

| MainStreaming® EDGE Distribution Network



To achieve “broadcast-grade streaming”, we must deliver high-quality, low latency video at high scale. As video streaming consumption grows, with estimates of 20-80 times more consumption expected in the future compared to today, we need to expand the capacity of our video streaming infrastructure.

To support this kind of scale, the solution must be efficient, high-performance, and sustainable. And it needs to be deployed inside ISP networks to achieve these goals. MainStreaming’s EDGE Distribution Network Architecture was designed to meet these objectives, and to meet the requirements of both Content Providers and Internet Service Providers.



| Content Provider focused

There are **four main technical requirement** areas that we find our customers care about the most for their streaming delivery:

1 Fast start-up time

For large live events and appointment-TV audiences, it is important that viewers can access their content in just a couple of seconds.

MainStreaming’s patented HTULL (high-throughput ultra-low-latency) protocol was designed to support intra-server communications that allows the Edge network to very quickly access the content it needs to support consumer demands, even in unexpected moments.

MainStreaming designed its software to work as close as possible to the hardware layer to reduce the risk of software interrupts and processing times slowing down the Edge response time.

2 Low Latency

Broadcast-grade streaming requires that “live means live”. Lagging a live event by more than a few seconds is not acceptable. At the CDN level, this is supported by avoiding congestion as much as physically possible.

MainStreaming’s CDN design is therefore based on three key principles:

- Edge capacity should be **close to the consumer** for minimal Edge-to-Player latency, to minimise the risk of network congestion.
- Edge capacity should be **proactively managed** around viewing schedules to ensure customers have the capacity required to deliver in high quality to their viewers.
- Edge interaction should be **ultra-low latency**, to transfer live and VOD content quickly across the Edge network and to minimise the impact of any latency caused by Origin-to-Edge communications.

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3 Sustained Performance

A great viewing experience is not just about the first 5 minutes. It's about the whole programme. And during a 1-hour show or a 2-hour football match, a lot can happen in an end-to-end delivery network that affects performance.

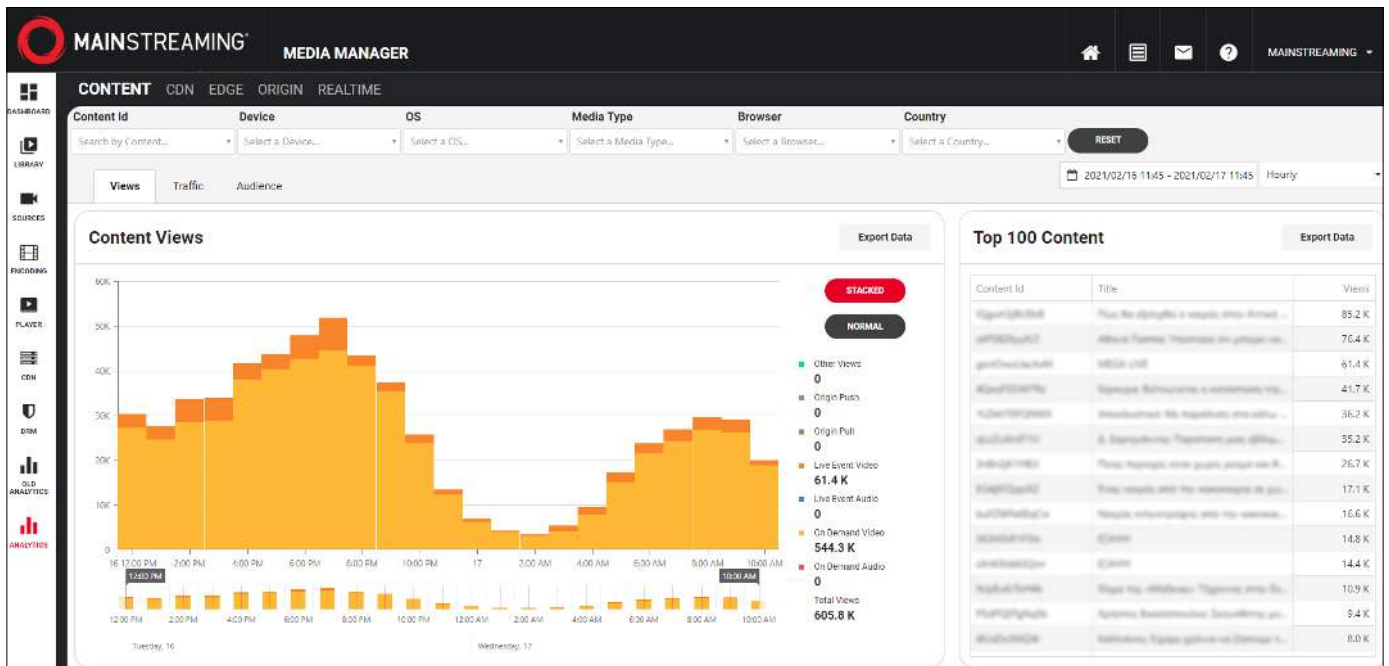
From the very beginning, MainStreaming purposefully designed and implemented continuous and highly scalable monitoring capabilities as a core part of the platform design, to inform stream-routing decisions from the start to finish of every streaming session.

The MainStreaming Edge network supports these monitoring capabilities in a distributed architecture, meaning that monitoring capacity, and therefore quality control, scales with streaming capacity.

4 Detailed Analytics

Transparency of content delivery performance, and assurances that viewers are having a great experience of our customer's service, have always been at the heart of MainStreaming's customer-centric ethos.

MainStreaming provides visibility of performance by Content, Viewer, Origin, Edge, and Network to give a holistic understanding of content delivery performance from the MainStreaming platform. Anything that can be measured from the server-side and add value to our customer's experience of working with MainStreaming is provided, again thanks to the scalable nature of our data collection and reporting from the distributed Edge network.



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| ISP focused

As Content Providers deliver more and more content to their viewers through ISP networks, the partnership between ISP and Content Provider grows in importance. Deploying Edge capacity inside the ISP network is a required part of efficient and scalable content delivery for major Content Providers. But this capacity must also support ISP requirements for highly efficient network design and operation. MainStreaming invests significant resources in network expertise, to develop hardware and software platforms that align with the main ISP requirements.

1 Sustainability-centric

IP Networks are big, they sprawl, and they are growing. Edge server capacity, that must expand to support growing demands for bandwidth-hungry video streaming, must operate with maximum energy efficiency.

MainStreaming was born with a mission to be a responsible global citizen and became a founding member of Greening of Streaming in 2021. Obviously, we work with hardware partners to optimise energy-efficiency of Edge servers we deploy.

More importantly, we made two big architectural design decisions when developing the MainStreaming EDGE platform that enables us to maximise energy efficiency. First, we focused only on video. This allows us to optimise both hardware design and energy usage for larger chunk sizes when compared to the high frequency processing functions like website acceleration. Second, we focused on running all video streaming and management functions on a single Edge server. This makes an Edge an autonomous unit which brings important benefits for stream quality, but it also means that the Edge platform scales easily without any centralised functions that can bottleneck performance.

2 Small footprint

Space is precious inside ISP networks. Edge servers must be dense. They must be configured to serve both large and small populations, as the Edge deployment locations will move closer to the viewers over time, and ultimately be more distributed. For instance, as fiber to the premises (FTTP) broadband expands, the access networks will become more centralised. In one large European country, access network operators could shrink from 8000 ADSL exchange locations to 1000 more centralised Fibre exchange locations. 1000 locations is still a very high number of locations to consider placing Edge servers compared to today's norm of 5-15 locations on an ISP network, but it presents an idea of the future platform for content distribution and Edge services for the next 100 years (i.e., the potential expected lifespan of fibre technologies).



MainStreaming therefore works with 1RU servers with high levels of throughput for their size, that can run both streaming, monitoring and video processing operations on a single server, without disrupting the most important critical-to-quality function of streaming. A single server, plus a switch to connect to the network and scale for multiple servers, is sufficient to serve high quality video with in-depth monitoring and Edge video services, like watermarking and tokenisation.

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3 Intelligent Routing

Quickly identifying the best Edge to serve a single consumer is a key function that MainStreaming has invested in.

MainStreaming has multiple ways to work with any ISP to ensure that the pathway for delivering the video to the consumer is optimal, both from the Origin to the Edge and from the Edge to the consumer.

MainStreaming has developed its distributed Smart Origin software to only ask for content once from the Origin before distributing that content amongst the required Edge servers. This reduces load on the ISP's backbone network and peering points.

MainStreaming has also implemented a blended approach to routing that we call AI Orchestrator, that can integrate easily and deeply with ISP-level routing tables, in order that MainStreaming can select the best Edge for the consumer and the ISP, and can continue to review that selection and make changes during the streaming session to move the consumer to a new Edge if appropriate. This functionality ensures customer satisfaction continues while optimising the load on the ISP network.

Want to know more?

| Video Use Cases at the EDGE

MainStreaming is working in various areas of advanced video Edge computing use cases, always with the foundation that stream quality is the most important requirement to be maintained above all else.

Our leading Content Provider customers are looking for functions like tokenisation, watermarking, ad insertion, packaging, and transcoding to be performed at the Edge, to support lean origin environments and leverage the distributed nature of the Edge platform.

ISPs benefit from these functions moving to the Edge, through a reduction in network bandwidth utilisation between the Origin and the Edge. If the Edge is deployed deeper inside the ISP network, then the ISP is able to further reduce network utilisation.

For more information on how MainStreaming can bring these benefits to your business, please **contact us**. Technical discussions about all the above points are available, with an NDA required to have an in-depth discussion about the AI Orchestrator functionality.



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