

Methodical construction of sustainable SDI nodes

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Background of our work

- What can we do to improve current practice of building SDI systems in Africa?
- What should ITC's role in this be?
 - research collaboration
 - regular & tailor-made trainings
 - joint implementations based on best-practice
 - the collaborative SDI knowledge network



Client orientation

- Aim at empowering organisations to serve their clientele better
 - through SDI systems based on SOA
 - improve efficiency of information cycles, both horizontal governance and hierarchical governance
 - better outreach to unknown and ad hoc clients
 - client profiling, digital rights management
 - the semantic geo-web
 - towards 'SDI for the masses'
 - data protection
 - derived data services
 - intentionally degraded services
 - compute services for the hardware-impaired
 - location-based services and single-point services

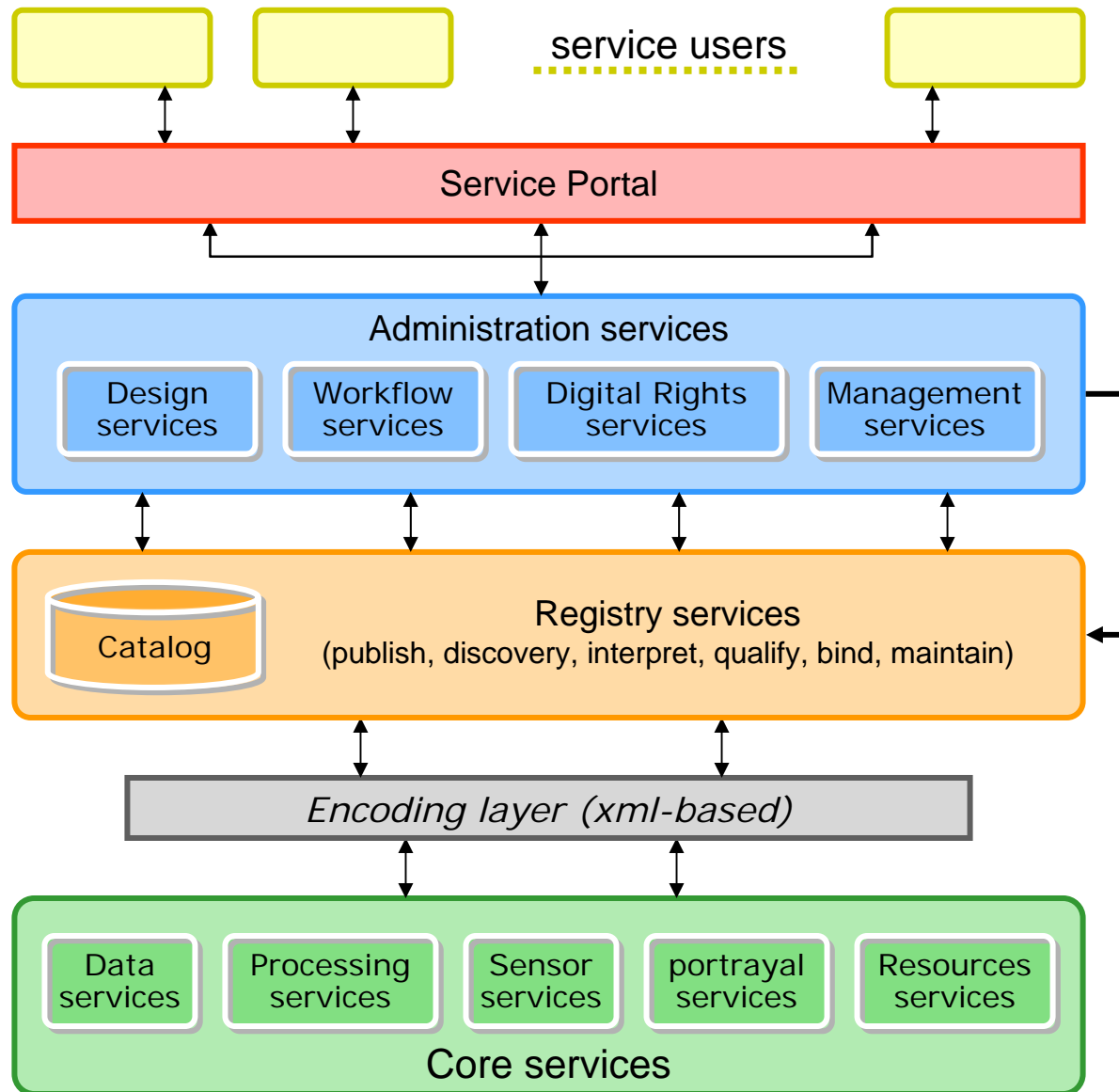


Philosophy

- SDI systems are ‘only’ complex IT systems
- Design and implementation of complex IT systems uses
 - a fixed system philosophy
 - separation-of-concerns
 - transformational techniques
 - sequences of well-documented system models
 - automated support for design validation

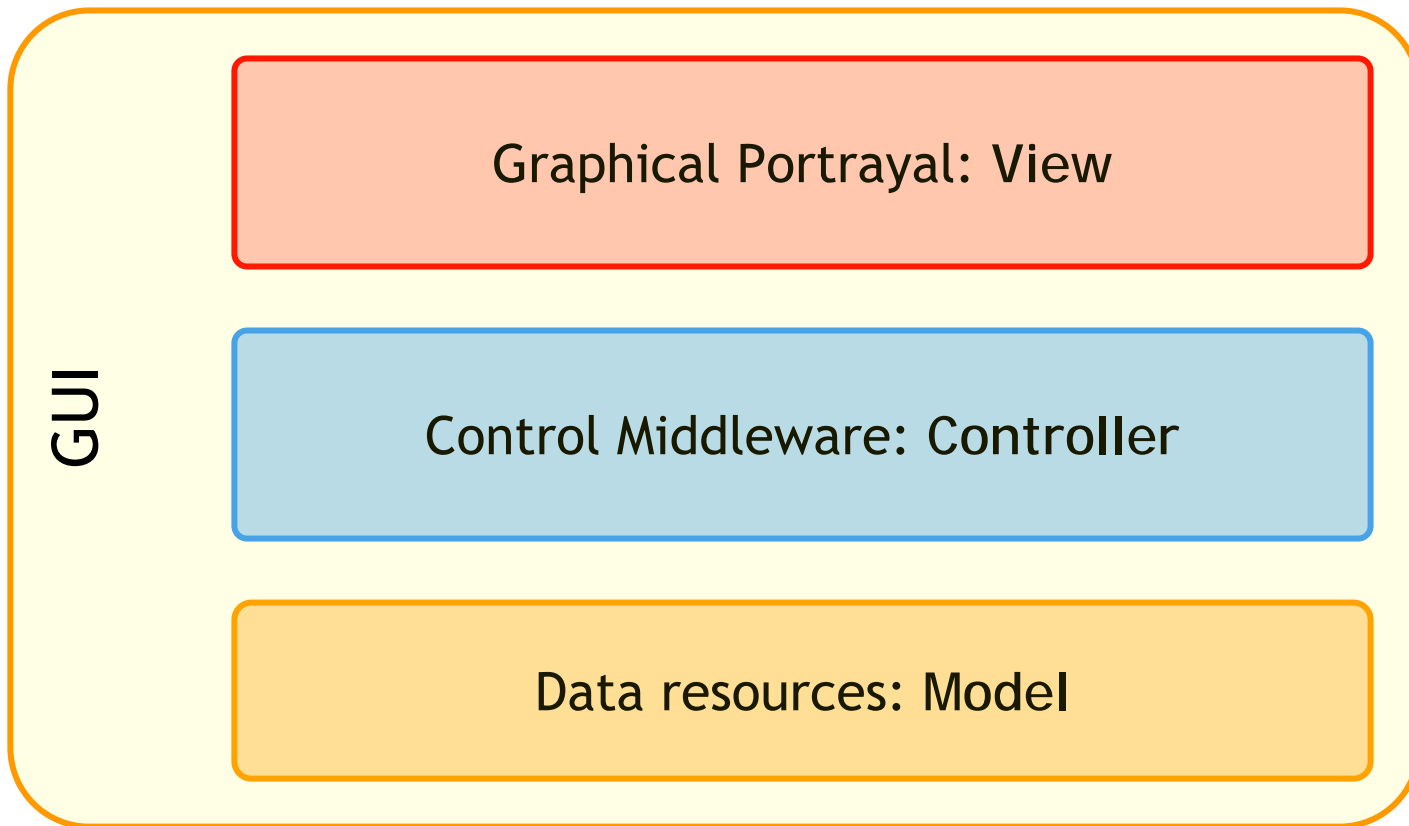


The service stack philosophy



Separation of Concerns, an example

- Graphical User Interface design:
the MVC paradigm



Separation of Concerns in SDI design

Use of different perspectives (RM-ODP)

- the business model
- the information and its meaning
- the functions provided
- the architecture and how to make it work
- the technology to achieve this

Use of different design phases (ANSI/SPARC)

- information and function content & semantics
- information and function structuring
- platform embedding
- optimisation of performance



Information Systems

Display information structure

- What is the content?
- How is it organised?

Display functionality

- What do the functions do?
- How can we use them?



IS structural design by sketch

Conceptual
information content

Which information must be there?



refinement: adoption of standards, design decisions

Logical data content

How will that information be organised?



refinement: choice of platform, adoption of further standards, design decisions

Platform logical
data content

How do we achieve it in platform(s) of choice?



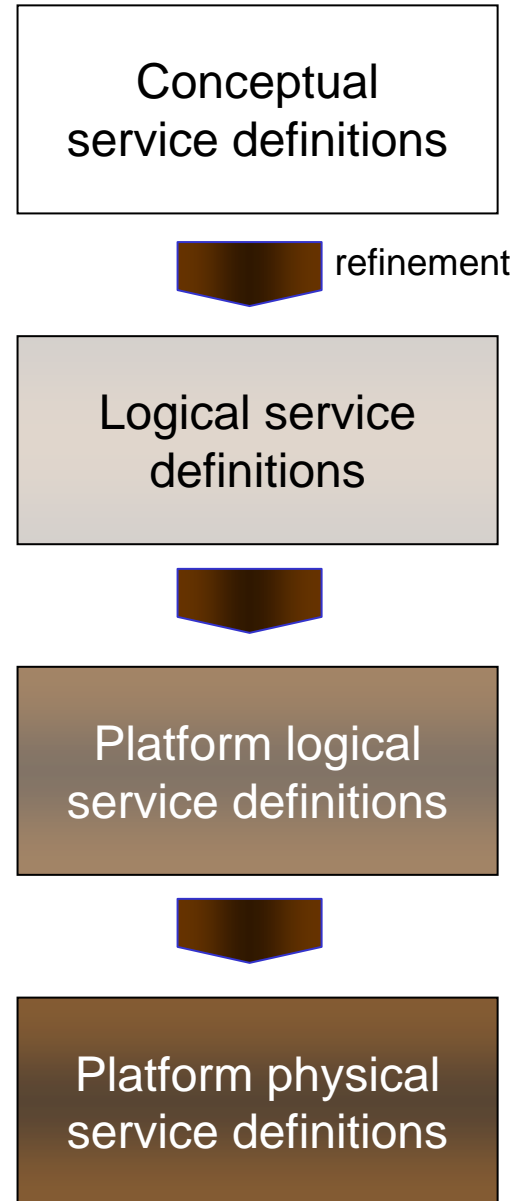
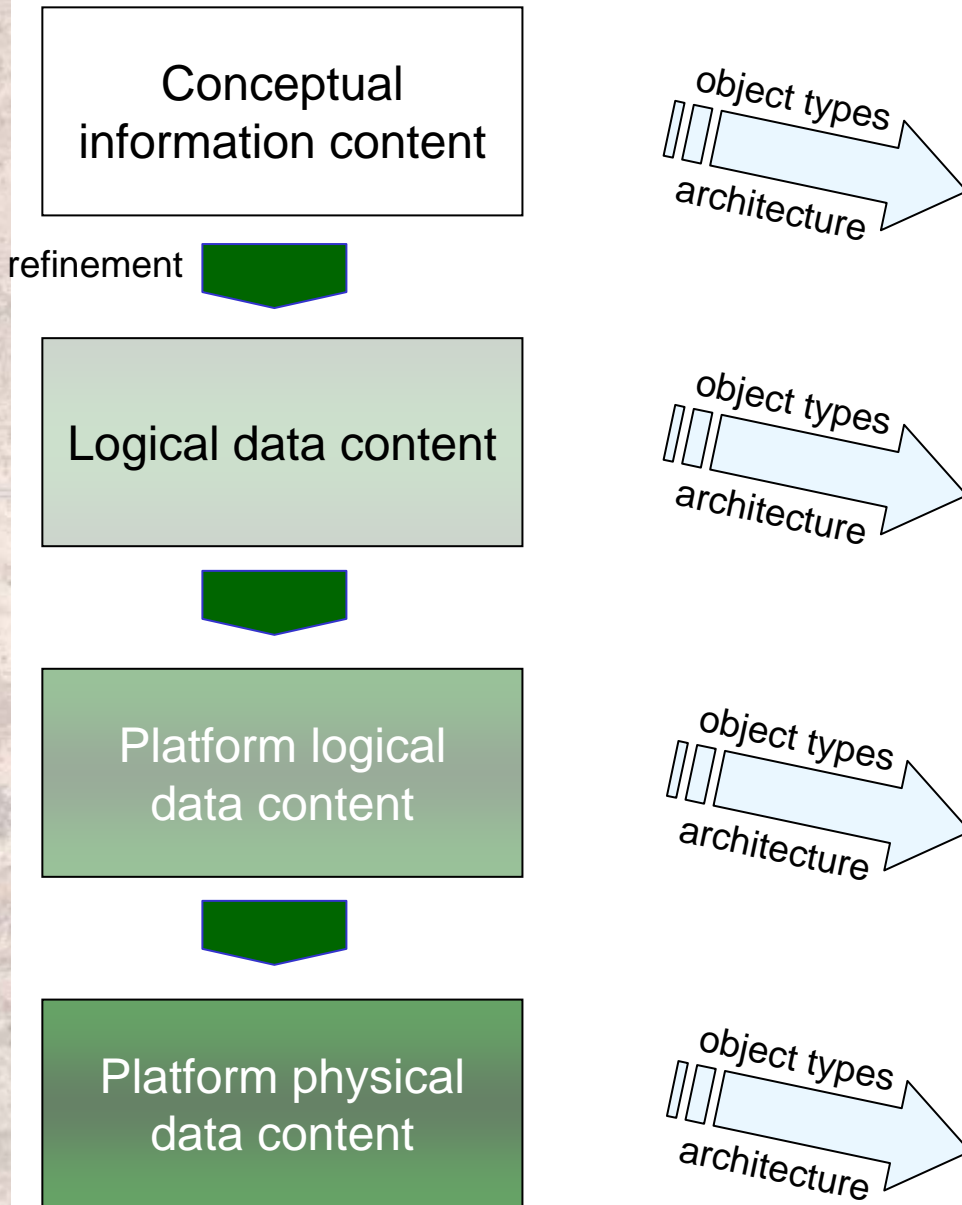
refinement: tuning on basis of expected or current usage

Platform physical
data content

How do we optimise the system's performance?



Hand-in-hand design

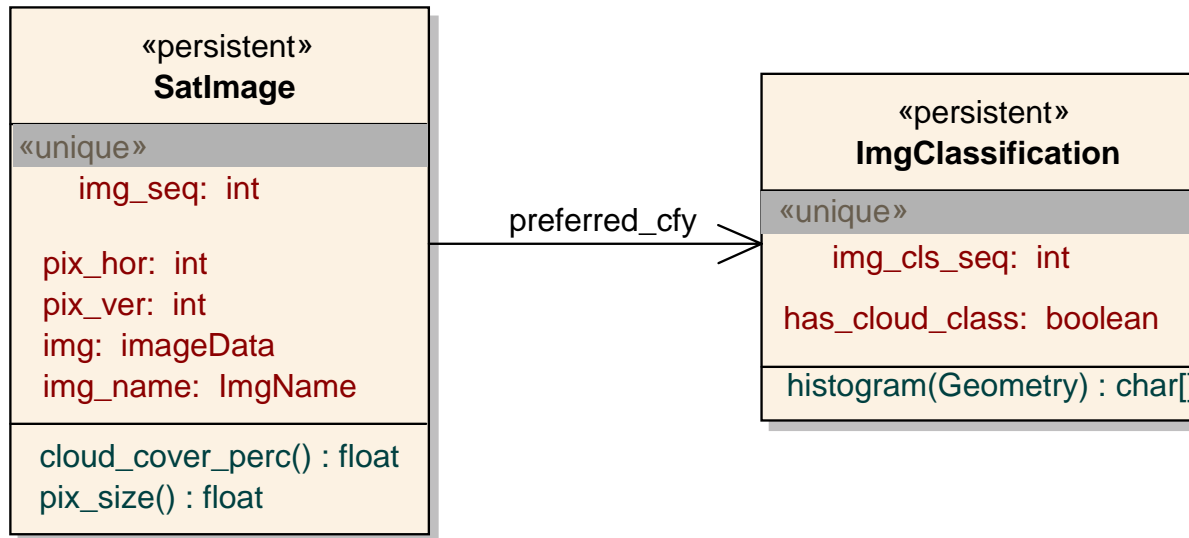


An example case specified

- The regional RS Agency is the central archive for specific sources of satellite data.
- One of its services to clients is the provision of some classes of satellite image, *restricted to some arbitrary geographic extent*.
- In this example, we specify the service to list available images that meet the quality characteristic of little cloud cover within an area requested.



Conceptual information content



Observe: conceptually a simple, partial data model

We apply standard UML, OGC data standards extension, OCL.

A conceptual service

g : GeoPolygon
p : real

result : Set(ImageName)

pre : IsValid(g) and $0.0 \leq p \leq 1.0$

post: noChange and

result =

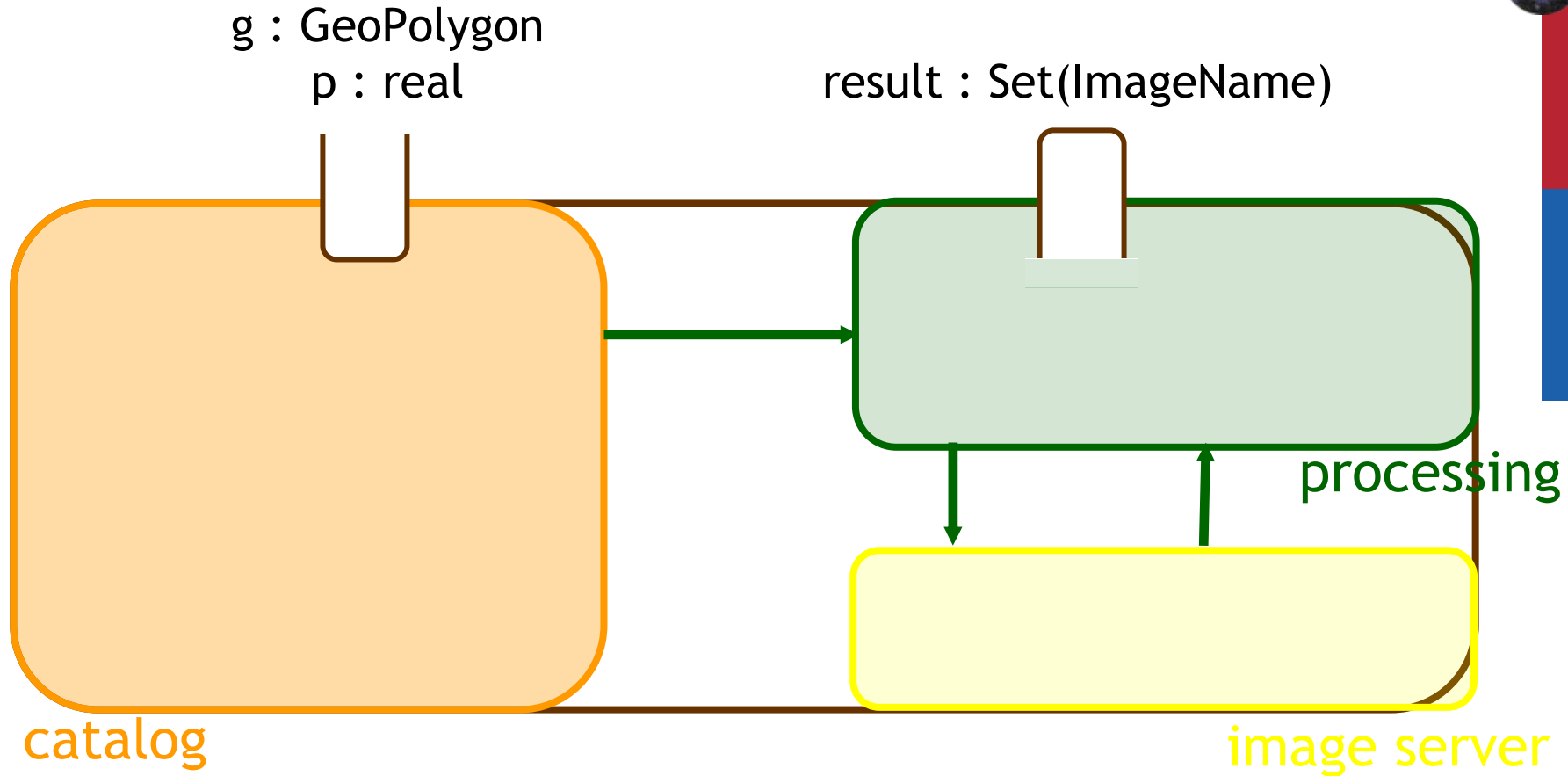
SatImage.AllInstances ->

select(s | histogram(intersection(s.img,g))['cloud'] < p
and s.preferred_cfy.has_cloud_class) ->

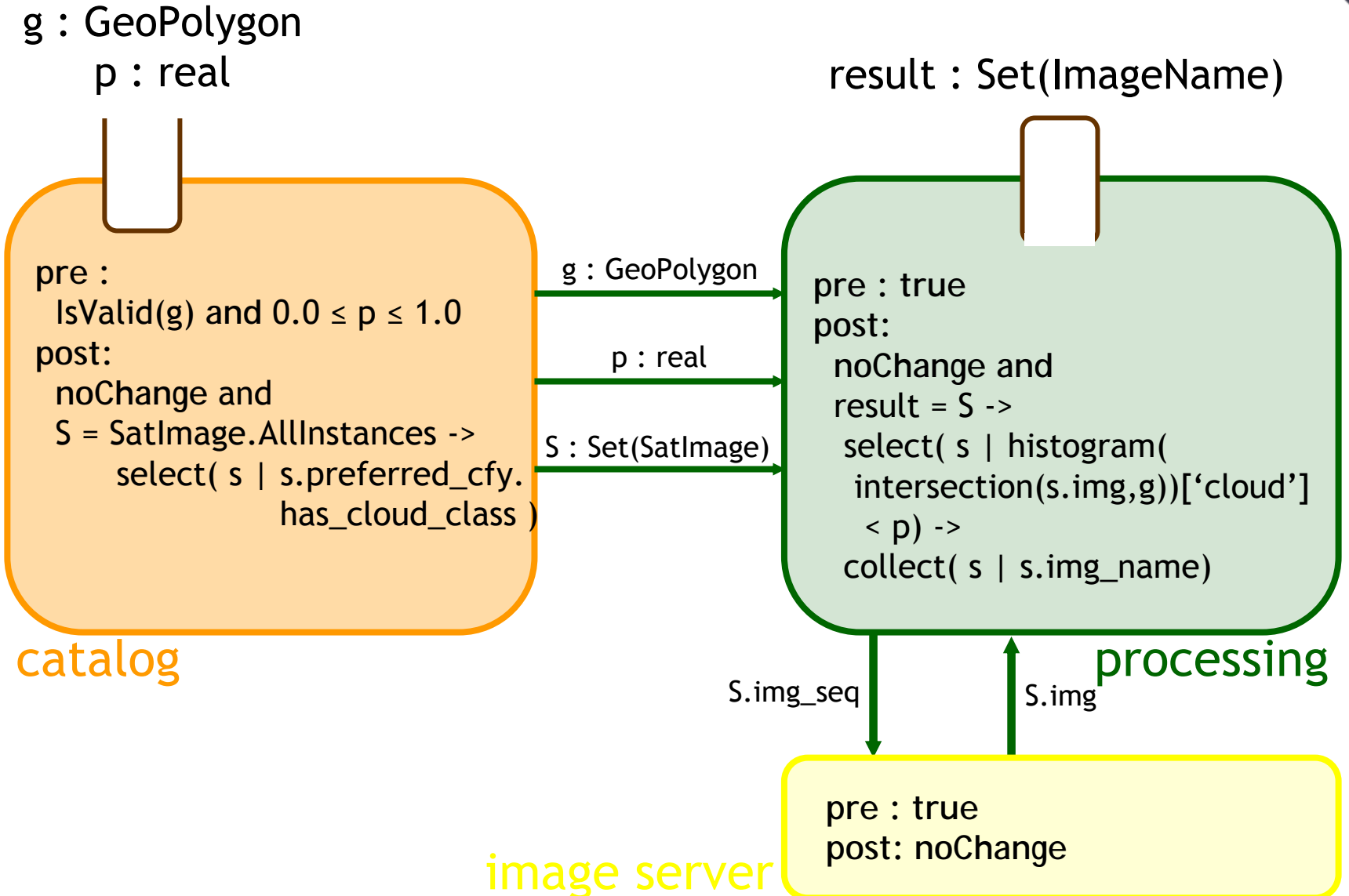
collect(s | s.img_name)

Observe: conceptually a single service

The same service logically



The same service logically



The same service (chain) physically

- Look at performance issues, depending on server capabilities:
 - Use size of img, img's cloud cover percentage and size area of interest g to selectively filter out potentially useful images.
 - Perform true image computations possibly in parallel on separate compute servers
 - Use bbox(g) to selectively retrieve image data only



Summary of paper

Our aims

- build a body of design & implementation knowledge for SDI nodes
- shared philosophy of modular system architecture & SOA
- standardized methods of design & implementation
- share in solutions over a collaborative knowledge network for SDI technology

Details of desing and implementation methods:

- separate concerns
- allow evolutionary growth
- transform designs
- document designs
- work in modules
- orient towards identified problems, and clear use cases



Invitation

ITC wants to partner with government, NGOs, and private sector in Africa on SDI development, especially *where clear use cases exist* and are having problems of implementation.

Partners in:

- joint research
- joint development
- capacity building



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