



Innovations in Clouds,
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MARCH 1 - 3, 2016

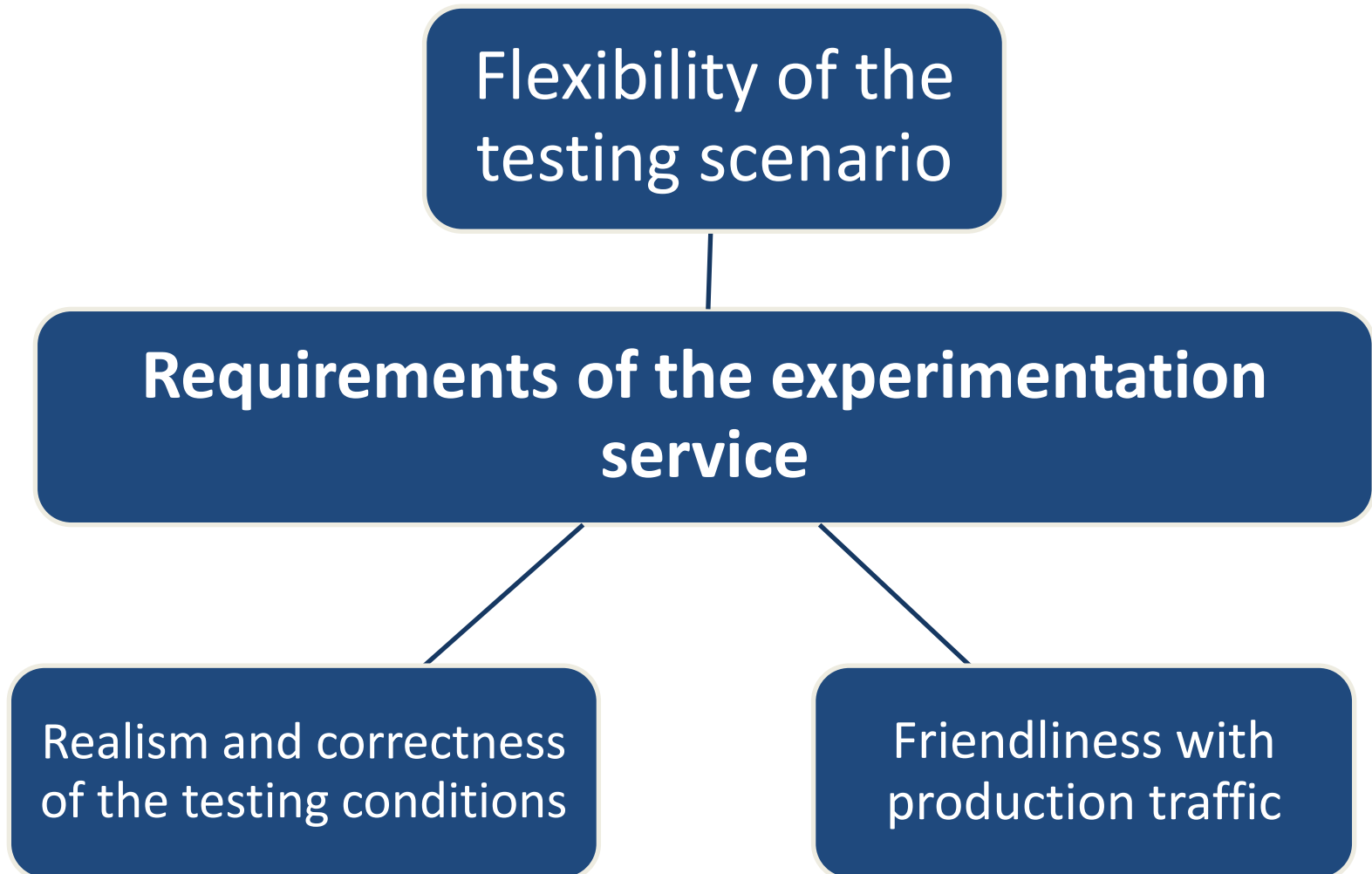
Experimentation As An ISP Service

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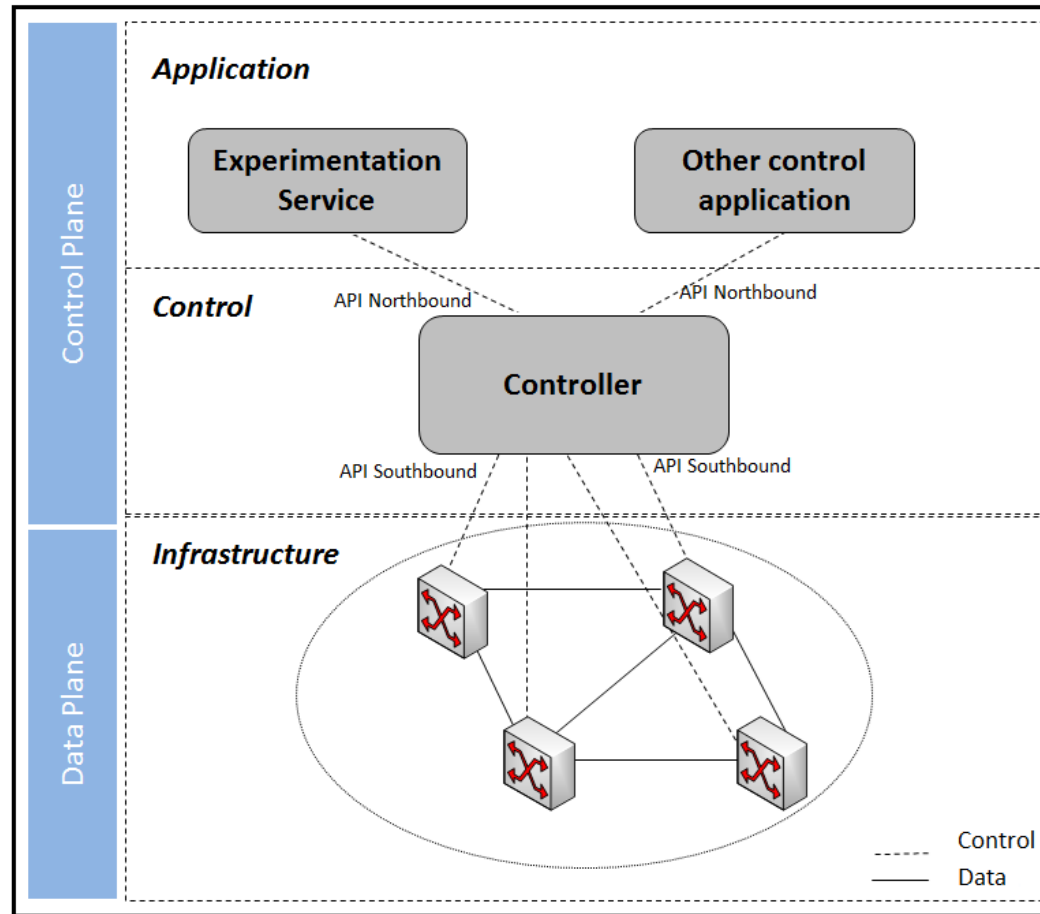


- Motivation and context
 - Towards realistic performance evaluation platforms
 - Operator networks IT-ization
- Requirements of the experimentation service
- Design of the experimentation service
- Performance evaluation
- Summary and perspectives

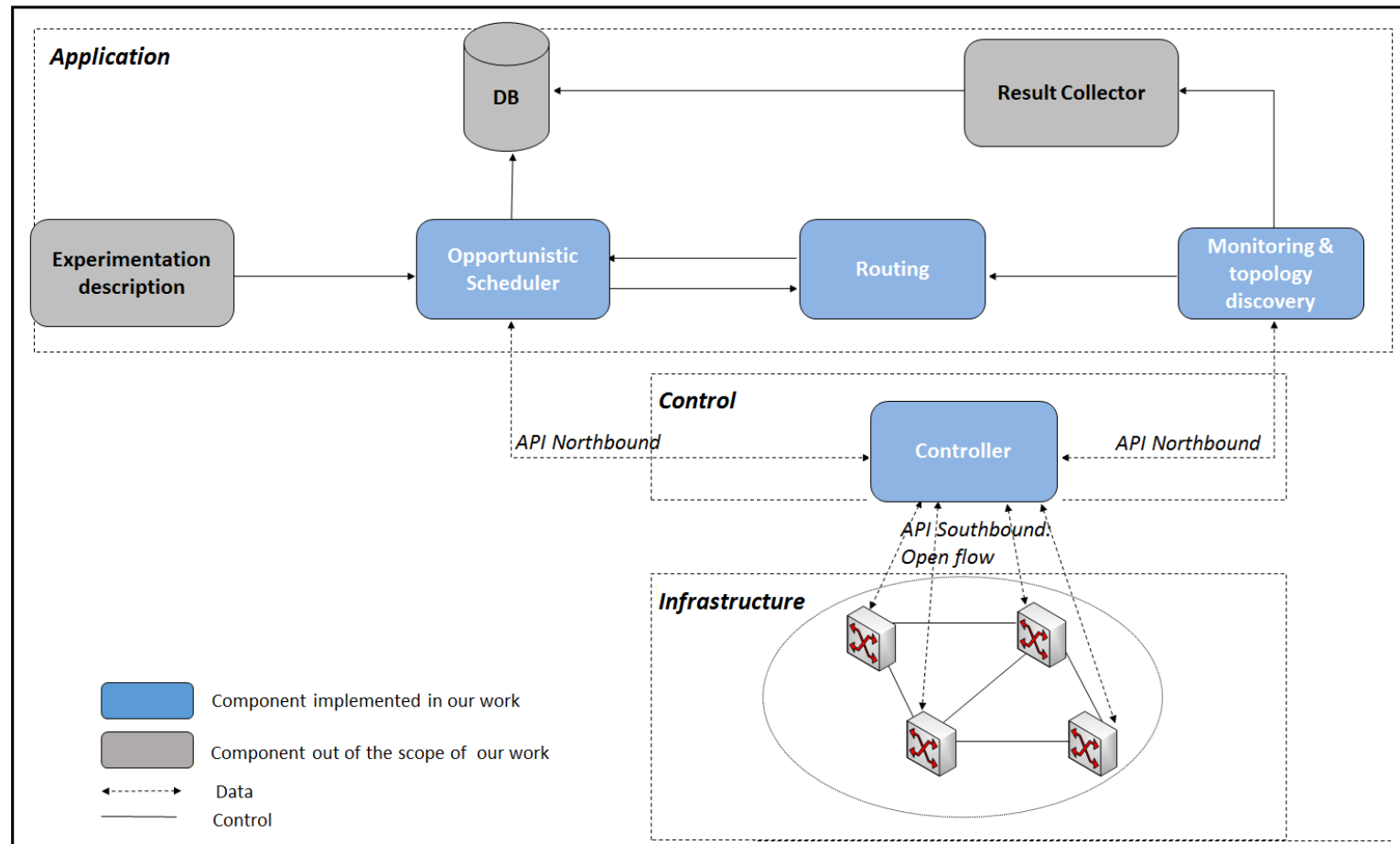
- Towards realistic performance evaluation platforms
 - Limits of current Testbeds
 - Approaches for federating Testbeds
- Operator networks IT-ization
 - SDN-based ISP network management
 - Network Function Virtualization and middleboxes



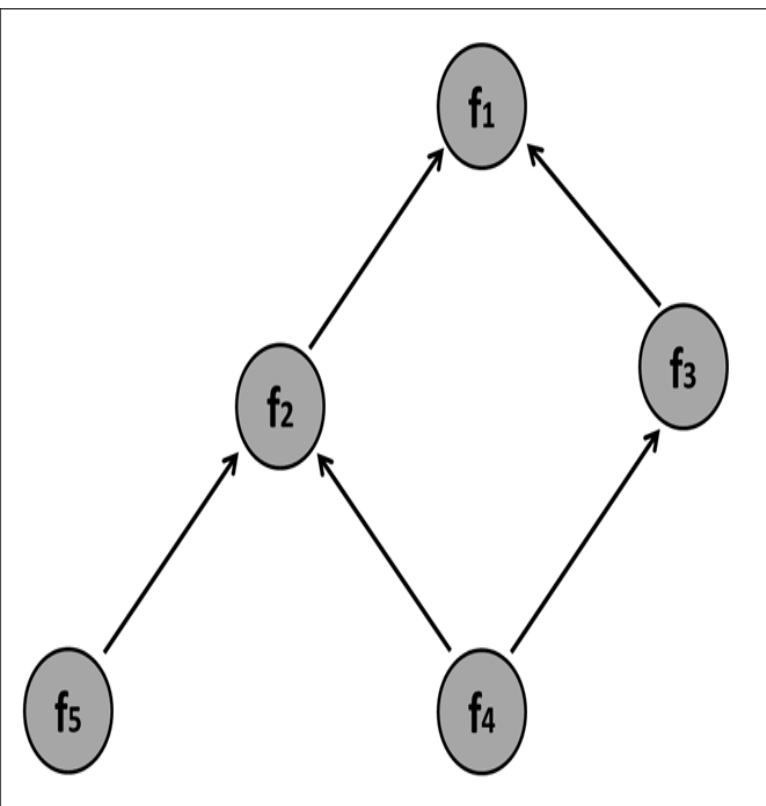
- **Global architecture:**



- Detailed design of the experimentation service:**



- Opportunistic scheduler of experimentation flows:



Temporal dependencies

```

Algorithm Scheduling_of_experimentation_flows
var
    L: List of flows to launch
     $G_d$ : Graph of temporal dependencies
    F: Set of launched flows

Begin
    L = Independent( $G_d$ )

    While ( $G_d \neq \emptyset$ ) do
        F = Launch_Flow (L)
         $G_j$  = Eliminate(F,  $G_d$ )
        L = (L \setminus F) U Independent( $G_d$ )
    done
End
  
```

Pseudo-algorithm of the scheduler

- **Simulation Model :**
 - enhance the existing NS-3 OpenFlow model to support a complex SDN-based ISP network:
 - topology discovery
 - network monitoring
 - route computing
 - equipment management
 - implement our experimentation scheduling component

- **Simulation Scenario :**

Settings	Values
Number of switches in the core network	4
Number of switches per distribution network	4
Number of hosts connected to a distribution network	2
Capacity of links	10 Mbps

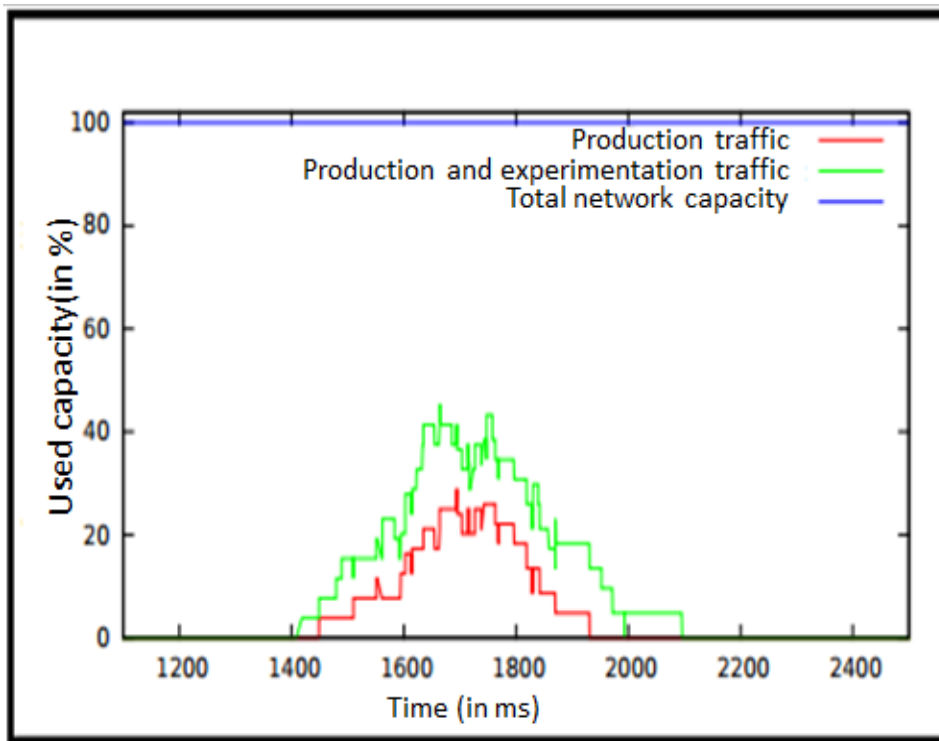
- **Simulated traffic :**

Production traffic: number of production flows (N_p)

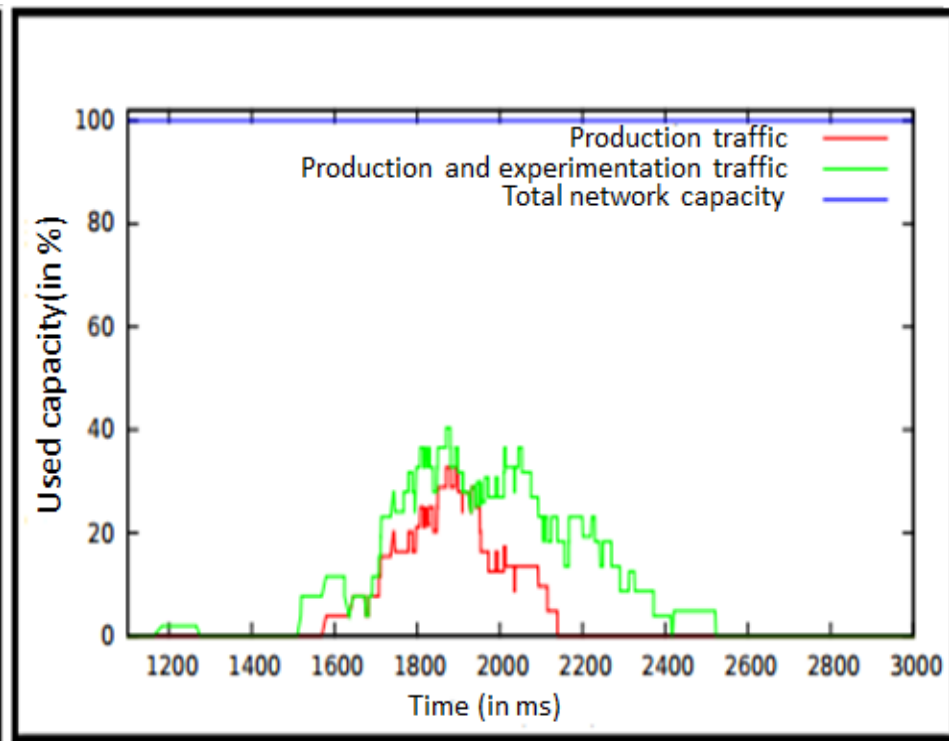
Experimentation flows: number of experimentation flows (N_e)

Density of experimentation flows: $d = N_e / (N_e + N_p)$

Usage of network capacity :



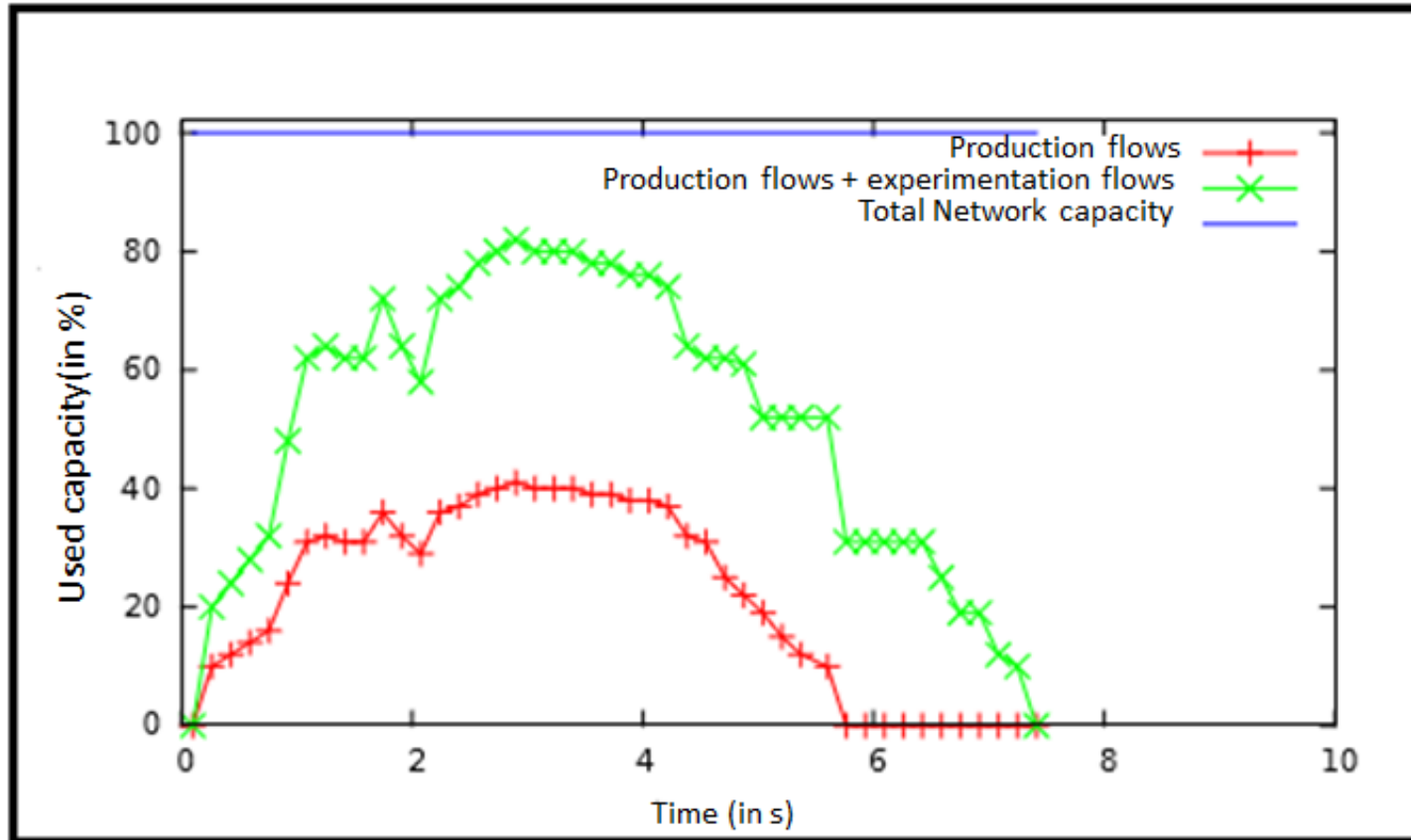
Number of flows = 30



Number of flows = 40

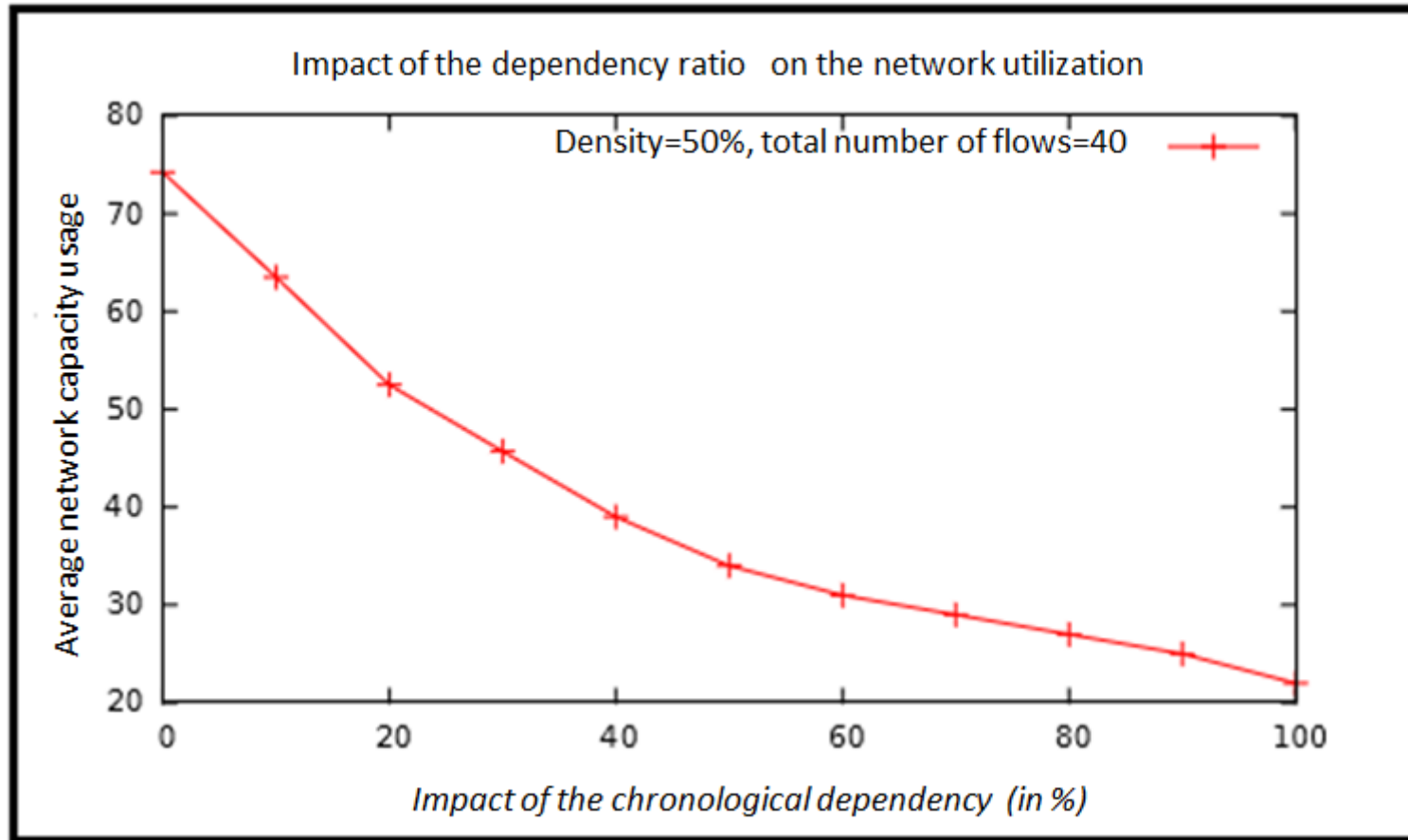
Usage of network capacity (shortest path only)

Friendliness with production traffic :



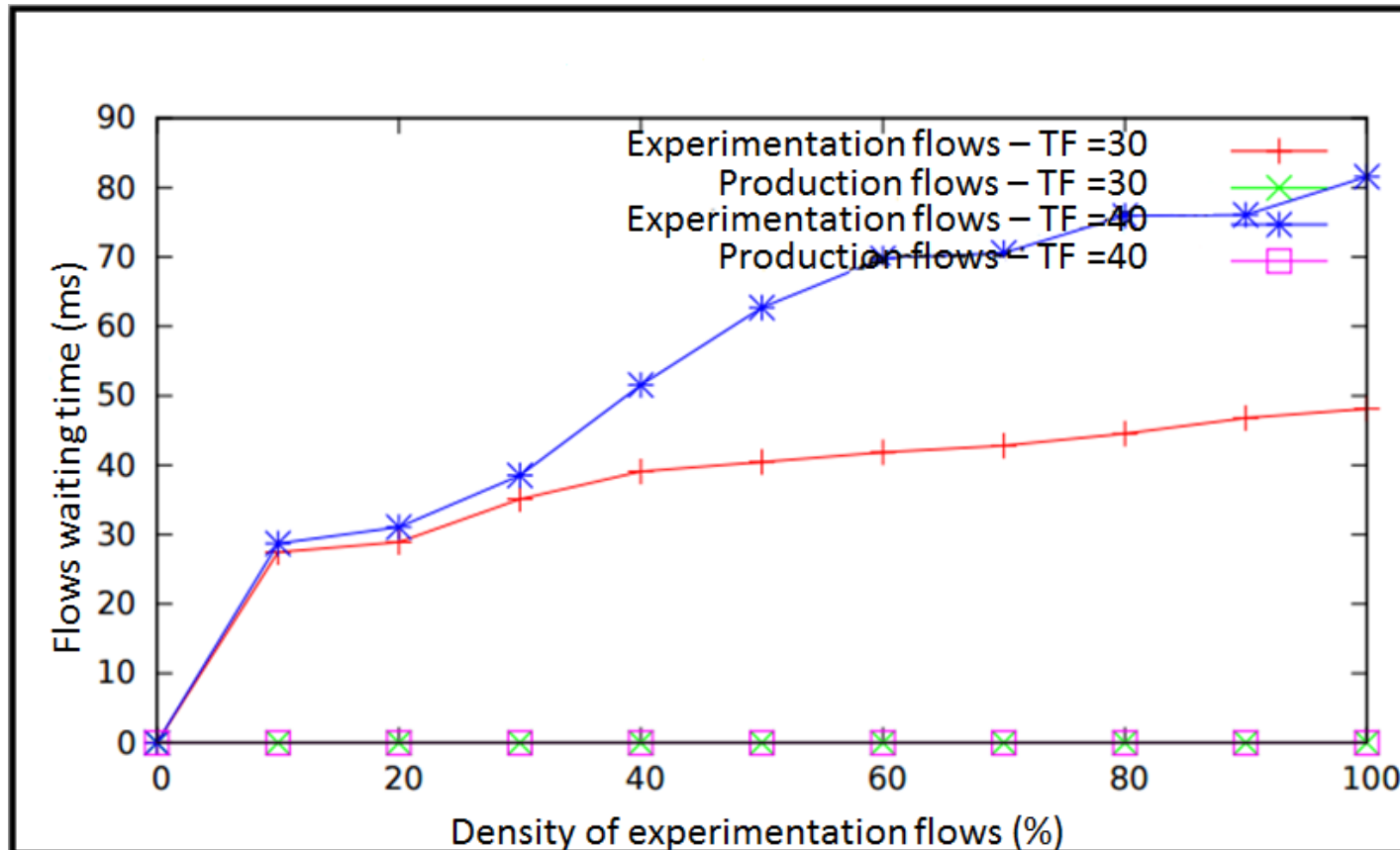
Network capacity usage in the multiple trajectory case

Friendliness with production traffic :



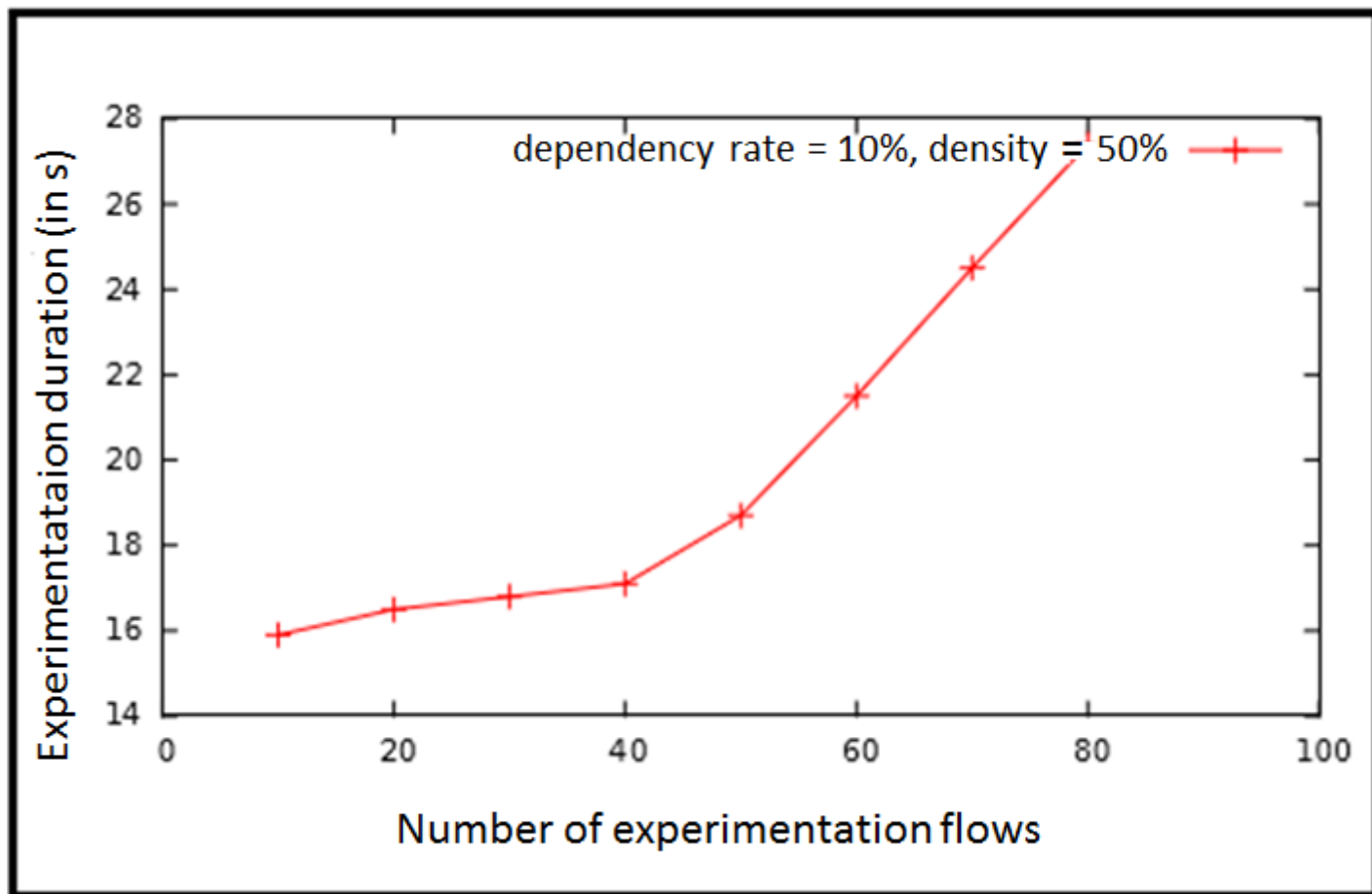
Impact of dependency on capacity usage

Quality and duration of experiments :



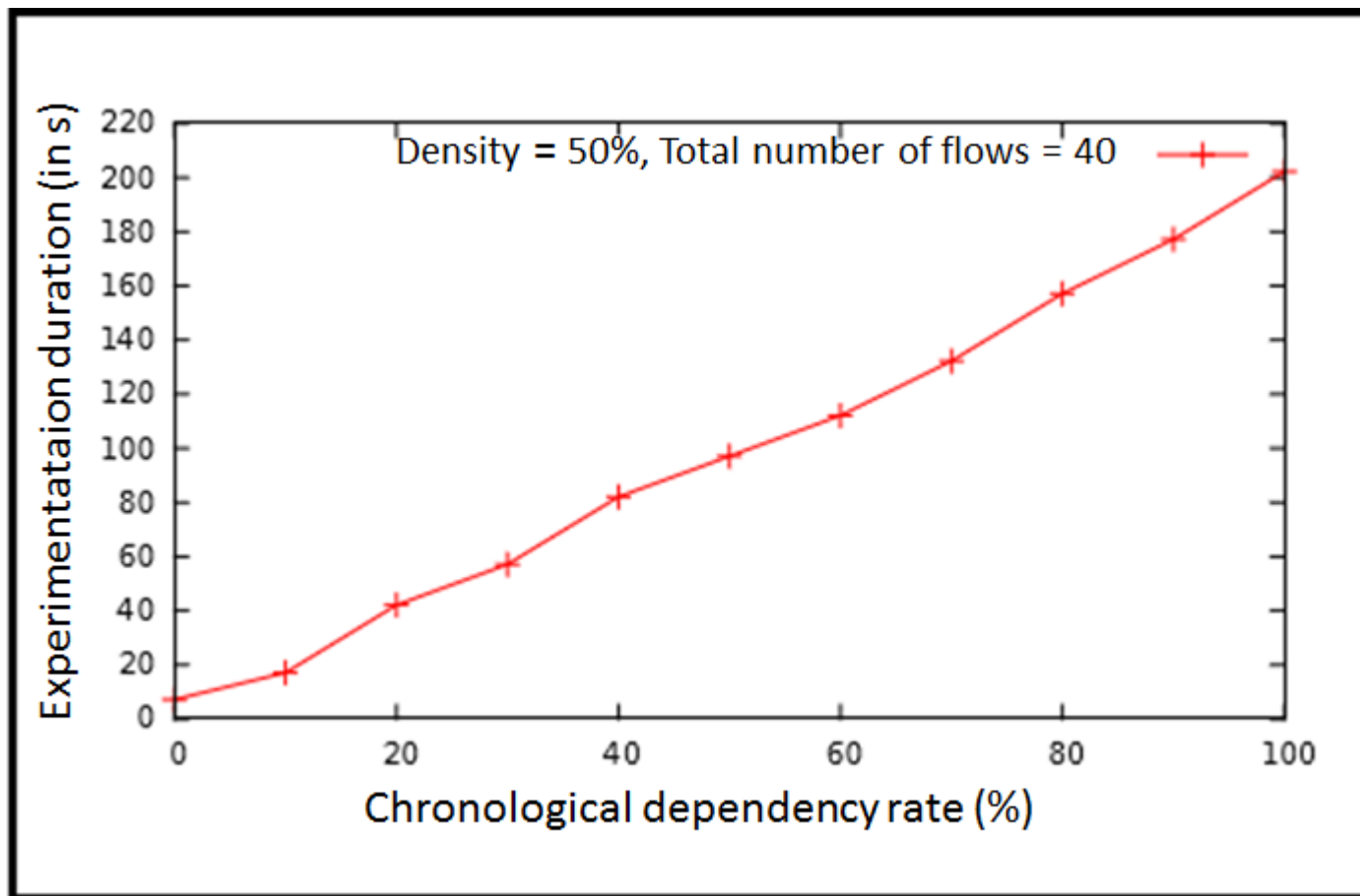
Measurements of waiting time

Quality and duration of experiments :



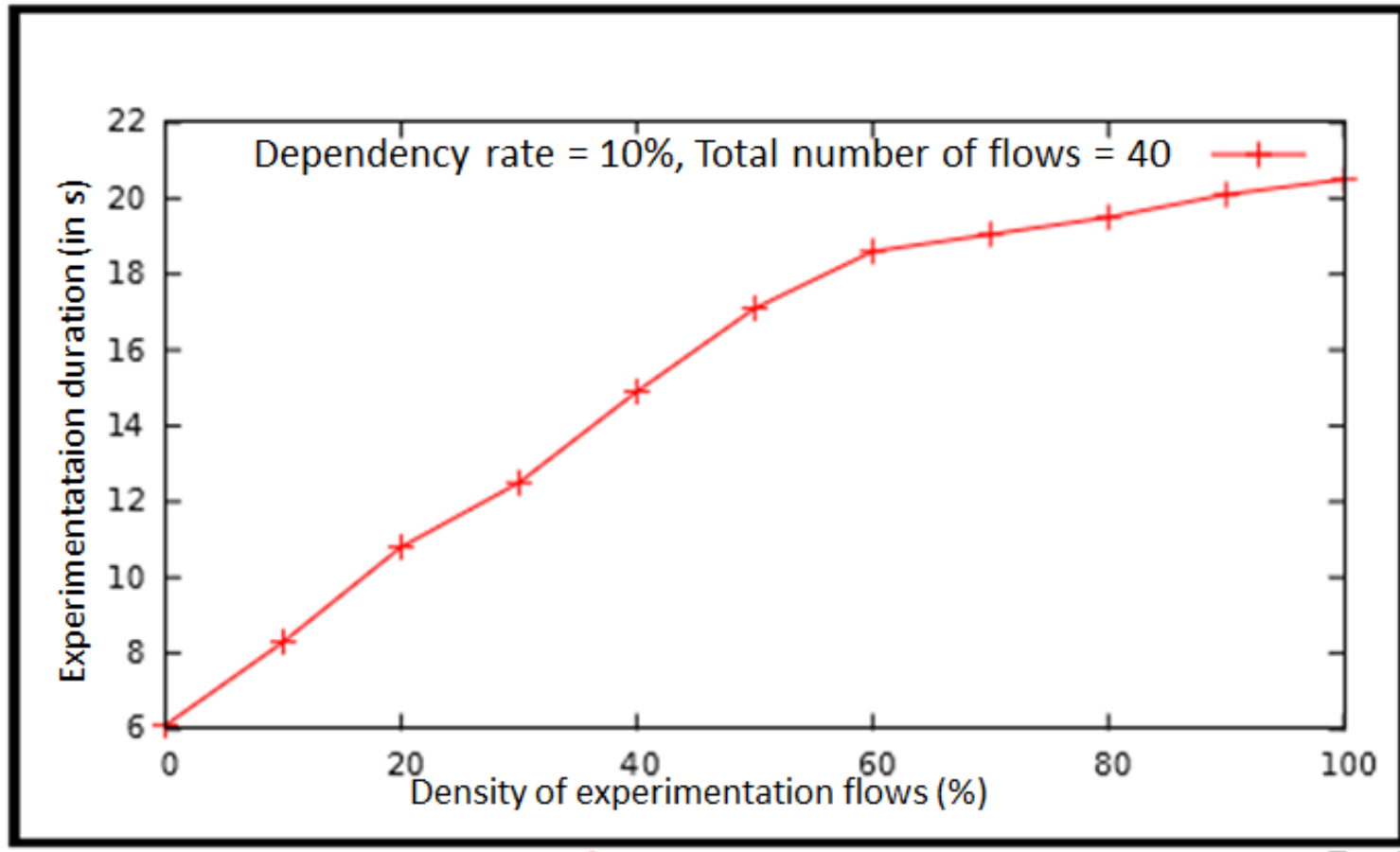
Impact of the size of the experimentation on its duration

Quality and duration of experiments :



Impact of the chronological dependency between flows

Quality and duration of experiments :



Impact of production traffic on experimentation duration



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Thank you!

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