unesco

Intergovernmental Oceanographic Commission

33rd Assembly

25 June- 3 July 2025

IOC Data Architecture

Agenda item 3.4.3

Pier Luigi Buttigieg, AWI / Chair of IODE's ODIS Programme Component
Emma Heslop, Programme Specialist GOOS, IOC/UNESCO
27 June 2025

Data Architecture: The core principle

Gathering and understanding the value of individual achievements

Harmoniously arranging them into something greater than the sum of their parts

IOC Data Architecture Vision

unesco
Intergovernmental
Oceanographic
Commission

A harmonised and tightly coordinated suite of IOC data systems delivering open, actionable, and freely available ocean data to all, advancing the ocean's digital ecosystem.

Data Architecture: Internal drivers

1. IOC has **mature digital assets - ready to connect**

2. **The time is now** - core technology functioning and work is aligned: IOC Data Strategy (2023), IODE and GOOS Data Strategies

3. Deliver on IOC potential - **the sum of the parts delivers exponentially more** increasing impact of investments and lowering operational costs

IODE
ODIS
@OTGA
OBIS
IH

GOOS
OCG Observing Networks
Data Assembly centres +
ERDDAP

unesco
GOOS BioEco Metadata Portal

Data Architecture: Key external drivers

1. Increased demand for high-quality digital products and services

2. Ocean Decade Data and Information Strategy & Vision 2030 – **a new digital marketplace is emerging - IOC needs a clear identity**

3. National, regional, and global requirements for improved ocean data access and competence:
   - Artificial intelligence
   - Rapidly evolving cybersecurity landscape
   - Data quality and trustworthiness
   - Regulatory compliance

First Step: IODE-GOOS Data Workshop

- Addressing the need to harmonise digital capacity across IOC, leveraging what exists
  - Identify roles and synergies
  - Develop a joint vision
  - Technical solutions identified
  - Coordination & future planning

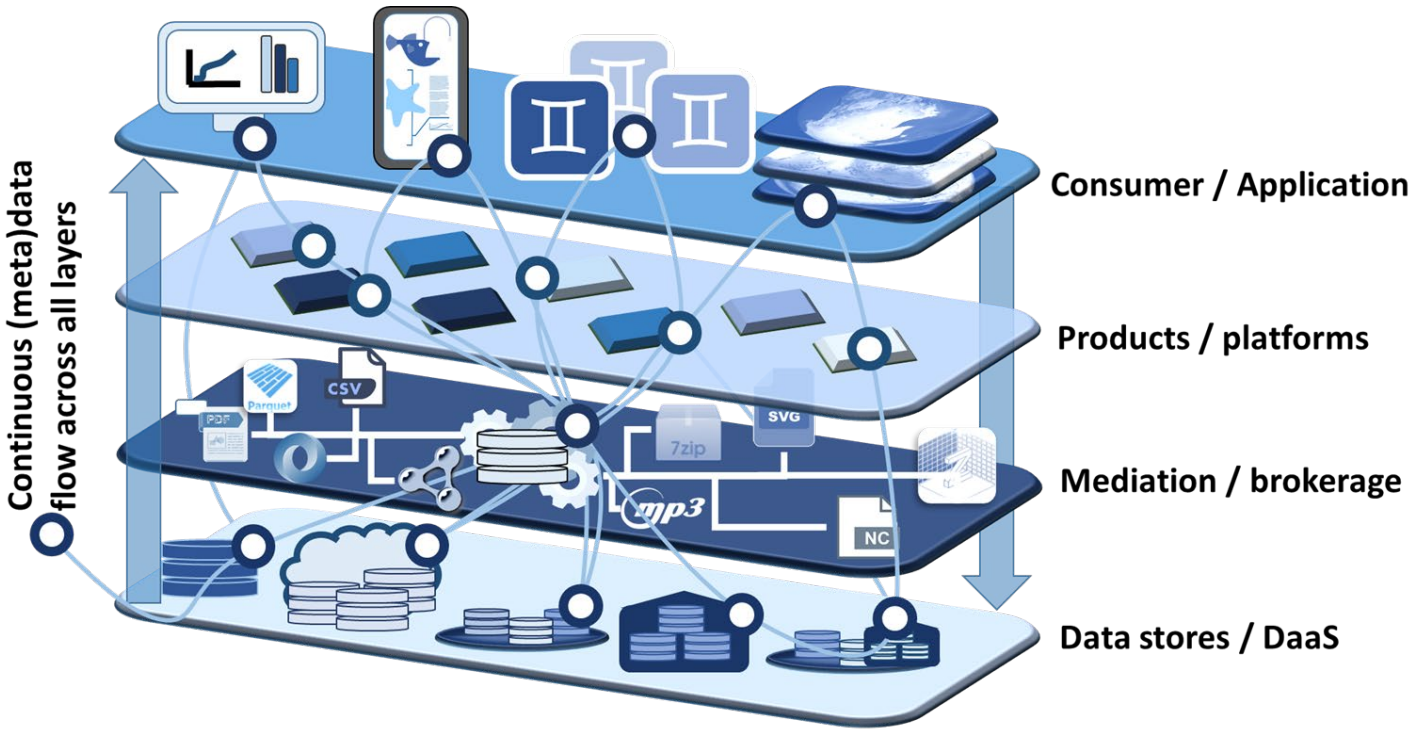
- Collaboration across IOC: GOOS, IODE, Ocean Science Section, Tsunami Unit, and Ocean Decade, and connection to WMO systems
- Interim cross-IOC Working Group to develop the concept proposal over three working meetings

unesco
Intergovernmental Oceanographic Commission

Sep 30 - Oct 02 2024

IOC Data Architecture Concept

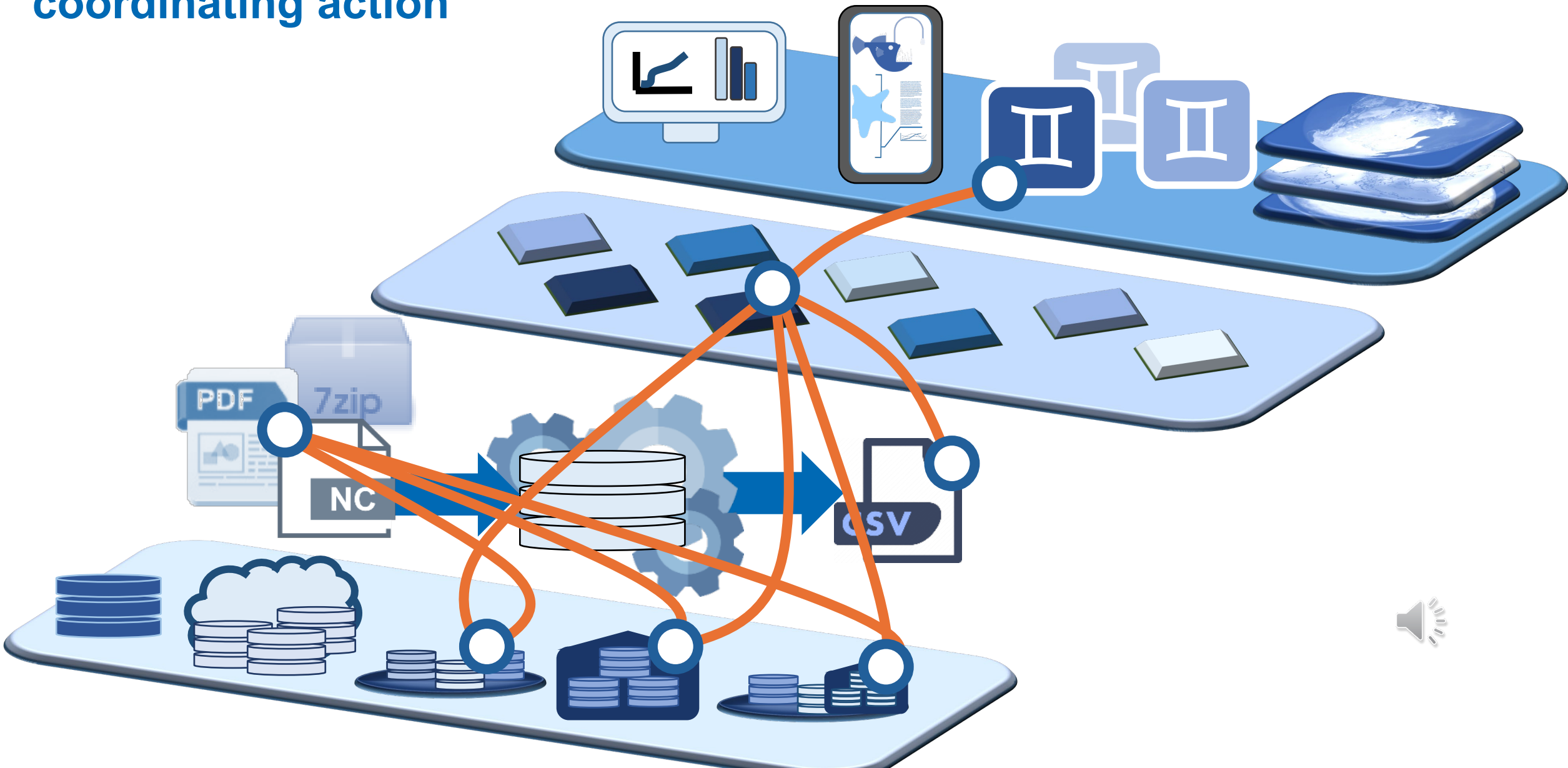
unesco
Intergovernmental Oceanographic Commission



A Data Fabric model

- Allows existing systems to run without major modification / costs
- Allows national data systems to connect and work with IOC more easily
- Inter-system communication for transparency and intelligence sharing
- Data products (e.g. EOV data products) and services (e.g. OBIS APIs) can use resources across all IOC data systems more efficiently

Data Architecture: coordinating action



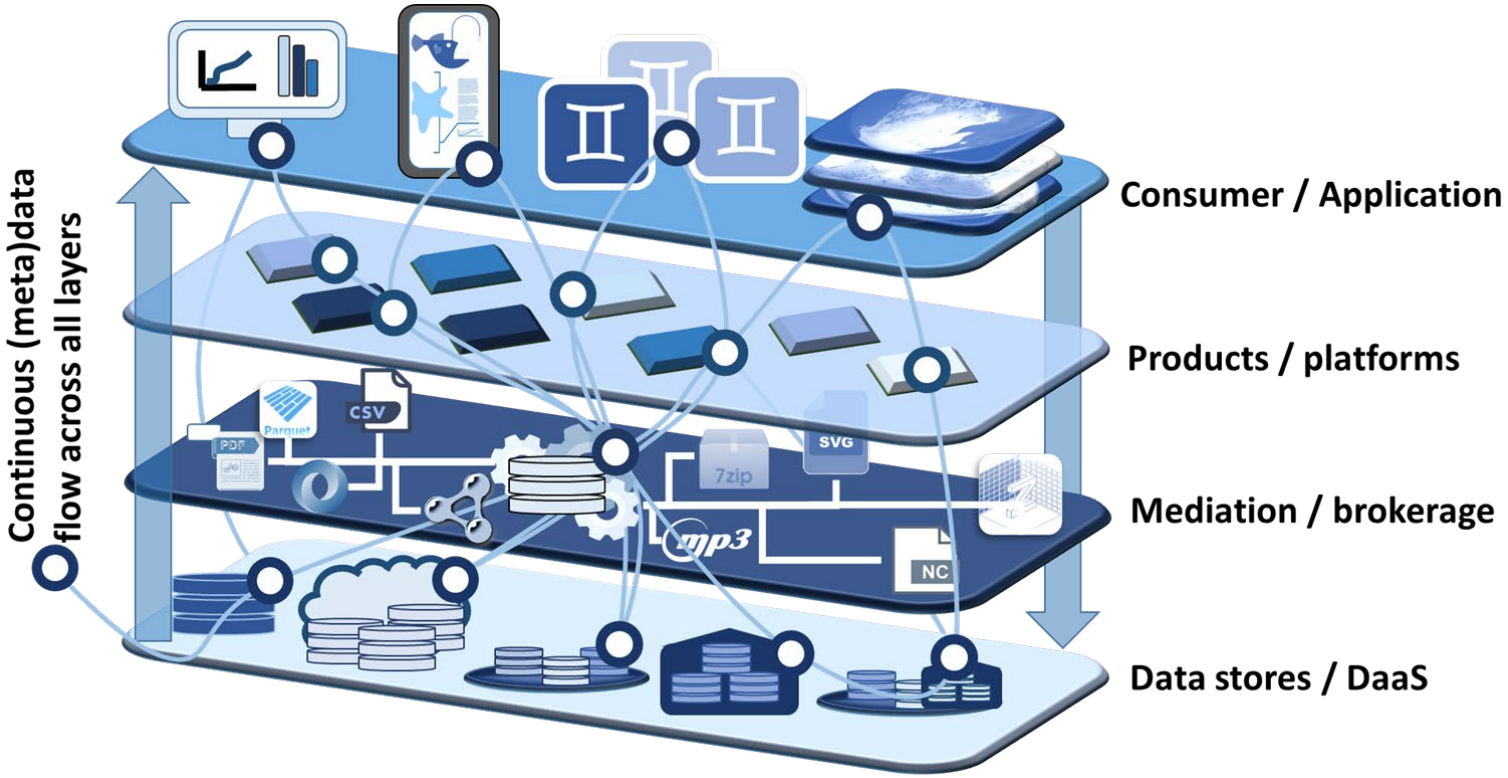
The core value

What will the IOC Data Architecture enable?

unesco
Intergovernmental
Oceanographic
Commission

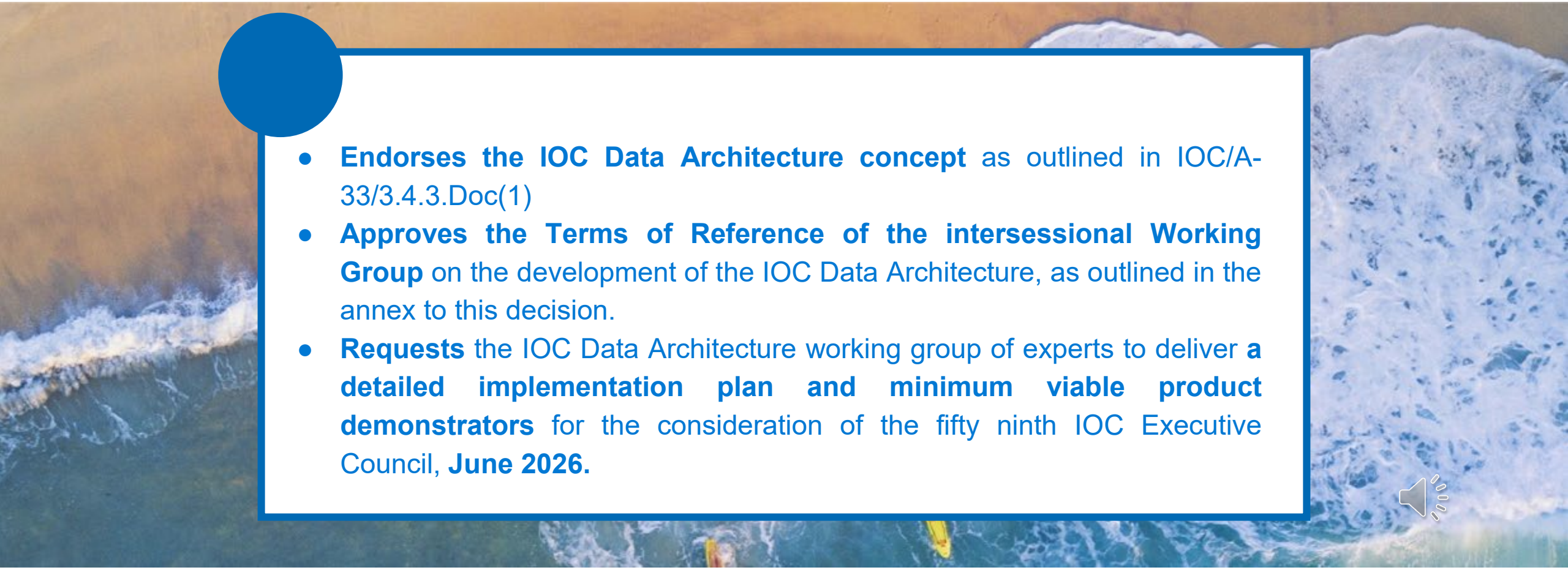
The IOC Data Architecture will consolidate and enhance IOC's digital assets and global value

It will simultaneously improve internal coordination and increase the impact of investment



IOC Assembly: Decision A-33/3.4.3 proposes that the IOC Assembly:

unesco
Intergovernmental Oceanographic Commission



- **Endorses the IOC Data Architecture concept** as outlined in IOC/A-33/3.4.3.Doc(1)
- **Approves the Terms of Reference of the intersessional Working Group** on the development of the IOC Data Architecture, as outlined in the annex to this decision.
- **Requests** the IOC Data Architecture working group of experts to deliver **a detailed implementation plan and minimum viable product demonstrators** for the consideration of the fifty ninth IOC Executive Council, **June 2026.**

IOC Member State support

unesco
Intergovernmental Oceanographic Commission

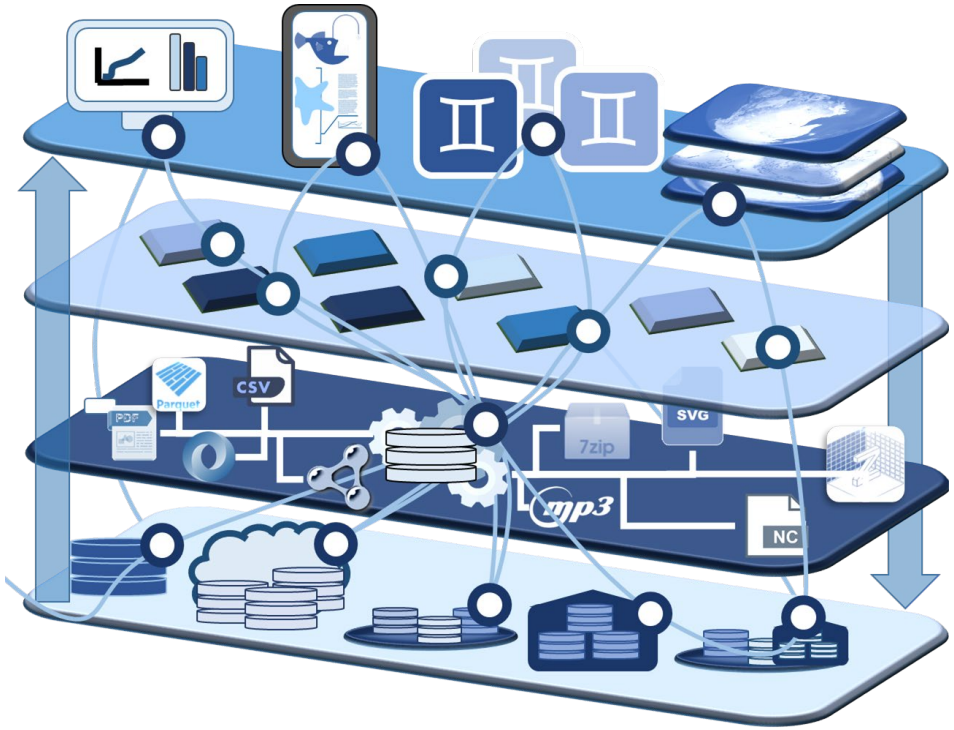
- **Approve** the IOC Data Architecture concept and the development of its implementation plan
- **Engage with co-development**: Tell us how the Architecture can address your priorities and how to effectively connect data systems, products, and services from your nation
- **Resource mobilisation** to create the core IOC Data Architecture and to connect national assets

unesco
Intergovernmental
Oceanographic
Commission

THANK YOU

IOC Data Architecture Concept

unesco
Intergovernmental
Oceanographic
Commission

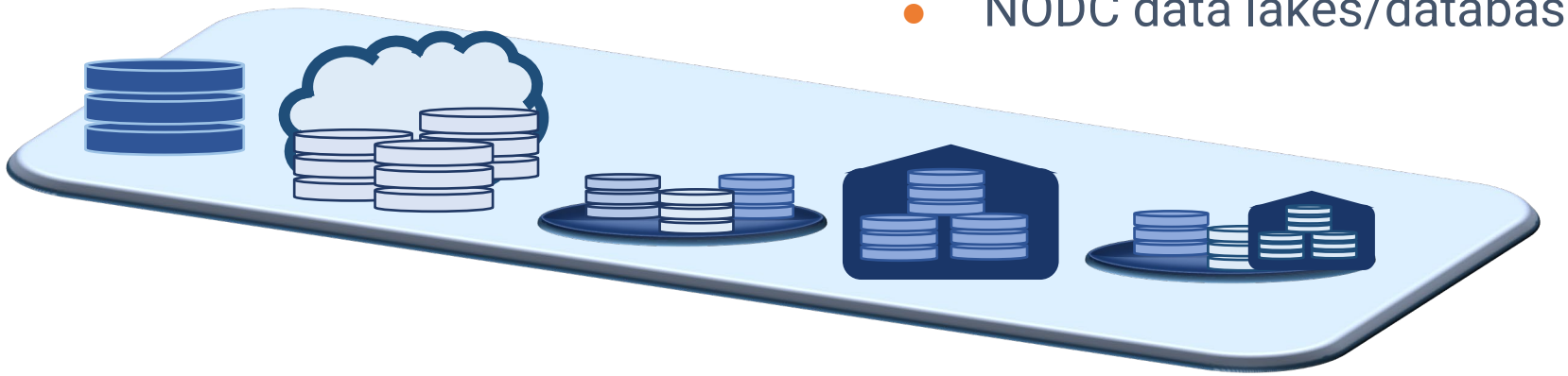


A brief tour of data fabric's layers

Layer 1: Data sources

Examples

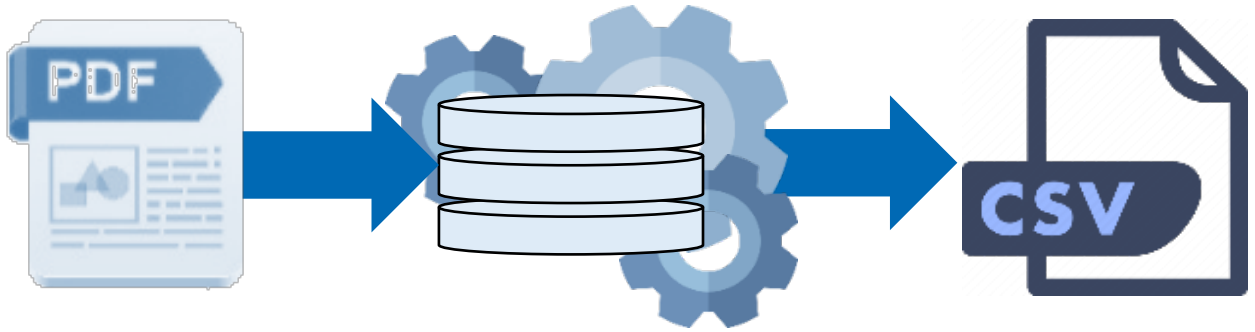
- GOOS G/DACS
- OBIS Node repositories and DACs
- Tsunami databases
- NODC data lakes/databases



Data stores / DaaS

ODISCat registering and verifying all sources

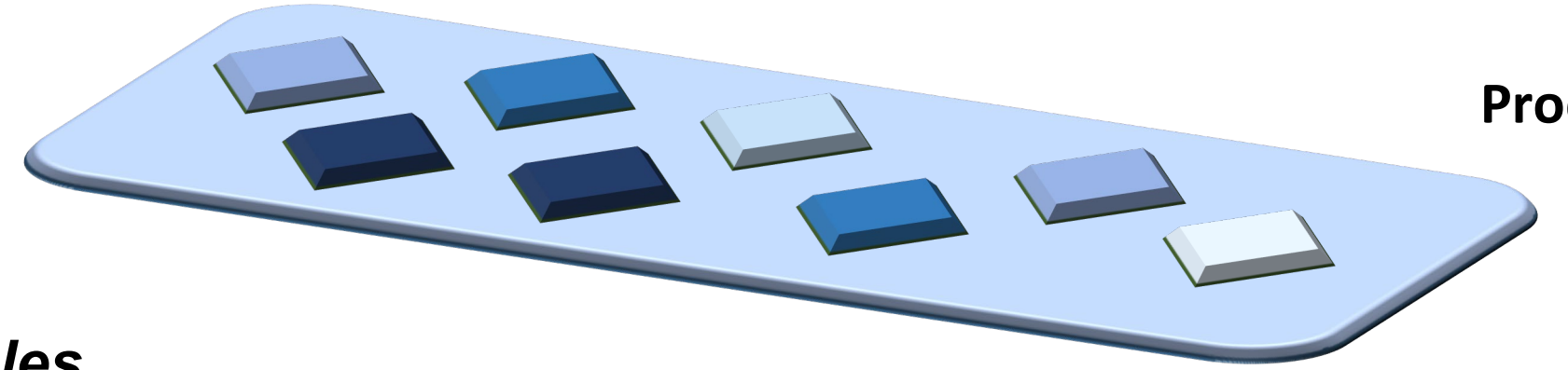
Layer 2: Data mediation and brokerage – EXAMPLE



- GOOS OCG ERDDAP Data Mediation Server
- IODE ODIS Knowledge Graph Services
- OBIS DwC-compliant data, QC, annotation & web services

Mediation / brokerage

Layer 3: Products and access platforms - EXAMPLE



Products / platforms

Examples

- GOOS Essential Ocean Variable products and services
- Ocean Science Section data products for SDGs, e.g., Oxygen
- GOOS OceanOPS operational services
- ODIS RDF-compliant Knowledge Graph products
- OBIS OBIS species and habitat distributions, ecosystem health indicators, bioinvasion alerts

Layer 4: Consumer and Application layer

Consumer / Application

Examples

- OBIS Map Services
- ODIS Search and Discovery Interfaces
- OceanOps operational monitoring interfaces

The “stitching” across the fabric

ODIS

Continuous (meta)data flow across all layers