The Vision for a LifeWatch ICT Infrastructure

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The LifeWatch ICT infrastructure is envisioned as a network of services providing secure access to biodiversity and related data and to analytical and modelling tools by individual and collaborative groups of researchers. The system combines the ideas of Open Distributed Processing, Spatial Data Infrastructures and Grid Computing to allow scientists to create collaborative virtual laboratories across multiple organisations. While the emphasis will be on the open sharing of data and workflows (and associated provenance information) with others, users will be able to control access where necessary.

Show Cases

User and site requirements are captured using several Show Cases, examples of the type of work done by taxonomists, ecologists and other biologists. From each Show Case, we extract a set of Biodiversity Research Capabilities. The aim is to identify the primitive capabilities with which biologists work. A biologist can then combine these capabilities in order to recreate the work of a Show Case or to create other arbitrary and novel experiments.
For Biodiversity Research Capabilities that are ICT based, we can similarly identify Technical Capabilities which must be present in the LifeWatch Architecture in order for the capability to be available. These Technical Capabilities depend on the Technical Elements, which are available to LifeWatch, particularly the data, hardware and software resources.

Showcase: Bioclimatic Modelling and Global Climate Change

Aim: Model the envelope of climatic and ecological conditions under which a species lives to calculate a potentially wider set of areas where the species might occur, or predict its future distribution under changing climatic conditions.

Research Capabilities

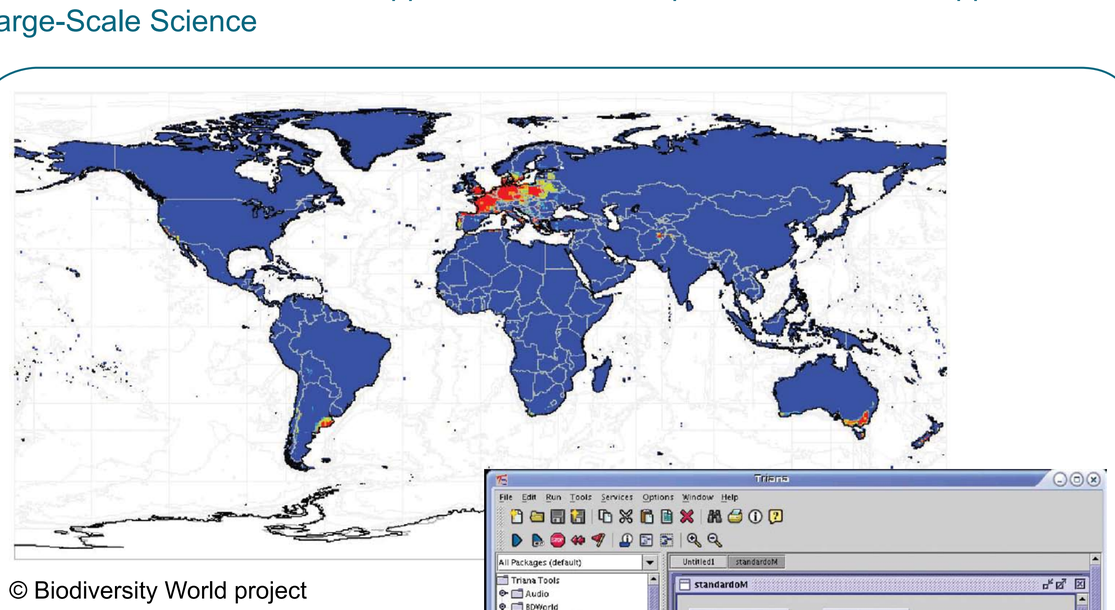
- Establish the envelope of climatic and ecological conditions under which a species lives
- Calculate a wider set of areas where the species might occur
- Predict its future distribution under changing climatic conditions
- Project predicted species distribution onto a map of the world

Technical Capabilities

- Access species occurrence data
- Access to regional climate data
- Access to bioclimatic modelling tools
- Execute workflow to perform modelling on occurrence and climate data
- Create species distribution map
- Display and interact with species distribution map

Reference

J. S. Pahwa et.al. (2006). *Accessing Biodiversity Resources in Computational Environments from Workflow Applications.* Workshop on Workflows in Support of Large-Scale Science



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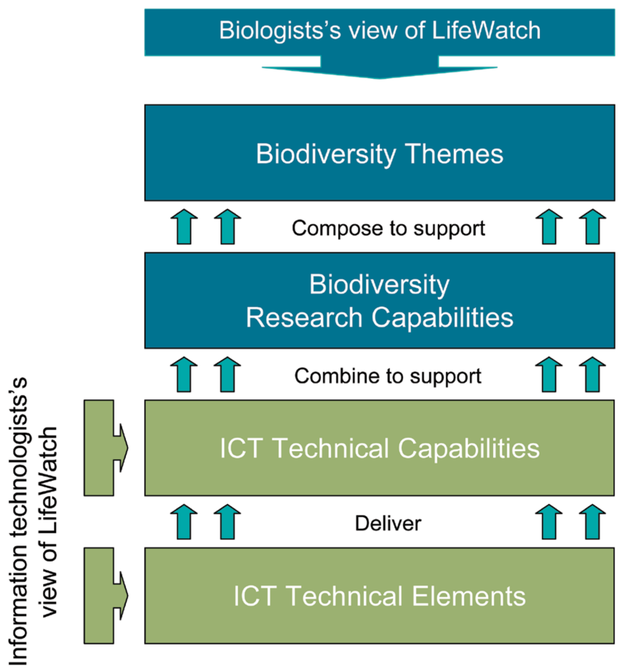
The LifeWatch Difference

- one environment for data collection and management, integration, analysis and modelling, presentation
- integration of multiple system levels: genomic → organism → habitat → ecosystem → landscape
- interoperability at semantic level
- globally unique identifiers
- workflow storage, editing, enactment
- provenance trail from collection to publication
- arbitrary annotation of data and tools by users
- INSPIRE compliance
- portal interface seamlessly combining resources

LifeWatch Architecture



In order to integrate established technologies from biology, ICT, and other fields, it is necessary to provide interoperability without requiring significant modification to existing resources. LifeWatch will provide a Service-Oriented Architecture where service interfaces provide a uniform "meeting point" for technologies from different fields.

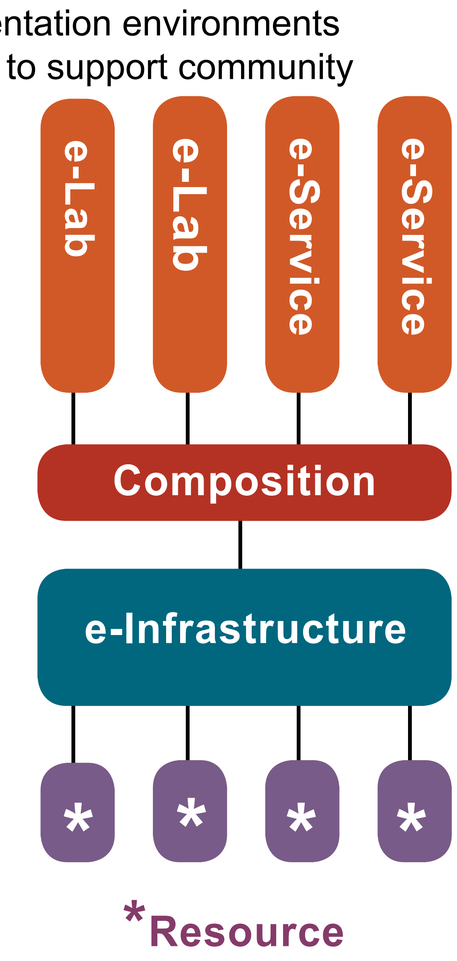
LifeWatch extends the ORCHESTRA Reference Model (based on RM-ODP, ISO/IEC 10746), by introducing generic information models, services and rules appropriate to biodiversity research, to create a LifeWatch Reference Model consisting of:

User Layer providing domain-specific presentation environments for control and monitoring of tasks and tools to support community collaborations, including feedback mechanisms to support data providers

Composition Layer supporting, through a semantic metadata framework for unambiguous discovery and provenance recording, the intelligent selection and combination of services

Infrastructure Layer providing mechanisms for enabling sharing of specific resources as generic services across multiple administrative domains

Resource Layer containing the specific IT resources, such as research observatories and collections, data repositories, computational capacity, sensor networks and analysis tools



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