Introduction

- What will it cost to use CGN?
  - Based on RMv6TF 2012 talk “TCO of CGN”
- What will it cost to run dual-stack?
  - Based on NANOG 57 talk
- What will it cost to buy IPv4 addresses?
  - New material

What will it cost to run CGN?

What Does CGN Cost?

- CGN reportedly breaks things[1]
- How many users affected (out of 10,000)?

Use	Number of Potential Users[2]	Number Affected	Number of Support Calls[3]	Number of Lost Users[3]
PS3	1100	550	137	137
P2P	1500	1200	300	300
Netflix	1200	60	15	15
Misc.	800	800	200	200
	6,700	2,610	652	652

[1] draft-donley-nat444-impacts
[2] North American sales per ten thousand homes, per various sources.
[3] Arbitrary guess. Spreadsheet at http://www.asgard.org/documents.html

Cost of CGN

Per 10,000 users

- Capital
  - Hardware, software, logging systems: US$90,000 ?
- Operations Expense
  - System support, maintenance: US$10,000?
  - If support call cost is $20, 652 calls = US$13,040.
- Lost Revenue
  - If (ARPU) is $400/year, the annual revenue lost to CGN is: $400 * 652 = US$260,800 per year.

Total CGN Costs per 10,000 Users
(USD)

Year 1	Year 2	Year 3	Year 4	Year 5	
$18,000	$18,000	$18,000	$18,000	$18,000	CAPEX (depreciation)
$10,000	$10,000	$10,000	$10,000	$10,000	OPEX
$13,040	0	0	0	0	Customer support
$260,800	$260,800	$260,800	$260,800	$260,800	Lost revenue
$301,840	$288,800	$288,800	$288,800	$288,800	TOTAL: $1,457,040

Detailed paper at http://www.asgard.org/documents.html

What will it cost to use CGN?

CGN costs US$1.5 million for every 10,000 users it's used for, or $30 per user per year.

What will it cost to run dual stack?

Cost of Dual-Stack

- Asked experts on various industry segments
  - Data Center/Host/Content
  - ISP
  - Enterprise
- Deployment Cost
- Operational Cost

Deployment Costs

Data Center, Hosting, Content	Security appliances, Monitoring systems	$1 per user
	Application development	$6 per user
ISP	Training 2-3 hours of training	$0.15 per user $150 per support/NOC employee 1 support staff per 1000 subs
	CPE	$25 per user $50 each, but only half need upgrades
Consumer Electronics	Labor	$0.30 per device

Capital expenditures are reduced if spread over a longer period of time, when upgrades were planned anyway.
So, start four years ago and it's cheap.

Operations Costs

	Develop	Operate
Content Data Center, Hosting,	$6 *pupy* +10-30% Application development Lower for hosting	$0.08 *pupy* 20% of OpEx increases by 1-5%
ISP	$6.40 *pupy* Device code	$0.25 - $1.27 *pupy*
Consumer Electronics	$0	$0

pupy = “Per User Per Year”

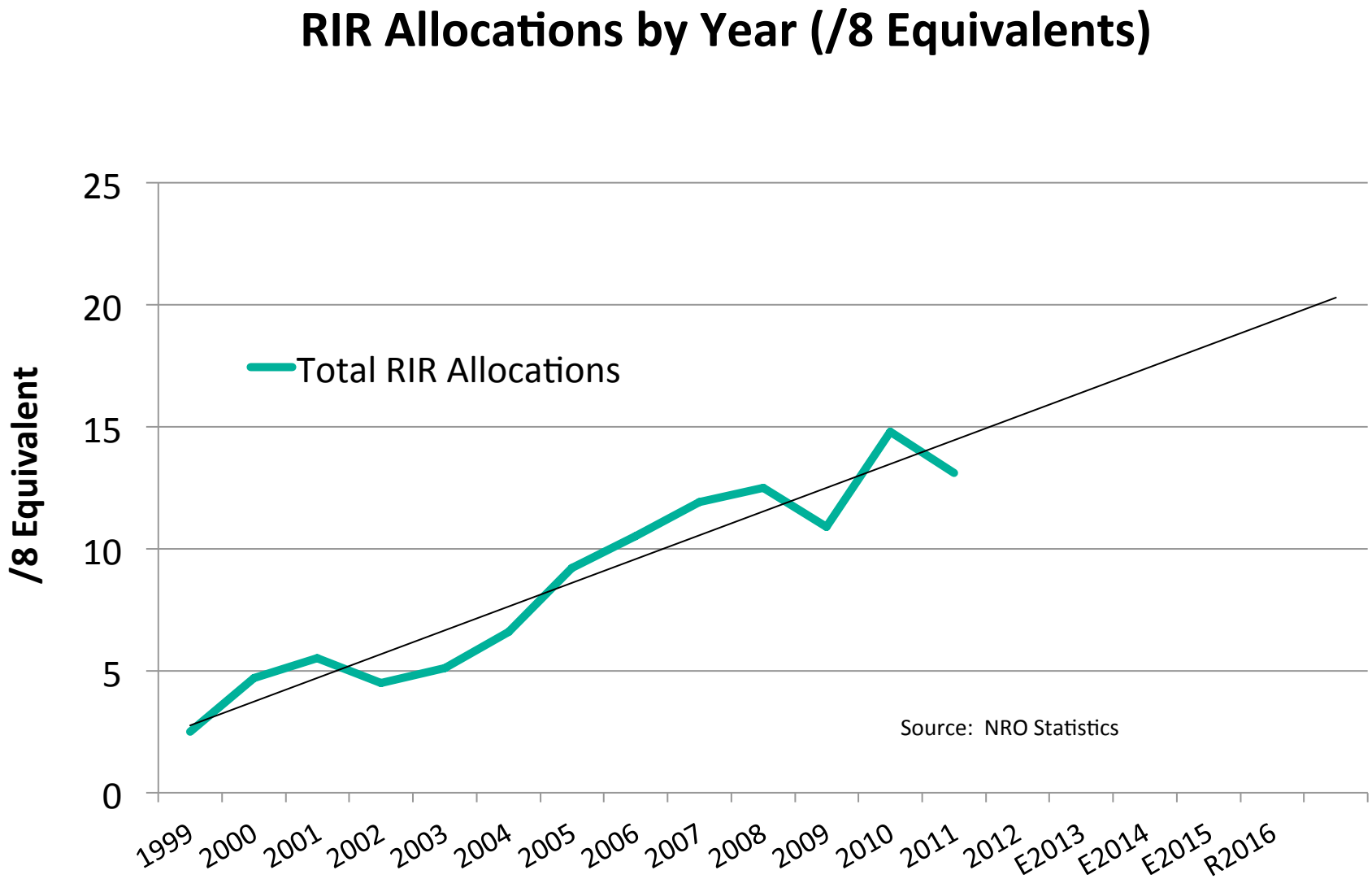
What will it cost to run dual-stack?

	Deploy	Operate
Data center Hosting Content	$7 per user	$6.08 per user per year
ISP	$25 per user	$7.50 per user per year
Electronics	$0.30 per device	$0 per device

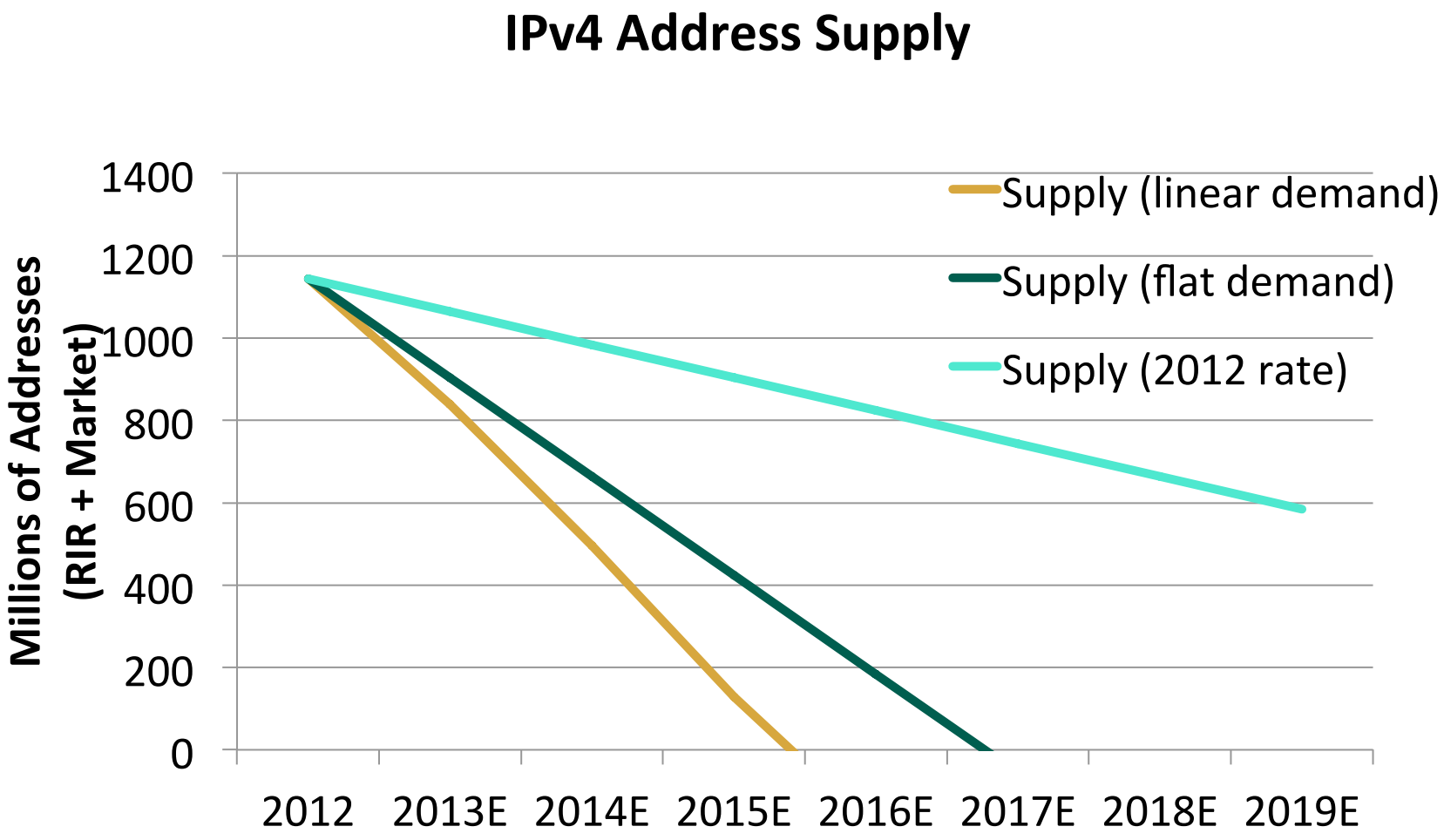
- Costs listed err to the high end
- Reduce deployment cost by starting sooner
- Reduce operation cost by limiting time dual-stack is supported

What will it cost to buy IPv4 addresses?

IPv4 Demand


RIR Allocations by Year (/8 Equivalents)
/8 Equivalent
25
20
15
10
5
0
Total RIR Allocations
Source: NRO Statistics
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
E2013
E2014
E2015
R2016

IPv4 Supply


IPv4 Address Supply
Millions of Addresses (RIR + Market)
1400
1200
1000
800
600
400
200
0
2012
2013E
2014E
2015E
2016E
2017E
2018E
2019E
Supply (linear demand)
Supply (flat demand)
Supply (2012 rate)

IPv4 Supply

At what price would someone sell an IPv4 address?

Tier	Summary	Cost per Address[1]	Addresses Available[2]
Tier 0	Remaining RIR space	$0.03 - $4	144,000,000
Tier 1	Unused	$9 - 12	480,000,000
Tier 2	Underutilized	$10 - 16	520,000,000
Tier 3	Substitutable	>$100	All IPv4

[1] "Cost" is not the same as "Price."

[2] Source: ARIN, LACNIC, AfriNIC; RouteViews

What will it cost to buy IPv4 addresses?

	2014	2015	2016	2017
Demand	280M	310M	330M	350M
Supply (Abandoned)	410M	100M	0	0
Supply (Underutilized)	520M	520M	290M	0
Cost[1]	$9 - 12	$9 - 16	$16-20	$n

[1] "Cost" is not the same as "Price."

- ***Expectation*** of price is not reflected; may be much higher.
- How many IPv4 addresses might be made available by substituting CGN (at US$30 or more)?

Resolution

Q: What will it cost to use CGN?
A: $30 per new user per year

Q: What will it cost to run dual-stack?
A: (ISP) $7.50 *pupy*
A: (Content) $6 *pupy*

Q: What will it cost to buy IPv4 addresses?
A: *At least* $9-20 per new user per year until 2017.

Q: How can I reduce my costs?

DISCUSSION