OceanViz

Emphatically visualizing ecosystems

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Funded by
the European Union

MarinePlan

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OceanViz

Emphatically

visualizing

ecosystems

Rationale

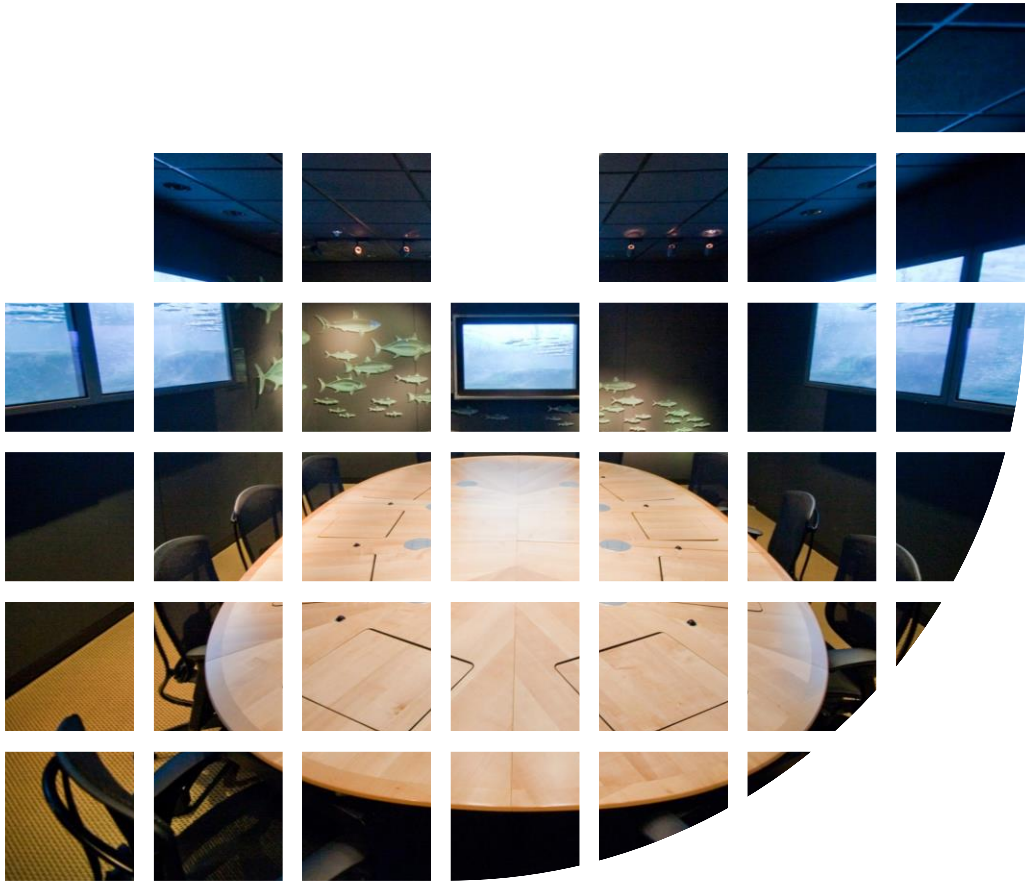
Spatial optimization and planning tools cannot look into the future to assess how their advice pay play out

Ecosystem models can do this, but they are complex to operate and interpret

2004: Concept

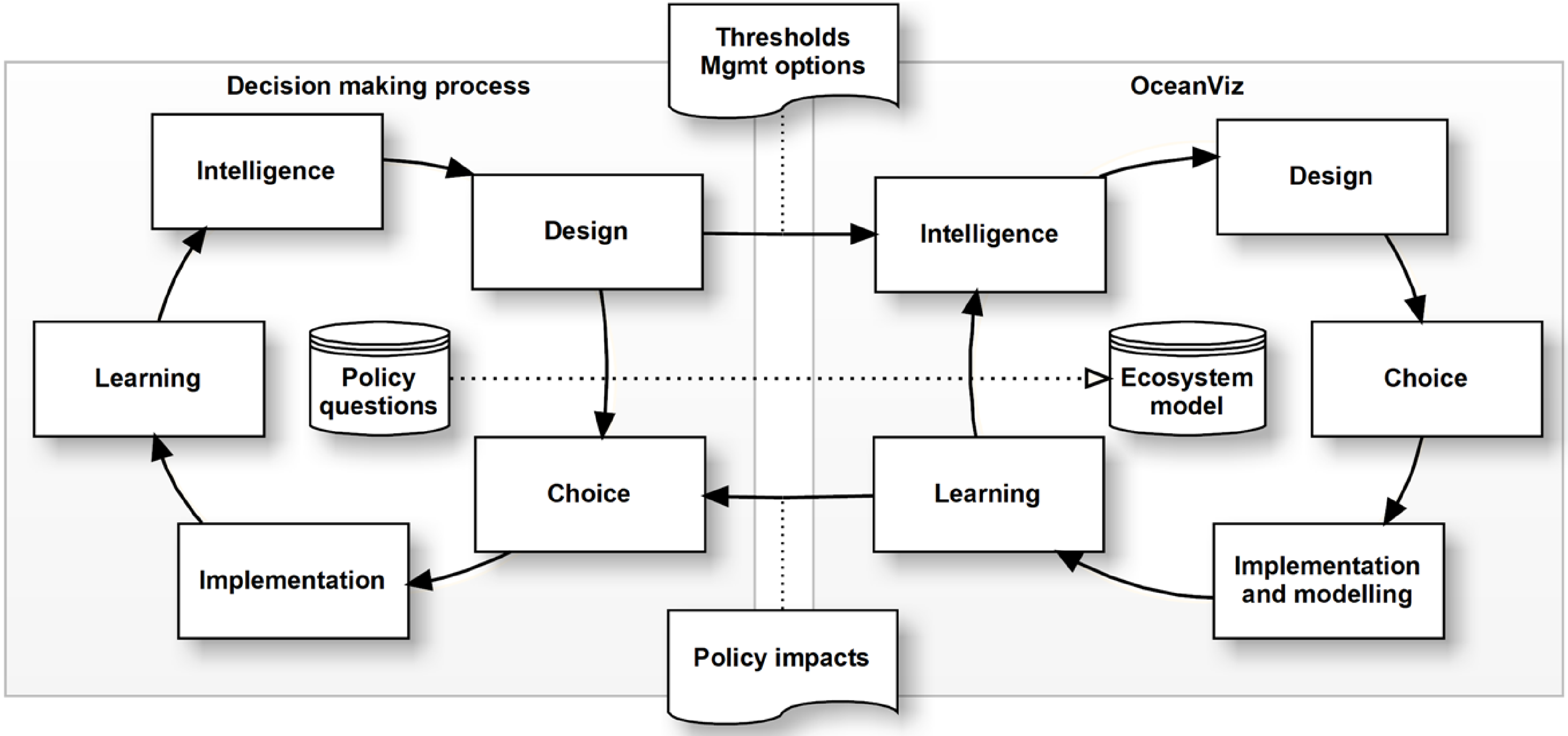
- Interlink models with 3D gaming technologies to show how planning options may affect the ecosystem
- Interactively explore planning options / future scenarios
- Use virtual ecosystems to complement scientific data
- Foster dialogue and discussions

2006: OceanViz v1



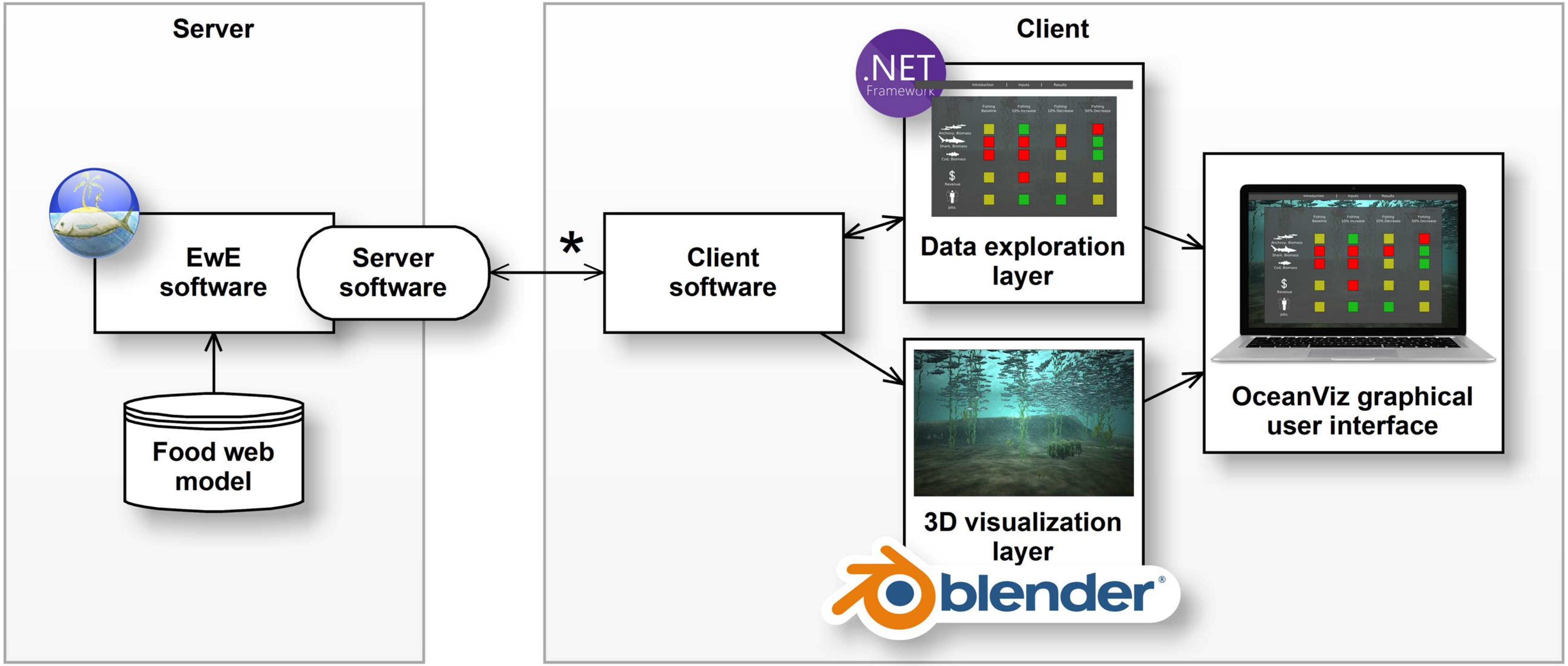
Concept

Integrating modelling into a decision making process



Steenbeek et al. 2021

Architecture



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The power of 3D animations

Data-driven dynamics

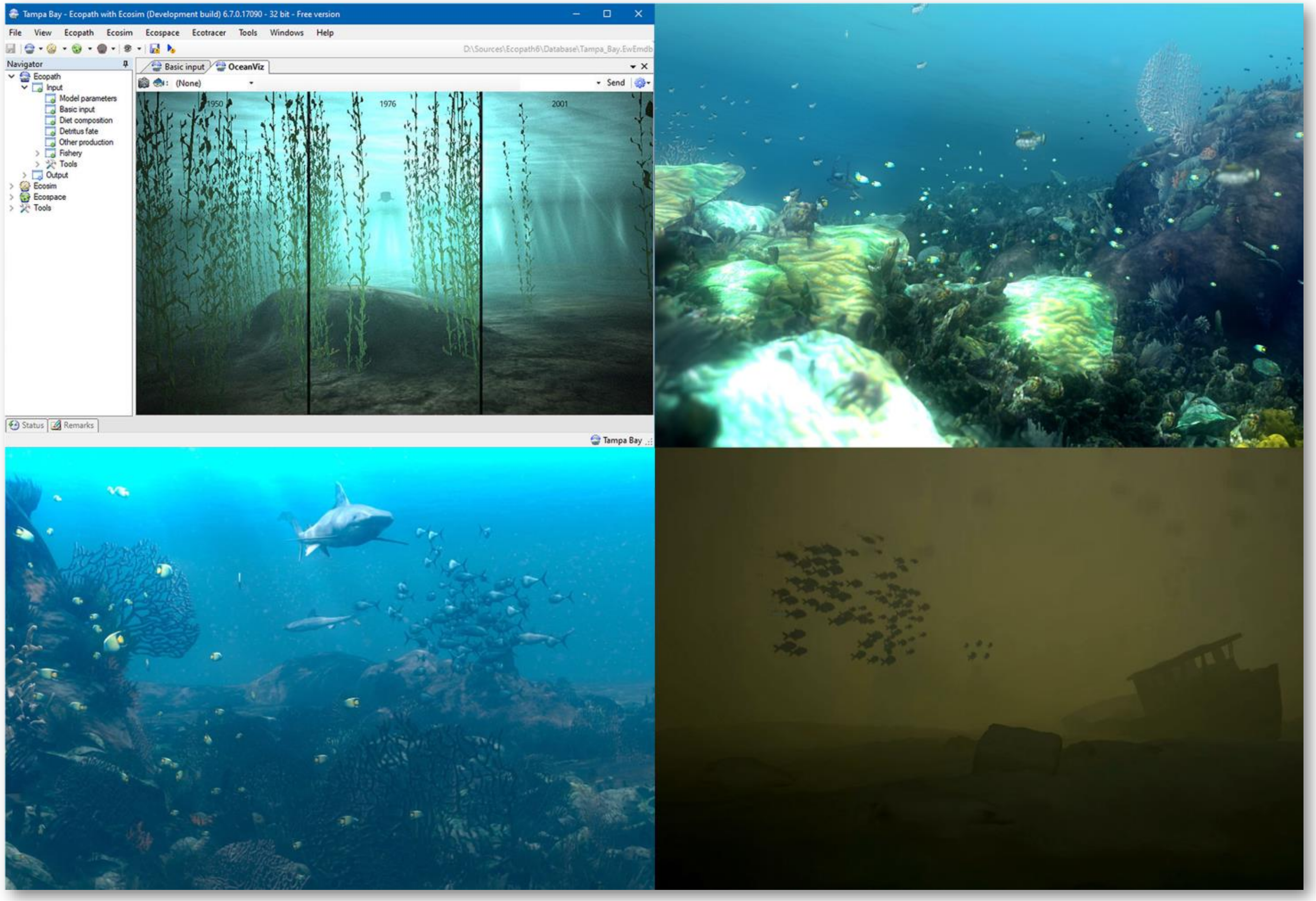
- Δ Biomass → Dynamic populations
- Δ Nutrients, ecosystem health → Ambience

Artistic freedom

- 3D fish and plants, location, proximity
- Light penetration
- Depth of view
- Colour attenuation

Challenges

- View entire ecosystem
- Performance vs. realism
- Simplified behaviour



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Showing change

Animating change is not that easy…

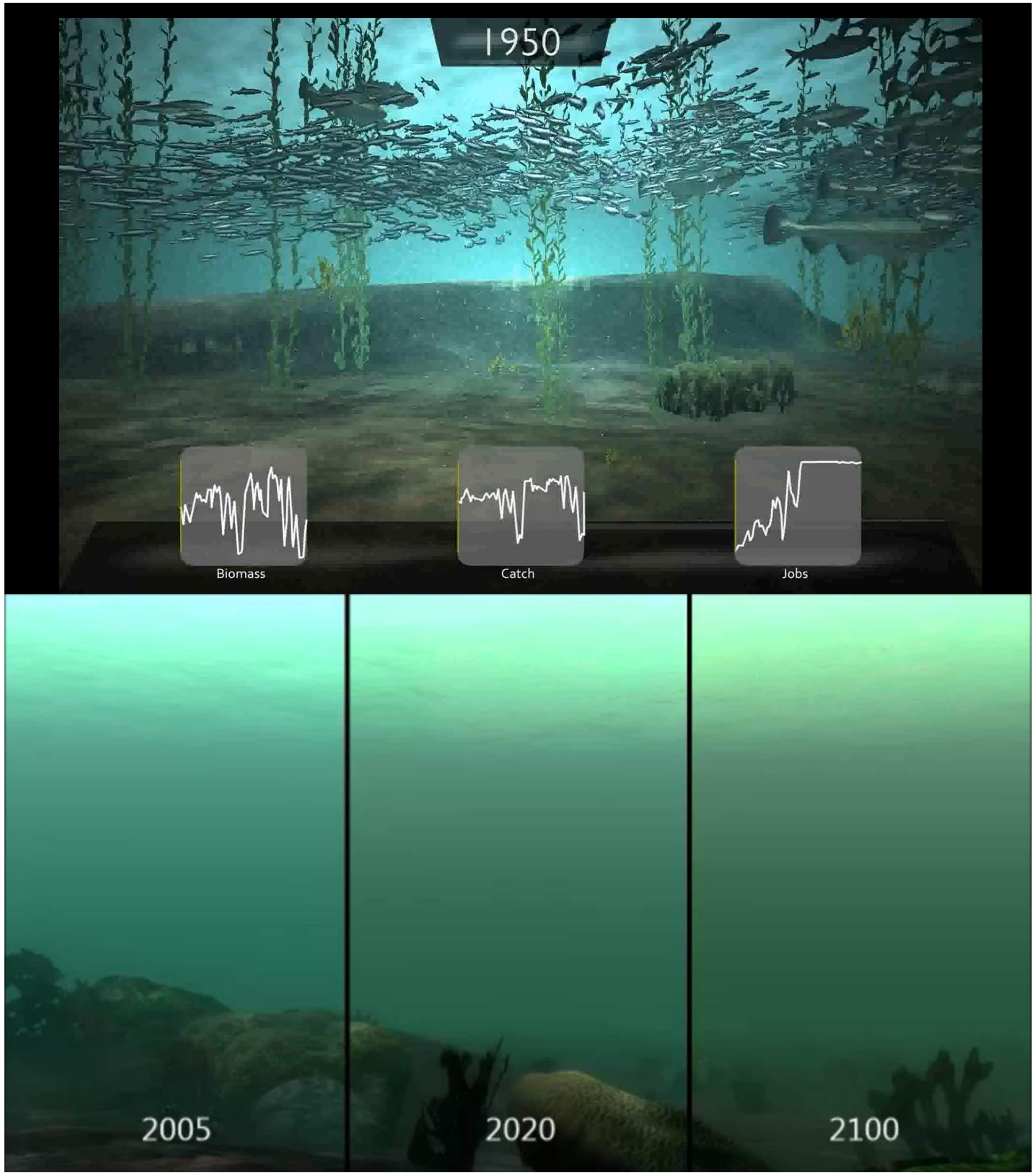
- Ecological models computer over time
- Showing change in 3D is not straight-forward

First attempts

- Gradually animate ecosystem change
- Bad idea because of “Shifting baselines”: Viewer adapts and forgets starting conditions

Solution

- Panels show “time slices” of a model simulation
- Allows for side-by-side comparison across time
- Visually impactful, empathic connections



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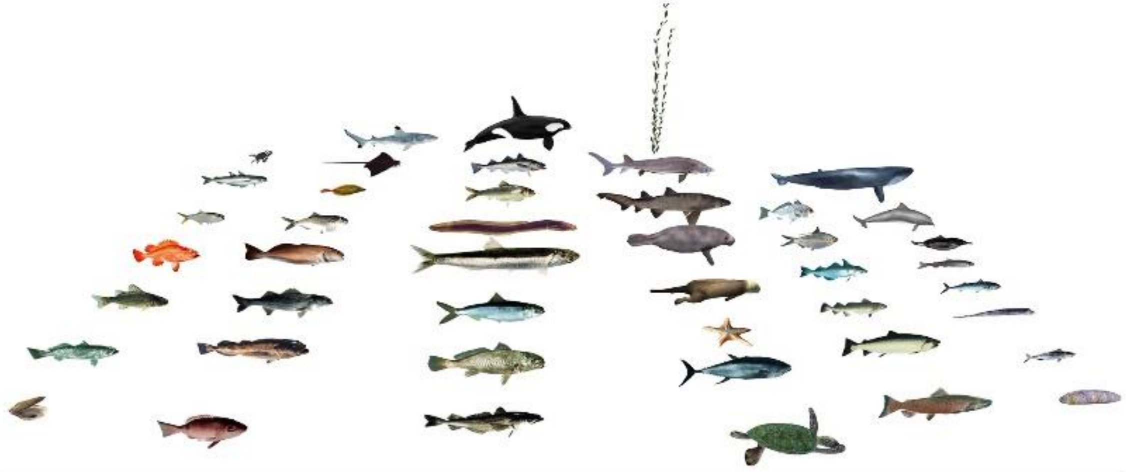
The power of 3D animations

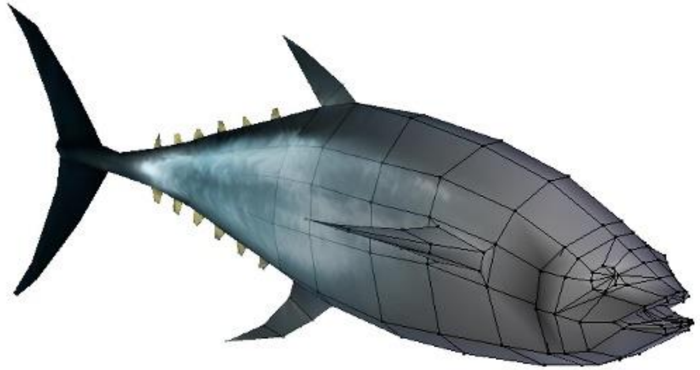
Technical

- A programmable underwater visualization engine
- Offers data connectivity, user interactivity
- Contains 200+ species, intelligent spawning and positioning

2006-2013

- Has been used for movies to disseminate studies
- Has been used as a “kiosk game”
- Proof-of-concept as a DST





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Reality

It didn't fly

OceanViz was ahead of its time

Uphill battle

- Computer hardware and software capabilities
- Building OceanViz sessions was costly and time consuming
- Stakeholder involvement was a novel concept

Naiveté

- Stakeholders were not interested in “showing their cards”

OceanViz went dormant for about 10 years

OceanViz revival

EU projects MarinePlan and NECCTON

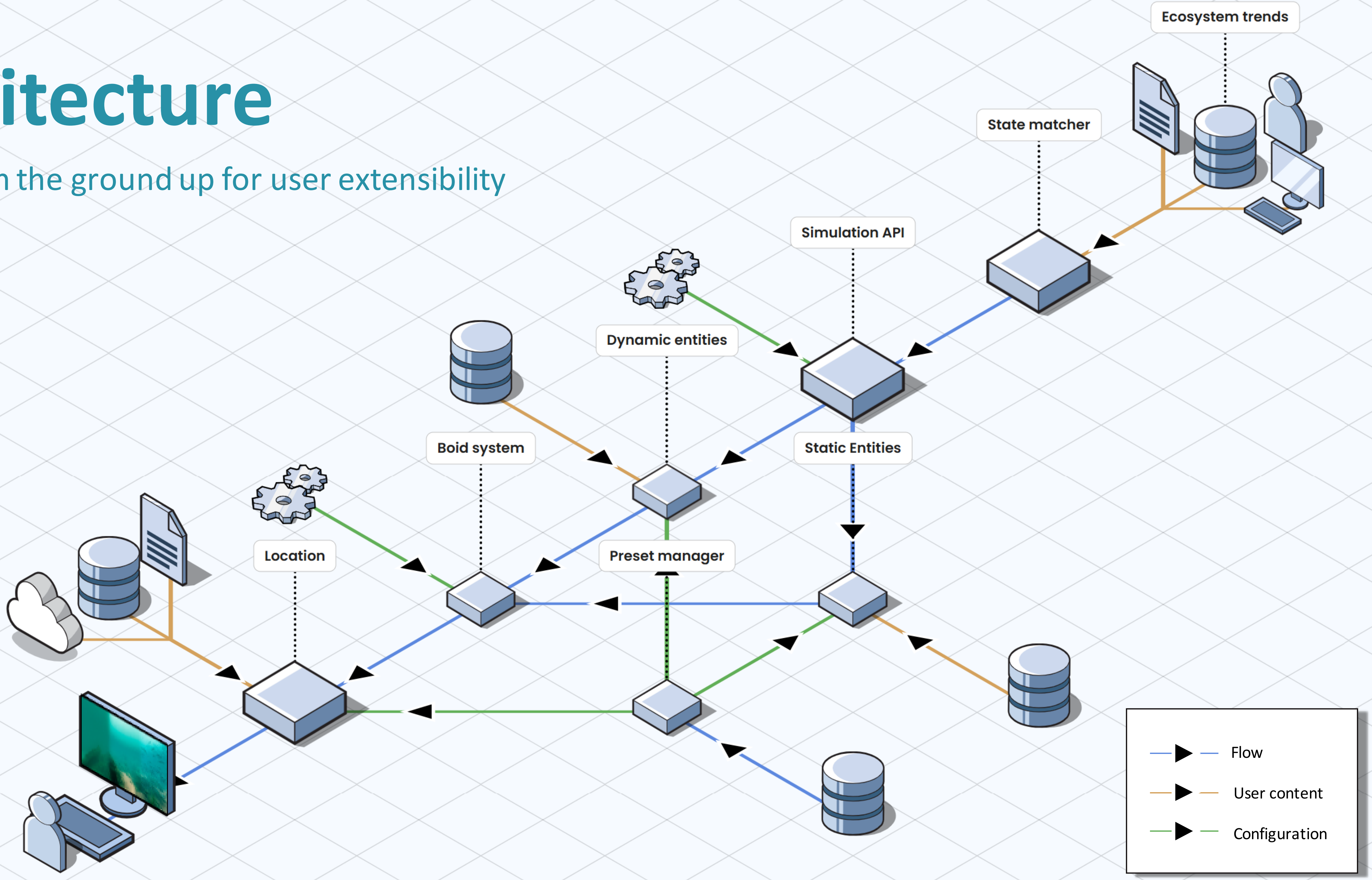
- Move OceanViz from the deprecated Blender engine to Unity
- Improve the bits that worked, and learn from earlier mistakes
- Recast in a modular and open-source framework
- Build and support a user community
- Abstraction of data flows / open to any use case
- Abstraction of connectivity / open to any integration
- Simple to use and simple to extend

>>> A LEGO box for visualizing marine ecosystem change >>>

NECCTON
NEW COPERNICUS CAPABILITY FOR TROPHIC OCEAN NETWORKS

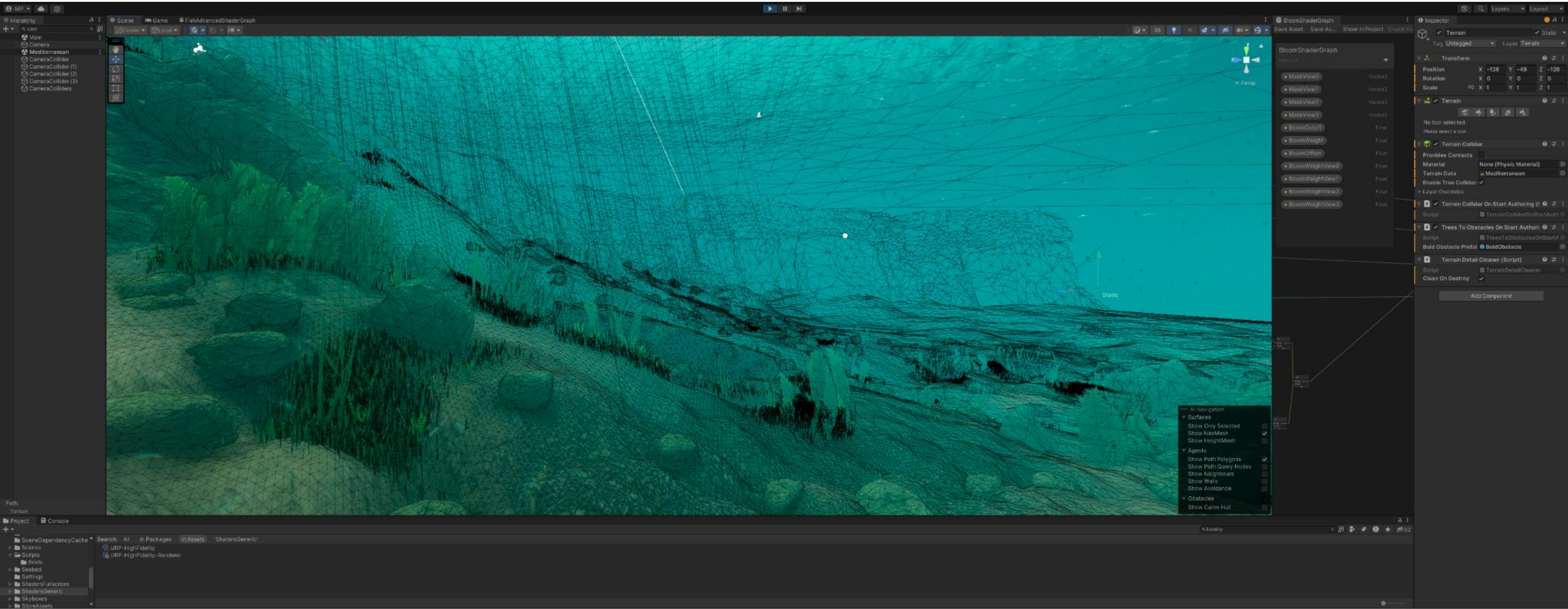
Architecture

Rebuilt from the ground up for user extensibility



Features

An open-source application, built with free development software



Features

Extensible library of physical environments

Features

An extensible library of animated 3D assets

Features

Rule-based placement of features

Features

Split-screen to convey ecosystem change

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Western Med CS

Putting

it all

together

What’s next?

Development roadmap in a world of uncertain academic funding

Sustain OceanViz long-term and foster wide adoption

- Keep building, one project at the time
- Give each project exactly what they need whilst building out OceanViz

Features

- Show any aquatic ecosystem in the world
- Procedural generation of realistic 3D ecosystems (LLMs fed by data streams)
- Expand to past and deep past ecosystems
- Expand to above water / terrestrial ecosystems

Community support

- Build (web-based) user interfaces for configuring and extending OceanViz
- Build tutorials and how-to videos re use and integration
- Work with you

Resources

Research Papers:

Steenbeek, J., Felinto, D., Pan, M., Buszowski, J., & Christensen, V. (2021). Using Gaming Technology to Explore and Visualize Management Impacts on Marine Ecosystems. *Frontiers in Marine Science*, *8*. https://doi.org/10.3389/fmars.2021.619541

Steenbeek, J., Pan, M., Łyczkowski, P. (in prep). OceanViz v3 – an Open-Source Toolkit in Unity for the 3D Visualization of Marine Ecosystems

Development progress

Source code: www.github.com/Official-EwE/oceanviz
Updates: www.youtube.com/@EcopathWithEcosim

Thank you!

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Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programmes HORIZON-CL6-2021-BIODIV-01-12 under grant agreement No 101059407 and by UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee grant numbers 10038951 & 10050537. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or UK Research and Innovation. Neither the European Union nor the granting authority can be held responsible for them.

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