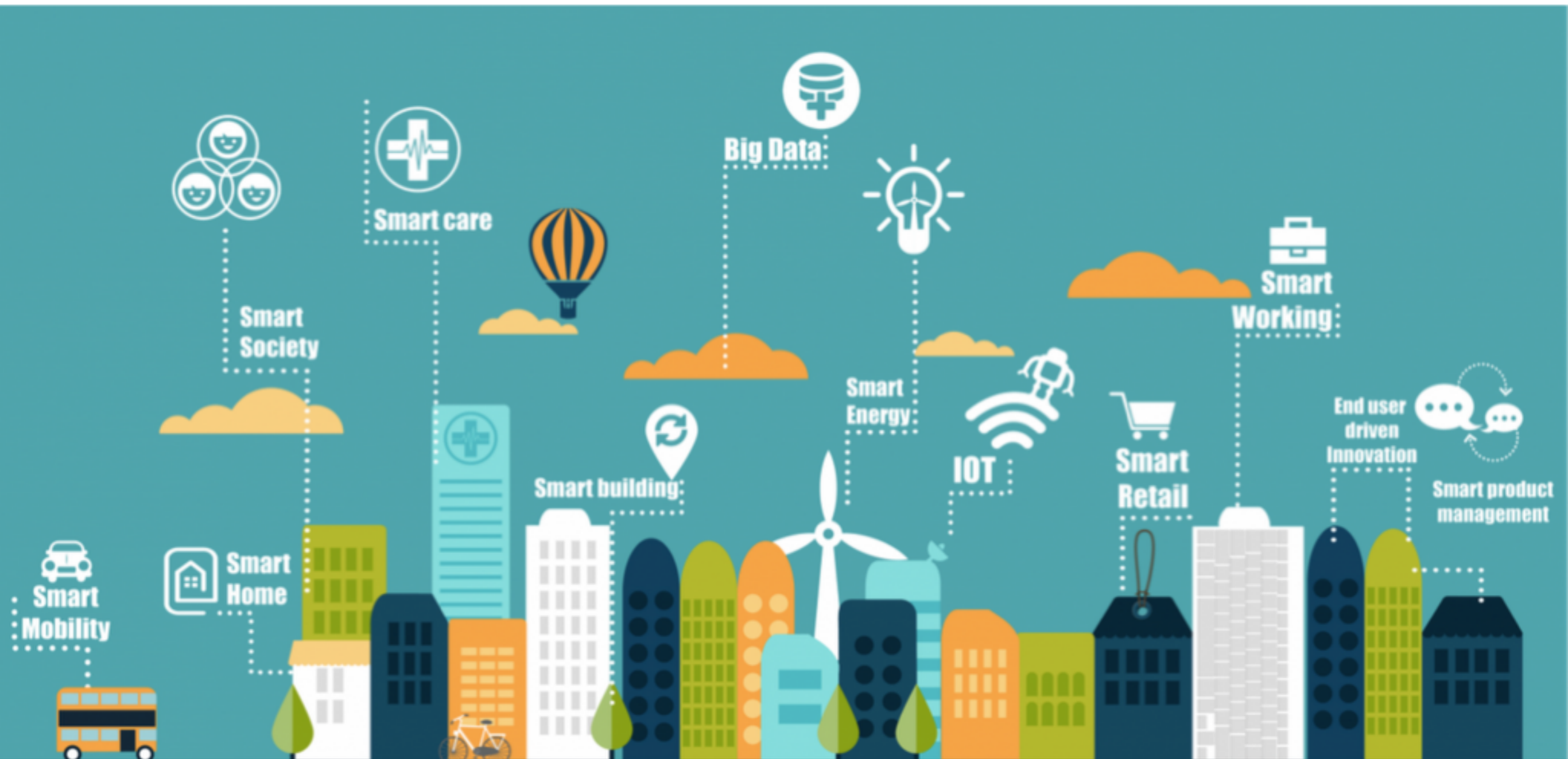




**RIPE NCC**  
RIPE NETWORK COORDINATION CENTRE

# IPv6 and Internet of Things: A Nice Couple

# IoT - Reality or a Marketing Stunt?



# Super Awesome Forecasts



- Cisco forecasts 24 billion Internet connected objects by 2019
- Morgan Stanley forecasts 75 billion networked devices by 2020
- Huawei forecasts 100 billion IoT connections by 2025
- Cisco projects that the financial impact of IoT on the global economy may be as much as 19 trillion \$ (trillion is the next cool thing after billion)

# Breathtaking, right?



# What is Internet of Things?



The term "Internet of Things" (IoT) denotes a trend where a large number of embedded devices employ communication services offered by the Internet protocols. Many of these devices, often called "smart objects" are not directly operated by humans, but exist as components in buildings or vehicles, or are spread out in the environment.

- RFC 7452 "Architectural Considerations in Smart Object Networking"  
Internet Architecture Board

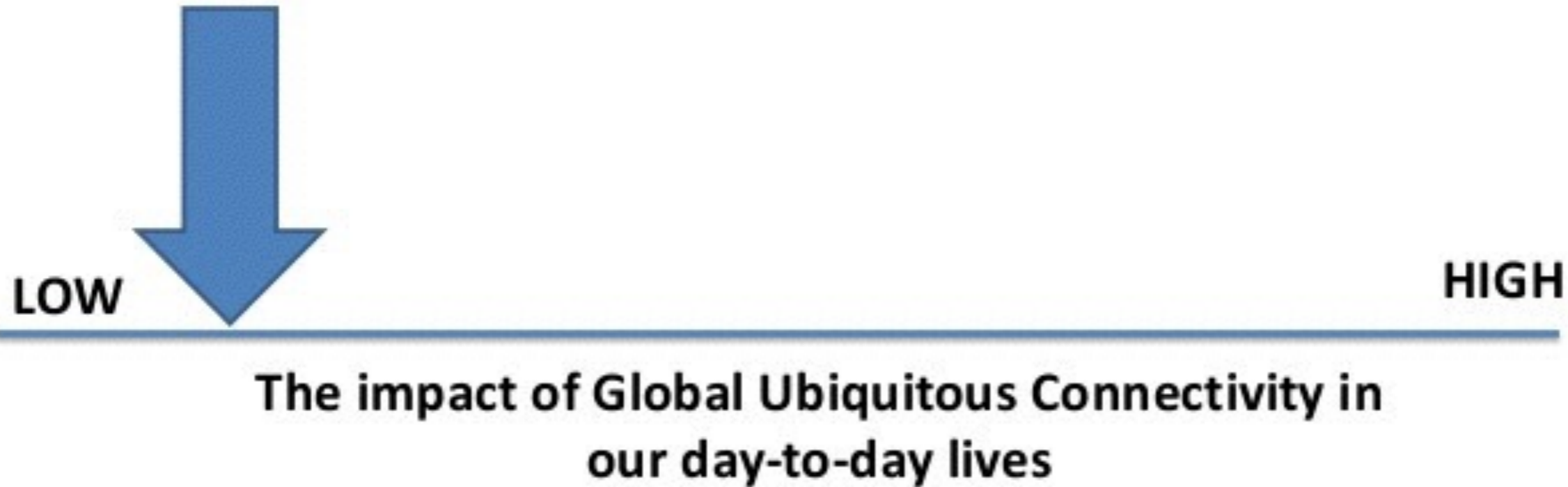
# Why now?



- The idea was with us forever (i'm 30 years old, so for me it is forever)
- The term exists since 1999
- Only now we have a very fruitful technological, social and economic grounds for IoT to become massive
- Tech grounds - Global Connectivity, Widespread Adoption of IP-based Networking and IPv6, Big Data, Rise of Cloud Computing...



# We are only here...



You might think the world today is an incredibly different place vs. just twenty years ago. Computers are used by the masses. Facebook has changed fundamental social interaction dynamics. The world carries iPhone and equivalents everywhere which has enabled an entire new world of location aware task-based applications. However, *we are just at the very first stages* of this journey.

# Smart Cities





# Barcelona



CityBikes app,  
App&Town,  
SOS info  
built thanks to  
**Open Data**  
of the City

**IoT trash cans**  
report their  
real-time  
status

ApparkB and  
Bicing  
encourage  
**smart mobility**

Smart City Campus  
Innovation Area to  
promote synergies and  
**innovation in  
urban solutions**



# Barcelona



- Saves 58 mln. \$ annually with water management systems
- Earns 50 mln. \$ annually with smart parkings
- Saves 30 mln. \$ annually with street lightning management systems
- Created 47 000 jobs
- Applied 83 smart projects in 12 different areas



## Dubai Smart City initiative

Dubai as the "smartest city in the world"



Principles: Communication, integration and cooperation

### Dubai Smart City Strategy

#### Strategic Goals

- Efficient Dubai:** Improved use of city resources and contribute to Dubai's Strategic Plan
- Seamless Dubai:** Integrated and information rich smart services weaved into daily life
- Safe Dubai:** Innovative security services to help anticipate and prevent
- Experience Dubai:** Improve City experience through a collaborative approach that fosters innovation from and for all City stakeholders

Transport

Communications

Infrastructure

Electricity

Economic services

Urban planning

100 Initiatives  
1000 smart services

- ▶ New initiative to make Dubai a world hub for innovation
  - ▶ Investing 4.5 Billion Dhs to transform Dubai Internet city and media city into innovation and smart communities
  - ▶ Aim: creating the "smartest" environment in the world for innovation

Arab Future Cities Summit, Dubai, 10-11 Nov 2014

# Industry 4.0



## INDUSTRY 4.0 CAN REIGNITE EUROPE MANUFACTURING

### FIRST INDUSTRIAL REVOLUTION

INTRODUCTION OF MECHANICAL PRODUCTION FACILITIES USING WATER AND STEAM POWER.



1780S

### SECOND INDUSTRIAL REVOLUTION

INTRODUCTION OF DIVISION OF LABOR, MASS PRODUCTION AND ELECTRICITY.



1870S

### THIRD INDUSTRIAL REVOLUTION

INTRODUCTION OF ELECTRONIC AND IT SYSTEMS.



1970S

### FOURTH INDUSTRIAL REVOLUTION

INTRODUCTION OF CYBER-PHYSICAL SYSTEMS.



TODAY

# Industry 4.0

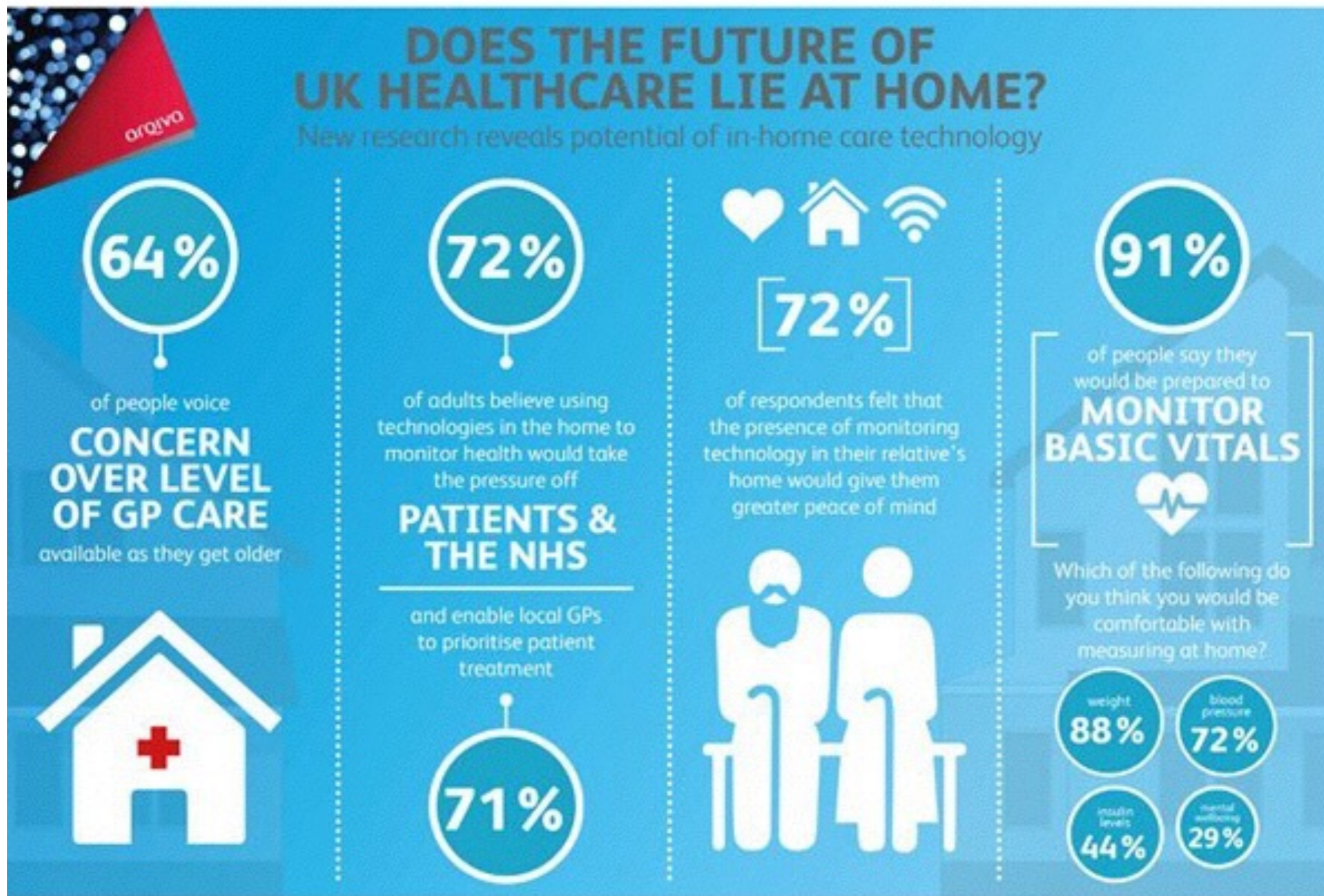


- Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real time
- Example - a system monitors all value chain of production, knows the logistics on every step, monitors the supply and market demand, analyzes it and makes real-time decisions, itself
- Can serve and manage whole geographical regions

# Connected cars



# Wearables and remote healthcare



# How will it work?



- Those shiny technologies
  - Smart Cities
  - M2M
  - Smart wearables
  - LTE (and what's coming after)
  - ...
- are «always-on» and are very IP-hungry, require a HUGE amount of IP address space to communicate over IP networks



# IoT IPv6



- As the Internet of Things continues to grow, devices that require true end-to-end Internet connectivity will not be able to rely on IPv4, the protocol most Internet services use today
- IPv6 is a perspective upgrade
  - there are 340 trillion trillion trillion IPv6 addresses vs 4.3 billion IPv4 addresses

# Bring it on IoT, I dare you!



# IPv6

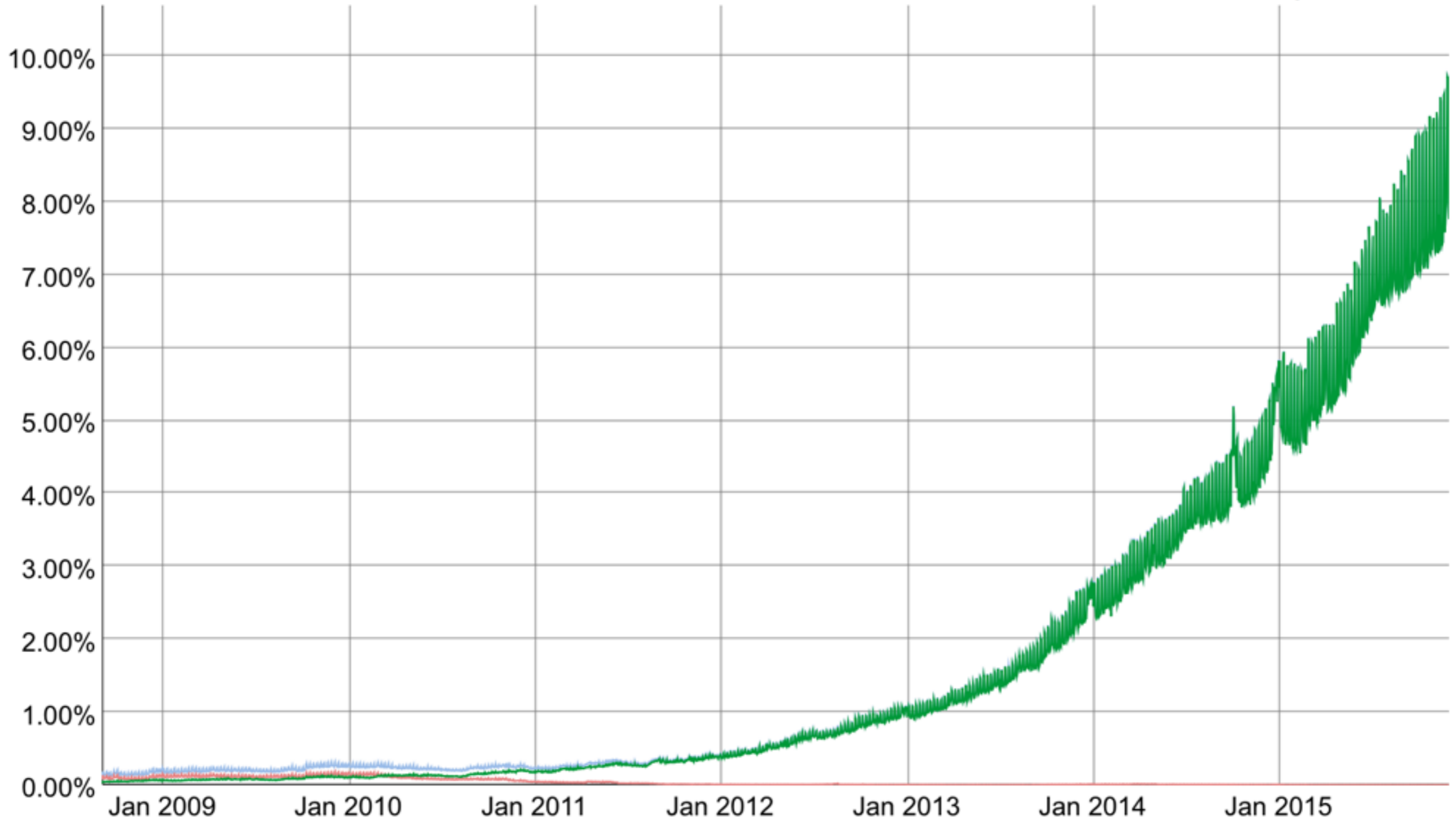


- RIPE NCC allocates IPv6 to all members in our region
- In US major ISPs started deploying IPv6 even before the lack of v4 addresses became a problem for them - they are waiting for IoT
- IPv6 is taking off and we believe that at least this will not be a hurdle for IoT

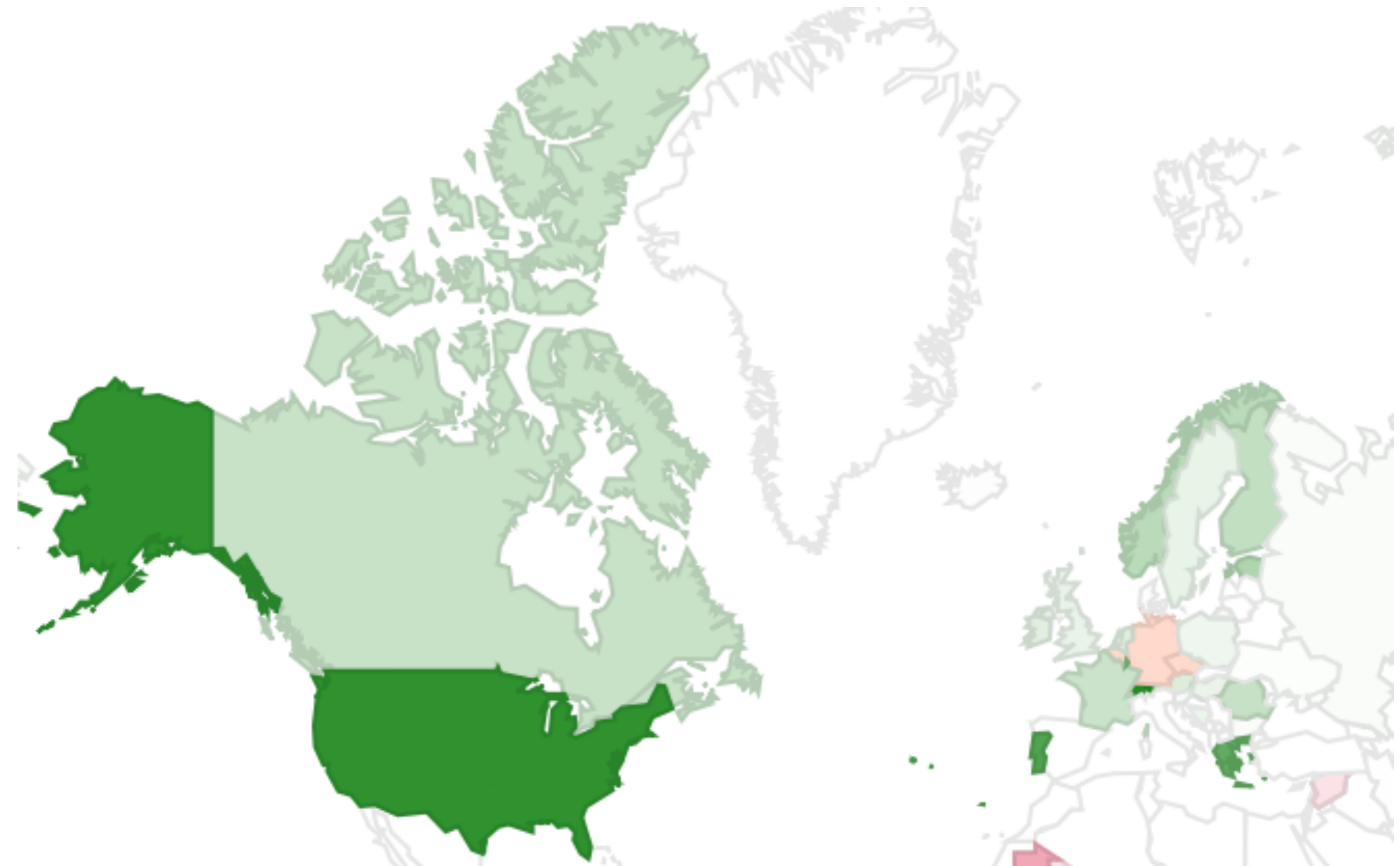
# IPv6 traffic



Native: 7.76% 6to4/Teredo: 0.00% Total IPv6: 7.77% | 1 дек. 2015 г.



# IPv6 traffic



# To conclude



- IoT is a huge opportunity
- ... and every huge opportunity has a big number of obstacles and issues
- Privacy, Security, Interoperability, Regulation and legal Issues - we still need to figure those out
- While we've got IoT's back covered with IPv6



# Questions

