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A Topology-Aware Adaptive Deployment Framework for Elastic Applications

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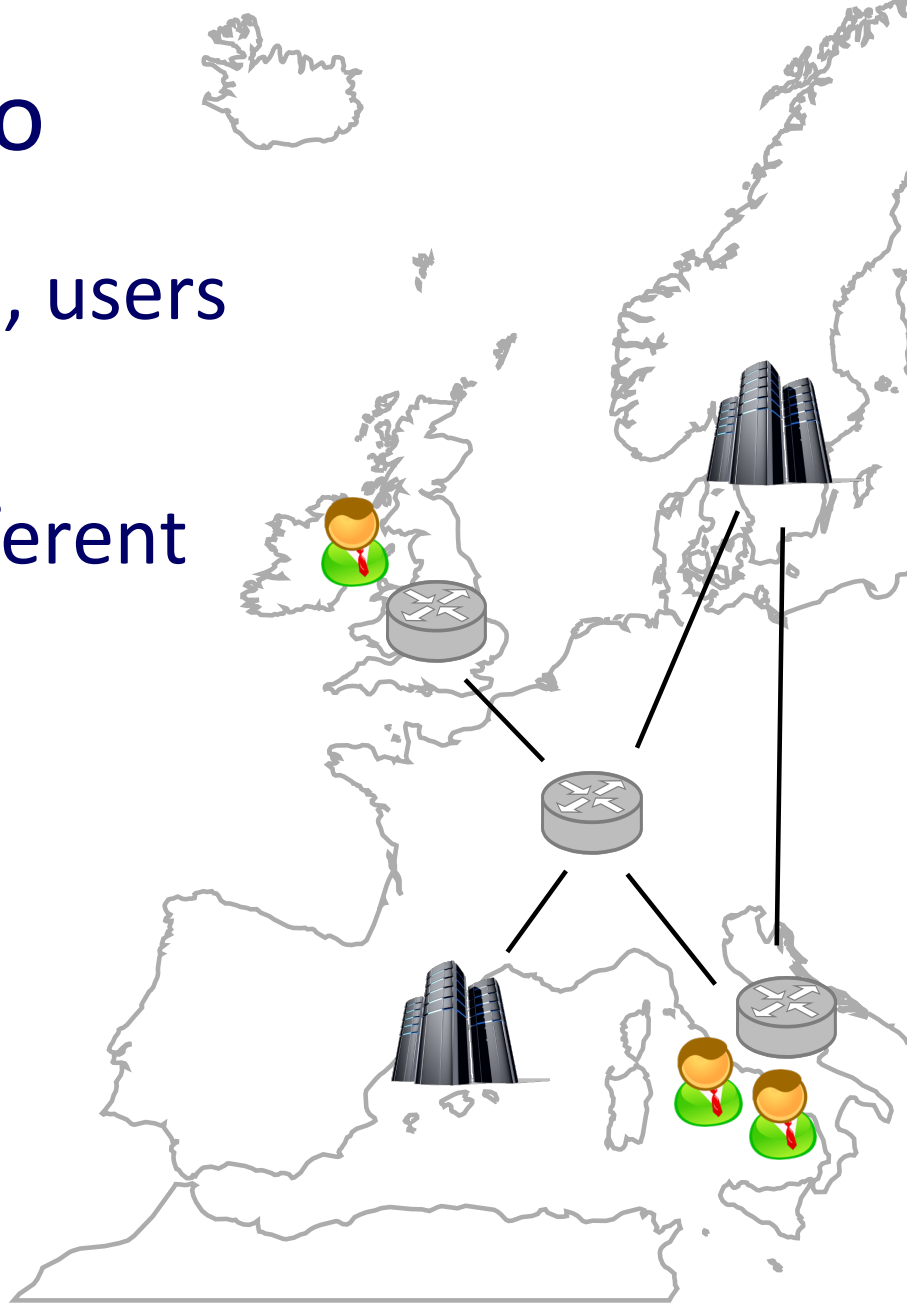
COMGREEN
Communicate. Green.

SAIL

Scenario

- Network with data centres, users
- Requests are served at different sides



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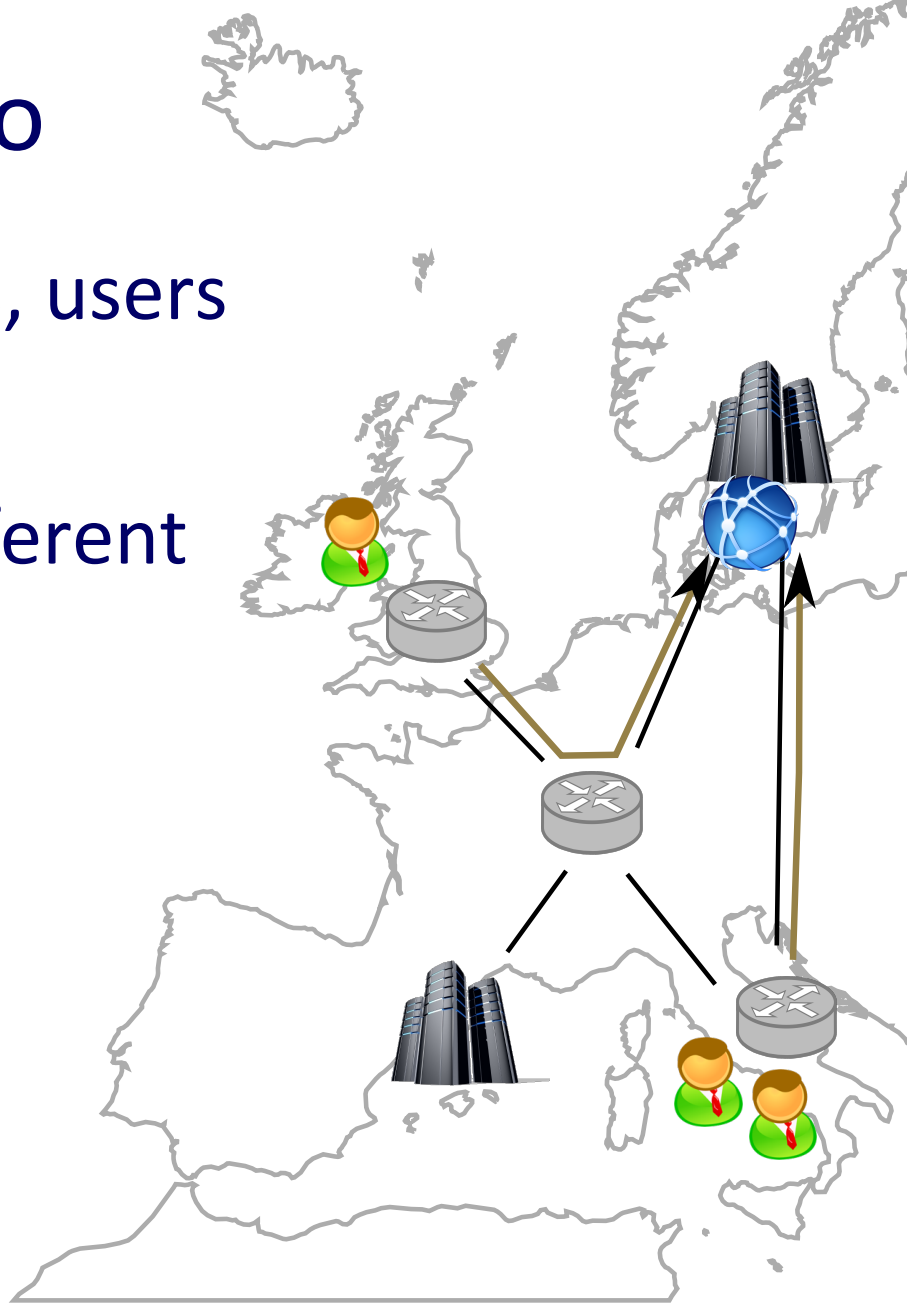
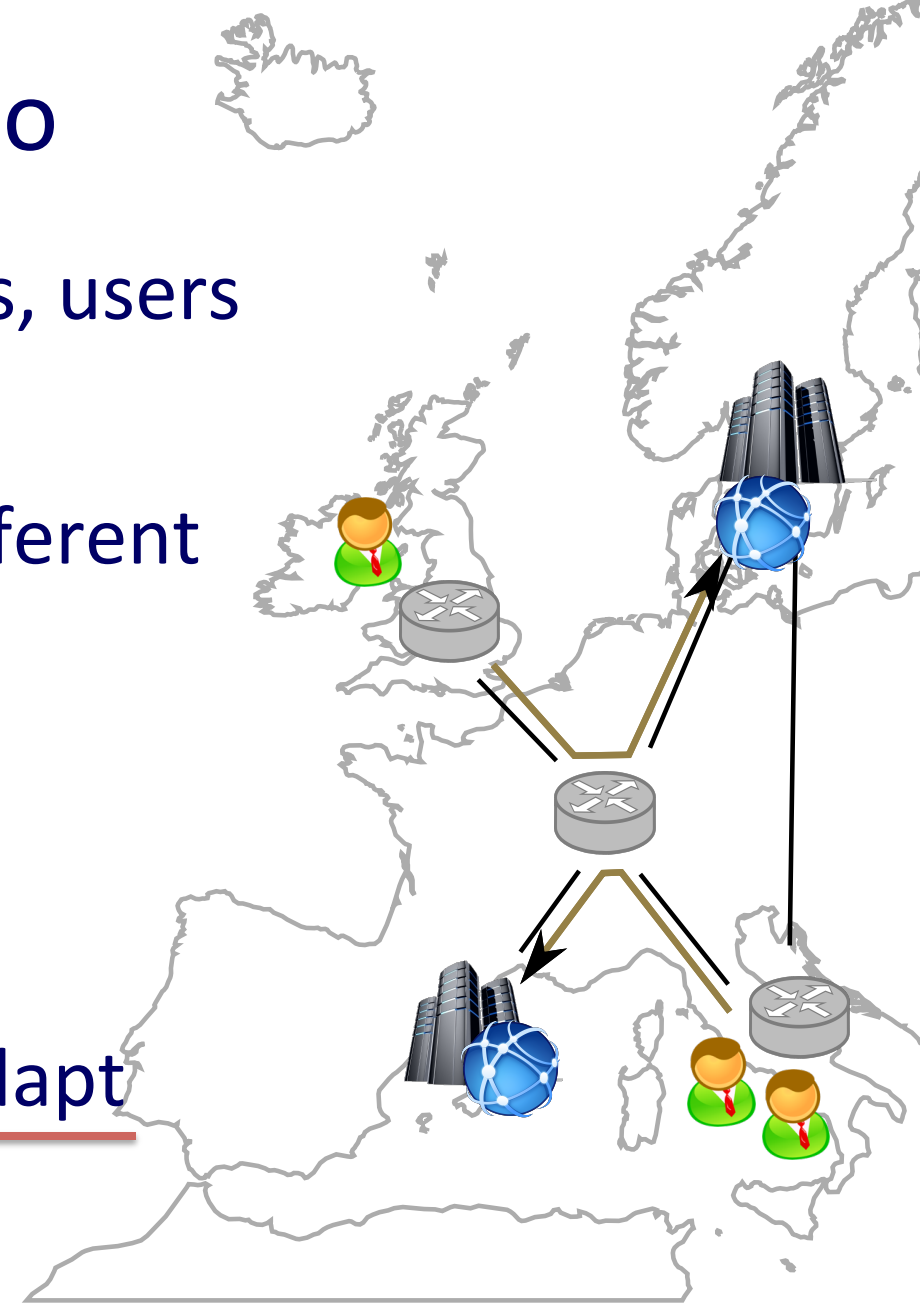


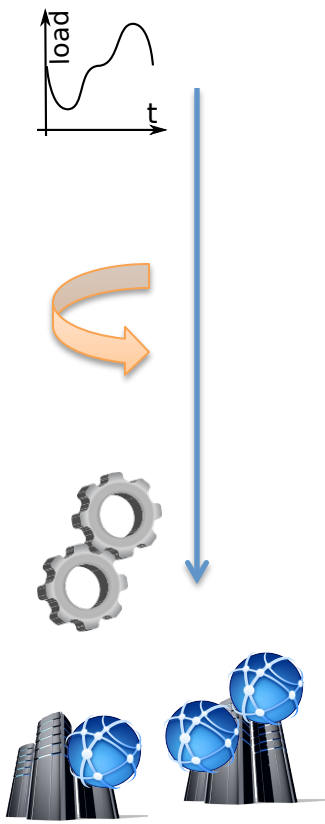
Scenario

- Network with data centres, users
- Requests are served at different sides
  - Benefits: Costs, Latency, …
- Load changes over times
  ➔ need to successively adapt



Adaptive Deployment

- Process
  - Monitor: Load or performance indicators
    - CPU, bytes/s, or Req./s
  - Logic: Reconfiguration
  - Execute
- Successive process



Big picture

- Diverse applications
  - Multi-tier
  - Stateful
- Diverse adaptations
  - Goals, Triggers, Algorithms, …
  - Focus: Network-properties
- Swiftly adapt
  - Automation

Big picture – and today

- Diverse applications
  - Multi-tier
  - Stateful

Hardware Virtualization

No runtime changes

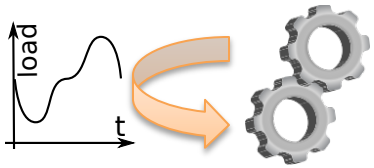
Obstacle: Isolation

- Diverse adaptations
  - Goals, Triggers, Algorithms
  - Focus: Network-properties

Missing: Generic solution

Manuel integration

- Swiftly adapt
  - Automation



Labor-intensive task

Missing system

Adaptation today

- Diverse applications
  - Multi-tier
  - Stateful

Hardware Virtualization

No runtime changes

Obstacle: Isolation

- Diverse adaptations
  - Goals, Triggers, Algorithms
  - Focus: Network-properties

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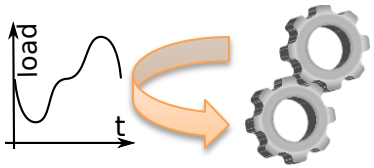


Labor-intensive task

Missing system

Adaptation: Tomorrow

- Diverse applications
  - Multi-tier
  - Stateful

Hardware Virtualization

Cont. changing deploy.

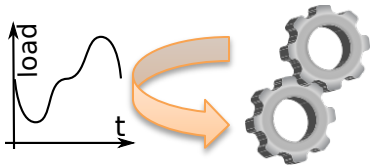
Bypass Isolation

- Diverse adaptations
  - Goals, Triggers, Custom
  - Focus: Network-properties

Plugin

Topology

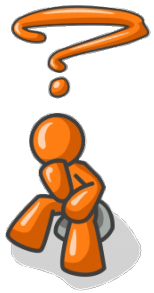
- Swiftly adapt
  - Automation



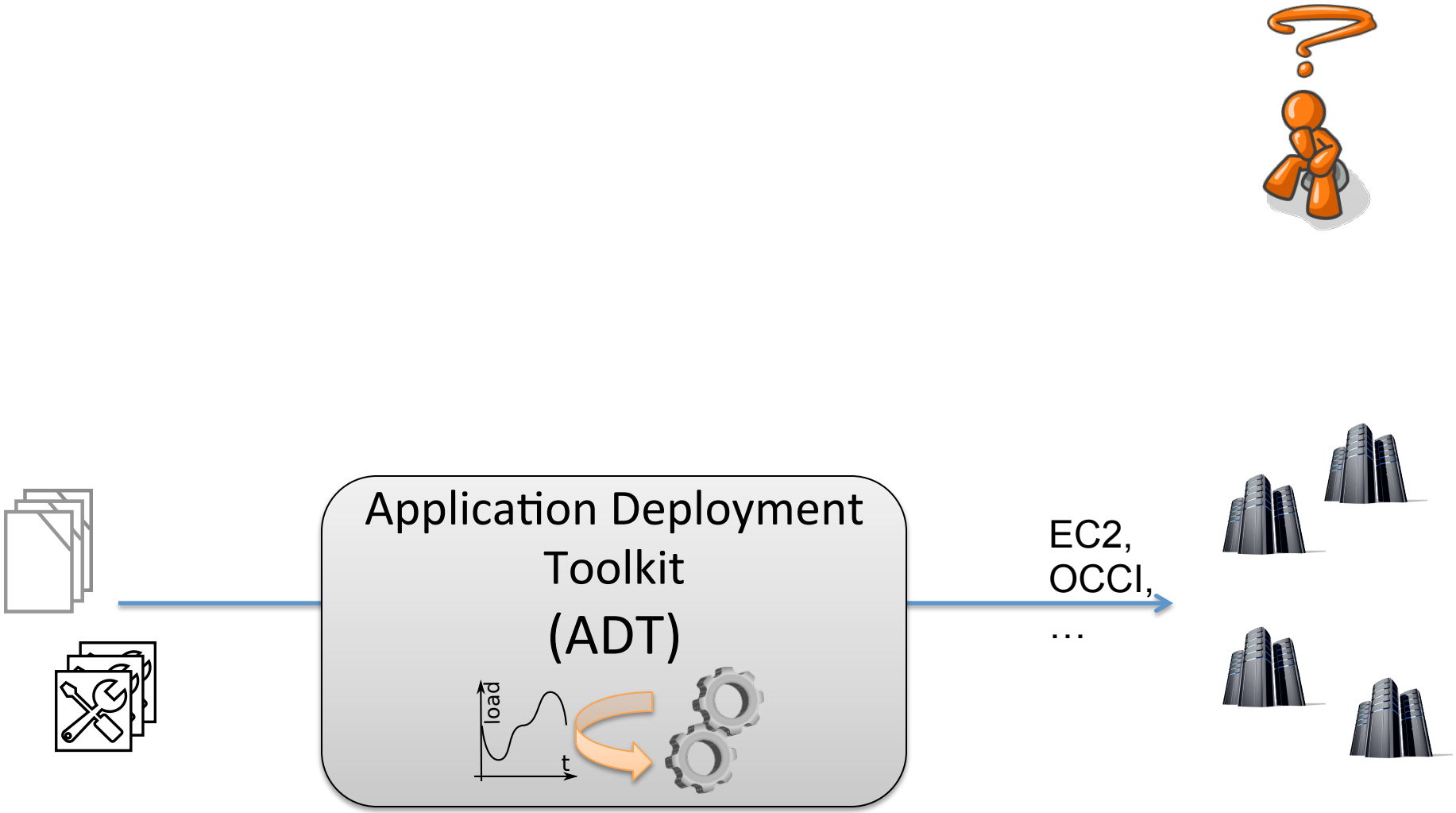
Self-managed

Framework

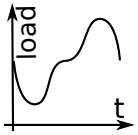
Automatic application adaptation

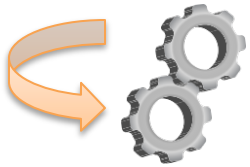


Automatic application adaptation



Automatic application adaptation

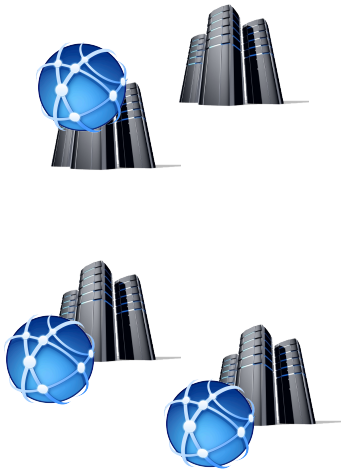
- How to 

 ?

ADT

Plugin

EC2,
OCCI,
...



Automatic application adaptation

- How to

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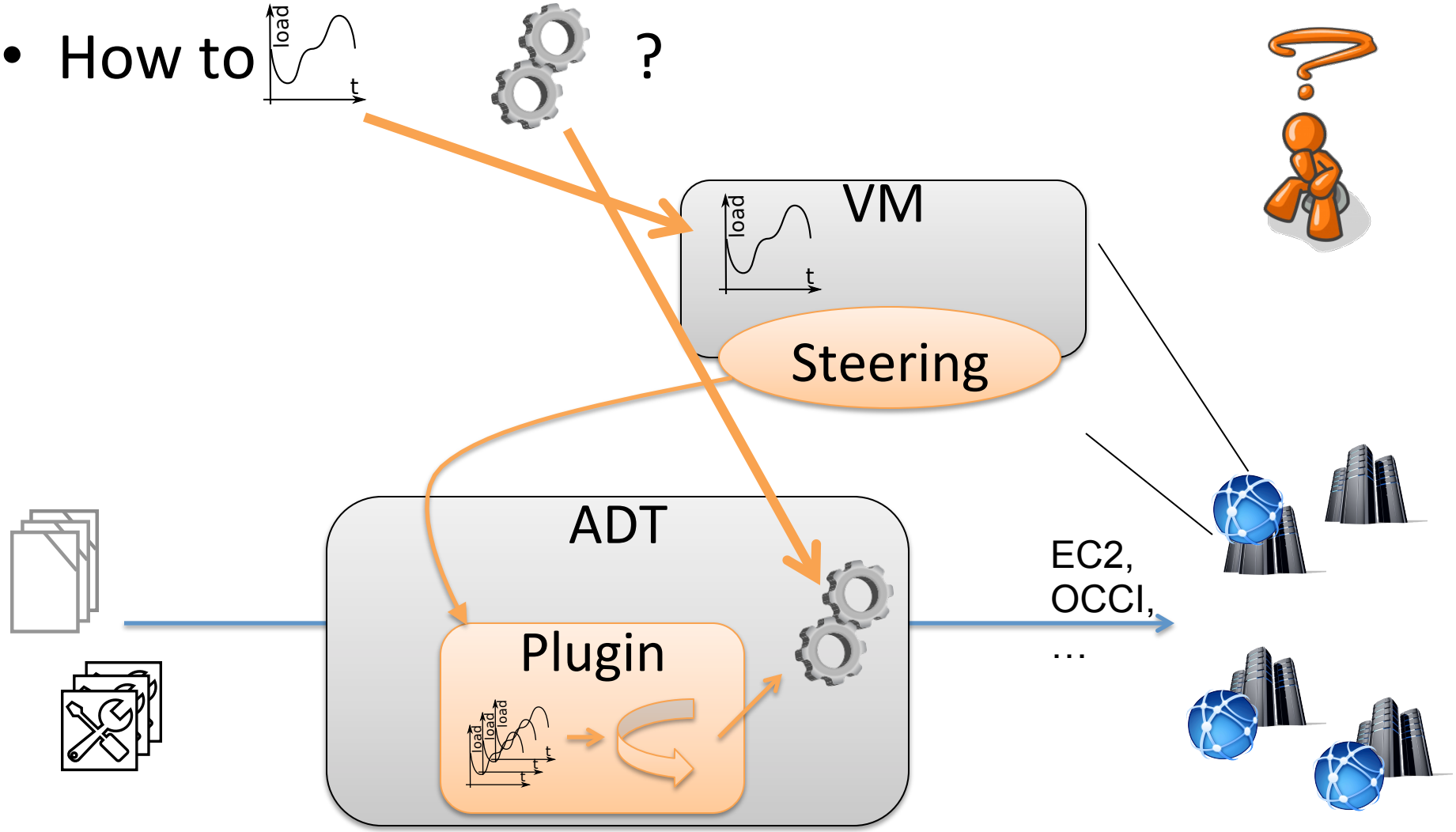
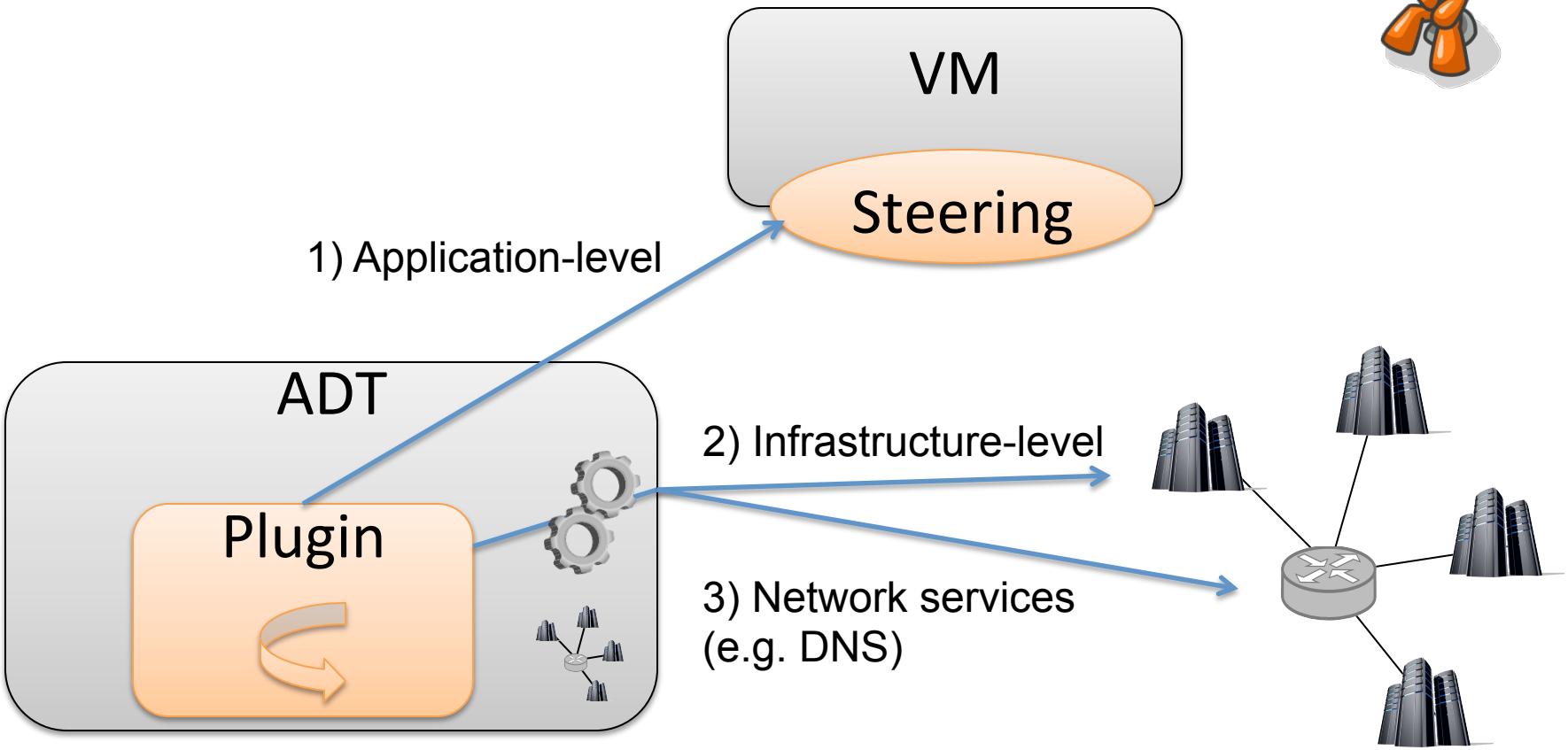


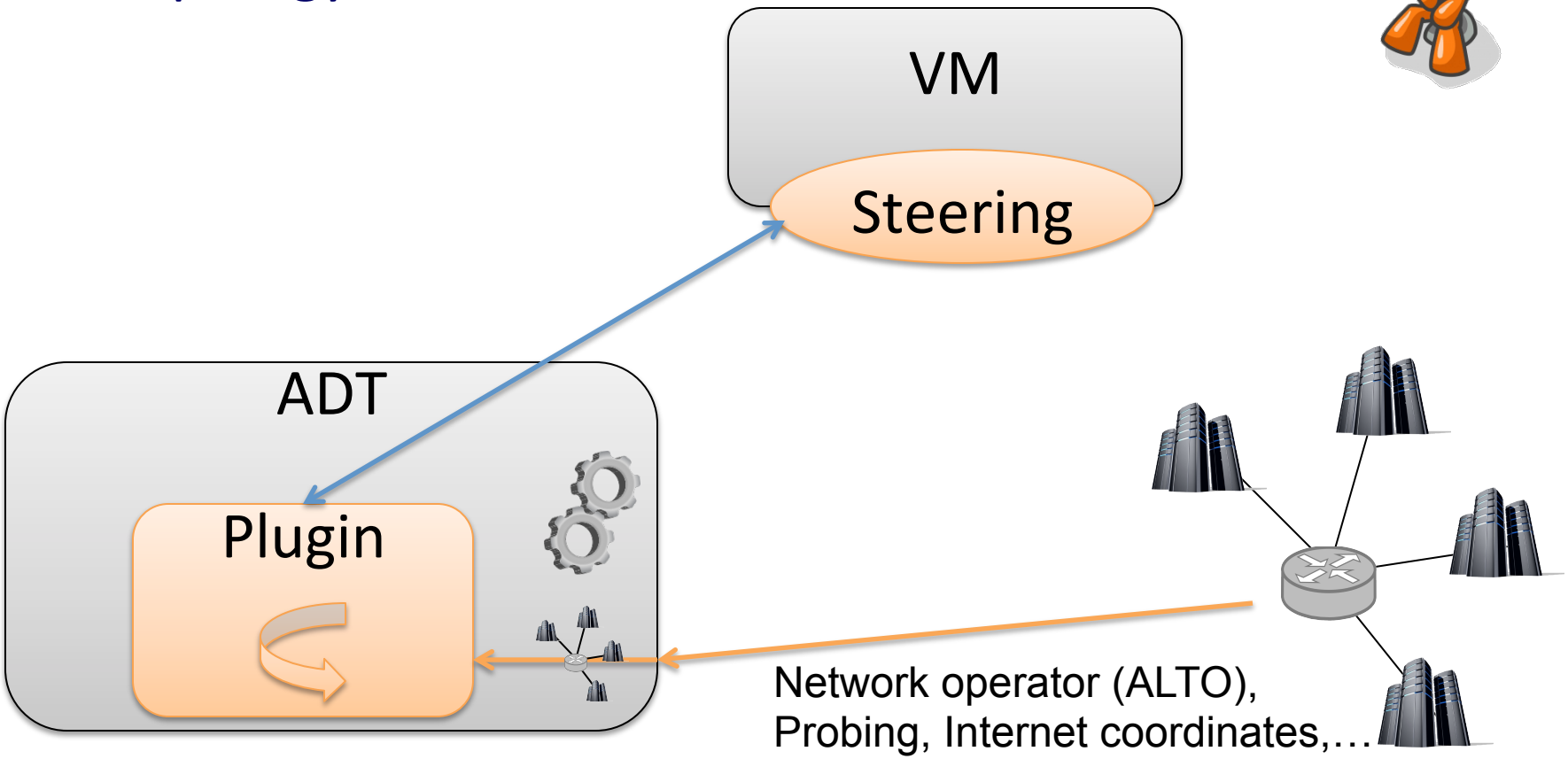
Automatic application adaptation

- Three kind of reconfigurations



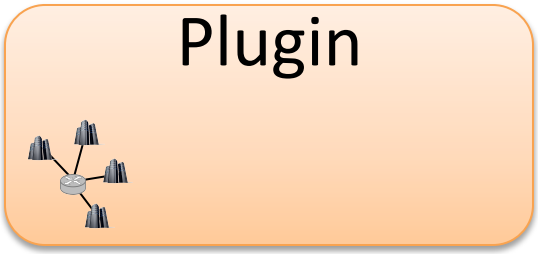
Automatic application adaptation

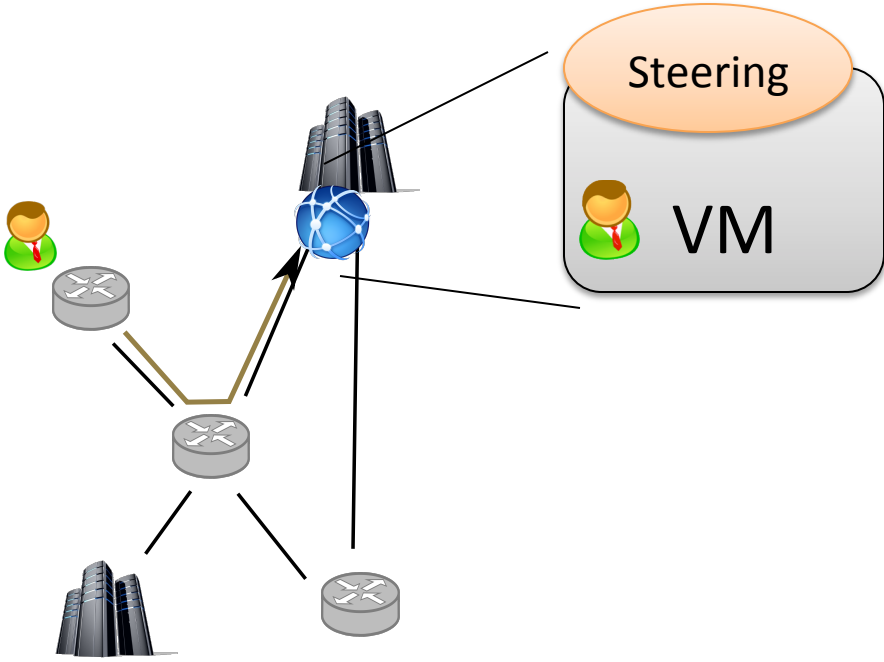
- Focus: Network
  - Topology



Automatic application adaptation

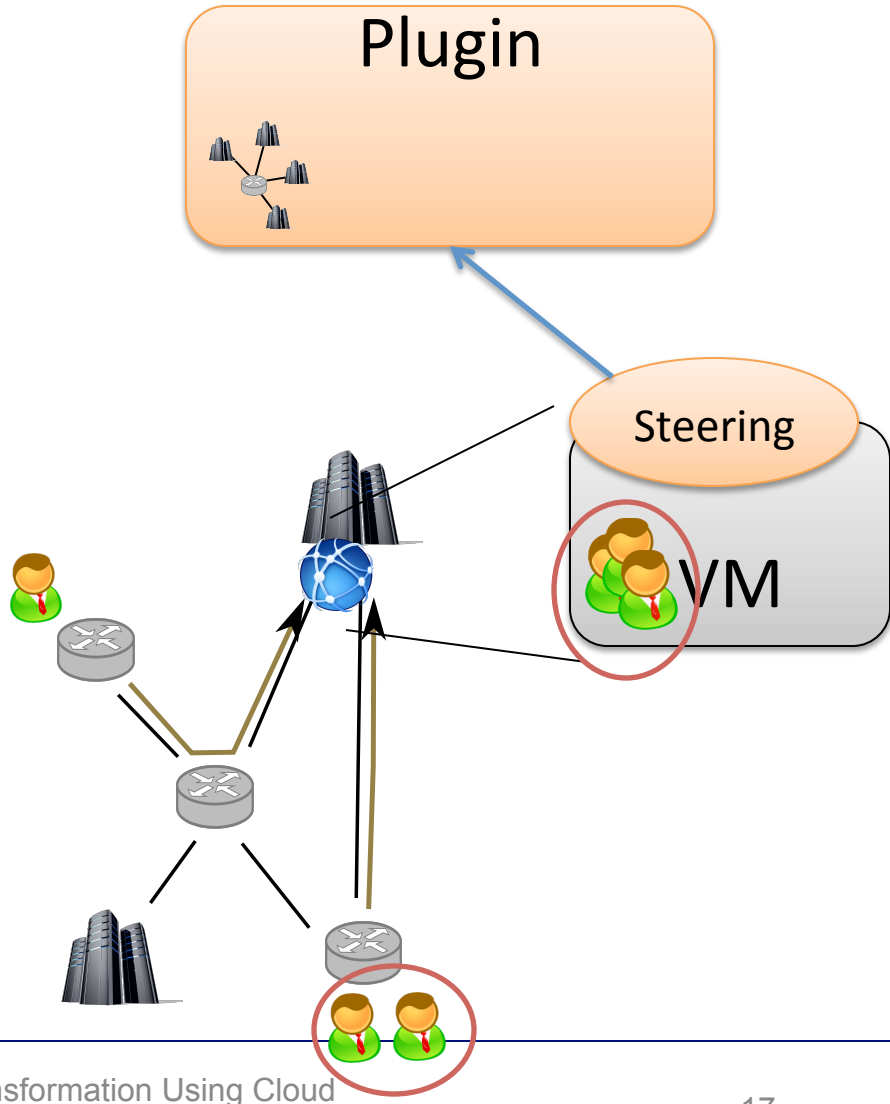
- Example:
  1. Interactive Web-Application (latency)





Automatic application adaptation

- Example:
  1. Interactive Web-Application (latency)
  2. New Users appear



Automatic application adaptation

- Example:
  1. Interactive Web-Application (latency)
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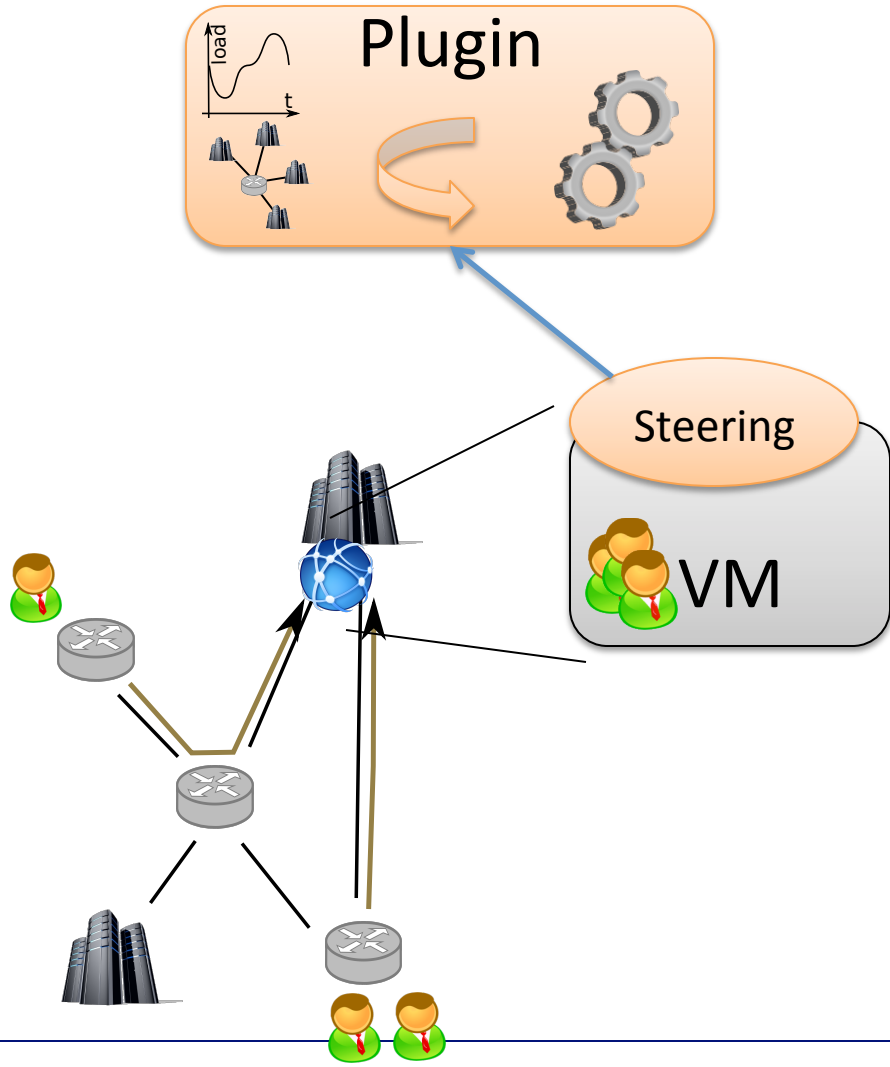
  3. Adapt deployment



Automatic application adaptation

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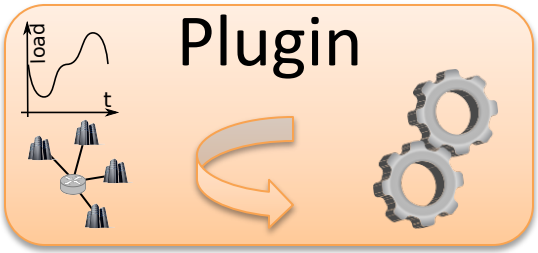
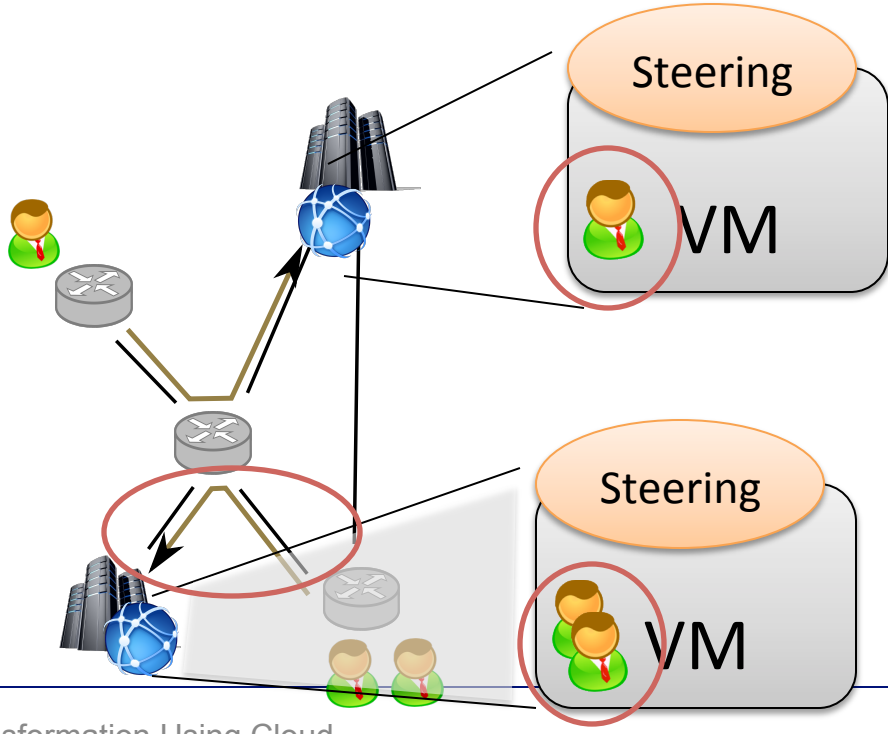
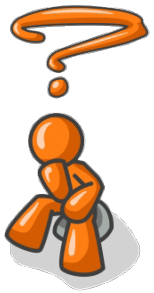
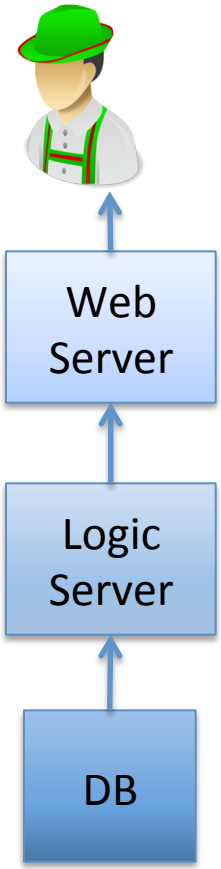




Automatic application adaptation

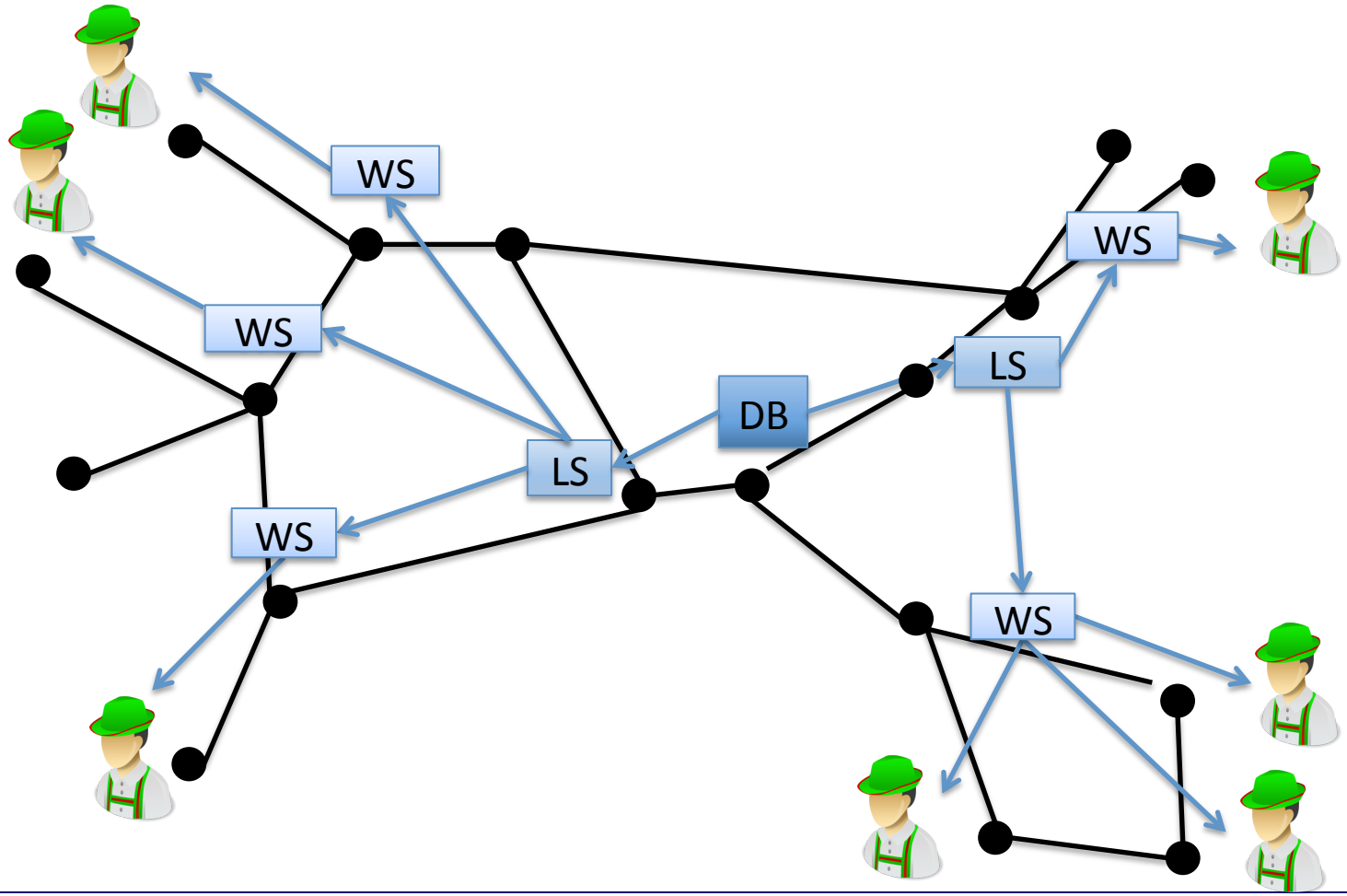
- Continuously changing environment
  - Multi-tier
  - Stateful

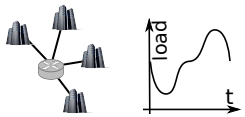




Automatic application adaptation

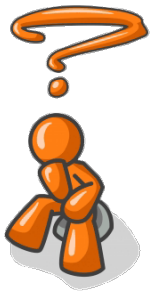
- Example adaptation

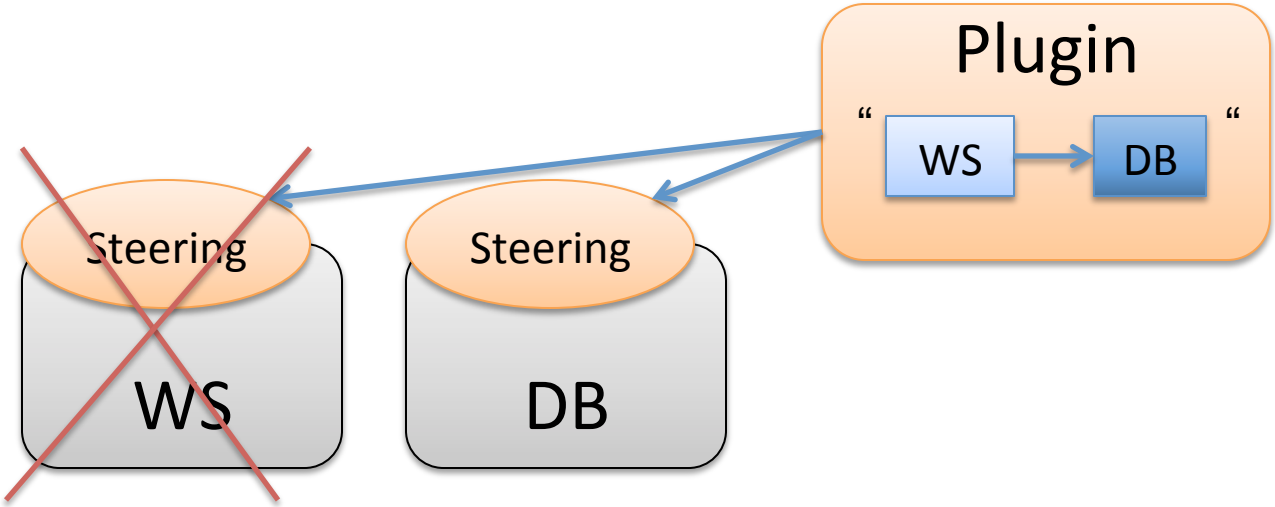




Automatic application adaptation

- Component (re)configuration
  - Interconnection (FS -> DB)
- Deployment sequence
- Notify infrastructure events
  - Destroy VM ➔ rescue state
  - Migrate VM ➔ switch into a robust state





Summary

- Framework, Plugin
  - Support for diverse application, adaptations
  - Ongoing process of
    - Monitor/aggregate performance data
    - Compute, reconfigure deployment
  - Enable Network-dependent adaptations:
    - Topology Manager: Exchangeable implementations
- Available online: http://tinyurl.com/o69vnn4
- Live demonstrations
  - Different applications, remote data centres

Thank you for your attention!

Matthias Keller