PDC 2021 – ESA's Planetary Defence NEO Coordination Centre DevOps model based Operations

Speaker: **Gianpiero Di Girolamo (ESA Space Safety Ground Segment)**
Co-authors: Johannes Klug, Elmar Brendel. Kamill Panitzek (ESA S2P GS Data Systems)
Alberto Garcia Ruiz, Pablo Hiroshi, Carlo Rafael Barrozzi Pignatari, Sebastian Orozco Pinzon (ESA S2P GS Data Centre) ,
Juan Luis Cano, Detlef Koschny, Angelo Foglietta, Dario Oliviero, Laura Faggioli, Ramona Cennamo, Regina Rudawska, Marco Micheli (PDO),
Ana Maria Teodorescu (ELIA), R. Schneider (ASTOS), Dario Bracali Cioci (SpaceDyS)

7th IAA Planetary Defense Conference - 28/04/2021

Outline

- Introduction
- Ground Segment
- Operations
- Teams
- DevOps approach
- CI/CD Infrastructure
- NEO Resulting DevOps Quadrant
- Achievements

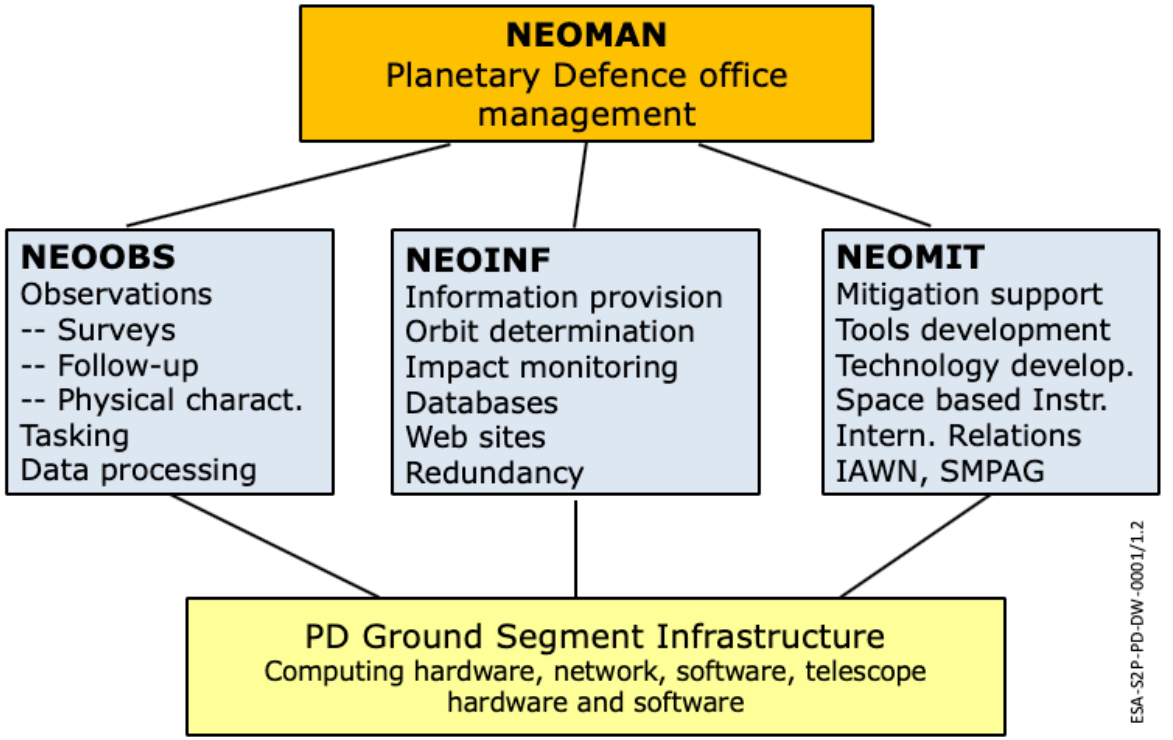
Planetary Defence OPS Pillars and Foundation

Operations

- Observation
- Information Provision
- Mitigation

Ground Segment Infrastructures

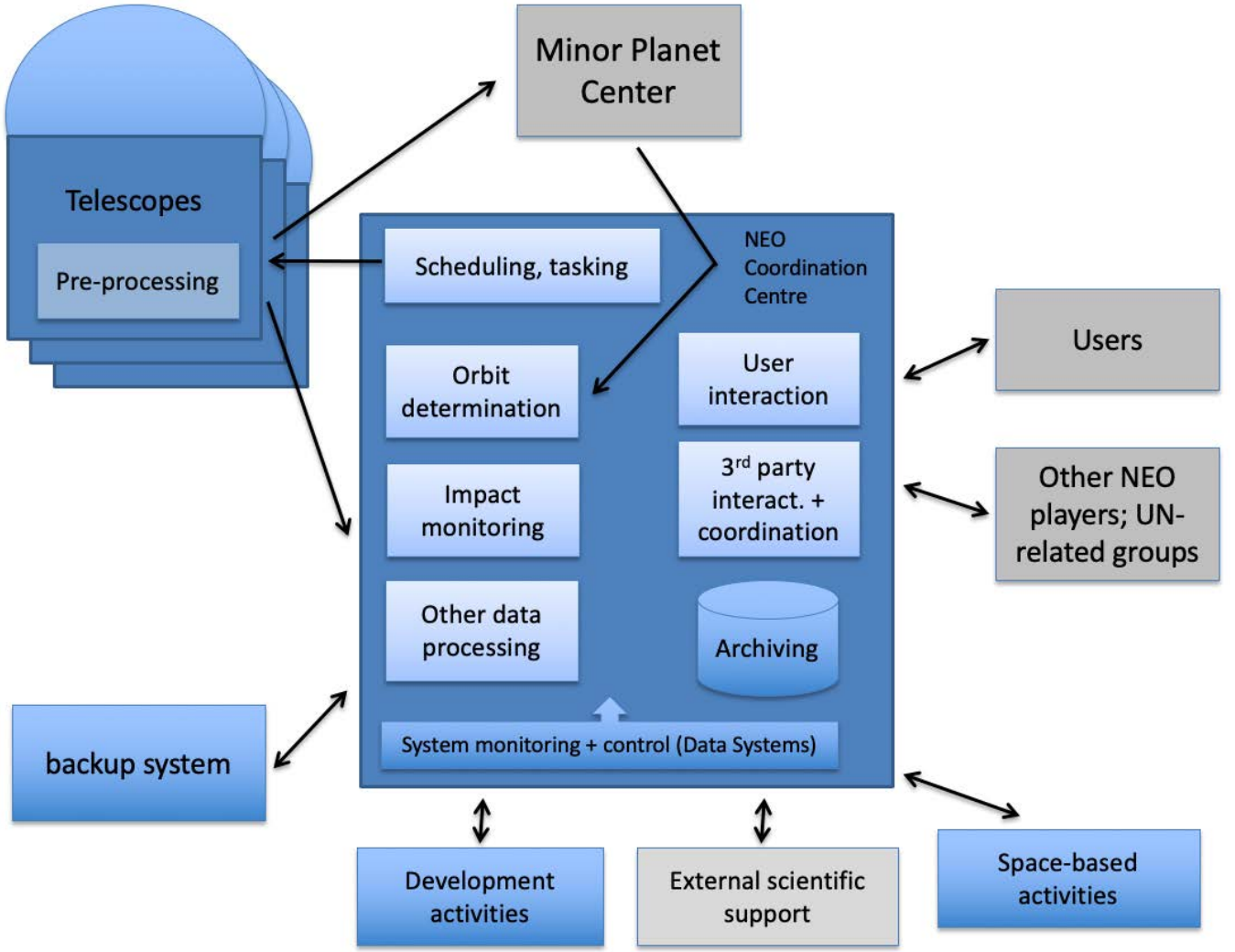
- Asset Engineering
- Development
- Validation
- Deployment
- Monitoring
- Maintenance
- Evolution



Development and Operation heterogeneity

An overall visual representation

- Variety of different activity demanding
  - **Software development**
  - **SLA for data sharing/acquisition**
  - **Consultancy cooperation with external scientist**



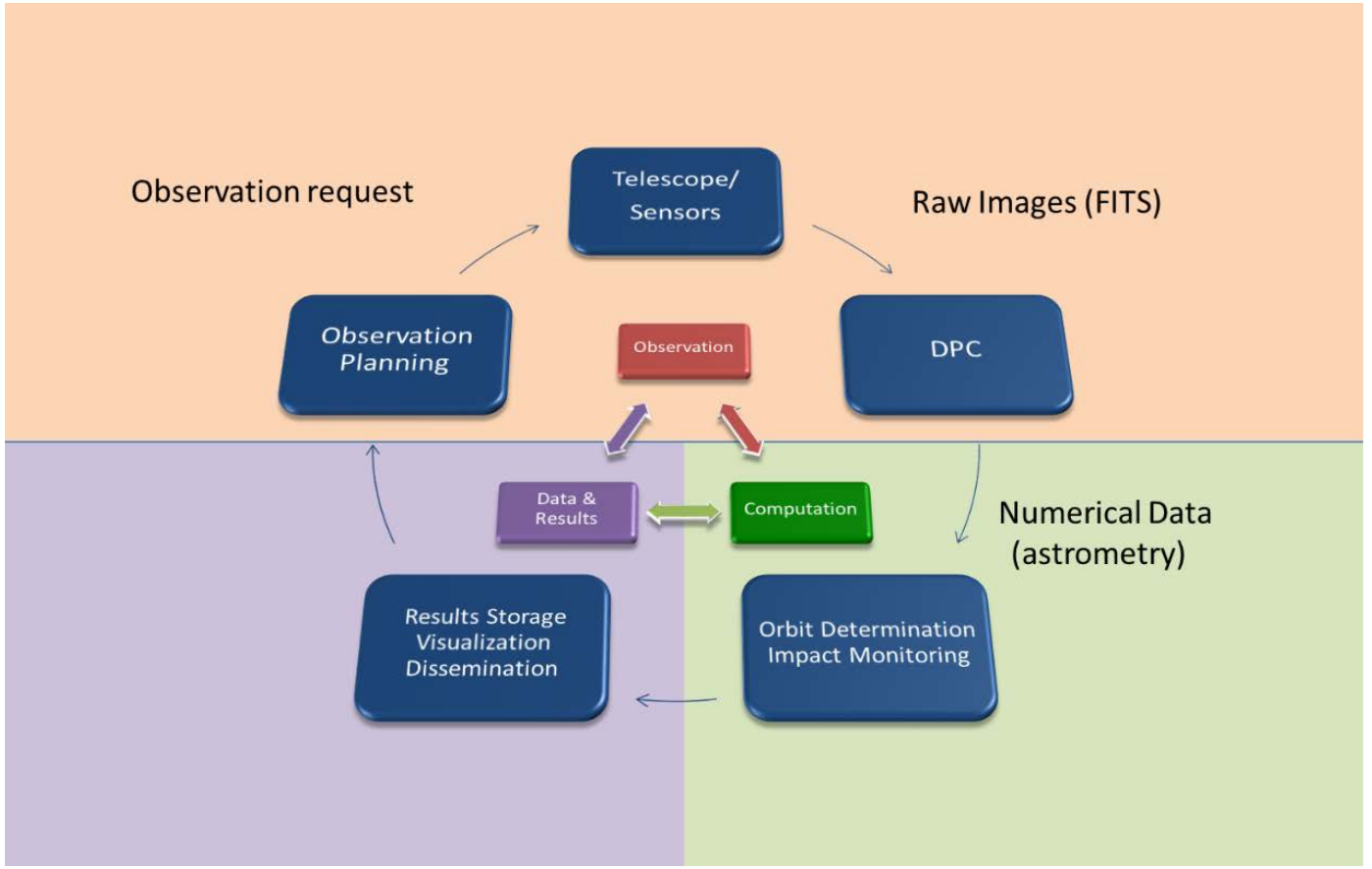
Development and Operation heterogeneity

An overall visual representation

- Variety of different activity demanding
  - Software development
  - SLA for data sharing/acquisition
  - Consultancy cooperation with external scientist

➢ Survey and follow up observation

  - **Big Software development outsourced to Industry**



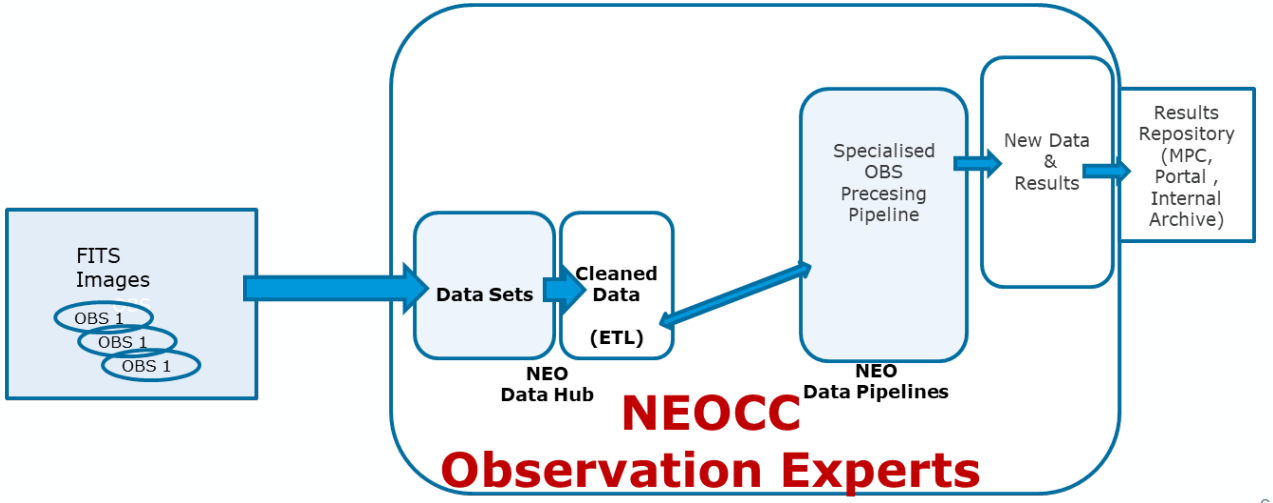
Development and Operation heterogeneity

An overall visual representation

- Variety of different activity demanding
  - Software development
  - SLA for data sharing/acquisition
  - Consultancy cooperation with external scientist
- Survey and follow up observation
  - Big Software development outsourced to Industry

➢ External data acquisition and refinement (in IT terms: Data Management)

- **Micro services, agile in house software development (data pipelines)**



Different Teams, Roles and … locations

Industry
- Operational SW Development
- Many industries

- Spread across Europe

- **Development**

ESA Ground Segment Team
- Data Systems (SW Engineers)
- Data Centre (HW Engineers)

- Located in Darmstadt (Germany)

- **Build, Test, Validation**

PD Operators
- OD/IM
- Observers
- Data (pipelines) Managers

- Located in Frascati (Italy) Darmstadt (Germany) and Nordwijk (Nederland)

- **Operation**

Different Teams, Roles and … locations

ESA Ground Segment Team

- Data Systems (SW Engineers)
- Data Centre (HW Engineers)
- Located in Darmstadt (Germany)

Industry

- Operational SW Development
- Many industries
- Spread across Europe

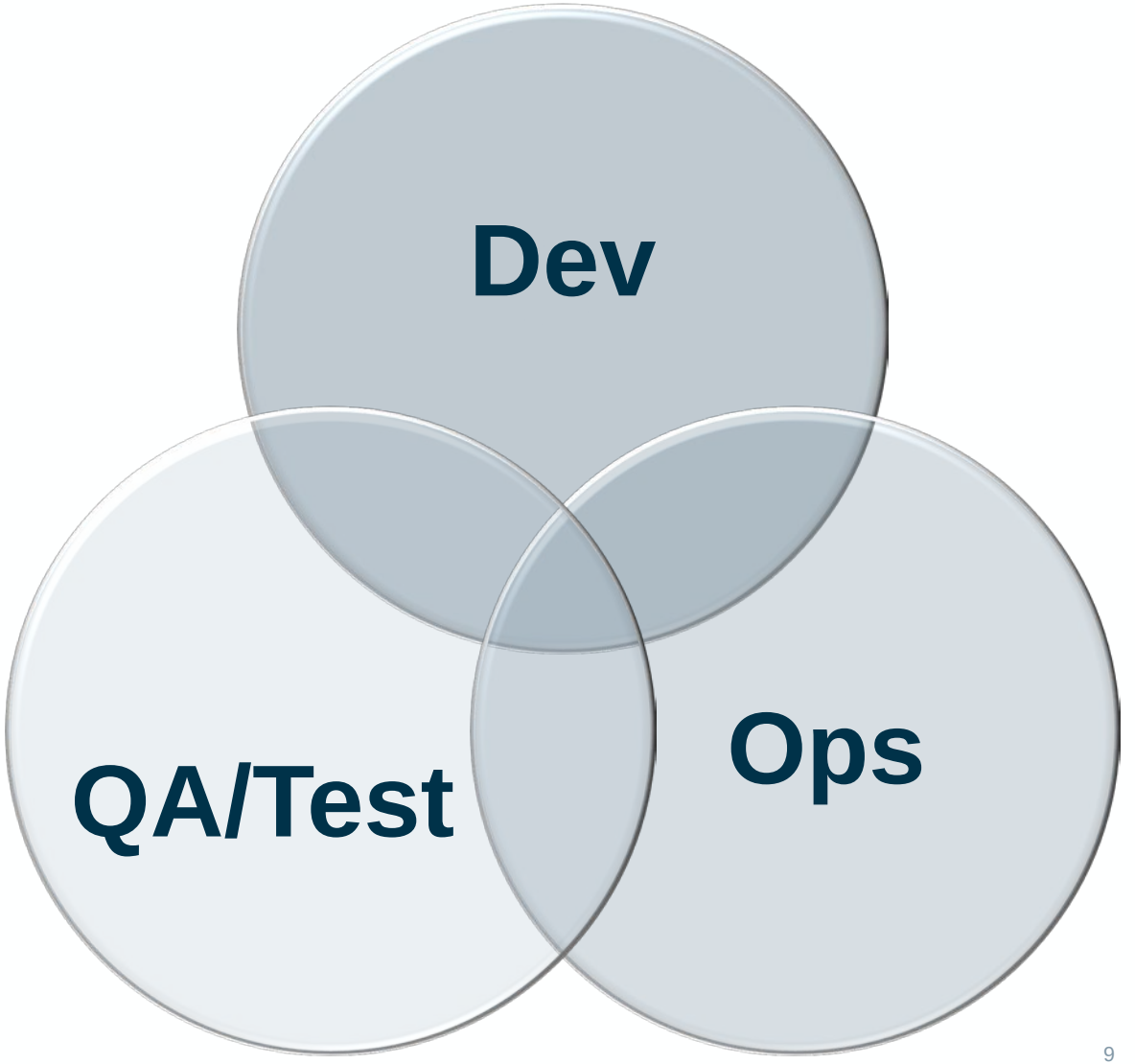
PD Operators

- OD/IM
- Observers
- Data (pipelines) Managers
- Etc
- Located in Frascati (Italy) Darmstadt (Germany) and Nordwijk (Nederland)

Evolve a Working Model towards DevOps

DevOps model fuses:

- Development
- QA/Testing/Validation
- Operation



Evolve a Working Model towards DevOps

DevOps model fuses:

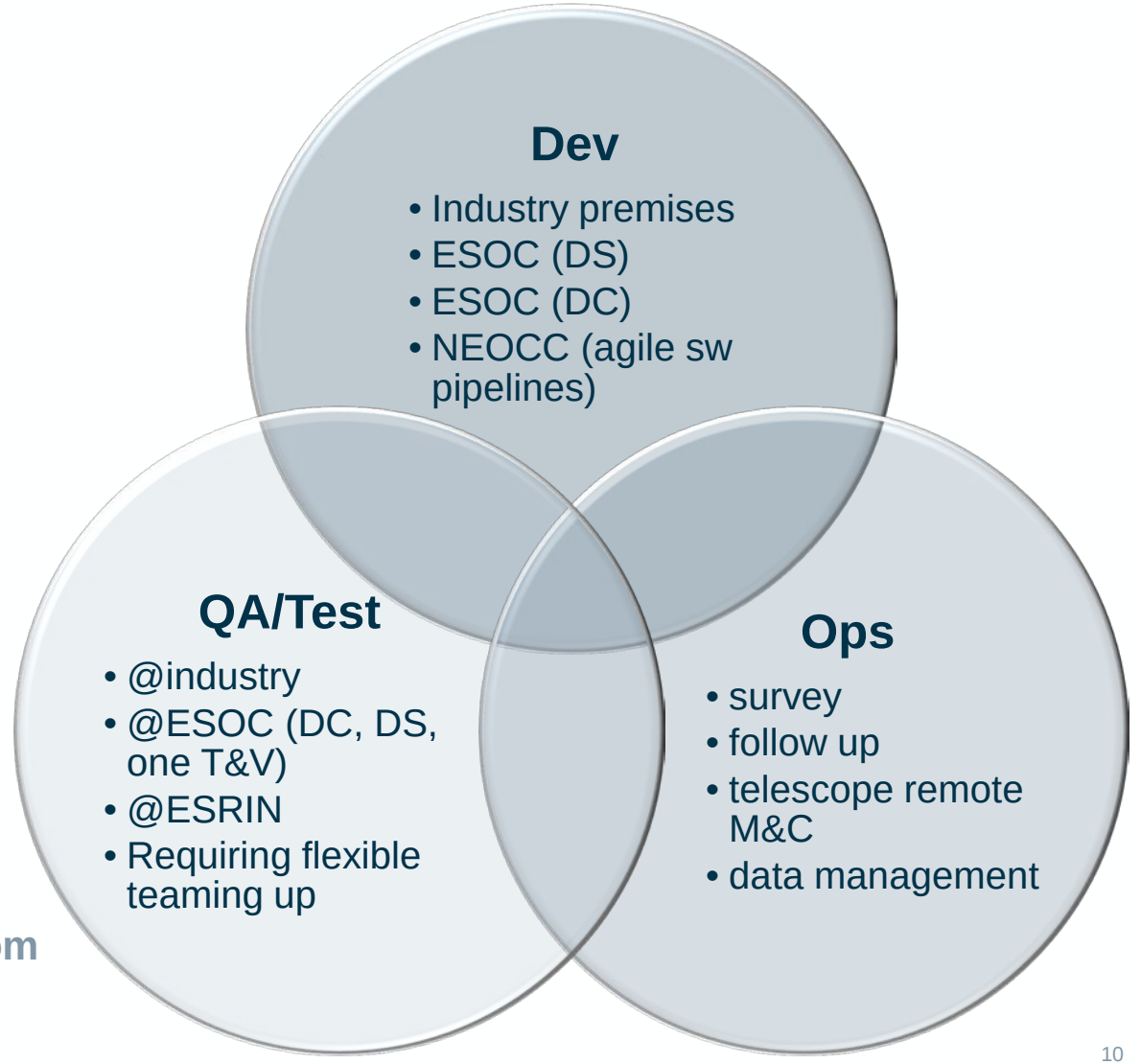
- Development
- QA/Testing/Validation
- Operation

NEO Peculiarity

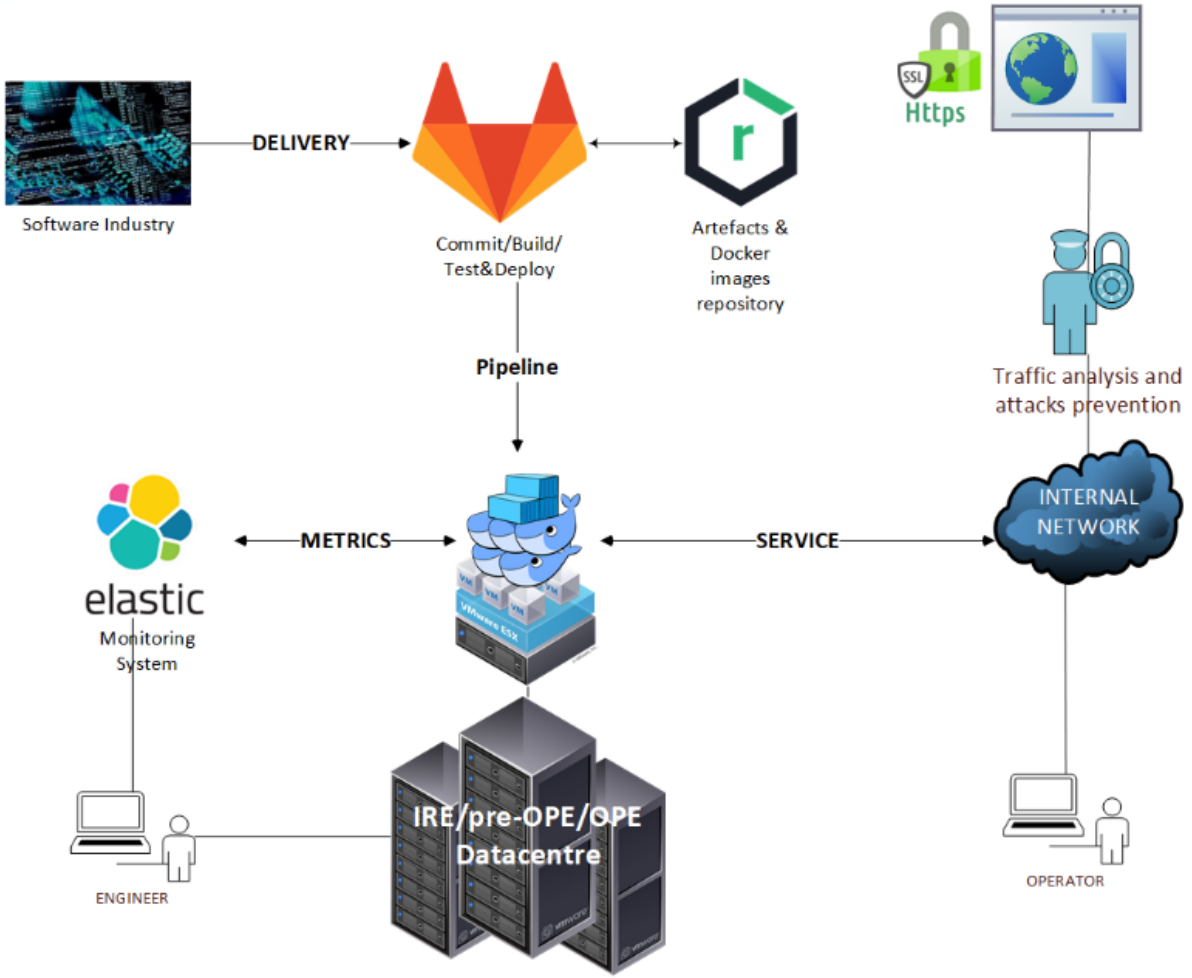
- **Different Development's cycles**
  - **Long (Industrial Procurement)**
  - **Short (NEOCC Op need agile SW changes)**
- **Different Teams location**
  - **Offsite (ESOC, ESA, Industry)**
  - **Onsite (NEOCC)**

➢ **This demands the definition of an efficient working model**

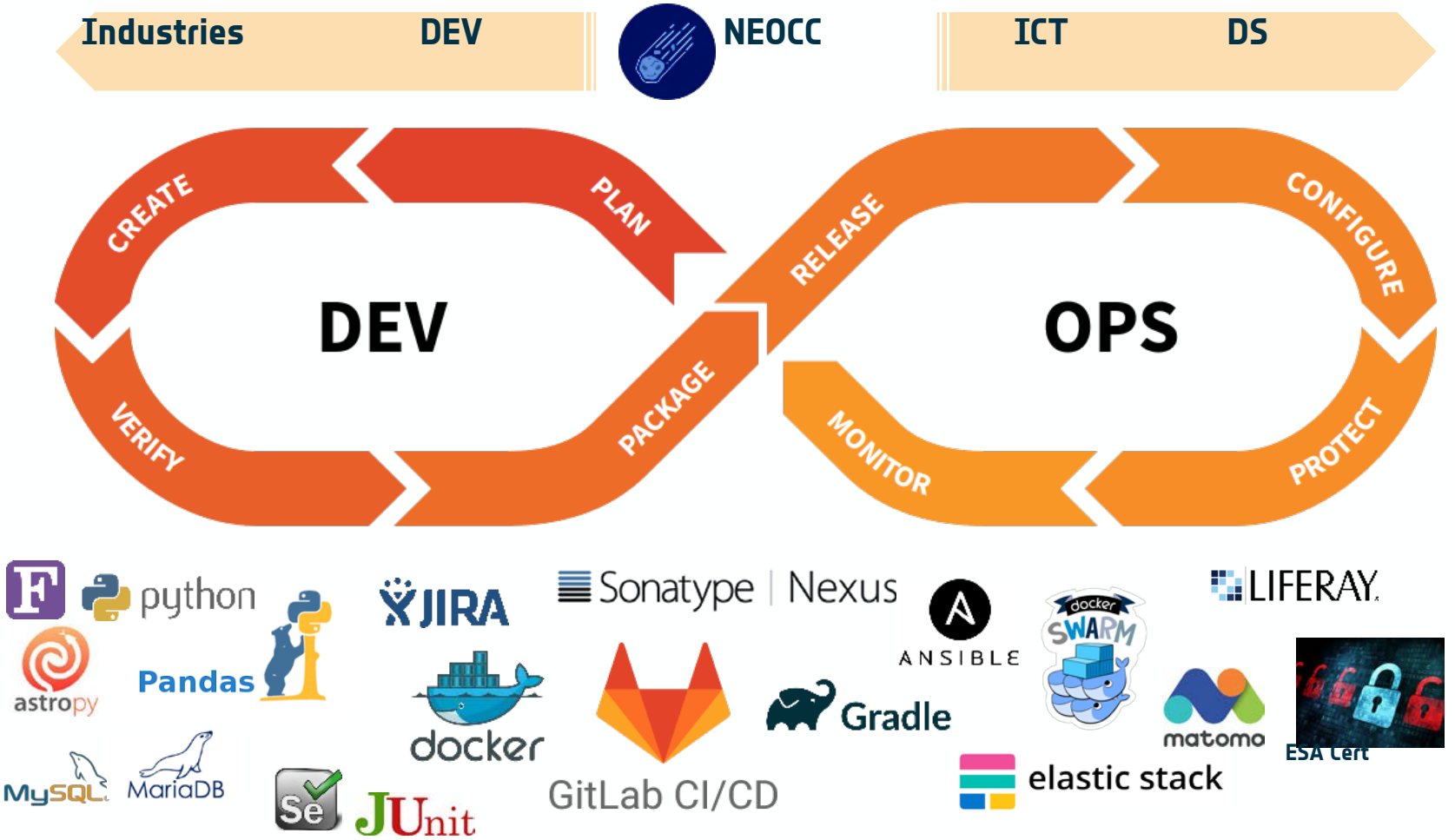
- **an infrastructure capable to support the dev&test&op&maintenance demand**
  - **Software & Data Management (not separated from the SW)**



ESA PD CI/CD Infrastructure



ESA PD CI/CD Infrastructure



ESA PD CI/CD Pipeline Design

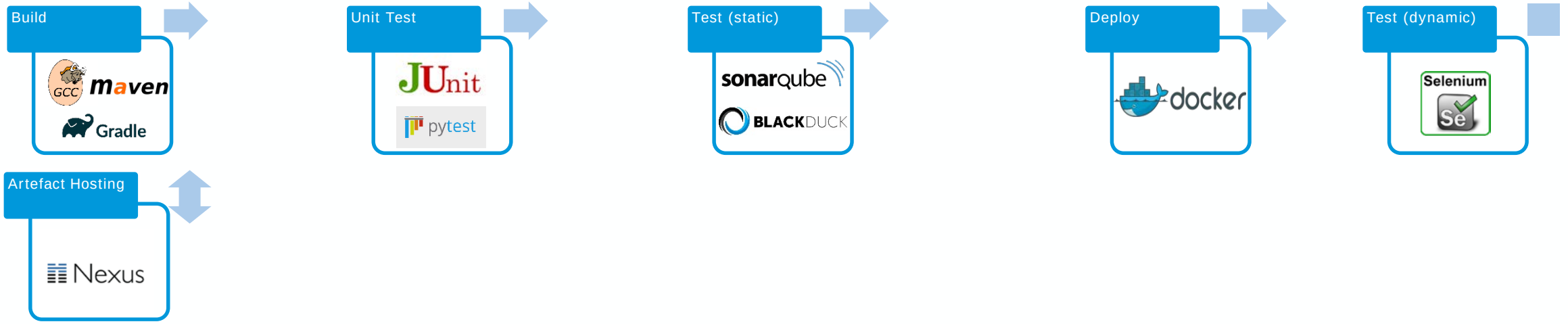
PD Project Pipeline - Example Run:

GitLab CI/CD

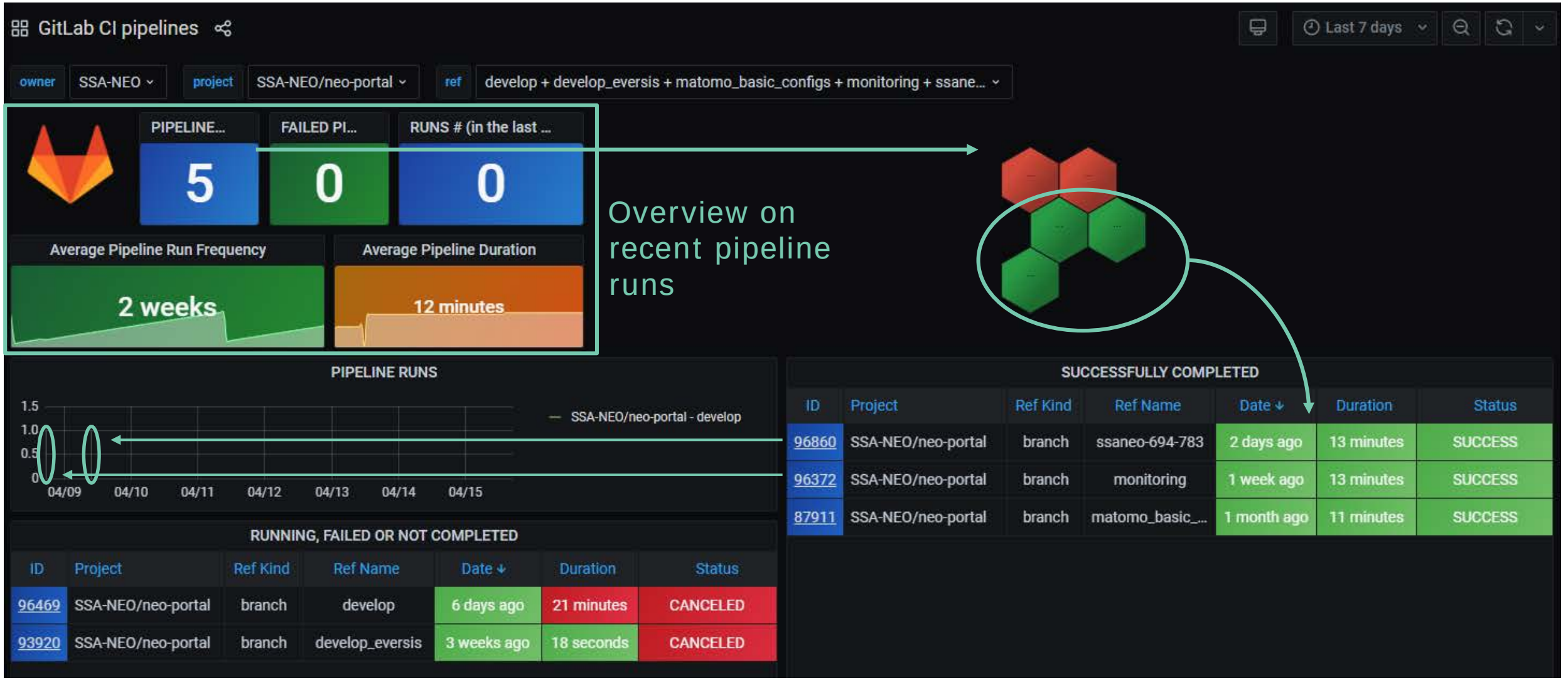
Pipeline Needs Jobs 10 Tests 38

! test_static
<<manually>>

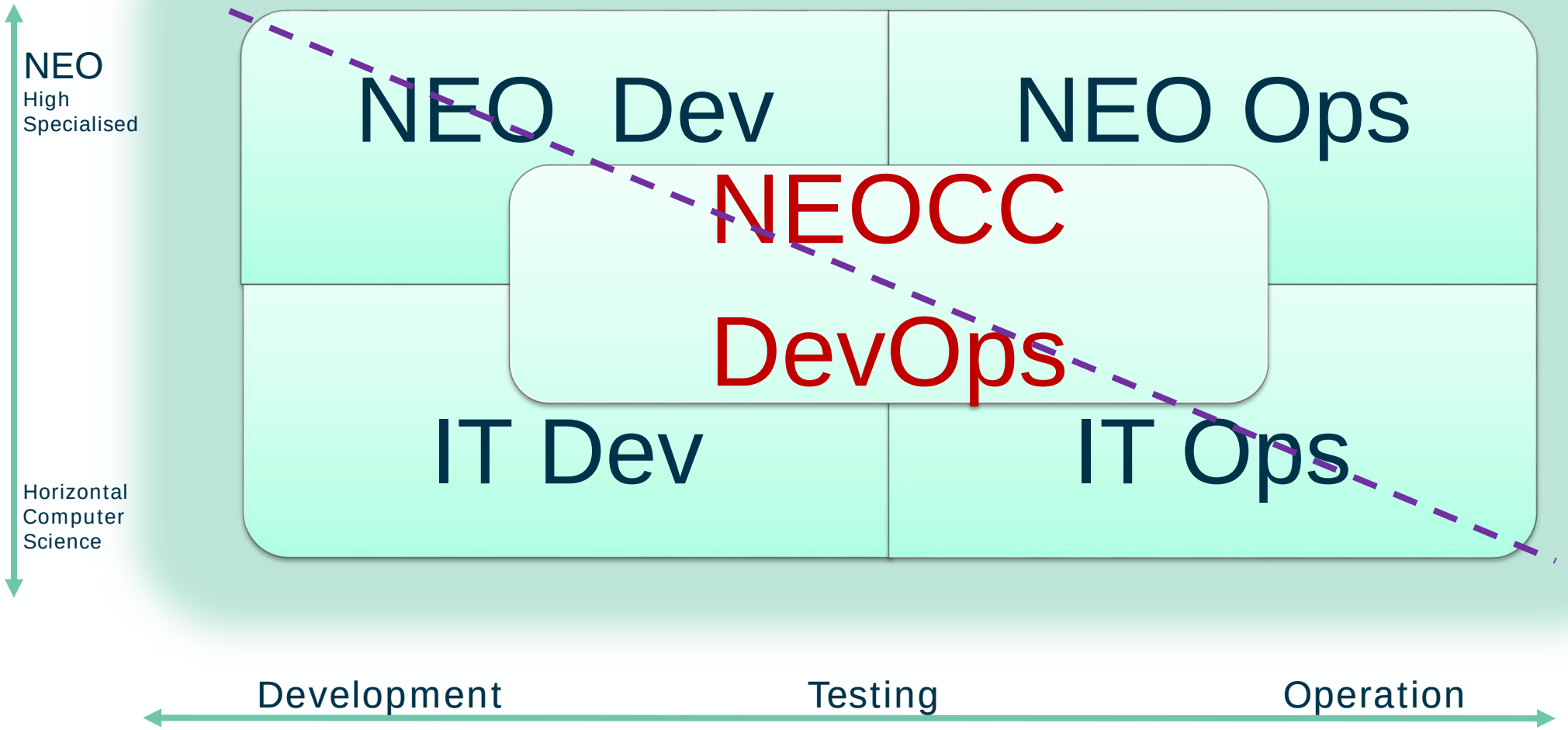
Conceptional CI/CD Pipeline Stages:



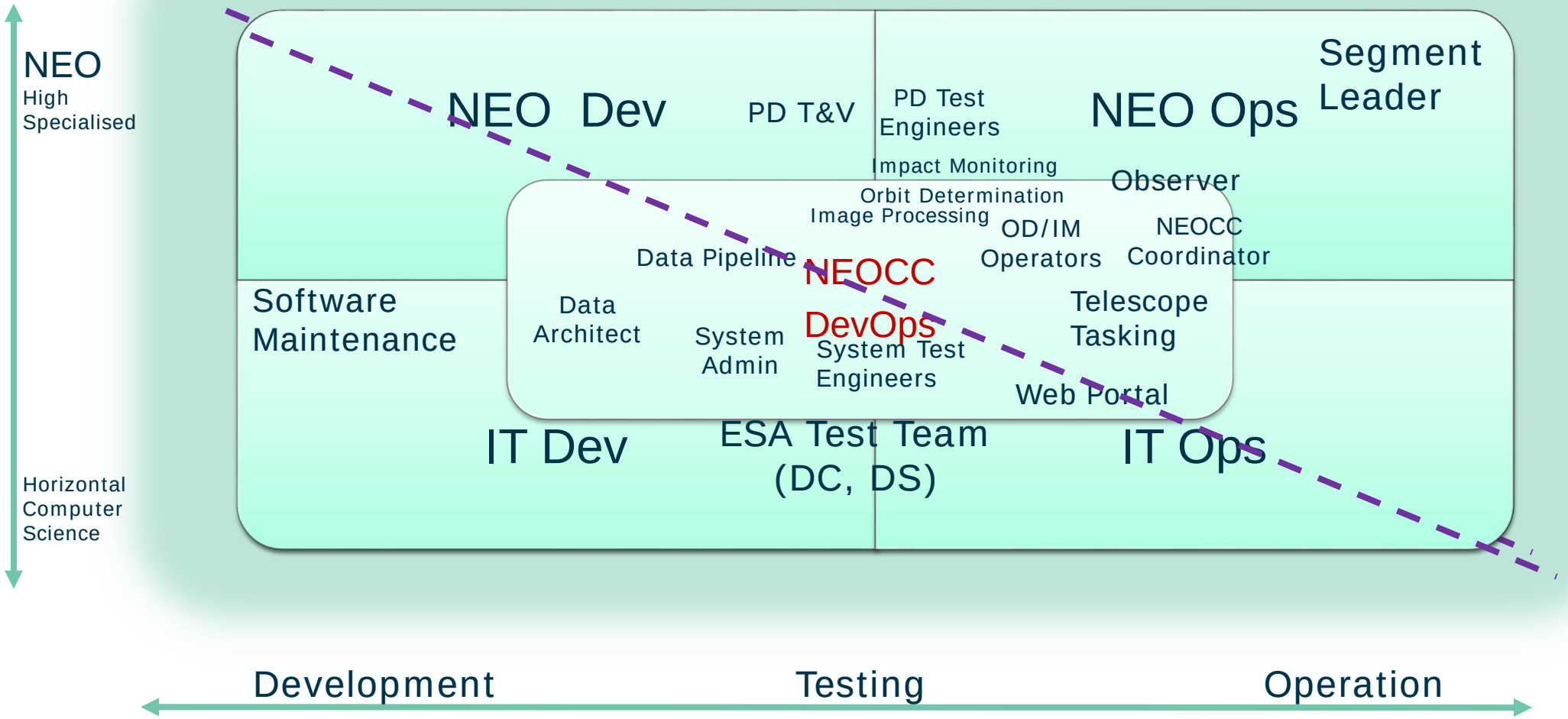
ESA PD CI/CD Pipeline Monitoring



ESA Planetary Defence DevOps Quadrant

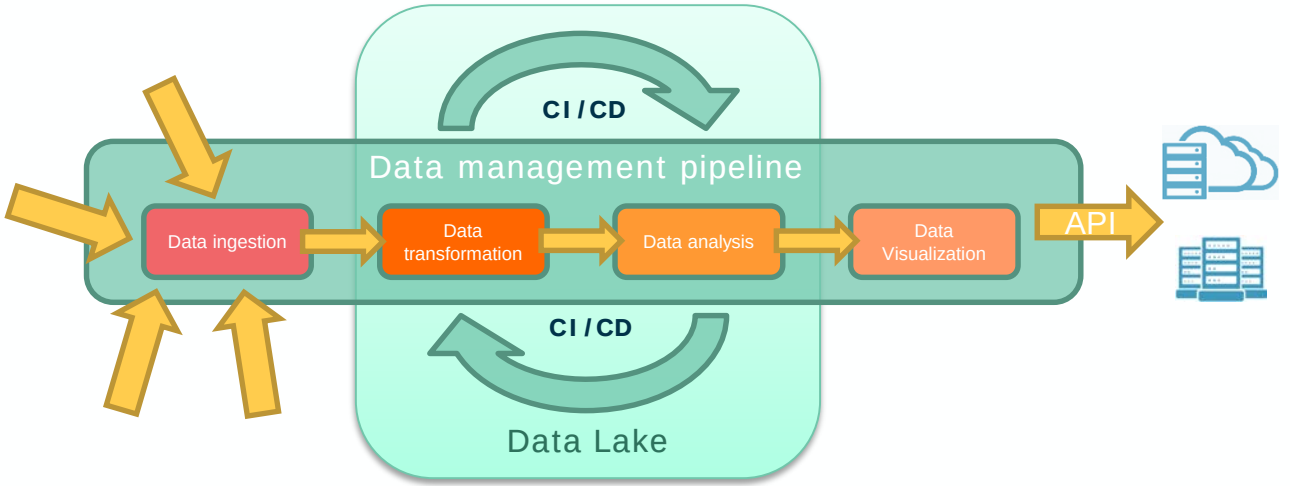


ESA Planetary Defence DevOps Quadrant



DevOps vision from NEOCC

- Continuous monitoring.
- Active participation
- Cooperation model .
- Automated and controlled processes
- Simpler despite Growing up fast



Factual metrics&results

ESA S2P PD

- runs Operations under an evolved, agile, and nonetheless controlled work processes
    - Fully validated DevOps model used into an Operational context
- 14 Software Repository with almost 100 components
    - consequently high delivery frequency
- Time from build to deploy from 140/200hours per delivery to minutes
- Combines and complements macro functionality procured offsite with microservices (data pipelines) developed in the scope of the specialised Operators activity
- The future growth of software components/delivery will not require a linear&proportional increase of the IT support
    - it will require to move efforts in the sustainability and evolution of the CI/CD infrastructure

Upcoming (continuous) challenges

The NEO Operation complexity requires hectic interaction with software and data

- ✓ Agile, efficient, controlled SW Management via modern CI/CD infrastructure
- ❑ NEOCC Operation Team can spent more time in creating agile data management pipelines
- ❑ Looking ahead to Increased number of functionality, data volume and heterogeneity

Upcoming Evolution fronts

- ❑ System and application log analysis
- ❑ MMI
- ❑ and others unknown … will (continuously) arise!