

## Introduction

- ▶ The Software-Defined Networking [1] (SDN) architecture moves the control logic to dedicated software-based controllers responsible for managing the whole network based on a logically centralized view. Such separation between the control and data planes introduces new concerns regarding the control plane scalability, reliability, consistency. In particular, the distributed SDN control plane architecture raises questions about the required number of SDN controllers and their optimal locations for the purpose of enhancing the network performance and guaranteeing the user's Quality Of Experience (QoE).
- ▶ The poster investigates and formulates the SDN controller placement problem [2] as a multi-objective optimization problem using the DCLARA clustering algorithm and the Sinalgo simulation and implementation framework. It proposes a novel approach to distributing the SDN control plane based on the desired performance metrics and requirements.

## What and Why is Software-Defined Networking ?

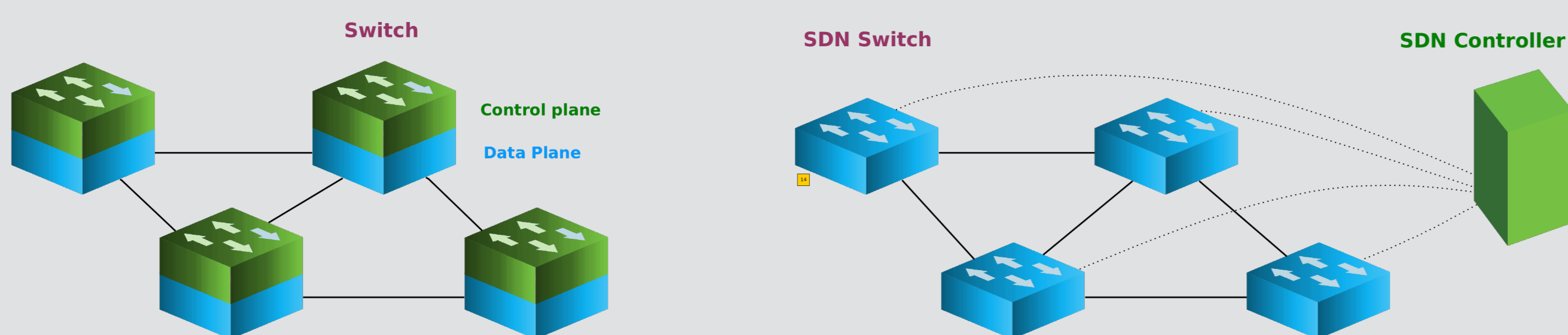


Figure : Conventional Networking Versus Software Defined Networking

- ▶ Separation between the Data Plane and the Control Plane,
- ▶ Centralization of the Control logic in Software-based controllers,
- Increased Flexibility, Better Visibility, Network Automation,

## Centralized vs Distributed SDN Control

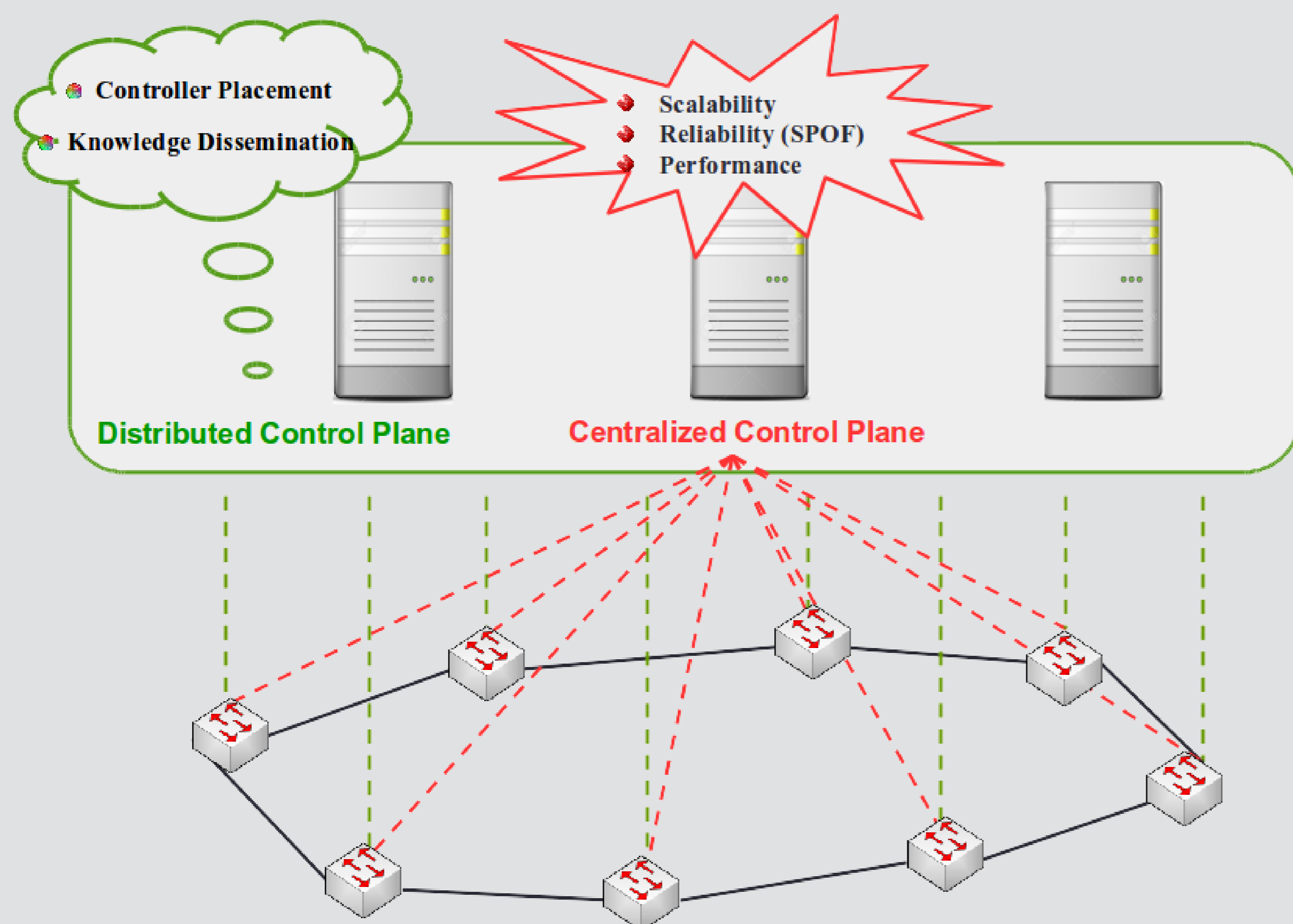


Figure : From a centralized to a distributed SDN control architecture [3]

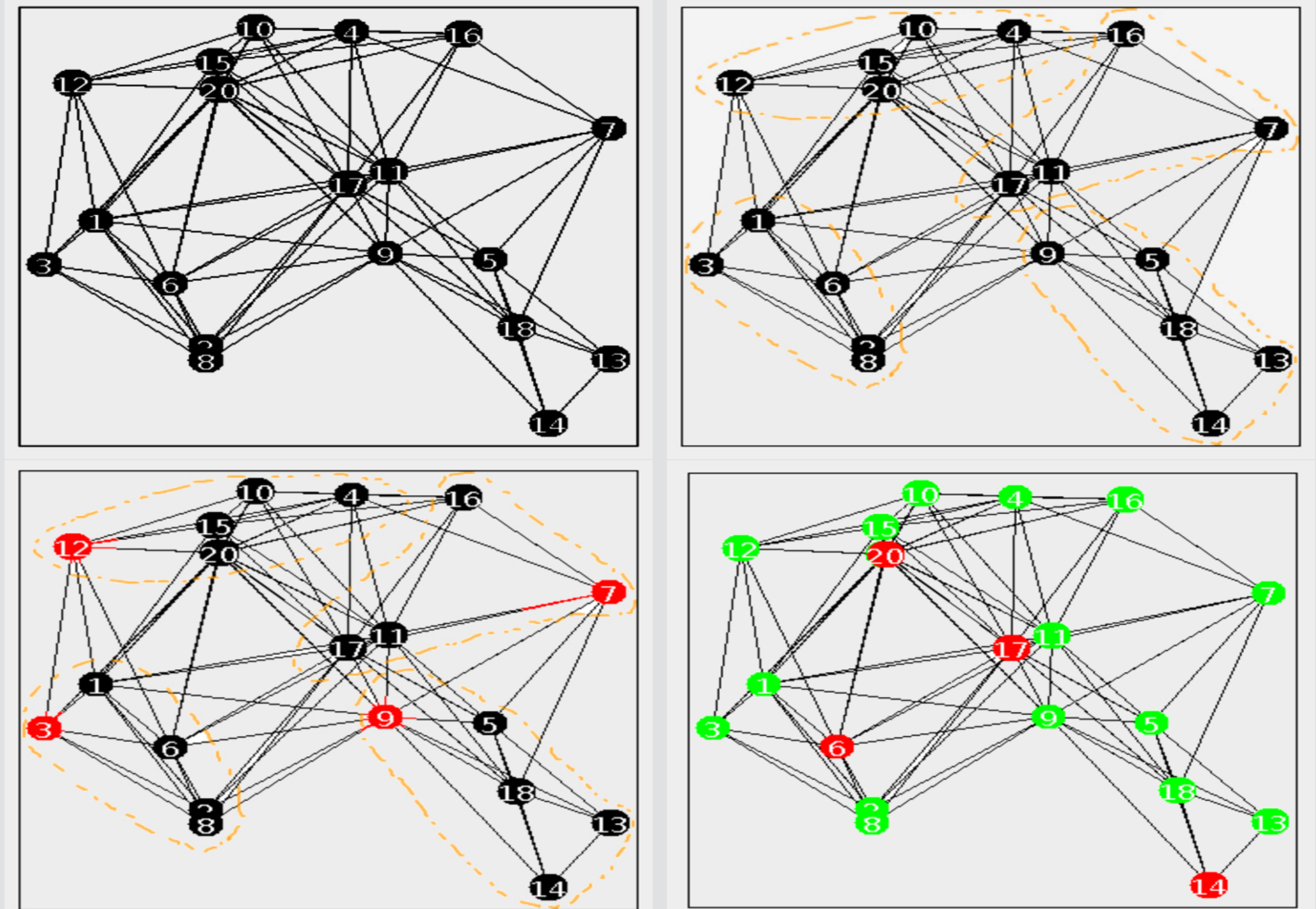
## Distributed SDN control challenges

We tackle the distributed SDN control challenges which we categorize into two main research problems:

- ▶ **The Controller Placement Problem**
  - ▷ It investigates the required number of SDN controllers and their optimal locations in terms of network performance metrics and depending on the existing constraints.
- ▶ **The Knowledge Dissemination Problem**
  - ▷ It investigates the type and amount of information to be shared among controller instances given a desired level of consistency.

## The Controller Placement Problem

We treat the controller placement problem as a **clustering-based multi-objective optimization problem** using the **Sinalgo** simulation framework.



♦ Generating the Network Topology

♦ Running the Leader Election Process

→ A Partitioned Network: Leader Nodes + Neighboring Follower Nodes

♦ Gathering and lifting local network information to Leaders

♦ Synchronizing these local information across Leaders

→ Building a Global Physical Network View (Topology+State)

♦ Completing the Global Network View using Dijkstra

♦ Launching the Optimization Algorithm

→ Producing Optimal SDN controller configuration solutions

PAM/CLARA

NSGA II

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## References

- [1] Diego Kreutz, Fernando MV Ramos, Paulo Verissimo, C. Esteve Rothenberg, S. Azodolmolky, and S. Uhlig. Software-defined networking: A comprehensive survey. *Proceedings of the IEEE*, 103:14–76, Jan 2015.
- [2] Brandon Heller, Rob Sherwood, and Nick Mckeown. The controller placement problem. In *in: Proceedings of Hot Topics in Software Defined Networking (HotSDN, 2012.*
- [3] Dan Levin, Andreas Wundsam, Brandon Heller, Nikhil Handigol, and Feldmann. Logically centralized?: State distribution trade-offs in software defined networks. In *Proceedings of the First Workshop on Hot Topics in Software Defined Networks, HotSDN '12*, pages 1–6, New York, NY, USA, 2012. ACM.

## Contact Information

- ▶ Web: <http://www.lab.lissi.fr>
- ▶ Email: [fetia.bannour@u-pec.fr](mailto:fetia.bannour@u-pec.fr)