

# Nexoedge: Multi-Cloud Storage for Edge

**nexoedge**

Project Overview

 THE **LINUX** FOUNDATION

 **LF** EDGE

## Market Overview: Edge Infrastructure

IoT accelerates the development of Edge-Cloud infrastructure which creating a new normal ecosystem that changes the lifestyle of all human beings.

### How Important is Edge? Its Value?

#### New Market New Demand

##### Market Size

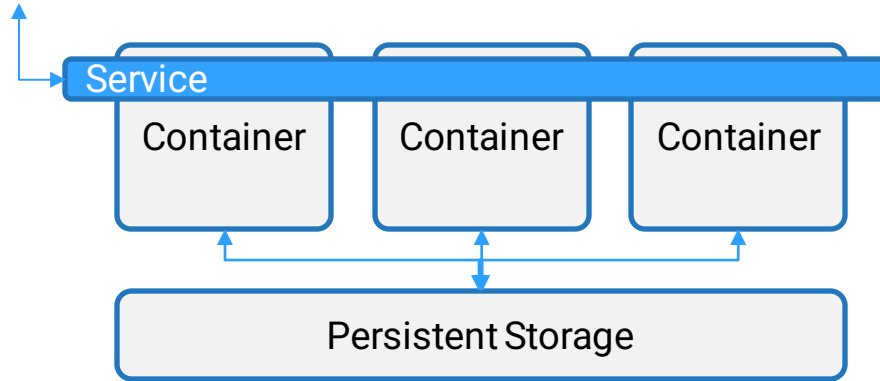
- According to the Linux Foundation, “Edge computing will be **4x larger than cloud** and will generate 75 percent of data worldwide by 2025.”
- Gartner claims companies generated a modest 10 percent of their data outside a data center or cloud in 2019; this amount is expected to reach 75 percent in the next six years.
- IDC predicts that in three years, 45 percent of IoT-generated data will be stored, processed, analyzed, and acted upon close to or at the edge of networks.

##### Vertical Market Adoption

- 5G, IoT and Edge computing will be necessary to deliver the automation, performance and cognitive insight required by many industries—including manufacturing, healthcare, energy and utilities, among others. Telecom operators will need to embrace open ecosystems to externalize innovation and accelerate new services.”

## Pain Point of Stateful Containers

User/Application



Some facts:

- Over 90% of the applications are deployed in containers\*
- Over 75% of respondents are either using or considering using stateful containers\*

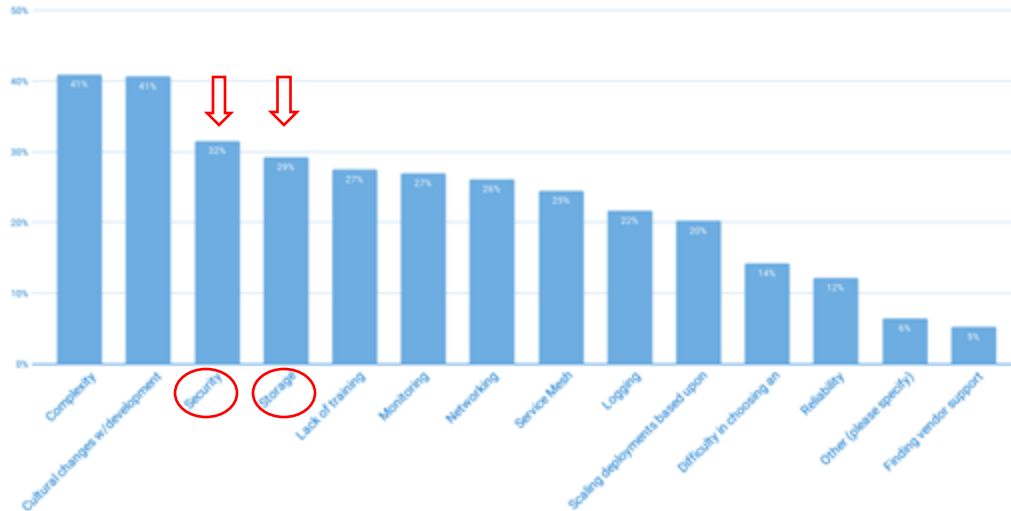
Pain Points:

- Limited local storage resources in clusters (often forcing stateless applications)
- Concerns regarding data security and increased cyberattacks on stored data
- Risk of data loss due to local disk/cluster failure
- Storage at a given cluster is not scalable

[\\*CNCF Survey Report 2020](#)

# Pain Points of Containers in CNCF

## What are your challenges in using/deploying containers?



In the CNCF SURVEY 2020, we could see pain points on **Security (32%)** and **Storage (29%)** was third and fourth respectively for challenge on cloud native projects.

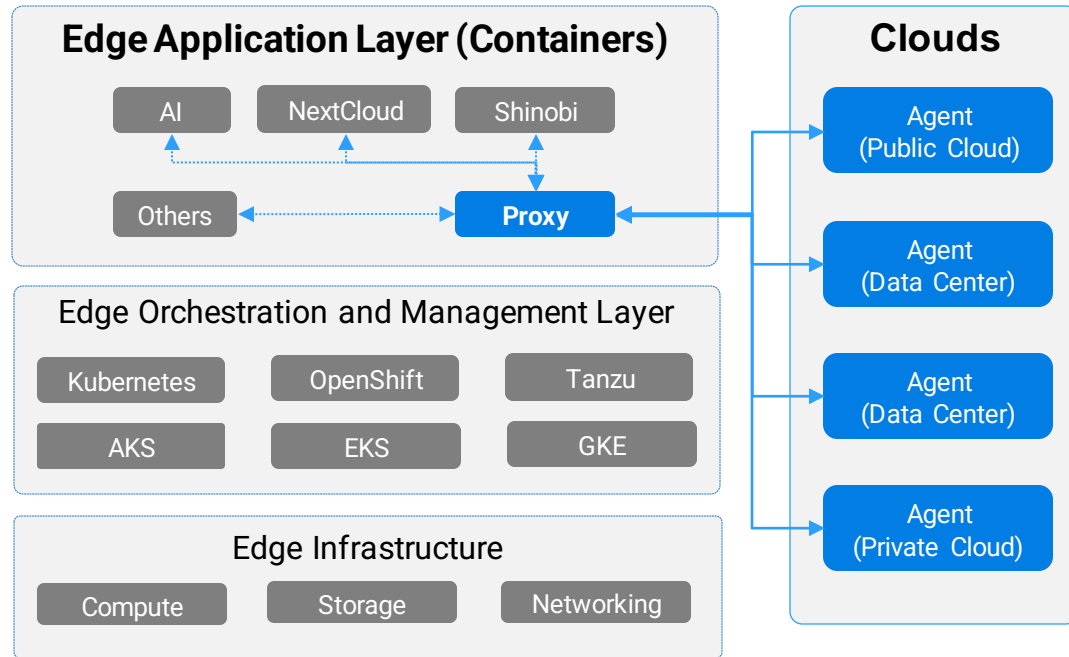
It is because in cloud native, most resources are ephemeral and unsuitable for keeping data long-term.

Regular storage is tied to the container and has a finite life span.

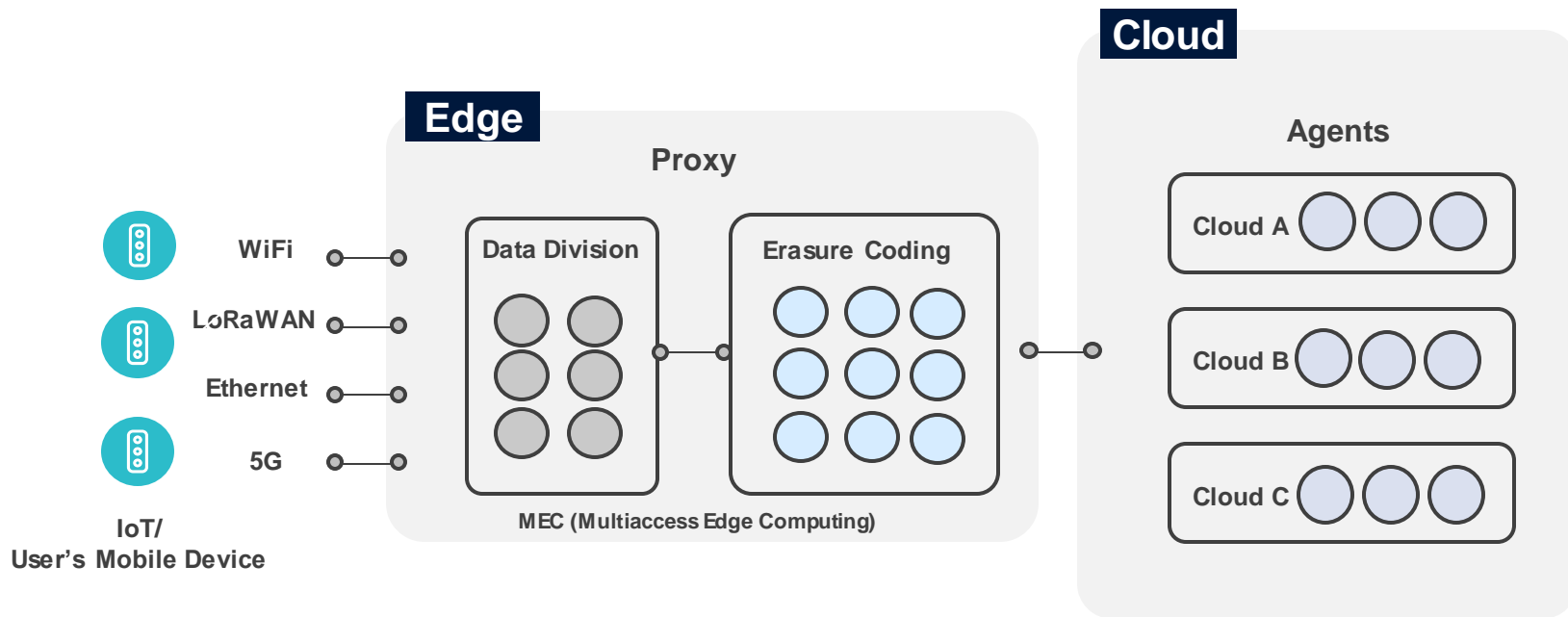
Capture of CNCF Survey Report 2020

# Reliable Persistent Storage for Containers via Nexoedge

- › Access data via the standard CIFS protocol
- › Data processing at edge for **data reliability** over clouds
- › **Container-based deployment**
- › **Encrypted communication** between edge (proxy) and cloud (agents)



# Data Reliability in Nexoedge: Data Flow



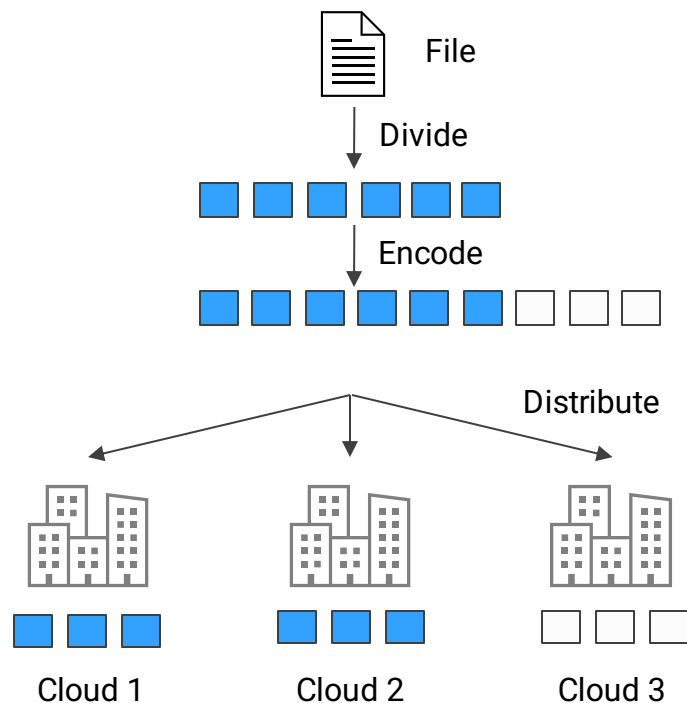
1 Connection and System Access

2 Edge Computation

3 Cloud Storage

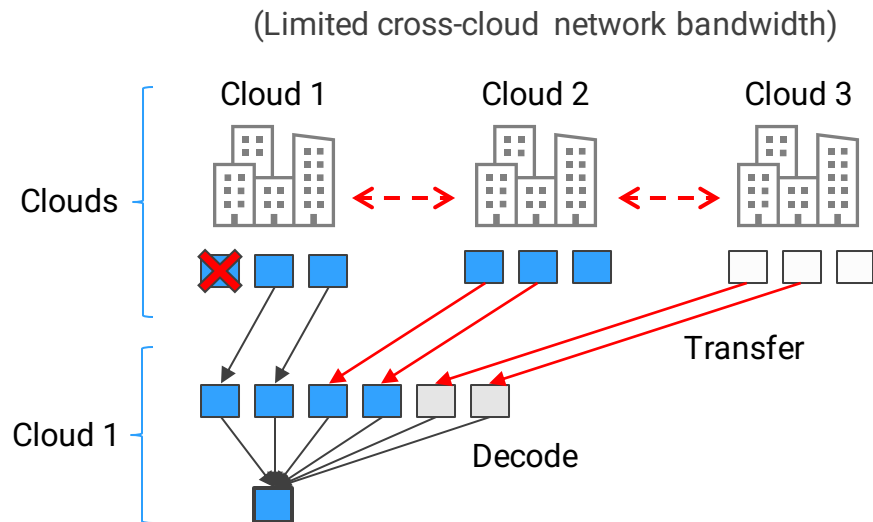
## Data Reliability in Nexoedge: Example

- › Divide the file into six data chunks
- › Encode the six data chunks into nine encoded chunks
- › Distribute encoded chunks to three clouds
- › Benefits
  - ✓ Lower storage overhead than replication (i.e., storing multiple data copies)
  - ✓ Data recovery: File is recoverable from a subset of six chunks in the clouds



## Data Reliability in Nexoedge: Data Repair with Less Network Bandwidth

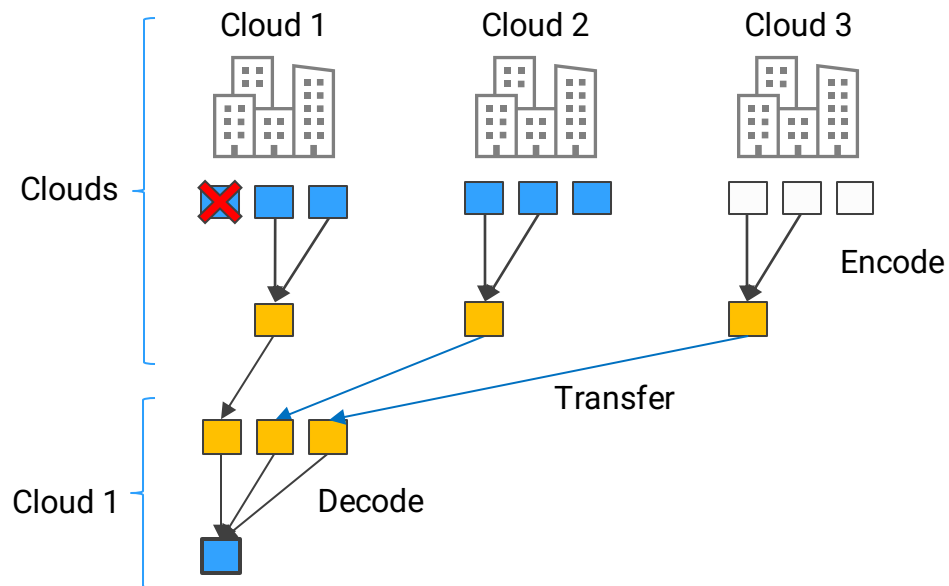
- › Single encoded chunk lost
- › **Conventional repair**
  - Transfer four chunks from clouds 2 and 3 to cloud 1
  - Decode for the lost chunk
- › Problem
  - Limited cross-cloud network bandwidth
  - **Significant data transfer across clouds leads to long repair time**





## Data Reliability in Nexoedge: Data Repair with Less Network Bandwidth

- › Single encoded chunk lost
- › Network-coding-based repair
  - › Encode chunks in each cloud
  - › Transfer two encoded pieces from clouds 2 and 3 to cloud 1
  - › Decode for the lost chunk
- › Benefit: Save the data transfer across clouds compared with conventional repair
  - › e.g., 50% in the example



## Contact Us

### **Linux Foundation Edge Project Nexoedge**

<https://wiki.lfedge.org/display/NEX/Nexoedge+Home>

### **Community Group Mailing List**

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Get the code



Find us on Slack (channel #nexoedge)