

# SMART DATA PRICING

## SDP 2016

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# SDP That We Have Seen (in U.S.)

## The MORE Everything Plan

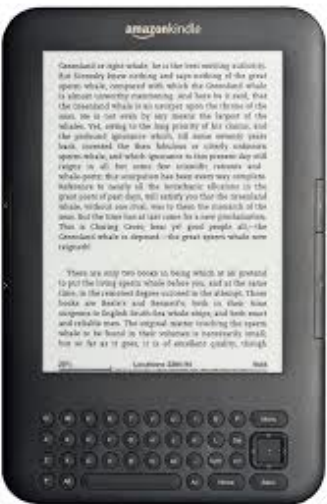
2 GB	3 GB	4 GB	6 GB	8 GB	10 GB	12 GB
*50*	*50*	*70*	*80*	*90*	*100*	*110*
14 GB	16 GB	18 GB	20 GB	30 GB	40 GB	50 GB
*120*	*130*	*140*	*150*	*225*	*300*	*375*
60 GB	80 GB	100 GB	<b>\$15 per 1 GB of data if you go over your plan allowance.</b>			
*450*	*600*	*750*				

Coming Soon



Browse.  
Stream.  
Enjoy.

With AT&T Sponsored Data, you can browse websites, stream video and enjoy apps on your wireless device without impacting your monthly data allowance.\*



## Standard AWS EC2 Instances, On Demand Pricing

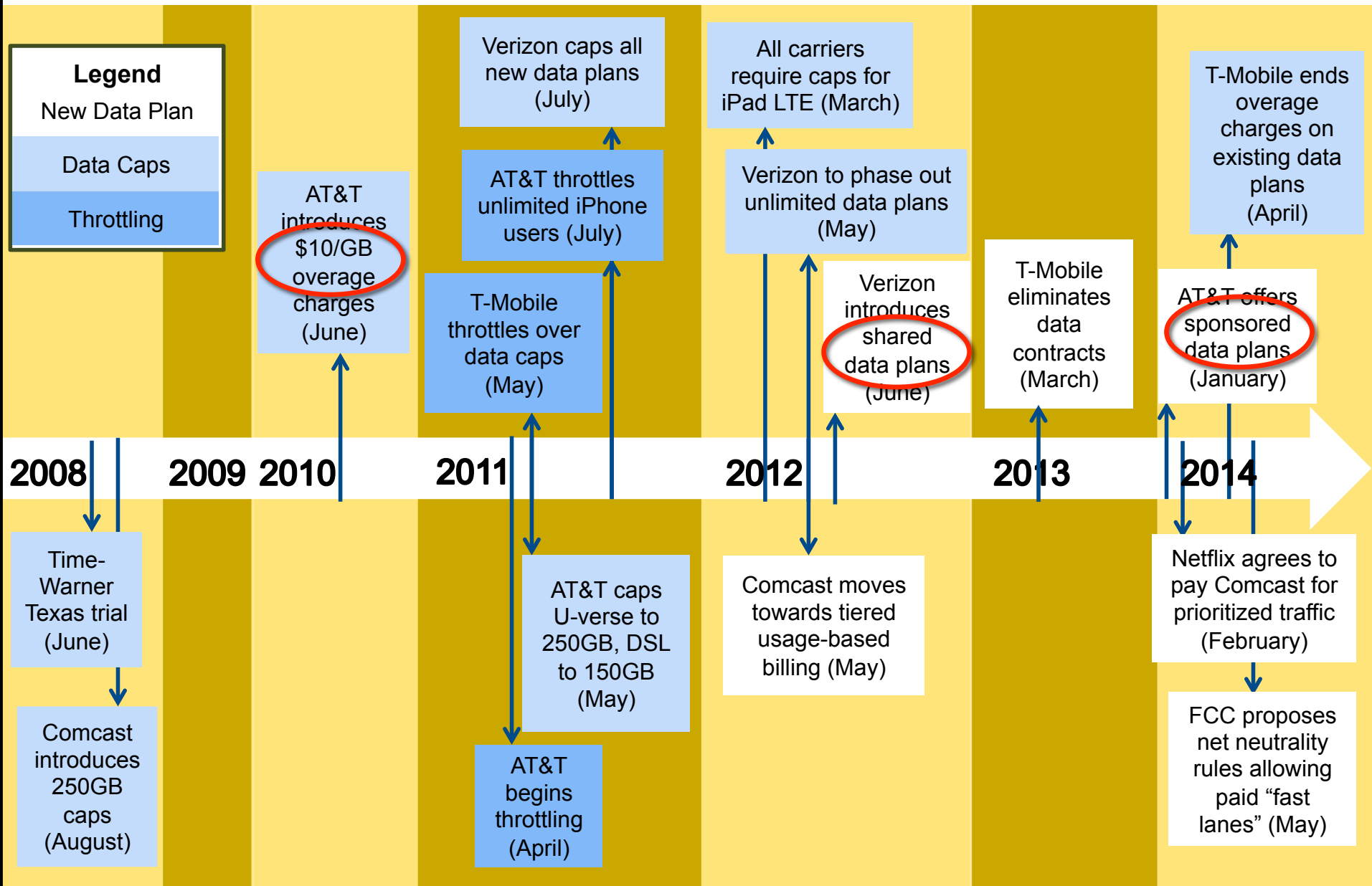
First Generation Instance Type	Linux Configuration	Old Price	New Price	Percent Change	\$ Per ECU Per Day
Small	1.7GB x 1ECU	\$0.08	\$0.07	-18.8%	\$1.56
Medium	3.75GB x 2ECU	\$0.16	\$0.13	-18.8%	\$1.56
Large	7.5GB x 4ECU	\$0.32	\$0.26	-18.8%	\$1.56
Extra Large	15GB x 8ECU	\$0.64	\$0.52	-18.8%	\$1.56

Second Generation Instance Type	Linux Configuration	Old Price	New Price	Percent Change	\$ Per ECU Per Day
Large	15GB x 13ECU	-	\$0.58	-	\$1.07
Extra Large	30GB x 26ECU	-	\$1.16	-	\$1.07



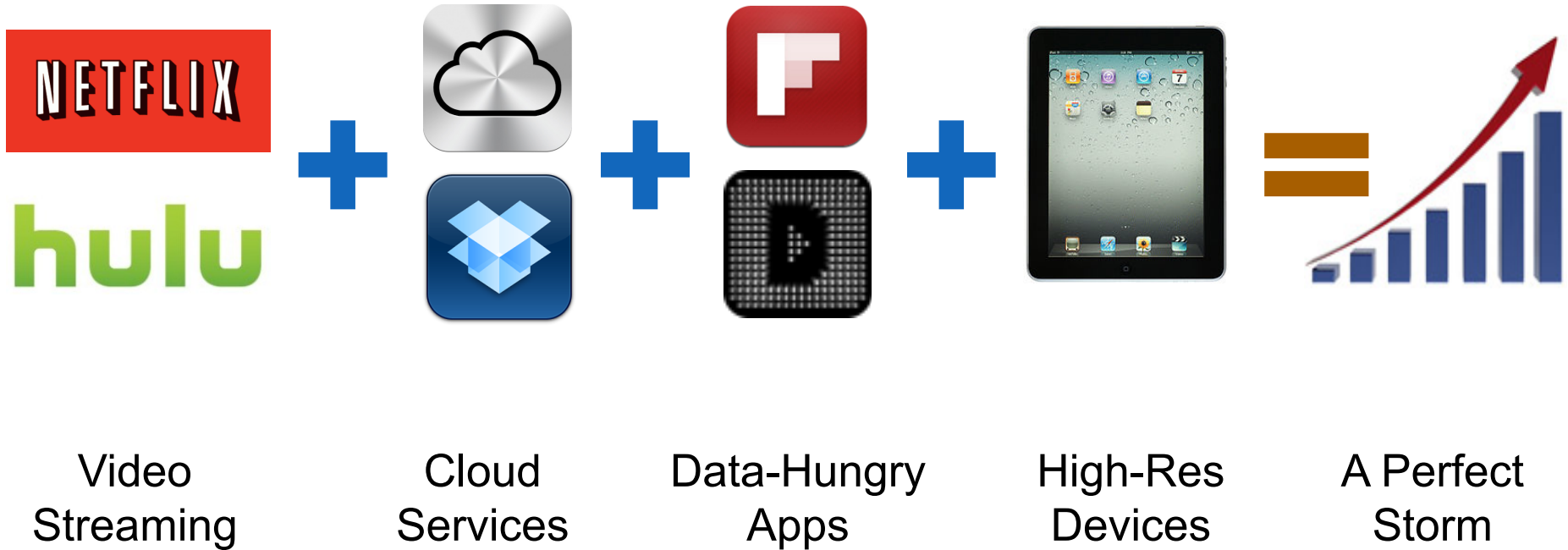
# Wireless

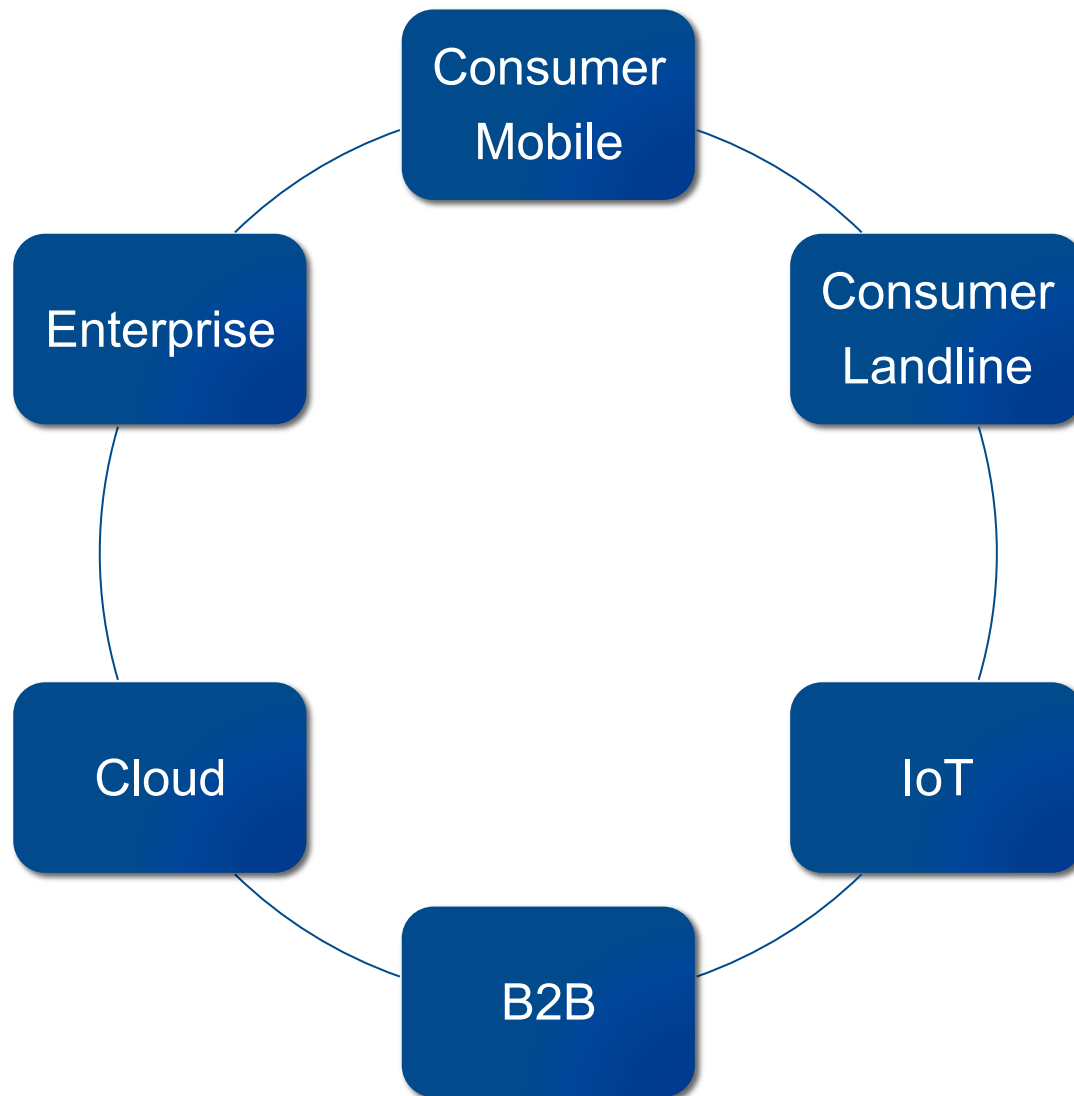
**Legend**  
New Data Plan  
Data Caps  
Throttling



# Wireline

# Demand Drivers





# SDP Dimensions

## A. How?

Usage-based, quota trading, demand response/**dynamic**...

## B. Who?

**Toll-free** (1-800, zero rating, sponsored data, split billing)...

## C. What?

App-based (no data plan), **cloud pricing**, IoT pricing, PMP...

## D. More...

Offloading, Quota-aware preloading, roaming, peering, virtual operators...

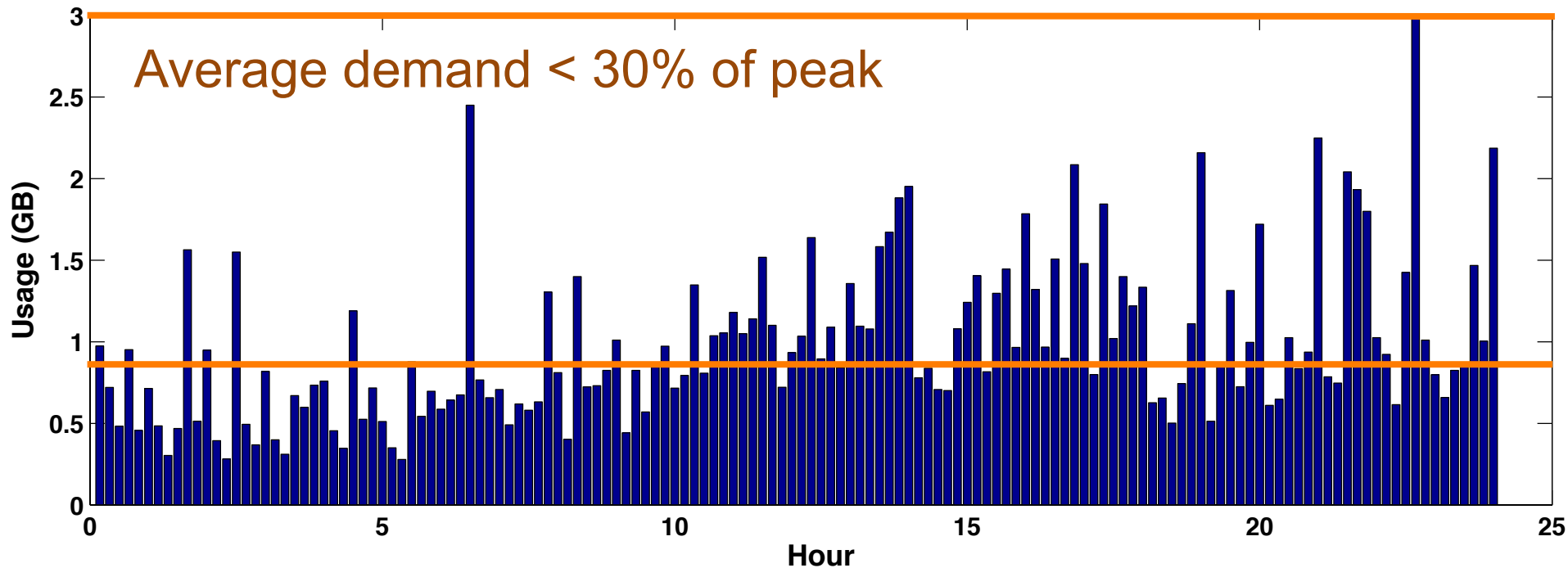
# DYNAMIC PRICING

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ACM Sigcomm 2012

IEEE ICDCS 2011, ACM SigChi 2013

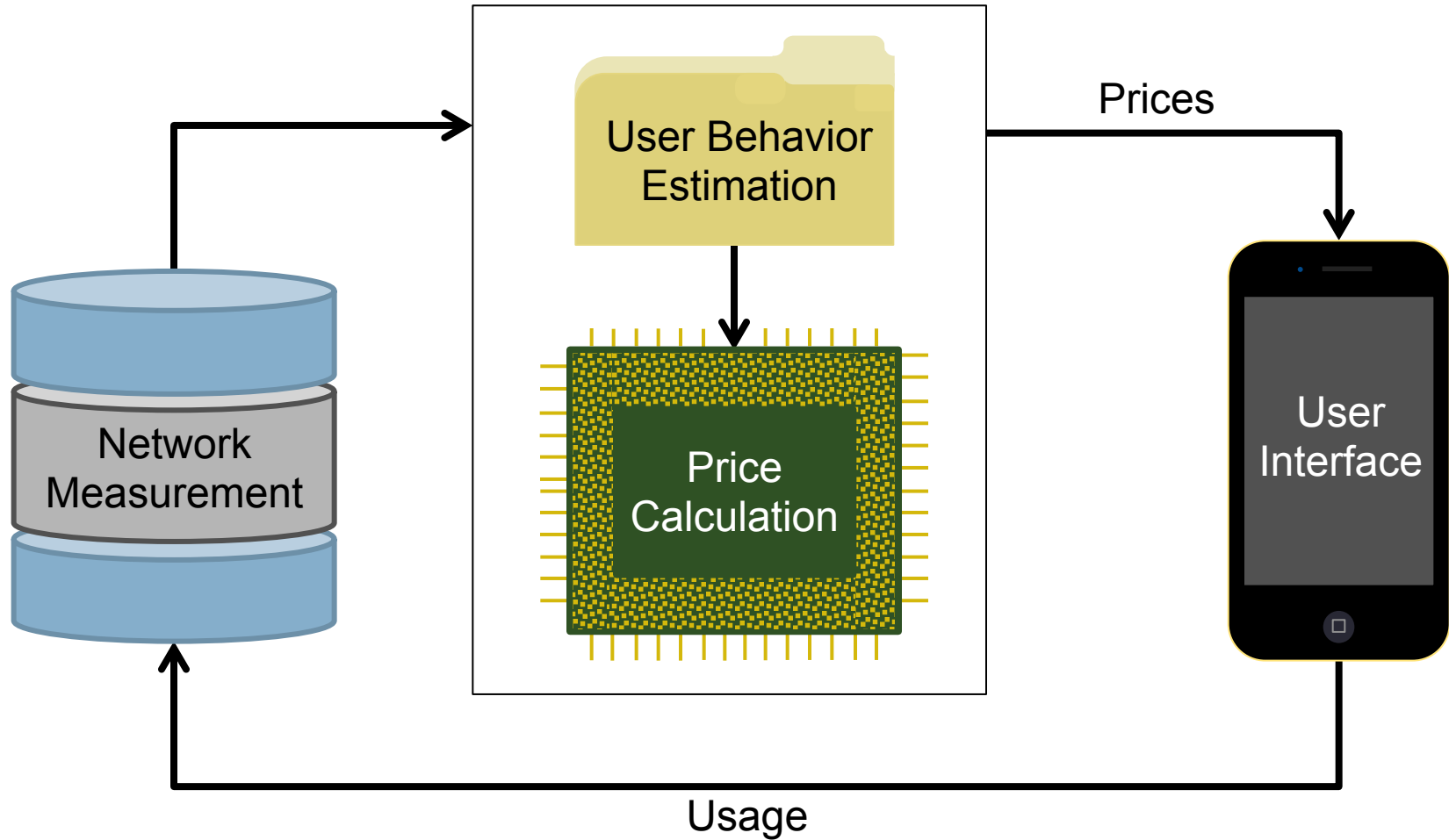
# Data Traffic Varies Over the Day



- Costs are driven by the peak
- Revenue is driven by the average



# TDP for Mobile Data

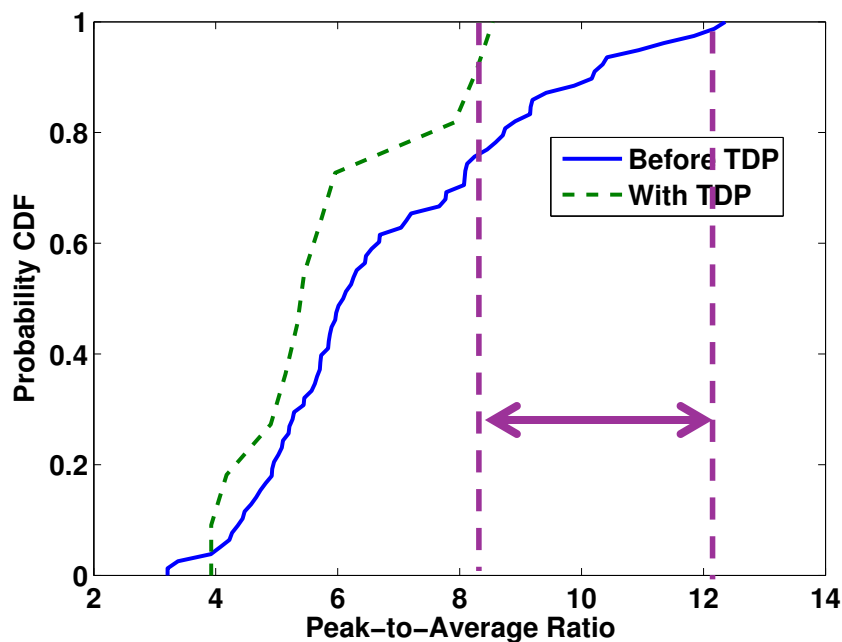


# Optimized TDP Impact

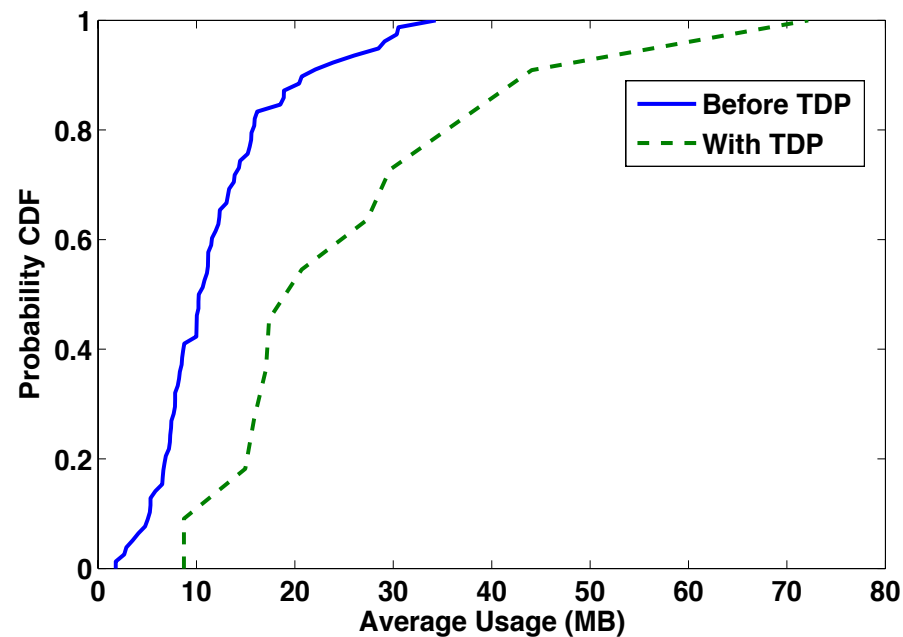
Does peak usage decrease with TDP?

Does this come from an overall decrease in usage?

PAR decreases by 30%



Overall usage increases by 130%



# OPEN TOLL-FREE

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IEEE INFOCOM 2015

# To an ISP, Sponsored Data Is...

A way to extract revenue from content providers



sponsored data

Browse.  
Stream.  
Enjoy.<sup>SM</sup>

AT&T

Any content  
data to

**also known as:**

Zero rating

Toll-free data

Split billing

1-800 data

Two-sided pricing

AT&T to subsidize

**Verizon to Start  
Days**



By Ina F.

December 9, 2015, 12:45 PM PST



**Data in Coming**

**<re/code>**

# To a Content Provider, It Is...

## A way to increase user demand

CPs can benefit from demand increases in different ways

CP Type	Benefit Source	Examples
Revenue	Advertisements Subscriptions	
Promotion	Goodwill Increased usage	

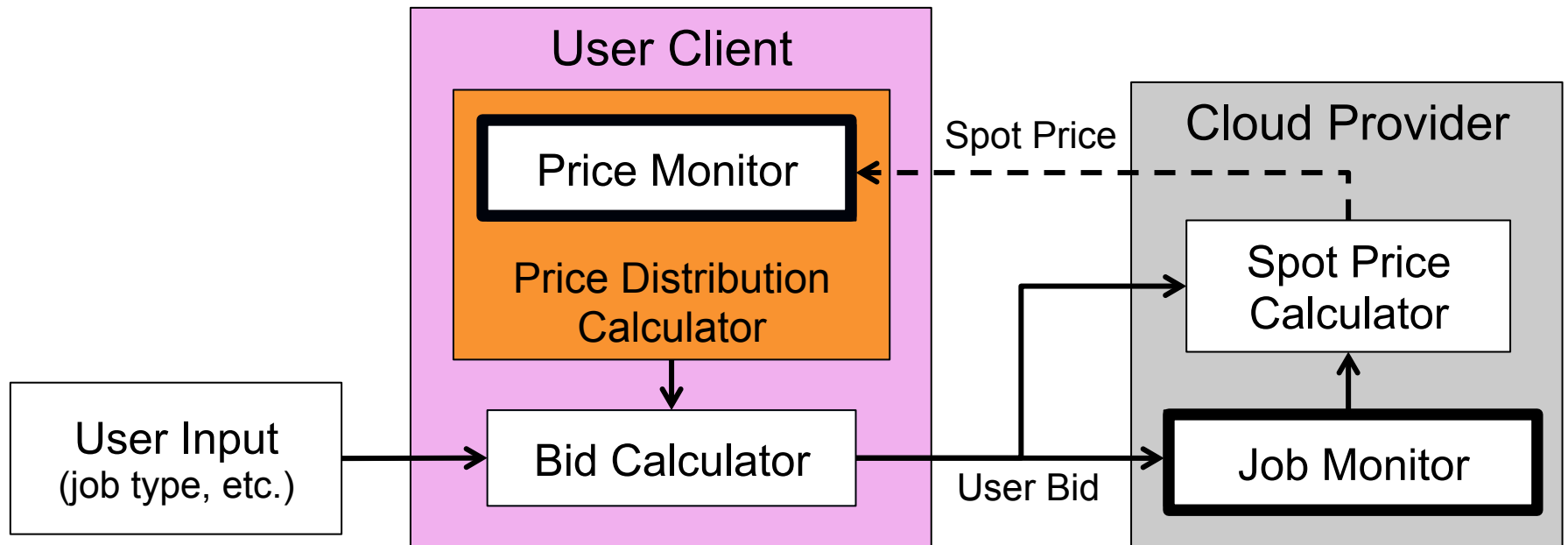
# CLOUD PRICING

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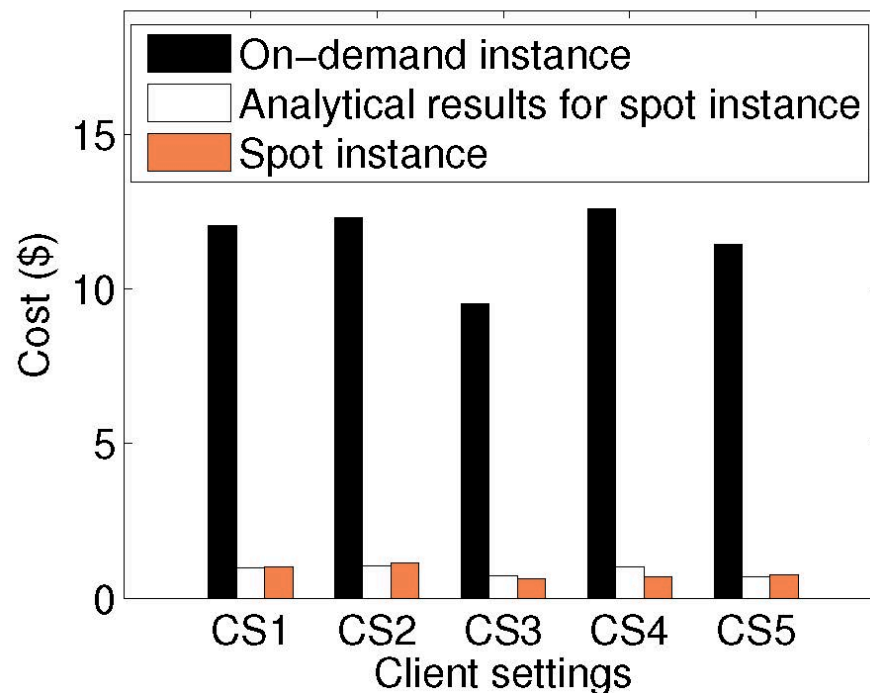
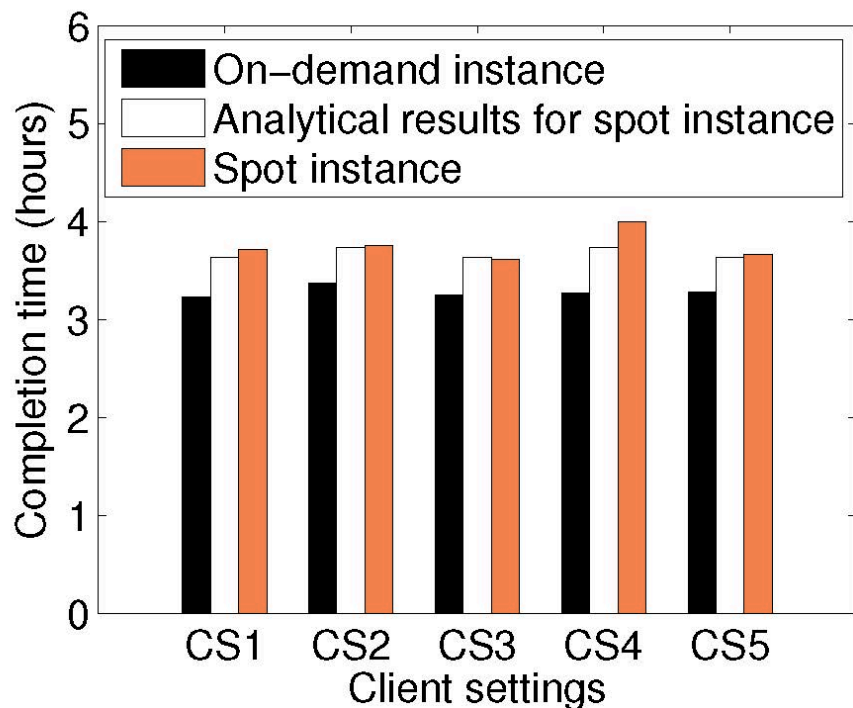
ACM Sigcomm 2015

ACM Sigmetrics 2016

# Spot Price Bidding



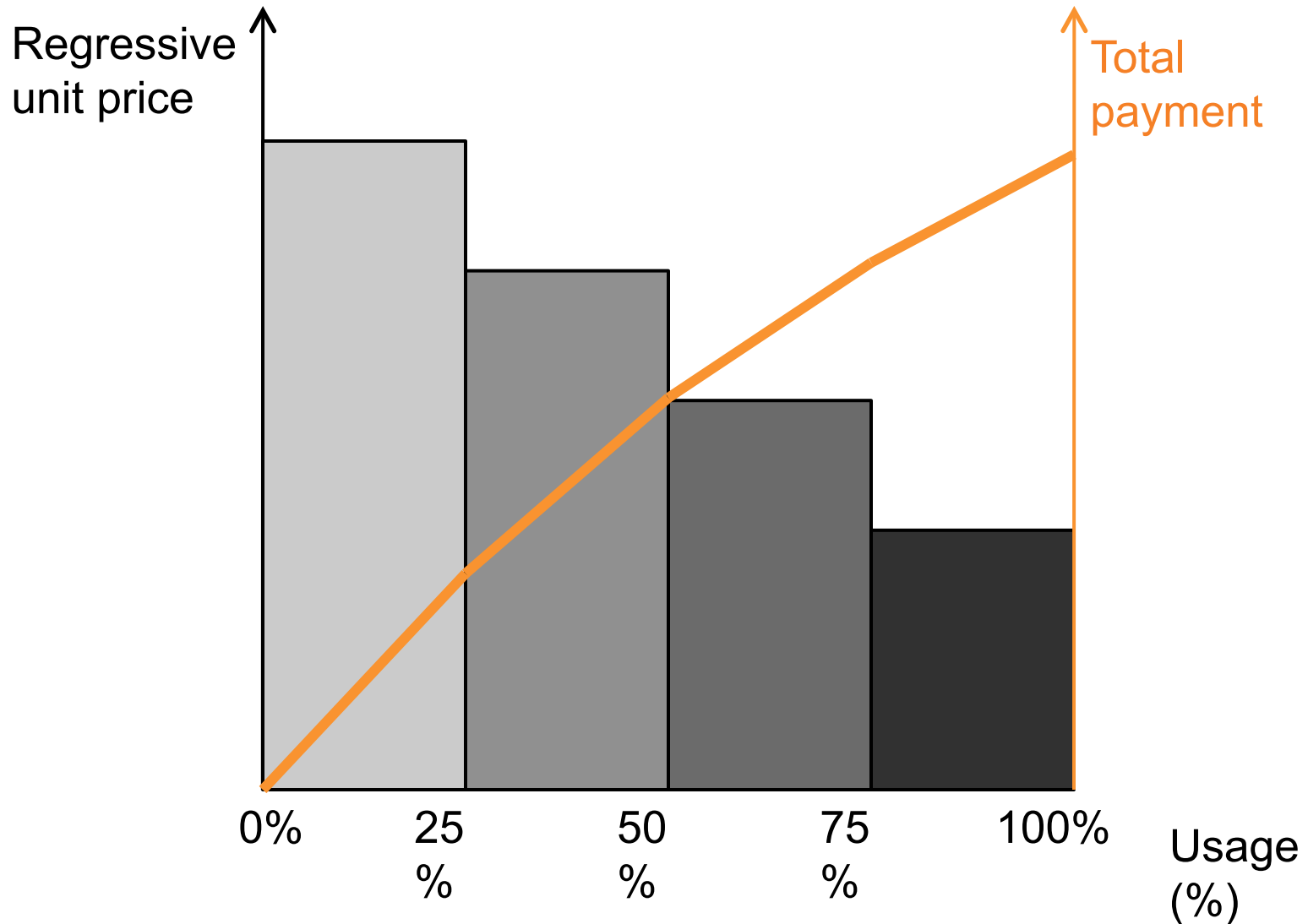
# Example of MapReduce Jobs



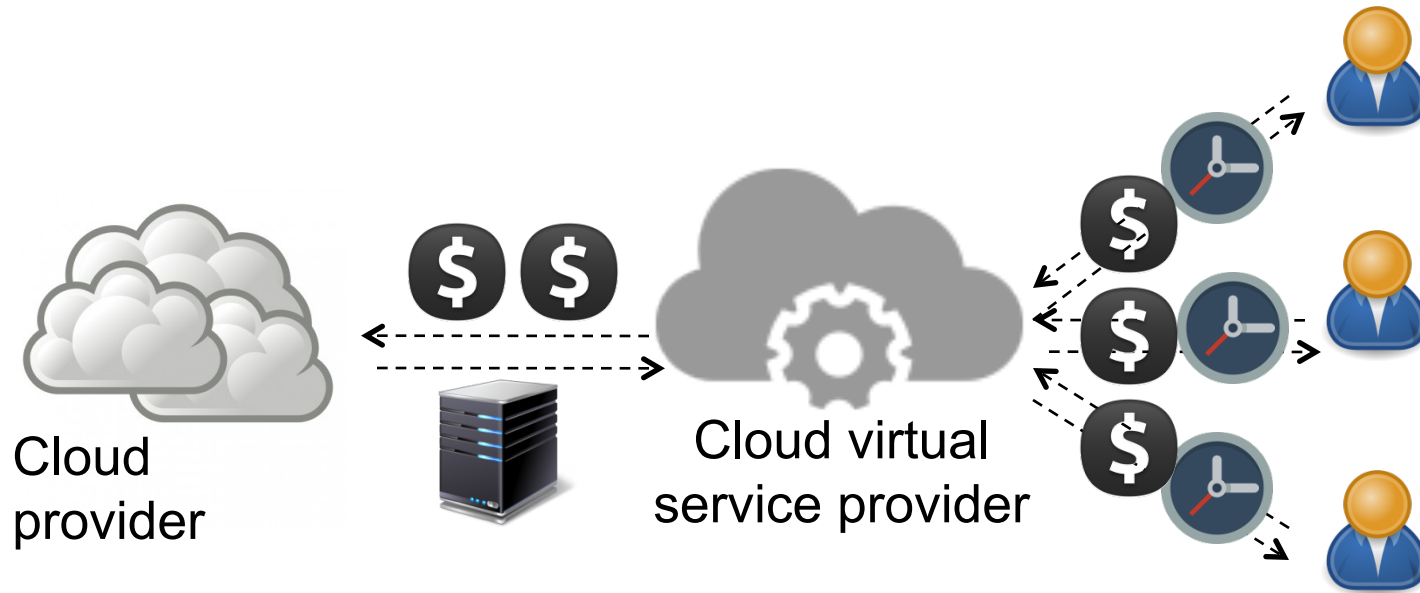
**The cost is reduced by up to 92.6% with just a 14.9% completion time increase.**

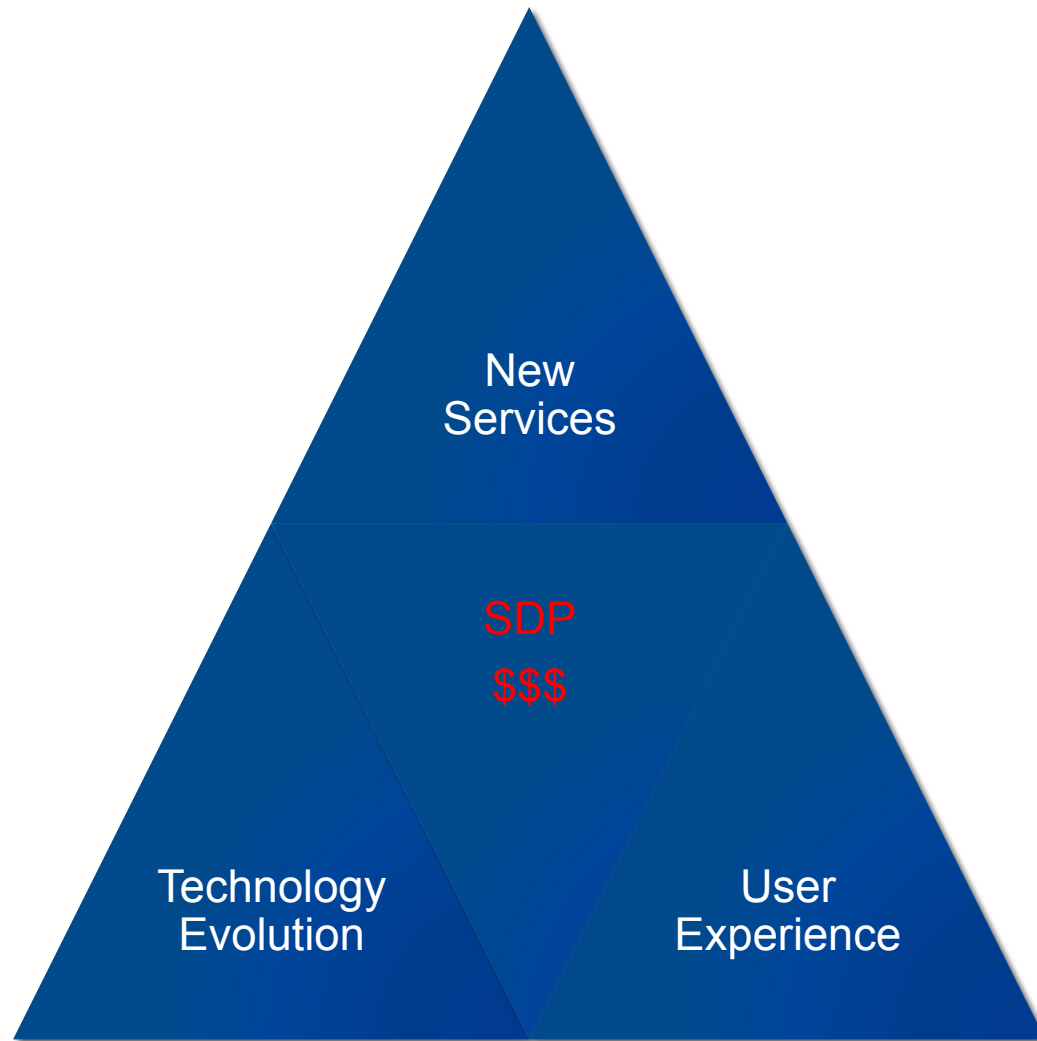


# Sustained-use Discounts



# Cloud Virtual Service Providers





New  
Services

SDP  
\$\$\$

Technology  
Evolution

User  
Experience

# Title II in US

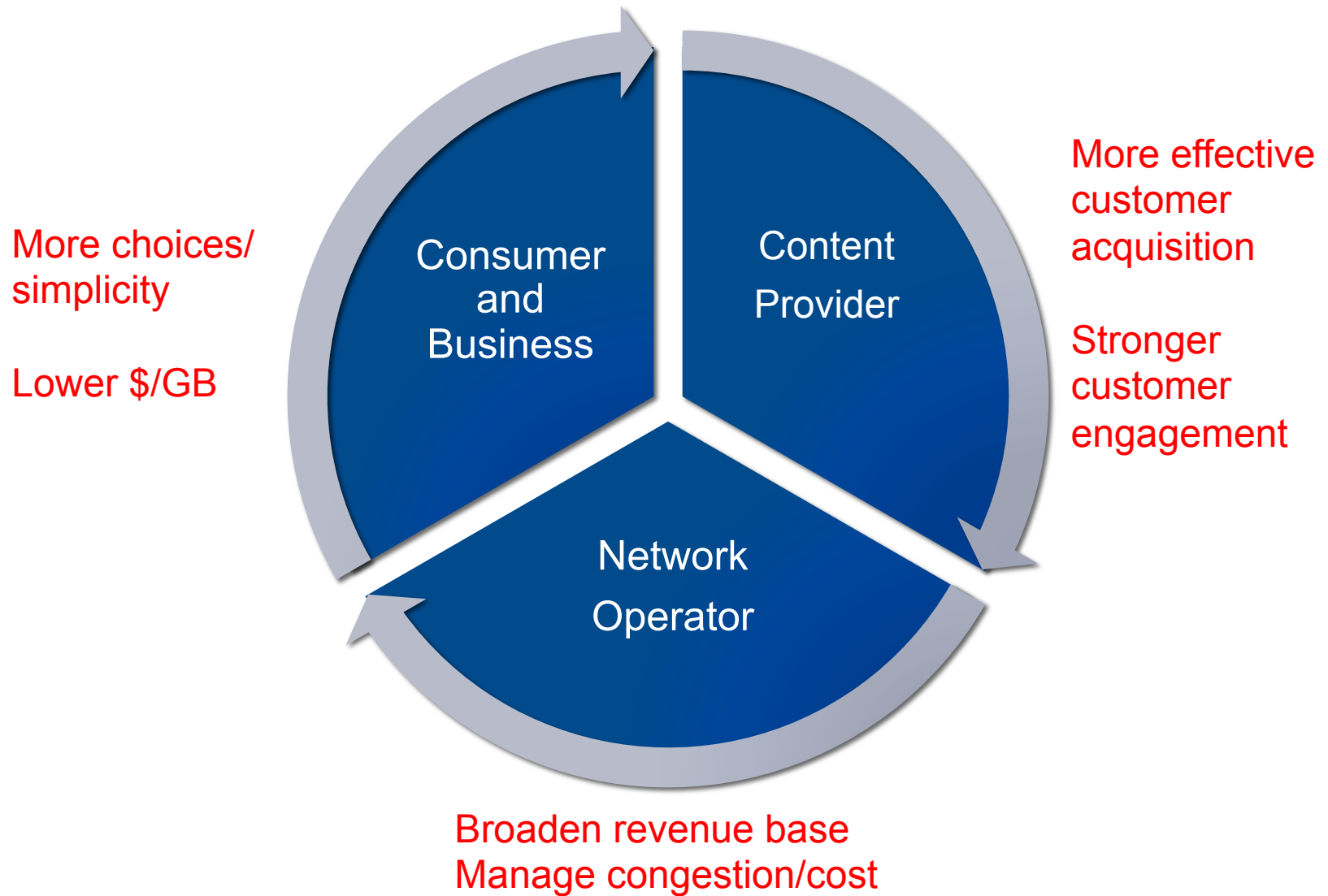
- Disclaimers:
  - Court decisions may revoke the ruling
  - Legislative action may supersede FCC
  - Executive branch may reverse the decision
- Networking not by managing bytes
- Instead, **manage network indirectly by pricing signals**
  - Especially with end user making opt-in decisions

# Implications

1. “No price control”
  - Usage pricing, family plan, quota rollover...
2. Not allowed: Unlimited + Throttling
  - Need: some form of SDP
3. Toll-Free must be Open
  - Closed toll-free may not be neutral
4. Utility Pricing
  - One possibility: demand response
  - Crucial differences: quality depends on congestion

- Think \$
- Not B

# SDP Impact



# Prediction of SDP 2020

- Prediction the future is almost always wrong
  - 2007: almost no one saw the rippling impact of iPhone and Kindle on pricing
  - 2010: almost no one believed AT&T's usage-pricing would stick
  - 2012: almost no one believed zero-rating would stick



# Prediction on “Not” SDP

1. Demand response to consumers
  - Too complex for typical consumers
  - **Except** perhaps: Transparent Preload in Valley (TPV)
2. Advertisement-sponsored long video content
  - Economics doesn't scale for advertisers
3. Closed toll-free
  - Regulatory uncertainty

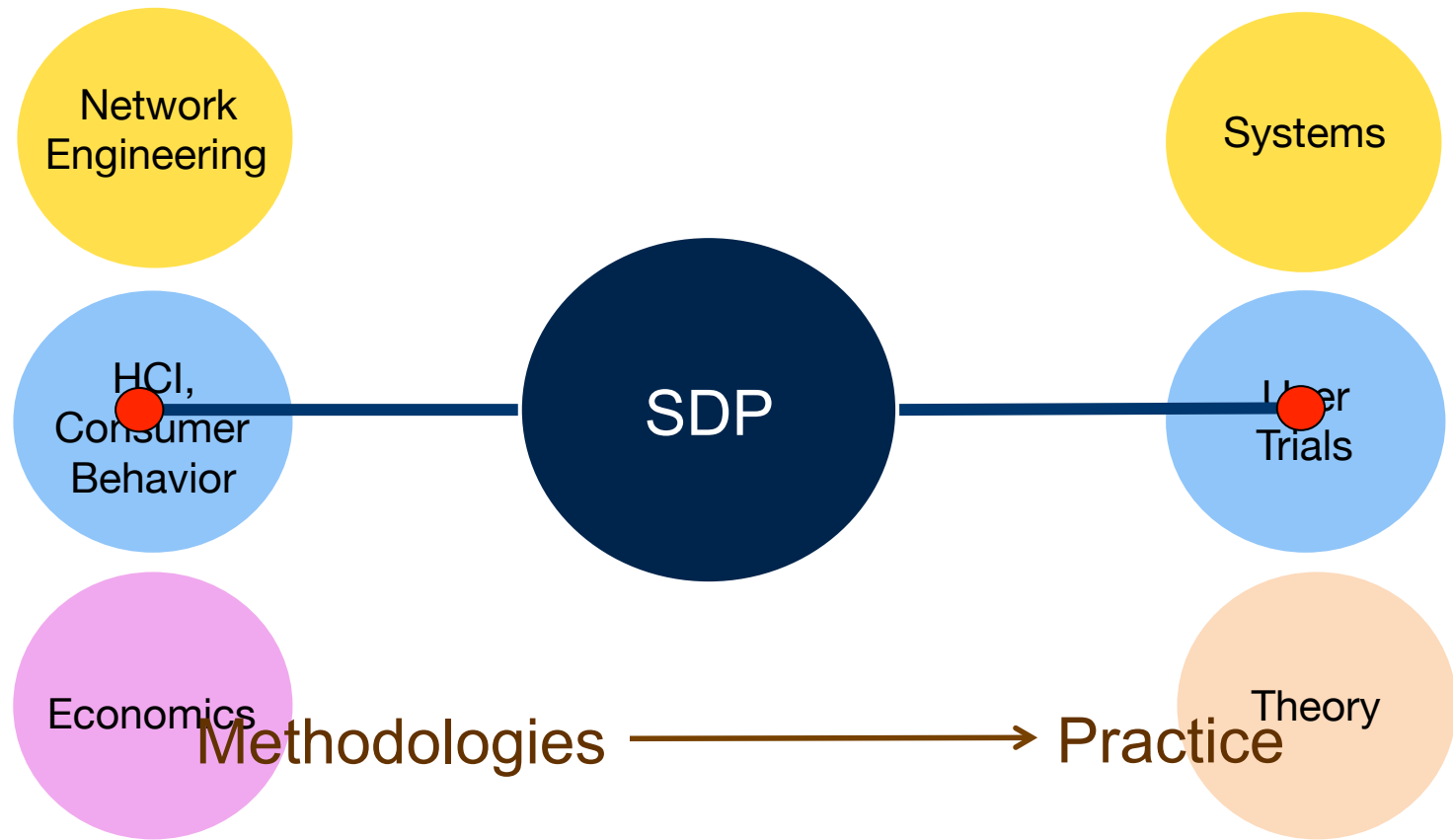
# Could Go Either Way

1. Mobile: Quota-engineering
2. B2B: Peering pricing at IXP or at edge
3. Cloud: latency-based SLA+pricing

# Prediction on “Hot” SDP

1. **“No postage/data plan”** (developing countries)
  - App-based pricing + open toll-free
  - Democratizing mobile data access to all consumers
2. **Revenue-broadening** (developed countries)
  - IoT pricing has to be new for new services
  - Enterprise pricing will evolve
3. **Pricing becomes network management tool**
  - “Thermostat” for HetNets in 5G

# SDP as a Research Area



# Thank you

- <http://sdpresearch.org>
- <http://sdpindustryforum.org>
- [chiangm@princeton.edu](mailto:chiangm@princeton.edu)