



ΚΙΤΙΠΛΥΣ ΜΙΛΗΔΣ

**The IP of IoT –
Top 5 Companies and
how their IP Pans out**

Google Verizon Cisco General Electric Amazon

THE ANALYSIS SUMMARY

The Physical Objects are linked through wired and wireless networks, the advantage being that they are deployed on the same Internet Protocol (IP) that connects the Internet. What's fascinating is the ability of these modern gadgets to sense the environment and communicate. With the ability of these devices in understanding the complexity of the data analysis and then act accordingly in providing the solution has had a great impact in every technological sector one can imagine.

With continued advancements in artificial intelligence, these modern gadgets have the ability to work without human intervention. Moreover, with the frequent base users shifting to smartphones and also the deployment of these gadgets becoming cost effective, the IoT is set to dominate the next decade pervasively.

This landscape report tries to cover the patented technologies for the world's top five IoT companies and details out what are the critical technologies that these innovative companies are working on. This report also covers the timeline of these companies in terms of patent filings related to internet of things. We also uncover important mergers & acquisitions that have happened involving these companies to further boost their IP related to the Internet of Things.



1999: *World was introduced to the term "Internet of Things (IoT) by Kevin Ashton. Kevin Ashton was then the Executive Director of Auto ID Center at MIT.*



AN INTRODUCTION

The internet of things is enabled by the use of sensors, actuators and communication technology which is embedded into gadgets that streamlines tracking and controlling of these gadgets over the wired or the wireless network such as internet. To make this work, generally a three step process is undertaken:

1. Capturing the data from the sensors,
2. Extracting the data from the network, and
3. Analyzing the data and drawing conclusions

This will lead to intelligent decision making abilities leading to improved efficiency and productivity for the same things which were earlier not part of the phenomena of Internet of Things. This has opened larger avenues for new types of products and services applicable to multiple industries.

The sensors alone will just gather data, evaluate and measure it. This all will be meaningless if the sensors are not properly connected to the machines to actually leverage something out of data. The best way forward to actually harness the true potential of IoT is through cloud based applications. This is because an alternative is expensive – having a vast infrastructure in place for all the data gathered from the sensors worldwide. Hence, the role of Cloud based applications becomes critical. This is why the top companies we have analyzed in this report actually are the market leaders in terms of research and patenting activity.



2020: *According to Gartner, 20.8 Billion things will be connected worldwide by Year 2020*

MARKET DYNAMICS

According to a study from Business Insider, The IoT will result in **\$1.7 trillion** in value added to the global economy in 2019. That is a huge number.

This industry is all set to take over the smartphone industry and the forecasts indicate more than 20 Billion devices connected by 2020. The main research focus has been on making the technology secure, robust, more efficient.

There are many verticals of adoption for the IoT, from wearable devices, to cars, smart homes, cities and industrial equipment.

The global wearables market is expected to reach a value of around 53.2 billion U.S. dollars in 2019, more than ten times its value five years prior.

It features items such as smart watches, fitness and health trackers, or even smart jewelry and smart clothing.

Smart watches and health & Fitness trackers are expected to account for more than 70 percent of all wearables sales worldwide in 2016.

Another Industry that has grown significantly is the Smart homes industry which is expected to be roughly of around US \$60 Billion by 2020.

McKinsey Global Institute predicts that **by 2025 the Internet of Things will generate up to \$11trillion** in value to the global economy.

Moreover, Software and services is pegged to be a \$600B market by 2019, attaining a 44% CAGR from 2015 to 2019.

These facts from Business Insider also predicts the number of devices connected via IoT technology will grow at a 35% CAGR from 2014 to 2019.

As we cover the Intellectual Property patterns of the five of the market leaders, we can realize how this fast evolving market is shaping up over the next five years.



ABOUT ANALYSIS



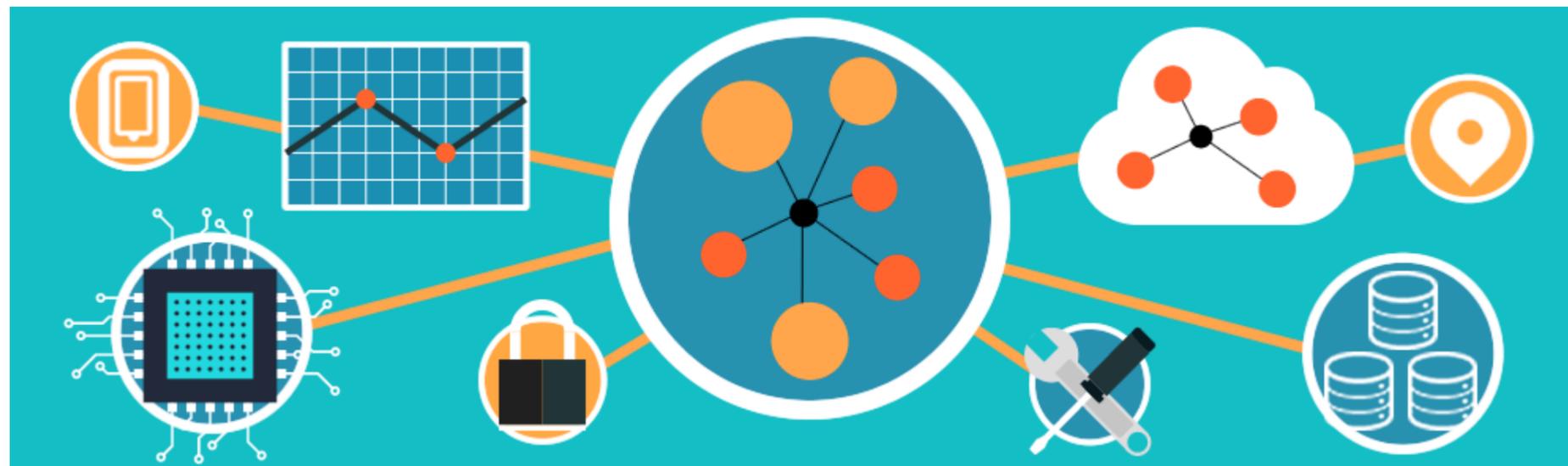
Patent analysis for the companies in this report focuses on patents and applications filed in the United States. Foreign filings listed are only family members of the US patents and applications and not the complete list of patents and applications in jurisdictions other than the US

It should be noted that analysis related to top five companies in IoT for 2016 have been covered in this report.

The charts represent the patent related figures for the data gathered upto October 31, 2016.

We have tried to cover maximum industries possible related to Internet of Things. However, these should not be assumed to be an exhaustive list of applicable industries.

The revenue related information and other market figures have been relied upon from other web resources such as Gartner, McKinsey and other technical blogs.



COMPANIES ANALYZED



Patents Analyzed: 1365

Key Focus Areas: Self Driving Cars, Smart Homes

Most Popular Product: Android Wear



Patents Analyzed: 1875

Key Focus Areas: Sensors, Sensor Systems

Most Popular Product: CISCO IR8x9 series Network Management Tool



Patents Analyzed: 524

Key Focus Areas: Industrial Cloud Services

Most Popular Product: Predix



Patents Analyzed: 798

Key Focus Areas: SDK, Smart Homes

Most Popular Product: Amazon Echo



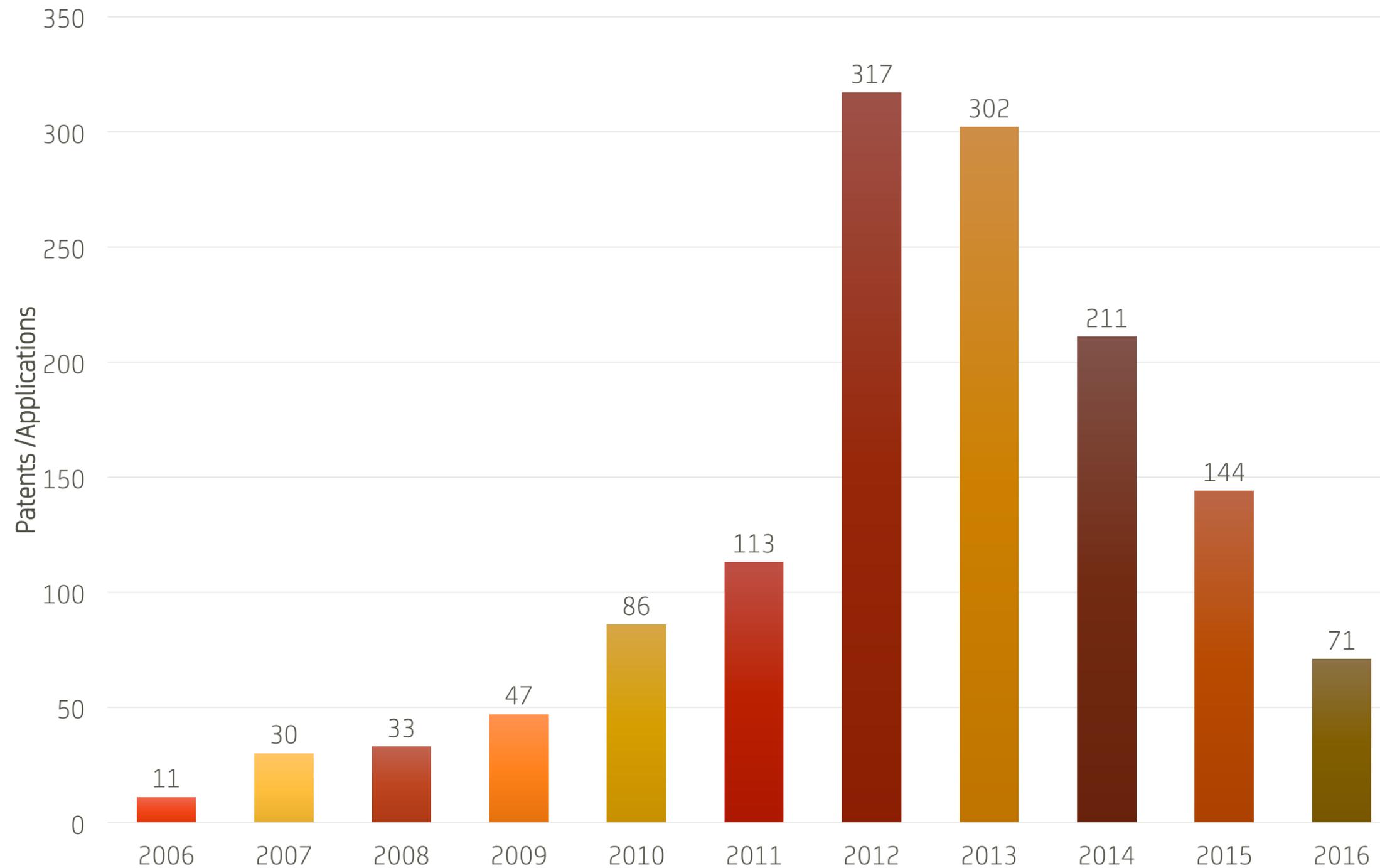
Patents Analyzed: 1549

Key Focus Areas: Network Security

Most Popular Product: ThingSpace

GOOGLE - PATENT FILING TREND

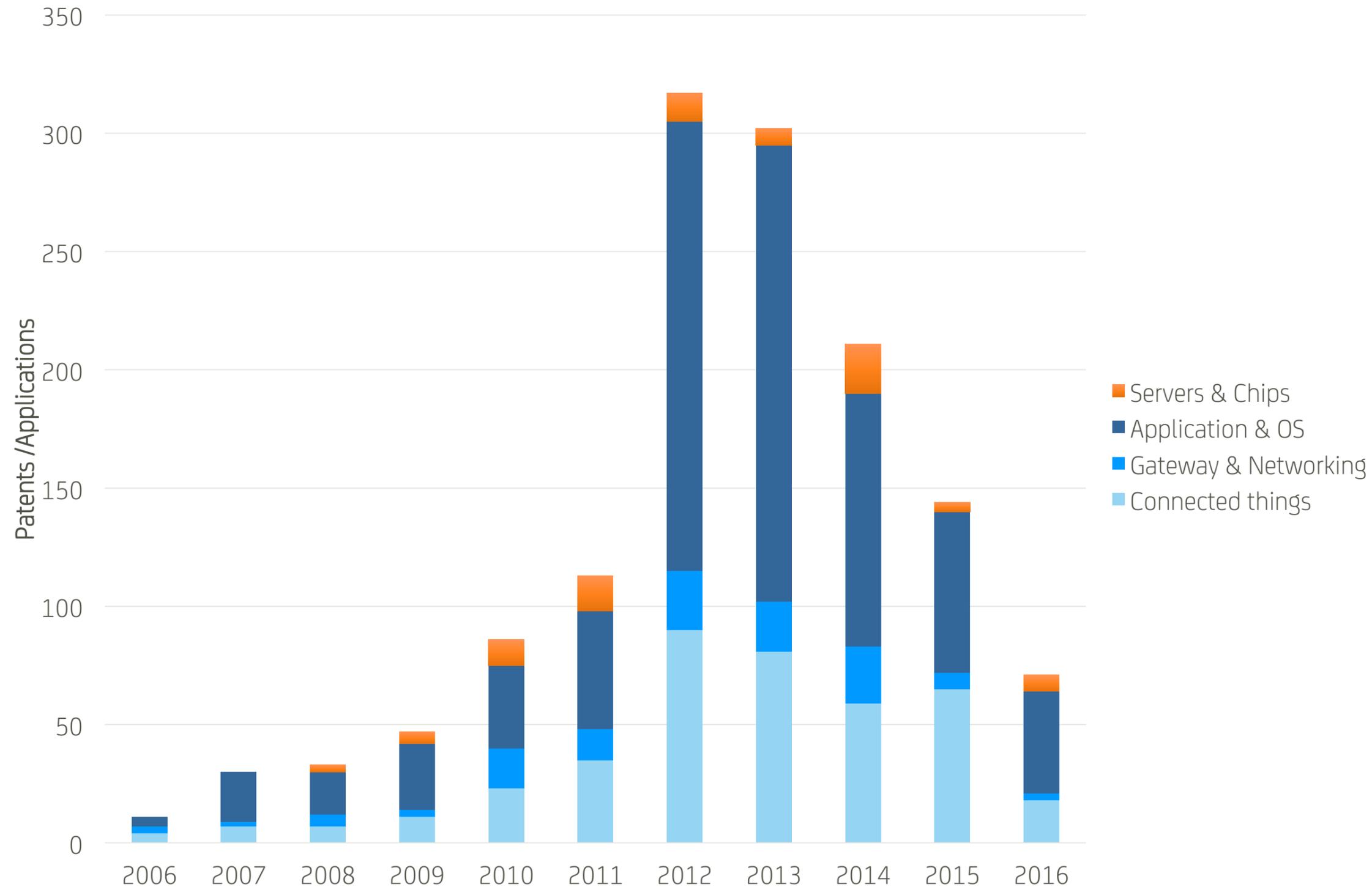
Filing Trend



- Google's first patent related to IoT was filed in 2006.
- The Patent filing has seen an increasing trend ever since.
- However, Since 2014, this trend has slightly slowed down.
- Google Acquired Nest In 2014 – A Smart Home start-up and also acquired it's patent portfolio.
- In the recent Years, Google has been pushing towards buying patent portfolios in a bid to become one of the market leaders in IoT
- Google Cloud is the main revenue generator for Google

GOOGLE - TECHNOLOGY BIFURCATION

Filing Trend



- Google's technology related patent filings has 56% focused on Applications, OS and Control Hubs.
- Google appears weak in technologies related to Servers and Chips – the least amongst the five companies considered for this report.
- Google has announced an IoT platform called Android things for the connected devices.
- Data Security, Encryption and Information retrieval are the key technologies in Google's Gateway & Networking Technology Segment

GOOGLE - ACTIVITIES RELATED TO IOT

Mergers & Acquisitions

- Google Buying Nest in January 2014
- Google purchased it for 3.2U.S. \$ Billion
- This bolstered the Google's portfolio of Smart homes
- Google acquired DropCam through it's Nest Labs subsidiary in June 2014
- Dropcam is an American technology company headquartered in San Francisco, California.
- The deal was finalized for U.S. \$555 Million.
- Google's £400 million acquisition of DeepMind happened in 2014. DeepMind is a British artificial intelligence company.

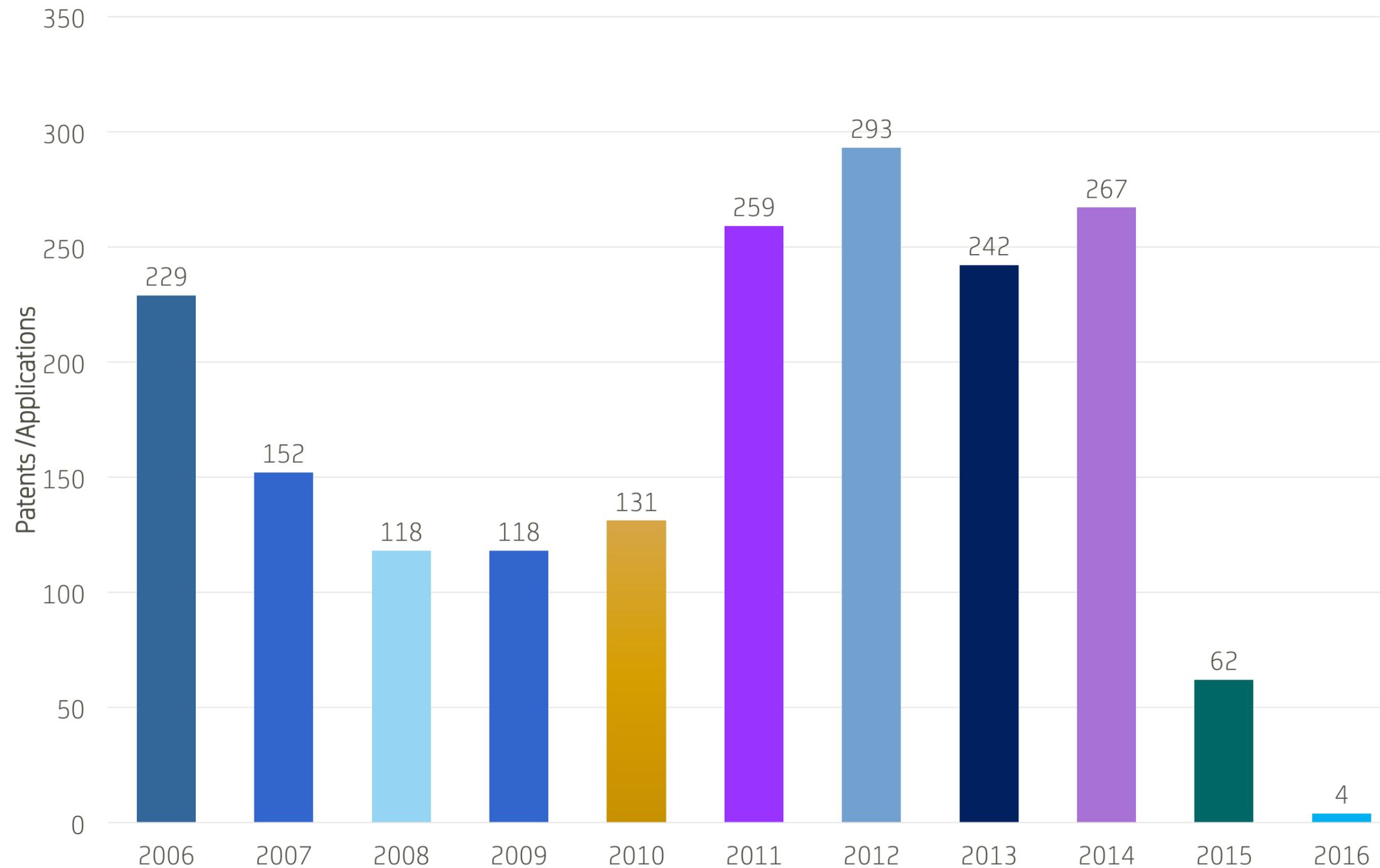
Key Products

- Google Nest Thermostat
- CO + Smoke Alarm
- Driverless Cars



CISCO - PATENT FILING TREND

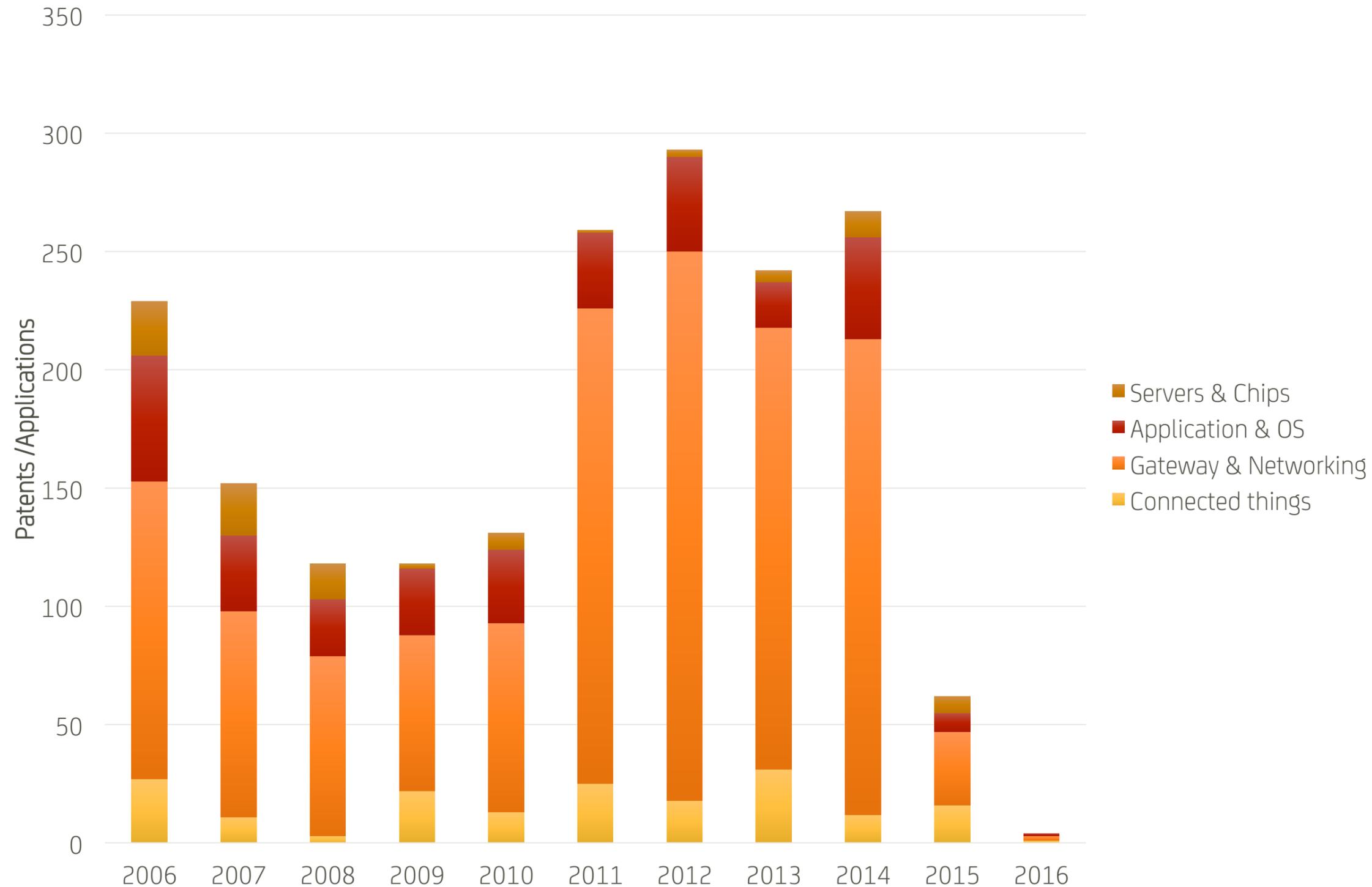
Filing Trend



- Cisco aggressively filed patent starting 2006
- The Patent filing has been consistent throughout the last decade.
- In 2015, Ericsson and Cisco went into a strategic partnership related to Patents
- The filing trend is inevitably slow in the last year
- Fog computing - created by Cisco, refers to extending cloud computing to the edge of an enterprise's network. Lots of patents since 2013.
- Cisco's routers and Switches accounts for the major revenue stream of the company

CISCO - TECHNOLOGY BIFURCATION

Filing Trend



- Around 70% of Cisco's technology related patents are focused on gateways and Networking
- When it comes to energy harvesting Industrial IoT, Cisco has a pretty Lean portfolio – under their Connected Things portfolio.
- Cisco has a lot of patents focusing on analytics related to sensors data and controlling the devices through software applications.
- Most of the Patents under “Connected Things” is for Sensors and Sensor Data Systems used for gathering data in embedded systems.

CISCO - ACTIVITIES RELATED TO IOT

Mergers & Acquisitions

2016: Cisco completed acquisition for Jasper for \$1.4 billion. Jasper is a cloud platform for IoT services such as connecting devices, delivering analytics and automating business functions.

2015: Cisco acquired ParStream, a privately-held company based in Cologne, Germany which develops highly specialized analytics databases built to analyze large amounts of data and store it in near real-time, anywhere in the network.

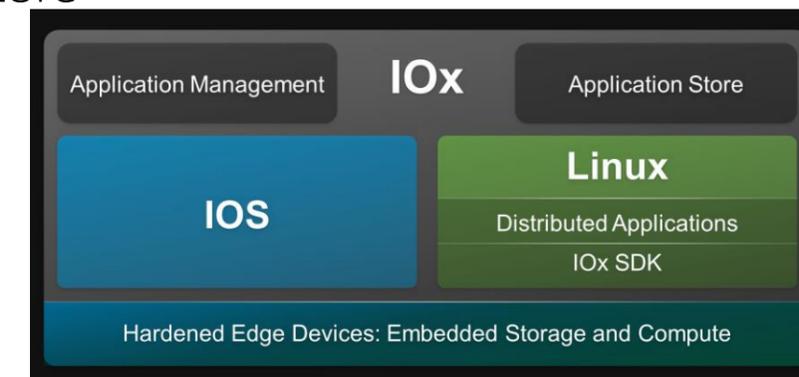
2015: Cisco acquired Piston Cloud Computing. Piston provides software that enables streamlined operational deployment of large scale distributed systems. Piston's enterprise grade software helps customers automate orchestration and deployment of underlying distributed systems for running applications on OpenStack.

2014: Cisco acquired Metacloud. Metacloud deploys and operates private clouds for global organizations with a unique OpenStack Private Cloud as-a-Service

Key Products

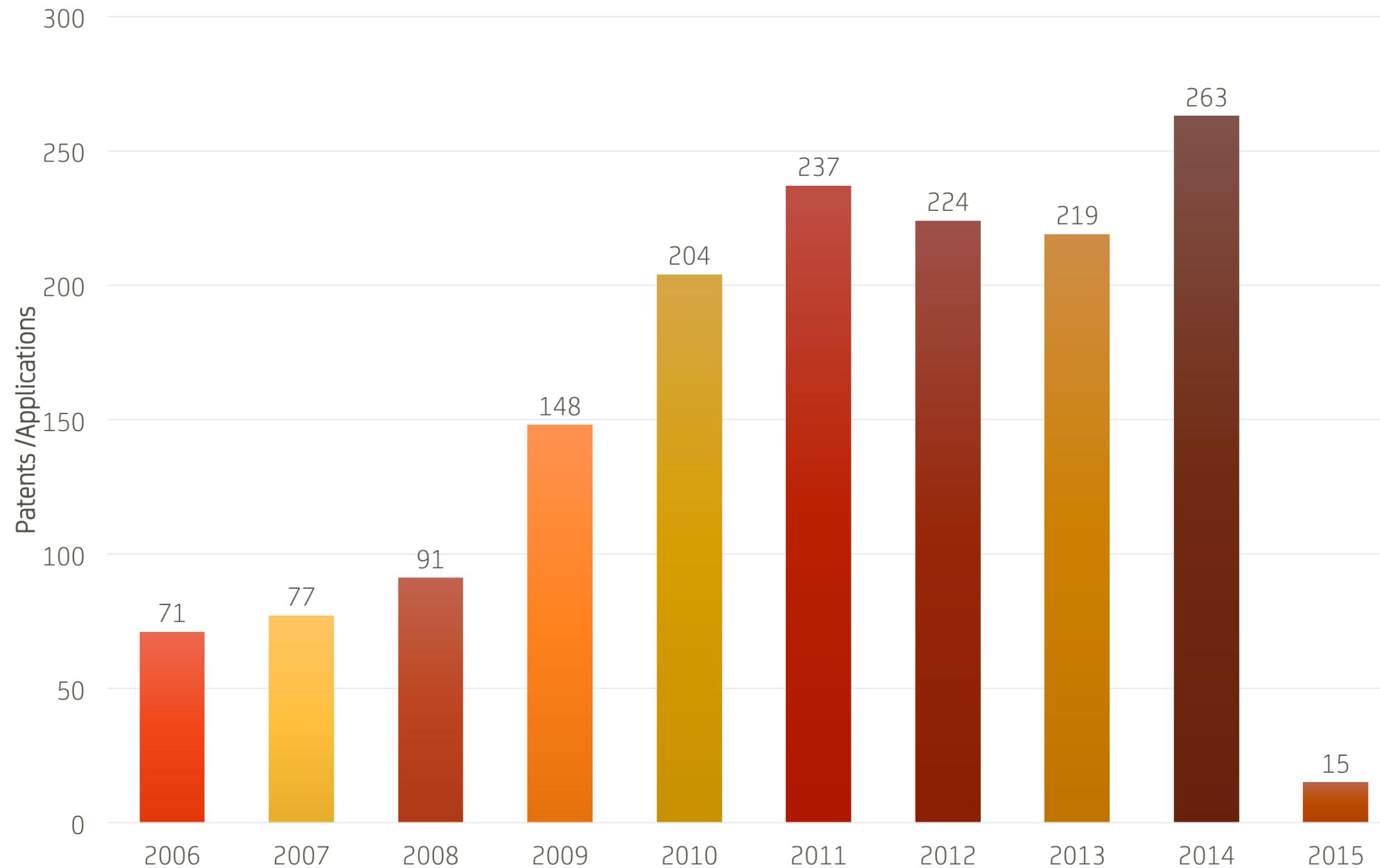


- CISCO IoT System Security
- Integrated Service router – IR8x(Series with embedded GPS and other sensors
- Cisco Mobile IP Gateway 2450 – Improving communication between the Back office and Transit vehicles.
- Cisco IoT Field network Director Software Platform
- Cisco IOx: Cisco IOx provides uniform and consistent hosting capabilities for fog applications across Cisco IoT network infrastructure



VERIZON- PATENT FILING TREND

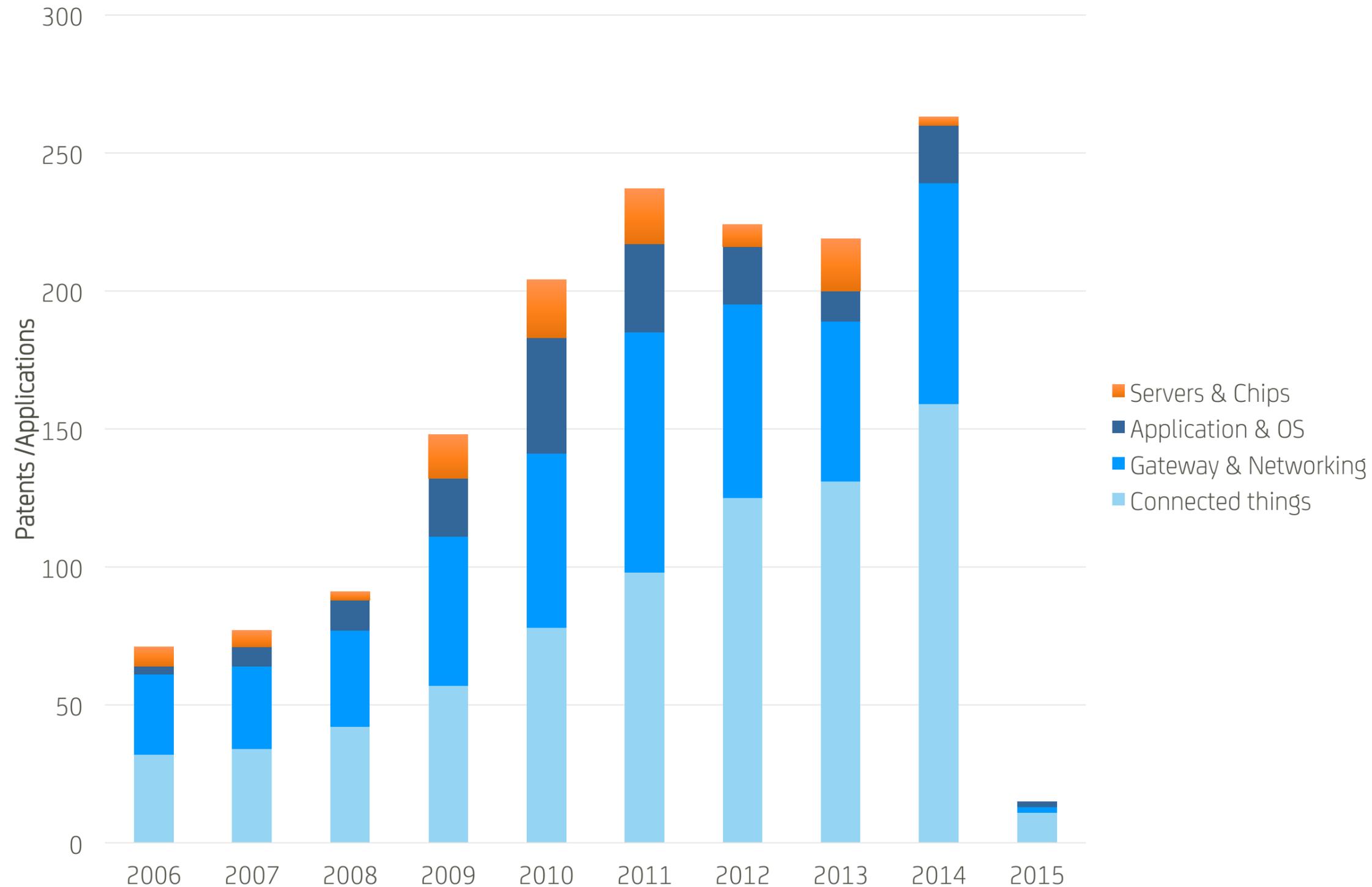
Filing Trend



- Verizon started with patent filings related to IoT a decade ago.
- The Patent filing has seen an increasing trend ever since.
- There have been a lean filing since January 2015
- Primarily because of high value acquisitions related to IoT with AOL, Telogis, Fleetmatics and Yahoo
- For 2015, Verizon's IoT revenue was 690 Million Dollars and is expected to grow 25% YoY.
- ThingSpace – an IoT software platform has been a biggest contributor to Verizon revenues

VERIZON- TECHNOLOGY BIFURCATION

Filing Trend



- Verizon's technology related patent filings has 50% focused on Connected Things like Connecting Cars, Homes and Cities.
- Verizon appears weak in technologies related to Servers and Chips.
- Verizon's ThingSpace is a powerful platform for developing IoT Apps for Connected Cities, Buildings and Healthcare
- Data Security, Networking and Information gathering are the key technologies in Verizon's Gateway & Networking Technology Segment

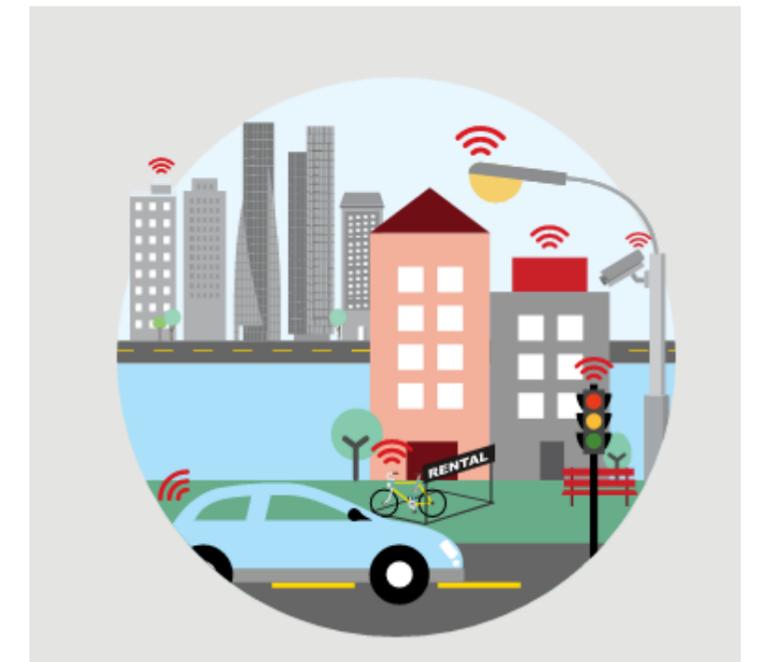
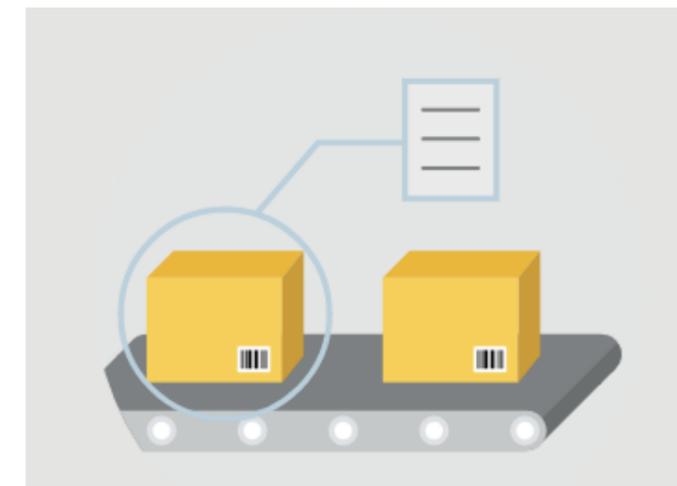
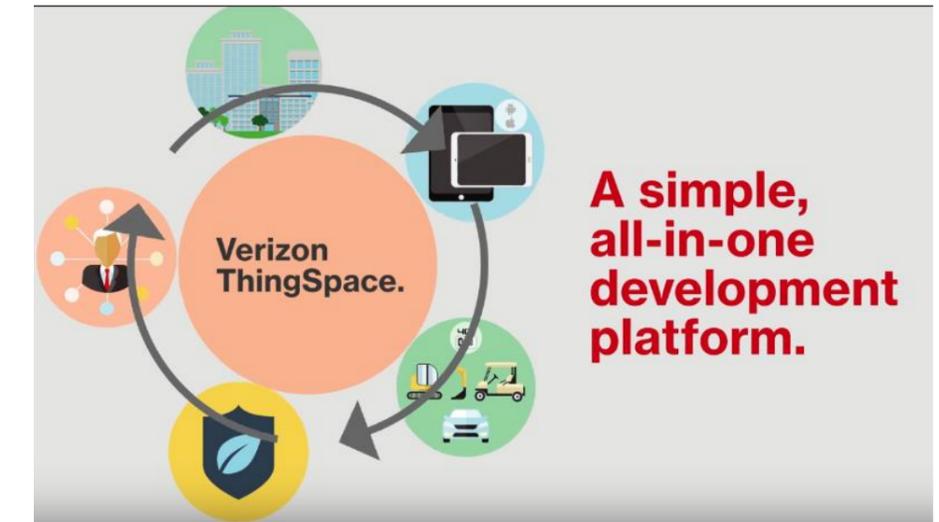
VERIZON - ACTIVITIES RELATED TO IOT

Mergers & Acquisitions

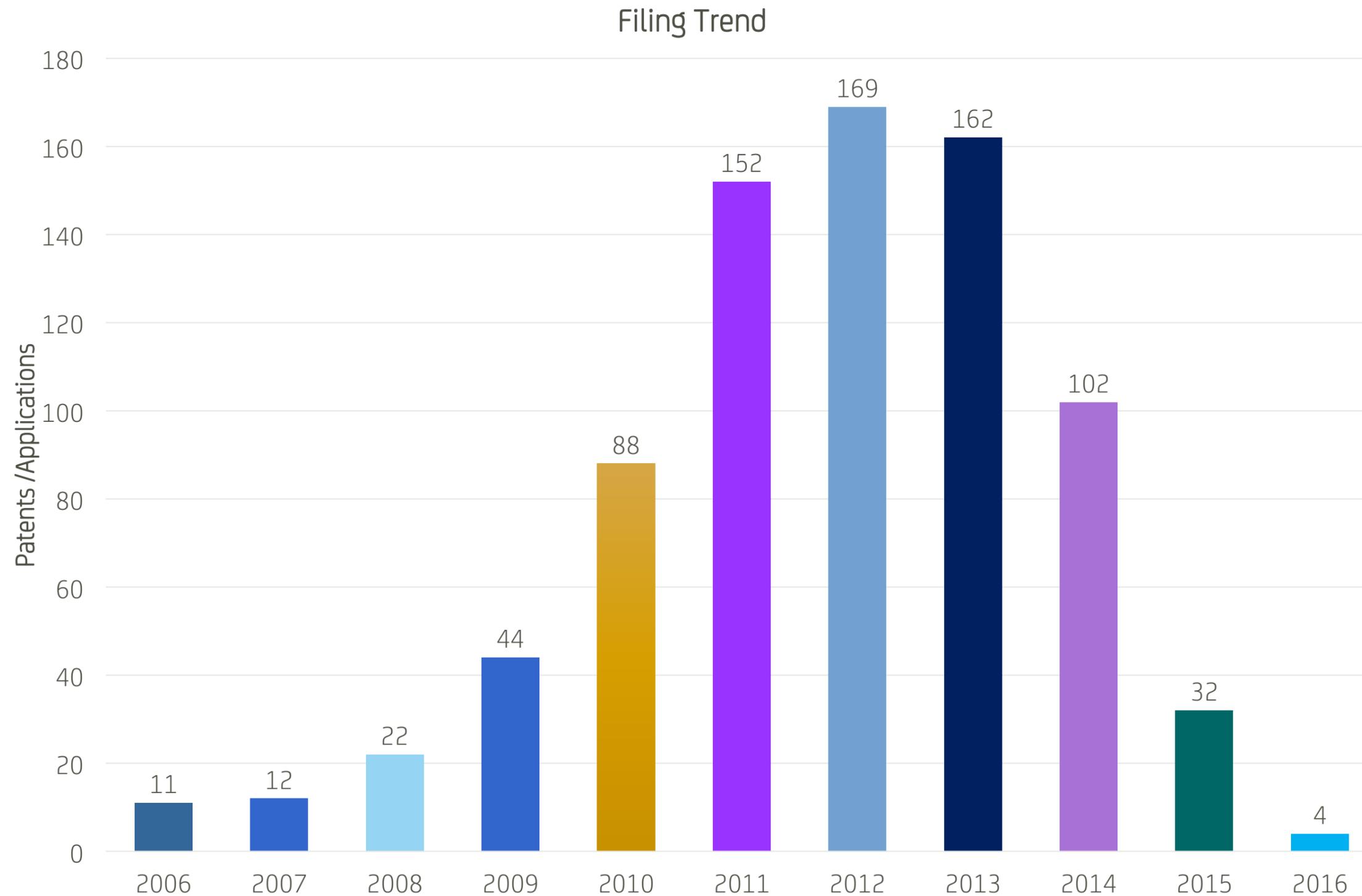
- 2016: Sensity Systems Inc., a private company based in Sunnyvale, California. It was acquired in September 2016 to bolster their Smart City Initiative
- 2016: LQD WiFi – a New York based company was acquired to further strengthen Smart City portfolio
- 2016: Verizon acquired Telogis in June 2016 for its highly successful cloud based vehicle fleet management software
- 2016: Fleetmatics – another telematics company was acquired by Verizon
- The AOL acquisition of 2015 was indirectly aligned with Verizon's IoT strategy by using Video and Advertising distribution technologies from AOL
- 2012: Hughes Telematics was the first company related to Telematics that was acquired by Verizon that kickstarted their IoT strategy

Key Products

- ThingSpace
- Asset Tracking
- Intelligent Lighting
- Intelligent Video
- Intelligent Traffic management



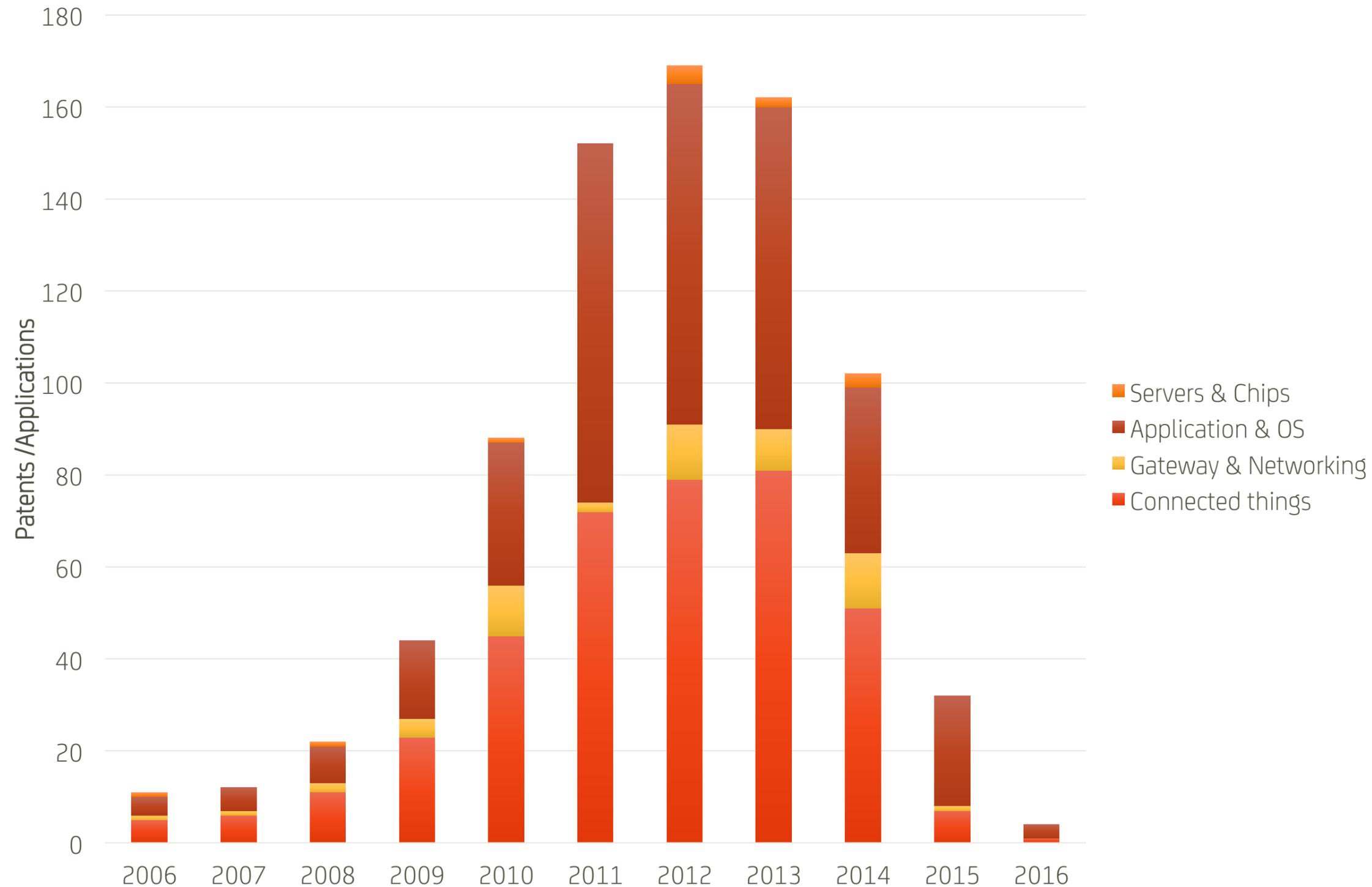
AMAZON - PATENT FILING TREND



- 74% of Amazon's patent filing is concentrated between 2011 and 2014
- The filing trend is inevitably slow in the last couple of years
- Patents around 2012 and 2013 were focused on solutions related to Smart homes.
- For 2015, Amazon's IoT revenue was a whopping \$7.8 Billions.
- The patents around 2013-14 focused more on logistics and efficient fleet management.

AMAZON - TECHNOLOGY BIFURCATION

Filing Trend



- Around 43% and 48% respectively, Amazon's portfolio for Application & OS and Connected Things
- Connected Homes and Fleet Management has been the primary technology segments for patent filing trends for Amazon.
- Amazon's Web Services SDK has been the most profitable segment related to IoT with an increase of 69.37% YoY
- Intelligence gathering and efficient networking rerouting techniques accounts for roughly 7% of the Amazon's IoT portfolio.

AMAZON - ACTIVITIES RELATED TO IOT

Mergers & Acquisitions

2016: NICE, based in Asti, Italy, which develops software and provides services for “high performance and technical computing” was acquired by Amazon to further boost Amazon Web services.

2015: Amazon acquired 2lemetry, a Denver-based startup which develops highly specialized analytics databases built to analyze large amounts of data from connected things

2015: Amazon acquired a Portland based video processing company Elemental Technologies.

2015: Amazon acquire a cloud technology startup ClusterK – whose tools cut down on cloud service costs by taking advantage from Amazon Web Services called Spot instances

2015: Israeli chipmaker Annapurna Labs, purchased for a reported price of \$350 million which indicates Amazon’s entry strategy to develop servers and chips to connect the things worldwide.

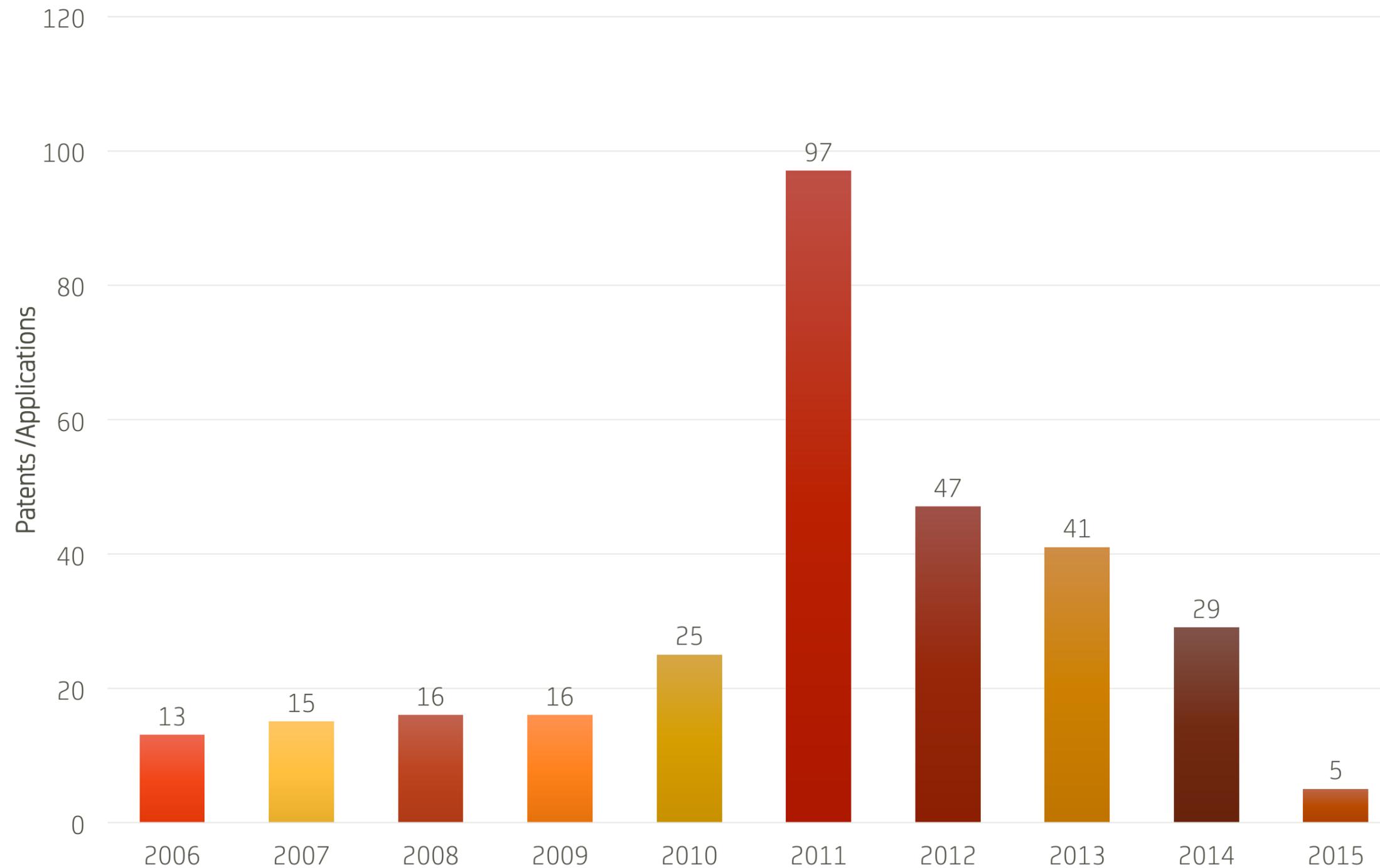
Key Products

- Amazon Echo
- AmazonFresh
- AmazonDash - The Dash tool let’s user create their grocery list on Amazon by scanning barcodes on products at home.
- Amazon Delivery Drones
- Amazon Web Services EC2 (Elastic Compute Cloud)
- Amazon Lambda



GE- PATENT FILING TREND

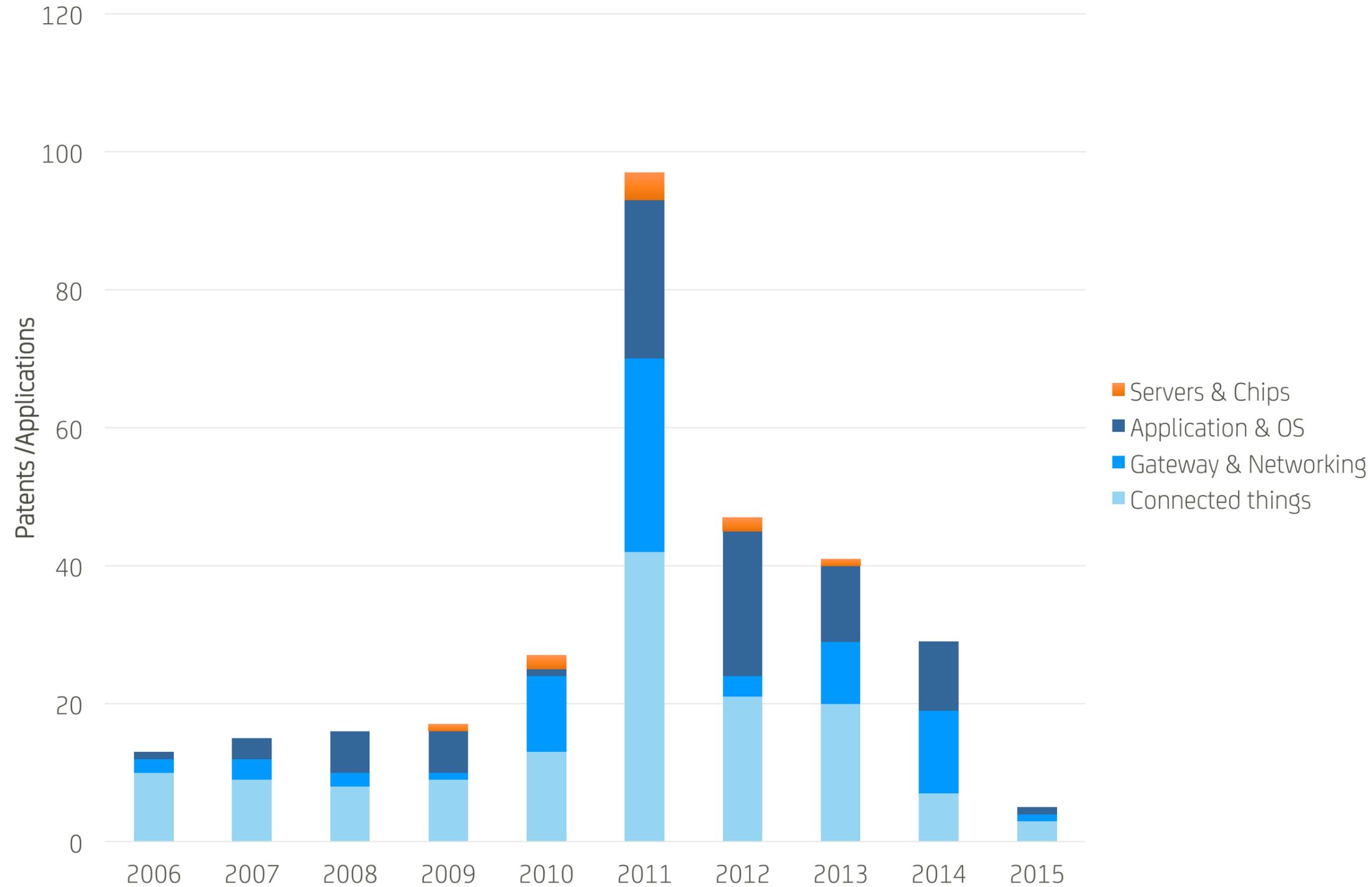
Filing Trend



- A spike in patent filings has been observed since 2011.
- In comparison to other players, GE has the least number of patents filed.
- No patents have been filed related to the scope of this study in 2016 as GE went into acquisition spree this year.
- GE is targeting and betting heavy on Industrial IoT – which is a definite edge over Google, Verizon, and Amazon
- For 2016, \$6 Billion revenue from Predix was estimated by BI
- Predix – Industrial Cloud Based Platform or PaaS – Platform as a service is the most popular offering from GE

GE - TECHNOLOGY BIFURCATION

Filing Trend



- Connected Things dominate their portfolio with an increased focus on Industrial IoT
- Through Industrial Analytics (IA), the collection, analysis and usage of data generated in industrial operations and throughout the entire product life cycle has been at the forefront of GE's strategy.
- GE's strength in their patent portfolio has been seen towards Power, Aviation and Healthcare.
- With Predix, it is betting heavily on Software side of the things

GE - ACTIVITIES RELATED TO IOT

Mergers & Acquisitions

- 2016: Service Max – Software for tracking equipment performance and industrial scheduling. It was bought for a whopping \$916 Millions
- 2016: BitStew was acquired for \$ 207 Million to integrate their analyzing and modeling of the data abilities within the Predix Platform
- 2016: Wise.io was acquired which deals in machine learning to improve customer service efficiency
- 2016: Meridium, an asset performance management software was also acquired and integrated with Predix
- 2016: Shipexpress a supply chain company was also acquired to tap into efficient railway shipping and transportation.
- 2016: Daintree Networks for Networked Lighting Systems
- 2016: Wurldtech – a cyber security company

Key Products

PREDIX

- Predix
- Electricity Value Network (EVN) – Digital Power Plant
- Intelligent Lighting
- Security for the Industrial Internet
- GE Asset Management



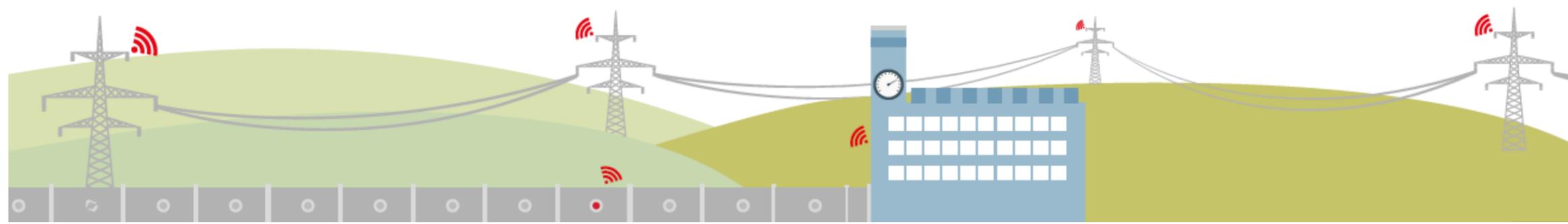
CONCLUSION

IoT adoption stands to grow significantly, in the next 18 months. It is likely because of falling costs, the continuing convergence of data and services and ever-increasing IoT technology simplification—a factor of utmost importance to consumers in particular. With simplicity at its core, Homeowners can look forward to address a range of everyday issues, from controlling and monitoring home security and environmental conditions to monitoring their teenagers' driving habits.

The cost efficiency, convenience, simplicity and security of connecting things will drive wider societal changes. This will eventually lead to increase in sharing economy with the growth and flourish by the use of connected cars and household gears. With the increased use of connected devices, the Neighbors can easily check for car's availability in their neighborhood for pooling and likewise whose household tools they can borrow to get the work done rather than going through the whole process of going to the store spending huge sums and buying the tools which apparently will hardly be used after the work is done.

Eventually, the ability to track usage will create new service categories. Rates for insurance and healthcare will be based on usage and behavior, which can be tracked through IoT.

With technology identifiable by everyone in today's world, Innovation, productivity and value will thrive as private companies and the public sector both come to the inevitable conclusion that IoT is imperative to delivering the integrated, easy to use and sustainable products and services.



ABOUT CITIUS MINDS

Citius Minds is a leading technology consulting firm supporting clients in advanced patent analytics and end to end patent litigation services. Together, Citius Minds' founding consulting experts have more than two decades of experience supporting the world's leading companies and law firms in their IP management needs.

Our Service Portfolio Includes:

- Patent Landscape Analysis
- Patent Invalidity Analysis
- Patentability Analysis
- Freedom-to-Operate Analysis
- Target Scouting and Infringement Identification
- Portfolio Analysis and Transactional Advisories
- Patent Litigation services
 - Infringement Contentions
 - Invalidity Contentions
 - IPR Drafting

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