

Imaging Services on the Grid as a Product Line : Requirements and Architecture

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Context : Services for the Grid

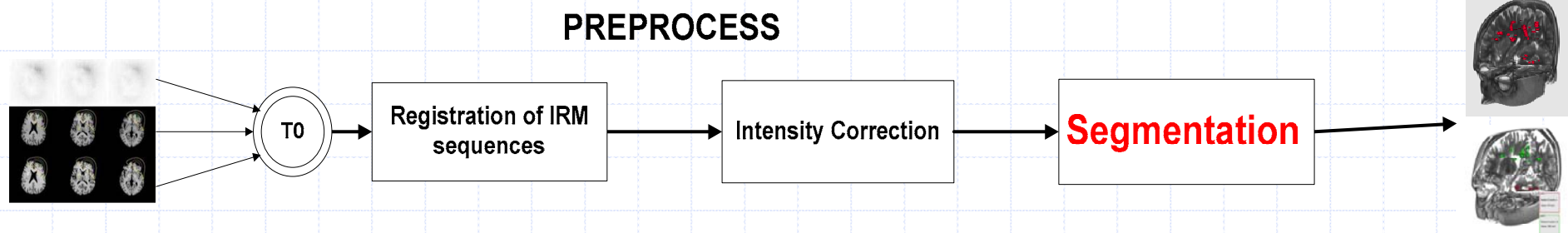
Grid

sharing data, algorithms
computation power, data-intensive

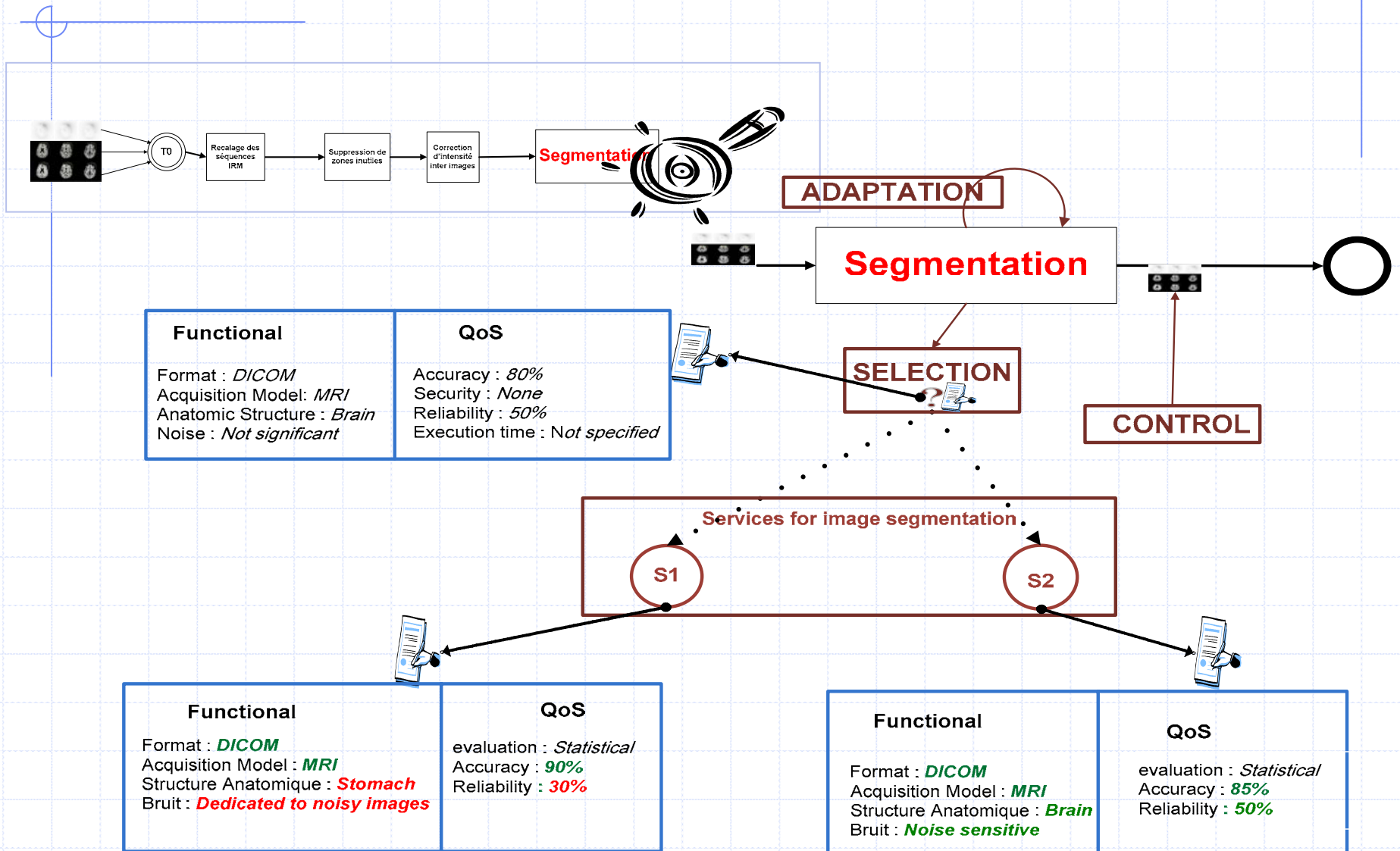
Workflows for the e-Science Grid

process chain, pipeline, data flow
reuse and compose (black) boxes

Implemented as Services

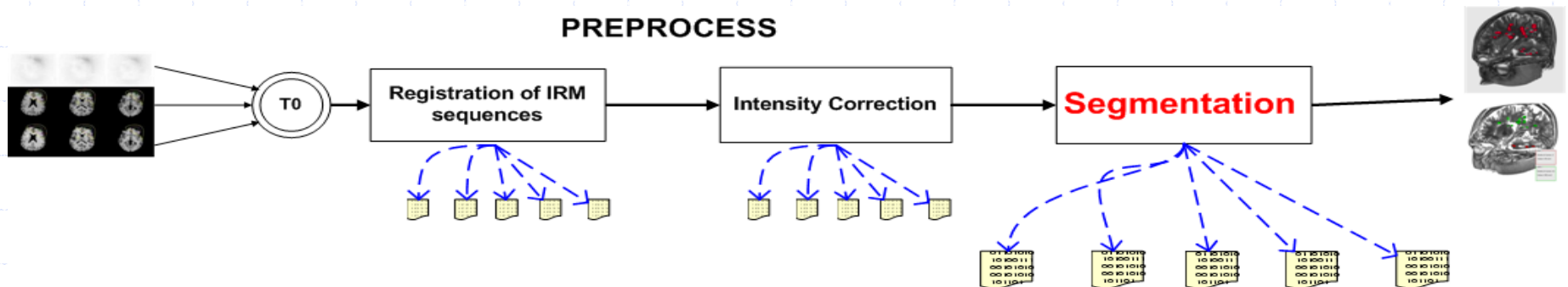
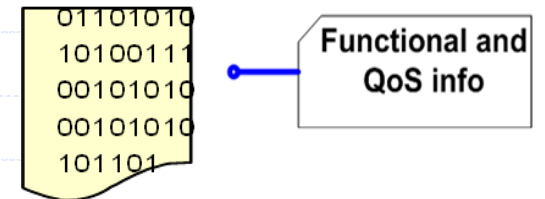


Requirements Overview

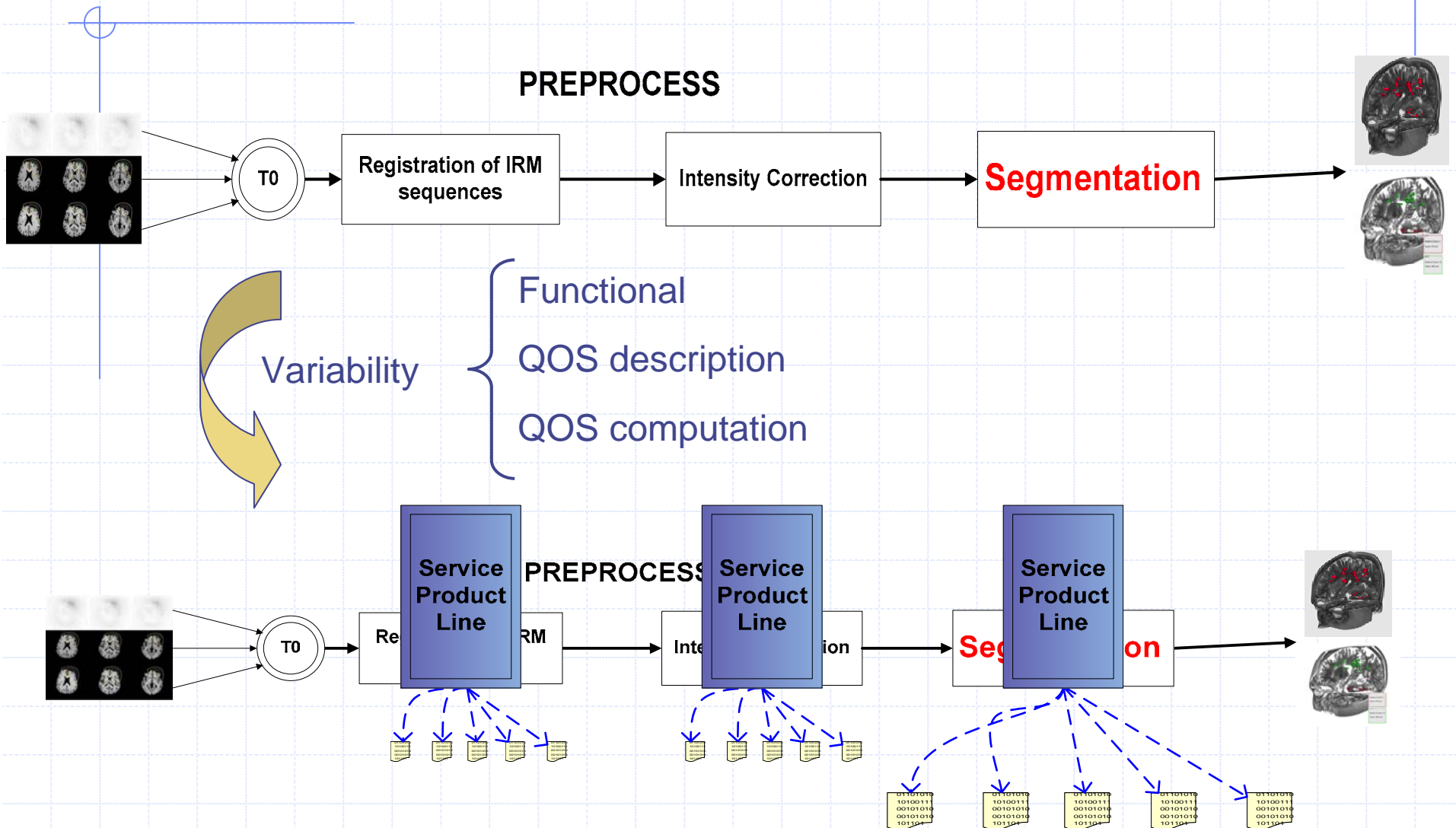


Composing Services on the Grid

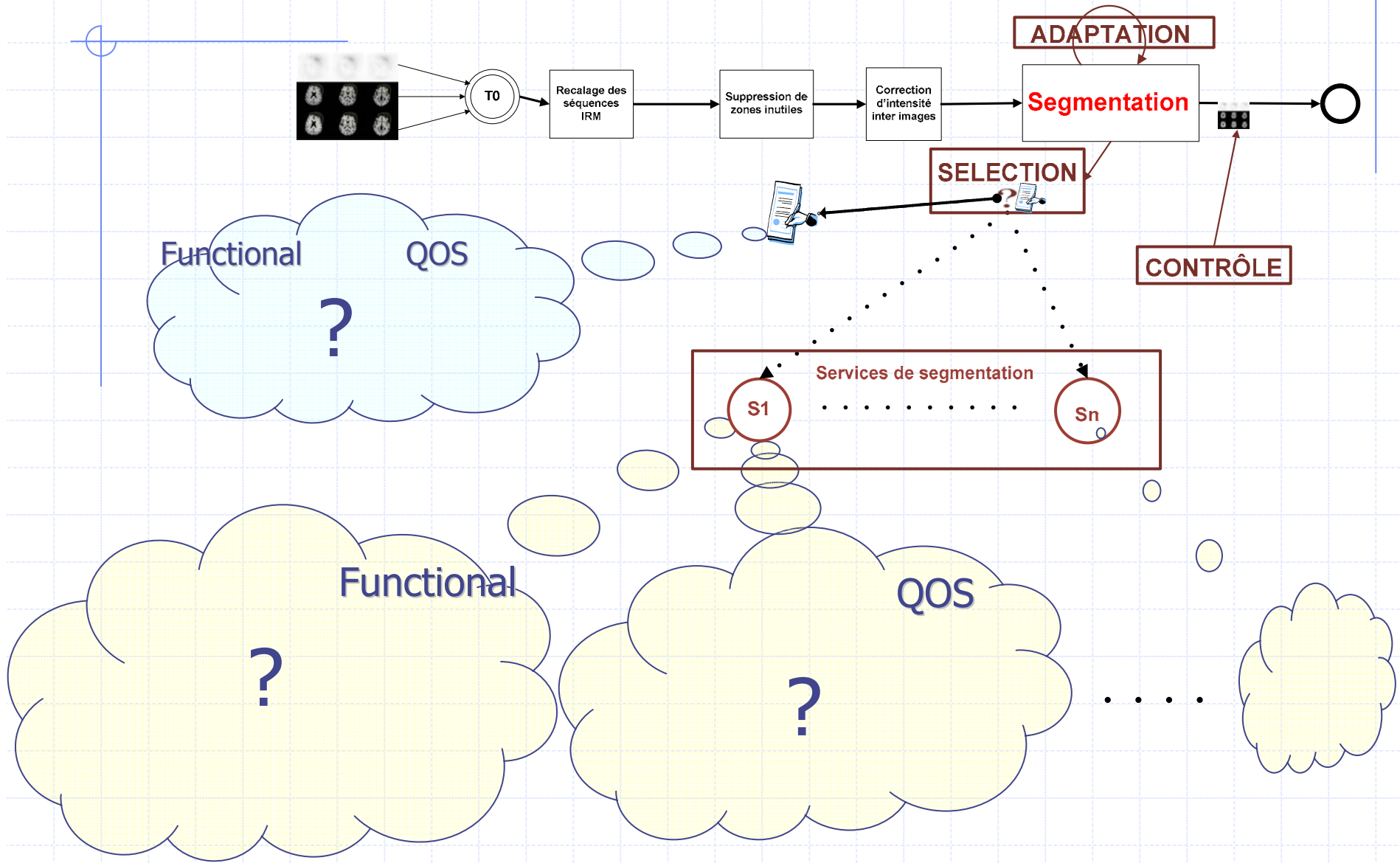
- § How to deploy Grid Services ?
 - § needs fine-grained information
- § How to manage *QoS* (Quality of Service) ?
 - § such as execution time, availability, reliability, etc. ?
- § To give information to ...
 - § workflow engine , software architect, scheduler
- § Our position : a *variability* problem !



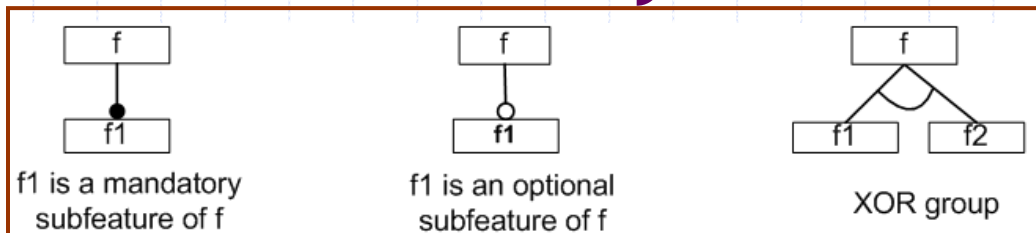
From Service to Product Line (1)



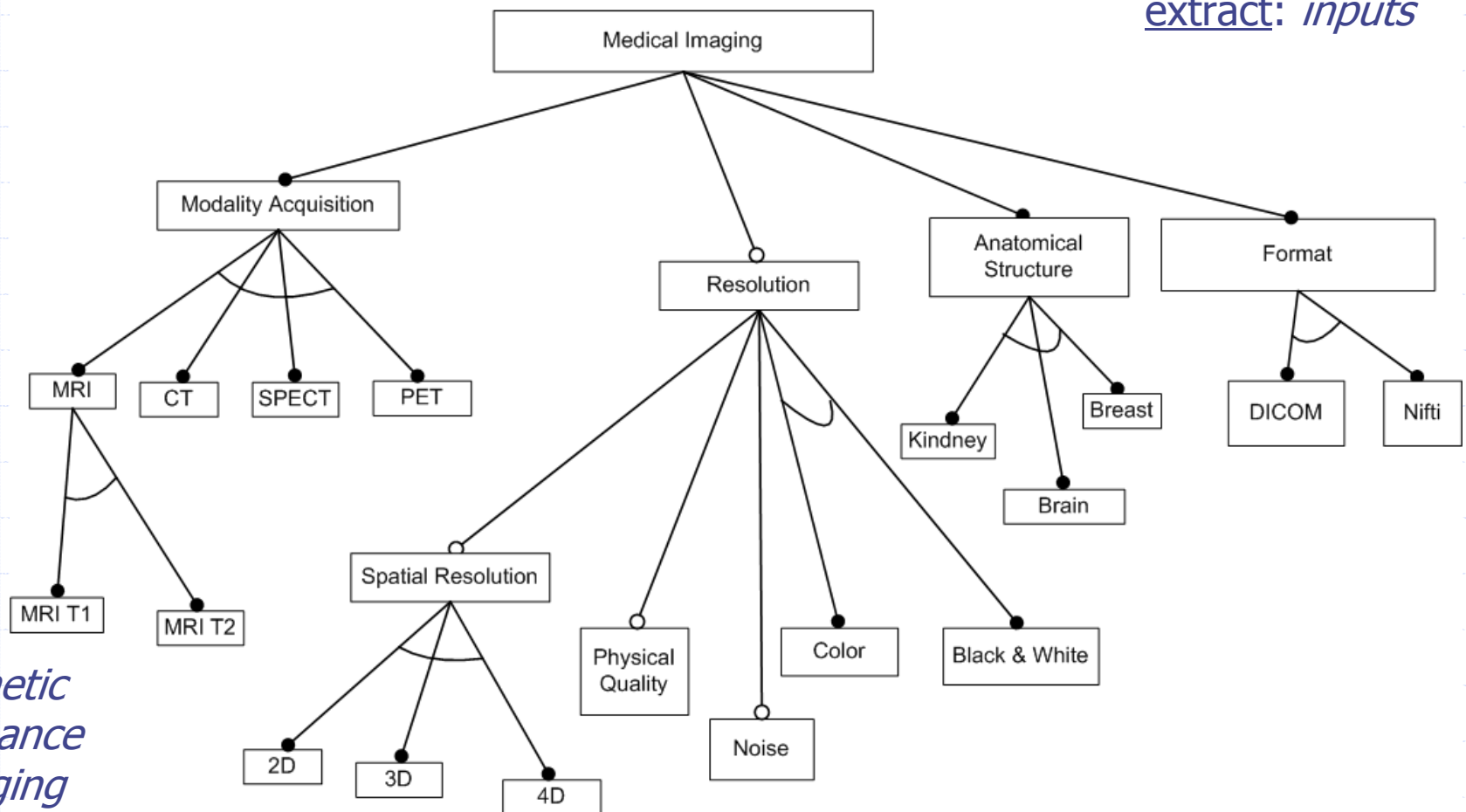
From Service to Product Line (2)



Functional Variability

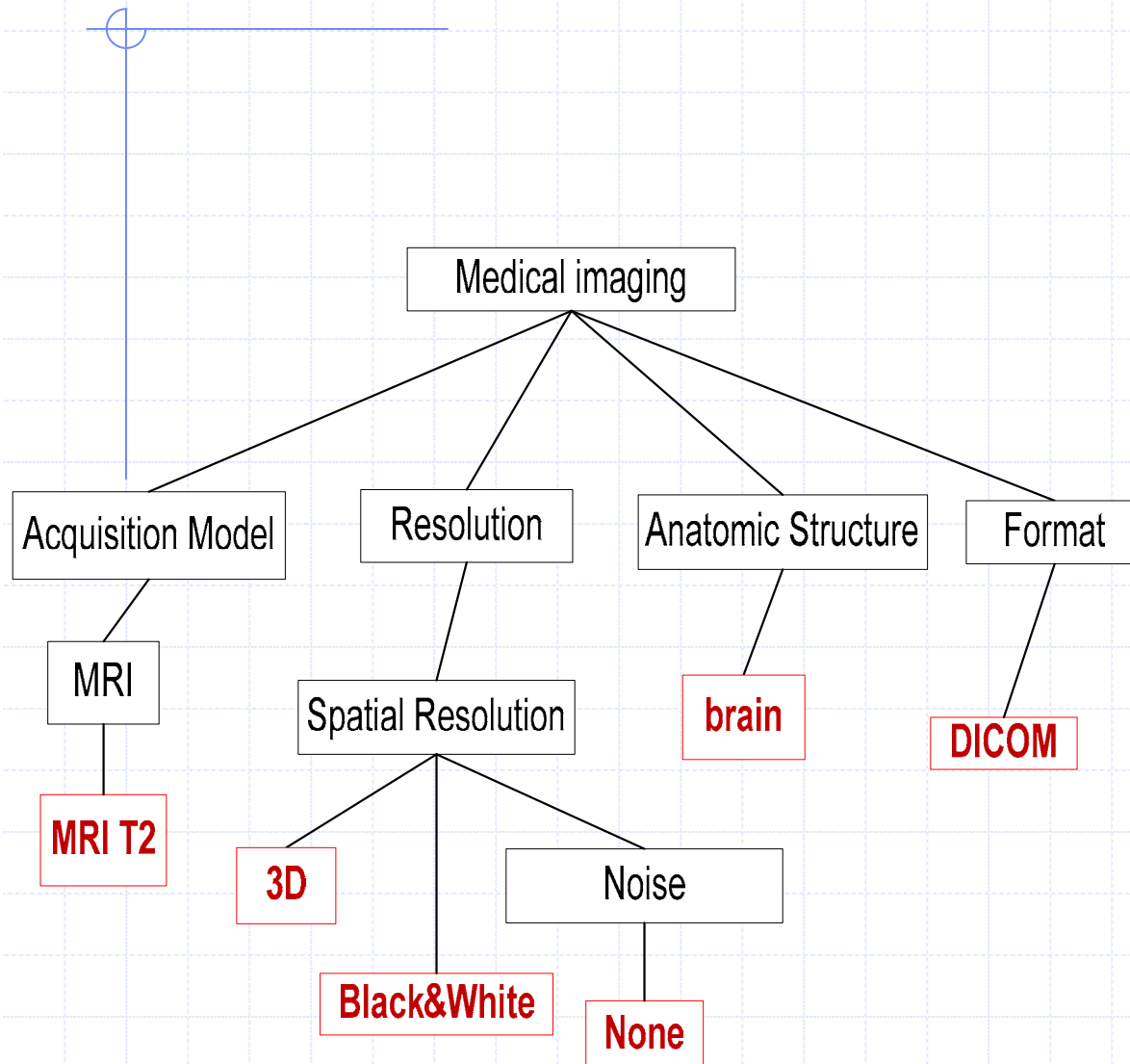


extract: inputs



*Magnetic
Resonance
Imaging*

Functional description : example



Acquisition Model

MRI = MRI T2

Resolution

Spatial Resolution

Dimension = 2D

color = B&W

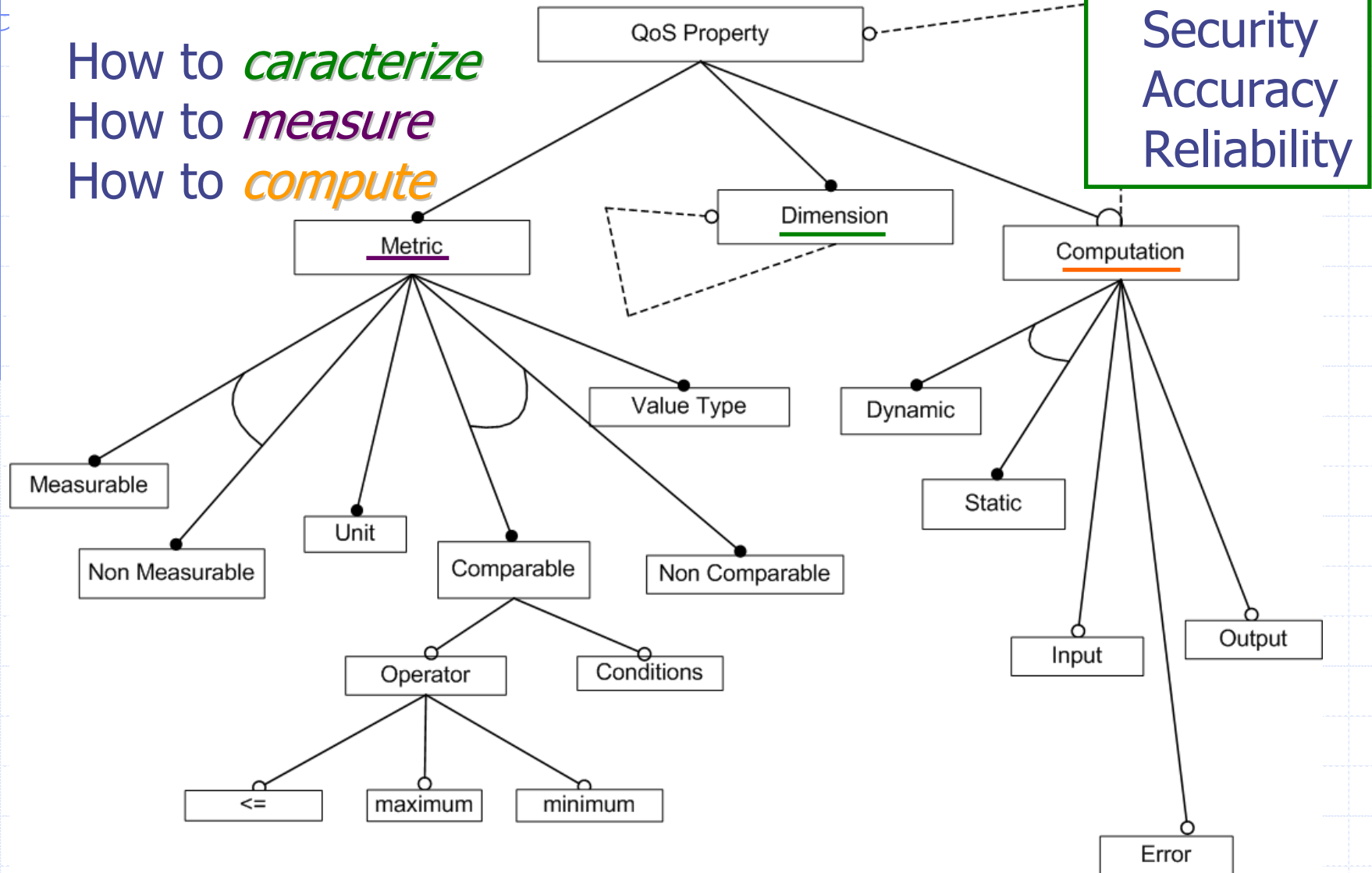
Noise = none

Anatomic Structure = brain

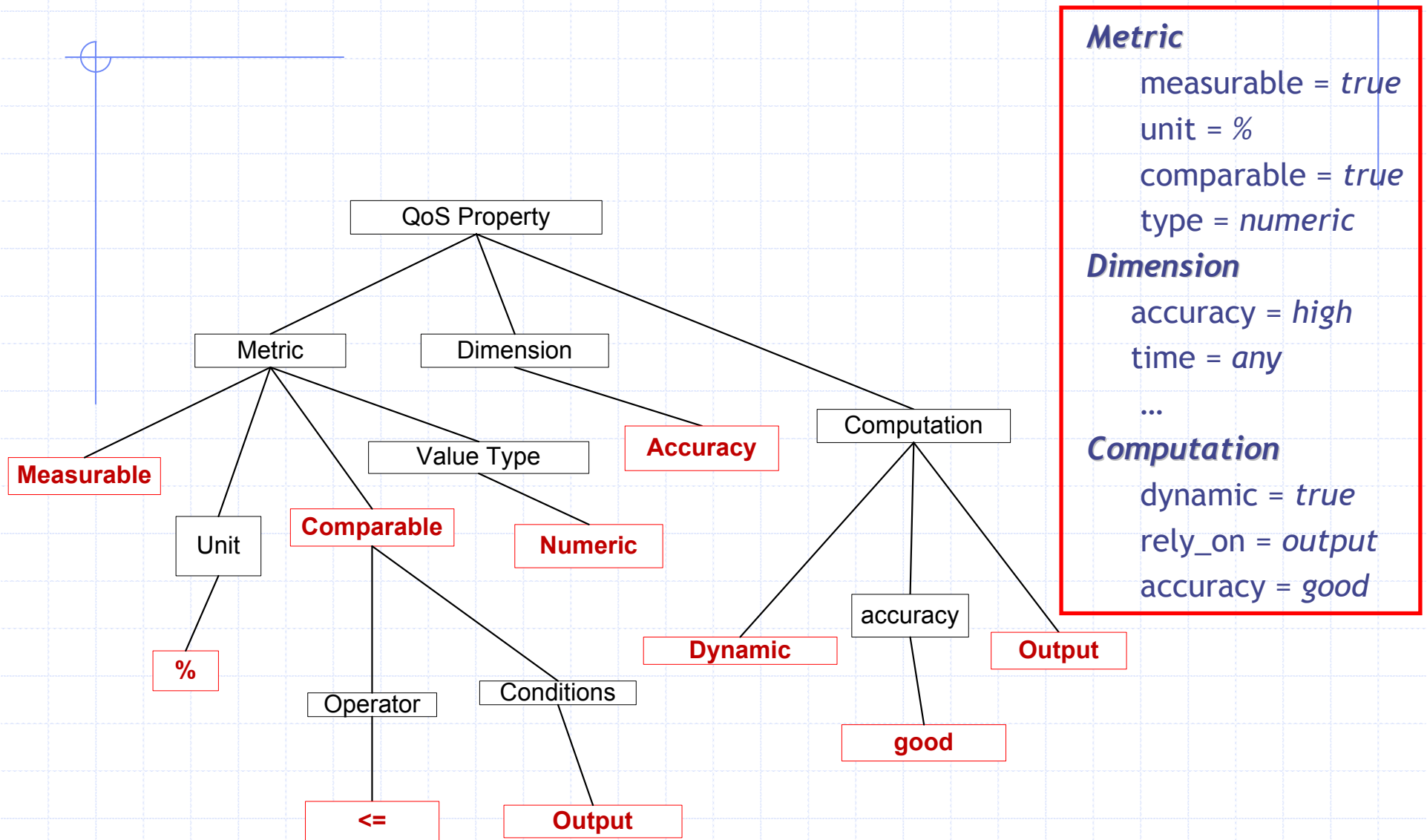
Format = DICOM

QoS Variability

How to *characterize*
How to *measure*
How to *compute*



QoS description : example



Segmentation: refining classification

QoS depends on application domain :

- goal of segmentation

- body region

- imaging protocol

“A particular segmentation may have *high performance* in determining the volume of a tumor in the brain on an MRI image,

... but may have *low performance* in segmenting a cancerous mass from a mammography scan of a breast”

Dimensions : time and space complexity, accuracy, robustness, precision, specificity, sensibility

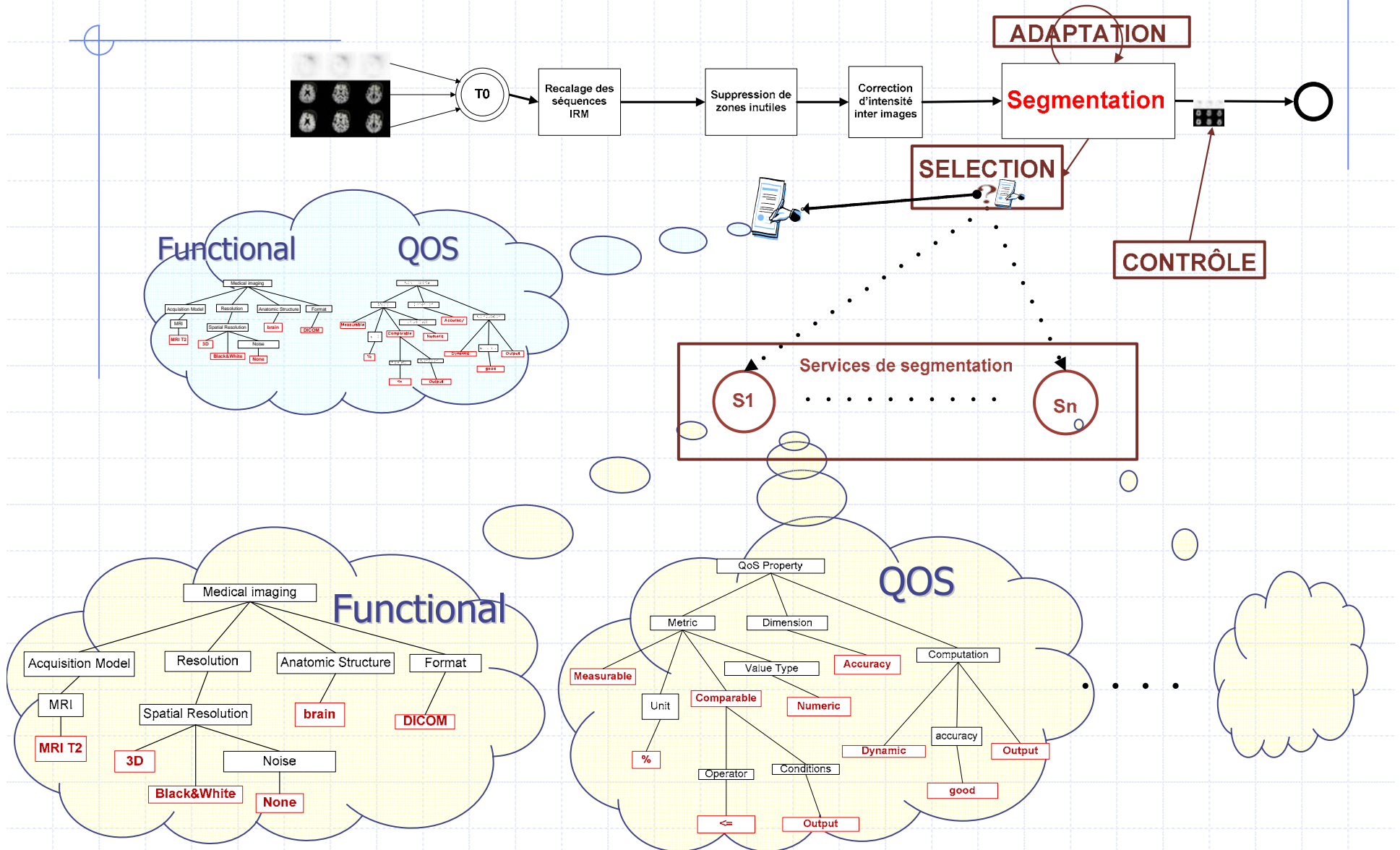
Interdependency between QoS and Computation of QoS :

- costly but precise

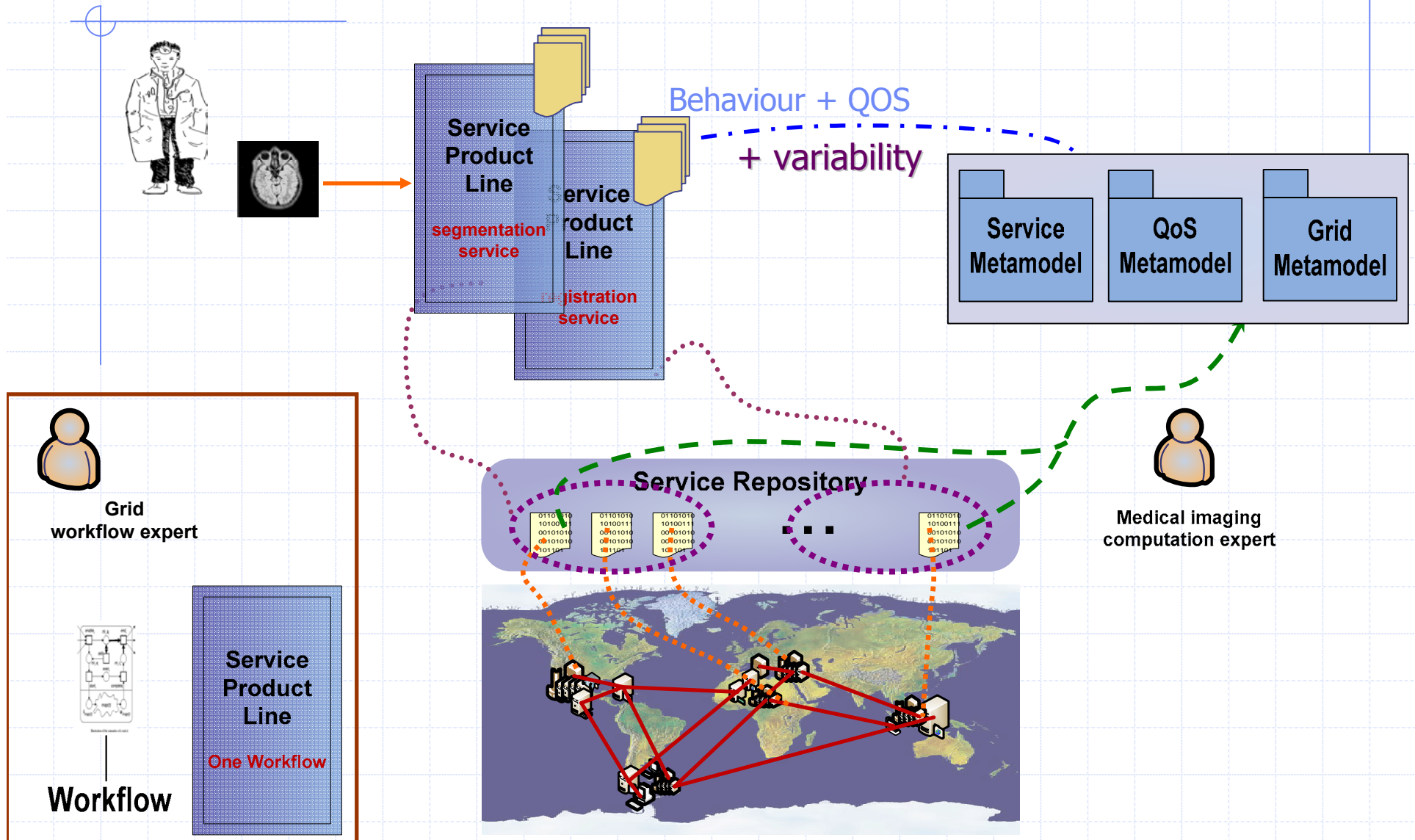
- quick but uncertain

- evaluation has a QoS too

Towards SPL: big picture



Towards Service product line



An MDE Approach

Equipping Service/Workflow with meta information

A common core (QOS & service metamodels)
Specific branches

Building the SPL

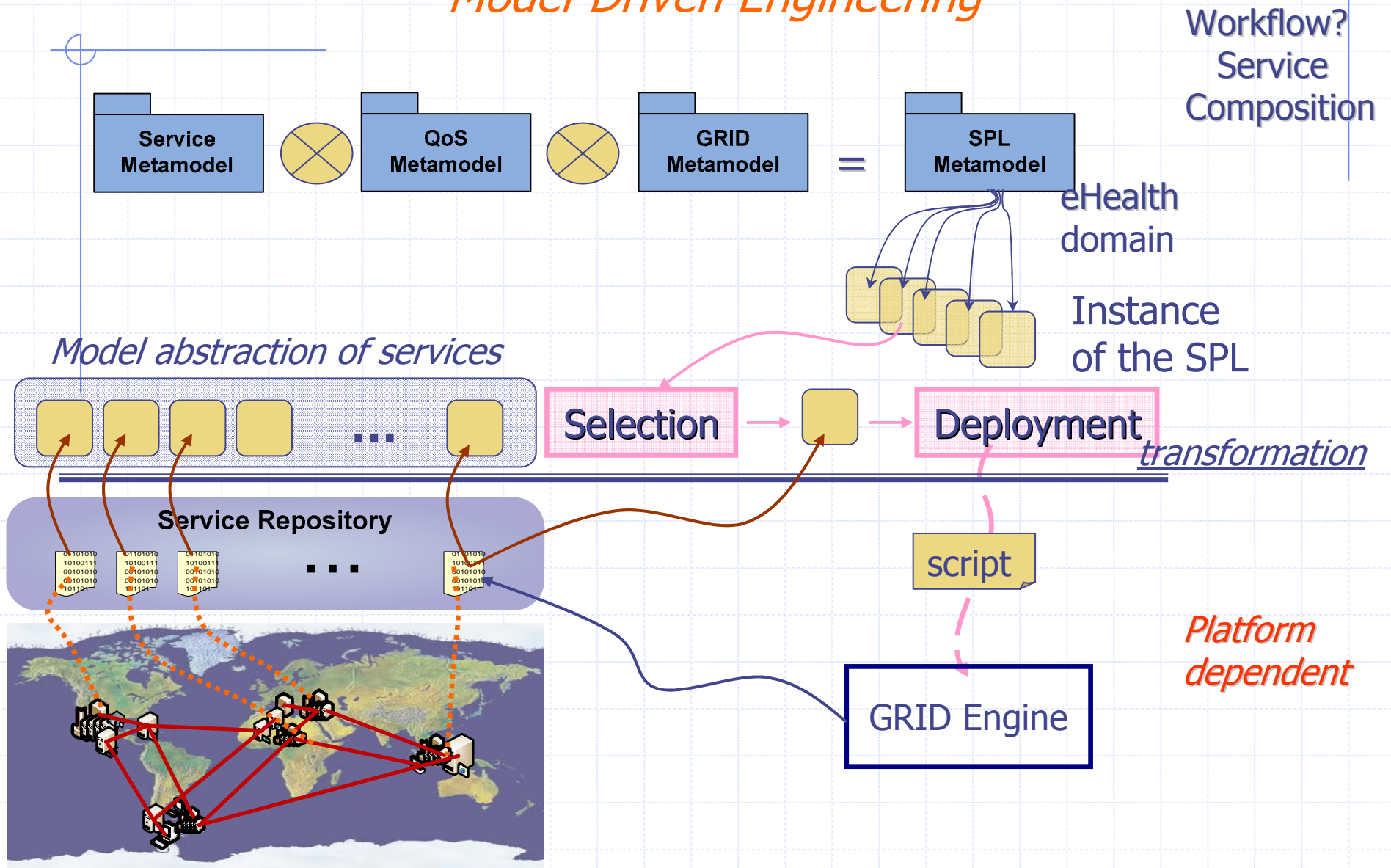
Describing a generic Domain-Specific service / workflow
Specifying composition protocol of one service
allow to address different workflow
includes also variability

Approach

Model Driven Engineering (MDE)
Platform independent, abstraction
Model transformation and/or model composition

An MDE Approach

Model-Driven Engineering



On-going Work

- q QoS multi-views

 - q experts collaboration

 - q from end users to services

- q How to infer a SPL ?

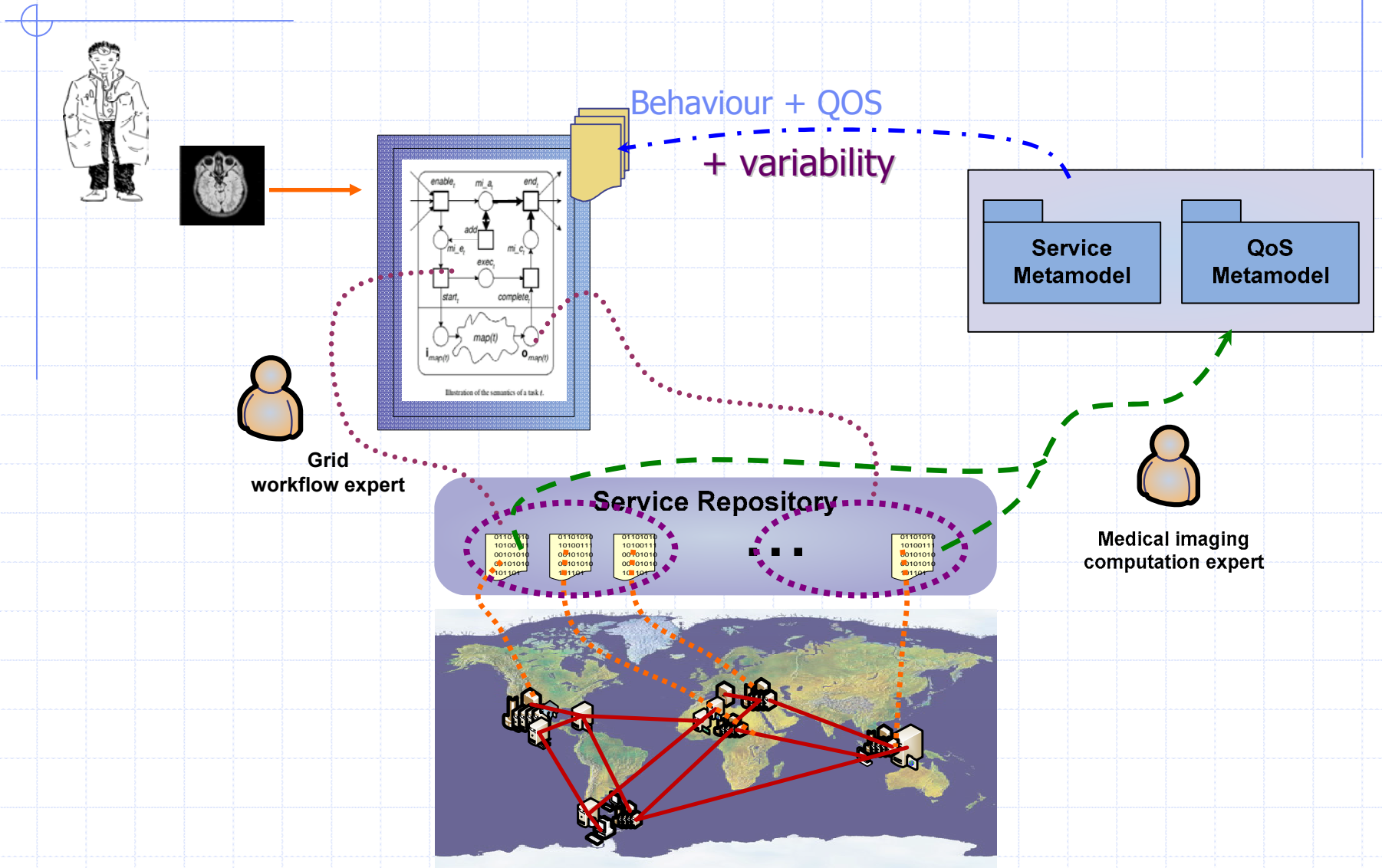
- q Derivation process

 - q who for the reasoning process ?

 - q heuristics needed

- q From Service to workflow

From Service to Workflow



Questions ?

