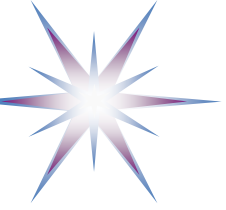


Greening Digital/Research Infrastructure: Complex approach

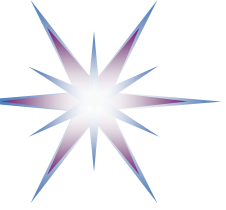
GreenDIGIT project

Yuri Demchenko
University of Amsterdam
TheNetworkingChannel
18 October 2023



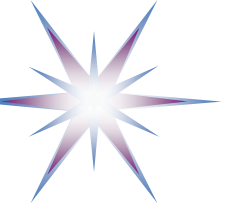
Energy Efficiency – Decarbonisation – Environmental Impact

- **Energy Efficiency in Digital Infrastructures:**
 - **Definition:** This refers to optimizing digital infrastructures to consume as little energy as possible for a given workload or service. It's about achieving more computational or storage results with less energy input.
- **Decarbonization of Digital Infrastructures:**
 - **Definition:** This specifically targets the reduction of carbon emissions associated with the operation and maintenance of digital infrastructures.
- **Reducing Environmental Impact of Digital Infrastructures:**
 - **Definition:** This is a more comprehensive consideration of the various ways digital infrastructures might affect the environment, going beyond just energy consumption and carbon emissions.



Energy Efficiency – Decarbonisation – Environmental Impact

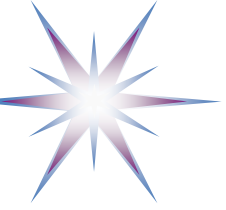
- **Energy Efficiency in Digital Infrastructures:** Design
 - **Definition:** This refers to optimizing digital infrastructures to consume as little energy as possible for a given workload or service. It's about achieving more computational or storage results with less energy input.
- **Decarbonization of Digital Infrastructures:** Operation
 - **Definition:** This specifically targets the reduction of carbon emissions associated with the operation and maintenance of digital infrastructures.
- **Reducing Environmental Impact of Digital Infrastructures:** Lifecycle
 - **Definition:** This is a more comprehensive consideration of the various ways digital infrastructures might affect the environment, going beyond just energy consumption and carbon emissions.



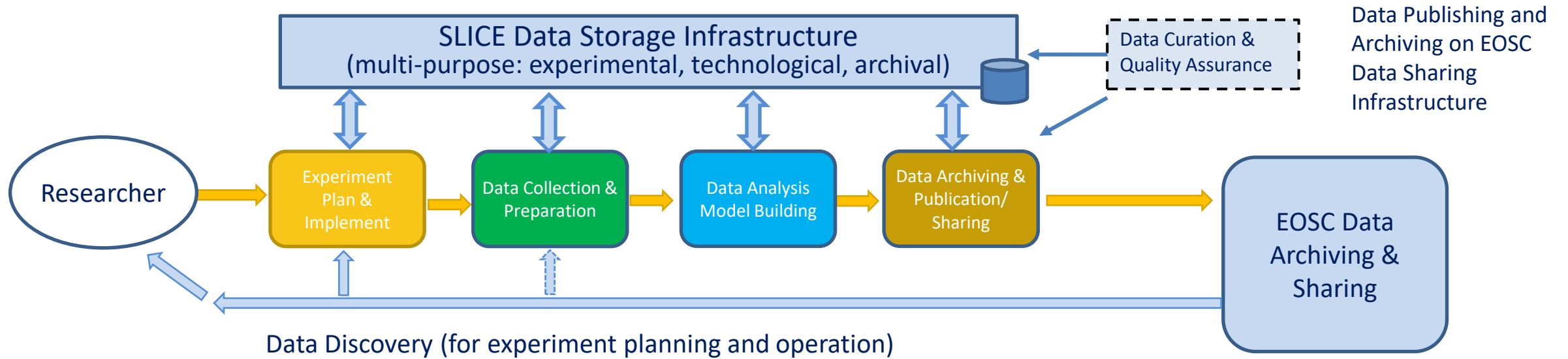
Sustainable/Green IT and RI – Ecosystem Optimisation

Sustainable IT refers to the integration of environmental considerations into the design, manufacturing, use, and disposal of information technology (IT) products and services.

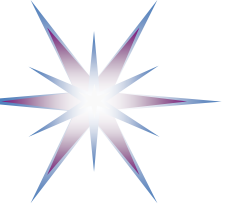
- 1. Software Sustainability:** Building and using software applications in a manner that requires fewer resources
 - Efficient coding practices that use less computational power.
 - Cloud-based services that optimize server loads.
- 2. Energy Efficiency:** Designing and using IT systems and infrastructure that consume less energy
 - Energy-efficient data centers, Power-saving modes on devices.
 - Energy-efficient cloud computing solutions.
- 3. Reducing Carbon Footprint:** Minimizing the greenhouse gas emissions associated with IT activities:
 - The energy sources of data centers (e.g., transitioning to renewable energy).
 - The carbon impact of IT supply chains.
- 4. Resource Management and Waste Reduction:** Reducing the use of non-renewable resources in IT products and minimizing e-waste
- 5. Awareness, green practices and education and training**
 - **GreenComp** – Green competences framework for researchers published by EC in 2023



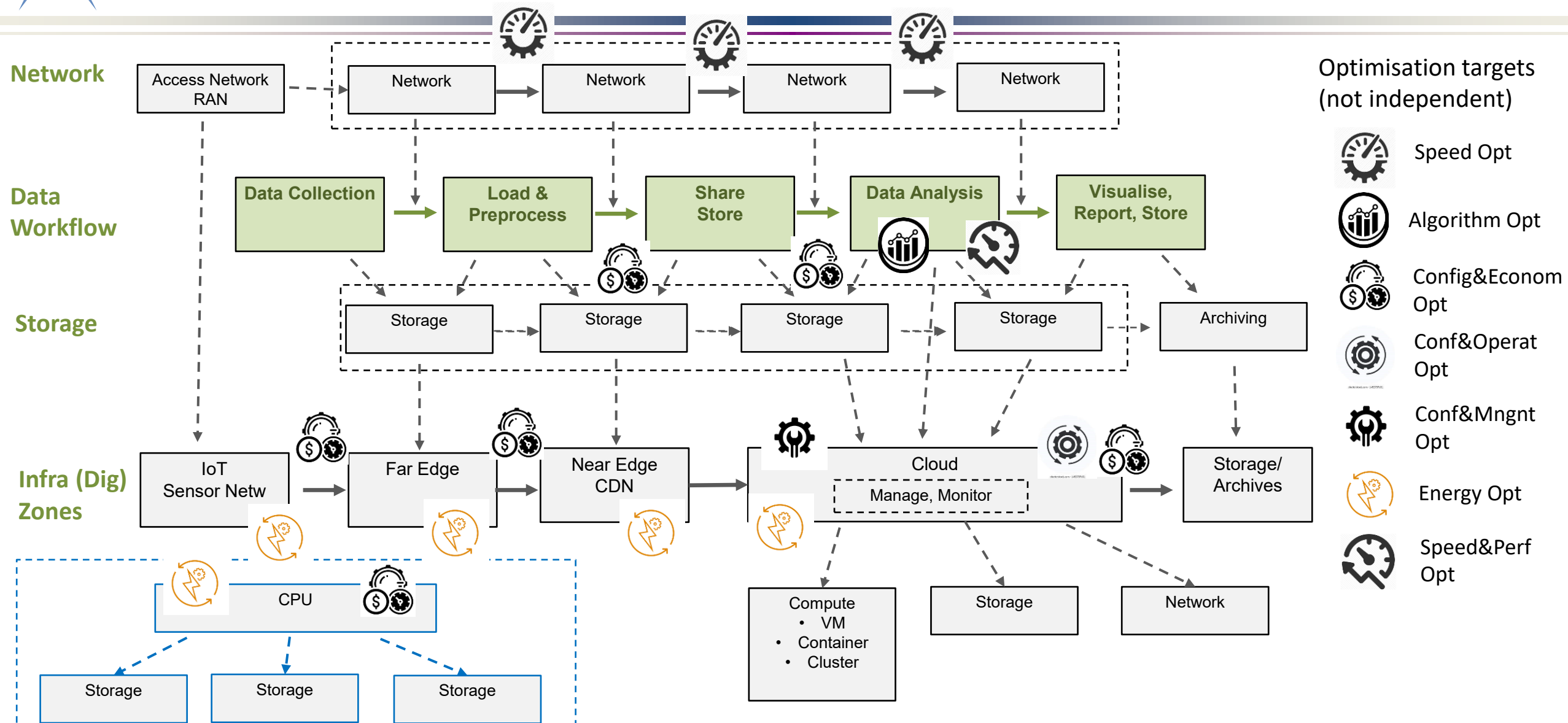
Research (Data) Lifecycle Model and Dataflow – SLICES-RI

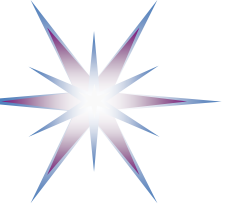


- **Each Data Lifecycle stage**– experiment, data collection, data analysis, and finally data archiving, works with own **data set, which are however connected**. All these data sets need to be stored and possibly re-used in later processes.
- **Energy Efficiency and Environmental Impact must we considered for the whole research (data) lifecycle**



Multi-factor model for Energy Efficiency and Performance Optimisation

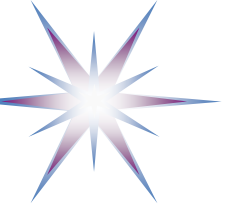




GreenDigit

GreenDIGIT project (2024-2027) – Objectives

- **Assess status and trends** of low impact computing within 4 DIGIT RIs (EGI, SLICES, SoBigData, EBRAINS) and in the broader digital service provider community of ESFRIs, to produce **recommendations and roadmaps** for providers for during and beyond the project.
- **Provide reference architecture and design principles**, as well as an actionable model for RIs about environmental impact assessment and monitoring, reflecting on the **whole RI lifecycle** and including the digital infrastructure components and their interaction with the broader environment.
- **Develop and validate new and innovative technologies, methods, and tools** for digital service providers within European Research Infrastructures through which they can reduce their energy consumptions and overall environmental impact.
- **Develop and provide for researchers technical tools** that assist them in the design, execution and sharing of environmental impact aware digital applications with reproducibility, Open Science and FAIR data management considerations.
- **Educate and support digital service providers and researchers** in the RI communities about good practices on environmental impact conscious lifecycle management and operation of infrastructures and services.



Research Infrastructures Survey:

- The survey will collect information about practices, policies and solutions used by RIs to manage, monitor and optimise energy consumption, their sustainability policies and local conditions compliance. The collected information will be used to identify, map and model the environmental impact that RI can have on the environment.
- **Join: greendigit-survey@list.uva.nl**

Embedding Sustainability aspects in Higher Education curricula:

- Identify and develop a set of curricula topics to support sustainable scientific application development and operation, facilitate effective use of energy saving technologies in all research and industry domains.
- **Join: greendigit-edu@list.uva.nl**