Integrated Service Delivery Across Service Providers & e-Infrastructures

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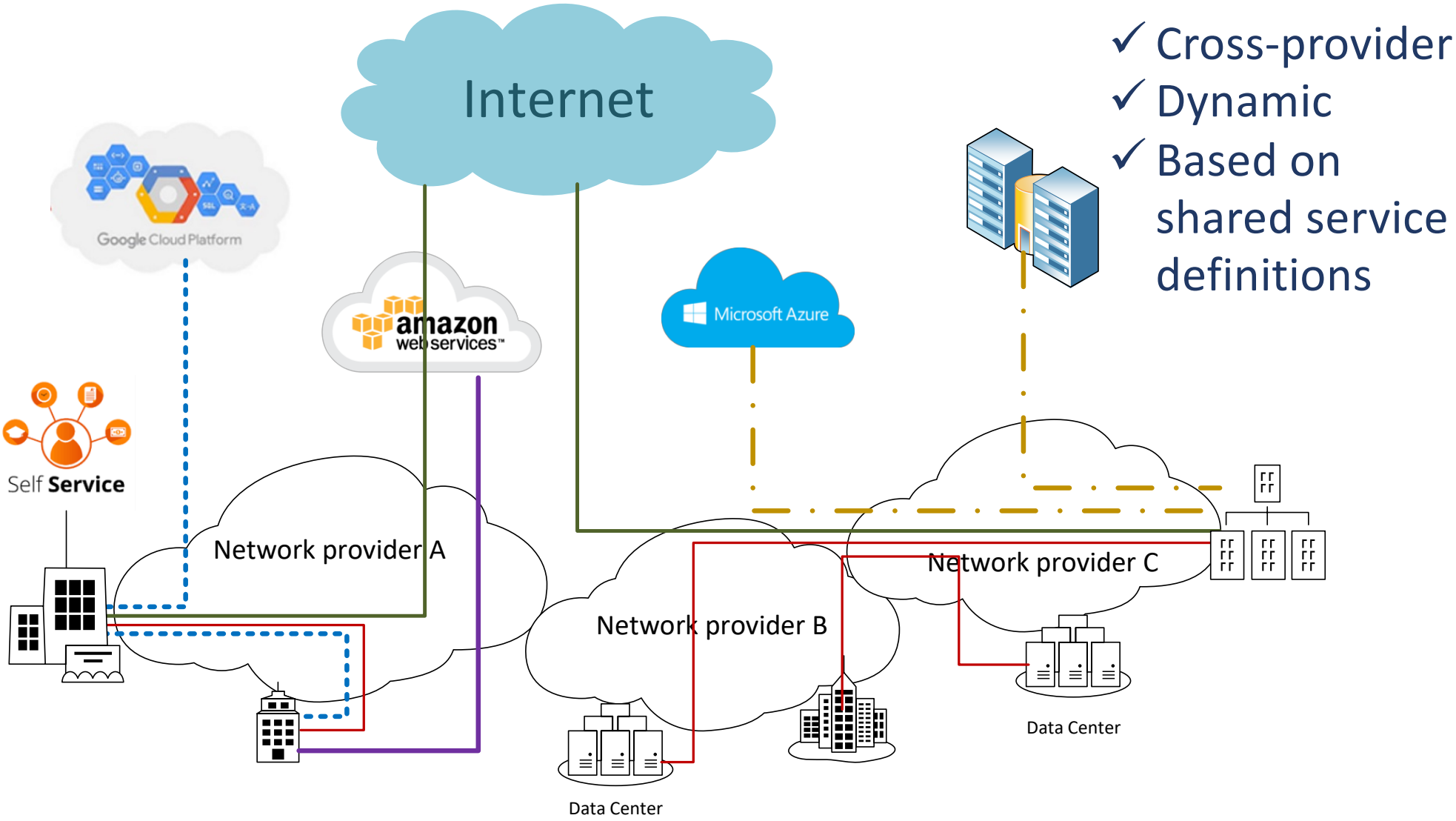
The global service provider landscape

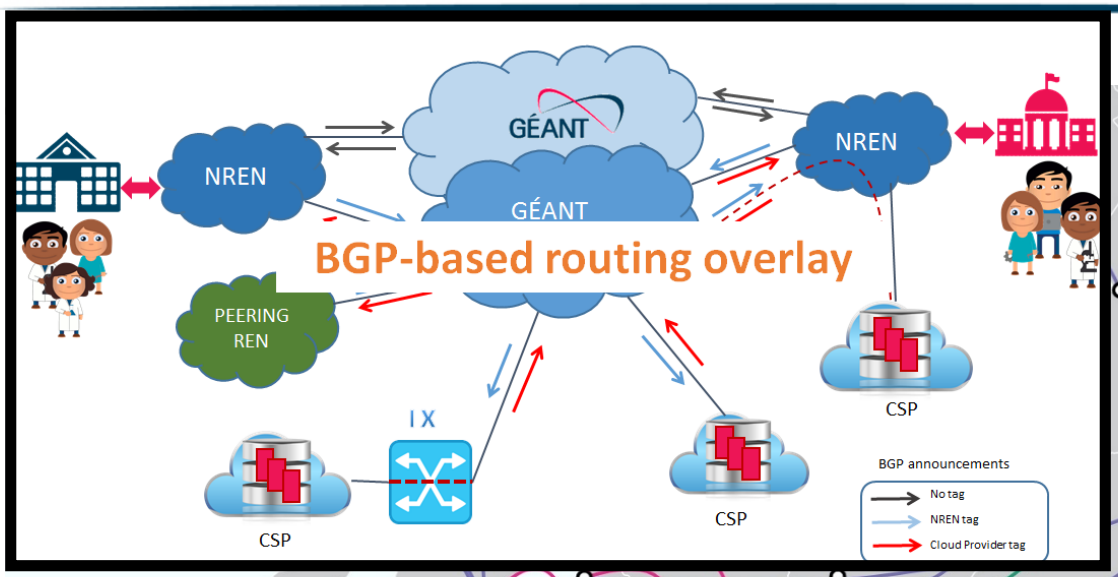
Multi-party service delivery

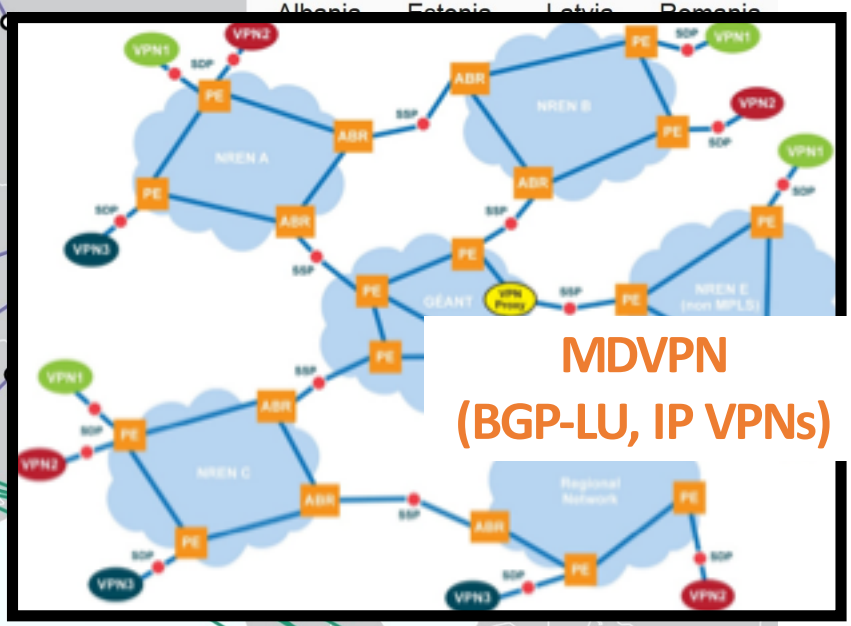


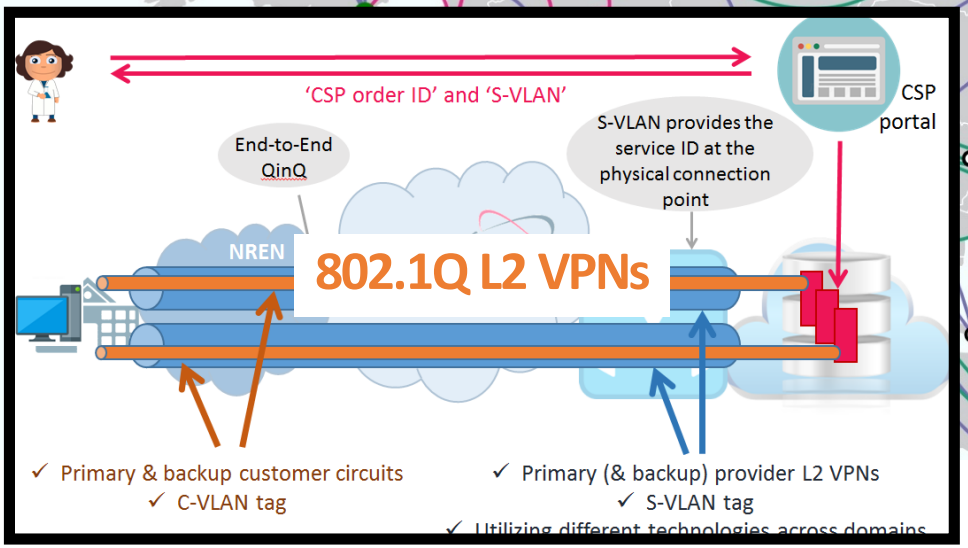
- ✓ Cross-provider
- ✓ Dynamic
- ✓ Based on shared service definitions

Does one size fit all?

Different technologies, different delivery timeframes







Challenges ahead

- **We can** engineer our ultra-fast, ultra-reliable networks to deliver bespoke connectivity

  - What are the **timescales** for delivery?
  - Are we ready to cope with **demand**/granularity?
  - Can we deliver a seamless user experience **across the NREN footprints**?
  - Can we **integrate with other service providers** to deliver an one-stop shop experience?
  - Can we offer **SLAs**? **Monitoring**?
  - What about 'after-sales'?
  - Can we expose our service catalogues via software APIs so that they can be **consumed by user applications**?

What do we need

A framework for end to end service delivery

language <-> orchestration <-> medium

Standards

Compliance ensures interoperability

Open APIs

- Product ordering
- Product catalogue management
- Product inventory management
- Service Ordering
- Service Inventory
- Agreement
- Service Catalogue
- Party Management
- Activation and Configuration

Modelling
A basis for provider interoperation

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- **Business entities**
  - Customers/Users: Institutions
  - Partners: NRENs
  - Suppliers: CSPs, others….
- **On-boarding**
  - Business Interactions - Agreements
  - Products - Product offerings - Product specifications
- **Fulfillment**
  - User Facing Services (e.g. L2 VPN)
  - Resource Facing Services (VRF, Virtual Circuit, …)
  - Resources (ports, interfaces, logical resources e.g. VLANs)

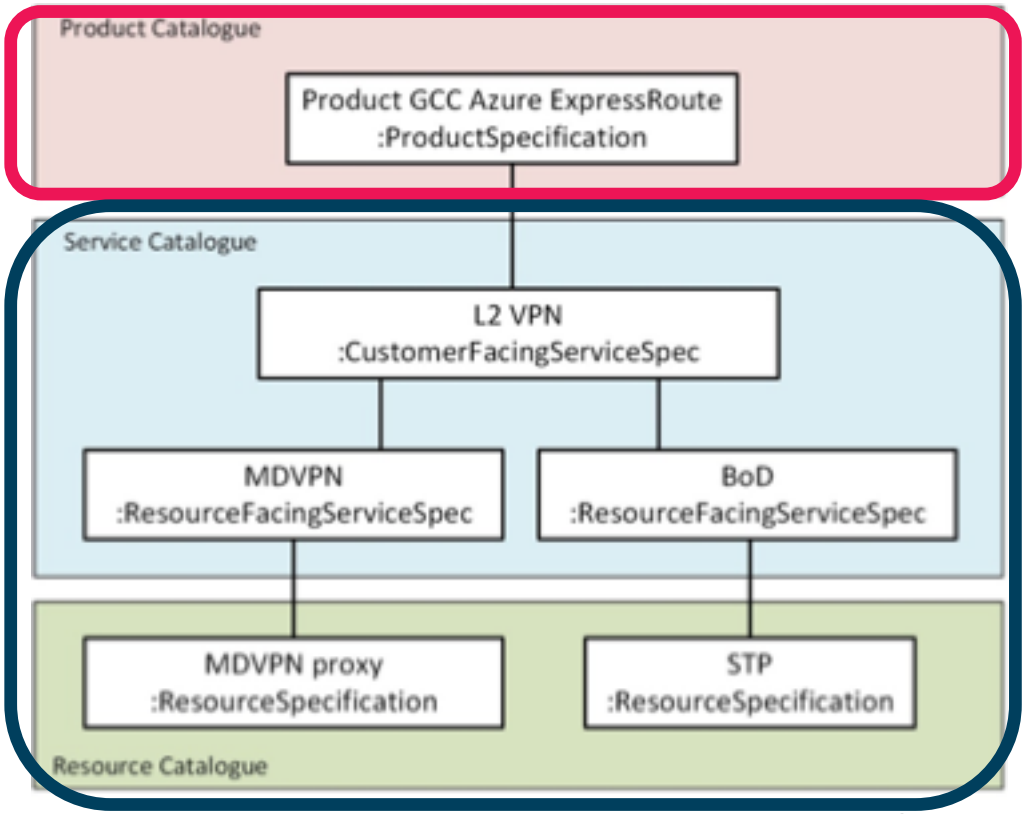
Our focus… usually

Modelling offerings

To deliver **products/services**, not technologies.

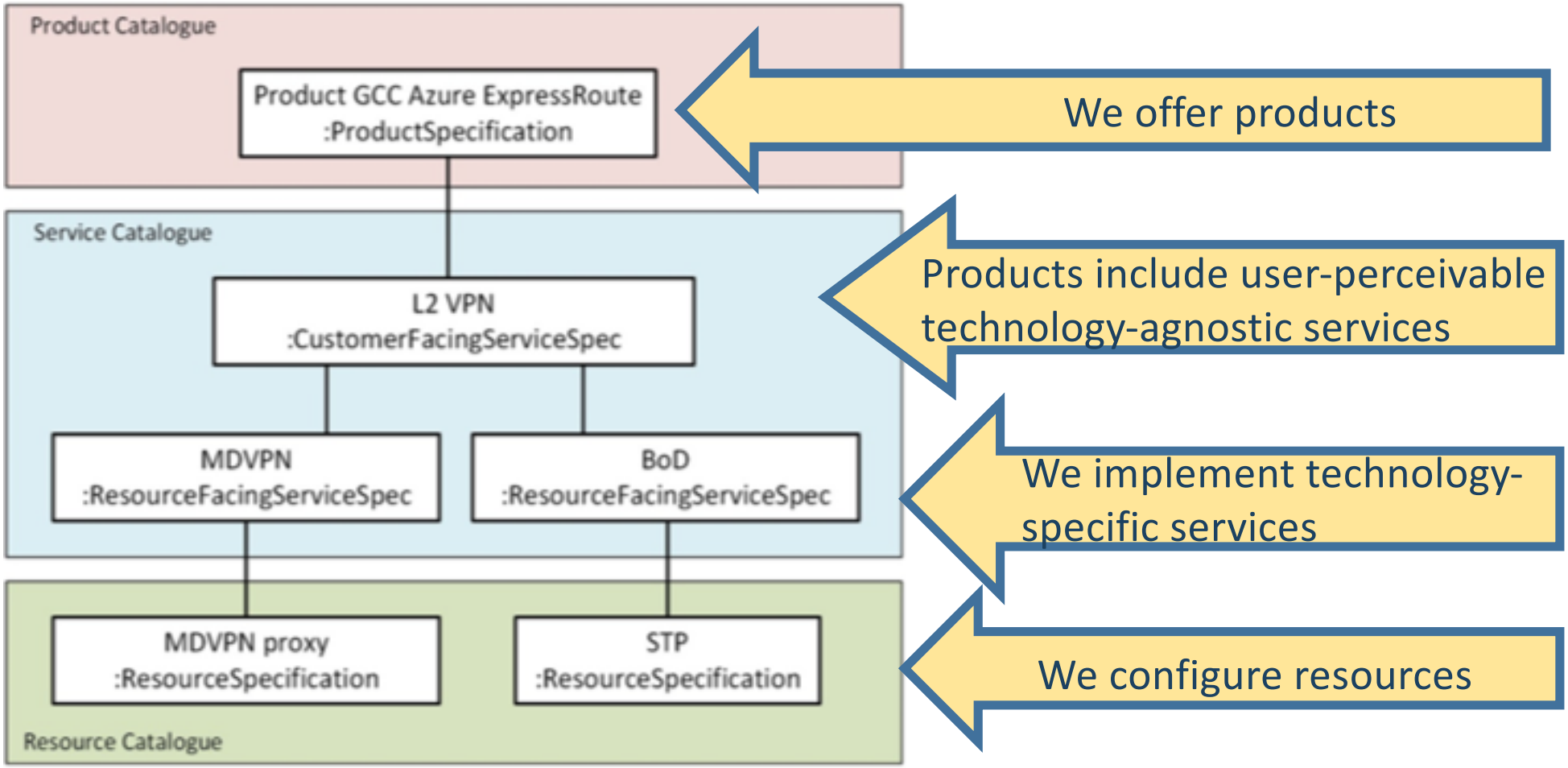
- Product* →
  - GÉANT Cloud connectivity (GCC)
- User facing service →
  - L2/L3 VPN
- Resource-facing services /technologies →
  - Ethernet over OTN
  - MPLS VPN
  - BoD
  - L3 VRF
  - ….

Expose *compatible* product offerings through catalogues

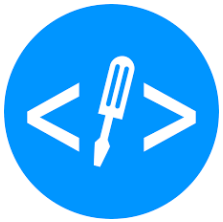


Map those internally to technologies and resources

Modelling offerings (2)



Modelling a resource-facing service



Service id in the service catalogue

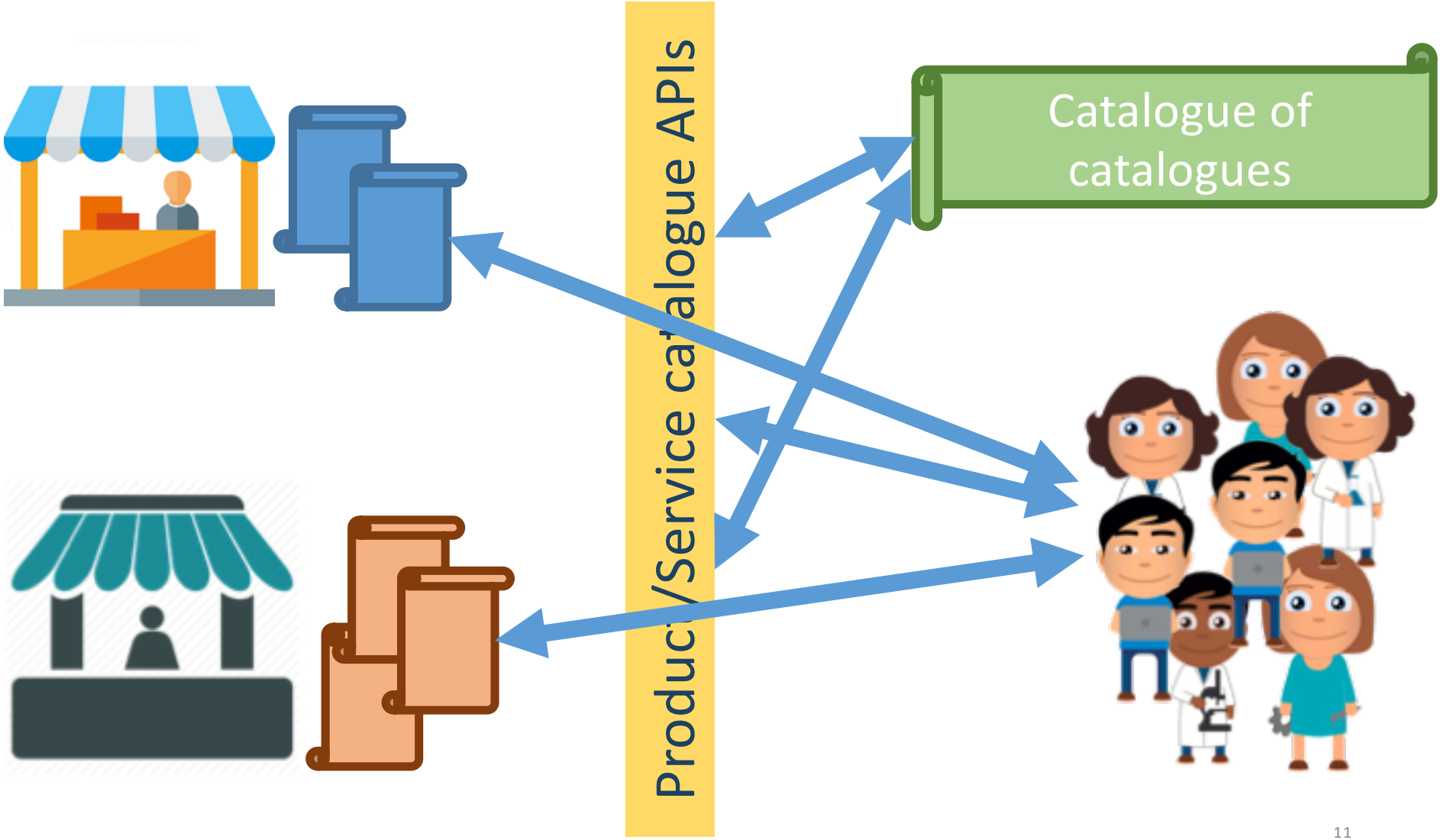
```
id:                                   "MDVPN"
identifiers:
  0:
    namespace:                        "domain:itsm"
    value:                            "4fa595cc-602c-498a-b153-767f5bf14b29"
resources:                            […]
characteristicSpecifications:
  0:
    name:                             "S_VLAN_IN"
  1:
    name:                             "S_VLAN_OUT"
  2:
    name:                             "BANDWIDTH"
  3:
    name:                             "MTU"
    specificationCharacteristicValues:
      0:
        value:                        1500
signalingProtocolSpecifications:
  0:
    protocolType:                     "BGP"
    characteristicSpecifications:
      0:
        name:                         "VRF_TARGET"
```

Service-specific parameters

Resources involved

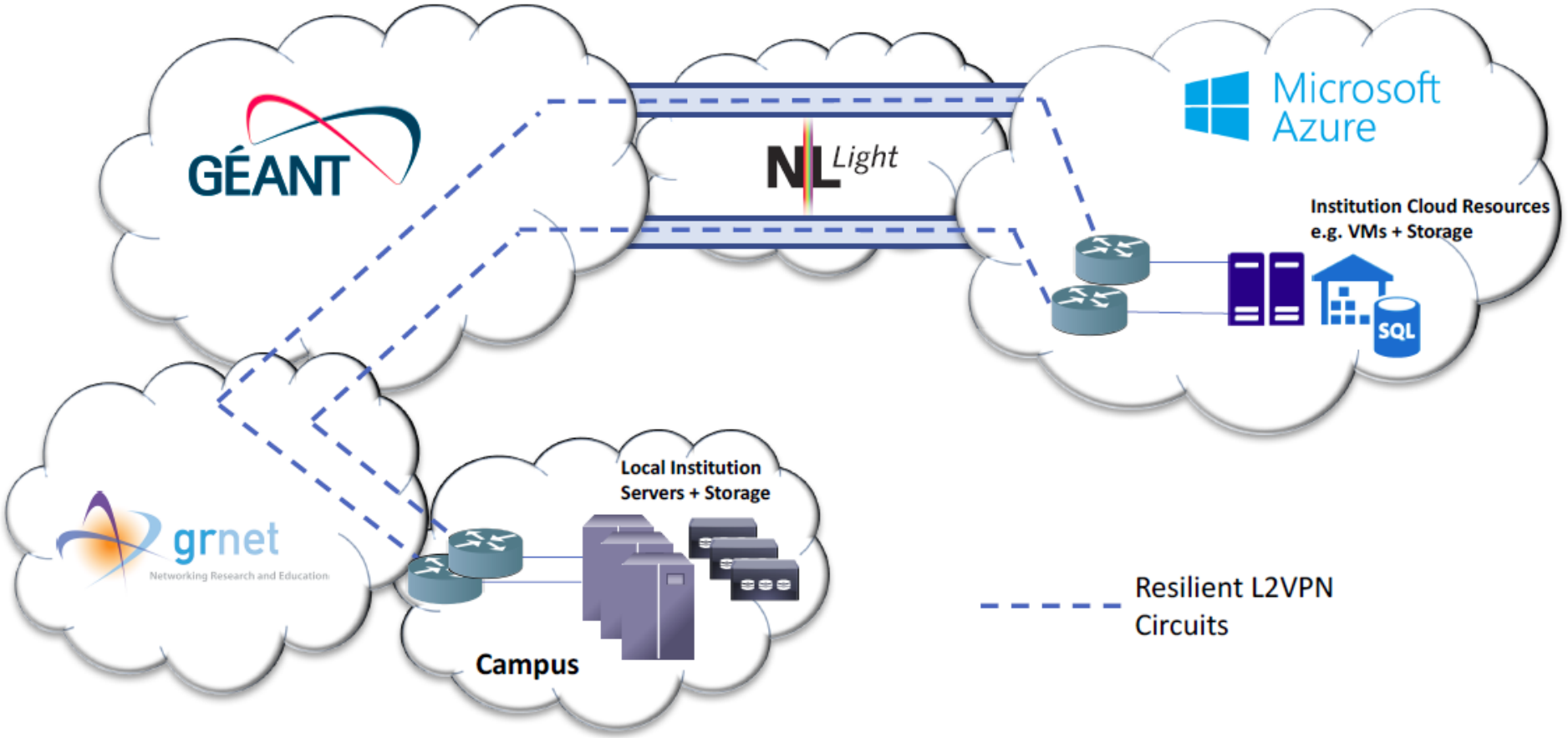
```
resources:
  0:
    tag:                              "GRNET-2"
    resourceType:                     "PE_ROUTER"
    deviceInterfaces:
      0:
        deviceInterfaceType:          "LOOPBACK_INTERFACE"
        networkAddresses:
          0:
            networkAddressType:       "DOMAIN_NAME"
            networkAddressValue:      "eier.grnet.org"
          1:
            networkAddressType:       "IPv4"
            networkAddressValue:      "62.217.102.13"
          2:
            networkAddressType:       "IPv6"
            networkAddressValue:      "2001:648:2ff3::13"
    ports:
      0:
        resourceType:                 "PORT"
        characteristics:
          0:
            name:                     "MTU"
            value:                    "1500"
          1:
            name:                     "VLAN_REWRITE"
            value:                    true
          2:
            name:                     "FREE_SVLANS"
            value:
              0:                      100
              1:                      101
              2:                      102
        portName:                     "<port-name>"
        bandwidth:
          measurementType:            "Gbps"
          totalAmount:                10
    isProxy:                          false
  1:
    resourceType:                     "VLAN_RANGE"
    fromValue:                        1
    toValue:                          100
```

Publishing products and services in catalogues

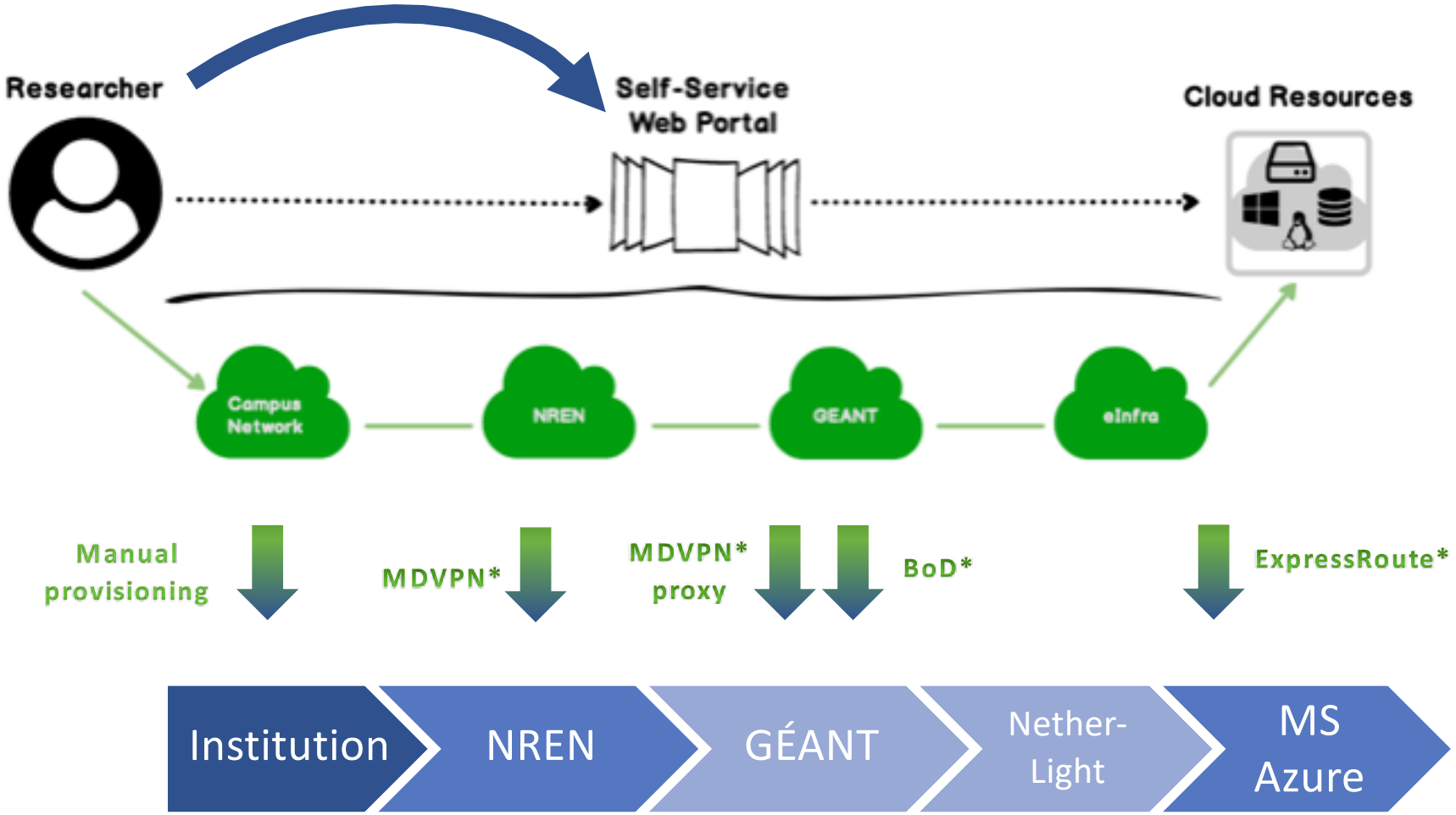


A real-world use case for NRENs

Interconnecting the campus with the cloud provider DC

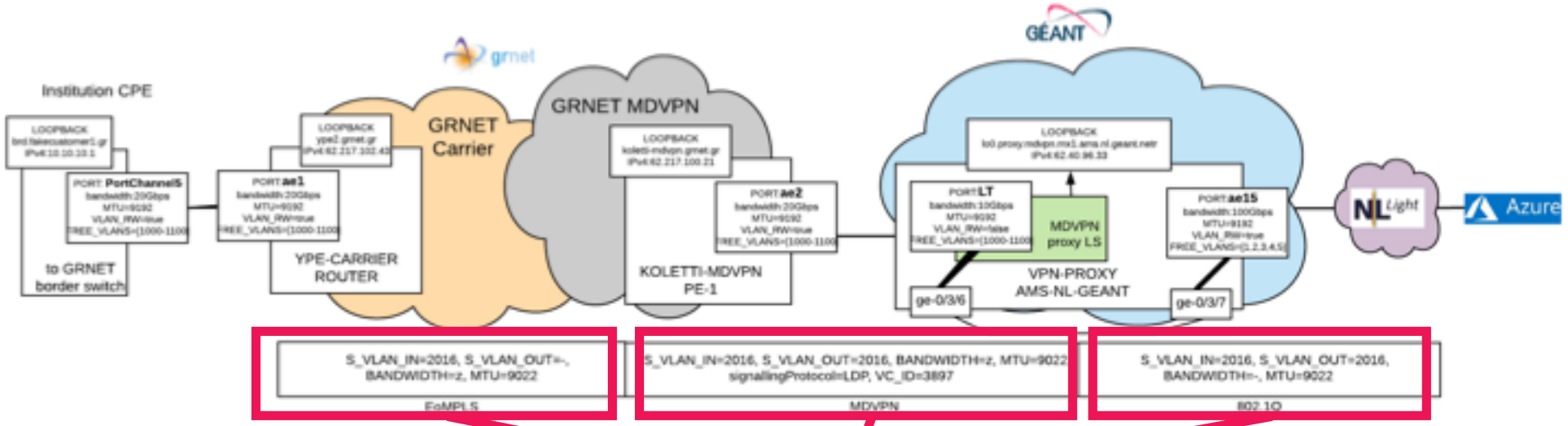


High Level Orchestration Overview



Under the hood

Delivering connectivity in weeks' timeframe or…?



3 different resource facing services

1 user facing service: "L2 VPN"

1 product offering: "GCCAzure ExpressRoute"

Institution → GRNET → GÉANT → Nether-Light → MS Azure

Different modelling agreements

PARTNER NNI agreement


```
identifiers:                    […]
businessInteractionType:        "AGREEMENT"
partyRoles:
  0:
    partyRoleType:              "PARTNER"
    party:
      partyType:                "ORGANIZATION"
      identifiers:
        0:
          namespace:            "crm"
          value:                "7600d3f4-6f1a-4fed-b20c-de84fe9032c2"
        1:
          namespace:            "edugain"
          value:                "geant-123"
      shortName:                "GEANT"
agreementType:                  "ENNI"
agreementItems:
  0:
    businessInteractionItemType: "AGREEMENT_ITEM"
    productOffering:
      href:                     "http://geant.org/offerings/GCCAzure.json"
      name:                     "Geant Cloud Connectivity to Azure ExpressRoute"
      productSpecification:     {…}
```


- ✓ NREN is handling GCCAzure traffic over to the institution
- ✓ GÉANT is receiving GCCAzure traffic from the Microsoft DCs
- ✓ GÉANT is transiting GCCAzure traffic from the Microsoft DCs to NREN

! Agreements can be added/removed programmatically

Modelling orders

- An order is a request to receive **an instance of product offering**
- The order is consistently **recorded and processed** across the involved providers
- There is order state at a global level and the user can in any point in time **track the status** of his order
- Orders are **qualified**
  - From a **business**
  - And **technical** point of view
- … and then they are **fulfilled**

Efficient delivering of services

- Modelling and advertising of offerings/services **programmatically**
  - No more exchanging spreadsheets/service definition docs offline
  - Ditto for managing business agreements and terms of service use
- Enabling service **chaining and composition**
- Incorporating **federated AAI** functions
  - Part of the orchestrated workflows
- Accommodating R&E but also commercial service providers' existing **APIs**
  - Create wrappers compliant to the framework's APIs
- **Dynamic onboarding** of service providers and users
  - Just turn on APIs and get in the game
- **Eliminate manual** tasks –where possible

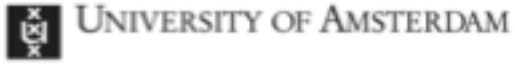
Where to start?

- Publish product/service offerings via agreed (standard) Open APIs
  - Agree on a set of **user-facing service specifications** e.g. for network connectivity
  - If needed, use schema extensions to customize service definitions

- Support a **minimum of east-west processes** (via APIs):
  - Order management
  - Fulfillment
  - Assurance
  - Provider to provider (B2B) agreement management

- Register with one, or more **inter-provider orchestrators** or deploy your own

Collaboration effort



Poster at stand #13

Integrating cloud service delivery

Thank you

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