

# Cybersecurity 2021

A Patent Landscape Report covering more than 50 years of innovation in protecting computing devices and data

# Headlines

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The original study only covered 100,000 patent families over a ten-year period. In this update more than **423,000 families covering more than 40 years** were studied

The number of new patent families published in Cybersecurity jumped by 17% between 2018 and 2019 and increased by another 18% between 2019 and 2020.

**China passed the US in the number of cybersecurity patent families** published in 2017 and will have 27% more new families in this area than the US for 2020.

China has gone from 9 of the top 25 companies in this study in 2017 to only 4 in 2020, but as a country they are still publishing more families and Huawei is a powerhouse.

**IBM has the largest collection of cybersecurity patent families**, followed by fellow US company Microsoft, but **Huawei is a surprising newcomer** with the second highest number of patent families in 2019 and 2020.

**Huawei, and Samsung have leaped into fourth and fifth place overall** for number of patent families and second and third for 2020. They have been among the fastest growing companies in Cybersecurity in the last five years.

Chinese companies Huawei, Alibaba, Tencent, ZTE, and Xiaomi file a significant number of their inventions in the **US as well as China**. Seeking protection in jurisdictions other than China is a clear signal of the importance the companies place on these innovations and their likely quality.

In the sub-category of **Secure Payments Mastercard and Visa have nearly three times** as many inventions as Capital One, but **Capital One is the largest influencer** in the space with citation connections to most of the other major players.

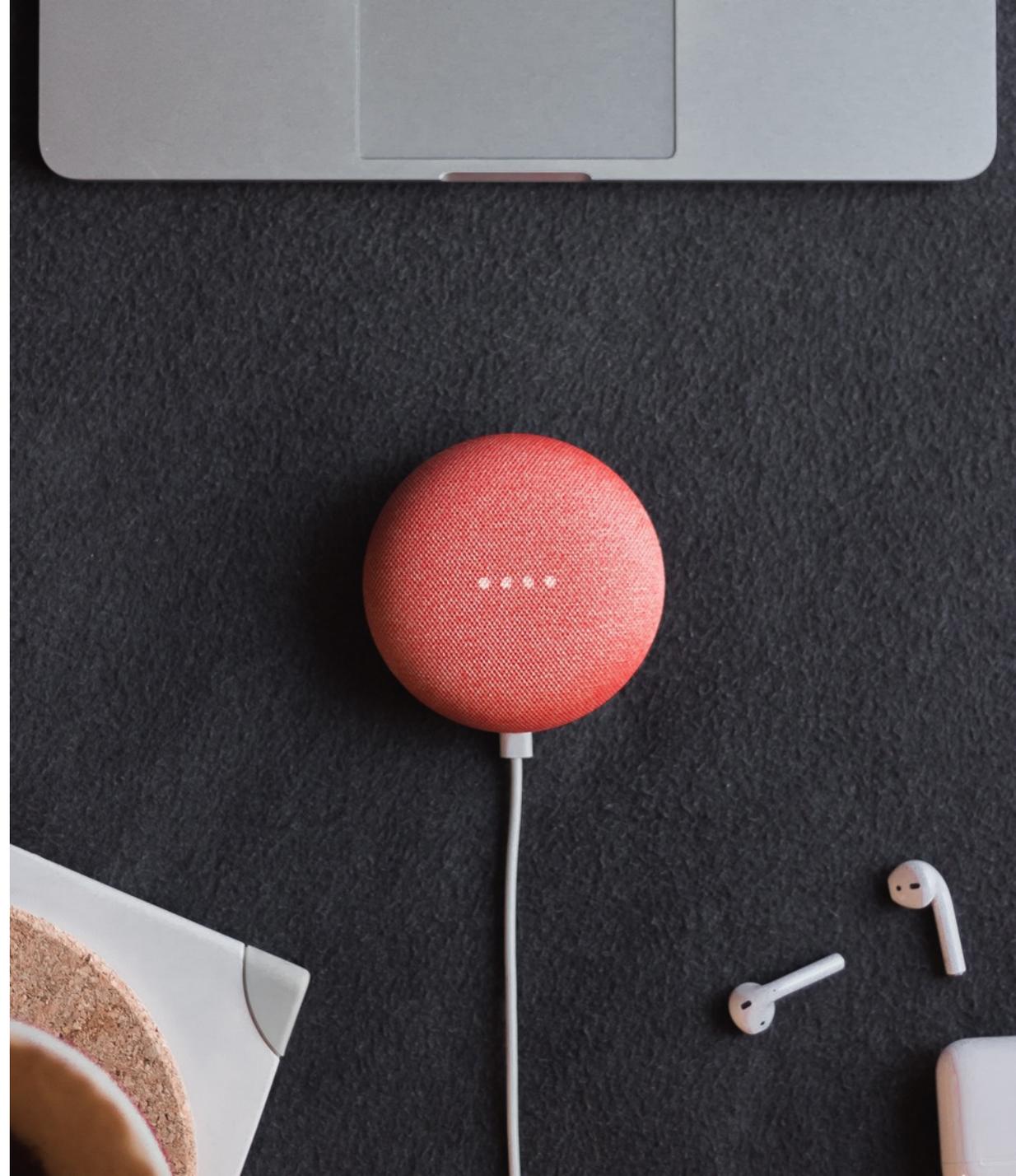
# Introduction

Cybersecurity, computer security or IT security is the **protection of computer systems from theft of or damage** to their hardware, software or electronic data, as well as from disruption or misdirection of the services they provide.

Cybersecurity includes controlling physical access to system hardware, as well as protecting against harm that may be done via network access, malicious data and code injection. Also, due to malpractice by operators, whether intentional or accidental, IT security personnel are susceptible to being tricked into deviating from secure procedures through various methods of social engineering.

**The field is of growing importance due to increasing reliance on computer systems**, the Internet and wireless networks such as Bluetooth and Wi-Fi, and due to the growth of "smart" devices, including smartphones, televisions and the various tiny devices that constitute the Internet of Things.

[https://en.wikipedia.org/wiki/Computer\\_security](https://en.wikipedia.org/wiki/Computer_security)



# History

In 1989, the first computer worm was created by Robert Morris. So aggressive in nature, this self-propagating virus proceeded to close much of the internet. It was the first widespread denial of service attack in the cyber world.

Viruses began to emerge in the 1990's such as the Melissa and ILOVEYOU viruses, and with this the beginning of the emergence of **antivirus technology**.

In the 2000's, computer security began to hit companies such as the more than 44.7 million credit card numbers stolen from TJX Corporation. More recently, the Target Corporation reported having over 40 million credit/debit cards information taken.

Regardless of whether you are an individual sitting at home on a computing device, a large corporation, or a national government, cybersecurity is an important facet of daily digital life.

<https://www.infosecurity-magazine.com/opinions/the-history-of-cybersecurity/>



# OVERVIEW



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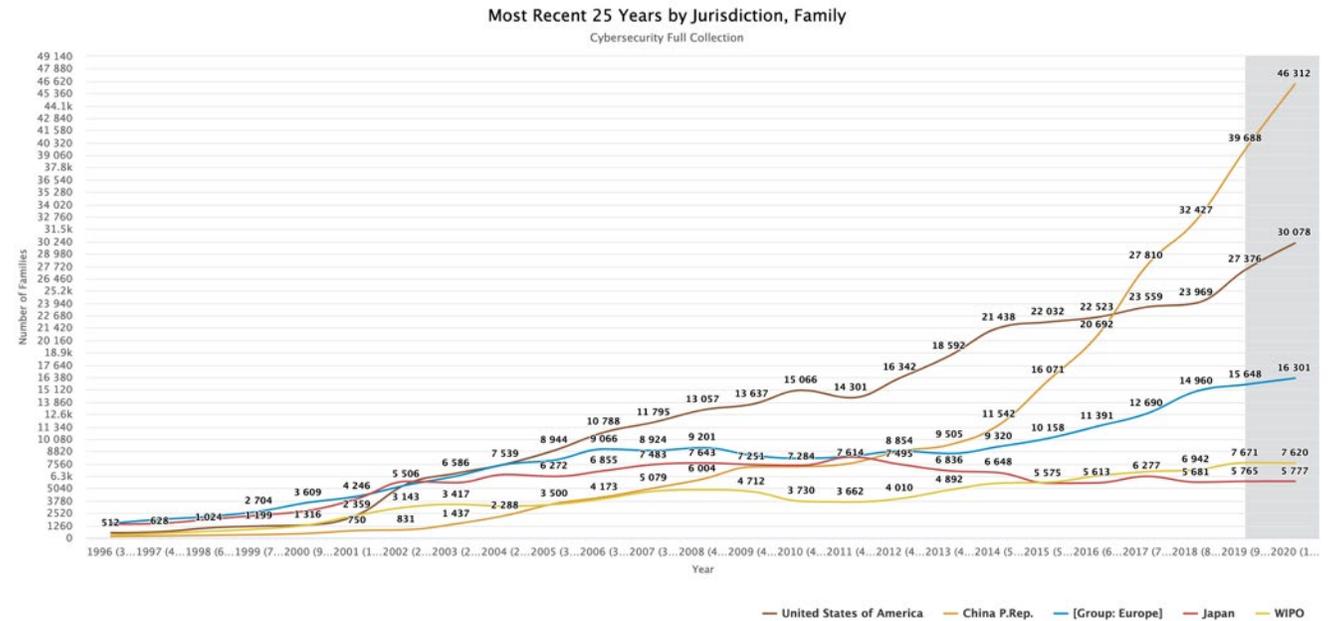


# Cybersecurity Patent Families by Priority Jurisdiction and Earliest Publication Year



**China is filing patents on cybersecurity at an unprecedented level** and continues to surpass the rest of the world in seeking patent protection in this area

- The year in this instance represents the publication of the earliest member of the patent family
- The United States was the leading priority country for patent family publications until 2016 when they were passed by China
- However, in the last three years the US has been publishing new families at a faster rate than they did for the previous five years
- European publications began increasing in 2013 but they still publish far fewer families than the US and China
- Japanese patent family publications peaked in 2011 and have remained flat since 2015



# Full Collection Dashboard

In this study **more than 434K patent families** over the course of more than 50 years including the top six patenting jurisdictions were analyzed.

This represents more than 468K granted patents, and a million patent applications.

China has more families where a Chinese document is included than the ones that contain a US member. Followed by Japan and Europe.

The dashboard also identifies some of the major concepts in this collection including **Network, Authentication, Encryption and Management**. Discussion of some of these subcategories will be covered in a subsequent section

IBM leads all assignees in total number of patent families and while Microsoft is listed second, they have a higher number of forward citations associated with their portfolio

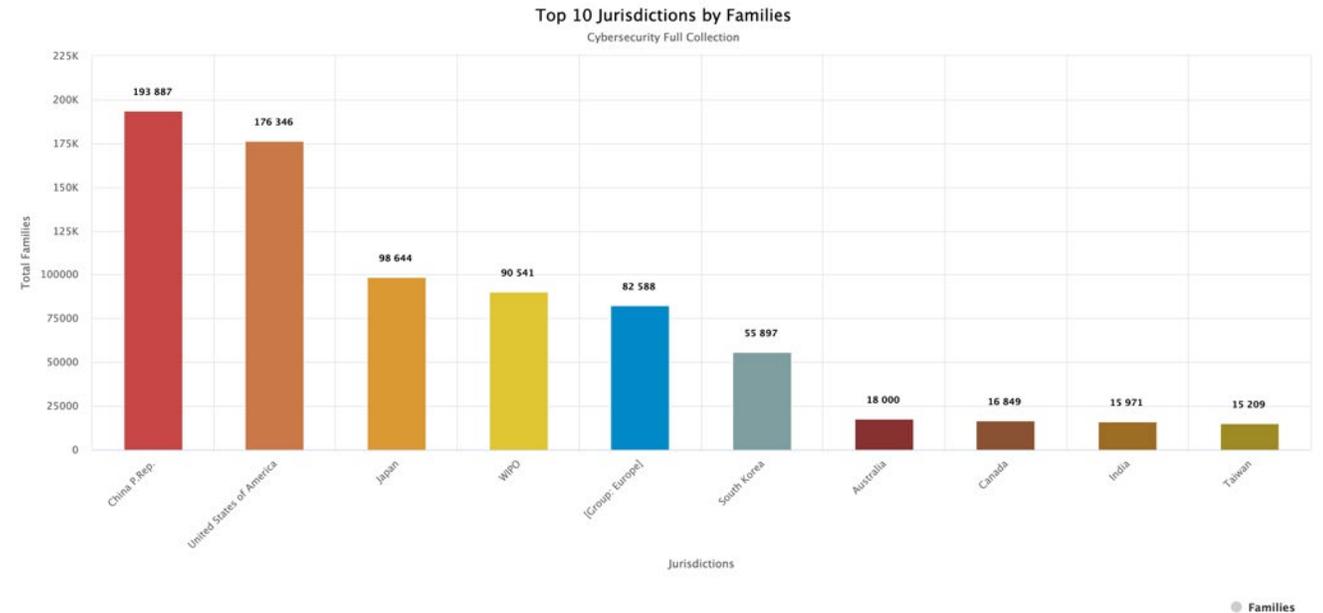


# Cybersecurity Patent Families by Top Jurisdictions



## China has 10% more cybersecurity inventions than the United States

- This Chinese advantage is even more significant due to the propensity for companies of all sizes to file patents in the US as a priority country more than they do in China
- The Europe group includes all the countries in the European Union that may have been included as the priority country, but even with this concession the number of patent families originating from Europe is significantly smaller than China and the US
- Japan like the US has a long history in this area, but it has seen declining numbers of patent families published per year
- Before 2015 Korea was producing half as many families as Japan, but since then their output per year is almost the same as

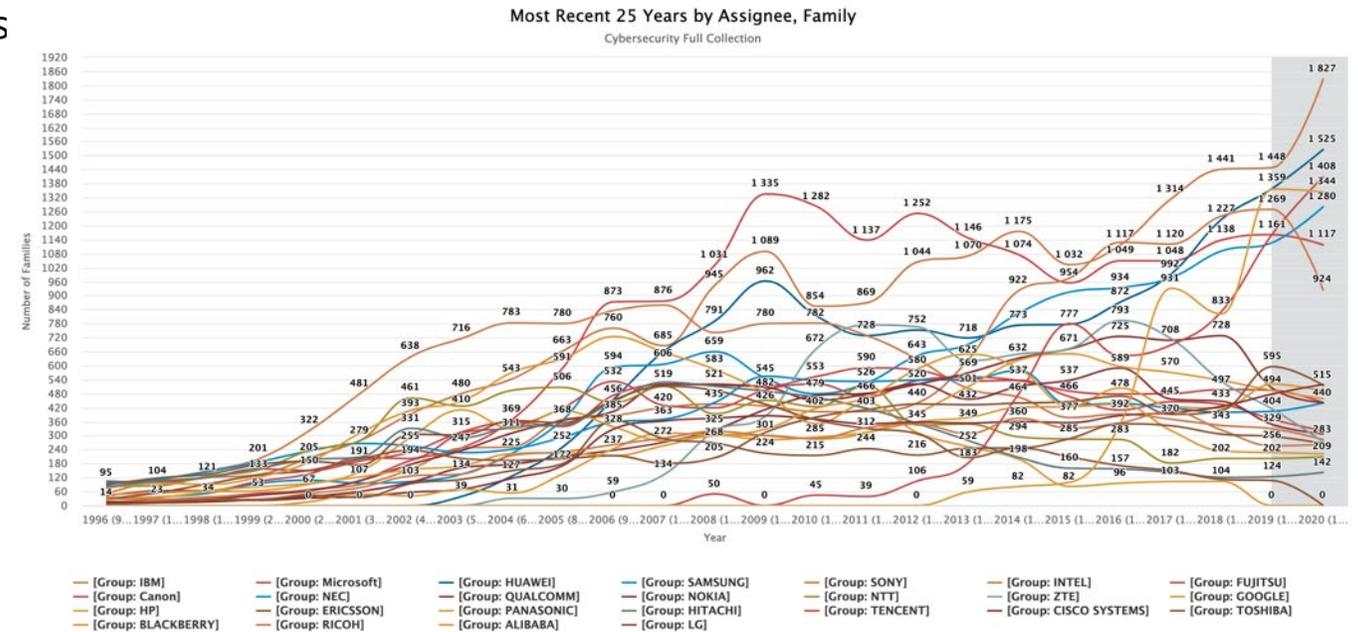


# Cybersecurity Patent Families by Top Assignees and Year



**IBM has the largest collection of cybersecurity patent families**, followed by Microsoft, but while the number of patent families IBM publishes per year has skyrocketed, Microsoft peaked in 2009

- The next eight companies, NEC, Huawei, Samsung, NTT, Hitachi, Fujitsu, Sony, and Canon, rounding out the top 10 are all Asian based companies
- The top publishing companies for 2020 begins with IBM followed by Huawei, Tencent, Alibaba, Samsung, Microsoft and Intel
- Huawei nearly caught IBM in 2019, and while Huawei grew by nearly 20% for 2020, IBM was able to widen the gap between them
- Intel was one of the fastest growing companies prior to 2020 but in that year their patent family publications dropped by 30%
- Tencent and Alibaba are listed 16<sup>th</sup> and 20<sup>th</sup> overall but leaped into the top four most published collections of patent families for 2020

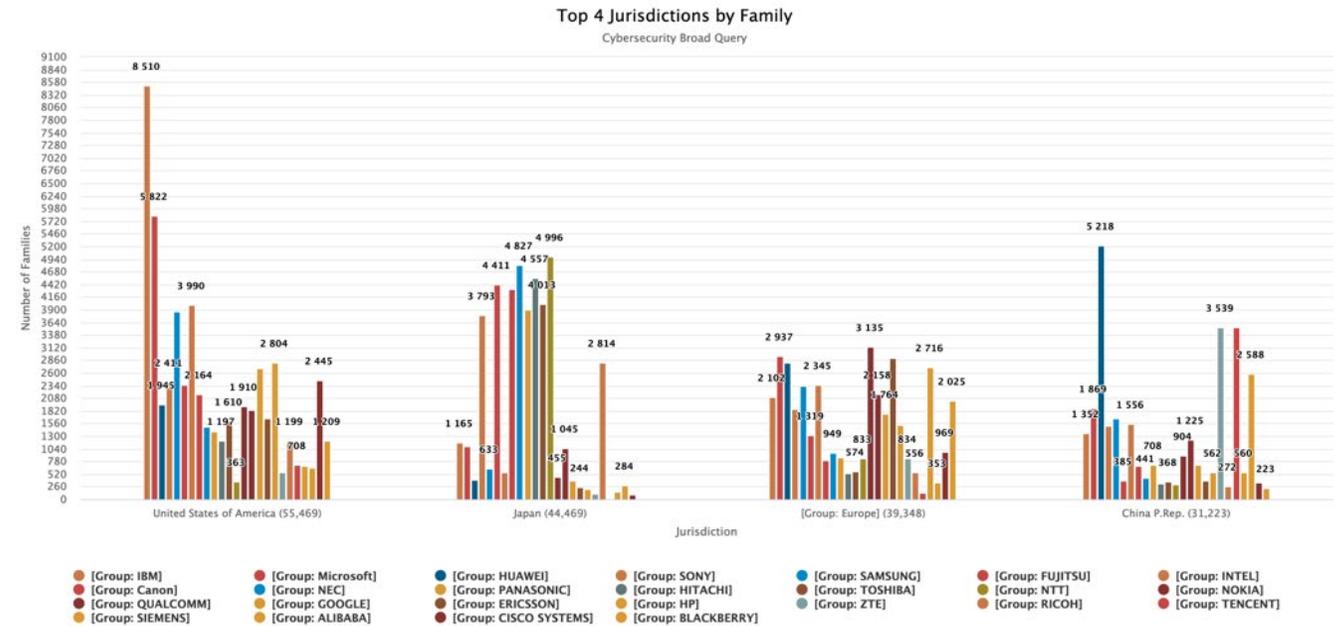


# Cybersecurity Patent Families by Top Assignees in the Top Jurisdictions



## Microsoft files the most patents in China of any non-Chinese company followed by Samsung and Intel

- Meanwhile, Huawei files a significant number of their inventions in the US, and Europe as well as China
- Alibaba, Tencent, ZTE, and Xiaomi also file an above average number of inventions outside of China
- Having major Chinese companies seeking protection in jurisdictions outside of China is a clear signal of the importance they place on these innovations and their likely quality
- Qualcomm files heavily in Europe and have almost as many filings in the US as they do in China; this is the highest of any US company in the top 25 when these jurisdictions are compared

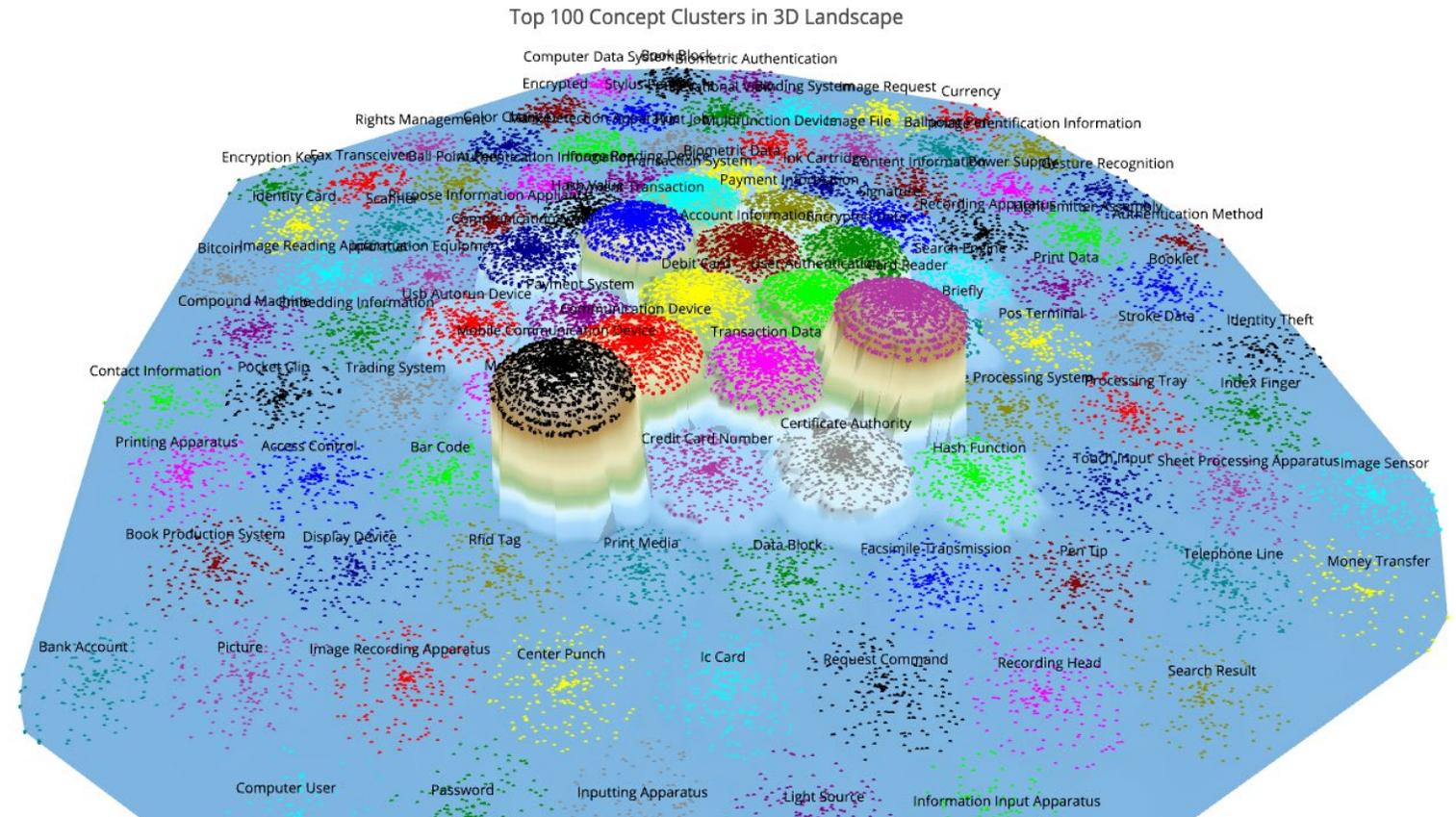


# Cybersecurity Concept Clusters Landscape



The top concept in cybersecurity by family count is **Mobile Communication Device** followed by **Authentication Methods**

- The new cluster landscape tool in Analytics v3 can handle much larger data collections than the previous version and includes a larger number of concept clusters
- Distinct clusters can be seen for many interesting and business critical concepts including:
  - Bitcoin
  - Currency/Money Transfer/Payment Transactions
  - Identity Theft
  - Image Identification
  - Communication Systems

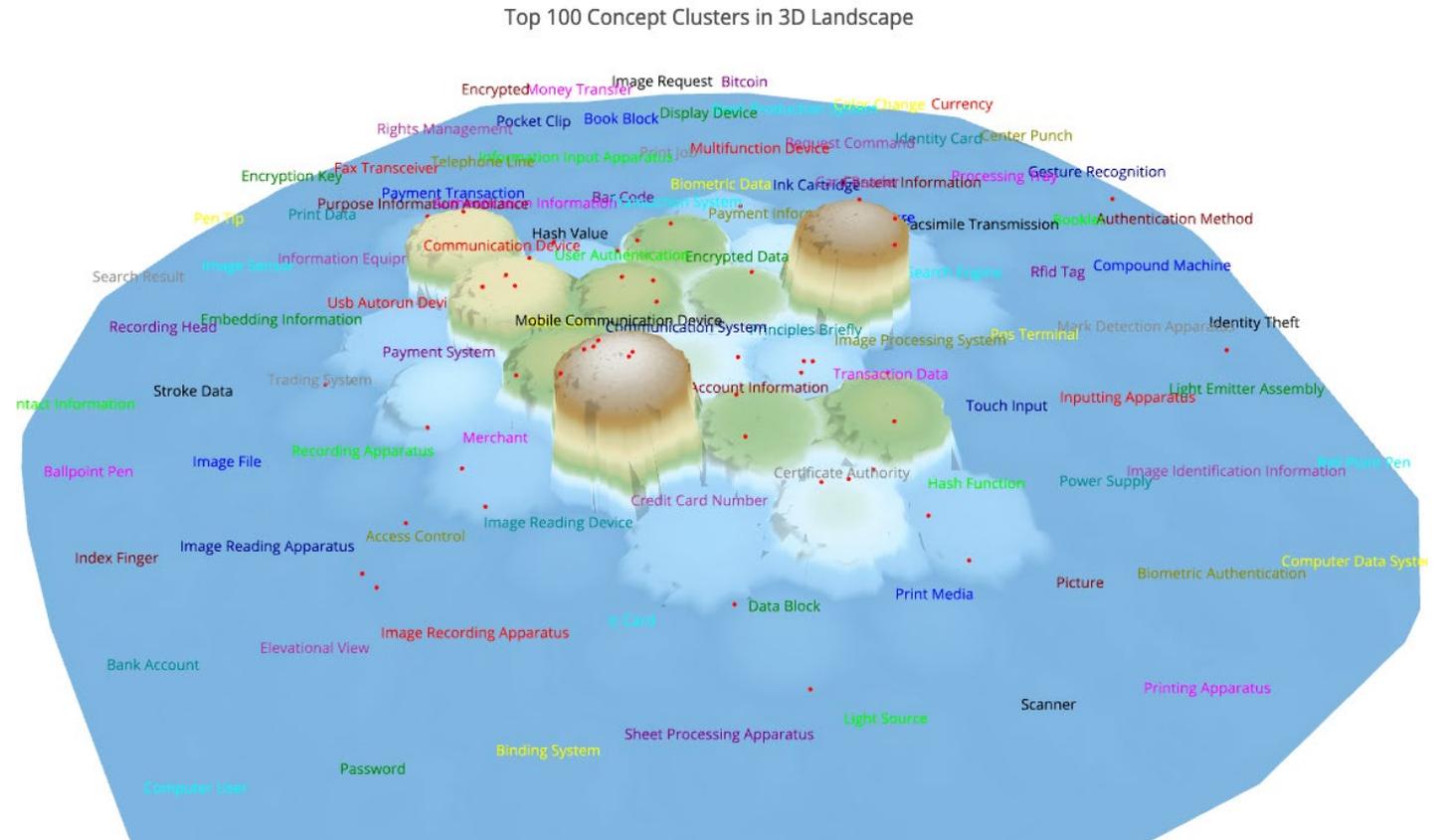


# Cybersecurity Concept Clusters Landscape - Huawei



As expected, most of the Huawei portfolio can be found in the cluster associated with **Mobile Communication Device**

- The new cluster landscape tool in Analytics v3 can now call out assignees within the landscape allowing for critical comparisons of areas of interest for individual companies
- Huawei patent families can also be found in several other portions of the landscape as well including:
  - Certification Authority
  - Additional Communication Devices
  - Payment Transaction
  - Account Information
  - Hash Values



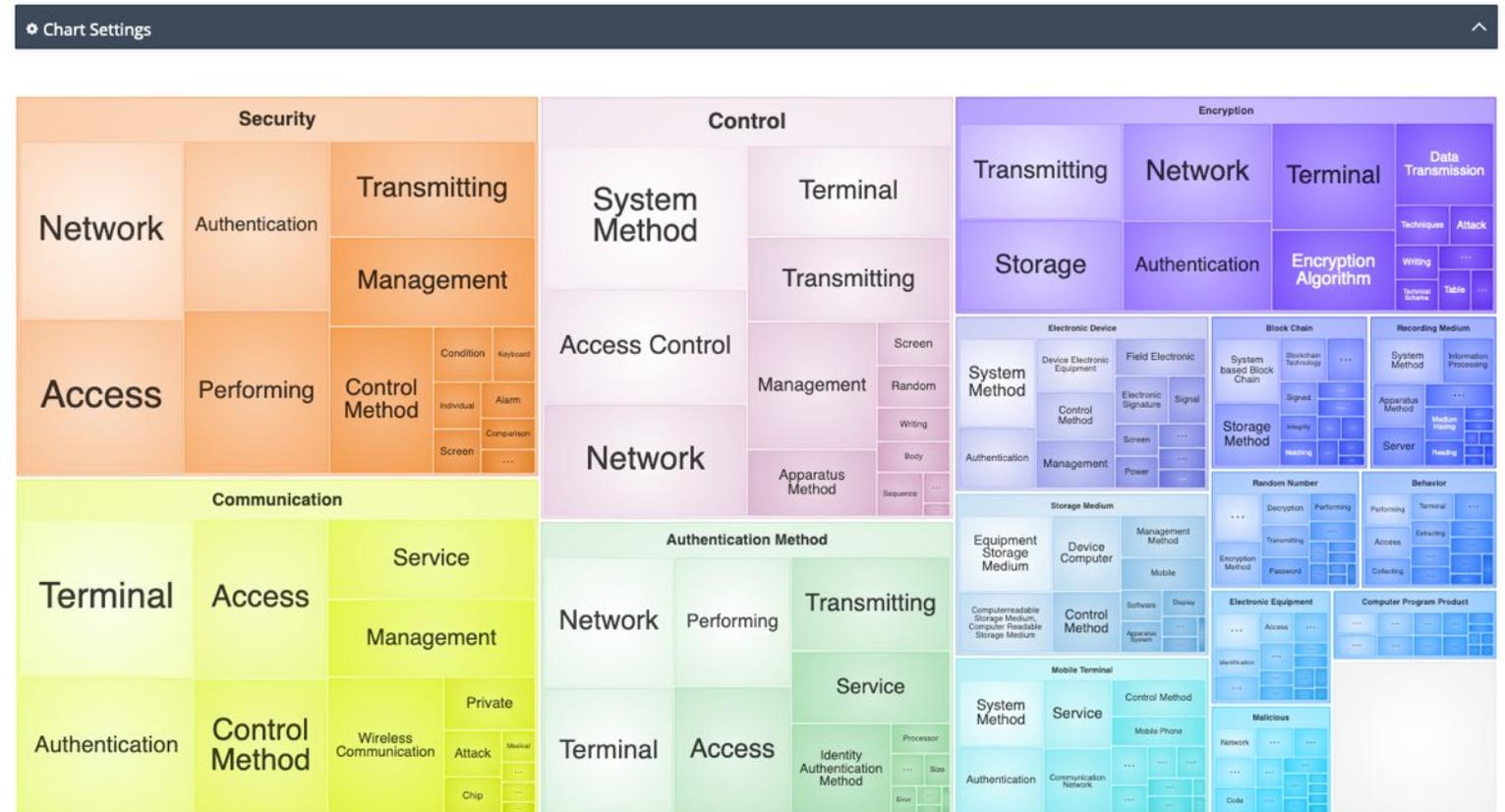
# Cybersecurity Keyword Clustering



## Network Security and Terminal Based Communication are the largest keyword clusters found in this collection

- In addition to creating expanded landscapes, Analytics v3 provides detailed keyword clusters for identifying critical themes within a large collection and the means to quickly drill into them
- Key business critical clusters identified with this visualization include:
  - Electronic Signatures
  - Blockchain Signed Ledgers
  - Identity Authentication
  - Wireless Communication
  - Encryption of Electronic Documents

Keyword Clustering for "Cybersecurity Broad Query"



# WORKING WITH SUB-CATEGORIES



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# Easily Compare Sub-Categories in Cybersecurity

There are several ways to sub-divide a large topic like Cybersecurity and doing so can provide business critical insights on the topic and the organizations that invent in the space.

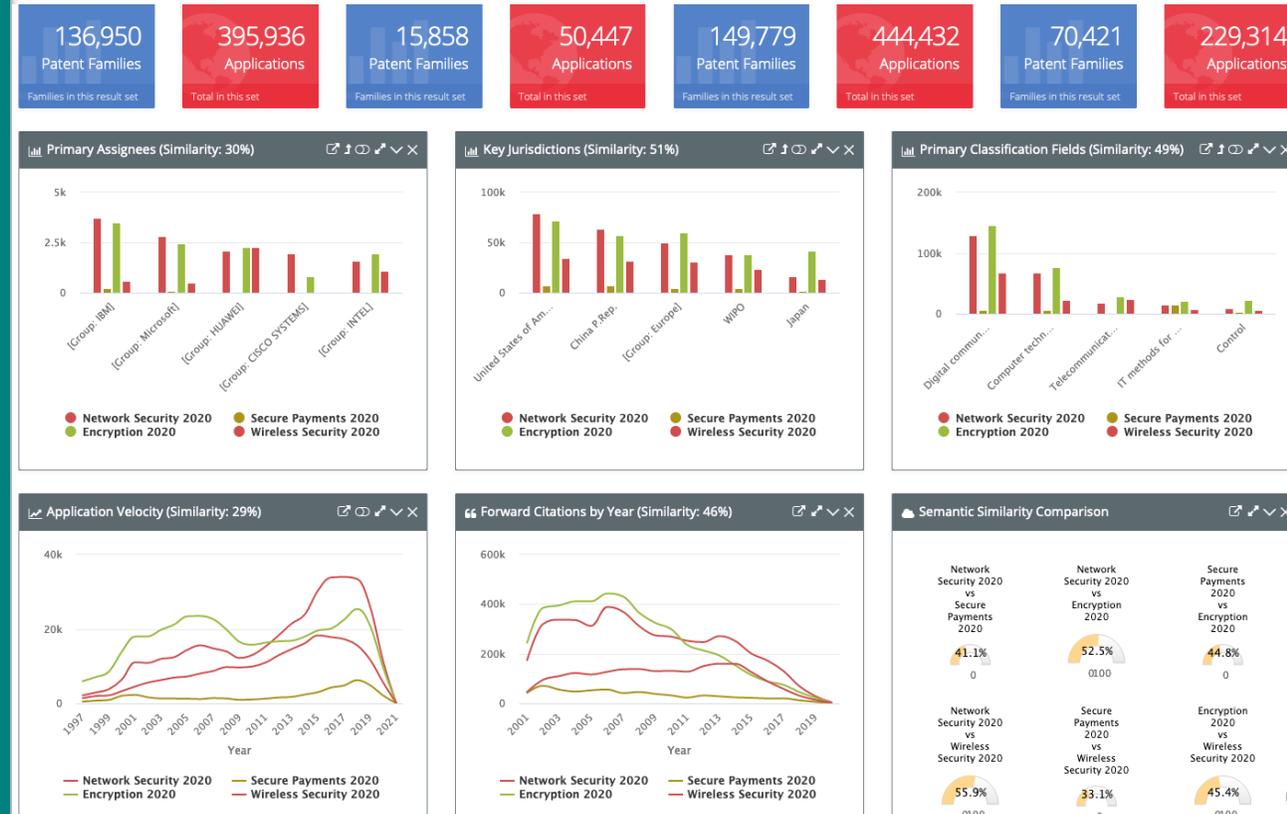
**With PatBase Analytics v3, it's now possible to explore up to four sub-categories at once** and identify key differences between them

In this example the **Network Security, Wireless Security, Encryption and Secure Payment** sub-categories were compared to one another

Network Security are similar sized sets and Microsoft have similar amounts of interest compared to the other two sub-categories

Intel is like IBM and Microsoft, but they have far more families in the Wireless Security area which is also clearly an area of interest for Huawei

Huawei also has a surprising amount of diversity in their portfolio

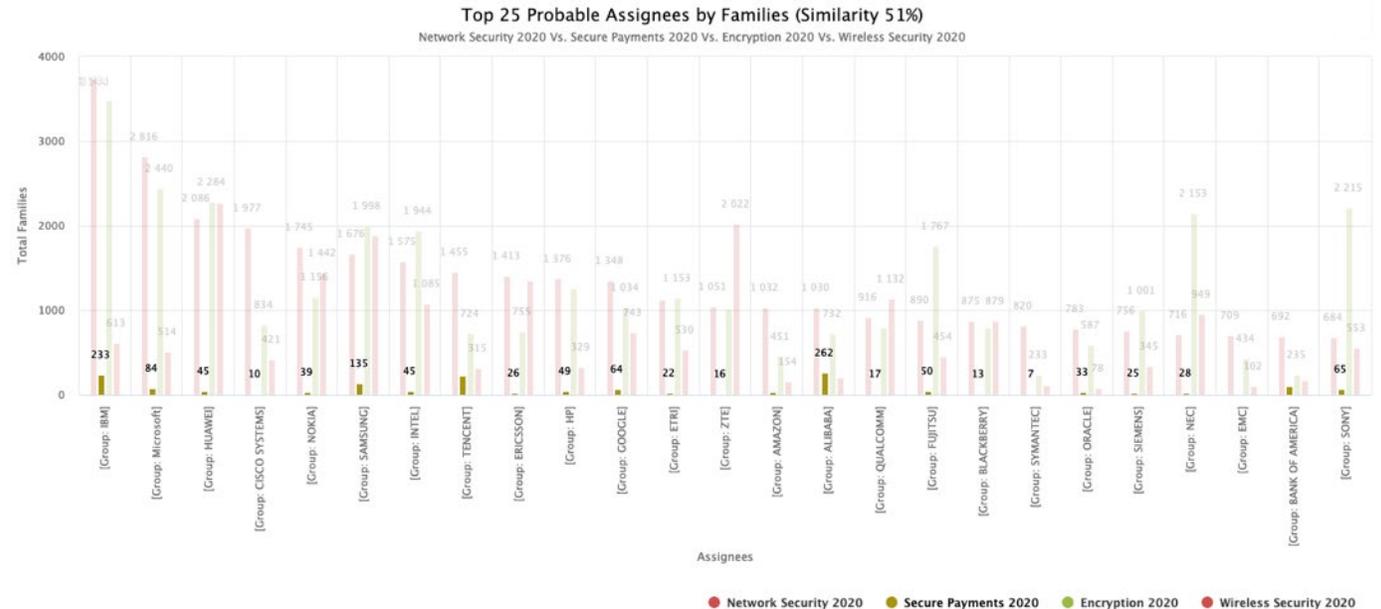


# Comparing Cybersecurity Sub-Categories by Top Assignees

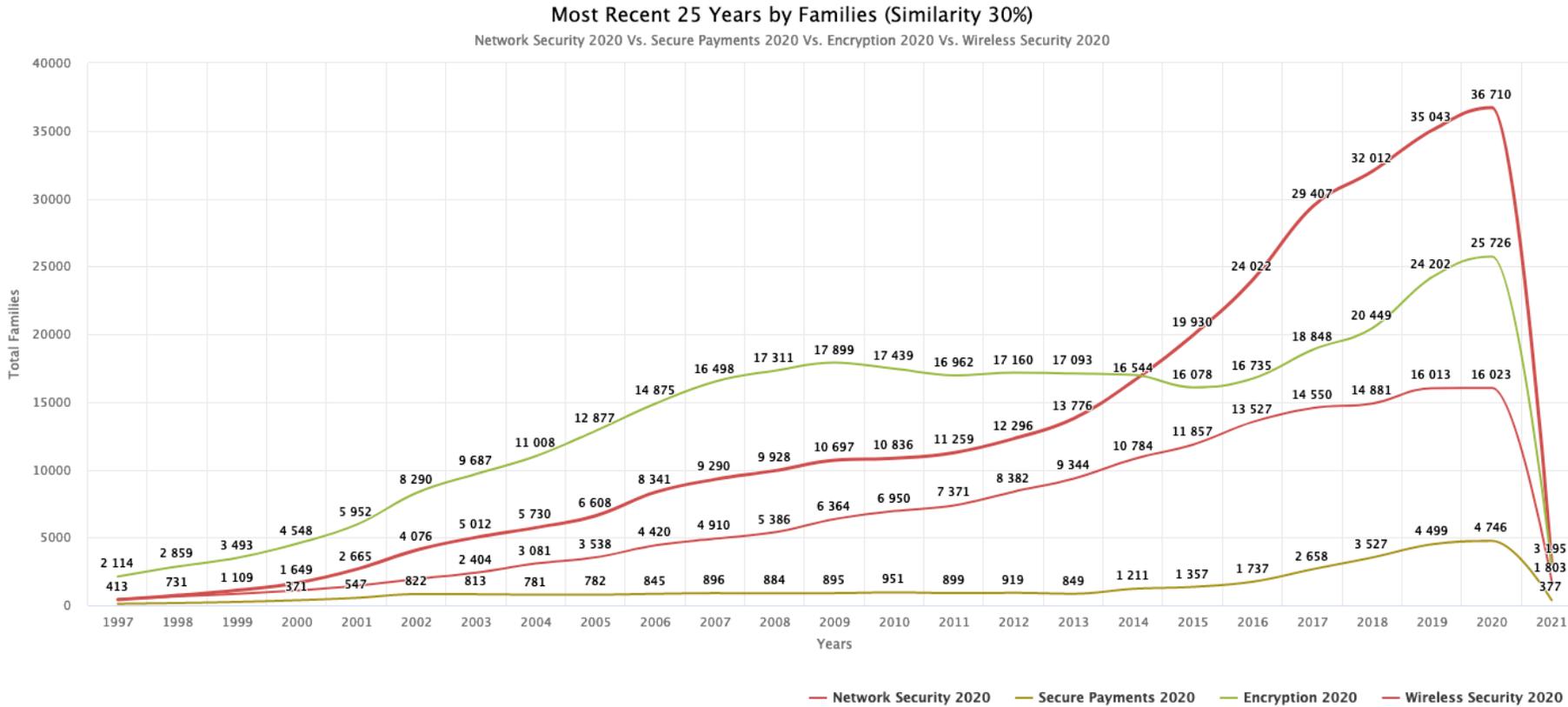


The comparisons can also be made outside of the dashboard allowing for a **detailed look at a particular analysis**

- Secure Payments can get a little lost in some of the images since it is the smallest of the sub-categories but by placing the cursor on the sub-categories the assignees in this area stand out against the background
- Alibaba is primarily interested in Network Security and Encryption, but they have the largest collection of Secure Payments patent families when compared with the top 25 assignees
- IBM comes in second in Secure Payments even though their portfolio is much larger overall than Huawei's



# Comparing Cybersecurity Sub-Categories by Count of Patent Families by Earliest Publication Year



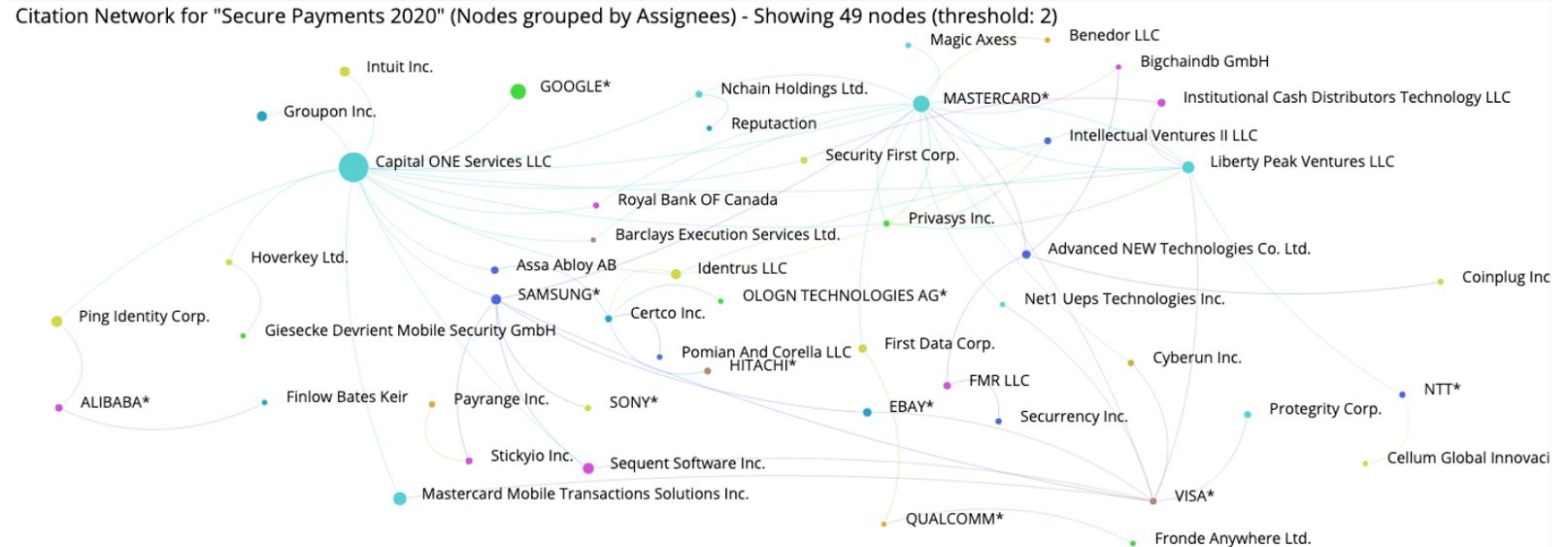
Before 2014, **Encryption** was the sub-category with the most patent families published per year. In 2008, there were also twice as many as Network Security, but this changed in 2015 when the number of **Network Security** patent families published per year skyrocketed.

# Secure Payments Partial Forward Citation Network Map



Looking at a **citation network diagram of the Secure Payments** sub-category it can clearly be seen that Capital One is one of the most influential companies in the space

- Citation network diagrams are another of the new features available in PatBase Analytics v3
- Capital One is influencing companies like Google and Samsung and through one degree out with Alibaba
- Mastercard and Visa are also highly influential companies in this sub-category but not to the same level of influence as Capital One



# Collection methodology

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- Searching was conducted in worldwide patent documents in PatBase™ for the following concepts:
  - IPC / CPC classes specific to Security Arrangements for Protecting Computers and Secure Payment Protocols
- Collection was limited to one document per family using INPADOC™ extended families and an earliest publication year prior to and including 2020
- Jurisdiction is based on earliest priority country or the inclusion of a family member in the grouped jurisdiction
  - Primary jurisdictions included the United States, Europe, Japan, Korea, China, Russia or WIPO applications
- Categorization was based on classification codes conducted for these families based on the major sub-categories
- Assignee names were standardized based on known mergers, acquisitions, and changes of ownership



## Anthony Trippe

Managing Director, Patinformatics, LLC

Anthony (Tony) Trippe is Managing Director of Patinformatics, LLC. Patinformatics is an advisory firm specializing in patent analytics and landscaping to support decision making for technology-based businesses.

In addition to operating Patinformatics, Mr. Trippe is also an Adjunct Professor of IP Management and Markets at Illinois Institute of Technology teaching a course on patent analysis and landscapes for strategic decision making. He recently launched the website [ML4Patents.com](http://ML4Patents.com) covering machine learning in the field of Intellectual Property.

# THANK YOU FOR YOUR ATTENTION

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