Society of Cable Telecommunications Engineers

30TH ANNIVERSARY

SCTE CABLE-TEC EXPO '13

OCTOBER 21-24 / ATLANTA, GA

INTERNATIONAL ATTENDEE BREAKFAST

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VOD MATHEMATICAL MODEL

Robert Rothschild

Headend Engineering

Cablevisión S.A (Argentina)

Cablevisión Argentina:

- 3,5 MM Video Subs, 1,6 MM Broadband Subs
- 600K SD STB and 500K HD STB
- VOD only for HD STB
- VOD Legacy with DSG
- 30% use VOD monthly, 1MM views/month

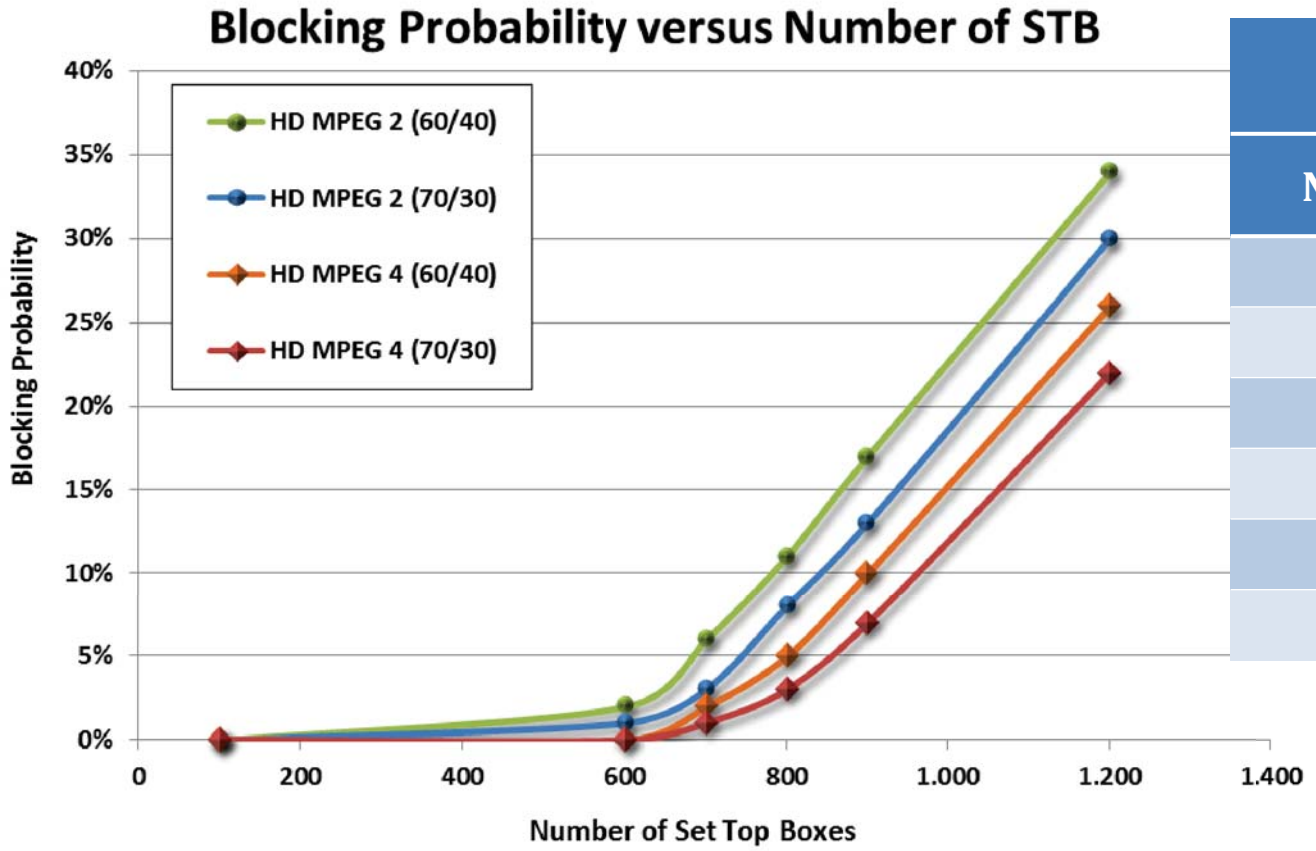
Main Objective:

- Define a mathematical model of VOD to determine the number of STB per Service Group design.

Some Considerations

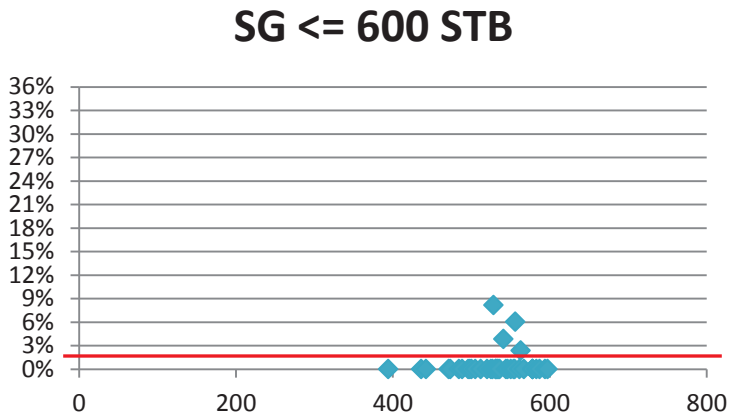
- Free Catch Up (one day after)
- MPEG-2 and MPEG-4 content
- SD and HD
- Peak busy period = 3 hours
- Average viewing time = 50 and 100 minutes
- 3% blocking probability desired

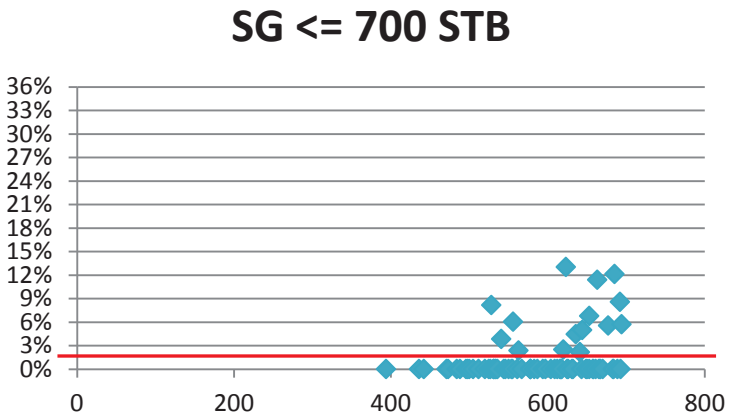
Model Simulation

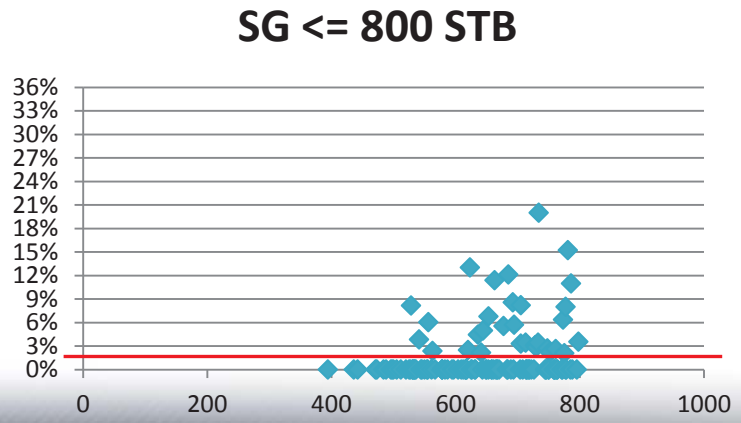


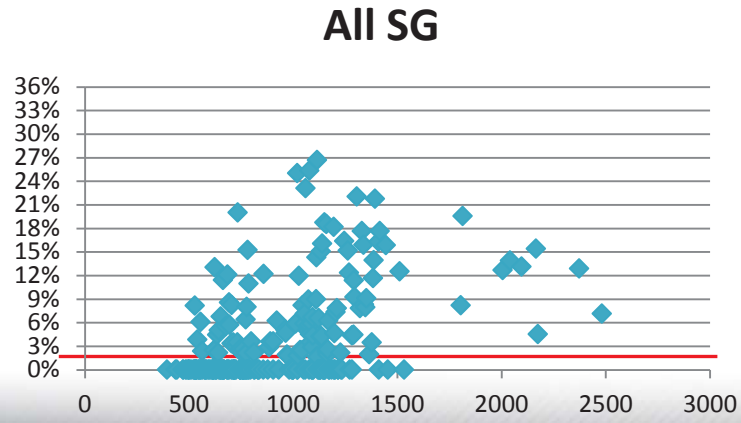
HD MPEG 2 30 Streams	
N° STB	Blocking Probability
100	0%
600	1%
700	**3%**
800	8%
900	13%
1.200	30%

Real Data


SG <= 600 STB
36%
33%
30%
27%
24%
21%
18%
15%
12%
9%
6%
3%
0%
0
200
400
600
800


SG <= 700 STB
36%
33%
30%
27%
24%
21%
18%
15%
12%
9%
6%
3%
0%
0
200
400
600
800


SG <= 800 STB
36%
33%
30%
27%
24%
21%
18%
15%
12%
9%
6%
3%
0%
0
200
400
600
800
1000


All SG
36%
33%
30%
27%
24%
21%
18%
15%
12%
9%
6%
3%
0%
0
500
1000
1500
2000
2500
3000

Conclusions

- Service Group size = 700 STB
- Model is used to find impact if we change free catch up from SD to HD.
- We use blocking to monitor system performance (3%)
- We monitor the Service Group behavior weekly, but node-split decisions are made after months of analysis

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Thank You!

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Support

Components	Measurement	Weighting	Nominal (Goal)	Guarded	Serious	CRITICAL
Availability	Mins out/sub/month	mins/10	<20	20-30	30-50	>50
Congestion	% customers in service groups at 85% congestion threshold	%/10	<10%	10-20%	20-30%	>30%
Stream Failure Ratio	% streams not delivered	use %	<3%	3-4%	4-5%	>5%
VOD Excellence Index			**>6**	**6-9**	**9-13**	**>13%**

Example			System A	System B	System C	System D
Availability	Mins out/sub/month	mins/10	22	8	45	68
Congestion	% customers in service groups at 85% congestion threshold	%/10	8%	15%	36%	14%
Stream Failure Ratio	% streams not delivered	use %	2.50%	4.20%	3.30%	5.60%
VOD Excellence Index			**5.5**	**6.5**	**11.4**	**13.8**

December 1, 2008

VOD: Care and Feeding
Best Practices
By Keith R. Hayes, Charter Communications

http://www.cable360.net/ct/operations/bestpractices/32737.html

If you know the traffic and the available streams, this model calculates the blocking probability P_B that an attempt is blocked at the first intent. It is based on the following considerations:

1. The amount of users is very big.
2. The attempts are random and according to a Poisson distribution.
3. The requests are first come first served based on availability in the QAM.
4. Bloqued requests are lost. This is a loss model, there is no queuing.
5. The time a user is watching a movie follows an exponential distribution (though it's not sensible to this type of distribution)

$$P_B = \frac{\frac{A^N}{N!}}{\sum_{I=O}^{N} \frac{A^i}{i!}}$$

Where

- A: traffic in Earlangs
- N: number of available streams

Erlang traffic is defined as:

$$A = \frac{x * h * (\lambda_{SD} * t_{SD} + \lambda_{HD} * t_{HD}) * p}{T}$$

Where

- x: Number of VoD system service areas.
- h: System number of STB per service area.
- λ_q: Average number of request attempts, per STB and per period (q = SD or HD).
- t_q: Average holding time of a request for a type of content in minutes (q = SD or HD).
- p: Penetration of service in VoD system service area.
- T: Peak busy period in minutes.

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