# Towards digital sovereignty with cloud federation

*how to break the dominance of the hyperscalers*

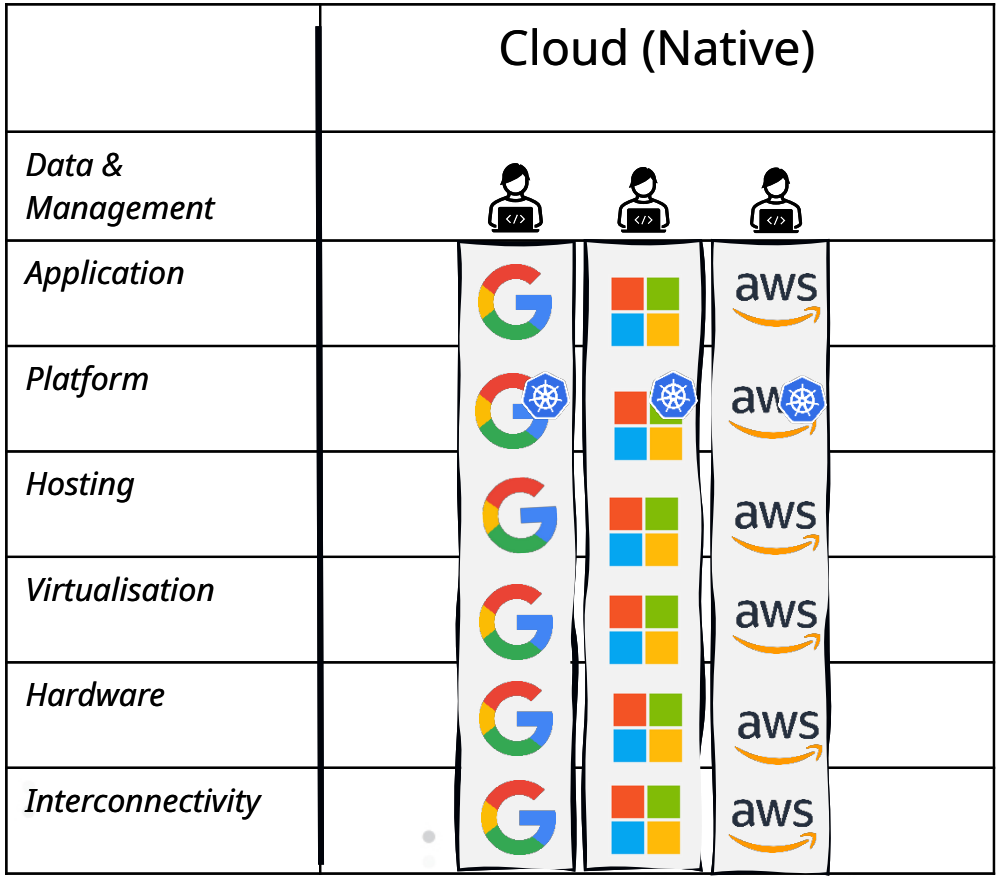
# Introduction

- ECOFED: European Cloud services in an Open FEDerated ecosystem
- Consortium consists of 2 cloud providers, a system integrator, a research institute and an internet exchange
- Part of IPCEI-CIS, an European Union research program to strengthen European clouds
- IPCEI-CIS website: https://8ra.com (… a .com domain)

# Towards a federated cloud

- We already have a federated cloud, it's called the Internet.
- Integral federated services include
  - DNS, HTTP, SMTP, BGP
- Cloud has become synonymous with consolidation, and obscures the inherent nature of the internet as it originally evolved
- Service delivery and description protocols are not yet standardised

# Core problem statement




## *Vertical integration*

Pros

- ease of use (one interface..*per hyperscaler*)
- integration possibilities

Cons

- vendor lock-in
- Entry  barriers for newcomers - very high
- limits competitive innovation

# Objective **ECOFED**

*Create the technical basis for an interoperble, open and competitive cloud.*

Through a sensible approach of decoupling infrastructure, platform and application while keeping the benefits gained from monolithic hyperscalers in regards to provisioning, maintainence and integration.

# From mono cloud to multi provider ecosystems

***Keep: freedom of choice and decoupling***

| | Pre-Cloud | Cloud (Native) | Federated Cloud |
|---|---|---|---|
| *Data & Management* |  |  | **1+1=3**<br>**Combine the benefits of Pre-Cloud en Cloud (Native)** |
| *Application* | Atos ilionx<br>CGI centric | | |
| *Platform* | Red Hat LAMP<br>IBM<br>django | | |
| *Hosting* | leaseweb<br>transip bit EQUINIX | | |
| *Virtualisation* | vmware<br>CITRIX XenServer<br>Xen Project<br>PROXMOX<br>Red Hat | | |
| *Hardware* | IBM<br>Hewlett Packard Enterprise<br>intel<br>DELL<br>SUPERMICRO<br>AMD | | |
| *Interconnectivity* | eurofiber<br>ndix<br>amsix<br>kpn<br>NL-ix | | |

***Keep: usability, integration and management***

# Technology

- Stack agnostic
  - Do not force providers to redesign their existing infrastructure.
  - Do not force providers or consumers to run our special software packages, keep it open and full of choice.
- Technology shifts: ECOFED should be forward compatible, support the new solutions from tomorrow and the ones coming from the 12th or 13th edition of the Dutch hacker camps. We do not focus only on todays software (k8s, etc).
- Uniformity: some commonality in the form of a standard or protocol is necessary
- Existing technology: make use of existing standards in the ECOFED framework in order to make use of existing tooling and applications – *minimal reinvented wheels*.

# Functionality

*What should be supported by the ECOFED technology:*

- User declarations on desired services including service requirements
- Mapping those to the service offerings by providers
- Service provisioning by users at providers that meet the user's desired state
- Reconcile changes to the services by users
- Transfer of services from one provider to another, initiated by users
- Special focus on data take in and take out.
- Automatic resolution of technical, juridisdical and administrative demands

# Building blocks

- Multi Provider Linked Infrastructure (MPLI, ECOFED development, open) – our communication standard.
- Service Ontologies (ECOFED development, open) – our shared language
- Compliance Labels (ECOFED development, open) – our compliance framework
- Trust through Verifiable Credentials (third-party, i.e. FACIS)
- Service Catalogues (third-party, i.e. DOME)
- Service Orchestrators (third-party, i.e. OpenTofu)

# Multi Provider Linked Infrastructure

MPLI provides an API and standard for discovering, provisioning, and transferring services. It matches user requests using service ontologies and delivers service declarations to providers. Providers use ‘Workers’, agents that translate MPLI declarations to their infrastructure to deliver the services.

MPLI functions here as a unified middleware layer.

ECOFED delivers the API and worker specification, a reference implementation for the API and some reference implementations for service workers.


# Why service ontologies

- Data and configuration is siloed at providers with different formats and terminologies
- To federate service delivery we need a shared understanding of data for humans and machines
- A semantic layer enables interoperability through shared meaning
- Declarative and semantic technologies enable structure AND meaning
- This technology enables reasoning and inference over the data

# Service Ontologies

- Based on existing W3C standards:
  - RDF: universal graph-based data model
  - SHACL: shapes constraint language that validates data against expected structure and rules
- Users describe their desired state in a declarative manner
- The service ontology provides a common language for service providers to describe offerings and for consumers to describe requirements. These can then be trivially matched together.

# Why compliance label

The ECOFED label shows that service offering follows the characteristics of an open ecosystem in order to distinct itself from other services that that are part of an in-platform offering (vendor/hyperscale), with no or limited interoperability/switchability/portability in place.

Through the ECOFED compliance label a customer shopping for a cloud service can trust before the service has been bought (or has been activated) that a cloud service with the label is built, operated and delivered in an open multi-provider ecosystem.

# The compliance label

Through the ECOFED compliance label you can see that the particular service:

- is comparable
- has a pre-defined set of service characteristics and configuration parameters
- offers the capability to be switched to and from another provider
- provides information for automated dependency resolution
- is offered by a trusted provider

# ECOFED status – August 2025

- Test Workloads
  - The MPLI and ontology concepts were validated by the transfer of a simple virtual machine from provider A to provider B to provider C, all three running different hypervisors in different networks
  - Refined the technology through migration of containers and PostgreSQL databases
  - Established working patterns between teams spread across three participating organisations – to ensure we do not create vaporware.
- Active in the IPCEI-CIS ecosystem: 8ra.com Task Force
- Results will be published as open-source through the Linux Foundation Europe
- Learning lessons from Gaia-X FS and exploring partnership with DOME
- Prepared for (future) EU legislation such as the Data Act

# Want more info or wish to participate?

- More information and updates on: https://ecofed.eu/
- Participate in a user panel, contribute to the ontologies, orchestrators, help us in the further development of MPLI: info@ecofed.eu
- If you really want to strengthen the European cloud sector **start buying services at European cloud companies**

# Questions?