The Future for HSIP and CDN

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Level 3's network is built to enable the growth of the internet

Exceptional Global Connectivity

Level 3 continues to be the world's most connected ISP

Renesys® "Customer Base" Rankings (June 15, 2009)

North America	
Rank	Service Provider
1	Level 3 Communications
2	Global Crossing
3	Sprint
4	AT&T
5	Verizon/MCI
6	Savvis
7	Cogent
8	Teleglobe/TATA
9	Qwest
10	XO

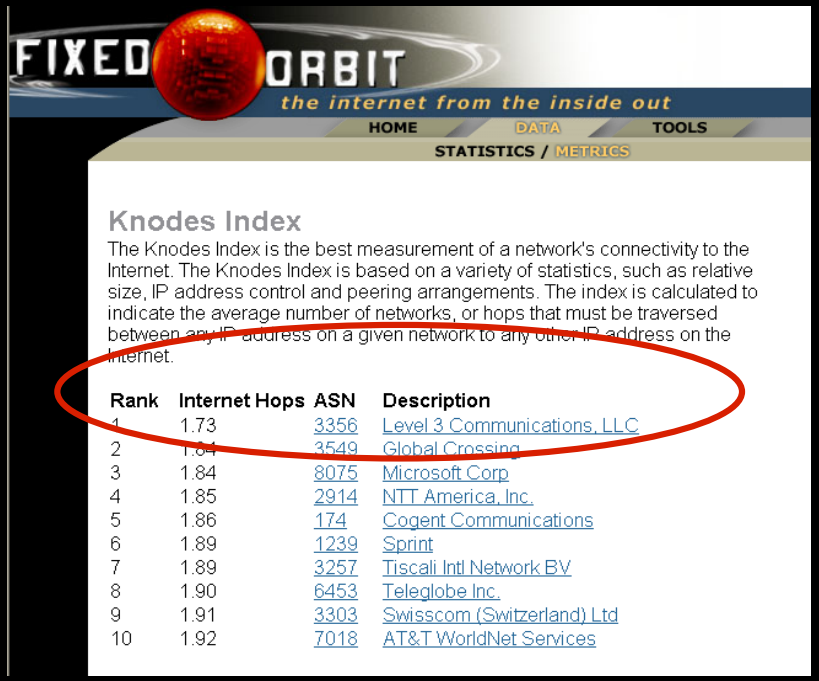
Europe	
Rank	Service Provider
1	Level 3 Communications
2	Sprint
3	TeliaSonera
4	Global Crossing
5	Tiscali
6	Deutsche Telekom
7	Teleglobe/TATA
8	Verizon/MCI
9	Cogent
10	France Telecom

Asia	
Rank	Service Provider
1	Level 3 Communications
2	Sprint
3	NTT
4	Global Crossing
5	China Telecom
6	TeliaSonera
7	Savvis
8	KDDI
9	AT&T
10	Verizon/MCI

Date:15/06/2009

About Renesys and Backbone Customer Base:
Renesys (www.renesys.com) is an independent network intelligence company who's tools provide service providers a real-time view of the global Internet. Renesys measures "Customer Base" as a means of ranking providers who are responsible for meeting the Internet transit needs of large customer networks within a given market.

Fewest AS Hops


FIXED ORBIT
the internet from the inside out
HOME DATA TOOLS
STATISTICS / METRICS

Knodes Index

The Knodes Index is the best measurement of a network's connectivity to the Internet. The Knodes Index is based on a variety of statistics, such as relative size, IP address control and peering arrangements. The index is calculated to indicate the average number of networks, or hops that must be traversed between any IP address on a given network to any other IP address on the Internet.

Rank	Internet Hops	ASN	Description
1	1.73	3356	Level 3 Communications, LLC
2	1.84	3549	Global Crossing
3	1.84	8075	Microsoft Corp
4	1.85	2914	NTT America, Inc.
5	1.86	174	Cogent Communications
6	1.89	1239	Sprint
7	1.89	3257	Tiscali Intl Network BV
8	1.90	6453	Teleglobe Inc.
9	1.91	3303	Swisscom (Switzerland) Ltd
10	1.92	7018	AT&T WorldNet Services

Source: http://www.fixedorbit.com/metrics.htm – updated: 15/06/2009

Fewest hops

Level 3 customers reach global Internet destinations in an average of **1.73 hops , fewer than any other provider**

Extensive Connectivity to an extraordinary community of on-net customers and peers

The Internet user has a better, faster experience

- 19 of the top 20 telecom carriers
- 9 of the top 10 largest telecom providers in Europe
- 9 of the top 10 largest U.S. ISP's
- 9 of the top 10 largest U.S. Cable MSOs
- 4 of the top 5 U.S. wireless service providers
- 8 out of top 10 most popular Internet destinations

ISP Strategies

Peer it all!

- Many ISPs place almost all of their effort on reducing the percentage of traffic that travels over their transit links – but at what cost?
- This misses the point – the cost isn't in the external bandwidth – it's in your networks
- Transit is very cost effective when compared with the true costs of peering

HSIP Tomorrow

Capacity per fiber pair: 40Gbps or 100Gbps

- Constantly evaluating cost optimisation and new product options;
- Now able to provide oc769, STM192 inter-continental Europe to North America
- Currently evaluated SLTE path to offer end-to-end native OC 760/STM192
- 40 Gigabit Ethernet – are people likely to use it ?
- 100Gbps Systems are starting to deploy

http://www.cable360.net/ct/news/ctreports/Cienas-100G-Stimulates-Finance_35516.html

Why Move to IPv6

- IPv4 Address Base Exhaustion
- Mandatory for a lot of Government Organisations
- Don’t fall behind the curve
- Projected IANA Unallocated Address Pool Exhaustion: 26-Sep-2011
- Projected RIR Unallocated Address Pool Exhaustion: 09-Oct-2012

Source: Potaroo.net 26/02/10

Country Migration Status's

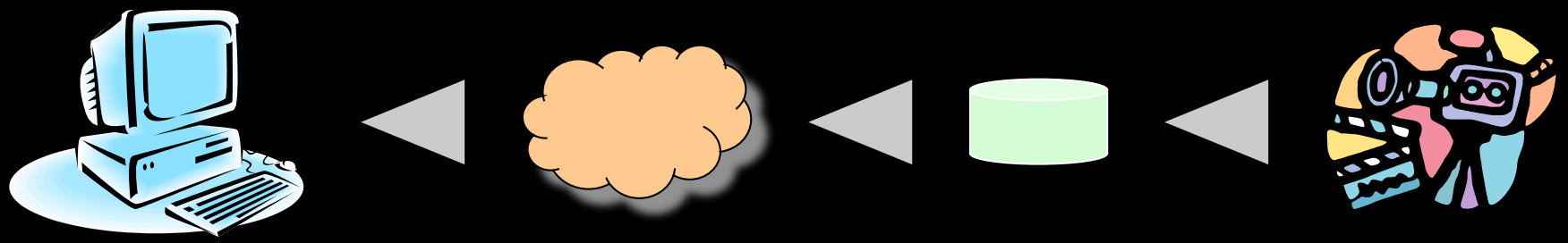
Country	Deployment Statistics	IPv6 networks	IPv4 Networks
Luxembourg	24%	10	42
Iceland	21%	6	29
Czech Republic	19%	34	176
The Netherlands	17%	85	511
Portugal	15%	11	75
Norway	14%	17	120
Ireland	14%	18	130
Germany	13%	149	1,183
Switzerland	12%	51	437
Sweden	11%	38	344
Poland	4%	39	887
All Countries in Europe		792	11,124

ISP Strategies – Make Content

Pay for the network!

- Content cannot be distributed to all ISP's Network
- QoS and the fabled walled garden
- Slightly subtler… Build a CDN in your network

Content Distribution Challenges



Consumer

- Choice of content
- Value for money
- Quality of experience
- Choice of viewing locations

ISP

- Manage cost
- Monetise content
- Build own CDN?
- Pricing model

CDN

- Maintain service excellence
- Ensure technology leadership
- Manage costs
- Protect IP

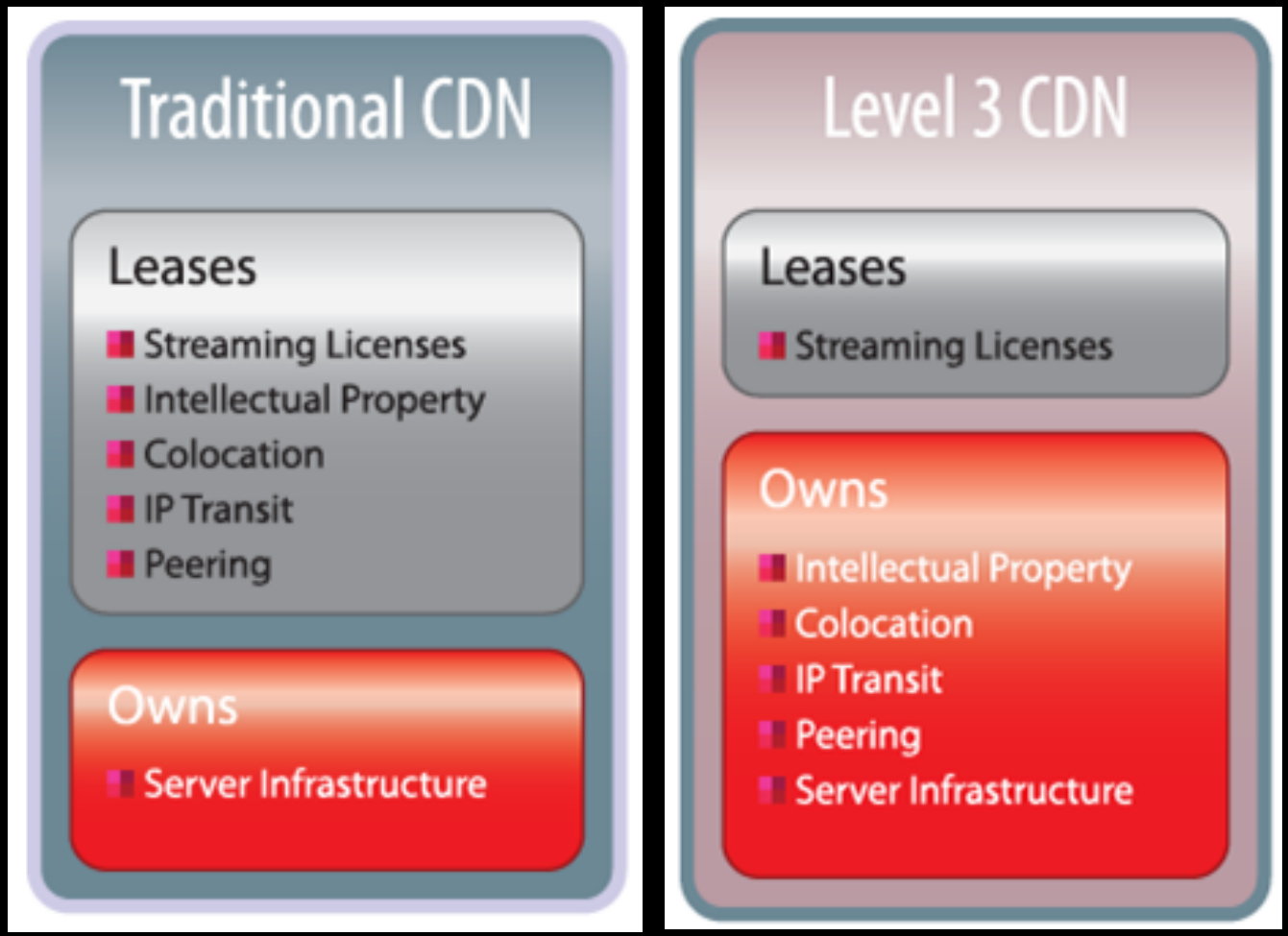
Content owner

- Monetise assets
- Ensure content security
- Understand usage

Content Delivery Networks

- Most Carriers are or thinking about deploying CDN
- Key cost component for existing CDN are distribution
- Carriers have to find ways of handling Bandwidth demanding applications
- Carriers already have the network in place

Why CDN and Carriers?

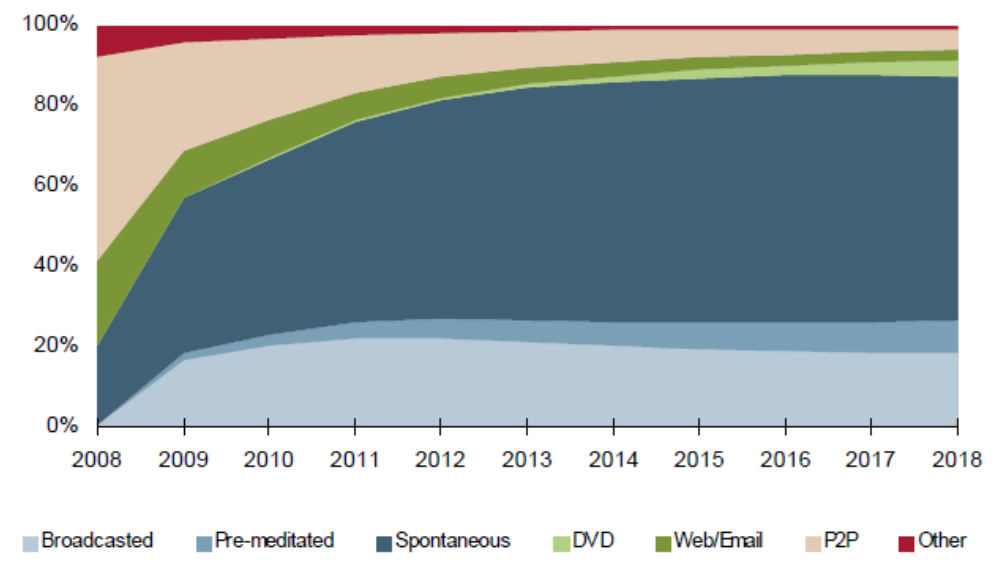


It's All About Video

Level 3's network is built to enable the growth of the internet

The growth of the internet is driven by video traffic

What are we delivering today?



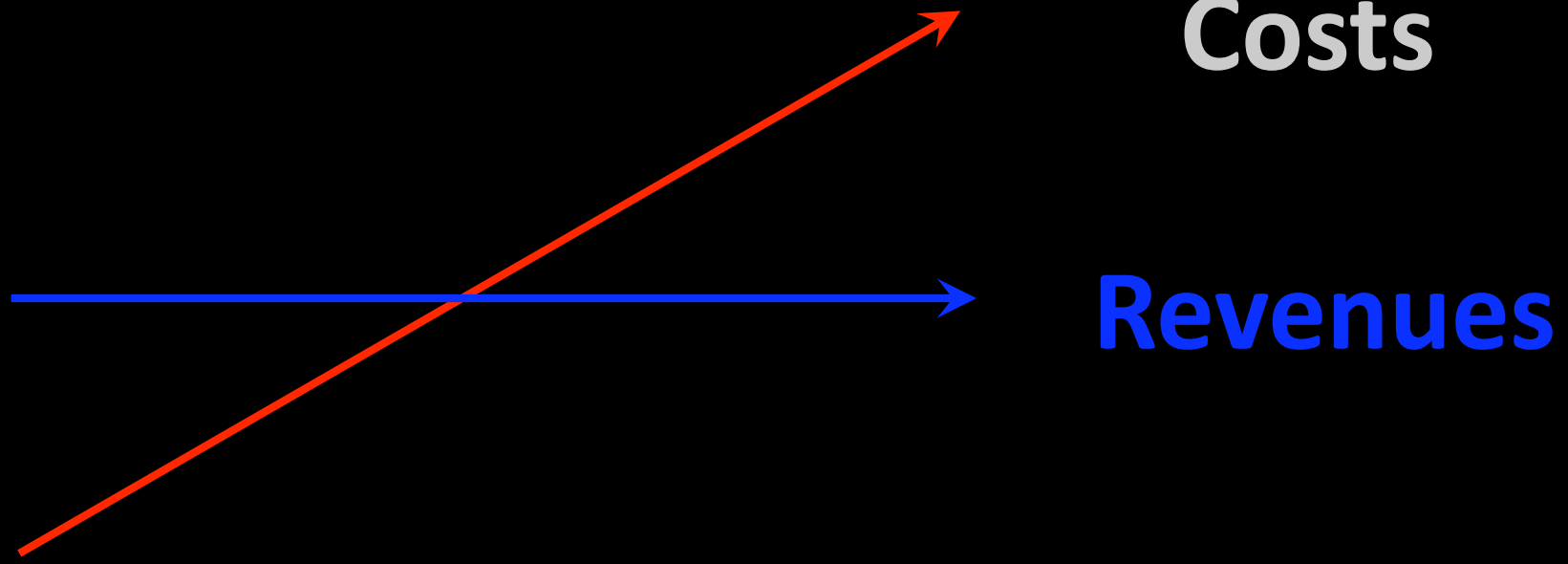
Source: Analysys Mason, Nov 2008

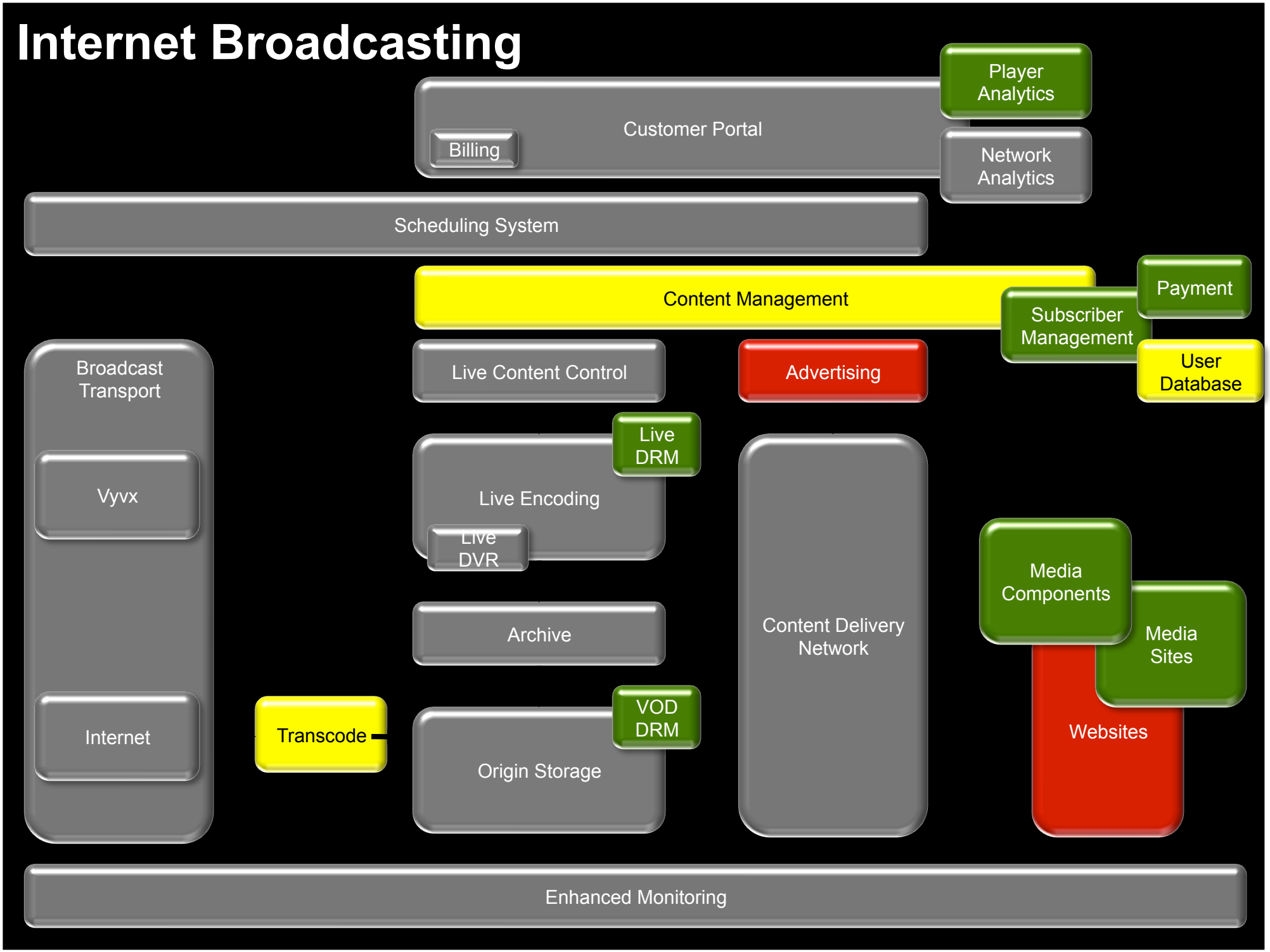
- Video consumption moves online
  - Almost all TV will be on-demand and consumed over IP networks
  - More pronounced shift to broadcasting linear content over IP
  - Wide range of specialist independent channels, at the expense of existing broadcasters
  - DVD content is downloadable (new DVD rental models)
  - P2P is declining

- Bandwidth composition as a result
  - one minute of medium-quality video equates to around 7-10MB of data
  - Expecting **2Mbps** / broadband line by 2018 (average annual growth 55%)

Broadband Capacity

- The ISP commercial model is not ideal for video delivery




Internet Broadcasting
Player Analytics
Customer Portal
Billing
Network Analytics
Scheduling System
Content Management
Payment
Subscriber Management
User Database
Broadcast Transport
Live Content Control
Advertising
Live DRM
Vyvx
Live Encoding
Live DVR
Archive
Content Delivery Network
Media Components
Media Sites
Websites
Internet
Transcode
VOD DRM
Origin Storage
Enhanced Monitoring

ISP Strategies: Conclusions

- Sure focus on peering, but that isn't the problem
- Want to build your own CDN? Really?
- QoS your way to pointlessness (and cost you won't recover)

Or…

- Design your network to take feeds locally
- Work with interconnecting parties to lower the number of equipment hops each bit in your network makes
- If the problem is cost, complexity isn't likely to be the solution
- Don't convince yourself someone else should pay for your problem – they won't


Mobile
Enterprise
Internet
Service Provider
Broadcaster
Venue
Infrastructure
Transport
Packet
Content Delivery
Fiber

Thank You

For more details please contact:
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