be



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