



# Towards an Open Source Wind Lidar Platform

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ISARS 2016 Varna, Bulgaria

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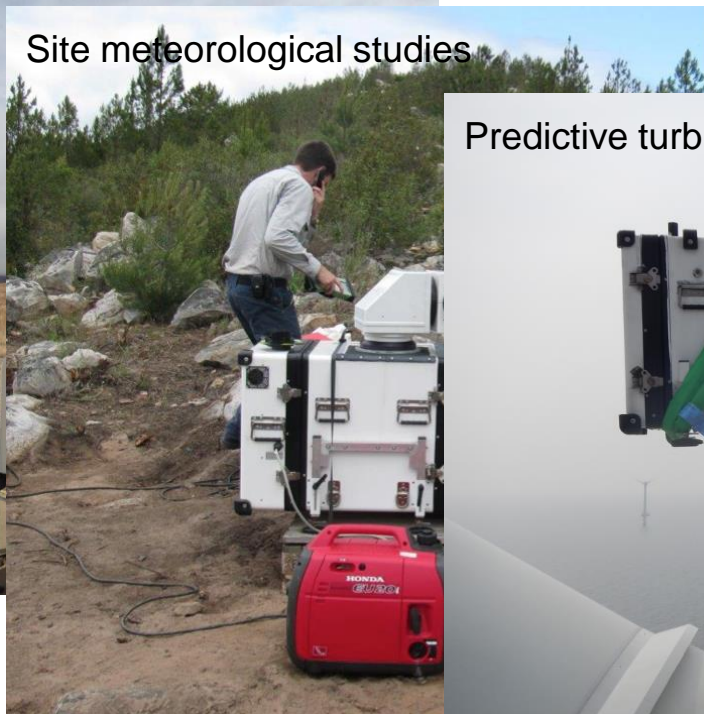
# Lidar is Revolutionizing Wind Energy



Turbine performance testing



Site meteorological studies



Predictive turbine control



# Different Users – Different Needs

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## Researchers

- Want to experiment
- Have time to explore and develop new ideas
- Build their own lidar systems

## Wind Energy Industry

- Just wants it to work now and every day
- Wants to try out research
- Buys commercial lidar

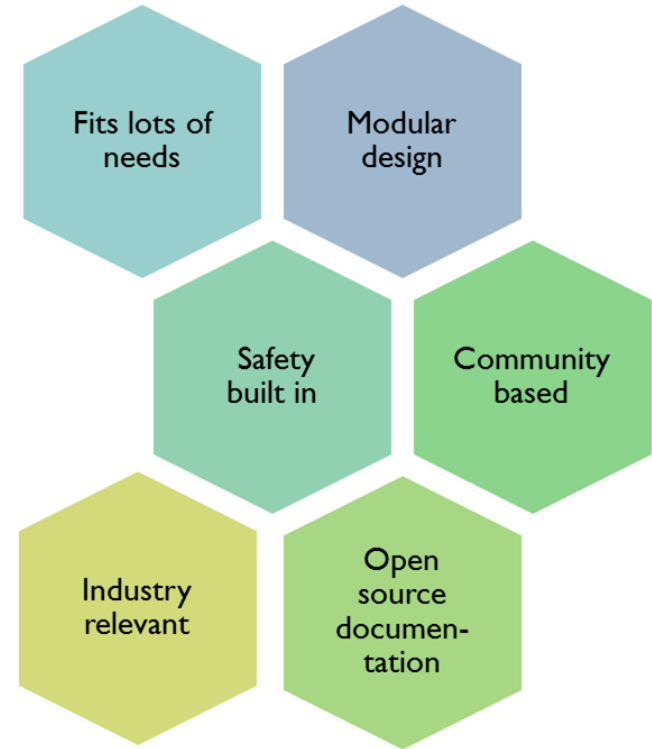
*Can the same black-box lidar serve both groups?*

# Our Solution is OpenLidar



A way to adapt a common lidar architecture for different users:

- Safe
- Customizable
- Documented
- Collaborative
- Can be commercialized



# Reaching Our Goal

Phase 1

- **Development of modular framework**
- Description of the interfaces between the modules
- Description of the measurement process control

Phase 2

- **Development of module designs**
- Collaboration across multiple organizations

2016 - 2018

Phase 3

- **Build prototype(s)**
- Different PIs focusing on different modules

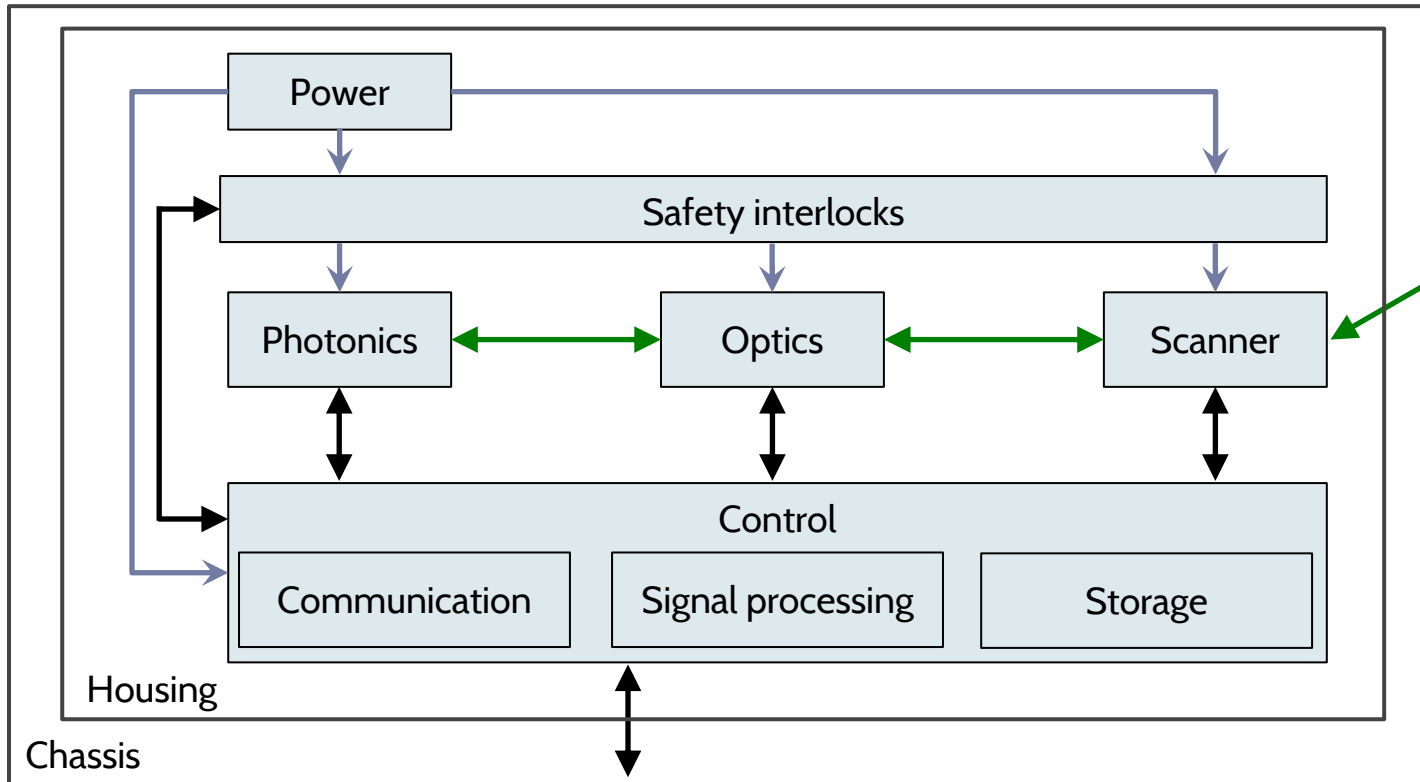
2018 - 2020

Phase 4

- **Mass Customization**
- Hardware and software can be adapted for any application

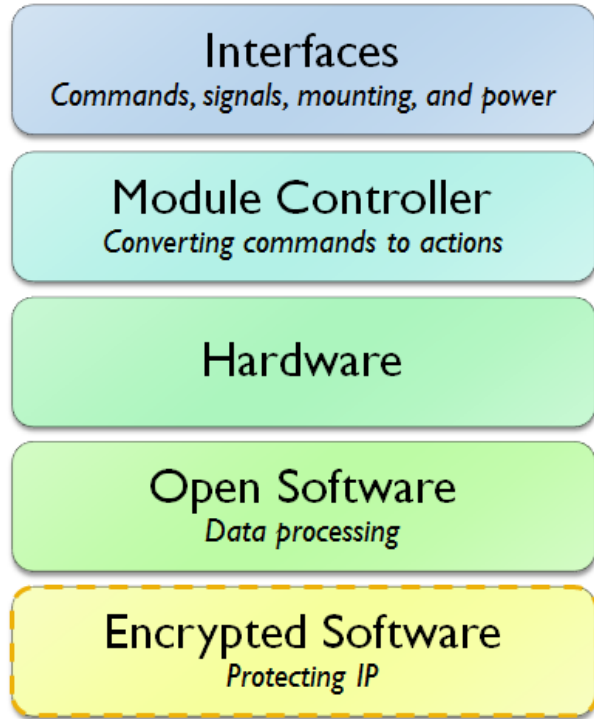
2020 -

# A Modular Architecture is the Key



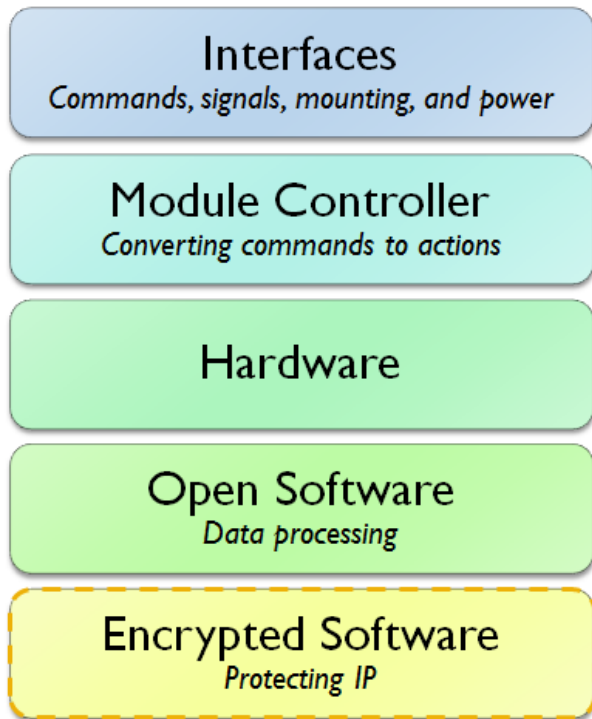
Black - digital signal  
Green - optical signal  
Blue - power

# The Controller Manages the Lidar



- Receives commands from master computer
- Converts commands into measurement strategy
- Embedded PC or FPGA
- Algorithms to calculate LOS wind speed
- Noise reduction algorithms

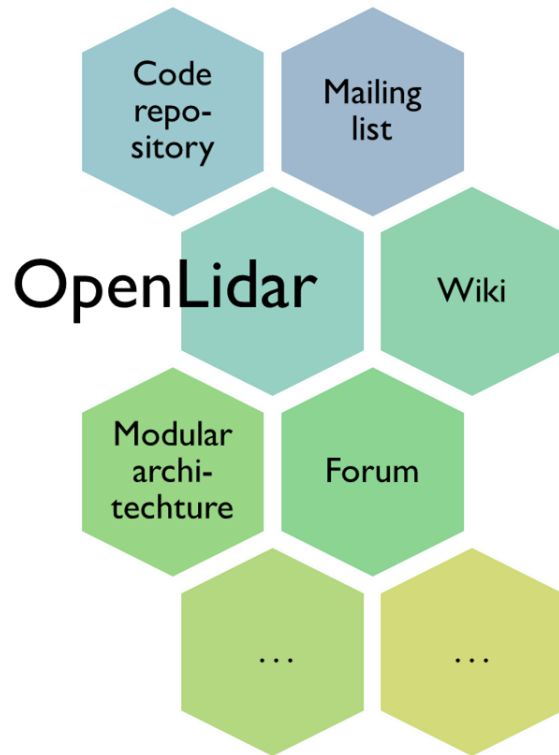
# The Scanner Directs the Beam



- Receives trajectory commands and power
- Translates trajectories into scanner movement
- Mirrors, prisms, stepper motors, ....
- Motor controls
- Feedforward pointing control



# OpenLidar Tools



The Wiki is a platform for

- Project information
- Documentation
- Data sharing
- Community exchange
- OpenLidar end users

[www.openlidar.net](http://www.openlidar.net)

# How to use OpenLidar



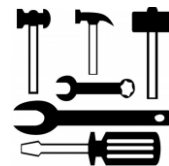
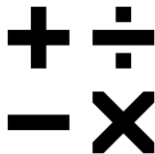
Newbie

Q: How can I develop and build a scanning lidar?

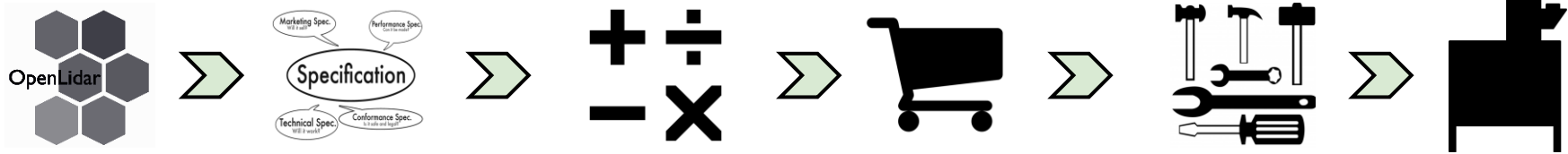


OpenLidar  
community

- A:
1. Check OpenLidar Wiki
  2. Establish necessary specifications and calculations
  3. Select components for the modules, acquire a list of vendors, order components
  4. Assemble the lidar.



# Two Lidar Shopping Lists



## 200-m Vertical Profiler

- 1 DOF scanner
- Control module (relatively simple)
- Photonics module (lower power)
- Power module
- ...

## 10-km All-sky Scanner

- 3 DOF scanner
- Control module (more complex)
- Photonics module (higher power)
- Power module
- ...

# Benefits for you



## Researchers:

- Get the tool they need
- Develop new modules
- Try out new ideas

## Industry:

- Develops and sells no-frills starter OpenLidar
- Partners with academia to develop technology
- Tries out new ideas on a common testbed



# How Can You Get Involved?



- Join the community
- Help refine the OpenLidar concept
- Design and build a module or lidar with these ideas
- Look for funding to explore OpenLidar
- Get students involved

[www.openlidar.net](http://www.openlidar.net)

[contact@openlidar.net](mailto:contact@openlidar.net)



# Let's Talk!



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