Content Delivery/Distribution Networks (CDN)

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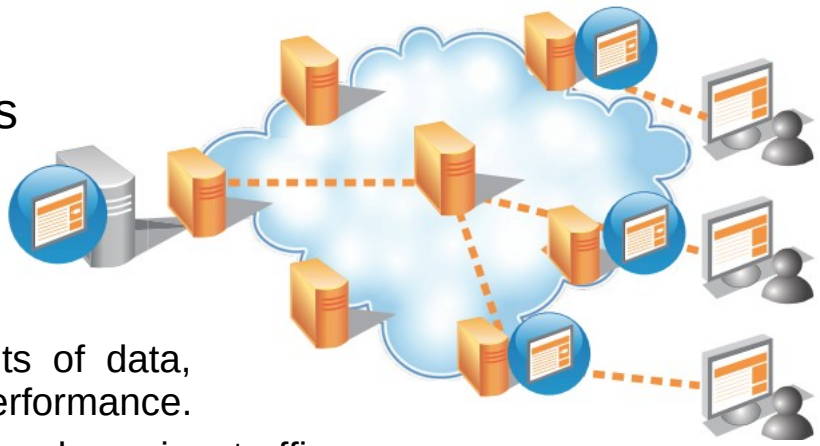
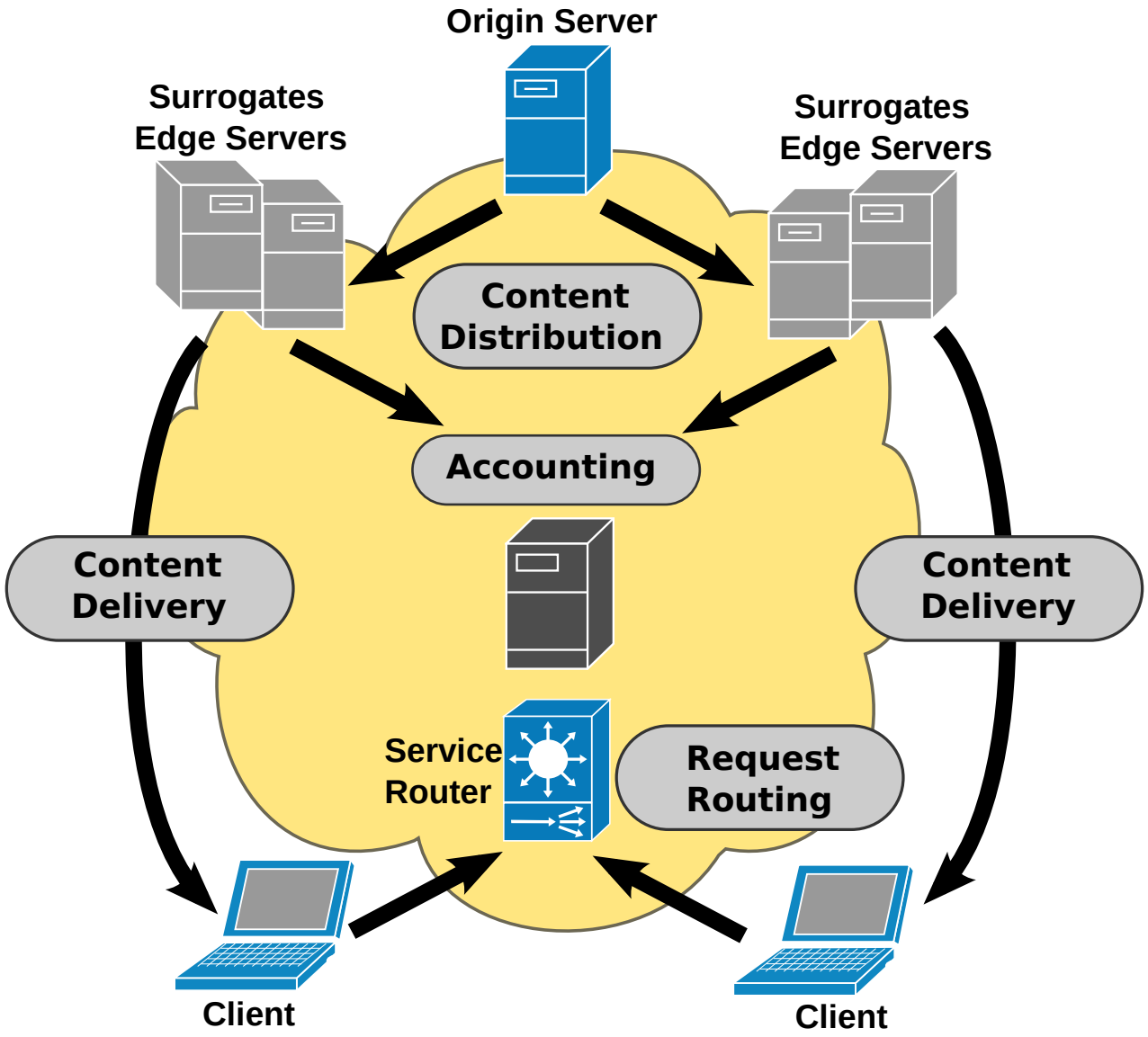


- Consists of geographically distributed network of servers around the globe.
- Improvement goals:
  - Scalability
    - Ability to expand in order to handle new and large amounts of data, users and transactions without any significant decline in performance.
    - Dynamically allocation of resources to address flash crowds and varying traffic.
    - Acts as a shock absorber for traffic by automatically providing capacity-on-demand to meet the requirements
    - Avoids costly over-provisioning of resources and provides high performance to every user.
  - Security
    - Provides protection of content against unauthorized access and modification, distributed denial-of-service (DdoS) attacks, viruses, and other unwanted intrusions.
    - Eliminates the need for costly hardware and dedicated component to protect content and transactions.
  - Reliability, Responsiveness and Performance
    - Improves client access to content through (ng it from multiple locations.
    - The reliability and performance is affected by the distributed content location and routing mechanism, as well by data replication and caching strategies.
- Evolution
  - First Generation: Focused on Static or Dynamic Web Document.
  - Second Generation: Focused on Video-on-Demand (VoD), audio and video streaming.

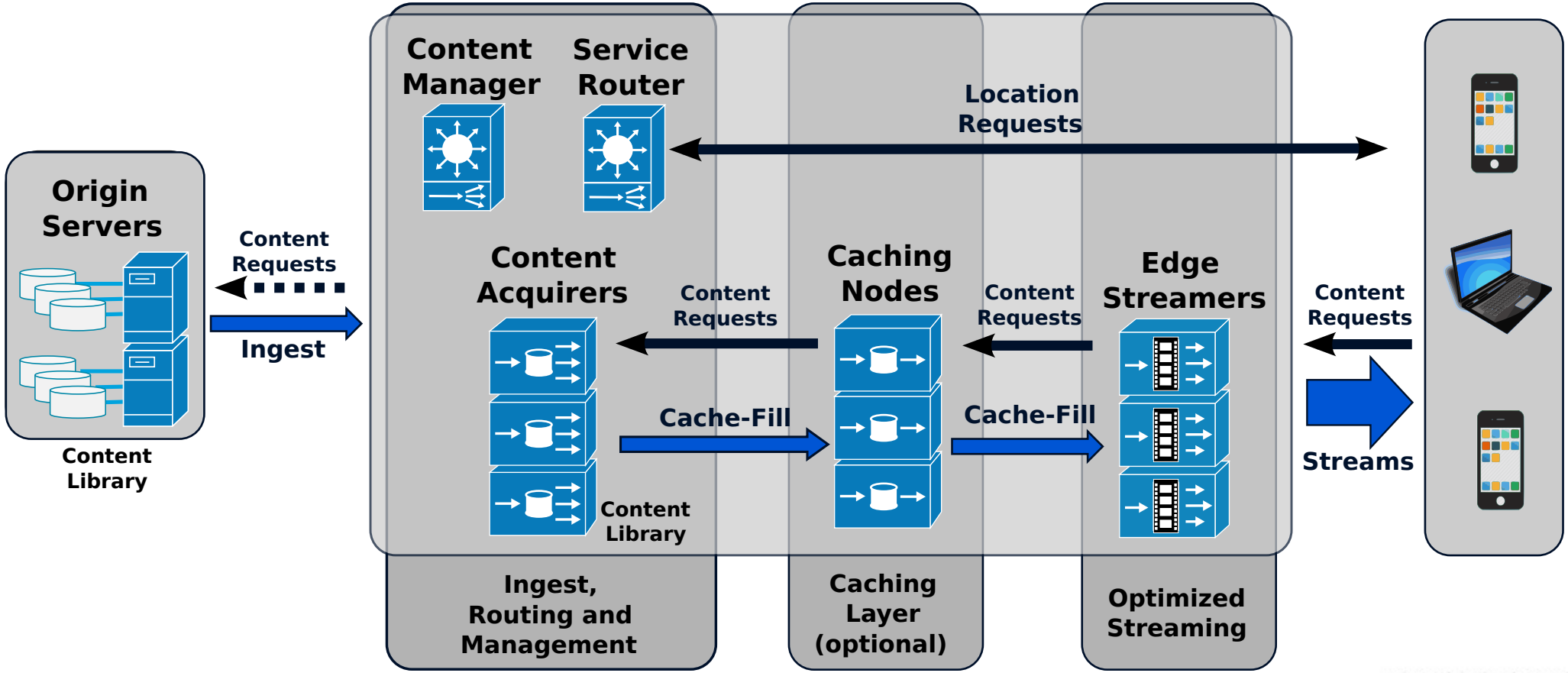
CDN Components

- **Content Delivery** Infrastructure
  - Delivering content to clients from Surrogates (Edge Servers).
- **Request Routing** Infrastructure
  - Steering or directing content request from a client to a suitable Surrogate.
- **Content Distribution** Infrastructure
  - Moving or replicating content from content source (origin server, content provider) to surrogates.
- **Accounting** Infrastructure
  - Logging and reporting of distribution and delivery activities.



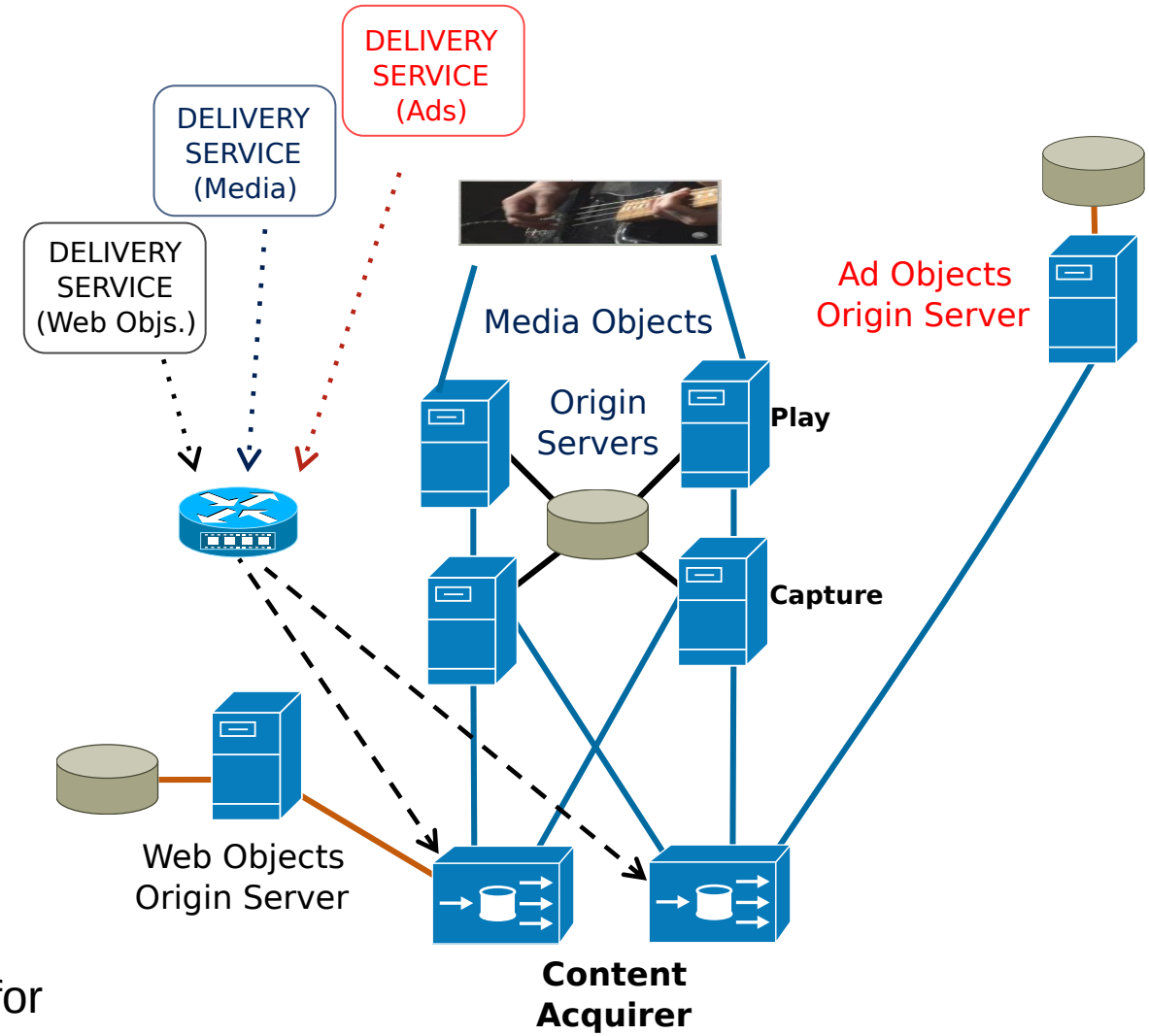
CDN for VoD and Streaming

- VoD and Streaming have QoS strict requirements.
- Surrogates become:
  - Content Acquirers
  - Cache Nodes
  - Edge Streamers



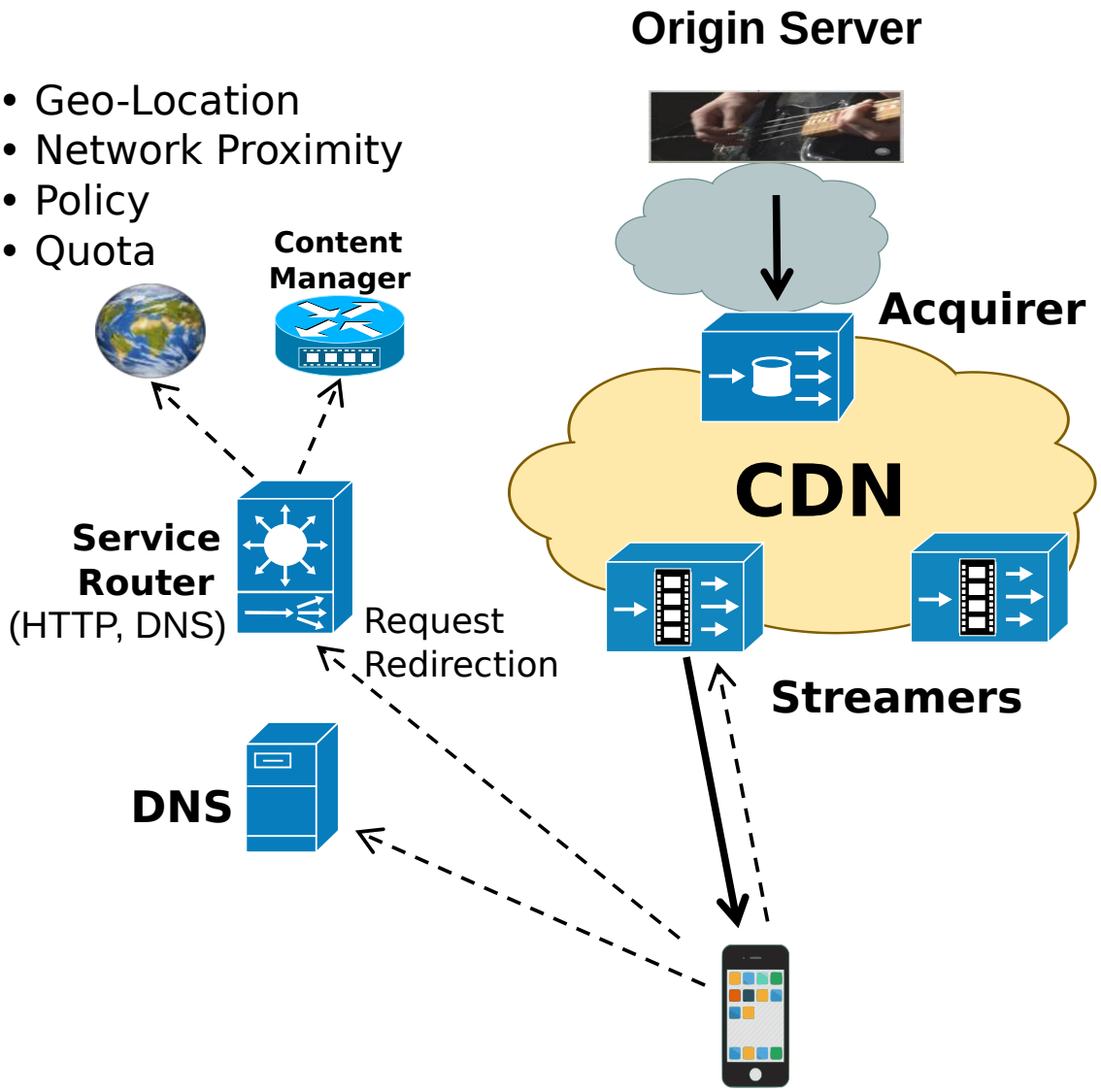
Origin Servers

- Origin Servers (OS)
  - Organized Media on Storage.
  - Authorize Acquirers.
  - Package Content.
- Ingest must be flexible, resilient and secure.
- CDN can ingest from multiple Origin Servers.
  - Local or Remote locations.
- Origins can be replicated.
  - Locally (load balancing).
  - Remotely (disaster recovery).
- Origins can have structure.
  - Security.
  - Capture/Recording/Playout separation for better scalability.

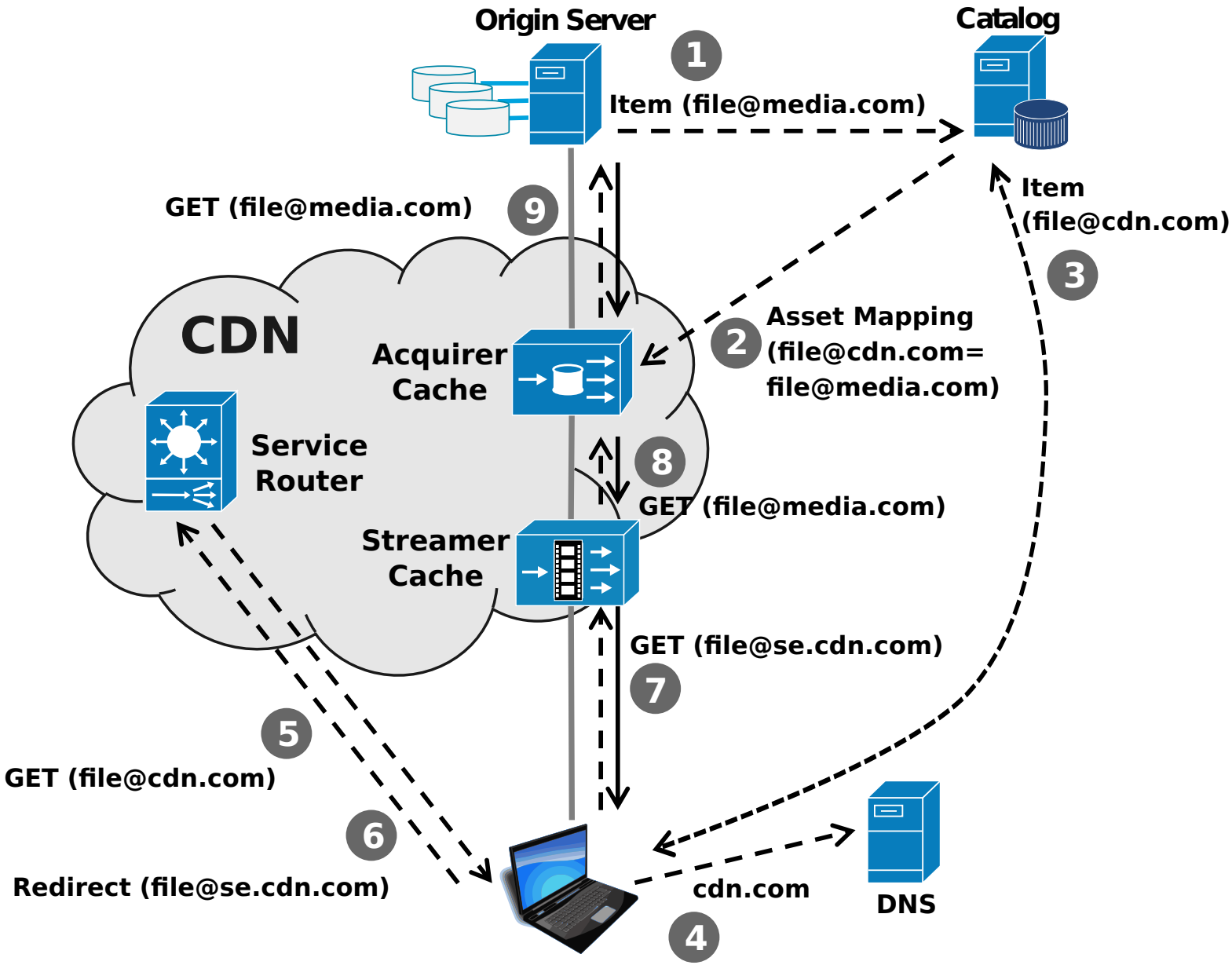


Routing Service

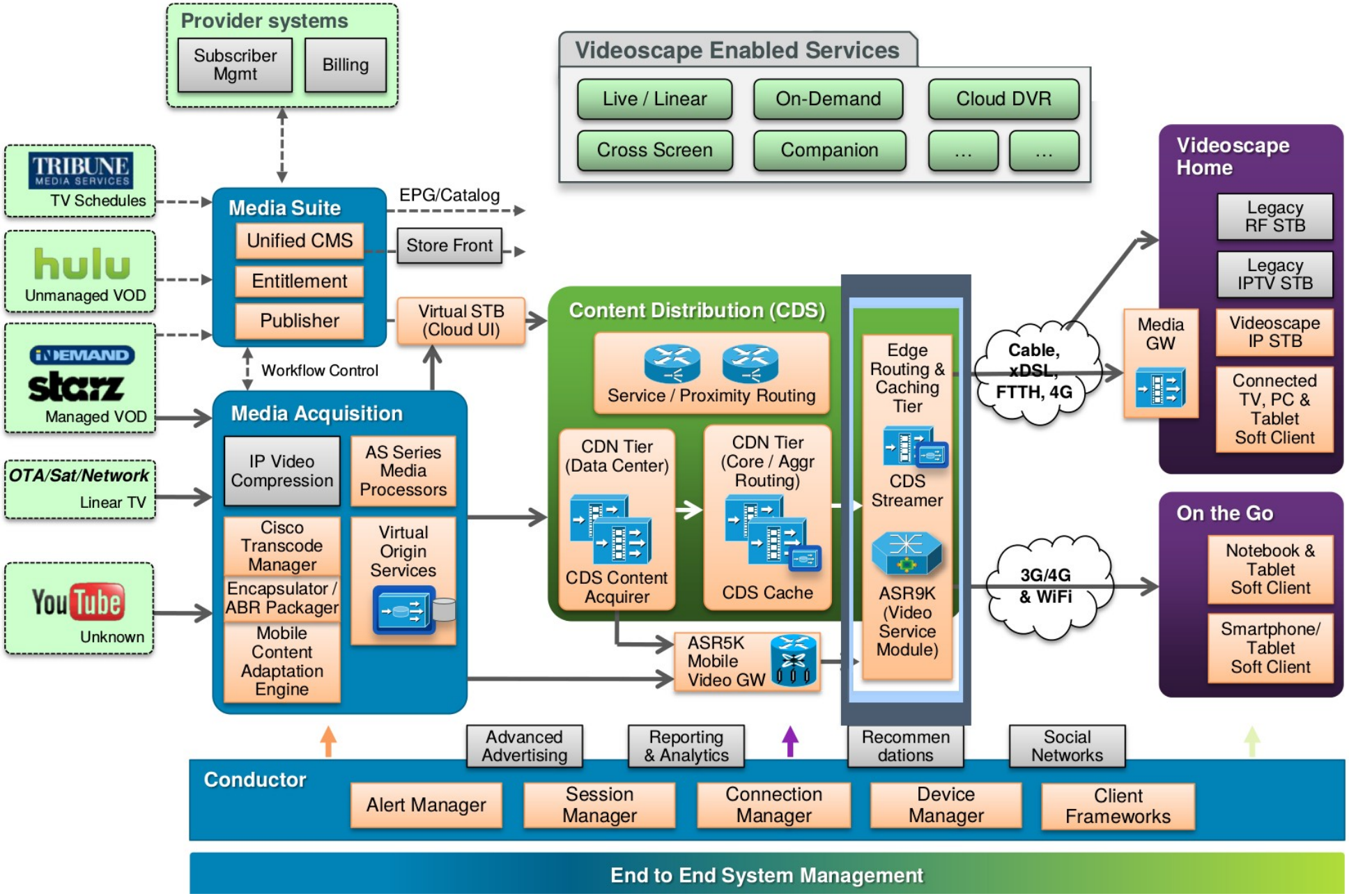
- Request Redirection model.
  - Service Router is the Authoritative DNS for “Delivery Service”.
- HTTP-based 30x redirection.
  - Service Router resolves domain name to its own IP address.
  - Service Router then uses HTTP 302/307 redirection to a Streamer.
- DNS-based redirection.
  - Service Router resolves domain to IP address of Streamer.
- Service Router Criteria.
  - Based on Client IP Address.
    - Determines Geo-Location, Network Proximity, Policy, and/or Quota.



CDN Caching


Origin Server
Catalog
1
Item (file@media.com)
GET (file@media.com)
9
Item
(file@cdn.com)
3
CDN
Acquirer
Cache
2
Asset Mapping
(file@cdn.com=
file@media.com)
Service
Router
8
GET (file@media.com)
Streamer
Cache
GET (file@se.cdn.com)
7
5
GET (file@cdn.com)
6
Redirect (file@se.cdn.com)
cdn.com
4
DNS

A CDN Architecture



Source: Cisco,Guillaume Gottardi, Next Generation Service Edge Architectures, CiscoLive London 2012

Alternative CDN Content Distribution

- Content Classification
  - Content manager assesses content popularity.
  - Content manager drives content distribution.
    - Popular Content is pre-positioned on the edge.
    - Less Popular content is dynamically cached from central site.
    - Unpopular content is off-loaded directly to Origin.
  - Content popularity may change!
- Peer to peer
  - Distributed Hash Table model.
  - Content can be cached anywhere.
  - Appropriate in fully meshed topologies.