Delphi and University Co-Operation Models

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March 6th. 2017

DELPHI
Innovation for the Real World

Delphi Automotive

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Innovation for the Real World

Security Classification

Delphi Automotive



20,000
engineers and scientists



$15.2B
2016 revenue



126
manufacturing sites

14
major global technical centers



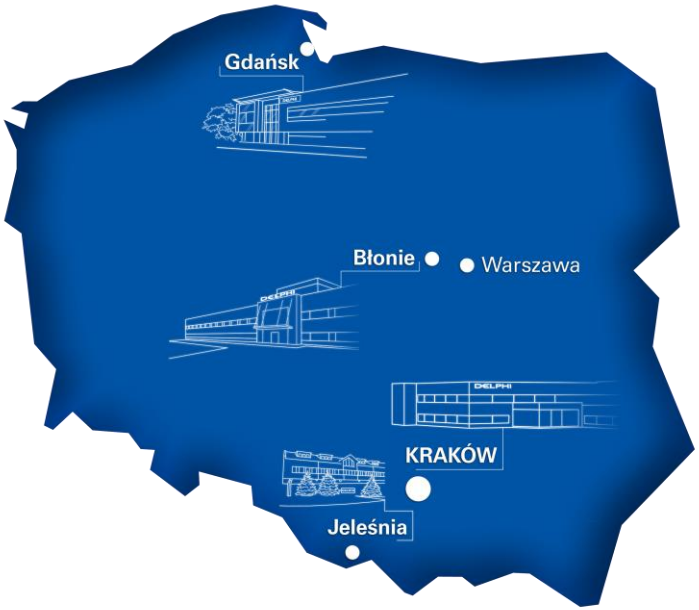
$1.5 B
in Research & Development



173,000
people in
44
countries

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Delphi in Poland



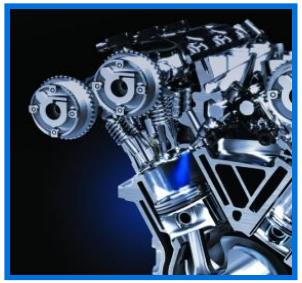


$ 380 M
investment

3 manufacturing sites
1 technical center



+5000
employees



ISO/TS 16949
quality
ISO 14001
environment

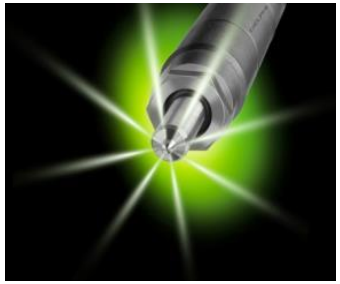
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Delphi Automotive
Megatrends / Technologies

Safe

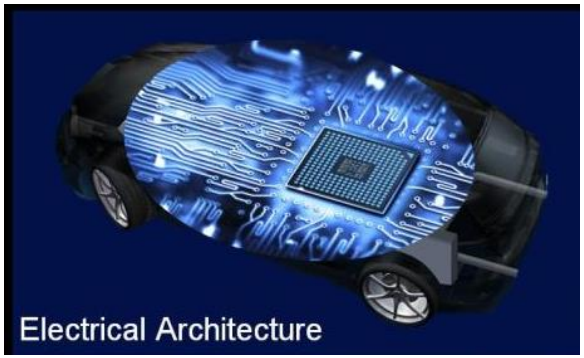


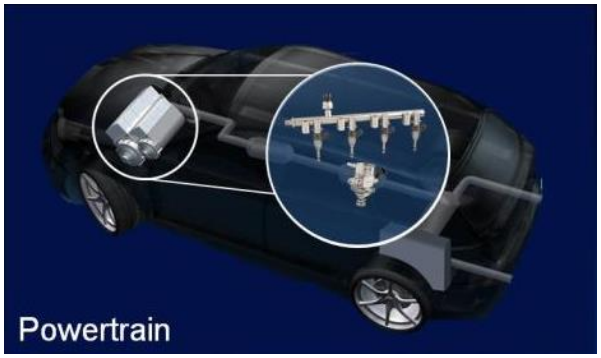
Green



Connected



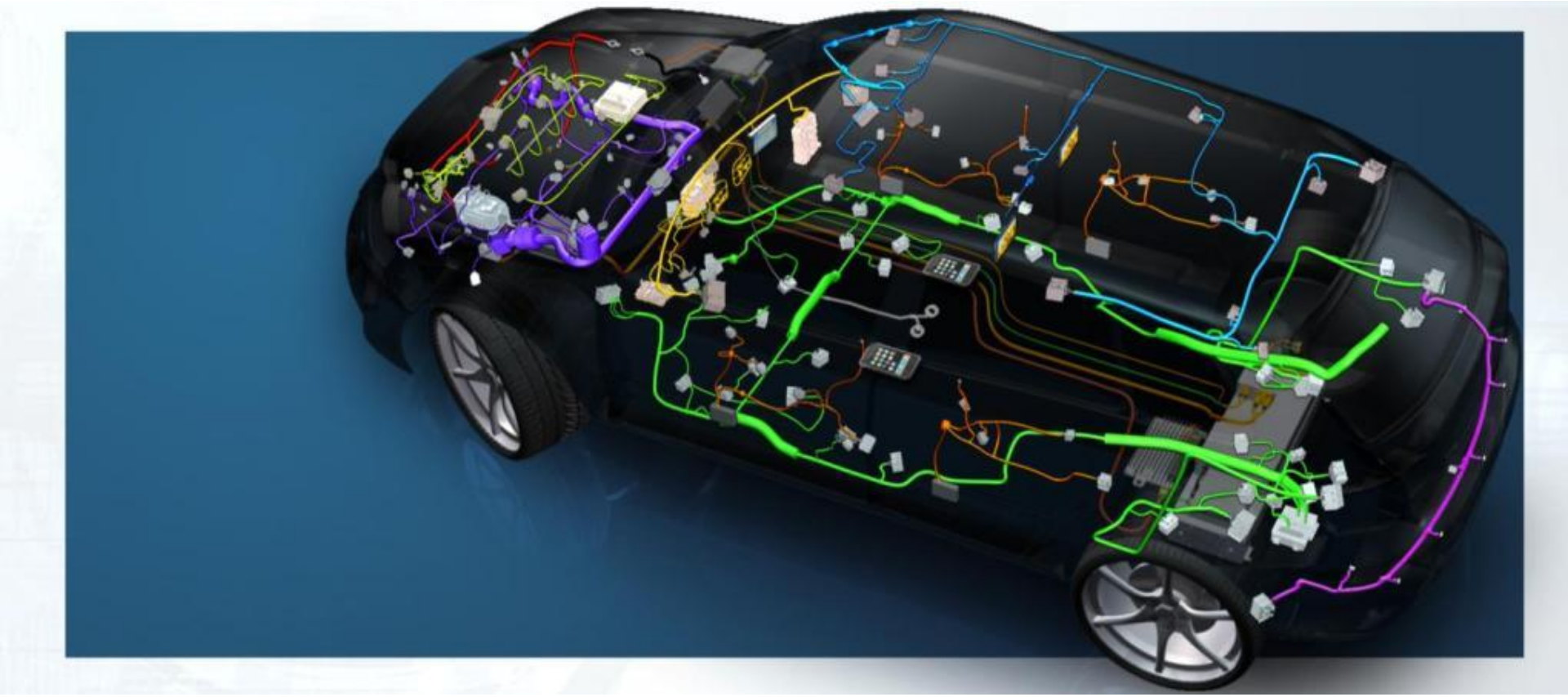






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Delphi Technologies
Electrical / Electronic Architecture



- Electrical architecture optimization reduces weight, improves fuel economy and provides the backbone for hybrid/electric applications, safety and consumer connectivity electronics.

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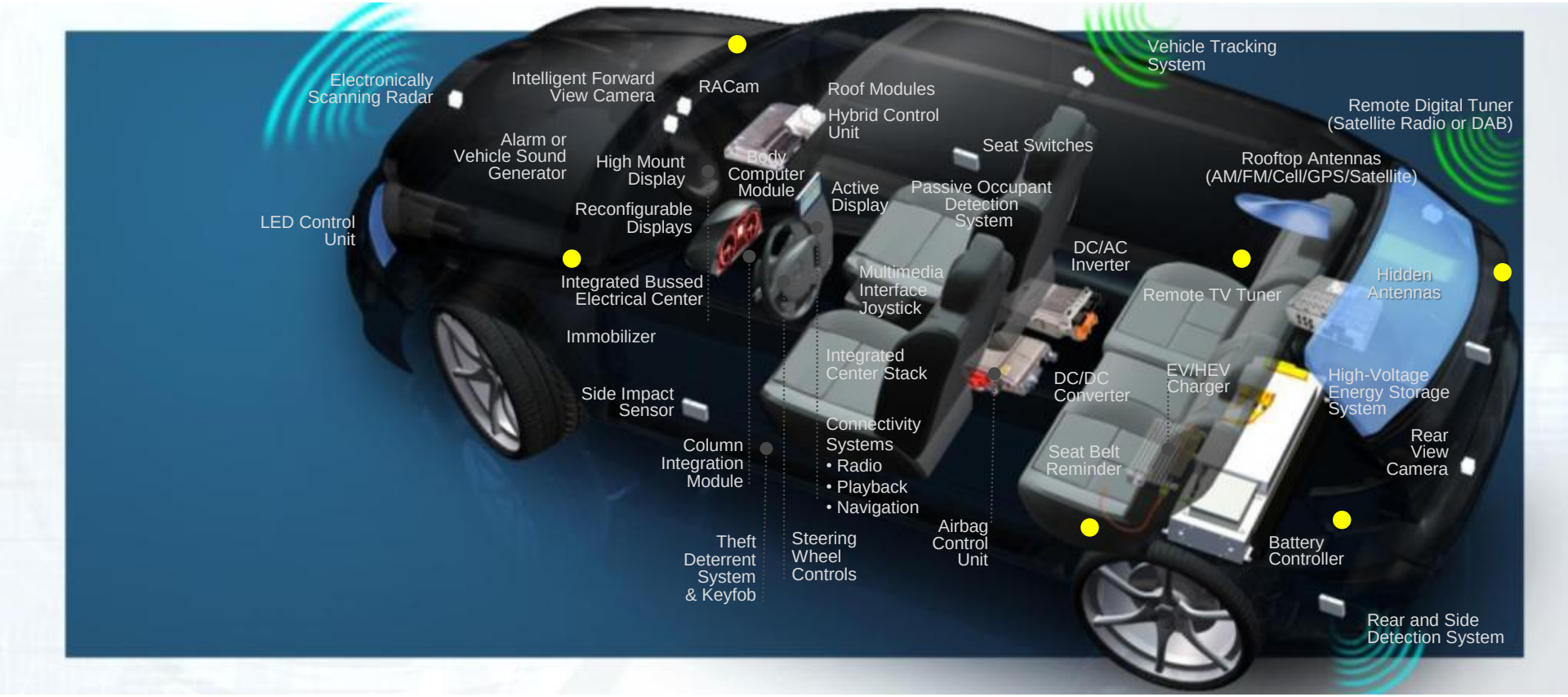
Delphi Technologies
Powertrain Systems



- Supports CO^2 and fuel economy solutions including advanced fuel injection systems, diesel common rail, and variable valve train technologies.

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Delphi Technologies
Electronics & Safety

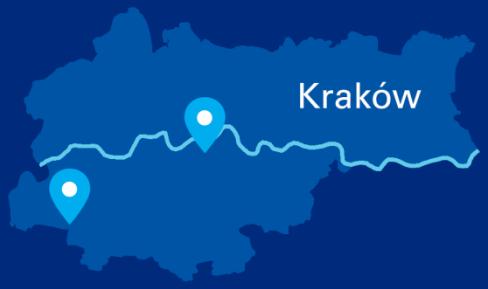


- Leading electronics and software technologies drive performance, safety, and driver convenience features. Content growth expected in active safety, hybrid/electric vehicles, and connectivity.

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Delphi in Krakow





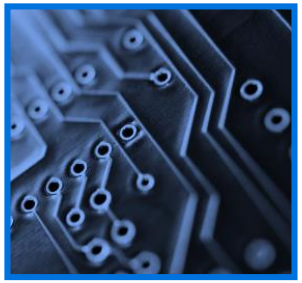
+15 years
of experience

3 engineering groups
and shared services

2 locations



+1700
employees

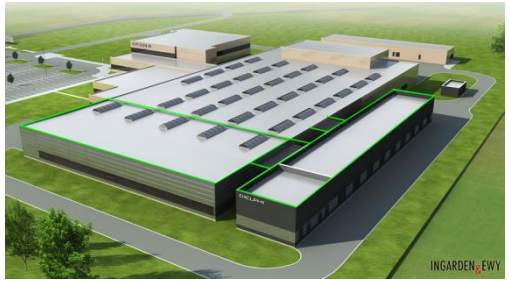


ISO/TS 16949
quality
ISO 14001
environment

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Delphi Kraków











Technical Center (opened July 2000)

- Validation laboratories
  - environmental
  - metrological
  - shop floor
  - visual inspection
  - dynamic tests

Enterprise Park

- R&D offices & laboratories
  - development of electronic products
  - Software, Hardware, Harness development
  - functional tests
- Regional Shared Service Center

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Delphi Kraków





- **R&D offices & laboratories**
  - development of electronic products
  - software development
  - development of electrical/ electronic architecture
  - functional tests





- **Regional Shared Service Center**
  - Local teams
  - Regional divisional teams
  - Regional corporate teams
  - Range of activities:
    Finance (accounting, financial analysis, AP/AR, tax, treasury, scanning center)
    GSM (purchasing direct / indirect, logistics, process center)
    Global/EMEA HR, Global/EMEA IT, Global/CEE Communications



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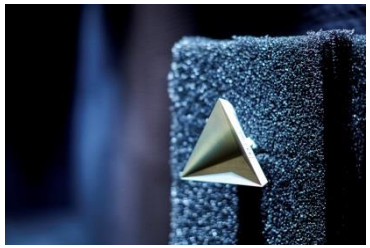


Validation laboratories

- environmental
- metrological
- shop floor
- visual inspection
- dynamic tests













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SYS
Systems Eng:
-Customer Interface
-Requirements Eng.
-Implementation Plan

SW
Software Eng:
-SW architecture
-SW builds
-SW unit test
-System Integration

EE
Electrical Eng:
-HW architecture
-HW development
-HW builds



Other:
-Purchasing
-Software Quality Assurance (SQA)
-Manufacturing (MFG)

IT&V
Independent Test
& Verification:
-Functional Test
-System Tests/Test Drives
-Test Automation
-Integration Tests
-Verification
- Test benches (SW, HW)

VE
Validation Engineering:
-Durability/Stress Tests
-Temperature Tests
-Humidity Tests
-…

ME
Mechanical Engineering:
-ME Requirements definition
-Simulation
-3D design
-…

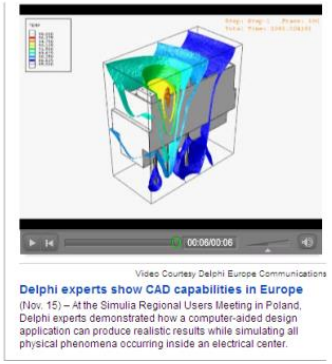
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Technical Center Krakow
+15 years - Publications and events

















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Delphi & University Co-operation Example
West Lafayette Verification Lab
Indiana, USA

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Innovation for the Real World

Security Classification

Delphi - West Lafayette Verification Laboratory

- Laboratory based on the Purdue University Research Park, Indiana, USA.



- Opened Autumn 1998
  - Lab Operates 60 hours per week (7AM to 7PM, Monday - Friday)
- On Site Delphi Staff
  - Site Manager/Advanced Project Engineer
  - Engineers from Delphi Technical Centre, Kokomo, Indiana on rotation
- On Site Administration
  - Provider: Alliance Group Technologies (Consulting group)
  - All “HR” Functions for Student Employees Provided by Alliance

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West Lafayette Verification Laboratory

- Students recruited from Purdue University
- Comprise of
  - Undergraduates, graduates and post graduate students.
- Recruited from the following disciplines
  - Engineering (Aerospace, Computer, Electrical and Mechanical).
  - Science (Computer Science, Maths and Physics).
  - Technology (EET).
- Key Points
  - Work schedule is flexible based around availability, exams etc. Minimum required work hours is 12 hours/week.
  - Average of **49 students are employed** throughout the year.
  - More than **800 students have been employed** at the Laboratory since 1998.

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West Lafayette Verification Laboratory

- Employment
  - **Laboratory Job Opportunities** are posted around the campus and online
  - **Full time students** apply formally to work in the lab and are subject to interview
  - **Academic performance** is checked every semester to ensure work is not causing drop in grades. A minimum monitored with Minimum GPA is 2.75 (Checked)
  - **Paid hourly**
    - **Pay is increased** based on annual performance appraisal or promotion to a supervisory (of less experienced students) level
    - **Raises assessed** 2 times/year – at the end of each semester
  - **Work schedule is flexible** based around availability, exams etc. Minimum required work hours is 12 hours/week

West Lafayette Mission



- Scalability
  - Rapid adjustment of staff hours to meet demand.
  - Monthly effort has ranged from 1963 hours to 5574 hours in the past 12 months, based on demand.

- Flexibility
  - From soldering cable assemblies to developing field re-flash software.
  - From development of rollover software simulation environments to executing hundreds of vehicle ignition cycles
  - From WEB site development to writing powertrain automated tests

- Recognition days
  - Student staff and teams are recognised for exceptional performance

Core Scope of Work

- SW verification and application development
- Provide HW and SW Engineering Tool Support & Development
  - Worldwide support for all Delphi Technical Centers.
- Manufacture of cables and test harnessing in support of US test programs
- Requirements engineering using dedicated SW tool chain (e.g. DOORS/Polarion)
  - Script development.
  - Document Import Service.

Example: SW Verification Activities

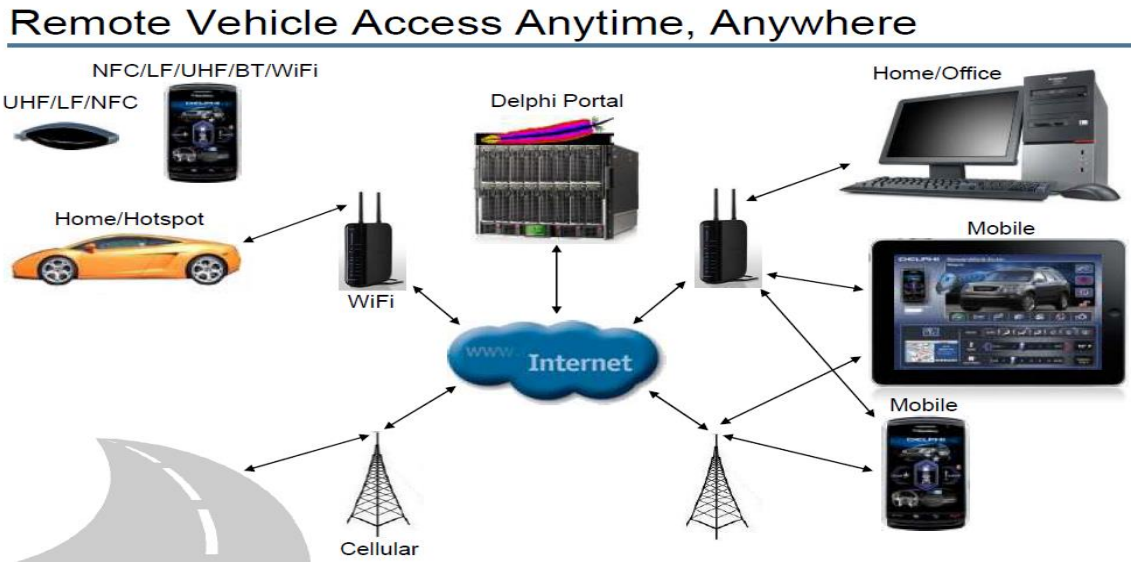
- Car Connectivity using the Smart Phone
  - Created and verified the Android Apps for the Bluetooth gateway concept using Java software.



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Example: Verification Activities

- Cloud Server integrating Smart Phones into vehicles
  - Developed the Web based vehicle communication concept using the C++ listening client, PHP and MySQL
  - Smart Phone is integrated into the Cloud Website which contains the vehicle communications and video options



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Example: Lift-Gate Hands Free Opener

GM Lift-Gate Hands Free Opener (HFO)

- BCM: Linux laptop
  - Configured vehicle server to communicate to LIN
  - Enabled trunk/lift-gate operation in Vehicle Communications
  - Implement algorithm to turn HFO on & look for foot gesture
  - CAN communication
- Test & verify functionality



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Example: Remote Keyless System

- Passive Keyless – Relay Attack
  - Action at door handle (sensor or button) starts LF communication from vehicle to relay station
  - Relay station transmits signal from one station to the other
  - Fob receives LF signal from relay station and responses on HF path to relay station
  - Relay station transmits signal from one station to the other
  - Vehicle receives valid HF signal from relay station and unlocks the doors
  - Operation is limited due to short range of LF communication (< 2 m)



HF communication, e.g. 433 MHz

LF communication, e.g. 125 kHz

RF communication, long range

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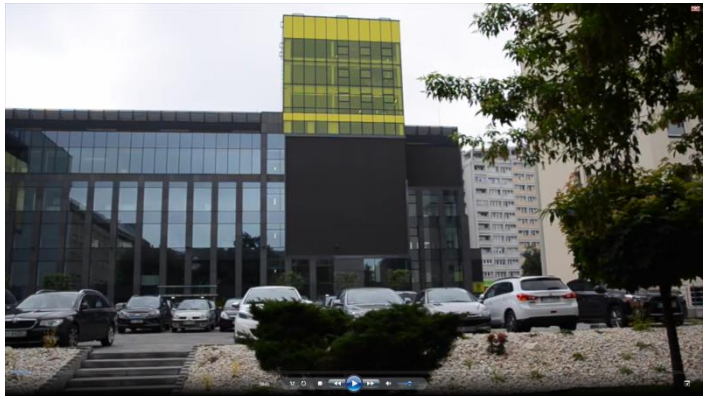
Delphi & University Co-operation Example
AGH Laboratory
Krakow, Poland

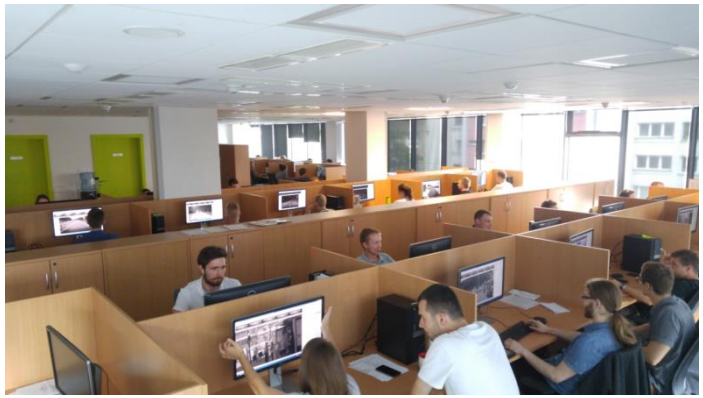
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Innovation for the Real World

AGH Laboratory

- Founded in Q1 2016
- Active Safety and Autonomous Driving
- Focused on GroundTruthing & Labeling
- Lab output is used for development and verification of Vision Algorithms:
  - GroundTruthing
  - Calculating Performance Metrics
  - Neural Network Learning
- Labeled files are fully utilized in Delphi development process
- Each student has real impact on car of future
- **Student's effort will save many human lives!**

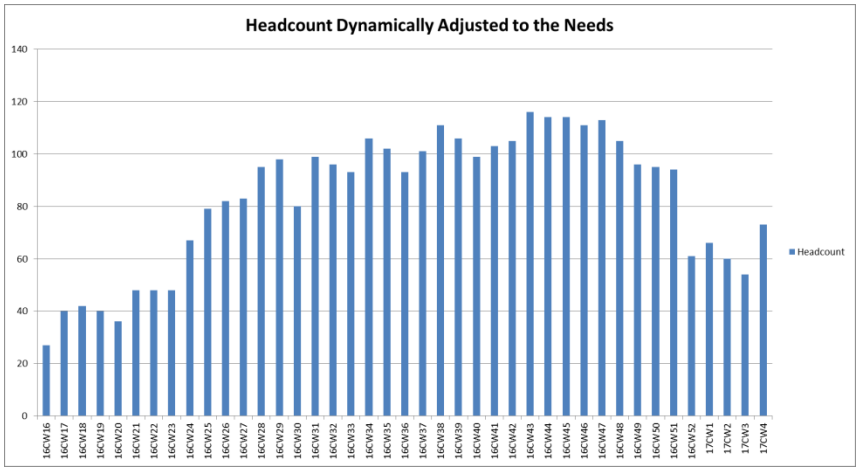


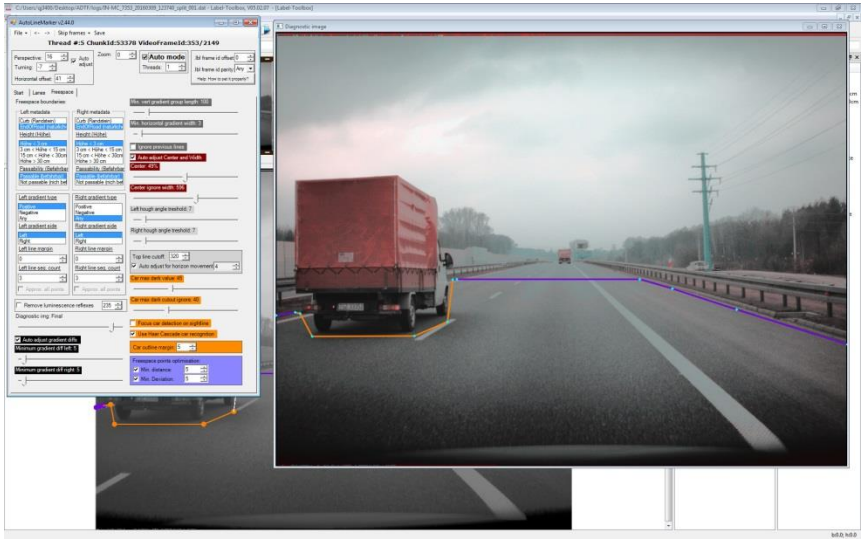


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AGH Laboratory – student's benefits

- Students are paid for work
- AGH Lab is entry level, next step is Delphi internship
- More than 10 AGH students became Delphi Employees (Q3 2016)
- Currently we hire ~100 of students
- Last year AGH students spent >100000 man hours in the Lab





www.delphi.com



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Delphi & University Co-operation Example
PolSl Laboratory
Gliwice, Poland

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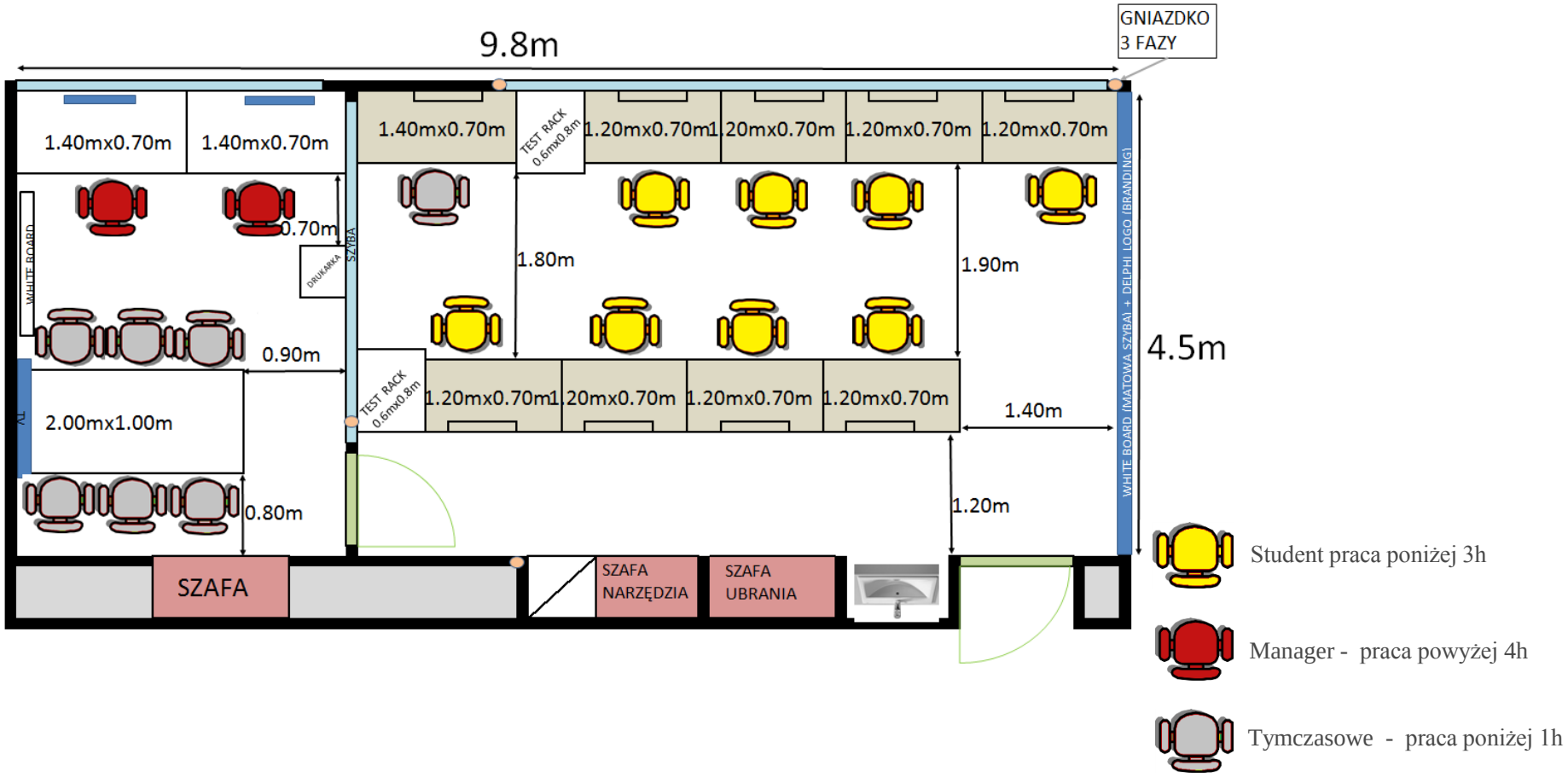
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Core Scope of Work -plans

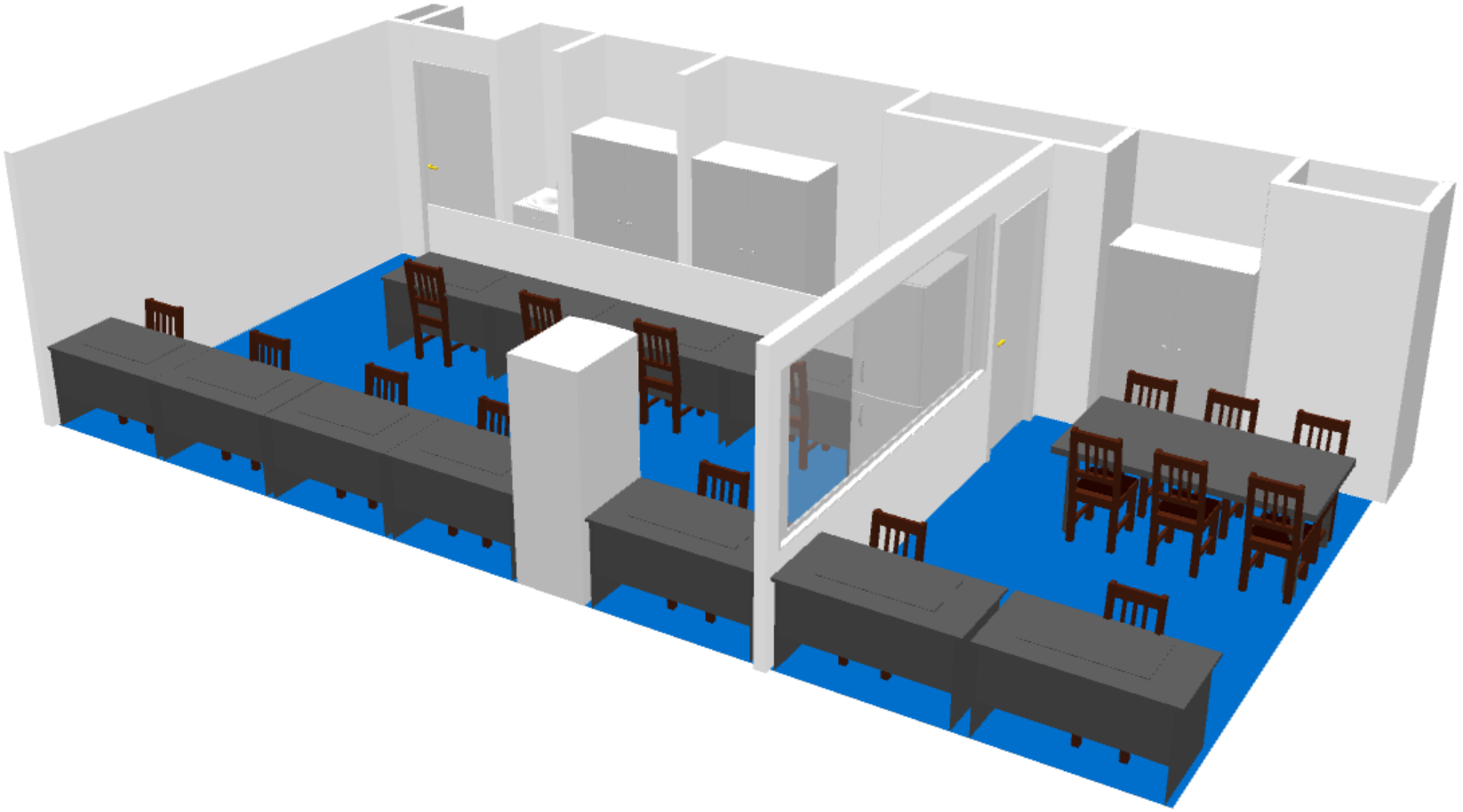
- Laboratory of Fault Analysis, Teardown analysis,…
- Laboratory of HW EE support
- Delphi preparation ongoing
- Contract under preparation

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Plan pomieszczenia



Widok 3D



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