DIstributed **S**DN **CO**ntrollers for rich and elastic services

ANR-13-INFR-013

WP2 – Resilient and Scalable SDN Control Plane

Leader : ENSL

10 avril 2014

WP2 at a glance

- **Schedule**
  - Starting date: M4 (soit le 1er avril)
  - Ending date: M30
- **Efforts (men.month)**
  - TCS: 19
  - ENSL: 44
  - INRIA: 18
  - 6WIND: 0

2 main Tasks

- **Tasks 2.1 Distribution of SDN controllers (TCS, ENSL, INRIA)**
  - Replication of the control plane
  - How many controllers ? Where ?
  - How to affect the authority of each of them ?
- **Task 2.2 Network-wide Distributed and Multi-class Admission Control (ENSL)**
  - Benefit from the SDN capabilities to extend the power of AC
  - Go beyond a single link use case (path or network-wide approach)
  - Prioritize the traffic (assuming a prior classification)

WP2 technical staff

- **ENSL**
  - Thomas Begin, Isabelle Guérin-Lassous, Anthony Busson
  - PhD recruitment from ENSL
    - Huu Nghi Nguyen (started on 1st april 2014)
- **INRIA**
  - Damien Saucez, Thierry Turletti, others ???
- **TCS**
  - Mathieu Bouet, Jérémie Leguay, Vania Conan, others ???
- **6wind**
  - ???

WP2 – Goals

- **Milestone**
  - M4: Surveys of SDN distribution and admission control techniques – M15
  - e.g., S. Muppala, G. Chen and X. Zhou, Multi-tier service differentiation by coordinated learning-based resource provisioning and admission control, *JPDC 14*

- **Deliverable**
  - D2.1: Network characterisation and distributed SDN control plane - M30 - TCS, ENSL, INRIA
  - D2.2: Network-wide Distributed Admission Control - M30 - ENSL

WP2 – Technical content

- **Distribution of SDN controllers**
  - Based on the knowledge of the control plane
  - How to scatter SDN controllers to guarantee resilience and performance criterions?
  - Follow-up questions
  - How many SDN controllers ?
  - Where ?
  - How to attribute role to SDN controllers ?
- **Define a Control Plane**
  - To reflect the current state of the network
  - Based on collected measurements
  - Which metrics ? And where ?
- **Network-wide and Multi-class Admission Control**
  - Take benefit of SDN technology to extend the capabilities of AC
  - Deal with a path (and not a mere link)
  - Allow prioritization among IP traffic

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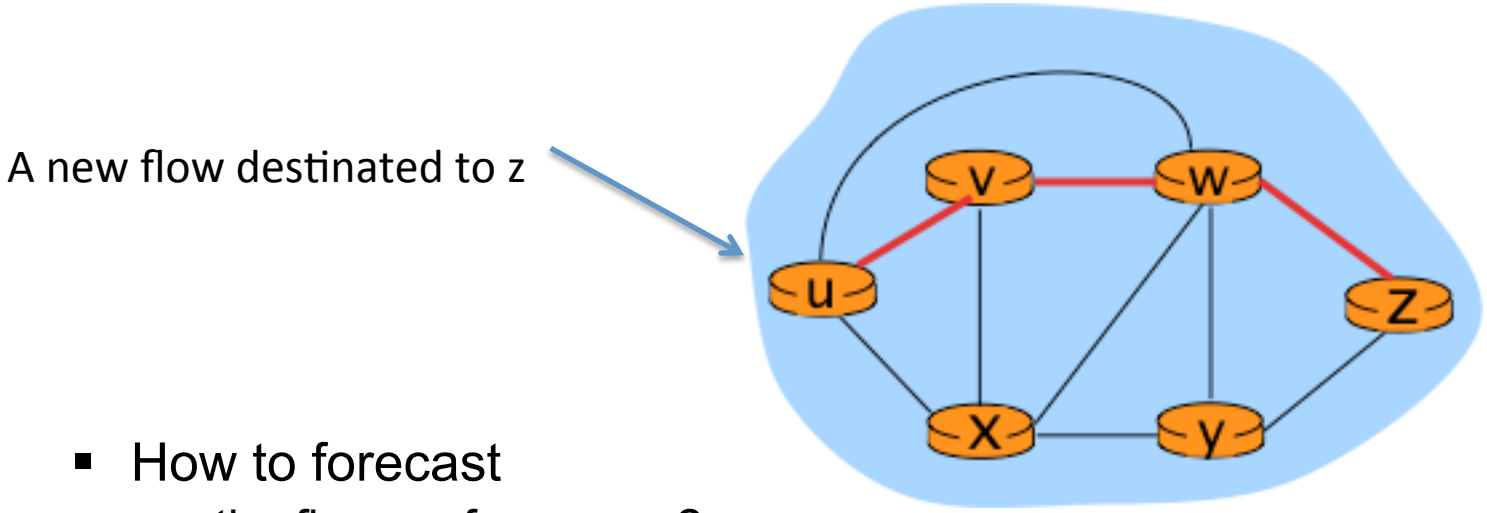
ENSL roadmap for WP2

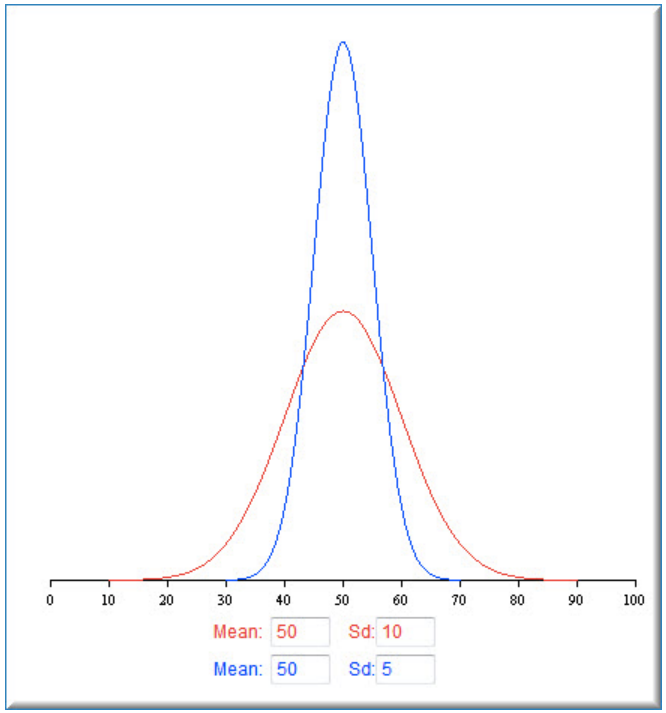
- **Control Plane and AC**
  - They are closely related since AC relies on measurements



  - How to forecast
    - the flow performance ?
    - and its impact on the other existing flows ?
  - Based only on measurement collected locally at each node
  - Probabilistic outcome
    - Find out the path ”bottleneck”
    - Possibly allocate more ressource to this node
    - Route differently

WP2 – Problem setup

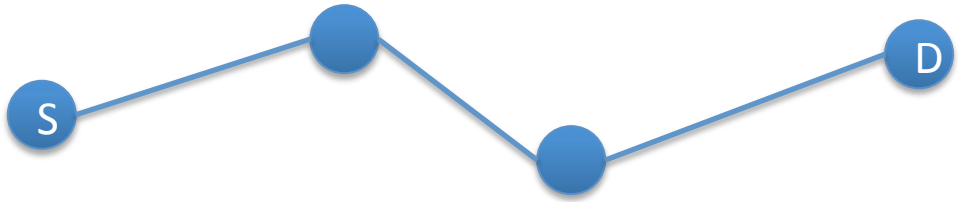
- **How to forecast the path performance given the nodes performance ?**
  - e.g. Waiting delay along a path from the waiting time observed at each node
- The answer is simple for the mean values
- But we believe mean values are not enough to properly characterize a performance parameter



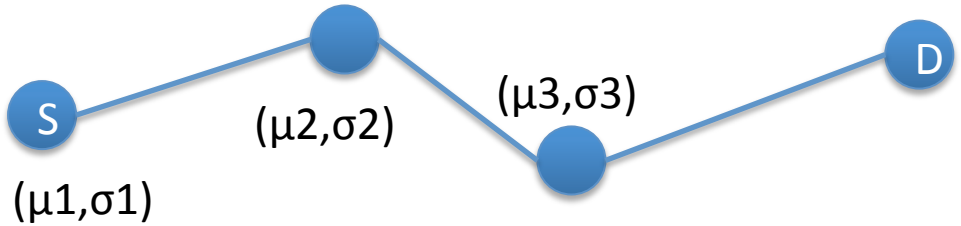
- How to estimate the standard deviation ?

WP2 – Scientific approach

- A path between a source and a destination is a set of links



- At each link , we measure the performance (e.g. delay, loss) characterized by its first two moments (μ,σ)



- Based on this data, can we forecast the performance along the whole path beyond its mean value ? i.e. its standard deviation
  - μ = μ1 + μ2 + μ3
  - σ2 = sqrt(σ1^2 + σ2^2 + σ3^2 + 2Cov(σ1, σ2) + 2Cov(σ2, σ3) + 2Cov(σ1, σ3))

WP2 – Scientific approach

- **The covariance term is, in general, not void**
- **We need to find out a way to approximate the covariance term…**

- **Assuming we succeed, then we will be capable to give predictions on a network behavior if a new flow (application) takes place**
  - We will simply assess the new performance at each node (rely on an existing predicting tool for that)
  - Then we combine these data to estimate the first two moments of the global metric
  - Done!

WP2 – Discussion

- Anyone is welcomed to participate to this research