Edge-assisted Traffic Engineering and Applications in the IoT

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Motivation

IoT group communication
GET coap://building1.green
GET coap://building1.green
GET coap://building1.green
PUT coap://yellow ON
PUT coap://yellow ON
PUT coap://yellow ON
Recommended implementation approach

• For each possible group create an IP multicast group
• All Things should join the corresponding IP multicast groups
• Add the appropriate DNS entries
An alternative approach
Leverage edge and SDN technology
Design Goals

- No modification to endpoints
- Use only existing standards
SDN underlay
BF Forwarding

[Diagram showing a network of nodes and connections with binary codes: 00000001, 00000100, 00001000, 00010000, 00100000, 01000000, 10000000, 00100000, 00010000, 00001000, 00000100, 00000010, 00000001]
BF Forwarding

```
00000001 00000010 00000100 00001000 00010000 00100000 01000000
```

Diagram showing the flow of BF Forwarding with nodes and connections.
BF Forwarding

```
00000010
00000001
00000010
00000100
00001000
00010000
00100000
01000000
01101111
```
BF Forwarding
Enhanced SDN controller

• The controller knows the whole topology and link identifiers
• Each edge node is associated with a set of “tags”
  • E.g., building1, yellow, green
• The controller can create paths from one edge node to others with specific tags
  • E.g., a path form a node towards all “yellow” nodes
Protocol handler

PUT coap://yellow ON
Protocol handler

PUT coap://yellow ON
Protocol handler

PUT coap://yellow ON
Protocol handler

PUT coap://yellow ON

Path to yellow
Protocol handler

PUT coap://yellow ON

Path to yellow
Protocol handler

PUT coap://yellow ON

Path to yellow
Protocol handler

PUT coap://yellow ON

Path to yellow

01101111
Protocol handler

PUT coap://yellow ON

Path to yellow
Benefits and status

• No need for IP multicast support
• Easier group management
• Things do not have to be aware of the groups they belong

• Implemented for mininet, POX SDN controller, and the CoAP protocol
• Topology initially included in a configuration file
  • Now the SDN controller discover the topology
Thank you

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