

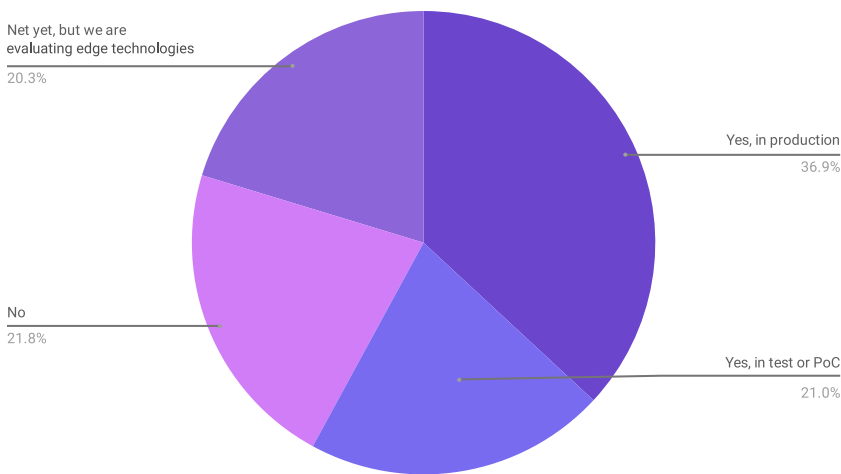
KUBERNETES AT THE EDGE: ORGANIZATIONS ARE USING EDGE TECHNOLOGIES, BUT THERE IS ROOM TO GROW

With the help of the [Kubernetes IoT Edge Working Group](#) and [LF Edge](#), CNCF recently conducted a microsurvey of the extended community to see how organizations are using edge technologies with Kubernetes.

The survey received 271 responses overall.

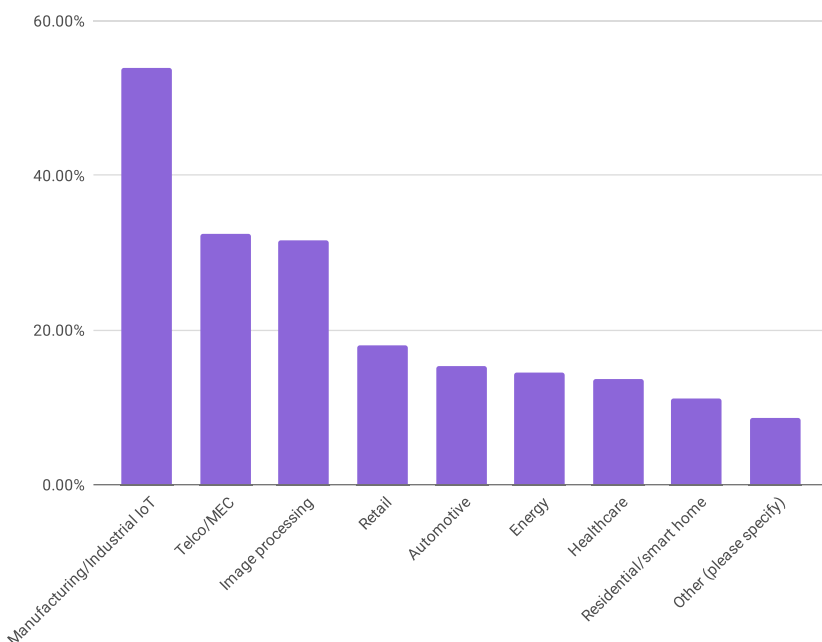
58% or 145 respondents use edge technologies – 37% in production and 21% in test or PoC.

IS YOUR ORGANIZATION USING EDGE COMPUTING?



42% of respondents did not use edge computing and were disqualified from the survey. Of the 157 qualified respondents, 87 completed the full survey, with varying rates of response throughout.

WHAT IS YOUR EDGE USE CASE?

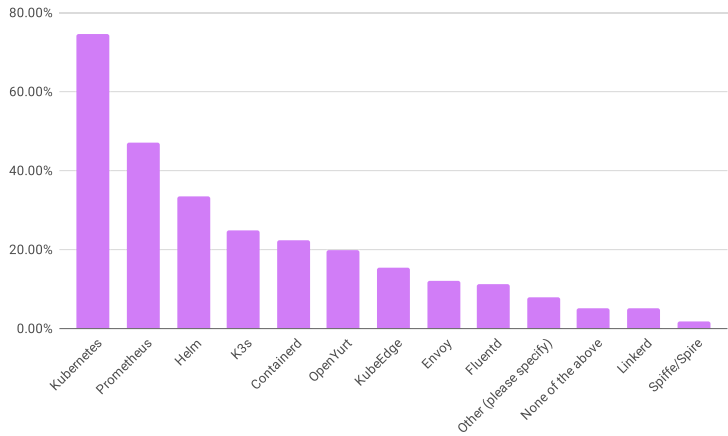


According to 117 respondents, the most popular edge use case is manufacturing/ industrial IoT, with 54% of respondents (respondents were allowed to select multiple responses). 32% of respondents use edge for Telco/MEC, and 32% use edge computing for image processing.

Responses for other included space, personal AI, government/academic research, and sports/entertainment/ event venues.

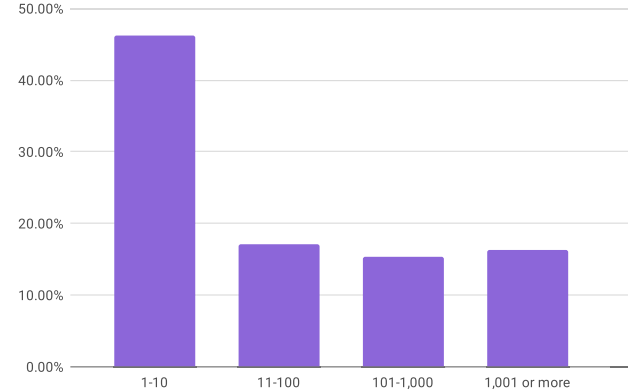
KUBERNETES AT THE EDGE

WHICH CNCF PROJECTS ARE YOU USING FOR EDGE APPLICATIONS?



Of 117 respondents, 75% use Kubernetes for their edge applications. Other popular projects are Prometheus (47%), Helm (33%), and k3s (25%).

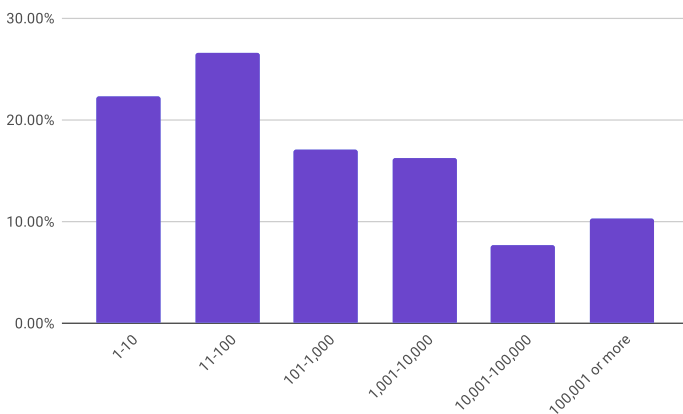
HOW MANY KUBERNETES CLUSTERS ARE YOU MANAGING?



Of the 111 respondents using Kubernetes with edge deployments, nearly half, 49%, use between 1-10 Kubernetes clusters.

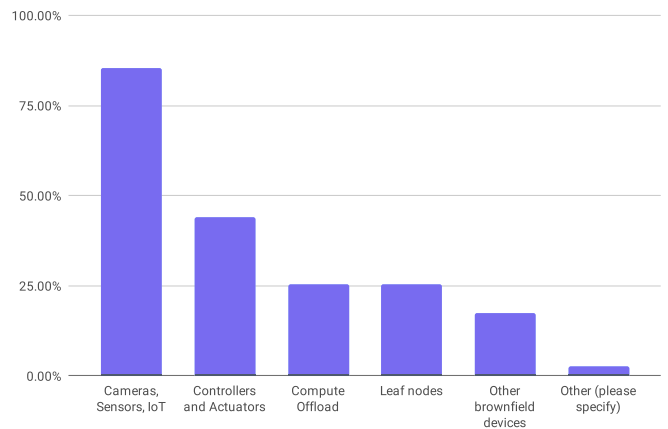
EDGE DEPLOYMENTS

HOW MANY NODES/DEVICES ARE YOU MANAGING?



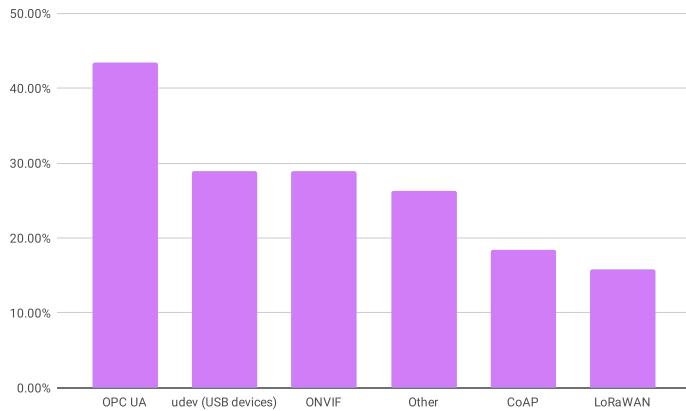
Almost half of respondents (49%) manage fewer than 100 nodes/devices. 10% manage 100,000 or more, demonstrating the variety in edge deployment sizes.

WHAT KIND OF DEVICES ARE INTERACTING WITH YOUR CLUSTER?



Of 117 respondents, 70% indicate that devices (such as IoT devices, leaf devices, or sensors) interact with their cluster. Of those who responded yes and responded to the question (75), 85% have cameras, sensors, or IoT devices interacting with their cluster. 44% have controllers or actuators, 25% have compute offload, and 25% have leaf nodes.

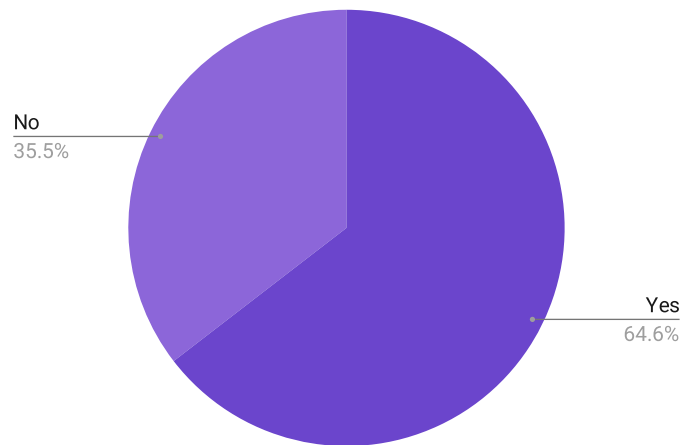
WHAT PROTOCOLS DO THESE DEVICES COMMUNICATE WITH?



Respondents indicate that these devices communicate using several different protocols with OPC UA is the most common protocol at 43%.

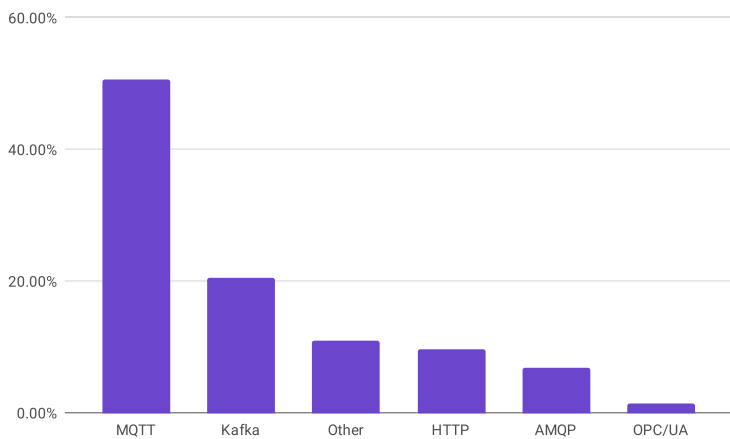
Responses for other included Bluetooth, camera, MQTT,

DO YOU NEED A MESSAGE BROKER ON THE EDGE SIDE?



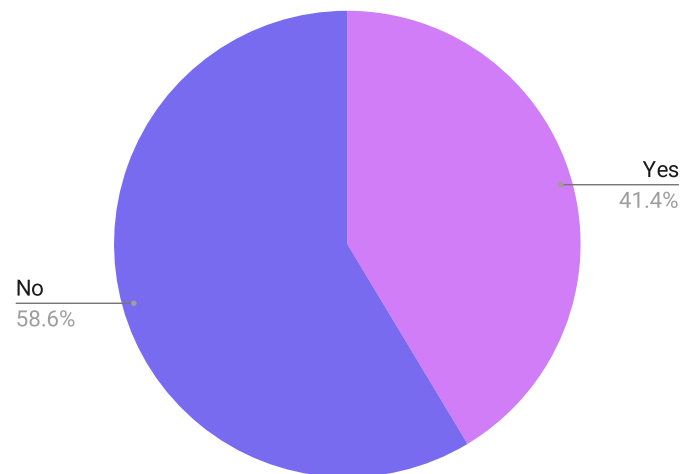
Of 110 respondents who answered the question, nearly two-thirds (65%) need a message broker on the edge side.

WHAT PROTOCOL DO YOU USE WITH THE MESSAGE BROKER?



Of these who need a message broker, 51% use the MQTT protocol.

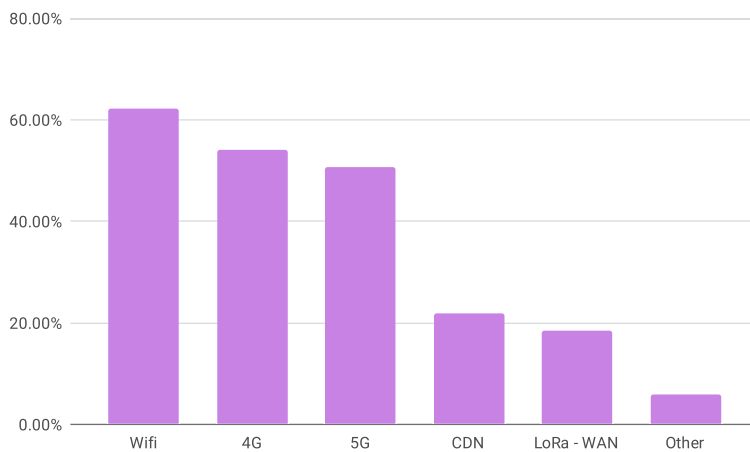
DO DIFFERENT CUSTOMERS SHARE ONE EDGE DEPLOYMENT?



The following questions were all answered by 87 respondents.

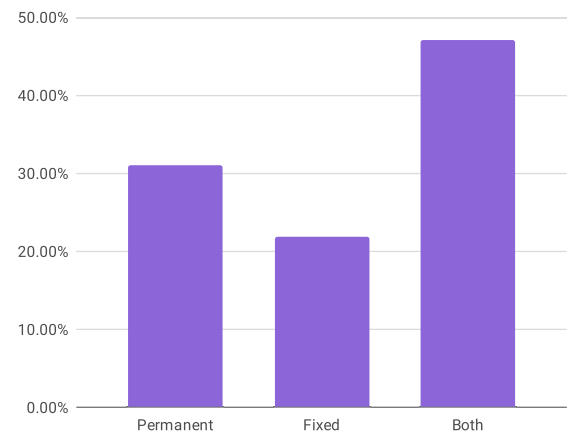
The majority of organizations (59%) do not have different customers sharing one edge deployment.

HOW DO YOU ACCESS THE EDGE?



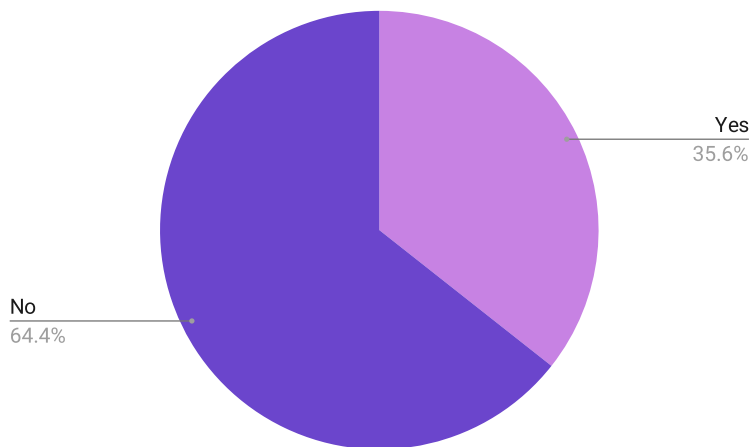
Wifi is the most common way of accessing the edge, as selected by 62% of respondents. This is followed by 4G (54%) and 5G (51%).

ARE YOUR EDGE LOCATIONS PERMANENT OR FIXED?



Almost half (47%) of organizations have both permanent and fixed edge locations. Of those who don't use both, permanent (31%) is more common than fixed (22%).

DO YOU RUN A SERVICE MESH ON THE EDGE?



The majority of respondents (64%) don't run a service mesh at the edge.

THE TOP THREE CHALLENGES WHEN AUTHORIZING, DEPLOYING, AND/OR RUNNING APPLICATIONS AT THE EDGE ARE:

1. Security of the deployment and content.
2. Edge devices going offline.
3. Observability of activities/status at edge.

METHODOLOGY

The microsurvey was designed by the Kubernetes IoT Edge Working Group. It was conducted during March and April 2021 and was shared with the CNCF, Kubernetes, and LF Edge communities.

Of 134 qualified respondents:

- 47% were from Asia
- 25% were from Europe
- 25% were from North America
- 4% were from Africa, Australia, and Oceania, or South and Central America

Almost half (47%) represented large enterprises with more than 5,000 employees.

- Another 16% came from organizations with between 1,000 and 5,000 employees.
- 16% came from an organization with between 50-999 employees.
- 21% came from an organization with fewer than 50 employees.

Almost half (49%) selected software architect as a job function. Others include:

- 19% SRE/DevOps engineer
- 18% front end/applications developer
- 16% DevOps management
- 15% full-stack developer

56% represented organizations in the software/technology industry. Other industries include:

- 10% telecommunications
- 4% agriculture
- 4% consulting