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AlphaSense

Industrial Internet of Things Maritime Condition Monitoring

December 2015

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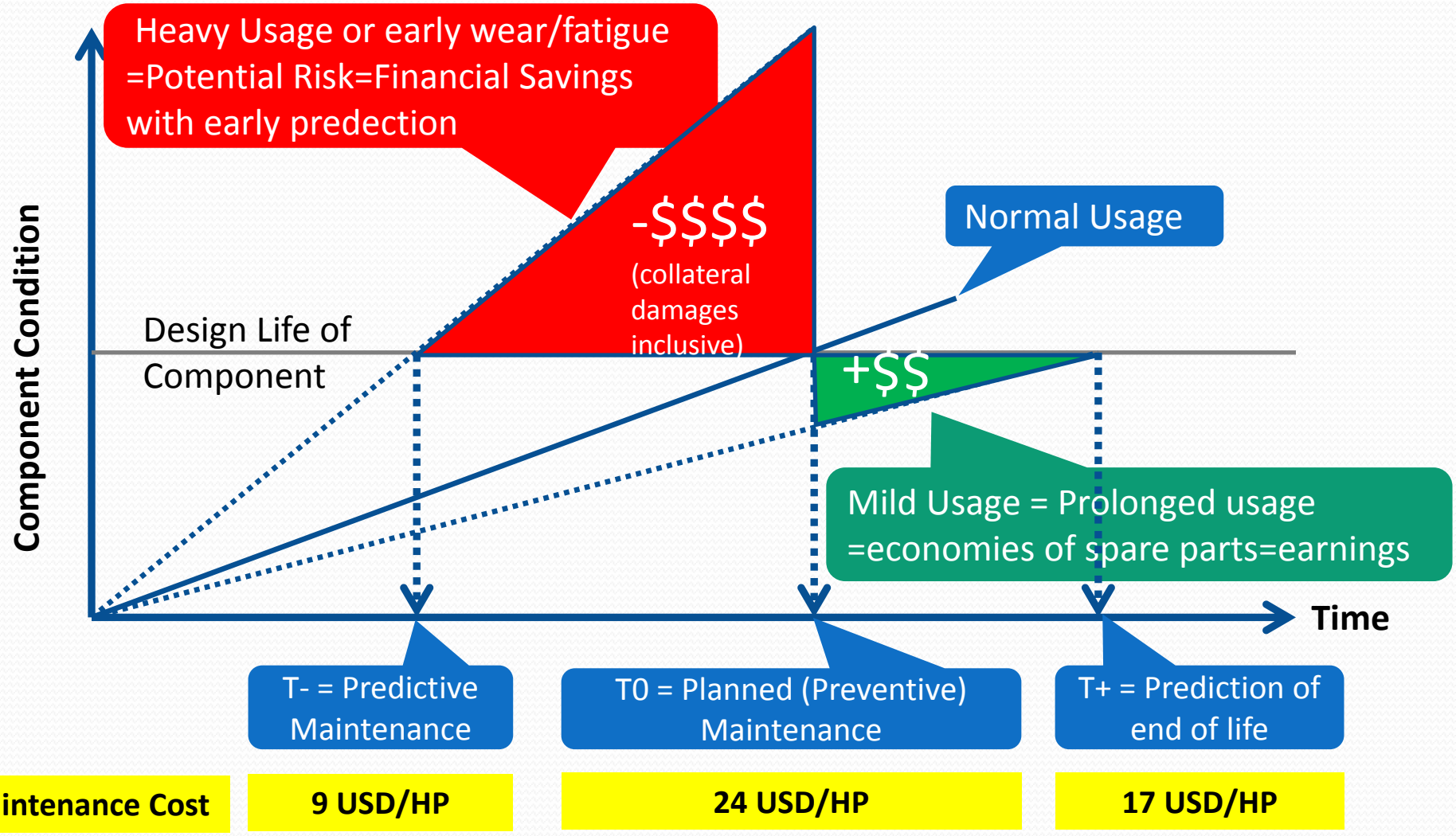
The problem and the market need

- **The problem**
  - Premature machinery or component failure
  - Suboptimal usage of material resources in maintenance (80% of main engine damages occur within 3 months after the main engine overhauling inspection by class)
  - Human errors in operations
  - New environmental, regulatory and customer compliance requirements
  - Limited information regarding vessels' monitoring in maritime HQs
- **The need**
  - Affordable retrofit of condition monitoring systems with minimal infrastructure modifications
  - Continuous and automatic condition monitoring, analysis and reporting to company HQs
  - Aggregation, consolidation and synchronization of condition measurements in space and time from different machines irrespective of manufacturer
  - Fulfillment of new regulations = demand for retrofitting condition monitoring systems

Predictive vs Preventive (planned) maintenance



Maintenance Cost	9 USD/HP	24 USD/HP	17 USD/HP

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AlphaSense typical Condition Monitoring Applications

- Condition based Maintenance (Predictive Maintenance) of components (e.g. bearings) and machinery (e.g. turbochargers, pumps)
- Tankers manifold pressure recording during loading/unloading (Exxon-Mobil requirement)
- Refrigerated Containers internal temperature-humidity monitoring
- Environment monitoring in cargoes of bulk carriers
- Exhaust gases monitoring and recording in Emission Controlled Areas (ECA)
- Exhaust economizer monitoring and control in container vessels
- Electrical energy monitoring
- Optimal voyage route planning
- Fuel oil consumption and bunkering monitoring
- Bridge Navigational Watch Alarm systems

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The AlphaSense Solution

A wireless sensor network solution consisting of hardware and software to continuously acquire, analyze and synchronize in space and time, condition measurements from various components and/or machinery

- **Benefits**
  - Prediction of failures,
  - Optimized maintenance planning (reduced spares inventory)
  - Automation of reporting
  - Avoidance of collateral damages
  - Minimization of cabling cost
  - Elimination of cabling problems due to fatigue and environment parameters
  - Safer operations
  - Quick and affordable regulatory compliance
  - Improved reliability and vessel valuation
  - Risk and failure management
  - Competitive vetting advantage from P&I clubs and charterers

You can only manage and improve, what you measure

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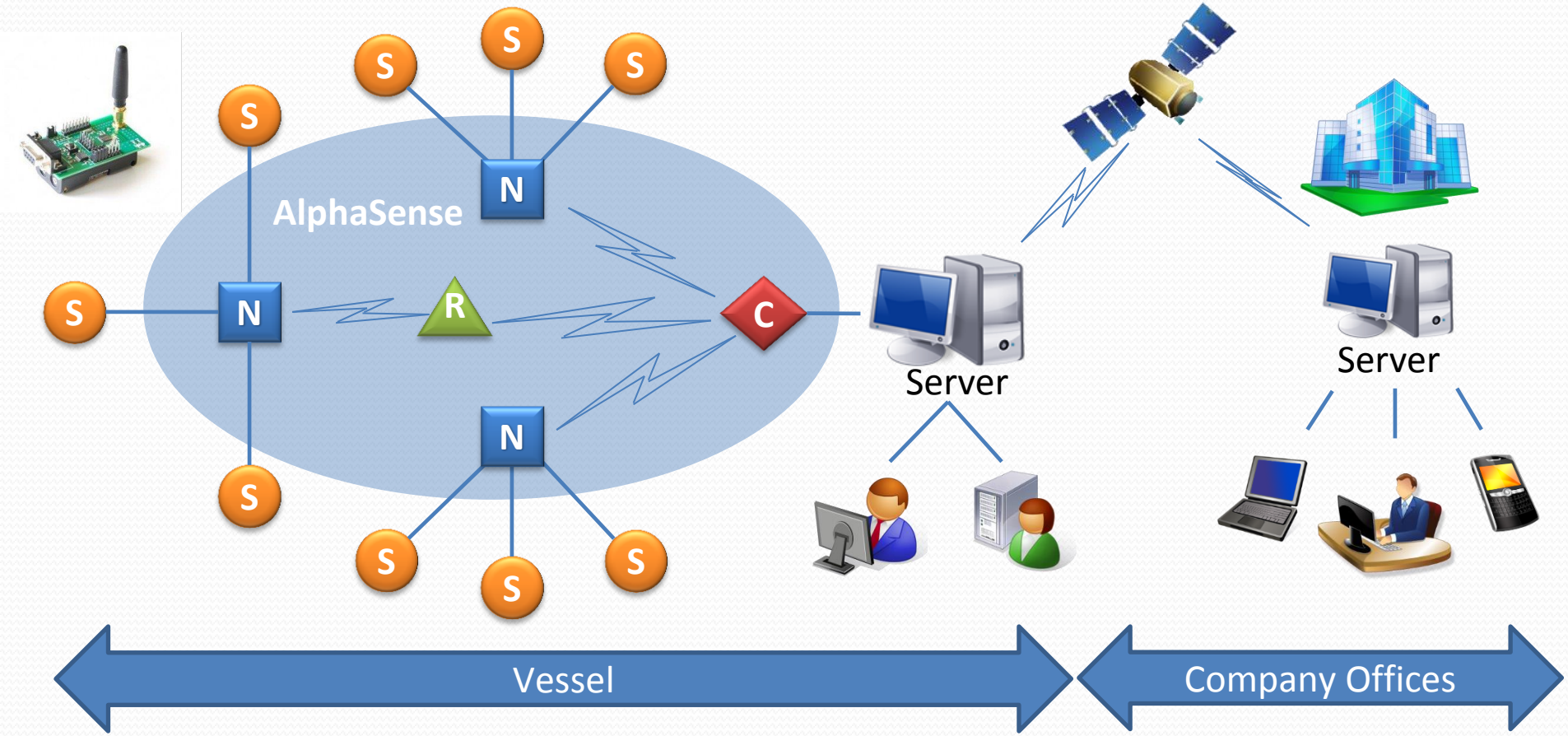
AlphaSense@Maritime Solution

S **S**ensor N Sensor **N**ode Device R Network **R**outer C Network **C**oordinator



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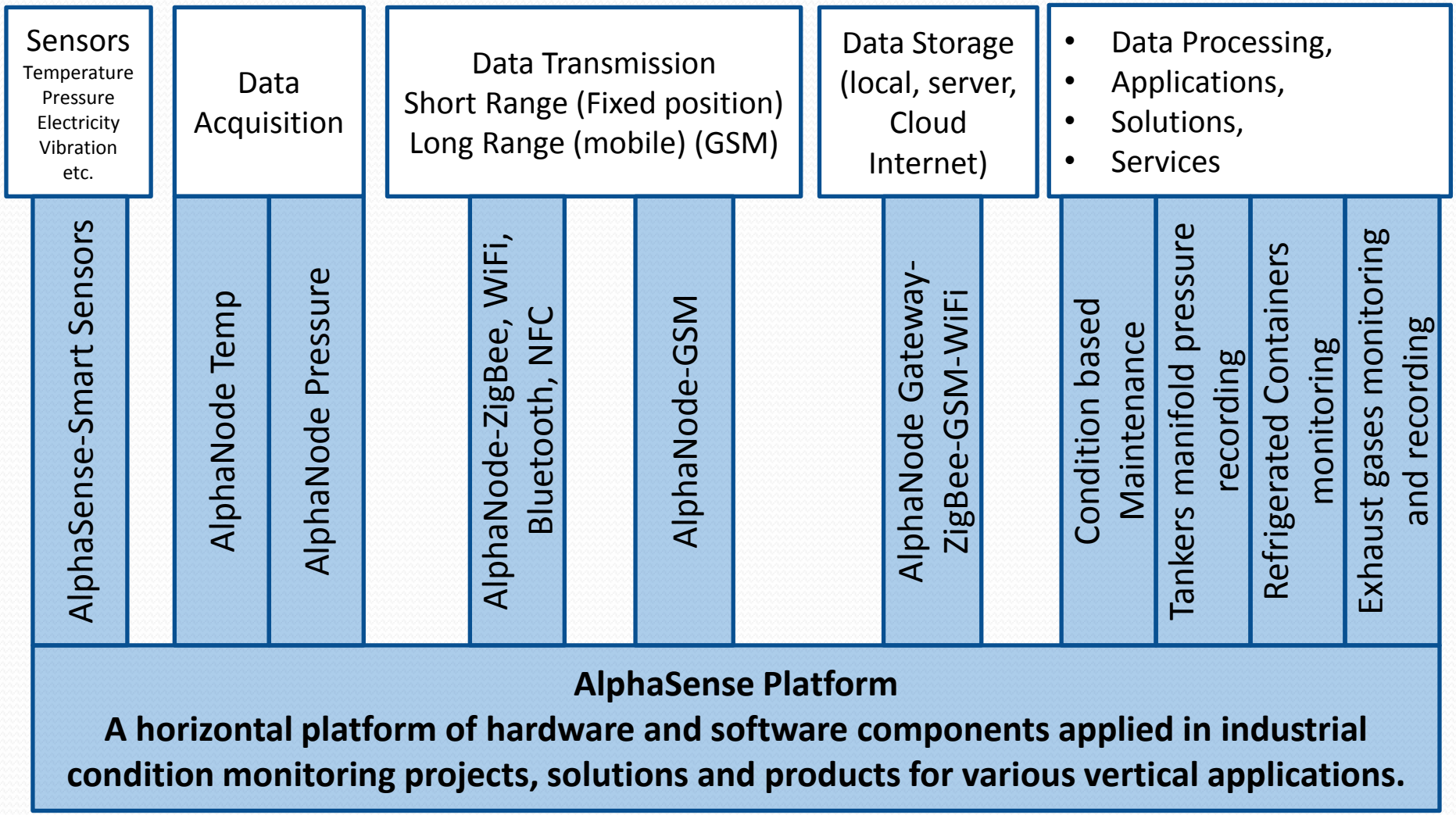
The AlphaSense Platform



The Market

- Vessels of any type
- 35000 commercial vessels worldwide
  - >4800 vessels in 600 companies of Greek interests
  - 8350 vessels of Japanese interests
  - 6400 vessels of Chinese interests
- Minimum retrofit cabled solution >$100K
- Minimum market value: $3.5b
- Average age of Greek vessels ~10 years (ideal for retrofitting)
- Many and different applications per type of vessel
- New IMO regulations with technical requirements, require retrofitting of monitoring systems
- Charterers are more environmentally and safety conscious

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You can only manage and improve, what you measure

The best way to predict future, is to measure at present

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