Industrial DevOps Applied
Introductions

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Intent of Industrial DevOps

• How to scale DevOps practices across large complex systems composed of hardware, firmware, and software

• Address the misconception is that this form of rapid iteration and flow is only for software, or small applications or systems

• Provide an extended definition for DevOps, and provide recommendations
Companies like Lockheed Martin and Northrop Grumman build life human safety critical like F-35 and the B-2
Example: Autonomous Vehicle

Autonomous vehicles have similar complexity and human safety details as many of the products that Lockheed Martin and Northrop Grumman currently do.
Organize Around the Value Stream

1. Visualize and organize around the value stream
2. Multiple Horizons of Planning
3. Base decisions on objective evidence of system state and performance
4. Architect for Scale, Modularity, and Serviceability
5. Iterate / Reduce batch size / Get fast feedback
6. Cadence and Synchronization
7. Continuous Integration
8. Test Driven Development

Vehicle Value Stream

→ Safety and Security Value Streamlet

→ Collision Avoidance Value Streamlet
Multiple Horizons of Planning

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Short Term MVP’s
To
Long Lead Items
Apply Decisions Based on Objective Evidence

<table>
<thead>
<tr>
<th>Time Horizon</th>
<th>Capability</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>epic</td>
<td>Annual</td>
<td>Enhance obstacle detection through updates to sensor types; refactoring architecture</td>
</tr>
<tr>
<td>feature</td>
<td>Quarterly</td>
<td>Enhanced Lidar sensor color profile</td>
</tr>
<tr>
<td>User story</td>
<td>Iteration</td>
<td>Split Lidar by component value</td>
</tr>
<tr>
<td>task</td>
<td>Day</td>
<td>Update cloud point extents in ESRI</td>
</tr>
</tbody>
</table>

Evidence at each level

1. Visualize and organize around the value stream
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Applying Architecture for Modularity

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7. Contin-uish Integration
8. Test Driven Development
Iterate and reduce batch size

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Applying Cadence and Synchronization

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Example: harmonic multiple system integration

- Cadence
  - Makes routine that which can be routine
  - Lowers the transaction cost of events
  - Makes waiting times predictable
  - Facilitates planning
  - Makes small batches feasible

- Synchronization
  - Causes multiple events to happen at the same time
  - Prevents alignment errors from accumulating
  - Facilitates cross-functional tradeoffs
  - Provides objective evidence
  - Allows synchronization of design cycles
Apply Continu-ish Integration

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Apply Test Driven

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New Camera
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Industrial DevOps Publication

- Industrial DevOps expands the definition of DevOps outside of software to enable significant cyber-physical systems development programs to be more responsive to changing needs while reducing lead times.

- It is the application of continuous delivery and DevOps principles to the development, manufacturing, deployment, and serviceability of significant cyber-physical systems.

Summary

Leveraging the power of Industrial DevOps for large complex systems is an industry step change and the companies that solution this problem first will increase transparency, reduce cycle time, increase value for money, and innovate faster.
QUESTIONS?