



Sousse University



ADDRESSING CLOUD PROVIDERS LOCK-IN

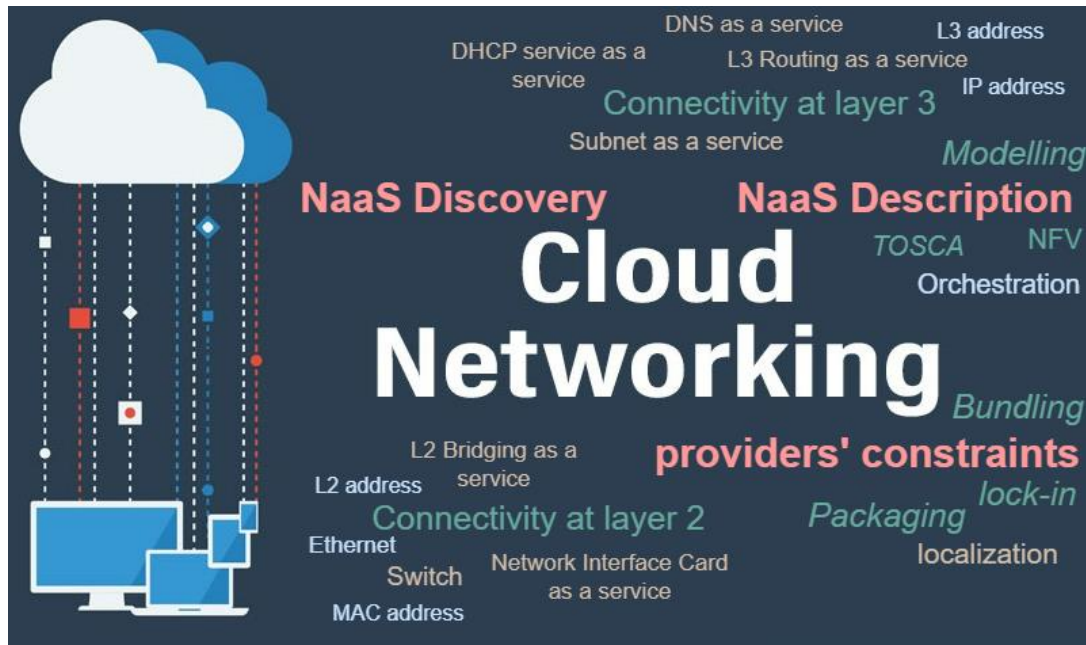
RELAXING CUSTOMERS REQUESTS BASED-ON PROVIDERS CONSTRAINTS FOR NAAS DISCOVERY

Imen Jerbi, Hayet Brabra, Mohamed Sellami, Walid Gaaloul, Sami Bhiri, Boualem Benatallah, Djamal Zeghlache, Olivier Tirat



NETWORK-AS-A-SERVICE

DEFINITION AND CHALLENGES



Network-as-a-Service (NaaS): cloud paradigm enabling cloud customers to connect their distributed services across multiple clouds without relying on their own infrastructures.

NaaS providers impose **constraints on the interconnection services** offering.

CONSTRAINTS ON INTERCONNECTION SERVICES

(1) INTERCONNECTION SERVICES AS PURE BUNDLES

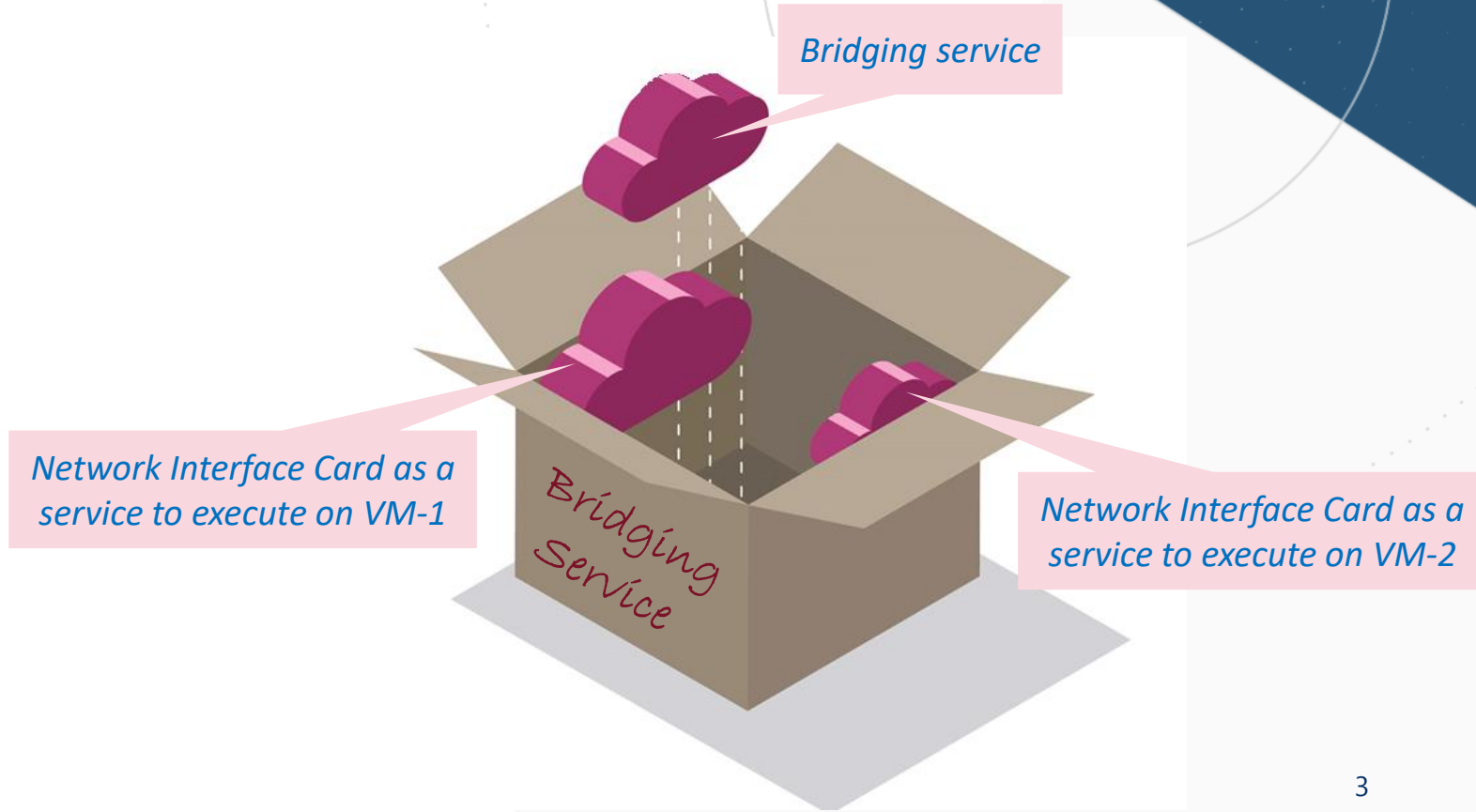
1. Interconnection services are provided as pure bundles (i.e., packages)

- Pure bundling is a strategy in which only a bundle of services is available for purchase

I need a service to bridge packets between two VMs in a same subnet



Bob

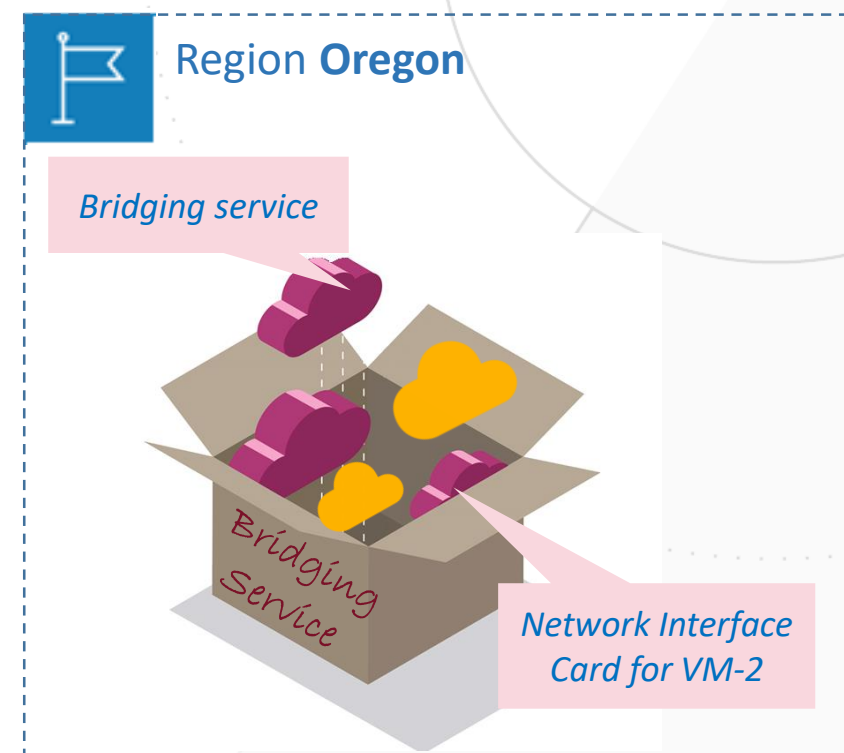
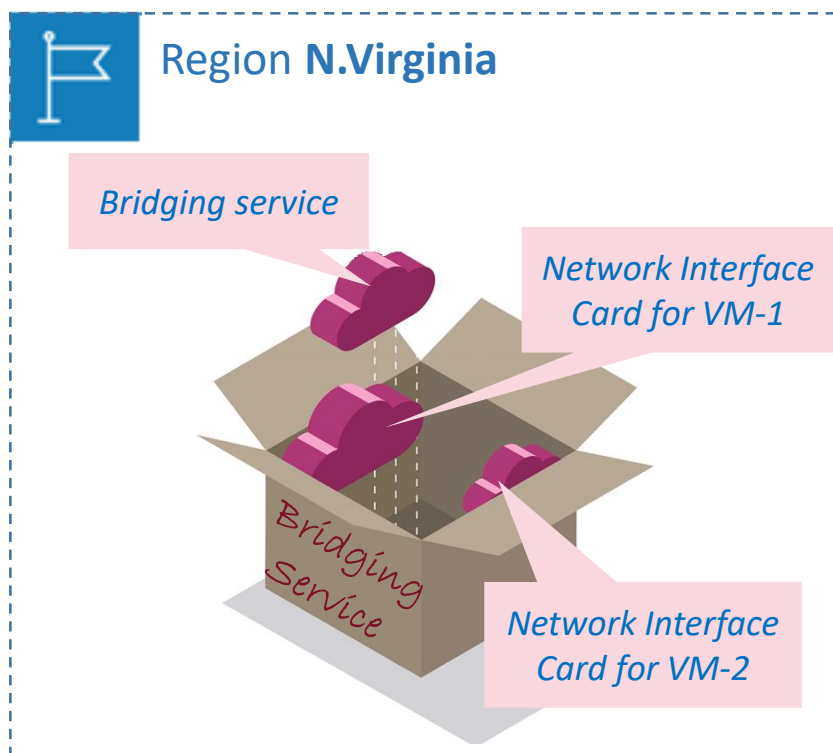


CONSTRAINTS ON INTERCONNECTION SERVICES

(2) DEPENDENCY BETWEEN SERVICES' FUNCTIONALITIES AND LOCATIONS

2. Interconnection **services' functionalities depend on their locations.**

- a service may be bundled differently according to providers/regions



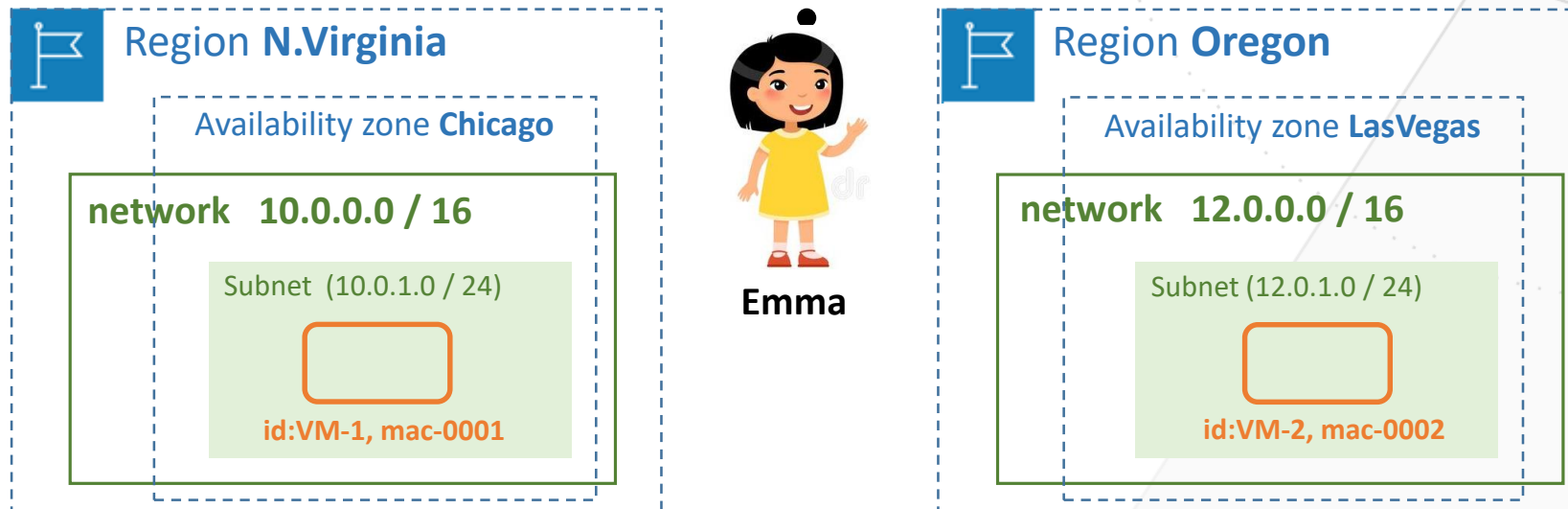
CONSTRAINTS ON INTERCONNECTION SERVICES

(2) DEPENDENCY BETWEEN SERVICES' FUNCTIONALITIES AND LOCATIONS

2. Interconnection **services' functionalities depend on their locations.**

- a service may be bundled differently according to providers/regions
- a service may be available in a region but restricted in another

I need a service to interconnect my VMs via their MAC addresses



CONSTRAINTS ON INTERCONNECTION SERVICES

CHALLENGES AND RESEARCH PROBLEM

1. Constraints imposed on interconnection services are **not visible** to customers until the deployment phase.
 - **customers are locked** at the networking layer and consequently at higher layers.
2. Service discovery solutions should be able to
 - **identify the providers constraints** that prevent a customers request from being satisfied.
 - **assist customers with request relaxation plans**

HOW TO IDENTIFY PROVIDERS CONSTRAINTS ?



I need a service to bridge packets
between two VMs in a same subnet

Providers response to Bob's Request

Without our approach
of providers' constraints identification



The Bridging Service you are looking for



With our approach
of providers' constraints identification



The Bridging Service you are looking for
is bundled with 02 network interface cards

HOW TO IDENTIFY PROVIDERS CONSTRAINTS ?



Emma

I need a service to interconnect my VMs via their MAC addresses

Providers response to Emma's Request

Without our approach
of providers' constraints identification

Impossible to fulfill this request.



With our approach
of providers' constraints identification

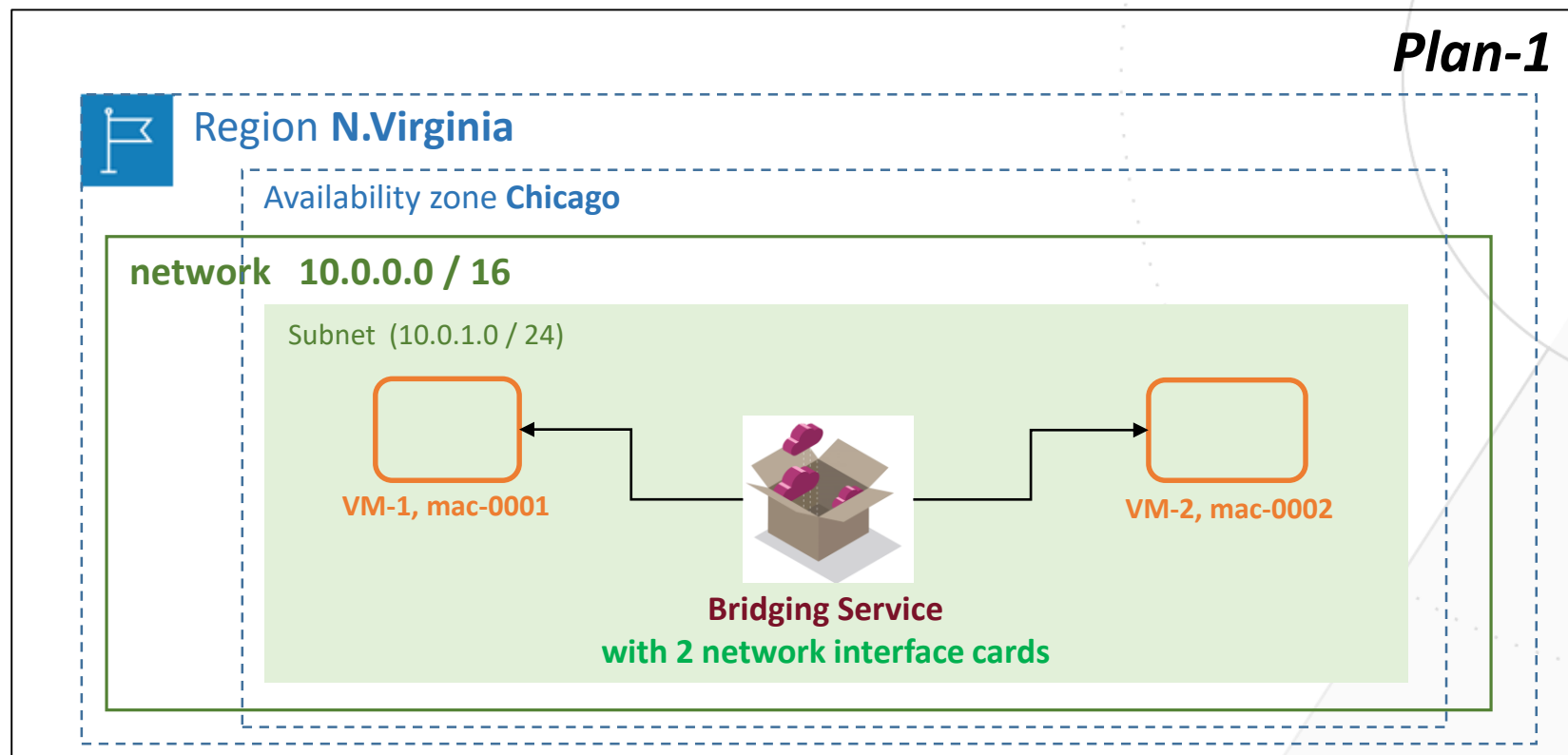
Impossible to fulfill this request
due to the following constraints

« VMs should be in the same subnet (AZ and region) to be connected via their MAC addresses »

« VMs in different regions (AZs and subnets) can be connected via their IP addresses using an L3 connectivity NaaS »

HOW TO ASSIST CUSTOMERS WITH REQUEST RELAXATION PLANS?

Our recommended plans for Emma w.r.t the identified providers constraints

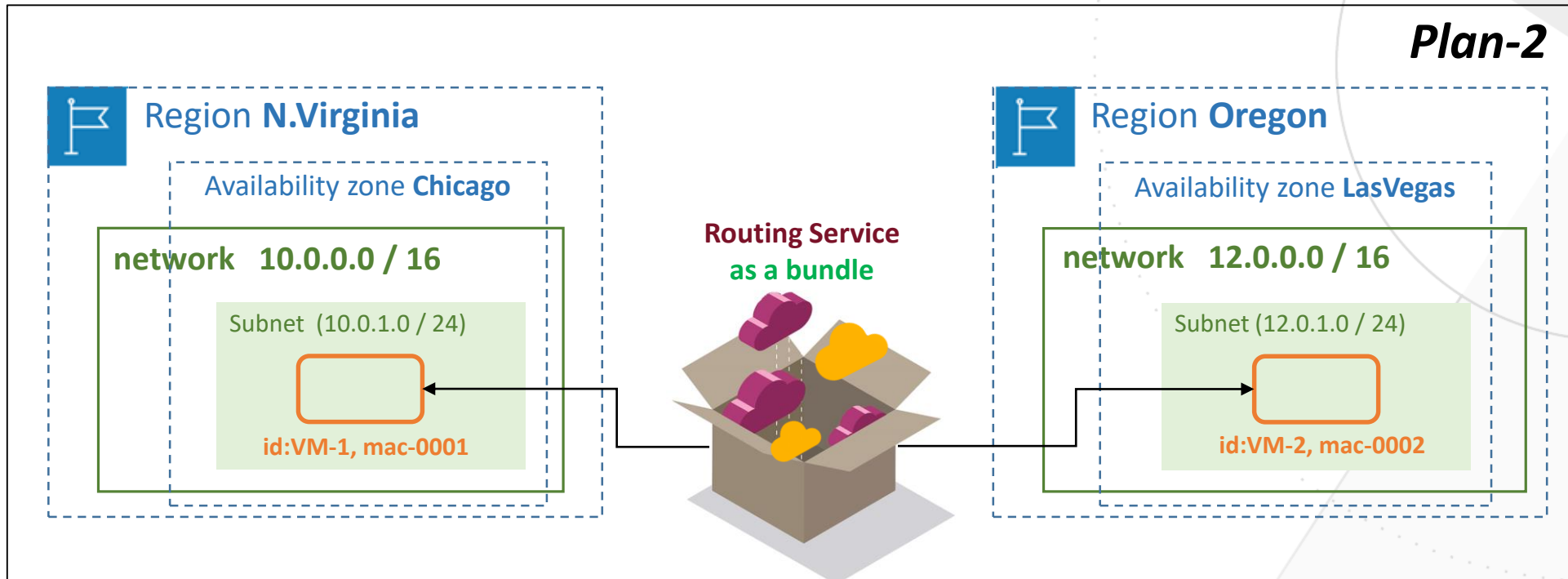


Moving a VM to another region can be costly

(sometimes more expensive than purchasing a new VM in the target region)

HOW TO ASSIST CUSTOMERS WITH REQUEST RELAXATION PLANS?

Our recommended plans for Emma w.r.t the identified providers constraints



More advanced plan but with more services that the customer did not ask for (hence, **more expensive**)

CONTRIBUTIONS OVERVIEW

1. To identify the providers constraints, we proposed **a model** which is able to capture and to explicitly describe these constraints.
 - *Details can be found in [1][2]*
2. We proposed **a set of rewriting rules** to identify the different request relaxation plans w.r.t the identified constraints.
 - *Details can be found in [3]*

[1] Definition and Induction of a Specification Order Relation between Capabilities. SCC'21 conference

[2] Enabling Multi-Provider Cloud Network Service Bundling. ICWS'22 conference

[3] Request relaxation based-on provider constraints for a capability-based NaaS services discovery. CAiSE'23 conference