



# The Information and Knowledge Layers of the GRIDs Architecture

KEITH G JEFFERY

DIRECTOR, IT & HEAD, ITD

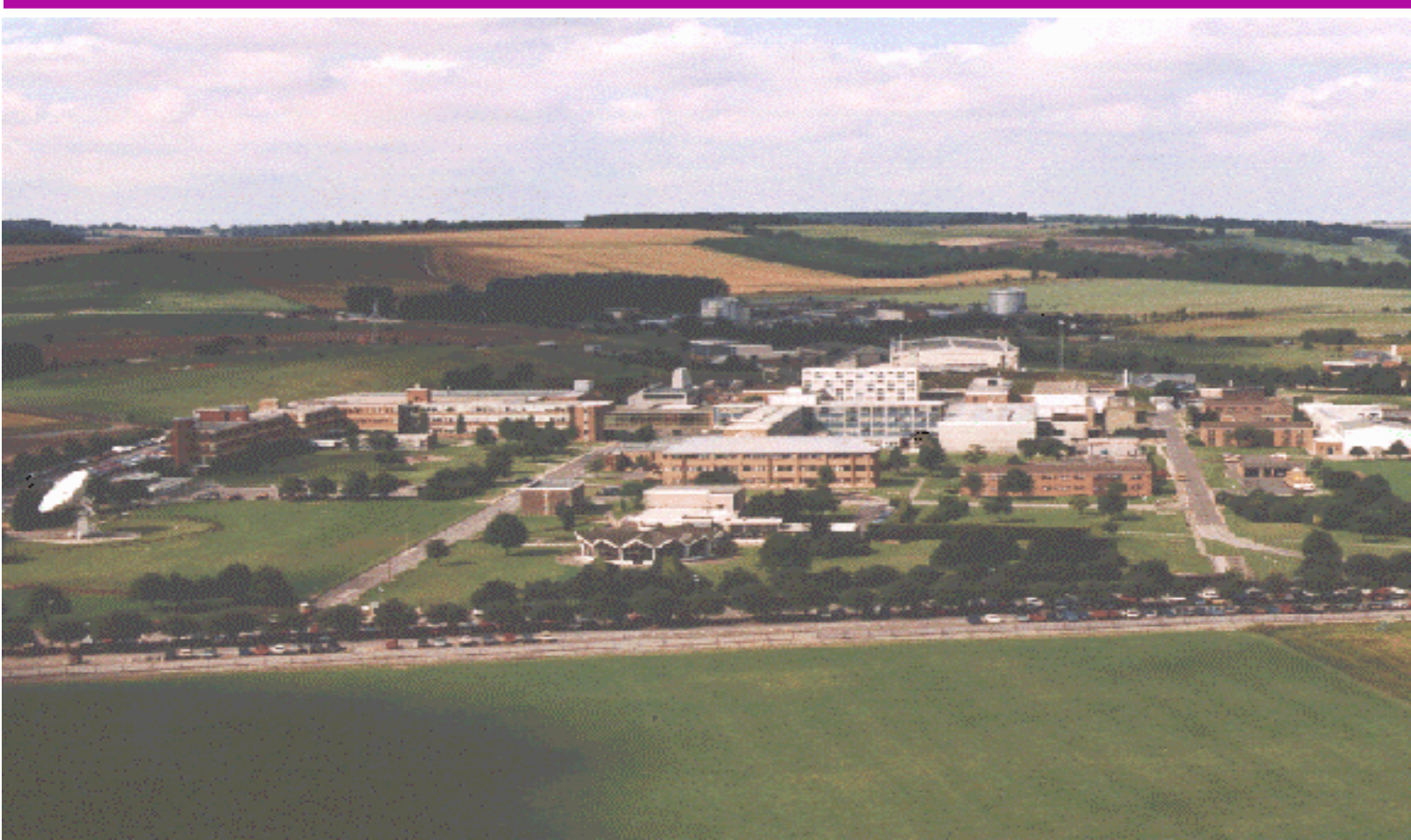
KGJ@RL.AC.UK

[HTTP://WWW.ITD.CLRC.AC.UK/](http://www.itd.clrc.ac.uk/)





# CLRC-RAL SITE





CLRC

- RAL AND DL
- E-SCIENCE
  - PAUL DURHAM
- E-BUSINESS AND EVERYTHING ELSE
  - KEITH JEFFERY
  - E-GOVERNMENT, E-INFORMATION, E-LEARNING, E-CCULTURE...
  - W3C AND ERCIM
- UK GRID SUPPORT CENTRE



# STRUCTURE OF PRESENTATION

- PROPOSITION
- THE IDEA
- PLANNED ENHANCEMENTS
  - ISSUES TO BE DEALT WITH
- APPLICATIONS
  - WHY USE GRIDS
  - TARGET
  - WHAT HAS TO BE DONE
- CONCLUSION



## PROPOSITION (1)

- MOST OF THE WORK TO DATE ON GRID TECHNOLOGY HAS CENTRED ON HIGH PERFORMANCE COMPUTING AND METACOMPUTING
- ALTERNATIVE APPROACH: 3-LAYER VIEW
  - KNOWLEDGE
  - INFORMATION
  - COMPUTATION / DATA



## PROPOSITION (2)

- TECHNOLOGIES FROM DISTRIBUTED COMPUTING, DATABASE AND IR, FORMAL SOFTWARE ENGINEERING, KNOWLEDGE ENGINEERING.....
- INTERSECTION WITH W3C
  - WEB OF TRUST
  - SEMANTIC WEB
  - WEB SERVICES



## PROPOSITION (3)

- PERMITS PULLTHROUGH
  - FROM E-SCIENCE GRAND CHALLENGES
  - TO E-BUSINESS
- THUS PROMOTING SUSTAINABILITY AND WIDESPREAD BUY-IN
  - FOR GREATER BENEFIT OF COMMERCIAL AND NON-COMMERCIAL SECTORS
  - AND ESPECIALLY E-HEALTH, E-ENVIRONMENT, E-CULTURE, E-LEARNING .....

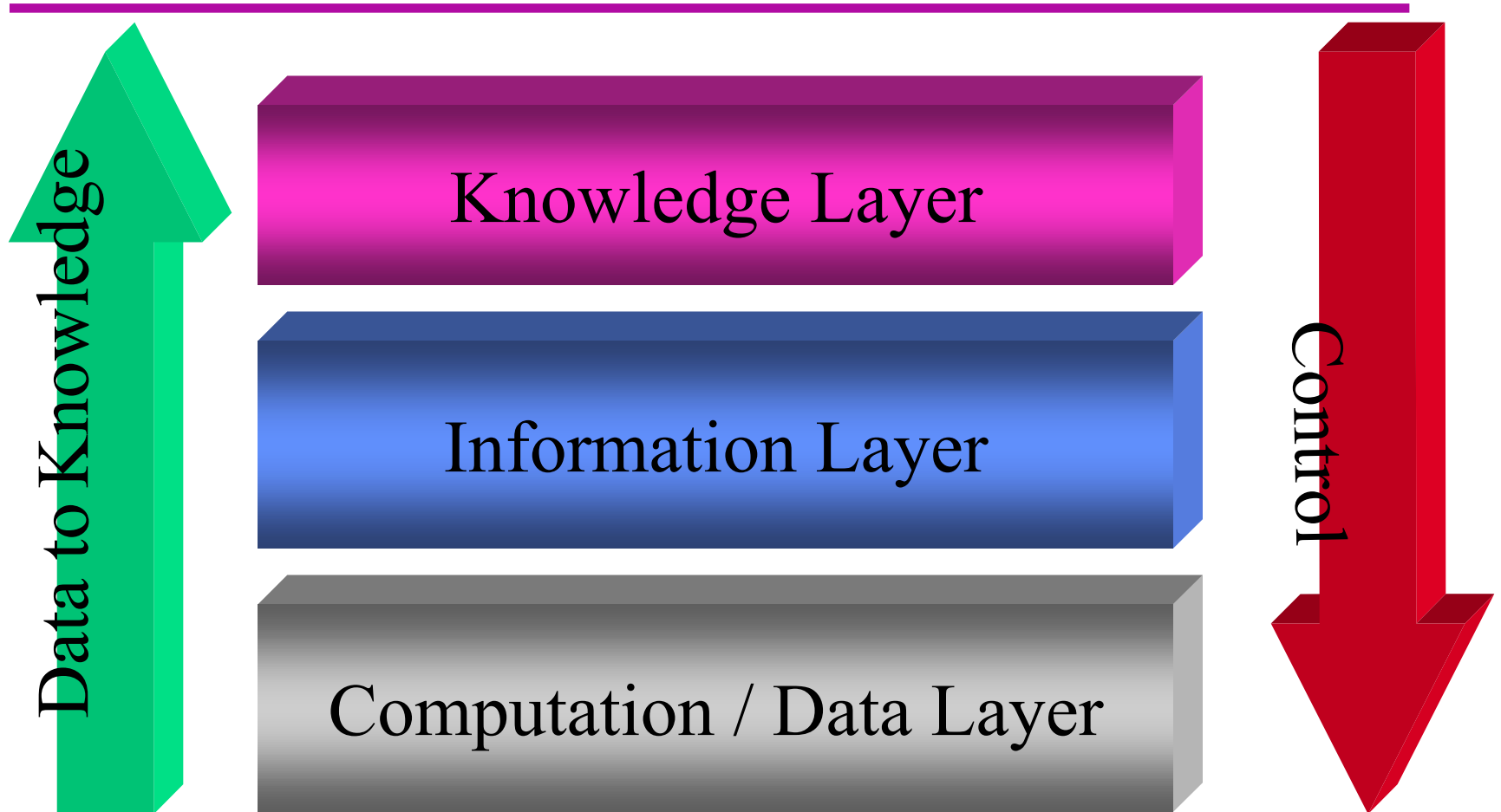


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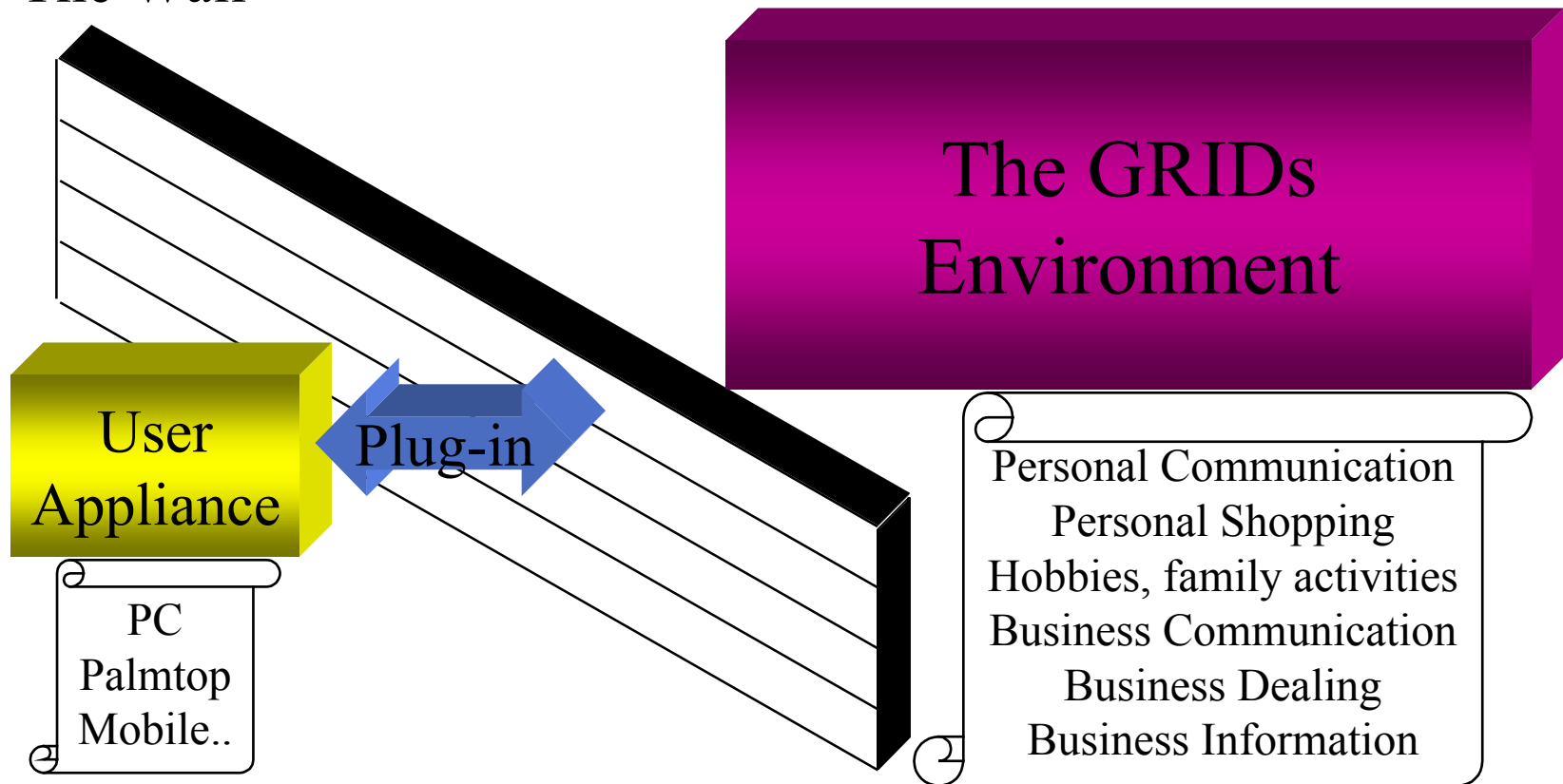
# THE GRIDS ARCHITECTURE





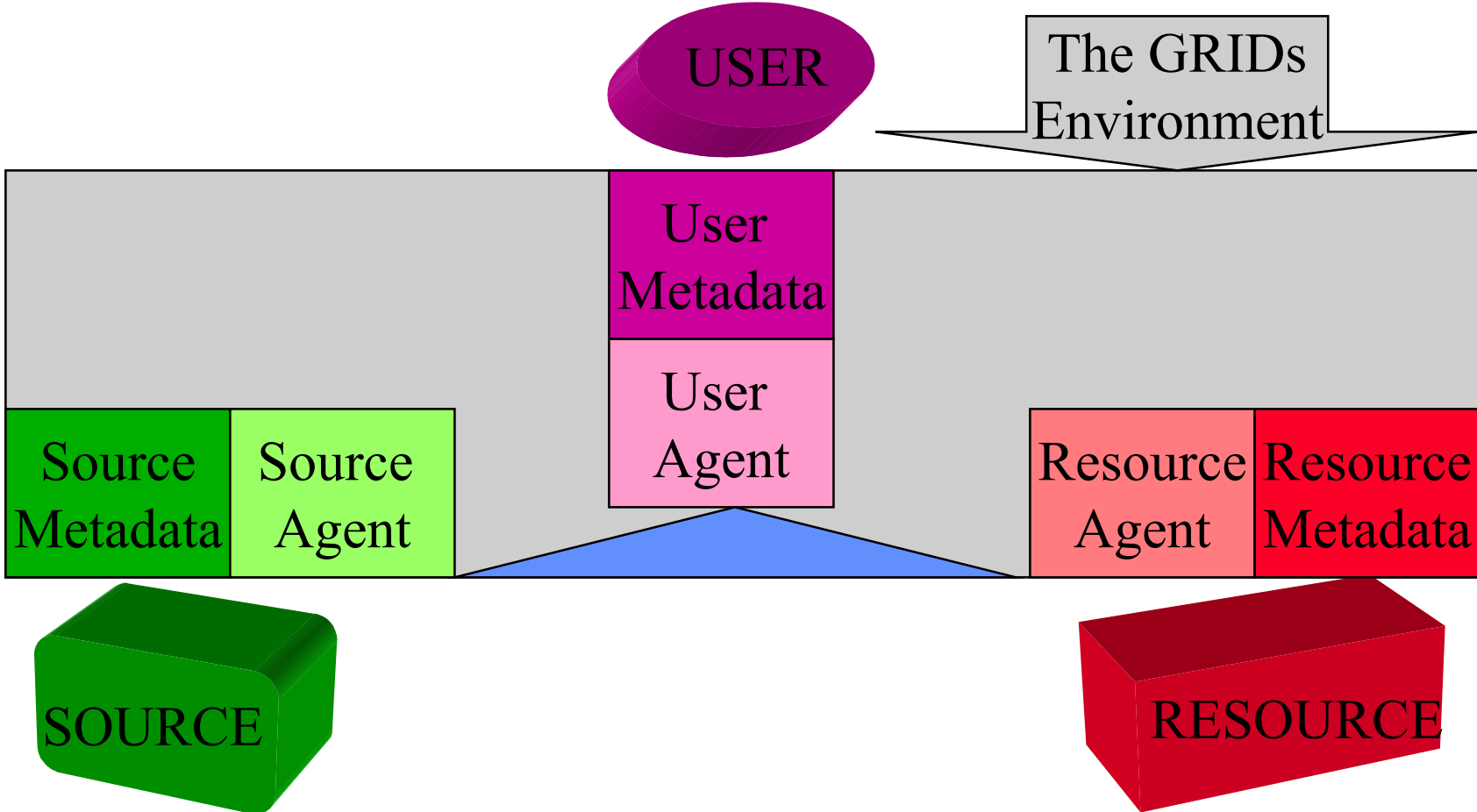
# THE BIG IDEA: WHAT IT PROVIDES

‘The Wall’



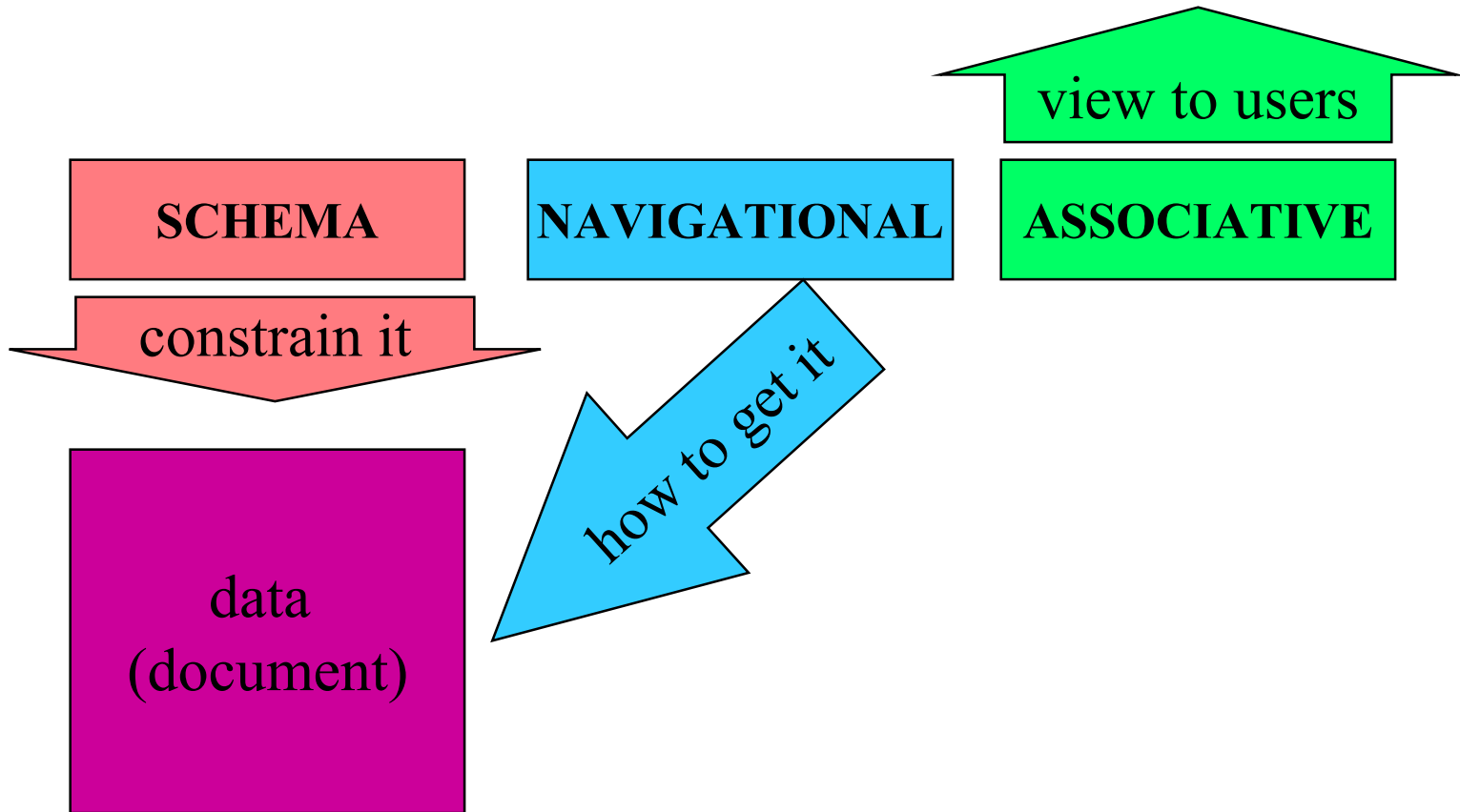


# A POSSIBLE ARCHITECTURE





# CLASSIFICATION OF METADATA





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## PLANNED ENHANCEMENTS (1)

- FULL SCALABLE DIRECTORY
  - [FULL GRAPH INCLUDING CYCLES, NOT TREE]
  - E.G. PERSON <DATES,ROLE> ORGUNIT <DATES,ROLE> PROJECT
- AUTHENTICATION:
  - MULTIPLE MODES CONVERGENT TO CERTIFICATE
- AUTHORISATION:
  - BY AUTHENTICATED PERSON / ROLE
  - AGAINST ACCESSING / UTILISING SERVICES, SOURCES, RESOURCES, OTHER USERS



## PLANNED ENHANCEMENTS (2)

- METADATA
  - FOR DESCRIPTION OF
    - USERS,
    - SOURCES [DATA / INFORMATION/ SOFTWARE OR SERVICES],
    - RESOURCES [ENGINES EG COMPUTATION, VISUALISATION OR SERVICES]
  - BASED ON RDF/XML;
  - USING THE METADATA 3 KINDS CLASSIFICATION
    - SCHEMA,
    - NAVIGATIONAL,
    - ASSOCIATIVE [DESCRIPTIVE, RESTRICTIVE, SUPPORTIVE]



## PLANNED ENHANCEMENTS (3)

- THESAURI AND DOMAIN ONTOLOGIES
  - BASED ON DAML+OIL OVER RDF/XML?
  - BEYOND SIMPLE FOPL; F-LOGIC?
- WEB TOOLS (SERVICES)
  - (WITH FUNCTIONAL SIGNATURES AS INTERFACES)
- INTELLIGENT AGENTS
  - PROBABLY CONFORMING TO FIPA



## ISSUES TO BE DEALT WITH

- CAN WE SIMPLIFY THE ARCHITECTURE SO THAT
  - ALL ENTITIES {USERS, SOURCES, RESOURCES}
  - ARE REPRESENTED AS SERVICES
  - AND DEFINE A METADATA FOR DESCRIPTION OF SERVICES (ACTING AS A KIND OF SERVICE FUNCTIONAL SIGNATURE)
- IS THE CERIF MODEL ([WWW.CORDIS.LU/CERIF](http://WWW.CORDIS.LU/CERIF)) SUITABLE FOR THE DIRECTORY?



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## APPLICATIONS

- THE TARGET APPLICATION AREAS ARE E-BUSINESS, E-COMMERCE, E-LEARNING, E-PUBLISHING, E-HEALTH, E-ENVIRONMENT, E-CULTURE... ETC ETC
- AT THE INFORMATION LAYER INCLUDES DATABASE, INFORMATION RETRIEVAL, WEB (E.G. DIGITAL LIBRARIES *sensu lato*)
- AT THE KNOWLEDGE LAYER INCLUDES DECISION SUPPORT, ADVISOR SYSTEMS, CONSTRAINT-BASED PROCESS SYSTEMS (E.G. VIRTUAL ORGANISATIONS)



## APPLICATIONS: WHY USE GRIDS

- THE GRIDS ARCHITECTURE CAN PROVIDE UBIQUITOUS PERVASIVE HOMOGENEOUS ACCESS TO
  - HETEROGENEOUS DISTRIBUTED DATA / INFORMATION SOURCES WITH
  - DATA ==> INFORMATION ==> KNOWLEDGE ENHANCEMENT AND TO
  - COMPUTATION OR VISUALISATION RESOURCES TO GENERATE (EG THROUGH DATA MINING) INSIGHT.
- IT CAN ALSO PROVIDE SUCH ACCESS TO HETEROGENEOUS DISTRIBUTED ENGINES (EG FOR COMPUTATION OR VISUALISATION)
- IT CAN ALSO PROVIDE SUCH ACCESS TO SERVICES.
- ALL INVISIBLE TO THE END-USER BEHIND A HELPFUL UI



## APPLICATION ENVIRONMENT TARGET

- THE TARGET IS
  - USER-FRIENDLY E-INFORMATION AND E-BUSINESS
  - MORE SUPPORTIVE, INTELLIGENT, EASY TO USE AND INTEGRATED WITH LIFESTYLE
  - THAN CURRENT WEB-BASED SOLUTIONS.
- THIS IMPLIES
  - THE USER DOES NOT KNOW (OR CARE) FROM WHENCE COMES THE INFORMATION OR COMPUTE-POWER TO SOLVE HER PROBLEM



## WHAT HAS TO BE DONE TO APPLICATIONS TO USE GRIDS

- NEED TO TAKE LEGACY APPLICATIONS AND GRIDS-WRAP THEM
- DEVELOPING APPLICATIONS WILL DEVELOP IN THIS DIRECTION TO CONVERGE
- NEW APPLICATIONS CAN BE BUILT FROM THE BEGINNING TO THIS ARCHITECTURE



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## CONCLUSIONS

- GRIDS TECHNOLOGY WILL 'COME OF AGE' WHEN:
  - IT IS AS / MORE UBIQUITOUS THAN WWW
  - IT IS AS / MORE PERVASIVE THAN WWW
  - IT PROVIDES THE END-USER WITH MORE LEVERAGE THAN WWW
- IMPLIES WHEN
  - SUPPORTED BY MAINSTREAM IT COMPANIES
  - USED IN COMMERCIAL AND NON-COMMERCIAL