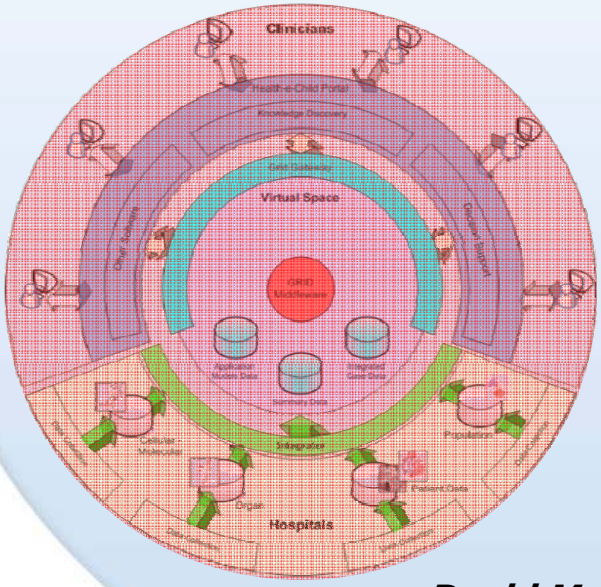
Health-e-Child

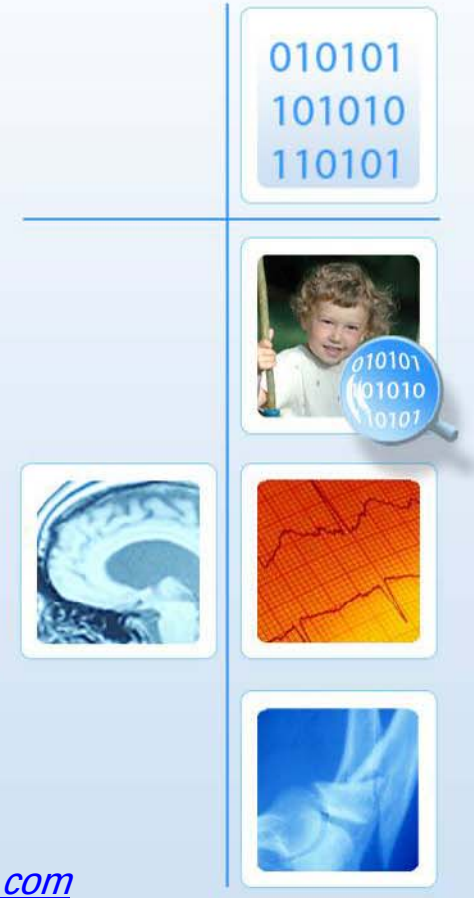
maat Gknowledge

The Health-e-Child Project & Platform

A gLite Adoption Case Study

2007-10-01 EGEE Business Track
Budapest, Hungary





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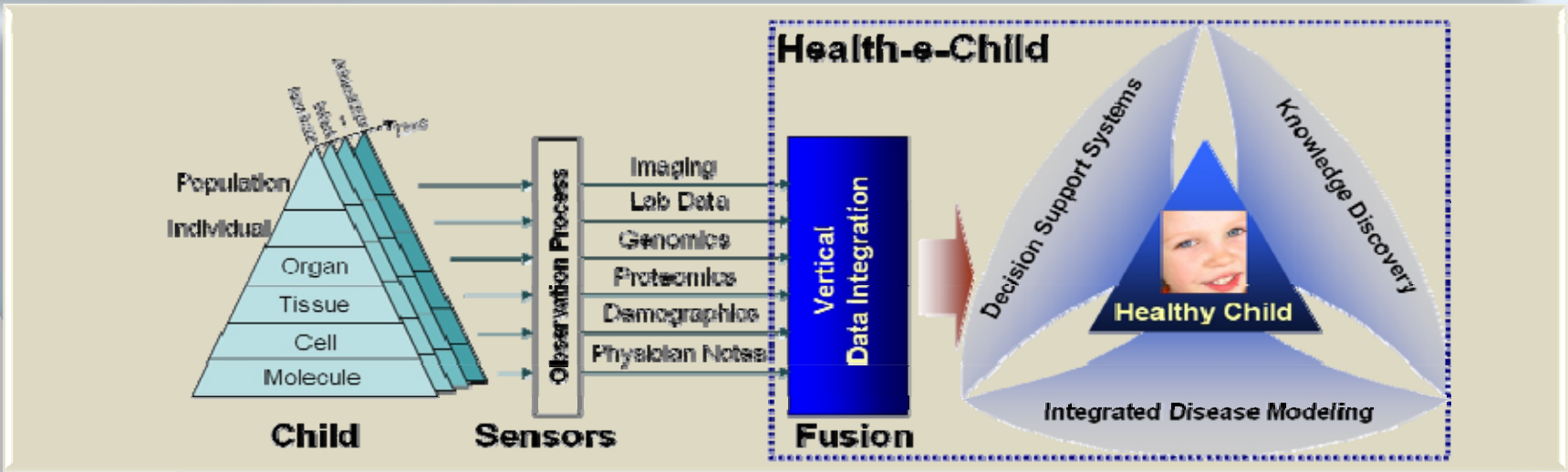
maat Gknowledge – MAAT http://www.maat-g.com

Project Information

Instrument	Integrated Project (IP) of the Framework Program FP6
Project Name	Health-e-Child (HeC)
Project ID	IST-2004-027749
Coordinator	Siemens AG, Dr. Jörg Freund
Partner	14 European (companies, hospitals, institutions)
Timetable	01-Jan-06 to 31-Dec-09 (4 years)
Total Cost	16.7 Mio. €
EC Funding	12.2 Mio. €
Web Page	http://www.health-e-child.org

Project Objectives

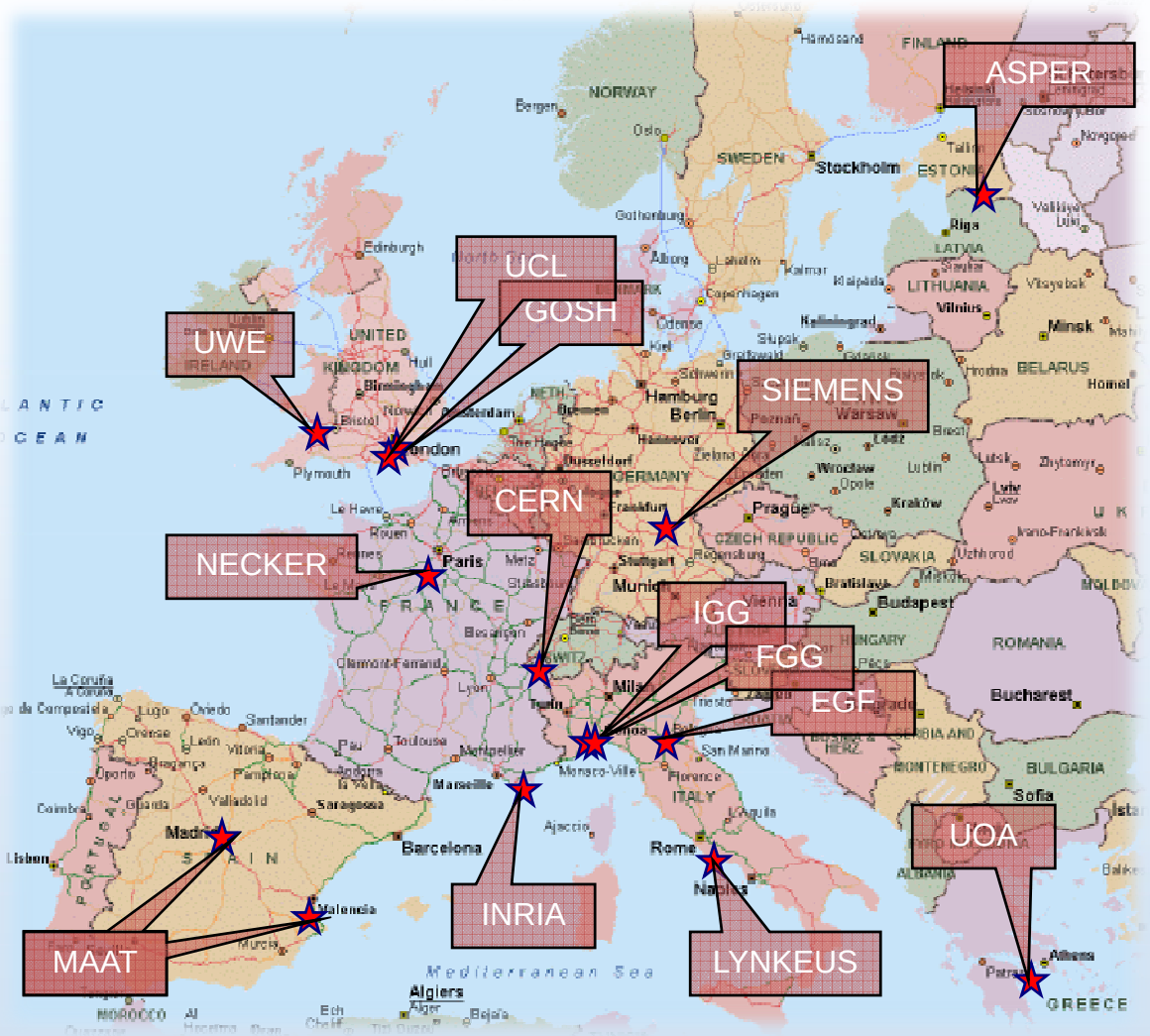
- Establish Horizontal and Vertical integration of data, information and knowledge for Paediatrics
- Develop a grid-based biomedical information platform, supported by sophisticated and robust search, optimisation, and matching techniques for heterogeneous information,
- Build enabling tools and services that improve the quality of care and reduce its cost by increasing efficiency
  - Integrated disease models exploiting all available information levels
  - Database-guided decision support systems
  - Large-scale, cross-modality information fusion and data mining for knowledge discovery
- A Knowledge Repository for Paediatrics



A Distributed Environment

Clinical Site

R&D Site



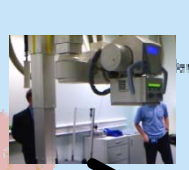
Introduction

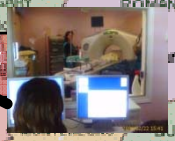
A Distributed Environment

End-Users: Clinicians

Clinical Site

R&D Site





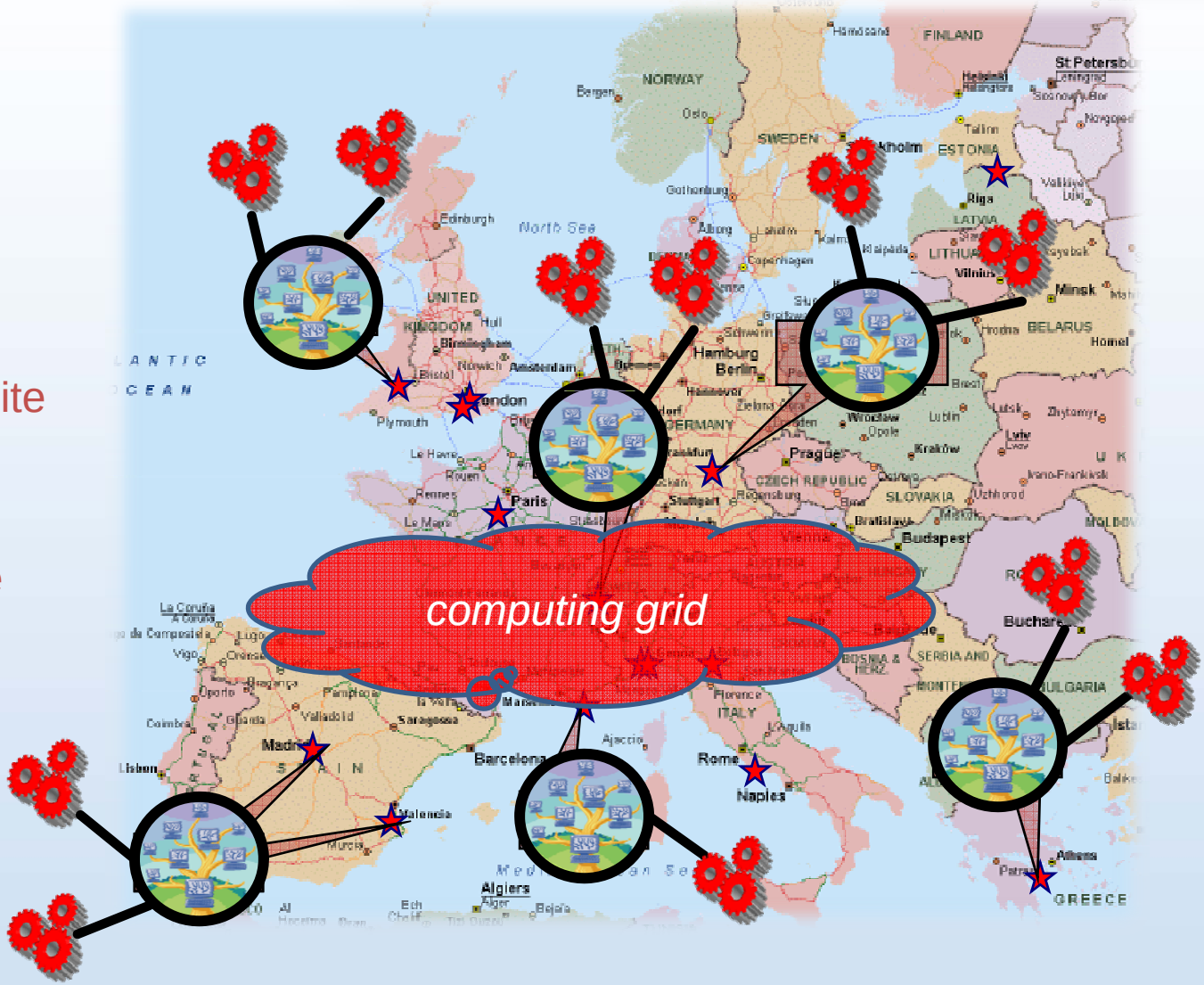
data grid

Introduction

A Distributed Environment

Clinical Site

R&D Site



Challenge

Problem Description

Security

- Interconnecting Hospitals through the Internet
- Providing Services & Data Online

Privacy

- Connecting a Research Platform to Hospitals' Information Systems
- Manipulating Patient Data

Heterogeneity

- Dealing with several imaging devices, technologies, protocols, data, environments…

Distribution, Scalability

- Coping with geographically distributed sites across Europe (France, UK, Italy…)
- Building a scalable system for a future expansion

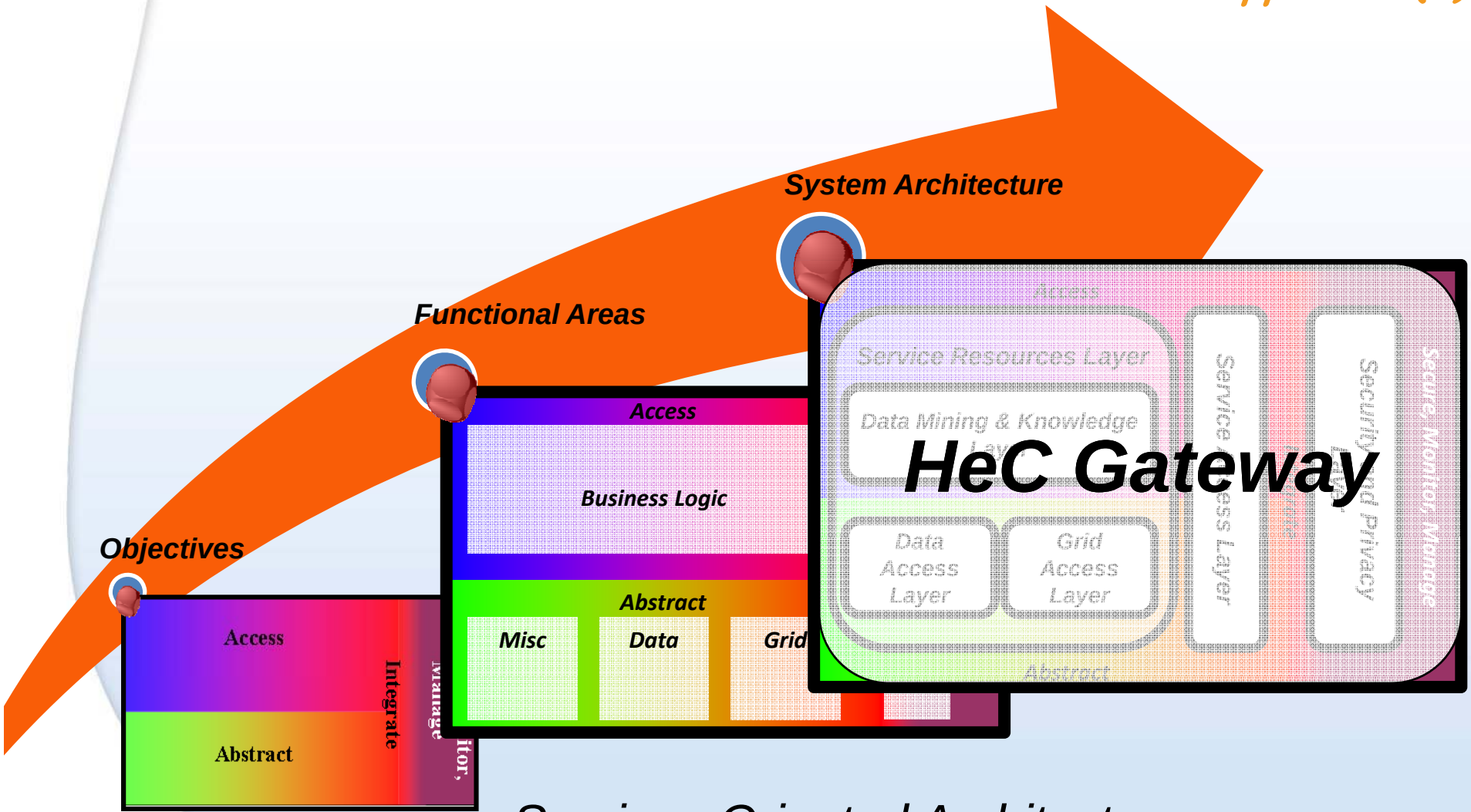
Usability

- End-users: Clinicians
- Providing a rapid and efficient access to the Platform

Solution

Solution

Our Approach (1)



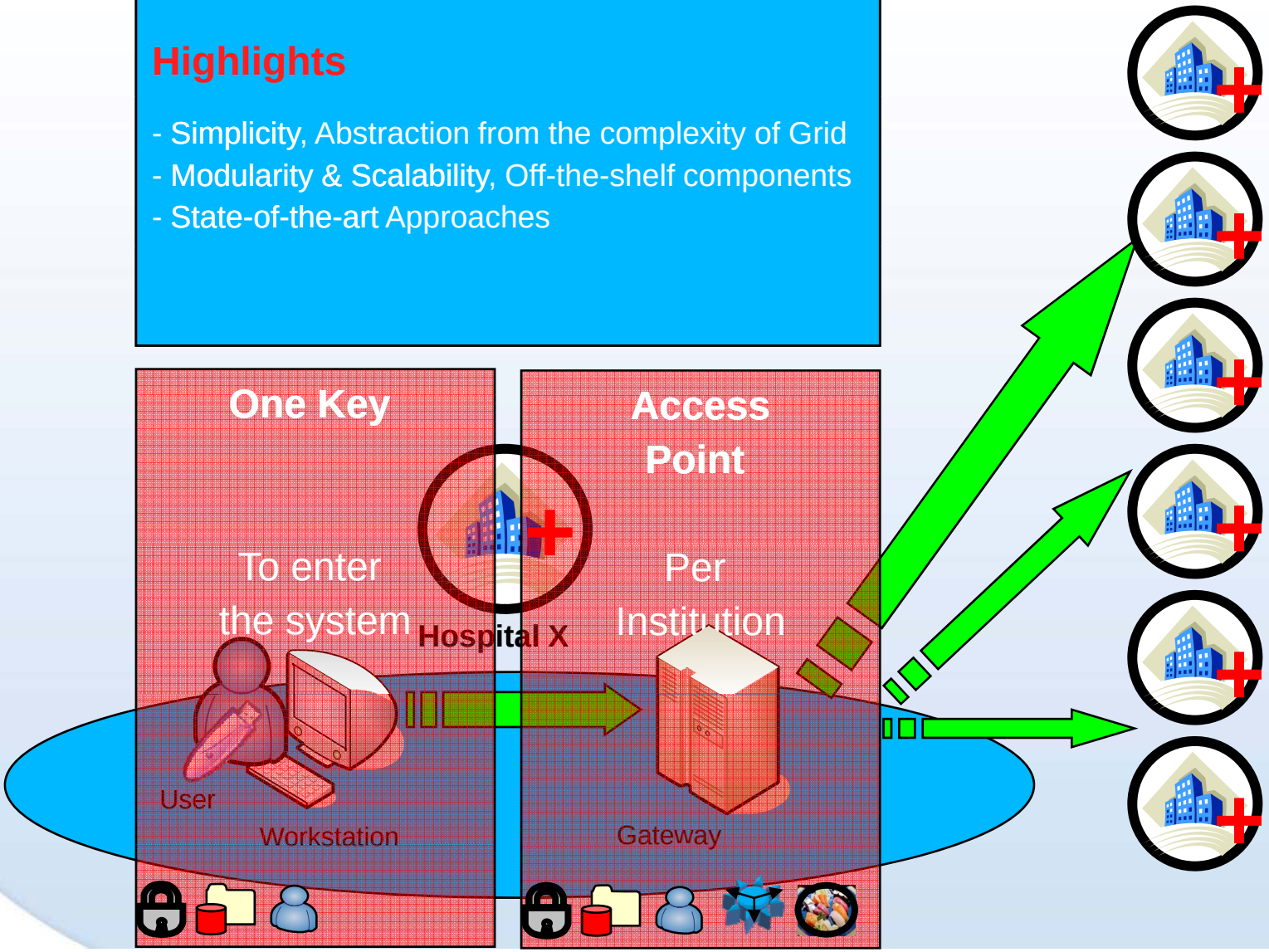
Services-Oriented Architecture,
an Ecosystem of Biomedical Utilities

Solution

Our Approach (2)

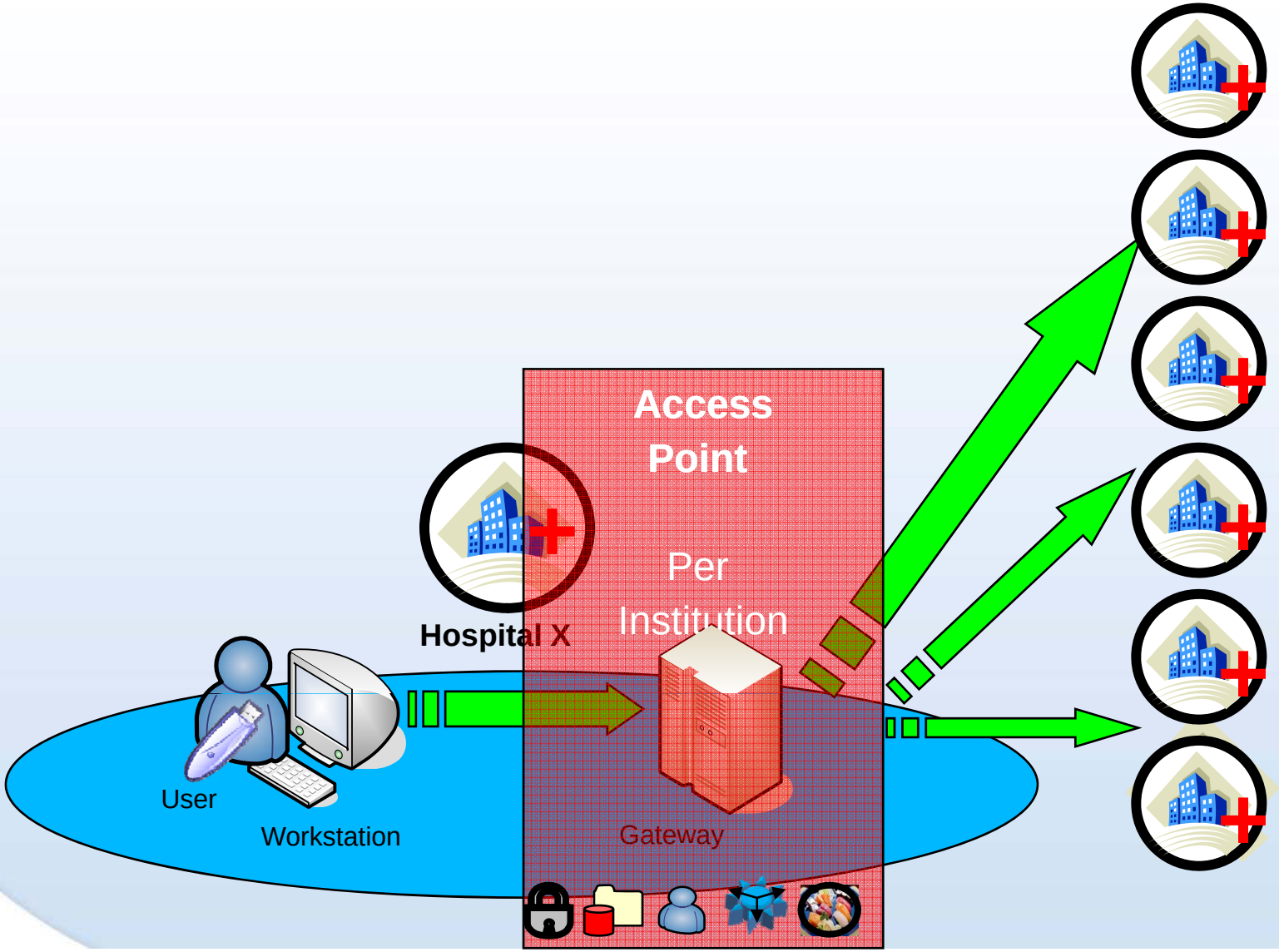
Highlights

- Simplicity, Abstraction from the complexity of Grid
- Modularity & Scalability, Off-the-shelf components
- State-of-the-art Approaches



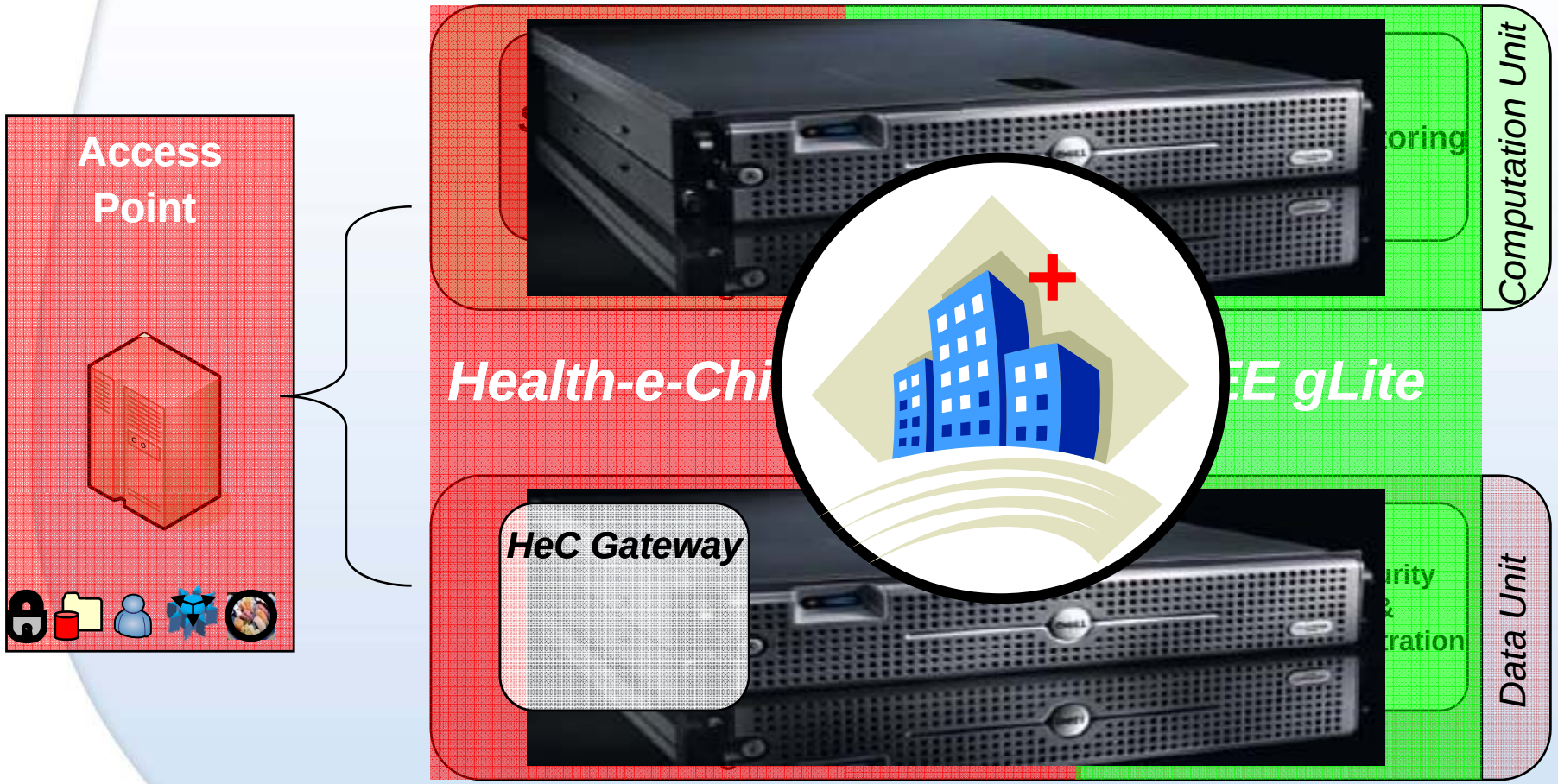
Solution

Our Approach

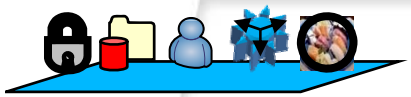


The Platform

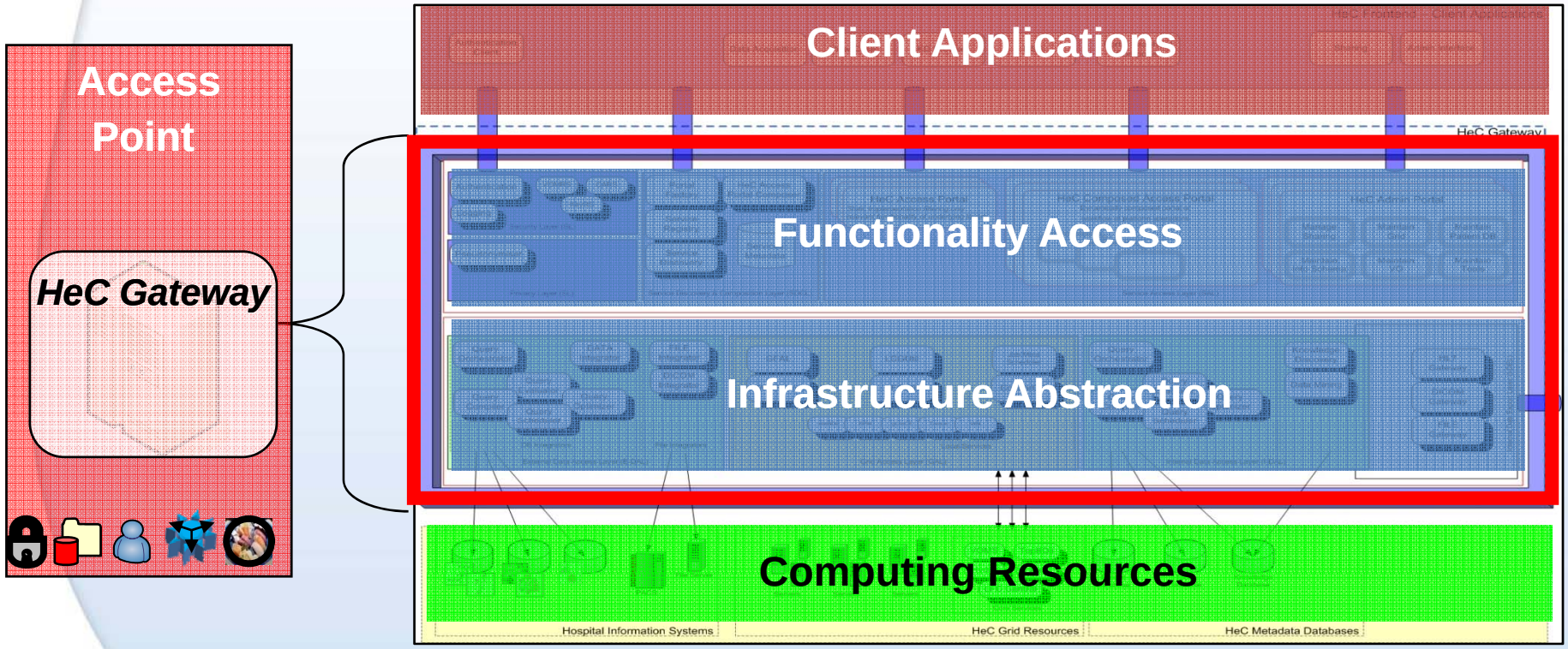
The Health-e-Child Access Point



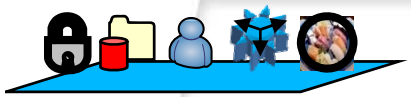
Virtualization…



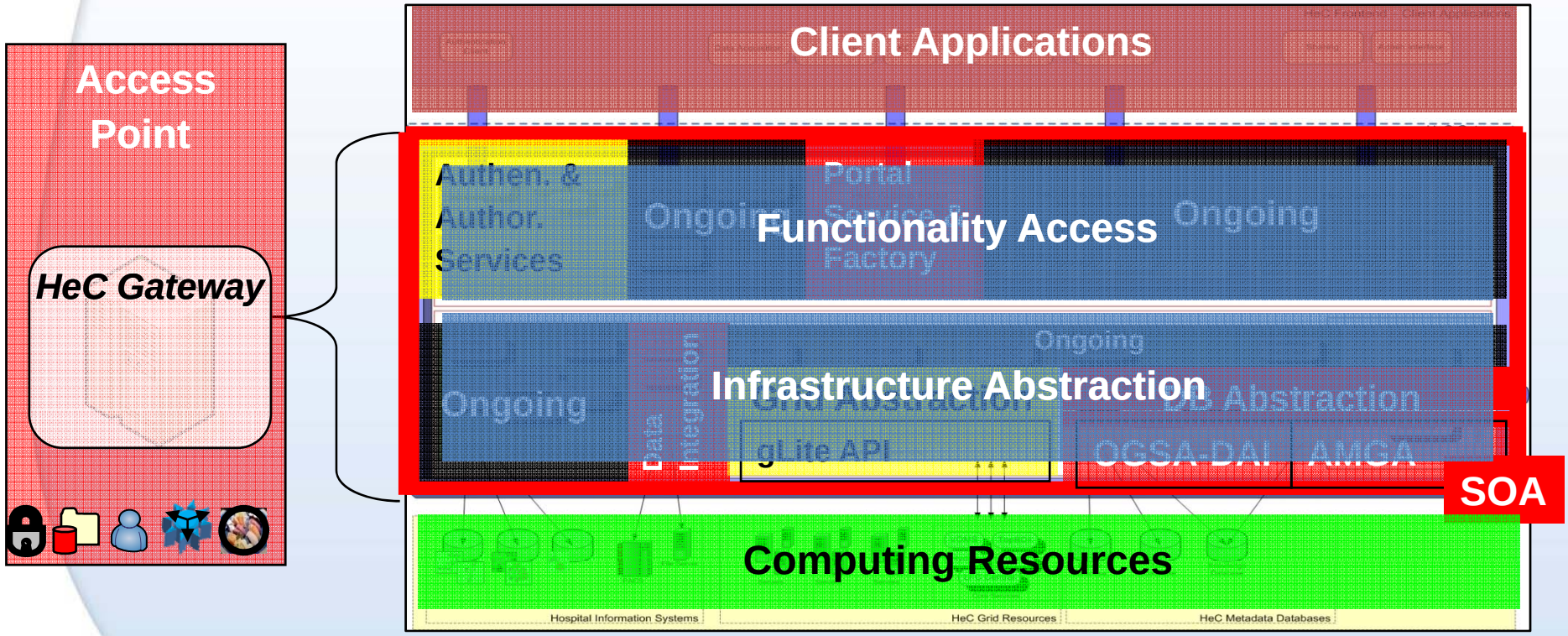
The Health-e-Child Gateway (1)



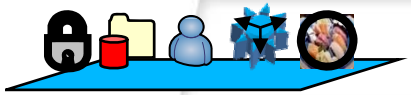
Inside the box…

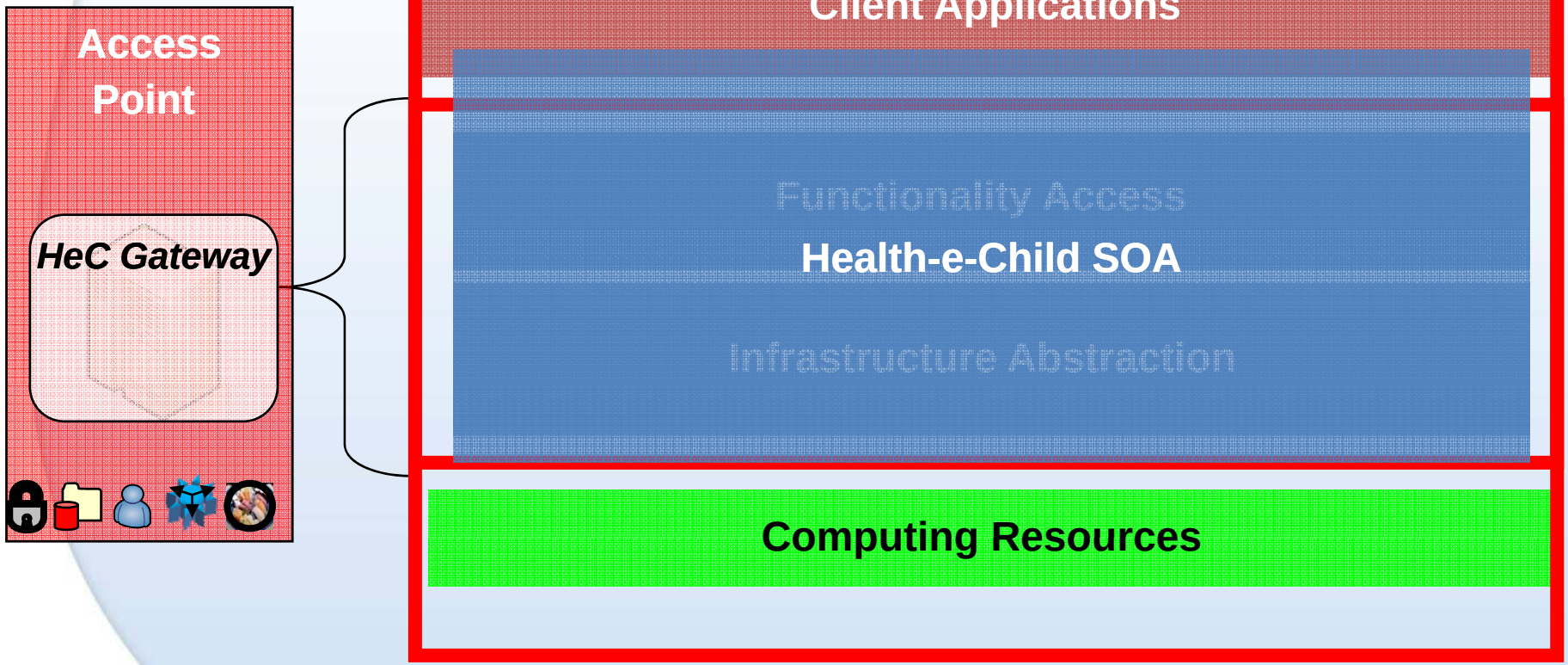


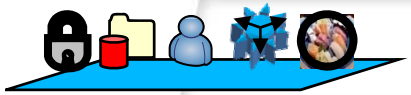
The Health-e-Child Gateway (2)

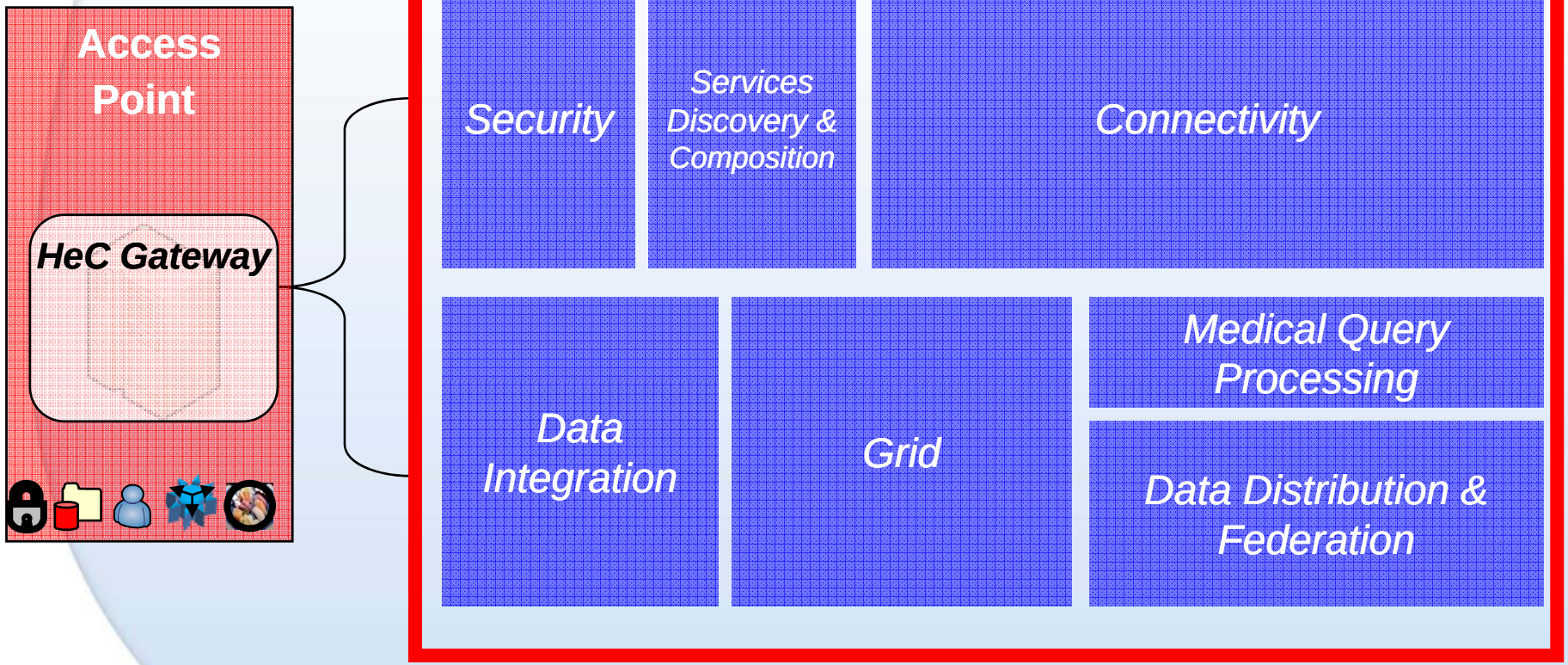


Inside the box…

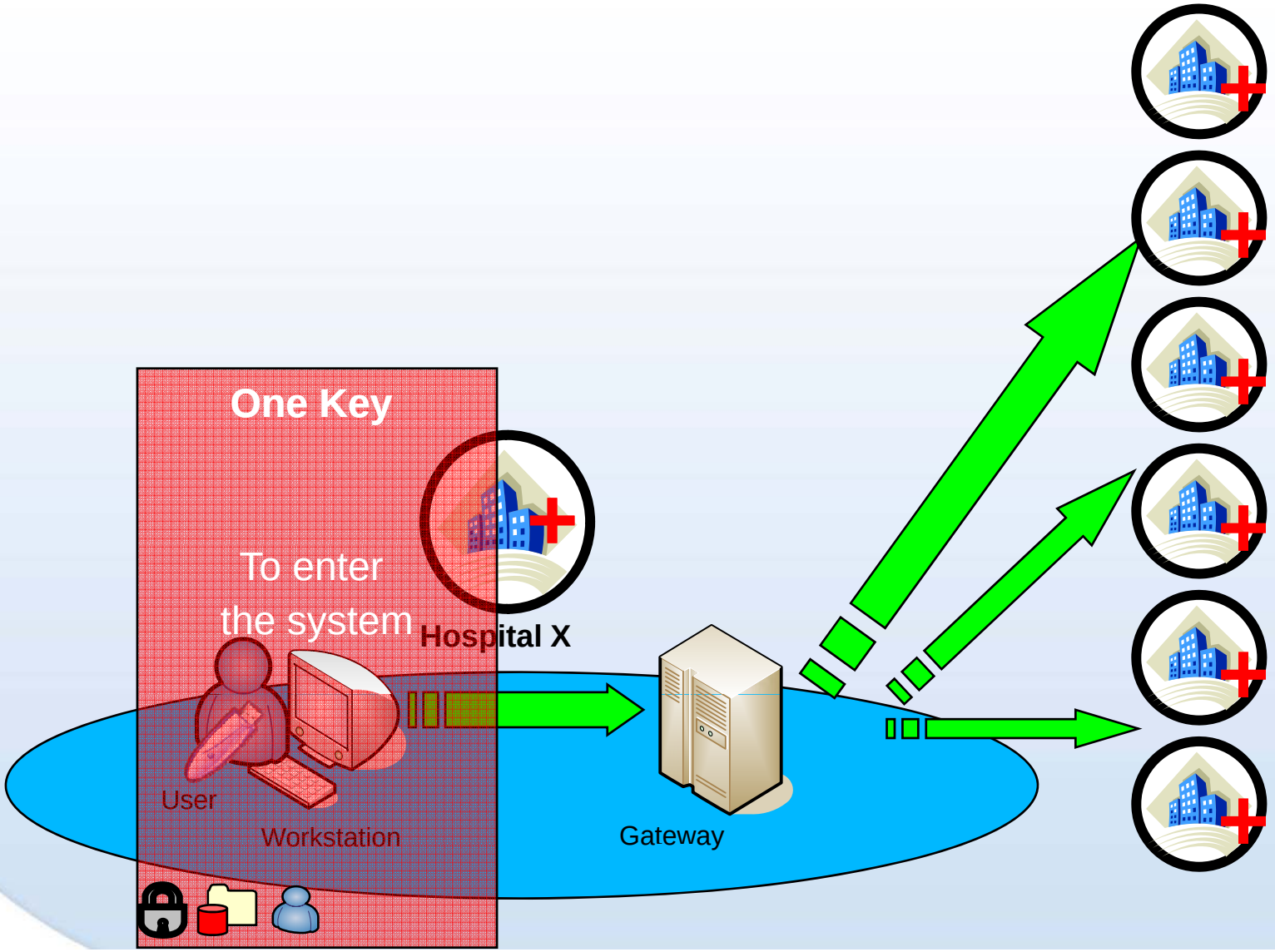



Access Point
HeC Gateway
Client Applications
Functionality Access
Health-e-Child SOA
Infrastructure Abstraction
Computing Resources

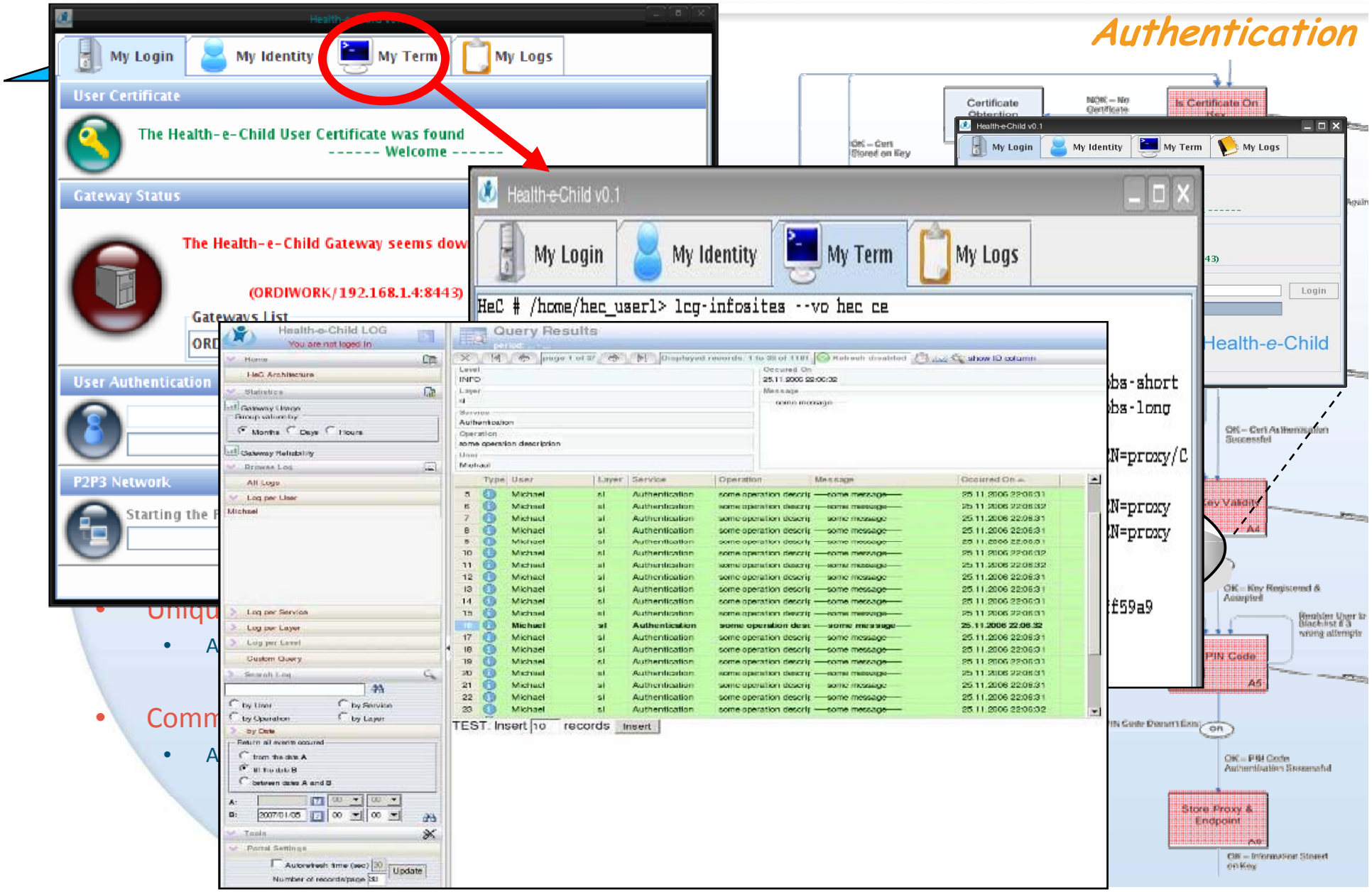



Access Point
HeC Gateway
Security
Services Discovery & Composition
Connectivity
Data Integration
Grid
Medical Query Processing
Data Distribution & Federation

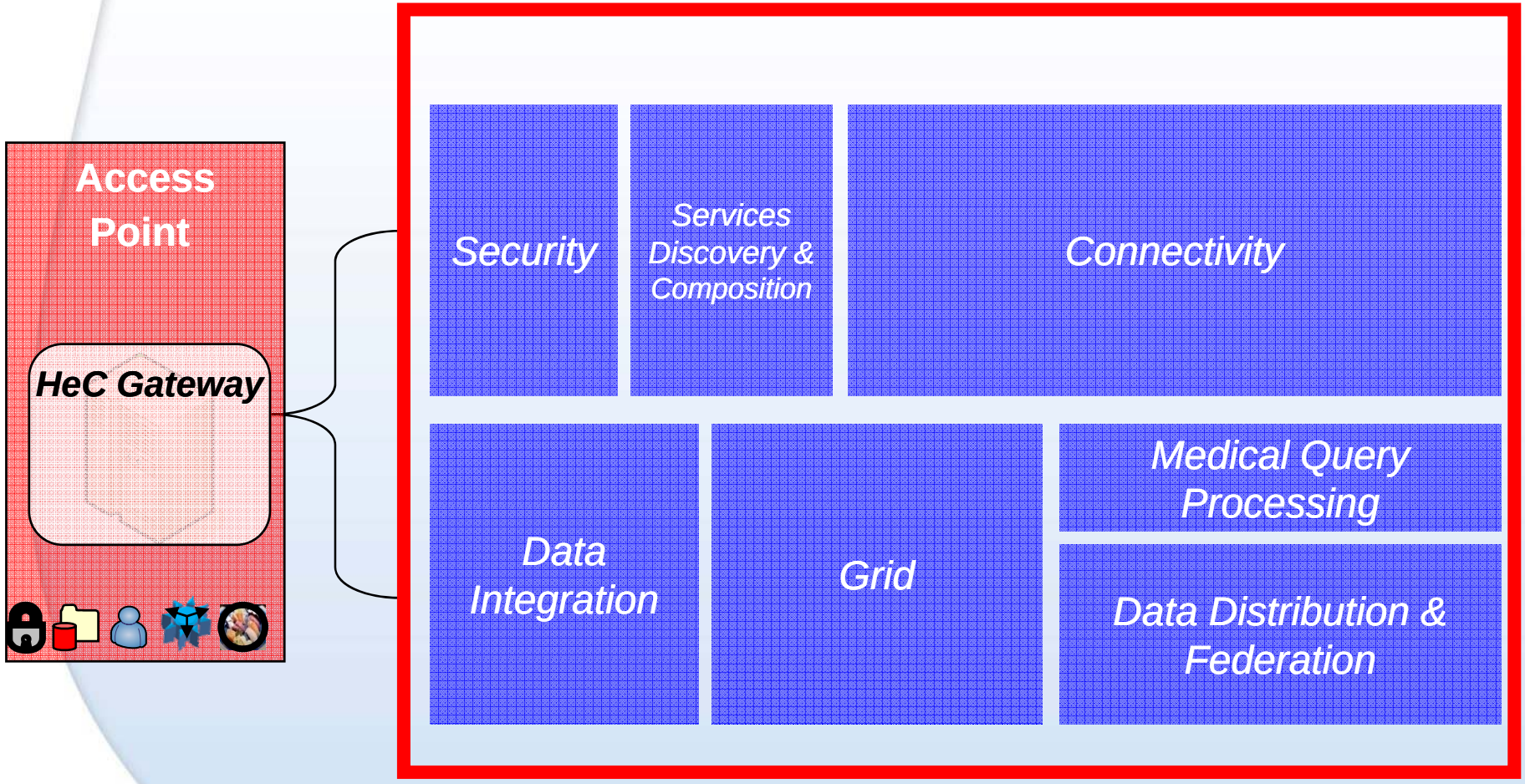
Our Approach



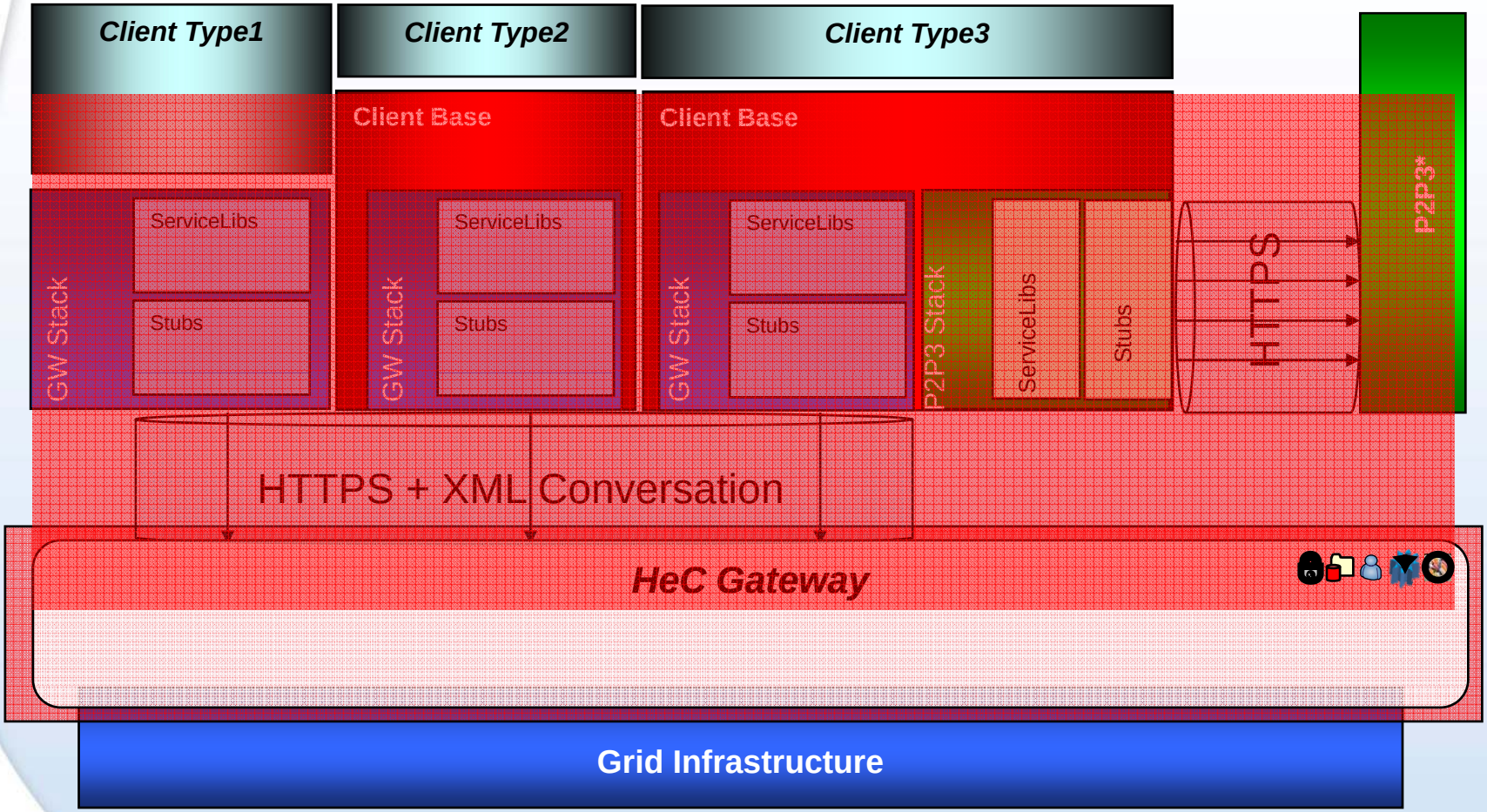
Project Results @ M18



Project Results @ M18

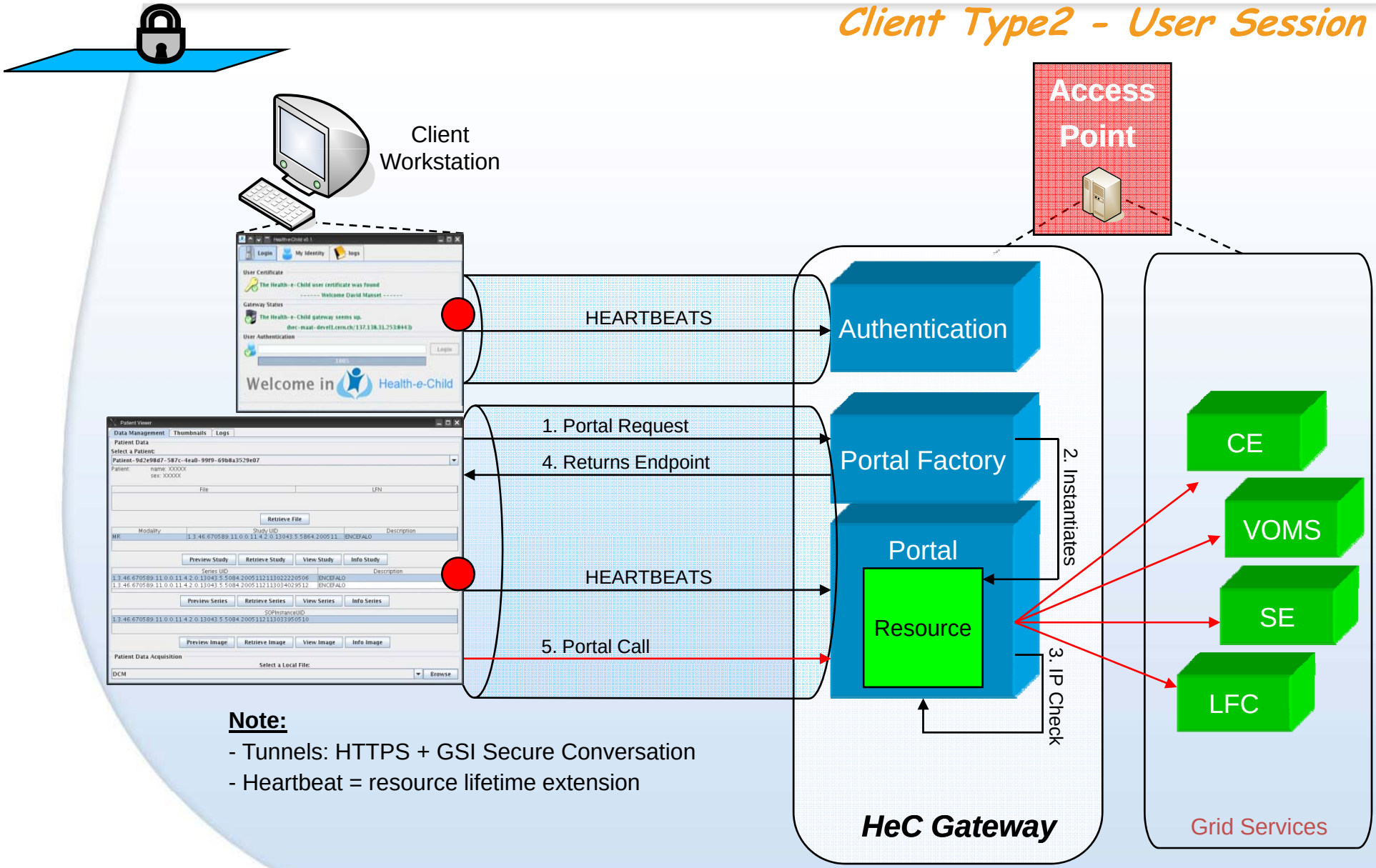


Client Connectivity (1)



*P2P3: Peer-To-Peer Patient Privacy

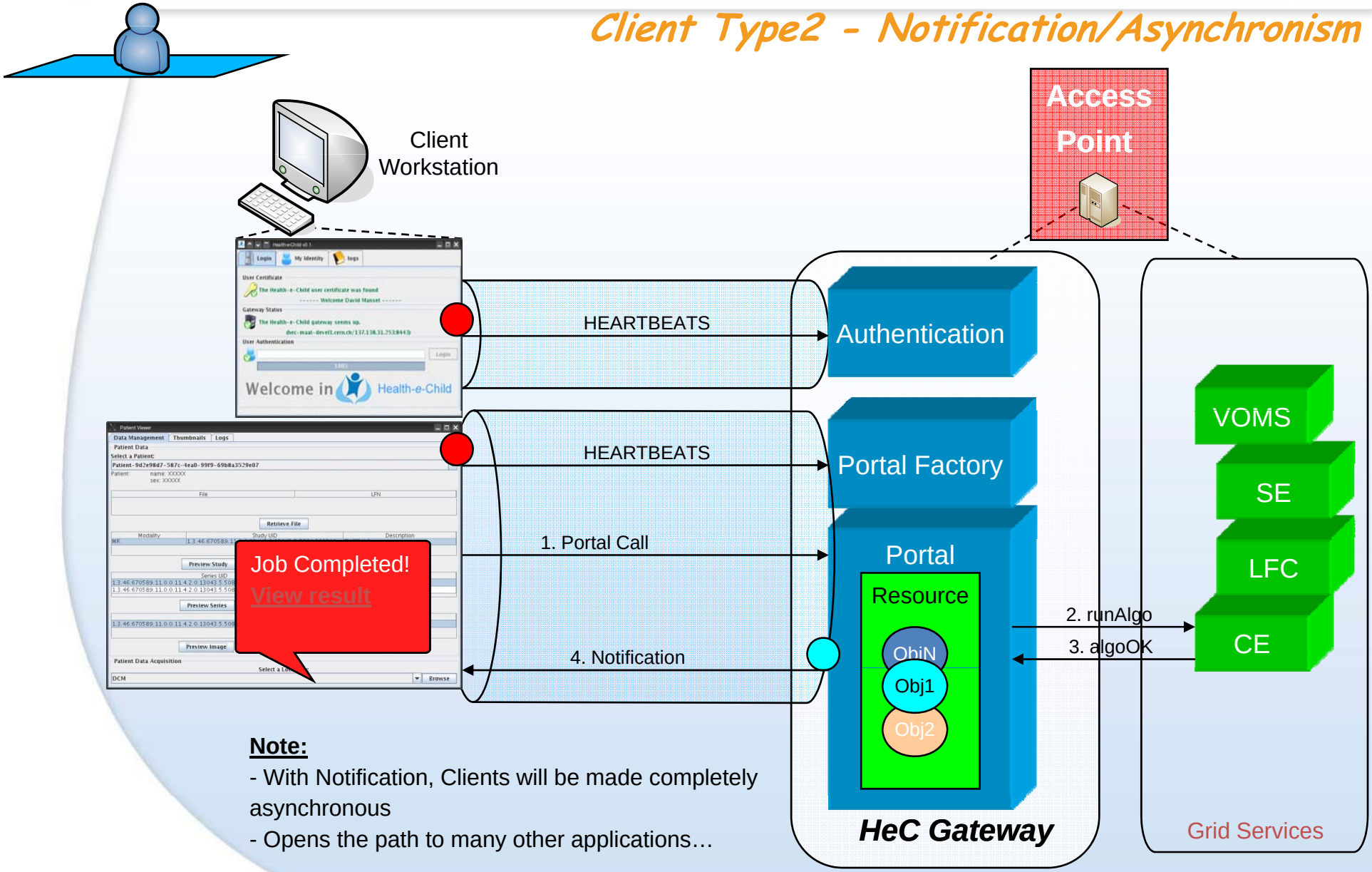
Client Type2 - User Session



Note:

- Tunnels: HTTPS + GSI Secure Conversation
- Heartbeat = resource lifetime extension

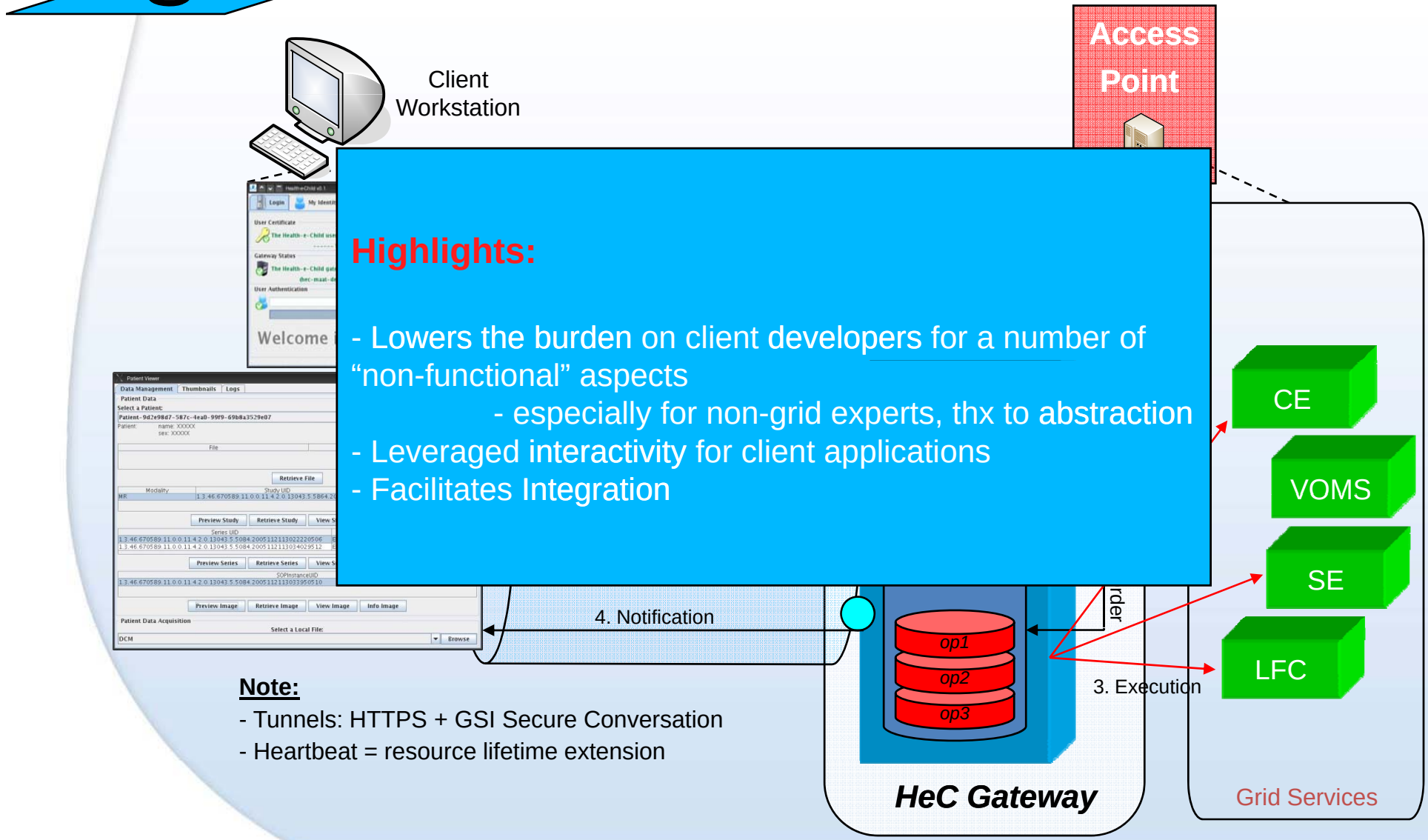
Client Type2 - Notification/Asynchronism



Note:

- With Notification, Clients will be made completely asynchronous
- Opens the path to many other applications…

Client Type2 – Operation Management



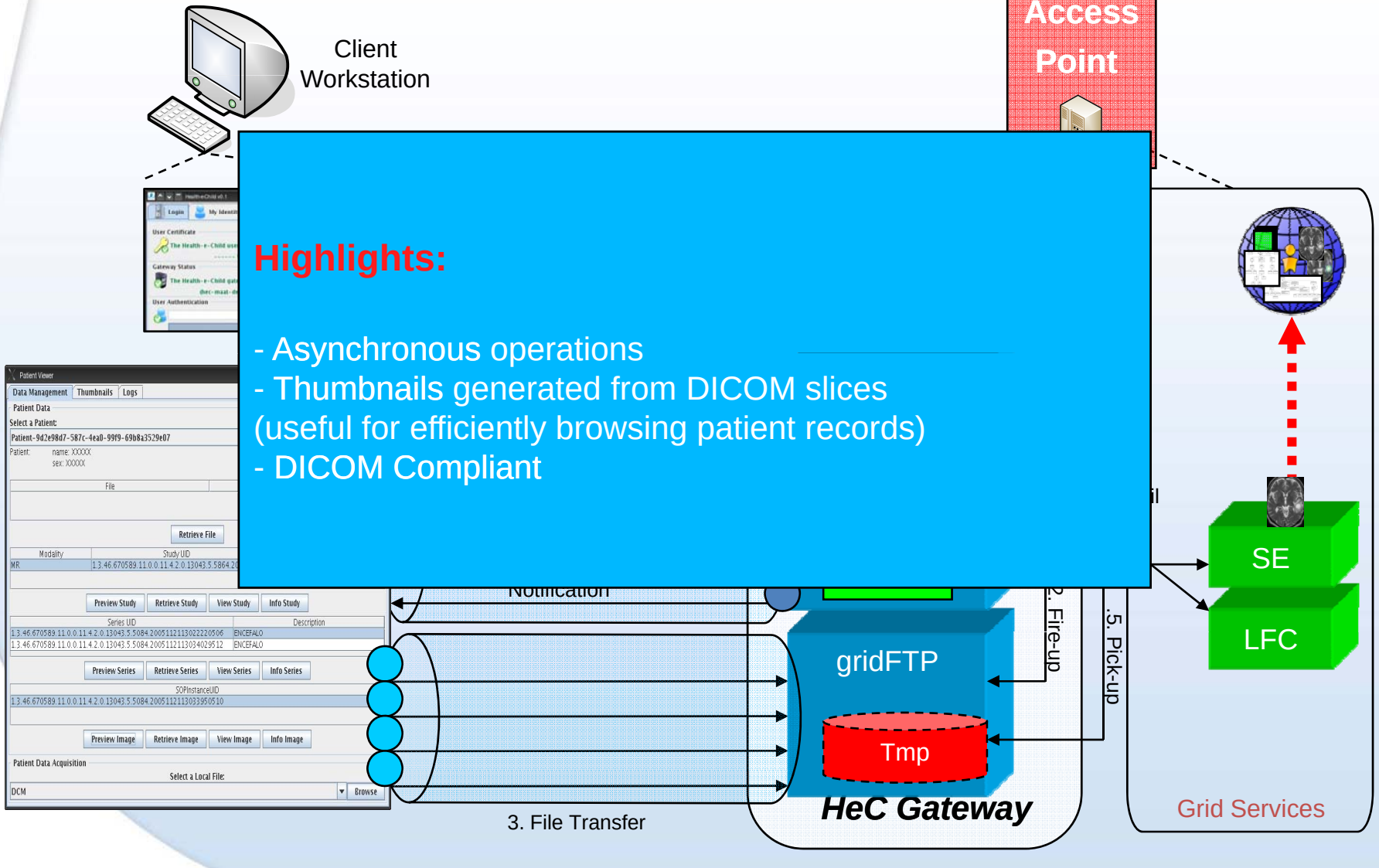
Highlights:

- Lowers the burden on client developers for a number of "non-functional" aspects
  - especially for non-grid experts, thx to abstraction
- Leveraged interactivity for client applications
- Facilitates Integration

Note:

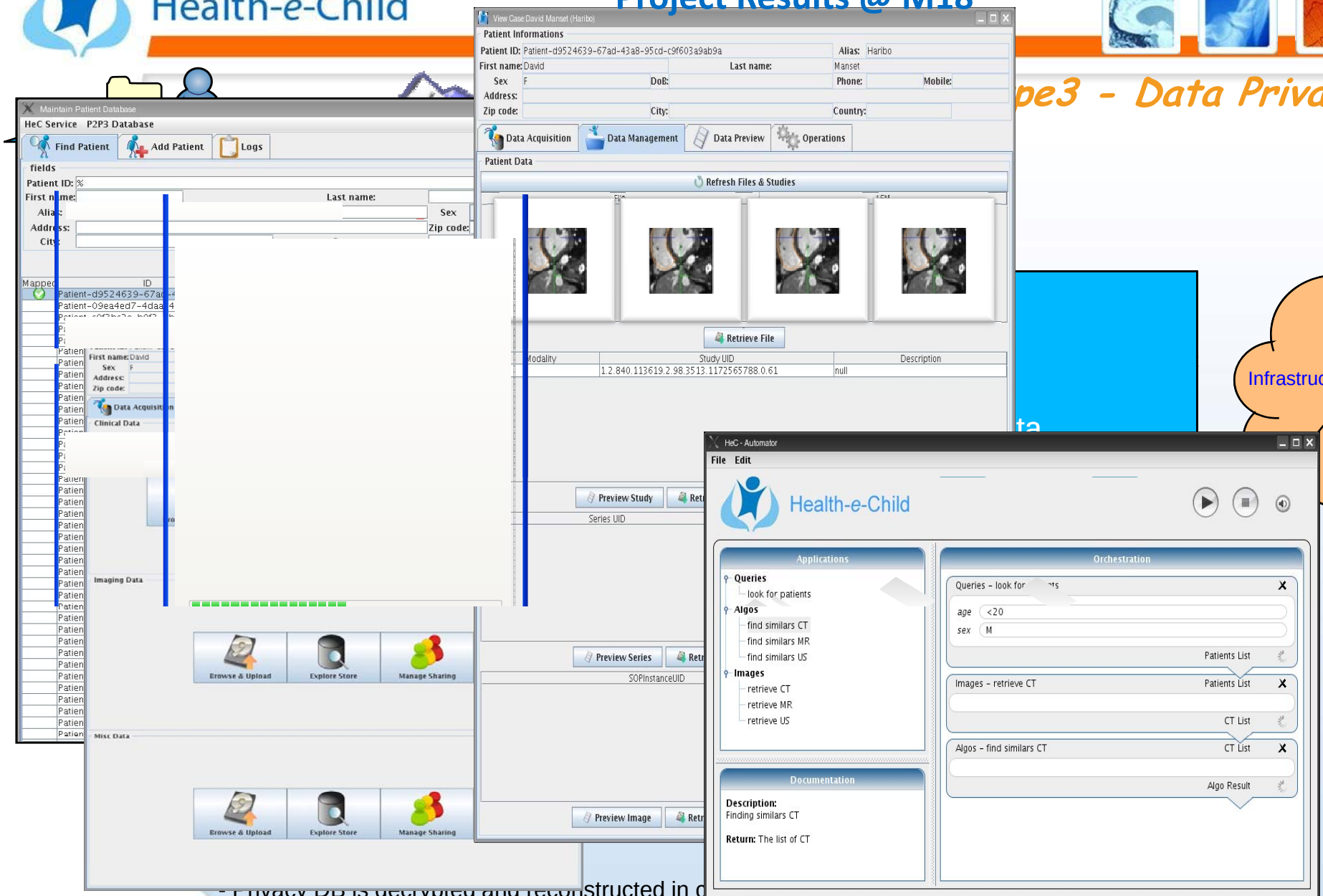
- Tunnels: HTTPS + GSI Secure Conversation
- Heartbeat = resource lifetime extension

DICOM Files


Client
Workstation
Access
Point
Highlights:
- Asynchronous operations
- Thumbnails generated from DICOM slices
(useful for efficiently browsing patient records)
- DICOM Compliant
Patient Viewer
Data Management
Thumbnails
Logs
Patient Data
Select a Patient:
Retrieve File
Preview Study
Retrieve Study
View Study
Info Study
Preview Series
Retrieve Series
View Series
Info Series
Preview Image
Retrieve Image
View Image
Info Image
Patient Data Acquisition
Select a Local File:
Browse
Notification
2. Fire-up
.5. Pick-up
gridFTP
Tmp
HeC Gateway
SE
LFC
Grid Services
3. File Transfer

Project Results @ M18

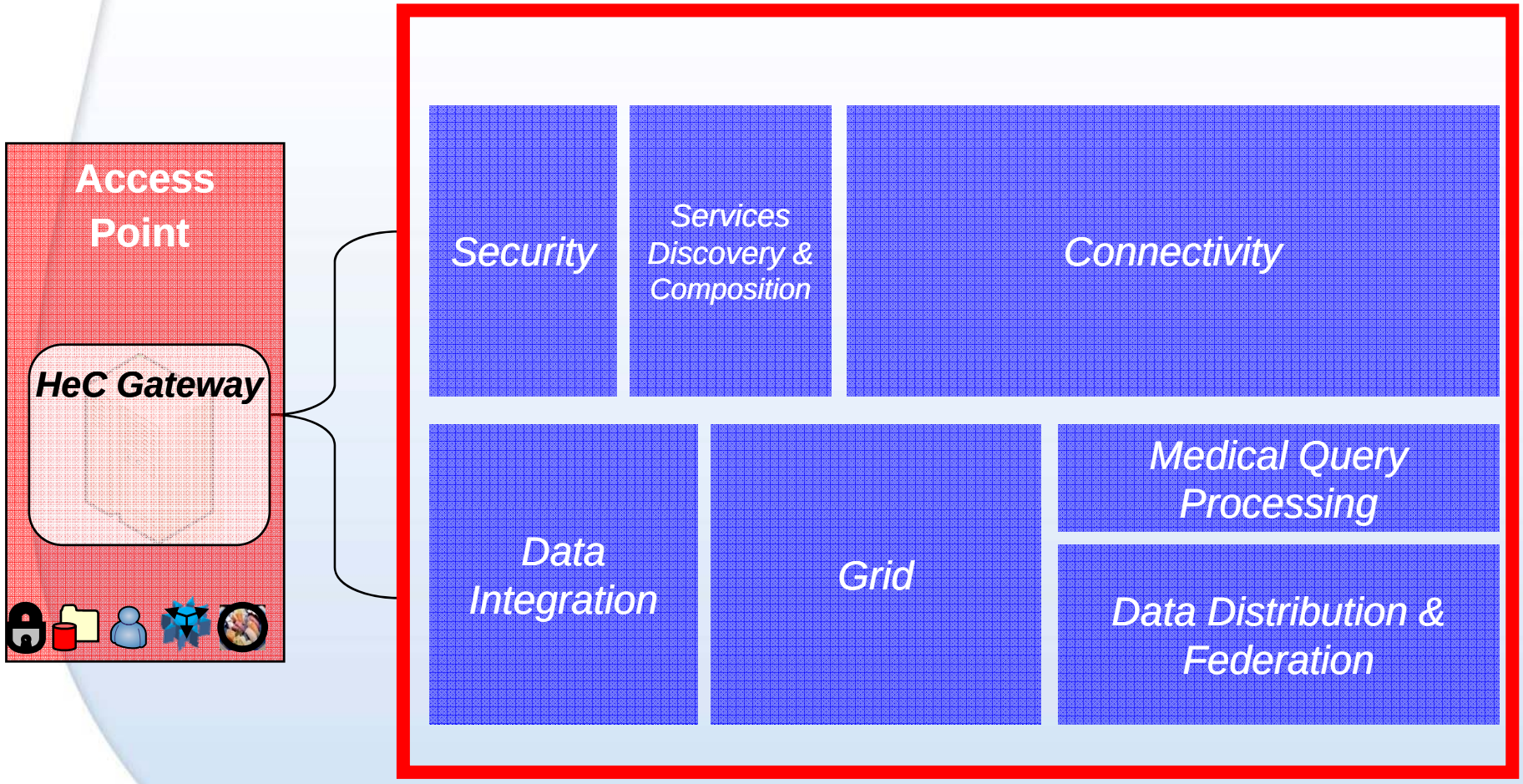
pe3 - Data Privacy



- Privacy DB is decrypted and reconstructed in c
once clinician is authenticated in the VO

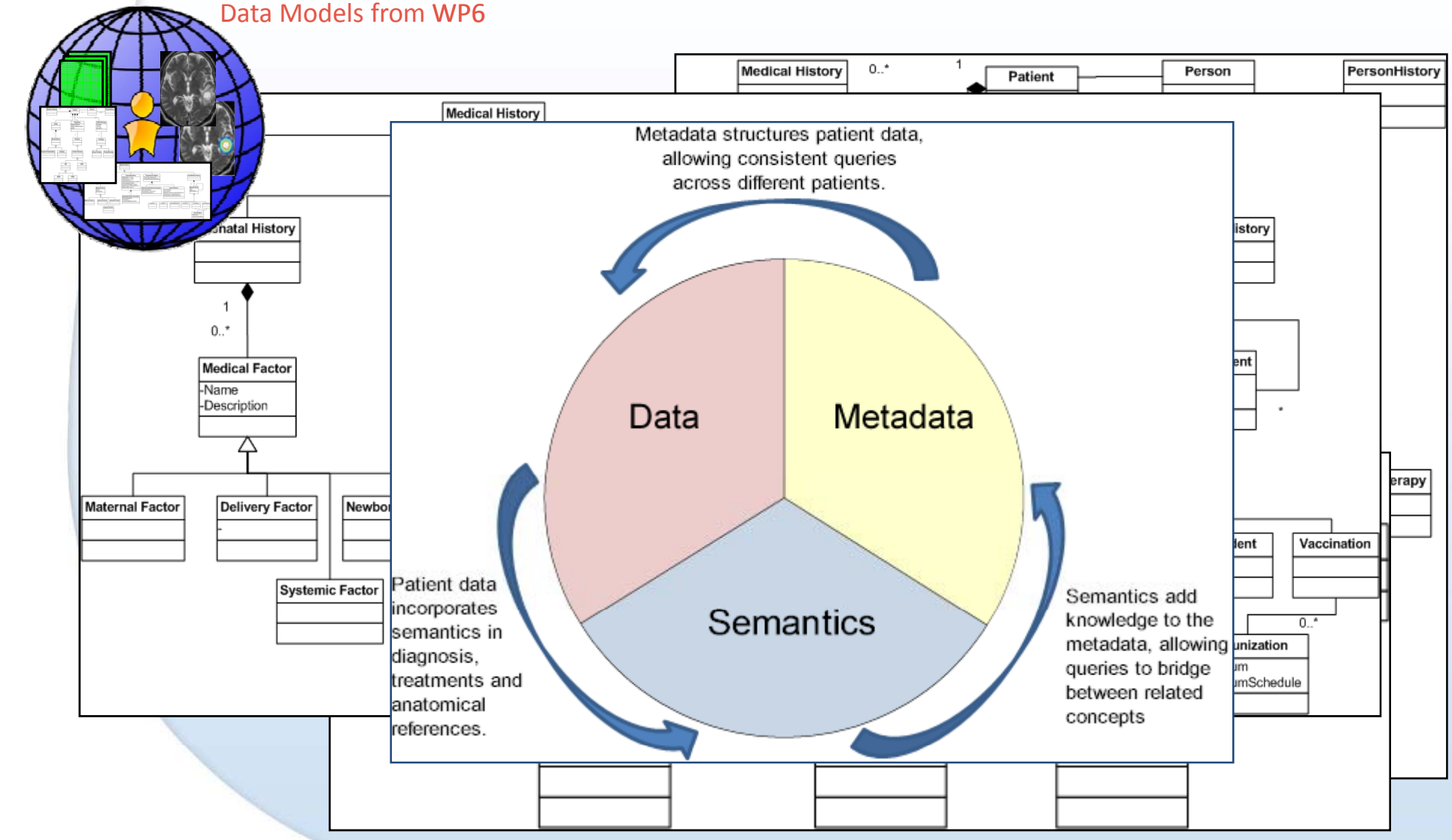
Patient Private Info

Project Results @ M18



Integrated Data Model

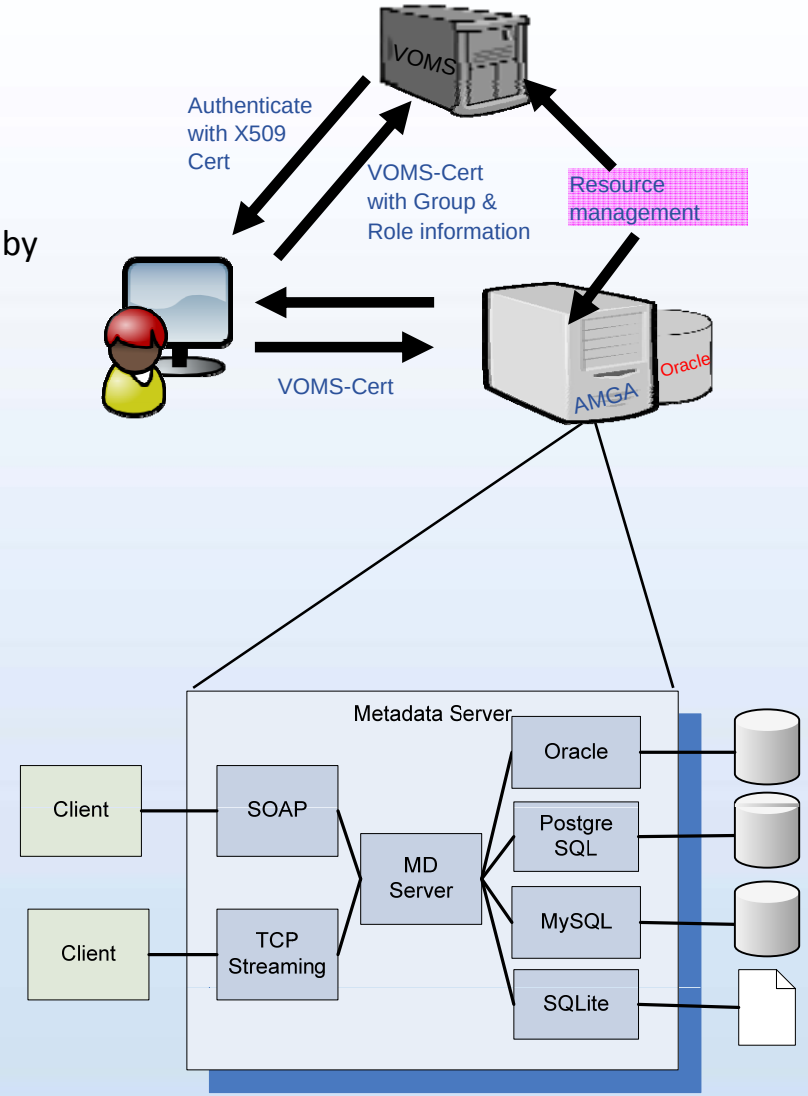
Data Models from WP6



Data Distribution & Federation

Abstraction Layer - AMGA

- Backends
  - Runs on any Linux flavour
  - Oracle, MySQL, PostgreSQL, SQLite
- Frontends
  - TCP Streaming
    - High performance
    - Client API for C++, Java, Python, Perl, Ruby
  - SOAP
    - Interoperability
- Secure connections – SSL
- Authentication based on
  - Username/password
  - General X509 certificates
  - Grid-proxy certificates
- Authorisation:
  - Users/groups
  - Unix style permissions
  - ACLs – Per-collection or per-entry
  - Access control via a VO



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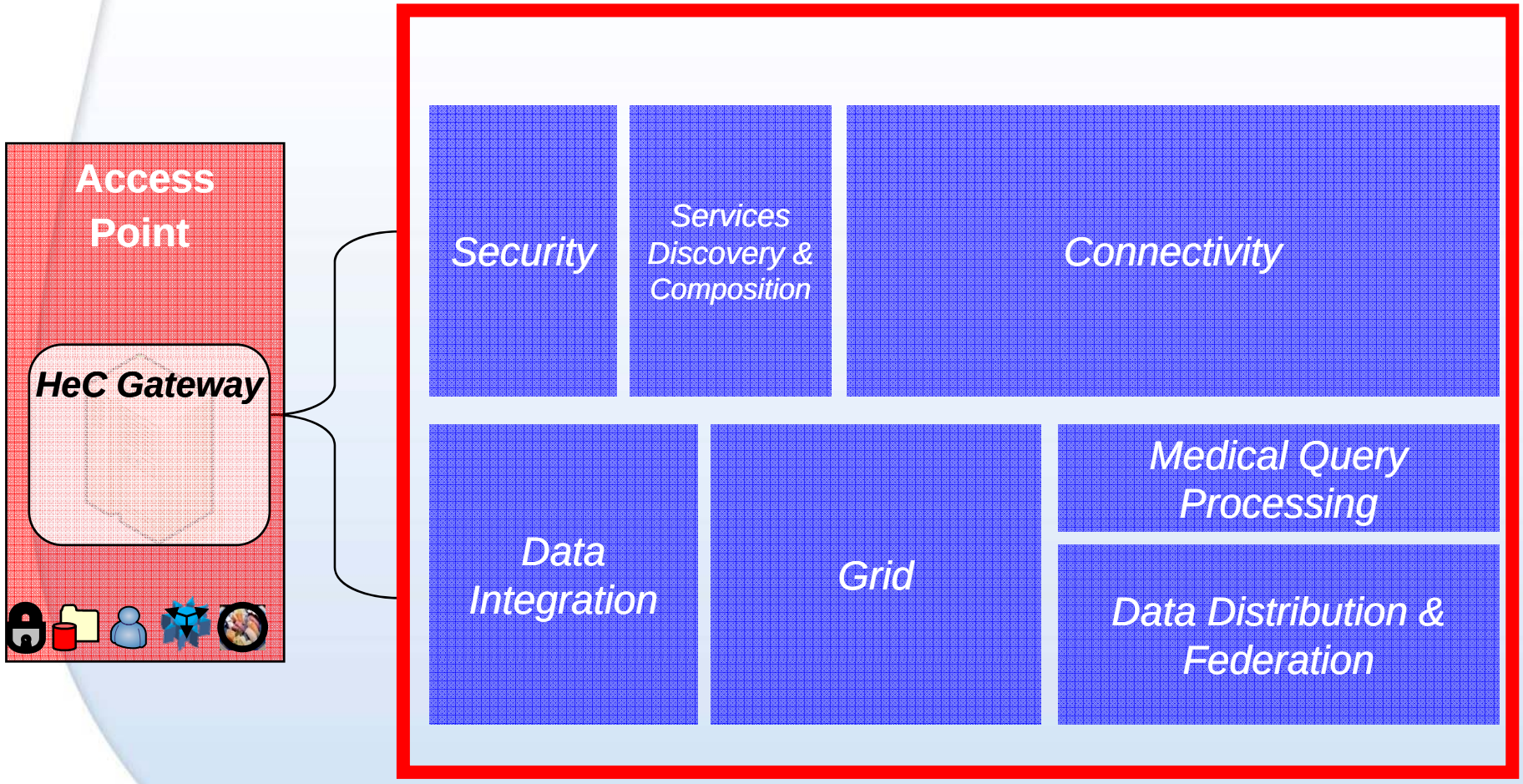
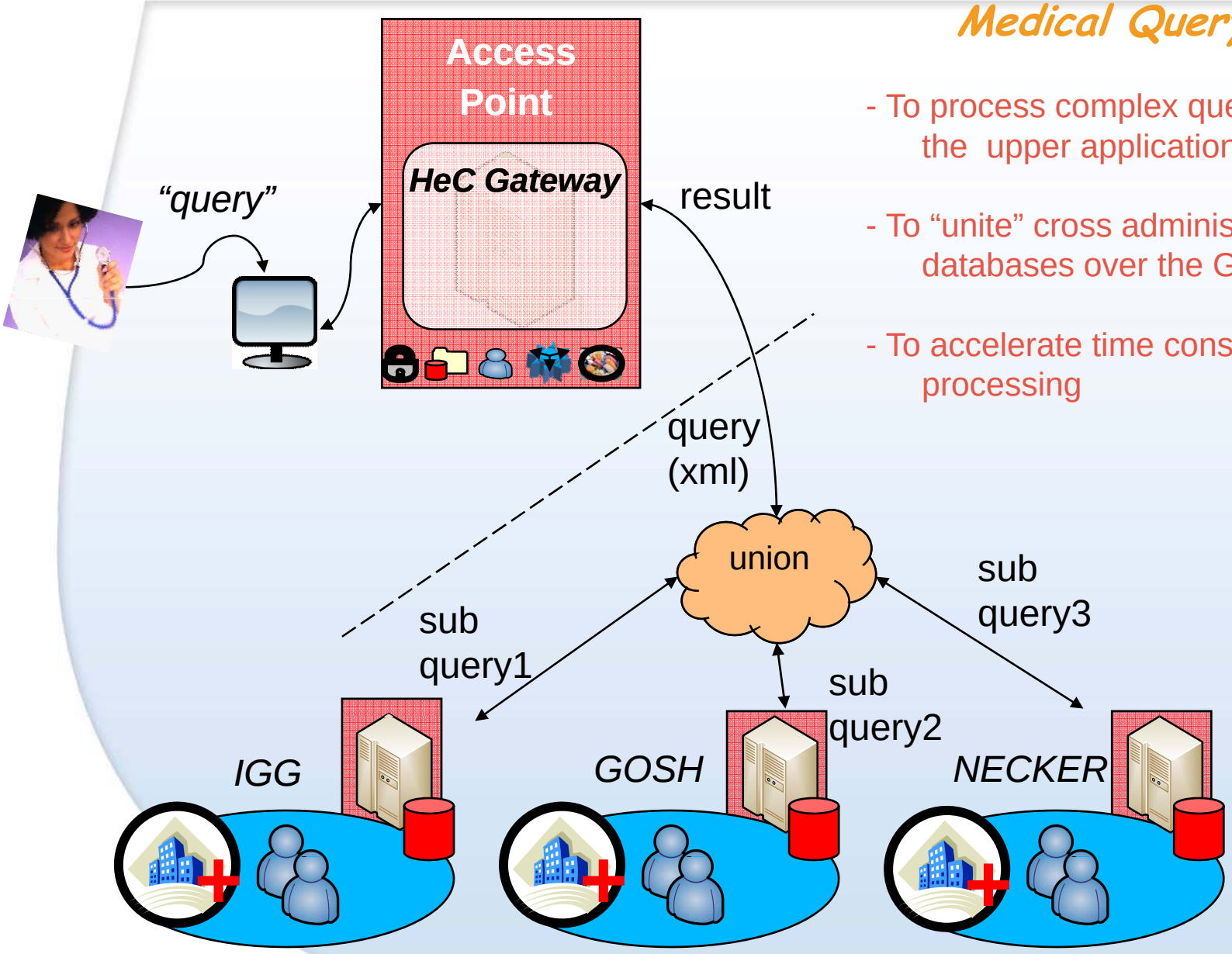


Medical Query Processing

- To process complex queries supporting the upper applications
- To "unite" cross administration domain databases over the Grid
- To accelerate time consuming processing



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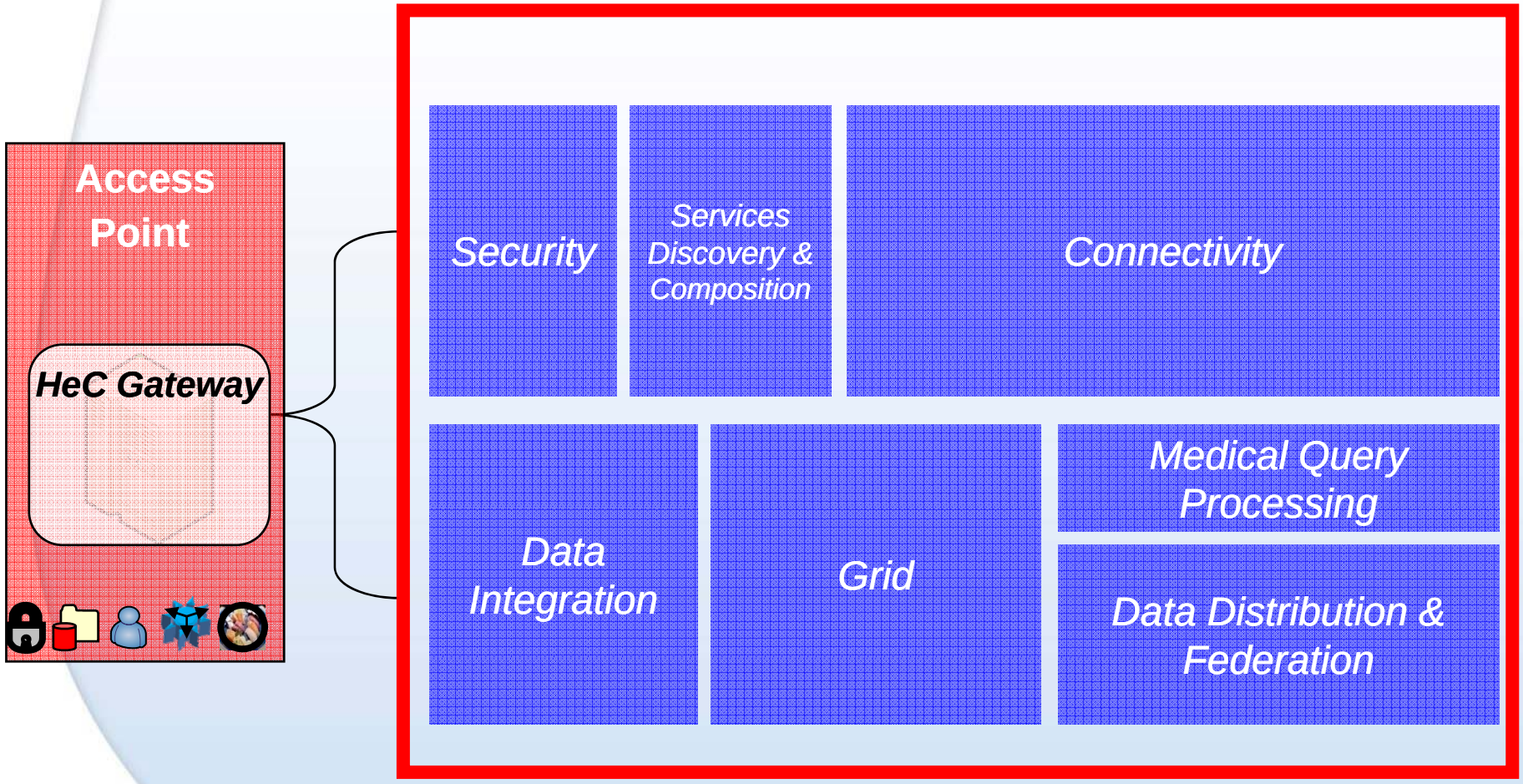
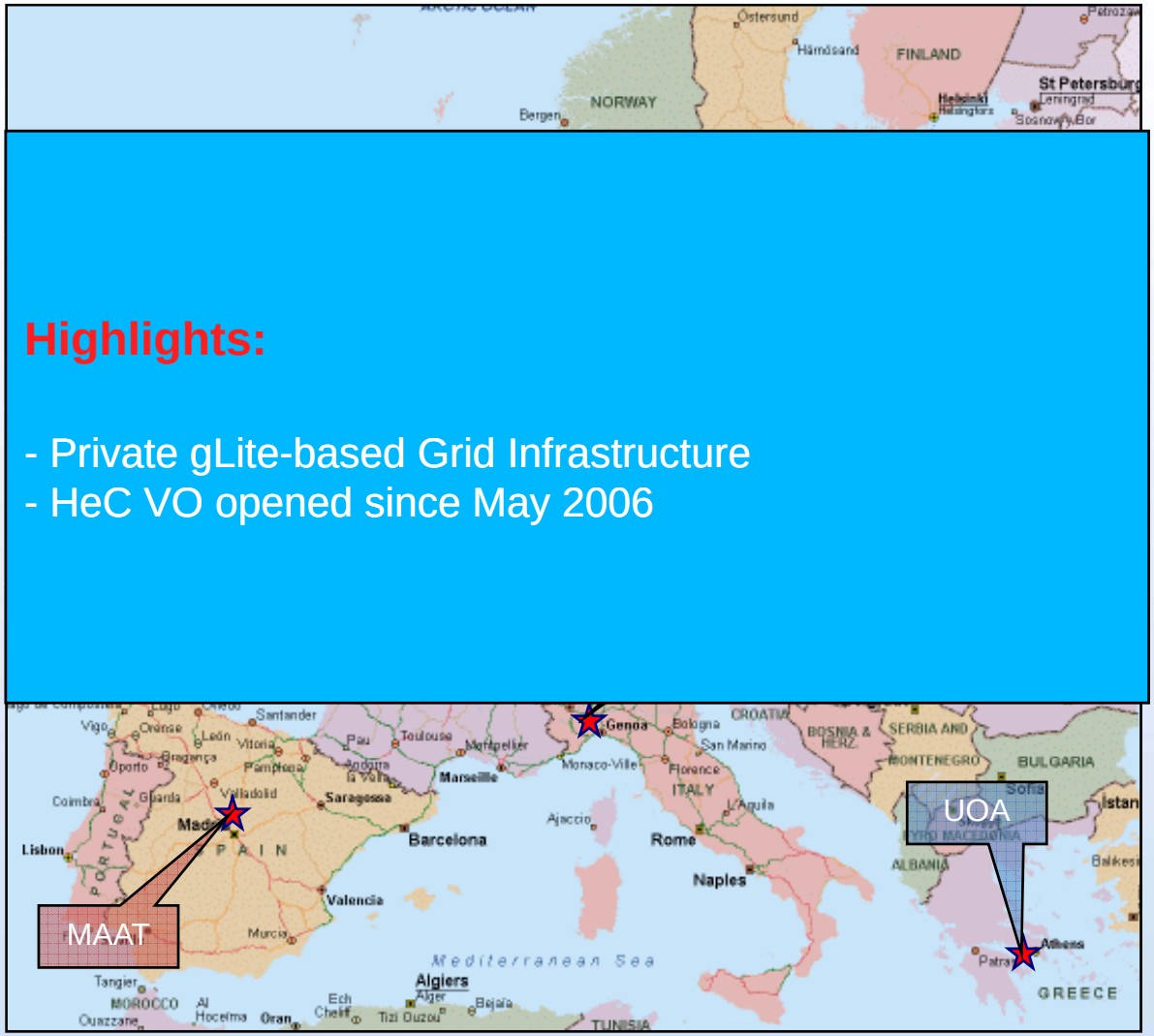
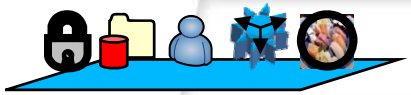
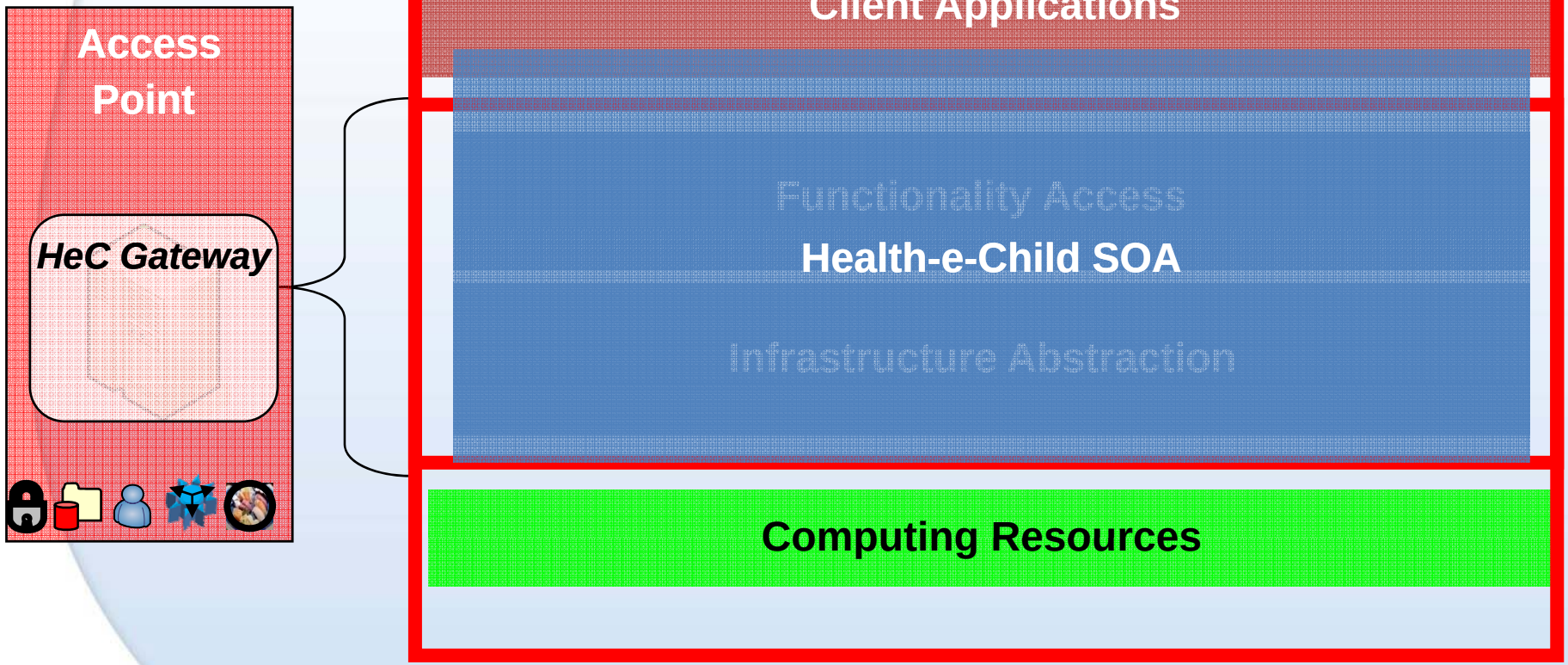


Grid Infrastructure






Access Point
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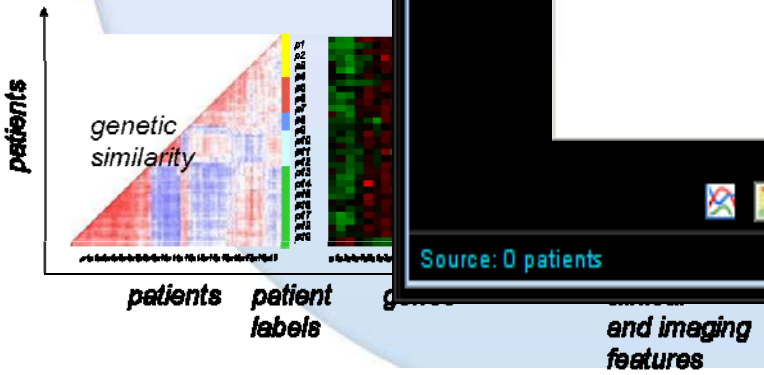
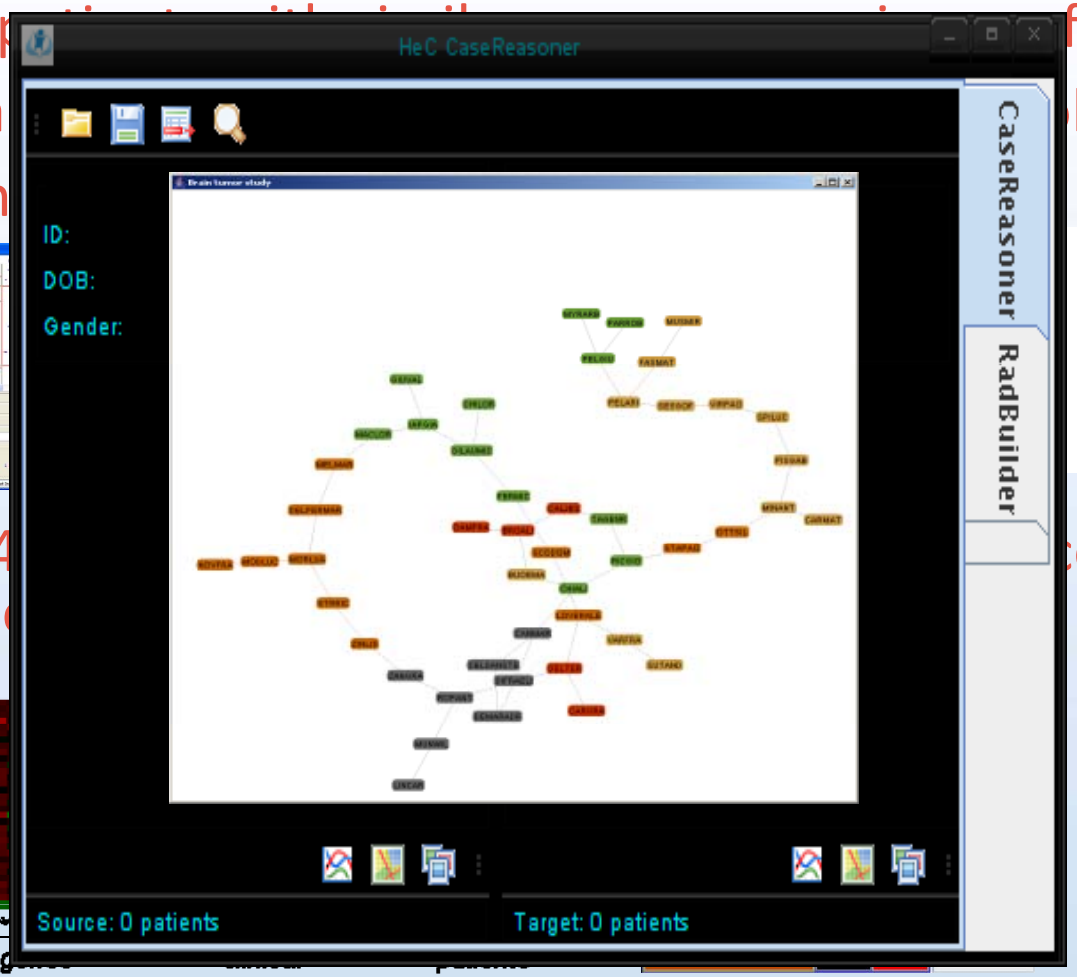
Infrastructure Abstraction
Computing Resources

HeC Case Reasoner (1)

- Patient cohort determined by filtering and / or similarity search
- e.g. male p file
- Goal: Visua hort
- up to 4 dim

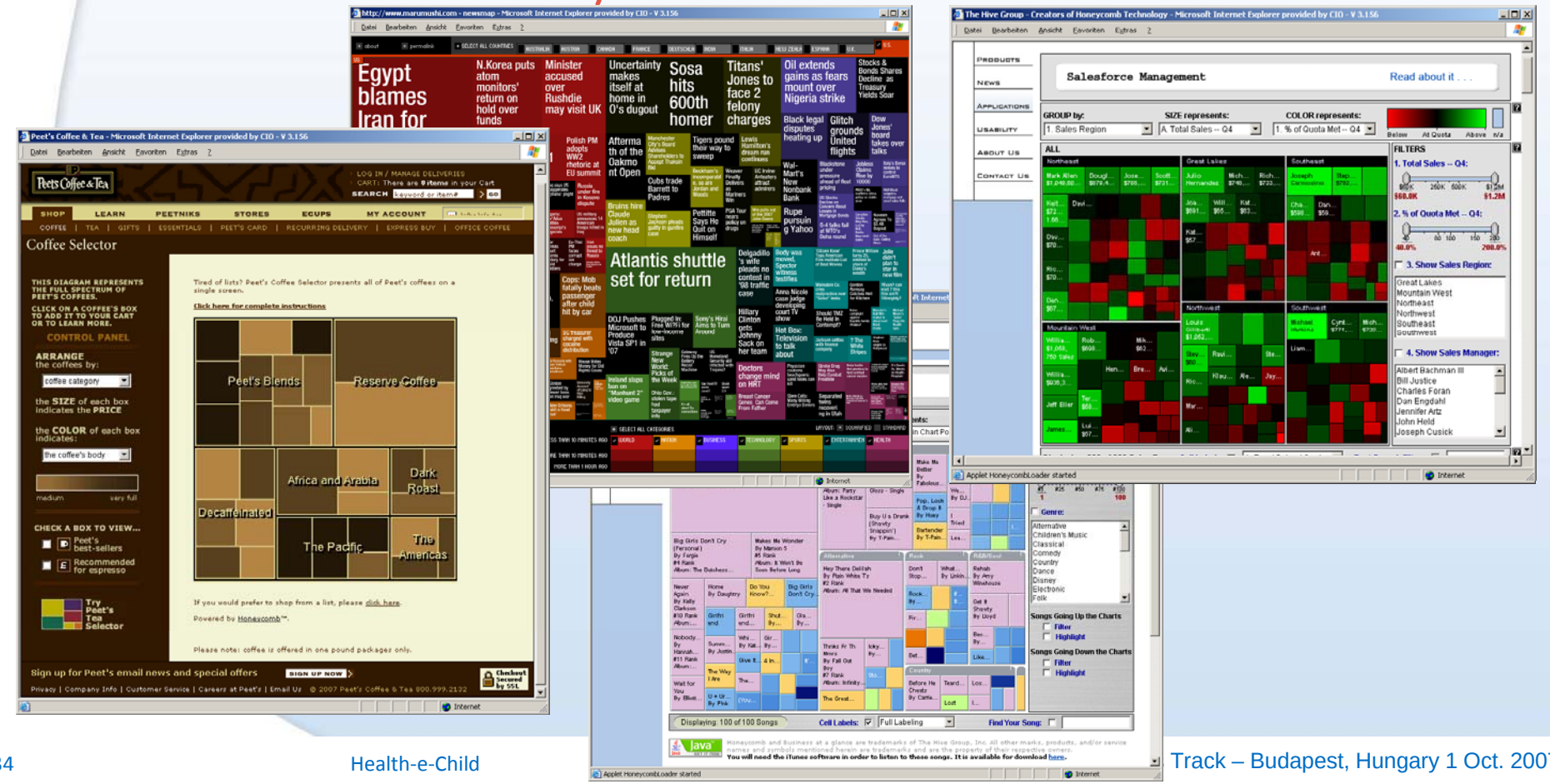
- more than 4 es, tree maps, neighborho





HeC Case Reasoner (2)

Treemaps lately became very popular and have been demonstrated to be significantly faster than spreadsheets to analyze data that is clustered hierarchically



THANK YOU FOR YOUR ATTENTION

More Information

www.health-e-child.org

Live demo @ EGEE User Forum in Budapest

http://indico.cern.ch/contributionDisplay.py?contribId=174&sessionId=23&confId=18714

HeC/Share/Healthgrid Workshop

http://indico.cern.ch/sessionDisplay.py?sessionId=50&slotId=0&confId=18714#2007-10-05