

# Scale Up/Scale Out for 5G Network Slicing



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Satellite used to be the most common way for sports broadcasters and big festival producers to send live video from a remote venue to a central production facility. Though the technology has been used successfully for decades it is expensive and clumsy to deploy utilizing large trucks with roof-mounted dishes.

By the late 2000s IP technology emerged as an alternative to satellite uplinks, enabling large events to adopt REMI (remote) production models. Instead of requiring large OB trucks on site, individual camera feeds can be sent over dedicated fiber or managed IP networks back to a central live production facility. And now, private 5G networks can provide the local connectivity for multi-camera contribution to a cloud-based control room or the video village at the event.

Cellular 5G is a radical departure for mobile data networking and computing. It offers better connectivity for many devices, low latency, and huge amounts of bandwidth. The technological underpinning of 5G opens an entirely new way of networking the myriad of devices into powerful production systems, replacing entire subsystems that once ran on their own hardware such as intercoms and transcoders.

5G network slicing is a way of providing separate pathways for many services within the network which makes it easier to manage the technology and guarantee performance.

The benefits will become clear. Here's how network slicing works.



## SOFTWARE-DEFINED NETWORKING

The 5G network must be treated as one whole entity supplemented by suitable slice management and operations technology in order to partition, assign and manage the network slices. This function is called “orchestration”. Most of the “5G Core” software products have built-in orchestrators, but for larger systems involving 30 and more cells you would want to use specially-designed products.



Each individual end-to-end network slice has the functionality of a complete network including specific capabilities, operational parameters, latency, and networking characteristics. Each layer will have its own resource requirements such as for compute, storage, or connectivity.

Some individual programs used in Audio/Video production function as their own network slicing “shell” running apps within the program. For example, the Haivision StreamHub includes a two-way IFB/Audio Intercom, video returns, transcoding, and an IP video gateway with discrete control screens while simultaneously routing dozens of input streams from cameras and other live devices. The Grass Valley AMPP system incorporates video switching, audio mixing, replay, and dozens of other functions into one integrated platform.

There are many circumstances, though, where it is beneficial to create dedicated sub-networks that would work independently of other applications.

Think of network slicing as an extension of software-defined networking. These are the broad elements of SDN:

- **Centralized management:** The controller facilitates management of network resources. Administrators can configure, monitor and troubleshoot the entire network from a central point either locally or in the cloud.
- **Flexibility and Agility:** Administrators can define and modify network policies, routing rules and security measures through a software-based control layer.
- **Scalability:** The network infrastructure is easier to scale. Applications, services and functions within the network ecosystem can be added or retired as needed allowing for efficient resource utilization and better allocation based on real-time demands.
- **Security:** Security measures such as access control, firewall rules, and intrusion detection can be easily implemented across the entire network for real-time threat detection and rapid response.

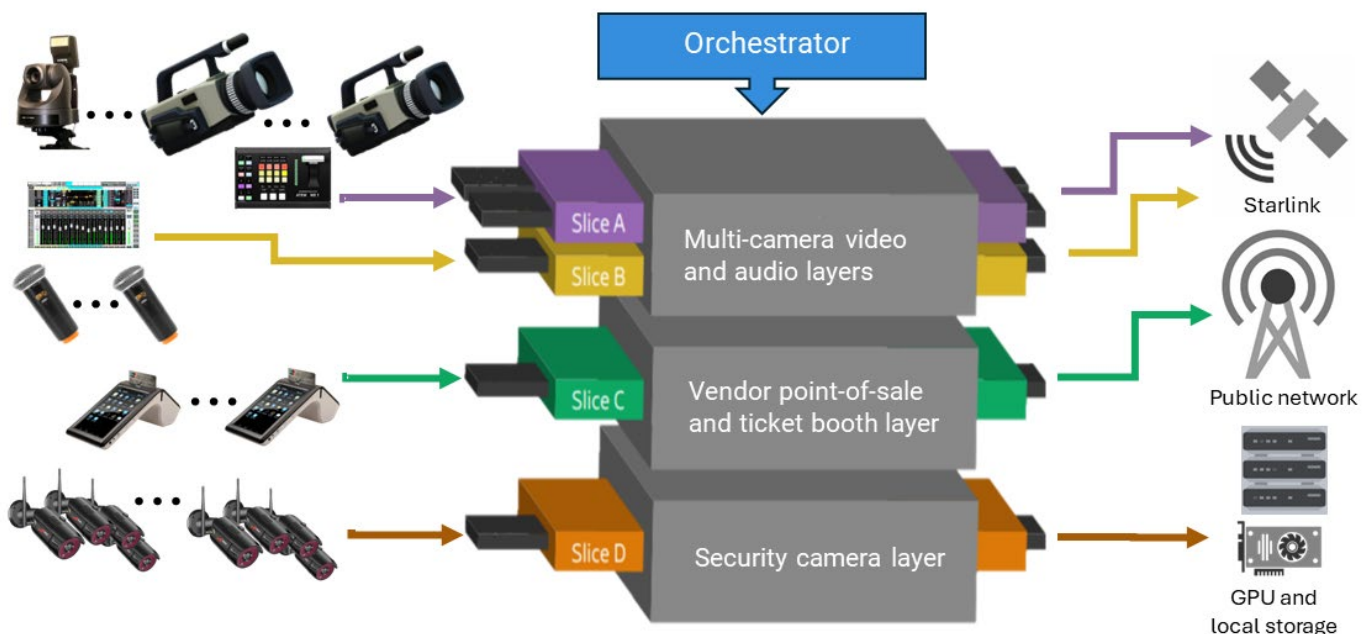
# A NETWORK SLICING USE CASE – LIVESTREAMING FROM A FESTIVAL

You might think of a livestreaming video setup as simply a camera and mic connected to the web. That’s for amateurs. The companies that livestream from major outdoor festivals now utilize sophisticated multi-camera setups, crews that roam around the venue, and even do their own audio sub-mixing bringing in live interviews.

There are several manufacturers of all-in-one production systems used by livestreamers such as Tricaster and LiveU. Video and audio sources are usually wired, but the output can be wireless with bonded cellular transmitters. Tricaster systems can connect up to 8 cameras and have many uses beyond livestreaming, but the typical system will have 3 or 4 cameras and as many audio sources.

**A private 5G network turns this all on its head.** Each source connects to the 5G network with a dedicated SIM card (avoiding the congestion of the public cell network). Camera encoders include Haivision, Vislink, BSI/NEP; other devices connect through a 5G IP encoder hub such as from Haivision and TVU; cell phones and tablets natively connect. All the sources are free to roam in the coverage area.

Now the cameras can be dynamically grouped into multiple configurations on the fly, and each group can be routed to different backhaul systems such as a Starlink uplink, a remote cell tower to get on the internet, a production van in the video village, or local data storage.



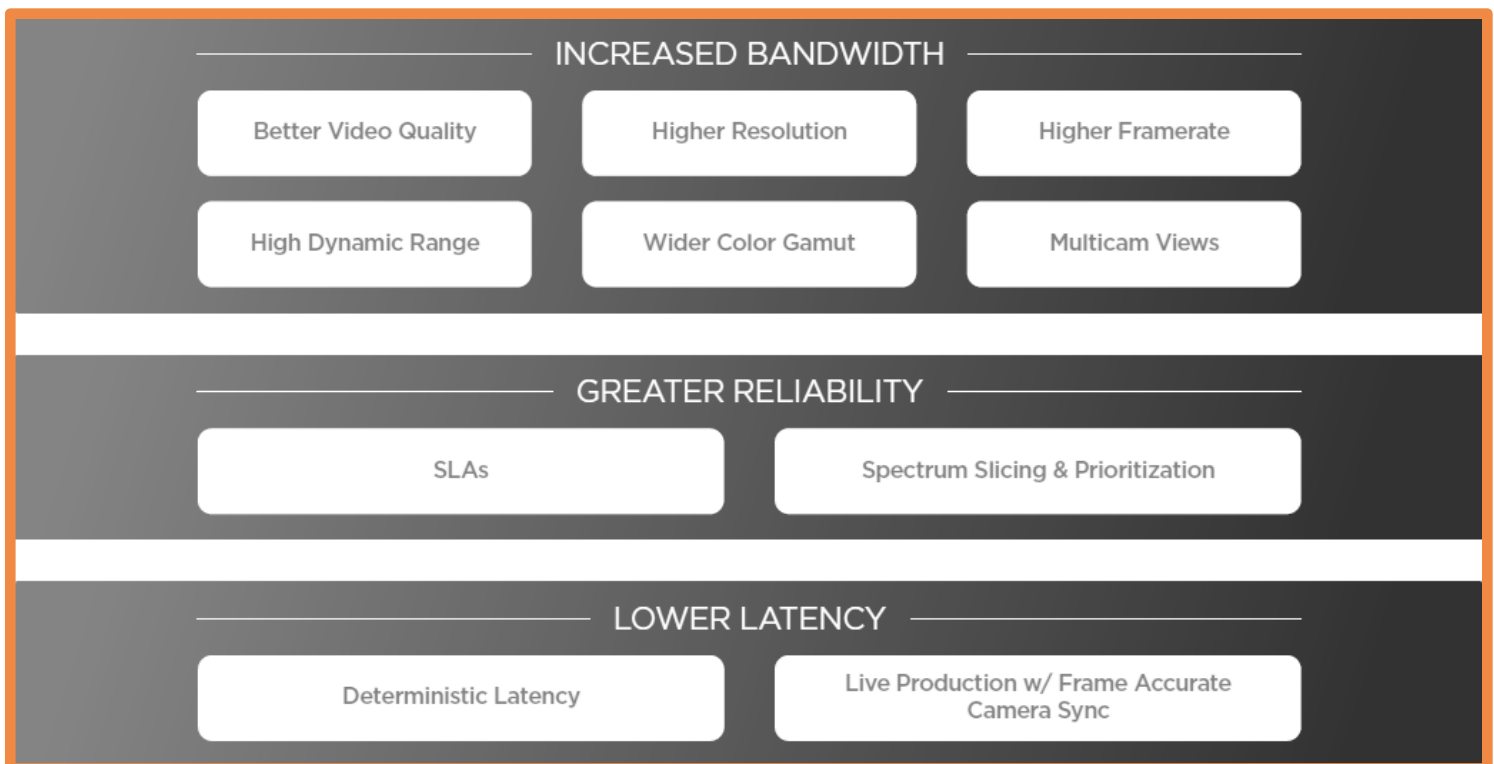


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A separate audio system can be established for both local mixing and intercom/talk-back (IFB) to communicate with the team wirelessly. Normal RF wireless systems would bring the mics back to the mixer where they can be fed into the private 5g network.

There's still plenty of bandwidth to create a network slice for "tenants" such as vendors with point-of-sale devices and ticketing kiosks. These services normally just use public cell networks to get online and process transactions. In this case, they use uncontested bandwidth on the private 5G network, then this slice connects with the public web for a more reliable experience.

Event security is becoming a bigger concern for the major festivals and large-scale events. Organizers can now install 5G wireless surveillance cameras around the perimeter of the venue which connect to the private 5G network with SIM cards on a dedicated slice preserving adequate bandwidth. Each camera is routed to a local recording system or even pointed to the cloud to store the footage securely. If something happens in the crowd it can be isolated and retrieved for documentation. The signals can be routed through a GPU to do face recognition or other AI processes.







## THE ACROMOVE PRIVATE 5G NETWORK-IN-A-BOX

The essential elements in a 5G network that must come together seamlessly –

- **Radio Access Network (RAN):** This includes radio units, antennas, and base stations that connect your devices to the 5G network.
- **Core Network:** The core network manages data traffic, routing, and security.
- **Backhaul and Transport:** Ensures reliable data transfer between RAN and core network components.
- **Edge Computing:** For processing data locally, reducing latency.

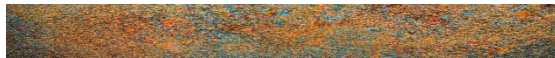


Acromove's system is a complete turn-key configuration in a portable package that is extremely easy to deploy on location. It runs on AC, internal batteries that act like a UPS, external sources like car batteries, and even solar panels. It can also be rackmounted.

It combines the entire 5G network with a powerful edge cloud server that can run additional software like editing, transcoding, logging, asset management, instant replay, and remote video/audio switching systems like Grass Vally AMPP and Ross Video Graphite CPC. Built-in 10G networking can connect the device to a local network where other servers can be added for more storage or compute power.

It has four ports to connect 5G small cells with hybrid cables that supply power and signal. These ports can be expanded to handle upwards of 32 small cells for the largest and most difficult installations. Various backhaul solutions are supported such as Starlink LEO satellite uplink, high-gain 5G antennas, mmWireless transmitter, or fiber/Ethernet.

The system can be remotely controlled due to an integral LTE modem or local WiFi with a specially-developed WebApp that runs on a cell phone, iPad, or laptop. It's easy to operate with minimal training and does not require a specialist to be with the unit.



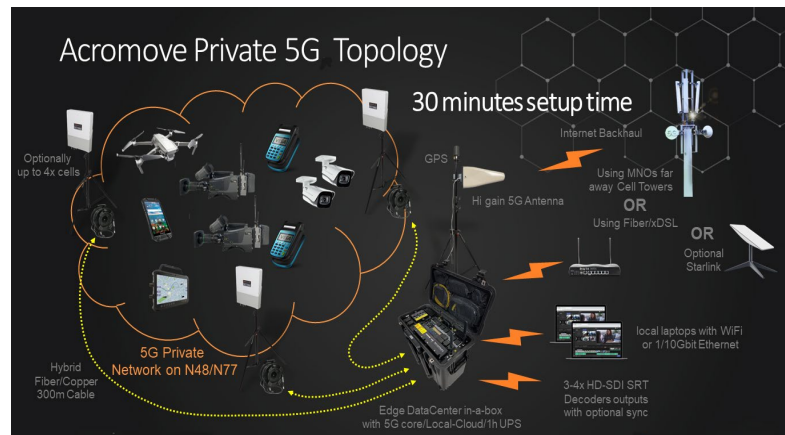
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## What Devices Can Connect?

- **HD/UHD/4K Camera encoders:** Haivision Pro460, BSI Mini TX 5G, TVU systems, Vislink, LiveU, Peplink/Vitek.
- **Smartphones and tablets:** Apple iPhone with IOS14+, Apple tablet with iPadOS 17+, iPad Pro (6th generation) and later, many Samsung smartphones like Galaxy S23, any other modern 5G compatible device.
- **Point-of-Sale systems:** Through 5G SA N77/N48 and any WiFi access point that supports 5G connectivity like Mikrotik Chateau 5G, Netgear Nighthawk M6 pro, Peplink with 5G like MAX BR1 Mini 5G.
- **Supports up to 30 devices per small cell:** When used with more than one small cell we can calculate 20-25 SIMs per cell for cameras to allow headroom for handovers when they move from cell to cell. Hundreds of PoS devices and dozens of security cameras can be connected simultaneously.

The encoders that mount on the back of the cameras also enable ancillary services like intercom, return video and audio, camera shading, and even remote pan/tilt/zoom (PTZ) control. Integrating all these features really simplifies a production setup requiring fewer personnel on location.

Another interesting feature of the Acromove Private 5G Network is the ability to create sub-networks (network slices) for multiple “tenants” to simultaneously provide discrete services over the network. For example, an outdoor music festival can connect all the ticketing booths and on-site vendors to web-based payment processing, surveillance cameras can have their own network monitored by security teams, all while providing a broadcast multi-camera HD camera contribution system for recording.



### Form factor practical for all use cases

**Rack Portable systems**

- Small cells require distinct data and power connections from a generator, and the accompanying cables do not meet IP65 standards for dust and water resistance.
- Management requires a laptop due to the absence of a VPN router with remote management capabilities.
- Deployment requires the operator to complete full wiring setup each time.
- A base is required to elevate server ports above ground level, protecting against water and dust ingress.
- Power from Utility or generator needed with power splitters to run server and Small cells.

**Acromove solution**

- Small cells work with 1 cable that is IP65, and carries also power from integrated UPS.
- Fully remote managed with app, 4/5G Router or Starlink port.
- No wiring is needed, its already integrated with FTP GNSS.
- No base needed for protection, the box is IP68 at its bottom and IP52 on the top panel, submersible IP68 when closed.
- No need for external power, On board 1.5h UPS and operation from Car batteries or Foldable Solar panels, apart from Utility or generator.

**acromove**  
Edge DCs + Private 5G




## SUMMING UP

As the broadcast and livestreaming industries continue to evolve, staying ahead requires embracing innovative technologies that enhance efficiency and reduce costs.

Stand-Alone Private 5G Networks are a prime example of how innovation can revolutionize operations. By creating a high bandwidth/low latency “liquid Ethernet” environment, private 5G networks empower production companies to deploy resources in places and ways that were previously difficult or expensive to cover.

Ultimately, embracing this technology is not just about improving efficiency or reducing costs; it’s about enabling the next generation of media experiences. As private 5G continues to evolve, the possibilities for innovation in broadcasting are limitless.

Wireless Private 5G Networks will play an increasingly important role in the months and years to come.



About SUSO – [www.SUSO.Pro](http://www.SUSO.Pro) is a consulting organization headed by Steve Crouch. It provides business development and representation services to companies seeking to establish alternative sales channels mainly in the US market. SUSO also offers system and product design services.

About Acromove – <https://acromove.com/> provides Private 5G and Edge Cloud Data Center Infrastructure solutions. Our novel solutions enable enterprises to transfer massive amounts of data effortlessly and to bring a true cloud computing experience to the Edge.