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Cyber Security in Self Driving Cars

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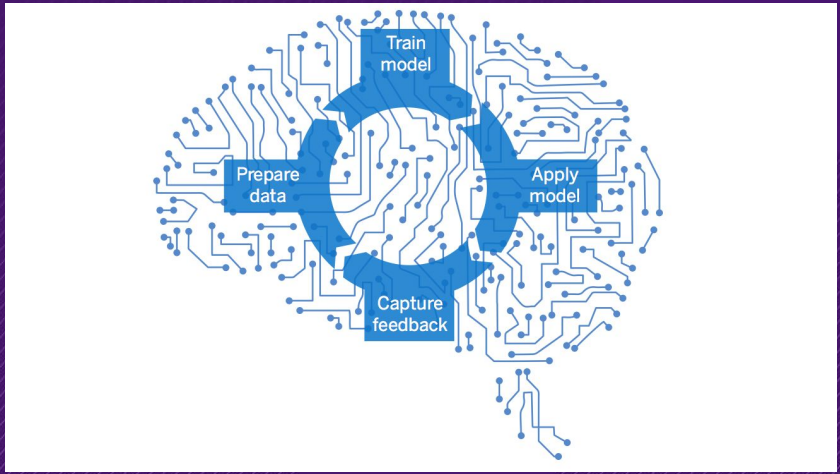
Solutions Search - What are we focusing on?

- Machine Learning
- Simulation Testing
- Cloud Storage
- Code Reviewers/ Encryption
- Collaboration among manufacturing companies
- Firewall



Solution Mechanism - How do they work?

Machine Learning

- Object detection: the identification and the recognition of the objects classification
- Object localization: the prediction of where and the object is located and the ability to predict movement.

Algorithms

- Regression
- Pattern Recognition
  - Support vector machine - SVM
  - Histograms of Oriented Gradients - HOG
  - Principal Component Analysis - PCA
- Cluster
- Decision Matrix

Solution Mechanism - How do they work?

Simulation Testing

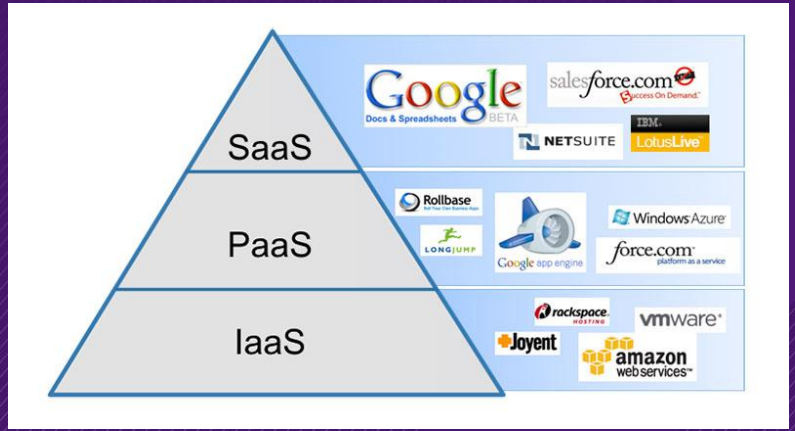
- Virtual Testing
  - Safety
  - Testing Exploits
  - Failure allows quick new data
- Quick learning
  - Machine learning
- Simulation is the framework
  - Creates quality of data

Solution Mechanism - How do they work?

Cloud Computing

Cloud Service Model

- Software as a Service (SaaS)
  - Google Docs
- Platform as a Service (PaaS)
  - Windows Azure
- Infrastructure as a Service (IaaS)
  - Joyent



Cloud Computing Integration

- Interact with Vehicles
- Storage
  - Set protocols
  - Records all data

Solution Mechanism - How do they work?

Code Reviewers

- Open source
  - Limits risk
- Open source for innovation
- Improvements
  - People can learn from other's methods making their own methods more efficient.

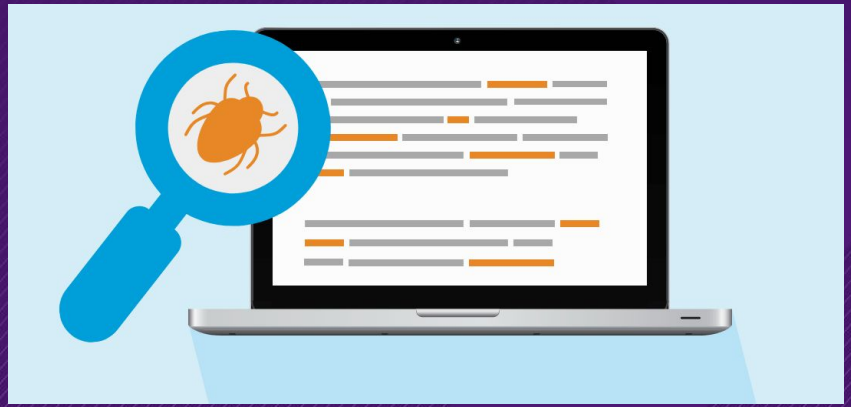
Encryption

- Secure and Safe
- Cyber Security
- Ties in with Firewall Protection

Solution Mechanism - How do they work?

Static Code Analysis

- Automated way of checking source code.
  - Efficient
  - Fast
- Helps catch things that might have been missed



Security Improvements

- Early Developments
- “Bug Hunts”
  - Code Exploits / Vulnerabilities

Solution Mechanism - How do they work?

Collaboration among manufacturing companies.

- Shared Technology between companies to prevent information breach.

Standard Safety Protocol

- Sharing protection and cybersecurity solutions
- Creates easy testing for vulnerabilities
- Reports of potential threats

Solution Mechanism - How do they work?

Firewall

AUTOSAR (Sectigo's Embedded Firewall)

- Embedded security system within automotive vehicles
- Prevent Cyber Attacks
  - Enforces Filtering rules
  - Detects anomalies
  - Identify Traffic

Solution Comparison - Technology Collaboration

- Technology and resources collaboration among manufacturing companies.
  - Advantage - Collaboration would mean better resources to develop a resilient technology that can secure the cars' infrastructure and keep hackers locked out.
  - Disadvantage - Each manufacturer may have a different coding system. It would give hackers an opportunity to exploit self-driving vehicles.

Solution Comparison - ML / Simulation Testing

- Machine Learning
  - Advantage - Identify & prevent unusual behavior
  - Disadvantage - Parameter selection, accuracy needs improvement, model selection restriction, additional methods for unbalanced dataset
- Simulation Testing
  - Advantage - Fast, more insights to underlying physics
  - Disadvantage - Expensive, don’t produce solutions

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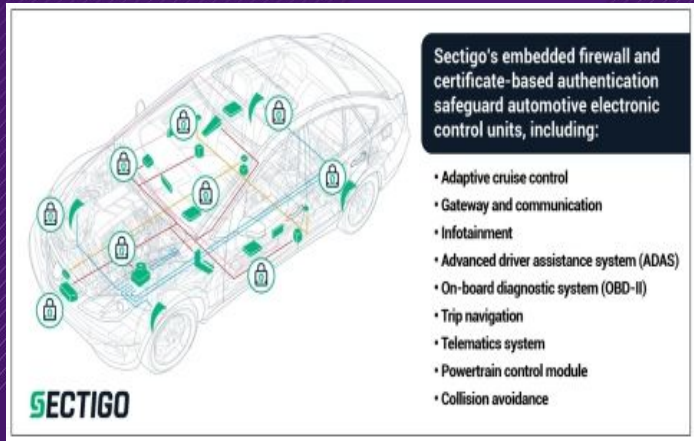
Solution Comparison - Cloud Storage / Encryption

- Cloud Storage
  - Advantage - Cheap, multiple layers of security
  - Disadvantage - Dependent on internet connection, no physical control of data
- Code Reviewers / Encryption
  - Advantage - Improves security/integrity of system software
  - Disadvantage - Information can't be highly encrypted w/o data delay

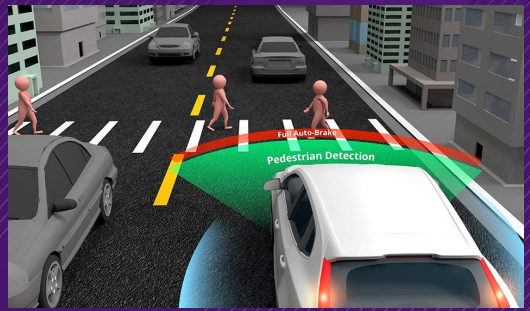
Solution Comparison - Firewall

- Firewall (Sectigo Embedded)
  - Advantage - Detects anomalies & identifies traffic variances to protect cars from network-based cyberattacks
  - Disadvantage - Controls all aspects of the vehicle



Solutions Integration - Machine Learning

- Our solution will involve the use of several potential solutions combined with machine learning being the main basis.
- Machine Learning with simulation testing will not only allow self-driving cars to test out how efficiently they are run, but also allows machine learning to map out what is going well and not so well.

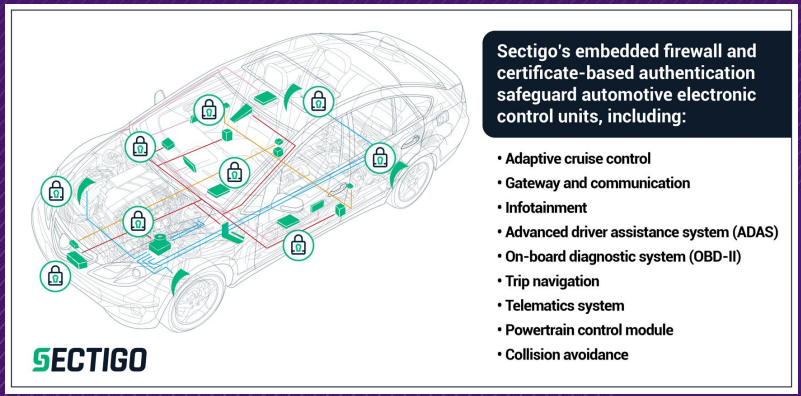


Solutions Integration - Cloud Storage

- The second main basis of our solution is the use of cloud storage.
- This is necessary for the protection of data within the cloud when it comes to the use of machine learning.
- This ensures the encryption and code review of data in order to prevent data from being compromised.

Solutions Integration - Firewall

- Although having an embedded firewall was one of the best options it has its shortcomings where it can interfere with other aspects of the car such as encryption or cloud storage access etc.



Thank You for your time! If you have any questions please let us know.

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