

 THE LINUX FOUNDATION  
**OPEN SOURCE SUMMIT**  
NORTH AMERICA

# Open Horizon Lightning Talk

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#ossummit



# What is Open Horizon?

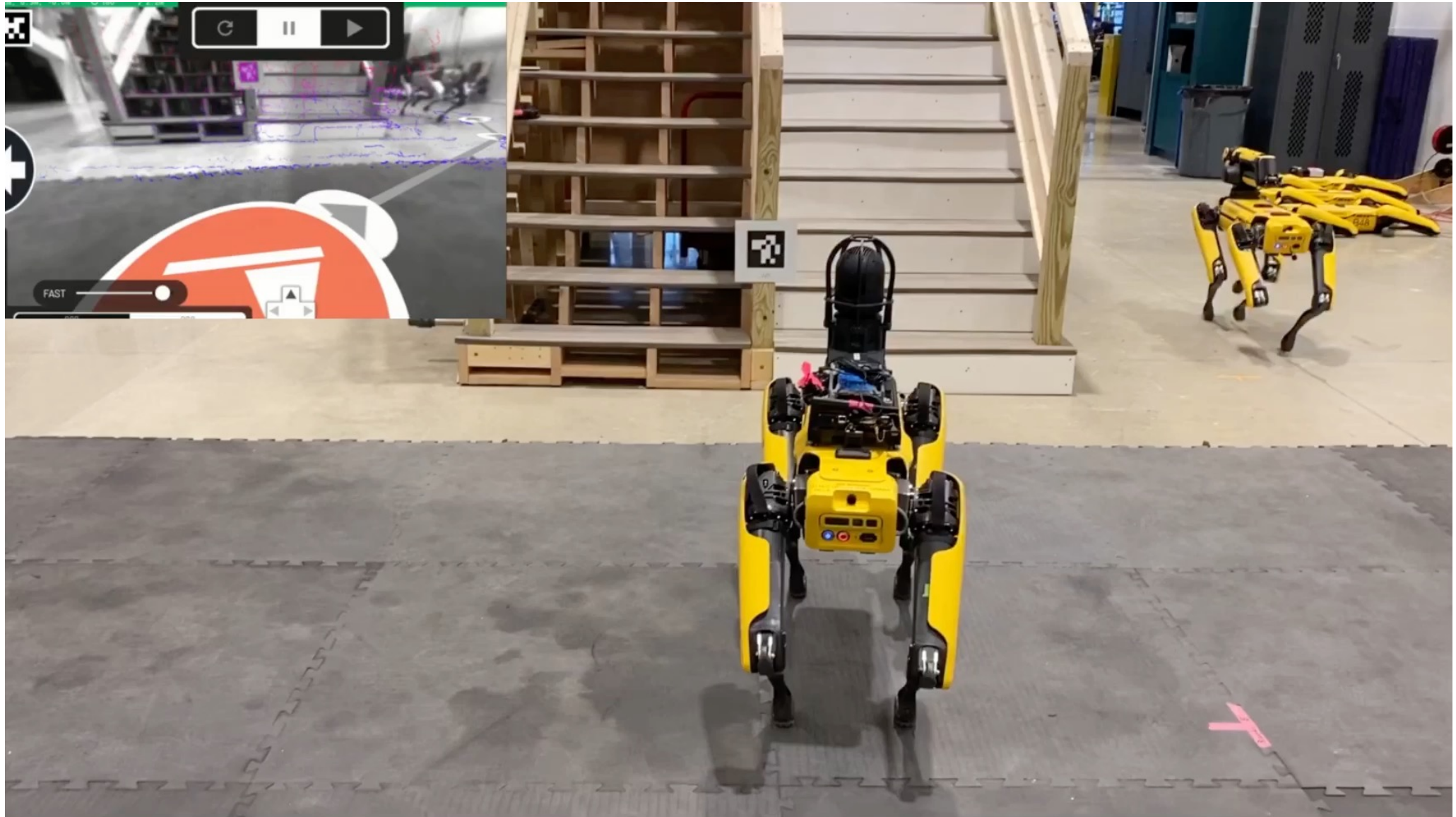
- The most powerful open source project you've never heard of!
- Edge fleet management for containerized software and data files
  - on most types of [Kubernetes clusters](#)
  - on most [stand-alone Linux, using docker or equivalent](#) (with 512MB or +)
  - on most hardware architectures (x86, ARM, others)
  - at massive scale
- Open source, with open governance under the Linux Foundation's LF-Edge:  
<https://www.lfedge.org/projects/openhorizon/>

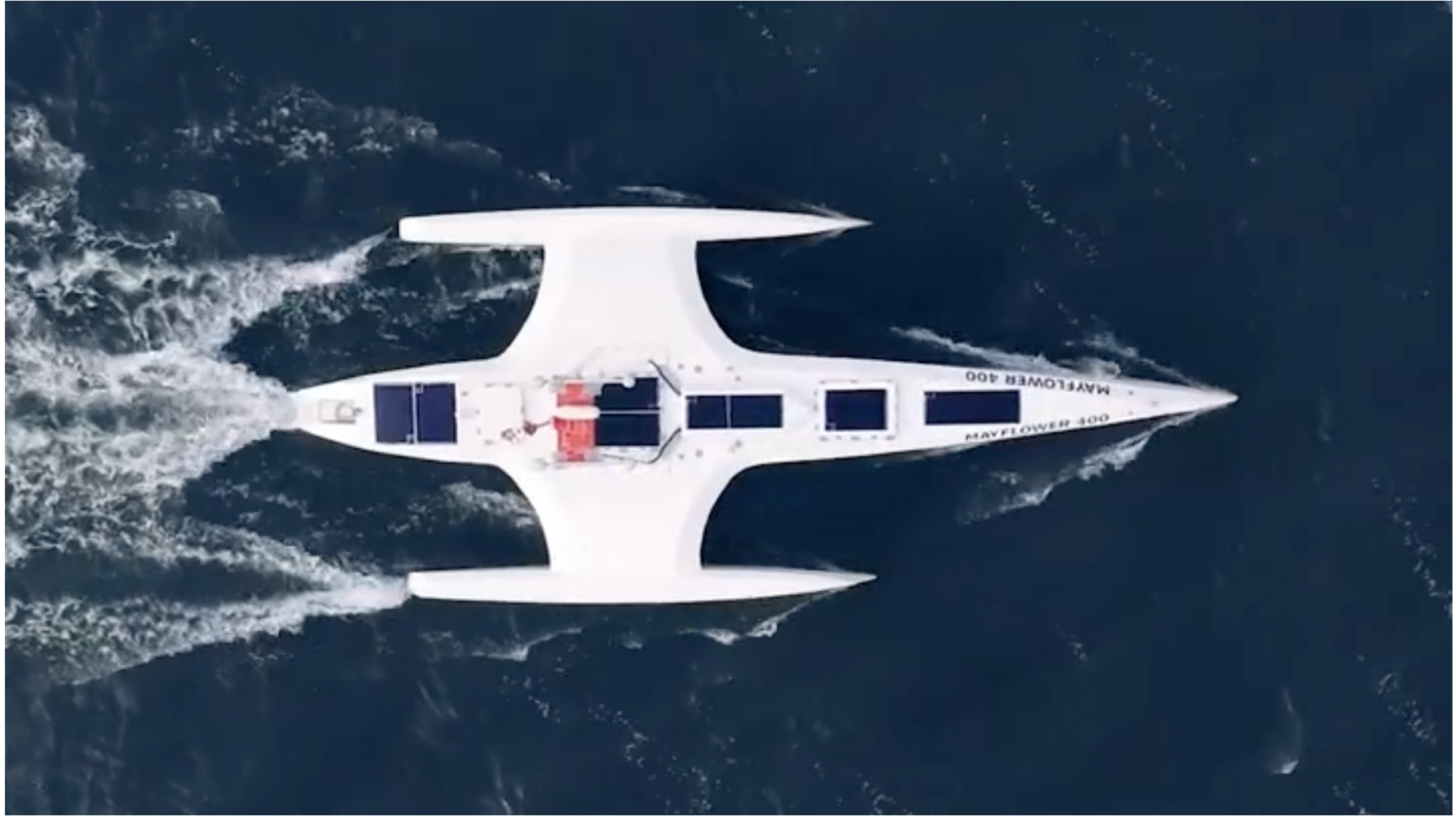


# Edge Computing Examples...

- Edge computing is about bringing computation assets (HW, SW) close to the input data and close to where actions must occur
- Edge use cases are many and varied:
  - Conversational AI
  - Security video
  - Autonomous vehicles
  - Loss prevention
  - Patient monitoring
  - Factory automation
  - Traffic Management
  - and many, many more!
- Here are two examples where Open Horizon is being used **today**...







# Edge Computing Examples....

- Visit <https://mas400.com/> for more details
- To watch live (camera video and/or numeric telemetry):
  - <https://mas400.com/dashboard#live>



# Architecture – Quick Snapshot

- Agents are autonomous, firewalled, driven by policies you set
- Nothing ever initiates contact with Agents, Agents always initiate
- Edge node IP addresses are kept private (for security/privacy)
- All code and data files and deployment details are all cryptographically signed
- Highly decentralized, scales extremely well
- Agents continue to function when disconnected from Hub
- A compromised Management Hub cannot take control of Agents!
- All comms (even between internal components) are encrypted
- Agent/AgBot comms have “perfect forward secrecy”
- Model Management System enables independent lifecycles for code and data
- This also enables model update with zero downtime
- Secrets Manager enables Agent to share secrets with containers at runtime



# Open Horizon Policies

- Policies are the basis for the autonomy of the Open Horizon Agent
  - Simpler Deployment Patterns can be used instead, but they are less capable
- Policies can be attached to edge **nodes**, **services**, and **deployments**
- Policies always contain **properties** and/or **constraints**
- Properties are simply name/value pairs. E.g.:
  - `"name": "HasCamera", "value": true`
- Some are defined automatically by the Agent (e.g., node attributes)
  - All of the Agent-defined properties have an `"openhorizon."` prefix
- Constraints are logical expressions in terms of Properties. E.g:
  - `"openhorizon.memory >= 2000"`
- The constraint language is rich with many operators





# Open Horizon Policies

- Each Agent independently runs constraint resolution based upon:
  - The policies attached to its own node, and
  - Any relevant Deployment Policies (which the AgBots suggest to them), and
  - Any (optional) Service Policies attached to the Service in that deployment, then
  - Matches all those Property values to all of those Constraint expressions, and...
  - Evaluates the result (which is specific for its node only)
  - When the result is "true", the Service will be verified then deployed to its node
- A tool is provided to facilitate modeling and to debug deployments
  - `hzn deploycheck ...`
- This tool enables you to see the effect of Policy changes ahead of time without actually applying them across your fleet



# Open Horizon Usage

- Edge nodes can be registered using their SDO/FDO voucher:
  - `hzn voucher import ...`
- Or edge nodes can be manually registered:
  - `hzn register ...`
- Then you can publish a Service definition (JSON) for your container
  - `hzn exchange service publish ...`
- And publish a deployment pattern (JSON) or deployment policy (JSON):
  - `hzn exchange pattern publish ...`
  - `hzn exchange deployment addpolicy ...`
- Assuming your Policy Constraints all resolve using your Policy Properties, your Agents will deploy your Service to the appropriate set of your nodes



# Open Horizon Usage

- All Policies may contain Properties and/or Constraints, as you wish
- Deployment Policies must also identify the specific Service they will deploy
- How I normally use Policies:
  - Normally my Node Policies contain only Properties (no Constraints)  
I use these to identify any node specifics: its capabilities, its intended role, etc.
  - Normally I omit Service Policies, but developers can use these to specify requirements for their Service containers (e.g., memory requirements)
  - Normally my Deployment Policies contain only Constraints (no Properties)  
I use them to orchestrate the Service deployment any way I want  
E.g., I can essentially say:  
“deploy to all smart cameras with Intel Movidius VPUs that are installed for shelf monitoring in the cereal aisles of all stores in Texas”
- When the scale is large (many thousands of nodes) this “intent” approach is much easier to use than the common prescriptive/declarative approach





**Want to learn more?  
Please join my Open Horizon  
Talk on Thursday**



# Open Horizon: Videos, Docs, Example Code...

- Open Horizon playlist on the LF Edge YouTube channel:
  - <https://bit.ly/34o9Qn4>  
(tech deep dives, flow animations, hands-on demos)
- Open-Horizon documentation:
  - <https://open-horizon.github.io>
- Open-Horizon GitHub (source code)
  - <https://github.com/open-horizon>
- Examples ready for Open-Horizon:
  - <https://github.com/open-horizon/examples>
  - <https://github.com/open-horizon-services/>



## Open Horizon: Contact Us...

- To contact us on the Linux Foundation chat system, first get a Linux Foundation ID (**free**) from here:
- <https://identity.linuxfoundation.org/>
- Then join one of the “open-horizon-...” channels, e.g., the Examples Working Group channel, here:
- <https://matrix.to/#/#open-horizon-examples:chat.lfx.linuxfoundation.org>
- Or send me an email:
- [glendarling@us.ibm.com](mailto:glendarling@us.ibm.com)



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