Centralized control of distributed networks

Olivier Tilmans — Université Catholique de Louvain

www.fibbing.net
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State of the art opposes two networking paradigms, swapping each other's strengths and weaknesses.

Centralizing routing decisions

✓ **Flexibility**
Can use any path

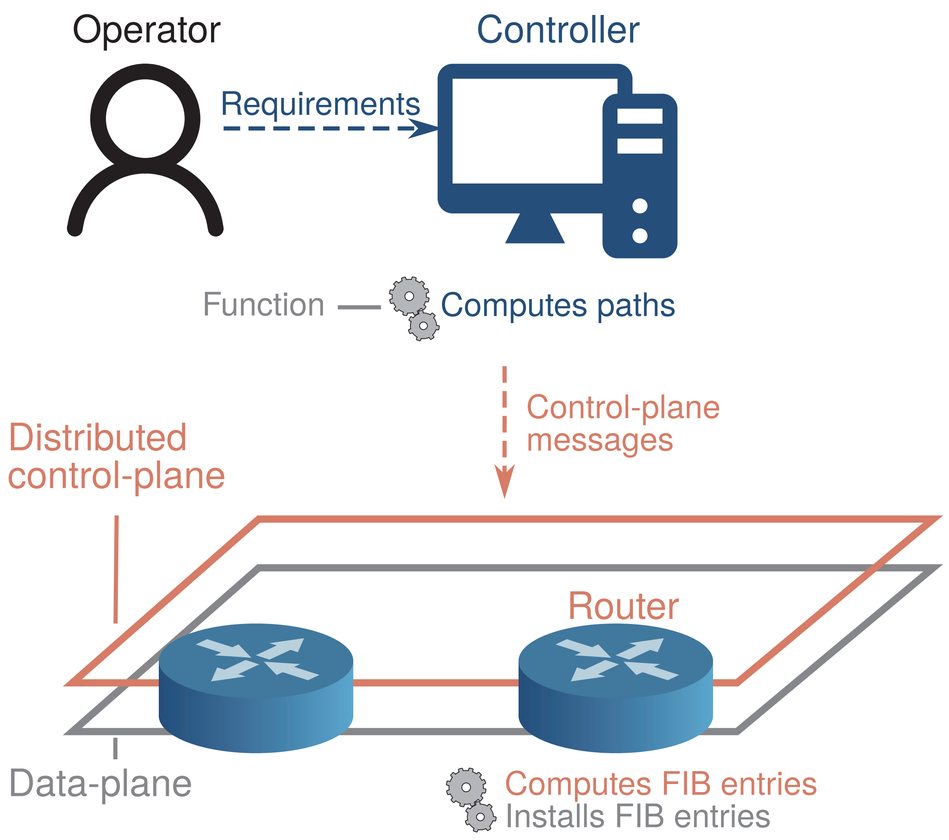
✓ **Manageability**
Single point of control for operators

Using distributed routing protocols

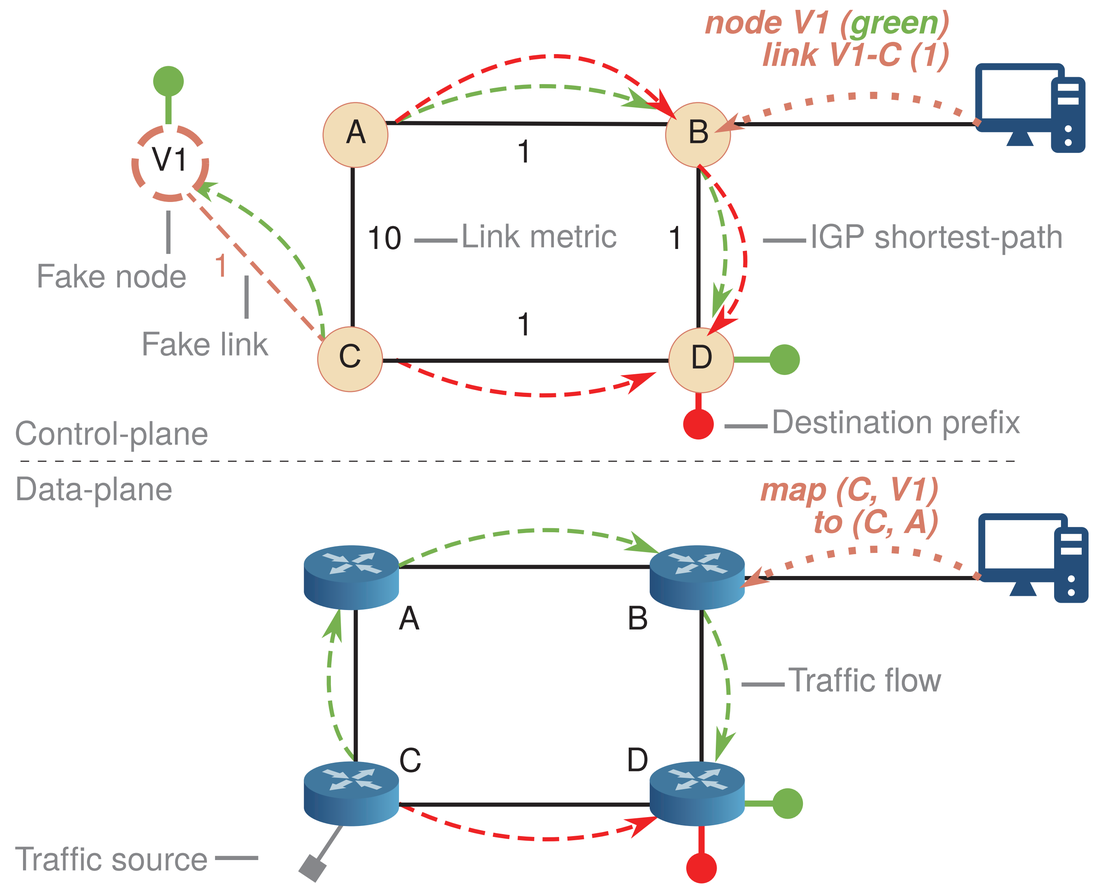
✓ **Resiliency**
React quickly to any set of failures

✓ **Scalability**
Work in very large networks

We propose an architecture [1] ***combining*** these advantages.



We control link-state IGP by manipulating the shared topology.



The controller can enforce ***any*** forwarding DAG on a per-destination basis, supporting various use-cases.

- **Traffic steering**
  Enforce middlebox traversal
- **Equal-cost path addition/removal**
  Provide fine-grained control over ECMP
- **Backup path provisionning**
  Prevent post-failure issues

This architecture can be further explored.

- We can control today's OSPF routers
  What are the minimal requirements to control any link-state IGP?
- We fully control the paths and costs
  How can we control other protocols using the IGP?
- We modelize the routers to decide what control-plane message to send
  How can we verify the network behavior?

[1] Stefano Vissicchio, Olivier Tilmans, Laurent Vanbever, and Jennifer Rexford, «Central Control over Distributed Routing», in *proceedings of the 2015 ACM SIGCOMM Conference*, London, UK, 2015.