

28-07-2021

## **Milestone M3.4 (M60)**

### **NREN Survey Distributed, Data Collected and Reporting Website Updated Version 3**

#### **Milestone M3.4**

Contractual Date:	31-08-2021
Actual Date:	28-07-2021
Grant Agreement No.:	856726
Work Package	WP3
Task Item:	Task 3
Nature of Milestone:	O (Other)
Dissemination Level:	PU (Public)
Lead Partner:	GÉANT Association
Document ID:	GN4-3-21-20BF3A
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The research leading to these results has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 856726 (GN4-3).

#### **Abstract**

This document presents the timeline and key findings of the 2020 NREN Compendium survey, as confirmation that the survey has been distributed, data collected and reporting website updated, in fulfilment of Milestone M3.4.

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# 1 About the Compendium

## 1.1 Overview

The GÉANT Compendium of National Research and Education Networks in Europe (the Compendium) is the result of a broad, collective effort to portray the networks of the research and education community in Europe.

National Research and Education Network (NREN) organisations run special communication networks dedicated to supporting the needs of the scientific and academic community within a country. In Europe, NRENs are interconnected by the pan-European GÉANT network, the largest and most advanced R&E network in the world.

Published since 2000, the Compendium is a living picture of what NRENs do every day to meet users' requirements and help them in their research, teaching and learning activities. The annual NREN Compendium survey invites Europe's NRENs to provide detailed information about their network, equipment and users. The survey conducted in 2020 focused primarily on the period from January to December 2019, extending to 2020 and 2021 where Compendium survey data are supplemented by data from other sources (for example, data on education from the Task Force on Educational Technologies). It requested information relating to five areas of interest to NRENs: organisation, end users, involvement in EC-funded projects, network and traffic, and services, including security, trust and identity, cloud and education. The survey questions were drafted under the guidance of subject specialists from within the GN4-3 project. This same group also led the analysis of the respondents' data. The key findings from the survey are summarised in this document; further details are provided in *Compendium 2020* [[COMP\\_2020](#)]. Specific reports compiled from NREN data may also be generated from the full online version of the Compendium [[COMPENDIUM](#)].

## 1.2 Methodology

The Compendium survey is carried out by GN4-3 Work Package 3 User and Stakeholder Engagement, Task 3 Stakeholder Insights (WP3 T3).

The survey questions were drafted in collaboration with subject specialists from within the GN4-3 project; the same group is also involved in reviewing and analysing the respondents' data, and helping to produce the detailed *Compendium 2020* report [[COMP\\_2020](#)].

The survey is conducted online, with all European NRENs invited to take part. The information is provided by those who actually carry out the NRENs' work, from the executive directors to technical officers to service portfolio strategists and many more professionals besides.

## 1.3 Timeline

The timeline for the 2020 Compendium survey is shown in Table 1.1 below.

Milestone	Date	Status
Survey distributed/opened	September 2019	Completed
Survey closed	December 2019	Completed
Data collected	February 2020	Completed
Reporting website updated	March 2020	Completed
<i>Compendium 2020</i> produced	June 2020	Completed

Table 1.1: Timeline of 2020 Compendium survey

## 2 Key Findings

Figure 2.1 below shows the countries represented in the 2020 Compendium, i.e. whose NRENs responded to the 2020 Compendium survey (40 out of a possible 43).



Figure 2.1: Countries represented in the 2020 Compendium (in green)

As in past Compendium surveys, the 2020 results reveal changes and continuing trends in the NREN landscape, although the changes are mostly gradual. That said, the (ongoing) COVID-19 pandemic has left traces in some of the more recent data.

The environment in which NRENs operate still varies considerably. Nevertheless, most European countries have a broadly liberalised telecommunications market, where access to bandwidth and technology is unconstrained by regulation or monopoly. NRENs therefore need to respond to the specific demands of the research and education community if they are to justify their existence to

their funding bodies, many of whom are not their primary users. The data from the Compendium survey should help to trace how NRENs meet this challenge.

### **Budget and Staff Numbers**

Reflecting the continuing increase in the importance of data networks in research and education, budgets and staff numbers as a whole have expanded between 2019 and 2020 (by 2% and 11%, respectively). The growth has enabled NRENs to upgrade their networks and further develop their service portfolio.

### **Pan-European Activities**

A clear trend over the last few years has been an increasing involvement of NRENs in European-level activities: the number of EC-funded projects which had at least one NREN as a participant has almost doubled, from 56 in 2018 to 103 in 2020. Most of these projects are connected to European e-infrastructures, in particular to the European Open Science Cloud (EOSC) project. However, the number and identity of the individual NRENs engaging in European projects has not changed significantly in the last four years, meaning that about a third of NRENs have little involvement at the European level.

### **Traffic**

The importance of research and education networks is manifest in the volume of traffic NRENs carry. Traffic volumes have continuously increased over the past years, across all NRENs, more than half of which reported a rise in traffic in 2020, with most of this growth coming from research institutes. Overall, the recorded traffic grew by almost 30% between 2019 and 2020. Moreover, NRENs expect this trend to continue into the medium term: for the years 2020–2023, virtually all NRENs who responded to the survey forecast traffic growth and more than half of them anticipate a growth of 50%, across all organisations within the NRENs' remit. As last year, high growth is expected to come from schools, with an anticipated traffic growth of 73%, but unlike previous years, the highest growth is expected to come from research institutions, with 75% growth anticipated. Third place is taken by universities, estimated to grow by 67%. Note, however, that all these numbers are pre-COVID-19 and a drop of traffic volumes is expected for 2020, which can already be seen in the 2020 numbers from the GÉANT network.

### **Capacity**

While traffic volumes grew significantly during the past year, the capacities of NRENs' backbone and access networks have increased at a steady but much slower rate, reflecting the longer timescale of network upgrades. It is noticeable, though, that the access networks keep increasing in capacity, especially for the non-core user types, such as schools. The capacities for access to an NREN's network range from 1 Mbps up to 100 Gbps, depending on user types. Universities and research institutions are the best-connected institution types. Over half of the respondents indicate 1 Gbps as typical capacity for connected universities and research institutions, but in some countries, the typical connectivity for these users has reached 10 Gbps and more than 90% of NRENs provide these high-capacity connections to at least some universities and research institutions. Other user types mostly have more modest requirements, but their link capacities are increasing as well.

## Services

NRENs have long since moved beyond their core role as connectivity providers, and now provide additional services, responding to technological changes and changes in the demands of the research and education community. A good example of this is the expansion and improvement of the trust and identity (T&I) infrastructure. Originally focused on securing access to R&E services, T&I infrastructures are increasingly being adapted to deal with the growth in collaboration and sharing of resources across institutions and borders. This is particularly apparent in initiatives such as InAcademia and MyAcademicID, which ascertain the student's status in order to provide access to services that are not strictly speaking an R&E service domain, for example, student discounts.

Another such development is the ongoing commodification of ICT services that just a few years ago were relatively obscure, notably cloud services. One of the consequences of the rise of commercial cloud services seems to be a dramatic drop in Software as a Service (SaaS) type services, which very few NRENs offer any more, presumably having been replaced by commercial providers. On the other hand, NRENs have taken steps to make their experience in the procurement of these types of services available to their customers, leveraging their market size to gain discounts for their users. Cloud services are a prime example here, but procurement support extends to other areas as well.

Another development is the involvement of NRENs not just in running infrastructure used for education, but also in supporting specific education content and services. While not all NRENs are following this path, among those that do, the development of new services is proceeding at a startling pace. The NRENs active in this area may become important gatekeepers or mediators between content/service providers and consumers in their education sectors.

### 3 Conclusions

While the diversity and complexity of the different NRENs can make comparisons challenging, it is the ambition of the Compendium survey and the Compendium itself to provide an overview of and insights into this thriving, multi-faceted community. The annual snapshots provided by the Compendium monitor the growth and changes among the NRENs in a systematic way.

As the NRENs' core business is providing infrastructure, many changes are slow. Nonetheless, changes do happen, and the aim of the Compendium is to track and present developments that shape and alter the ways NRENs are serving their user base. Currently, educational services are seeing a rapid development. This has certainly been accelerated by the COVID-19 pandemic, with IT tools required to support remote education, but was a recognisable trend before that. Another trend is the increasing involvement of NRENs in pan-European research infrastructure projects such as EOSC, PRACE or EuroCC. As providers of national research and education networks, NRENs are natural partners for such initiatives that facilitate international collaboration in science through the creation of Europe-wide research structures. In a third example, trust and identity services, which have long been core services provided by NRENs, allowing users within the research and education community to authenticate and access resources, are seeing use beyond their original domain. Increasingly, T&I infrastructure is leveraged for use in adjacent areas such as student discounts or study credentials. All three developments are reflected in the Compendium.

Following and reflecting trends entails gradually adjusting the scope of the Compendium accordingly. Over time, therefore, the Compendium survey will develop the data it captures and assesses in order to remain relevant and continue to provide a dataset with which NRENs can inform and shape their strategic decisions.

## References

- [COMP\_2020] <https://www.geant.org/Resources/Documents/Compendium-SRD-2020.pdf>
- [COMPENDIUM] <https://compendium.geant.org/>

## Glossary

<b>EC</b>	European Commission
<b>EOSC</b>	European Open Science Cloud
<b>EuroCC</b>	European Competence Centre (high-performance computing)
<b>GN4-3</b>	GÉANT Network 4 Phase 3 project, part-funded from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 856726
<b>ICT</b>	Information and Communications Technology
<b>NREN</b>	National Research and Education Network
<b>PRACE</b>	Partnership for Advanced Computing in Europe
<b>R&amp;E</b>	Research and Education
<b>SaaS</b>	Software as a Service
<b>T&amp;I</b>	Trust and Identity
<b>WP3</b>	Work Package 3 User and Stakeholder Engagement
<b>WP3 T3</b>	WP3 Task 3 Stakeholder Insights