

## SMPTE - Media Processing Transformation

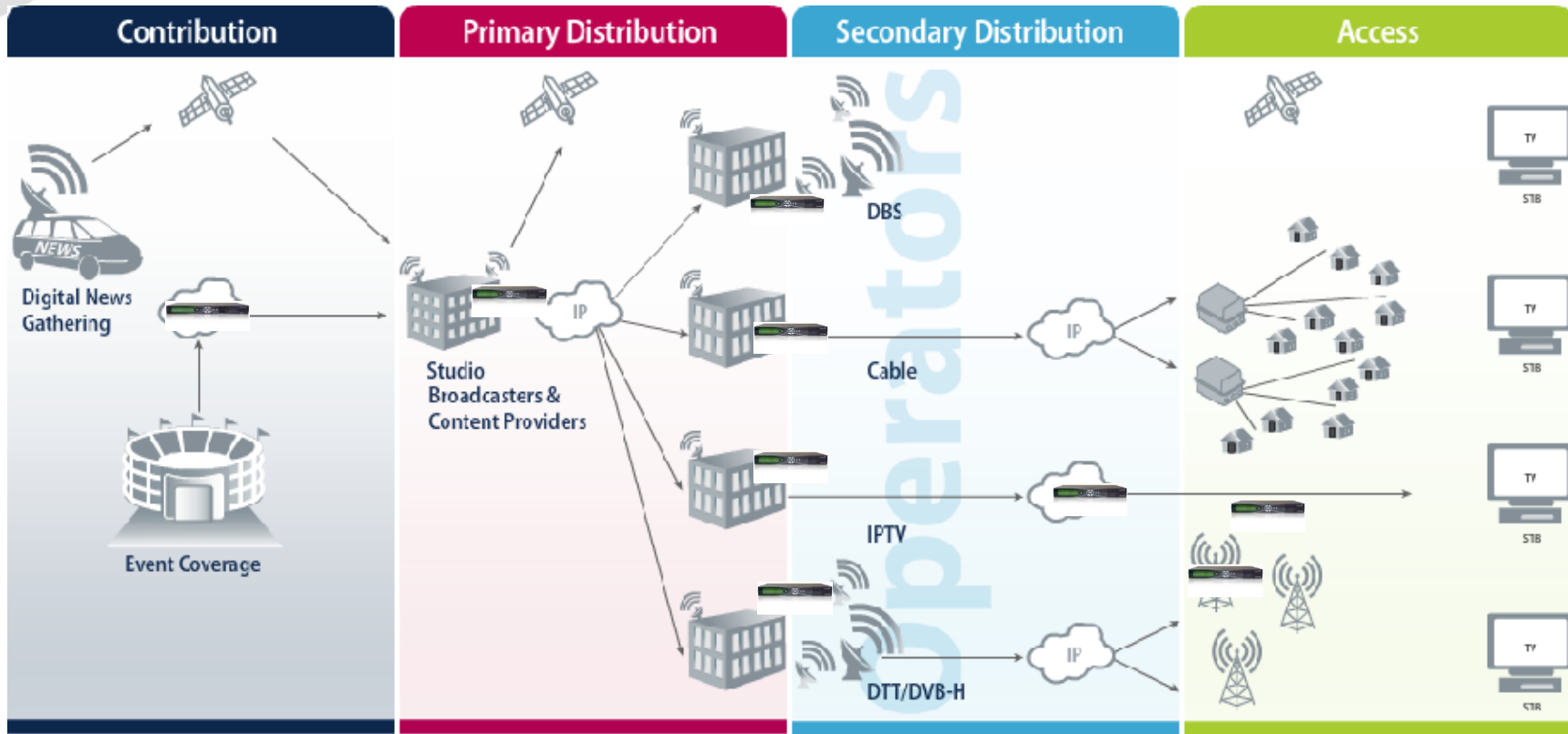


- Traditional Media Processing Headend Review
- New Generation Cloud Media Processing Introduction
- Transformation Challenges
- Personalized
- Case Study

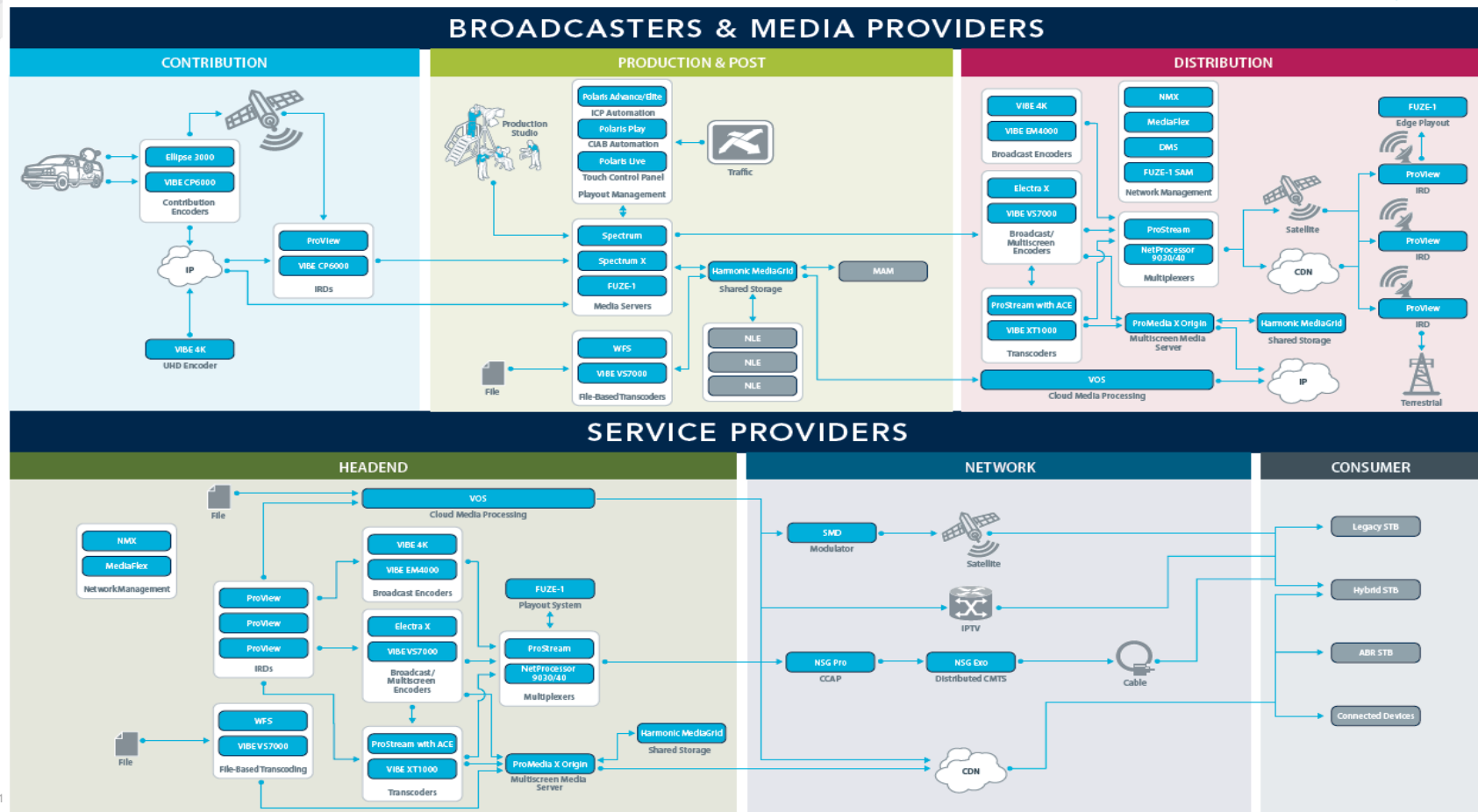
# Traditional Media Processing



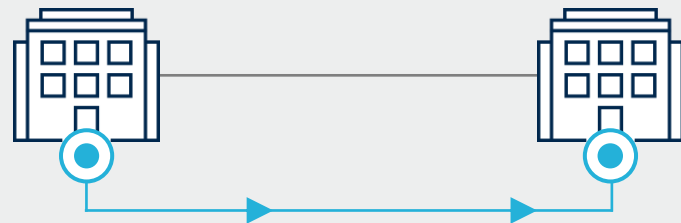
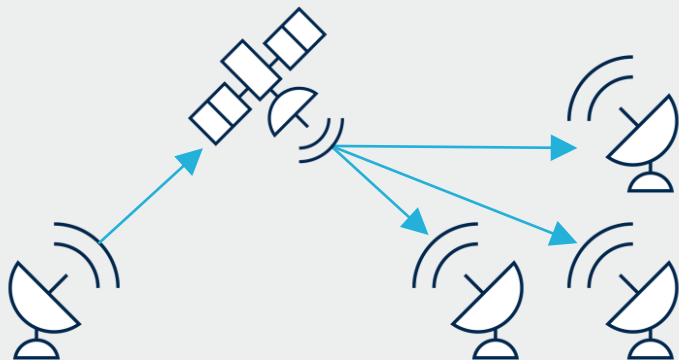
# Traditional TV Broadcast Workflow



# Traditional End-to-End Workflow Diagram



# Traditional DISTRIBUTION CHALLENGES



## Expensive

When being delivered worldwide (e.g. multiple satellite hops) or to only a few hundred affiliates

## Multi-year contract

Lock in to a commitment with provider

## Fixed infrastructure costs

High upfront costs to enable distribution

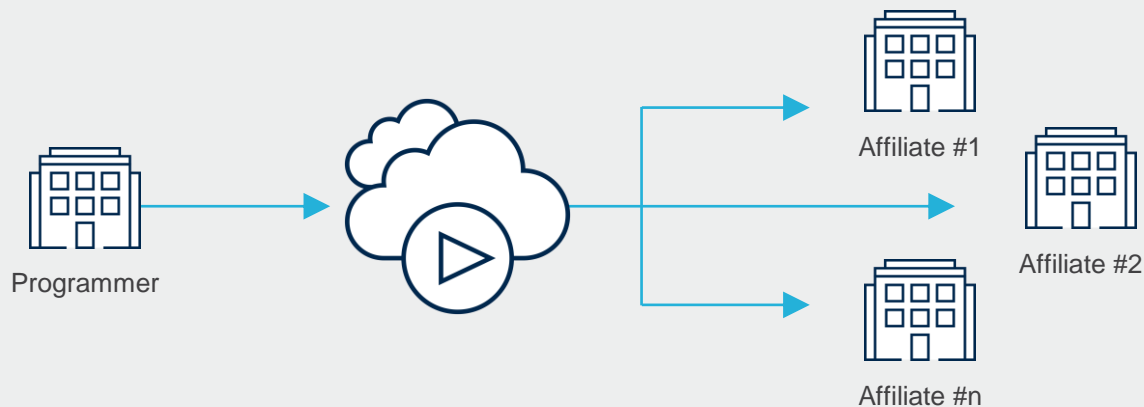
## Complex “per affiliate” customization

Due to multicast nature of Satellite

# Cloud Media Processing







## Pay per Use

Pay as you go/grow with affiliates

## Global Distribution

Global, CDN-enabled reach without distribution contracts or commitments

## Full Flexibility

Quickly add affiliates by connecting an appliance to open internet and manage each one via web browser

## Easy “per affiliate” customization

Content, graphic branding, ad placement





Scheduled  
Playback



Traditional  
channels



Live events  
& Pop Up channels



Deliver to Syndication  
Partners



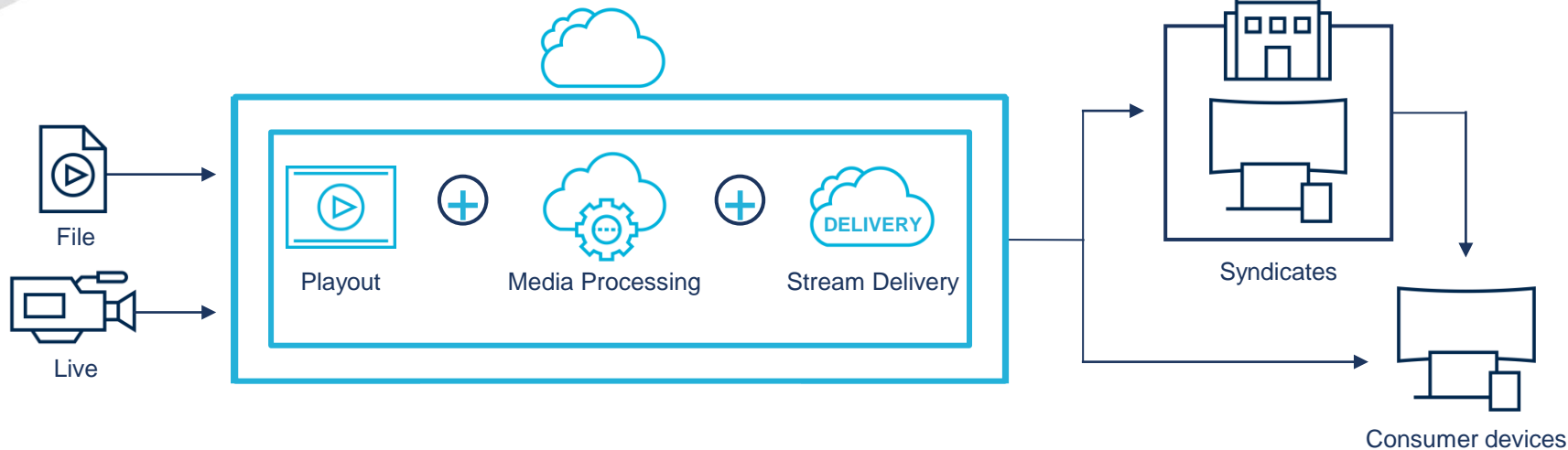
Stream to  
Consumers

## Powerful capabilities that enable customer channels

The most advanced cloud technologies for media applications available today.

Through continual advancements customers have access to our ever-growing feature set that enables enhancing channel creation workflows.

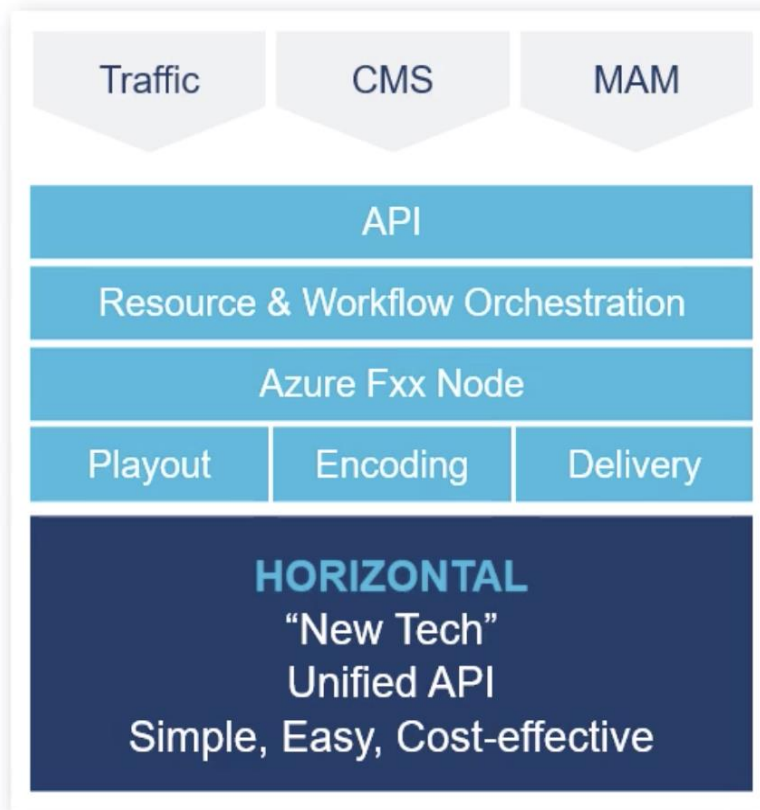
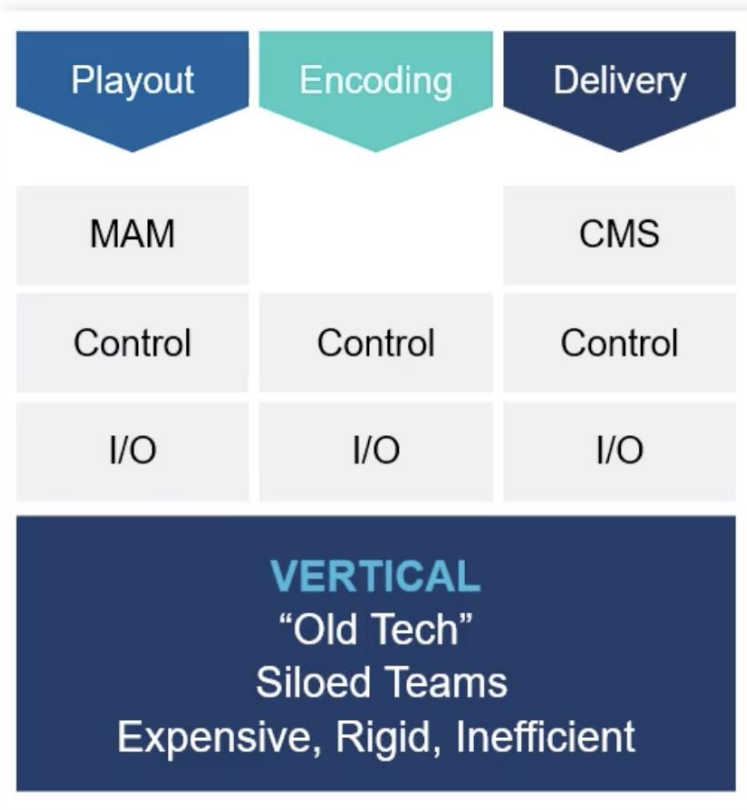
# Three main components – Payout, Media processing + Delivery



**The world's most advanced channel origination and distribution platform fully managed by Harmonic**

Schedule-based channel delivery solution for originating traditional linear channels, short term live events and simultaneously streaming to consumers and syndication partners

# VERTICAL vs. HORIZONTAL APPROACH





Limited Reach



Global Reach

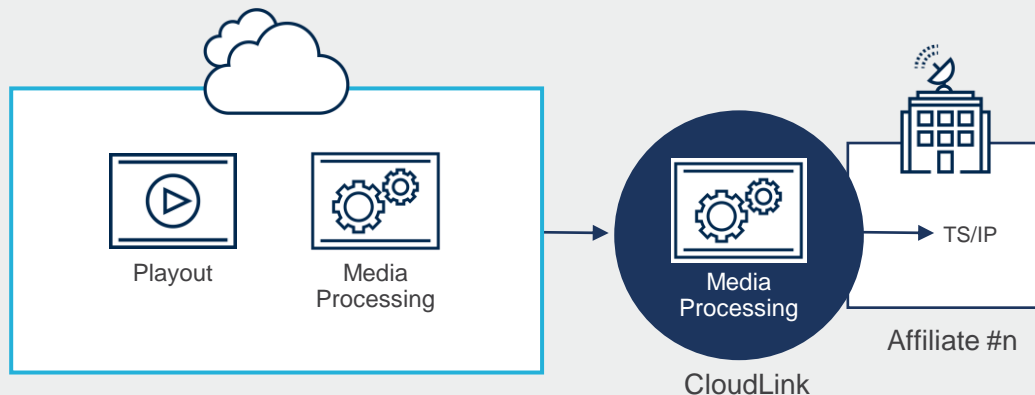


## Customize Content



Customize channels with targeted, regional content

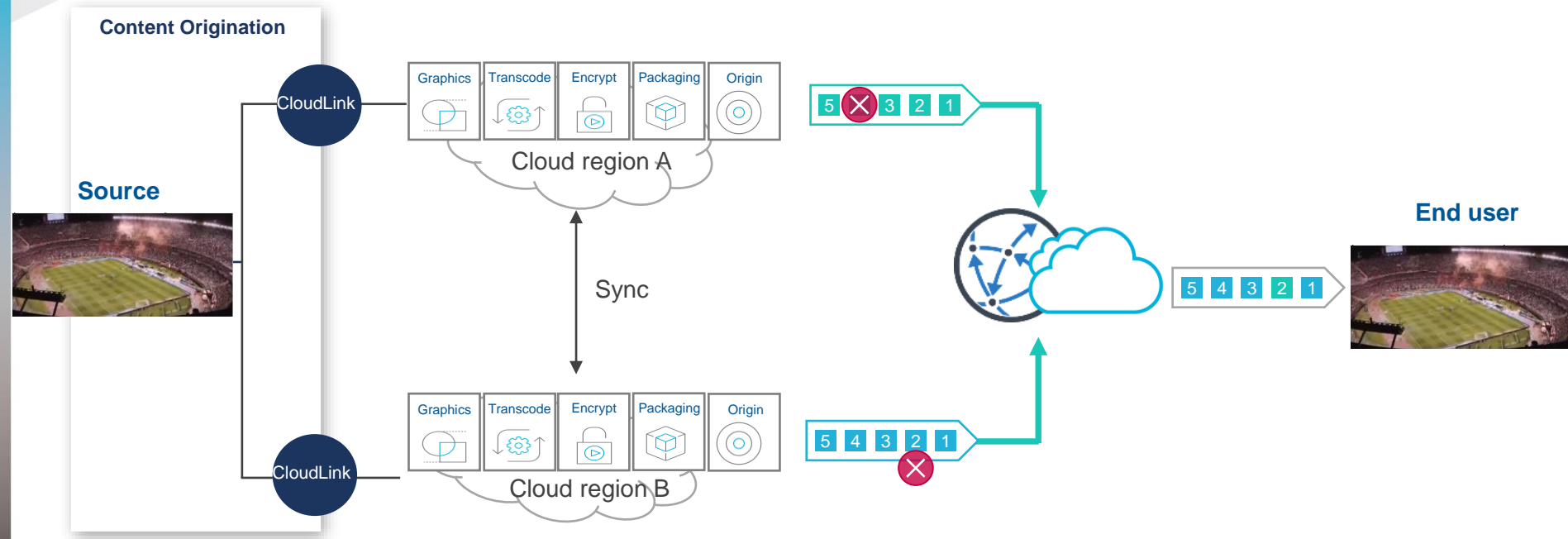
Enable affiliates to insert local content, ads and graphics



Best combine media processing features to customize content in any affiliate

# SERVICE CONTINUITY by Multi-Cloud

## 1+1 CLUSTER SEAMLESS GEO-REDUNDANCY

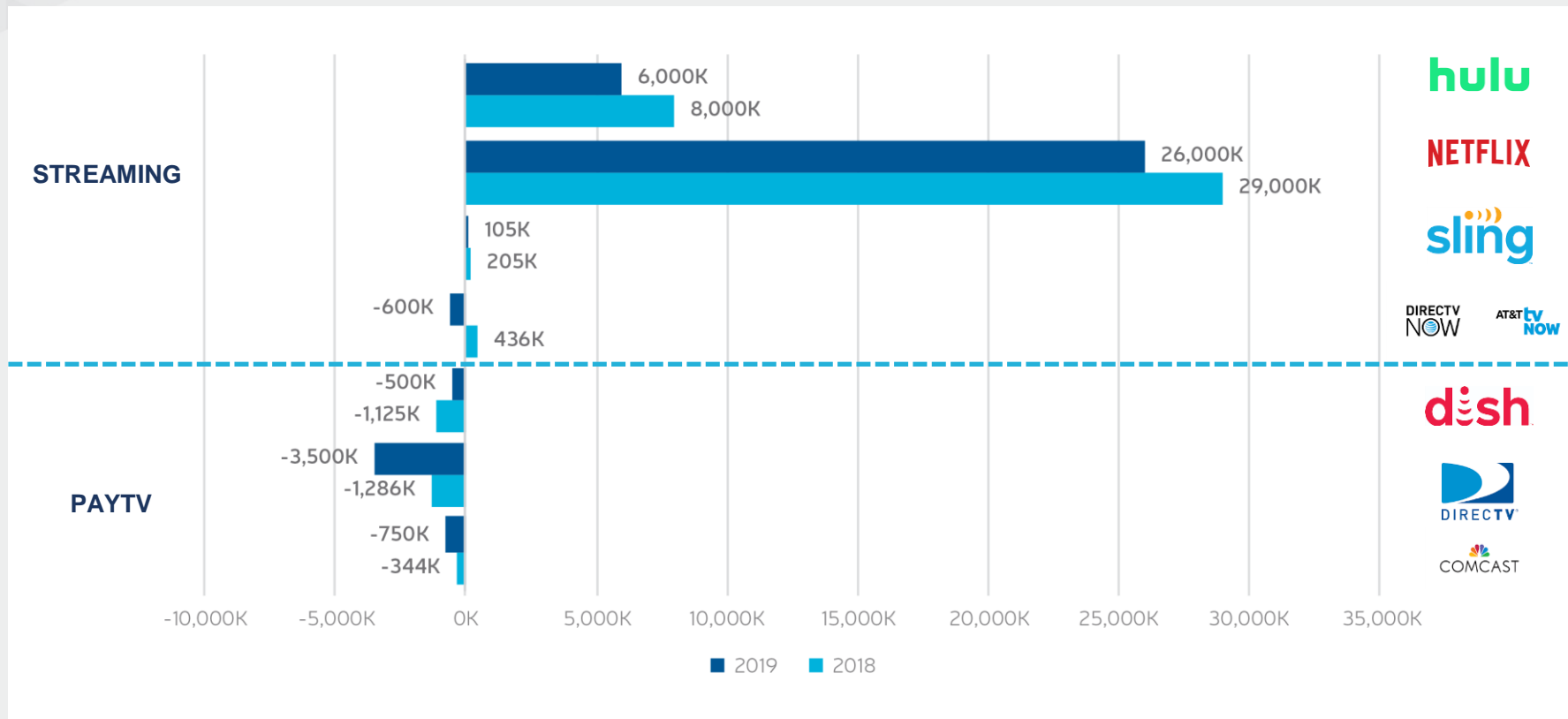


# Transformation Challenges

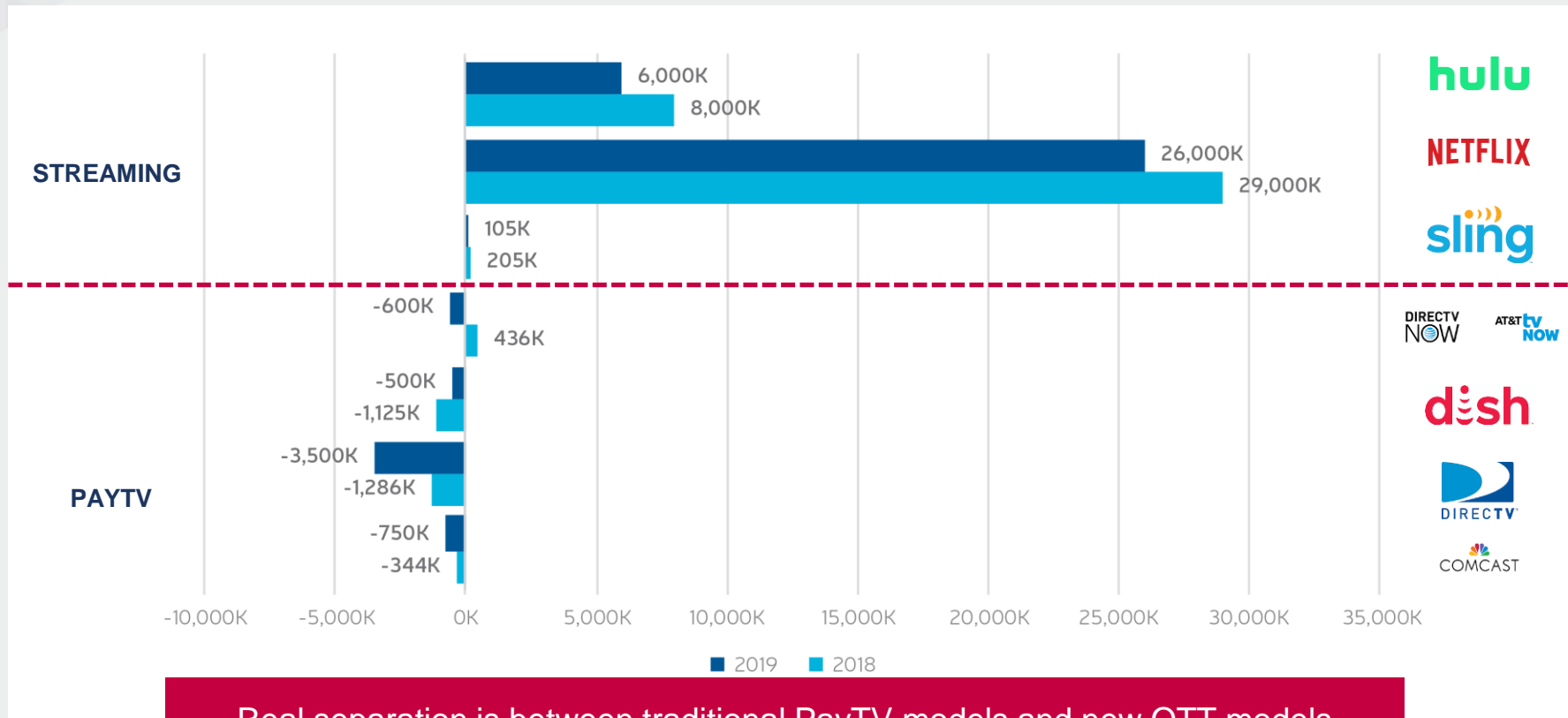




# Subscriber changes in the last 2 years



# Subscriber changes in the last 3 years



Real separation is between traditional PayTV models and new OTT models

## 2 MEGA TRENDS

**Streaming**

**Personalization**

**Cloud infrastructure**

**Flexibility / Scalability**

**This will shape next 10 years of the video industry**

**End Goal is personalized TV**

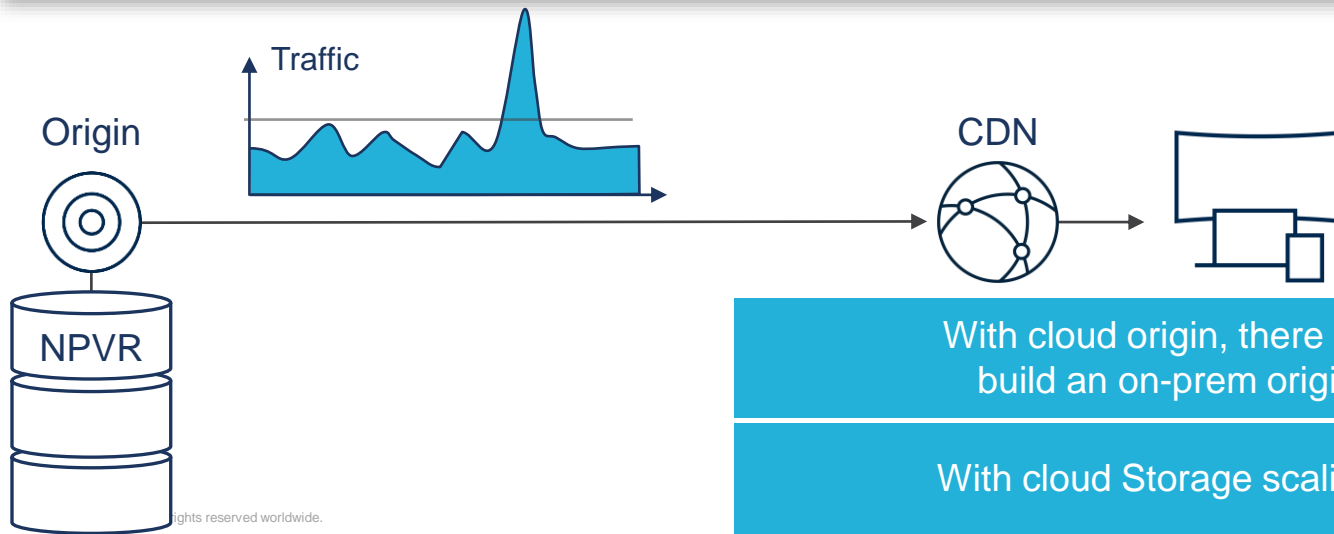
- Infrastructure complexity: High storage, Bandwidth & CDN Capacity
- Operational complexity
- High resiliency and availability
- Density – codec efficiency
- Technical complexity - Personalization at Scale

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# Streaming in the Cloud enables **SCALABILITY & FLEXIBILITY**

Live events and CDN hit ratio call for high traffic peaks

NPVR storage capacity is hard to predict



With cloud origin, there is no need to build an on-prem origin for peak!

With cloud Storage scaling is simple !

- Infrastructure complexity: High storage, Bandwidth & CDN Capacity
- Operational complexity
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# In the Cloud **SAAS MAKES SIMPLE OPERATION**



24/7/365  
highly skilled DevOps

Proactive Monitoring  
& Resolution

Inventory/ EOL  
management



Continuous Upgrades

Security  
Upgrades

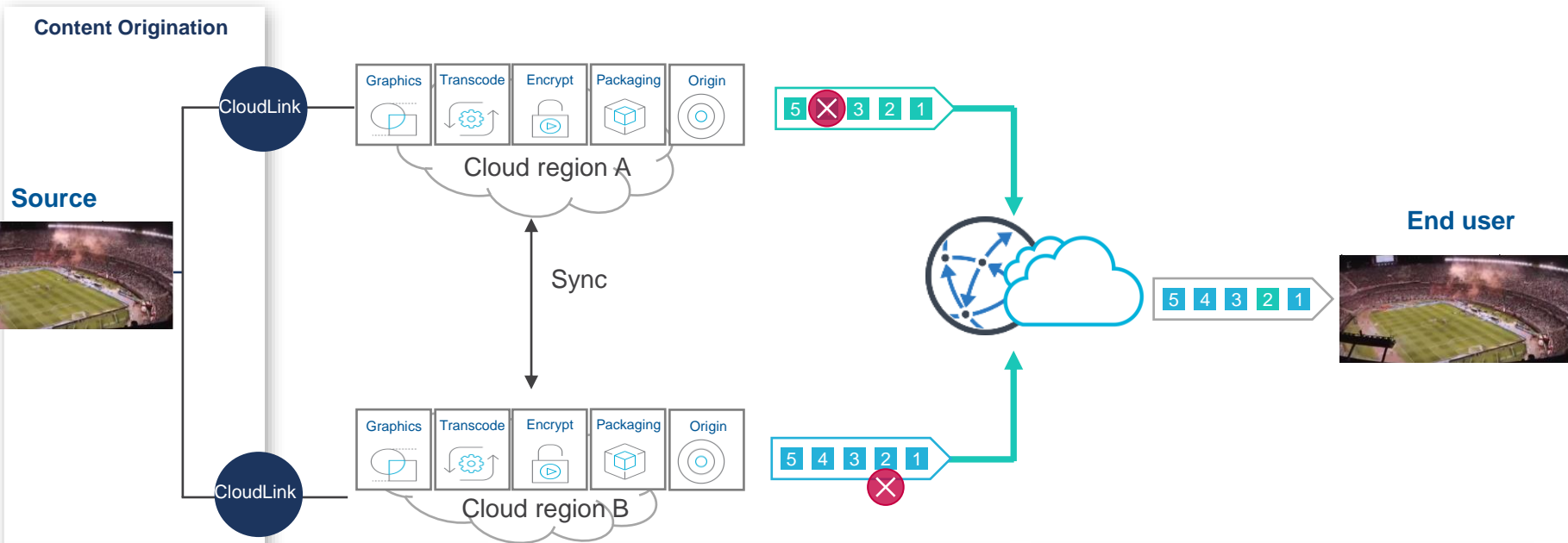
Linux  
Patches

**EASIER MAINTENANCE**

- Infrastructure complexity: High storage, Bandwidth & CDN Capacity
- Operational complexity
- High resiliency and availability
- Density – codec efficiency
- Technical complexity - Personalization at Scale

# SERVICE CONTINUITY

## 1+1 CLUSTER SEAMLESS GEO-REDUNDANCY



### Resiliency

- Dual Cloud regions
- Dual Cloud providers
- Dual source uplinks

### Seamlessness

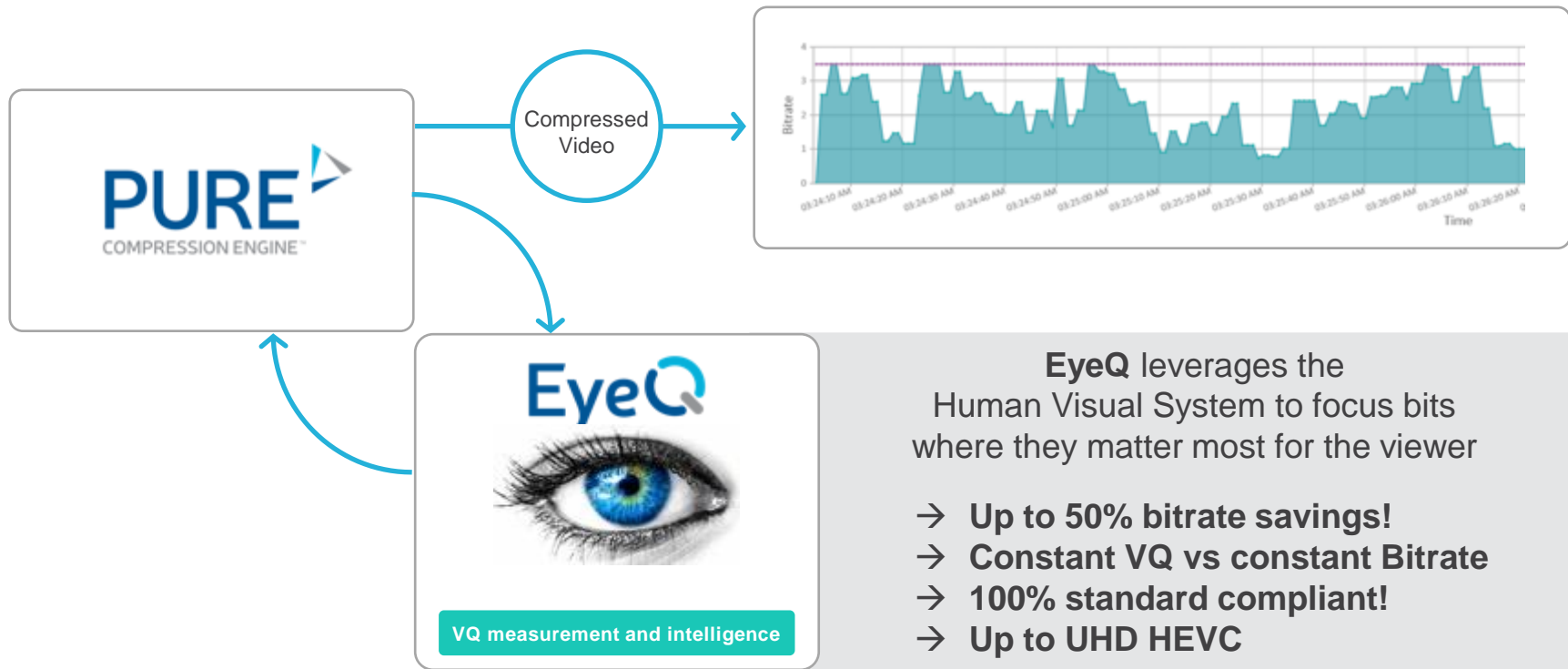
- Seamless failover on live
- Synchronized encoders
- Synchronized manifests
- Synchronized segments

### Proven in the field

- High availability
- 99.995% availability or more
- seamless user experience at all times

- Infrastructure complexity: High storage, Bandwidth & CDN Capacity
- Operational complexity
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- Density – codec efficiency
- Technical complexity - Personalization at Scale

# Harmonic EyeQ: A Closer Look



**EyeQ** leverages the Human Visual System to focus bits where they matter most for the viewer

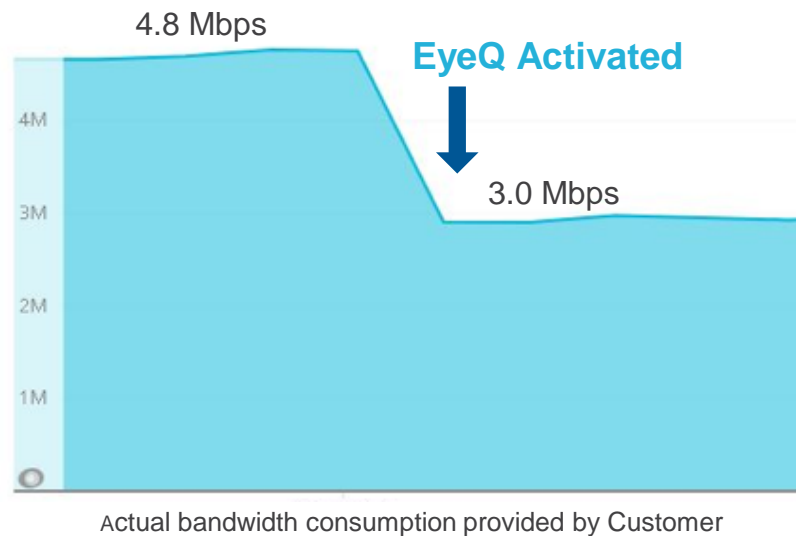
- **Up to 50% bitrate savings!**
- **Constant VQ vs constant Bitrate**
- **100% standard compliant!**
- **Up to UHD HEVC**

## Streaming Service

- 1M+ subscribers on fixed and Mobile
- 500+ channels
- Live, VOD, cDVR, time-shift & ssDAI

## Challenge:

- Reduce 3rd party CDN cost
- Reduce costs on Mobile
- Maintain same QoE



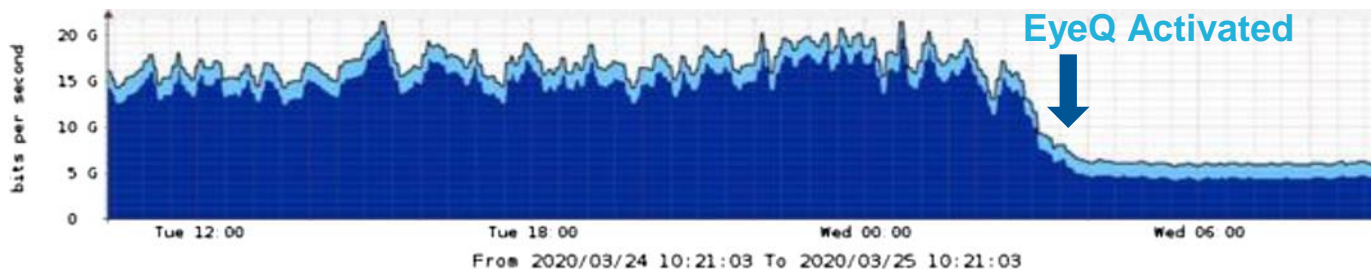
**38% bandwidth & storage savings** once EYEQ activated on all channels

## Streaming Service

- 10M+ subscribers on fixed and Mobile
- 50+ channels
- Live, VOD, cDVR, time-shift & ssDAI

## Challenge:

- Bandwidth pressure during COVID-19
- Needed a solution to be deployed fast without changing current infrastructure



Backbone bandwidth graphics provided by customer shown below

Backbone traffic reduction: 50%, CDN peak usage reduction: 30%



# CPU SAVINGS WITH NEW AI BASED ALGORITHM

## CONTEXT ADAPTIVE DELIVERY

### DYNAMIC FRAME RATE ENCODING

Dynamic selection of the best Frame rate to encode a content based on live analysis and AI prediction model

### ELASTIC ENCODING

Change dynamically the amount of CPU cycles allocated to a given service based on channel audience/ content



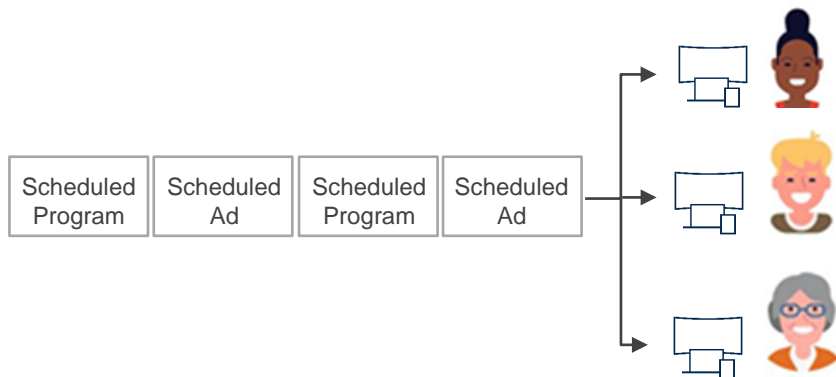
**ARTIFICIAL**  
intelligence

Up to 20% CPU saving

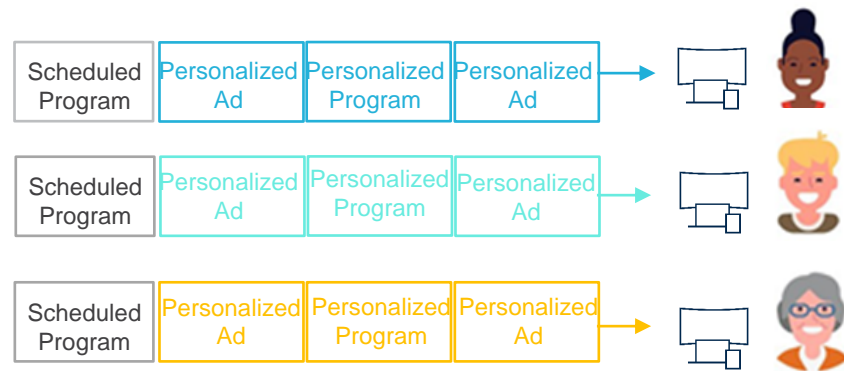
- Infrastructure complexity: High storage, Bandwidth & CDN Capacity
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# PERSONALIZED TV vs. BROADCAST TV

## Broadcast TV



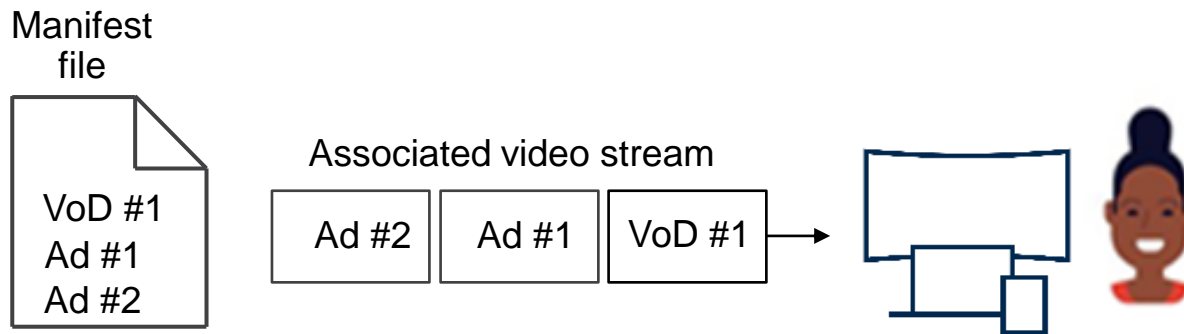
## Personalized TV



Targeting programs and ads to individual viewers based on analytics gathered over time

# HOW DOES PERSONALIZED TV WORK (1/3)

## MANIFEST FILE



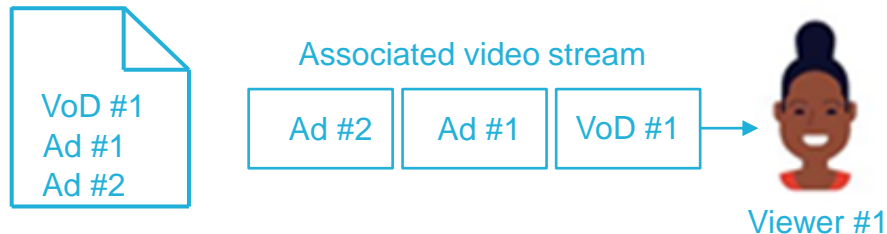
When a stream is requested, video & audio segments are accompanied by a **manifest file** that is a playlist and determines the playback order.

A new manifest is delivered with each segment of video requested.

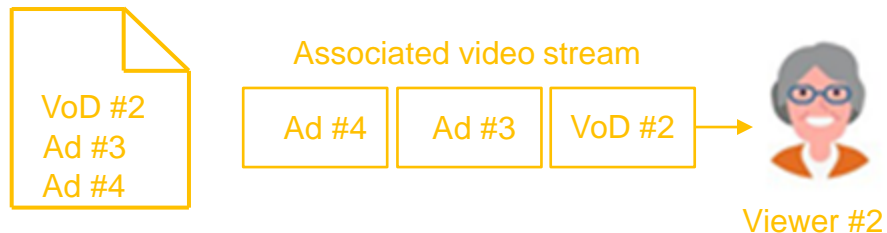
# HOW DOES PERSONALIZED TV WORK (2/3)

## DYNAMIC MANIFEST MANIPULATION

Manifest file #1



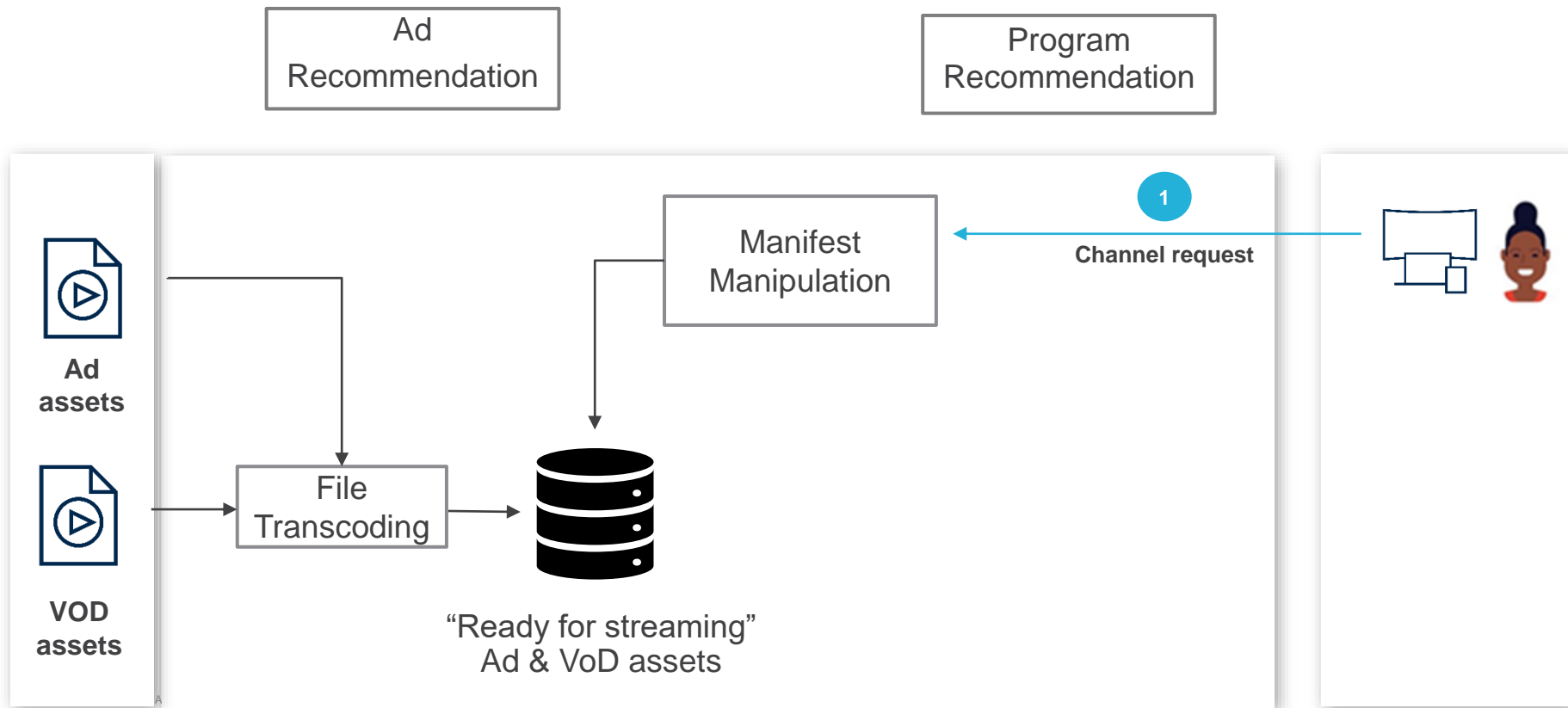
Manifest file #2



The ability to **customize the manifest file dynamically**, at a per viewer level, opens up opportunities to tailor the viewing experience.

# HOW DOES PERSONALIZED TV **WORK** (3/3)

## AD & PROGRAM RECOMMENDATIONS



# HOW DOES PERSONALIZED TV WORK (3/3)

## AD & PROGRAM RECOMMENDATIONS



FreeWheel  
Google Ad Manager

Ad  
Recommendation



Program  
Recommendation

2

Program Call

1

Channel request



Ad  
assets



VOD  
assets

File  
Transcoding



"Ready for streaming"  
Ad & VoD assets

Manifest  
Manipulation





# HOW DOES PERSONALIZED TV WORK (3/3)

## AD & PROGRAM RECOMMENDATIONS



FreeWheel  
Google Ad Manager

Ad  
Recommendation



Program  
Recommendation

Program  
Response

Program Call

3

2

1

Channel request



Ad  
assets



VOD  
assets

File  
Transcoding



"Ready for streaming"  
Ad & VoD assets

Manifest  
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# HOW DOES PERSONALIZED TV WORK (3/3)

## AD & PROGRAM RECOMMENDATIONS

FreeWheel  
Google Ad Manager

Ad  
Recommendation



Program  
Recommendation

Program  
Response

Program Call

3

2

1

Channel request

4

Manifest  
Manipulation

4

Associated video stream

Manifest file #1



Ad  
assets



VOD  
assets

File  
Transcoding



"Ready for streaming"  
Ad & VoD assets



# HOW DOES PERSONALIZED TV WORK (3/3)

## AD & PROGRAM RECOMMENDATIONS

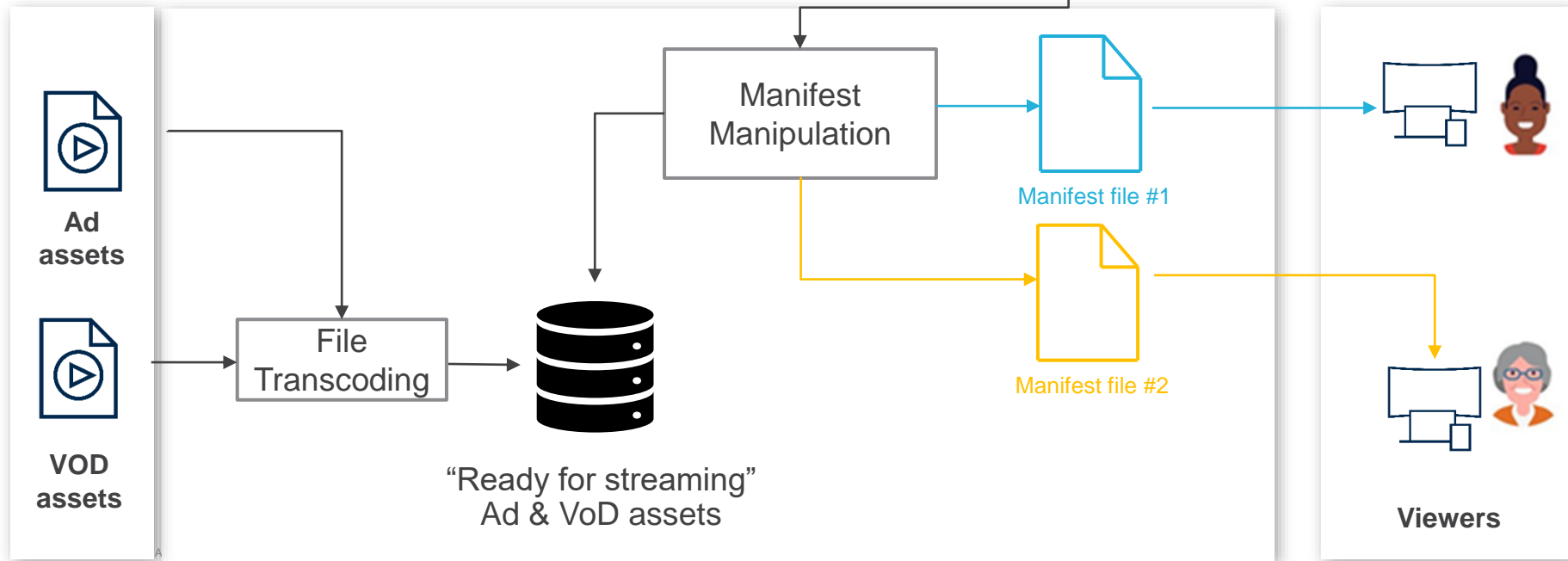


FreeWheel  
Google Ad Manager

Ad  
Recommendation



Program  
Recommendation



# CLOUD DISTRIBUTION BY HARMONIC: IT WORKS!



**Pay Per Use Pricing**, very favorable  
for starting small and growing

**No fixed infrastructure costs:**  
use the cloud, whose infrastructure is  
upgraded over time in the background

**Monthly Costs Are Lower** for the  
equivalent channel over satellite

**Simple, dedicated Web Apps**  
to grant/revoke access to affiliate

**Not Just Primary Distribution:**  
Launch pass-thru only distribution &  
add-on 'per affiliate' customization

**Content Customization**  
in the cloud or at the affiliate

**Global Distribution** over the  
internet simplifies delivery

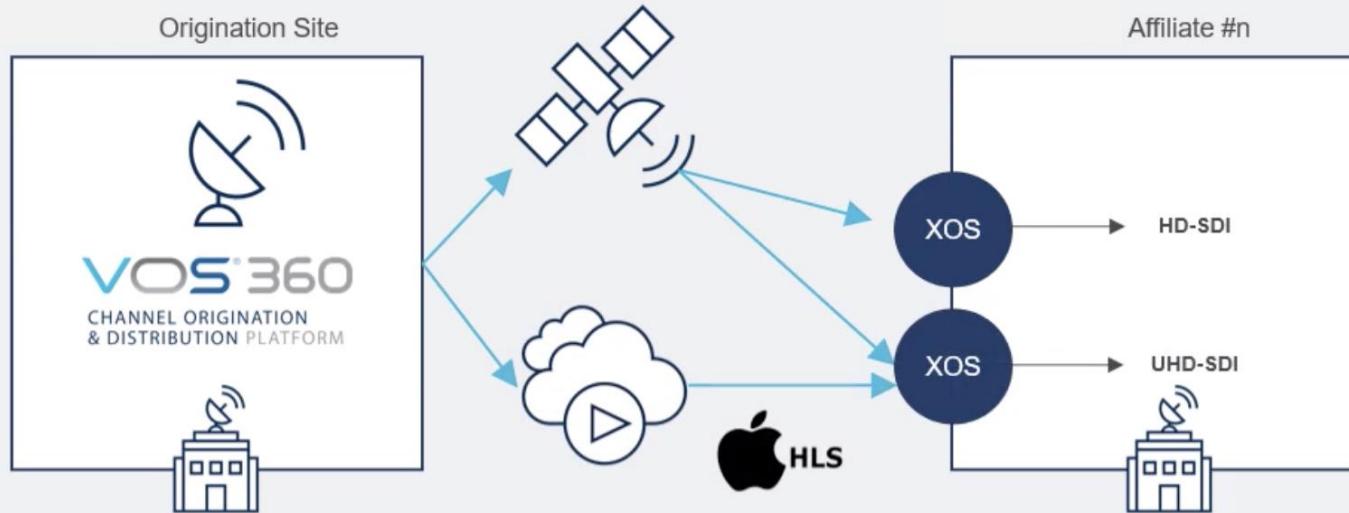
**24x7x365 DevOps** to operate and  
ensure highly reliable distribution

## Cases Study



# HYBRID SATELLITE / CLOUD DISTRIBUTION

## SKYPATH CASE STUDY EXPLAINED



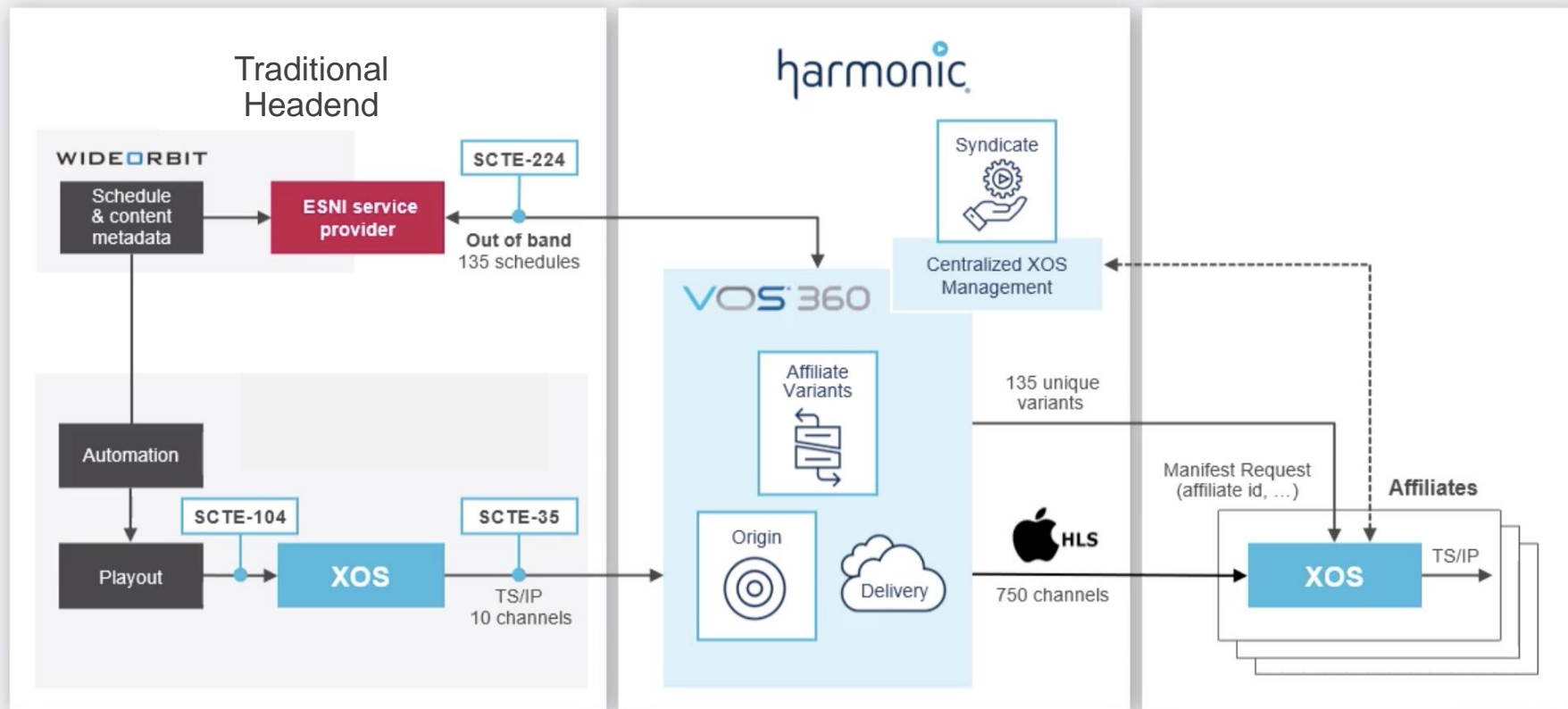
**Phase 1:**  
XOS as Satellite Receiver

**Phase 2:**  
Summer Olympics  
UHD to 15 Markets

**Phase 3:**  
Cloud Distribution with  
Affiliate Variants

# CLOUD DISTRIBUTION & VARIANTS CREATION

## SPORTSNET CASE STUDY EXPLAINED



# NEW USE CASE: OTT LINEAR PLAYOUT



Less Complex,  
Lower Cost

Personalization  
with SCTE-224

Server-Side Dynamic  
Ads with VAST

VOD Assets In,  
Live Channel Out



**Thank You**

