Delphi and University Co-Operation Models

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Delphi Automotive
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
Delphi in Poland

- 3 manufacturing sites
- 1 technical center
- +5000 employees
- $380 M investment
- ISO/TS 16949 quality
- ISO 14001 environment
Delphi Automotive
Megatrends / Technologies

Safe

Green

Connected

Electrical Architecture
Powertrain
Electronics & Safety
Electrical architecture optimization reduces weight, improves fuel economy and provides the backbone for hybrid/electric applications, safety and consumer connectivity electronics.
Delphi Technologies Powertrain Systems

- Supports CO² and fuel economy solutions including advanced fuel injection systems, diesel common rail, and variable valve train technologies.
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.
Delphi in Krakow

3 engineering groups and shared services
2 locations
+1700 employees
+15 years of experience

ISO/TS 16949 quality
ISO 14001 environment

What’s next in Safe, Green and Connected
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
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
Validation laboratories

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

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
- ...

Other:
- Purchasing
- Software Quality Assurance (SQA)
- Manufacturing (MFG)
Technical Center Krakow
+15 years - Publications and events

MODEL-BASED REAL-TIME TESTING OF EMBEDDED AUTOMOTIVE SYSTEMS
Paweł Skruch and Gabriel Buchala
Delphi Technical Center Krakow
Poland

Delphi experts demonstrated how computer-aided design application can produce realistic results while simulating all physical phenomena occurring inside an electrical center.
Delphi & University Co-operation Example
West Lafayette Verification Lab
Indiana, USA
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
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.
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.
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
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
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)
Delphi & University Co-operation Example
AGH Laboratory
Krakow, Poland
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!
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
Delphi & University Co-operation Example
PolSI Laboratory
Gliwice, Poland
Core Scope of Work -plans

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

Student praca poniżej 3h

Manager - praca powyżej 4h

Tymczasowe - praca poniżej 1h
Widok 3D