The interplay between Governance, Technology, and Policy in Metaverses

An Example with Seamless Avatar Interoperability Using Self-Sovereign Identity

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Quick background

Afonso Ferreira

- ✓ **Director of research** in Algorithms, Optimisation, Networks, Cybersecurity, AI

- ✓ Leading my lab in **four European + French projects**

- ✓ **Head, European relations** for Digital matters at CNRS

- ✓ **Policy maker** in Future and Emerging Technologies, Cybersecurity, and Privacy at the European Commission

- ✓ **Foresight designer** and practitioner, mainly on the impact of the Digital Revolution and Digital Transformation

- ✓ Working at the nexus of **Technology / Policy / Futures**

- ✓ **Consulting** for Foreign Companies, EU Institutions, and European Projects

The French CNRS

- 30.000++ staff (**11.000 researchers**)
- 3 billion++ € annual budget
- 1.000++ research units
- 1.500++ **start-ups** since 2010
- 200++ **joint labs with industry**

- 20++ **Nobel** prizes / 10++ Medal **Fields**
- 1.1 billion++ € won in H2020
  - **1st beneficiary** of the Programme
  - **1st beneficiary of HE so far**
- 70++ joint **laboratories in the world**
- All scientific domains
  - **Multidisciplinary** by design

The nexus of
Policy / Technology / Futures
(and its impact on software design)

- Governance
  - Governance can be defined as: "The system by which entities are directed and controlled". It is concerned with structure and processes for **decision making, accountability, control and behaviour** at the top of an entity
- Policy
  - Policy defines the course or method of action selected from among alternatives and in light of given conditions to **guide and determine present and future decisions**
- Legislation
  - Legislation is the process or product of **enrolling, enacting, or promulgating law** by a legislature, parliament, or analogous governing body
- Technology
  - The application of **scientific knowledge** for practical purposes
- Futures
  - Foresight understands the future as an emerging entity that's only partially visible in the present, not a predetermined destiny that can be fully known in advance (predicted). There are no hard facts about the future and the evidence base is always incomplete. **The objective is not to 'get the future right', but to expand and reframe the range of plausible developments that need to be taken into consideration**. Strategic foresight does not attempt to offer definitive answers about what the future will hold. (OECD)

Policy & Legislation in the EU

- Plenty on Digital matters since 2016

- Eg [Europe's Digital Decade: digital targets for 2030](), whose proposed principles are:
  - Putting people and their rights at the centre of the digital transformation
  - Supporting solidarity and inclusion
  - Ensuring freedom of choice online
  - Fostering participation in the digital public space
  - Increasing safety, security and empowerment of individuals
  - Promoting the sustainability of the digital future

EU Legislation framing the Software Industry
(Selected only)

I. (Personal) Data Protection

Data and IoT

- GDPR
- European data strategy
  - Regulation on European data governance
  - The Data Act

II. Markets and Competition

Big Tech / IoT / Software markets

- Digital Services Package for the European Digital Single Market
  - Digital Services Act
  - Digital Markets Act
- The Digital Content Directive (Also here)
- The Sale of Goods Directive

III. (Cyber)Security

The thin line between National Security and EU Security

- (GDPR)
- NIS2 Directive
- CER
- DORA
- eID Regulation Revision and also here
- Artificial Intelligence
  - A European legal framework for AI to address fundamental rights and safety risks specific to the AI systems ;
  - Liability rules on products and AI
    - An AI liability directive - adapting liability rules to the digital age and AI ;
    - A Proposal for a product liability directive
- IoT
  - EU Cyber Resilience Act

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The full vision of Metaverses

- **Massive:** They can host an unlimited number, or at least a very high number of concurrent users

- **Immersive:** They offer three-dimensional and embodied experiences

- **Persistent:** Metaverses will never stop or reset. Or at least that will be the perception of their users

- **Open:** Anyone can go into metaverses, move within them as an avatar, interact with other avatars, socialise, trade, build, produce intellectually, and so on.

- **Economically developed:** There will be extensive trade in goods and services within the metaverses, which may or may not have an impact in the physical world outside them

Metaverse Governance & Legislation

Metaverse Governance & Legislation

- A metaverse is a digital world. Therefore, it needs governance ***inside***
  - Not the same as the concept of interface between the digital world of a metaverse and our physical world
- In this new technological frontier that are metaverses, it is not clear *what* will be regulated, *who* will establish and enforce rules, or *how* this will be done
- But any place, physical or digital, at some point of population density will need some kind of order maintenance, including the notion of fundamental rights
- In the EU, as we saw, the rule-of-law is dominant and its institutions are mostly fit for purpose. **Are they enough for new private digital worlds?**

Gaps – Technology & Policy

- The technologies needed to build metaverses, as envisioned here, are just emerging
  - A great deal of **technological and integration research** will be required in the next few years

- Many metaverses already exist, representing parallel universes
  - How to ensure **interoperability, portability, security, and data protection**
  - How to build your metaverse in a **compliant** manner
  - **Awareness of impact on climate change** (huge data centres, high performance computing, blockchains,etc)

- The policy in the making is also encompassing
  - From the governance viewpoint, there will be a need to **protect fundamental rights**
  - Protection of avatars and citizens from **surveillance vs technological needs in bio/neuro-metrics**
  - **Identity and Authentication**
  - Questions may address future concepts, like **whether avatars should be given citizen status**
  - Questions may be simple extensions of existing concerns, like **should metaverses be subject to existing laws for the physical world?** If so, how not to hinder innovation and creativity

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Example of technical questions directed by policy

- Interoperability between Metaverses

  How can an Avatar securely travel between Metaverses?

  (*with R. Laborde and other colleagues – IEEE MetaCom'23, Kyoto, June 2023*)

  - **Digital Identity**
    - In a wide sense encompasses every attribute of the user, i.e., any characteristic or property of an entity that can be used to describe its state, appearance, or other aspects
  - **Data interoperability**
    - Data formats that can be processed and ensure the same meaning across Metaverses
  - **Self-Sovereign Digital Identity**
    - Aims to give people control of personal information
    - A new decentralized identifiers (DID) model where the user is at the center and controls the sharing of his or her identity
    - W3C Verifiable Credentials
  - **Authentication**
    - Guaranteeing unicity of presence in a single Metaverse
  - **The Schengen of Metaverses – Governance**
    - Trade-offs between online technical solutions and offline governance agreements

Metaverse(s)

Laws & Regulations (EU GDPR, EU Data Act, EU Data Governance Act, …)

Governance (centralized)

Governance (collaborative)

Technology / infrastructure
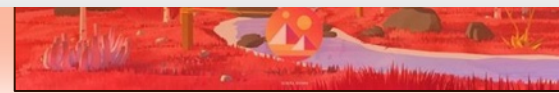
Technology / infrastructure

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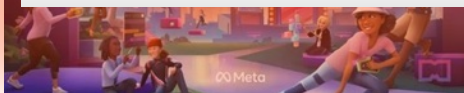
13
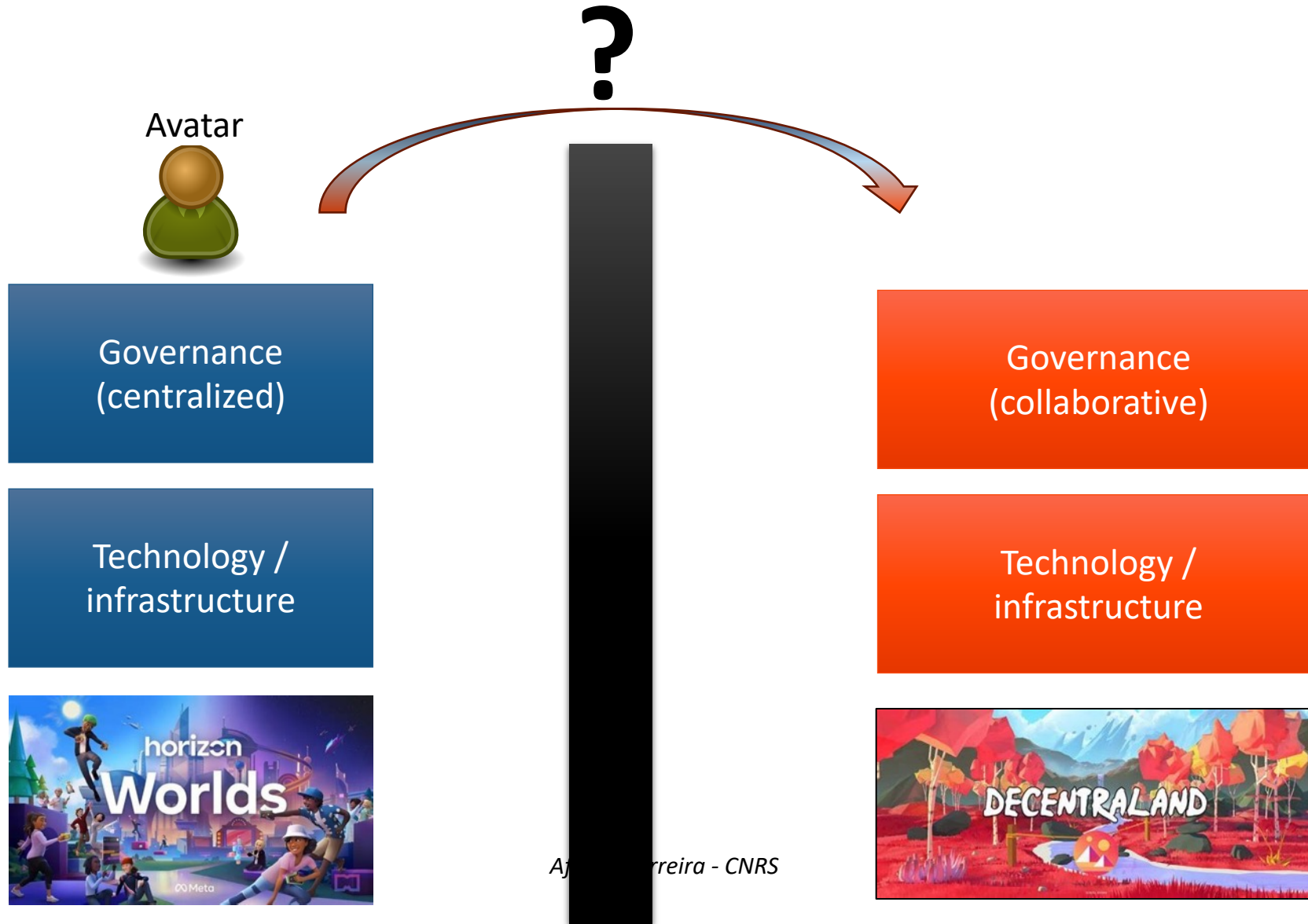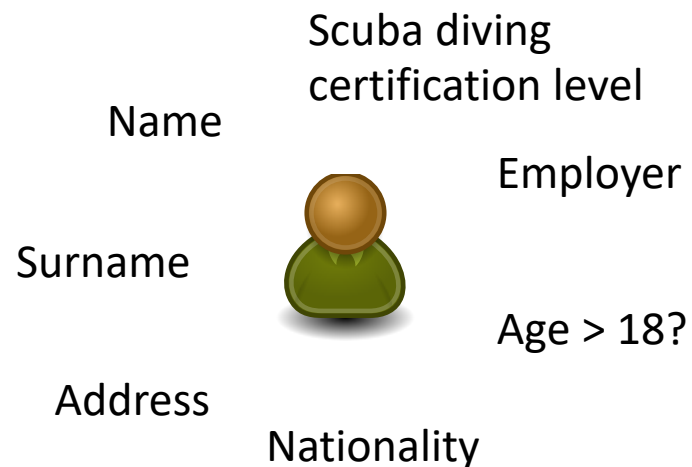
Art. 20 GDPR

Right to data portability

1. The data subject shall have the right to receive the personal data concerning him or her, which he or she has provided to a controller, in a structured, commonly used and machine-readable format and have the right to transmit those data to another controller without hindrance from the controller to which the personal data have been provided, where:

   (a) the processing is based on consent pursuant to point (a) of Article 6(1) or point (a) of Article 9(2) or on a contract pursuant to point (b) of Article 6(1); and

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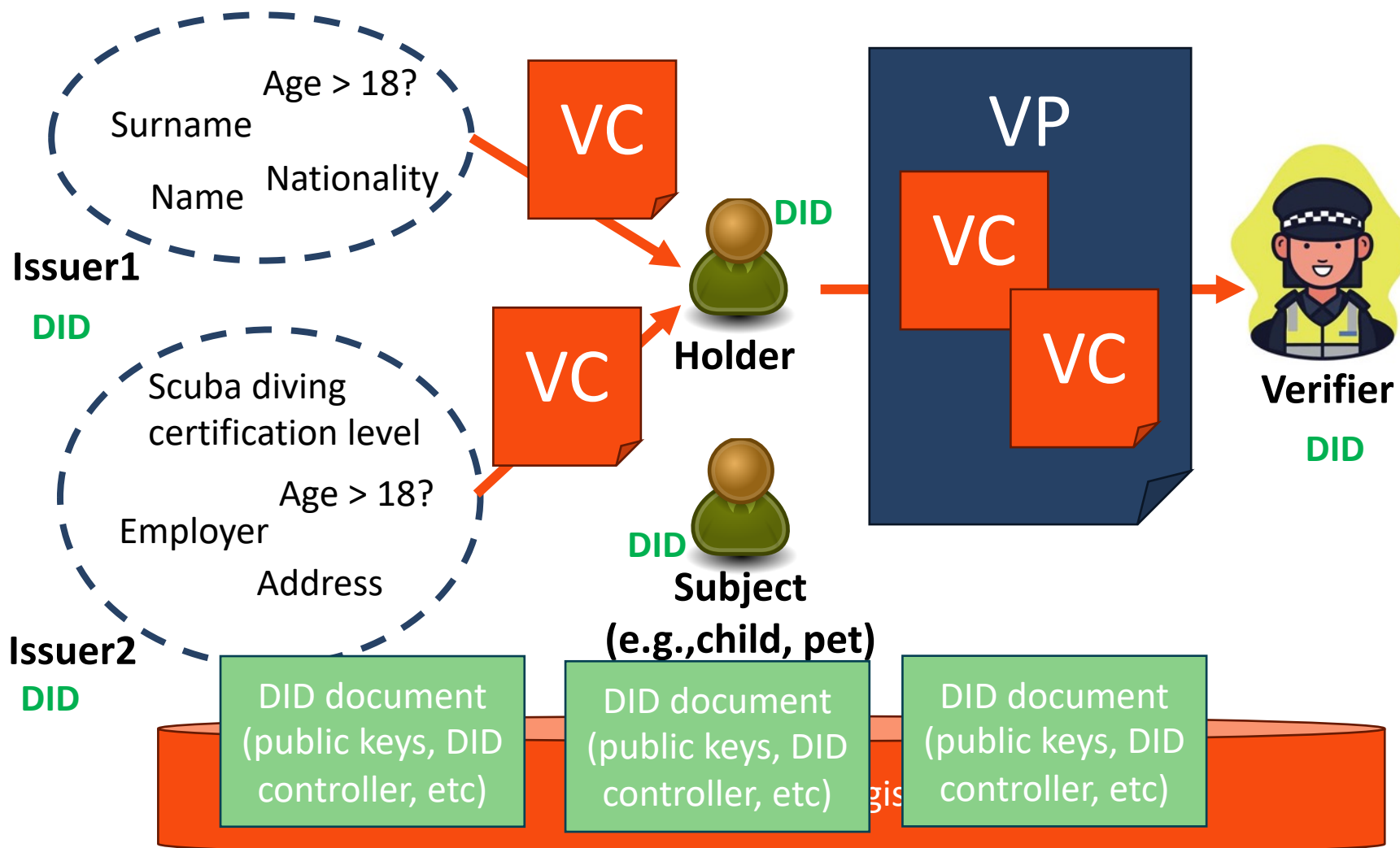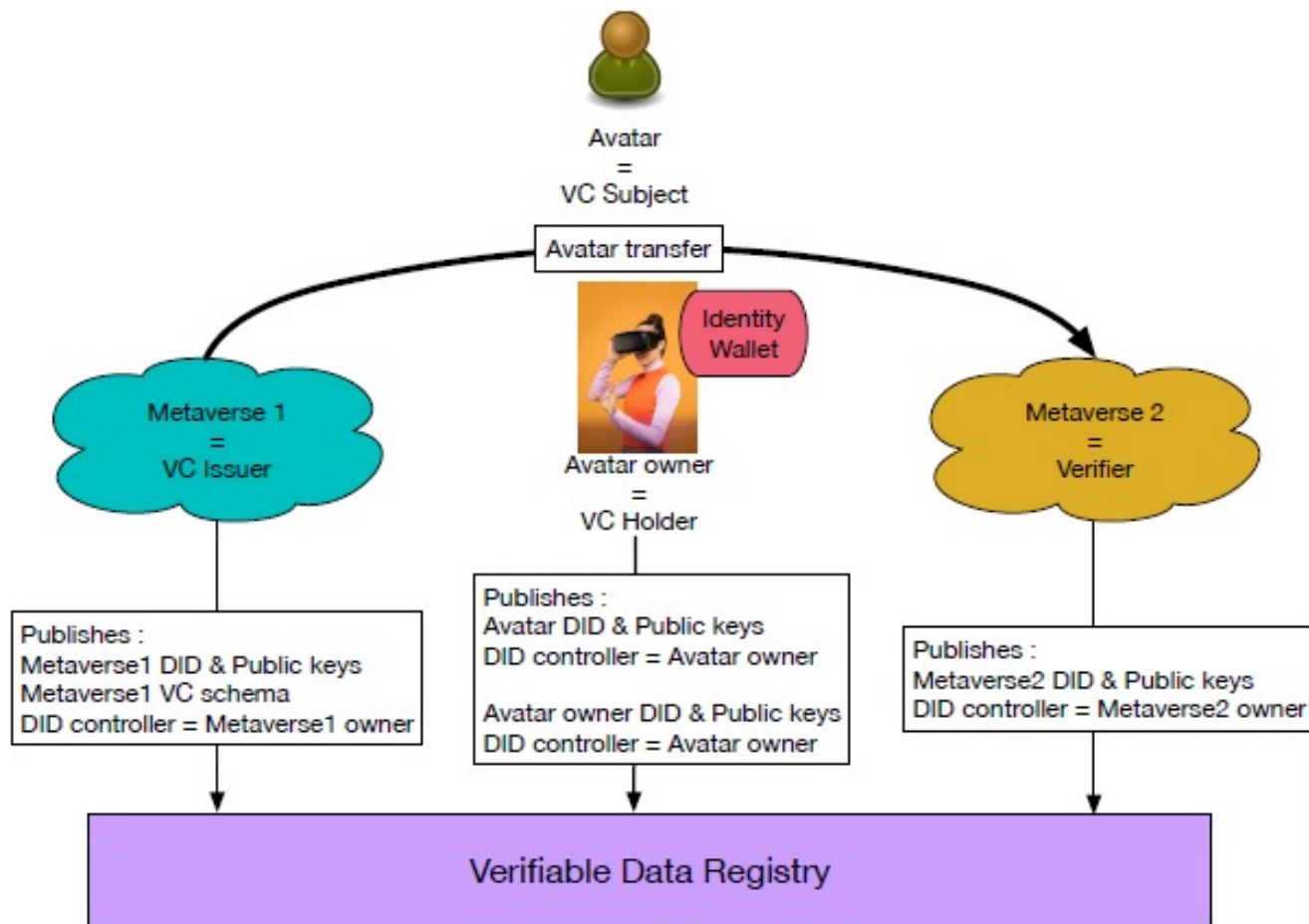
Interoperability between metaverses

?

Avatar

| Governance (centralized) | Governance (collaborative) |

| Technology / infrastructure | Technology / infrastructure |

Self-Sovereign Identity at a glance

Scuba diving
certification level

Name

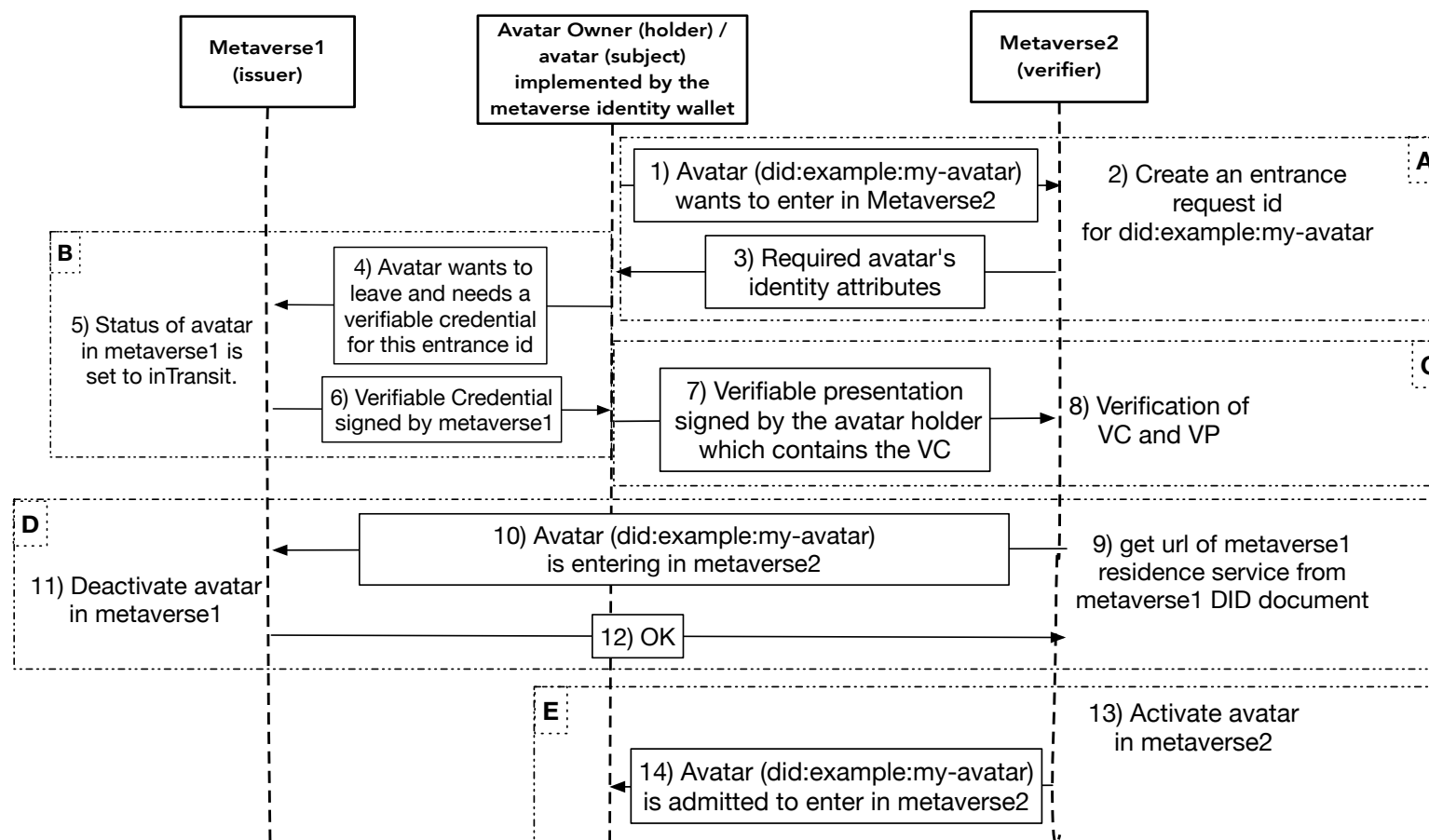Employer

Surname

Age > 18?

Address

Nationality

Identity = every attribute of an entity, i.e., any characteristic or property of the entity that can be used to describe its state, appearance, or other aspects

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Self-Sovereign Identity at a glance With W3C Decentralized Identifiers

XMAT (Cross-Metaverses Avatar Travel) Protocol

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Key takeaways

- EU policies in the digital sphere have a large impact on the Software Industry
- Metaverses are coming
  - Interplay Between Policy and Technology
  - Existing regulations
  - Need for new regulations
- E.g. GDPR and Data portability require technological solutions
  - Avatar interoperability = XMAT Protocol
  - Inter-metaverses governance
- Current & Future Work
  - PoC in the making
  - Interviewed two Law Enforcement Agents
- Work supported by :
  - H2020 CyberSec4Europe (GA 830929), H2020 LeADS (GA 956562), Horizon Europe DUCA (GA 101086308), and CNRS EU-CHECK

Thanks for your attention