

# LiveMicro: an Edge Computing System for Collaborative Telepathology



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July 9, 2019



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— EST. 1818 —

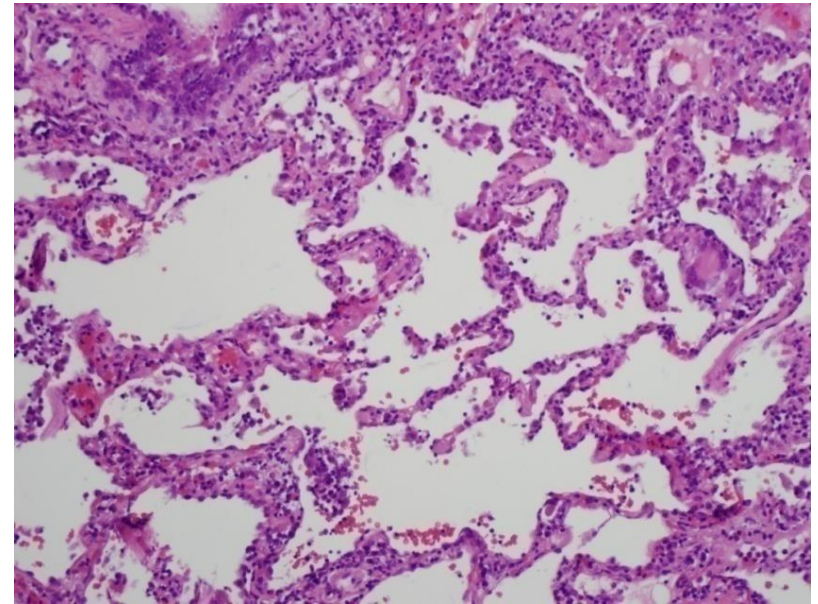
# Pathology

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- Diagnosis of disease based on the laboratory analysis
- Histological samples to analyze

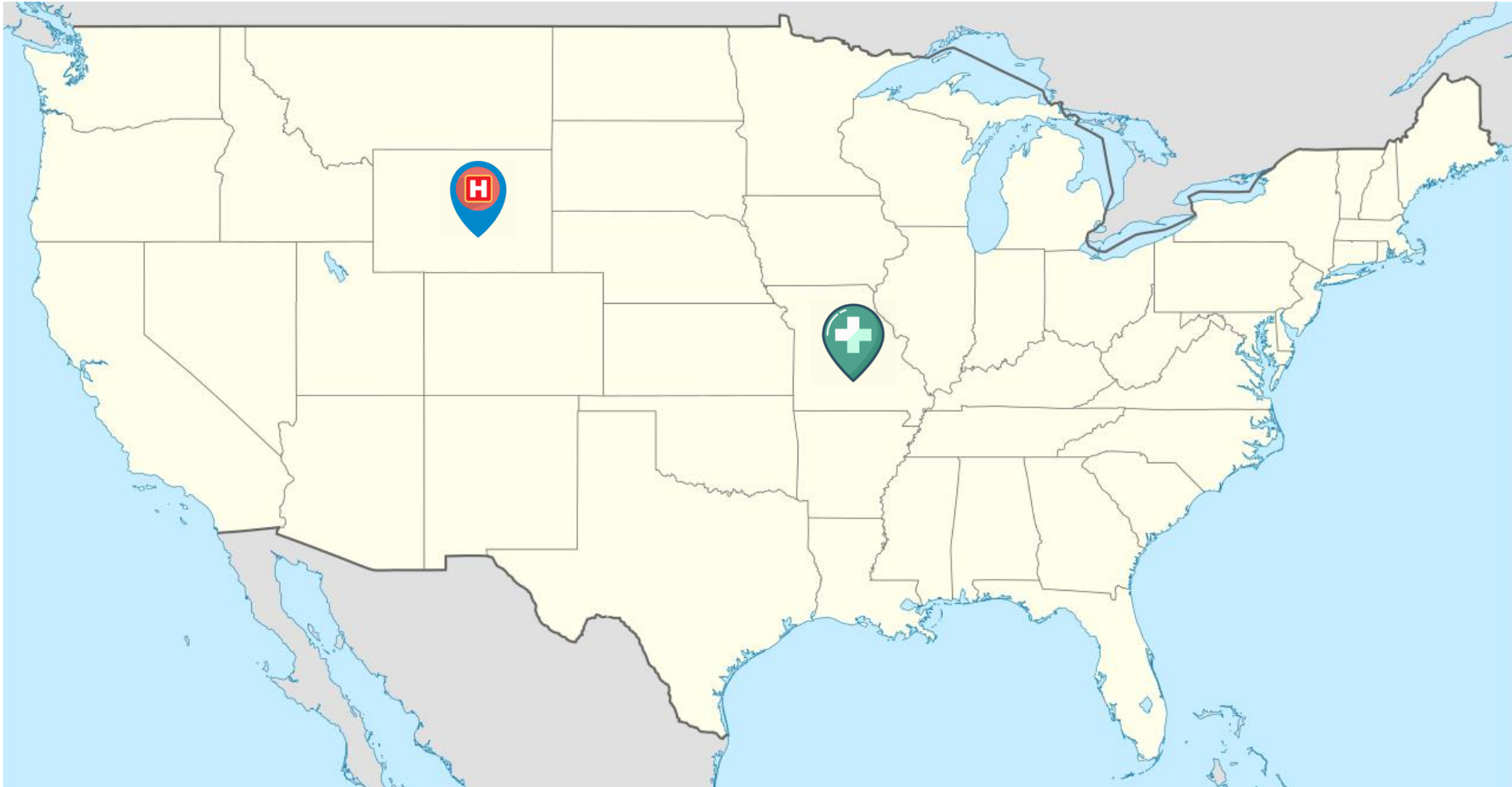


Medical Doctor (MD)



# Tele - Pathology

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# Why Telepathology?

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- Scarce local experts
- Urgent cases cannot be handled via email
- Second opinion from other expert MDs



# Contribution: Step-up microscope firmware via edge computing

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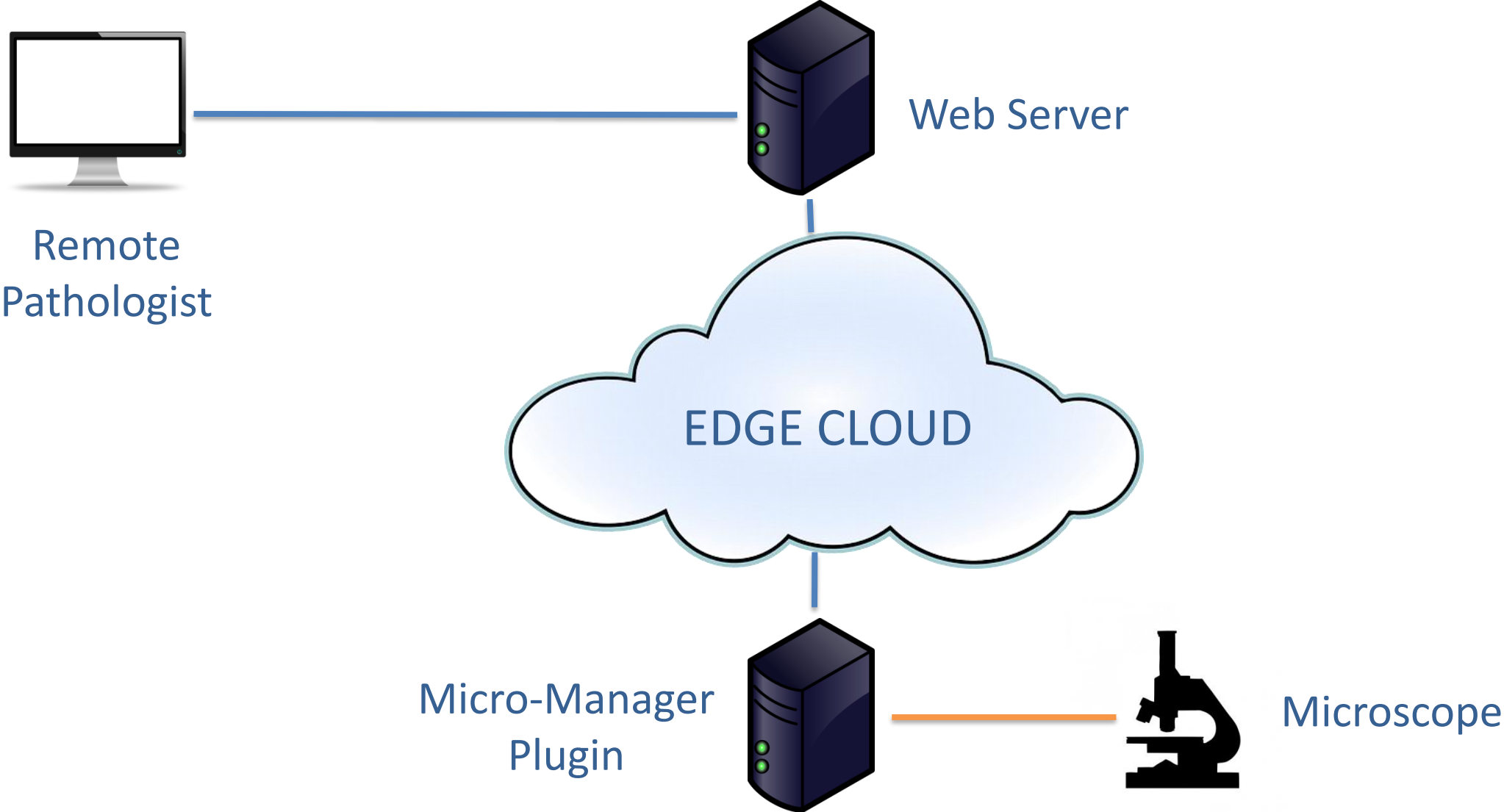
- System design
- On-campus prototype
- Evaluation
  - Histological image and video processing at the edge
  - Scalability performance analysis

# Overview

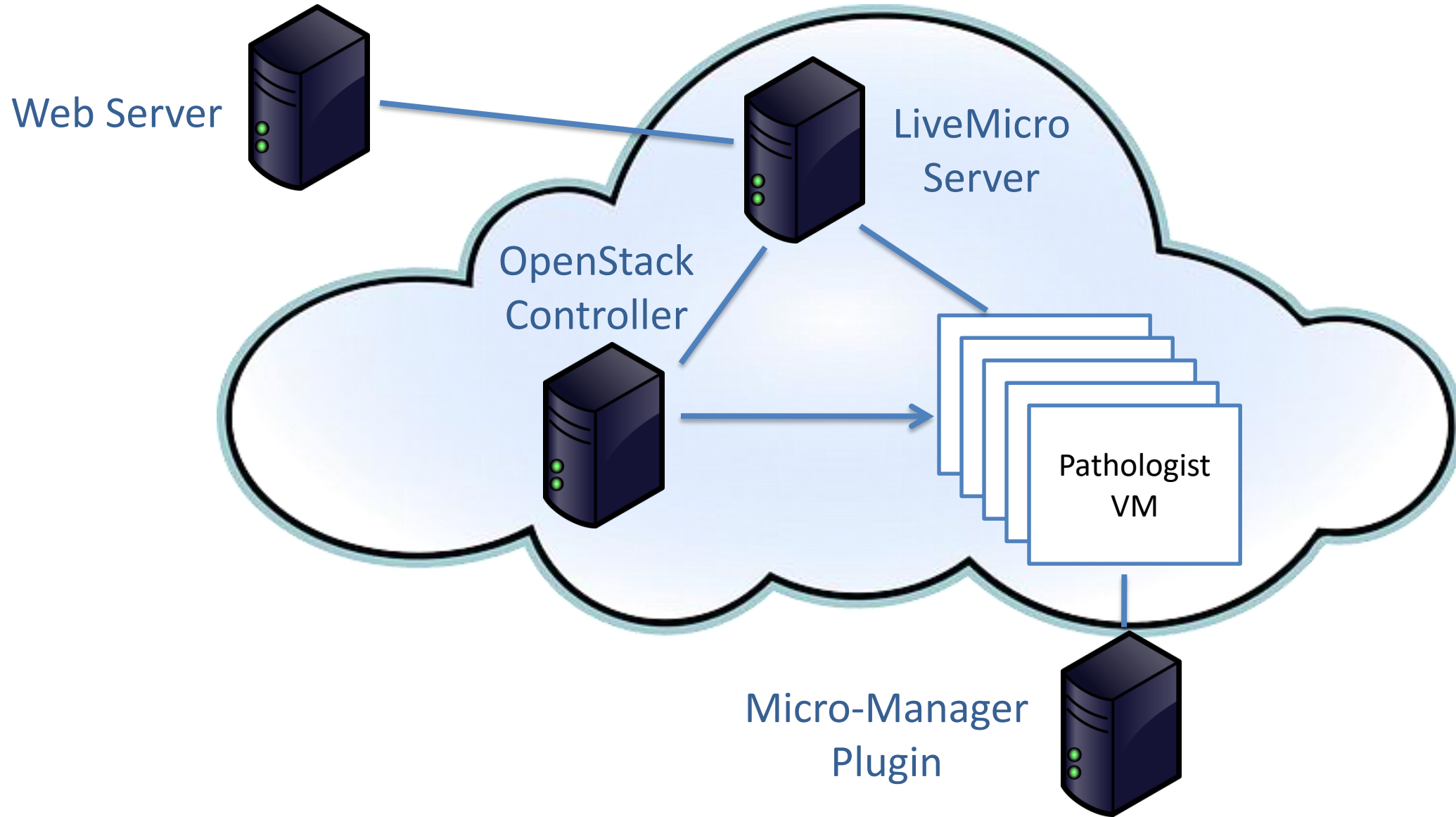
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- **System design**
- Edge cloud management
- Testbed
- Results
- Final words

# System Design

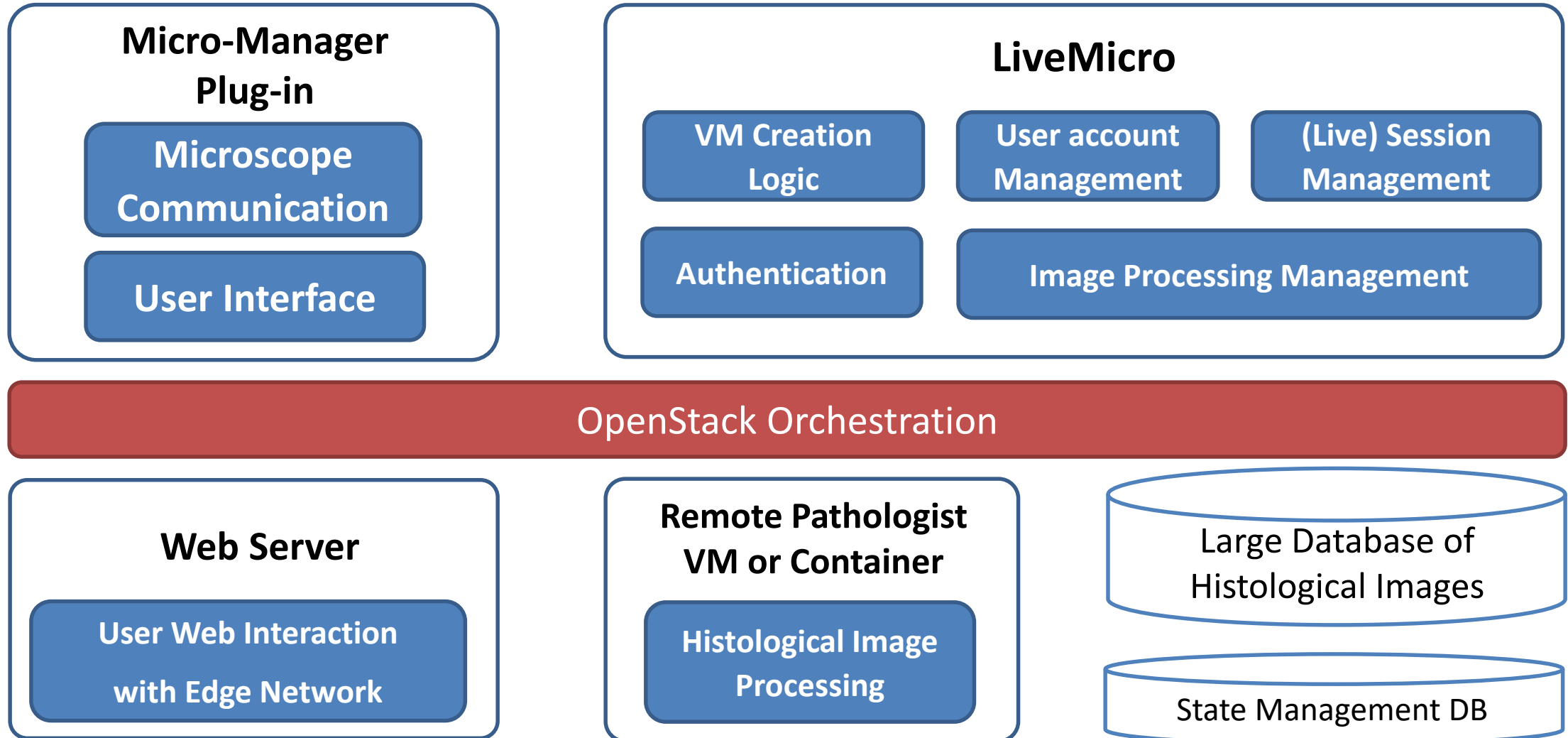


# Edge Cloud: each pathologist is assigned to a VM





# System Architecture



# Overview

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# VM lifetime management with OpenStack

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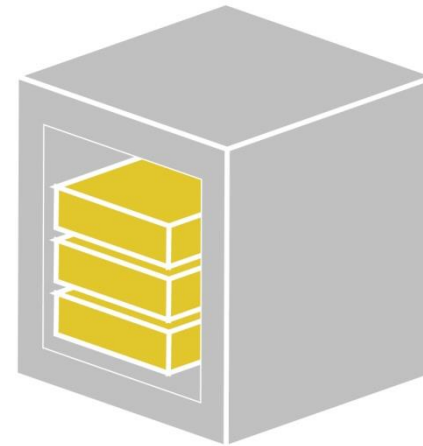
OpenStack is responsible of VMs deployment and the related destruction.



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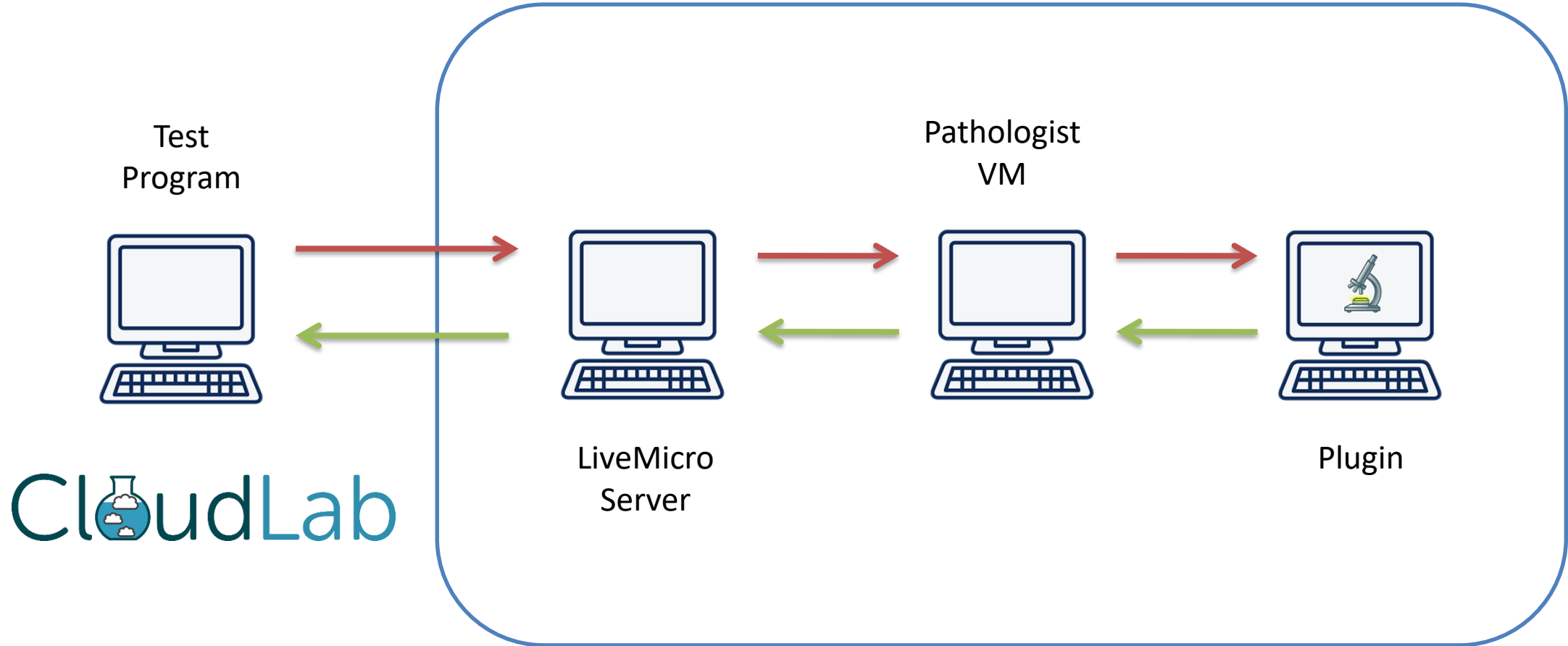
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# Evaluation testbed

SLU Physical Infrastructure



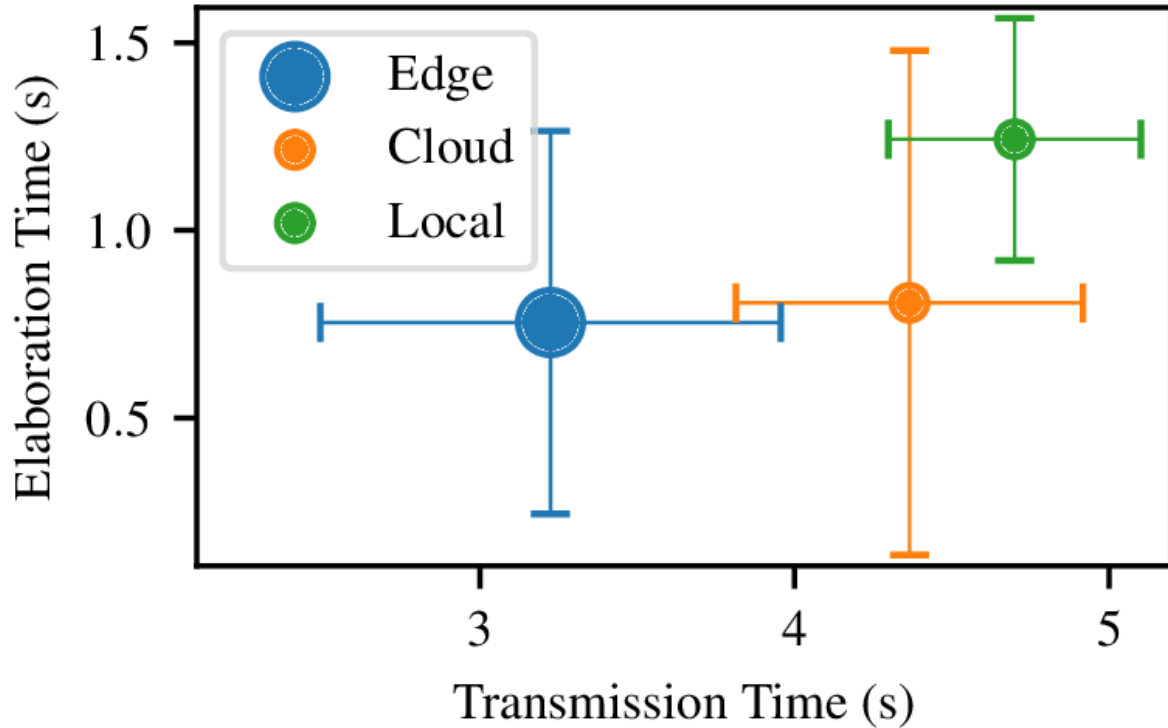
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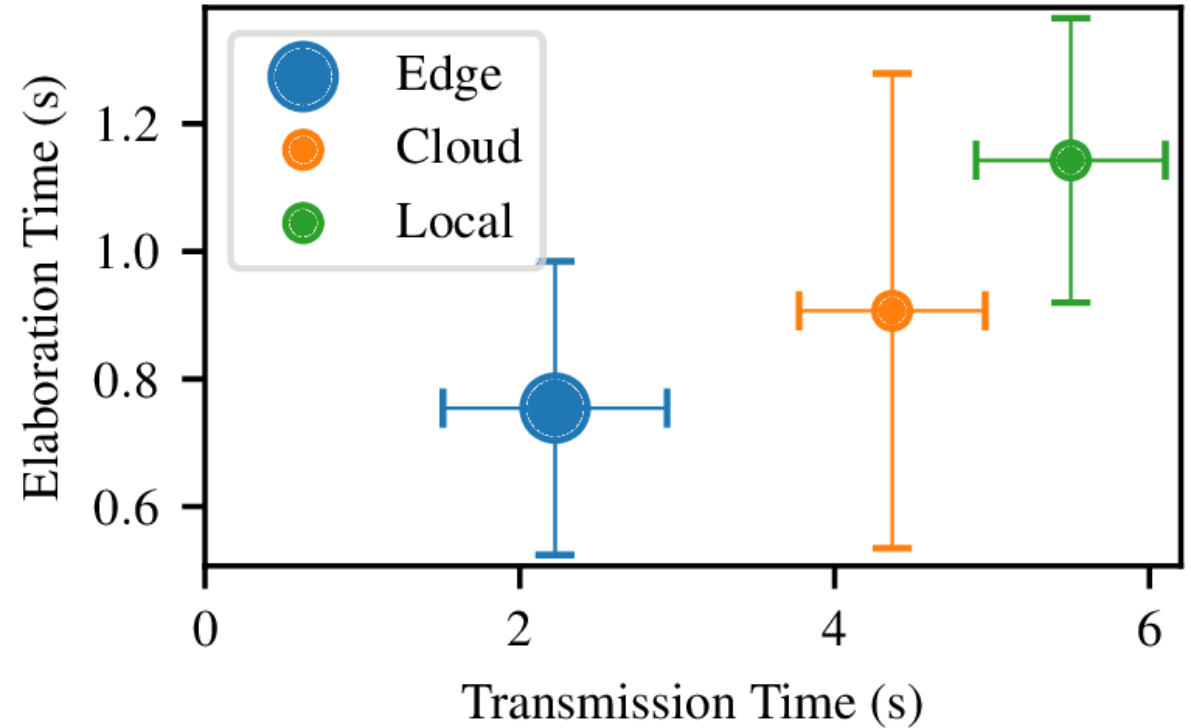
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# Edge computing reduces transmission time

Image Processing



Video Processing



For videos, the coding enhances edge advantages

# Overview

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- System design
- Edge cloud management
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- Results
- **Final words**



# Final Words

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Telepathology enables remote slide consultation



Existing telepathology solutions are expensive or not exhaustive

**Edge computing** can improve medical diagnosis by image processing and real-time control of the microscope

# Discussion

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- *Feedback*

How could we use edge computing for network or in-network processing?

What are the open problems in edge computing that this application still needs to scale?

- *Controversial Points*

Could the solution work without end-to-end performance guarantees?

Billing and payment system

- *Open Issues*

LiveMicro should be evaluated in a real scenario

Containers, unikernels as alternative to VMs

Implementation of other HW specific plugins

- *Under what circumstances the whole idea might fall apart*

What if no stable network?

**THANK YOU**

Alessio Sacco