Automotive Technology and IP Outlook
April 2016

Strategy and M&A for Technology and IP

STG

Silicon Valley | Boston

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Technology is transforming the automotive industry

**The Connected Car**  
The car as a wireless device, computer, and entertainment system

**The Electric Car**  
The car that is powered electrically

**The Self-Driving Car**  
The car that drives autonomously

**The Shared Car**  
The car as a service

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Sources: SBD automotive; BCG; Research and Markets;  
http://aswathdamodaran.blogspot.com/2015/10/the-ride-sharing-business-playing-pundit.html
Technologies from other industries are driving this change

Automotive technologies on the rise (examples)

<table>
<thead>
<tr>
<th>Description</th>
<th>What the auto industry is saying</th>
<th>Where the technologies originated (not automotive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5G wireless communications: used for connected car systems</td>
<td>“Visteon is investing in in-car technology... which will enable automakers to quickly transition to 5G without having to tear up the vehicle architecture.” -Martin Green, Telematics &amp; Connected Car Technology Manager at Visteon (SAE, 2016)</td>
<td>Semiconductors, Telecommunications, Mobile Devices, Internet of Things</td>
</tr>
<tr>
<td>LiDAR: sensory technology (e.g., gyroscopes) used for safety and autonomous vehicles</td>
<td>“Many in the industry are concluding that you need a LiDAR sensor on each of the four corners of the vehicle, with a 120° sweep. The idea is to generate a point-cloud of information around the vehicle.” -Jeff Owens, CTO of Delphi (SAE, 2016)</td>
<td>Aviation, Geology, Software, Sensors</td>
</tr>
<tr>
<td>Lithium batteries: used for electric vehicles</td>
<td>“In this ‘second phase’ of vehicle electrification, there’s an even greater focus on full-system development. My company is not just a battery cell supplier going forward, but part of holistic propulsion-system development.” -Denise Gray, CEO of LG Chem Power (SAE, 2016)</td>
<td>Chemistry, Energy, Consumer Electronics</td>
</tr>
</tbody>
</table>
New players entering the space – not the usual suspects

Automotive incumbents

**Automotive manufacturers**

- TOYOTA
- Mazda
- GM
- Ford
- HYUNDAI
- VOLVO
- DAIMLER
- HONDA
- KIA
- Fiat Chrysler Automobiles
- BMW
- NISSAN
- FCA
- Volkswagen

**Automotive Suppliers**

- DENSO
- Delphi
- BorgWarner
- Continental
- Bosch
- Getrag
- TRW
- Visteon

New entrants

**Tech companies**

- Google
- Apple
- Cisco
- Samsung
- LG
- Microsoft
- Amazon
- IBM
- Facebook

**Semiconductor companies**

- Qualcomm
- Intel
- NXP
- ARM
- Micron
- NVIDIA
- Avago
- Texas Instruments

**Electric vehicle companies**

- Tesla
- Faraday Future
- Tencent
- NEXTEV
- LeEco

**Ride sharing companies**

- Uber
- Lyft
- DiDi

Note: exemplary companies shown; not comprehensive
We see 4 critical strategic technology/IP issues in automotive

1. **Technology ownership battles**
   Whether incumbent auto companies want it or not, auto patent conflict is almost certainly ahead – impacting product launches and profit pools.

2. **Rise of non-practicing entity ("NPE") litigation**
   Plan on getting sued by NPEs for patent infringement, but in the current environment it isn’t quite as scary as you might think.

3. **Development of new technology standards**
   Standards and the associated patent pools will become even more critical, and if you don’t handle them properly you may lose your competitive advantage.

4. **Emergence of China**
   Chinese companies are emerging in automotive, but they will struggle to enter Western markets if they don’t acquire IP rights in the necessary geographies.
What are the implications for automotive players?

<table>
<thead>
<tr>
<th>Technology/IP issues</th>
<th>What to do about it</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Technology ownership battles</strong></td>
<td>Automotive incumbents: Carefully file and acquire patents to prevent entrants from gaining traction; use IP for partnerships/supply chain relationships, lock in favorable cross licenses, and enforce selectively to slow entrants</td>
</tr>
<tr>
<td></td>
<td>New entrants: You need the right patents ASAP to level the playing field – file, acquire patents, and partner for technology access</td>
</tr>
<tr>
<td><strong>2. Rise of non-practicing entity (“NPE”) litigation</strong></td>
<td>All automotive players: Fight NPEs in court and at the PTO – take advantage of new laws allowing you to challenge their patents (e.g., file inter partes reviews); rather than viewing NPEs purely as threats, use them to your advantage – coopt them to get good deals on patents and/or partner with them</td>
</tr>
<tr>
<td><strong>3. Development of new technology standards</strong></td>
<td>All automotive players: Get involved in standards bodies early to influence their direction; build an IP portfolio that allows you to benefit from technology proliferation; and monetize your standard essential patents either through patent pools or other means</td>
</tr>
<tr>
<td><strong>4. Emergence of China</strong></td>
<td>Emerging Chinese EV companies: Beef up your IP portfolios ASAP – file &amp; buy patents with global coverage</td>
</tr>
<tr>
<td></td>
<td>Automotive incumbents: Leverage your significantly larger patent portfolios to cut favorable deals with patent-poor Chinese EV companies, raise their technology costs, or shut them out of the market</td>
</tr>
</tbody>
</table>
Technology ownership battles

1. **Technology ownership battles**
   Whether incumbent auto companies want it or not, auto patent conflict is almost certainly ahead – impacting product launches and profit pools

2. Rise of non-practicing entity (“NPE”) litigation
   Plan on getting sued by NPEs for patent infringement, but in the current environment it isn’t quite as scary as you might think

3. Development of new technology standards
   Standards and the associated patent pools will become even more critical, and if you don’t handle them properly you may lose your competitive advantage

4. Emergence of China
   Chinese companies are emerging in automotive, but they will struggle to enter Western markets if they don’t acquire IP rights in the necessary geographies
Automotive patent wars aren’t new – conflict in the early 1900s later drove cross-licensing stability for incumbents.

1899: Electric Vehicle Company purchased rights to George Selden’s patent for a three cylinder, gas-powered motor vehicle.

1900: The Electric Vehicle Company launched patent infringement lawsuits against automotive companies.

1903: Organization licensing this patent became the Association of Licensed Automobile Manufacturers (“ALAM”); members of ALAM given a license and charged a 1.25% royalty on cars produced.

1903: Ford denied a license and ALAM sued Ford for patent infringement.

1909: Court ruled in favor of the Selden patent.

1911: Court of appeals found that the patent is invalid, thereby defeating the patent, but after ALAM had profited from years of licensing the rest of the industry.

Following the Selden automotive patent wars, there was a period of “patent peace.”
Telecom similarly experienced a period of stability, until disruption occurred with the advent of smartphones.

The “smartphone wars” began in 2009 when Nokia sued Apple for patent infringement of 10 patents. Apple countersued and litigation in the space took off.

Litigation activity among the large smartphone companies declines as cases settle and cross-licensing agreements are reached.

<table>
<thead>
<tr>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013+</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOKIA</td>
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<td></td>
<td>NOKIA</td>
<td></td>
<td></td>
<td>ERICSSON</td>
</tr>
<tr>
<td></td>
<td>HTC</td>
<td>HTC</td>
<td>HTC</td>
<td>HTC</td>
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<tr>
<td></td>
<td>MOTOROLA</td>
<td>MOTOROLA</td>
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<td>htc</td>
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<tr>
<td></td>
<td>Motorola</td>
<td>Motorola</td>
<td>Motorola</td>
<td>Motorola</td>
</tr>
<tr>
<td></td>
<td>Microsoft</td>
<td>Microsoft</td>
<td>Microsoft</td>
<td>Microsoft</td>
</tr>
<tr>
<td></td>
<td>Samsung</td>
<td>Samsung</td>
<td>Samsung</td>
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<tr>
<td></td>
<td>Microsoft</td>
<td>Microsoft</td>
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<tr>
<td></td>
<td>Sony</td>
<td>Sony</td>
<td>Sony</td>
<td>Sony</td>
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<tr>
<td></td>
<td>Apple</td>
<td>Apple</td>
<td>Apple</td>
<td>Apple</td>
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<tr>
<td></td>
<td>Google</td>
<td>Google</td>
<td>Google</td>
<td>Google</td>
</tr>
<tr>
<td></td>
<td>BlackBerry</td>
<td>BlackBerry</td>
<td>BlackBerry</td>
<td>BlackBerry</td>
</tr>
</tbody>
</table>

Examples – cases shown below only emphasize the most significant patent infringement lawsuits, but there were many others.

- US patent infringement lawsuit
- International Trade Commission complaint
- International patent infringement lawsuit
- Licensed patents from

Technology ownership battles
The smartphone patent wars were spawned by a shift in market leadership – incumbents were overtaken by new entrants.

Most of the mobile device incumbents were overtaken

Nokia releases the Nokia 7650 in June 2002, its first camera phone and first phone to run on the Symbian OS

Motorola Q released in 2005 as a thin smartphone without a touchscreen

In Nov. 2007, Google announces Android operating system as open-source platform

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First iPhone released in 2007; mobile devices become consumer products and not just business products

HTC Dream, the first Android smartphone, released in 2008

In 2014, Microsoft acquires Nokia’s phone business for $7.2B

Motorola acquired by Google for $12.5B, announced in 2011

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In 2014, Microsoft acquires Nokia’s phone business for $7.2B
Will the same thing happen in automotive?

Percentage of US Automobile Sales

<table>
<thead>
<tr>
<th>Car Manufacturer</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM</td>
<td>21%</td>
</tr>
<tr>
<td>Ford</td>
<td>17%</td>
</tr>
<tr>
<td>Toyota</td>
<td>16%</td>
</tr>
<tr>
<td>Chrysler</td>
<td>14%</td>
</tr>
<tr>
<td>Nissan</td>
<td>13%</td>
</tr>
<tr>
<td>Honda</td>
<td>10%</td>
</tr>
<tr>
<td>Other</td>
<td>9%</td>
</tr>
</tbody>
</table>

Smartphone entrants realized they needed patents – so they spent billions on IP acquisitions

<table>
<thead>
<tr>
<th>Companies Involved</th>
<th>Deal Type</th>
<th>Date</th>
<th>Deal Size</th>
<th>Description of Patent Acquisition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google; Motorola</td>
<td>Company acquisition</td>
<td>8/15/11</td>
<td>$12.5B</td>
<td>Google acquired Motorola Mobility, largely motivated by Motorola’s 17,000+ patents and 7,500+ applications</td>
</tr>
<tr>
<td>Rockstar Bidco (Apple, Microsoft RIM, Sony, EMC, Ericsson); Nortel</td>
<td>Patent acquisition</td>
<td>6/30/11</td>
<td>$4.5B</td>
<td>Rockstar Bidco paid $4.5B for Nortel’s patent portfolio in a bankruptcy auction, outbidding Google in the process</td>
</tr>
<tr>
<td>Microsoft; AOL</td>
<td>Patent acquisition</td>
<td>4/9/12</td>
<td>$1.1B</td>
<td>Microsoft paid $1.1B to acquire 800+ patents and to license hundreds more from AOL; shortly thereafter, Microsoft sold a portion of the AOL patents to Facebook for $550M</td>
</tr>
<tr>
<td>Google; IBM</td>
<td>Patent acquisition</td>
<td>9/14/11</td>
<td>Undisclosed</td>
<td>Google purchased 1,000+ patents from IBM to bolster its patent portfolio at the height of the smartphone patent wars</td>
</tr>
</tbody>
</table>

Qualcomm and Microsoft profited from smartphone wars by having the right patents in the right parts of the ecosystem.

- Rose to industry leadership quickly – now among the perennial semiconductor giants like Intel.
- Succeeded in large part due to its targeted and strategic use of patents, which it skillfully licensed to the mobile device ecosystem.
- Generated $51B in patent licensing revenue since 2006, of which $44B is profit.
- Has made leveraging its IP portfolio a strategic priority – more so than many other tech companies.
- Made strategic patent acquisitions to augment its war chest of assets.
- Generated $3.4B in Android patent licensing in 2013; more than $1B of which was reportedly paid by Samsung for its sales of mobile devices.

Who will strategically use their patents in the new, high-tech automotive world?
Auto companies “playing nice”… but mobile phone makers tried that too, and patent wars broke out anyway

**Toyota:** 5,680 fuel cell patents made available for royalty-free use until 2020

“[Technology development would require] a concerted effort and unconventional collaboration between automakers, government regulators, academia and energy providers.”
- Bob Carter, SVP of automotive operations, Toyota Motor Sales USA (2015)

**Ford:** Opens portfolio of electrified vehicle technology patents (2015)

**Daimler:** “We are looking at what has been happening in consumer electronics in the last few years… I don’t know the solution yet; but sure, we don’t want to go the same way.”
Christian Hahner, head of IP and technology management, Daimler (2015)

**Hyundai:** “At Hyundai, we’re quite open with our assets – that is, we are willing to license a patent based on needs with a competitor, provided it can help our industry as well as our customers.”
Seung Cheol Lim, IP planning and strategy, Hyundai Motor Company (2015)

**Tesla:** “[We] will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology.” (2014)

**Nokia:** “Harri Mannisto, Director, Multimedia Experiences at Nokia, noted that commercial mobile TV services were on the verge of launching in several markets across the world. ‘In order for mobile TV to be a true success, we need interoperable mobile devices and systems which deliver the best experience for consumers.’” (2006)

**Motorola:** “Operators around the world are evaluating broadcast mobile TV as a compelling new service to offer their subscribers -- and interoperability will play a key role in bringing these services to market faster,” said Rob Bero, director of broadcast technologies, Motorola.” (2006)

Sources:
The state of play in 2009 for smartphones – big patent discrepancy between incumbents and new entrants

**Smartphone incumbents** held many more patents in 2009 than new players

**New entrants** lacked patents in 2009

Note: Patent counts estimated using Thomson Innovation

<table>
<thead>
<tr>
<th>Company</th>
<th>Count of US patents granted between 1994 and 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung</td>
<td>28,865</td>
</tr>
<tr>
<td>Motorola</td>
<td>14,233</td>
</tr>
<tr>
<td>Nokia</td>
<td>7,450</td>
</tr>
<tr>
<td>Apple</td>
<td>2,873</td>
</tr>
<tr>
<td>RIM/Blackberry</td>
<td>1,305</td>
</tr>
<tr>
<td>Google</td>
<td>294</td>
</tr>
<tr>
<td>HTC</td>
<td>156</td>
</tr>
<tr>
<td>LG Ericsson</td>
<td>89</td>
</tr>
</tbody>
</table>
Look familiar? The current state of play in automotive IP

**Automotive incumbents** have substantial US patent portfolios

**Emerging electric vehicle players** need to beef up the size of their portfolios to have a chance

Count of US granted patents filed since 1996

<table>
<thead>
<tr>
<th>Company</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toyota</td>
<td>16,743</td>
</tr>
<tr>
<td>Honda</td>
<td>16,005</td>
</tr>
<tr>
<td>GM</td>
<td>13,173</td>
</tr>
<tr>
<td>Ford</td>
<td>10,028</td>
</tr>
<tr>
<td>Daimler</td>
<td>5,966</td>
</tr>
<tr>
<td>Nissan</td>
<td>5,860</td>
</tr>
<tr>
<td>Hyundai</td>
<td>3,951</td>
</tr>
<tr>
<td>VW</td>
<td>3,896</td>
</tr>
<tr>
<td>Fiat</td>
<td>2,186</td>
</tr>
<tr>
<td>Chrysler</td>
<td>2,174</td>
</tr>
<tr>
<td>BMW</td>
<td></td>
</tr>
</tbody>
</table>

These companies need to aggressively file and acquire patents

<table>
<thead>
<tr>
<th>Company</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tesla</td>
<td>244</td>
</tr>
<tr>
<td>Atieva</td>
<td>50</td>
</tr>
<tr>
<td>Fisker (Karma)</td>
<td>23</td>
</tr>
<tr>
<td>Faraday Future</td>
<td>1</td>
</tr>
<tr>
<td>NextEV</td>
<td>0</td>
</tr>
<tr>
<td>LeEco Motors</td>
<td>0</td>
</tr>
<tr>
<td>Via Motors</td>
<td>0</td>
</tr>
<tr>
<td>Future Mobility (Tencent/Foxconn)</td>
<td>0</td>
</tr>
<tr>
<td>CH-Auto</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Patent counts estimated using Thomson Innovation. Includes granted US patents only and does not include pending applications or non-US equivalents.
The leading connected car patent holders come from the automotive, semiconductor, and mobile device industries.

Connected Car Patent Holdings (US granted patents + pending applications)

- General Motors: 787
- Qualcomm: 633
- Ford: 359
- Denso: 312
- LG: 289
- Samsung: 280
- Micron: 280
- Intel: 278
- IBM: 244
- AT&T: 243
- Ericsson: 216
- Sony: 179
- Marvell: 174
- Apple: 164
- Motorola: 159
- Semiconductor Energy Lab: 153
- Nokia: 148
- Microsoft: 144
- Google: 133
- Hyundai: 129

Search using Thomson Innovation: All-DWPI field text contains: (wifi OR wireless OR bluetooth) AND (car OR vehicle OR automobile), priority year 1996 or later, US apps and grants. Returned 19,153 distinct application numbers. Exemplary companies shown above.
Mobile comms, GPS, telematics, and power monitoring are examples of connected car technologies being patented.

Thomson Innovation “Themescape” map above (originally developed by STG founding partner, Kevin Rivette) clusters patents by the similarity of words in the patents. Mounds represent high concentrations of patents. Colored dots represent patents held by the companies specified above. The patents represented include 19,153 documents related to connected car, using the search described on the previous page.
Electronics companies – not just automotive companies – hold electric vehicle patents

**Electric Vehicle Patent Holdings (US granted patents + pending applications)**

- **Toyota**: 2,075
- **Ford**: 1,431
- **Hyundai**: 1,167
- **General Motors**: 994
- **LG**: 772
- **Samsung**: 754
- **Honda**: 693
- **Hitachi**: 638
- **Nissan**: 597
- **Panasonic**: 515
- **Mitsubishi**: 491
- **Denso**: 480
- **Yazaki**: 434
- **Bosch**: 369
- **Sanyo Electric**: 276
- **Tesla**: 204
- **Sony**: 203
- **Toshiba**: 182
- **Matsushita Electric**: 155
- **General Electric**: 148

Search using Thomson Innovation: All-DWPI field text contains: "electric vehicle" OR "electric car" OR "electric automobile" OR "electric drivetrain" OR "electric drive train", priority year 1996 or later, US apps and grants. Returned 23,877 distinct application numbers. Exemplary companies shown above.
Toyota and Ford dominate Tesla in electric vehicle patenting

Toyota, Ford, and Tesla are shown on the Thomson Innovation "Themescape" map above (originally developed by STG founding partner, Kevin Rivette) clusters patents by the similarity of words in the patents. Mounds represent high concentrations of patents. Colored dots represent patents held by the companies specified above. The patents represented include 23,877 documents related to electric vehicles, using the search described on the previous page.

- Ford concentrated in electric/hybrid engines
- Tesla focused mainly on batteries
- Toyota

Technology ownership battles
Google learned its lesson from the smartphone wars – now it is filing patents like crazy in auto

### Self-driving/Autonomous Vehicle Patent Holdings (US granted patents + pending applications)

- **Google**: 201
- **Ford**: 106
- **General Motors**: 96
- **Honeywell**: 72
- **Lockheed**: 69
- **Boeing**: 69
- **Toyota**: 60
- **US Navy**: 55
- **iRobot Corp**: 51
- **Honda**: 42
- **Deere**: 39
- **Caterpillar**: 36
- **Korea Electronics Telecomm**: 35
- **Volkswagen**: 33
- **Bosch**: 31
- **Raytheon**: 30
- **BAE Systems**: 30
- **Symbolic**: 28
- **Volvo**: 27
- **CGG Services**: 26

Search using Thomson Innovation: All-DWPI field text contains: (autonomous OR self-driving OR "self driving" OR driverless) AND (vehicle OR vehicles OR car OR cars OR automobile OR automobiles), priority year 1996 or later, US apps and grants. Returned 3,774 distinct application numbers. Exemplary companies shown above.
Google’s patenting in autonomous driving is focusing on software and object detection.

Google has a concentration of autonomous vehicle software patents.

IBM has a concentration of autonomous vehicle software patents.

Google’s patents are concentrated in software and object detection.

Auto OEMs lead the way on patenting physical systems of self-driving vehicles.

Thomson Innovation “Themescape” map above (originally developed by STG founding partner, Kevin Rivette) clusters patents by the similarity of words in the patents. Mounds represent high concentrations of patents. Colored dots represent patents held by the companies specified above. The patents represented include 3,774 documents related to autonomous vehicles, using the search described on the previous page.
# Examples of Google’s autonomous vehicle patents

<table>
<thead>
<tr>
<th>Patent #</th>
<th>Title</th>
<th>Description</th>
<th>Filing year</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>9196164</td>
<td>Pedestrian notifications</td>
<td>Notifying a pedestrian of the intent of a self-driving vehicle</td>
<td>2012</td>
<td><img src="image" alt="Figure 6A" /></td>
</tr>
<tr>
<td>9123152</td>
<td>Map reports from vehicles in the field</td>
<td>Collecting image data to create a map for a vehicle</td>
<td>2012</td>
<td><img src="image" alt="Figure 6B" /></td>
</tr>
<tr>
<td>9132840</td>
<td>User interface for displaying internal state of autonomous driving system</td>
<td>Method for selecting images for display on display apparatus of vehicle</td>
<td>2010</td>
<td><img src="image" alt="Figure 2" /></td>
</tr>
</tbody>
</table>
Uber dominates ride sharing patenting

Will Uber leverage its IP position to advance its business objectives?

Ride-sharing patent holdings

- **Uber**: 180
- **Sidecar**: 12
- **Lyft**: 2
- **DiDi**: 0

- **US Granted Patents**
- **US Pending Applications**
- **International Pending Applications**
- **International Granted Patents**
- **WIPO Pending Applications**

Sidecar purchased by GM on Jan 18, 2016. Its lone US granted patent played a significant role in the acquisition.

Uber patents cover geolocation, route optimization, payment methods, on-demand transport services, navigation, and other ride sharing systems.
Additional technology and automotive companies are patenting in the ride sharing space – example patents

<table>
<thead>
<tr>
<th>Company</th>
<th>Patent #</th>
<th>Title</th>
<th>Description</th>
<th>Filing year</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>facebook</strong></td>
<td>20160026936 (pending)</td>
<td>Event-based ridesharing</td>
<td>A system allowing users to RSVP to an event and say whether the user is willing to take passengers to that event</td>
<td>2014</td>
<td><img src="image" alt="Figure" /></td>
</tr>
<tr>
<td><strong>Apple</strong></td>
<td>20140082069 (pending)</td>
<td>Automated coordination of ride sharing between members of social group</td>
<td>Allows individuals to propose and accept transportation routes for ride sharing with friends</td>
<td>2012</td>
<td><img src="image" alt="Figure" /></td>
</tr>
<tr>
<td><strong>parc®, A Xerox Company</strong></td>
<td>8036824 (issued)</td>
<td>System and method for setting a rideshare transaction fee</td>
<td>Can modify fee en route depending on real-time demand for ride sharing services</td>
<td>2011</td>
<td><img src="image" alt="Figure" /></td>
</tr>
<tr>
<td><strong>GM</strong></td>
<td>8688532 (issued)</td>
<td>Real-time ride share system</td>
<td>Matches driver and rider based on telematics and relays a background check on the rider to the driver</td>
<td>2009</td>
<td><img src="image" alt="Figure" /></td>
</tr>
</tbody>
</table>
Other tech cos are focusing on partnerships in automotive

- Amazon and Ford are working together on a connected car-smart home interface
- Amazon’s Echo and Alexa home automation services could connect with a connected car
- For example, a user could tell Alexa to start and warm the user’s vehicle
- Example shown at CES in 2016:
  "The command 'Alexa, ask my Ford for the charge status of my C-Max' spoken to the cylindrical tower was met with a robotic response communicating the current battery level of the plug-in hybrid and the estimated range."
- Microsoft has partnered with automakers Toyota, Ford, Volvo, Nissan, and others, as well as connected car specialist Harman
- In a blog post, Microsoft executive vice president for business development said:
  "In the near future, the car will be connected to the Internet, as well as to other cars, your mobile phone and your home computer. The car becomes a companion and an assistant to your digital life. And so our strategy is to be the ultimate platform for all intelligent cars."
- Microsoft is attempting to find safe ways to integrate Office 365 to the road
- In 2016, Hyundai announced a partnership with Cisco for connected car services
- The deal received senior-level attention: Hyundai Vice Chairman Chung Eui-sun met Cisco Chief Executive Chuck Robbins, where they came to an agreement to co-develop vehicle technology
- The partnership also aims to make communication between car systems more effective with potential autonomous car applications
- Hyundai has stated it wants its cars to be “high-performing computers on wheels"
Use IP to your advantage – a history lesson from GE, which forced MHI out of the US wind turbine market using its patents

- **February 2008**: GE files for cease-and-desist order to prevent MHI turbine import.
- **January 2010**: ITC ruled against GE; GE is appealed this ruling.
- **January 2010**: Two weeks after ITC ruling, GE announced that MHI wind turbines infringed two other GE patents.
- **May 2012**: MHI filed an antitrust lawsuit against GE, which federal judge stayed in August 2010.
  - MHI claimed GE used "sham lawsuits" as a marketing tool against MHI.
  - Damages could exceed $1B.

- **March 2012**: Fed circuit partially overturned the ITC’s ruling on threshold req’mnt.
- **March 2010**: MHI is ordered to pay $170mm in damages to GE.
  - MHI appealed, challenging validity of patents in suit.
- **March 2012**: Court dismissed GE’s claims of infringement by MHI on a second patent related to turbine base design from the Jan 2010 lawsuit.
- **July 2012**: USDC granted GE’s motion for summary judgment, essentially dismissing MHI case.


MHI suspends US turbine sales.
P&G and Kimberly Clark used their patents to force new entrant Paragon out of the diaper market

Paragon Trade Brands P&L Metrics

- Operating Income ($M)
- Net Income ($M)

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Income</th>
<th>Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>43</td>
<td>25</td>
</tr>
<tr>
<td>1995</td>
<td>7</td>
<td>-3</td>
</tr>
<tr>
<td>1996</td>
<td>36</td>
<td>21</td>
</tr>
<tr>
<td>1997</td>
<td>26</td>
<td>-213</td>
</tr>
<tr>
<td>1998</td>
<td>38</td>
<td>-65</td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td>-28</td>
</tr>
</tbody>
</table>

Kodak’s attempt to enter the instant camera business was thwarted by poor IP strategy

- Polaroid owned instant camera market
  - Polaroid’s instant camera sales had exploded to the point where they represented 15% of all camera purchases in the US.
  - Polaroid was “fanatical about surrounding its products with patents.”

- Kodak sought to enter the instant camera business
  - Kodak launched a renewed all-out research effort “Project 130” to develop instant cameras and films.
  - Kodak hires New York law firm to advise on patent matters who issued written instructions to Kodak technical staff that they “should not be constrained by what an individual feels is potential patent infringement.”

- Kodak launches instant camera/Polaroid files patent suit
  - Kodak launched its new line of instant cameras and films along with the largest advertising campaign in the history of the consumer photo business.
  - One week later, Polaroid filed suit against Kodak for infringing 7 of its instant photography patents.

- Kodak ordered to pay $1B in damages
  - Total cost to Kodak – $925M in damages. Kodak forced to shut down its $1.5 billion manufacturing plant, lay off 700 workers, and spent nearly $500M to buy back 16M instant cameras it had sold to consumers between 1976 and 1985.
  - Legal fees during the 14 year court battle amounted to $100M

Source: Kevin Rivette (STG founding partner), Rembrandts in the Attic
TomTom’s US market entry was met with a slew of patent lawsuits, but they successfully fought off the attacks

Dutch company TomTom entered the US GPS market with no US granted patents.

TomTom CEO Harold Goddijn - “In 2005 we spent more money on patent disputes... than all our technology development put together.”

Aug - National Products sued TomTom

Feb - Garmin filed patent suit against TomTom, (5 patents related to ease-of-use features and the inner workings of its in-car devices).

TomTom countersued, using patents recently purchased from Horizon Navigation.

April - Mobile Traffic Systems Corp sued TomTom and others for patent infringement

April - United States District Judge ruled either invalid or not infringed, all five patents brought in Garmin’s suit against TomTom.

Undisclosed settlement reached between Garmin and TomTom

June - National Products suit settled outside of court

March - Mobile Traffic Systems Corp suit settled out of court

TomTom’s success was built on an aggressive defense and a patent acquisition strategy that enabled them to go on offense.

TomTom Granted and Acquired Patents by Publication or Reassignment/Acquisition Date

*Notes: Acquisition was announced June 2007, though at least three of the Horizon patents used in a countersuit against Garmin changed ownership to TomTom in mid 2006.

Source: Thomson Innovation, STG Analysis
As an automotive incumbent, what’s my next move?

- It’s nice that you want to avoid patent wars, but they are inevitable – don’t bury your head in sand
- Don’t assume that new market entrants can’t eat away at your market share – just ask Motorola and Nokia
- The time to act is now – before new entrants gain momentum – and you can be like Qualcomm and Microsoft which have generated billions in patent royalties from smartphone manufacturers

### Call to action

- Make sure you have the right patent assets
  - Figure out where you should be filing your patents based on where the industry is heading
  - Identify high-value patent portfolios and acquire the relevant ones
- Leverage your patent position to encourage favorable partnerships and supply chain relationships
  - Induce partnerships by demonstrating the relative strength of your IP
  - Lock in favorable royalty rates now before it’s too late, and benefit from the revenue streams
- File patent infringement lawsuits against competitors that are unwilling to negotiate
  - Demonstrate to new entrants’ investors that they have serious IP risks and disturb their ability to raise money
  - Limit competitors’ ability to fully access their supply chains

### Action agenda
As a new automotive entrant, what’s my next move?

- Apple and Blackberry/RIM have demonstrated that it’s possible to take an industry by storm

Call to action

- But the incumbent auto companies have many more patents than you do
- Don’t assume that they won’t use their IP to disrupt your business and attempt to keep you out of the market

Action agenda

- Make sure you’re aggressively filing patents
  - The technologies that you file on need to be thought through carefully
  - Your filings need to be in the appropriate jurisdictions around the world
- Acquire substantial patent portfolios from others in the industry
  - It’s going to be hard to level the playing field just by filing your own patents, so you should be proactively buying assets
- Once your IP position is more equal to that of incumbents, cut balanced and favorable deals with them
  - Form partnerships with better terms
  - Negotiate favorable cross-licensing deals
Rise of non-practicing entity ("NPE") litigation

Technology ownership battles
Whether incumbent auto companies want it or not, auto patent conflict is almost certainly ahead – impacting product launches and profit pools

Rise of non-practicing entity ("NPE") litigation
Plan on getting sued by NPEs for patent infringement, but in the current environment it isn’t quite as scary as you might think

Development of new technology standards
Standards and the associated patent pools will become even more critical, and if you don’t handle them properly you may lose your competitive advantage

Emergence of China
Chinese companies are emerging in automotive, but they will struggle to enter Western markets if they don’t acquire IP rights in the necessary geographies
What is a non-practicing entity (“NPE”)?

- The definition depends on who you ask
  - Some use “NPE” and “patent troll” interchangeably
  - Others don’t view NPEs as negatively and instead view them as patent value enablers

- An NPE, broadly defined, is any group that enforces patent rights, but barely, if at all, practices the patented invention. Examples include:
  - Assertion-focused entities that acquire patents, enforce them on behalf of the original owner, and often share the proceeds with the original owner (i.e., outsourced patent licensing)
  - Universities that have filed patents to protect their inventions
  - Innovative companies that are struggling to break into a product market, but have invested in patent protection and believe their patents are being infringed
  - R&D shops that don’t have the wherewithal or desire to commercialize the technology
  - Large corporations with patented inventions non-core to their primary business, but want to generate revenue from those patent assets

- NPEs attempt to generate patent licensing revenue from alleged infringers of their patents – often through litigation
  - Without litigation, licensing discussions can be slow and licensees have little incentive to pay for a license
  - NPEs typically file patent infringement lawsuits in an effort to induce expeditious settlements and royalty payments
Rather than viewing NPEs purely as litigation threats, auto companies should use them to their advantage

**Strategy 1:**
Acquire patents at fire-sale prices from NPEs that are desperate to sell patent portfolios in exchange for quick cash.

**Strategy 2:**
Settle with NPEs early and at favorable rates; give yourself a cost advantage relative to competitors who will have to pay more.

**Strategy 3:**
Partner with savvy NPEs to monetize your own patent assets.

Your company is now in a position of strength and has leverage over competitors.

Your company no longer has to worry about the NPE while it threatens competitors.

Your company can both bolster revenue and go on the offensive against competitors.
NPEs have made headlines – high profile cases

<table>
<thead>
<tr>
<th>NPE</th>
<th>Accused infringer</th>
<th>Size of settlement or jury verdict</th>
<th>Settlement or jury verdict date</th>
<th>Settlement reached?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carnegie Mellon University</td>
<td>Marvell</td>
<td>$750M</td>
<td>2/17/16</td>
<td>Settled</td>
</tr>
<tr>
<td>SmartFlash</td>
<td>Apple</td>
<td>$533M</td>
<td>2/24/15</td>
<td>Not settled</td>
</tr>
<tr>
<td>VirnetX</td>
<td>Apple</td>
<td>$368M</td>
<td>11/7/12</td>
<td>Not settled</td>
</tr>
<tr>
<td>WARF Wisconsin Alumni Research Foundation</td>
<td>Apple</td>
<td>$234M</td>
<td>10/19/15</td>
<td>Not settled</td>
</tr>
<tr>
<td>ParkerVision</td>
<td>Qualcomm</td>
<td>$173M</td>
<td>10/17/13</td>
<td>Not settled</td>
</tr>
</tbody>
</table>
NPEs are explicitly talking about auto as a growth area...

"We are pleased to have acquired the rights to this portfolio as it demonstrates our growing strength and opportunity in the automotive sector."
- Paul Ryan, former CEO, 5/2/2013 in a press release announcing an auto patent portfolio acquisition

"It’s an important time in the transportation industry as the consumer depends on technology to stay connected with their professional and social networks. This dependency is driving consumer electronics, connectivity, and information technologies rapidly to converge in automotive and other transportation industries. Automotive companies are finding the need to maintain access to a wide array of relevant patents, not traditionally available in the automotive space."
- Adriane Brown, President and COO, 2/27/15 in a press release announcing a licensing deal with Ford

"This is our first acquisition in the automotive market, a market in which we see significant opportunity."
- Jim Skippen, CEO, 4/1/2014 in a press release announcing an auto patent portfolio acquisition

Sources: http://www.reuters.com/article/idUSnCCN84kYVD+1c7+MKW20140401
...they’re making the patent acquisitions to prove it...

<table>
<thead>
<tr>
<th>NPE</th>
<th>Date</th>
<th>Automotive Patent Purchases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wi-LAN</td>
<td>Apr. 2014</td>
<td>A Wi-LAN subsidiary acquired an automotive patent portfolio, according to Wi-LAN’s CEO: “This is our first acquisition in the automotive market, a market in which we see significant opportunity.”</td>
</tr>
<tr>
<td>Marathon</td>
<td>Dec. 2013</td>
<td>Marathon subsidiary Signal IP acquired car safety patents from Delphi in late 2013 and used them to sue BMW, Fiat, Honda, Jaguar-Land Rover, Kia, Mazda, Mercedes-Benz, Mitsubishi, Nissan, Porsche, Subaru, Volkswagen, Volvo, and Ford in April 2014</td>
</tr>
<tr>
<td>Acacia</td>
<td>Mar. 2013</td>
<td>Acacia acquired an undisclosed number of display patents from Rambus. Acacia has asserted the portfolio against many automobile manufacturers</td>
</tr>
<tr>
<td>Acacia</td>
<td>Feb. 2012</td>
<td>Acacia acquired 300+ patents from Automotive Technology Industries in February 2012 and created subsidiary American Vehicular Sciences to assert them</td>
</tr>
</tbody>
</table>

[http://www.reuters.com/article/idUSnCCN84kYVD+1c7+MKW20140401](http://www.reuters.com/article/idUSnCCN84kYVD+1c7+MKW20140401)
...and they’re responsible for the majority of patent infringement lawsuits filed in the automotive space.

Count of Automotive Patent Infringement Lawsuits per Year
(color represents type of entity filing the lawsuit)

- Operating Company
- NPE (Small Company)
- NPE (Individual)
- NPE (Patent Assertion Entity)

They are suing primarily on safety and car multimedia IP

Automotive NPE Litigation by Technology Area

Which NPEs have been the most litigious in automotive?

<table>
<thead>
<tr>
<th>NPE Name</th>
<th>Count of Lawsuits Filed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acacia (American Vehicular Sciences)</td>
<td>48</td>
</tr>
<tr>
<td>Beacon Navigation</td>
<td>36</td>
</tr>
<tr>
<td>Cruise Control Technologies</td>
<td>28</td>
</tr>
<tr>
<td>Peter Wingard (individual)</td>
<td>22</td>
</tr>
<tr>
<td>Delaware Radio Technologies</td>
<td>17</td>
</tr>
<tr>
<td>Norman IP Holdings</td>
<td>17</td>
</tr>
<tr>
<td>Marathon (Signal IP)</td>
<td>17</td>
</tr>
<tr>
<td>NovelPoint Tracking</td>
<td>13</td>
</tr>
<tr>
<td>Affinity Labs of Texas</td>
<td>12</td>
</tr>
<tr>
<td>Joao Control &amp; Monitoring Systems</td>
<td>12</td>
</tr>
</tbody>
</table>

However, NPEs aren’t as scary as you think

Third parties can challenge a patent’s validity/enforceability

- The America Invents Act (2011) created proceedings such as inter partes reviews ("IPRs"), which allow third parties to challenge a patent’s validity
- If the challenger wins, the patent is invalidated (i.e., the ability to enforce the patent is revoked)

Many granted software patents are no longer enforceable

- The US Supreme Court’s *Alice v. CLS Bank* (2014) decision allows third parties to challenge the enforceability of existing, granted software patents
- Post-*Alice*, third parties are often successful in killing software patents that the Patent Office previously allowed under different rules

It’s difficult to block an infringer’s product

- A four-factor test must be met to block an infringer’s product (district court)
- At the International Trade Commission, a “domestic industry” requirement must be met in order to block an infringer’s product

Jury verdicts can be overturned

- Even if a federal jury finds infringement/damages, the ruling doesn’t necessarily stick
- District court judges, appellate court judges, and Supreme Court judges can overrule the decision – and it’s happened a number of times recently
Judges have overturned some of the headline NPE jury verdicts

<table>
<thead>
<tr>
<th>NPE</th>
<th>Accused infringer</th>
<th>Size of settlement or jury verdict</th>
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<td>VirnetX</td>
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<td>Qualcomm</td>
<td>$173M</td>
<td>10/17/13</td>
<td>Not settled</td>
</tr>
</tbody>
</table>

Note: VirnetX’s jury verdict was wiped out, but a new trial was ordered in which it won a new, $625M jury verdict. That verdict is now being appealed.
Auto companies are taking advantage of the new rules

<table>
<thead>
<tr>
<th>Auto Company</th>
<th>Number of Inter Partes Reviews (&quot;IPRs&quot;) Filed</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRW Automotive</td>
<td>50</td>
</tr>
<tr>
<td>Ford</td>
<td>35</td>
</tr>
<tr>
<td>Toyota</td>
<td>35</td>
</tr>
<tr>
<td>Mercedes-Benz</td>
<td>19</td>
</tr>
<tr>
<td>Honda</td>
<td>16</td>
</tr>
<tr>
<td>Volkswagen</td>
<td>13</td>
</tr>
<tr>
<td>Chrysler</td>
<td>11</td>
</tr>
<tr>
<td>Hyundai</td>
<td>11</td>
</tr>
<tr>
<td>Nissan</td>
<td>7</td>
</tr>
<tr>
<td>Bosch</td>
<td>7</td>
</tr>
</tbody>
</table>

For example, Ford has filed IPRs against Paice LLC, an automotive NPE inventor of hybrid vehicle technology which experienced success before IPRs existed.

IPRs are an effective tool to nullify NPEs’ patents, and at the very least can be used to delay patent infringement lawsuits and drive up NPEs’ costs.

Auto companies are also taking defensive measures

- **RPX** is a defensive patent aggregator that protects members against NPEs
- In February 2015, Ford became the first automotive company to sign up with RPX
- RPX announced a contract with an unnamed second automotive member in Q4 2015

- **Google’s License-on-Transfer network** formed as a defensive coalition to counter unreasonable patent litigation
- Ford, Mazda, Hyundai, and Kia are automotive members

- **Allied Security Trust**
  - Patent holding company that defends members against NPE litigation
  - AST’s 29 members include Ford and Honda as well as tech companies such as Sony, Intel, IBM, and Microsoft

- **Unified Patents**
  - Google-backed defensive patent service that monitors and defends against NPE litigation
  - Established a special “automotive zone” in June 2015, which currently has 20+ members

Some NPEs are moving out of the business

<table>
<thead>
<tr>
<th>NPE</th>
<th>Announcement date</th>
<th>Business shift away from IP licensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unwired Planet™</td>
<td>April 2016</td>
<td>Unwired planet is selling its IP licensing business to Optis UP Holdings for $40M in cash</td>
</tr>
<tr>
<td>Marathon Patent Group</td>
<td>March 2016</td>
<td>Marathon Patent Group is launching an IP commercialization platform, intending to create product company spin-offs rather than relying solely on IP licensing; its first platform is with 3D Nanocolor Corp.</td>
</tr>
<tr>
<td>Pendrell’s</td>
<td>March 2016</td>
<td>Pendrell’s CEO Lee Mikles stated that the company is “shifting its primary focus to business opportunities that provide more reliable cash flow” than IP licensing</td>
</tr>
<tr>
<td>DSS</td>
<td>February 2016</td>
<td>DSS is reorganizing to provide more support to its Packaging and Printed Products, Digital Solutions, and Plastics divisions in order to grow its non-IP licensing business areas</td>
</tr>
<tr>
<td>Vringo</td>
<td>October 2015</td>
<td>Once an exclusively IP licensing business, Vringo acquired two product companies: fliCharge, a wire-free charging technology company, and Group Mobile, a supplier of rugged computers, mobile devices and accessories</td>
</tr>
<tr>
<td>ITUS Corporation</td>
<td>June 2015</td>
<td>Patent licensing company ITUS (formerly Copytele) formed a new subsidiary, Anixa, for the purpose of developing and marketing non-invasive, early cancer screening tests</td>
</tr>
</tbody>
</table>
However, beware of NPE enforcement in Europe because of its patent-friendly court system (Germany in particular)

<table>
<thead>
<tr>
<th>NPE</th>
<th>Defendant(s)</th>
<th>Outcome in German Court</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acacia</td>
<td>Deustche Telekom/HTC</td>
<td>Acacia granted injunction by German court on 11/27/15, banning HTC smartphones from being sold in the country</td>
</tr>
<tr>
<td>Vringo</td>
<td>ZTE</td>
<td>Vringo won an injunction in Germany (and in other jurisdictions around the world), but ultimately agreed to a global settlement with ZTE for $21.5M on 12/5/15</td>
</tr>
<tr>
<td>Stryker</td>
<td>Stryker</td>
<td>Stryker found to infringe and injunction against infringing medical devices enforced in December 2014</td>
</tr>
<tr>
<td>Facebook, Yahoo, Tumblr, Instagram, Pinterest, Twitter</td>
<td>Facebook, Yahoo, Tumblr, Instagram, Pinterest, Twitter</td>
<td>Yahoo and Pinterest found to infringe in 2016; injunction issued</td>
</tr>
</tbody>
</table>

Furthermore, The Unified Patent Court (potentially up and running in 2017) would allow NPEs to win injunctions against infringing products across all of Europe in one fell swoop.
As an automotive player, what’s my next move?

Call to action

- The NPEs are here and they have a target on the back of the automotive industry
- Legal and regulatory changes are making life more difficult for NPEs
- NPEs are looking for any way they can to monetize their assets

Action agenda

- Defend yourselves by taking advantage of legal and regulatory changes
  - File inter partes review petitions against NPEs’ patents, force them to spend money defending them, and delay lawsuits for as long as possible
  - Introduce *Alice* challenges against patents that are related to software and attempt to invalidate them
- Coopt NPEs
  - Acquire strong patents from NPEs that are looking to unload assets and quickly raise some cash, and negotiate to buy at distressed prices
  - Settle early at favorable rates (most favored nation or better) and raise the relative costs for competitors
  - Partner with NPEs to monetize your own patent assets
Development of new technology standards

1. Technology ownership battles
   Whether incumbent auto companies want it or not, auto patent conflict is almost certainly ahead – impacting product launches and profit pools.

2. Rise of non-practicing entity (“NPE”) litigation
   Plan on getting sued by NPEs for patent infringement, but in the current environment it isn’t quite as scary as you might think.

3. Development of new technology standards
   Standards and the associated patent pools will become even more critical, and if you don’t handle them properly you may lose your competitive advantage.

4. Emergence of China
   Chinese companies are emerging in automotive, but they will struggle to enter Western markets if they don’t acquire IP rights in the necessary geographies.
What is a standards body? What is a patent pool?

**Standards body**
- A body responsible for setting an industry-wide standard for practicing a technology
- Some standards are government mandated and others are set by industry players
- Examples include: IEEE standards for wireless communication, ATSC for broadcasting, and HEVC for video compression

**Patent pool**
- Patents that cover inventions used by the standard are necessarily used (infringed) by any party that uses the standard
- Patents declared “essential” to the standard must be licensed to infringers on fair, reasonable, and non-discriminatory terms (“FRAND”)
- Standard essential patent owners sometimes hand these patents to a “pool”, which acts as an outsourced patent licensing arm
Emerging automotive standards require multi-layered strategy

Key question: what should remain proprietary?

<table>
<thead>
<tr>
<th>Standards necessary</th>
<th>Description</th>
<th>Possible automotive examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standardization of certain features essential to development of a product category</td>
<td>Physical connections (e.g., battery charging infrastructure), virtual connections (e.g., autonomous vehicle communication protocols), OBD/OBD-II</td>
</tr>
</tbody>
</table>
| Strategic use of standards| Selectively seek standardization – and thereby commoditization – of portions of the technology stack or product architecture, e.g.,  
                        | • Drive down cost of specific BOM items  
                        | • Level playing field in areas not expected to be an advantage | Going forward, priorities depend on strategy and position in the value chain. For some auto OEMs, standardization of battery systems or entertainment systems would be advantageous, while others should seek to keep these proprietary |
| Avoid standardization – protect advantage | Core differentiating technologies need to be proprietary and protected | Historically, less tech standardization in auto, but some, e.g., tire pressure monitoring systems (TPMS) and consumables |

<table>
<thead>
<tr>
<th>Description</th>
<th>Possible automotive examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core differentiating technologies need to be proprietary and protected</td>
<td>User interface (“look and feel”)</td>
</tr>
<tr>
<td>Physical connections (e.g., battery charging infrastructure)</td>
<td>Advanced drivetrains</td>
</tr>
<tr>
<td>virtual connections (e.g., autonomous vehicle communication protocols)</td>
<td></td>
</tr>
<tr>
<td>OBD/OBD-II</td>
<td></td>
</tr>
</tbody>
</table>

Advanced technology standards...
There are already a number of auto-focused standards groups

- **SAE International**
  - Founded in 1905, the Society of Automotive Engineers is now working to develop connected car standards
  - Published more than 1,600 standards recommendations for nearly every system in road-going vehicles
  - Beginning to develop standards for connected cars on vehicle to infrastructure (V2I) and vehicle to vehicle (V2V) communication

- **GENIVI Alliance**
  - Nonprofit industry alliance founded in 2009
  - Aims to drive adoption of open-source In-Vehicle Infotainment (IVI) software
  - Cars with GENIVI solutions are currently on the road in North America, South America, Europe, and Asia

- **Open Automotive Alliance**
  - Founded by Audi, GM, Google, Honda, Hyundai, and NVIDIA in January 2014
  - Goal is to bring the Android platform to cars
  - Android Auto has already been developed and is present in cars on the road
SAE, for example, has many categories of tech standards

- Automotive standards have been around essentially as long as automobiles themselves; SAE founded in 1905
- SAE has over 10,000 standards in its database
- Its standards help ensure safety, quality, and interoperability

**A small sample of SAE automotive standard categories**

- Environment
- Human Factors and Ergonomics
- Maintenance and Aftermarket
- Manufacturing
- Engines
- Power and Propulsion
- Safety
- Transportation Systems
- Chassis
- Performance Tests
- On-board Energy Sources
- Engine Cooling Systems
- Lubricants
- Fuel Systems
- Connecters and Terminals

Source: http://standards.sae.org/automotive/
Some automotive players are getting involved in “connected car” standards bodies

<table>
<thead>
<tr>
<th>Manufacturers</th>
<th>Open Automotive Alliance</th>
<th>Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMW, Nissan, Daimler, Renault, Volvo, Honda, Hyundai, Jaguar, John Deere</td>
<td>Audi, Chrysler, Ford, GM, Honda, Hyundai, Kia, Mazda, VW, Volvo, Mitsubishi</td>
<td>Bosch, Continental, Delphi, Denso, Ericsson</td>
</tr>
<tr>
<td>Bosch, Continental, Delphi, Denso, Ericsson</td>
<td>Denso, Continental, Delphi</td>
<td>Bosch, Continental, Delphi, Denso,</td>
</tr>
<tr>
<td>Intel, Qualcomm, Micron, NVIDIA, ARM, Texas Instruments</td>
<td>Google, LG, NVIDIA, Panasonic</td>
<td>Google, LG, NVIDIA, Panasonic</td>
</tr>
<tr>
<td>Mentor Automotive, Harman, Visteon, Desay SV</td>
<td>Parrot Automotive, CloudCar, Harman, Visteon</td>
<td>Mentor Automotive, Harman, Visteon</td>
</tr>
</tbody>
</table>

Source: Standards body publications
The Connected Car:
The car as a wireless device, computer, and entertainment system

**Potentially important technologies**
- Car/mobile phone interfaces
- In-car wifi and internet standards
- Smart home integration (i.e. Ford and Amazon’s Alexa)
- V2X and 5G communication

The Electric Car
The car that is powered electrically

**Potentially important technologies**
- Universal charging stations
- Battery/charger interfaces, communicating with charging station
- Battery communication with connected car

The Self-Driving Car
The car that drives autonomously

**Potentially important technologies**
- Autonomous vehicles communicating with each other (V2V)
- Communicating with outside entities and infrastructure (V2I)
- LiDAR

The Shared Car
The car as a service

**Potentially important technologies**
- Car-as-service universal interface with mobile phone/smart home
- Map and navigational standards across cars used for ride-sharing
- Combination with autonomous vehicles
There are a number of options to monetize standard essential patents ("SEPs")

Example options – not comprehensive

**License portfolio independently**

1. Develop own licensing program
   - Internal resources identify and pursue infringing parties

2. Use a licensing agent
   - Contract with third party to execute licenses, typically on a commission-driven basis

**License portfolio jointly with others**

3. Monetization partnership
   - Two or more parties negotiate specific terms for joint patent monetization. Not a pool, which by definition is open to all comers

4. Create or join a patent pool
   - Using established manager (e.g., MPEG-LA) or independently

**Outright exit**

5. Asset sale
   - Auction assets to high bidder

No single “right answer” to cover all circumstances – situation-dependent
Patent pools have generated significant returns for investors

<table>
<thead>
<tr>
<th>Pool</th>
<th>Years</th>
<th>Technology</th>
<th>Model description</th>
<th>Patent pool revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPEG-2</td>
<td>1997-2019</td>
<td>Video compression</td>
<td>Used proprietary revenue data; estimates available from public sources</td>
<td>$18.1B  $1,100M</td>
</tr>
<tr>
<td>(MPEG LA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| AAC         | 2000-? | Audio compression | Financial analysis of Via Licensing  
Device modeling                                                                                                                                                                                                      | $13.5B  $880M       |
| (Via)       |        |                   |                                                                                                                                                                                                                   |                     |
| HEVC        | 2015-2030 | Video compression | Used proprietary internal model of HEVC-addressable devices  
(projection only)                                                                                                                                                                                                   | $6.7B  $550M (projection only) |
| (MPEG LA)   |        |                   |                                                                                                                                                                                                                   |                     |
| MPEG-4      | 2001-2017 | A/V compression | Applied rate card to historic and forecast sales of relevant CE devices                                                                                                                                              | $4.5B  $510M        |
| (MPEG LA)   |        |                   |                                                                                                                                                                                                                   |                     |
| ATSC        | 2004-2021 | OTA broadcast    | Modeled ATSC device sales across TVs, STBs, and other applications                                                                                                                                                  | $3.1B  $220M        |
| standard    |        | standard         |                                                                                                                                                                                                                   |                     |

Note: STG estimates for all categories

*75th percentile year
Warning: watch out for standards body commitments

Nokia, previously a mobile phone leader, committed some of its early and fundamental wireless communication patents to the European Telecommunications Standards Institute (ETSI).

Nokia then advocated an industry-wide commitment that royalty rates for 3G technology should not exceed 5% cumulatively.

Their hope was that these rates would allow for technology proliferation, and that they could win by having the best supply chain.

What they didn’t anticipate was that mobile device companies would figure out better supply chains.

And making matters worse, they were then unable to fully leverage their patents to thwart competitors’ growth because of the 5% royalty cap they endorsed.

Committing patents to a standards body can generate royalties, but it can also limit your ability to enforce your patents and keep competitors out.
As an automotive player, what’s my next move?

- Technologies that were historically central to the computer and consumer electronics industries are now being integrated into cars.

**Call to action**

- There will be a need for many new types of technology standards for the automotive industry as it evolves technologically.

- With the emergence of new standards will be the need for patent pools (as we’ve seen in the electronics industry).

**Action agenda**

- Get involved with standards bodies early on
  - Influence the direction of the technology to benefit your business
  - Shape the adoption of new technology

- Build an IP portfolio that allows you to benefit from standards
  - Carefully file patents around the anticipated direction of the technology standards
  - Acquire patents from other companies that relate to key technology areas

- Monetize your standard essential patents – either through patent pools or other methods
  - Form/join a patent pool and negotiate favorable economics based on the strength of your IP
  - License bilaterally (alone or through an agent) or even consider a sale of non-core IP
Emergence of China

1. Technology ownership battles
   Whether incumbent auto companies want it or not, auto patent conflict is almost certainly ahead – impacting product launches and profit pools

2. Rise of non-practicing entity (“NPE”) litigation
   Plan on getting sued by NPEs for patent infringement, but in the current environment it isn’t quite as scary as you might think

3. Development of new technology standards
   Standards and the associated patent pools will become even more critical, and if you don’t handle them properly you may lose your competitive advantage

Emergence of China

4. Chinese companies are emerging in automotive, but they will struggle to enter Western markets if they don’t acquire IP rights in the necessary geographies
Pollution is a serious problem in China, so the nation is focused on reducing CO2 emissions via electric vehicles

- The Chinese government has allocated nearly $16B for charging facilities and other electric vehicle infrastructure

- China cut taxes on domestic purchases of “NEVs” by 50% in 2015 (“NEV” stands for New Energy Vehicles – both battery electric and plug-in hybrid vehicles)

- Any NEV purchased for commercial use is completely exempt from normal vehicle and vessel taxes

- Manufacturers of NEVs also receive generous subsidies

Sources: http://evobsession.com/1-4-china-auto-market-2015/   http://i.telegraph.co.uk/multimedia/archive/03514/china_smog_3514149b.jpg
http://www.ibtimes.com/china-increases-subsidies-energy-efficient-vehicles-it-enough-alleviate-pollution-1929627
As a result of the measures to control emissions, EV sales are dramatically increasing in China.

2015 saw ~188,700 NEVs sold in China, a roughly 223% year-on-year increase over sales in 2014.

Sources: http://evobsession.com/1-4-china-auto-market-2015/
http://www.ibtimes.com/china-increases-subsidies-energy-efficient-vehicles-it-enough-alleviate-pollution-1929627
Many electric vehicle companies are coming from China

<table>
<thead>
<tr>
<th>CH-Auto</th>
<th>Faraday Future and LeEco</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="CH-Auto" /></td>
<td><img src="image" alt="Faraday Future and LeEco" /></td>
</tr>
</tbody>
</table>
| - Electric car design firm aiming to put its first cars into production in late 2016  
  - Founded by former Beijing Jeep executive Lu Qun | - Founded by Chinese internet billionaire Jia Yueting in 2014  
  - Main bankroller LeEco, also owned by Jia Yueting, recently unveiled a separate electric car initiative |

<table>
<thead>
<tr>
<th>NextEV</th>
<th>Karma Automotive</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="NextEV" /></td>
<td><img src="image" alt="Karma Automotive" /></td>
</tr>
</tbody>
</table>
| - Headquartered in China and backed by many prominent Chinese entrepreneurs  
  - Led by CEO Padmasree Warrior, former CTO of Cisco | - Formerly Fisker Automotive, relaunching as Karma in 2016 after going into bankruptcy in 2013, originally founded in 2008  
  - Manufactures luxury hybrid and full-electric sedans |

<table>
<thead>
<tr>
<th>Atieva</th>
<th>Tesla</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Atieva" /></td>
<td><img src="image" alt="Tesla" /></td>
</tr>
</tbody>
</table>
| - Founded in 2007 by former Tesla VP  
  - Taken over by Chinese state-owned carmaker BAIC in December 2015 | - Founded in 2003, IPO in 2010  
  - Production is currently in the US, but company may build a factory in China if demand is high enough |

<table>
<thead>
<tr>
<th>Future Mobility</th>
<th>Via Motors</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Future Mobility" /></td>
<td><img src="image" alt="Via Motors" /></td>
</tr>
</tbody>
</table>
| - Started in 2016 with heavy backing from Tencent and Foxconn  
  - Hired away several of BMWs electric vehicle executives to join the team | - Spun off from engineering firm Raser Technologies in 2010  
  - Manufactures electrified trucks, vans, and other work vehicles  
  - Up-fits other OEM’s factory-new vehicles, currently just GM |
Chinese EV companies need to augment their patent estates – particularly if they want to enter the US market.

**Automotive incumbents** have substantial US patent portfolios

**Emerging electric vehicle players** need to beef up the size of their portfolios to have a chance

Count of US granted patents filed since 1996

<table>
<thead>
<tr>
<th>Company</th>
<th>Patents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toyota</td>
<td>16,743</td>
</tr>
<tr>
<td>Honda</td>
<td>16,005</td>
</tr>
<tr>
<td>GM</td>
<td>13,173</td>
</tr>
<tr>
<td>Ford</td>
<td>10,028</td>
</tr>
<tr>
<td>Daimler</td>
<td>5,966</td>
</tr>
<tr>
<td>Nissan</td>
<td>5,860</td>
</tr>
<tr>
<td>Hyundai</td>
<td>3,951</td>
</tr>
<tr>
<td>VW</td>
<td>3,896</td>
</tr>
<tr>
<td>Fiat Chrysler</td>
<td>2,186</td>
</tr>
<tr>
<td>BMW</td>
<td>2,174</td>
</tr>
</tbody>
</table>

**Note:** Patent counts estimated using Thomson Innovation. Includes granted US patents only and does not include pending applications or non-US equivalents.
Why should Chinese companies buy patents? A recent, cautionary tale from Ninebot

- Ninebot’s hoverboard products faced an ITC patent infringement complaint filed by Segway
- In order to avoid an exclusion order, Ninebot acquired Segway
- On March 16, 2016, the ITC issued a general exclusion order prohibiting the import of products infringing Segway/Ninebot’s hoverboard patent

Ninebot went from prey to predator by strategically acquiring Segway (and its IP), and in the process it gained a strategic edge over competitors

Source: http://www.iam-media.com/blog/Detail.aspx?g=d8b2de4e-21ac-46df-b0d6-4c3a7aef3b51
International expansion requires the right patent protection; just ask Xiaomi, an emerging Chinese smartphone maker.

Chinese-based Lenovo understood the need for IP when it entered the smartphone market

**Motorola Mobility Acquisition**

- On January 29, 2014, Lenovo acquired Motorola Mobility from Google
- $2.91B deal
- Google maintains ownership of majority of the Motorola Mobility patent portfolio, but Lenovo receives a license to all IP
- Lenovo also receives over 2,000 patents from the deal

**Unwired Planet Patent Acquisition**

- On March 21, 2014, Lenovo acquired a wireless patent portfolio from Unwired Planet
- $100M deal
- Deal consists of 21 patent families related to 3G and LTE
- Lenovo also gets license to Unwired Planet’s full portfolio of 2,500 issued and pending patents

But it’s not just about acquiring patent assets, it’s also about the associated cross-licenses – Lenovo gets it

- In 2004, Lenovo purchased IBM’s PC group for $1.75B
- In order to effectively expand out of China, Lenovo needed IP protection in the geographies it was expanding into
- IBM had already established cross-licenses with the major PC competitors, enabling Lenovo to operate freely in the space after the acquisition

By acquiring the cross-licenses that IBM had already established with PC competitors, Lenovo was able to enter the PC market with less concern about being sued
Everyone should be stocking up on Chinese patents

Specialized, low-cost, and fast courts
- Cost <1/10 the cost of US litigation
- Specialized IP courts
- Judges use technical advisors
- Short time from filing to trial (<1 year)

Increasingly advantageous for patentees
- High win rate (up to 75%)
- Foreign patentees win more than domestic patentees
- Validity challenges rarer than in the US and often not completed until after judgement and injunction are issued

Injunctions are awarded
- Injunctions are virtually guaranteed (95%)
- A litigation win can effectively hamper an infringer’s sales around the world because what is not sold in China is often made there

Source: Erick Robinson Law360 article China Increasing Patent Rights As US Goes The Other Way, October 22, 2015
Patent holders are winning and getting injunctions in China – and it’s not just China-based companies.

![Bar chart showing patent holder success/injunction rates in Chinese courts.](chart.png)

*when defendant is a Chinese company

### Will other Asian nations become new important IP battlegrounds as labor moves there?

**Vietnam**
- Vietnam is increasingly becoming a top outsourcing location as Chinese labor costs rise
- The Vietnamese government has been heavily involved in encouraging Vietnam’s growth as an outsourcing destination

**Indonesia**
- Indonesia is a strong candidate to take up Asian manufacturing with Chinese labor costs rising
- Large population (250 million)
- Less political strife and uncertainty than Vietnam and Thailand

**Thailand**
- The Thai government is making strides to go after more “high value” manufacturing
- Foreign direct investment in Thailand is growing both amongst western nations and fellow ASEAN nations

As an emerging Chinese EV company, what’s my next move?

- Pollution is causing China to emphasizing electric vehicles, and new automotive companies are emerging
- Relative to incumbent automotive players, these new companies lack IP
- China’s patent system is getting stronger

Call to action

- Beef up your IP portfolios ASAP
  - You’re trying to go to market quickly, so buy patents in bulk from others in the industry
  - Simultaneously, strategically file patents

Action agenda

- Think globally
  - Ensure that you have IP protection in China, where patent enforcement is becoming stronger
  - Additionally, secure protection in the US, Europe, and emerging Asian countries that are increasing manufacturing prowess (e.g., Vietnam, Indonesia, and Thailand)
As an automotive incumbent, what’s my next move?

**Call to action**
- Chinese EV companies are picking up steam
- They could develop strong positions in China and even outside of China
- But they don’t have much IP

**Action agenda**
- Leverage your existing IP position
  - Strike licensing deals with the emerging Chinese EV companies so you can profit as they grow
  - File patent infringement lawsuits against emerging Chinese EV companies to keep them out of markets
  - Induce technology partnerships with emerging Chinese EV companies as appropriate
  - Considering selling non-core IP assets to emerging players that might be allies

- Buy patents before your Chinese EV competitors do – don’t allow them to level the playing field
  - Proactively seek out assets and maintain your IP edge over the new entrants