Placement of Controllers in Software Defined Networking using Affinity Propagation

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Overview

Software Defined Networking

Controller Placement Problem

Current Methods and Their Issues

Problem Statement

Proposed System

Modules

Evaluation Measure

Progress So Far

Gantt Chart

Conclusion

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Software Defined Networking

- Emerging network architecture.
- Separates control plane from data plane.
- Control plane provides a global view and is programmable.

Software Defined Networking Architecture

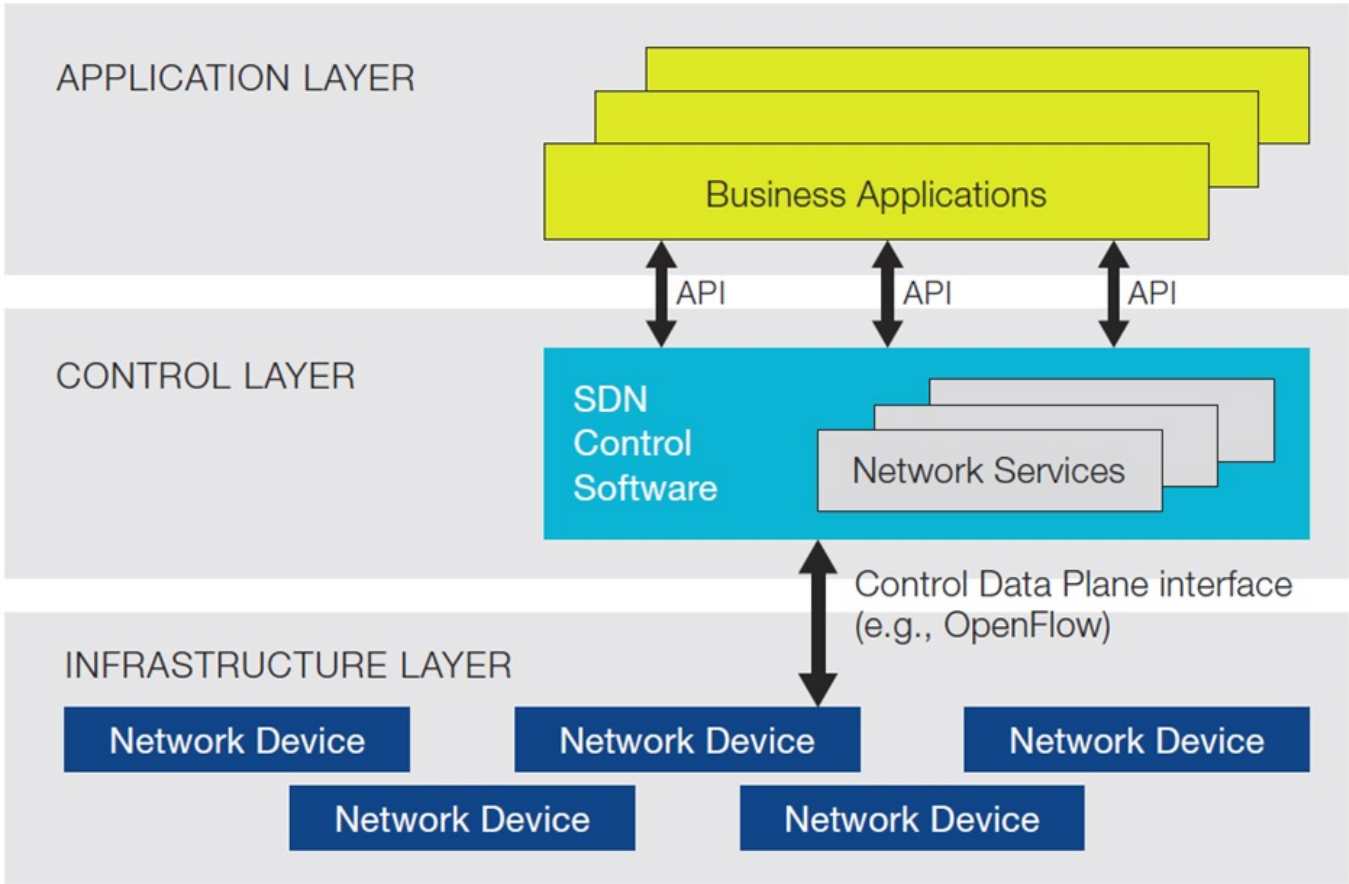

Fig. 1: SDN architecture*

** adapted from Jammal et al.*

Software Defined Networking

- For large scale network, single controller is not enough.
- Multiple controllers were introduced.
- Leads to some research challenges
  - Maintaining global view of the network
  - Optimal placement of controllers

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Controller Placement Problem

Given a network topology

- How many controllers are needed?
- Where in the topology should they go?

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Current Methods and Their Issues

- K- center based approaches
- Clustering based approaches
- Issue
  - All methods need to specify the number of controllers as input.

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To determine the number of controllers and their location in software defined networking using affinity propagation

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Overview of Proposed System

- Create network topology.
- Partition the network into sub networks using affinity propagation algorithm
  Affinity propagation clustering automatically determines the number of sub networks
- Balance the number of nodes in subnetwork
- Placement of controller in each sub network

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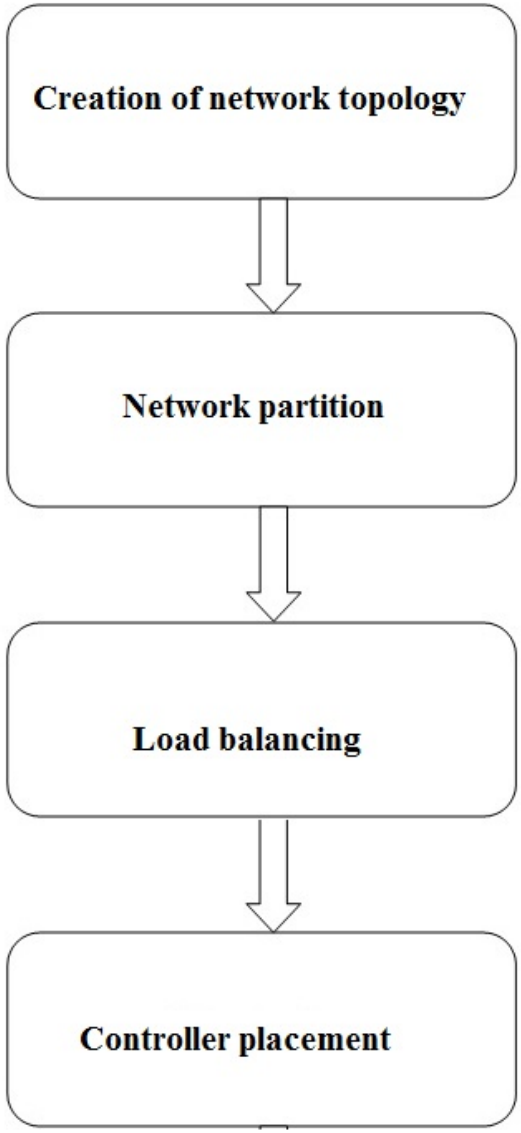
Creation of network topology
Network partition
Load balancing
Controller placement

Creation of network topology

- Select a network like cernet, internet2 OS3E
  (Here we use internet2 OS3E network)
- Collect longitude, latitude and location(city) of nodes in that network
- Create network topology

Clustering and Load balancing

- Partition the network into sub networks using affinity propagation.
- There are exemplars in the sub network which represents it.
- Check the number of nodes in sub networks.
- If it is greater than a predefined threshold value allocate it to neighbouring sub networks.
- Place controllers in the location of exemplars.

Why Affinity Propagation??

- Automatically determines the number of controllers
- Exemplar based message passing algorithm
- Input:Shortest distance between nodes
  (measure of latency)

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Evaluation Measure

- Average case latency
- Worst case latency
- Imbalance metric

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Progress So Far

- Completed literature survey.
- Completed module designing.
- Studied papers in network which uses clustering methods.
- Chose evaluation metrics
- Included load balancing module.
- Created network topology.
  - Chose Internet2 OS3E network as input
  - Collected details about Internet2 OS3E(longitude and latitude of nodes, city in which node is located)
  - Wrote code to select topology

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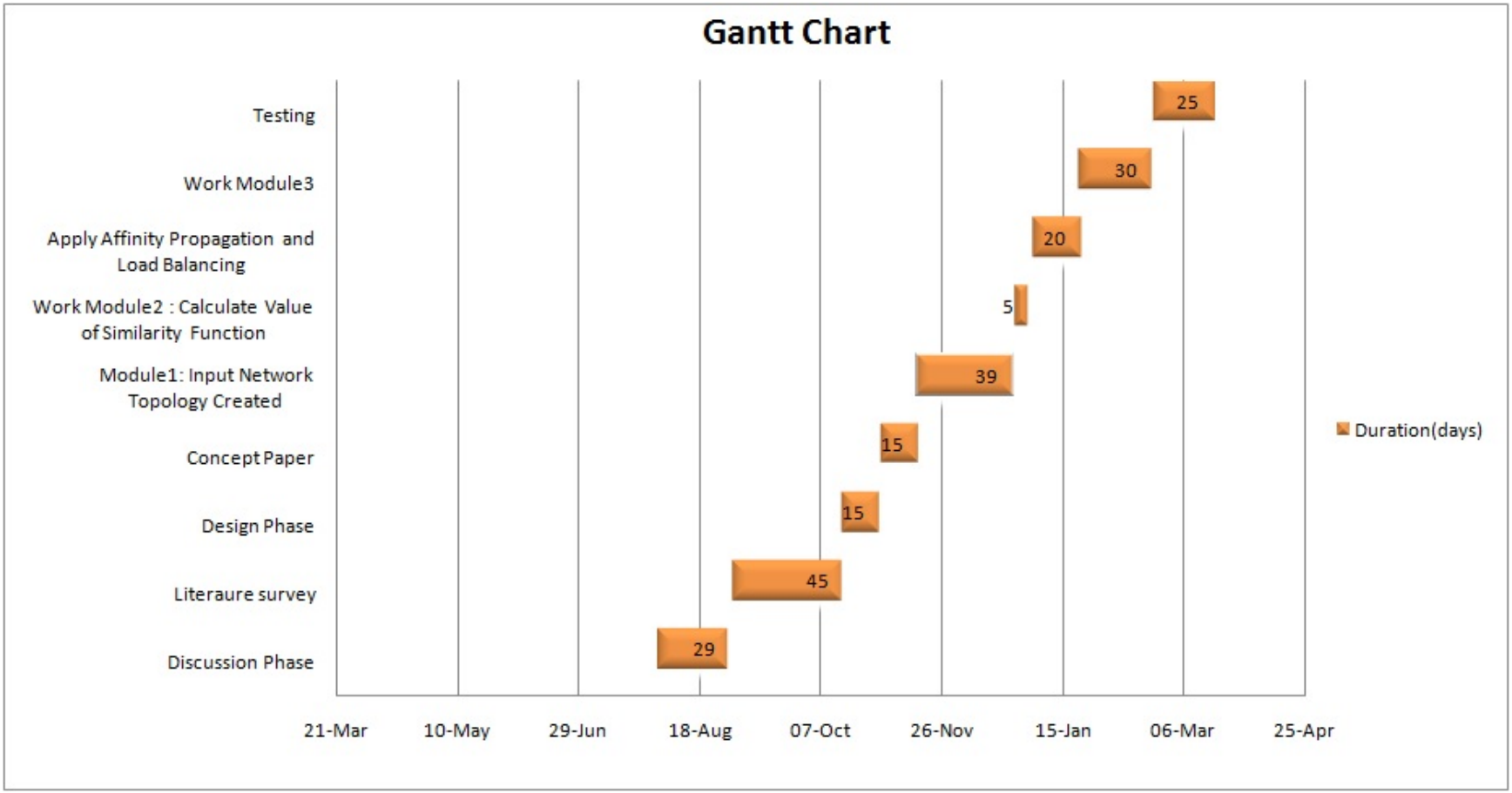
Gantt Chart
Testing
Work Module3
Apply Affinity Propagation and Load Balancing
Work Module2 : Calculate Value of Similarity Function
Module1: Input Network Topology Created
Concept Paper
Design Phase
Literaure survey
Discussion Phase
25
30
20
5
39
15
15
45
29
Duration(days)
21-Mar
10-May
29-Jun
18-Aug
07-Oct
26-Nov
15-Jan
06-Mar
25-Apr

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Conclusion

- Proposed system for controller placement problem is discussed.
- Different modules of the system are discussed.
- Progress of the work done is discussed.

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Thank you!