πNet

A microservice-based control plane app for SDN with a graphical tool to display network topologies

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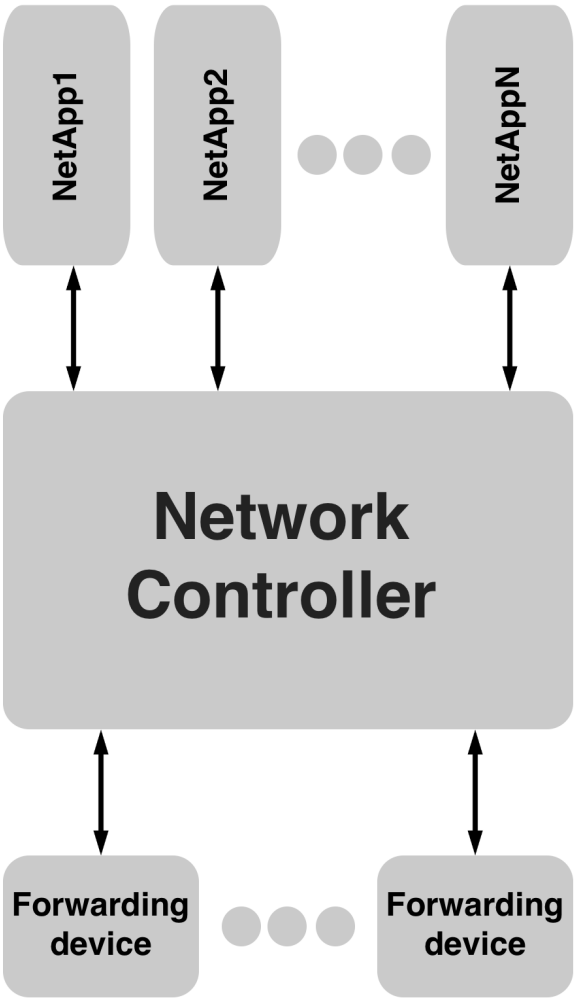
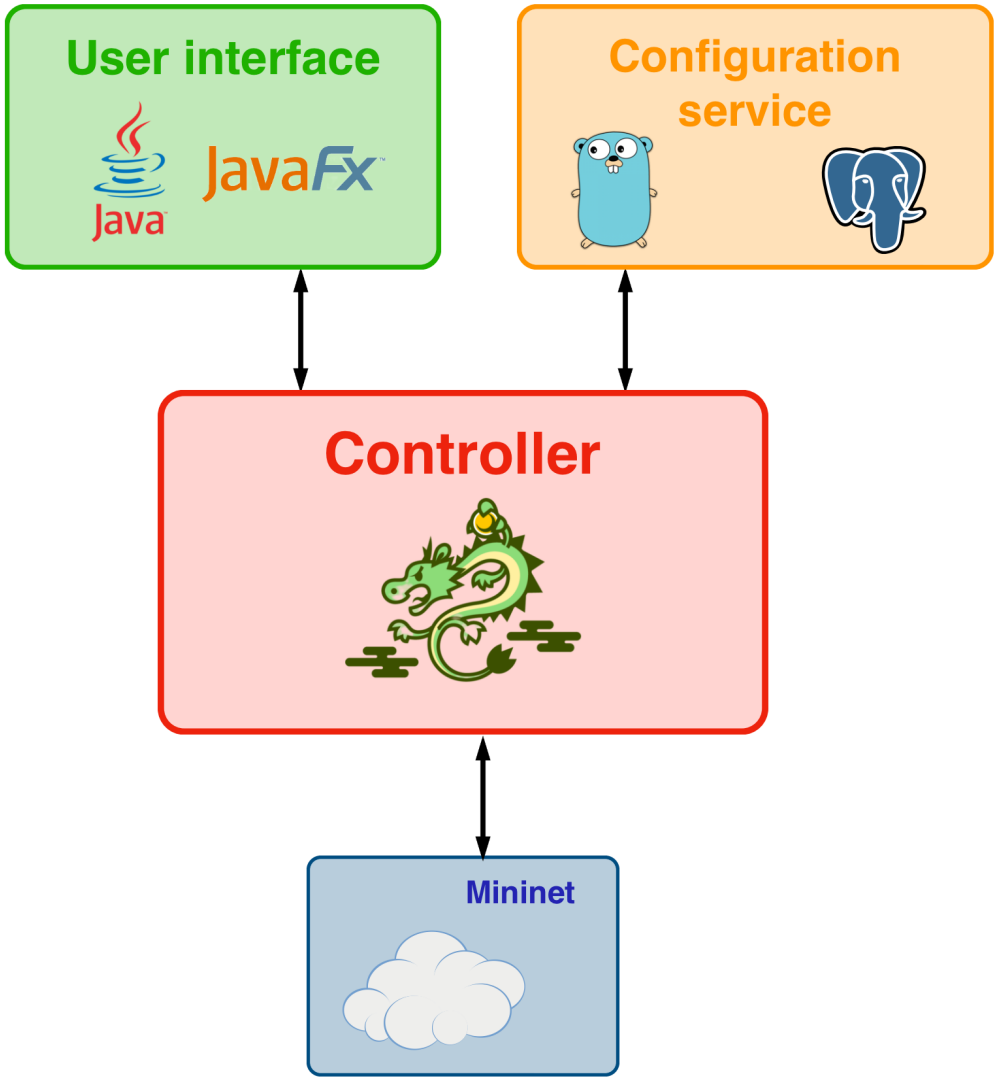
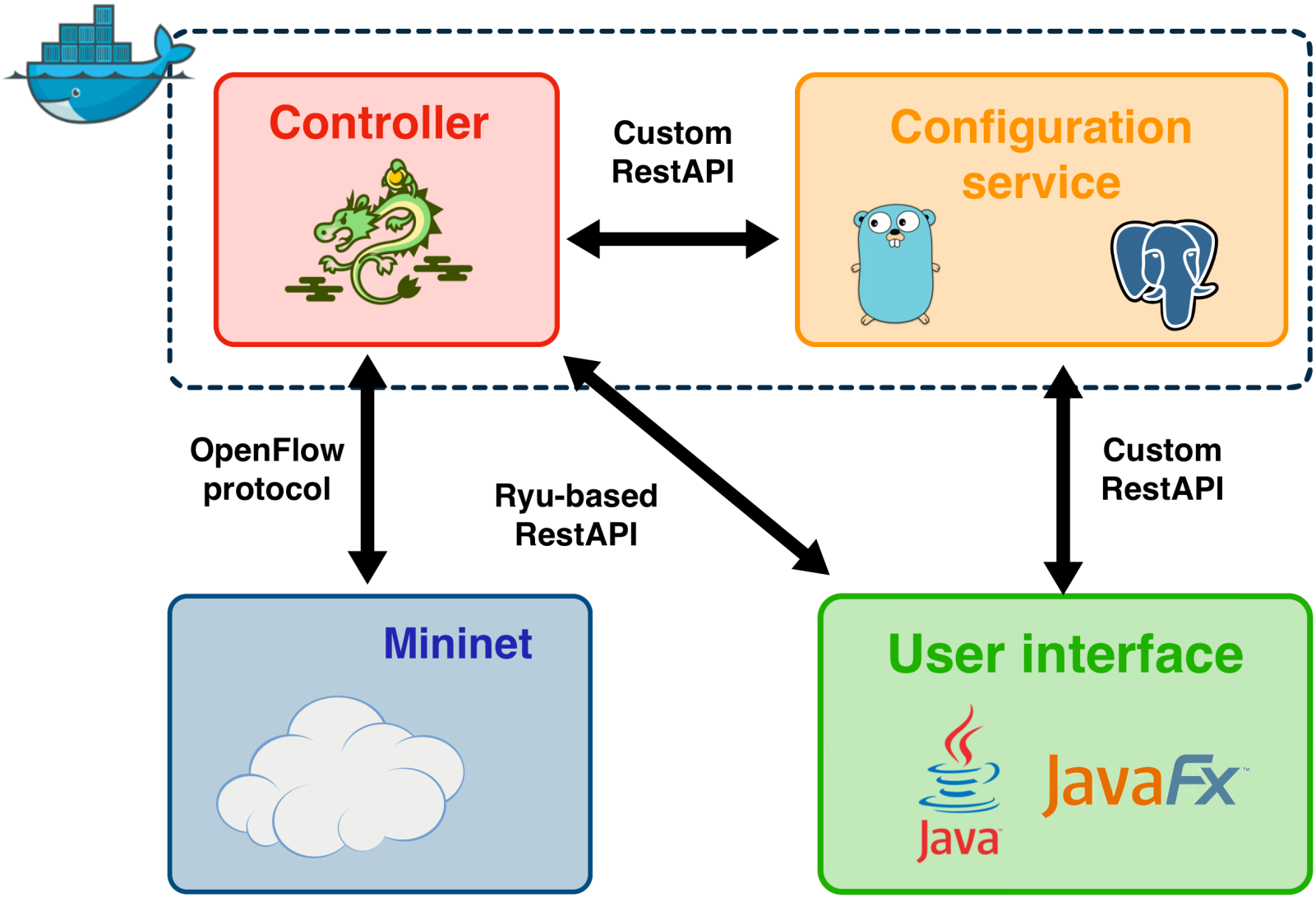
General structure: SDN & our app



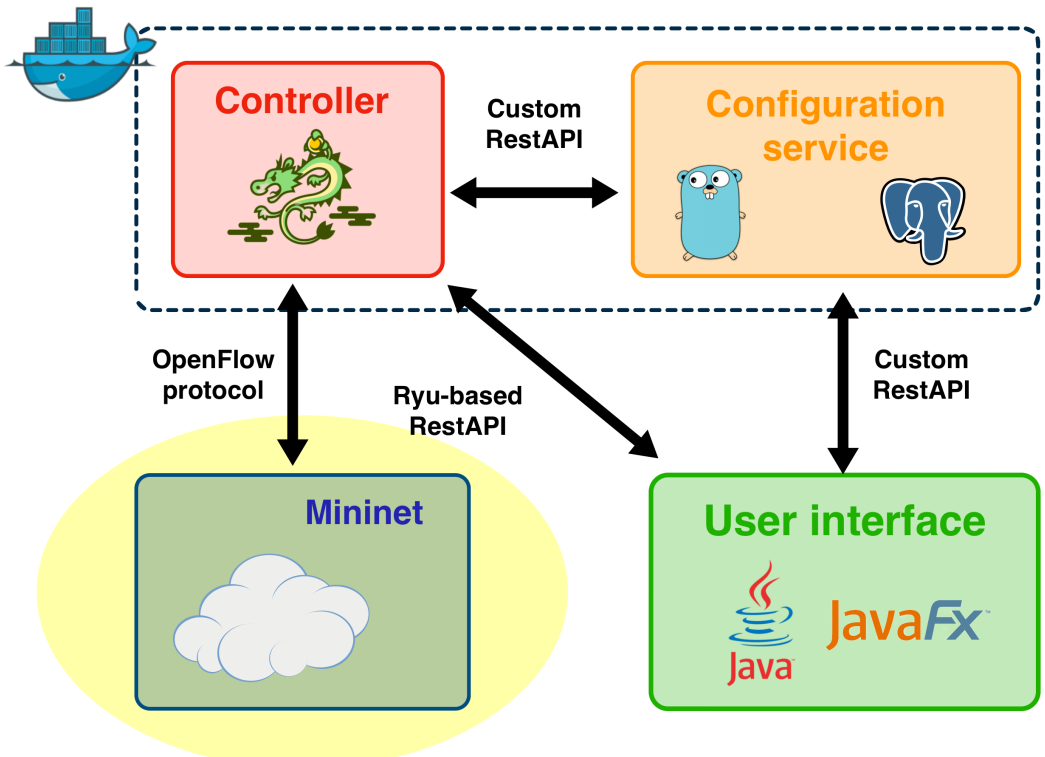


General structure



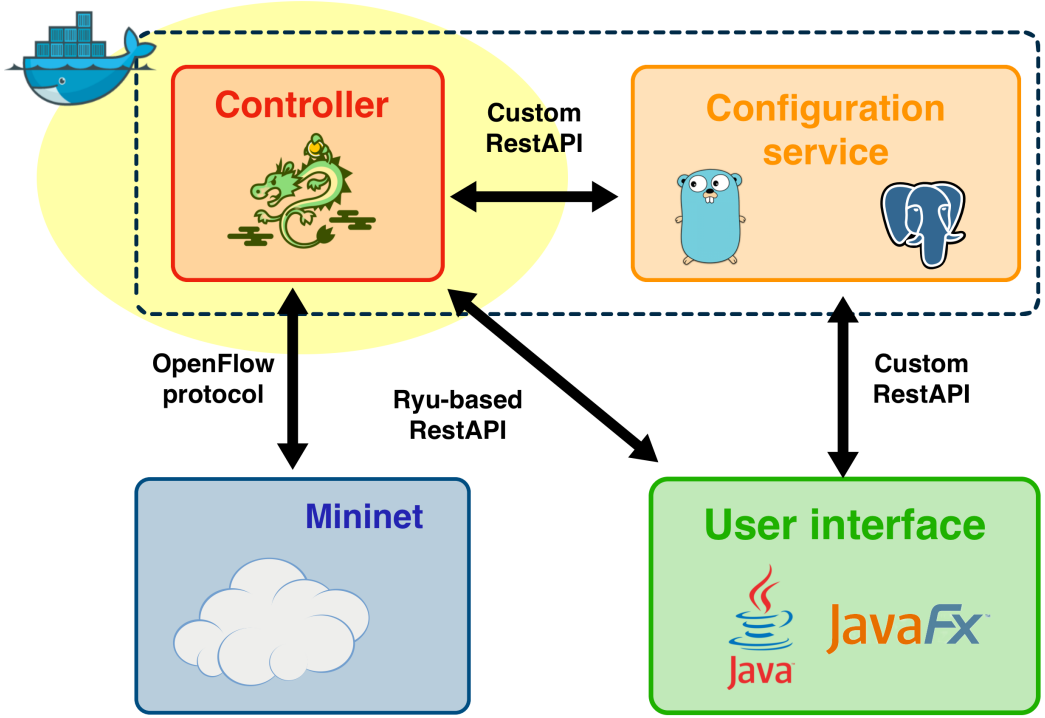
MiniNet

- We used Mininet to emulate the network infrastructure.
- Python scripts have been provided as configuration tools to quickly instruct Mininet on how the network is organized.



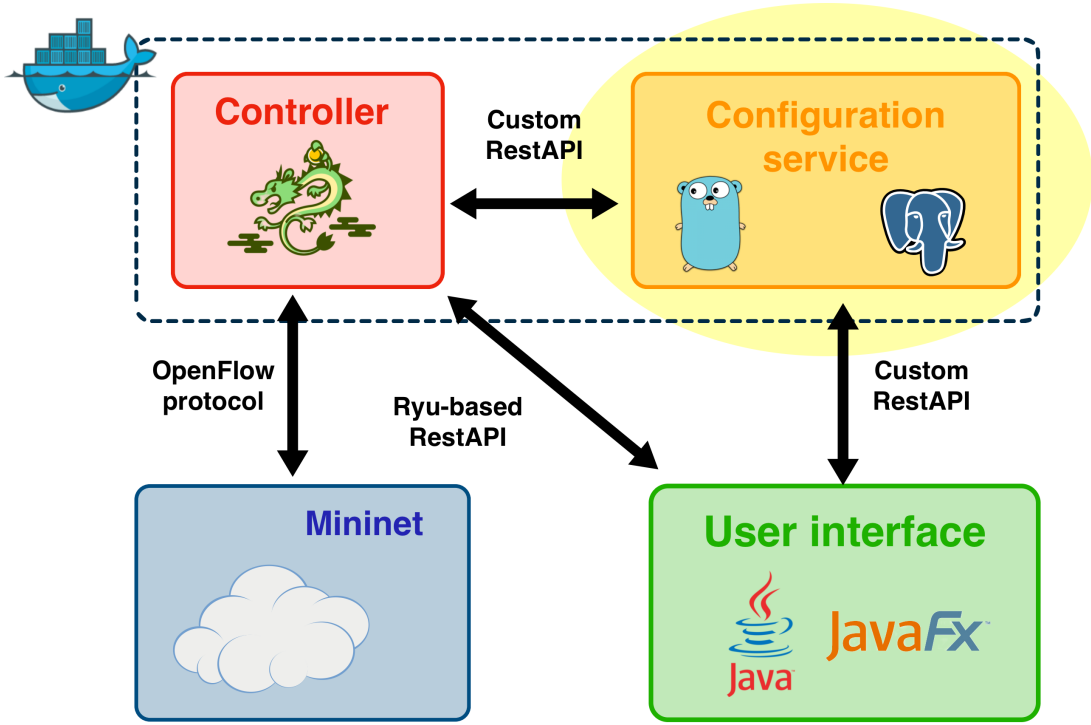
Ryu w/ OpenFlow

- Ryu directly configures the OF switches by writing rules in their flow tables.
- It exposes a REST API that can be queried to retrieve information about the network physical configuration.



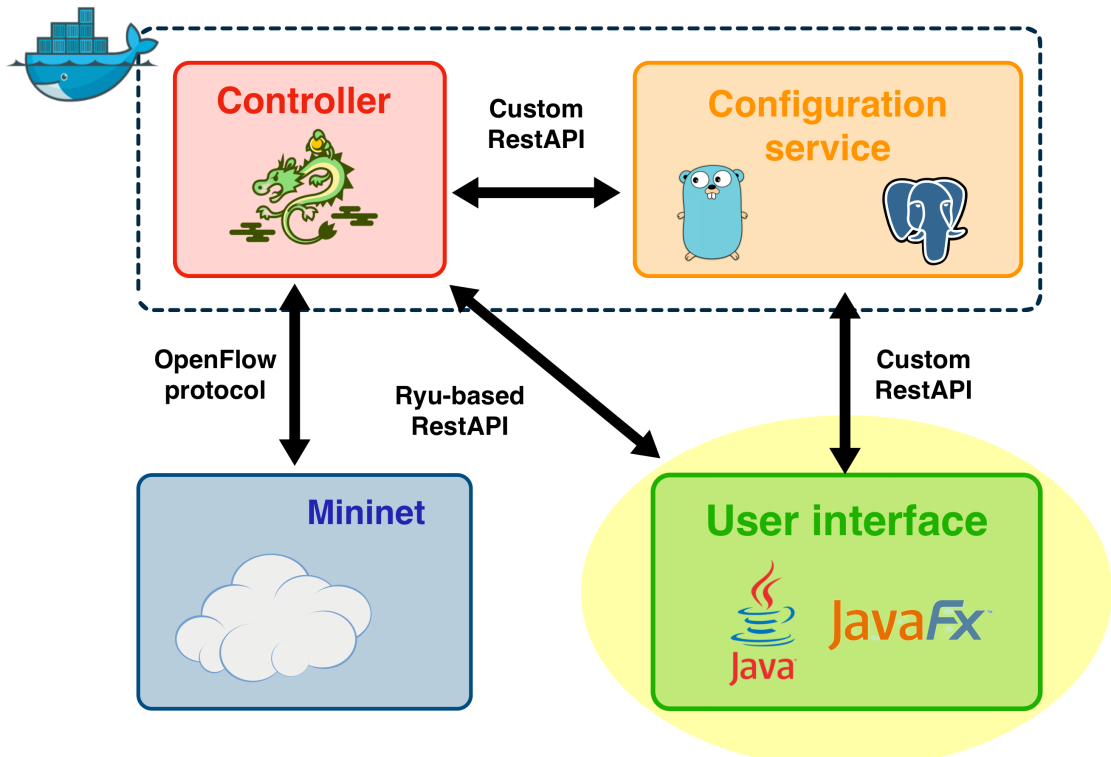
Configuration service (Go & PostgreSQL)

- The L3 network configuration is retrieved from a PostgreSQL database.
- A GoLang microservice sits on top of the DB to service requests from Ryu and the GUI.



GUI (Java & JavaFX)

- We used Java and JavaFX to implement the graphical interface.



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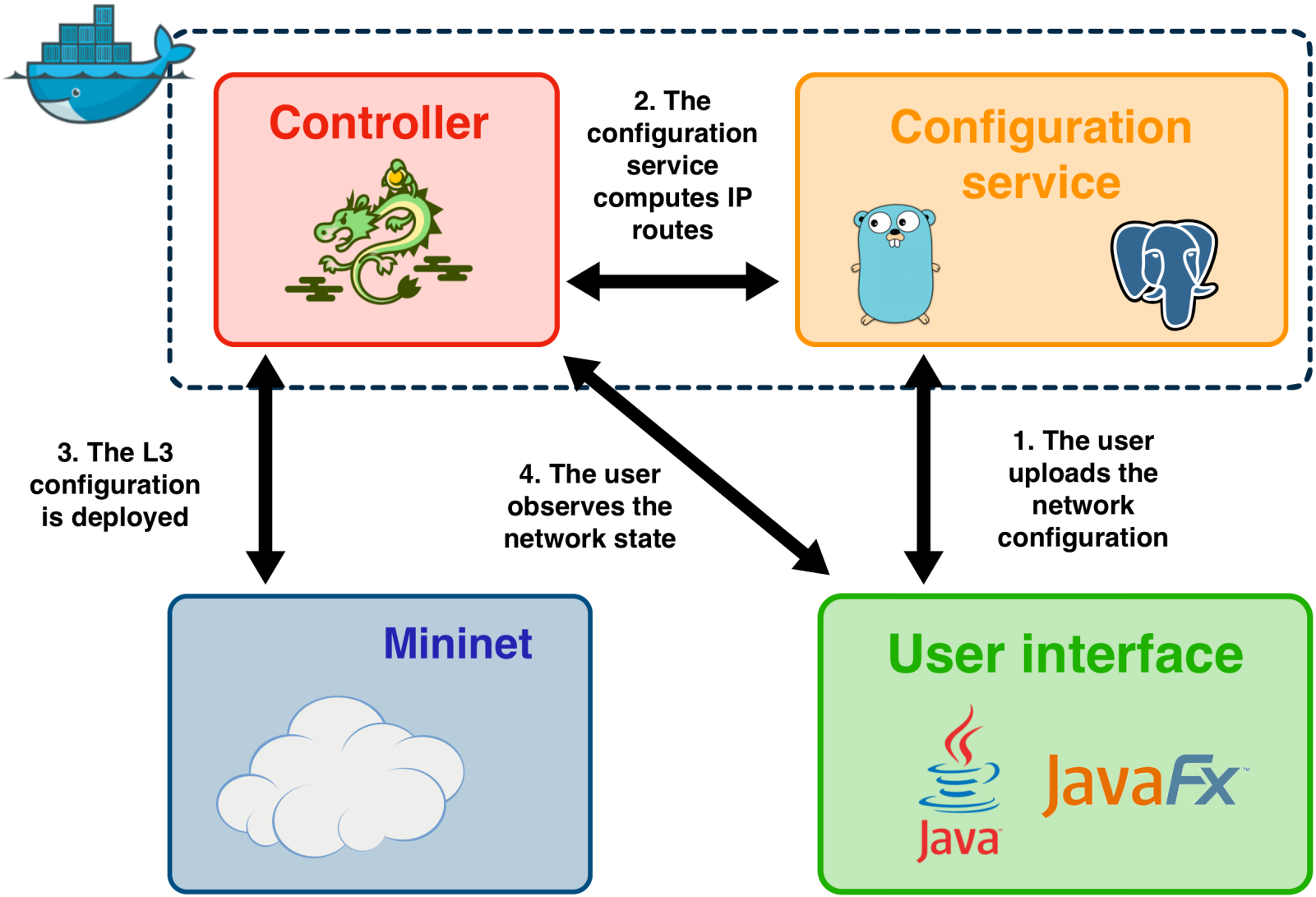
Live Demo


Controller
2. The configuration service computes IP routes
Configuration service
3. The L3 configuration is deployed
4. The user observes the network state
1. The user uploads the network configuration
Mininet
User interface
Java
JavaFx

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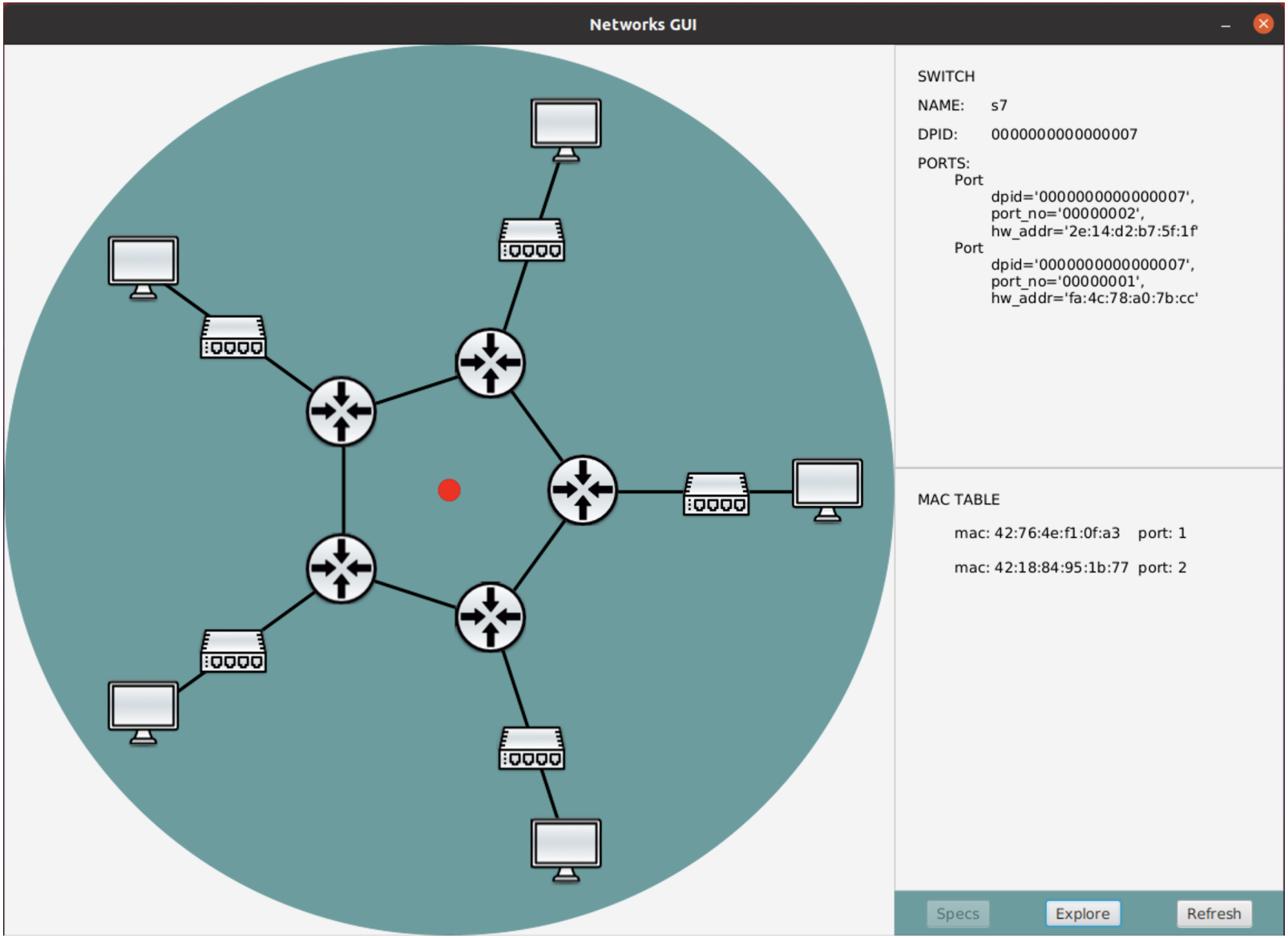
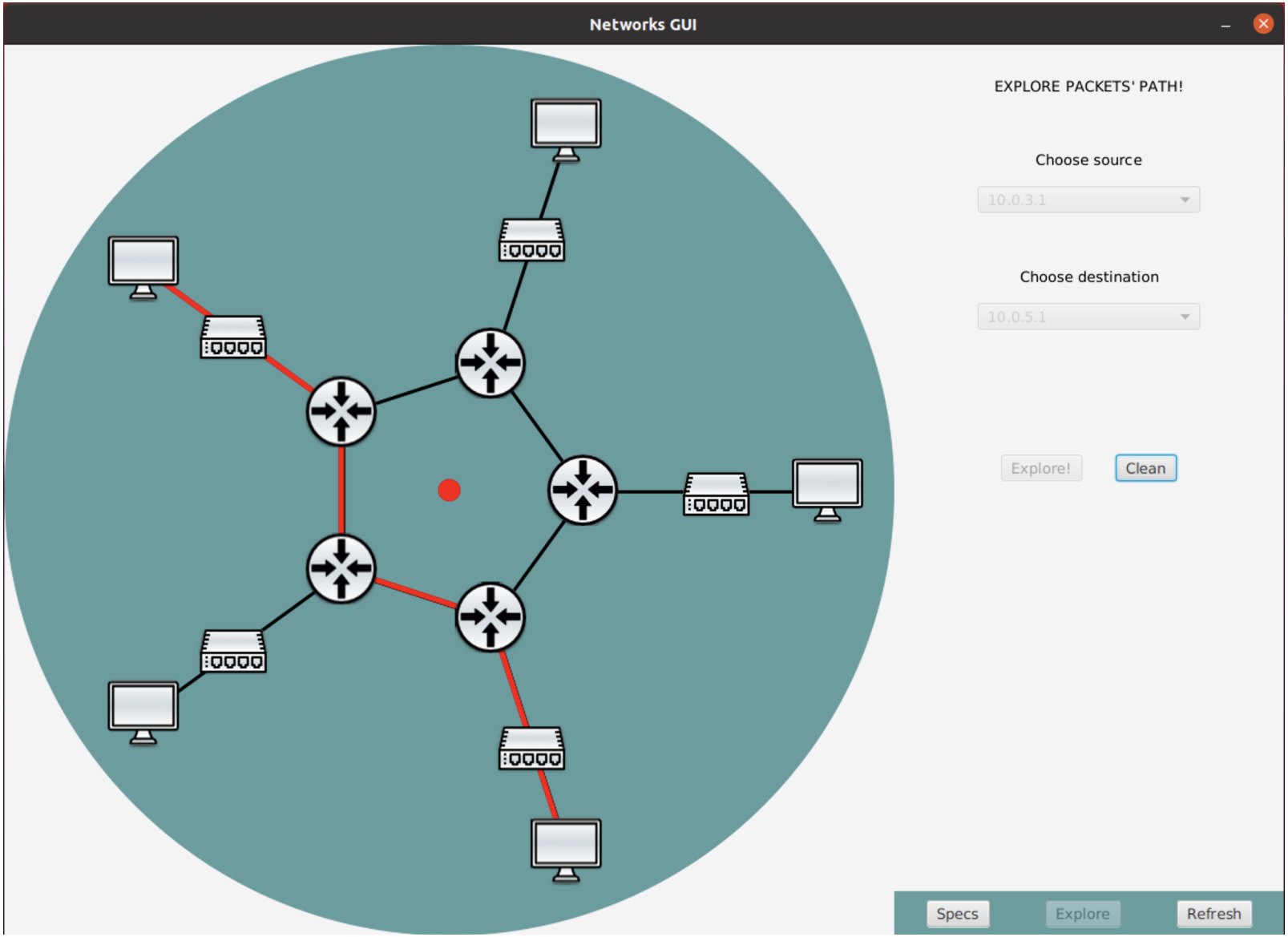
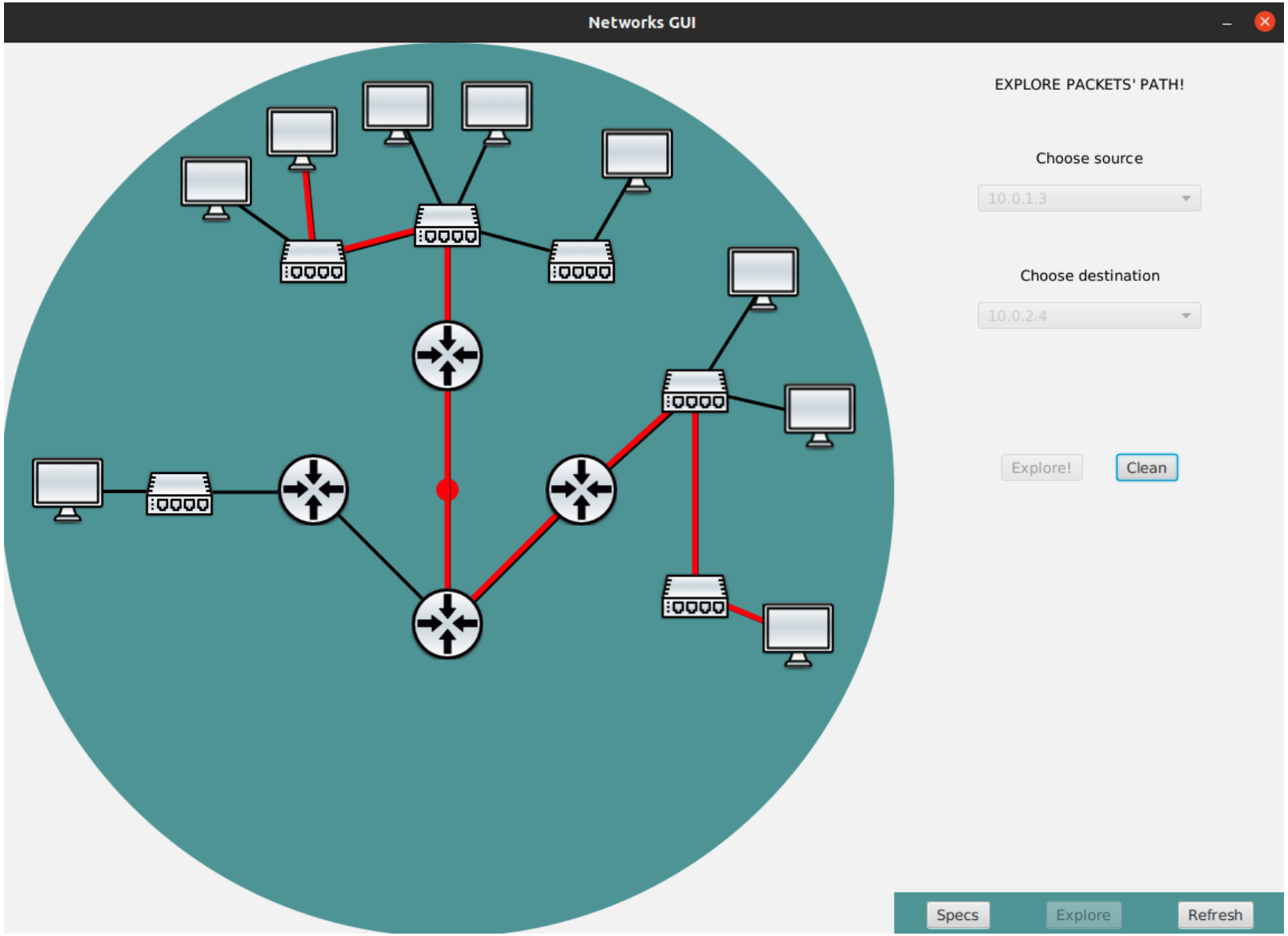
GUI: the general view



GUI: the Explore section



GUI: a more complex topology



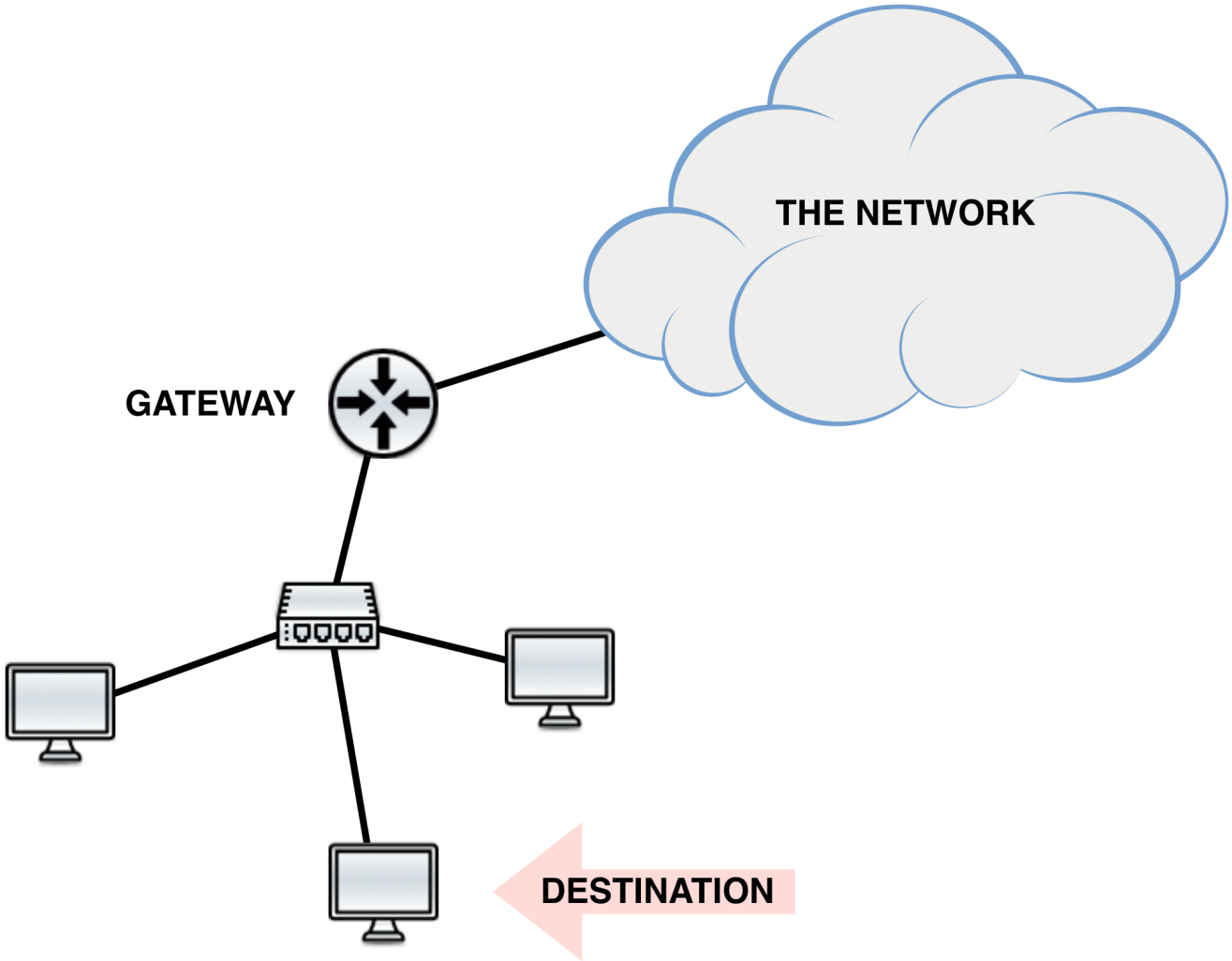
Configuration service

- The L3 configuration uploaded by the user is saved in the PostgreSQL DB.
- The network core is represented as a graph.
- Shortest paths are computed by performing BFS (no need to use Dijksrtra) and the IP tables are built.

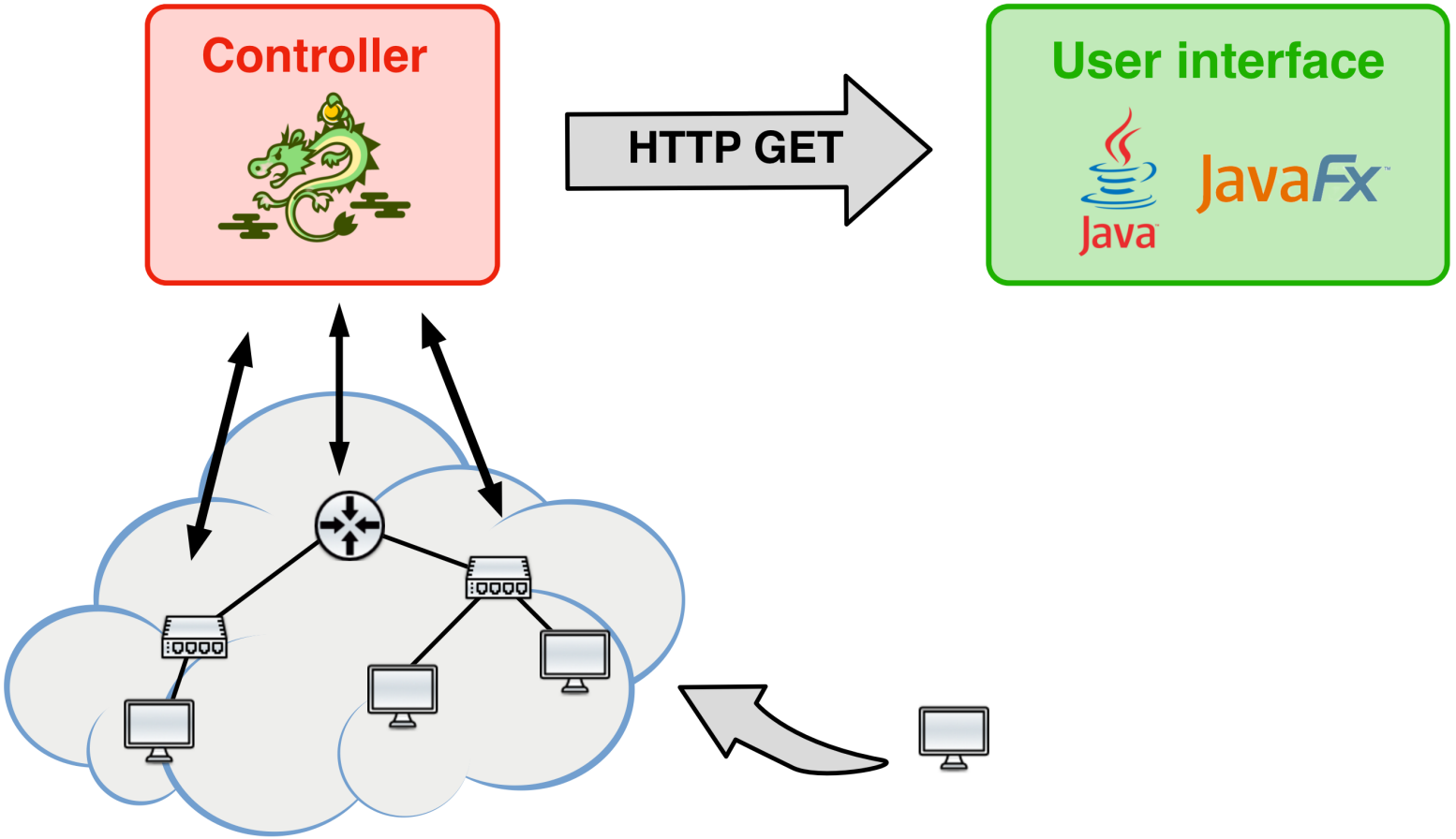
Ryu

- Ryu is notified by the Go microservice when a network configuration is available.
- It then learns which switches should operate at L2 and L3, respectively.
- It then writes the necessary rules in the flow tables.

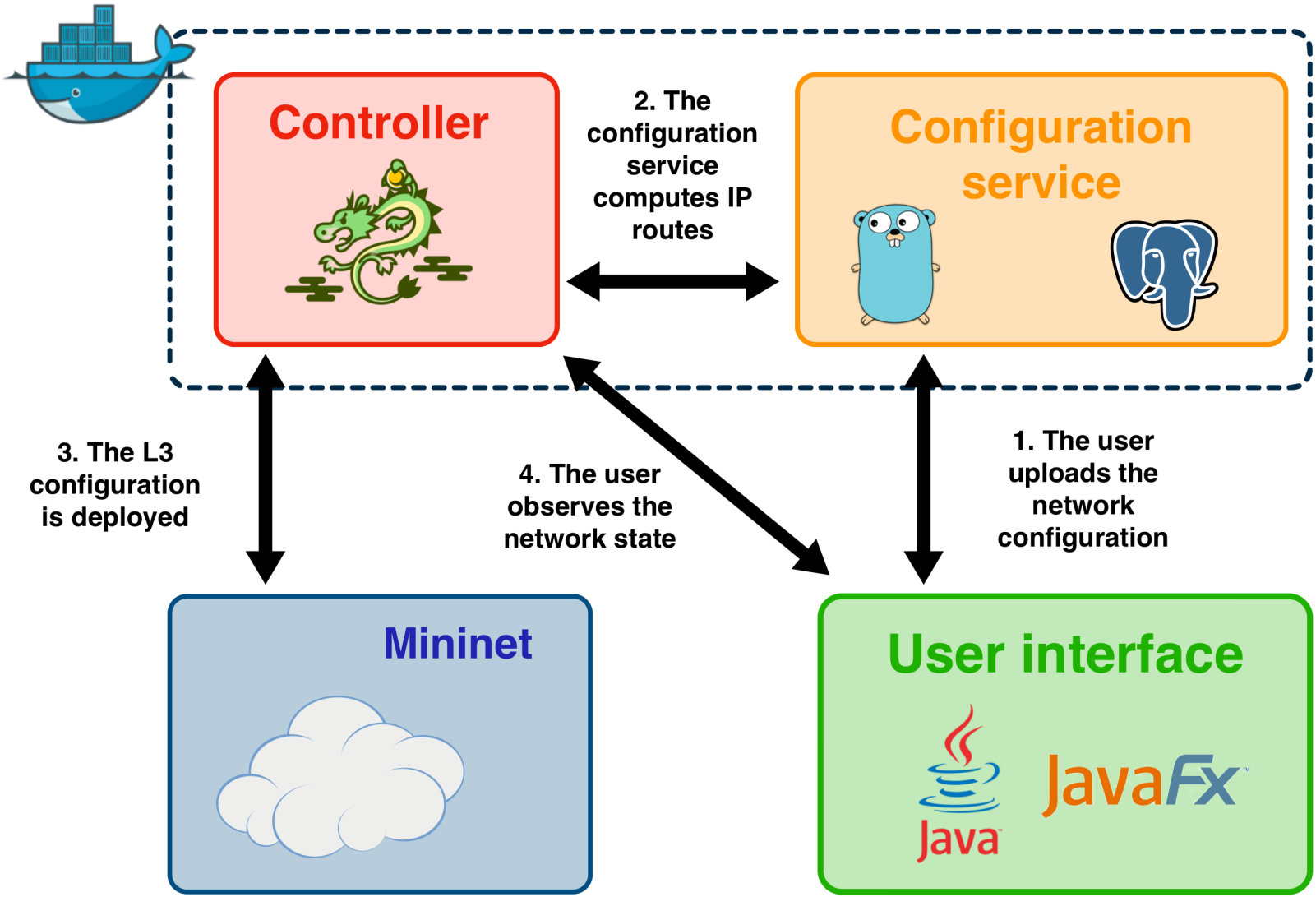
ARP handling



HTTP notifications



The complete flow



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Future improvements

- more advance forwarding and routing policies
- slicing implementation
- scalability
- simplify the configuration procedure