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MICROSERVICE-BASED FABRIC COLLABORATIVE MODEL TRAINING

INTRODUCTION

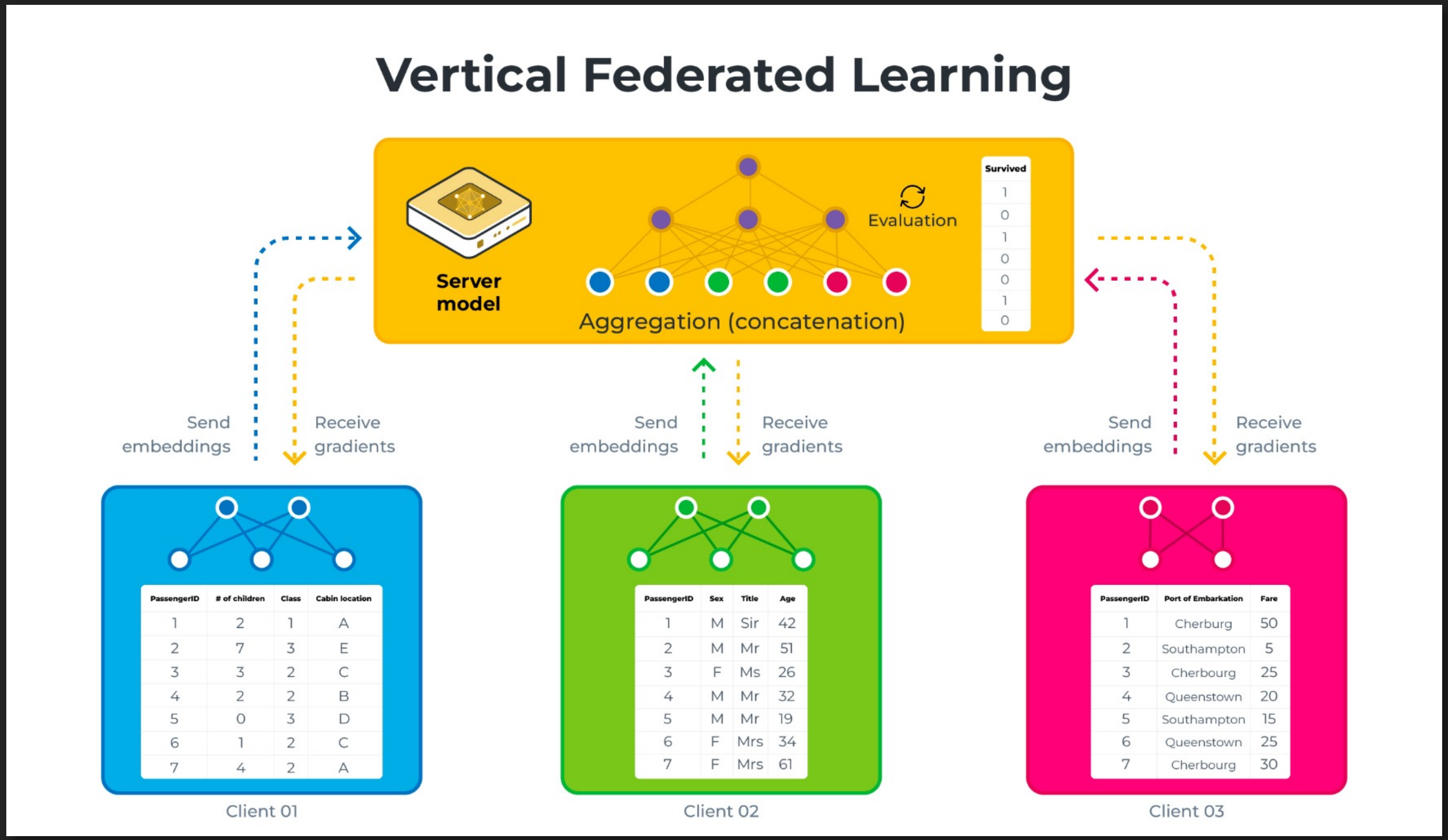
- Collaborative Model Training with Federated Learning
  - An approach that enables multiple organizations to train machine learning models on decentralized data, while maintaining data privacy and sovereignty.
- Key Benefits
  - Enhanced privacy and security compared to traditional approaches, making it valuable in sectors with sensitive data (e.g. healthcare, building retrofitting financing).

CONTRIBUTIONS

- Demonstrate Secure Collaborative Model Training with Vertical Federated Learning for the building energy consumption prediction use case.
- Use Microservices Architecture to allow for digital data exchange while ensuring privacy and contractual agreements.
- *Use FABRIC to create a realistic, multi-site networking slice and evaluate the implementation.*

BACKGROUND

- DYNAMOS Microservices Orchestration
  - Flexibility, scalability, and resilience by enabling independent deployment, management, and scaling of individual components
- Vertical Federated Learning
  - Distributed Model
  - Clients have heterogeneous features
  - Common set of samples among the clients



Survived
1
0
1
0
0
1
0

PassengerID	# of children	Class	Cabin location
1	2	1	A
2	7	3	E
3	3	2	C
4	2	2	B
5	0	3	D
6	1	2	C
7	4	2	A

PassengerID	Sex	Title	Age
1	M	Sir	42
2	M	Mr	51
3	F	Ms	26
4	M	Mr	32
5	M	Mr	19
6	F	Mrs	34
7	F	Mrs	61

PassengerID	Port of Embarkation	Fare
1	Cherburg	50
2	Southampton	5
3	Cherbourg	25
4	Queenstown	20
5	Southampton	15
6	Queenstown	25
7	Cherbourg	30

USE CASE

- Vertical Federated Learning for building energy consumption prediction based on data from different sources.
  - EU Client 1: Building registry (area, floors, windows)
  - EU Client 2: Weather data (temperature, humidity)
  - US Client 1: Energy Provider (energy consumption)

CONSUMPTION IS THE TARGET VARIABLE

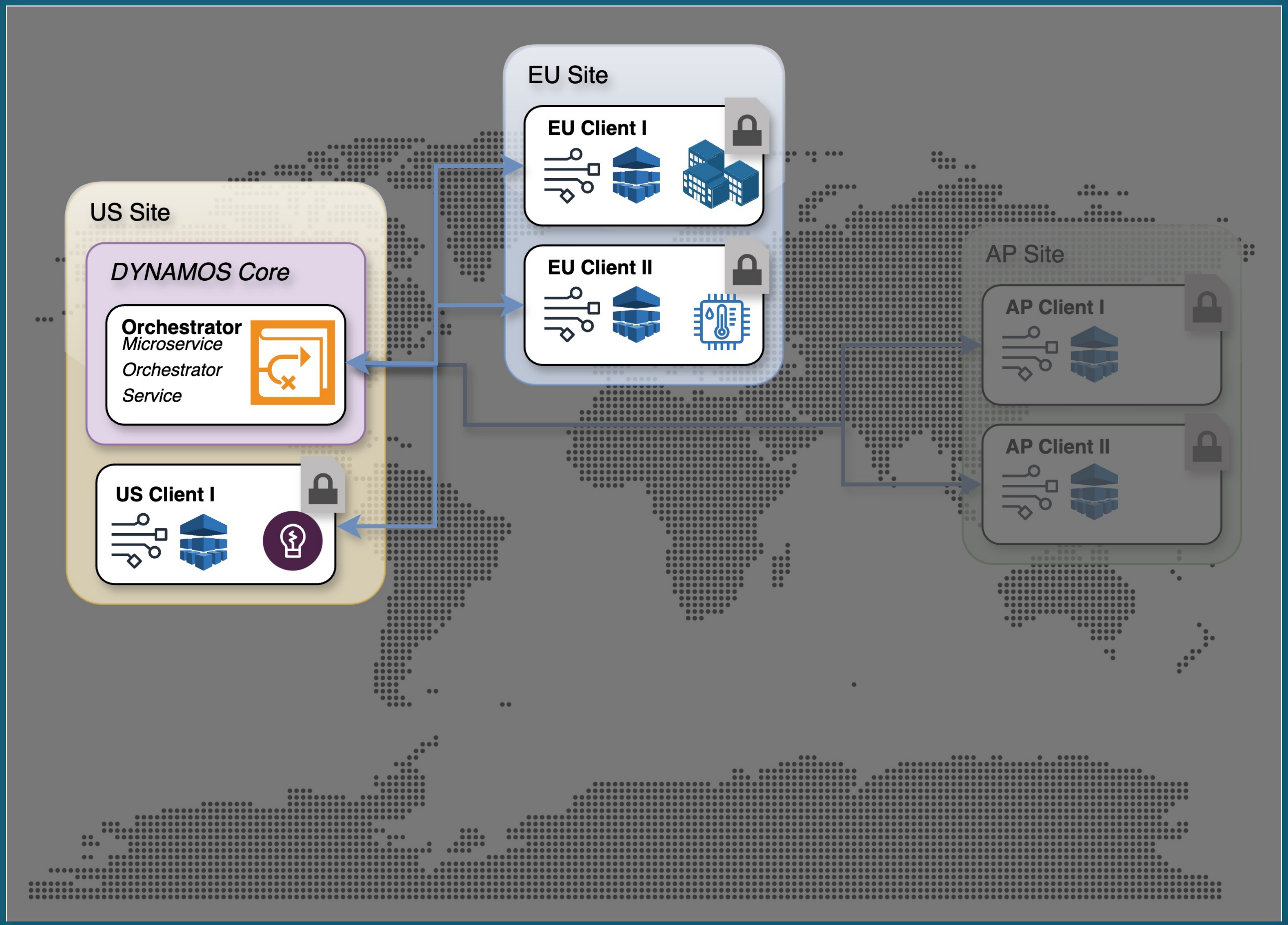
ID	Area	Floors	Windows
1	130	1	10
4	50	1	3
5	75	2	4

ID	Temp	Humidity	Date
1	20	80	2024-01-01
4	24	90	2024-01-01
5	16	90	2024-01-01

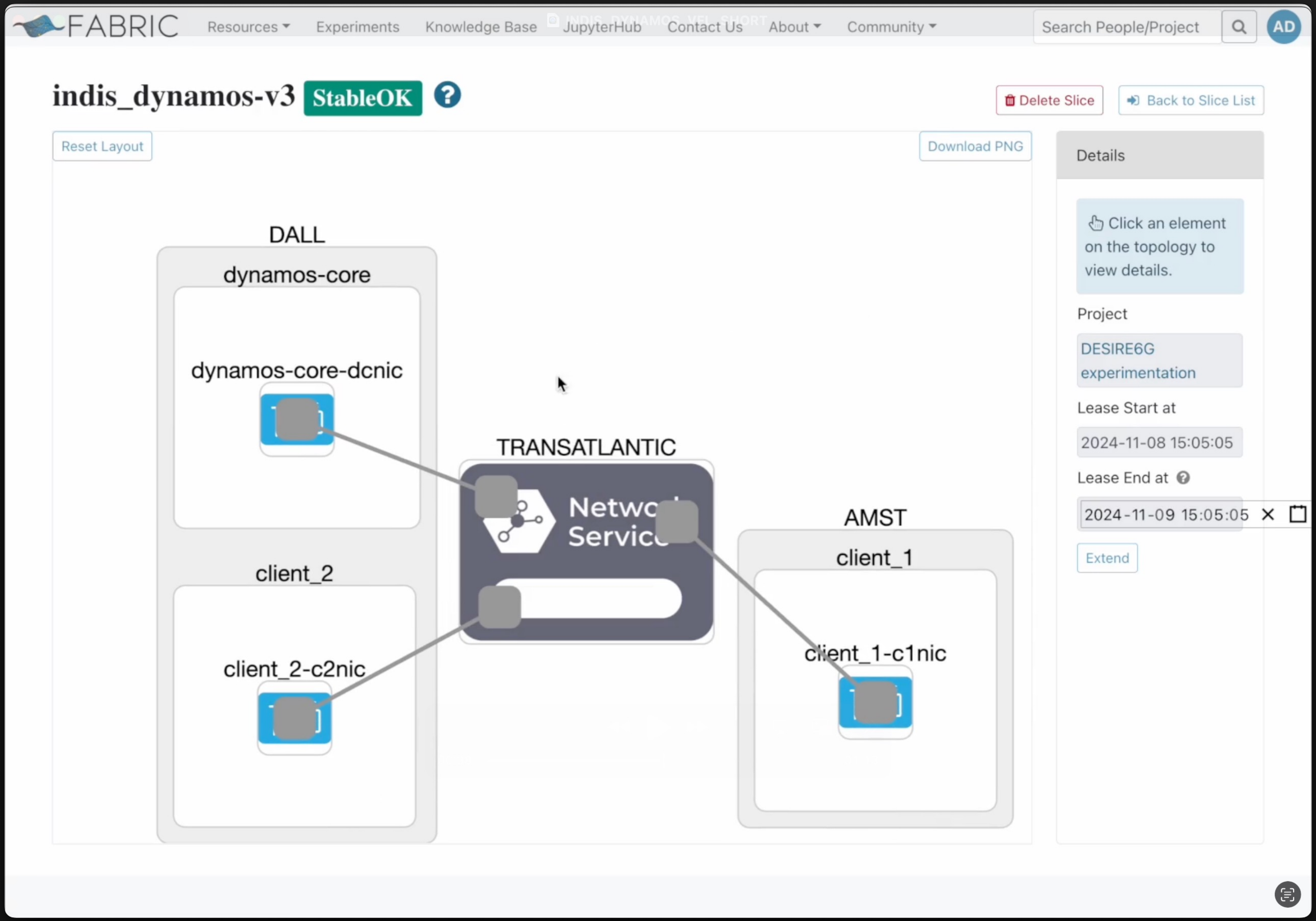
ID	Consumption	Date
1	200	2024-01-08
4	260	2024-01-08
5	180	2024-01-08

FABRIC SLICE

- Demo focused on two international sites.
- Emulating a scenario with 3 inter-site clients:
  - 2 clients in EU AMST
  - 1 client in US CIEN
- VFL Aggregator is deployed at the US site.
- L2STS Networking, Transatlantic data transfers between sites.

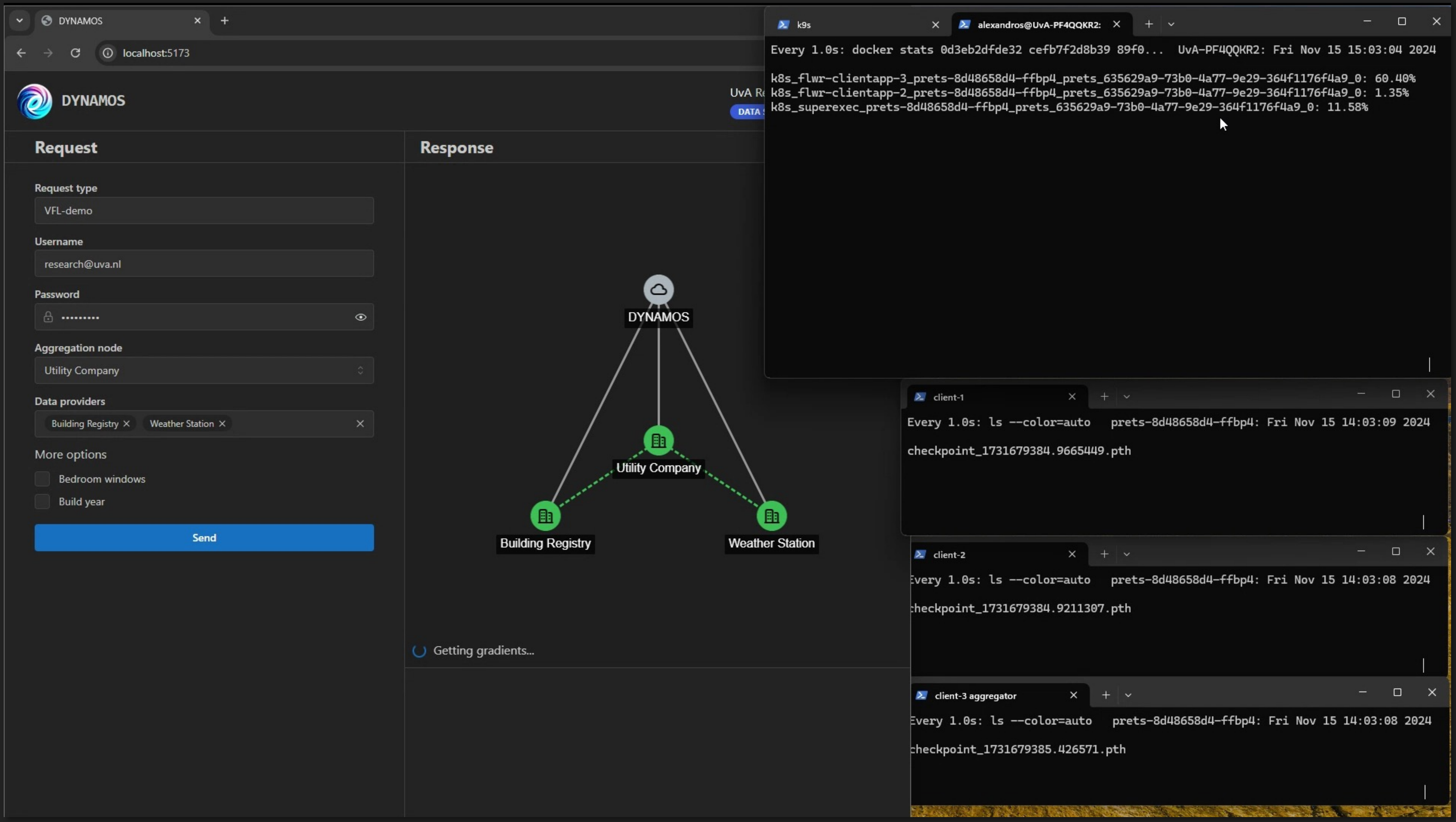


SLICE DEPLOYMENT



MICROSERVICES-BASED FABRIC VFL COLLABORATIVE MODEL TRAINING

DEMO



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INFORMATION

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