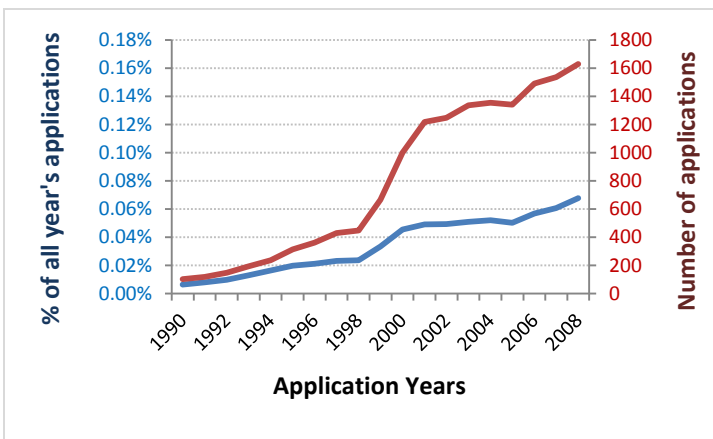


# IP and the Connected Car

25 years ago, having a phone in your car was much more feasible than having your own mobile phone. With the level of power and transmitters that were required, this was almost a given, carrying around the kit required to run the phone just wasn't a realistic proposition for most people. Since the surge in portability and power of mobile phones, car specific technology has been less of a focus for communications, but the Internet connected car concept is emerging as a key battleground in mobile technology. Just as mobile phones have gone from communications specific devices to all-encompassing media players, productivity tools and games devices, the network capabilities of automobile wireless connected devices have followed their own evolutionary path. The prime exemplar of this evolution is the satellite navigation device, something that many drivers now rely on, and it is starting to become a critical part of a much wider technology ecosystem.

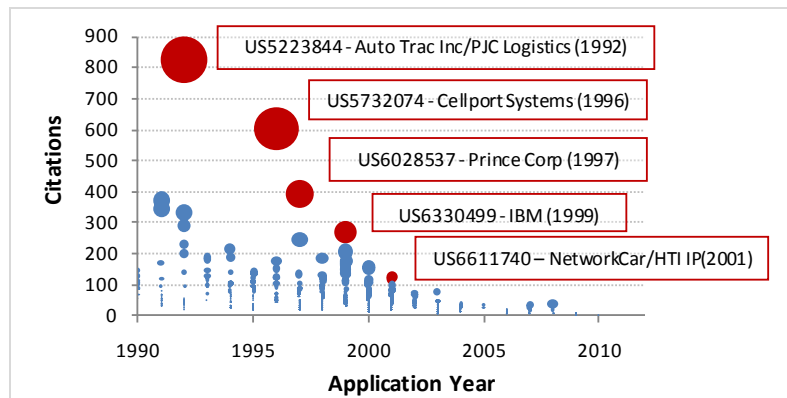
Given the wide field of communications technology that is now pervading almost all aspects of our daily lives, to gain further insight into the automotive specific applications we looked at networking and mobile connection technology



patents that made specific reference to use in vehicles. This enabled us to take a snapshot of the technology that could then be used as a kernel for any future investigation. We observed that the level of filings has grown massively in both relative and absolute terms, rising from around 100 (six hundredths of a percent of all patent filings that year) in 1990, to around 1600 filings in 2008, ten times the relative number of filings, and remember this is for just automotive patents, other associated patents without these terms form part of a much wider field of IP. This is not, by its very nature, a technology that sits alone. Connectivity is

a digital spiderweb and development in one area of this technology is likely to ripple through to others.

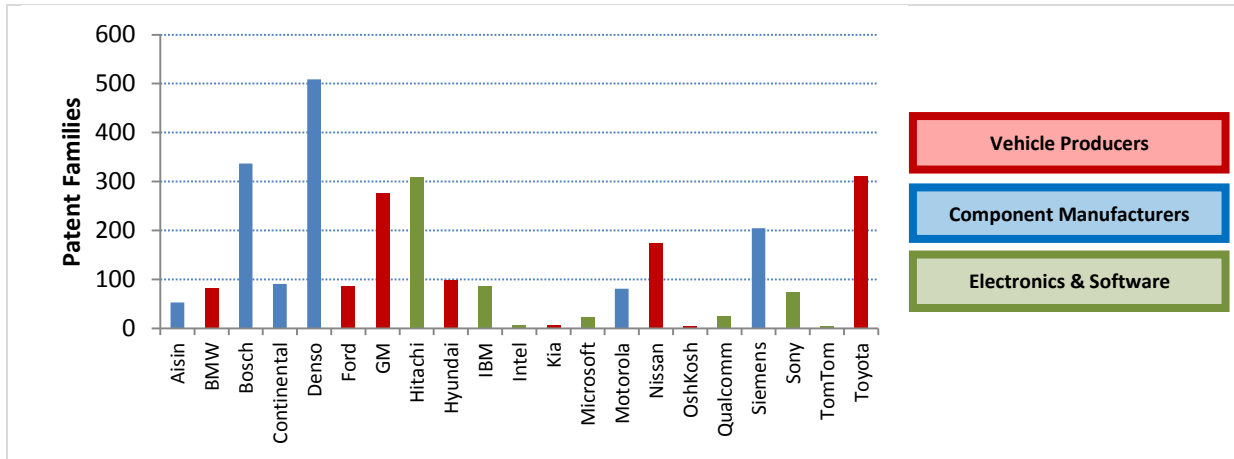
In the course of development of a technology area, there are always patents that stand out as important, influencing those that follow and acting as a nexus for research and development. There is no reliable way to really know which patents these will be before it happens, but citations, once they begin to accrue, will tend to snowball as something becomes accepted as a necessary cornerstone for the technology area. Several patents stand out as very highly cited, the highest being a 1992 vehicle tracking and security system patent with over 800 citations. Originally developed by 'Auto Trac Inc', the patent is currently assigned to 'PJC Logistics', a company about which little is known but that has filed suits against over 200 companies relating to infringement of this patent. Patents from 'Cellport Systems' and 'Prince Corp' that describe in-car communication and networking systems are also obviously important in this area, rounding out the three mostly highly cited patents.



More recent, yet still highly cited, are vehicle diagnostics systems from IBM and NetworkCar (patent now assigned to HTI IP).

But an individual patent is rarely enough to maintain a strong IP position, and most companies involved in the production and installation of mobile networking or automobile computing will have clusters of patents that relate to this area. Some of these will of course be stronger than others, depending on many factors: their areas of technology focus, level of innovation, IP strategy. All of these things and more can contribute to the level of patent holdings a

company may have. A small selection of some of these companies and the size of their patent holdings identified during this search are shown in the following chart.



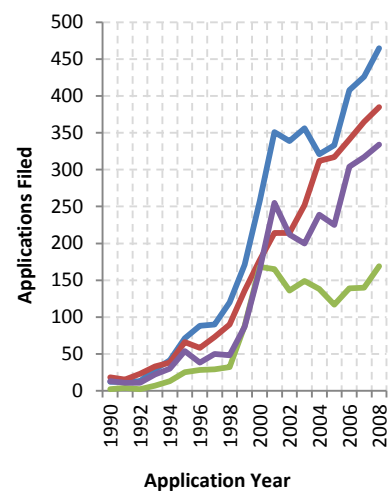
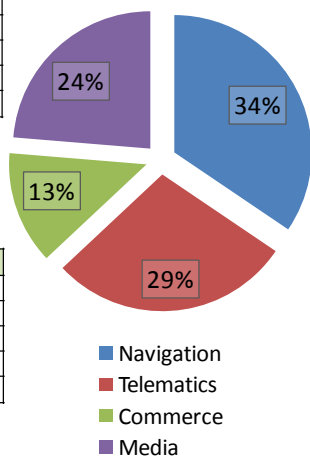
The companies that hold the largest number of patents in our data are automotive component manufacturers, in particular Bosch and Denso. A result such as this makes sense, with their businesses based on manufacturing elements that span many aspects of the vehicle, Bosch for example make filters, test equipment and electric motors. The vehicle manufacturers themselves that are close behind appear to be those which have led development of electric and hybrid vehicles such as Toyota, Ford, GM and Nissan, suggesting that an overlap between electric vehicle and network technologies may be being exploited. If such an overlap is influencing development, it would be natural to assume that it wouldn't be the only one. As well as in-car navigation, other common systems are telematics and in-car entertainment, along with the developing field of utilising commercial functions such as search, advertising and payments to facilitate the provision of services. Keywords within the patents were used to assign them to one or more of these categories and the results, indicating the current most common assignees and the level of holding, both at present and over time are shown below.

Assignee	% Media
Bosch	3.80%
Denso	2.41%
General Motors	2.41%
Panasonic	2.32%
Motorola	2.19%

Assignee	% Navigation
Denso	3.25%
Bosch	3.23%
General Motors	2.96%
Panasonic	2.43%
Hitachi	2.37%

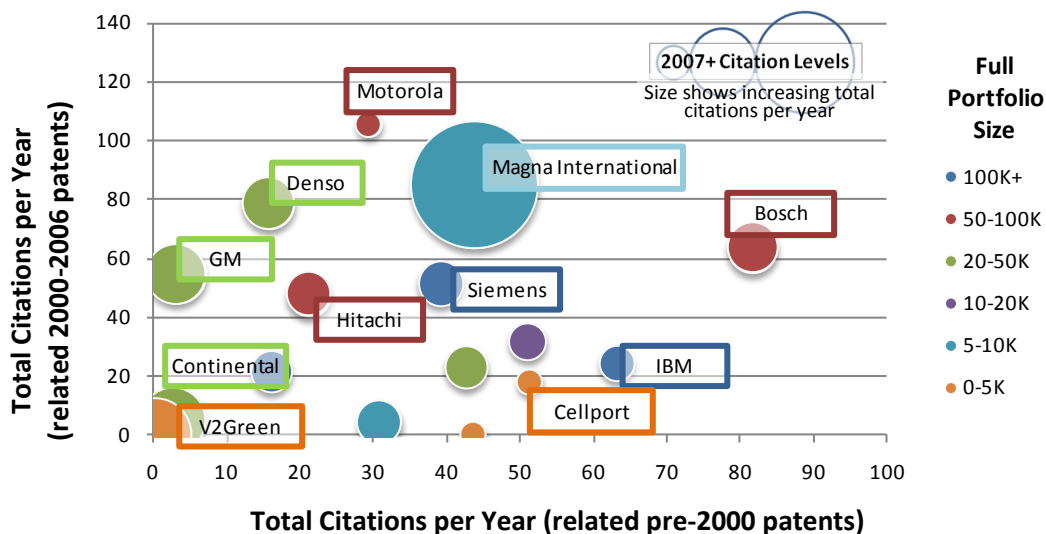
Assignee	% Commerce
Mitsubishi	6.42%
Panasonic	3.96%
Toshiba	3.73%
Denso	3.50%
Bosch	2.81%

Assignee	% Telematics
General Motors	6.04%
Bosch	3.31%
Denso	2.46%
Hitachi	2.08%
Daimler	1.90%



As we can see, all four of these categories have received greatly increased filings over the course of the last 20 years, with navigation leading the way. The current level of filings in applications relating to Commerce appears to have remained steady over the previous 10 years, indicating that technology developing in that area has yet to experience the recent jumps in patent filing that the other categories have seen, especially given that this is an area with significant potential for companies to recoup investments if successful. The overall increase in all of these categories suggest that vehicle and component manufacturers are becoming more and more confident about both the economic benefits of connected systems to be added to their products, and the public's desire to use them. Honda, Toyota, Audi, BMW and Ford all have their own systems, to name but a few, but the development of these offerings requires technologies from vehicles, electronics, networking and importantly, software. The software of the connected car will be required to absorb and manage the mass of information in a secure way that is linked to the vehicle's resources for seamless delivery of safety, search, navigation and security. In the case of electric cars add to that the monitoring of battery power and smart solutions that communicate with charging stations.

With the development of connected car technology looking to be led by electronics and software providers, it is prudent to ask if this opinion marries with the data available. We can ask which companies have strong portfolios in this area, this can be done by considering the number of citations per year that patents in this data set have received. Here we see, as with previous charts, that the influential companies are spread across a range of industries.



By looking at the changing levels of citation, in this case from patents published before 2000, from 2000-2006 and then in the last 5 years, we can see how the influence is spread amongst a range of assignees. While overall this chart is fairly evenly spread, indicating a fairly level playing field in terms of levels of influence, a few companies do stand out. Who are they? And what is making them stand out? The company with the largest number of citations in the last few years is Magna International. Magna, a Canadian automotive parts producer, supplies parts to most vehicle producers, but it is the patents obtained in a merger with Donnelly Corp in 2002 it holds for mirrors that interface with other systems in the vehicle that have grabbed the bulk of recent citations. Bosch again appears influential here in all time steps, given their large portfolio and importance across multiple technology areas this is likely to continue. Interestingly, two companies, V2Green and Continental both have had little in the way of citation before 2007, but recent patents (electric vehicle smart charging for V2Green, automotive data control & networking for Continental) have emerged as key indicators of the direction of future technology.

The spread of networked telematics and automotive operating systems is a sure sign of the health of this kind of technology, implanting a base from which other technologies can grow. Even with detractors questioning the merits of these technologies and claiming a response with limited popularity, the absolute and relative increases in the number of patents filed in this area are a clear sign that the outlook is good for connected car technology. As it develops, future technology in this area can be expected to progress down many avenues. The development of advanced software and sensors, seen in some form already in work by high profile companies such as Google, are likely to lead to autonomous vehicles. Management of electric vehicle power systems will form part of a much wider infrastructure. Media and commercial services will become commonplace in vehicles as they have in our phones, and the current trend towards of the 'Internet of Things' will link vehicles, components and infrastructure at levels an order of magnitude greater than we currently see. All of these technologies will rely on connectivity to vehicles at the heart of their operation and that looks set to ensure that the connected car becomes as inescapable in future as the mobile phone is today.

### Suggested Links

- <http://clearviewip.com/news/electric-and-hybrid-vehicles-and-ip/>
- [http://www.highperformancepontiac.com/features/hppp\\_0904\\_1992\\_pontiac\\_firehawk/photo\\_07.html](http://www.highperformancepontiac.com/features/hppp_0904_1992_pontiac_firehawk/photo_07.html)
- <http://www2.dft.gov.uk/adobe/pdf/245385/249577/satellitenavigationresearch.pdf>
- <http://www.cjdigital.com/more-than-200-carriers-sued-for-patent-infringement/>
- [http://gigaom.com/cleantech/the-cloud-now-for-connecting-electric-cars/?utm\\_source=social&utm\\_medium=twitter&utm\\_campaign=gigaom](http://gigaom.com/cleantech/the-cloud-now-for-connecting-electric-cars/?utm_source=social&utm_medium=twitter&utm_campaign=gigaom)
- <http://www.eurocomms.com/features/7713-connected-car--the-future-on-wheels>
- <http://www.economist.com/node/13725743>
- <http://www.inc.com/magazine/20091101/the-connected-car.html>