ROS Hub And You
The Robotics Cloud: A Case Study

https://roshub.io/roscon
What is ROS?

“A dwarf on a giant’s shoulders sees farther of the two”
# ROS Features

<table>
<thead>
<tr>
<th>Communication</th>
<th>Generic Robot API</th>
<th>Tools</th>
</tr>
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<tbody>
<tr>
<td>- Infrastructure</td>
<td>- Standardized Data Formats</td>
<td>- Visualization</td>
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<tr>
<td>- Computation</td>
<td>- Robot Geometry</td>
<td>- Simulation</td>
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<tr>
<td>- Topics</td>
<td>- Robot Modeling</td>
<td>- System Analysis</td>
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<tr>
<td>- Services</td>
<td>- Diagnostics</td>
<td>- Data Logging</td>
</tr>
<tr>
<td>- Parameters</td>
<td>- Navigation</td>
<td>- Packages</td>
</tr>
</tbody>
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- Generic Robot API
  - Standardized Data Formats
  - Robot Geometry
  - Robot Modeling
  - Diagnostics
  - Navigation
ROS Key Players
Design Patterns
# ROS Design Patterns

## Best Practices
- Tests in simulation
- Model robot as URDF
- Composable `.launch`
- `Action` oriented systems

## Composable Modules
- Domain specific libraries
- Wrap libraries as ROS packages
- Generic Nodes
  - Unix design principles

## Optimizations
- Custom hardware communication
- Nodelets
- Hardware acceleration
ROS Limitations
## ROS Limitations

<table>
<thead>
<tr>
<th>Security</th>
<th>Management</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>● No Users</td>
<td>● No remote management</td>
<td>● Remote monitoring</td>
</tr>
<tr>
<td>● No Authentication</td>
<td>○ Code</td>
<td>● Success/Failure</td>
</tr>
<tr>
<td>● No Authorization</td>
<td>○ Deploy</td>
<td></td>
</tr>
<tr>
<td>● Not safe on open networks</td>
<td>○ Update</td>
<td></td>
</tr>
<tr>
<td>● Not safe on public internet</td>
<td>○ Configure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● No cloud support</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Organizational delegation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● No mobile apps</td>
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</tbody>
</table>
The solution

- Teleoperation
- Device Management
- Process Management
- Fleet Management
- Simulation
- Data Analytics
- 3rd Party Integrations
Engineering
Engineering

Parallel Paths

- Product
  - Hardware
  - Electrical
  - Firmware
  - Software
- Support
  - Deployment
  - Monitoring
  - Repair

Requirements → Prototype → Design → Build → Evaluate → Optimize → LAUNCH
Operations
Product Line Management
Product Line Management

- Same product different SKUs?
- Product line refresh cycles?
- Total different products
- Concurrent product support operations
Feature Roadmap
Feature Roadmap

- Teleoperation ✔
- Device Management ✔
- 3rd Party Integrations ✔
- Process Management
- Fleet Management
- Simulation
- Data Analytics
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https://www.youtube.com/watch?v=4nTWZwGRUwA

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