



Technical Report

Media Content Distribution (MCD); MCD framework; Part 9: Content Delivery Infrastructures (CDI)

PREVIEW
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Contents

Intellectual Property Rights	5
Foreword.....	5
Introduction	5
1 Scope	6
2 References	6
2.1 Normative references	6
2.2 Informative references	6
3 Definitions and abbreviations.....	8
3.1 Definitions	8
3.2 Abbreviations	9
4 Role of Content Delivery Infrastructures	10
5 Use cases and Requirements	10
5.1 Requirements from Content Providers	10
5.2 Specific Use Cases	11
5.3 Specific Requirements.....	11
6 Taxonomy of CDNs	12
6.1 Traditional Internet CDN	12
6.2 Operator VOD CDNs	13
6.3 Caches	13
7 State of the art	13
7.1 Existing and upcoming CDN Architecture Standards	13
7.1.1 ITU-T IPTV GSI, SG13 and SG16.....	13
7.1.1.1 Assessment.....	15
7.1.2 ETSI TISPAN.....	16
7.1.2.1 Assessment.....	18
7.1.3 ATIS IIF	18
7.1.3.1 Assessment.....	19
7.1.4 Open IPTV Forum	20
7.1.4.1 Assessment.....	20
7.1.5 DVB.....	20
7.1.5.1 Assessment.....	21
7.1.6 3GPP.....	21
7.1.6.1 Assessment.....	21
7.1.7 IETF CDNi	22
7.1.7.1 Assessment.....	23
7.1.8 OMA.....	23
7.2 Existing and upcoming Content Delivery Protocols	24
7.2.1 HTTP	24
7.2.2 OIPF Adaptive Streaming.....	24
7.2.3 3GPP HTTP Adaptive Streaming	24
7.2.4 MPEG DASH	24
7.2.5 ATIS Adaptive Streaming	25
7.2.6 DVB Adaptive Streaming	25
7.2.7 DTG Adaptive Streaming	25
7.2.8 IETF HTTP Live Streaming	25
7.2.9 IETF and Content Delivery.....	25
7.3 Existing and upcoming Content Injection related protocols.....	25
7.3.1 CableLabs Asset Distribution Interface (ADI)	26
7.3.2 ISO Archival Interfaces	26
7.4 Existing CDN Proprietary Solutions	26
8 Gap Analysis	26

9	CDN Architectures and Interfaces.....	27
9.1	Content Delivery	28
9.2	Content Control (Cc).....	28
9.3	Content Provision (Cp).....	28
9.4	CDN Interconnection (Ci).....	29
10	Conclusions and Recommendations.....	29
Annex A:	Bibliography	31
History		32

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Media Content Distribution (MCD).

The present document is part 9 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.1].

The present document is part of a series of Technical Reports that are providing a landscape of the subjects pertaining to Media and Content Distribution. The present document reviews Content Delivery Infrastructures.

Introduction

The last decade has seen a flurry of standards compete for attention in the space of IPTV and mobileTV, in addition to an already large number of proprietary systems. This has resulted in confusion and a lack of agreed standards, leading to the domination of proprietary implementations. Because these implementations could work in isolation without adverse relationships with the IP networks, the damage was limited to the creation of non interoperable islands, with operators building their proprietary universe in a piecemeal fashion with very limited possible reuse, increasing costs.

The next steps are seeing how TV and video applications now connect to the internet at large. The internet is a different setting: it is shared by everyone and based on strongly established legacy standards, but it is also facing the challenge of delivery content on a scale that may be above its capabilities. The growth of the Web has been made possible by the internet commercial Content Delivery Networks, which has allowed large-scale delivery of Web content.

The role of the present document is to set the stage for creating Technical Specifications in the domain of Content Delivery Infrastructures standards.

1 Scope

The present document is part 9 of the set of documents described in TR 102 688-1 [i.1].

The present document describes the domain of Content Delivery Infrastructures and the existing solution elements. It also identifies the Use Cases and Requirements that should be satisfied by the resulting solution, perform a Gap Analysis of the state of the art with respect to the requirements and outlines elements of solution that could result in new specifications.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

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2.1 Normative references

The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TR 102 688-1: "Media Content Distribution (MCD); MCD framework; Part 1: Overview of interest areas".
- [i.2] ETSI TR 102 688-2: "Media Content Distribution (MCD); MCD framework; Part 2: Views and needs of content providers".
- [i.3] ETSI TS 182 019: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Content Delivery Network (CDN) Architecture".
- [i.4] IETF RFC 3466: "A Model for Content Internetworking (CDI)".
- [i.5] ETSI TS 102 990: "Media Content Distribution (MCD); CDN Interconnection, use cases and requirements".
- [i.6] Recommendation ITU-T Y.1910: "IPTV architecture document".
- [i.7] ETSI TS 126 234 (V9.3.0): "Universal Mobile Telecommunications System (UMTS); LTE; Transparent end-to-end Packet-switched Streaming Service (PSS); Protocols and codecs (3GPP TS 26.234 version 9.3.0 Release 9)".
- [i.8] Recommendation ITU-T Y.2019: "Content delivery functional architecture in NGN".
- [i.9] ETSI TS 126 237: "Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsystem (IMS) based Packet Switch Streaming (PSS) and Multimedia Broadcast/Multicast Service (MBMS) User Service; Protocols (3GPP TS 26.237)".
- [i.10] ISO/IEC 23009-1: "Dynamic Adaptive Streaming over HTTP".

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- [i.12] ISO 20652:2006: "PAIMAS (Producer-Archive interface methodology abstract standard)".
- [i.13] ETSI TS 126 247 (V10.0.0): "Universal Mobile Telecommunications System (UMTS); LTE; Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH) (3GPP TS 26.247 version 10.0.0 Release 10)".
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- NOTE: Available at <http://tools.ietf.org/html/draft-ietf-cdni-use-cases-08>.
- [i.22] IETF draft-davie-cdni-framework.
- NOTE: Available at <http://tools.ietf.org/html/draft-davie-cdni-framework-01>.
- [i.23] IETF draft-deventer-cdni-content-terminology.
- NOTE: Available at <http://tools.ietf.org/html/draft-deventer-cdni-content-terminology-00>.
- [i.24] IETF draft-ietf-cdni-problem-statement.
- NOTE: Available at <http://tools.ietf.org/html/draft-ietf-cdni-problem-statement-08>.
- [i.25] IETF draft-jenkins-cdni-names.
- NOTE: Available at <http://tools.ietf.org/html/draft-jenkins-cdni-names-00>.
- [i.26] IETF draft-jenkins-cdni-problem-statement.
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NOTE: Available at <http://www.oipf.tv/specifications>.
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NOTE: Available at <http://www.oipf.tv/specifications>.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

adaptive streaming: process that adjusts the quality of a video based on changing network conditions to ensure the best possible viewer experience

Content Delivery Infrastructures (CDI): system of equipments and networks which role is to ensure efficient delivery of Content to clients

NOTE: Content Delivery Networks are typical examples.

Content Delivery Network (CDN): system of computers containing copies of data, placed at various points in a network so as to maximize bandwidth for access to the data from clients throughout the network

NOTE: Also known as Content Distribution Network (CDN).

content delivery: describes the delivery of Content Items over a delivery medium such as broadcasting or the Internet

content distribution: act of moving content between CDNs

content ingestion: act of introducing content (and associated data) into the Content Delivery Infrastructure

content item: piece of media "content" such as audio or video or computer software

content preparation: act of preparing content and metadata before its ingestion into a CDN

progressive download: type of streaming in which the audio or video file begins to play after a certain minimum amount of data has been transferred, rather than requiring the entire file to be downloaded before playback starts

web cache: caching of web documents (e.g. HTML pages, images, video, etc.) to reduce bandwidth usage, server load and perceived lag

NOTE: A web cache stores copies of documents passing through it; subsequent requests may be satisfied from the cache if certain conditions are met.

web proxy: in computer networks, server (a computer system or an application program) that acts as an intermediary for requests from clients seeking resources from other servers

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ADI	CableLabs Asset Distribution Interface
BCAST	Broadcast Services (OMA)
CCF	Cluster Controller Function
CD&LCF	Content Distribution & Location Control Functions
CD&SF	Content Delivery & Storage Functions
CDI	Content Delivery Infrastructure
CDN	Content Delivery Network
CDNCF	Content Delivery Network Control Function
CDN-I	Content Delivery Network Interconnection
CN	Content Network
CORBA	Common Object Request Broker Architecture
DASH	Dynamic Adaptive Streaming over HTTP
DCD	Dynamic Content Delivery (OMA)
DTG	Digital TV Group
FFS	For Further Study
FTP	File Transfer Protocol
GSI	Global Standards Initiative
HTTP	Hyper Text Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
IIF	Interoperability Forum
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IPTV	Internet Protocol television
ITF	IPTV Terminal Function
MCD	Media Content Delivery
MPEG	The Moving Picture Experts Group
NGN	Next Generation Network
OAIS	Open Archival Information System
OIPF	Open IPTV Forum
OMA	Open Mobile Alliance
PAIMAS	Producer-Archive Interface Methodology Abstract Standard
PIM	Personal Information Manager
RTMP	Real Time Messaging Protocol
RTP	Real-Time Protocol
RTSP	Real-Time Streaming Protocol
SDP	Service Delivery Platform
SIP	Session Initiation Protocol
STB	Set Top Box
TV	TeleVision
UDP	User Datagram Protocol
UE	User equipment
URI	Uniform Ressource Identifier
VOD	Video On Demand

4 Role of Content Delivery Infrastructures

The role of Content Delivery Infrastructure is to efficiently, scalably and with adequate performance and timeliness distribute content items to final customers.

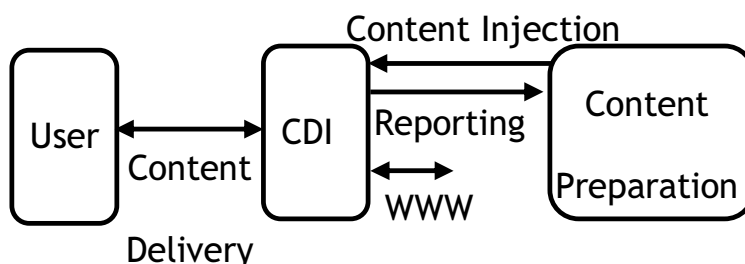


Figure 1: CDN in context

CDIs interact with two main entities: Content Provision on the upstream and Clients (users) on the downstream.

CDIs get their content from an upstream source: the Content Provision. The Content Provision typically injects content into the CDI and extracts or receives reports on content consumption.

The role of the CDI is to respond to user requests for given pieces of content. The "Content Delivery" relationship is constrained by what protocols clients implement.

Alternatively, the CDI can retrieve content from the internet on behalf of the client, thus behaving like a Web Proxy.

5 Use cases and Requirements

This clause gathers use case and requirements from earlier MCD documents (notably [i.2]) and adds more elements that were derived from a more precise understanding of the content delivery landscape.

5.1 Requirements from Content Providers

The following requirements are being abstracted from the "Needs of content Providers" document [i.3]:

- R1: Support of Content access through a Content Portal
- R2: Support for protected content delivery, support for different Content Protection Mechanisms
- R3: Support for content delivery reporting mechanisms (optionally qualified by destination, time, etc.)
- R4: Support for file-based and stream-based content delivery
- R5: Support for Progressive Download and Adaptive Streaming
- R6: Support of a mechanism to remove content items from the CDI
- R7: Support for joint delivery of Metadata and Content
- R8: Support for control of delivery based on geographic location criteria
- R9: Support for Push and Pull models of content provision
- R10: Content Format neutrality, including content encapsulation and content protection
- R11: Support for Multicast Delivery

5.2 Specific Use Cases

The content Delivery Infrastructure should satisfy the following use cases:

User

- **UC1:** Operator content Live Streaming: an operator offers content for live streaming, the user retrieves the content from the CDI as it is being played
- **UC2:** Internet content Live Streaming: an item of content is offered by an internet content provider, the user retrieves the content from the CDI as it is being played
- **UC3:** Operator content downloading: an operator offers content download, the user retrieves the content from the CDI for later consumption
- **UC4:** Internet content downloading: an item of content is offered by an internet content provider, the user retrieves the content from the CDI for later consumption
- **UC5:** Interconnection of CDNs for wide distribution
- **UC6:** Interoperable Content Injection
- **UC7:** Mobile streaming: an operator offers content for live streaming, the mobile user retrieves the content from the CDI as it is being played, through the mobile network

CDN Interconnection Use Cases should be looked up in annex A of [i.5].

5.3 Specific Requirements

The following requirements should be satisfied by the Content Delivery Infrastructure:

Network:

- RN01: Should work on basic IP networks
- RN02: Should be portable on different network infrastructures (ITU-T or ETSI NGN, 3GPP, IETF, etc.)
- RN03: Should not require deep integration with a specific underlying infrastructure
- RN04: Should not unnecessarily prescribe CDN implementation
- RN05: Should support delivery to mobile terminals as well as fixed terminals
- RN06: Should optionally support specific delivery modes for mobile terminals
- RN07: Should optionally support QoS for delivery of content to the user
- RN08: Should not expose QoS in the user interface
- RN09: Should reuse existing protocols to the maximum possible extent
- RN10: Should be reusable for different applications

User-related:

- RU1: Should support basic delivery protocols: HTTP and optionally RTSP/RTP
- RU2: Should support progressive download and Adaptive Streaming delivery modes where applicable
- RU3: Should support trick modes for Content Delivery
- RU4: Should support geographic proximity Content Delivery
- RU5: Should support mechanisms for request routing (i.e. allowing requests to be transferred to different entities to improve the operation efficiency)