

# **Cisco Digital Video Products and Solutions**

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# Agenda

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- **Statistical multiplexing overview**
- **Cisco 6920 RateMux**
- **Video over IP in the core network**
- **DOCSIS cable modem + set-top box network**

# Statistical Multiplexing

# CBR vs. VBR Streams

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## Constant Bit Rate

- High bit rate required to accommodate complex video scenes
- Bandwidth wasted on simple video scenes
- Driven by networks with fixed data rates
- VoD titles often CBR

## Variable Bit Rate

- Average bit rate of VBR stream less than comparable CBR stream
- Can peak above comparable CBR for complex video scenes
- Presents opportunity for statistical multiplexing
- Most satellite feeds VBR

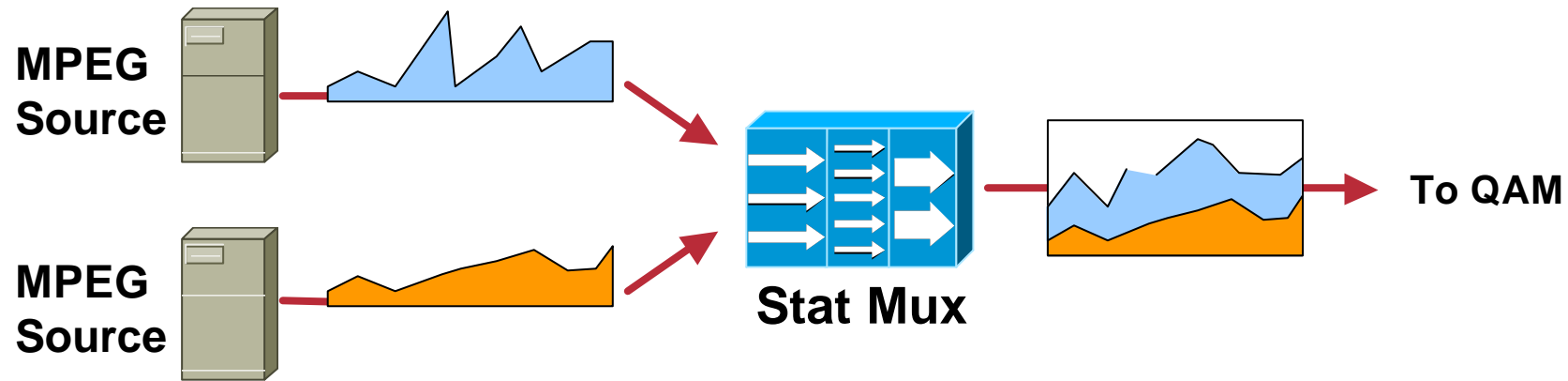
# Statistical Multiplexing (Stat Mux)

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- **Stat mux exploits the fact that the coding complexities of a selection of video sources, at any given time, are usually quite different**
- **For a large group of video sources, there might be only one or two “difficult” scenes at any given time**
- **Stat mux uses variable bit rate (VBR) encoding to give more bits to the more difficult scenes**

# Statistical Multiplexing

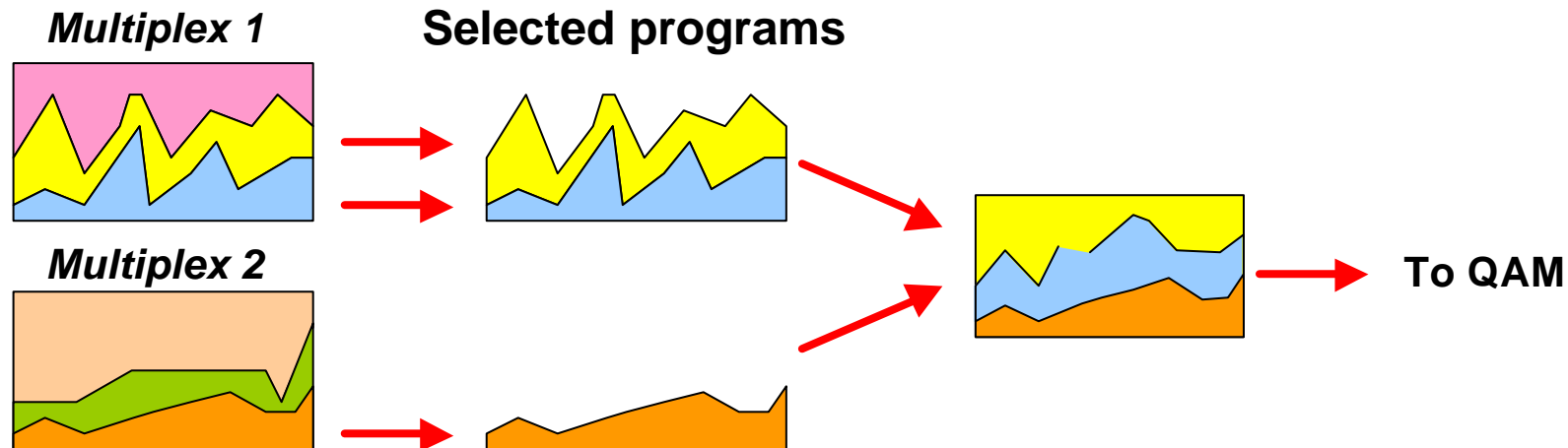
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- **Single-program VBR streams from multiple sources are multiplexed together into a multi-program CBR output stream such that the total bit rate does not exceed the available bandwidth of the QAM channel**
- **Opportunistic data applications can be inserted within the multi-program CBR output stream to “fill-in” the gaps between the CBR and VBR rates**

# Statistical Re-multiplexing

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- Multi-program streams from satellites, encoders or video servers can contain multiple VBR streams which have been statistically multiplexed together into a CBR stream
- The selected streams from these sources are then statistically re-multiplexed into a multi-program CBR stream that conforms to the available bandwidth of the output channel
- The technical challenge is to combine video streams from different sources in order to construct a new multiplex, taking into account the fact that the individual video programs have peak bit rates that, when combined, could exceed the total fixed bit rate of the output

# Why use Statistical Multiplexing?

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- **Stat Mux can increase the number of coded programs in a fixed bandwidth, without decreasing the quality of any program**
- **Enables operators to squeeze even more programs into a channel or transponder**

# **Cisco 6920 RateMux: Introduction, Applications and Configuration**

# Cisco 6920 RateMux

## *Product Definition*

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### What it is...

**MPEG-2 Statistical Multiplexer with:**

- ✍ **Modular design**
- ✍ **Digital Signal Processing (DSP)**
- ✍ **DVB-ASI and DHEI interfaces**
- ✍ **Management via browser**

### What it does...

**Combines digital programming from a variety of sources into an optimized MPEG-2 transport stream for distribution over cable networks**



# Cisco 6920 RateMux

## *Features and Benefits*

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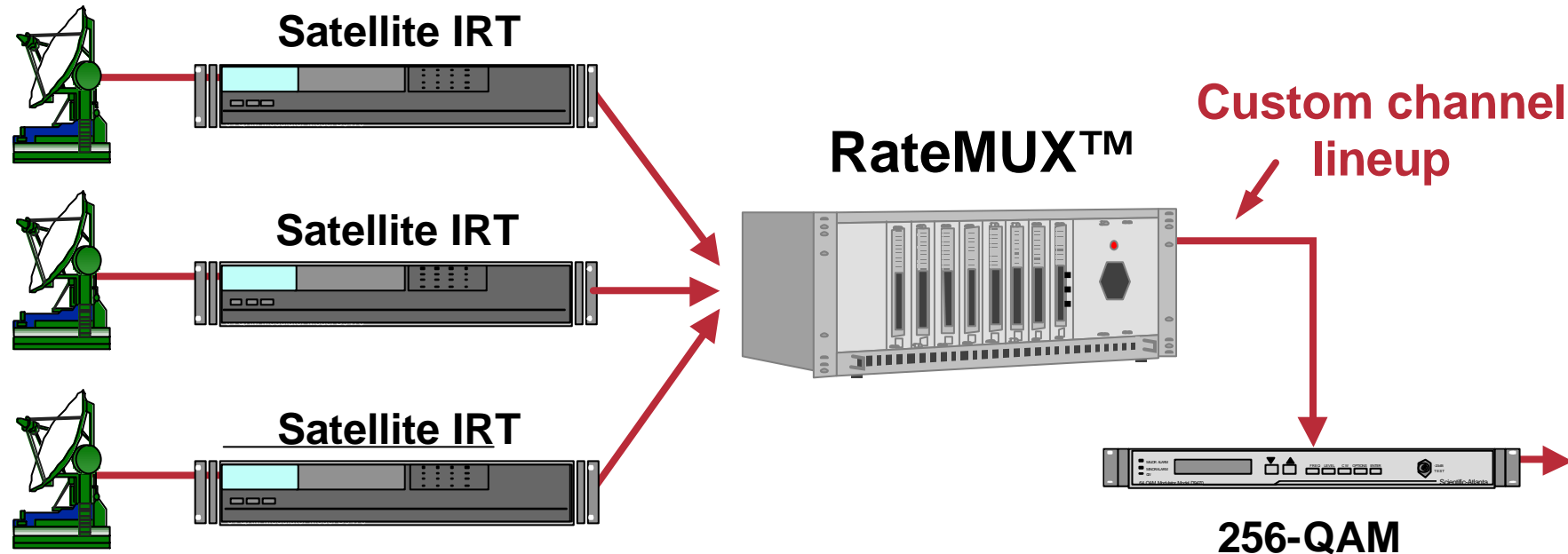
- **Programming flexibility**  
Create custom channel lineups from a variety of sources
- **Bandwidth optimization**  
Optimize HFC bandwidth utilization with rate reduction and statistical multiplexing
- **Revenue generation**  
Generate new revenues with standards-based digital ad insertion, multi-tier programming and HDTV
- **Investment Protection**  
Programmable DSP technology enables new video processing features via software upgrade
- **Flexible modular design**  
Configure RateMux with I/O and DSP cards to match your application requirements



# RateMUX Applications

## *Grooming*

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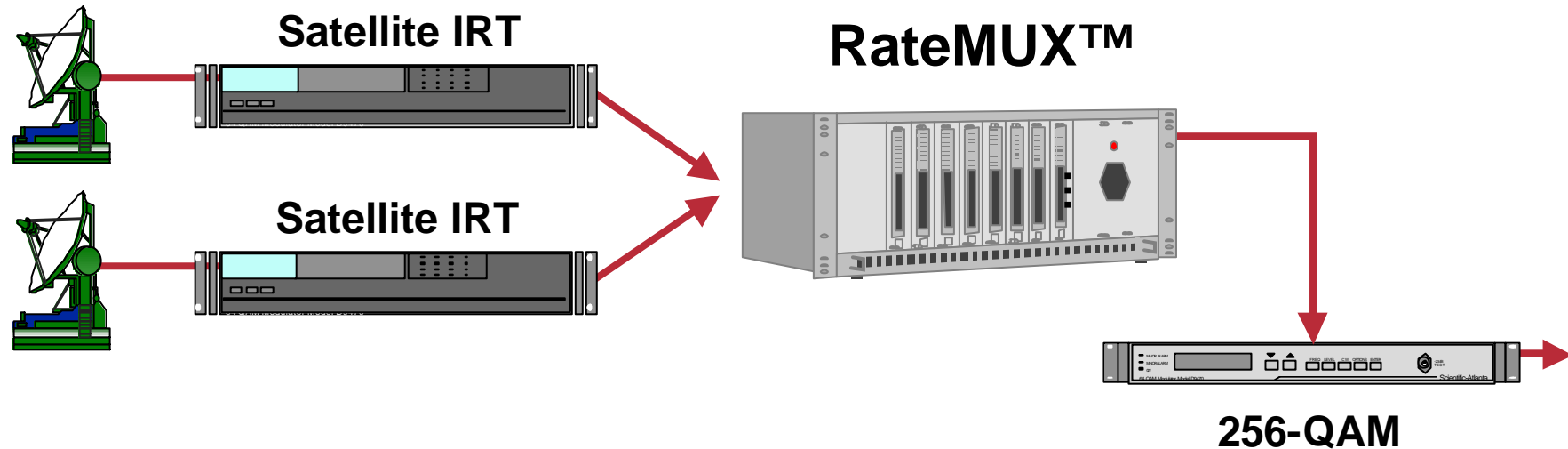


- Create custom channel lineups from multiple feeds
- Statistical re-multiplexing ensures highest quality possible within QAM channel bandwidth constraint

# RateMUX Applications

## *256-QAM Channel Packing*

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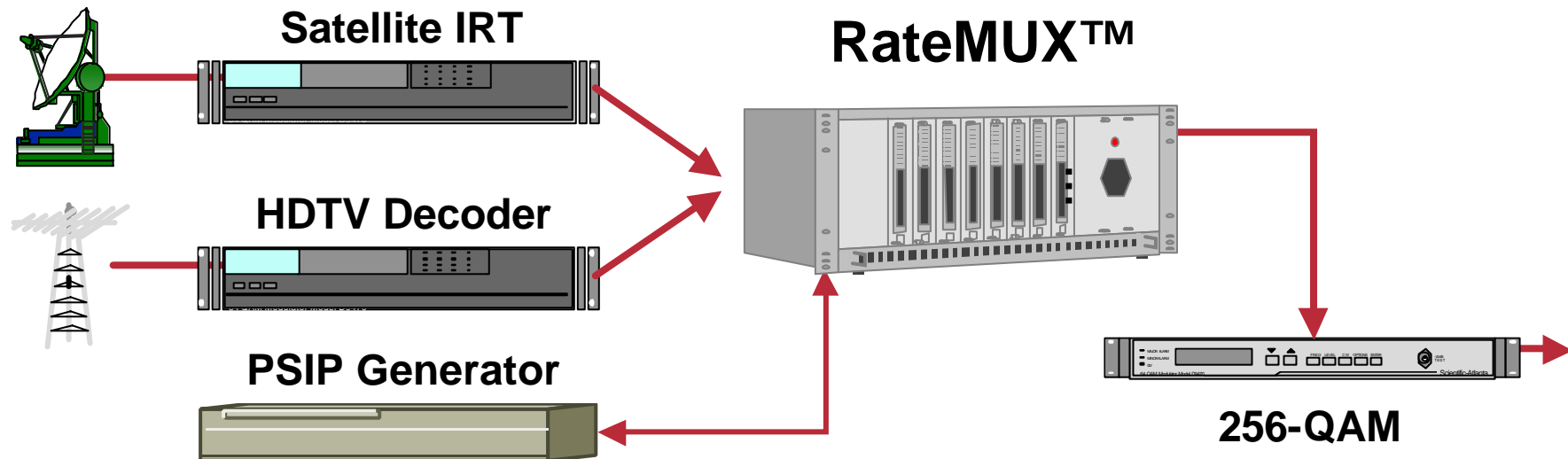


- Receive satellite feed based on 64-QAM distribution and add programs from another satellite feed or other source to fill up 256-QAM channel
- Statistical re-multiplexing ensures highest quality possible within QAM channel bandwidth constraint

# RateMUX Applications

## *HDTV Carriage*

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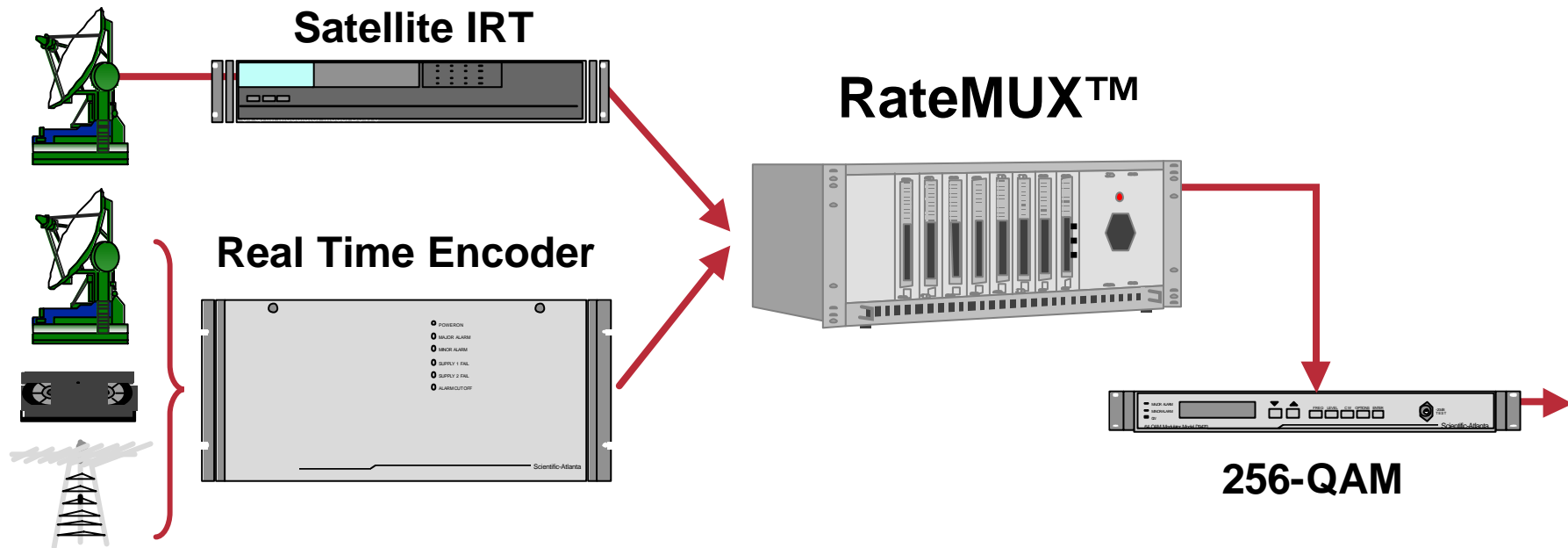


- **Multiplex HDTV program with programs from satellite feed to maximize use of QAM channel in HDTV applications**
- **Statistical re-multiplexing ensures highest quality possible within QAM channel bandwidth constraint**

# RateMUX Applications

## *Local Program Insertion*

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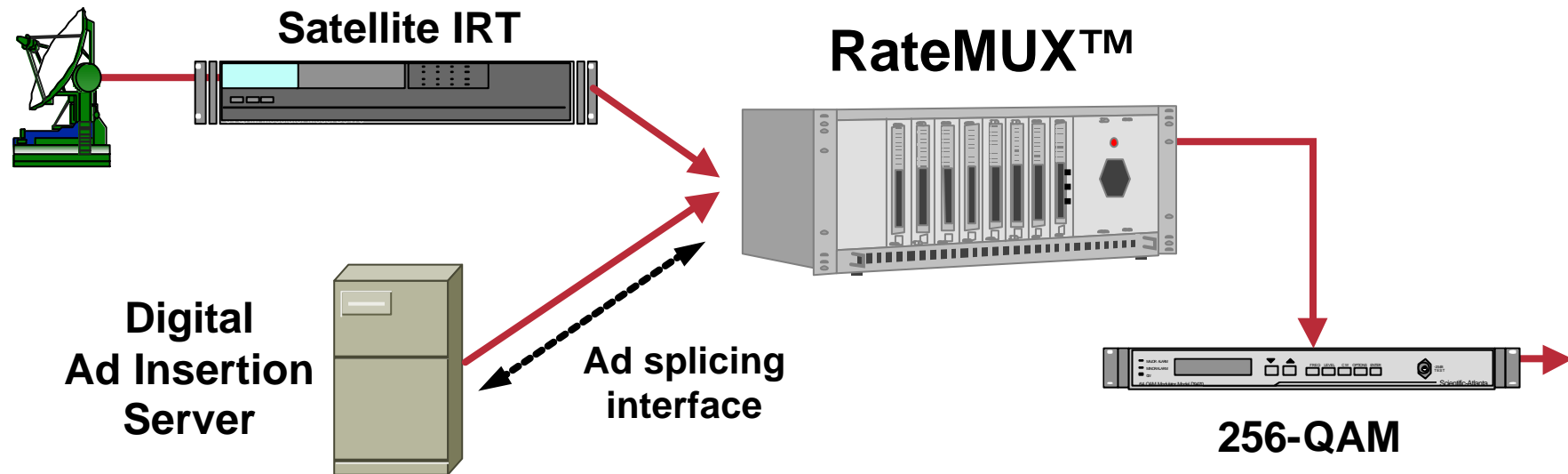


- Insert local programming from a variety of sources with selected programs from satellite feed
- Statistical re-multiplexing ensures highest quality possible within QAM channel bandwidth constraint

# RateMUX Applications

## *Digital Ad Insertion*

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- Splice digital ads into programs from satellite feed to generate ad revenues from the digital tier
- Bit rate reduction of digital ads typically required to match bit rate of programs on satellite feed

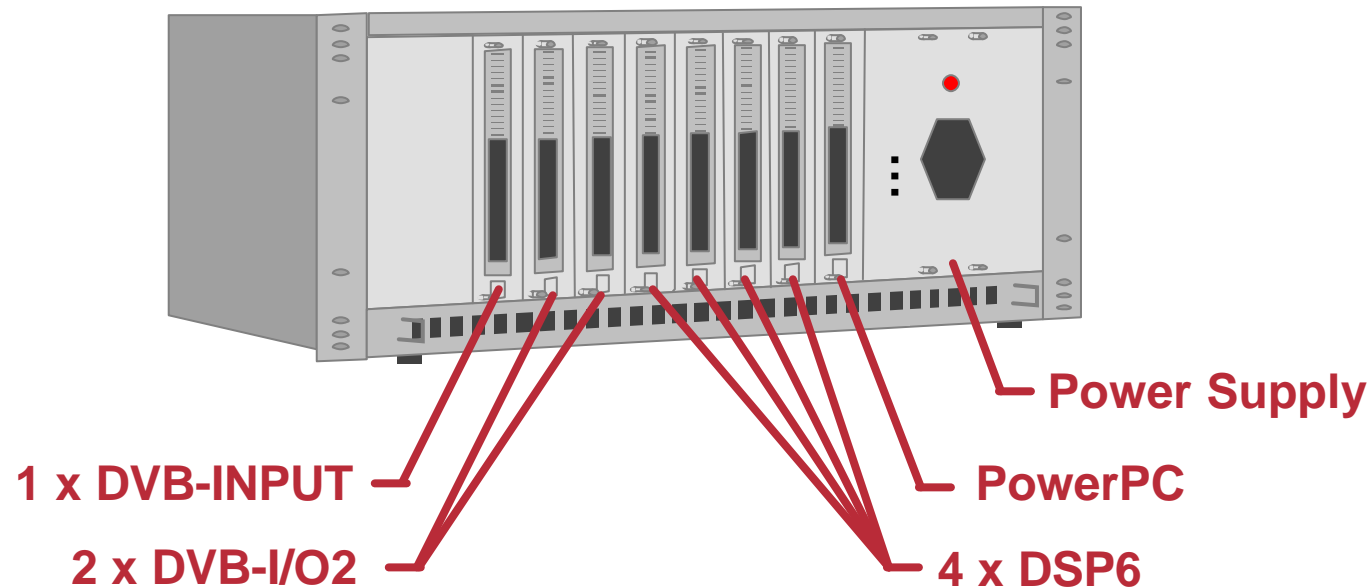
# Cisco 6920 RateMux Components

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Component	Product Number	Description
Chassis	6920-Ratemux	4RU; 8 slots; 15 IN / 4 OUT
I/O Cards	6920-DVB-I/O	3 IN / 2 OUT (cloned)
	6920-DVB-I/O2	3 IN / 2 OUT
	6920-DVB-INPUT	4 IN
	6920-DHEI-I/O	3 IN / 1 OUT
	6920-DHEI-INPUT	4 IN
DSP Cards	6920-DSP3	3 DSPs; 2 programs per DSP (9 Mbps)
	6920-DSP6	6 DSPs; 3-5 programs per DSP (14 Mbps)
Processor Card	6920-PWRPC	PowerPC; RJ-45 port; RS-232 port

# Example RateMux Configuration

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<b>Inputs</b>	<b><math>(1 \times 4) + (2 \times 3) = 10</math></b>
<b>Outputs</b>	<b><math>2 \times 2 = 4</math></b>
<b>Programs</b>	<b><math>4 \times 6 \times 3 = 72</math></b>

# Video over IP in the Core Network

# Why Video over IP in the Core?

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**IP enables two key network capabilities lacking in current digital video networks:**

- **Performing intelligent network services** such as routing, QoS, traffic engineering and security using proven, standards-based protocols
- **Connecting any source to any destination** using flexible routing/switching

# Video Market is Changing...

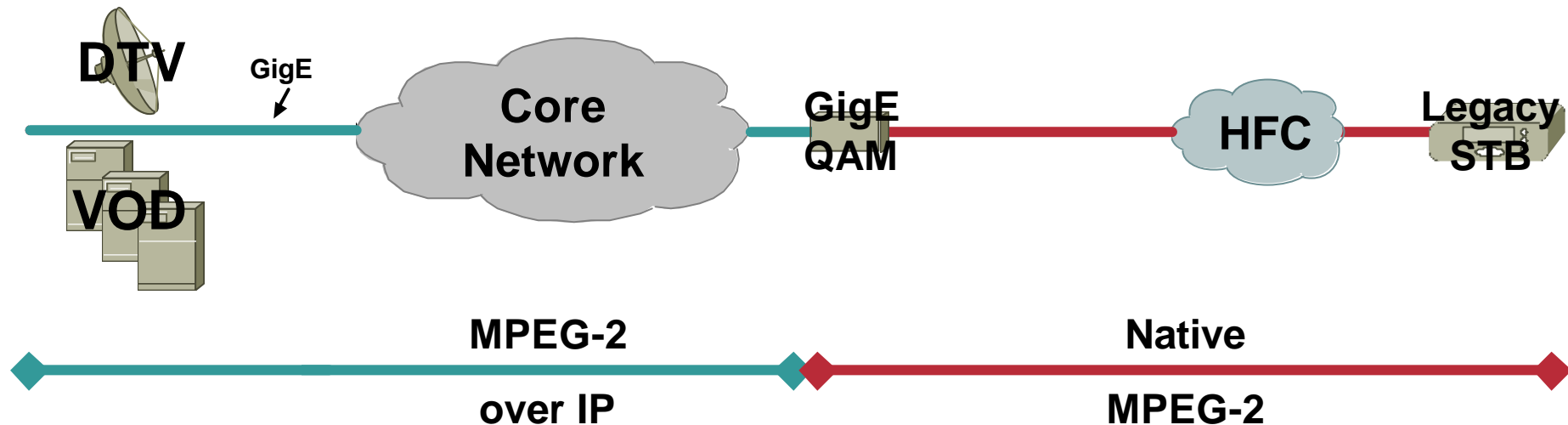
## Flexibility is Important!

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- DVD experience is rapidly becoming the benchmark, not VHS tape rentals
- S-VOD very popular—but breaks traditional VOD engineering assumptions
- Network-PVR on industry radar screen...usage rates & access patterns totally different from Movies On Demand!
- Blockbuster trialing subscription biz models...satellite putting disks in growing percentage of boxes...
- Studios experimenting with direct VoD approach over Internet (iVoD)

# Video over IP in the Core Network

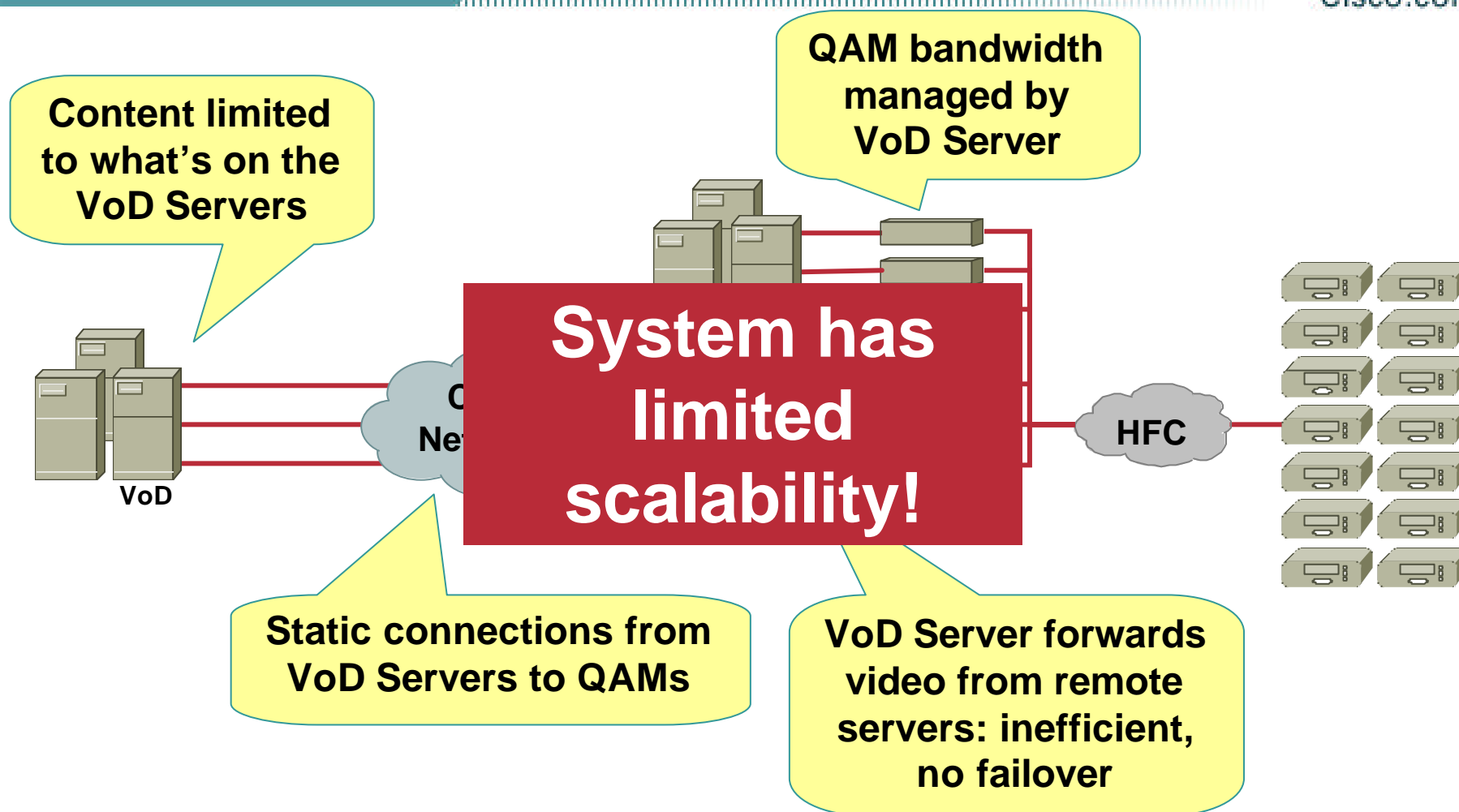
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- Lower server cost per stream
- Lower transport cost per stream
- Greater network flexibility, scalability
- Overlay services on existing HFC and STB
- Convergence to common infrastructure
- Building block for future video over IP to the home

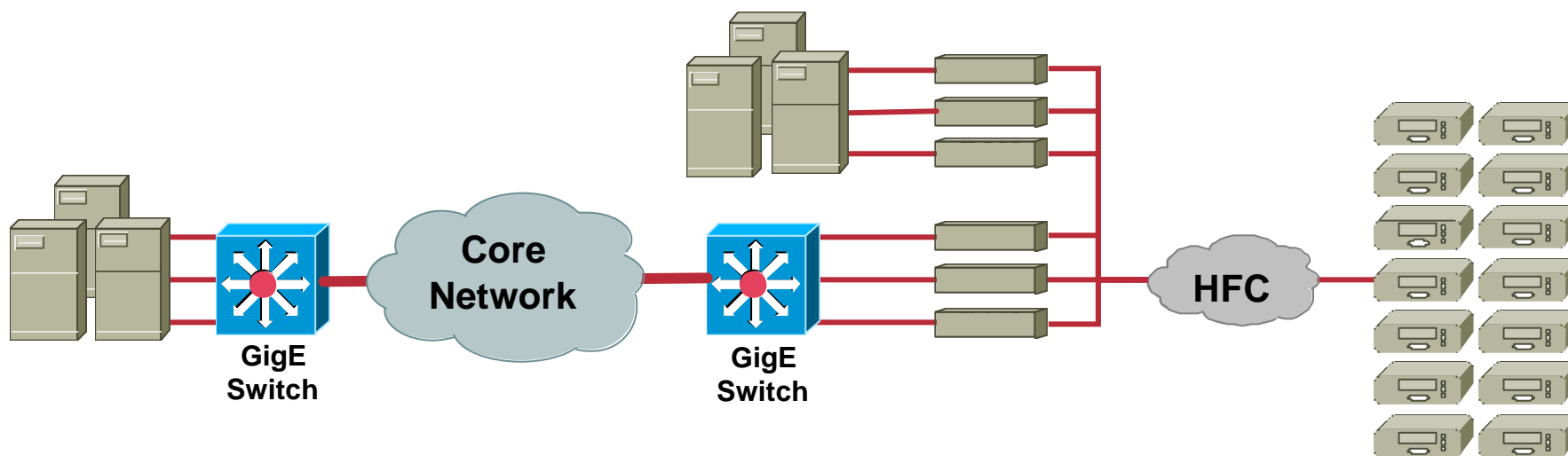
# Current VoD System

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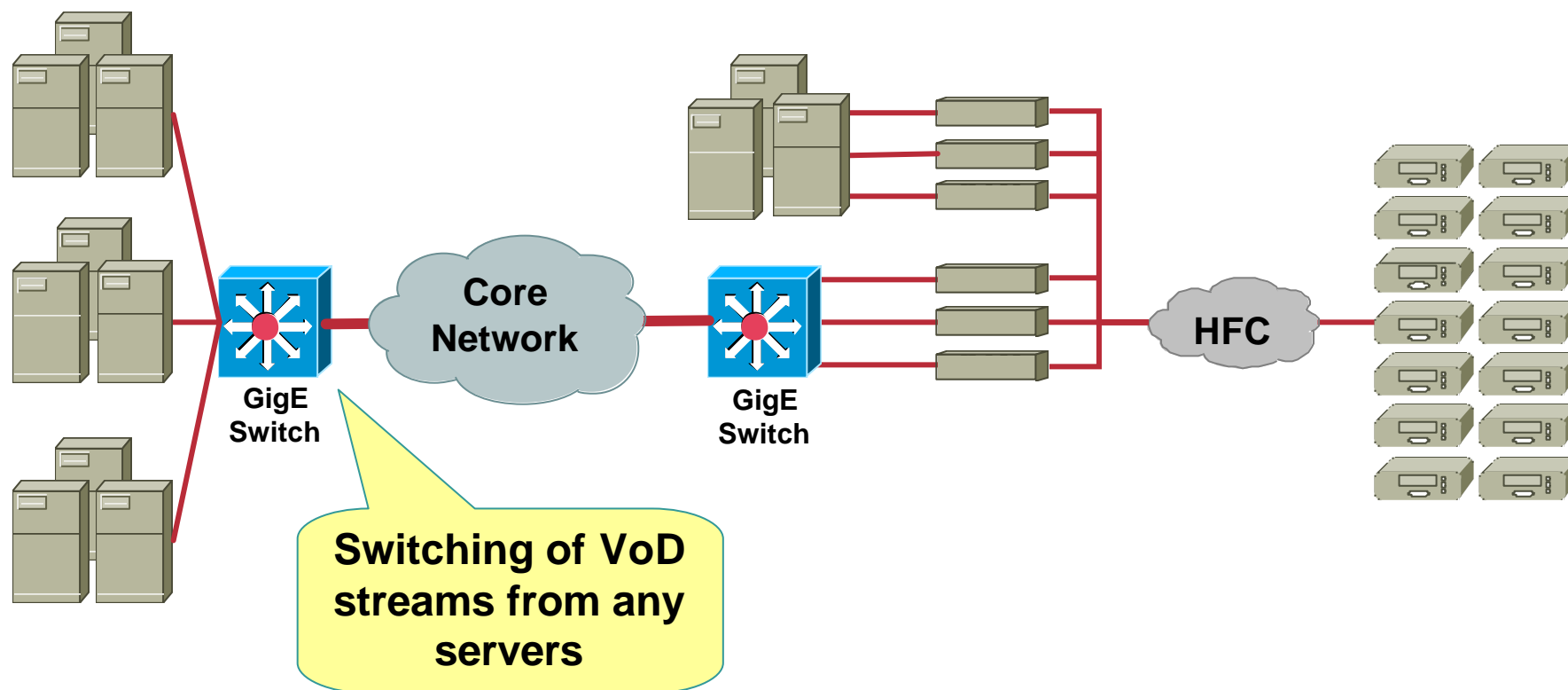
# VoD with GigE Switching

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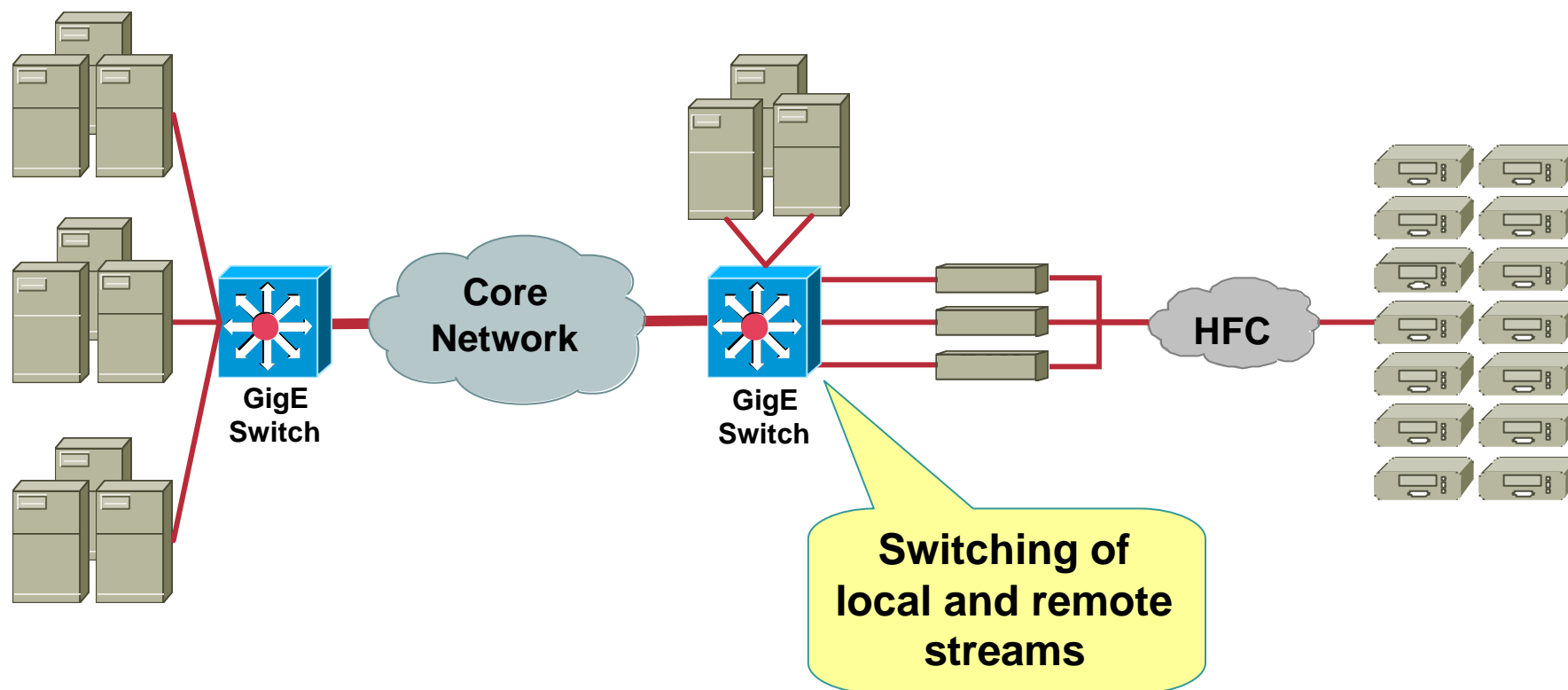
# VoD with GigE Switching

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# VoD with GigE Switching

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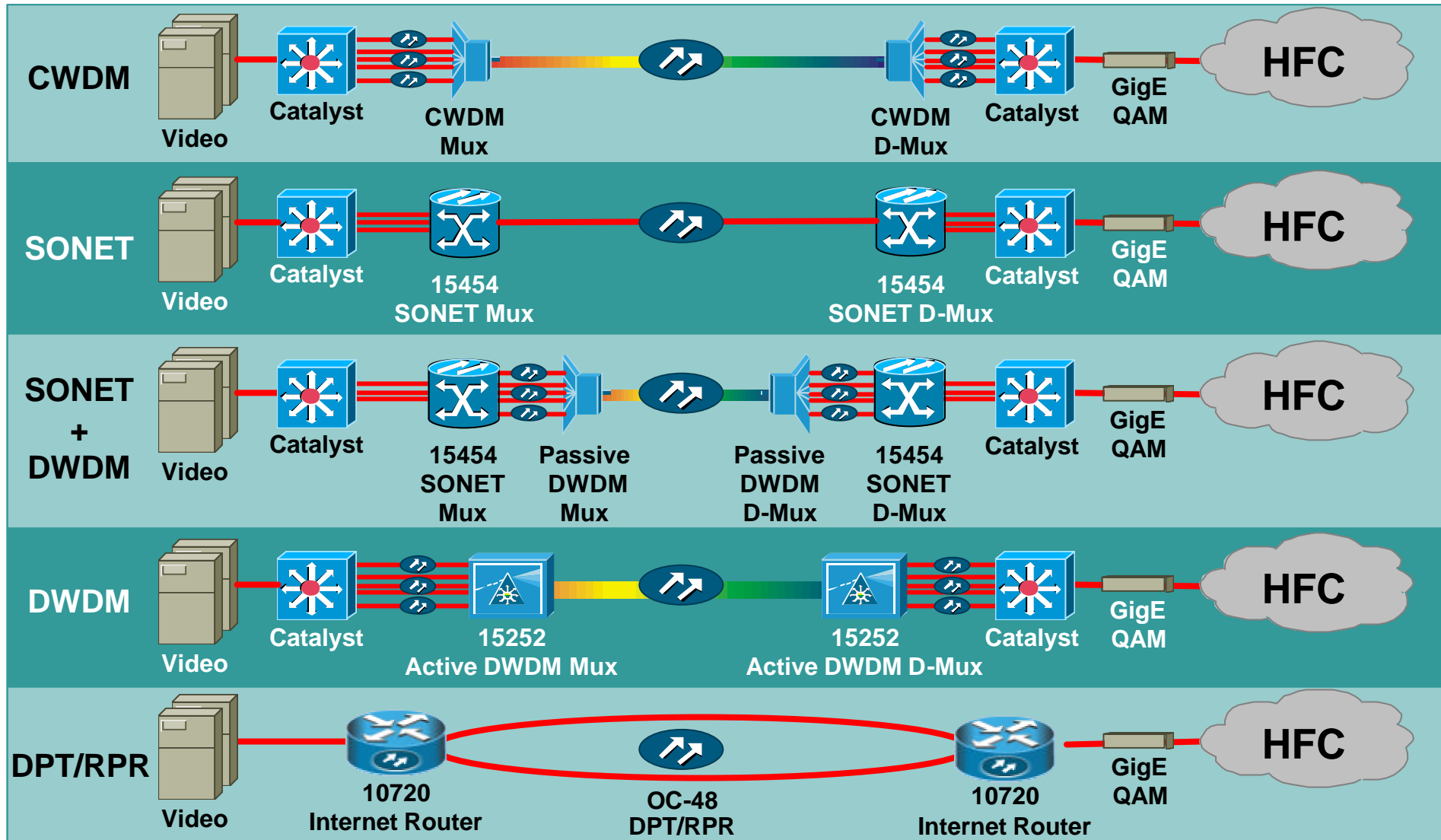
# VoD with GigE Switching

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# Video over IP Core Network Solutions

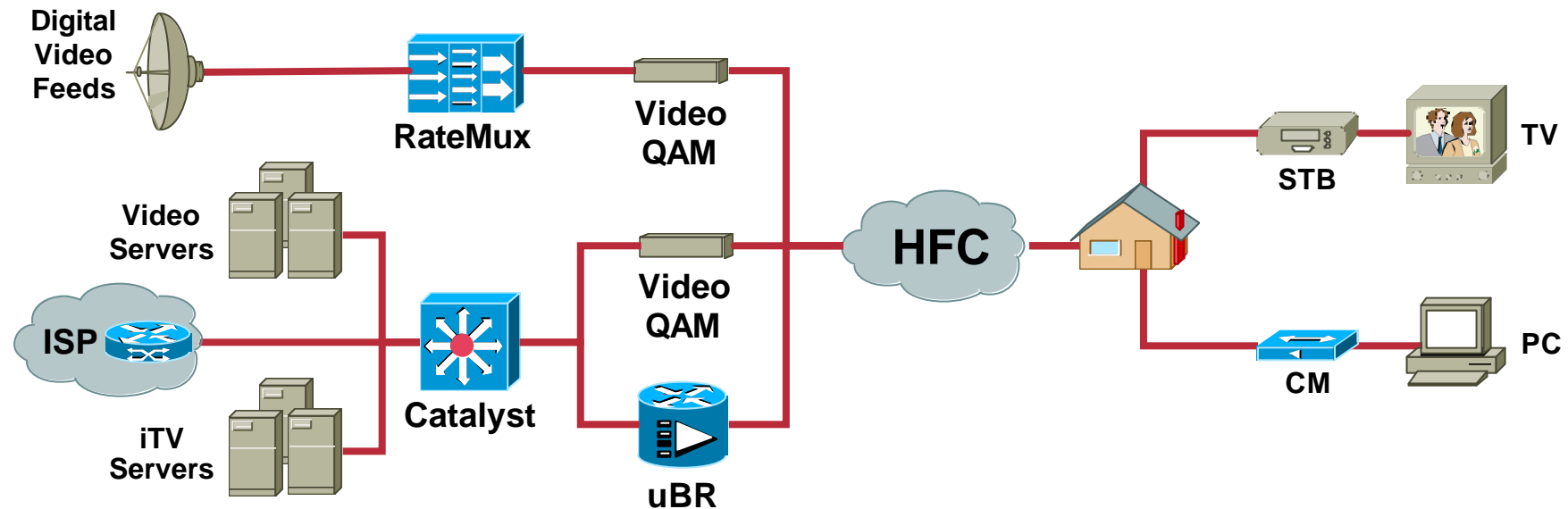
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# **DOCSIS Cable Modem + Set-top Box Network**

# DOCSIS CM + STB Network

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- Deliver high-speed data services to cable TV subscribers over DOCSIS infrastructure
- Consolidate cable modem and STB data traffic on a shared DOCSIS channel

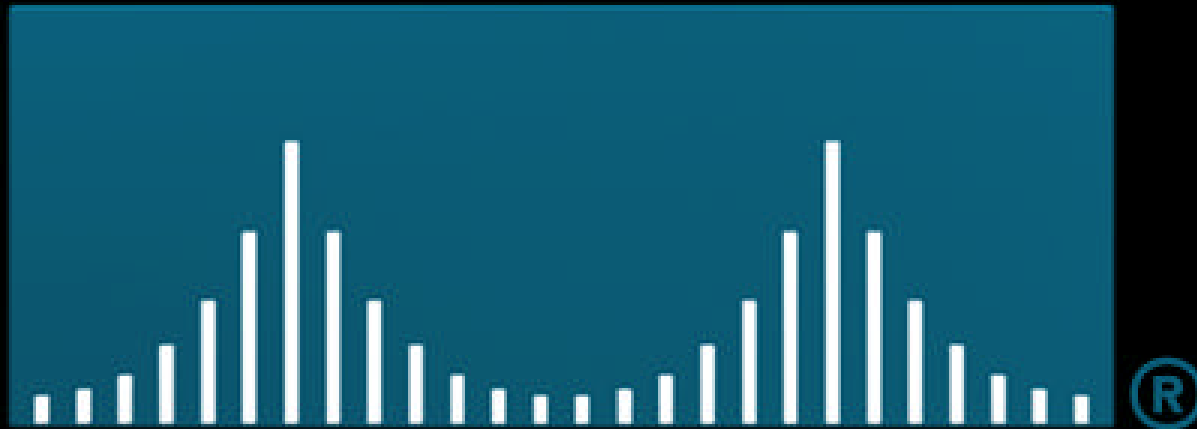
# Summary

# Summary

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- **New digital video services provide new revenue opportunities**
- **Cisco 6920 RateMux provides advanced video processing capabilities to optimize video network**
- **Video over IP in the core is underway with VoD**
- **Cisco's industry-leading DOCSIS CMTS products provide the best platform for supporting DOCSIS STB deployments**

# CISCO SYSTEMS



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