

Contribution

Demonstration of the CDN-as-a-VNF model.
2 virtual functions:

- vCDN : virtual CDN (delivery phase)
- vMG : virtual Media Gateway (request phase)

chained together & optimally embedded inside the ISP topology → in order to respect the CDN-ISP collaboration contract (SLA).

This permits to keep ISP topology private while letting the CDN control some low level network capabilities of content delivery. Our algorithm increased the request acceptance rate by 52% and decreased the consumed bandwidth by 31%.

Keywords: *Service Function Chaining, Virtual Network Functions, ISP, CDN, Collaboration, Software Defined Networks*

Service Level Agreements

- SLAs are a way to formalize the CDN "demand" for connectivity. ISP responds to the SLA by pricing the connectivity "offer" they supply.
- On top of video-streaming specific input, the SLA contains the User area to be connected as well as the connection to the external CDN network through peering points.

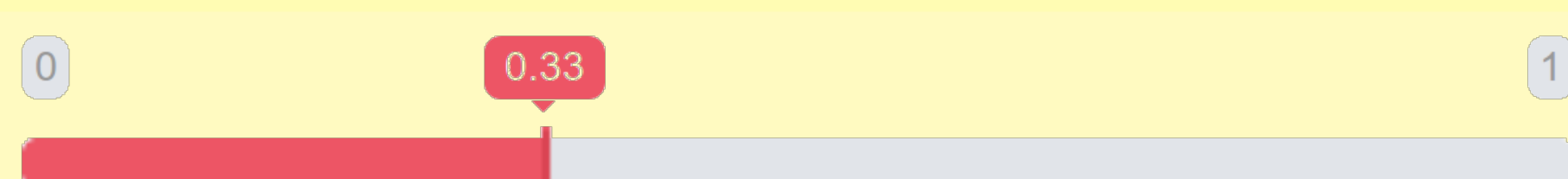
Average Bandwidth per user (Mbps)



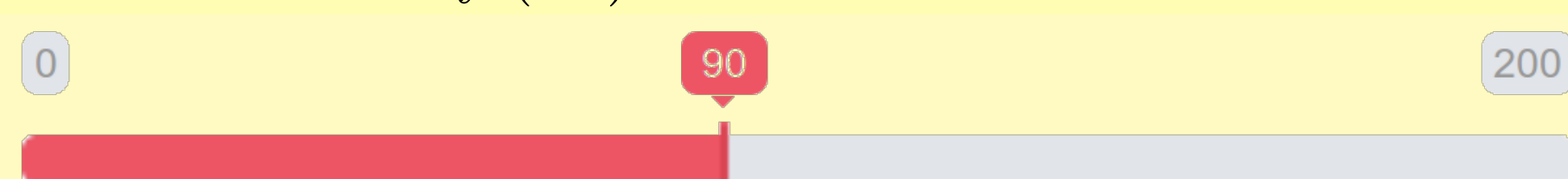
Number of Users



vCDN Hit Share (%)

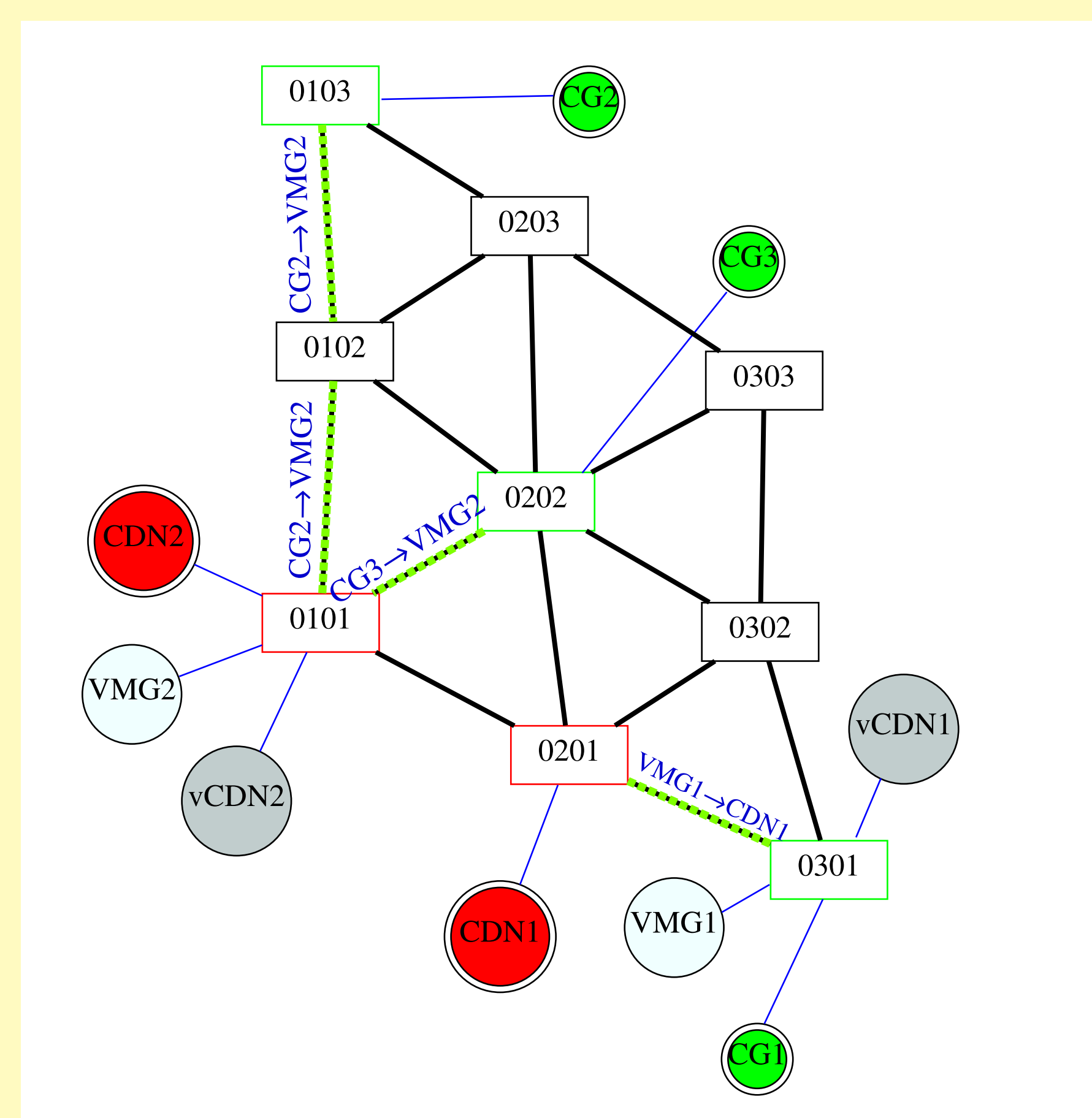


Maximal Latency (ms)

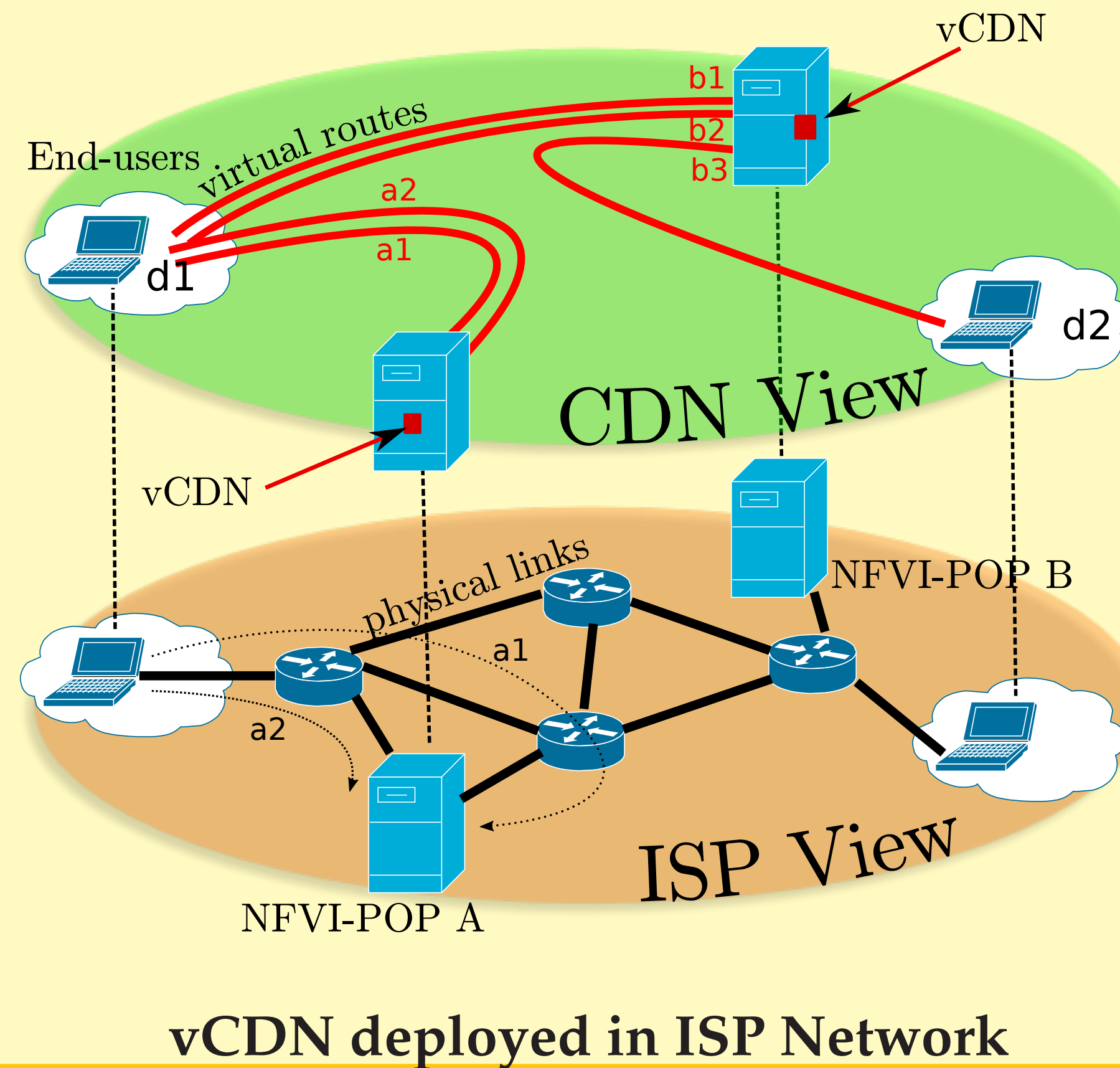


Sample SLA

Sample Embedding

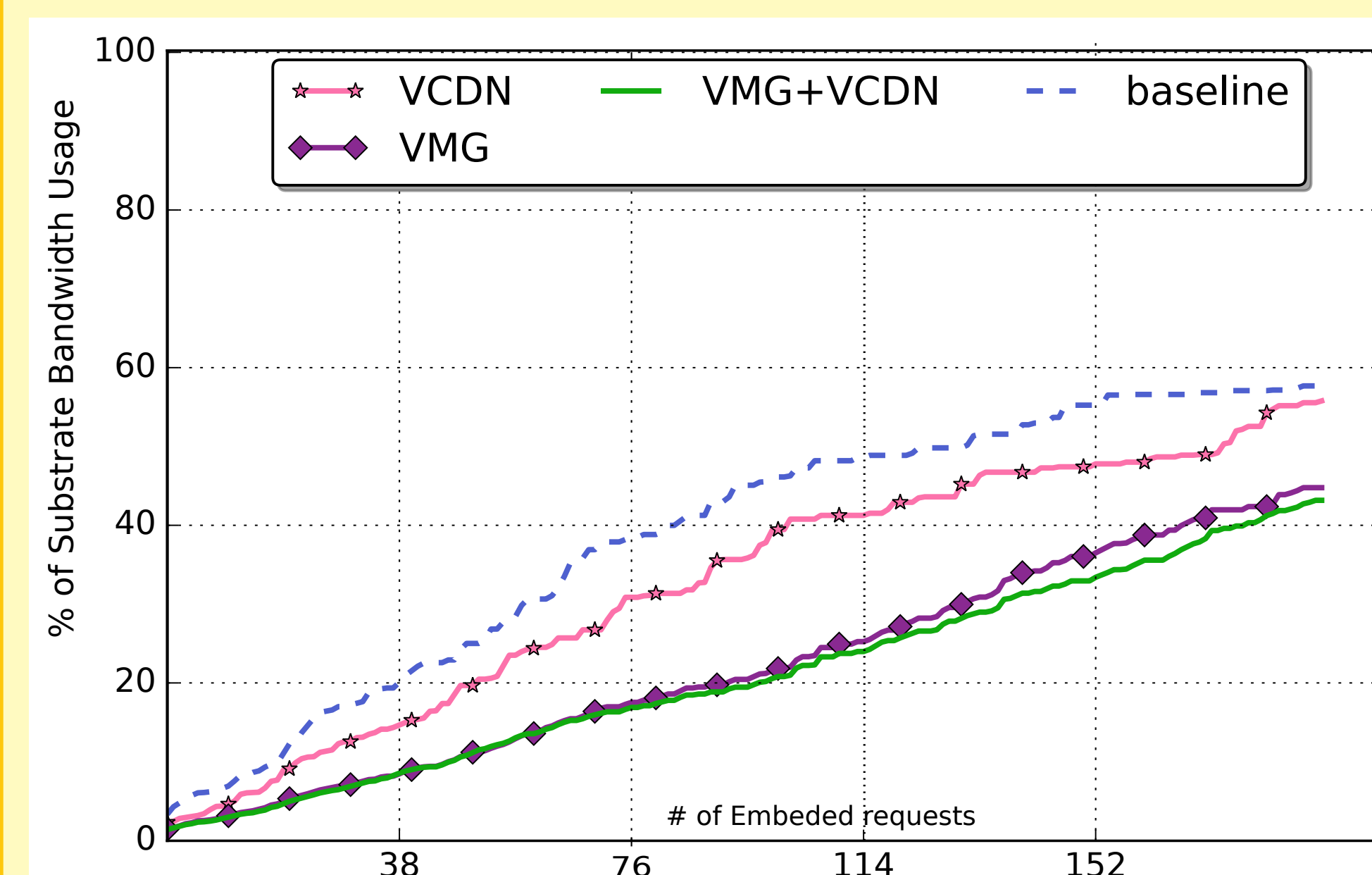


High Level Architecture

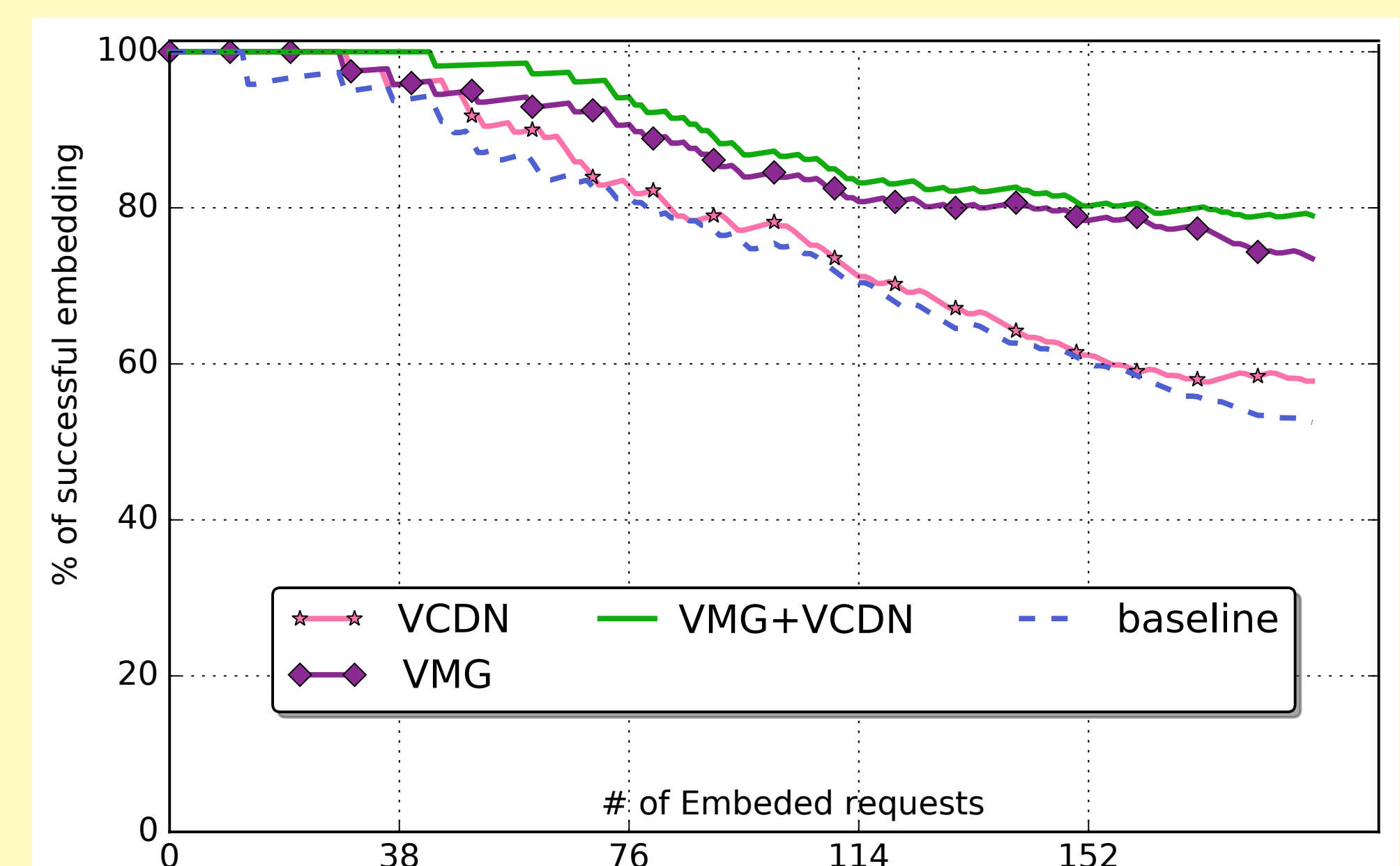


- Goal: To instantiate a NFV platform within the ISP Network capable of hosting (vCDN) services
- ISP managed NFVI-Points of Presence (POPs) are at the edge of the network, interconnected by physical links and switches that support SDN.
- CDN manages a "CDN View" overlay that abstracts the ISP Topology.
- CDN providers manage CDN operations dynamically through an API e.g. to decide which route to use and to react to route congestion.

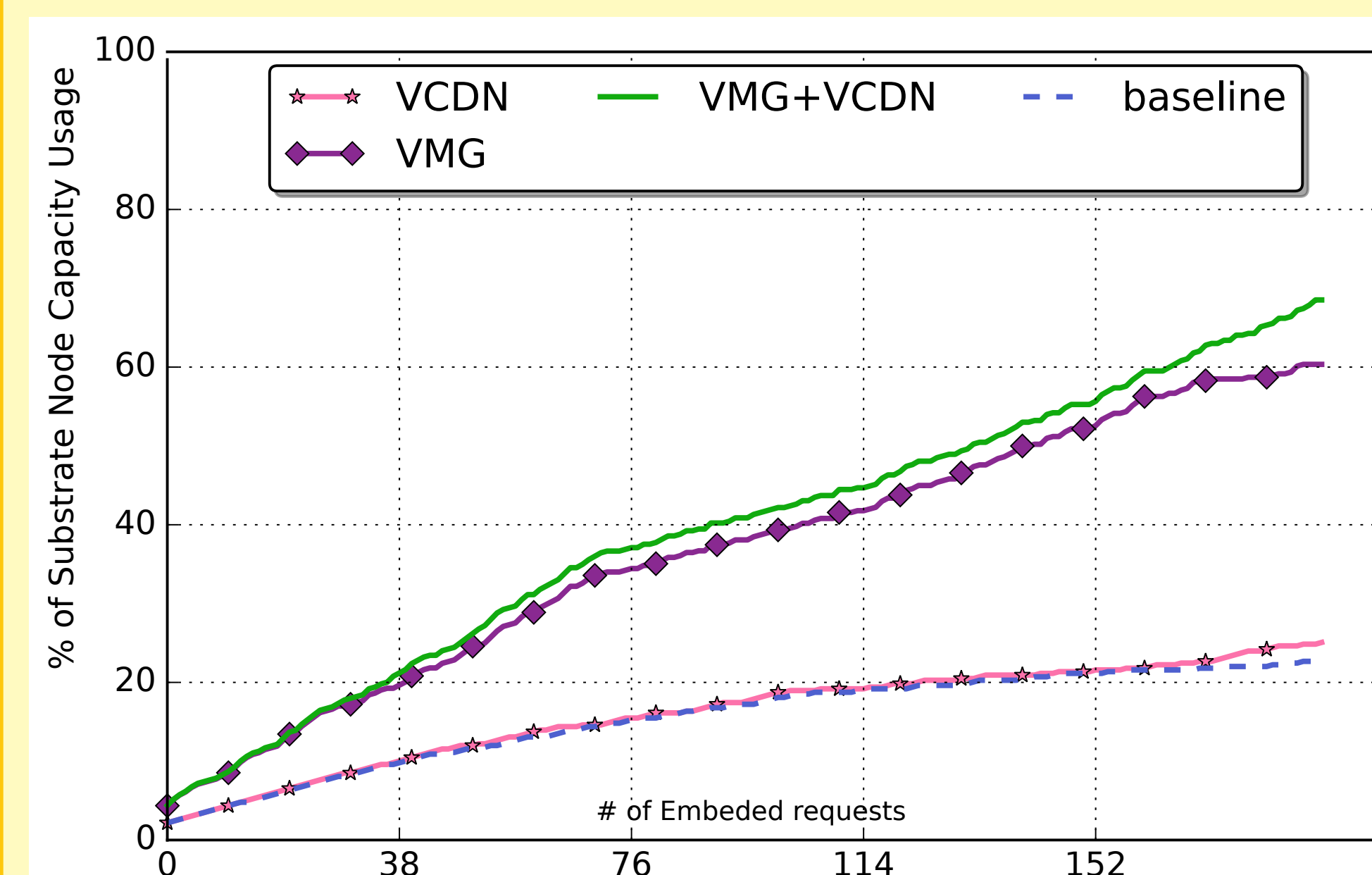
Results



Network Resource Consumption



Requests Embedding Rate



Servers Resource Consumption

- Results show the embedding of a random set of SLAs over the GEANT Topology.
- We compare 4 strategies where SLA-derived Service Function Chains (SFC) are modified according to the topology, in order to minimize embedding cost.
- We use an ILP formulation to optimize exactly the SFC embedding problem
- Our algorithm (vMG+vCDN) performs a 52% increase in embedding requests, and a 31% decrease in network utilisation.
- As we increase the number of vNFs, we have a 3x increased node capacity consumption.

Références

- [1] Herbaut, N., D. Négru, D. Magoni, and P. A. Frangoudis, "Deploying a Content Delivery Service Function Chain on an SDN-NFV Operator Infrastructure", 2016 International Conference on Telecommunications and Multimedia (TEMU), Heraklion, IEEE, 07/2016
- [2] Herbaut, N., D. Négru, Y. Chen, P. A. Frangoudis, and A. Ksentini, "Content Delivery Networks as a Virtual Network Function: a Win-win ISP-CDN Collaboration", IEEE Global Communications Conference, 12/2016
- [3] D5.32 - Network Functions Implementation and Testing - T-NOVA WP5 Deliverable <http://www.t-nova.eu/results/>

Thanks to

