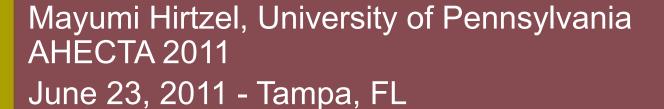
# Over the Top/Under the Hood OTT Video over IP



### Overview

- Introduction
  - Questions? Perspectives?
- (A little) Background about Penn and PVN
  - Why we chose an OTT solution
- So, what is "OTT"?
  - "And what makes you qualified to talk about it?"
- OTT Examples (Hardware and Interface)
  - Specifics of each option
  - Quality Comparison
- Findings at Penn

### Video over IP

- How many of you offer video over IP (streaming, on-demand capacity) on your campus broadband Ethernet network?
- How many of you have a broadband Ethernet network?

### How, When, With What

- Even if you don't have "on-demand, video over IP" as a service, students are using your network to watch TV, movies, and more:
  - How they want to watch it
  - When they want to watch it
  - With the device of their choosing

#### PennNet and PVN

- PennNet: Penn Internet access
  - Wired Ethernet
    - 10Mbs to wallplate (throttled)
    - Wireless issues
- Penn Video Network
  - HFC distribution network on campus (ca 1994)
  - ~8000 drops / ~60 channels / 550MHz
    - Yes to Digital and some HD (QAM)

## Why OTT at Penn?

- Past "failures"
  - Inuk/Internet 2 project
  - No clear winner in IP Video for us
- After 2 years...
  - Why duplicate existing service?
    - Cable TV already successful
  - Supplemental lineup more appealing
  - "Who wants it?"

## Over the Top

- (In this case) Set-top box designed for media display using an Internet network input for data/packet retrieval
- Three examples:
  - AppleTV (Apple)
  - Boxee Box (D-Link)
  - Roku HD (Roku)

## Long Walks and Cute Animals

- Not an engineer!
- TV-watching habits
  - I like TV! (But not so much "live")
  - Media saturation from multiple sources
    - Laptop, smartphone, game systems, TV (sort of)
- Opinionated. Cheap. Impatient.
  Me ~ Average student viewer?

## Little Bit o'This, Little Bit o'That

#### AppleTV v. Boxee v. Roku

- Comparison and Findings
  - Connection/Output options
    - All wired connections
  - Hardware design
  - Ease of use
  - Get ready for some personal bias!

## AppleTV

- Slick design and user interface
- Link to your Apple everything (iTunes, iMovie, etc.)
- Fair number of media apps (Netflix, YouTube, Flickr, iTunes); also rental/purchase
- HDMI out (rassa-frassa-! No Cable Provided?!); Optical out
- 720p
- No enterprise wireless

#### Boxee Box

- Odd design / Big
- Keyboard remote
- HDMI out (cable provided); Optical out
- 1080p and 1080i
- Many, many apps / channels
  - Favor "freebies" like YouTube, TED, Khan Academy
- Essentially designed to replace PC running Boxee software

#### Roku HD

- Functional design Streaming Media Player
- Basic remote and Interface
- 720p (later models go to 1080p)
- Most output options (HDMI, S-video, Composite, Component; Optical); basic cables provided
- Mid-range "Channel" options
  - Netflix, Hulu Plus, NHL, MLB, Amazon video
  - Pandora, iTunes
  - Higher-ed-specific (see TelVue)

## OTT Baseline Comparison

	AppleTV	Boxee	Roku	
Wired	X	Х	X	
Wireless	X	X	X	
Outputs	HDMI; Optical	HDMI; Optical	HDMI, S-video, Composite, Component; Optical	
# of Apps	Lowest	Highest	Mid-range	
Home Networking	X	X	N/A	
Resolution	720p	1080p/i	720p (1080p)	
Pricepoint	~\$99	\$150	~\$80-\$130	

## **OTT Biased Comparison**

	AppleTV	Boxee	Roku	
Hardware	No HDMI cable? <i>Really?</i>	Annoying design	Bare bones	
Interface	Pretty, but unintuitive	So. Many. Apps! Remote keyboard unhelpful	Boring	
Picture quality	Best	Good	Better	
Ease of setup	Good	Better	Best	
Home Networking	+	+	-	
Recommendation	Personal Preference			

### Did You Just Waste My Time?

- All OTTs specializing in digital media reception and streaming do essentially the same thing
- AppleTV, Boxee, Chumby, GoogleTV,
  Orb, PS3, Roku, Wii, XBOX 360 ...!
- Which one best matches your or your students' - needs and wants?

## Penn Findings

- No noticeable blips on network
  - No control group or testing
- Needed to educate students about registration
  - Not exactly as easy as "plug-and-play"
  - Same as any other Internet device
  - Largest percentage of registered "peripheral" Internet devices (not computers) was XBOX 360 @ 30%

## All About the Benjamins

...and the Benitas!

- Students want what they want: What's in the box, not the box itself!
  - Students don't think, "I want to watch Showtime tonight!" They think, "I want to watch 'Dexter' tonight!"

## K.I.S.S.

- Penn opted for a solution that was extremely low-cost - for us, and for them - with OTT recommendations
  - Mom and Dad already have Comcast, Time Warner, FiOS, Dish, DirecTV at home - many are also available to students (remotely)
    - Education issue
    - HBO Go very successful example
    - Talk to your vendors about on-demand options

#### What is the Answer?

- IP Video is the future ...
  - ... But how far away?
  - Over IP? In "The Cloud?"
- Existing OTT services are a stop-gap solution
  - No clear "winner" in the race of which service is best
- If you want to take a cautious approach to Video over IP, OTT is one way to do it.

## Q & A / Hands-On

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