Giga Annual Report 2022

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Introduction

The Internet has connected the world like never before – revolutionizing how we learn, work and live. It has transformed entire economies and industries, created jobs and new opportunities, and improved the lives and life chances of billions of people. Having access to the Internet has become a game-changer.

Against this backdrop, it is unimaginable that one out of three people – more than 2.7 billion people worldwide – are still offline and left without access to the Internet. Among them are 1.3 billion children who are missing out on the opportunities that come from being connected. Far too many children and young people are being left behind because they are digitally excluded – increasing the inequalities between those who grow up with access to information and choice and those who have to live without the Internet.

Every child has a right to an education and access to information. That is why closing the digital divide is one of the important and urgent issues of our time that deserves global attention.

That is why the **United Nations Children's Fund (UNICEF)** and the **International Telecommunication Union (ITU)** joined forces to create **Giga**, an initiative aiming to connect all schools to the Internet by 2030. By connecting all schools to the Internet, we ensure that every child has a fair shot at success in an increasingly digital world.

It is an ambitious – but not impossible – mission. We will need to innovate with new technologies and funding mechanisms to bring down the cost of connecting all schools. We will have to bring together governments, technology providers and corporations to implement long-lasting connectivity solutions.

2022 has shown us how innovation and collaboration has advanced our mission. In this report, we look back at the progress we have made and the impact we have had, as we push ourselves to achieve more in the coming years. Giga is building a movement that will use open-source tools, new partnerships, and global advocacy to ensure all schools are connected to the Internet and all children have access to information, opportunity and choice.

Contents

giga | unicef for every child | ITU

Giga Annual Report 2022

Our Progress

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Our Progress

Since our establishment in 2019, Giga has made an impact on the lives of children by connecting schools to the Internet. By December 2022, we had:

Mapped the locations of

2.1M

schools across 136 countries*

Connected

5,561

schools in 20 countries to the Internet

Connected

2.12M

students to the Internet

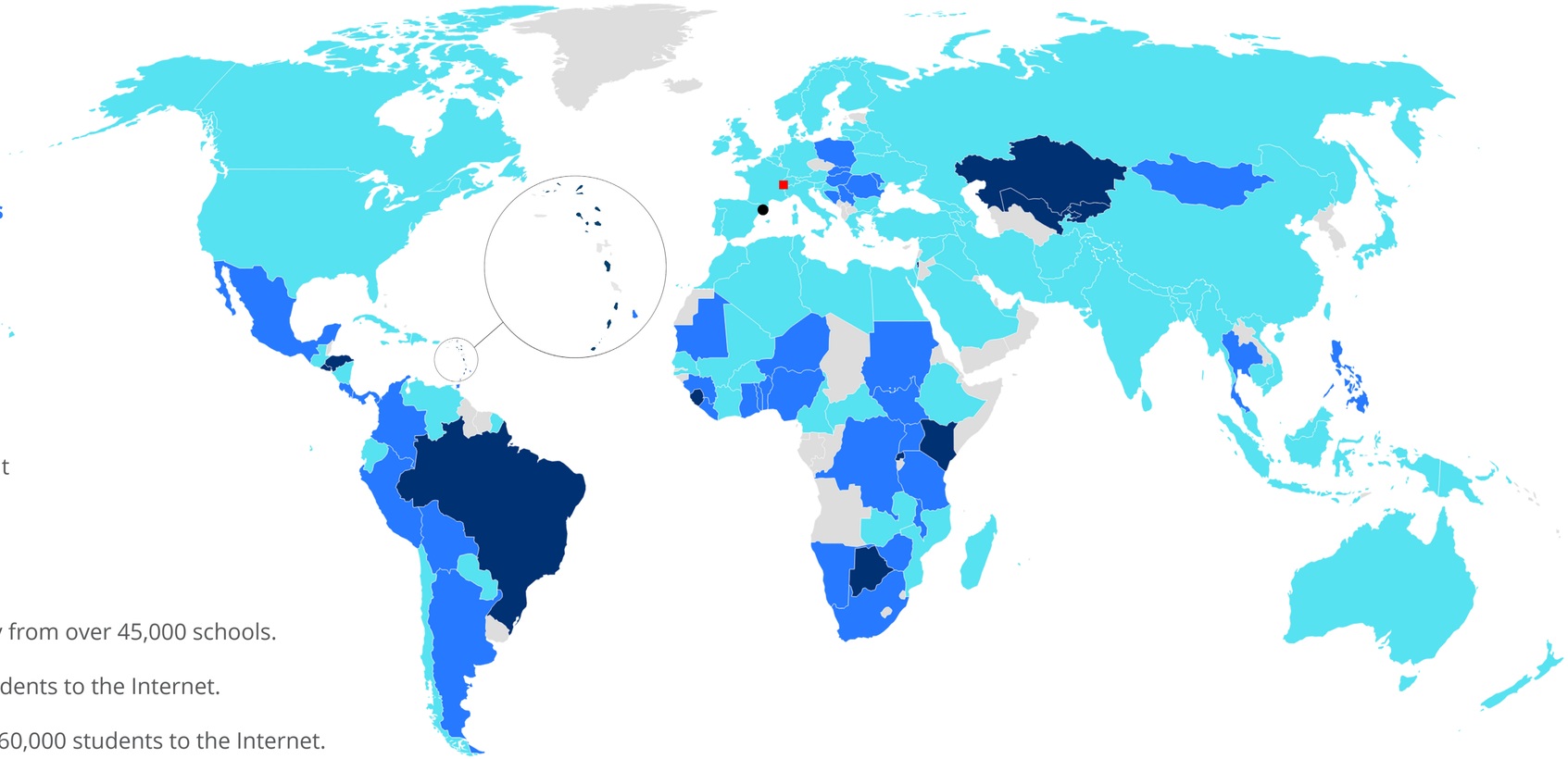
** 55 countries were mapped directly by Giga with Governments and Partners, and 81 were mapped through OpenStreetMap*

Our Progress

Giga's Global Effort

As of 2022, Giga has **mapped school locations in 136 countries** (55 countries were mapped directly by Giga and 81 are mapped through OpenStreetMap).

Giga has also **connected schools in 20 countries**:
Anguilla, Antigua and Barbuda, Botswana, Brazil, British Virgin Islands, Dominica, El Salvador, Grenada, Honduras, Kazakhstan, Kenya, Kyrgyzstan, Montserrat, State of Palestine*, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Sierra Leone, Uzbekistan.



In **Brazil**, we established live reporting of Internet service quality from over 45,000 schools.

In **Botswana**, we helped to connect 600 schools and 393,142 students to the Internet.

In **Honduras**, we helped to connect 545 schools and more than 60,000 students to the Internet.

In **Kenya**, we helped to connect 309 schools and more than 115,000 students to the Internet.

In **Kyrgyzstan**, we mapped the locations of all of the country's 2,080 schools.

In **Rwanda**, we helped the Government to secure connectivity services that improved speed by 400%.

In **Sudan**, we analysed 1.2 million satellite image tiles with the help of artificial intelligence (AI) to map the locations of 20,000 schools.

Giga Headquarters
Geneva, Switzerland

Giga Technology Centre
Barcelona, Spain

- Countries connected by Giga
- Countries mapped by Giga
- Countries mapped through OpenStreetMap

**The "State of Palestine" is officially recognized by the United Nations as a Non-Member Observer State, the status was granted on 29 November 2012.*

Our Progress

New Giga Offices

With the support of **Switzerland** and **Spain**, Giga is now able to anchor its operations and expand its mission: in 2022, we opened our Headquarters in Geneva, Switzerland, which connects us with other UN agencies and stakeholders based in Switzerland. And in 2023 we look forward to establishing our Technology Centre in Barcelona, which will be the physical homebase of our technology product development teams.

Ca l'Alier in Barcelona, Spain will be the future home of Giga's Technology Centre.

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> It is so important, especially right now, to generate new ideas for investing in our young people. Today's young generation is the largest in history. We need them to be ready to learn, to work, and to prosper.

H.E. Paul Kagame
President of the Republic of Rwanda

Giga Annual Report 2022

Our Impact

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Our Impact

Our Approach: Giga's Four Pillars

Our work is guided by four main strategic pillars – map, model, finance and contract – each responding to a critical challenge that needs to be addressed to achieve universal school Internet connectivity by 2030.

Map

Where are the schools that remain offline?

Connecting all schools to the Internet starts with locating the schools that are still not connected to the Internet. We map the location and connectivity status of all schools using existing data, and fill data gaps using satellite images and AI. We have created and maintain Giga Maps, a real-time map of school connectivity that allows us to easily identify demand for infrastructure and funds, measure progress towards achieving universal Internet access and continuously monitor global connectivity.

We provide a live and accurate picture of the quality of Internet services provided to schools based on real-time reporting from Internet service providers and schools themselves via the Giga Daily Check App. More than 2 million schools across 137 countries have been mapped to date and can be viewed at **www.giga.global/map**. All the technology described in this report is open-source, public domain, and can be reused, adapted, extended, and built upon further.

Model

What is the best strategy to connect schools to the Internet?

Using complete data on the location and connectivity status of schools, we help governments to explore technology, policy and regulatory options to create school connectivity plans that are optimized for cost, sustainability and national needs. This involves modelling and analysing each country's connectivity infrastructure, policies and regulations, as well as the costs, risks and revenue potential associated with different school connectivity scenarios.

We then advise governments on the best possible technology, policy and regulatory solutions for providing schools with sustainable connectivity and the country with safe, secure, reliable and fit-for-purpose infrastructure to support future digital development needs.

Our Impact

“When we piloted Giga, we were able to bring down the cost of connecting schools to the Internet by 55%. And this is just 63 schools. So imagine how much we will be able to do once we start to scale to the remaining 4,000 schools. This is the power of Giga – by aggregating demand for Internet connectivity, we make it more affordable to connect schools.”

H.E. Paula Ingabire
Minister of ICT and Innovation, Rwanda

Finance

How can we attract capital to fund school connectivity?

Unconnected schools are generally located in regions where low commercial potential and high risk have stifled private sector investment in connectivity infrastructure. To address this, we develop creative financing solutions that make use of grant funds, private capital, development loans, loan guarantees and other financing mechanisms. These solutions aim to increase incentives for, reduce risks of and encourage private sector investment in the infrastructure needed to connect schools.

Contract

How can we enhance procurement processes to ensure that schools are connected, and stay connected, to the Internet?

Giga advises governments on the procurement and contracting process to ensure that they select suitable service providers and secure stable Internet connections.

Giga uses UNICEF’s and ITU’s expertise in procuring infrastructure and supply chain services to help governments to define the services they require, assess contract bids, award contracts, and monitor and evaluate the performance of service providers.

Map

The best estimate is that there are 6 to 7 million schools around the world, but no one knows for sure how many schools there are or where they are located. One of Giga's most important objectives is to accurately find this out. To do this, we first gather all existing data on school locations and connectivity status from governments and other sources. Next, we use AI to identify school buildings in satellite images with over 90% accuracy. This allows us to validate existing data and fill the many gaps.

"The Internet has been a game-changer, even in the performance and the grades of our students in school. Because they can now learn and discover things on their own, their attitude has changed greatly."

Justus Mwangangi Kingoo
Science Teacher at Namoruputh Primary School, Kenya

Our Impact

Map

Giga Maps

2030 Targets*

Min. download speed in every school
20 Mbps

Min. download speed available per student
50 Kbps

Min. data allowance for every school
200 GB

**The United Nations Office of the Secretary-General's Envoy on Technology and ITU have established a set of aspirational targets for 2030 for achieving universal and meaningful digital connectivity. Given the rapid pace of innovation in digital learning, these targets must be regularly assessed and updated to reflect the evolving requirements of teachers and students.* Read more at: https://www.itu.int/itu-d/meetings/statistics/umc2030/

Giga Maps provides an interactive world map that displays the location and connectivity status of all schools known to Giga (currently 2.1 million). Each school is represented by a coloured dot: **red** means that a school is not connected to the Internet; **yellow** shows schools that are connected but with limited bandwidth; and **green** means that connectivity is sufficient for learning purposes, including video streaming.

Giga Maps also monitors connectivity quality in real time based on data from schools that use the Giga Daily Check App and quality-of-service data available from service providers. This enables governments to hold Internet providers accountable and pay only if sufficiently high-quality connectivity is provided.

Above: Map of Brazil showing connectivity of schools

Our Impact

Map

Sudan

Using artificial intelligence to map the locations of 20,000 schools

Statistics: Sudan

Schools mapped
20,280

Schools connected
0

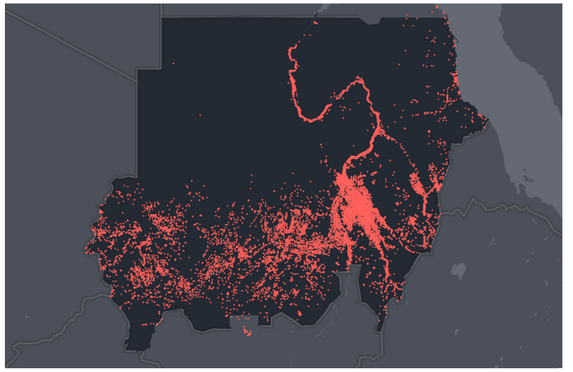
Students connected
0

Giga has developed AI models tailored to local contexts that are capable of accurately determining the precise geographical locations of schools from satellite images. AI models have been developed for nine countries so far, including Sudan, a country with limited information on only around 50% of its public schools.

The AI model we developed for Sudan was used to analyse over 1.2 million satellite image tiles, covering the entire settlement area of the country. Over 20,000 schools were mapped nationwide with a 90% accuracy rate – a rate considered high for this type of model.

Although originally expected to run for one year, the project was completed in just six weeks – thanks to our partnerships with **Omdena**, which provided 52 volunteers from the global AI community, and **Dell Technologies**, which provided a high-performance computing environment that supported high-speed data processing.

Building on our work in Sudan, we will continue to optimize our AI capabilities as we expand our mapping work to 40 more countries.



Using artificial intelligence, Giga mapped the locations of 20,280 schools in Sudan.

“The Internet benefits us. It helps with studying subjects that we do not know, such as computer science.”

Balgybek Pernegul
Student at Bolashak School, Kazakhstan

Our Impact

Map

Brazil and Sierra Leone

Transmitting real-time connectivity data

Statistics: Sierra Leone

Schools mapped
11,089

Schools connected
162

Students connected
36,570

For the statistics of Brazil, see page 22.

Giga Maps hosts real-time connectivity data from over 65,000 schools in nine countries. For instance, over 45,000 schools in Brazil report data on Internet service quality daily using an application developed by **NIC.br**. In Sierra Leone, 80% of connected schools in the capital Freetown report data on Internet service quality through an extension to their web browser provided by **Measurement Lab (M-Lab)**.

To make the collection of data on Internet service quality easier and more efficient, a joint Giga-**Ericsson** technology team built the Giga Daily Check App – an application that enables schools to regularly transmit quality-of-service data to Giga. The app was piloted in 16 schools across Botswana, Panama and Honduras in Q3 2022 before its release in October 2022. The app will be rolled out on a larger scale in 2023.

Model

To help governments to develop efficient school connectivity plans and sustainable business models, Giga develops analytical models that compare the costs of different connectivity technologies, evaluate the implications of different policy and regulation changes, and consider other critical factors. The aim of these models is to determine the scenario that is best suited to the local needs and context.

“Thanks to the Internet, I was able to learn many more things. I can find out what’s happening now in Kenya and look at maps and videos. I’ve been able to learn more on topics like engineering and wildlife. When I grow up, I would like to become an engineer because there are very few in this country.”

James Lokeny
Namoruputh Primary School, Kenya

Our Impact

Model

Kenya and Rwanda

Visualizing complex infrastructure data to support planning

Statistics: Rwanda

Schools mapped
4,194

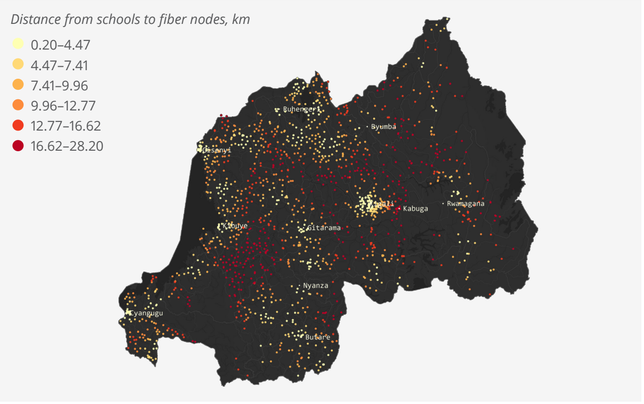
Schools connected
363

Students connected
264,881

For the statistics of Kenya, see following page.

Making sense of all these data is critical to helping governments make important decisions at the different stages of a school connectivity project – from project planning and design to technology selection, financing, contracting and delivery. Using data on school locations and national infrastructure, Giga creates interactive visualizations to help decision-makers to identify the most appropriate technologies for connecting schools in the most cost-effective way. The visualizations enable decision-makers to see school locations in relation to different layers of infrastructure, find out details of specific data points, estimate the relative costs of connecting schools using different technologies, and identify connectivity challenges and opportunities by region.

In addition to helping decision-makers to understand the existing infrastructure, the interactive visualizations help them to identify the possibilities for connectivity. For instance, if new fibre optic cabling is needed, Giga's interactive visualizations can be used to plot the shortest route by road and estimate the minimum material costs. Moreover, cell tower data from **IHS Towers**, a Giga partner, can be used to determine which towers are visible from schools and therefore identify potential new point-to-point fixed wireless solutions. The interactive visualizations, first developed for Kenya and Rwanda, are now available for 10 countries and are being scaled up for use across all Giga countries.



Above: Unconnected schools in Rwanda by distance to fiber nodes.

Model

Kenya

Universal Service Financing Efficiency Toolkit

Statistics: Kenya

Schools mapped
6,334

Schools connected
1,150

Students connected
451,848

The ITU Universal Service Financing (USF) Efficiency Toolkit was created with the support of the **UK Government's Digital Access Programme**. It was developed to promote the effective regulation of increased investment in and innovative models for school connectivity, and to ensure digital inclusion in unserved communities in Kenya. The toolkit provides analytical tools, examples of best practices, and templates designed to help policymakers, regulators and USF administrators to address common questions and challenges when using public funds to design, implement and finance programmes that facilitate access to digital technologies and communication infrastructure. It aims to help these stakeholders to evaluate the multitude of business models that need financial support to have local, municipal and national impacts, and to meet the United Nations Sustainable Development Goal targets related to digitalization.

The USF Efficiency Toolkit is now accompanied by a free online training course available on the ITU Academy web platform. Visit the link on the top of this page for more information.

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Finance

Connecting all schools to the Internet requires a large investment. Giga helps governments to deavelop innovative financing schemes, which are customized to local contexts, to attract investments from connectivity providers. By doing so, all schools, regardless of location and size, get access to a fast and reliable Internet connection.

"Zardaly Village, one of the world's hardest-to-reach areas, is now connected by Giga with the support of the Internet Society Kyrgyz Chapter. Now, there is Internet in the village, and people actively use it. We are pleased that the Internet helps not only for educational purposes, but also for local e-commerce which is already beginning to develop there."

Talant Sultanov
Co-Founder and Board Member,
Internet Society Kyrgyz Chapter, Kyrgyzstan

Our Impact

Finance

Botswana

Piloting connectivity credits

Statistics: Botswana

Schools mapped
1,031

Schools connected
609

Students connected
392,023

Connectivity credits aim to provide an incentive for companies to connect schools to the Internet in the hardest-to-reach, remote areas, where there is no compelling business case to do so. Giga is currently working with the Government of Botswana to develop a proof-of-concept pilot for connectivity credits.

Companies will receive connectivity credits for investing in connecting underserved schools to the Internet. As for carbon credits, connectivity credits will be traded on a marketplace, and companies will be able to exchange credits for rewards, for instance tax breaks, subsidies or the granting of licences for exclusive use of particular frequency bands (spectrum licences).

This scheme will benefit not only schools but also surrounding communities, as it will enable schools to act as connectivity hubs – allowing service providers to reach a wider range of consumers.

Our Impact

Finance

Uzbekistan

Establishing schools as high-speed connectivity hubs for the community

Statistics: Uzbekistan

Schools mapped
10,132

Schools connected
2

Students connected
1,388

To help governments to fund the ongoing costs of connectivity, Giga develops prototypes of innovative, sustainable financial models to provide a proof of concept that can later be scaled up at regional and national levels.

In Uzbekistan, Giga collaborated with the Ministry of Education to pioneer a “schools-as-hubs” model that redistributes Internet access from schools to households, businesses and other institutions within a 5-kilometre radius. The aim is to generate sufficient revenue to fully offset the costs of connecting local schools.

The prototype highlighted the importance of schools as anchors for community interaction. By design, schools are at the centre of communities, both physically and socially. They are therefore ideally suited to becoming high-speed connectivity hubs for the surrounding population. In this way, schools not only connect learners and teachers, but also empower entire communities. While this prototype involved only two schools that are redistributing high-speed connectivity to 1,000 users, it helped Giga to understand the stakeholders involved, the mechanisms of setting up a joint venture with a local service provider, and the challenges and opportunities for schools acting as anchors for community interaction.

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Our Impact

Finance

Rwanda

Staking Ether to finance school connectivity

Statistics: Rwanda

Schools mapped
4,194

Schools connected
363

Students connected
264,881

Giga explored the use of blockchain technology and cryptocurrencies as an additional way of financing universal school connectivity. One exploration focused on staking. In the same way as keeping money in savings accounts or bonds can generate income, staking is a way of earning rewards from digital assets or cryptocurrencies.

In collaboration with the Government of Rwanda, the **Ethereum Foundation** and **Launchnodes**, Giga was prototyping a staking model in Rwanda using the Ethereum blockchain and its associated cryptocurrency, Ether (ETH). The Ethereum Foundation donated 32 ETH – the equivalent of US$51,000 at the time of donation – to Giga for staking on an open-source cloud infrastructure in May 2022.

The staked Ether has already generated a small reward, but it failed to considerably offset the costs of school connectivity. Engaging in this prototype helped us understand how digital assets could be utilized in future connectivity projects, and what types of discussions would need to be had with central banks and others.

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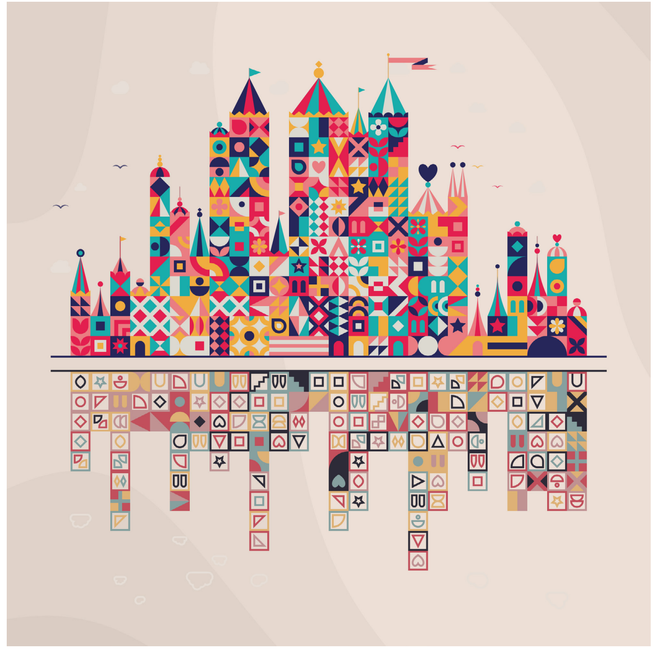
Our Impact

Finance

Patchwork Kingdoms

Financing school connectivity through art and non-fungible tokens

Feature: Patchwork Kingdoms



Detail of one of Patchwork Kingdoms' NFTs by Nadieh Bremer

In January 2022, with support from **Snowcrash**, Giga launched Patchwork Kingdoms, the United Nation's largest collection of non-fungible tokens (NFTs). NFTs are digital records that represent ownership of unique items such as digital artworks. Backed by blockchain technology, NFTs have unlocked a market for digital goods, such as art, music and virtual land, allowing these goods to be bought, sold and traded publicly.

The Patchwork Kingdoms collection, created by Nadieh Bremer, is composed of 1,000 unique and colourful pieces of art based on data from 283,000 schools mapped by Giga. With half of the world's schools still offline and 1.3 billion children still without Internet access at home, these artworks provide a striking illustration of this global digital divide.

The collection was popular among NFT collectors, with the pieces selling out within three hours. Moreover, each time NFTs are exchanged in secondary sales, additional funds are raised for connecting schools. Secondary sales are ongoing, and the project has so far raised more than US$700,000 for school connectivity. Given this pilot's unprecedented success, Giga is building a second NFT collection, which explores how NFTs could be used to represent every school in the world, with the aim of building the world's largest decentralized school database.

Contract

We help governments to procure connectivity services for schools. This includes helping them to figure out what services the market can provide, set guidelines for the work, choose the best Internet providers and make sure that providers deliver high-quality services on time. We also help governments with real-time connectivity monitoring and link it to contract management systems for greater transparency and accountability.

> “The use of the Internet had a very positive impact on our students. It enhanced their participation and interaction in the classroom and increased their involvement in lessons.”

Areej Owaisat
School Teacher, State of Palestine

Our Impact

Contract

State of Palestine

Securing connectivity for 10,000 underserved students

Statistics: State of Palestine

Schools mapped
2,935

Schools connected
70

Students connected
8,330

In the State of Palestine, Giga and its partners launched a competitive bidding process to seek proposals from telecommunications companies for connecting 70 underserved schools in the West Bank's Area C to high-speed wireless Internet. To ensure that schools would remain connected after the project, vendors were required to propose solutions for affordable financing, technology and business models. This successful public–private partnership has guaranteed sustainable connectivity for 70 schools, enabling 10,000 students and 1,000 teachers to learn and teach online. Moreover, the State's Ministry of Telecom and Information Technology has committed to covering the operating costs after installation.

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Contract

Brazil

Auctioning 5G bands to help fund universal school connectivity

Statistics: Brazil

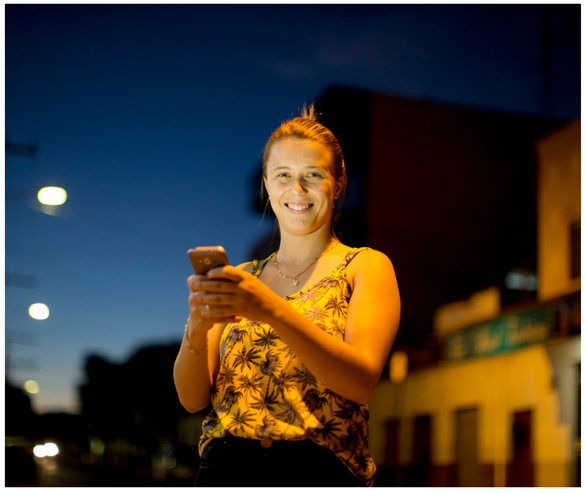
Schools mapped
187,933

Schools connected
200

Students connected
60,000

Telecommunications companies require licences for the exclusive right to use a radio frequency spectrum band for a particular application. Spectrum bands are often assigned through national auctions, which generate substantial revenues through upfront and annual fees. Brazil undertook a multi-band 5G auction in 2021, the largest ever in Latin America, raising 47.2 billion Brazilian reais (R$) (US$9.4 billion). Giga's founding partner, ITU, served as an advisor to the Brazilian Government in the lead-up to this 5G auction. As a result of Giga's advocacy efforts and data collected from Giga initiatives, the Government made providing school connectivity services a requirement for auction winners. Moreover, of the funds raised, R$3.2 billion (US$600 million) was allocated to financing efforts to achieve universal school connectivity in Brazil by 2024.

Through this auction process, Brazil has established itself as a leader in spectrum management – striking the right balance between government infrastructure objectives and private sector needs, while prioritizing the socioeconomic welfare of its most vulnerable people. Giga will continue to support the monitoring of real-time connectivity data in Brazil, to ensure that schools receive consistent and high-speed Internet access.



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About Us

About Giga

Our Team

At Giga, diversity is our strength.

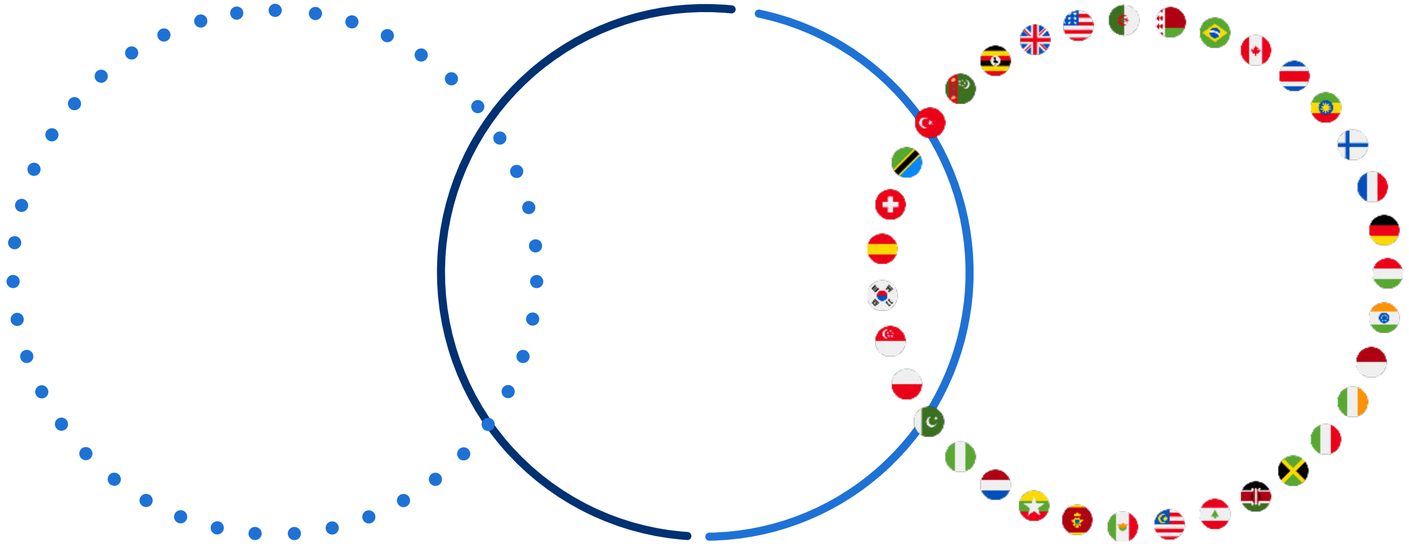
We are proud to have a team composed of 44 staff members (23 male, 21 female) from countries all over the world, namely Algeria, Belarus, Brazil, Canada, China, Costa Rica, Ethiopia, Finland, France, Germany, Hungary, India, Indonesia, Ireland, Italy, Jamaica, Kenya, Lebanon, Malaysia, Mexico, Montenegro, Myanmar, the Netherlands, Nigeria, Pakistan, Poland, Singapore, South Korea, Spain, Switzerland, Tanzania, Türkiye, Turkmenistan, Uganda, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

Moreover, our team members have diverse backgrounds in technology, development, education, finance, procurement, policy, blockchain, design, mapping, communications, multimedia and more. Giga's work is supported by ITU HQ and Regional Offices as well as UNICEF HQ, Office of Innovation, Regional and Country Offices.

44 team members

48% female, 52% male

representing 35 nationalities



About Giga

Our Partners

We would like to thank our partners, who contribute their time, passion and unique capabilities to our cause. Their generous financial and in-kind support are critical to Giga's success.

We are constantly expanding our reach to achieve our mission of connecting all schools and 1.3 billion students to the Internet by 2030. If you are interested in partnering with us, kindly reach out to **giga.partnerships@unicef.org**.

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Meta

LIQUID INTELLIGENT TECHNOLOGIES

JUMIA

Foreign, Commonwealth & Development Office

Government of Latvia

Our 2023 Goals

Map the location of

2.5M

schools

Help governments to connect

20,000

schools to the Internet

Reach

40

countries

Our Future

The first three years of Giga have allowed us to develop a better understanding of how the Giga approach works in different contexts. Our team has gained a wealth of relevant experience, evidence and expertise, and – with support from our partners – we are now ready to scale up our efforts.

In line with these overarching goals, in 2023, we aim to scale up real-time mapping of connectivity data to all Giga countries and launch a membership programme for internet service providers and mobile network operators supporting school connectivity. We will also launch and publish a toolkit for large-scale school connectivity procurement.

This year, we look forward to establishing our Technology Centre in Barcelona, Spain, now that we have opened our Management Headquarters in Geneva, Switzerland.

Closing the digital divide has never been more urgent or important. The pace of closing this divide needs to increase if we are to ensure that all children are connected to the Internet, and none is left behind. More than ever, we need your support to help us succeed in this important mission. Together, let’s connect all children to the Internet and give them unlimited access to information, opportunity, and choice.

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