Tech Trends

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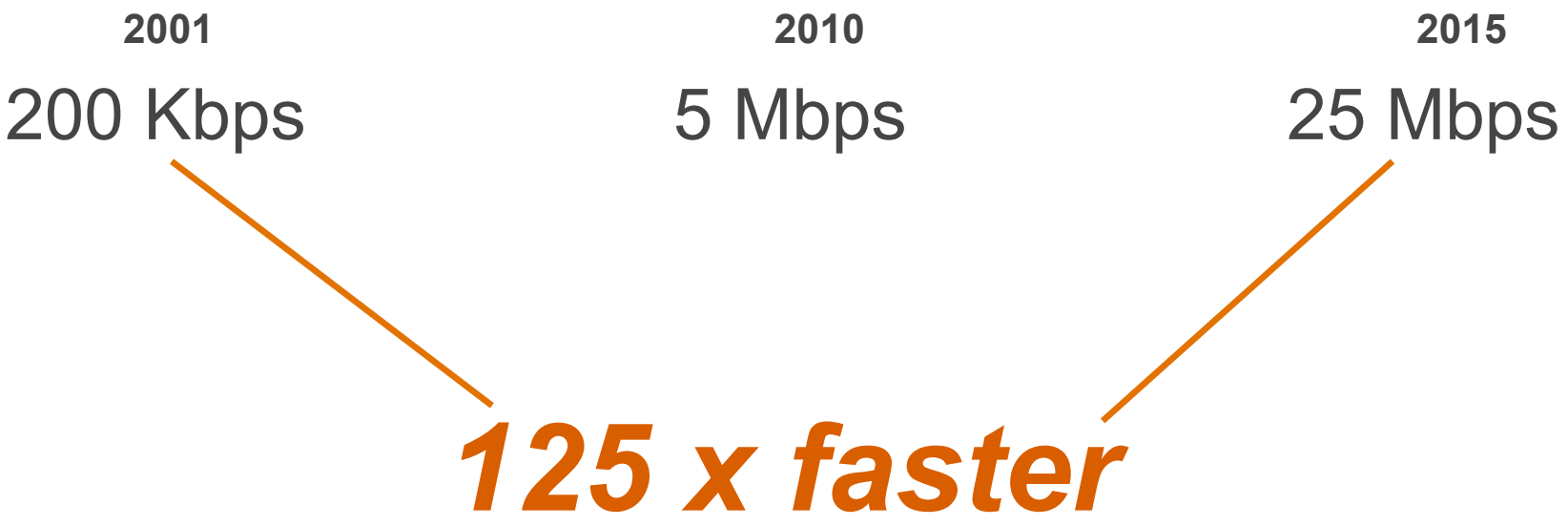
What is Broadband?

The FCC's Definition



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The State of Broadband

- 75% of homes have Internet service; 25% do not.
- The average customer spends $51.78 per month on Internet access.
- The average residential speed is 12 Mbps.
- The average home consumes 60 GB of data per month.
- Independent telcos have 88% of the Internet market-share in the communities they serve.

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Less than 8% of homes in the United States have a fiber connection.

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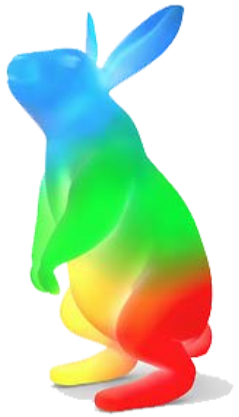
Google Fiberhoods

- Kansas City
- Austin
- Provo
- Atlanta
- Charlotte
- Raleigh / Durham
- Nashville
- Salt Lake City
- San Antonio

Google fiber



FEWER THAN 100,000 CUSTOMERS

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Verizon

- FiOS.
- 6 million connections:
  - Only 12% of the 50 million homes served.
- Less than one-third take-rate.
- Negligible increase in customer spending.

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AT&T

- U-Verse.
- Approximately 6 million FTTH customers.
- Discontinuing its build out.
- Trying to switch customers to DirecTV, which it purchased in 2015.

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The Internet of Things

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“The Internet of Things”

. . . the phenomenon of practically every gadget being able to communicate over the Internet, or directly with other gadgets.

At the “end of the Internet” is no longer just a computer or television, but bracelets, kitchen appliances, cars, medicine, machinery – every *THING* imaginable.

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Some ***AMAZING*** Statistics

- Already 8 billion devices worldwide.
- In rural America, an average of 3.75 connected devices per home.
- Projected 50 billion devices by 2020.
- The average home has $5,000 in consumer electronics.
- The average home spends $250 per month on connectivity.
- 65% of adults own a smartphone.
- 55% of adults own a tablet computer.

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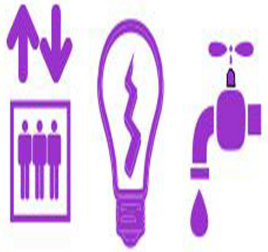
Vehicle,asset,person & pet monitoring & controlling

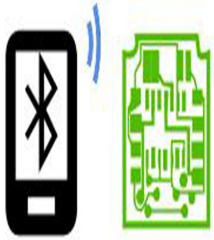
Agriculture automation

Energy consumption

Security & surveillance



Building managment



Embedded

Mobile

Internet of things

Everyday things get connected

for smarter tomorrow

M2M & wireless sensor network

Everyday things

Smart homes & cities

Telemedicine & helthcare

IoT Real World Examples

- Sensors on cattle can tell farmers tell when animals are sick or pregnant. (Each cow sends about 200 MB of data per year.)
- Parking apps can find an empty space to save the time and fuel spent circling the lot.
- Drones can deliver products to your doorstep.
- Smart homes are more efficient with thermostats and energy controls.
- Pacemakers can transmit heart conditions to medical professionals. Individual pills can notify doctors when they were swallowed.
- Retailers text coupons when you are in range of their stores.

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IoT Building Blocks

- **Application**

  An app is a computer program designed to perform functions, tasks, or activities for the benefit of the user. Every single IoT product has its own customized app.

- **Sensor**

  As with apps, there are lots of different sensors: thermostats, motion detectors, flood gauges, heart monitors, decibel readers, lighting meters, and on and on.

- **Transmitter / Receiver**

  Tiny transmitters and receivers send and receive data to each other or to a computer for processing.

- **Communications Channel**

  Finally, IoT devices need a communications pathway. Most are now wireless, requiring the use of a particular radio frequency.

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The Self-driving Car

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M2M

Many IoT communications are Machine to Machine

- No human intervention
- Represents 5-10% of all IoT
- Following pre-set instructions
- Will lead to artificial intelligence
- Examples:
  - Smart electric meters
  - Smart gas pumps

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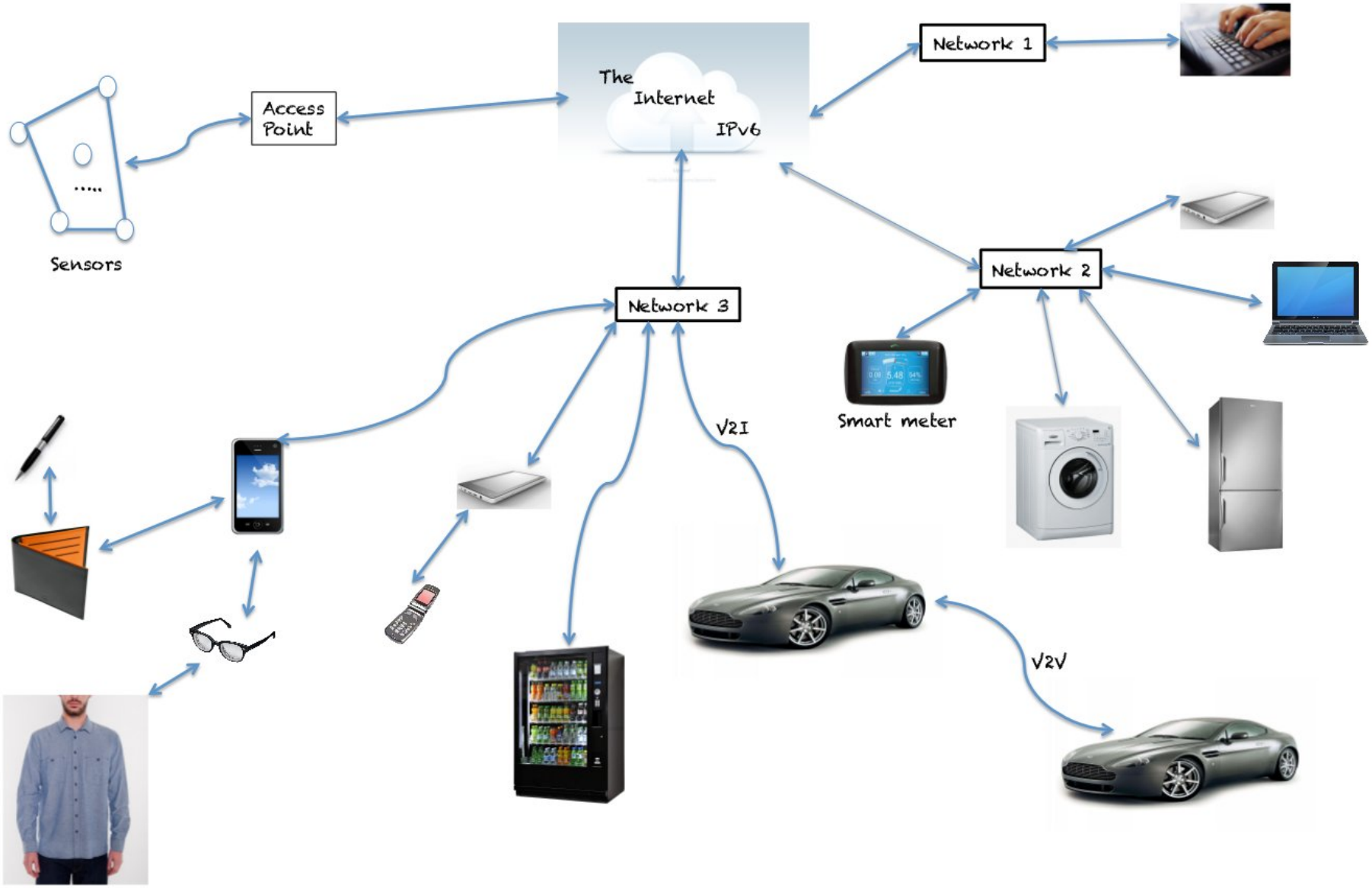
Network 1
The Internet
IPv6
Access Point
.....
Sensors
Network 2
Network 3
Smart meter
V2I
V2V

Wireless Issues

Because of the small amounts of data being transferred, the IoT accounts for less than 3% of all Internet traffic.

However,

- Wi-Fi networks interfere with one another.
- 50 billion devices will increase the percentage.
- Devices on the cellular network clog up cell towers in major cities.
- Data transfers might become much larger with more video applications.
- Devices will need to communicate over several different spectra.

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Security

- Many Internet-connected devices can already spy on people in their own homes:
  - Televisions, kitchen appliances, thermostats, ceiling fans, vacuum cleaners
- Computer-controlled devices in automobiles
  - brakes, the engine, locks, hood and trunk releases and even the dashboard – are vulnerable to attackers.
- Medical devices are also susceptible.
  - Imagine the danger of hacking into a pacemaker or insulin pump!
- M2M
  - Electrical grid
  - Weapons / defense systems
  - Broadcasting
  - Corporate sabotage

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Big Data

- Cloud computers can track your every "click."
- Accumulate massive amounts of data on you.
- Retailers purchase the data and customize advertising and promotions to your personal interests.
- Businesses can track large trends and forecast performance.
- Researchers can spot social developments.

There are infinite other uses for big data.

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Mass Customization

- Don't worry about the NSA. Google and Facebook know more about you than you know about yourself.

- Mobile Advertising:
  - Real-time, geo-specific
  - Push notifications
  - App based

- Mobile searches have surpassed desktop searches.

- Deloitte estimates 28% of the $970 billion in in-store sales were influenced by mobile devices last year.

- Cross-pollination.
  - Google / Target
  - Facebook / Nordstrom

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Business Analytics

- Real-time adjustments to maximize revenue.
- Pinpointing to capture the consumer at exactly the right moment.
- Shop for a plane ticket:
  - hundreds of diagnostics are running to determine the price for the ticket, based on supply and demand.
  - The price can literally change by hundreds-of-dollars within minutes.
  - There are no people making these decisions. It's all done automatically by computers in the cloud.

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Good or Bad?

The Good

- Reduces unwanted solicitations.
- Machines are tracking you, not people. It's all automated.
- Might provide real value in saving time, finding discounts, matching products to your unique tastes.
- Think of it as a personal shopper!
- Environmental friendly.

The Bad

- No privacy.
- Questionable security.
- Your every movement – virtual and physical – is known.
- Deluge of "customized" ads.
- Data accumulates and can be kept forever. You don't own it.

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Wireless Stats

- $200 billion annual industry.
- The average home spends $121 per month on mobile wireless.
- Almost one-half of homes are wireless only (no landline voice).
- 93% of American adults have a wireless phone.
- 70% of wireless users have a smartphone.
- The average user checks his cell phone more than 100 times per day.

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Wireless Stats

- 77% of mobile wireless traffic comes from smartphones.
- Smartphone screen time has surpassed tablets, computers and televisions combined.
- There are approximately 300,000 cell towers throughout the United States.
- There are approximately 8 billion connected devices worldwide (more than the global population).

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Mobile vs. Fixed

- **Mobile**
  - Move about within range of a tower.
  - Carry the device with you.
  - Move from one tower to another without interruption (handoffs).

- **Fixed**
  - Stay put.
  - The receiver is affixed to a home or building.
  - More bandwidth.

Separate networks, electronics and spectrum

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Blurring Lines

Mobile networks *are now being used for* ***fixed service****, thanks to bandwidth increases from 4G LTE*

Fixed networks *will be used for* ***mobile communications*** *with the build-out of large area Wi-Fi hot spots, the development of new handsets and the rollout of VoLTE.*

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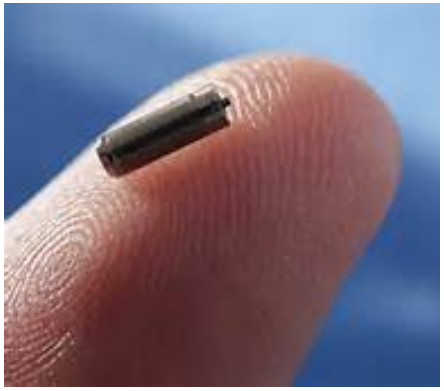
Power Sources



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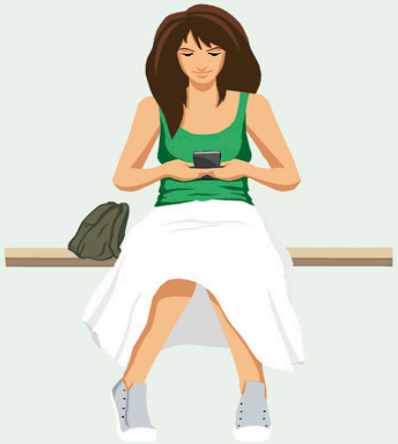
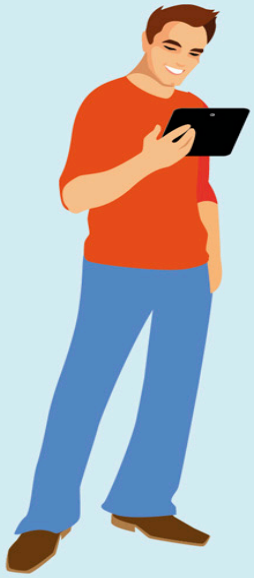
Generation	Device	Specifications
1G 		**1G** **Year** early 80s **Standards** AMPS, TACS **Technology** Analog **Bandwidth** – **Data rates** –
2G 		**2G** **Year** 1991 **Standards** GSM, GPRS, EDGE **Technology** Digital **Bandwidth** Narrow Band **Data rates** < 80 - 100 Kbit/s SMS / MMS

Generation	Device	Specifications
3G 		**3G** **Year** 2001 **Standards** UMTS / HSPA **Technology** digital **Bandwidth** Broad Band **Data rates** up to 2 Mbit/s SMS / MMS Internet access Video calls Mobile TV
4G 		**4G** **Year** 2010 **Standards** LTE, LTE Advanced **Technology** digital **Bandwidth** Mobile Broad Band **Data rates** xDSL-like experience 1 hr HD movie in 6 minutes SMS / MMS Internet access Video calls Mobile TV Gaming services Cloud computing

4G LTE

- Mobile wireless service.
- The “G” stands for “generation” not “gig.”
- Long-term evolution was coined in 2004, foreseeing a lengthy timeline to reach.
- Massive upgrade project:
  - Every cell tower.
- Theoretical speeds are 300 Mbps.
- Real world speeds are 10 Mbps.

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NFC

- Short-range wireless technology.
- Devices communicate within close proximity:
  - Uusually less than 4”
- Not a QR code or scan.
- Uses *radio* frequencies:
  - Google Wallet

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IDENTIFICATION
TICKETING
NFC
TIME &
ATTENDANCE
LOYALTY &
MEMBERSHIPS
PHYSICAL
ACCESS
CASHLESS
PAYMENT
HID
SECURE
PC LOG-ON
TRANSIT

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Wireless 5G

- Fifth generation.
- Due by 2020.
- 40 times faster speeds.
- Much greater reliability.
- Backbone of the IoT and M2M.

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5G Specifications

- Data rates up to 10 Gbps over the air.
- Latency reduced to 1 millisecond.
- Electrical efficiency to allow IoT devices to run on battery for up to ten years.

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5G

A person with a 5G smartphone could download a full-length 4K movie in about 6 seconds.

If not completely eliminated, data caps will be greatly increased.

That is not to say 5G will be cheap. Carriers will be able to charge a premium for this premium service.

Will require a new 5G smartphone ($$$).

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The subscription video model is broken!

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The New Video Model

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NETFLIX
comcast
sling
TELEVISION
PlayStation Vue
hulu
verizon FiOS
SHOWTIME
HBO
CBS ALL ACCESS
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Example Streaming Options

Stream	Month	Features
Showtime	$11	All programs – live and on-demand
HBO	$15	All programs – live and on-demand
CBS Access	$6	All programs – live and on-demand – except some sports
Nickelodeon Noggin'	$6	Archived shows – no live
Dish Sling TV	$20	20 cable channels – no network shows
Sony Vue	$50	50 channels – select markets
Comcast Stream	$15	12 broadcast + HBO – no cable channels

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Basic	Pause / RW	Replay	VoD
A&E	√	3 days	√
ABC Family	--	--	√
AMC	--	--	√
Cartoon / Adult Swim	--	--	--
CNN	--	--	√
Disney	--	--	√
El Rey	√	3 days	--
ESPN	--	--	--
ESPN2	--	--	√
Food Network	√	3 days	√
Galavision	√	3 days	√
H2	√	3 days	√
HGTV	√	3 days	√
History	√	3 days	√
IFC	--	--	√
Lifetime	√	3 days	√
Maker	√	1 day	√
TBS	--	--	--
TNT	--	--	--
Travel Channel	√	3 days	√

sling TELEVISION

20 channels
$20 per month

Add-on packages -- family, sports, news -- $5 per month each

BTW
Only one device at a time!

No broadcast (for now)

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Channel Line-up		
CBS	Esquire	OWN
NBC	Exitos	Oxygen
Fox	Food Network	Science
My9	Fox Business	Spike
Telemundo	Fox News	Syfy
Animal Planet	FOX Sports 1	TBS
BET	FOX Sports 2	TLC
Bravo	FX	TNT
Cartoon Network	FXX	Travel Channel
CBS Plus	HGTV	truTV
CMT	HLN	TV Land
CNBC	Investigation Discovery	USA Network
CNN	MSNBC	VH1
Comedy Central	MTV	Disney
Cozi TV	MTV2	ABC
Destination America	National Geographic	
Discovery Channel	NBC Sports	
Discovery Family	Nick Jr.	
DIY	Nickelodeon	
E!	Nicktoons	

PlayStation Vue

50 channels
$50 per month

Must use a PlayStation console

Just got Disney-owned channels (That includes ABC)

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Questions?

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