Telia CDN+ Solution Description

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Telia Content Delivery Network (CDN)

Telia's CDN is an easy-to-use cloud service that brings speed, scale and security to any website, resulting in faster page loads, a better user experience and higher search engine rankings. It prevents your site from failing under heavy load or even attacks and scales your web infrastructure to a global cloud network with **over 140 locations on 6 continents**. A self-service portal and APIs to enable real-time control as well as high visibility, configurability and customization so that you can be more autonomous, agile and productive Further, Telia guarantees 100% availability of the CDN service including 24x7 monitoring and issue resolution.
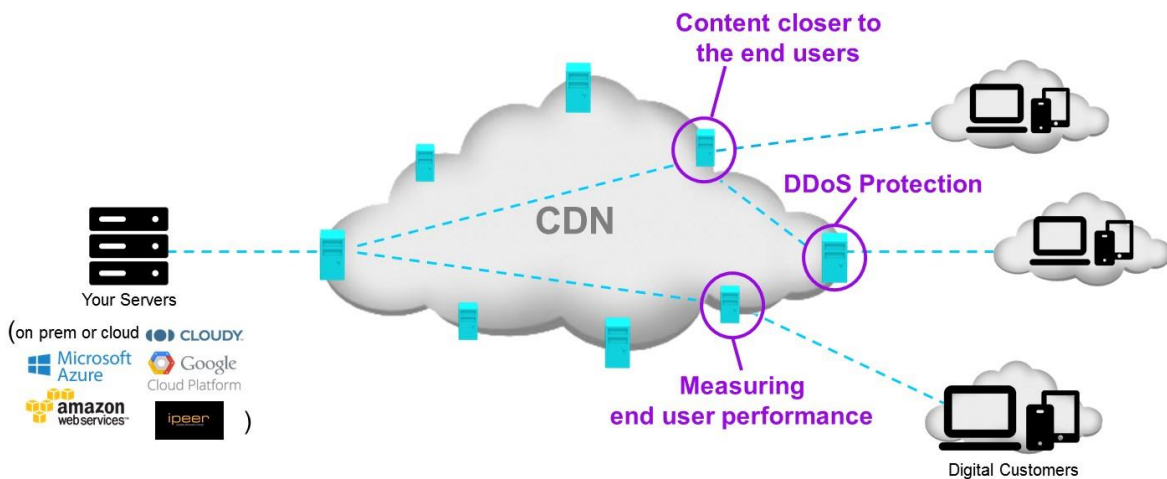

Telia CDN+

Telia CDN+ is an adaptable, multi-CDN service *specifically designed for video and audio streaming*. CDN+ provides a Selector service to combine multiple streaming CDNs. This enables you to dynamically select the best CDN to deliver from in order to achieve the best quality, lowest cost and best uptime for your video and audio services. You can combine your existing CDN(s) with commercial CDN services such as our own without changing your business or deployment models.

Our Selector uses the latest server-side technology hosted in our network for CDN selection, enabling you to add and combine CDNs without any client updates, SDKs, server-side coding, or changes to your workflows. By dynamically selecting the best CDN for delivery even down to each individual viewer, you can optimize capacity across your entire infrastructure of local CDN servers, global CDN providers and internet connections. You can even make selections based on the quality delivered to the viewers device in real-time to ensure a broadcast experience. In order to measure quality and control CDN selection our Selector delivers certain elements of the streams that would normally be delivered by the CDNs themselves. As you would normally pay the CDNs for this traffic, adding our Selector will simply transfer this cost to us rather than add any new cost.

The key benefits of our CDN+ service include:

- Combine your current CDN with any number of additional CDNs

- Optimize delivery redundancy, capacity, quality and cost now and in the future

- Improve performance of each of your CDN providers

- Reduce manual integration and operations

- Cost neutral

For customers of our CDN+, Telia can provide delivery via our own commercial CDN which is operated in partnership with Verizon's Edgecast service and our own-built, local Telia TV CDN. This combination provides un-matched local and global capacity and quality for Nordic and Baltic streaming service providers:
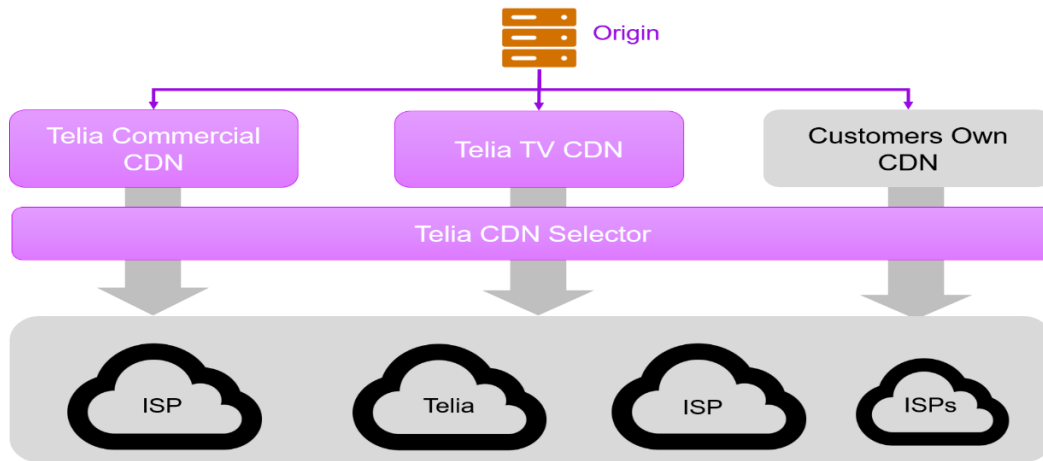
Our commercial CDN currently provides the following capacity and connectivity:

- Max, global capacity 98Tbps

- Over 150 Super POPs on 6 Continents

- Over 5000 local ISP interconnects

Our own-built Telia TV CDN currently provides the following:

- Max, local capacity in Nordics & Baltics 1.5Tbps

- Up to 30 x Local POPs in 7 countries available (restricted number in initial release)

- Tier 1 ISP with the largest network in the Nordics and the Baltics

CDN+ Selector Technology

Powered by DLVR

Our Selector service is powered by technology from DLVR Inc. This works by exploiting the technical structure of modern Internet video protocols. All three video protocols (HLS, DASH, and MSS) utilize the concept of a "manifest" to communicate to the playback device the technical information it needs to play a video.

When the user presses "play," the device begins playback by requesting the video manifest. The video manifest tells the device everything it needs in order to get the video and play it, including information about what bit rates (standard def, high def, low def) are available, the location and timing of each segment of the video at each bit rate, what order to play the video segments in, when to insert ad content into the playback, and a variety of other technical information. The manifest is like the "Rosetta Stone" for that video stream and it tells the device everything it needs to know. The device gets the manifest, reads it, and uses the information to retrieve and play the video. All of this is invisible to the user, of course – the user just sees video.

DLVR's patented technology leverages this process in multiple ways that are new, unique, and very powerful. To implement DLVR, an Internet video company simply points user requests for the manifest to the DLVR service, instead of to their usual CDNs (this means that integrating DLVR is a lot like integrating a CDN – something almost every video company already knows how to do).

When a device requests a video manifest from DLVR, DLVR retrieves the manifest from the Internet video company, reads the manifest and obtains all the technical data about the video, and then dynamically configures a customized manifest and sends it to the device.
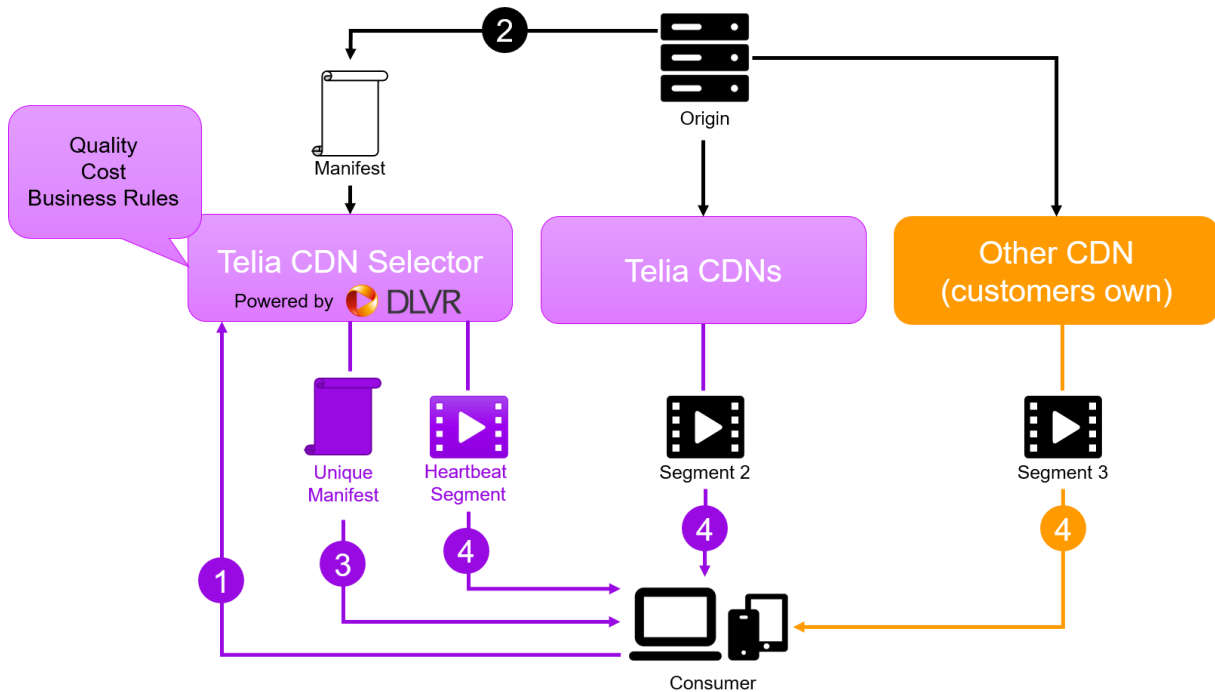
Reading the technical data about the video from the manifest gives DLVR all the same data that the device has about the video. This enables DLVR to build a precise mathematical representation of – a baseline for – the video stream as it is intended to be played for the user. Looked at in abstract terms, a video stream is really just a very dense, very precisely timed series of events – frames played one after the other, content followed by ads followed by content, and the like. By reading the manifest, DLVR obtains the sequence and timing of all of the events for this specific video stream.

Configuring a customized manifest for the user's video stream enables DLVR to:

Assign the selected content delivery network (CDN) to this specific user video stream. DLVR assigns the best CDN to power the video stream based on which video stream the user is watching, what device the user is using, where the user is located, the user's mobile or broadband network, and the real-time performance of the Internet video company's CDNs for those precise conditions. DLVR selects the best-performing CDN for each user's stream at that moment, giving users the best possible video experience. DLVR also considers an Internet video company's business rules – when two CDNs are performing equally well, the video company may prefer one CDN over another, or may want to divide the traffic according to certain percentages. DLVR factors both the performance of the CDNs and the video company's business rules into the CDN assignments it makes.

Each individual video stream is 'instrumented' so that DLVR can measure it and calculate the performance of the user's access network, the video company's CDN, and the video company's digital video workflow. DLVR instruments the stream by directing the device to request a small amount of video from DLVR every so often during the video stream – we call these "heartbeats." DLVR then compares the timing of these heartbeats to the correct timing that should occur when the stream is played properly. If the heartbeats stay on schedule, the video is playing properly; if the heartbeats don't stay on schedule, something has gone wrong – the video has stalled or buffered. The heartbeats also tell DLVR the stream's video resolution, and whether it is jumping around (to better or worse resolution) or staying the same, and at the same time allow DLVR to measure the user's access network conditions – is the mobile connection fast or slow. Finally, the heartbeats allow DLVR to measure the Internet video company's workflow performance.

In short, reading the manifest tells DLVR how the stream should play; configuring the manifest lets DLVR assign the best CDN to each stream and add in the heartbeats; and the heartbeats tell DLVR how the stream actually played, how the user's access network performed, and how the video company's workflow performed. The rest is math. DLVR calculates the performance of the CDN, and when playback problems happen DLVR determines which part of the video delivery flow hiccupped – the CDN, the user's access network, or the video company's digital workflow.

1) A consumer device requests a video manifest from DLVR

2) DLVR retrieves the manifest from the Internet video company's origin, reads the manifest and obtains all the technical data about the video

3) DLVR dynamically configures a customized manifest and sends it to the device.

4) DLVR assigns the best CDN to deliver the video segments based on fully configurable parameters such as quality, cost and other business rules.

4) DLVR directs the device to request a small amount of video from DLVR itself, every so often during the video stream. These heartbeats enable DLVR to measure the delivered quality without needing any integration with the software on the client device.

DLVR currently has eight issued U.S. patents and six issued EU patents covering these processes, with additional patents pending in the U.S. and around the world. These patents reflect DLVR's new and uniquely powerful approach to measuring and optimizing Internet video.

CDN+ Selector Data Insights API

Our CDN+ Selector Data Insights API provides real-time metrics on CDN selections including several categories of data: Content Delivery Metrics, Operational Metrics, Session Metrics and Snapshot Information. DLVR are continually adding enhanced metrics and analytics to the Insight API suite. Metrics include decision data representing the "what" and "why" of the CDN selection decisions DLVR makes on a per stream basis. This includes information such as:

- CDN Selection Accounting
    - Primary CDN selected
    - Secondary CDN selected
    - Avoided CDN
- Midstream CDN switch
    - From
    - To
- CDN Selection Reasons
    - Performance
        - Observed hazards
            - Downshifts
            - Rebuffering
        - Performance index
        - Predicted performance
    - Business Rules
        - Load balancing
        - CDN by Geo
        - Onnet

Representation modes: Stats, Time series and Session
Compilation types: Average, Standard Deviation, Count, Sum, Minimum and Maximum
Filtering: Account, Device, Geography, CDN Provider and Network.

For the complete specification of data available including Stream Metrics, Operational Metrics and Configuration Information, see DLVR Insights – API Publisher Summary document.

CDN+ DDoS Protection

Layer 3 & 4 DDoS Protection. Our real-time monitoring and detection software mitigates 99% of DDoS attacks directed at the network level within 60 seconds of identification. Malicious traffic is identified through the analysis of network traffic for anomalies such as a significant increase in SYN packets or a slow and steady rise in persistent connections. Traffic is then automatically rate limited and black holed whilst our 24/7/365 monitoring staff are alerted for further analysis/action. Signature filters are created to facilitate more efficient mitigation of similar attacks in the future.

Our customers automatically get this service simply by running their HTTP/S traffic across our CDNs. There is no hardware or software to install. As such, our customers do not need to be concerned about how much hardware capacity, network circuit bandwidth, or CPU resources are required. The protection is always available across our global platform, and resources scale on demand and enable protection against the largest attacks.

CDN+ Local Support Services

Telia has an expert team providing around-the-clock support through e-mail and telephone in Swedish and English. Our experienced technical engineers have expert level knowledge about our network, service architecture and workflows. They have undergone a multi-tiered training program to quickly provide assistance on any inquiry or support request via phone or email – on a 24 x 7 x 365 basis.

For our CDN+ customers, we can offer additional support services that are designed to ensure your streams are quickly restored and running at broadcast quality levels in the event of a failure in the CDNs. Our multi-CDN approach means we can offer an SLA which includes restoration of the delivery service within a maximum of 30 minutes.

Additional access is available to a team of highly experienced and local online video specialists with a combined technical experience of over 50 years working with the world's leading OTT video technologies. This team are available to help customers with their specific needs for service integration, implementation, changes and general optimization. Typically acting as trusted advisors to web application and video infrastructure developers during integration and facilitating seamless on-boarding of our self-service functions for operations, our services are designed to empower customers as much as possible.

CDN+ Business Model

In order to measure quality and control CDN selection our Selector service delivers certain elements of the streams that would normally be delivered by the CDNs themselves (customized manifests and heartbeat segments). As you would normally pay the CDNs for this traffic, adding our Selector will simply transfer this cost to us rather than add any new cost.

CDN delivery

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Selector delivery
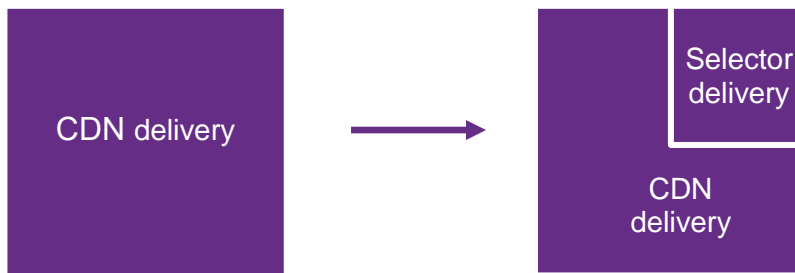
CDN delivery

We offer the following options:

Stand-Alone: If you decide to buy our Selector service and exclusively use our own, Telia CDNs for delivery, we charge one, combined price per GB for all the traffic – we call this our Stand-Alone option.

Telia Selector

Telia CDNs

Even if you already have your own CDN selector, ours will work behind it so you can still use our Stand-Alone option:

Existing selector

Existing CDNs
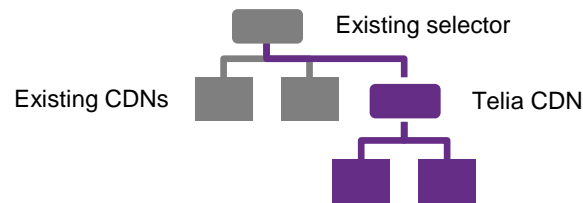
Telia CDN

Add-On: If you decide to buy our Selector and use our Telia CDNs along with your own CDNs, we only charge for the traffic delivered from our Selector and any traffic you decide to direct to our CDNs. This single price per GB is slightly higher than the Stand-Alone option as we don't ask for any volume commit and you are free to only use our CDN when you decide it is the most suitable. This is our Add-On option

Telia Selector

Telia CDNs

Existing CDN

Selector: If you want the full flexibility to just use our Selector service but to only deliver from your own CDNs, we only charge you for the elements delivered from our Selector in order to measure quality and to control the CDN selection. This is our Selector option.

Telia Selector

Existing CDNs

You can move between these different options at any time. Examples would be: you could start with our Stand Alone option and then change to our Add-On option if you wanted to add a CDN of your own. Or you start with our Selector option to manage your own CDNs but then change to our Add-On option if you would like to also add our CDNs to the mix.

Description of features

1 CDN+ Multi-CDN Streaming

1.1 Stand-Alone

We provide a complete, Multi-CDN service, combining our own Nordic & Baltic capacity with a leading, global CDN. Our CDN Selector dynamically selects the best CDN to deliver video from to achieve the best quality, lowest cost and best uptime. Using latest server-side technology hosted in our network, our service enables you to combine CDNs without any client updates, SDKs, server-side coding, or changes to your workflows. You pay one, combined price for the traffic used by our Selector i.e. video manifest files and "heartbeat" video segments used to measure quality and the same price for any traffic delivered from our Multi-CDN.

Multi-CDN delivery is via Telia's platforms for caching, streaming and protecting HTTP/S content. Via our carrier network, all our servers are connected with the most comprehensive peering in the Nordics and provide access to up to and over 130 Points of Presence (POPs) on 6 continents via our global CDN federation. The network is fully redundant via multi-homed networks and can tolerates disk, server, rack or complete datacenter failure without impact.

Delivery Includes:
- The CDN Selector delivers video manifest files and "heartbeat" video segments used to measure quality
- These objects and all other video segments are delivered through our network POPs located in the Nordics, Europe and North America
- Global peering routes to other regions
- Strategic transit routes to other regions

It excludes:
- Delivery through POPs in Asia-Pacific, Australia, and Latin America.
- Premium transit routes to other regions

1.2 Add-On

Keep your existing CDN(s) and add ours to the mix. Configure our Selector with business rules including volume quotas for your existing CDN(s), price and delivered quality. Using the latest server-side technology hosted in our network, our service enables you to combine CDNs without any client updates, SDKs, server-side coding, or changes to your workflows. You only pay for the traffic used by our Selector i.e. video manifest files and "heartbeat" video segments used to measure quality. You also pay for any traffic delivered from our Multi-CDN.

Multi-CDN delivery is via Telia's platforms for caching, streaming and protecting HTTP/S content. Via our carrier network, all our servers are connected with the most comprehensive peering in the Nordics and provide access to up to and over 130 Points of Presence (POPs) on 6 continents via our global CDN federation. The network is fully redundant via multi-homed networks and can tolerates disk, server, rack or complete datacenter failure without impact.

Delivery Includes:

- The CDN Selector delivers video manifest files and "heartbeat" video segments used to measure quality
- These objects and all other video segments are delivered through our network POPs located in the Nordics, Europe and North America
- Global peering routes to other regions
- Strategic transit routes to other regions

It excludes:
- Delivery through POPs in Asia-Pacific, Australia, and Latin America.
- Premium transit routes to other regions

1.3 Selector

Use just our Selector and continue to deliver from your own CDNs. Select the CDN based on delivery quality and a wide range of other business rules. You only pay for the traffic used by our Selector i.e. video manifest files and "heartbeat" video segments used to measure quality.

Our CDN Selector dynamically selects the best CDN to deliver video from to achieve the best quality, lowest cost and best uptime. Using latest server-side technology hosted in our network, our service enables you to combine CDNs without any client updates, SDKs, server-side coding, or changes to your workflows.

Delivery Includes:
- The CDN Selector delivers video manifest files and "heartbeat" video segments used to measure quality
- These objects are delivered through our network POPs located in the Nordics, Europe and North America
- Global peering routes to other regions
- Strategic transit routes to other regions

It excludes:
- Delivery through POPs in Asia-Pacific, Australia, and Latin America.
- Premium transit routes to other regions

1.4 Included Features:

The following features are always included in the above CDN+ Multi-CDN Streaming packages:

- Multi-CDN Rules Config – you complete a config form with some basic data including: the base URL of your origin server, a sample playout URL, your token authentication scheme and the hostname for your base URL for use in our SSL/TLS certificates. You also configure the business rules and their priority that you want to apply to the CDN Selector including: Quality, cost, quota, geography, ASN, device type etc. We will then provide a base URL for playout testing prior to production.

- Instant purge and push - content which is likely to be popular can be pre-loaded on to the edge servers in order to ensure instant quality of experience whilst reducing origin server and network load. Examples would be new software downloads or images /

multi-media assets associated with new product launches. Cached content can also be instantly purged from all edge servers, globally when for example only the latest version software should be available for download or when content rights for a specific asset expire.

- Optimized Stream Caching – Telia CDN+ uses pre-set cache settings on our CDNs to optimize for video streaming. These settings ensure client requests are served before the video segment is fully cached, requests back to the customers origin server are minimized and segments are validated and re-requested from the origin if there are errors.

- SSL/TLS Delivery – Telia CDN+ uses wildcard certificates to secure transactions on multiple hostnames that use the same domain. Telia uses one certificate for delivery of the manifest files and heartbeat segments from the CDN Selector (*.dlvr.teliacdnplus.net) and another for delivery of video segments from our CDN(s) (e.g. *.cdn1.teliacdnplus.net). Each customer will have a separate hostname (e.g. customer1.cdn1.teliacdnplus.net). This information is only visible if end-users inspect the code associated with player application on the client device. All hostnames and sub-domains, along with all certificate details, can also be seen by any end-user that views the properties of the certificate.

- DDoS Layer 3 & 4 Protection - real-time monitoring and detection software mitigates 99% of DDoS attacks directed at the network level within 60 seconds of identification. Malicious traffic is identified through the analysis of network traffic for anomalies such as a significant increase in SYN packets or a slow and steady rise in persistent connections. Traffic is then automatically rate limited and black holed whilst our 24/7/365 monitoring staff are alerted for further analysis/action. Signature filters are created to facilitate more efficient mitigation of similar attacks in the future.

- Logging & Analytics: CDN+ Data Insights API provides realtime metrics on CDN selections including several categories of data: Content Delivery Metrics, Operational Metrics, Session Metrics and Snapshot Information. Metrics include decision data representing the "what" and "why" of the CDN selection decisions our CDN Selector makes on a per stream basis. CDN Core reporting - a variety of basic reports are available to view from each CDN for usage patterns and to enable optimization of CDN config. Reports include how many sessions, aggregate bandwidth, and how much CDN storage space is being used. Cache statistics are also available, including cache hit rates which allow you to check whether caching has been optimized to ensure the fastest delivery speeds.

- Nordic Support (24x7x365) - Around-the-clock support through e-mail and telephone. Support is provided in Swedish and English.

- CDN Training (3 hours) - Quick launch training provides insights into the CDN portal, ticket creation and escalation paths thus enabling the customer to get up and running with the CDN service.

2 Managed Services

Any of the following managed services can be combined with any of the above CDN+ Multi-CDN Streaming packages:

2.1 Premium

24 x 7 x 365 Nordic support from our expert team including trouble-shooting support for your own CDN(s) including a 4 hour service restoration SLA. Minimum of 25 hours per month.

For emergency issues that substantially affect your service, we commit to resolve the issue within a maximum of 4 hours. To achieve this, our CDN Selector continually monitors the delivery of every stream and as long as there are at least two CDNs to choose from, it will ensure your service continues to function, even in the event of a total outage in one CDN. In addition, there is an automated process for the tiered removal of the CDN Selector service itself from the critical video delivery path if degradation or failure of these services is encountered.

2.2 Live Event

Real-time monitoring of delivery of named events including your own CDN(s) including a 30 minute service restoration SLA and pro-active monitoring and status communication. Minimum of 25 hours per month.

A dedicated expert who will follow your event(s) will conduct a pre-event planning call to define the performance baselines and thresholds with you. During the event(s), we will conduct proactive, real-time monitoring of vital health metrics and will provide continuous communication and alerting including regular status updates. We will then produce a post-event report for your review.

We commit to resolve emergency issues within a maximum of 30 minutes. To achieve this, our CDN Selector continually monitors the delivery of every stream and as long as there are at least two CDNs to choose from, it will ensure your service continues to function, even in the event of a total outage in one CDN. In addition, there is an automated process for the tiered removal of the CDN Selector service itself from the critical video delivery path if degradation or failure of these services is encountered.

2.3 Consultancy

Dedicated resources when you require one-time, live event support, project management, consultation, help with your own CDN configurations, ad-insertion systems or multi-CDN security. Minimum of 4 hours.

3 Optional Features

Any of the following optional features can be added to any of the above CDN+ Multi-CDN Streaming packages and Managed Services (with the exception of Real Time Log Delivery which can only be added to the Multi or Flex packages):

3.1 Premium Origin Storage

Origin disk space used on the CDN+ platform, excluding edge and origin shield cache space. Provides instant scale to cater for flash crowds or other surges in demand with full redundancy and global distribution. Manage your content from anywhere using the web based Media Control Center (MCC) with a full range of flexible publishing options.

3.2 CDN+ Token Authentication

A mechanism to create a per user unique hash to secure content on the CDN+ platform thus preventing unauthorized access to HTTP assets. Primarily used to prevent hot linking to protected documents and media streams. Our CDN+ uses a token scheme for communication between the end-user client software and our CDN Selector. These tokens will then be automatically adapted by the CDN Selector as part of the manifest modification to allow the preferred token scheme for communication between the client software and the selected CDN.

3.3 RSYNC / sFTP Support

RYSNC over SSH and the SSH File Transfer Protocol (SFTP) for secure file transfer to and from origin storage on the CDN including all analytics data.
SSH keys are used to authenticate the local machine. Once data has been stored on the CDN storage, it is only visible to users of the account under which it has been stored.

3.4 Real Time Log Delivery (RTLD) (only available with Multi or Flex packages)

Real-Time Log Delivery (RTLD) is a log streaming service that delivers edge request data from each of the CDNs to the endpoint of your choice in near real-time. RTLD enables you to understand at a granular level how well our Telia CDN+ is performing and empowers you to make better-informed decisions and take action faster to benefit users. Individual CDN activity may be delivered as compressed log data in near real-time to either:

- Your web server (via HTTP POST)
- An AWS S3 bucket (via HTTP PUT)

The body for each of these POST /PUT requests will be a JSON document that uniquely identifies a set of log data and describes one or more log entries. Each entry describes a HTTP/HTTPS request that was directed to the Telia CDN service. To reduce the amount of data that needs to be processed or stored, JSON Documents are compressed and log fields are selectable to only deliver the information that you require. Log data may also be downsampled to 0.1 or 1% of the total traffic served for each delivery platform. RTLD is a fully managed service which automatically scales to match the throughput of your data.