TELECOM INFRA PROJECT

Building an Ecosystem for Neutral-Host NaaS

Neutral-Host NaaS Solutions Group

October 7, 2022

Document version: v2.0

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1. Executive Summary

Connecting the unconnected will be one of the greatest achievements in the digital era. As of 2020, about 3.7 billion people had no internet access due to a lack of network access, high costs, or other factors.[1] But in the race to extend and improve connectivity—whether by bringing the mobile internet to a remote village or by unlocking 5G for the smart city of the future—there are significant roadblocks.

To start with, network infrastructure is expensive. In hard-to-reach rural locations, the per capita costs to deploy mobile services are often too high for any single operator to bear. This leaves entire communities with no coverage, limited coverage, or unaffordable pricing. Ultra-dense areas can pose the opposite challenge. In urban and indoor environments, 5G rollouts can come to a halt if there's not enough space for each operator to deploy their own equipment or network densification requires extra capital.

A network-as-a-service (NaaS) business model based on shared active infrastructure and a neutral host can get more people and places connected. Because this model is open to all operators, it can dramatically accelerate mobile network expansion while lowering capital and operating costs and increasing competition. Subscribers gain affordable coverage, better service quality, and support for new use cases. Meanwhile, mobile network operators (MNOs) can expand their coverage with little to no capital expenses, and neutral-host NaaS companies (NaaSCos) and investors can see attractive financial returns.

As a business model, neutral-host NaaS relies heavily on collaboration. The Telecom Infra Project (TIP) launched its Neutral-Host NaaS Solutions Group to bring together the stakeholders needed to design and scale successful deployments. This global collaboration hub offers business model and technical expertise, along with a supportive network of investors and policymakers, to help the ecosystem deploy neutral-host NaaS around the world.

2. Network Expansion Challenges

As today's MNOs seek to expand their coverage or upgrade service quality, they may encounter a number of challenges: high infrastructure costs, low ARPU/population density, geographical barriers, vendor lock-in, or physically constrained environments.

2.1 Cost and Supplier Concentration

Deploying new (or upgrading existing) infrastructure is costly. No matter how ambitious the MNO, capital will always be constrained. Investments are often funneled to areas where population density is the highest and more subscribers can be served, leaving coverage gaps in rural areas. Smaller MNOs with fewer resources may be locked out of markets entirely due to their inability to fund new infrastructure.

Supplier concentration poses another barrier. When network infrastructure is provided by a small number of suppliers and closed systems, MNOs are subject to vendor lock-in and innovation is limited, with smaller vendors edged out.

2.2 Rural Challenges

Although 95% of the world's population has access to a mobile broadband network, there are still coverage gaps.[2] Africa (18%) and CIS-Eurasia (11%) have the largest percentages of population with no access to mobile broadband.[2] High prices can prohibit service in other areas. For example, in sub-Saharan Africa, one gigabyte (GB) of data costs nearly 40% of the average monthly wage.[1]

Connecting rural areas may require installing equipment across treacherous environments: mountains, jungles, deserts, or water. In some regions, there may not be a power grid to draw from, nor any existing backhaul infrastructure. These additional challenges not only make expansion more expensive, but also require advanced problem-solving and creative approaches.

2.3 Urban and 5G Challenges

In urban environments, 5G can unlock new use cases, but deployments require cell site densification and indoor coverage. As a result, 5G rollouts are expected to drive up the total cost of network ownership.[3] In addition, physical barriers and limited real estate may restrict the number of 5G networks that can be supported in a given building, campus, or city.

3. Solution Overview: Neutral-Host NaaS

A NaaS business model based on shared active infrastructure and a neutral host can address the major challenges of greenfield or brownfield deployments. By enabling advanced forms of network and infrastructure sharing, neutral-host NaaS can unlock unprecedented network scalability and a wider range of funding opportunities.

3.1 Benefits of Shared Infrastructure

Shared infrastructure is already a proven way to lower network deployment costs and, in turn, the cost of services to subscribers. Infrastructure sharing streamlines the number of systems needed to serve a given area and effectively spreads the cost of network expansion across MNOs, tower companies, and other infrastructure providers.[4] For example, infrastructure sharing can:

- Reduce total capital expenses for land acquisition, tower construction, and base backhaul station setup.[4]
- Reduce operational expenses for energy, network maintenance, land rent, and infrastructure security.[4]

These savings can be passed through to subscribers, especially in a competitive market in which many MNOs are able to participate.

3.2 Neutral-Host NaaS Business Model

A neutral-host NaaS model makes the most of network and infrastructure sharing by opening it up to all operators, thus increasing competition. Here, the access network and local backhaul is financed, deployed, and operated by a third party, the NaaSCo. MNOs share the network through wholesale agreements, and as a result can expand their coverage and subscriber base with little to no capital expenses. The NaasCo is free to raise outside capital from investors, allowing even greater network scalability and coverage.

Neutral-host models maximize infrastructure sharing. With passive sharing, only a limited portion of infrastructure is shared: tower, power, and sometimes the backhaul network. All other components are owned and managed by individual MNOs. However, in a neutral-host NaaS model, a NaaSCo owns and manages everything except the core network. Spectrum is typically owned by the participating MNOs.

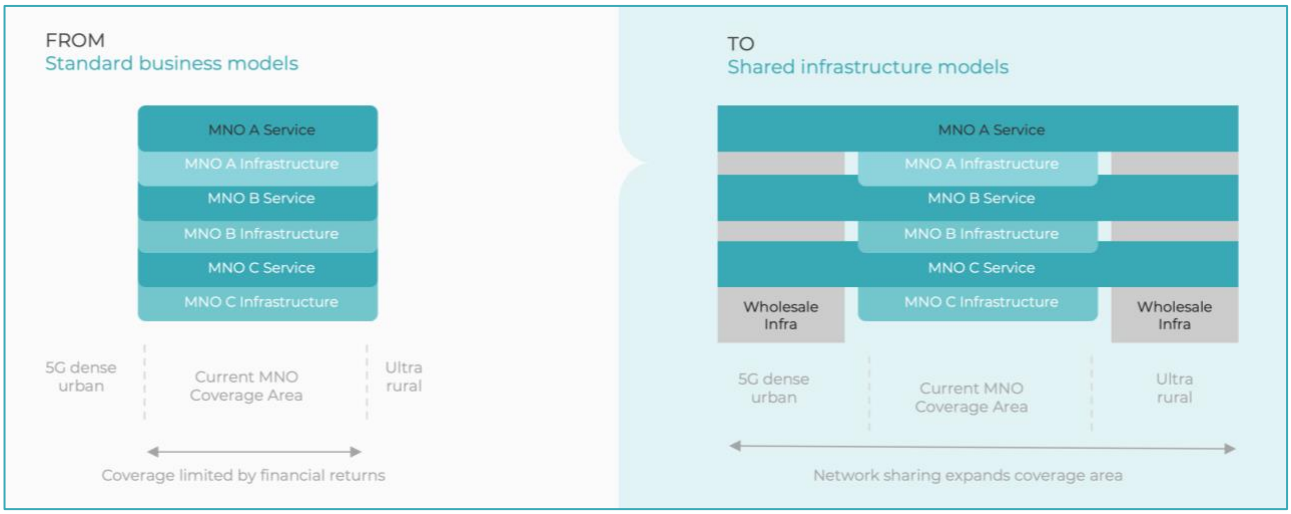
Infrastructure sharing with NaaS expands the range of coverage for MNOs beyond what was previously economical, as shown in Figure 1. By eliminating the need to deploy and maintain their own equipment, MNOs can bring coverage to ultra rural areas or provide a more dense network in urban environments.

3.3 Open, Disaggregated Networks

One key catalyst to a successful NaaS deployment is an open, disaggregated network. This enables the mixing and matching of equipment for greater flexibility in vendor selection and simpler network operations.

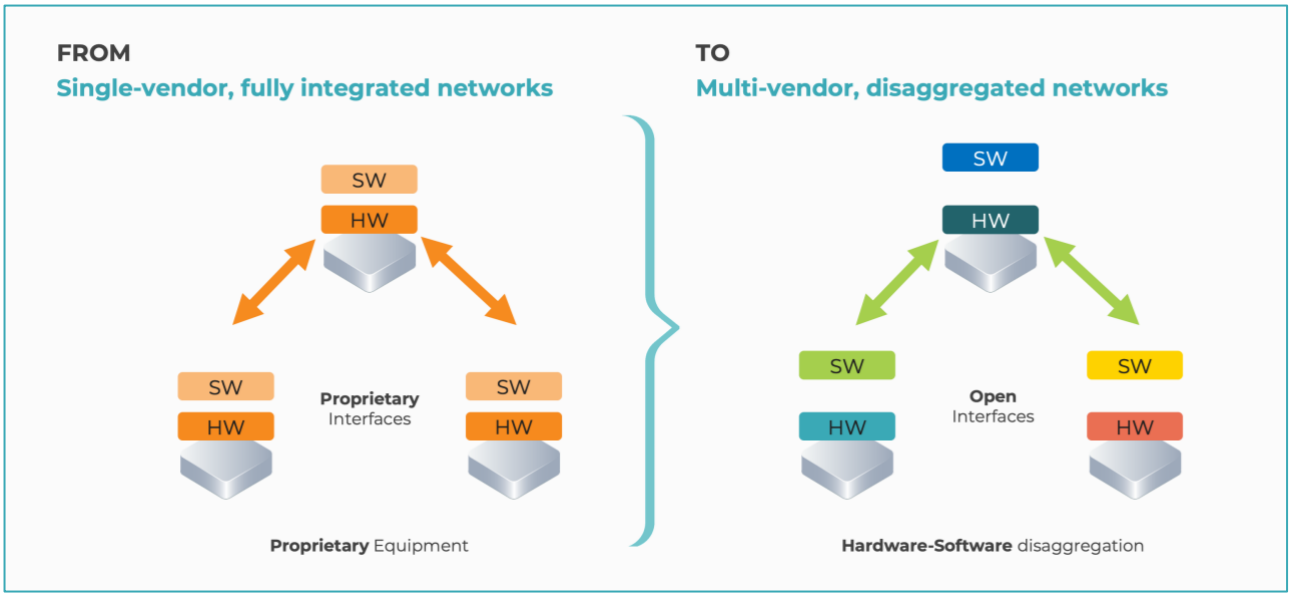
Since 2016, the Telecom Infra Project has been working to accelerate global connectivity through open, disaggregated, and standards-based technologies, such as OpenRAN. These technologies will play a key role in scaling NaaS models by helping to lower cost structures, break through proprietary systems, and eliminate vendor lock-in.

Figure 1: Network Expansion with Neutral-Host NaaS



Shared infrastructure allows MNOs to expand beyond their previously economical range into 5G or rural areas.

Figure 2. Greater Flexibility with Open Networks



Moving from single-vendor, fully integrated networks to multi-vendor, disaggregated networks enables greater flexibility in vendor selection.

The business case for NetCo/ServCo

Neutral-host NaaS models present an opportunity for operators to split their business into two parts: a network company (NetCo) and a service company (ServCo).

A carrier-neutral NetCo can grow its wholesale business by sharing its infrastructure with other operators, as demonstrated by British telecom O2, which added subscribers and traffic with its NetCo.[3] A neutral NetCo may also be an ideal orchestrator for the increased network sharing that will most likely come with 5G, according to McKinsey.[3] By spinning off these separate practices, operators may be able to improve business performance while being subject to less regulatory intervention.[3]

4. Telecom Ecosystem Benefits

Neutral-host NaaS business models are mutually beneficial to all stakeholders in the telecom ecosystem, particularly the NaaSCo and MNOs. NaaS paves the way for a repeatable and sustainable wholesale business model with technology, systems, and tools to drive efficiency and scale.

4.1 MNOs

Neutral-host NaaS models empower MNOs to expand their coverage in the most capital-efficient way possible. MNOs can move beyond their existing footprint, add new subscribers, and break into 5G with little or no capital expenses.

4.2 NaaSCos

As the third-party neutral host, the NaaSCo is able to capitalize on a growing market opportunity with an attractive risk/reward profile. This model allows NaaSCos to attract outside capital, enabling network scale. Potential NaaSCos, such as tower or fiber companies, may be able to leverage their existing assets. NaaSCos may choose to specialize in segment-optimized (e.g., ultra-rural) or open, disaggregated technologies.

Solving for regulatory challenges with NaaS

Governments often fund or mandate rural coverage in an effort to connect more of their citizens. However, when this results in a single MNO serving a region, low competition leads to other problems: less consumer choice, low service quality, and lower user adoption. A neutral-host NaaS model increases competition, enables MNOs to meet their coverage obligations, and provides a higher quality of service as costs are shared.

4.3 Policymakers

A neutral-host NaaS model gives policymakers a proven way to channel billions of dollars earmarked for infrastructure development in emerging markets to where it's needed. By increasing MNO coverage, neutral-host NaaS helps meet coverage and quality of service obligations.

4.4 Investors

The NaaS model creates new asset-based infrastructure investment opportunities that can be deployed around the world, yield solid returns, and provide positive social impact.

5. Architecture and Technology

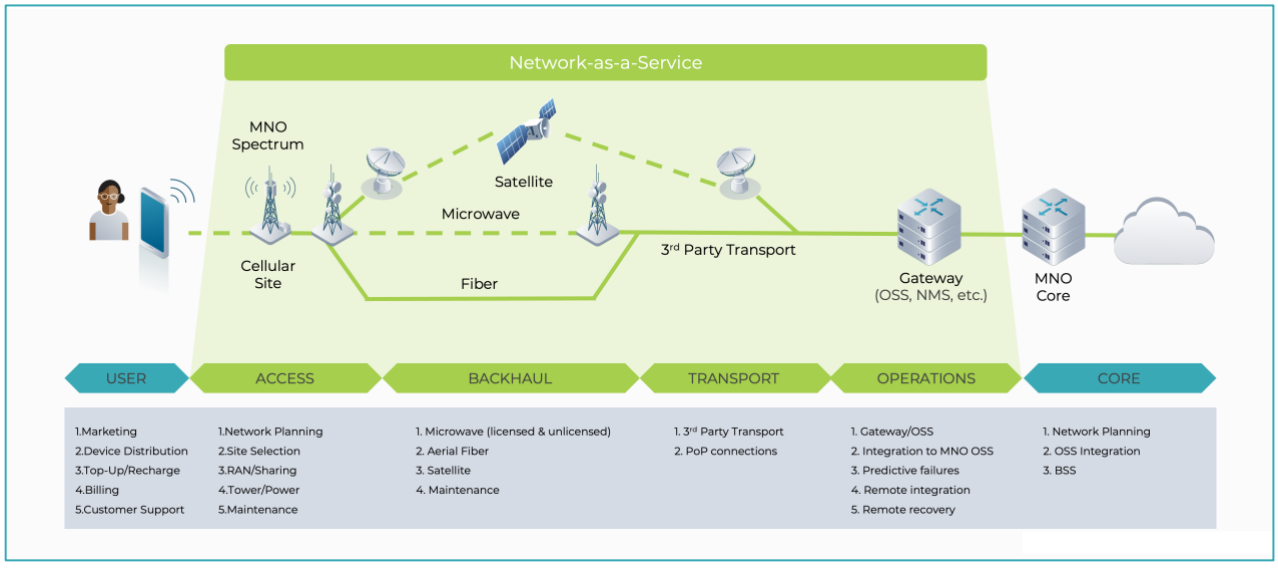
Shared infrastructure is at the heart of a neutral-host NaaS model. Open, disaggregated networks and other innovative technologies can further improve and optimize these models.

5.1 General Architecture

As illustrated in Figure 3, the access and backhaul networks in a neutral-host NaaS model operate on shared infrastructure. Key activities are covered by the NaaSCo, an MNO, or a third party.

- **User services** – Each MNO is responsible for its own marketing, device distribution, top-up/recharge, billing, and customer support, although some MNOs may prefer the NaaSCo to handle local distribution and top-up.
- **Access network** – The NaaSCo handles network planning, deployment, RAN, tower/power, and maintenance.
- **Local backhaul** – The NaaSCo is responsible for local backhaul, which could include microwave (licensed and unlicensed), aerial fiber, and satellite.
- **Transport** – A participating MNO or third party provides transport and PoP connections.
- **Operations** – The NaaSCo is responsible for the gateway, OSS, integration to the MNO OSS, predictive failures, and maintenance and upgrades.
- **MNO core** – MNOs are responsible for their core networks, OSS, and BSS.

Figure 3. NaaS Architecture and Key Activities



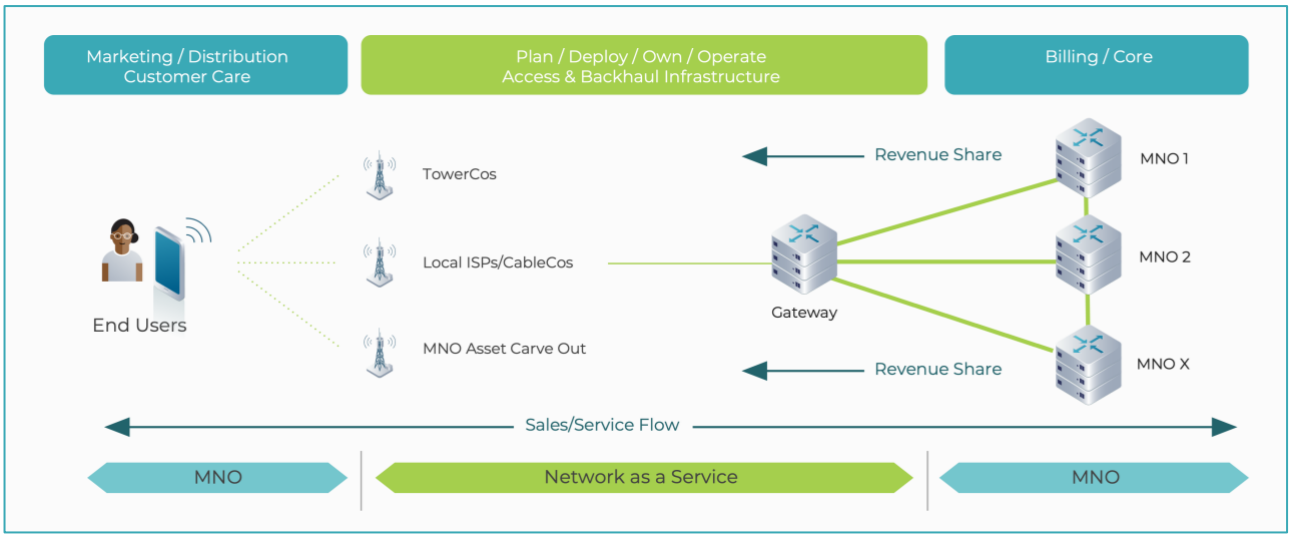
In a NaaS architecture, access and backhaul networks operate on shared infrastructure.

5.2 Technology

A neutral-host NaaS model is ideal for taking advantage of the latest networking and connectivity technologies. Because NaaSCos avoid traditional MNO vendor lock-in, they can experiment with alternative equipment providers, including OpenRAN. NaaSCos can also employ streamlined, cloud-based OSS tailored for their specific operations.

In rural deployments, creative thinking can help connect places that are so remote that no previous infrastructure exists. To reach villages where there was no power grid, Africa Mobile Networks (AMN) standardized a design for solar-powered sites and scaled them across multiple African countries.

Figure 4. NaaS Architecture



A NaaS Model is designed to optimized shared equipment between multiple MNOs.

MNO financial metrics

NaaS models are designed to positively affect MNO financial metrics with minimal risk. These include:

- EBITDA: NaaS can increase revenues while lowering OpEx, increasing EBITDA and MNO valuation.
- Cash flow: The increase in EBITDA with no capital expenses produces higher cash flow.
- Return on invested capital (ROIC): Because no MNO capital expenses are needed, NaaS provides better MNO ROIC.

6. Commercial Models

NaaSCos can choose from several commercial models based on their business objectives. In many cases, a hybrid model will offer the greatest balance of benefits to the NaaSCo and participating MNOs.

6.1 Revenue Share

In a revenue share model, the MNO remits a portion of revenues generated from NaaS sites. This minimizes the risk of unprofitable sites for MNOs, but may limit their upside relative to a fixed fee. Because risk is lower for the MNO, this model tends to offer a larger market opportunity for the NaaSCo. It also offers more upside, but involves significant risk, particularly in the first year or two following deployment as adoption increases.

6.2 Fixed Fee

With this model, the MNO pays a fixed monthly fee for service on NaaS sites. MNOs retain upside and have the certainty of a contractual, fixed cost. However, MNOs take on the risks from underperformance. Fixed fee models offer a contractual, fixed revenue stream for the NaaSCo; however, the return on investment is capped, and there is no potential upside.

6.3 Hybrid

In many deployments, a hybrid model is the most favorable to all parties. The MNO pays a lower fixed fee, plus a share of NaaS site revenue. This offers the greatest ability to share risks and rewards. However, a hybrid model is often more complex to negotiate.

7. Case Studies

So far, several NaaS models have been deployed around the world. The following examples show promise for future roll-outs.

7.1 Internet Para Todos (Peru)

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Internet Para Todos (IpT) is on a mission to bridge the digital divide in Peru. In 2019, this collaboration between Meta Connectivity, Telefónica, the Inter-American Development Bank (IDB), and the Development Bank of Latin America (CAF) began the world's largest rural NaaS network with a goal to connect rural communities in an economically sustainable way. It was also the first large-scale commercial deployment of OpenRAN technology based on standards developed by TIP.

As of 2021, IpT's wholesale cellular network had improved connectivity for more than 3 million mobile users in rural communities,[5] and more than 1,600 sites had been upgraded to 4G.[5] IpT has become a prominent example of how disaggregated networks and collaborative business models can connect more people. Together, Meta Connectivity and the TIP Neutral-Host NaaS Solutions Group are using this example to inform efforts to scale NaaS business models around the world.

7.2 Africa Mobile Networks (Sub-Saharan Africa)

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Africa Mobile Networks (AMN) is a founding member of TIP and delivers network services for the biggest MNOs in Africa. With a turnkey solution for 2G, 3G, and 4G voice and data, AMN is connecting towns and villages that have never before had network access. More than 1 billion phone calls are processed each year on AMN's network.[6] Today, AMN has deployed more than 2,000 sites in 10 countries, with a goal to cover almost every country in sub-Saharan Africa.[7]

7.3 KT Rwanda Networks (Rwanda)

This 4G LTE infrastructure company is a joint investment by the government of Rwanda and KT. Its stakeholders plan to cover 92% of the population via the wholesale provisioning of mobile networks.[8]

7.4 Polkomtel Infrastruktura (Poland)

In early 2021, Cellnex announced plans to acquire Polkomtel in a deal that Analysys Mason describes as a large-scale divestment of an MNO's network to a third-party service provider.[9] The company will operate as a NaaS with a mandate to commercialize the network to third parties.

8. TIP Neutral-Host NaaS Solutions Group

Today, NaaS business models are quickly gaining momentum. However, their success depends on collaboration and innovation from across the ecosystem. The TIP Neutral-Host NaaS Solutions Group provides a collaboration hub for stakeholders to explore how to best scale NaaS models around the world.

8.1 Mission and Objectives

The goal of the Neutral-Host NaaS Solutions Group is to enable the scaled deployment of NaaS solutions that leverage innovative business models, shared active and passive infrastructure, and lower cost structures to increase connectivity in areas that are low ROI with traditional network deployments. This group provides an environment in which stakeholders, who are often competitors, can collaborate and innovate to solve the competitive, financial, technical, operational, and regulatory obstacles that currently challenge NaaS scaling.

8.2 Participants

The solution group collaborates with operators, infrastructure providers, academic institutions, and other key stakeholders in conceiving innovative ways of building, testing, and deploying telecom network infrastructure.

Technical stakeholders include:

- NaaSCos
- OEMs
- System integrators

Demand-side stakeholders include:

- MNOs
- Policymakers
- Investors

8.3 Outcomes

The industry offers many of the elements needed to design, build, and operate NaaS networks and systems, but there is a lack of information about how to develop end-to-end solutions that enable NaaSCos to scale profitably. The Neutral-Host NaaS Solutions Group will publish solution reference designs, playbooks, and case studies to catalyze industry-led NaaS lab trials, field trials, and deployments.

As neutral-host NaaS levels the playing field for more MNOs to compete, the telecom industry will see an increase in service quality and user adoption of mobile network services. Ecosystem collaboration like the efforts led by the TIP Neutral-Host NaaS Solutions Group will spur advances in NaaS deployments, helping bring the benefits of connectivity to everyone, everywhere.

For more information about NaaS, visit telecominfraproject.com/naas. If you are interested in learning more about the solution group or have a project you'd like to propose, you can fill out a contact form to discuss next steps.

Sources

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