ACTIVE SAFETY

Teach In
Elena Rosman

VICE PRESIDENT, INVESTOR RELATIONS, APTIV
Active Safety Teach In Agenda

9:35 AM  MACRO ENVIRONMENT
MARKET OUTLOOK
Xavier Mosquet | BCG

10:25 AM  APTIV
APTIV ACTIVE SAFETY
Glen De Vos | Senior VP & CTO

11:00 AM  Q&A, INTERACTION
Q&A Round Table
Glen De Vos | Senior VP & CTO
Xavier Mosquet | BCG
David Strickland | Venable

REGULATORY INSIGHTS
David Strickland | Venable

INTERACTIVE LUNCH
Forward Looking Statements

This presentation, as well as other statements made by Aptiv PLC (the “Company”), contain forward-looking statements that reflect, when made, the Company’s current views with respect to current events, certain investments and acquisitions and financial performance. Such forward-looking statements are subject to many risks, uncertainties and factors relating to the Company’s operations and business environment, which may cause the actual results of the Company to be materially different from any future results. All statements that address future operating, financial or business performance or the Company’s strategies or expectations are forward-looking statements. Factors that could cause actual results to differ materially from these forward-looking statements are discussed under the captions “Risk Factors” and “Management’s Discussion and Analysis of Financial Condition and Results of Operations” in the Company's filings with the Securities and Exchange Commission. New risks and uncertainties arise from time to time, and it is impossible for us to predict these events or how they may affect the Company. It should be remembered that the price of the ordinary shares and any income from them can go down as well as up. The Company disclaims any intention or obligation to update or revise any forward-looking statements, whether as a result of new information, future events and/or otherwise, except as may be required by law.
Today’s Discussion

UNIQUELY POSITIONED WITH PORTFOLIO OF RELEVANT ACTIVE SAFETY TECHNOLOGIES UNDERPINNING INDUSTRY LEADING GROWTH OUTLOOK

MACRO
WHERE AND HOW WILL THE MARKET EVOLVE

APTIV
BUSINESS OUTLOOK AND COMPETITIVE DYNAMICS

PORTFOLIO STRATEGY KEY TO APTIV’S BOOKINGS AND MARKET SHARE GAINS

REGULATORY
IMPACT OF FEDERAL AND MUNICIPAL POLICIES

REGULATION DRIVING ADOPTION: AT THE FOREFRONT OF DEMOCRATIZATION
Passive Safety Reaching Its Limits

AUTOMOTIVE INDUSTRY SUCCESSFUL IN CONSTANTLY REDUCING VEHICLE FATALITIES, BUT PASSIVE SAFETY BENEFITS REACHING ITS LIMIT; ACTIVE SAFETY A CRITICAL NEXT STEP IN REDUCING VEHICLE FATALITIES

Fact: An extra ½ second of warning can mitigate 60% of front to rear crashes

TRAFFIC FATALITIES
Per 100M Vehicle Miles Traveled

0 1 2 3 4 5 6

SEAT BELTS
SEAT BELT MANDATES
ENERGY-ABSORBING BUMPERS
AIRBAGS
CHILD SEATS
SIDE / CURTAIN AIRBAGS
OCCUPANT DETECTION
ACTIVE SUSPENSIONS
FORWARD COLLISION WARNING
BASIC AUTOMATIC EMERGENCY BRAKING
INCREASED ACTIVE SAFETY PENETRATION

Source: NHTSA

Active Safety Teach In | June 26, 2018 | Aptiv
Less Mature Markets Even More Hazardous

SIGNIFICANT OPPORTUNITIES FOR PROGRESS REMAIN

VEHICLE FATALITIES

Sources: NHTSA, World Health Organization, The Economist
Today’s Presenters

BRINGING TOGETHER INDUSTRY THOUGHT LEADERS WITH APTIV COMMERCIALIZATION FOCUS

David Strickland
Partner in Venable’s Regulatory Group, and Former Administrator of the National Highway Traffic Safety Administration (NHTSA)

Xavier Mosquet
Senior Partner and Managing Director
The Boston Consulting Group

Glen W. De Vos
Senior Vice President, Chief Technology Officer and President, Mobility and Services Group
Executive Summary

ACTIVE SAFETY PENETRATION ACCELERATING
- Increasing consumer awareness and willingness to pay present upside for the active safety market
- OEMs making Active Safety core to their strategy and driving penetration of more advanced features

REGULATORS AND INFORMATION SERVICES SUPPORT CONTINUED DEMOCRATIZATION
- Regulators recognize active safety saves lives; continued empirical evidence supports mandates and recommendations
- China moving quickly to “catch up”; expected to follow EU standards

APTIV WELL POSITIONED TO CAPITALIZE ON CONTINUED TRENDS: 2018 REVENUE ~$1B
- Relevant portfolio of advanced solutions; winning in both premium and high volume segments
- Demonstrated Smart Vehicle Architecture capabilities ensure scalability and cost optimization
- Automated driving on the spectrum of Active Safety; leveraging SW investments and partnerships for L0-L3 applications
Active Safety Evolution
The number and severity of auto accidents in the U.S. are troubling

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td># of auto accidents</td>
<td>6 M</td>
</tr>
<tr>
<td># of people injured</td>
<td>2.4M</td>
</tr>
<tr>
<td># of fatalities</td>
<td>40K</td>
</tr>
<tr>
<td># of vehicles in crashes</td>
<td>13M</td>
</tr>
</tbody>
</table>

Societal cost: $910B+

Source: BCG analysis, Insurance Institute for Highway Safety, 2016, NHTSA October 2017
Active safety features can reduce backing and front-to-rear collisions by up to 62% and 50%, respectively\(^1\)

<table>
<thead>
<tr>
<th>Active safety feature</th>
<th>Type of crash</th>
<th>% reduction in crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear automatic braking</td>
<td>Backing</td>
<td>62</td>
</tr>
<tr>
<td>Automatic Emergency Braking</td>
<td>Front-to-rear</td>
<td>50</td>
</tr>
<tr>
<td>Forward collision warning</td>
<td>Front-to-rear</td>
<td>27</td>
</tr>
<tr>
<td>Rear cross-traffic alert</td>
<td>Backing</td>
<td>22</td>
</tr>
<tr>
<td>Rear view camera</td>
<td>Backing</td>
<td>17</td>
</tr>
<tr>
<td>Blind spot detection</td>
<td>Backing</td>
<td>14</td>
</tr>
<tr>
<td>Lane departure warning</td>
<td>Lane change</td>
<td>11</td>
</tr>
</tbody>
</table>

\(^1\) US backing crash study conducted 2012 – 2015, front-to-rear collisions study conducted 2010 – 2014 and lane change study conducted 2009 - 2015

Source: NHTSA, IIHS
Motor vehicle crashes cost U.S. society $910B per year
Current active safety features have the potential to reduce societal harm by 28%

Motor vehicle crashes cost the U.S. $910B or ~5% of real GDP each year

Current active safety features could save ~$250B annually or around ~2.5x federal spending on education

Four factors to unlock potential societal benefits of active safety

Active safety total societal contribution $250B

Source: BCG
US and EU regulators pushing NCAP at rapid pace

1979 NCAP established for frontal impact testing program
1980
1990
1994 Five-star rating system established
1997 Added testing and rating for side impact protection
1990
1997
1990
1997
2000
2000
2005
2005
2004 Added dynamic testing to rating for rollover resistance
2001 Added rating for rollover resistance based on static measurement
2007 Manufacturers must place NCAP star ratings on the Monroney label
2011 Added side pole testing, different sized dummies, collecting more crash data, Overall Vehicle Score
2014 ESC required Rearview Video Systems recommended
2015 Updated NCAP announced
2016 Added AEB to recommended list
2020 Mobile frontal test THOR
2015 Front & side impact test update Upper leg test
2016 Q6 and Q10 AEB VRU6 pedestrian Occupant detection, LKA, SAS
2018 Far-side occupant protection AEB VRU cyclists AEB Ph2 road departure

1. Automated Emergency Braking at low speeds. 2. Child restraint systems. 3. Child dummies with advanced biomechanical and anthropometric characteristics. 4. Pedestrian Legform Impactor. 5. Pedestrian test to assess impact on upper leg and pelvis at 40km/h. 6. Vulnerable Road User or pedestrians with disabilities or reduced mobility and orientation. 7. SAS = Speed Assistance Systems (i.e. Intelligent Speed Assist), SBR = Seat Belt Reminder.

Source: Expert interviews, Euro NCAP website, public search
US regulators committed to ensuring active safety penetration

Twenty automakers\(^1\) pledged to voluntarily equip virtually all new passenger vehicles by September 1, 2022.

Announced NCAP update to include crash avoidance and included AEB in list of recommended technologies.

Launched studies with industry and academia to study effects.

---

1. Participating OEMs include Audi, BMW, Fiat Chrysler, Ford, General Motors, Honda, Hyundai, Jaguar Land Rover, Kia, Maserati, Mazda, Mercedes-Benz, Mitsubishi Motors, Nissan, Porsche, Subaru, Tesla Motors, Toyota, Volkswagen and Volvo. These companies represent more than 99 percent of the U.S. automobile market.
EU regulators committed to continue pushing active safety as well, China to match EU NCAP standards.
### OEMs making active safety core part of their strategy

<table>
<thead>
<tr>
<th>OEM</th>
<th>Vision</th>
<th>2017 AEB take rate</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volvo</td>
<td>By 2020, no one will be killed or seriously injured in a new Volvo car or SUV</td>
<td>68%</td>
<td>In Sweden alone we have seen a decline of ~45% in rear-end frontal crashes thanks to our collision warning with autobrake system...we are determined to take the next step in reducing avoidable collisions with the addition of steering support and assistance systems. - Three60</td>
</tr>
<tr>
<td>Toyota</td>
<td>Toyota will lead the way to the future of mobility, enriching lives around the world with the safest and most responsible ways of moving people</td>
<td>56%</td>
<td>By the end of this year, the first generation of Toyota Safety Sense, the carmaker’s suite of active and passive safety systems, will be standard on almost every Toyota. But there's an even more powerful version of Toyota Safety Sense coming next year, and it too will become standard equipment. - CNET</td>
</tr>
<tr>
<td>GM</td>
<td>Zero Crashes, Zero Emissions, Zero Congestion</td>
<td>20%</td>
<td>General Motors offers automatic braking as optional equipment on about two-thirds of its models.</td>
</tr>
<tr>
<td>Nissan</td>
<td>Safety comes first</td>
<td>14%</td>
<td>Nissan Motor Co. said it would make automatic braking systems standard on an estimated 1 million 2018 model cars and light trucks sold in the United States.</td>
</tr>
</tbody>
</table>

Source: IIHS

Copyright © 2017 by The Boston Consulting Group, Inc. All rights reserved.
High level of awareness among consumers

Q: from the list of the safety or convenience car technologies below, how familiar are you with each one?

Note: n=1,511
Source: BCG 2017 Survey
## Consumer acceptance and willingness to pay for active safety

<table>
<thead>
<tr>
<th>Feature</th>
<th>2017 Penetration (US)</th>
<th>Owners who like it (US)</th>
<th>Owners say system helped avoid crash</th>
<th>Average willingness to pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward collision warning/assist/AEB</td>
<td>-20-30%</td>
<td>68-69%</td>
<td>18-19%</td>
<td>$470</td>
</tr>
<tr>
<td>Blind spot detection</td>
<td>40%</td>
<td>83%</td>
<td>35%</td>
<td>$270</td>
</tr>
<tr>
<td>Park assist</td>
<td>40%-90%</td>
<td>80%¹</td>
<td>20%¹</td>
<td>$190</td>
</tr>
<tr>
<td>Lane departure warning</td>
<td>30%</td>
<td>70%</td>
<td>7-12%</td>
<td>$170</td>
</tr>
<tr>
<td>Level</td>
<td>Name</td>
<td>Steering and acceleration/deceleration</td>
<td>Monitoring driving environment</td>
<td>Fallback performance of dynamic driving task</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------</td>
<td>---------------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>0</td>
<td>No Automation</td>
<td>Human driver</td>
<td>Human driver</td>
<td>Human driver</td>
</tr>
<tr>
<td>1</td>
<td>Driver Assistance</td>
<td>Human driver and system</td>
<td>Human driver</td>
<td>Human driver</td>
</tr>
<tr>
<td>2</td>
<td>Partial Automation</td>
<td>System</td>
<td>Human driver</td>
<td>Human driver</td>
</tr>
<tr>
<td>3</td>
<td>Conditional Automation</td>
<td>System</td>
<td>System</td>
<td>Human driver</td>
</tr>
<tr>
<td>4</td>
<td>High Automation</td>
<td>System</td>
<td>System</td>
<td>System</td>
</tr>
<tr>
<td>5</td>
<td>Full Automation</td>
<td>System</td>
<td>System</td>
<td>System</td>
</tr>
</tbody>
</table>

*Human driver monitor the driving environment*

*Automated driving system (“system”) monitors the driving environment*

Source: SAE Levels of Driving Automation, http://cyberlaw.stanford.edu/blog/2013/12/sae-levels-driving-automation
**Market evolving as a continuum rather than in discreet SAE levels**

<table>
<thead>
<tr>
<th>Use cases</th>
<th>Level 0</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 2+</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver in loop</td>
<td>Systems to aid or warn driver, including emergency intervention e.g. backup camera, blind spot warning</td>
<td>Adaptive Cruise Control (ACC)</td>
<td>Lane keep assist + ACC</td>
<td>Highway automated driving without lane change or driver assisted lane change</td>
<td>Highway automated driving, Lane change driver led/assisted or automatic</td>
<td>Most driving scenarios automated, including lane change</td>
<td>All driving scenarios automated, no steering wheel or pedals</td>
</tr>
<tr>
<td>Safe stop</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (lower engagement)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Driver reengagement</td>
<td>No</td>
<td>No</td>
<td>Likely (slow down in lane)</td>
<td>Likely</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Redundancy</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Adaptive Cruise Control (ACC): Yes
Systems to aid or warn driver, including emergency intervention e.g. backup camera, blind spot warning, collision warning
Lane keep assist + ACC
Highway automated driving without lane change or driver assisted lane change
Traffic jam assist (car in front)
Highway automated driving, Lane change driver led/assisted or automatic
Most driving scenarios automated, including lane change
All driving scenarios automated, no steering wheel or pedals
Each level of automation paves way for the next

<table>
<thead>
<tr>
<th></th>
<th>Level 0/1</th>
<th>Level 2</th>
<th>Level 2+</th>
<th>Level 3</th>
<th>Level 4/5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameras</td>
<td>1-2</td>
<td>1-2</td>
<td>4-8</td>
<td>5-6</td>
<td>5-14</td>
</tr>
<tr>
<td>Radar</td>
<td>0-5</td>
<td>3-5</td>
<td>1-5</td>
<td>3-5</td>
<td>8-21</td>
</tr>
<tr>
<td>Lidar</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1-5</td>
</tr>
<tr>
<td>Ultrasonic</td>
<td>4-6</td>
<td>6-12</td>
<td>4-12</td>
<td>8-12</td>
<td>0-12</td>
</tr>
<tr>
<td>AD module</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1-2</td>
<td>1-3</td>
</tr>
<tr>
<td>Driver monitoring</td>
<td>No</td>
<td>No</td>
<td>Camera/ touch</td>
<td>Camera/ touch</td>
<td>Camera/touch</td>
</tr>
<tr>
<td>Redundant steering/braking</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: AD stack composition based on benchmarking of solutions currently in production
Source: BCG analysis
Regulatory pace, consumer awareness/willingness and OEM commitment will continue market growth

Market size (million vehicles)

Source: BCG analysis

Market size ($B)

Potential upside possible from consumer willingness to pay for L2 and L2+ systems
Key implications for the market

1. Societal value of active safety is significant, 30+% of annual societal cost of accidents can be avoided short term, 90% as a target

2. OEMs will use active safety as point of differentiation

3. CPV and penetration are expected to continue growing, with the core market focused on L0-L2+ for the near future

4. Active safety will provide stepping stones for full autonomy (L4)
David Strickland

PARTNER, VENABLE
Regulatory Roadmap

REGULATORS RECOGNIZE ACTIVE SAFETY SAVES LIVES
- As early active safety technology has become more common, regulators have looked at the data and recognized that advanced safety features have reduced crashes and fatalities
- As more advanced solutions are deployed, regulators will continue to examine the data, and we expect will be sensitive to the societal benefits - both human and economic - this technology provides

TAKING PRAGMATIC APPROACH TO FUTURE REGULATION
- We expect that the regulator will continue to encourage manufacturers that have deployed these systems to democratize them, using NCAP and/or agreements akin to the AEB agreement
- In the U.S., the promulgation of regulations mandating ADAS systems will be based on data, which we expect to drive regulations across major markets; will start with US and EU, and China is expected to follow EU NCAP
Glen De Vos

SENIOR VICE PRESIDENT, CHIEF TECHNOLOGY OFFICER AND PRESIDENT, MOBILITY AND SERVICES GROUP, APTIV
Addressing Mobility's Toughest Challenges

Providing end-to-end solutions that enable the commercialization of new mobility

Smart Vehicle Architecture

- Software
- Sensing and Computing
- Signal and Power Distribution
- Connectivity

Smart Mobility Solutions

- Active Safety
- User Experience
- Connected Services
- Autonomous Systems
Leveraging Full Aptiv Capabilities

UNIQUELY POSITIONED WITH BOTH THE BRAIN AND NERVOUS SYSTEM OF THE VEHICLE

ACTIVE SAFETY PROVIDING SOFTWARE, DOMAIN CONTROLLERS AND SENSING SOLUTIONS WHICH ENABLE INCREASING SAFETY AUTOMATION

SIGNAL AND POWER DISTRIBUTION KNOWLEDGE ENABLES OPTIMIZED, FAILSAFE VEHICLE ARCHITECTURES, AND DE-RISKS INTEGRATION FOR CUSTOMERS

FOUNDATION IN SECURITY & CONNECTIVITY WITH 40M CONTROLLERS SHIPPED ANNUALLY; DEEP VEHICLE CONTROL AND ACTUATION EXPERTISE

AUTOMATED DRIVING ALGORITHMS AND EXPERIENCE HELPS DEFINE ROADMAP, DEMONSTRATE SCALABILITY

MULTIPLE APTIV PRODUCT LINES CONTRIBUTE TO - AND BENEFIT FROM - INCREASING SAFETY ADOPTION
Heritage In Active Safety

OVER 25 YEARS OF EXPERIENCE IN COMMERCIALIZING AUTOMOTIVE GRADE SAFETY SOLUTIONS

1985: Hughes Aircraft Corp sold to automotive industry to accelerate development of technology such as automotive navigation and collision avoidance systems

1993: First to provide early radar based back-up aids, which extended the range beyond ultrasonic sensors

1999: Industry's first radar-based Adaptive Cruise Control system production

2007: Industry first sensor fusion of radar and vision systems

2009: Industry first introduction of solid state radar. Vastly improved reliability and lowered cost, leading to broader market adoption

2014: Industry first integration of radar and camera into a single unit

2017: Industry first multidomain controller introduced on the Audi A8

2018: Global radar capabilities with lead development and application centers in every region
Active Safety Portfolio

COMPREHENSIVE ACTIVE SAFETY SOLUTIONS SUPPORTED BY DEEP SYSTEMS KNOWLEDGE AND RELEVANT PRODUCT PORTFOLIO
Perception Systems Enable Advanced Safety

INVESTMENTS IN ENGINEERING AND STRATEGIC PARTNERSHIPS UNIQUELY POSITION APTIV ACROSS ALL THREE SENSING MODALITIES

RADAR
25+ YEARS OF EXPERIENCE WITH THE 8TH GENERATION OF RADAR TECHNOLOGY IN DEVELOPMENT

STRENGTHS
- LONG RANGE SENSING
- OBJECT MOVEMENT
- ALL WEATHER PERFORMANCE

VISION
LEADING PLAYER IN THE MARKET WITH A LONG-TERM MOBILEYE PARTNERSHIP FOR VISION PROCESSING

STRENGTHS
- OBJECT CLASSIFICATION
- OBJECT ANGULAR POSITION
- NON-OBJECT SCENE CONTEXT

LiDAR
STRATEGIC INVESTMENTS DRIVE THE ADVANCEMENT OF SOLID STATE LiDAR SOLUTIONS

STRENGTHS
- PRECISE 3D OBJECT DETECTION
- RANGE ACCURACY
- FREE SPACE DETECTION
# The Importance of Sensor Fusion

MULTIPLE SENSING MODALITIES REQUIRED; SENSOR FUSION IS THE SECRET SAUCE THAT BRINGS THEM TOGETHER

<table>
<thead>
<tr>
<th></th>
<th>Radar</th>
<th>LiDAR</th>
<th>Camera</th>
<th>Fusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object detection</td>
<td>+</td>
<td>+</td>
<td>O</td>
<td>+</td>
</tr>
<tr>
<td>Pedestrian detection</td>
<td>-</td>
<td>O</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Weather conditions</td>
<td>+</td>
<td>O</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Lighting conditions</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Dirt</td>
<td>+</td>
<td>O</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Velocity</td>
<td>+</td>
<td>O</td>
<td>O</td>
<td>+</td>
</tr>
<tr>
<td>Distance – accuracy</td>
<td>+</td>
<td>+</td>
<td>O</td>
<td>+</td>
</tr>
<tr>
<td>Distance – range</td>
<td>+</td>
<td>O</td>
<td>O</td>
<td>+</td>
</tr>
<tr>
<td>Data density</td>
<td>-</td>
<td>O</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Classification</td>
<td>-</td>
<td>O</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

- **Assess confidence of the detected objects and evaluate plausibility of the object.**
- **Improve accuracy of position and motion estimation.**
- **Maximize availability and ensure failsafe operational performance.**
Smart Vehicle Architecture (SVA) for ADAS

APPLYING SMART VEHICLE ARCHITECTURE APPROACH KEY TO SCALABILITY, AND OPTIMIZED COST FOR NEXT GENERATION FUNCTIONALITY

APPLYING SVA APPROACH

- Improved decision making
- Significant mass reduction
- Reduced architectural complexity
- Failsafe sensing & compute
- Scalable, future proof software platform
- Optimized system costs

MAX SYSTEM CAPABILITIES

- SENSORS SUPPORTED: 2
- CLOCK SPEED: 50 MHz
- DMIPS: <56
- LINES OF CODE: <100K

COMMERCIALIZATION

- FUNCTIONAL SAFETY: NO
- SCALABILITY: NO
- FLEXIBILITY / REUSE: LIMITED
- OEM ON-COST: FIXED

MAX SYSTEM CAPABILITIES

- SENSORS SUPPORTED: 16
- CLOCK SPEED: 2+ GHz
- DMIPS: 130K
- LINES OF CODE: 15M+

COMMERCIALIZATION

- FUNCTIONAL SAFETY: YES
- SCALABILITY: HIGH
- FLEXIBILITY / REUSE: HIGH
- OEM ON-COST: OPTIMIZED

2007 | VOLVO S80

FUSION CONTROLLER

MSR RADAR

ANALOG CAMERA

Today

2018 | BMW

ACTIVE SAFETY DOMAIN CONTROLLER

SATELLITE LIDAR

SATELLITE RADAR

SATELLITE CAMERA
Today’s Active Safety Architecture

MARKET CONTINUING TO DRIVE PENETRATION OF MORE ADVANCED SOLUTIONS

**LEVEL 0/1**
Function-specific automation of one control function

**EXAMPLE FEATURES**
- Automatic emergency braking
- Adaptive cruise control
- Blind spot detection

**SENSOR SUITE**
- Rear corner radar x 2
- Front radar
- Forward camera

**LEVEL 2**
Combined function automation of two or more control functions

**EXAMPLE FEATURES**
- Highway assist
- Traffic jam assist

**SENSOR SUITE**
- Rear corner radar x 2
- Front radar
- Forward camera
- Multi-domain controller

**LEVEL 2+**
Conditional automation; driver engaged with hands-free highway assist

**EXAMPLE FEATURES**
- Auto lane change
- Highway assist
- Traffic jam assist

**SENSOR SUITE**
- Corner radar x 4
- Front radar
- Forward camera
- Multi-domain controller

**LEVEL 3**
Conditional automation; driver able to fully disengage under specified conditions

**EXAMPLE FEATURES**
- Highway pilot
- Safe stop on side of road

**SENSOR SUITE**
- Corner radar x 4
- Forward radar
- Forward vision
- Surround vision
- Driver state camera
- Forward LiDAR
- Multi-domain controller

**EXAMPLE FEATURES**
- Highway pilot
- Safe stop on side of road

**SENSOR SUITE**
- Corner radar x 4
- Forward radar
- Forward vision
- Surround vision
- Driver state camera
- Forward LiDAR
- Multi-domain controller
INCREASING LEVELS OF FUNCTIONALITY RESULT IN SIGNIFICANTLY HIGHER ADDRESSABLE CPV

**LEVEL 0/1**
Function-specific automation of one control function

- Sensing ($125 - 195)
- Compute (~$150)
- Embedded Software

$275 - 325
Addressable CPV

**LEVEL 2**
Combined function automation of two or more control functions

- Sensing ($200 - 225)
- Compute ($450 - 800)
- Embedded Software

$450 - 550
Addressable CPV

**LEVEL 2+**
Conditional automation; driver engaged with hands-free highway assist

- Sensing ($300 - 400)
- Compute ($450 - 800)
+ Software
  - Multi-Domain Sensor Fusion
  - Control Algorithms
  - Integration

$750 – 1200
Addressable CPV

**LEVEL 3**
Conditional automation; driver able to fully disengage under specified conditions

- Sensing ($1500 - 2000)
- Compute ($2300 - 2600)
- Signal & Power ($100 - 300)
+ Software
  - Multi-Domain Sensor Fusion
  - Planning and Policy
  - Control Algorithms
  - Integration

$4000 – 5000
Addressable CPV
Winning With Premium OEMs

- DELIVERING PREMIUM PERFORMANCE DIFFERENTIATION FOR L2 AND ABOVE
- SCALABILITY ENABLES CUSTOMIZATION
- COMPLEX CONTROLLER DESIGN MEETING FUNCTIONAL SAFETY REQUIREMENTS

Audi
LEVEL 0 – 3

BMW
LEVEL 0 – 4

MOST POWERFUL COMPUTE PLATFORM AVAILABLE IN A VEHICLE TODAY
- Mobileye and Nvidia based L2-L3 domain controllers
- Side Radars and Forward Camera for NCAP and AD features
- End to end test and verification responsibility for full domain controller

LEVERAGING AUTOMATED DRIVING CAPABILITIES AND PARTNERSHIPS
- Scalable domain controllers built on Mobileye / Intel SoC
- Next generation radar for NCAP and AD features
- End-to-end test and verification for cameras and corner radar functions
Democratization of Active Safety...

BASE ACTIVE SAFETY FUNCTIONALITY MOVING TO MASS MARKET PLATFORMS

Evidence of automation effectiveness driving new regulation standards, while consumer information programs continue to stimulate the ADAS market by requesting increasingly advanced active safety systems.

**REGULATIONS DRIVE ADOPTION**

Regulation extending the ADAS market to entry level vehicles...

...causing premium OEM to invest in more advanced safety technologies to continue to differentiate.

**INCREASED PREVALENCE VALIDATES EFFECTIVENESS**

**PREMIUM OEMS INVEST MORE TO DIFFERENTIATE**
... Leading To High Volume Applications

- Delivering cost optimization for L0 to lower level L2 solutions
- Scalability for design flexibility and engineering reuse
- Packaging optimized for all vehicle classes through smart vehicle architecture

North American OEM
LEVEL 0 – 2+

ENABLING COMPREHENSIVE, STANDARD SAFETY FUNCTIONALITY
- Scalable domain controllers with Mobileye SoC
- Next generation forward radar and camera, and side radars, for NCAP features
- 20 year Active Safety relationship

FCA
LEVEL 0 – 2+

SCALABLE, FLEXIBLE ARCHITECTURE ENABLES DESIGN REUSE
- Full Satellite System, including Driver State Monitoring and HD Map Module
- Scalable domain controllers, with end to end test and verification
- Fully scalable system from L0 to L2+, enabling evolution to L3
China Safety Market Maturing Rapidly

CHINA OEMs DRIVING EXPONENTIAL INCREASES IN ACTIVE SAFETY ADOPTION

Best Selling Model

- Chery QQ
  - 2006 Sales Price: $4,500
  - Sales Price: $22,000
  - 4x Addressable CPV
  - Available Features:
    - Airbags
    - ESP
    - Air-conditioning
    - ABS

- Tiggo 7
  - Sales Price: $22,000
  - Available Features:
    - Airbags (Driver/Front/Rear/Side)
    - Air-conditioning (Climate Control)
    - ABS, ESP
    - Adaptive Cruise Control
    - Auto Braking
Active Safety Financial Outlook

CUSTOMER AWARDS REFLECT MARKET SHARE GAINS

ADDRESSABLE MARKET

- $ Billions, % CAGR
- 2022: $11+
- 2017: $5
- 2014: $2

BOOKINGS

- Lifetime gross program revenues, $ Billions
- 2018: $3+
- 2017: $3.7
- 2016: $1.4
- 2015: $1.2
- 2014: $0.9

REVENUE OUTLOOK

- $ Billions, % CAGR
- 2022: $2+
- 2017: $0.6
- 2014: $0.2

Active Safety

Revenue In 2018

~$1B

35%

50%

2022
Active Safety Leading To Automated Driving

AUTOMATED DRIVING ON THE SPECTRUM OF ACTIVE SAFETY SOLUTIONS; INVESTMENTS IN SOFTWARE, SENSING AND COMPUTE DRIVE REVENUE TODAY AND IN THE FUTURE

ACTIVE SAFETY
Software & systems integration enabling leadership position in active safety

AUTOMATED DRIVING
Accelerating with OEMs and New Mobility to deliver level 4/5 solutions
Automated Driving Investments

ACQUISITIONS AND AUTOMATED DRIVING SOFTWARE STACK PROVIDERS, AND STRATEGIC INVESTMENTS IN SOLID STATE LiDAR COMPLEMENT EXISTING APTIV CAPABILITIES

SOFTWARE
STRATEGIC ACQUISITIONS OF AUTOMATED DRIVING FULL-STACK SOFTWARE PROVIDERS

SOLID STATE LiDAR
STRATEGIC INVESTMENTS ENSURE ACCESS TO TECHNOLOGY, WHILE ACCELERATING COMMERCIALIZATION
ADVANCED CAPABILITIES HELPING DIFFERENTIATE CURRENT APTIV PLATFORMS AND INFORM PRODUCT ROADMAPS

AUTOMATED DRIVING ON THE SPECTRUM OF ACTIVE SAFETY
• Existing strengths in sensing and compute core to unlocking functionality
• Demonstrated AD capabilities differentiate Aptiv, ensure scalability and reuse

CONNECTED SERVICES CAPABILITIES
• OTA evolves from development applications to full vehicle lifecycle management
• Embedding OTA on all applicable Aptiv products by 2020

SCALABLE ARCHITECTURES
• Ensuring OEM architecture are scalable from Level 2 today to Level 4 in future
• AD failsafe operational knowledge informing architecture product roadmaps
Summary

APTIV WELL POSITIONED TO BENEFIT FROM DEMOCRATIZATION OF ACTIVE SAFETY

- Core Active Safety market for L0-L3 poised for growth inflection
- Portfolio of relevant technologies enabling OE point of differentiation and scalability
- Increasing levels of functionality result in significantly higher addressable CPV
- Customer awards validate growth outlook and market share gains
- Active Safety on the spectrum of automated driving
Glen W. De Vos
Senior Vice President, Chief Technology Officer and President, Mobility and Services Group

Glen De Vos is senior vice president and chief technology officer of Aptiv, a position he has held since March 2017.

In this role, Mr. De Vos is responsible for leading the company’s innovation strategies and development of advanced technologies. As CTO, Mr. De Vos leads the global engineering organization, which includes more than 16,000 technologists located in 14 major technical centers across the globe.

Previously, Mr. De Vos served as vice president, Software & Services, Delphi Electronics & Safety (E&S), located at the company’s Silicon Valley Lab in Mountain View, CA. He began his Delphi career with E&S in 1992 and following several progressive engineering and managerial roles in infotainment and user experience, was named vice president, Global Engineering for Delphi E&S in 2012.

Mr. De Vos has extensive business, engineering, and manufacturing experience including time at General Electric and ITT Power Systems.

Mr. De Vos received a Bachelor of Science in Engineering from Calvin College in 1982, a Bachelor of Science in Mechanical Engineering from the University of Michigan in 1983, and a Master of Business Administration from Ball State University in 1994.
Xavier Mosquet
Senior Partner and Managing Director, The Boston Consulting Group

Xavier joined BCG in London in 1985. He later moved to Paris, then in 2005 opened BCG’s Detroit office. He has been for 8 years the leader of BCG’s Global Automotive Practice. Xavier received five Awards for his consulting work in the Automotive industry with US Treasury. He was named Turnaround Consultant of the Year in 2010 by the Global M&A Network and one the Top Global 25 Consultants in 2012 by Consulting Magazine.

Work experience at BCG
Within BCG, Xavier Mosquet specializes in the Automotive sector on matters of strategy and operational excellence. He notably led the BCG team working for the Presidential Automotive Task Force and the US Treasury in the restructuring of GM and Chrysler, the forming of the Fiat-Chrysler alliance and the GM IPO. He supports his clients in NA, Europe and Asia.

Select publications
• A Road to Safer Driving, BCG-MEMA report 2015
• The Electric Car Tipping Point, the future of powertrains for owned and shared mobility, BCG report 2018
• Revolution in the Driver’s Seat, the road to autonomous vehicles, BCG report 2015
• Self-Driving Vehicles, RoboTaxis and the Urban Mobility Revolution, BCG report 2016
• Testimony on Automotive Innovation, US Senate Committee Hearing 2016

Prior experience
Prior to joining BCG in 1985, Xavier worked for four years with Total as department head for renewable energy.

Education
Xavier holds a general engineering degree from the French Ecole Nationale des Mines, a Master of Physics from Paris University, and an MBA with distinction from INSEAD.
David Strickland
Partner, Venable LLP

A partner in Venable’s Regulatory Group, David Strickland focuses his practice on transportation policy, consumer protection, internet privacy, data security, and legislative and government affairs. In addition, David is Counsel to the Self-Driving Coalition for Safer Streets. He has significant federal government and private practice experience.

Most recently, David served as the fourteenth Administrator of the National Highway Traffic Safety Administration (NHTSA). As the top automotive safety official in the United States, he was responsible for fulfilling the agency’s mission to reduce crash-related fatalities and injuries while ensuring the highest standards of safety on the nation’s roads.

David oversaw a broad range of vehicle safety and policymaking programs, including setting vehicle safety standards, investigating possible safety defects, and tracking safety-related recalls; annually distributing over $600 million in highway safety grants to states and leading the behavioral safety program; and establishing and enforcing the regulations on fuel economy. His major accomplishments at NHTSA include overseeing the development of the first national fuel economy programs for both passenger vehicles and heavy-duty trucks in conjunction with the Environmental Protection Agency, and implementing the vehicle safety and highway safety grant mandates included in the 2012 Highway Reauthorization (MAP-21). He also issued the first ejection mitigation standards for passenger vehicles to help keep passengers from being partially or fully ejected from vehicles during a rollover crash; mandated that lap and shoulder belts be installed on all new motorcoaches; launched the nation’s largest connected vehicle (V2V) safety pilot program; and issued the first automated vehicle policy. In addition, David brought national attention to child passenger safety issues and was a leader in the campaigns to fight impaired and distracted driving.
Aptiv Technology Advisory Council (ATAC)

INDUSTRY THOUGHT LEADERS ADVISING APTIV LEADERSHIP ON EMERGING TECHNOLOGY TRENDS; INTERACTIONS GUIDE PRODUCT STRATEGIES AND INVESTMENTS

Mr. Hamid Akhavan
Former Chief Executive Officer of Unify Inc.

Mr. Glenn Lurie
Chief Executive Officer of Synchronoss Technologies
Former Chief Executive Officer of AT&T’s Mobility

Mr. Michael D. Hillman
Head of Hardware of Oculus VR, LLC, a wholly-owned subsidiary of Facebook Inc.

Mr. David Strickland
Former Administrator of the National Highway Traffic Safety Administration (NHTSA)