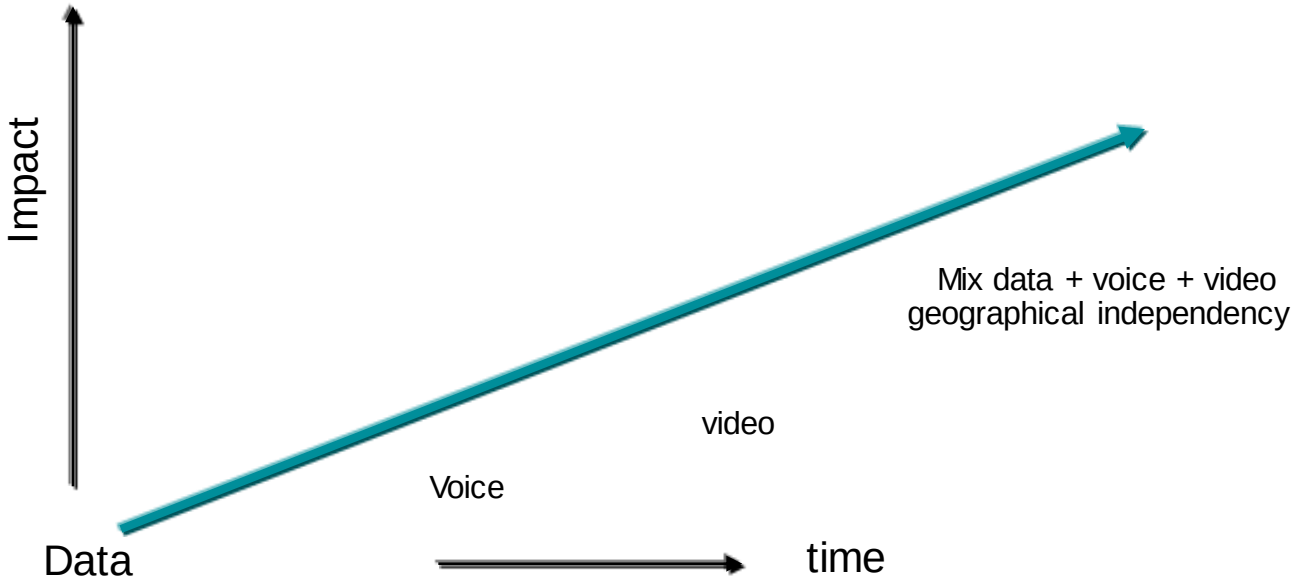
How Video can change our lives and lifestyle

Hans Bogaert

Cisco Vision

Services are going to be all IP

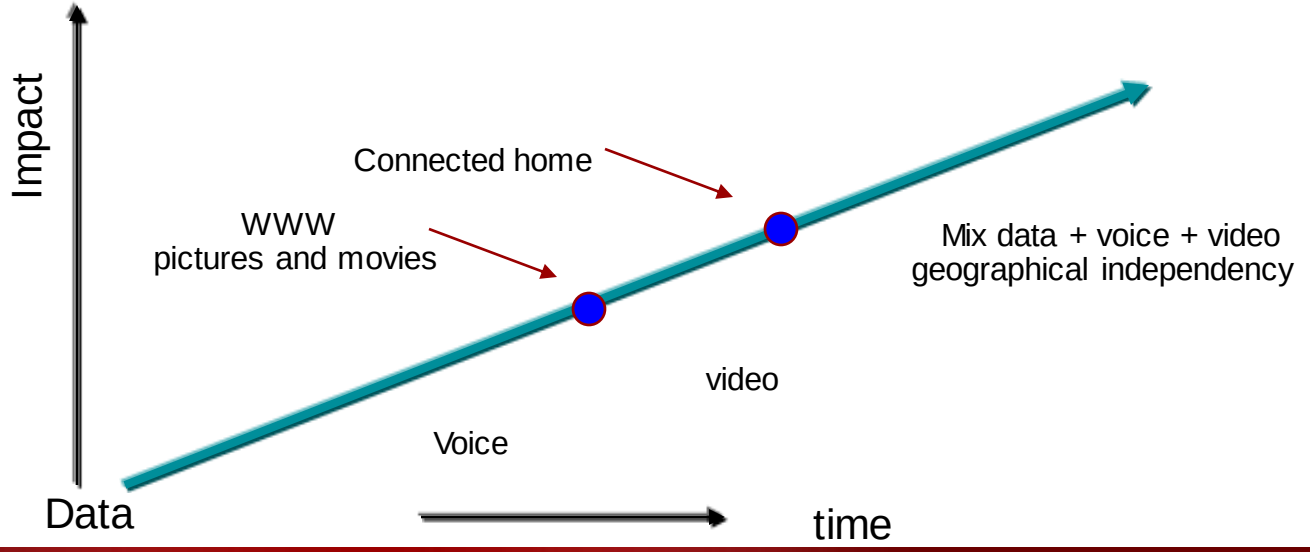
From the moment Broadband internet became available for the consumer market conversion have been happening



Cisco Vision

Services are going to be all IP

Consumer Broadband internet
has accelerated service conversion



Cisco and consumer market

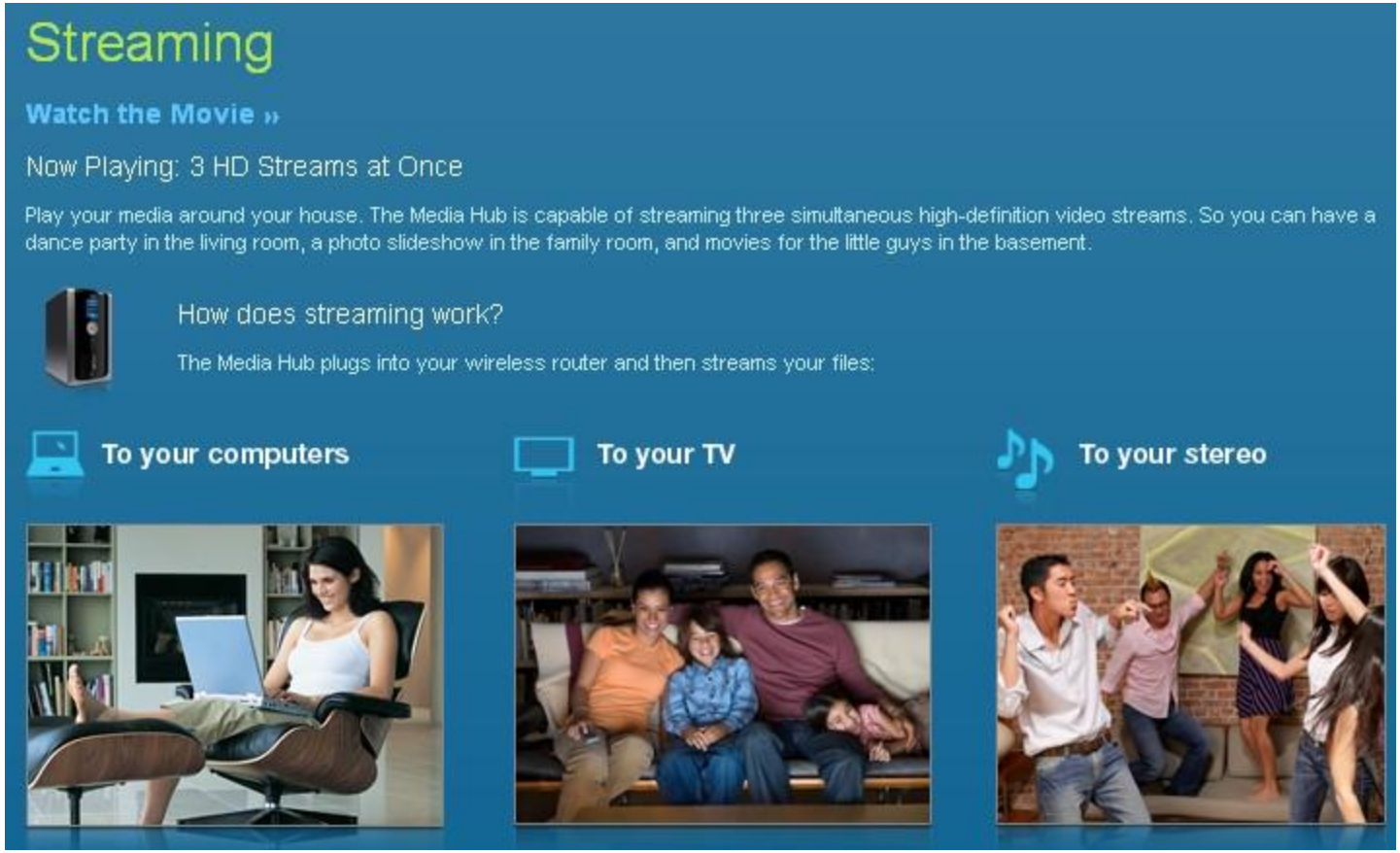
Networkers at Cisco live!

Linksys

Hubs
Router
Switches usb stick

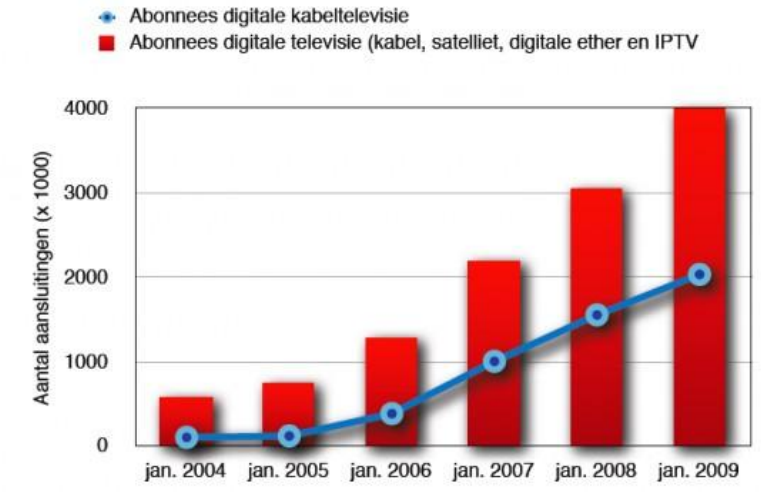
Consumer solutions

Cisco and consumer market

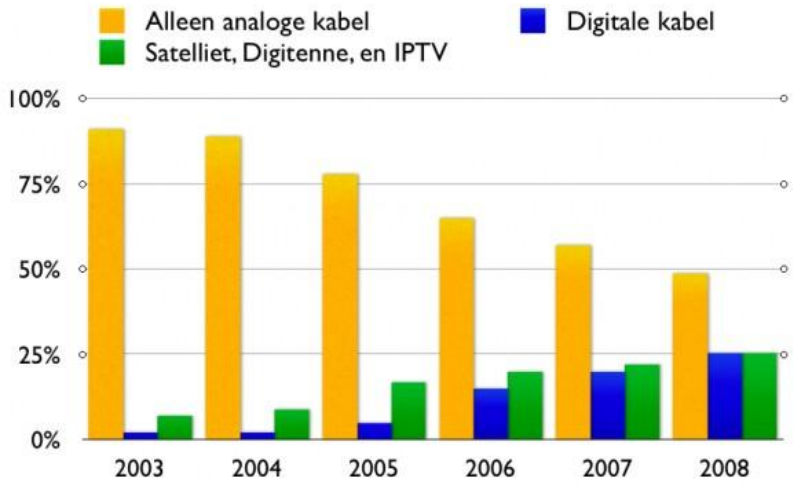


Consumer behaviour is changing

- UPC 35 % subscribers watch Digital TV (STB)
- STB users = moving away from BC TV to VOD
- 2008 these 35% subs watched 34 Million VOD sessions



Bron cijfers abonnees digitale kabeltelevisie: NLkabel
Bron totaalcijfers abonnees digitale televisie: iMMovator (Monitor Digitale TV), cijfer januari 2009 betreft een schatting op basis van cijfers Q3 2008, trend en cijfers NLkabel



Future Content distribution

any content, any device,
any location
from a single, open
delivery platform.

Personalized / On-Demand Video

Internet Video

TV

Mobile

PC

Linear

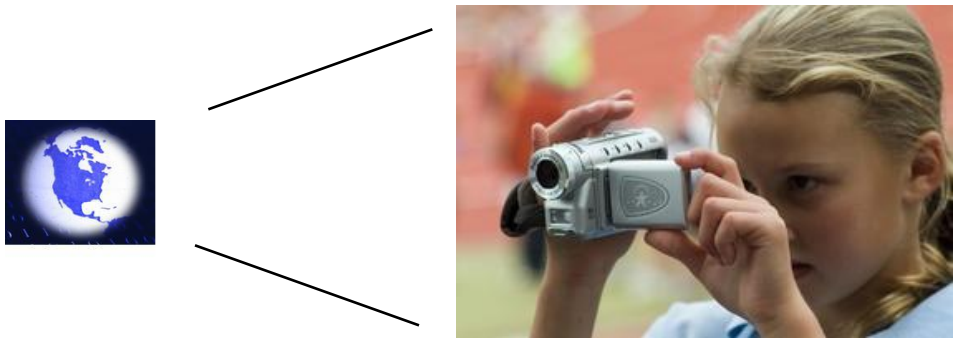
On Demand

Time Shifted

Personalized

The impact of the bigger IP pipe

- Internet access started with 2400Kb/s
- We quickly moved to 56Kb/s
- Then 128Kb/s, 256Kb/s etc
- I now have at home 24 Mb/sec
- With the IP pipe getting bigger the world changed from



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With the pipe getting bigger the world changed from

New Content Players

BBC I –player (now national but soon global)

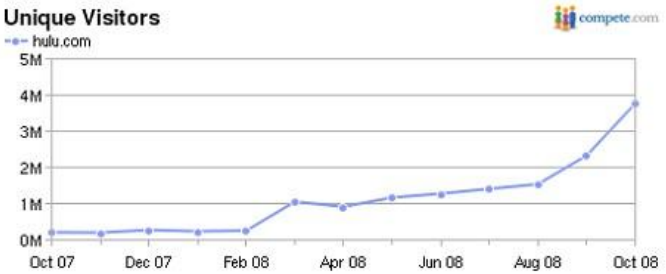
BBC iPlayer

May 2008 75 million downloads (total)

January 2008 11.2 million downloads
September 2008 22.8 million downloads

http://www.bbc.co.uk/iplayer/

- **Find programs you want to catch up on or watch again from the past seven days and watch them on the website through a method known as streaming.**
- **Download and store them on your computer for up to 30 days if you have a Windows PC or mobile (nokia 96) , MAC, Linux, Nintendo WII or video players**



Hulu offers full episodes and segments from over 400 different TV shows, some no longer on the air, some in syndication, and many currently shown only in the United States. The TV content on Hulu is provided by NBC, Fox and their TV production subsidiaries Universal Media Studios and 20th Century Fox Television, respectively, as well as the aforementioned cable networks and other TV studios such as Sony Pictures Television, Warner Bros. Television, MGM Television and Lionsgate Television. Hulu allows users to share or edit these clips. Shows that get the most traffic on the site include *The Daily Show*, *The Colbert Report*, *Battlestar Galactica*, *The Simpsons*, *Bones*, *House*, *Arrested Development*, *Family Guy*, *The Office*, *Saturday Night Live*, *American Dad!* and *It's Always Sunny in Philadelphia*. It is the original host of Joss Whedon's *Dr. Horrible's Sing-Along Blog*.

Hulu, LLC

hulu

Type	Joint Venture
Founded	August 29, 2007
Headquarters	Los Angeles, California, U.S.
Key people	Jason Kilar, CEO
Owner	NBC Universal and News Corp
Slogan	Watch your favorites. Anytime. For free.
Website	hulu.com
Type of site	video on demand
Launched	March 12, 2008

As a response Utube moved to HD to (if uploaded in HD)

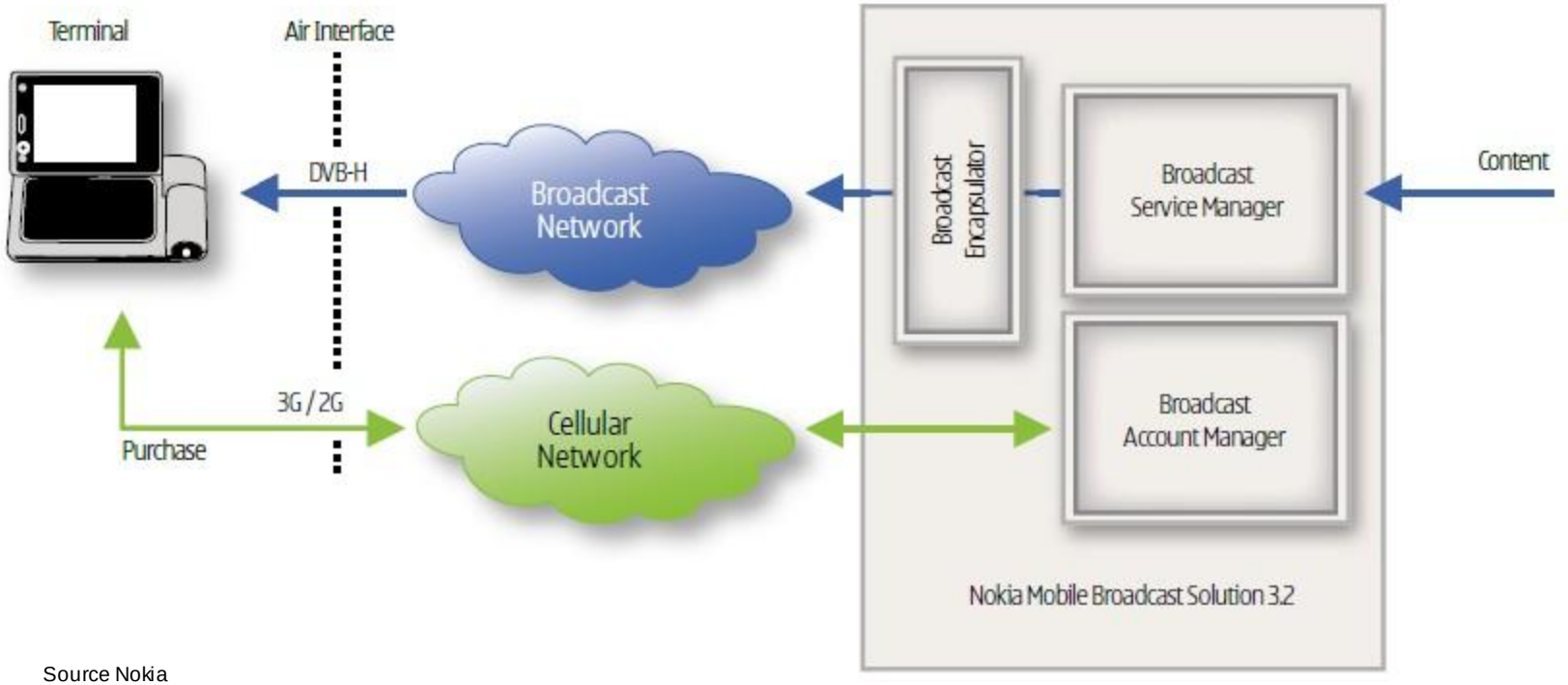
Mobile TV

mobitv

Watch Broadcast TV on your mobile

Full range of TV Channels

DVB-H broadcast TV



Source Nokia

Mobile Video

The Challenge for Mobile TV is how to introduce interactive TV in a scalable way

Wireless spectrum is often limited
Every individual session consumes bandwith

Increase video codec efficiency (less kb/sec) with AVC/MPEG4
Improve the RF transmission efficiency (DVB-T2)

IP radio (Mobile radio)

Networkers at Cisco live!

tunin.fm

iPhone player

Selection of radio stations

Select your favorite station out of an extensive selection of hundreds of radio stations world wide. It's easy to find your favorite. You can find the radio station by genre, country or by name.

Is your favorite radio not listed in iCarRadio?
Let us know, and we'll do the best we can to add your station.
Send your mail to support@tunin.fm

Work also on GPRS and WIFI

Short list of product in the home

Embedded ethernet port

Toshiba
Panasonic
Philips
Samsung
Pioneer

Sharp puts Internet, sort of, on its TVs

Posted by Michael Kanellos

LAS VEGAS--Sharp is going to put select Internet content on some models of its TVs, the latest attempt by TV makers to cut out the PC.

The Aquos Net service, which kicks off later this month, will let viewers click a button on their remote and get Nasdaq stock quotes, local weather information, high-definition images, traffic information from Traffic.com and cartoons. NBC later will put information from some of its sites on the Aquos Net service.

Aquos Net in action
(Credit: Michael Kanellos)

Other publishers will be added later. (Sharp has offered a similar service in Japan for a little over a year.).

The Internet content appears as a small square on the right side of the TV (see picture). It can be expanded to fill more of the screen. The service also comes with a connection to a portal, where Sharp technicians will help you with things like contrast and color.

Later, the company hopes to add full-motion video, Bob Scaglione, senior vice president of marketing at Sharp, said at a press conference here at the **Consumer Electronics Show**.

Users can not troll the Net and go wherever they want, he added. When they use Aquos Net, users are actually connecting to servers in New Jersey owned and controlled by Sharp, not to the publishers directly. Sharp's servers then push content down to your home.

The service is, initially, less encompassing and ambitious than a service launched last year by Sony which also featured video. But that was part of the plan, Scaglione said. Adding video capability adds more costs, he said. Sharp debated having video at the launch the service but decided not to go with video initially.

Sony's service also requires a piece of add-on hardware. Sharp's TVs will come with a built-in Ethernet plug. Once

Movie Studios are streaming video

Disney channel available in the USA

Movie Studios are streaming video

Warner Brothers will stream videos in China

November 5, 2008 — 1:15pm ET | By Pete Wylie

Warner Brothers followed MTV and MySpace's unique entry into the anti-piracy battle Tuesday with the announcement that it would begin a legal streaming video service in China. Users will "rent" Warner Brothers titles for between 60 cents and $1 per video, according to the company's statement. The release mention movies *I Am Legend*, *Fool's Gold* and *Speed Racer* as some of the first titles to be made available through the deal.

TOOLS
- Email
- Print
- Comment
- Contact Author
- Reprint

Movie Studios are streaming video

Networkers at Cisco live!

SONY PICTURES

Sony has finally acted to exploit its position as both a maker of electronic hardware and producer of entertainment by streaming Hollywood blockbusters over the internet to its latest television sets before they are released on DVD.

Hancock, featuring Will Smith, will be the first film to be delivered over the internet, rather than by satellite or cable, to Sony's Bravia LCD models. Initially, the service will be available in America from the autumn.

The move marks what Sir Howard Stringer, Sony's chief executive, describes as a belated exploitation of the Japanese group's unique range of expertise. The company also announced plans yesterday to invest $17 billion (£8.5 billion) on technology over the next three years.

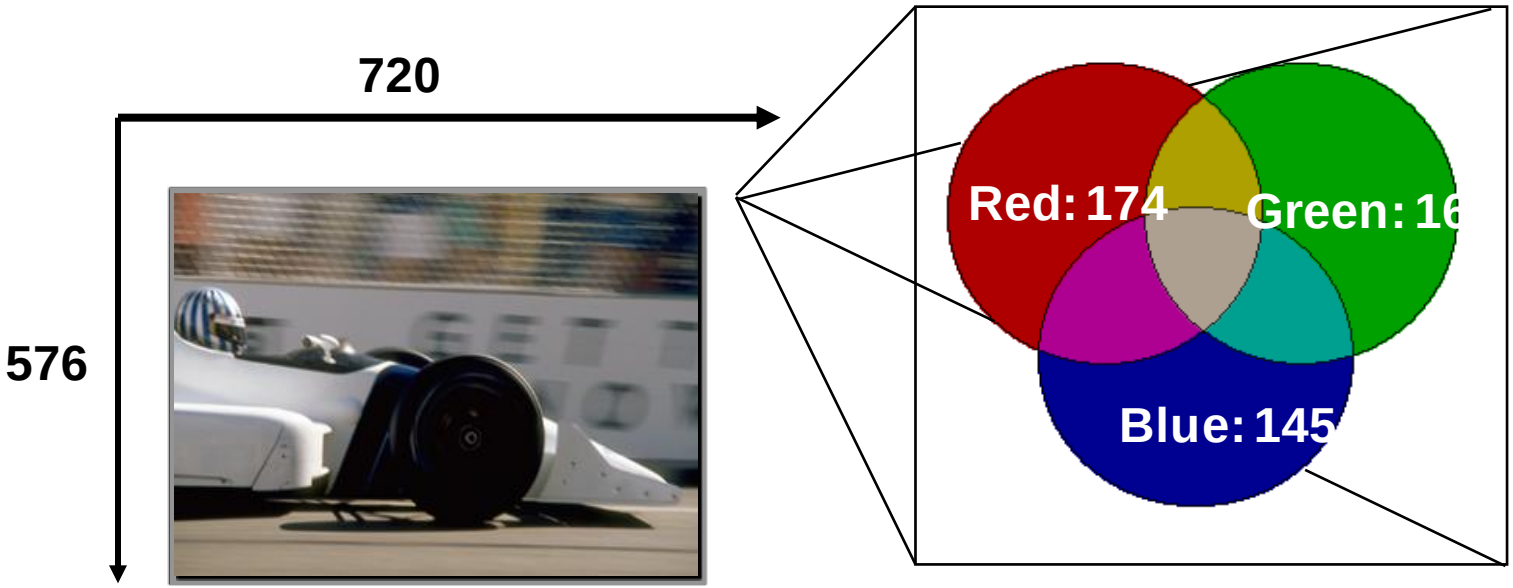
27 june 2008 source the times

Impact on the service provider

- Users will move away more and more from broadcast /MC to unicast
- More unicast channels will be streamed to the end users
- Due to these changes the QOS will become even more important then before
- a big broadband IP pipe does not provide QOS by default
- To have a good user experience you have to be connected to a SP network that can deliver QOS
- New content players want there viewers to come back to there portal. User experience is key
  therefore they need the SP to help then realise that

IPTV compression

Uncompressed Pal video

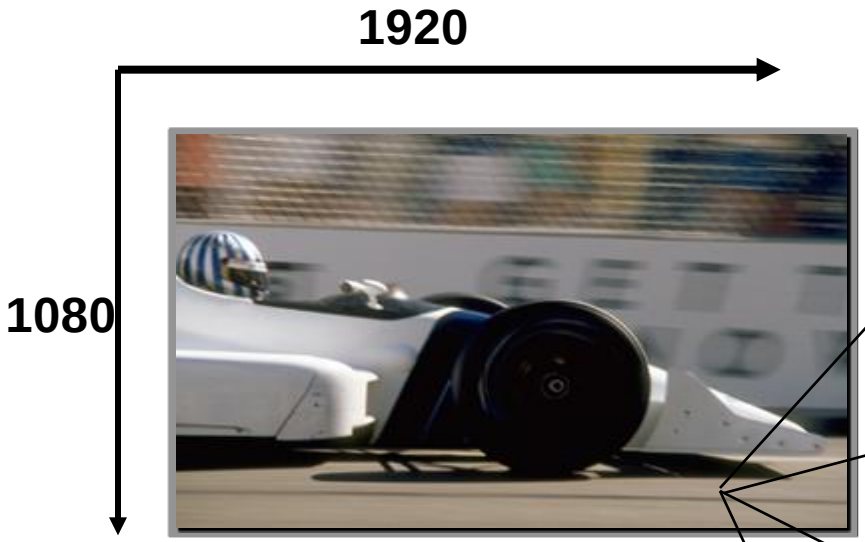


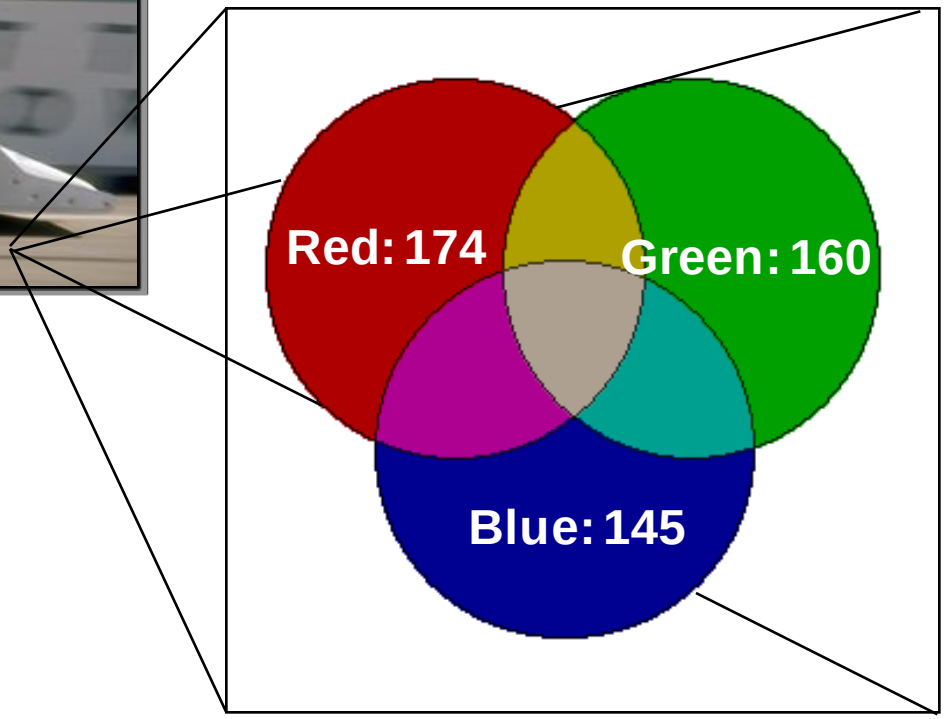
8 bits depth
Sampling 13.5 MHz
= 324 Mb/sec (4.4.4)

8 bits depth
Sampling 13.5 MHz
= 270 Mb/sec (4.2.2)
SDI ASI

8 bits depth
Sampling 13.5 MHz
= 124 Mb/sec (4.2.0)
(unofficial name 4.1.1)

Uncompressed HD video data rate





1920 x 1080 pixels x

(3 x 8) bits/pixel x

25 frames/second

= 1.244 Gbps

What is IPTV

- The analog video is converted to digital via the encoder
- Encoding can be lossless or lossy depending on the application
- The digital video is then encapsulated to be used over an IP network (1500B packet)
- Transported via UDP

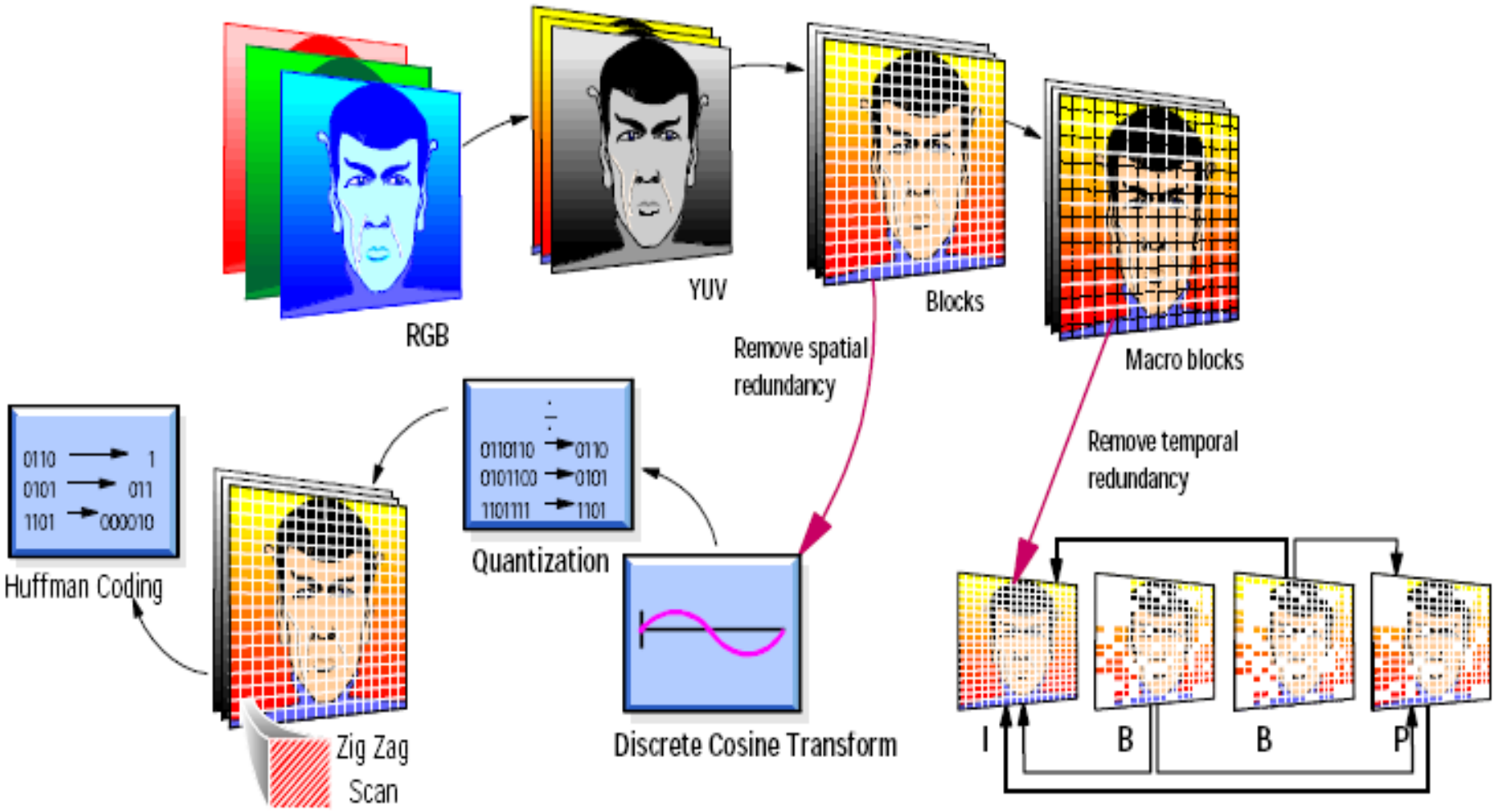
compression

- Traditional transmission transmit every frame

- With compression technique

Next image duplicate 4 times

Video Compression

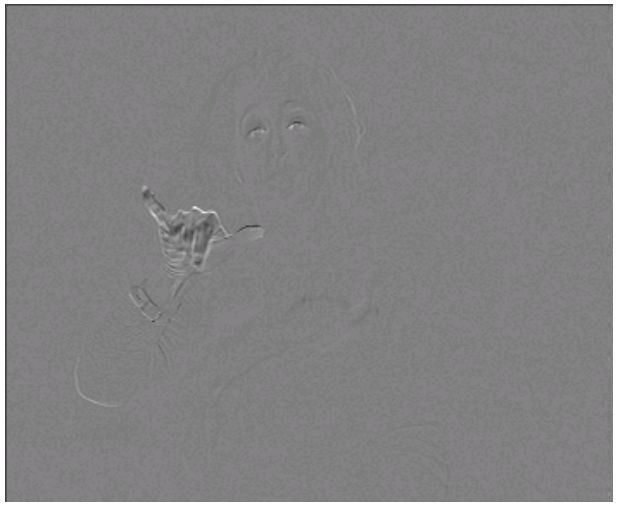


Temporal Redundancy

Motion Compensation (Example #1)

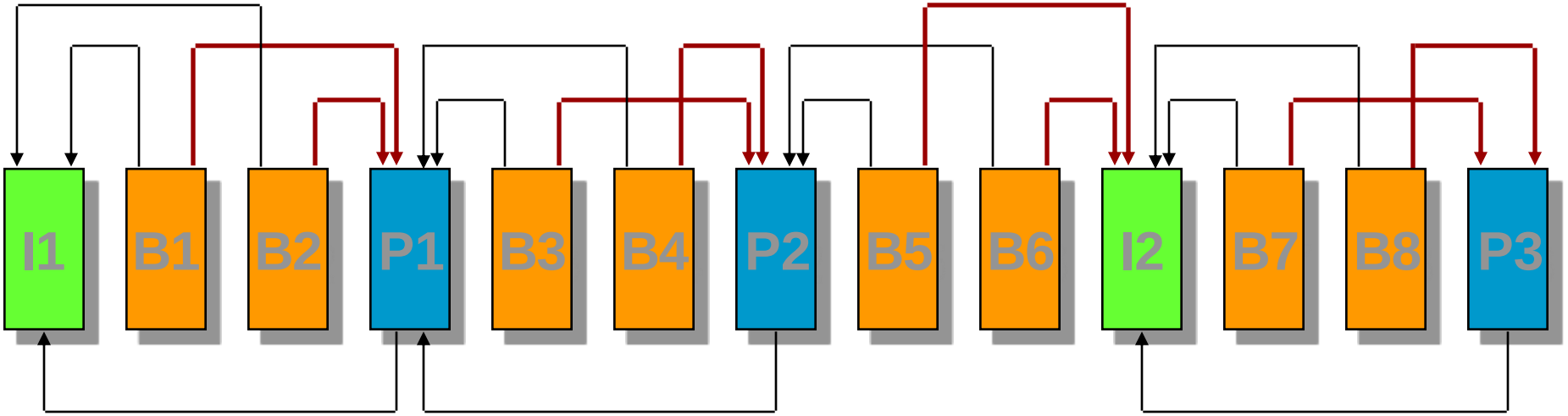
Frame 151

Frame 152

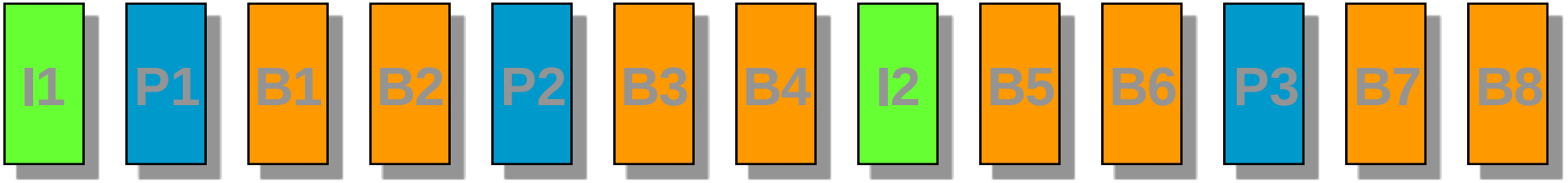


Difference Frame

I-, P-, B- Frames : GOP

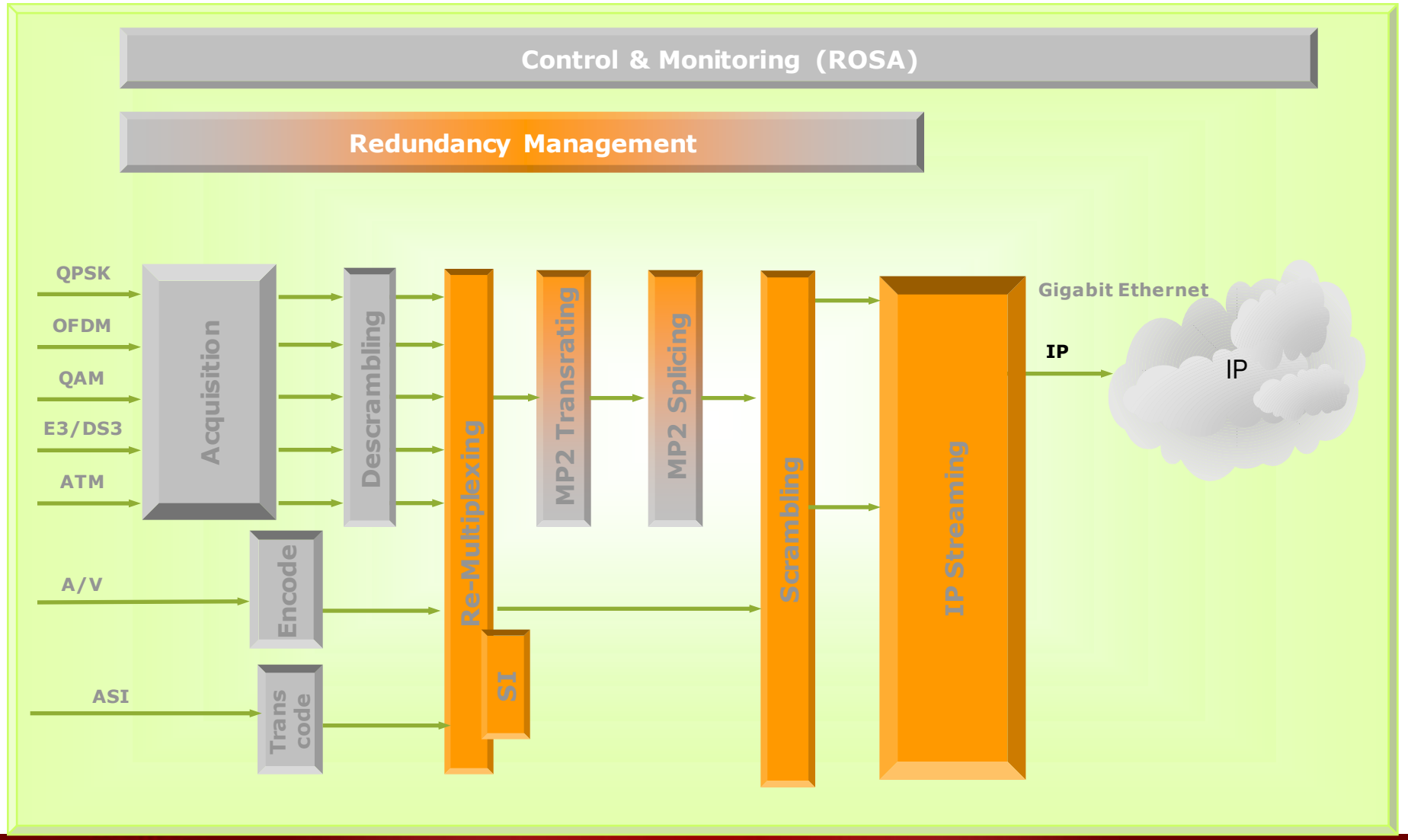


Display Order

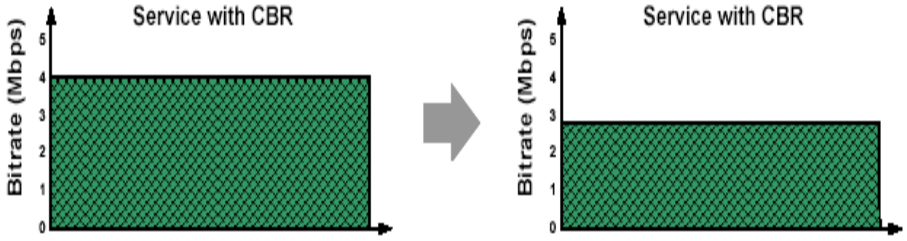


Transmission Order

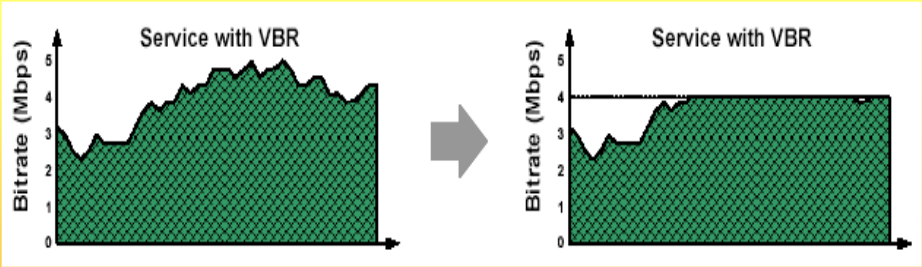
Functionality in IPTV headend



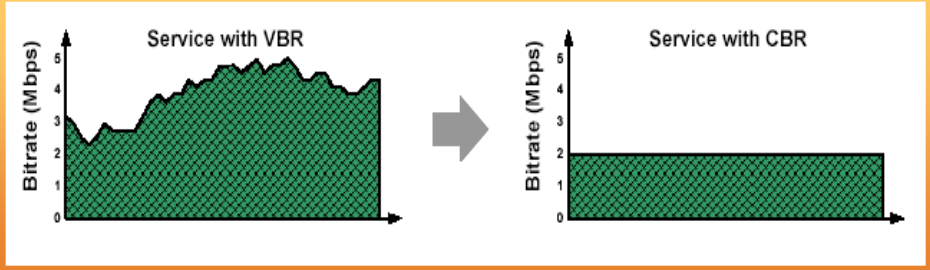
SPTS streams



4 Mbps CBR transrated into 3Mbps CBR
Application: Fixed bandwidth content processed to match output channel bandwidth

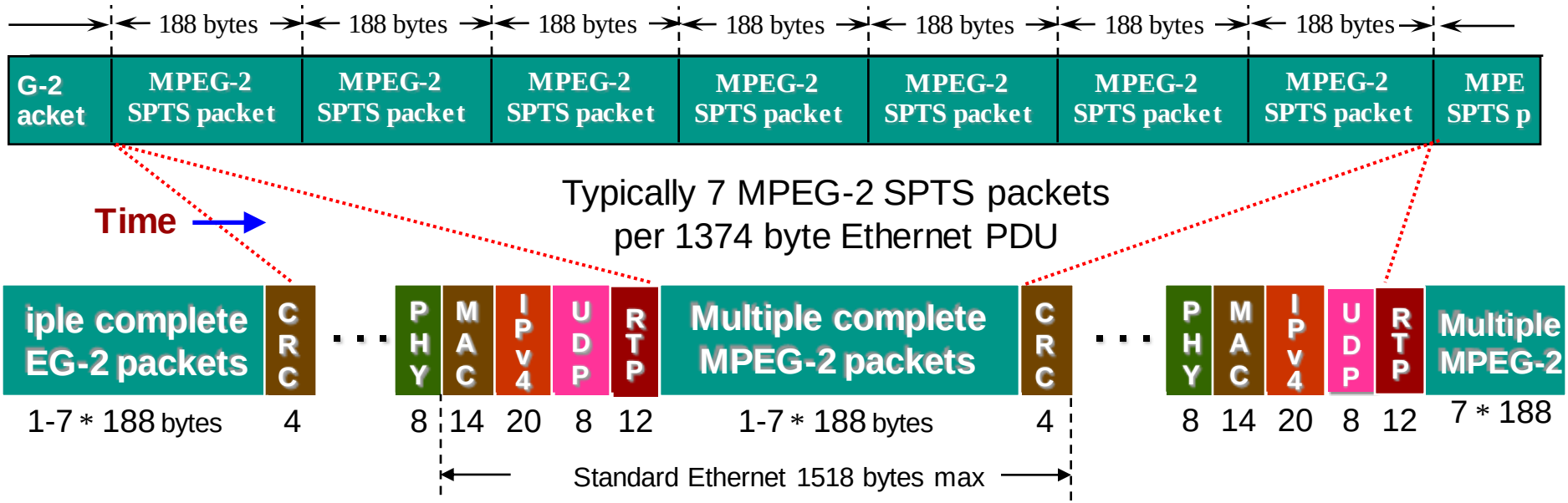


VBR transrated into 4Mbps clamped VBR
Application: Variable bandwidth content processed to fit output channel bandwidth and allow room for bursty data



VBR transrated into 2Mbps CBR
Application: Variable bandwidth content processed into fixed bandwidth content to match output channel capacity

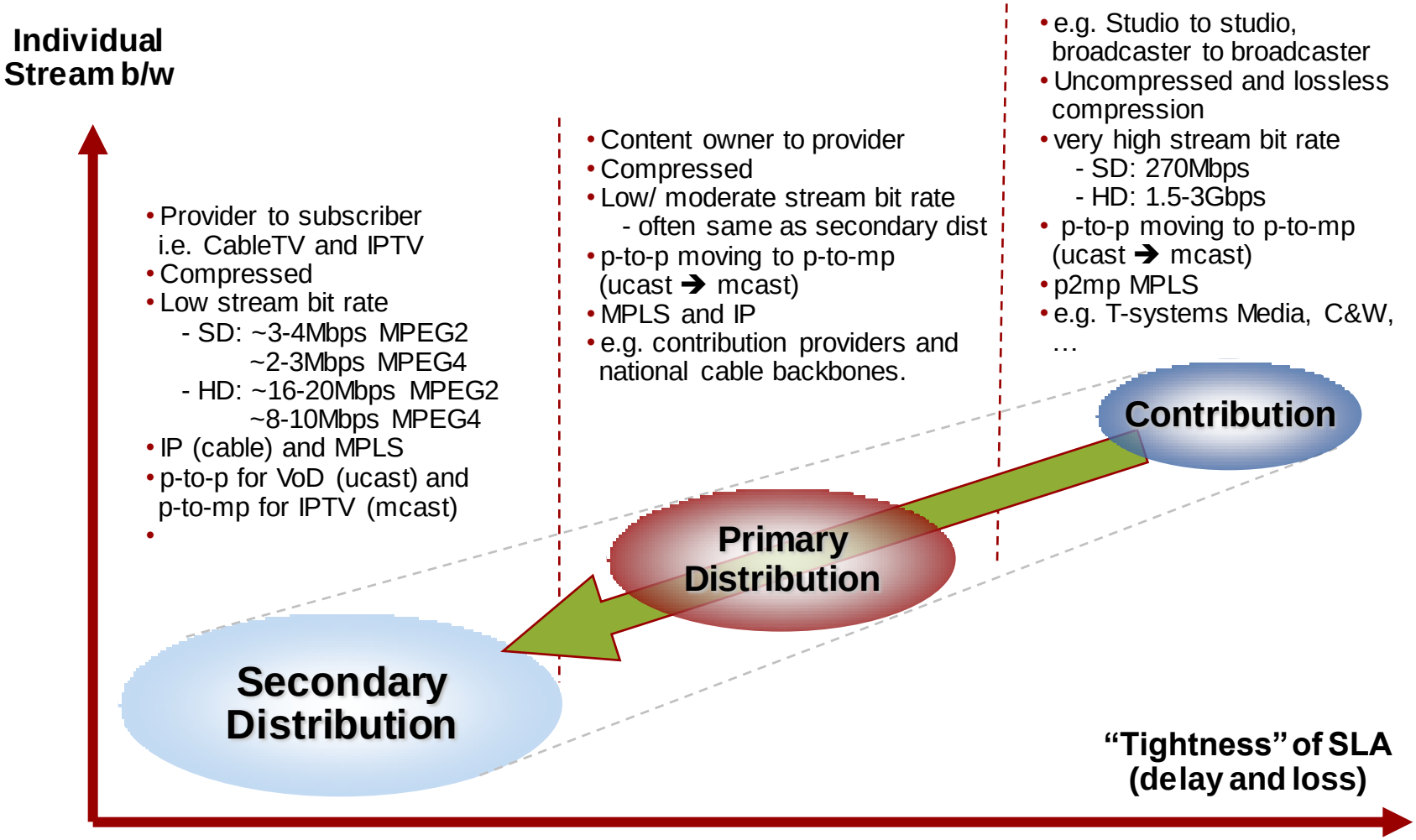
MPEG-2 SPTS over RTP/UDP/IP



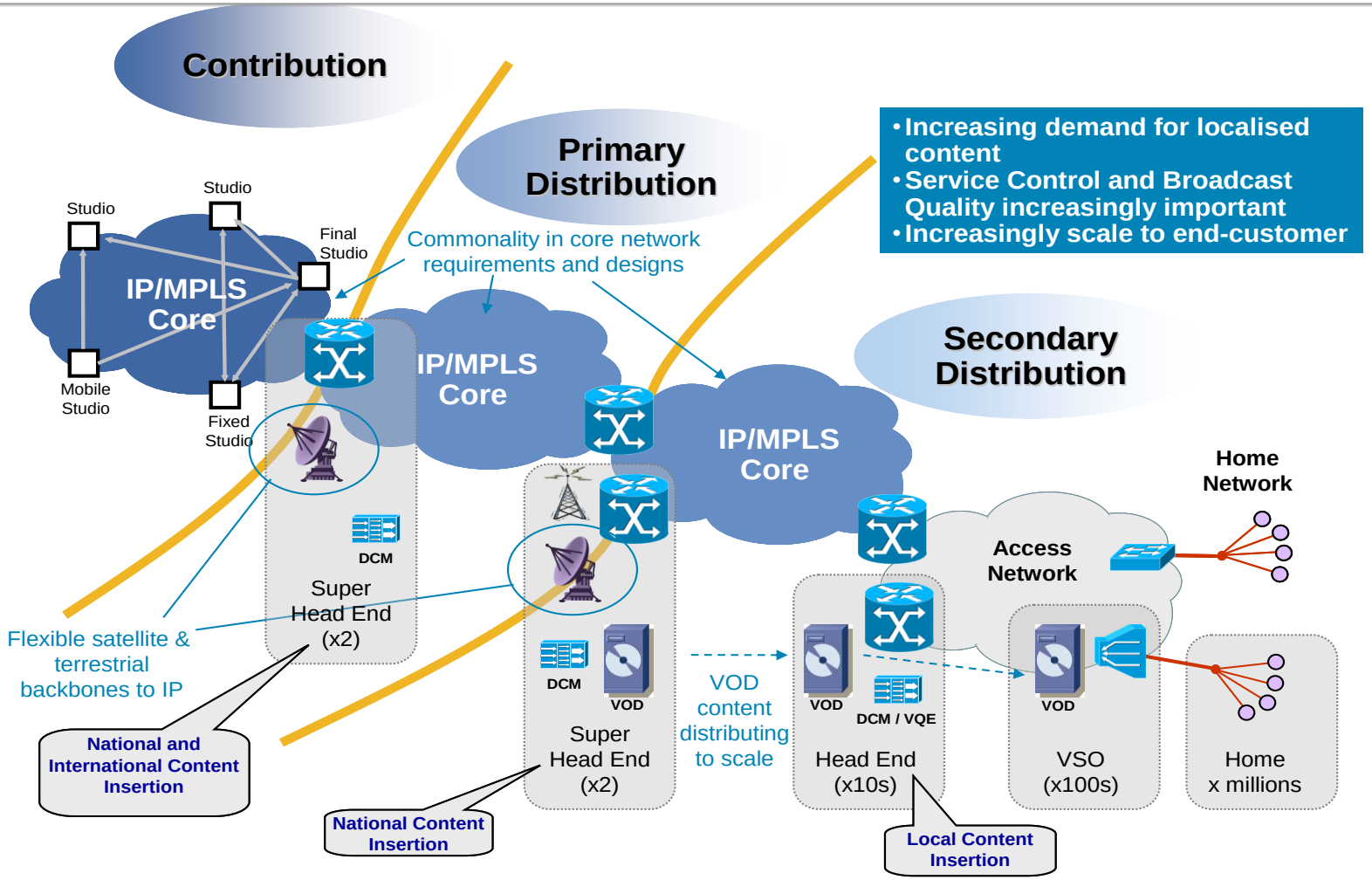
- Adds RTP-layer time stamp, sequence number, and other capabilities defined by IETF RFC 3550 (RTP) and RFC 2250 (MPEG over RTP)
- RTP/UDP/IP/GigE overhead is approximately 1 - (7*188/1382) = 5%

IPTV transport

Taxonomy of Video Service Providers



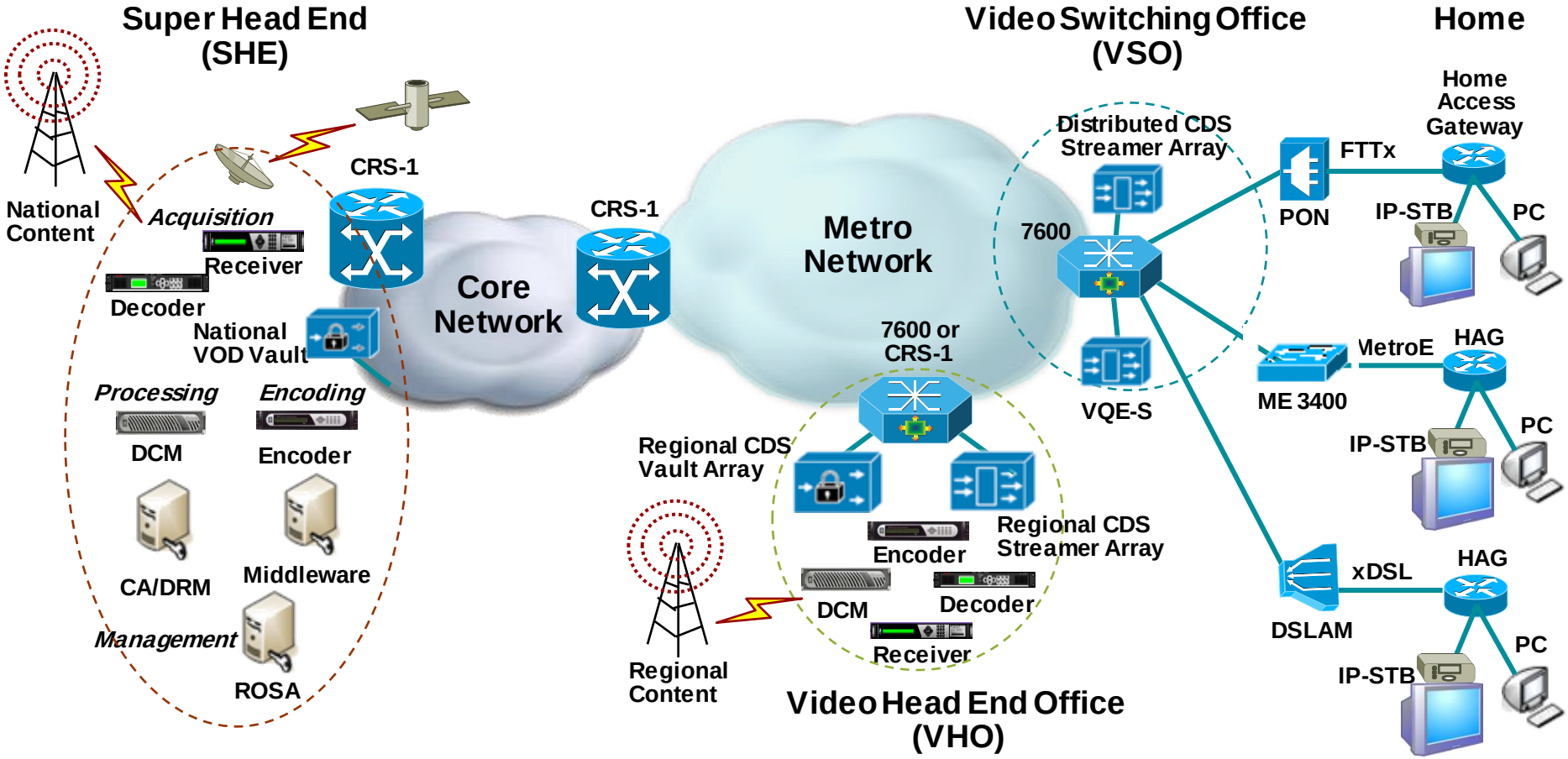
Broadcasting mapped to IP transport



The SP transport Network

IPTV Network Architecture

An End-to-End IP Network



Primary Causes for Packet Loss

- Delay / jitter
- Congestion
- PHY-Layer Errors (in the Core)
- Network Reconvergence Events

Video is very Susceptible to Loss

Networkers at Cisco live!

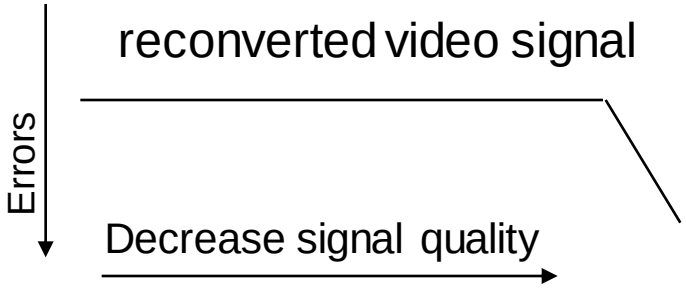
Unlike voice, any single unrecovered video packet loss may result in an impairment

- Depending upon specific encoding and compression scheme etc., losses of different packet types are realised as different types of visible impairment

No Loss – Perfect Quality

0.5% Packet Loss

5% Packet Loss

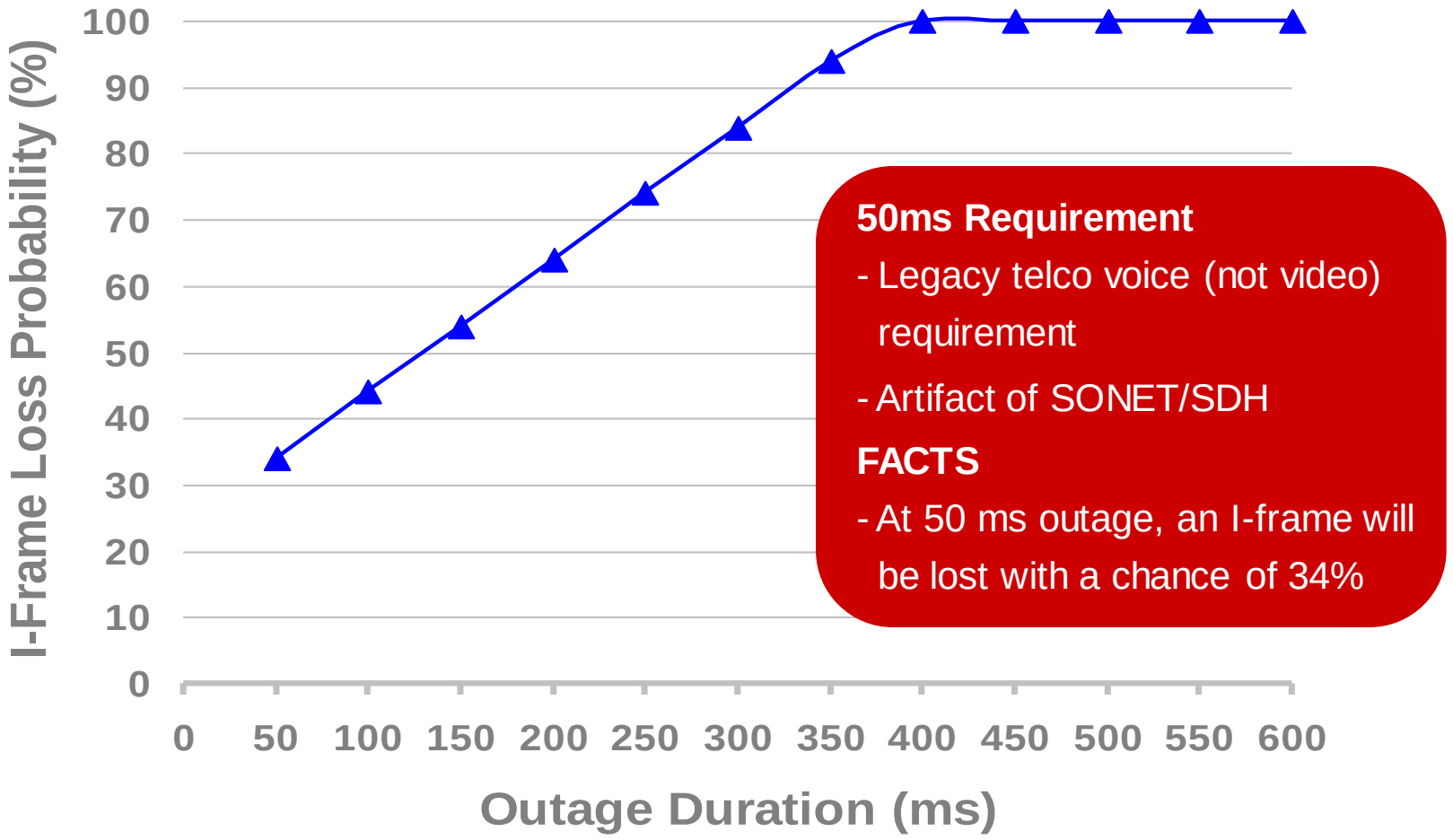


The magical 50 mSec failover

- Where does this 50 Msec come from ? (voice)
- Is 50 Msec also important for video ? (IBP frame)
- If I have 50 Msec failover in the core but it takes seconds seconds in the headend or access ….
  The total impact is what counts to the subscriber.
- If one failover triggers another parameter then the total of the delay is what the viewer will see

MPEG Frame Impact from Packet Loss

GOP Size: 500 ms (I:P:B = 1:3:7)



Core Impairment Contributors?

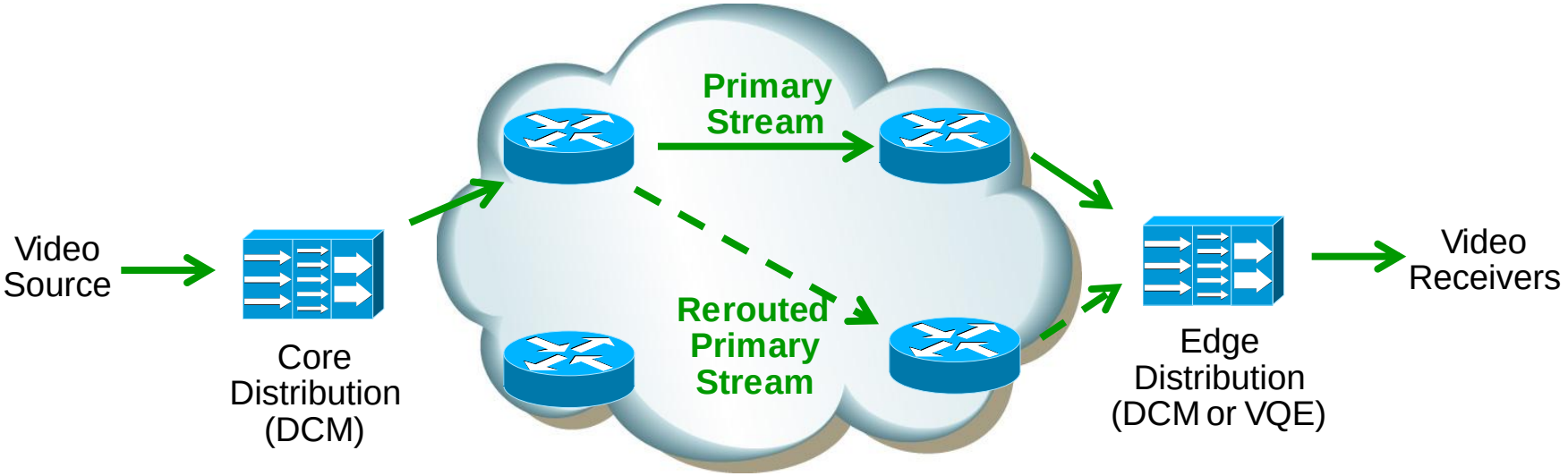
	Impairment Rate
Trunk failures	**.0010 /2h**
Hardware failures	**.0003 /2h**
Software failures	**.0012 /2h**
NSF/SSO helps here	
Software upgrades (Maintenance)	**.0037 /2h**
Total	**.0062 Imp/2hrs** **One impairment every two weeks**

Note that average mean time between errors on a DSL line is in the order of minutes if no protection is applied

Back of envelope calculations across several SPs show mean time between core failures affecting video is > 100 hours

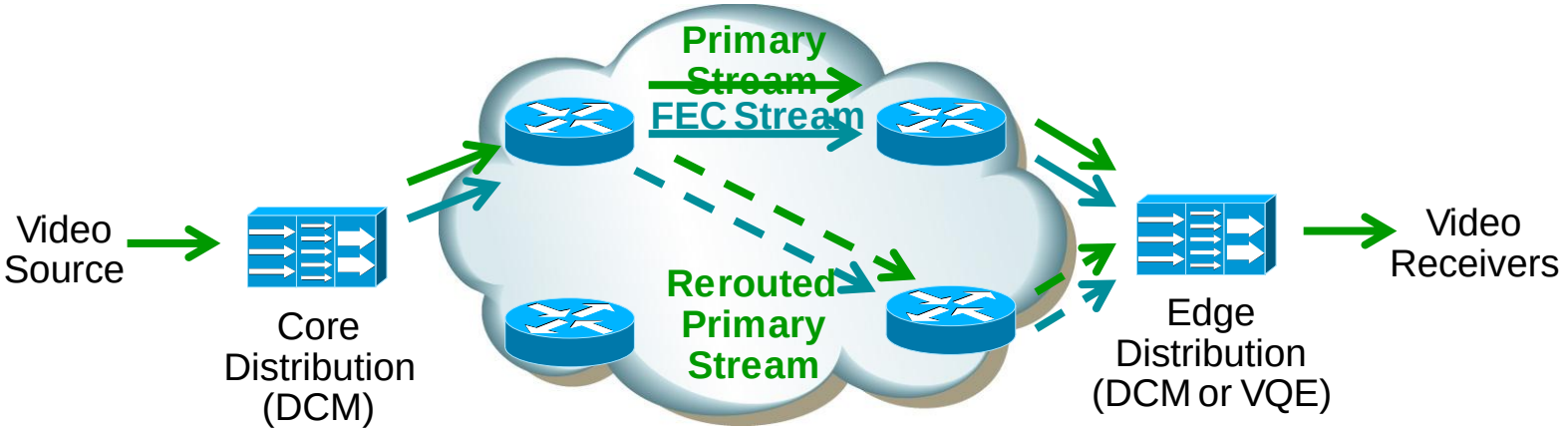
Based on assumptions, data from industry standards and customers

Fast Convergence or Fast Reroute



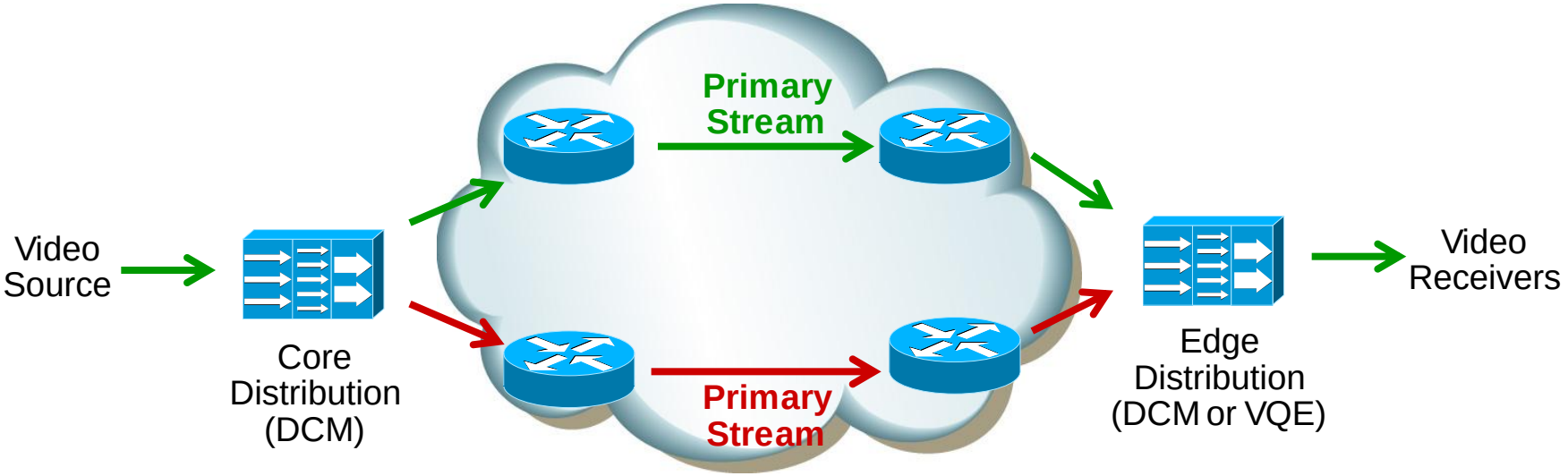
- Network reconverges / reroutes on core network failure (link or node); loss of connectivity is experienced before the video stream connectivity is restored
- Fast Convergence or Fast Reroute
  - ✓ Lowest bandwidth requirements in working and failure case
  - ✓ Lowest solution cost and complexity !!!!!!!
  - ! Requires fast converging network to minimize visible impact of loss
  - ✗ Is not hitless – will result in a visible artifact to the end users

Forward Error Correction (FEC)



- FEC adds redundancy to the transmitted data to allow the receiver to detect and correct errors (within some bound) without the need to resend any data
- Forward Error Correction
  - ✓ ✓ Supports hitless recovery from loss due to core network failures if loss can be constrained
  - ✓ ✓ No requirement for network path diversity – works for all topologies
  - ✓ ! Requires fast converging network to minimize FEC overhead
  - × × Higher overall bandwidth consumed in failure case compared to live / live
  - × × Incurs delay – longer outages require larger overhead or larger block sizes (more delay)

Spatial (Path) Diversity (a.k.a “live / live”)



- Two streams are sent over diverse paths between the sender and receiver
- Spatial diversity
  - ✓ Supports hitless recovery from loss due to core network failures if have network stream split and merge functions (e.g. DCM)
  - ✓ Lower overall bandwidth consumed in failure case compared to FEC
  - ✓ Introduces no delay if the paths have equal propagation delays
  - ×

Transport Light Reading

- Lightreading transport design and test
- 1000 000 users
- Test with voice video and data
- Test with oversubscription (QOS)
- Test on hardware and link failures

“ Cisco transport design proved that we can deliver such a network with low latency and perfect QOS “

http://www.lightreading.com/document.asp?doc_id=126173

Content Delivery System

Reaction from Cable operators to DBS satellite

- Satellite operators launched New type of satellites that could deliver hundreds of TV channels at a moment where cable could deliver 50 channels.
- Cable operators moved to digital video to be able to transport more channels and implemented a new unique feature as competitive weapon
- This solution is called CDS and is Usable for both cable and Wireline operators

CDS Topologies

- Centralised

  this topology allows you to create a CDS system with limited hardware investment.
  Not scalable
  all CDS traffic need to go via the transport network

- Decentralised

  This topology is expensive as you install all the equipment close to the end user. It is scalable from a user perspective but as the content library grows you have the problem to push the content to all the CDS devices who are close to the end user

Cisco Content Delivery System Vision

Enables any content, any device, any location from a single, open delivery platform.

Personalized / On-Demand Video

Internet Video

TV

Mobile

PC

Cisco CDS

Linear

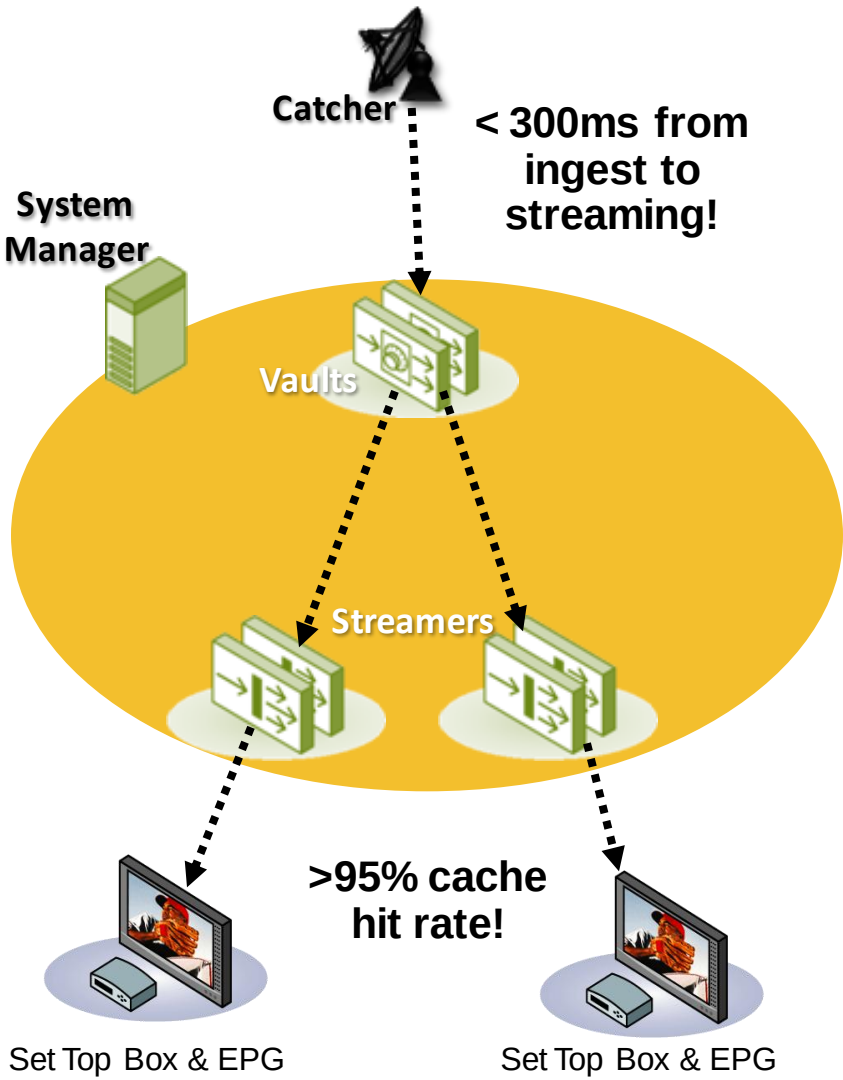
On Demand

Time Shifted

Personalized

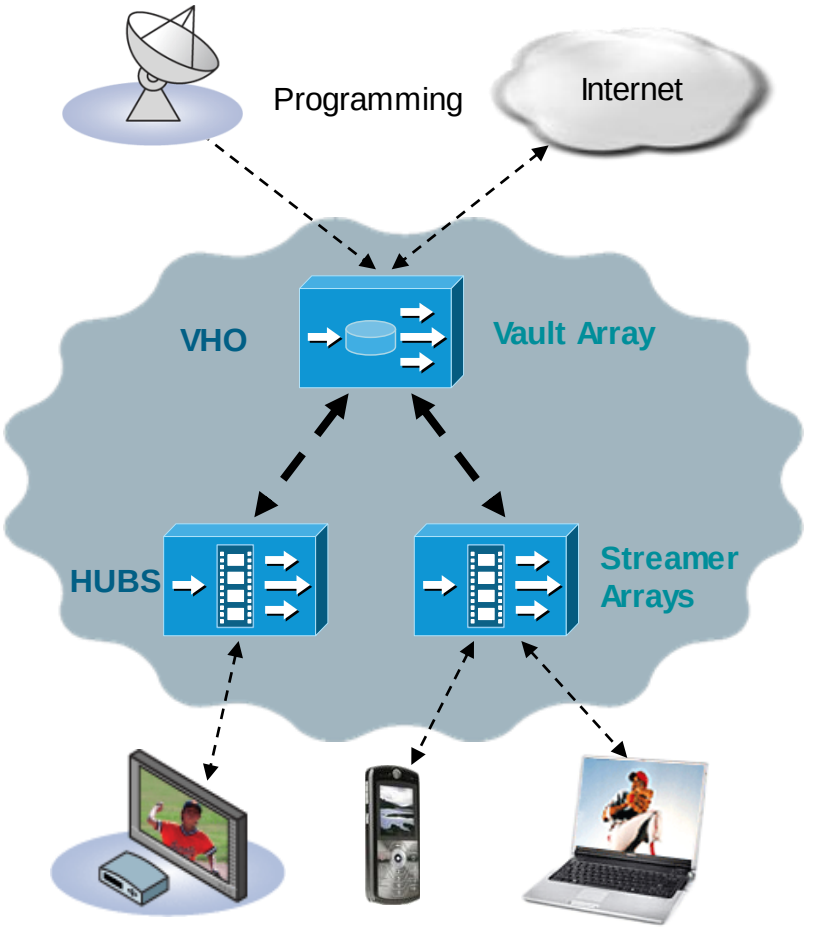
CDS TV Elements

- Vault
  - Ingest & reliable storage of video (or other) assets
- Streamer
  - “Personalized” video streaming
  - Pulls content from Vault on demand & caches at network edge
- CDS Manager
  - Element Management System
  - Single system manages all of CCDS
- ISV
  - Integrated Streamer-Vault



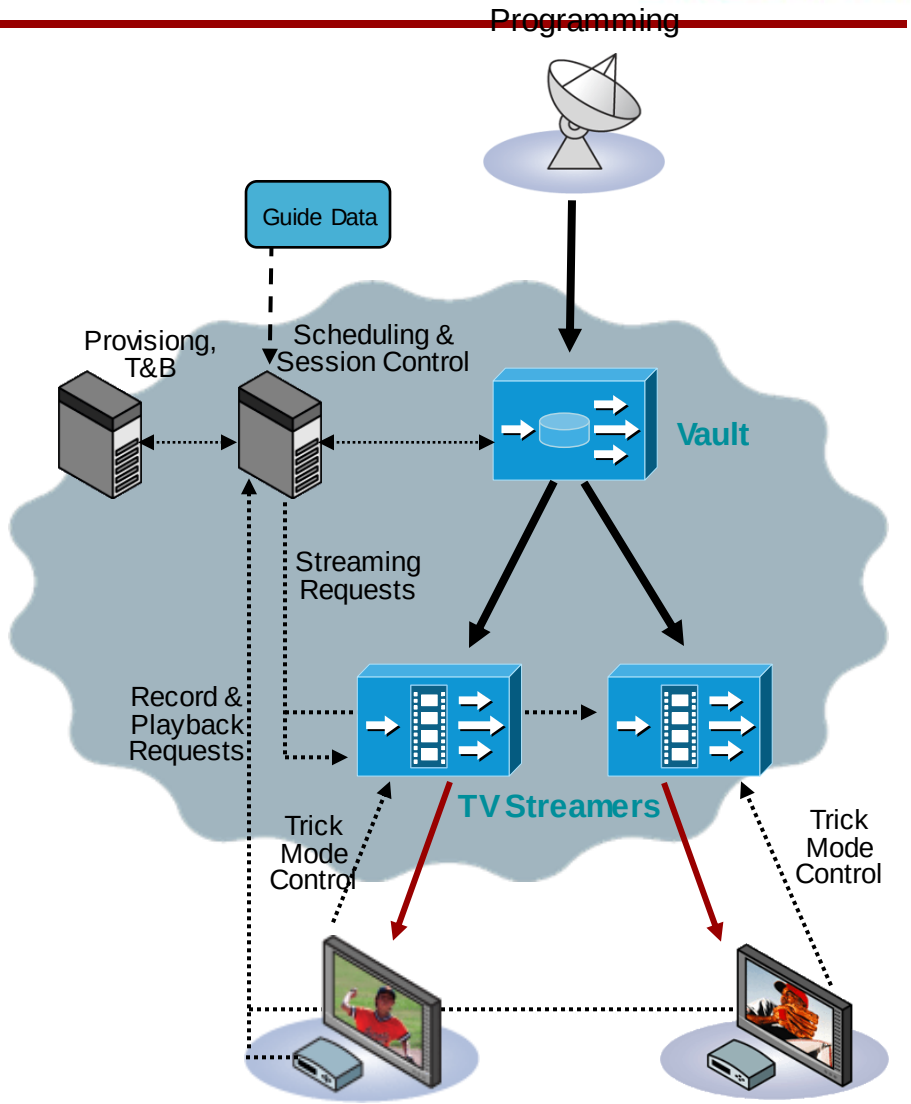
Cisco CDS Flexibility = Lowest Total Cost

- "Pooled resource" savings
  - Service availability without costs of 1:1 sparing
- Bandwidth savings
  - 95% less network bandwidth than centralized solutions
- Less costly replication
  - No library replication
  - No 1:1 box redundancy



Application Time-Shift TV

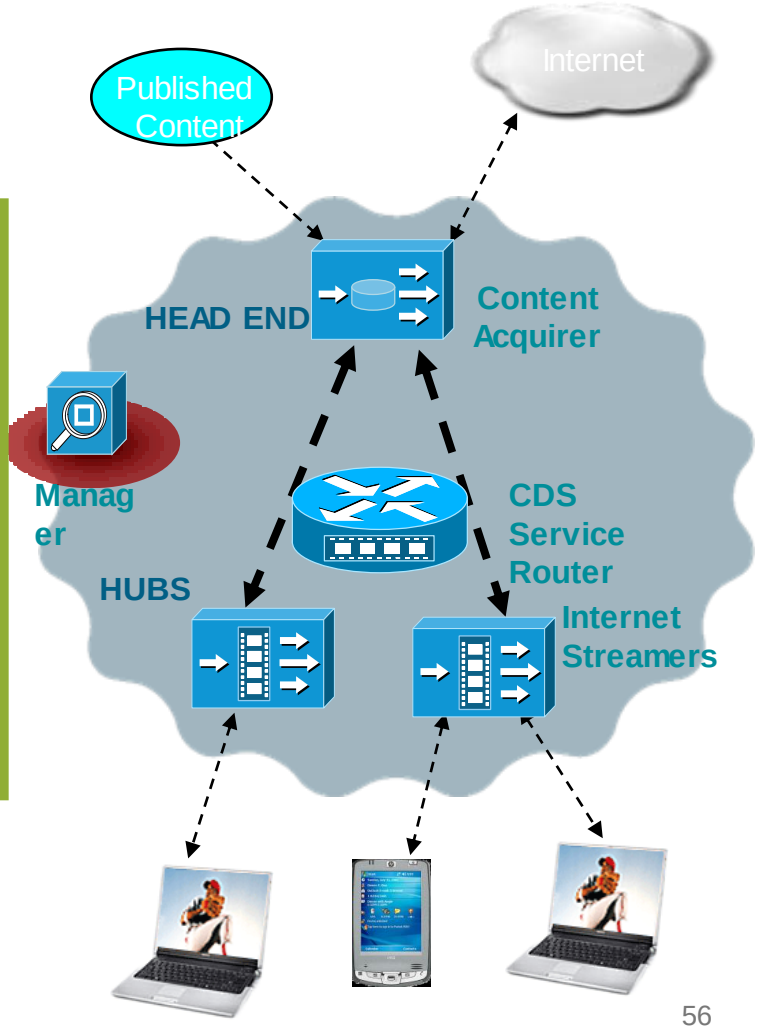
- **Deployment Examples**
  - TWC Start Over
  - CVC RS-DVR
  - Shanghai OCN



CDS-IS

CDS Internet Streaming

- Enables ingest and delivery of web and video content to IP enabled devices such as PCs
- The Cisco CDS solution includes support for multiple popular content formats such as
  - Windows Media
  - Adobe Flash
  -
  - MPEG-4/H.264; Apple QuickTime*
  - The CDS platform can be used to stage any file-based content for the consumer
  - PC Portal: Anti-virus files, etc.
  - Set Top Boxes: OCAP application files, etc.



Comcast the FAN

Bigger, Better Video

The new Fan uses Flash 8 technology for cleaner, crisper video. Check out the higher resolution:

Watch news videos
Watch music videos
Watch entertainment videos
Watch sports videos

Extended Interaction

Experience extended interaction with the Fan 3.0! Change the order of video playback by rearranging thumbnails, save videos, create playlists or even share videos with friends. This and much more is now possible with the new Fan!

Create Playlists

The Fan 3.0 now allows you to create your own playlists. Save every video you love and place them into your desired playlist. The Fan makes it simple to create and manage your playlist with great ease.

comcast.net Fan 3.0

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New Search Features

Searching has never been so easy. With the Fan 3.0, you can now search any desired topic knowing everything you search gets saved in a "past searches" drop-down menu that also allows you to clear your history.

What People Are Saying about the Fan 3.0

Actual comments from actual customers (really, we're not making these up).

"This is great! I have been wondering when we could expect to view a full screen of the Fan."

"Much easier on the eyes."

"This is the Shizet....boomalicous...Love to see more!"

"The new Fan is quite simply COMFANTASTIC!"

"I found it to be much easier to view, and it held my interest for a longer period of time."

"I love the new format. It is nice to have the option to enlarge the picture to nearly full screen. The personal playlist is something I look forward to..."

"I love the new design. The best part is the full screen viewing and the ability to pick newer topics. The search function is easier to see."

FAQs

How do I save a video in the Fan to watch later?
How do I scroll through the Fan videos?
How many playlists can I create in the new Fan?
How do I adjust the volume in the new Fan?
More Fan 3.0 FAQs

VQE

Video Service expectations

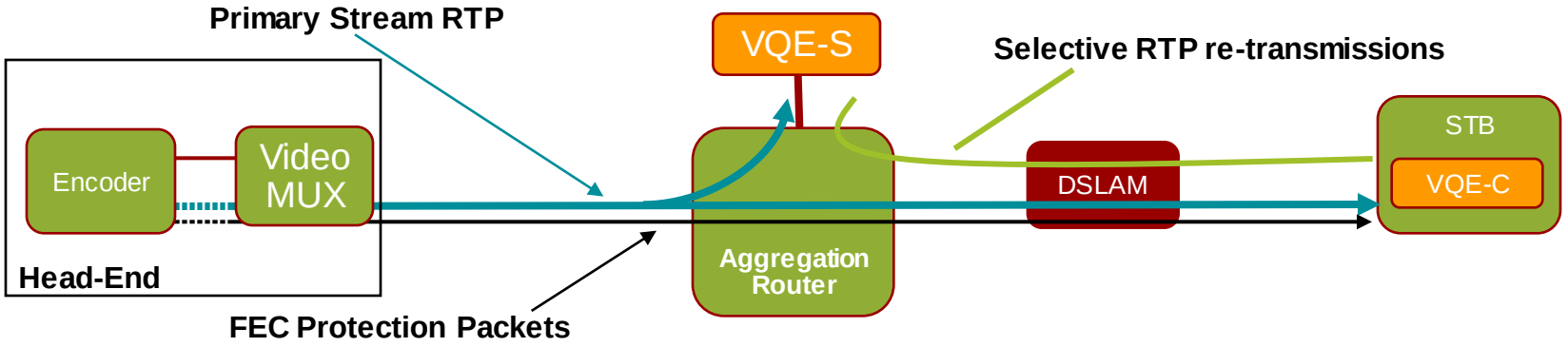
- IPTV is using compression
- Packet loss can lead to visible artefacts in the picture
- Visible artefacts can lead to unhappy customers
- Unhappy customer leads to more trouble tickets
- Unhappy customers lead to churn

Cisco Visual Quality Experience (VQE) Technology

Preserving IPTV Quality of Experience

- Real-time IPTV error repair for guaranteed quality of experience
  - Mitigates effects of bit errors on DSL transmission lines
- Quality of Experience monitoring
  - Monitoring and reporting of IPTV statistics with per-subscriber granularity
- Scalable, network-based, rapid channel change
  - Maintains consistent user experience
- Initially targeting Wireline Providers

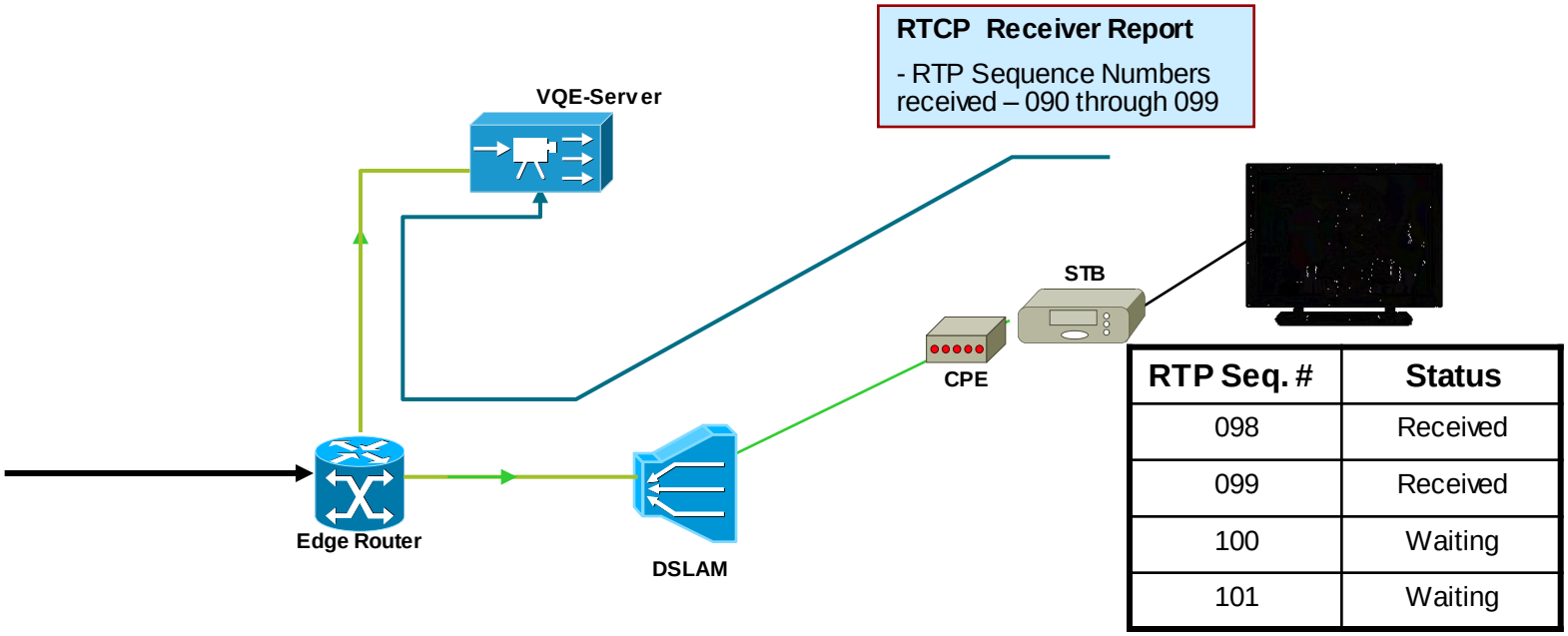
Cisco Solution for Edge



- Head-end support for RTP encapsulation
- Head-end support for FEC short block length
- VQE Client support for FEC receive and RTP selective re-transmission
- VQE Server support for RTP selective re-transmission
- Network Level pre-requisites
  - IGMPv2 (v3 preferred)
  - Aggregation Router support for ECMP Load-balancing, High Availability)
  - QoS scheme

FEC: Pro-MPEG Code of Practice 3 / SMPTE 2022-1

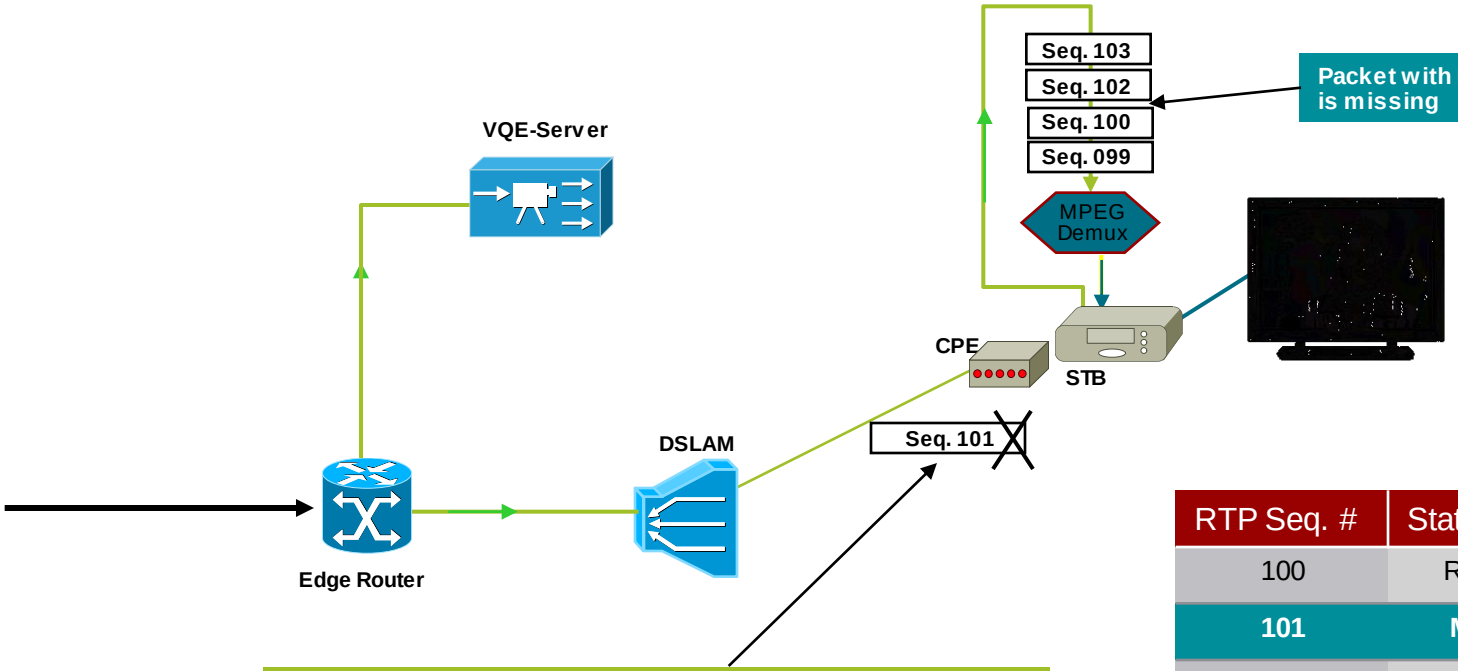
Error Repair—One



RTP Seq. #	Status
098	Received
099	Received
100	Waiting
101	Waiting

- Multicast packets transmitted from source encapsulated in RTP
  - Each IPTV packet has unique RTP sequence number
- STB VQE client checks RTP sequence numbers of each incoming packet
  - Checking for "holes" in de-jitter buffer (missing RTP sequence numbers)
  - Reception statistics periodically sent in RTCP messages to VQE server—Receiver Reports

Error Repair—Two

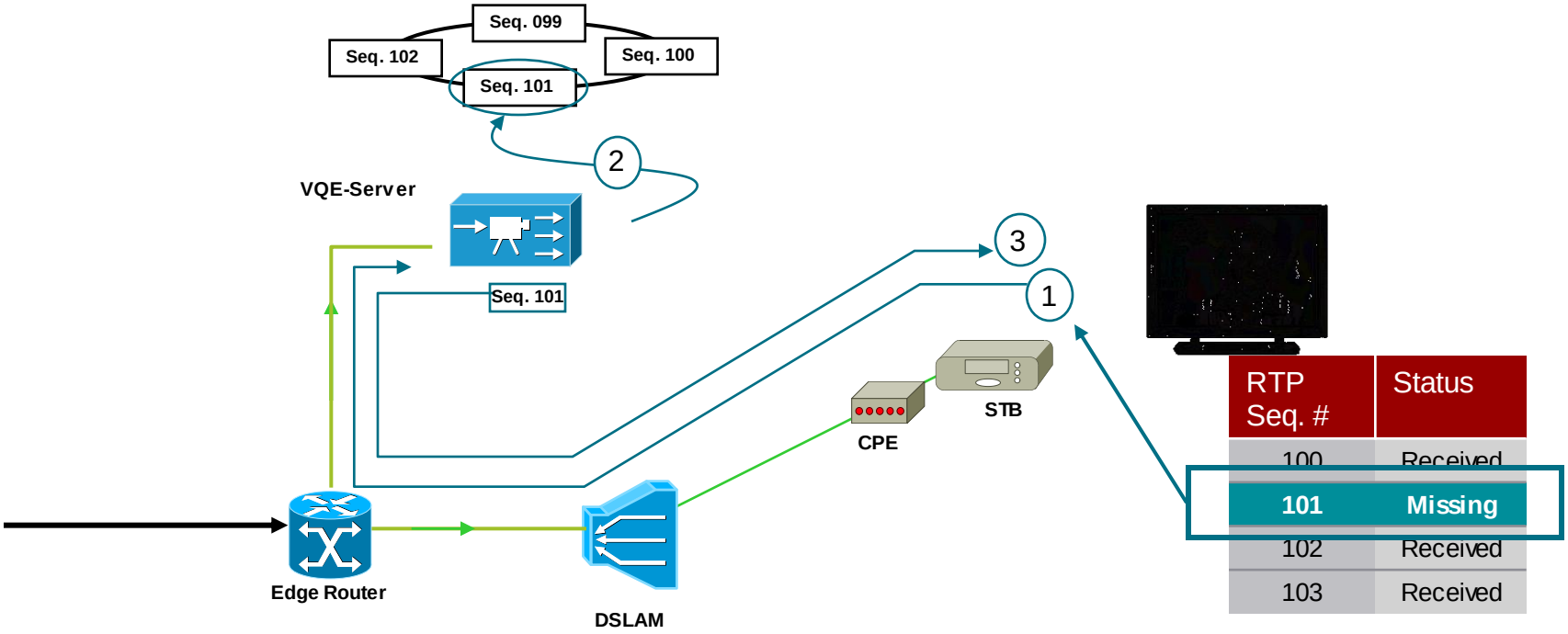


RTP Seq. #	Status
100	Received
101	**Missing**
102	Received
103	Received

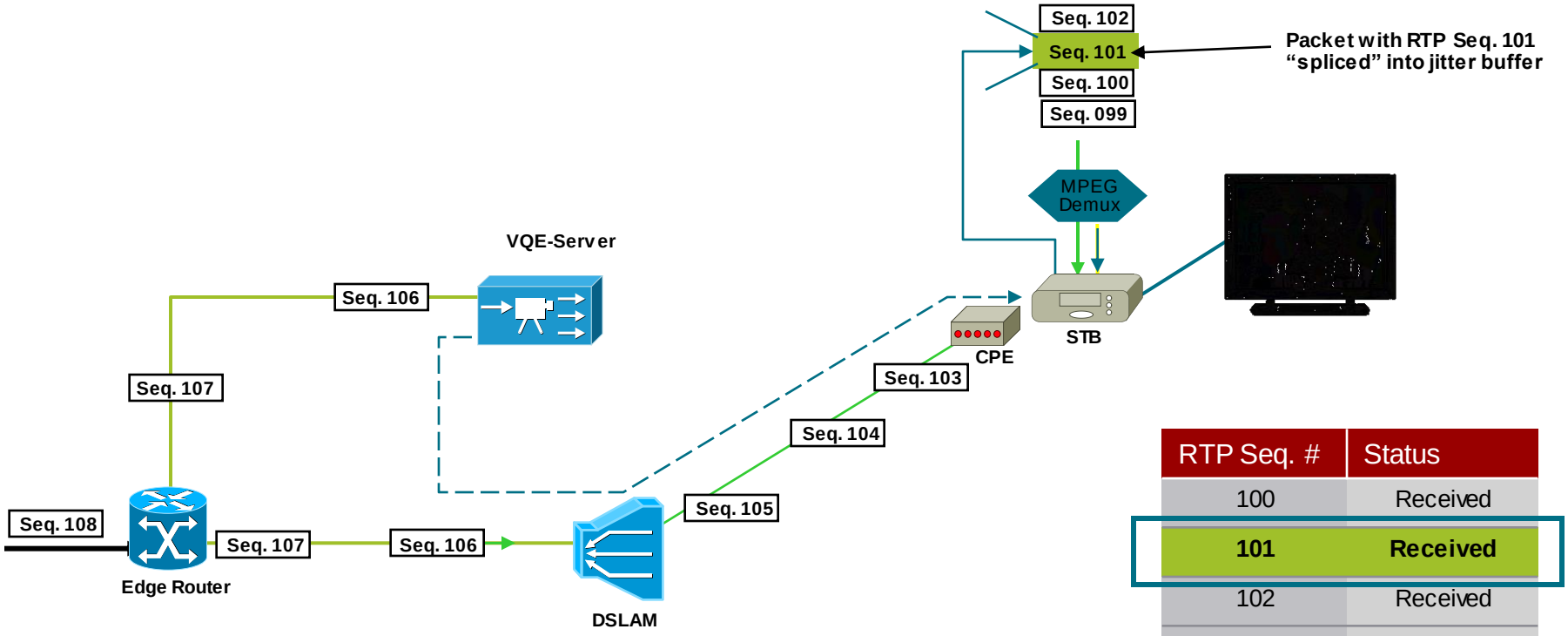
- Packet gets corrupted during transmission over DSL line
  - Fails CRC error check and is discarded
- VQE-C identifies a 'hole' in RTP sequence numbers in de-jitter buffer

Error Repair—Three

- STB/VQE-C communicates with VQE-S using RTCP message
- Requests re-transmission of missing packet (s)
- Up to 16 packets may be requested in single transaction



Error Repair—Four



RTP Seq. #	Status
100	Received
101	**Received**
102	Received
103	Received

- RTP Packet Received by VQE-C
  - Packet spliced into appropriate position in jitter buffer
  - Process occurs prior to MPEG Demux stage
  - Retransmission / Error mitigation transparent to subscriber

Demo VQE error repair

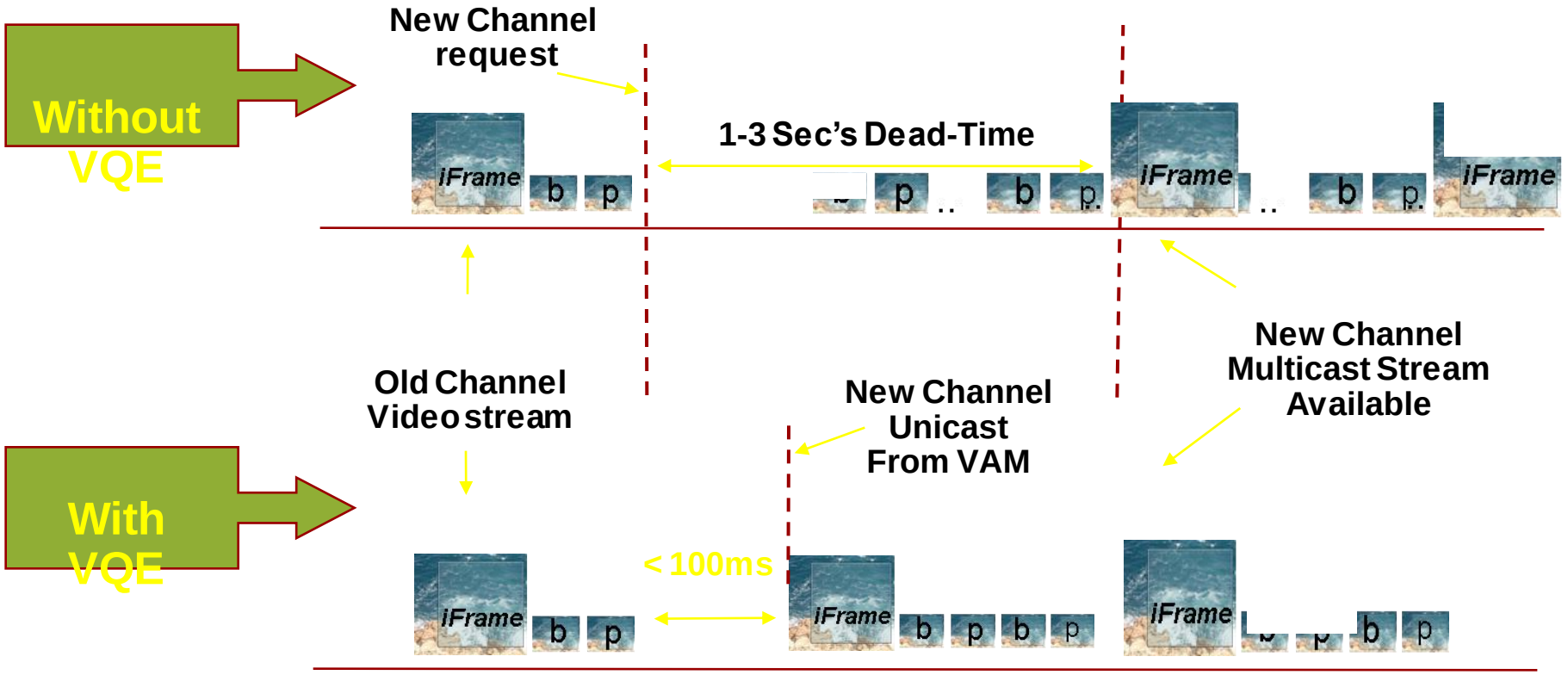
- MPEG 4 MOVIE

  Demo VQE.mov

Fast Channel change

Rapid Channel Change Scalable Network-based

Maintains the channel surfer's experience



VQE bridges multicast join delays

< 100ms to initiate Channel Change

* Full frame of integrated video content

Demo VQE fast channel change

- MPEG 4 MOVIE

  Demo fast channel change.mov

Summary

- The time that consumers are looking at BC TV in a walled garden design is rapidly going away
- Operators need to adapt / use the competitive advantage by re-organising there network to satisfy the changing needs of there subscribers
- Cisco focus is on all services end to end IP
- IP from Camera to the Home

- Cisco is providing the products /solutions to make this transformation happen


CISCO