



Developing a Roadmap for a European Healthgrid

Structuring and supporting Healthgrids Activities and Research in Europe (SHARE): developing a roadmap

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 <http://www.eu-share.org>

 <http://www.healthgrid.org>

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SHARE Consortium



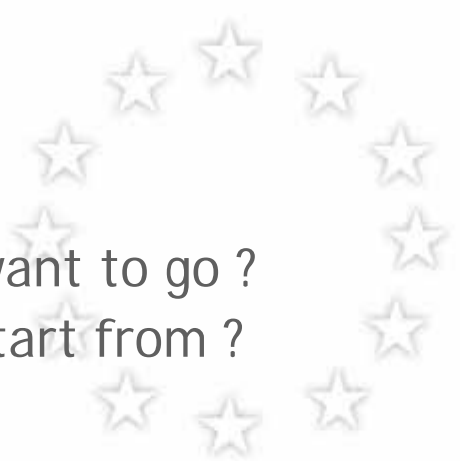
Share: 2 year project (2006-2007) funded by EU to produce a roadmap for HealthGrid adoption

- CNRS/IN2P3
- HealthGrid
- Universidad Politécnica de Valencia
- University of the West of England, Bristol
- Research Centre for Computer and Law (CRID) - University of Namur
- European Health Management Association
- Empirica GmbH

- Argonne National Laboratory
- Academia Sinica Grid Computing Centre
 - APAMI (Asia-Pacific Association for Medical Informatics)



- A little history
- SHARE
 - Objectives
 - Products
- Road Map
 - Where do we want to go ?
 - Where do we start from ?
- Challenges
 - Technology
 - Milestones
- Invitation to contribute ...



- The concept of “grids for health” took off in Europe in 2002; the HealthGrid initiative has played a key role since then.
- The HealthGrid vision relies on the setting up of grid infrastructures for
 - medical research,
 - healthcare, and
 - the life sciences
- ... which implies:
 - the availability of **grid services**, most notably for data and knowledge management;
 - the **deployment** of these services on infrastructures involving **healthcare centres** (e.g. hospitals), **medical research laboratories** and **public health administrations**; and
 - the definition and adoption of **international standards** and **interoperability mechanisms** for medical information stored on the grid.

- Five conferences:
 - HealthGrid 2003, Lyon
 - HealthGrid 2004, Clermont-Ferrand
 - HealthGrid 2005, Oxford
 - HealthGrid 2006, Valencia
 - HealthGrid 2007, Geneva
 - HealthGrid 2008, Chicago
- The HealthGrid Association edited the HealthGrid Whitepaper (<http://whitepaper.healthgrid.org>) in 2005 outlining the concept, benefits and opportunities offered by applying grids in different applications in biomedicine and healthcare.

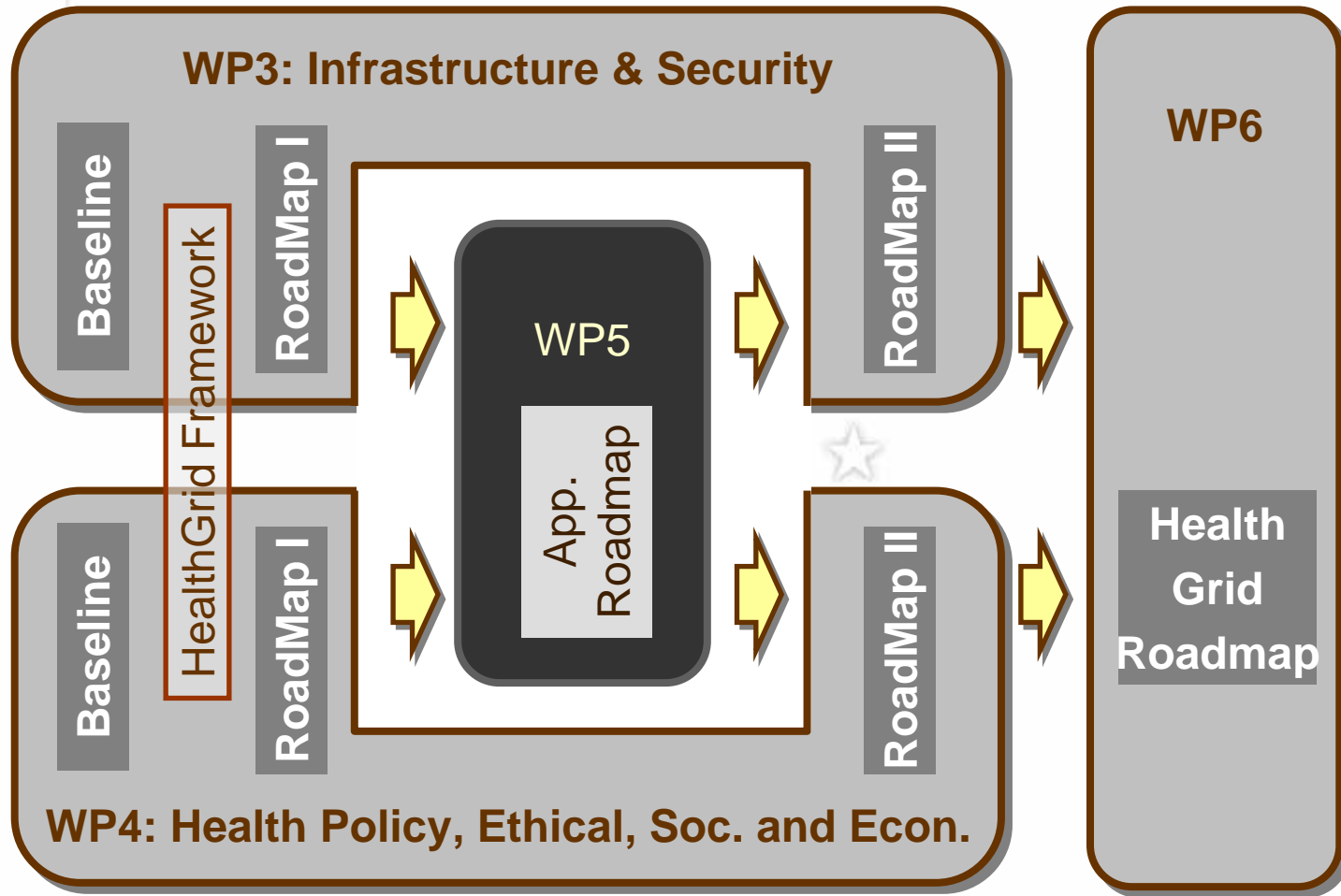


SHARE Objectives



- **SHARE aims at identifying the important milestones to achieve the wide deployment and adoption of healthgrids in Europe** to address the issues identified in the action plan for a European e-Health Area described in the communication COM(2004) 356.
- The mission of SHARE is to set the **targets**, assess the current situation, identify key **gaps**, barriers and **opportunities**, short term achievements and key **developments** and actors to achieve the vision.
- The roadmap will cover issues regarding networks, infrastructure deployment, grid operating systems, services to end-users, standards, security, legal and regulatory developments, ethical, social and economic issues.







SHARE Products



- HealthGrid framework
- Baseline
 - Evolution of the HealthGrid White Paper: the state of the art.
 - Predictable or foreseeable outcomes and likely developments from current activities.
- Roadmaps
 - Starting point, destination, mode of transport, “whistle stops”, travellers and difficulties on the trip.
 - Analysis of the current situation, requirements, actors, needs.
 - Opportunities and barriers from the end-user’s point of view as well as technological, legal, ethical and economic constraints.
- Knowledge base (<http://kb.healthgrid.org/>)



What is the goal ?

An environment, created through the sharing of resources, in which heterogeneous and dispersed health data:

- molecular data (e.g. genomics, proteomics)
- cellular data (e.g. pathways)
- tissue data (e.g. cancer types, wound healing)
- personal data (e.g. EHR)
- population (e.g. epidemiology)

as well as applications, can be accessed by all users as a tailored information system according to their level of authorisation and without loss of information.

- State of the art documented in Share deliverable D3.2 available on <http://www.eu-share.org>
 - Review of MammoGrid, GEMSS, eDiamond, CLEF, BIRN, EGEE, DEISA, Unicore, etc.
- Consultation of the community through a series of workshops and conferences
 - HealthGrid conferences (Valencia, June 2006)
 - HealthGrid workshops at MIE (August 2006), EGEE conference (September 2006), AMIA (November 2006)
 - Belief workshop on biomedical informatics (October 2006)
 - Networking session at IST2006 (November 2006)
 - EC Review March 2007



Situation in 2007: strengths & weaknesses



- International grid infrastructures available for scientific research
- But grid infrastructures have not entered into hospitals
- Grid toolkits offering grid services in a secure, interoperable and flexible manner (GT4, GRIA, ...)
- But they have not been tested at a large scale on biomedical applications
- Successful deployment of CPU intensive biomedical applications achieved world wide
- Very few applications involving manipulation of distributed biomedical data demonstrated so far
- Emergence of eScience environments like myGrid or VLe where bioscientists can manipulate their own concepts
- But these environments are not available on grid infrastructures





Perspectives: the challenges on the road to a wider adoption



- Grid technology
- Grid deployment
- Standardization
- Communication



Issues related to grid technology

- No middleware fulfills yet all the requirements for life sciences and medical research
 - The ones which have demonstrated their scalability (gLite, Unicore) need additional functionalities e.g. in the area of data management
 - Some which offer powerful and demonstrated data management functionalities (SRB) have limited job management services
 - The previous middleware are not so far built on web services and therefore do not offer standard interfaces
 - More recent grid middleware based on web services have not yet demonstrated their robustness and scalability



Deployment issues



- Very limited deployment of grid nodes in healthcare centres and biological laboratories
- Need for functionalities allowing secure manipulation of medical data
- Need for an easy to install middleware distribution
- Need for friendly user interfaces to the grid for non experts



- Definition and adoption of international standards and interoperability mechanisms is required for storing biomedical information on the grid
- Examples in the world of health
 - standard for the exchange of medical images on the grid based on DICOM
 - standard for the exchange of Electronic Health Records on the grid
 - Standard for recording and ensuring consent
 - Standards for anonymization and pseudonymization
- Beyond standards, agreed ontologies are also needed
 - Good example: gene ontology in genomics

- Grids are vaguely known to the bioinformatics and medical informatics community
- Grids are mostly unknown to the biology and medical community
- Reaching out these communities requires dedicated efforts
 - Need for success stories demonstrating the impact of grids for biomedical research
 - Prerequisite: grids must become a serious alternative to the existing computing models
 - CPU crunching is not sufficient

- Determining what the responsibilities of the healthgrid actors are
- Verifying that the patient has unambiguously expressed his/her consent before any data manipulation
 - ▲ Allowing patient access to data is recommended
- Legal framework in EU member states has to evolve
 - allowing the transfer of medical data between member states
 - Accessing the minimum data required, limiting the period of data storage, etc.
- Protecting patient privacy (de-identification, anonymisation, encryption...)



Proposed actions for a wider adoption

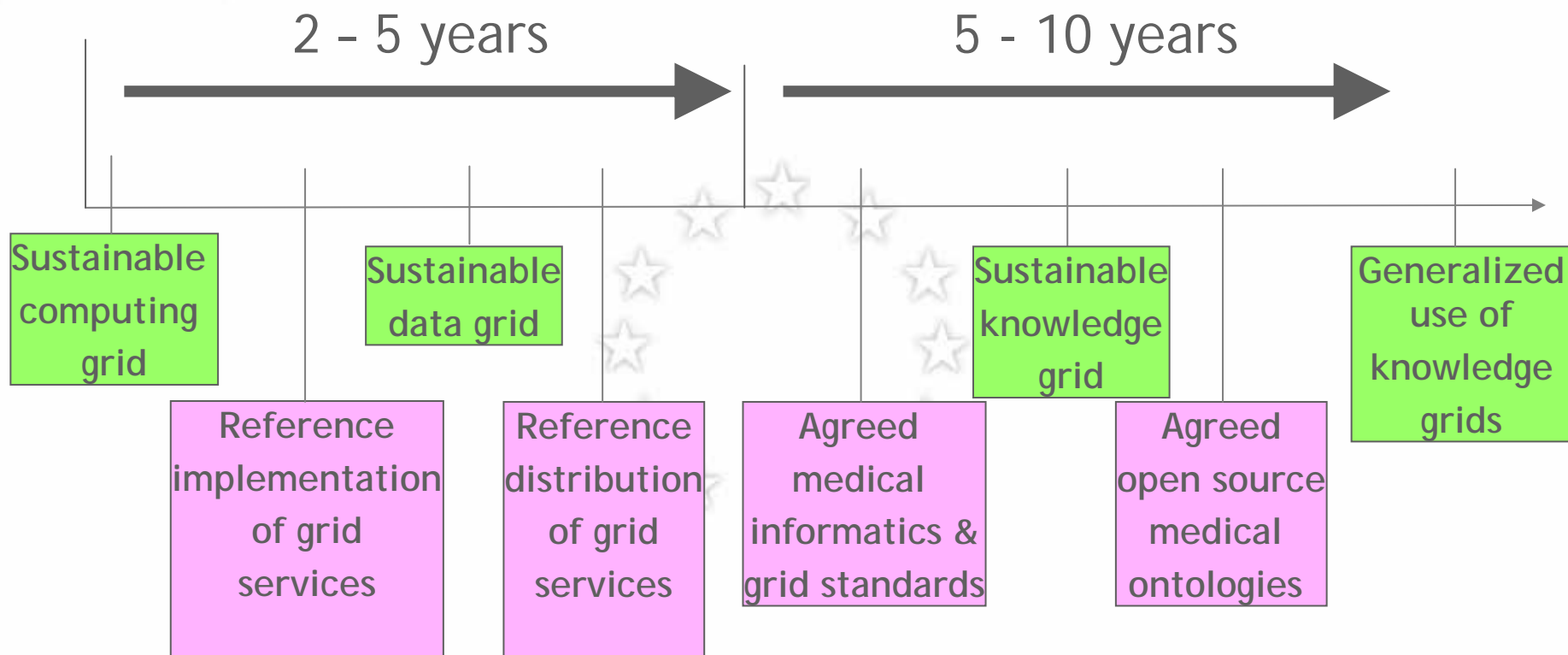


- Develop reliable grid services **fulfilling** (legal) **biomedical requirements** notably for data & knowledge management
- Define and adopt European/ International standards and interoperability mechanisms for the sharing of medical information on grids
- Integrate healthcare centres in the existing grid infrastructures
 - hospitals, medical research laboratories and public health administrations
- Promote the creation of one or several dedicated infrastructure
 - biomedical research in a first step
- Favour technology transfer & training toward end-users in the biomedical community



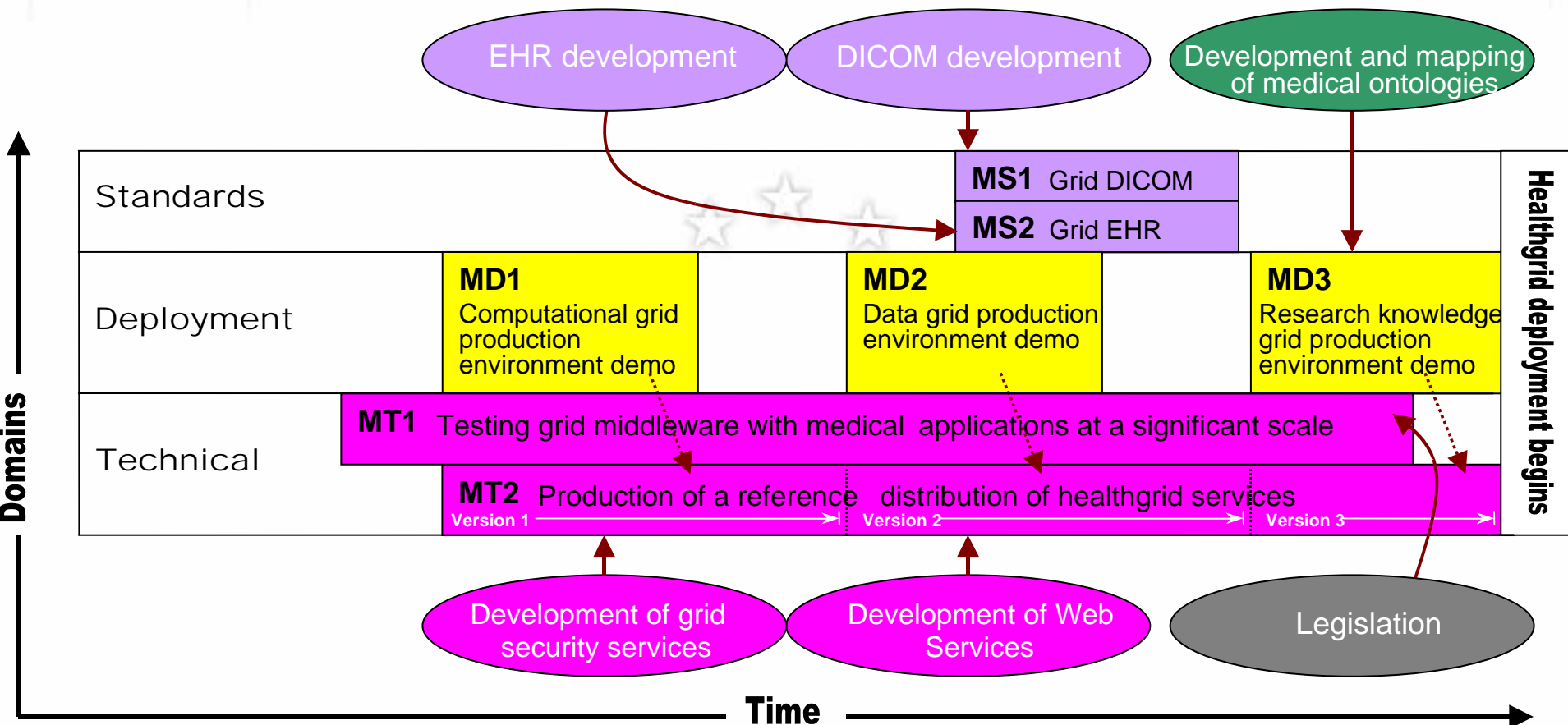
- In relation to technology
 - IT.1 A reference implementation of grid services using standard web service technology and allowing computation and secured manipulation of distributed data
 - IT.2 A reference distribution of a reference implementation of grid services for the installation of grid nodes in medical research centres
 - IT.3 An agreed set of standards for sharing medical images and records on the grid
 - IT.4 Agreed and implemented open source medical ontologies

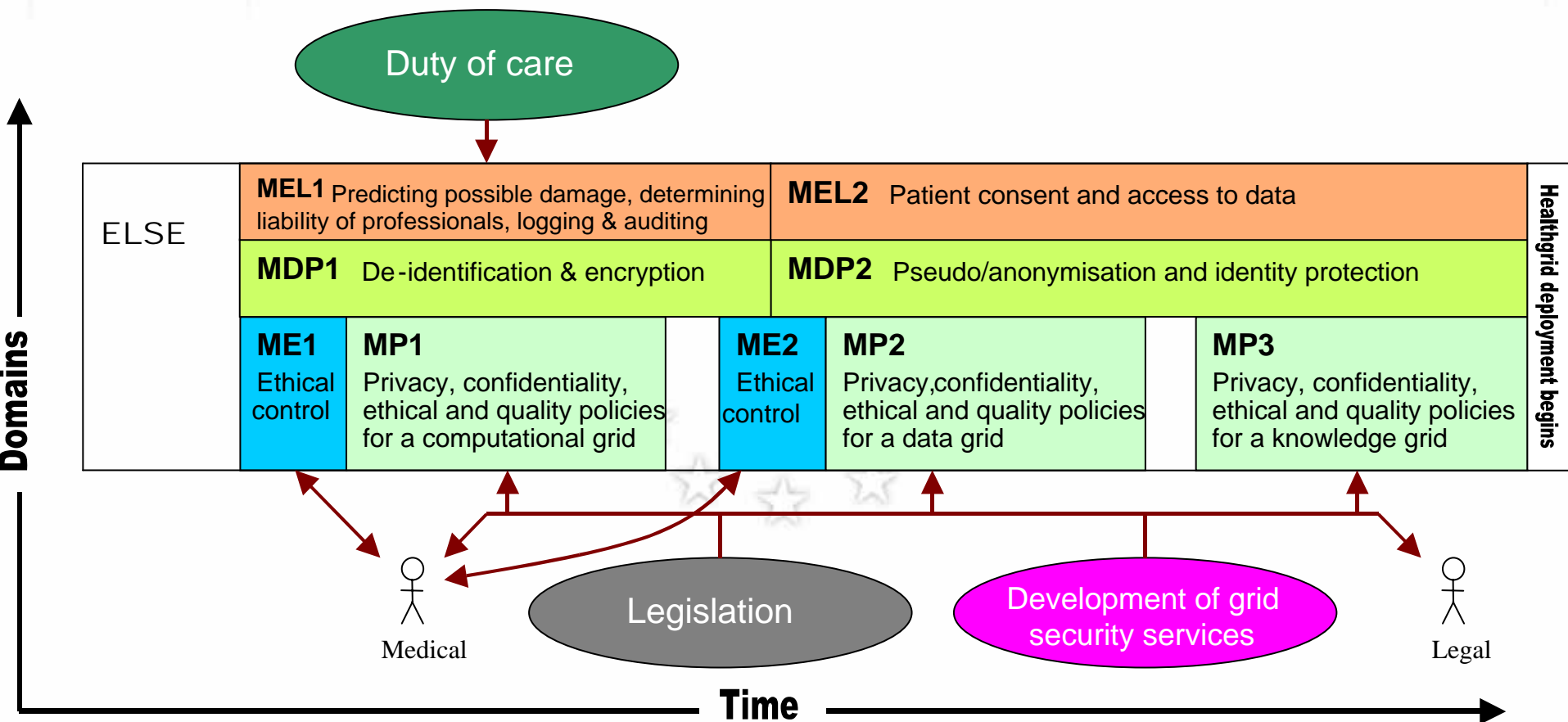
- In relation to deployment
 - GD.1 A sustainable computing grid infrastructure for the medical research community
 - GD.2 A sustainable data grid for a well defined medical research topic
 - ▲ Distributed storage and distant query of medical data
 - GD.3 A knowledge grid for a well defined medical research topic
 - ▲ Distributed data integration and computing
 - GD.4 A generalized use of knowledge grids



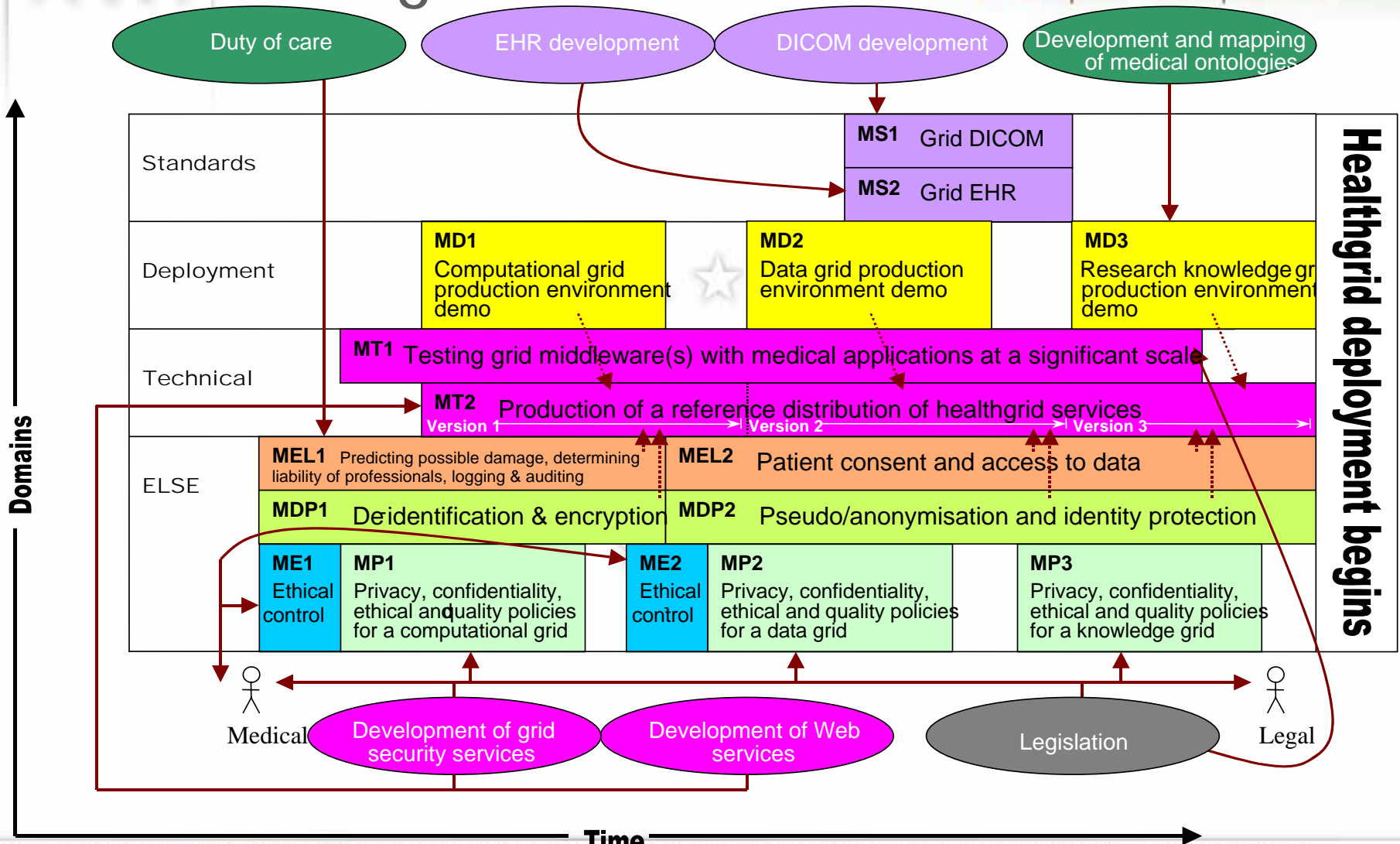
www.eu-share.org/deliverables.html

discussions on <http://wiki.healthgrid.org>





Integrated Roadmap Diagram



The Share project (FP6-2005-IST-027694) is funded by the European Commission Information Society and Media DG under the 6th Framework Programme.



- SHARE is an activity to search, consolidate and analyse the trends of research on grid technologies applied to health.
- SHARE will cover all the issues regarding healthgrids, from the technical to the legal, social and economic point of view.
- SHARE needs inputs from relevant actors in the field world-wide:
 - <http://wiki.healthgrid.org/index.php/Roadmap:index>