A Cloud Encoding Pricing Comparison

Amazon Elastic Transcoder

Azure Media Services

Bitmovin

encoding.com

Hybrik

Telestream

Zencoder

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Introduction

Cloud encoding vendors offer a range of pricing models, from Software-as-a-Service (SaaS), to Platform-as-a-Service (PaaS), to hybrid plans with elements of both. Because of the range of models, it can be difficult to accurately compare prices between services. That said, in all the analysis that I've performed, it's been clear that existing cloud pricing structures are simply too high for widespread adoption.

For example, as I wrote in a *Streaming Media* column, The Cost of the Cloud for Video Encoding: Crunching the Numbers, according to a white paper authored by encoding.com, you couldn't economically justify cloud encoding without significant cuts to encoding and/or IT staff. Running the numbers for consulting clients over the last few years, cloud encoding proved much costlier than simply buying an encoding appliance, and it often made economic sense for companies with simple encoding needs (e.g. no DRM, no captions) to consider their own FFmpeg-based cloud development.

Recently, a new company named Hybrik launched with a pricing model that finally makes cloud encoding the most affordable option for companies spending $1,000 or more in monthly encoding costs. By way of background, Hybrik was formed by original founders of Rhozet (the makers of Carbon Coder), which was ultimately acquired by Harmonic and is still widely used for on premise operations. When Hybrik launched at NAB 2016, they announced that Sony DADC had signed on as their first major customer.

Hybrik sponsored me to create this white paper comparing their pricing structure with the published pricing available for other services, including Amazon, Azure, Bitmovin, encoding.com, Telestream, and Zencoder. While preparing this document, I sent my calculations to these services so they could confirm my math and let me know of any other unpublished pricing brackets or pricing plans. The only company I didn't attempt to verify with was Amazon, because their pricing model was so simple and the company seldom responds to press inquiries.

Executive Summary

Let's start with the summary numbers, then explore the detail. We based our model on a one-hour project encoded to ten different layers (Table 2) and two different formats (DASH and HLS). I computed prices on volumes ranging from one hour to 1,000 hours a month.

Table 1 summarizes pricing for all services. As you'll learn, Azure is comparatively inexpensive because it's creating MP4 streams to transmux to HLS/DASH during distribution, rather than the complete DASH/HLS packages. If you're creating MP4 files only and packaging dynamically, prices for the other services will drop by close to 50%.

	Monthly Source Hours							
Overall Cost	**1**	**10**	**50**	**100**	**200**	**300**	**400**	**1000**
Hybrik	$1,001	$1,011	$1,056	$1,112	$1,225	$1,337	$1,450	$2,957
Amazon	$29	$286	$1,428	$2,856	$5,712	$8,568	$11,424	$28,560
Azure	$19	$189	$947	$1,893	$3,787	$5,680	$7,573	$18,482
encoding.com	$199	$957	$3,909	$7,599	$14,979	$22,360	$29,740	$74,021
Zencoder	$67	$504	$2,520	$3,360	$6,720	$10,080	$13,440	$33,600
Bitmovin	$29	$307	$1,390	$2,689	$5,198	$6,975	$9,620	$20,990
Telestream Cloud	$49	$410	$1,783	$3,355	$6,147	$9,171	$11,088	$27,720

Table 1. Cost summary by service.

Also, encoding.com's pricing is likely overstated because they share only the lowest tiers of PublicCloud pricing on their web site (and declined to provide additional pricing), and because most of their higher volume customers have already moved to the Reserved Cloud, which utilizes the less expensive, Platform-as-a-Service pricing.

Figure 1 graphically displays the comparison data.

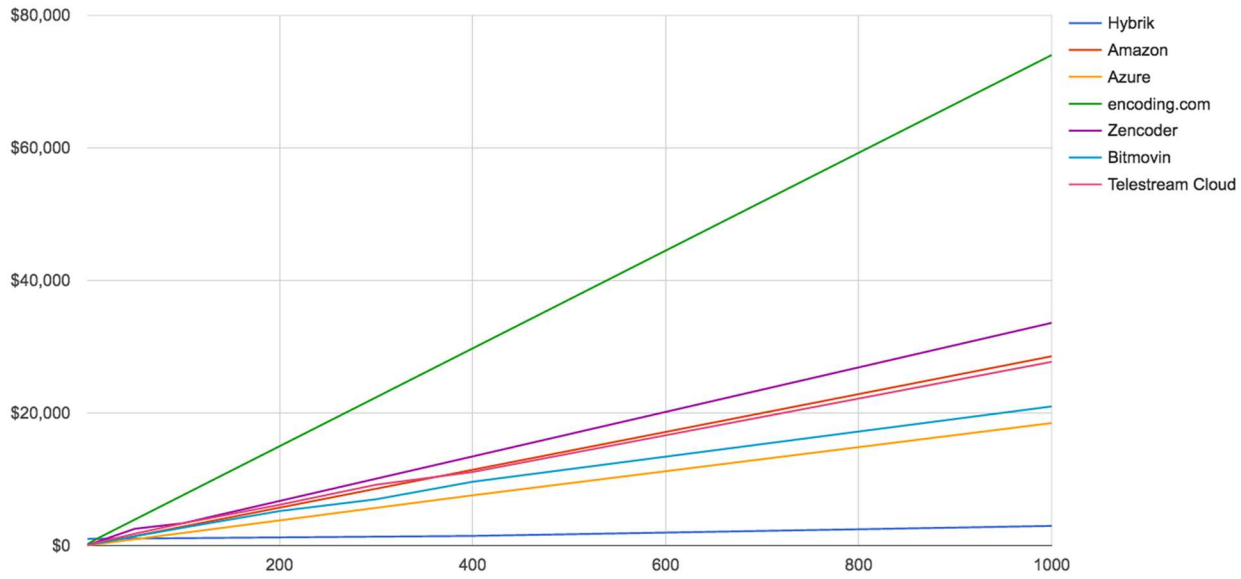

Figure 1. Monthly encoding costs by service.

That's the summary, let's dig into the details, starting with a description of our project assumptions.

Our Project Assumptions

Our test project assumes a one-hour video supplied in MXF format at 50 Mbps. We assumed that this video was encoded into HLS and DASH formats using the encoding ladder shown in Table 2.

Layer #	Layer Sizes	Video Rate	Audio Rate	Total Rate	Total Rate/hr.
1	1920x1080	5.800	0.128	5.928	2.61
2	1920x1080	4.300	0.128	4.428	1.95
3	1280x720	3.000	0.128	3.128	1.37
4	1280x720	2.400	0.128	2.528	1.11
5	960x540	1.800	0.128	1.928	0.85
6	960x540	1.100	0.128	1.228	0.54
7	640x360	0.800	0.128	0.928	0.41
8	480x270	0.560	0.128	0.688	0.30
9	416x234	0.375	0.128	0.503	0.22
10	416x234	0.235	0.128	0.363	0.16
		Total output GB / source-hour			**9.51**

Table 2. Our project bitrate ladder.

You'll note that there are four streams that are 720p or higher, which is relevant for services that have an upcharge for HD outputs. Table 3 summarizes the critical data points for this project using a one-hour source as our model.

Summary Data	One Hour Source
Total Input GB / source-hour	21.97
Number of multi-bitrate sets	2
Total Output GB / source-hour	19.03
Total Output Minutes / source-hour	1200
Output HD Minutes / source-hour	480
Output SD Minutes / source-hour	720

Table 3. Critical pricing-related data points.

Note that for our estimates, we assumed that each video file has an associated audio file, as opposed to one audio file for the entire adaptive group. If you produced the adaptive group with a single audio file, it would reduce pricing slightly for services that charge by output GB.

Before getting into the details, let's start with a brief overview of how cloud services charge for encoding. If you're familiar with this, you're welcome to jump over to the individual calculations.

Cloud Pricing Models

There are generally three different ways that cloud services charge for their operations. These are:

- Charge by the minute of output
- Charge by the gigabyte of data processed
- Charge for exclusive use of a dedicated machine in the cloud

Per-minute pricing. When a service charges by the minute, you pay based upon total output minutes, so if you start with a 60-minute file, and output ten layers in your adaptive group, you pay for 600 minutes of output video. On top of this is often a cost multiplier for outputting high-definition video, usually 2x for videos from 720p to 2K, and 4x for videos larger than 2K. As shown in Table 3, our pricing model assumed six SD streams, and four HD streams, which usually count for 2X minutes. Our pricing model assumed HLS and DASH outputs, which usually means twice the number of total minutes.

Per-GB pricing. When a service charges by the GB of processed throughput, one service charges for both input and output data, while others only charge for output data. Output data obviously includes all the various layers in the encoding ladder for both DASH and HLS. Table 3 shows that in our project, the total per-hour input was 21.97 GB, and the combined one-hour output for DASH and HLS was 19.03 GB.

Dedicated machine pricing. When you rent a dedicated machine in the cloud, you generally pay a flat monthly fee for a machine you can run 24/7 on your specific encoding operations. You are not charged for minutes or gigabytes. The total quantity of encoding that each dedicated machine can perform is not fixed, and will depend on the type of encoding being done and the type of machine you rented. For example, if all of your jobs are 2-pass encodes rather than single-pass, a dedicated machine will perform fewer encodes per month. Ditto if you use the Placebo x264 preset as compared to Medium or Slow.

These are the traditional models; now let's take a look at Hybrik.

The Hybrik Model

Fundamental to all three pricing models is that the service provider manages all of the machines in their environment, and you submit jobs to them for processing. The cloud provider manages and pays for all cloud machines deployed in their environment, which sometimes are their own computers (Amazon, Azure), and sometimes are rented from third parties like Amazon, Google, or Azure.

The Hybrik model is different. Rather than charging by GB or minutes, Hybrik charges a flat monthly fee to manage your transcoding environment. All of the actual media processing takes place in your own Amazon Web Services (AWS) cloud account. You pay Hybrik a flat monthly fee based upon the number of simultaneous encoding instances you can address, and you pay Amazon for your actual machine use.

Here's the Hybrik pricing model:

- 10 cloud machines - $1,000/month
- 100 cloud machines - $5,000/month
- 1000 cloud machines - $10,000/month

To keep overall encoding costs as low as possible, the Hybrik system allows the customer to use the AWS spot market to bid on machines to get them at the lowest possible price – often saving over 80% off of the normal on-demand pricing. As you'll see, we used this spot pricing in our pricing calculations.

Let's start our per-company analysis with Hybrik.

Hybrik Costs

For all comparisons, we assumed a ten-machine Hybrik contract that costs $1,000/month. If you're not currently spending $1,000 a month for cloud encoding, and don't see costs rising to this level, then Hybrik is not a good choice for you.

Beyond this flat fee is machine time payable to Amazon. To compute this, we ran our test project through the Hybrik system using two-pass encoding and the medium x264 preset. Taking a step back, note that Hybrik uses FFmpeg and the x264 codec, and allows users precise control over the encoding parameters used for each job, including the number of encoding passes (single or two-pass) and x264 preset (fast, medium, slow, etc.).

Machine ID	Zone	Type	Created	Deleted	Price/hr($)
AWS					
202331	us-east-1c	c4.4xlarge	Oct/10/2016 10:01:57 PM	Oct/11/2016 05:58:53 AM	0.1388
202332	us-east-1c	c4.4xlarge	Oct/10/2016 10:01:57 PM	Oct/11/2016 05:58:47 AM	0.1388
202333	us-east-1c	c4.4xlarge	Oct/10/2016 10:01:57 PM	Oct/11/2016 05:58:49 AM	0.1388
202334	us-east-1c	c4.4xlarge	Oct/10/2016 10:01:57 PM	Oct/11/2016 06:58:48 AM	0.1385
202335	us-east-1c	c4.4xlarge	Oct/10/2016 10:01:57 PM	Oct/11/2016 05:58:49 AM	0.1388
202336	us-east-1c	c4.4xlarge	Oct/10/2016 10:01:57 PM	Oct/11/2016 05:59:20 AM	0.1388
202337	us-east-1c	c4.4xlarge	Oct/10/2016 10:01:57 PM	Oct/11/2016 05:58:54 AM	0.1388
202338	us-east-1c	c4.4xlarge	Oct/10/2016 10:01:57 PM	Oct/11/2016 05:59:20 AM	0.1388
202339	us-east-1c	c4.4xlarge	Oct/10/2016 10:01:58 PM	Oct/11/2016 05:59:51 AM	0.1388
202340	us-east-1c	c4.4xlarge	Oct/10/2016 10:01:58 PM	Oct/11/2016 05:58:53 AM	0.1388

Table 4. Machine time to encode our test project.

Those familiar with FFmpeg know that these parameters can have a significant impact on encoding time. We used the default medium preset and two-pass encoding to present a conservative cost estimate, and

encoded ten jobs on ten cloud computers simultaneously. Table 4 is from the Hybrik interface, and shows us the machine type, zone, price, and how long each machine was active and working on our jobs.

Table 5 converts the raw data shown in Table 4 to actual costs. As you can see in the Hours:Min column, the machines associated with the jobs ran from just under 8 hours to just under 9 hours. Actual processing time was shorter, but since you pay for machines by the complete hour, we included the complete hour to compute our costs. Note that when a machine completes a job, Hybrik keeps it running to just under the next complete hour so that any additional jobs start quickly and use the remaining, already-paid-for, machine time. That's why all the machines shut off at around the 56-minute mark.

Machine Type	Hours:Min:Sec	Rounded Up	Machine Cost per Hour	Total Charges
c4.4xlarge	7:56:56	8 hrs.	$0.1388	$1.110
c4.4xlarge	7:56:50	8 hrs.	$0.1388	$1.110
c4.4xlarge	7:56:52	8 hrs.	$0.1388	$1.110
c4.4xlarge	8:56:51	9 hrs.	$0.1385	$1.246
c4.4xlarge	7:56:52	8 hrs.	$0.1388	$1.110
c4.4xlarge	7:57:23	8 hrs.	$0.1388	$1.110
c4.4xlarge	7:56:57	8 hrs.	$0.1388	$1.110
c4.4xlarge	7:57:23	8 hrs.	$0.1388	$1.110
c4.4xlarge	7:57:53	8 hrs.	$0.1388	$1.110
c4.4xlarge	7:56:55	8 hrs.	$0.1388	$1.110
			Average Cost Per Job	**$1.124**

Table 5. Actual Machine Costs

As you can see in Table 5, the average price for all ten jobs was $1.124 per job. From a machine utilization perspective, this is a worst-case price, since there's some unused extra time at the end of every job. If you ran consecutive jobs, or used only two machines for the ten jobs, you would waste time like this only on the final job.

To be fair, the pricing shown in Table 5 is spot pricing, and there's no guarantee that you'll be able to acquire that class of machine for that price. Figure 2 shows three months of AWS spot pricing for the 4.8xlarge computer in US East-1a.

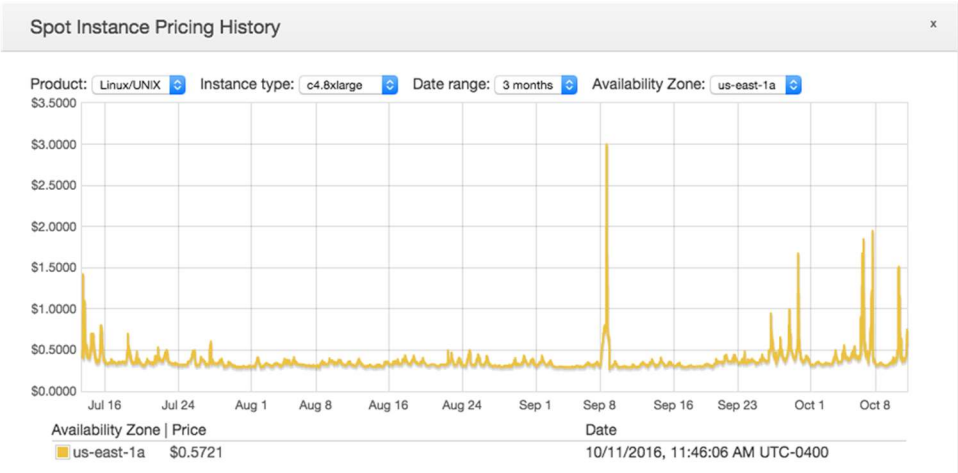

Figure 2. Three months c4.8xlarge pricing in US East.

For the most part, the number is comfortably below the $.50/hour line, but it does occasionally spike much higher. Note that with the Hybrik system, you can set a maximum bid price, so you control your cost. The system will also check for spot pricing in other zones within your region automatically, assuring you of the lowest possible available price.

Your alternative is to use on-demand machines rather than spot-market machines, which means that you pay a flat standard price per hour for every machine. To date, most Hybrik customers are using spot pricing for a majority of their encoding in order to keep their encoding costs as low as possible.

Note that if you use C4.4xlarge cloud instances, and run ten machines 24/7, you would only be able to encode 900 hours of source video a month using our 2-pass setting. Since our estimated monthly source hours analysis scales up to 1000 hours, we had to use a more powerful cloud computer to produce a 1000 hours per month, which proved slightly more expensive.

Specifically, we had to use C4.8xlarge cloud instances to produce at a rate that would deliver 1000+ hours a month. Using the same methodology described above, the ten jobs took between five and six hours to complete, at a per hour machine cost of about $0.34. This yields an average worst-case cost per job (from a machine utilization perspective) of $1.956, which is the price used in the 1000 source cost calculation shown in Table 6, and all subsequent cost comparisons.

	Monthly Source Hours							
Costs	**1**	**10**	**50**	**100**	**200**	**300**	**400**	**1000**
Hybrik Monthly Flat Fee	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
Hybrik AWS Costs	$1.12	$11	$56	$112	$225	$337	$450	$1,957
Hybrik Total	**$1,001**	**$1,011**	**$1,056**	**$1,112**	**$1,225**	**$1,337**	**$1,450**	**$2,957**

Table 6. Hybrik costs for varying monthly source hours.

To be clear, I used $1.124 per job for all calculations except for 1000 hours. Because I had to use a more expensive computer to encode 1000 hours per month, I used $1.956 per hour for this white paper.

Amazon Elastic Transcoder Costs

Amazon Elastic Transcoder charges by the minute, and prices vary by region. In the US West, SD minutes cost 1.7 cents while HD minutes cost 3.4 cents (Figure 3).

Figure 3. Amazon pricing.

Beyond that it's a simple math calculation, multiplying the SD minutes shown in Table 3 times 1.7, and the HD minutes by 3.4, and multiplying the per hour charge by the number of processed hours. We've done the work for you in Table 7, which also includes Hybrik pricing.

	Monthly Source Hours							
Costs	**1**	**10**	**50**	100	**200**	**300**	**400**	**1000**
SD Costs	$12	$122	$612	$1,224	$2,448	$3,672	$4,896	$12,240
HD Costs	$16	$163	$816	$1,632	$3,264	$4,896	$6,528	$16,320
Amazon total	**$28.56**	**$286**	**$1,428**	**$2,856**	**$5,712**	**$8,568**	**$11,424**	**$28,560**
Hybrik total	$1,001	$1,011	$1,056	$1,112	$1,225	$1,337	$1,450	$2,957

Table 7. Amazon Elastic Transcoder pricing compared to Hybrik.

Figure 4 compares prices graphically. Interestingly, as we saw back in Table 5, the average machine cost per job for Hybrik in the Amazon Cloud was $1.1240. Despite owning the machines in the cloud, Amazon takes a 25x markup ($29 compared to $1.12) over this per-job cost, and since Amazon's prices don't decrease with volume, they push this markup through all monthly source hours.

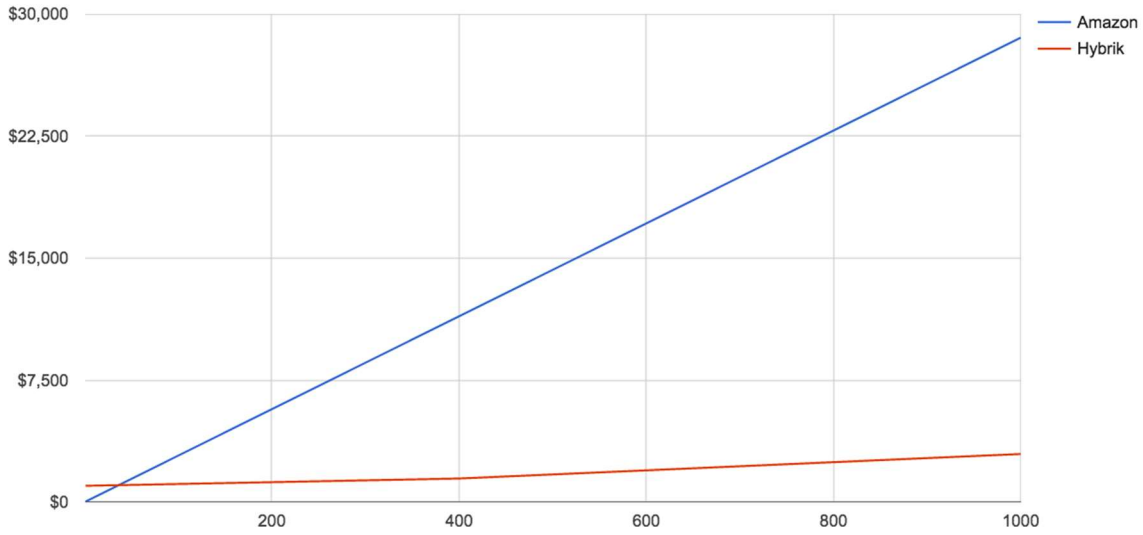

Figure 4. Amazon pricing compared to Hybrik.

Microsoft Azure Costs

Microsoft Azure is an integrated cloud encoding/delivery service with multiple encoders and multiple delivery schemas. Basic encoding pricing is based upon output GB with two encoders differentiated by features and supported formats (Figure 5).

DATA PROCESSED	STANDARD ENCODER[3]	PREMIUM ENCODER[3]
First 5 TB [1] / Month	$1.99 per output GB	$3.99 per output GB
Next 5 TB (5-10 TB) / Month	$1.89 per output GB [2]	$3.79 per output GB [2]
Next 15 TB (10-25 TB) / Month	$1.69 per output GB [2]	$3.39 per output GB [2]
Next 25 TB (25-50 TB) / Month	$1.49 per output GB [2]	$2.99 per output GB [2]
Next 50 TB (50-100 TB) / Month	$1.29 per output GB [2]	$2.59 per output GB [2]
Over 100 TB/Month	Contact Us	Contact Us

Figure 5. Pricing for Microsoft Azure.

I checked with contacts at Azure regarding which encoder to use, and was advised that Azure doesn't produce HLS and DASH output files. Rather, the service creates MP4 files and dynamically converts them to HLS and DASH during delivery. This means that companies encoding and delivering through Azure would only need to encode one set of MP4 files, or half the encoding necessary for other delivery scenarios. My contact also advised me that the Standard Encoder would suffice for this task

Applying the pricing shown in Figure 5 to our production assumptions yields the results shown in Table 8, which my contacts at Azure reviewed for accuracy. I also confirmed that Azure can dynamically deliver MP4 files produced by other services, and computed the Hybrik cost by cutting the per-job encoding costs in half and adding that to the monthly charge. Since Hybrik could achieve the necessary volume using C4.4xlarge machines, I used the $1.124 price per job for the 1000 monthly source hours' calculation, rather than the $1.956.

	Monthly Source Hours							
Costs	**1**	**10**	**50**	**100**	**200**	**300**	**400**	**1000**
Output GB	9.51	95.1	475	951	1,902	2,854	3,805	9,514
Pricing / GB	$1.99	$1.99	$1.99	$1.99	$1.99	$1.99	$1.99	$1.99
Cost - First 5TB	$18.93	$189.33	$947	$1,893	$3,787	$5,680	$7,573	$9,950
Balance GB								4,514
Price / GB								$1.89
Cost – Next 5TB								$8,531
Azure total	**$19**	**$189**	**$947**	**$1,893**	**$3,787**	**$5,680**	**$7,573**	**$18,482**
Hybrik total	$1,001	$1,006	$1,028	$1,056	$1,112	$1,169	$1,225	$1,562

Table 8. Microsoft Azure pricing compared to Hybrik.

Note that in addition to per GB encoding costs, Azure also charges for Media Reserved Units, which "are recommended if your workload requires one or more concurrent tasks to be running. You can increase the overall throughput from the service by (a) increasing number of Media Reserved Units to get more tasks processed concurrently, and (b) by using a faster Media Reserved Unit (e.g. S3)." Note that media Reserved Units cost between $2.23/day ($69/month) and $12.87/day ($399/month).

In speaking with the Azure representatives, I learned that the need for these reserve units, and which model to rent, depends upon multiple factors, particularly how quickly the customer needs to process the video. While it's likely that customers processing in the hundreds of hours of video a month will need a Reserved Unit, I couldn't estimate this cost, so I didn't include it in the calculation. Note that if you're comparing Azure to Hybrik (or any other service), be sure to include the estimated cost of these reserved units in your calculation.

Figure 6 shows these results graphically.

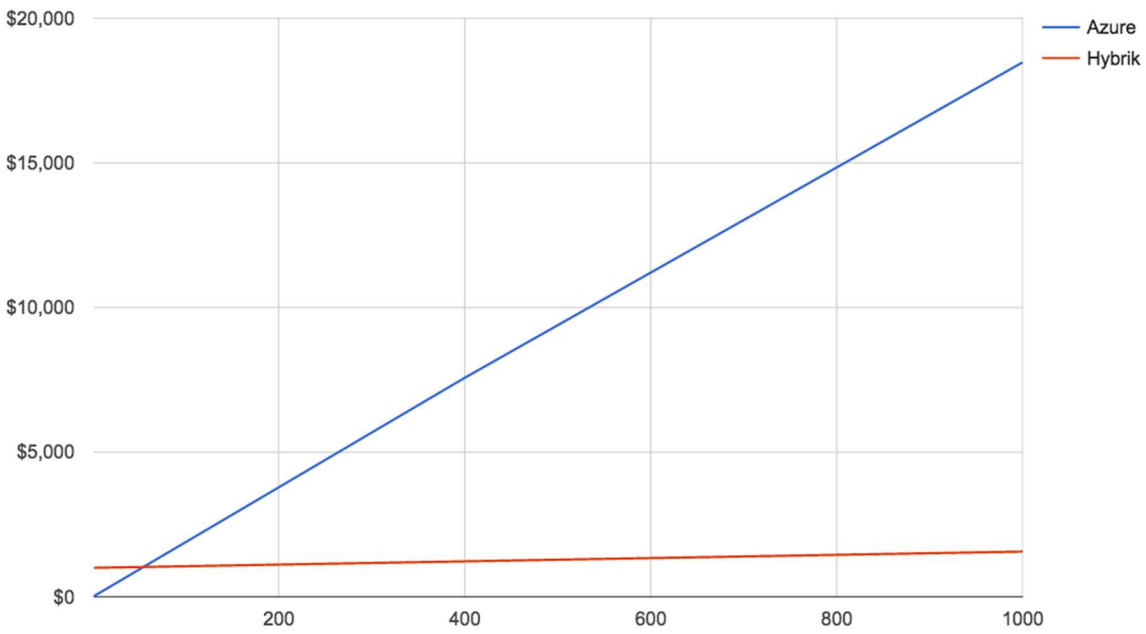

Figure 6. Microsoft Azure pricing compared to Hybrik.

encoding.com Costs

encoding.com has two pricing structures, PublicCloud and Reserved Cloud. Under Reserved Cloud, customers “Pay a fixed fee per month for 24/7/365 unlimited encoding on an AWS Reserved Instance in any one of their 10 MPAA aligned data centers. Choose our recommended AWS RI or the RI of your preference.” According to the encoding.com website, pricing for a reserved instance starts at $2,000, which includes all machine time, though the company doesn’t list the computer specs for this pricing.

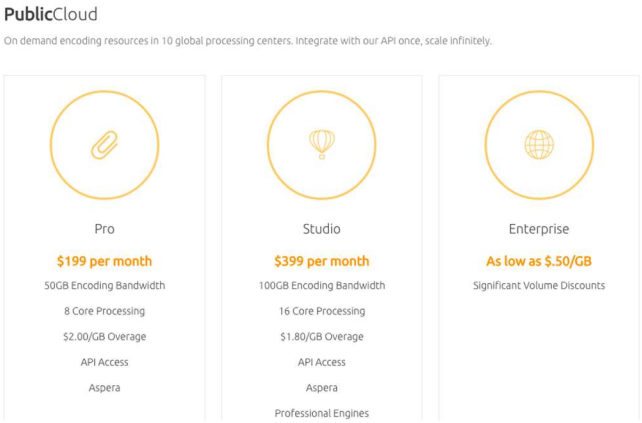

Figure 7. Encoding.com’s PublicCloud pricing.

encoding.com’s PublicCloud pricing is shown in Figure 7. In our model, we entered the top tier at 10 hours of video a month, which was the lowest entry point for all services, most of which define much higher tiers. We asked for guidance from encoding.com, and heard back that,” To be frank, most of our customers are not using our public OnDemand model -- they are using our Reserved Cloud. This is

because we're playing at the high end of the market...Reserved Cloud Instances are as low as $2,000 per instance per month and each one has been seen to process up to 40 TB/month."

For the sake of completeness, Table 9 shows how encoding.com's PublicCloud price compares to Hybrik. At the very least, if you're a volume user and you're not using the Reserved Cloud, you need to consider cutting over to it. Otherwise, even for high volume users paying by the GB, Table 9 and Figure 8 probably bear little resemblance to the price you're really paying.

	Monthly Source Hours							
Costs	**1**	**10**	**50**	**100**	**200**	**300**	**400**	**1000**
Input/output GB	41.00	410.01	2,050.05	4,100.10	8,200.20	12,300.29	16,400.39	41,000.98
Monthly price	$199	$399	$399	$399	$399	$399	$399	$399
Included bandwidth	50	100	100	100	100	100	100	100
Overage	NA	310	1,950	4,000	8,100	12,200	16,300	40,901
Cost per GB	NA	$1.80	$1.80	$1.80	$1.80	$1.80	$1.80	$1.80
Overage cost	$199	$558	$3,510	$7,200	$14,580	$21,961	$29,341	$73,622
encoding.com total	**$199**	**$957**	**$3,909**	**$7,599**	**$14,979**	**$22,360**	**$29,740**	**$74,021**
Hybrik total	$1,001	$1,011	$1,056	$1,112	$1,225	$1,337	$1,450	$2,957

Table 9. encoding.com pricing compared to Hybrik.

As is their right, encoding.com doesn't publicly disclose reserved instance pricing, and you definitely need to check the specs on the computer you get for $2,000 a month. By way of comparison, Hybrik users could pay $1,000 to access up to ten Amazon encoders, and run three C4.8xlarge systems 24/7 for the entire month at $0.50/hour for a total of $2,080. Figure 8 shows how Hybrik's pricing compares to encoding.com's PublicCloud pricing.

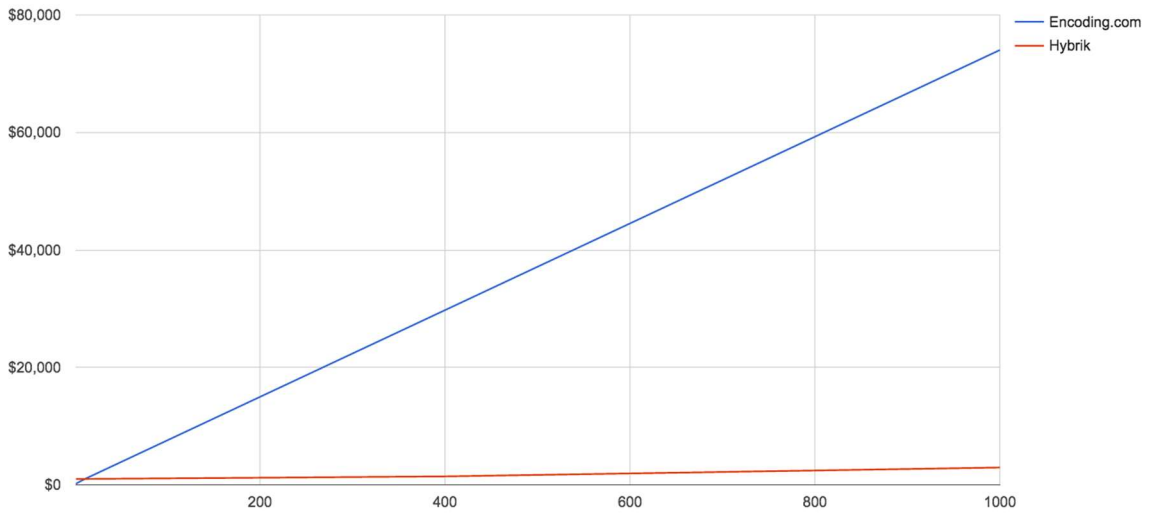

Figure 8. encoding.com PublicCloud pricing compared to Hybrik.

Zencoder Costs

Zencoder pricing is based upon output minutes, with the tiers shown in Figure 9. Zencoder differentiates pricing based upon resolution as follows:

- Each SD minute (output frame size under 1280x720) counts as 1 regular minute.
- Each HD minute (output frame size of 1280x720 to 2048x1080) counts as 2 regular minutes.
- Each UHD minute (output frame size above 2048x1080 and up to 4096x2160) counts as 4 regular minutes.

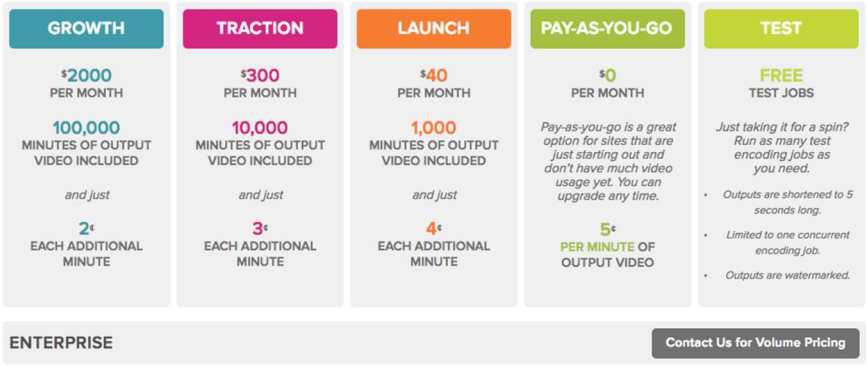

Figure 9. Zencoder's pricing tiers.

In addition, Zencoder charges only 1/4 the regular per minute charge for transmuxing from MP4 to HLS output, but doesn't extend the same discount to DASH. Since our test project has no need for MP4 files, the most cost effective approach is to encode the source files directly to HLS and DASH.

	Monthly Source Hours							
Costs	**1**	**10**	**50**	**100**	**200**	**300**	**400**	**1000**
SD minutes	720	7,200	36,000	72,000	144,000	216,000	288,000	720,000
HD minutes	960	9,600	48,000	96,000	192,000	288,000	384,000	960,000
Total	1,680	16,800	84,000	168,000	336,000	504,000	672,000	1,680,000
Monthly	$40	$300	$300	$2,000	$2,000	$2,000	$2,000	$2,000
Included minutes	1,000	10,000	10,000	100,000	100,000	100,000	100,000	100,000
Overage	680	6,800	74,000	68,000	236,000	404,000	572,000	1,580,000
Charge	$0.04	$0.03	$0.03	$0.02	$0.02	$0.02	$0.02	$0.02
Overage charge	$27	$204	$2,220	$1,360	$4,720	$8,080	$11,440	$31,600
Zencoder total	**$67**	**$504**	**$2,520**	**$3,360**	**$6,720**	**$10,080**	**$13,440**	**$33,600**
Hybrik total	$1,001	$1,011	$1,056	$1,112	$1,225	$1,337	$1,450	$2,957

Table 10. Zencoder pricing compared to Hybrik.

Table 10 shows our calculations of Zencoder pricing, which the company declined to review. Note that our calculations move into the highest volume pricing tier at 100 hours per month, so it's likely that Zencoder has additional tiers for larger customers. Figure 10 graphically displays this comparison.

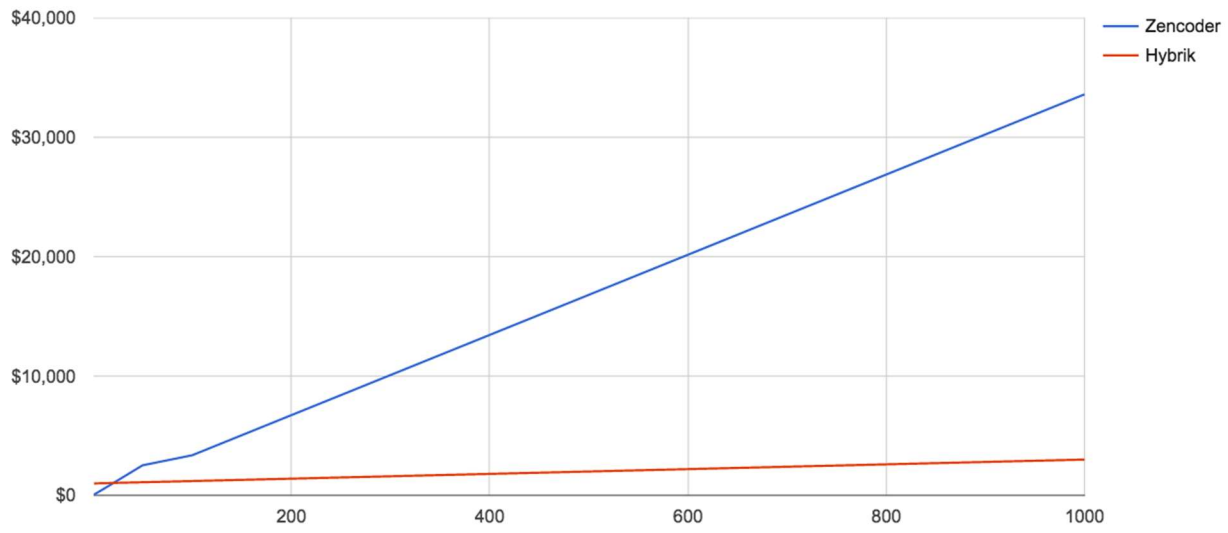

Figure 10. Zencoder pricing compared to Hybrik.

Bitmovin Costs

Bitmovin charges based upon output GB with pricing shown in Figure 11. We asked our contacts at Bitmovin if there were higher price tiers, and they shared their enterprise pricing, which includes month tiers at 5 TB ($5,990 plus $1.39/GB), 10 TB ($10,990 plus $1.29/GB), and 20 TB ($20,990 plus $1.19/GB), with one higher tier for quantities in excess of 50 TB ($49,990 plus $1.09).

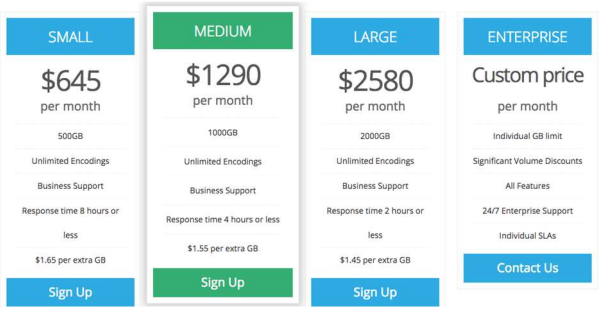

Figure 11. Bitmovin's lower pricing tiers.

Our calculations skipped the 10TB tier and jumped from the 5 TB tier for 300 and 400 hours to the 20 TB tier for 1000 hours. You can achieve a lower price by paying by the year but we used monthly pricing.

	Monthly Source Hours							
Costs	**1**	**10**	**50**	**100**	**200**	**300**	**400**	**1000**
Output GB	19	190	951	1,903	3,806	5,708	7,611	19,028
Monthly	$29	$149	$1,390	$1,290	$2,580	$5,990	$5,990	$20,990
Included GB	20	100	1,000	1,000	2,000	5,000	5,000	20,000
Overage GB	0	90	0	903	1,806	708	2,611	0
Charge / GB	$1.95	$1.75	$1.55	$1.55	$1.45	$1.39	$1.39	$1.19
Overage charge	$0	$158	$0	$1,399	$2,618	$985	$3,630	$0
Bitmovin total	**$29**	**$307**	**$1,390**	**$2,689**	**$5,198**	**$6,975**	**$9,620**	**$20,990**
Hybrik total	$1,001	$1,011	$1,056	$1,112	$1,225	$1,337	$1,450	$2,957

Table 11. Bitmovin pricing compared to Hybrik.

Figure 12 shows these results graphically.

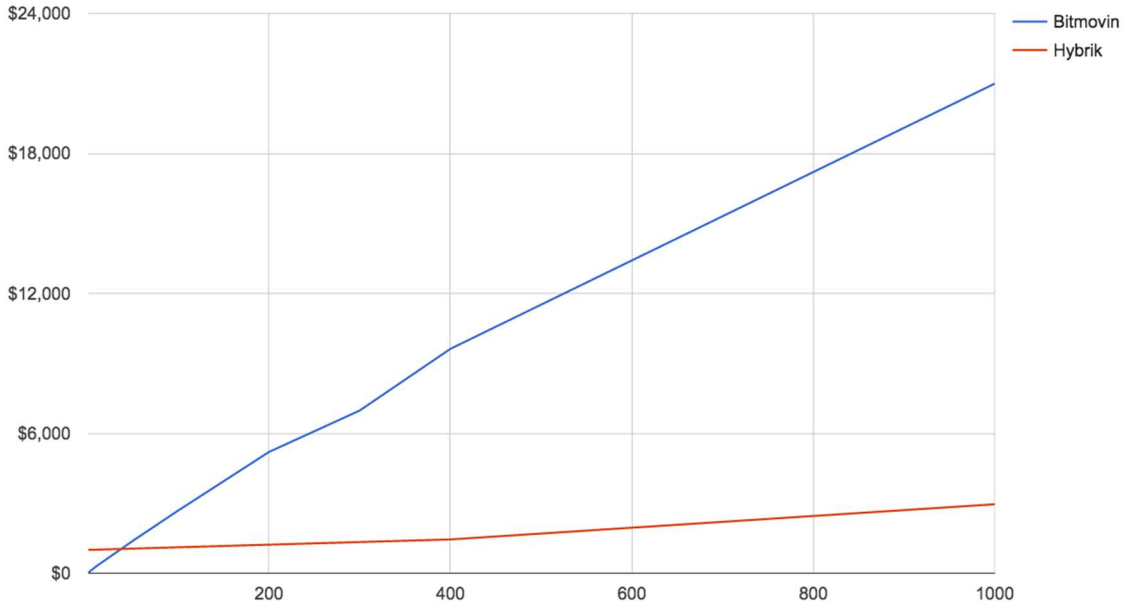

Figure 12. Bitmovin pricing compared to Hybrik.

Telestream Cloud Costs

Telestream Cloud prices based upon output minutes, with high volume prices shown in Figure 13, and some lower tiers available. In addition to these published tiers, Telestream shared that pricing for 1 million minutes per month would start at $11,000/month, with overages charged at $0.011 per minute, though these prices are usually customized for each client and require an annual commitment.

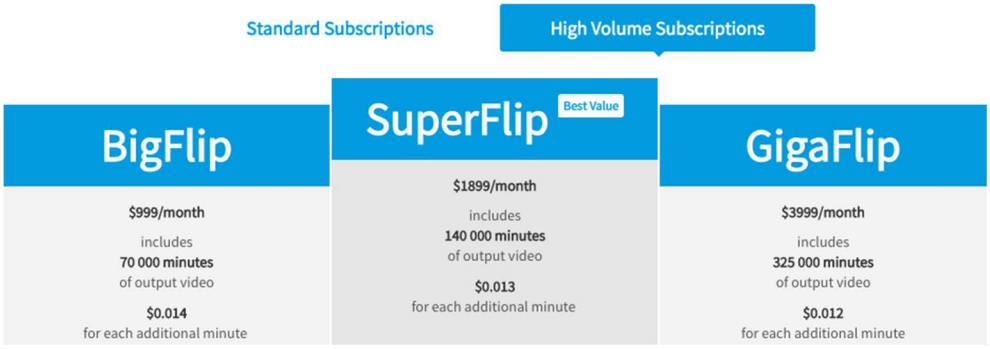

Figure 13. Telestream Cloud pricing tiers.

Telestream differentiates pricing based upon resolution. Specifically:

- Each SD minute SD (less than 1280×720) counts as 1 regular minute.
- Each HD minute (1280×720 - 1920x1080) counts as 2 regular minutes.
- Each UHD minute (more than 1920x1080, up to 4096x2160) counts as 4 regular minutes.
- Each 4K+ minute (more than 4096x2160) counts as 8 regular minutes.

Telestream Cloud charges .25x rates for transmuxing operations, so the least expensive way to price this project would be to output to MP4 and then transmux to HLS/DASH. Table 12 shows our pricing calculations, which Telestream did review for accuracy.

	Monthly Source Hours							
Overall Cost	**1**	**10**	**50**	**100**	**200**	**300**	**400**	**1000**
SD minutes	720	7,200	36,000	72,000	144,000	216,000	288,000	720,000
HD minutes	960	9,600	48,000	96,000	192,000	288,000	384,000	960,000
Total MP4 Min.	1,680	16,800	84,000	168,000	336,000	504,000	672,000	1,680,000
Transmux min. (.25*2)	840	8,400	42,000	84,000	168,000	252,000	336,000	840,000
Total minutes	2,520	25,200	126,000	252,000	504,000	756,000	1,008,000	2,520,000
Monthly	$39	$199	$999	$1,899	$3,999	$3,999	$3,999	$3,999
Included minutes	2,000	12,000	70,000	140,000	325,000	325,000	325,000	325,000
Overage	520	13,200	56,000	112,000	179,000	431,000	683,000	2,195,000
Charge/min	$0.019	$0.016	$0.014	$0.013	$0.012	$0.012	$0.012	$0.012
Overage charge	$10	$211	$784	$1,456	$2,148	$5,172	$8,196	$26,340
Telestream Total	**$49**	**$410**	**$1,783**	**$3,355**	**$6,147**	**$9,171**	**$12,195**	**$30,339**
Hybrik total	$1,001	$1,011	$1,056	$1,112	$1,225	$1,337	$1,450	$2,957

Table 12. Telestream pricing compared to Hybrik.

Figure 14 shows these results graphically.

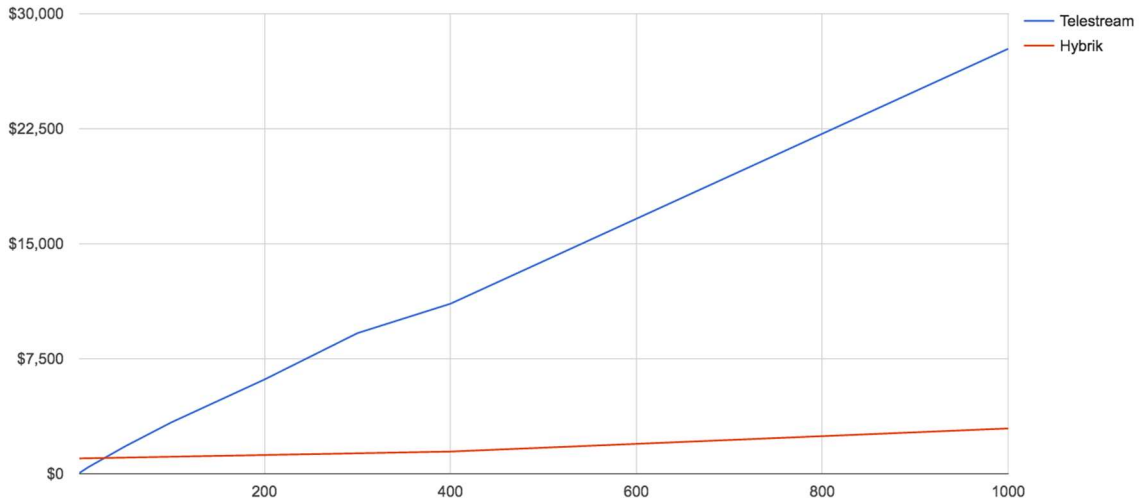

Figure 14. Telestream Cloud pricing compared to Hybrik.

Analysis

Table 13 shows the machine cost associated with encoding our one-hour project with the Hybrik system. It does not take into account the monthly fee, but rather shows just the actual machine cost for comparison purposes. I've also included the cost of encoding our one-hour project with the other services either by direct calculation or by multiplying GB/minutes charges times the overage charge at the lowest quantity/highest price tier (double the Azure multiple because the Hybrik cost is half to produce MP4s only). You'd assume that these companies all get a better rate than the spot price used for our calculations, yet the lowest price (Amazon) is a 25x multiple of the Hybrik cost. Amazon and Azure own their own cloud computers, so their costs are even lower, and their markup higher.

	Hybrik	Amazon	Azure	encoding	Zencoder	Bitmovin	Telestream
Cost per hour	$1.12	$28.56	$18.93	$73.80	$67.20	$37.05	$48.88
Multiple over cost	NA	25.4	33.7	65.7	59.8	33.0	43.5

Table 13. Cost per hour of encoding at lowest quantity.

There's a lot that goes into creating and managing a cloud service, including software development, support, management staff, marketing, the whole nine yards. But 25x is quite a multiple, and multiple services are at 40x+. The multiple is particularly striking when you consider that the basic building blocks, FFmpeg and x264, are common among most services. Though cloud encoding is in reality a commodity service, even Amazon has been charging premium prices.

None of this should be taken as a criticism. It's not my place to criticize what companies charge for their services, and my personal philosophy is that companies should charge the highest price they feel that the market will bear. The downside of this strategy is that companies leave themselves open to competition with different pricing and operating structures, which is exactly what is happening here.

I look at Hybrik as operating like a co-op. Rather than hiring your own engineer(s) to develop your own FFmpeg-based cloud service, throw some money into the Hybrik pot, and they'll develop and maintain the software for you. You're in charge of acquiring, managing, and paying for your cloud resources, and in

return, Hybrik makes no markup on these machine costs. It's a bit more work on your part, but the savings are apparent.

Most readers on the wrong side of 40 remember the days when we paid exorbitant stock brokerage fees to fat cat brokers who did very little besides take our money, and booked travel through agents who also got a significant cut because they had the "technical savvy" necessary to book a flight. Then a legitimate, low cost provider came into each of these markets, and changed how they did business and the pricing structure. I see Hybrik as potentially serving the same role in the cloud encoding market.

My Tests and Other Caveats

I have not fully tested the Hybrik system. I started out beta testing their interface and presets and successfully worked through multiple projects. I did compare Hybrik's output quality to FFmpeg command scripts that I wrote and found the quality virtually identical, which sounds simple but it's not. I encoded all the files in the adaptive group used for the test projects and confirmed that they played after creation.

I have not tested captioning or DRM capabilities, or any of the system's quality control workflows. I looked at this paper more like a math exercise, focused almost exclusively on accurately computing competitive pricing, and you should take it as this. I will say that I have sent one consulting client to Hybrik, advising them that I found the pricing model compelling, but warning them to perform their own technical due diligence. I recently heard that they had completed their testing and signed a contract to use the Hybrik system. I also know that Hybrik is being used by some big name facilities, such as Sony DADC.

I know that choosing a cloud encoder involves a lot of criteria, including workflows, codecs, support levels, service level agreements, encoding speed, and many others. This whitepaper only addresses the pricing issues, and switching encoding providers will have some effort associated with testing new presets and workflows. You've seen the price differences with Hybrik, and can draw your own conclusions regarding whether the effort might be worthwhile.