



Enabling Media Rich Curriculum with Content Delivery Networking

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Media Rich Content & Communication

- **Online & Software Based Content**
- **Whole class teaching**
- **Individual learning**
- **Distance learning**



Warren Junior, Barking & Dagenham LEA, UK

Examples UK Content Providers:

espresso[™]
education



Granada Learning



Network – User Perception (Ideal)

Data Centre

Cust. Prem.

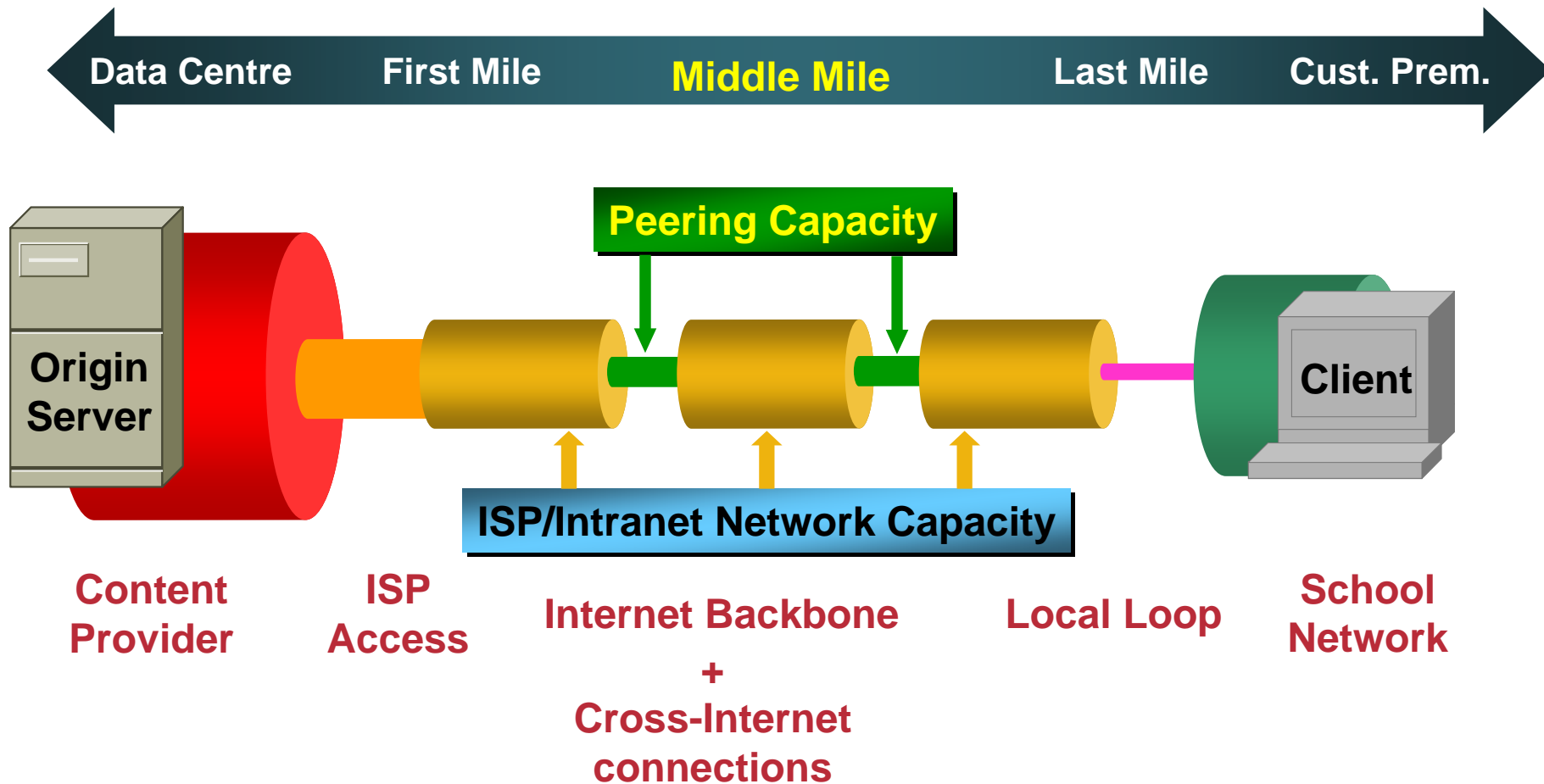


**Content
Provider**

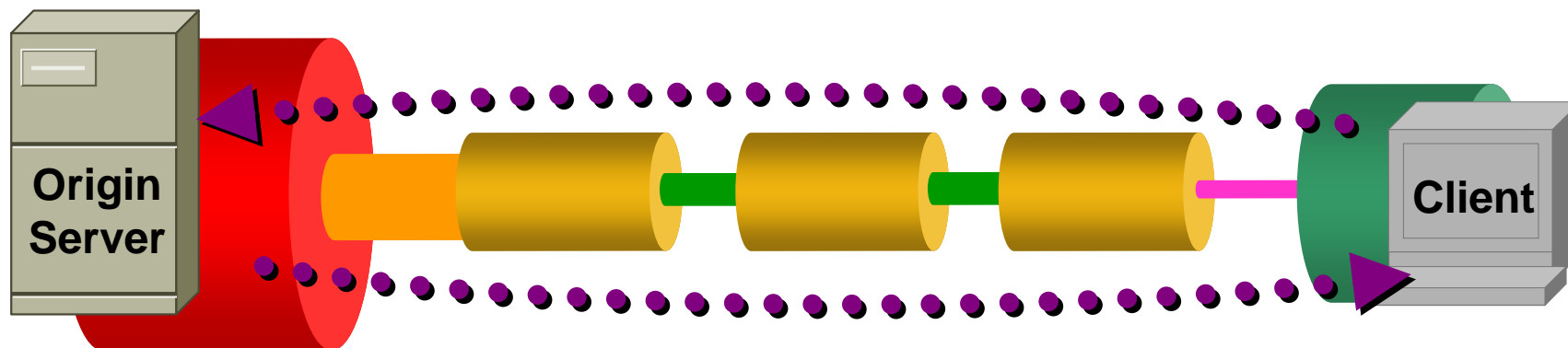
Internet

**School
Network**

True Anatomy of a Network

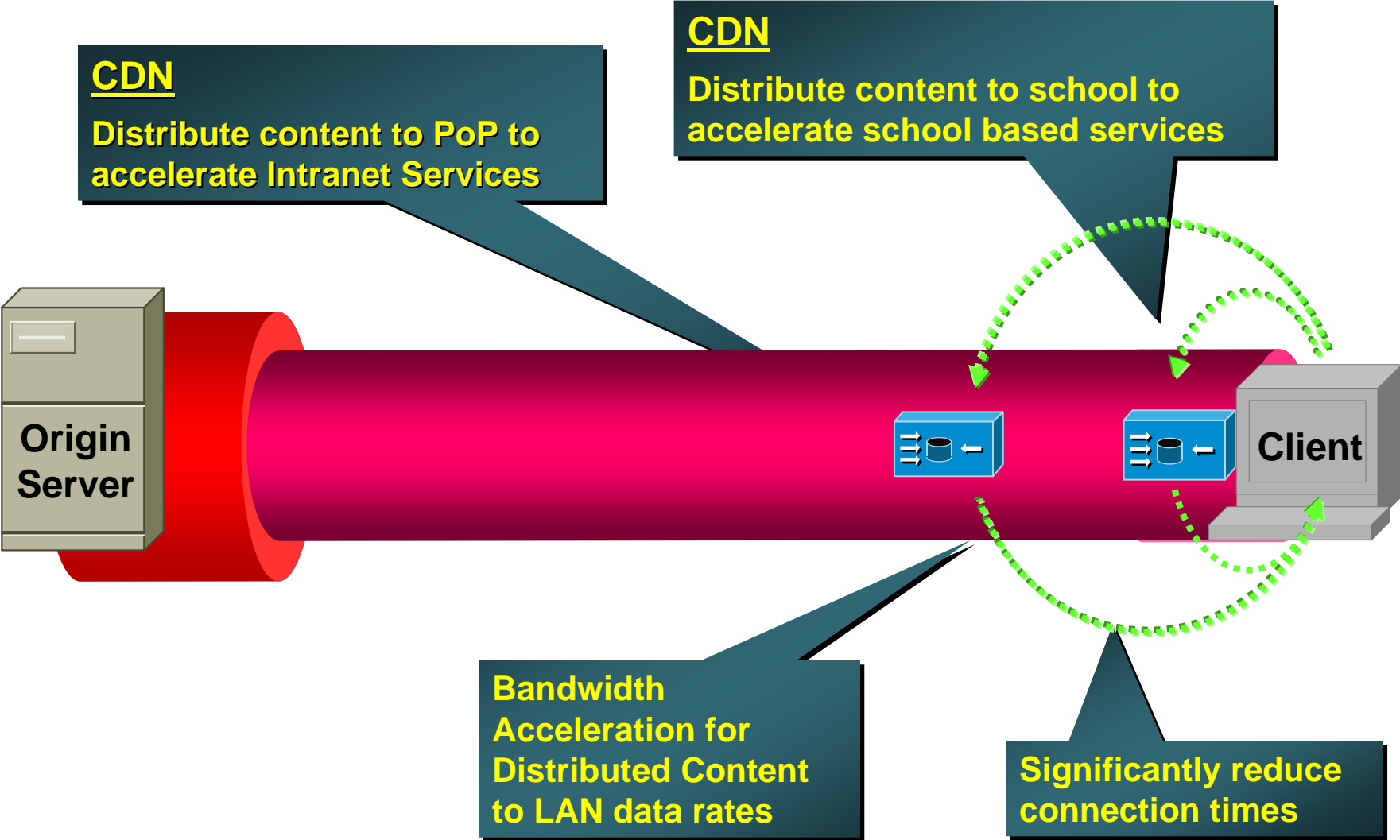


Impact on Solutions Deployment



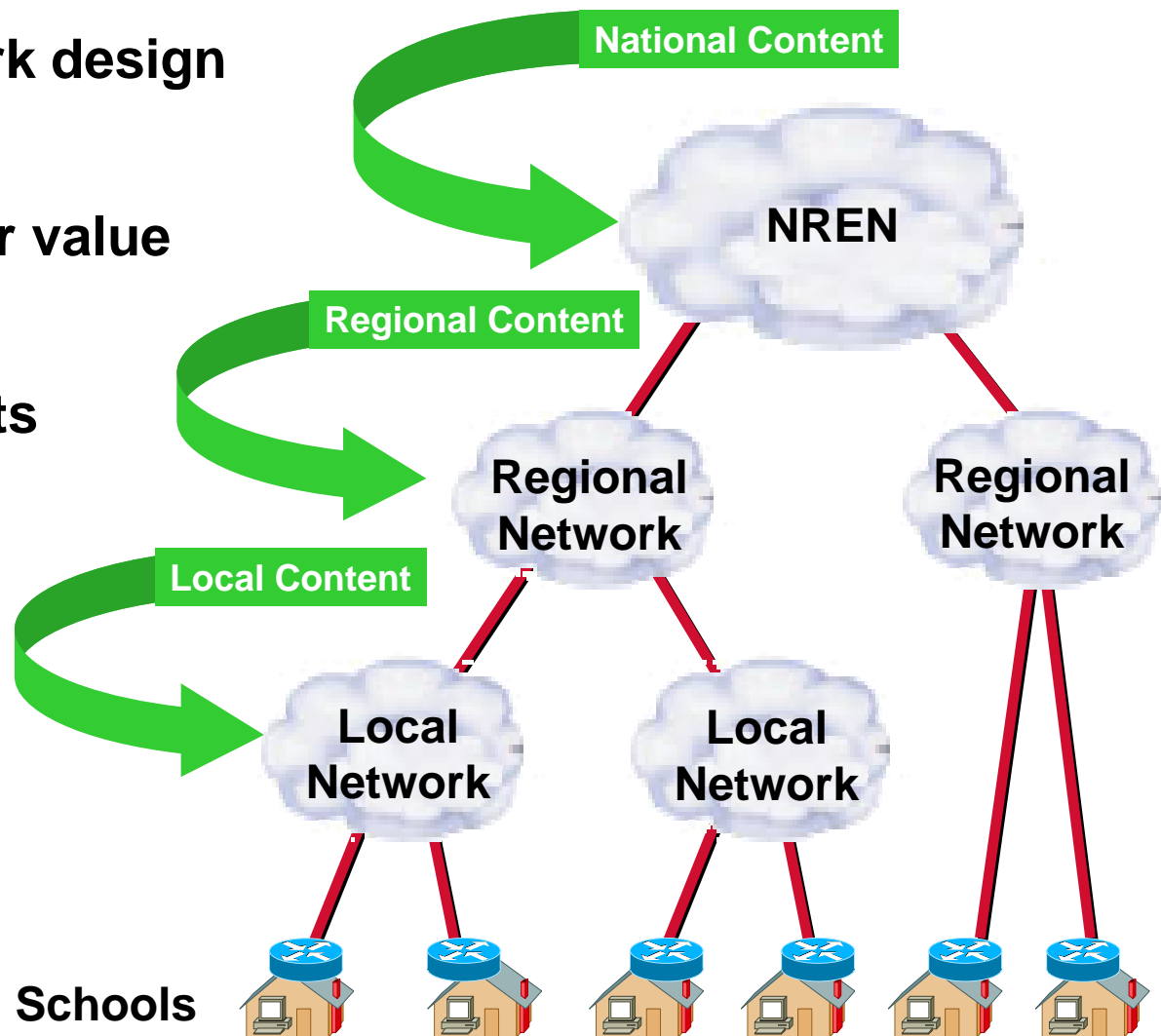
- **Poor Application Performance**
- **No means to enable Rich/Streaming Media Content**
- **User Dissatisfaction (teachers won't use)**
- **Ineffective Use of Bandwidth & Server Resources**

Content Acceleration with CDNs



Education Content Distribution Networking

- Embed CDN into network design
- Build with connectivity
- Network delivers greater value
- Equity of services
- Reduce Bandwidth Costs



Agenda

- **Definitions**
- **Applications**
- **Operation**
- **Key considerations**
- **Scottish Schools Digital Network**

What is the Difference Between Simple Caching and True Content Delivery Networking?

Caching:

Reactive - Stores and serves content from edge nodes on the local network based on users' requests and content freshness (pull model).

Content Delivery Network (CDN):

Proactive - Pre-populates content (especially large files) , under control of the Content Distribution Manager, to edge nodes ahead of users' requests (push model). Serves content on local network as requested.

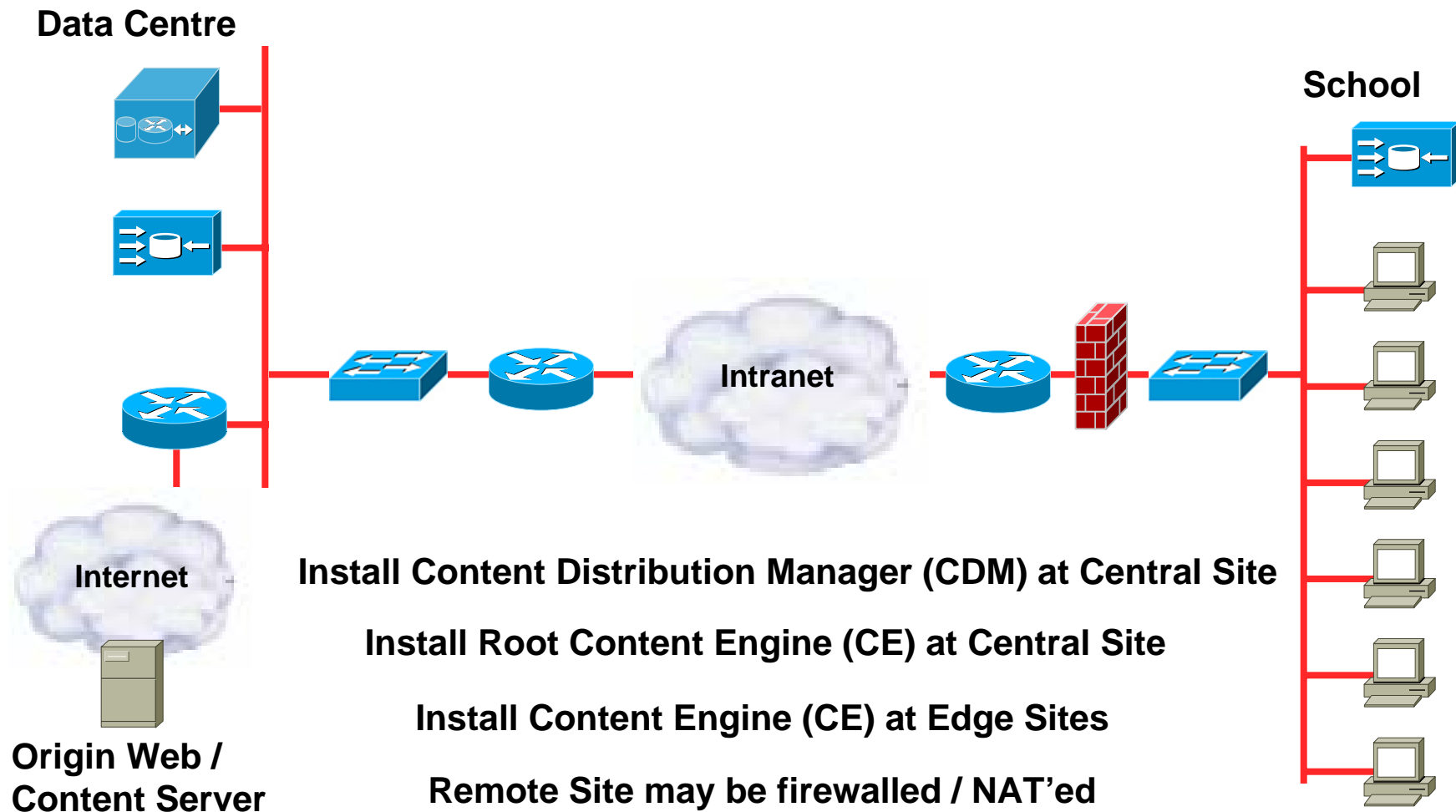
Need to deliver both Caching and CDN in one Solution

Caching and Content Delivery Applications

- **Delivery of curriculum content**
- **Professional development / training**
- **Software distribution**
- **Virus engine and definition distribution**
- **Live and scheduled lectures**
- **Conferences**
- **Executive broadcasts**
- **TV distribution**



Setup



Content Engine Considerations

- **Appliance v Server**

 - Reliability

 - Performance

 - Management

 - TCO

- **Content Filtering**

 - User based

 - Filter locally, control centrally

- **Storage**

 - Internal & SAN / NAS

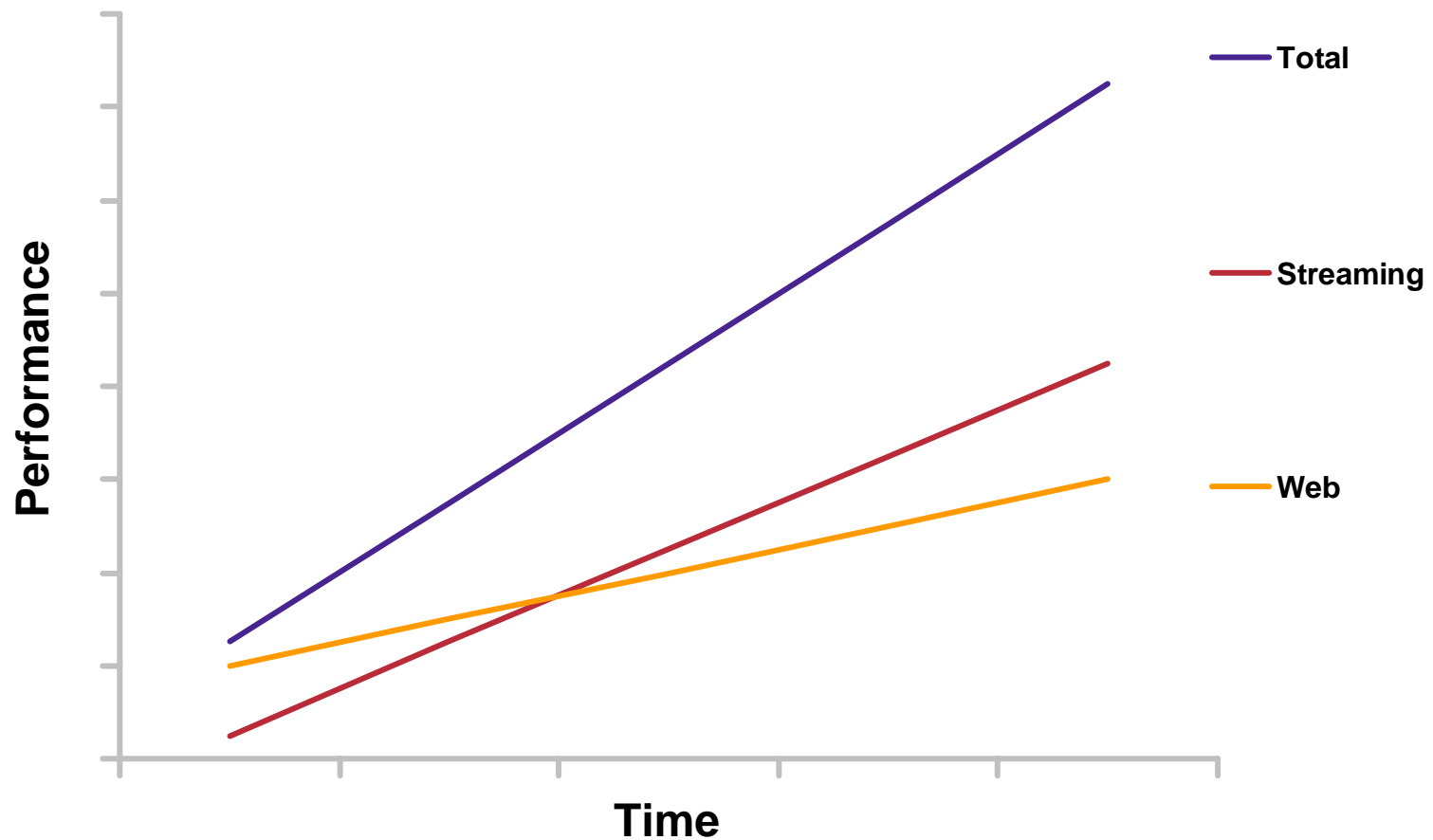
Rack Mount Appliance



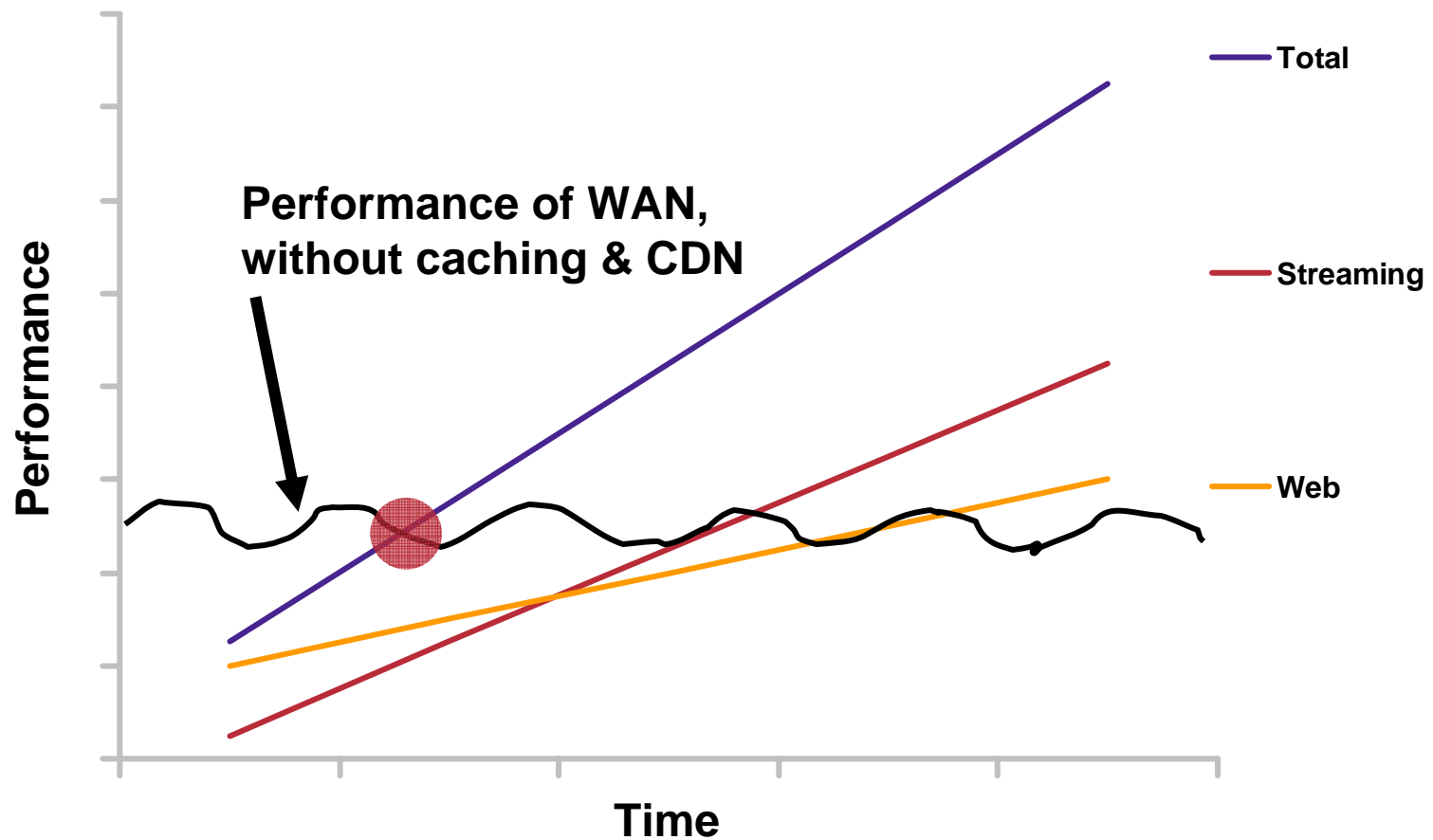
Access Router Module Appliance



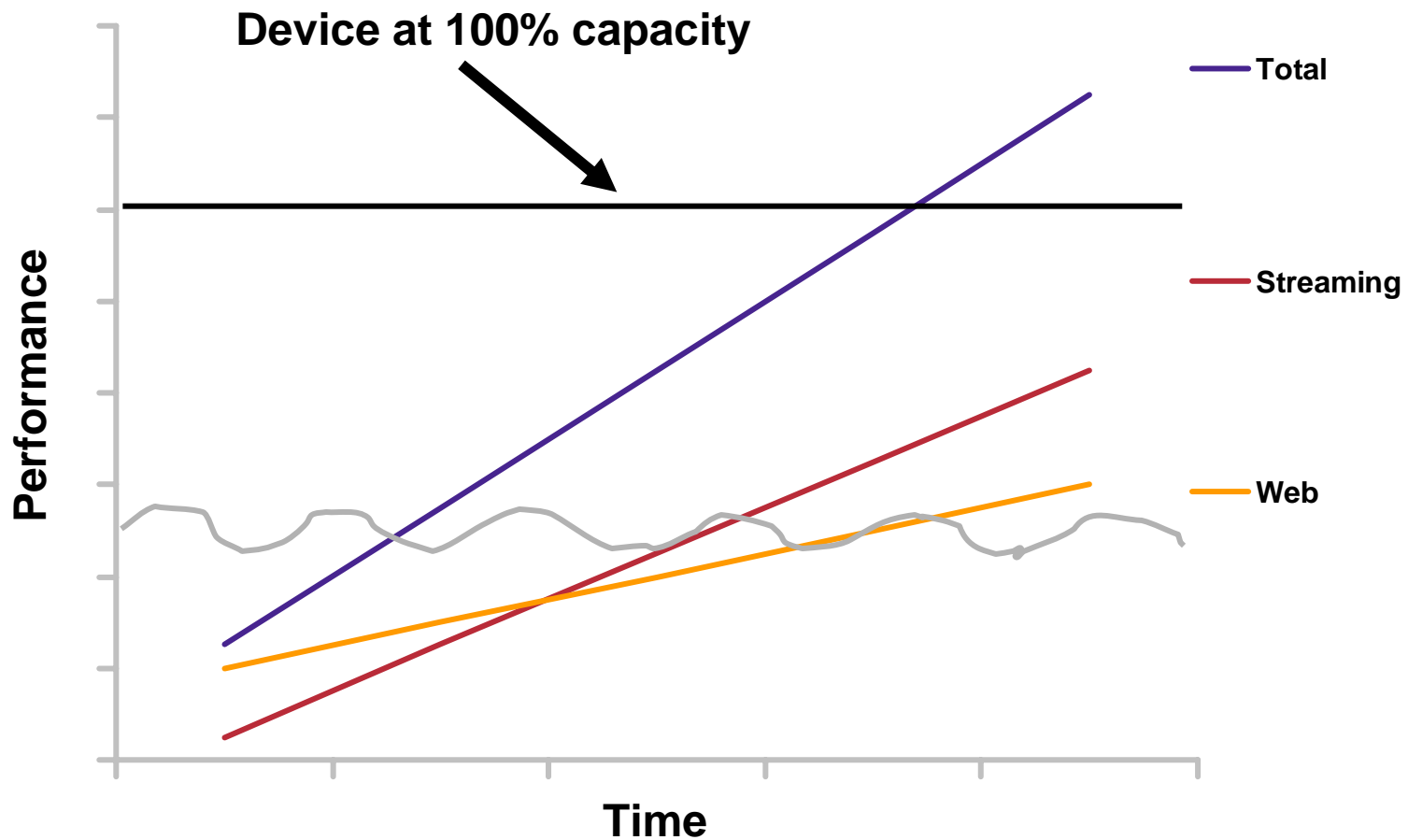
Performance – Types of Content



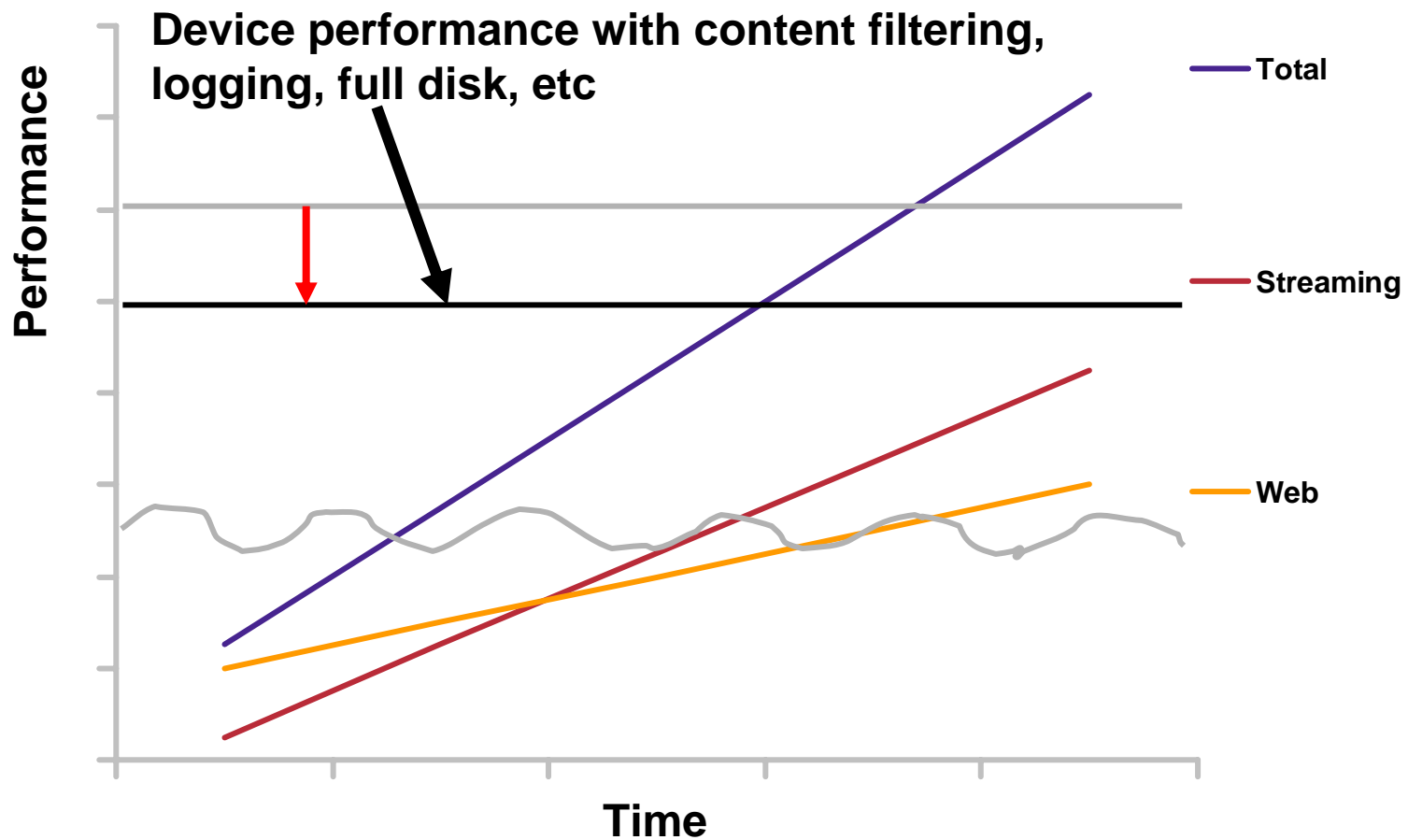
Performance – Native WAN Maximum



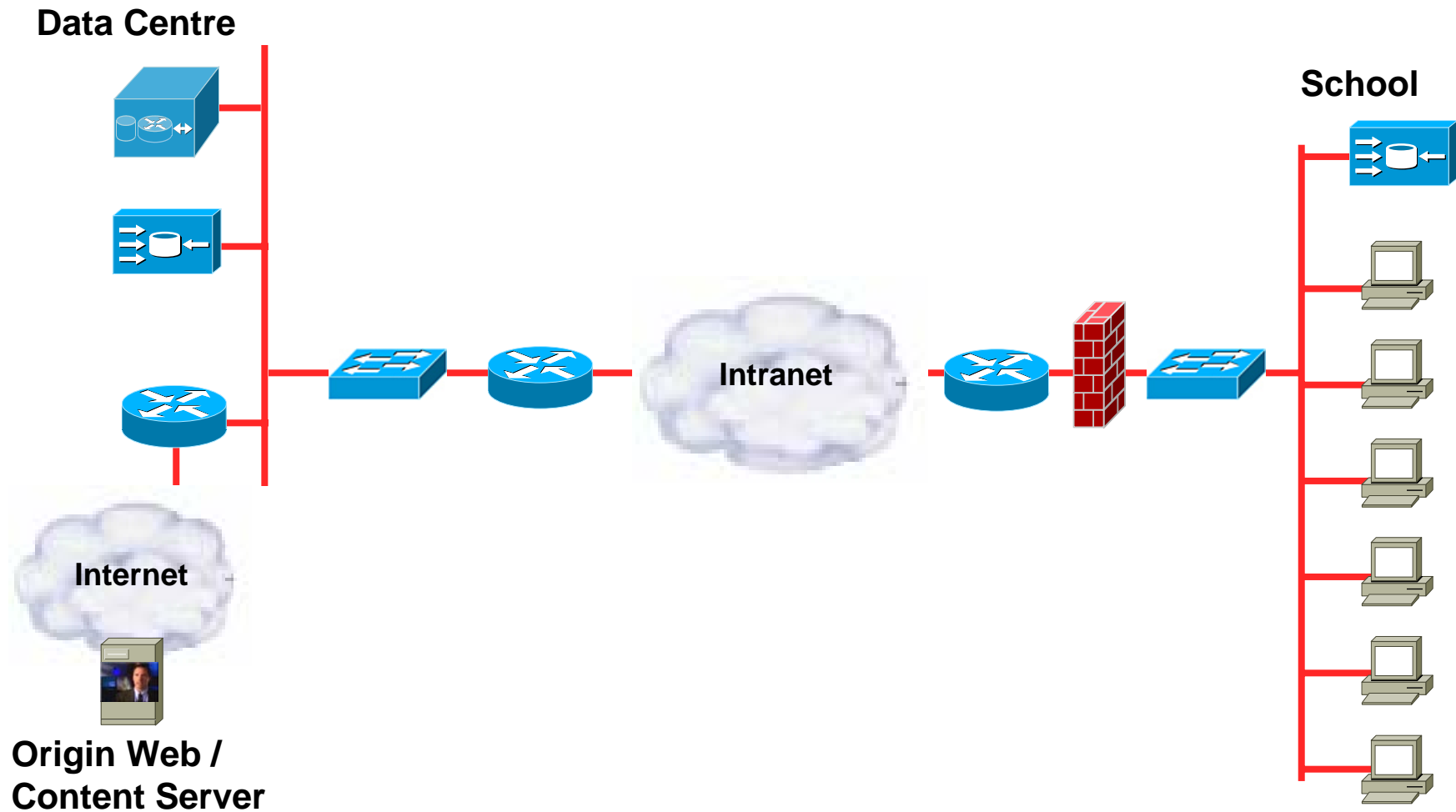
Performance – Content Engine Maximum



Performance – Content Engine Maximum



Identify Content



Identify Content

- **Interface**

 - CDM web interface

 - API to 3rd party – portal, content directory or learning management system

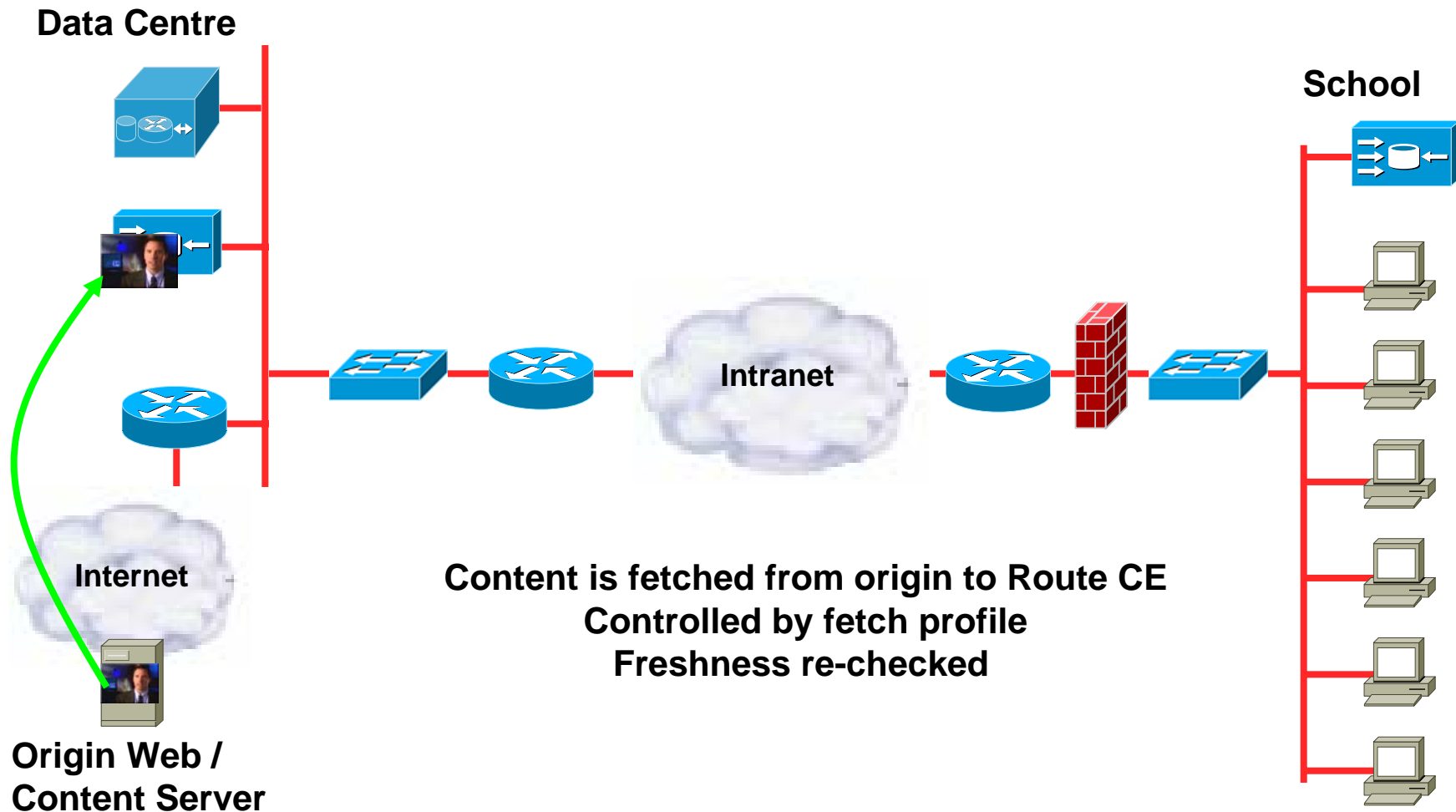
- **Identify Content**

 - XML Manifest list

 - Generated by content provider, portal, content directory or learning management system

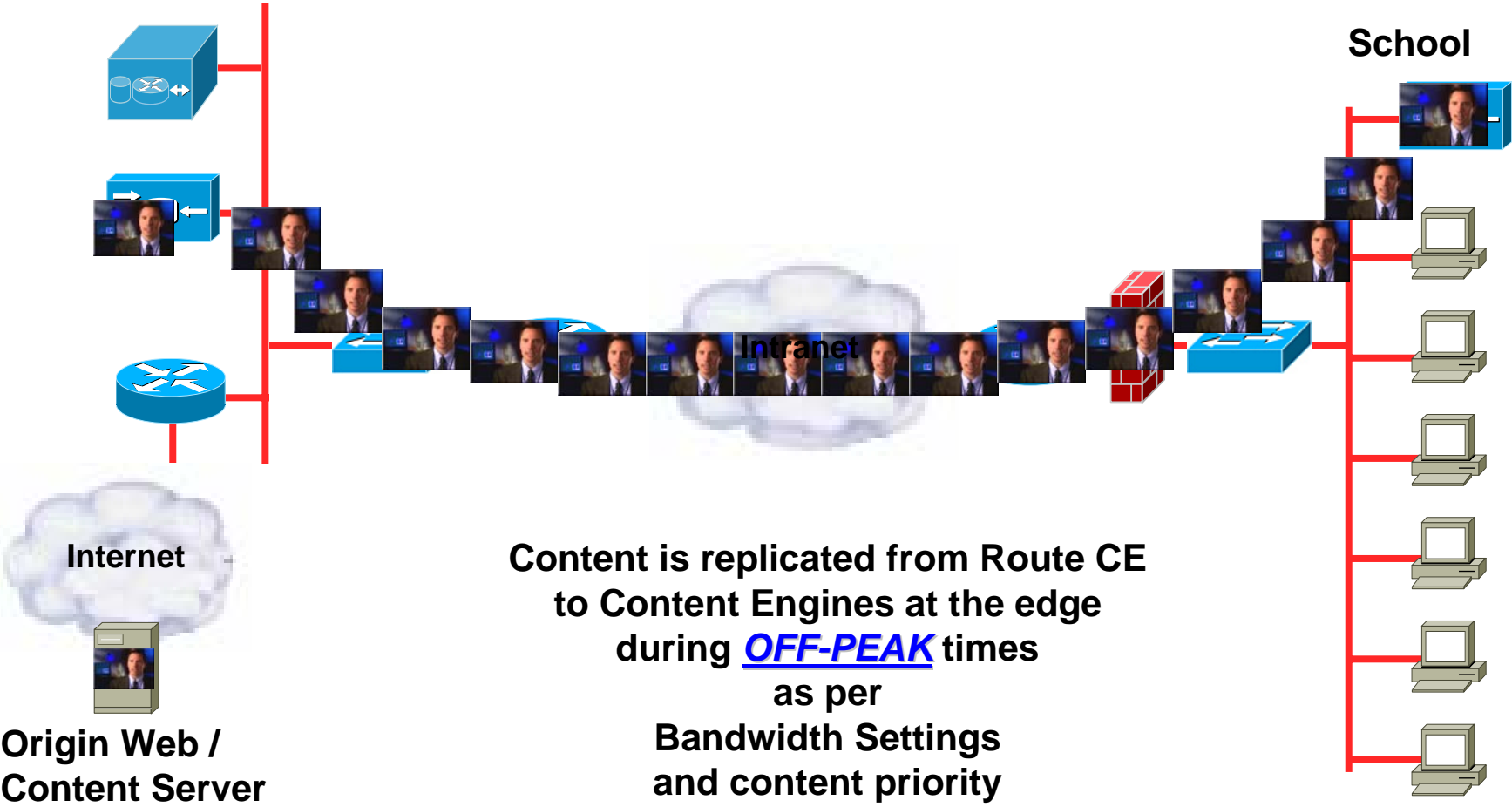
```
<?xml version="1.0"?>
<CdnManifest xmlns:xsi =
  "http://www.w3.org/2001/XMLSchema-
  instance"
  xsi:noNamespaceSchemaLocation =
    "CdnManifest.xsd">
  <server name="cisco-cco">
    <host name="http://www.cisco.com"
      proto="http" />
  </server>
  <item \
    server="cisco-cco"
    src="jobs/index.html"/>
  <crawler
    server="cisco-cco"
    start-url="index.html"
    reject="\.pl"
    depth="4"/>
</CdnManifest>
```

Fetch Content



Replication

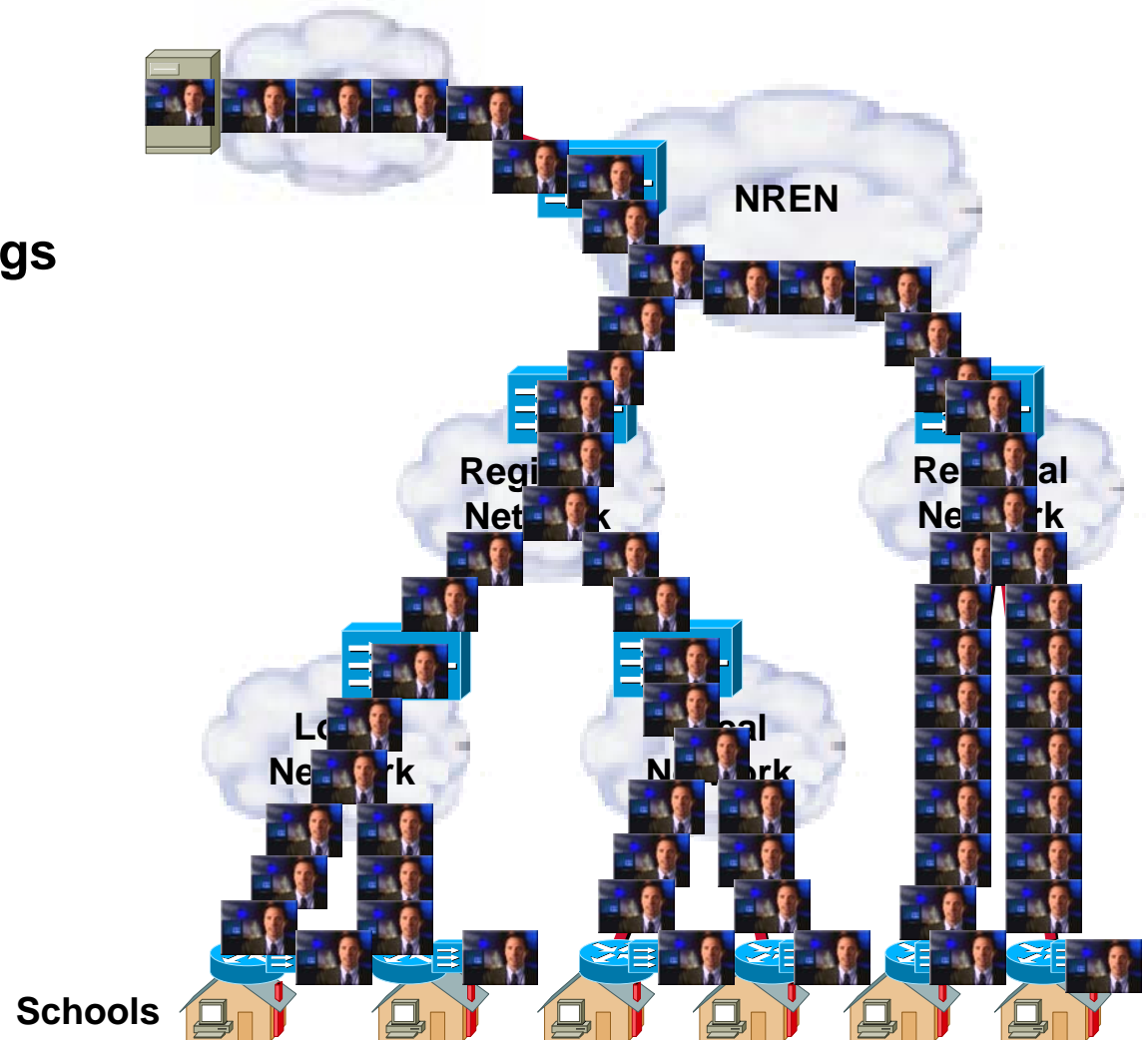
Data Centre



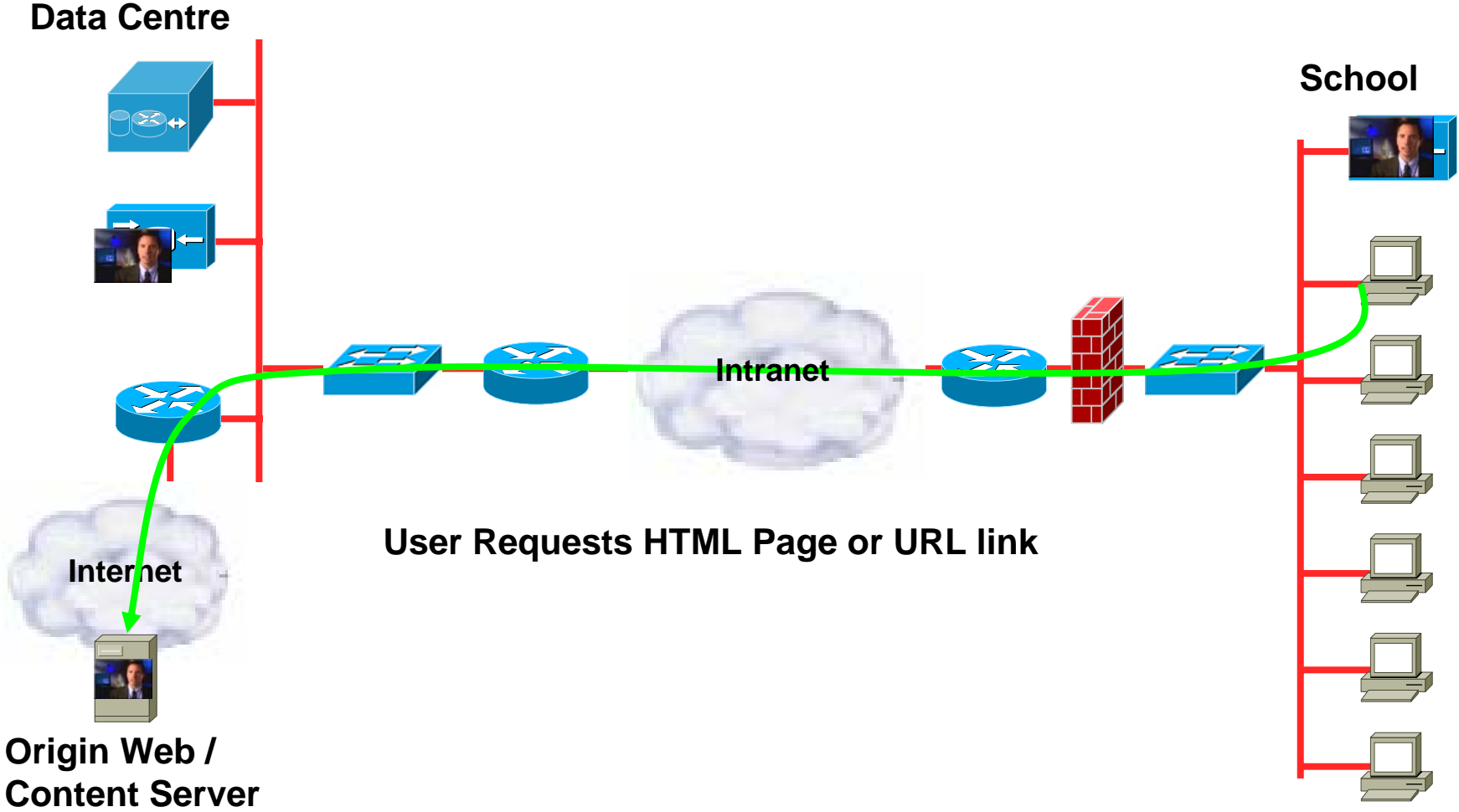
Content is replicated from Route CE to Content Engines at the edge during **OFF-PEAK** times as per Bandwidth Settings and content priority

Hierarchical Replication

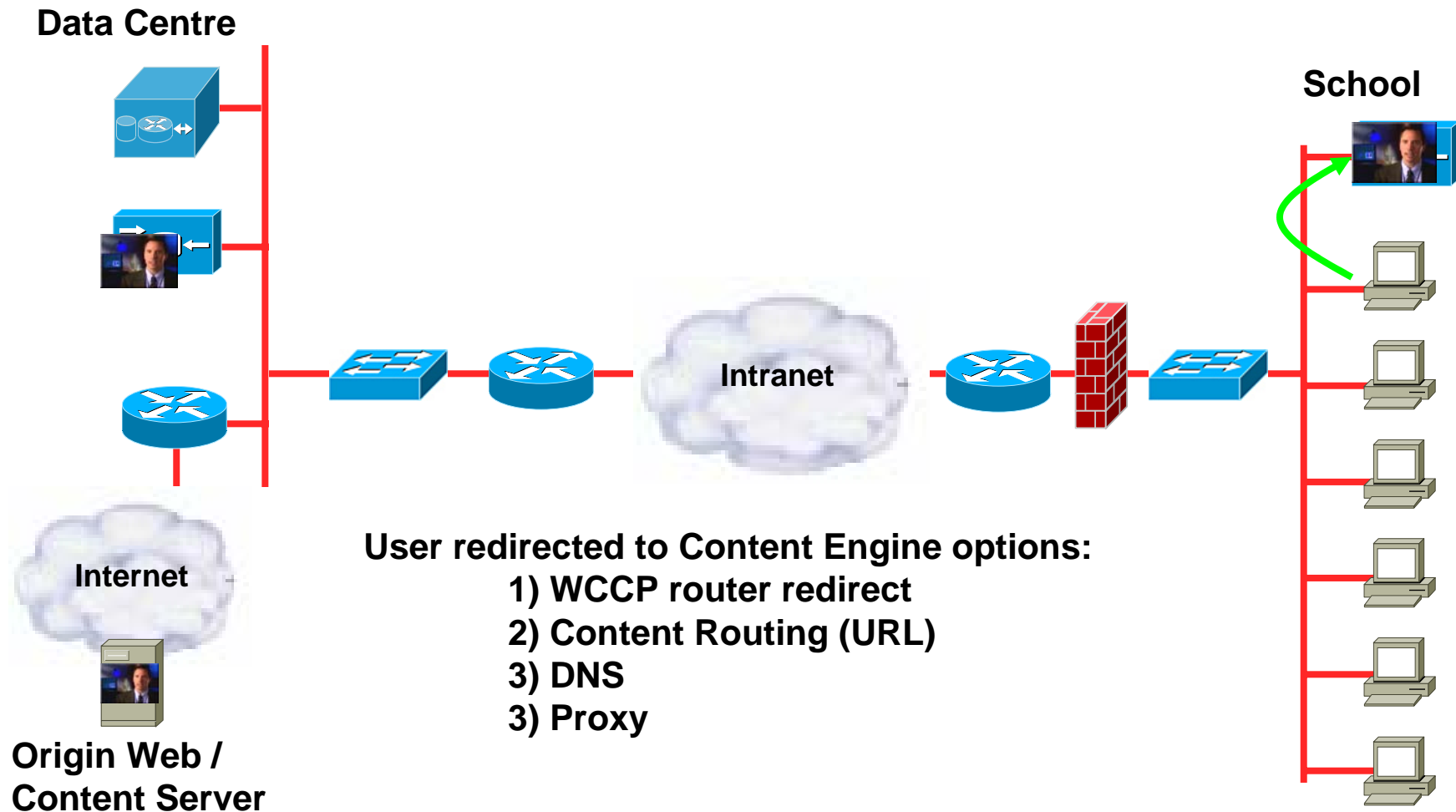
- **Replicate per level**
Different replication settings per Content Engine
Group management
- **Unicast or Multicast**



User Requests



Redirection



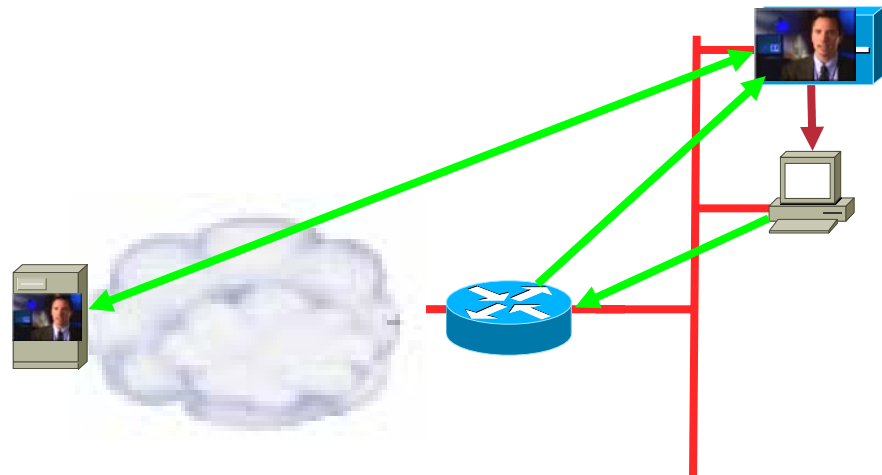
Transparent Operation with WCCP

- **Web Cache Communications Protocol**
- **Benefits**

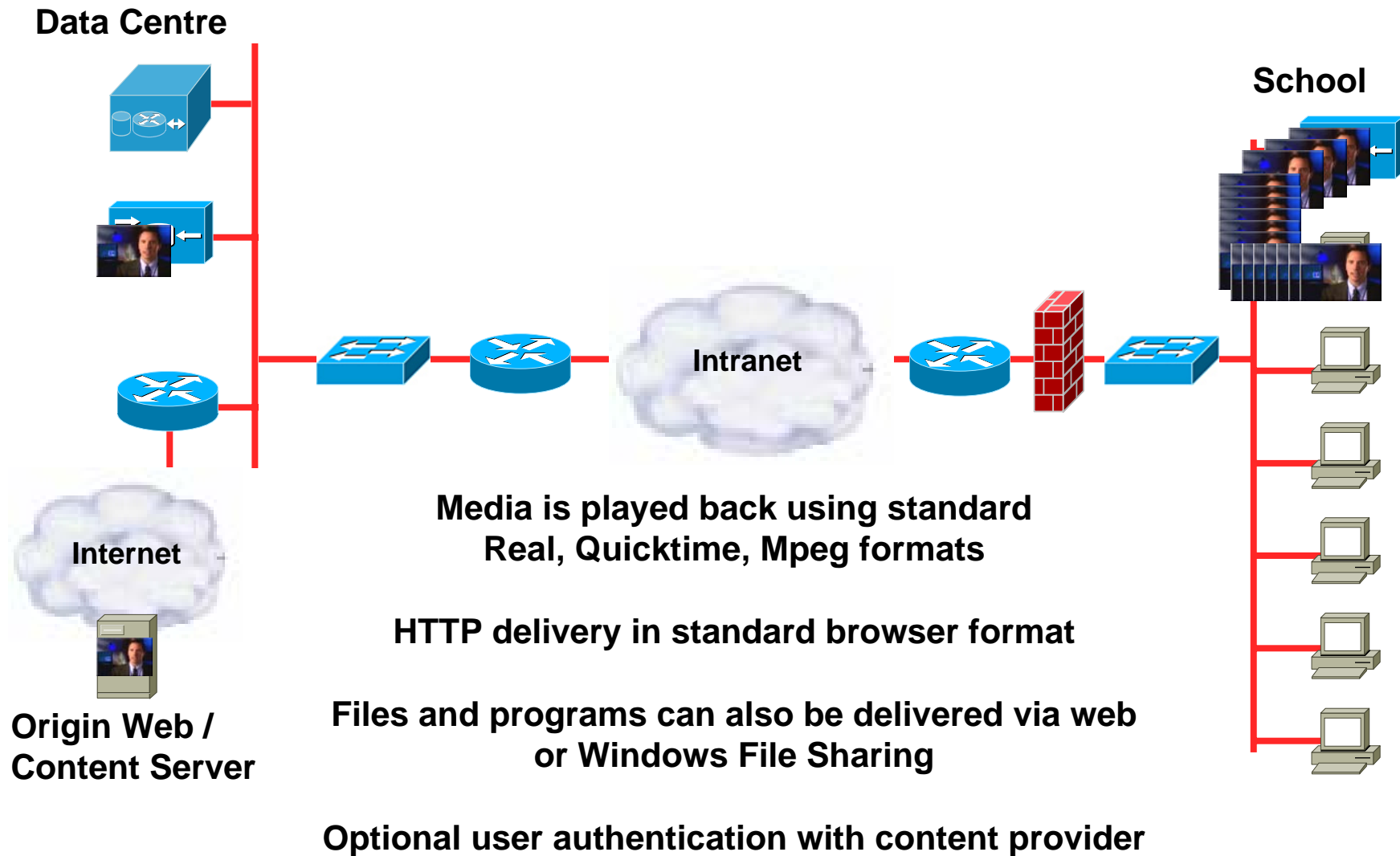
No PC re-configuration

**Automatic failure and
overload by-pass**

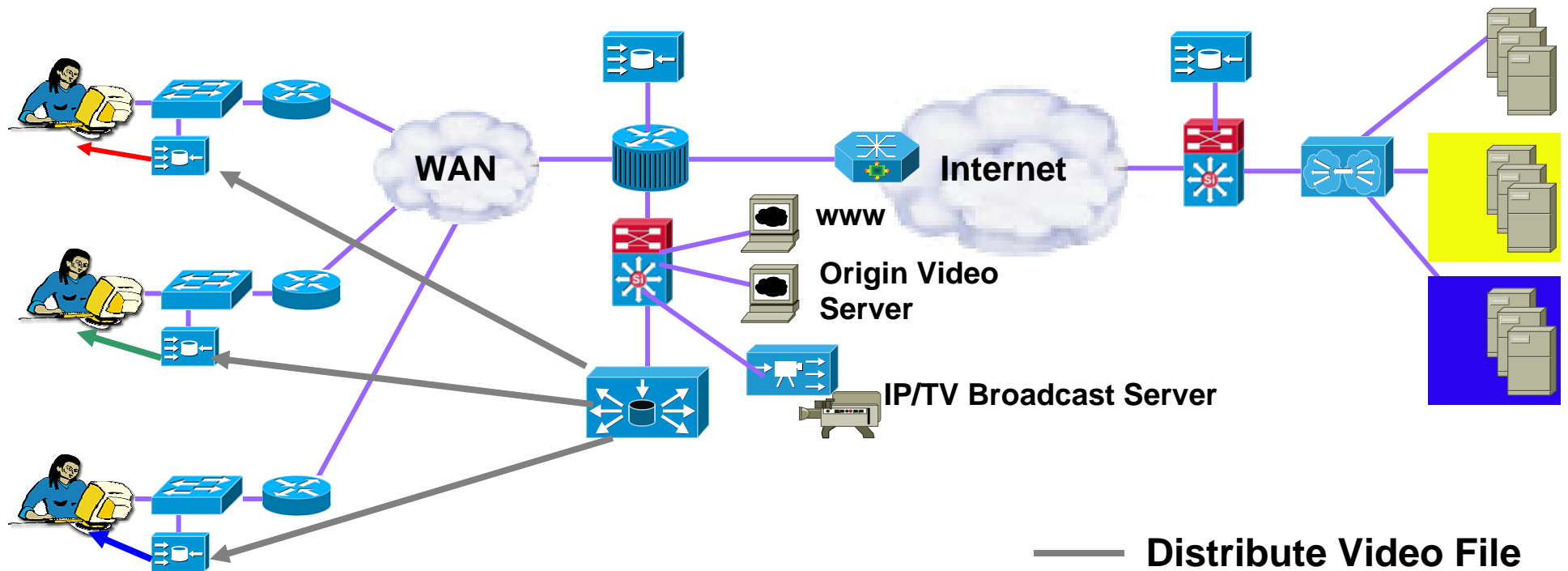
Load balancing



Content Delivered to User



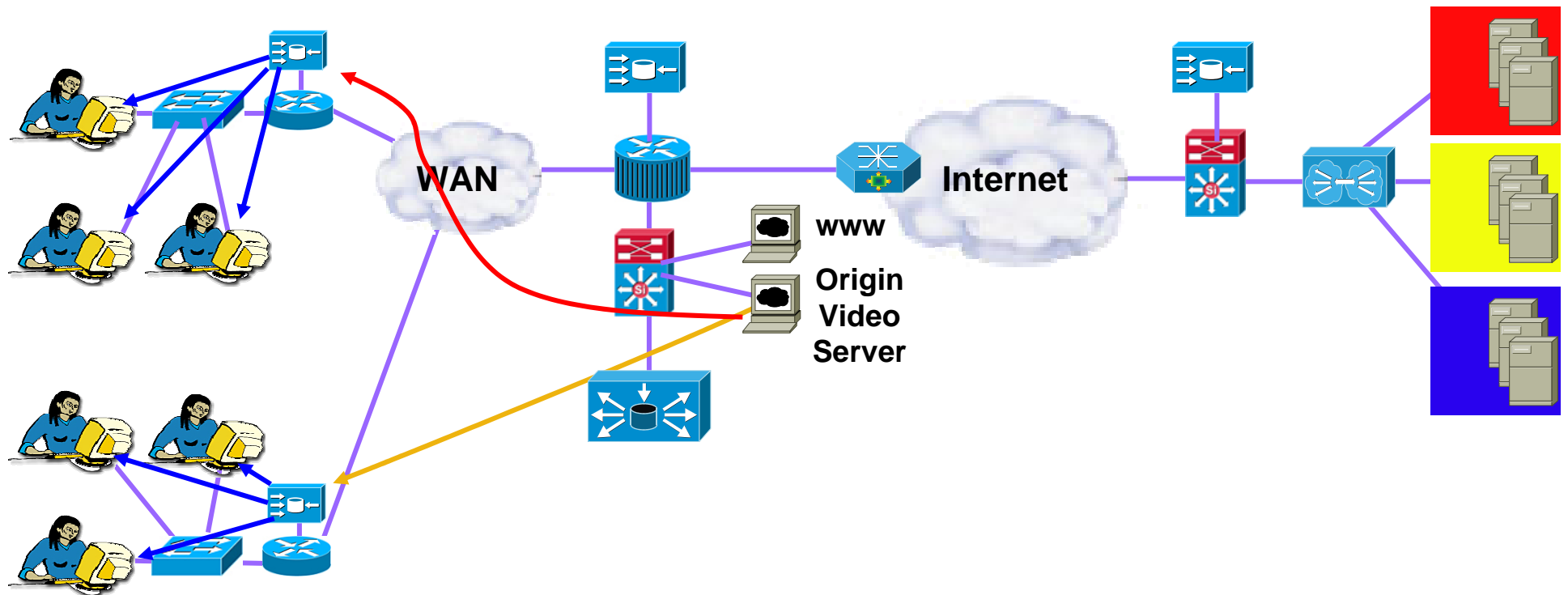
On Demand Video – Content Distribution



True streamed video distributed with video server software – DRM

- Distribute Video File With CDM ahead of Client Requests or cache on first view
- Separate Controllable Stream Per User
- Separate Controllable Stream Per User
- Separate Controllable Stream Per User

Live Stream Splitting

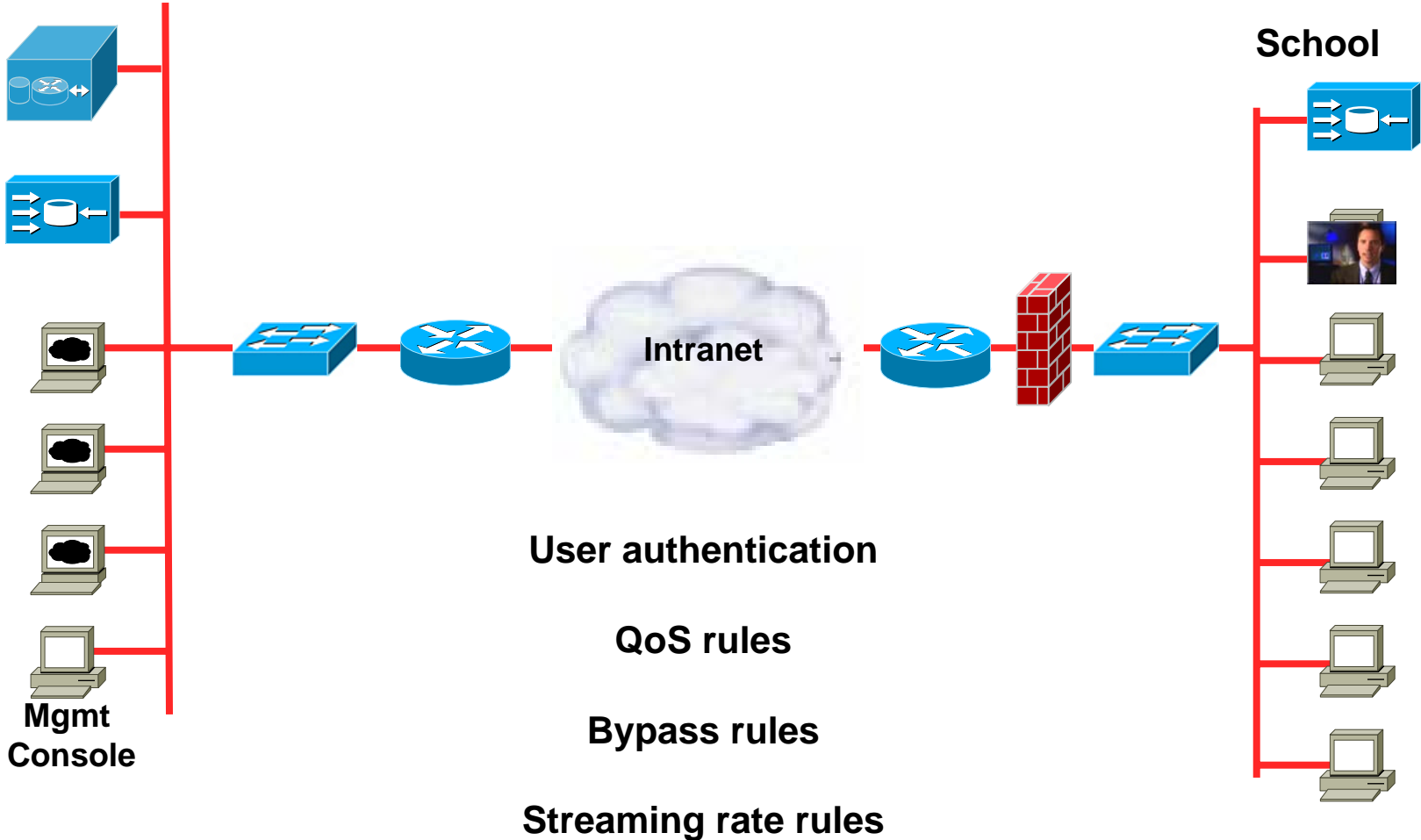


True streamed video split with video caching / splitting software – DRM

- Live Streaming Video
- Unicast to CEs
- CEs Unicast or Multicast to Local Users

User Delivery Controls

LEA/RBC



School

Total Cost of Ownership (TCO)

- **Capital cost**
 - How much is it to purchase?
- **Investment protection**
 - How long will it last?
 - Will development continue to keep pace?
 - What is involved in scaling it?
- **Deployment costs**
 - What is involved in deployment?
 - What is involved in integration?
- **Management & support costs**
 - What is the management overhead as the deployment scales?
 - Is management box-by-box or system wide?
 - Who does development?
 - What burden does it place on schools?

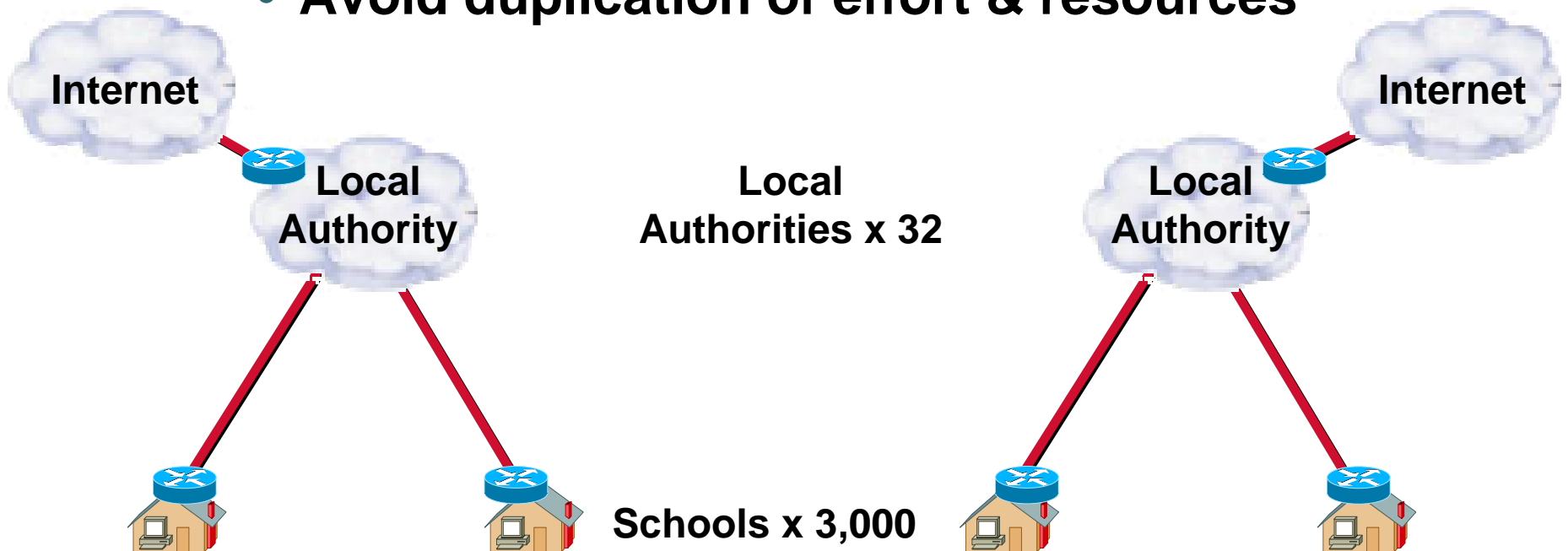




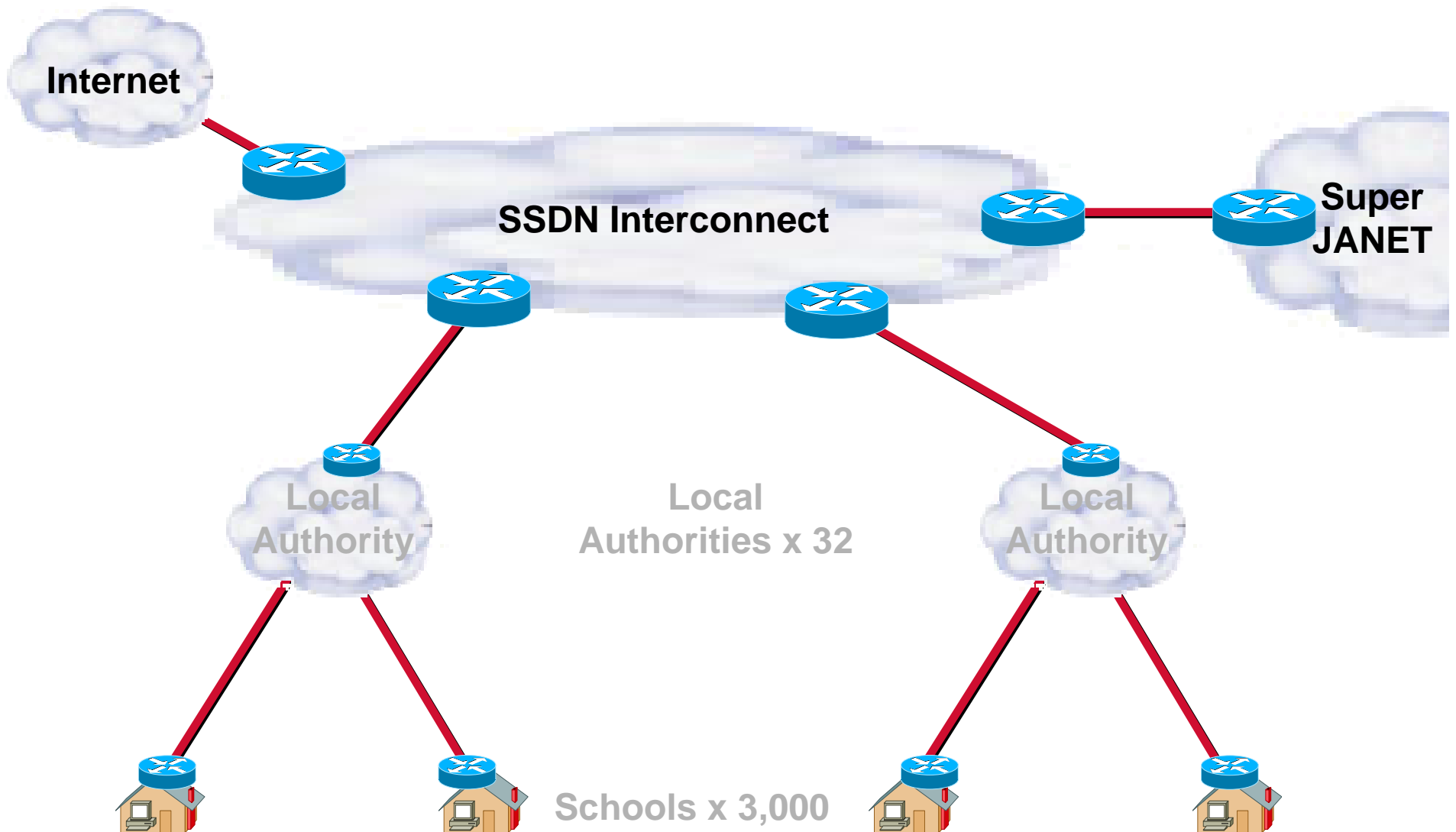
The What and The Why?



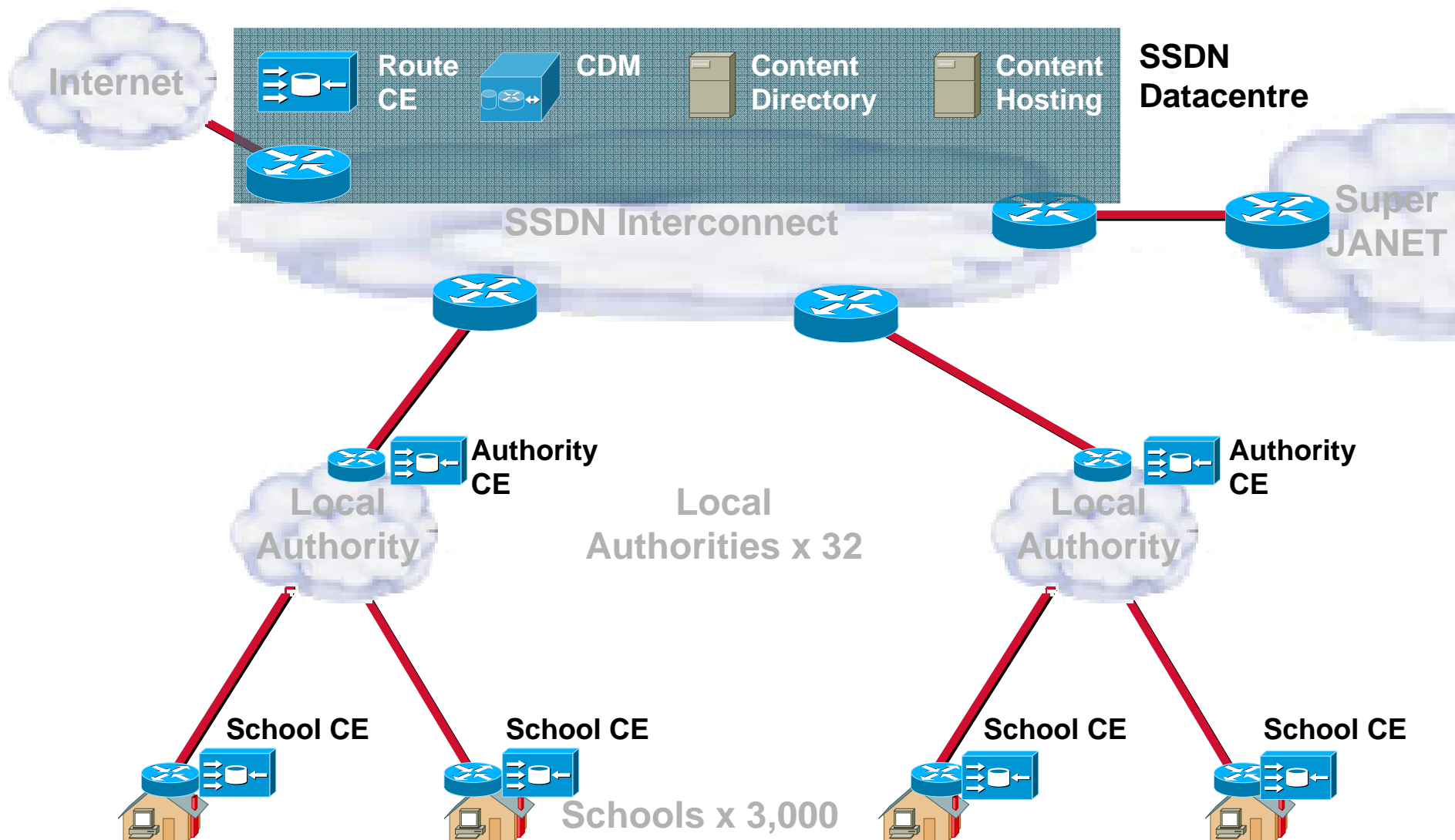
- Transform Education
- Rural – equity of access issues
- Own curriculum, small country
- Avoid duplication of effort & resources



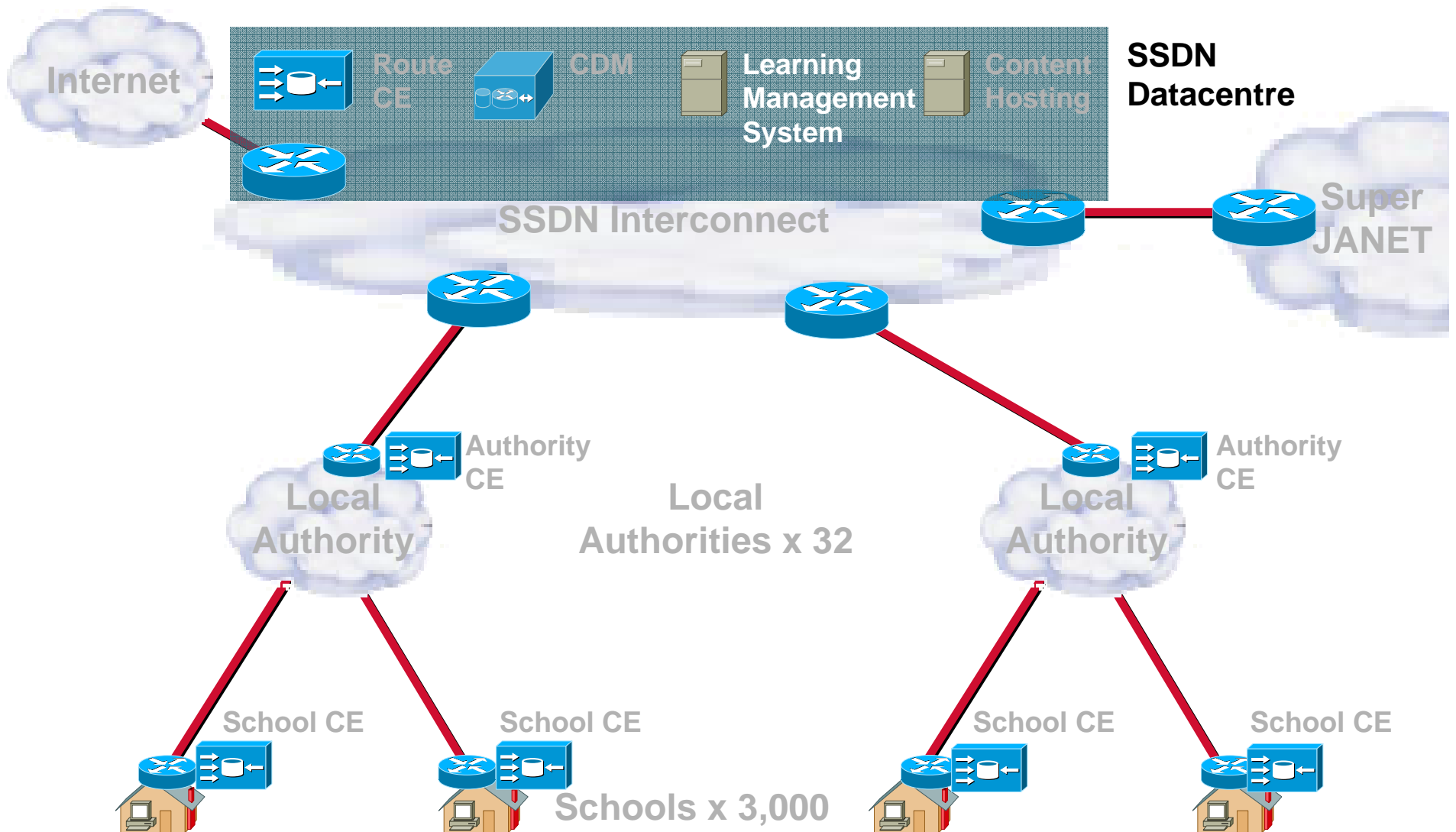
Scottish Schools Digital Network



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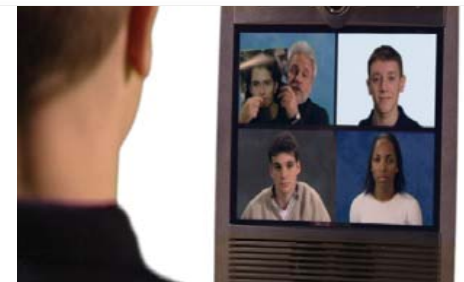




Q & A

Summary

- **Media Rich Content & Communication Transforming Education**
- **Bandwidth, Latency & Reliability**
- **Teacher Confidence**
- **Content Delivery Networking Integrated with Infrastructure**
- **Greater Range of Services**
- **Equity of Services**
- **Save Bandwidth Costs**



More Information

- www.cisco.com/go/cdn
- www.cisco.com/global/UK/news/pdfs/2005/scottish_exec_050705.pdf
- http://newsroom.cisco.com/dlls/2005/prod_053105.html
- www.cisco.com/go/education



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