



UNICORE  
SUMMIT

 **JÜLICH**  
FORSCHUNGSZENTRUM

**UNICORE**

# UNICORE 2020

## *Strategic Options for the Future*



Digital Agenda

1001100101011101110000100 **2010-2020**  
for Europe

Morris Riedel et al.

Federated Systems and Data

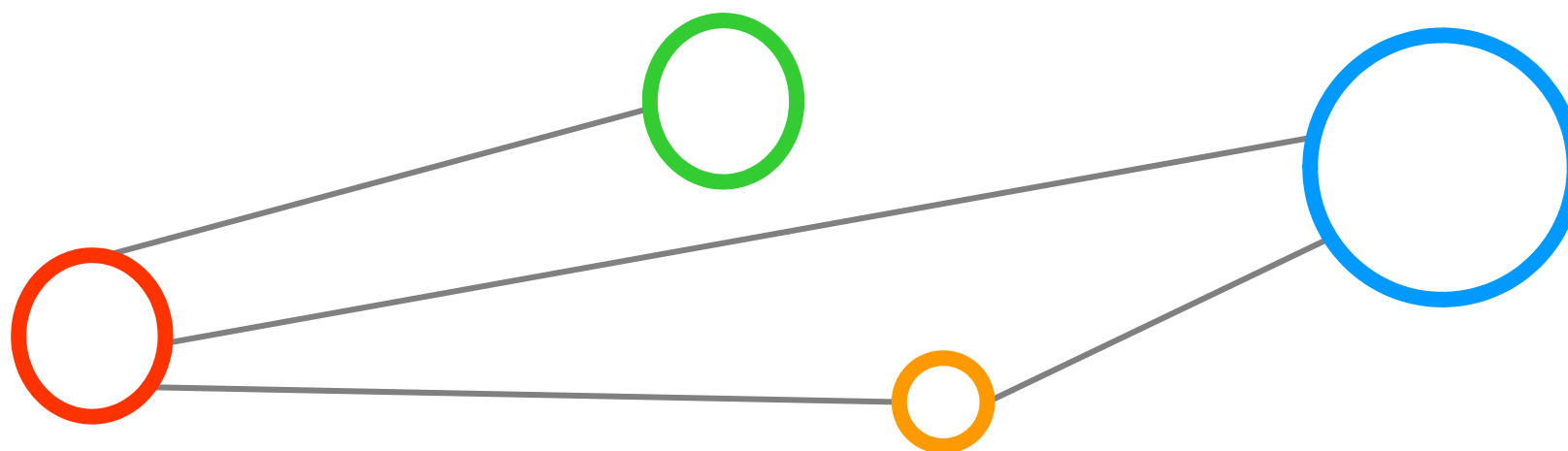
Jülich Supercomputing Centre

2012-05-31, Dresden

THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

 **HORIZON 2020**

# Outline

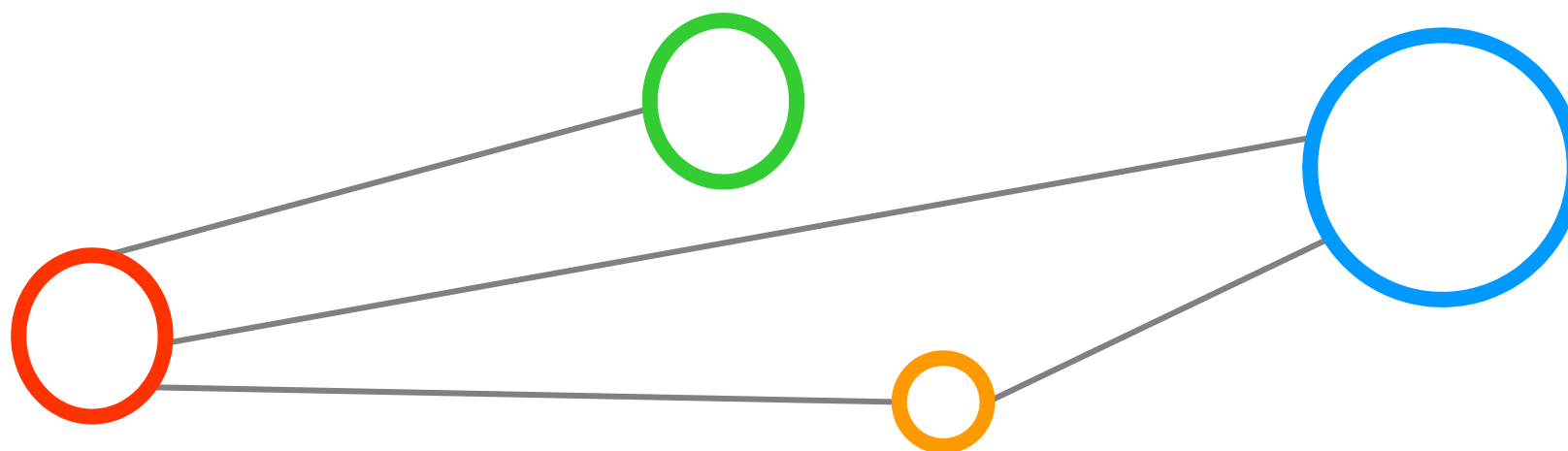


# Outline

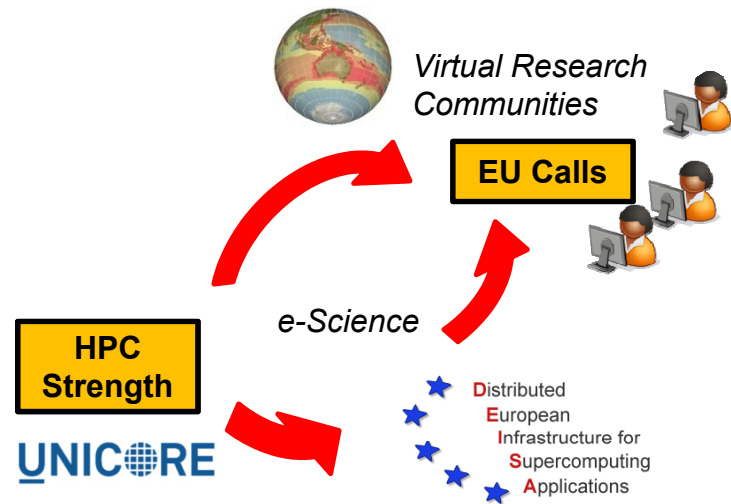
- Review 2010 Roadmap
  - Status Assessment
  - Progress and key Achievements
- Roadmap Update towards 2020
  - Strategic Options on the Horizon
  - UNICORE Next Generation Usage
  - Extension towards 'Big Data'
  - Application Enabling Activities
  - EC and NSF Plans of the Future
- Summary
- References



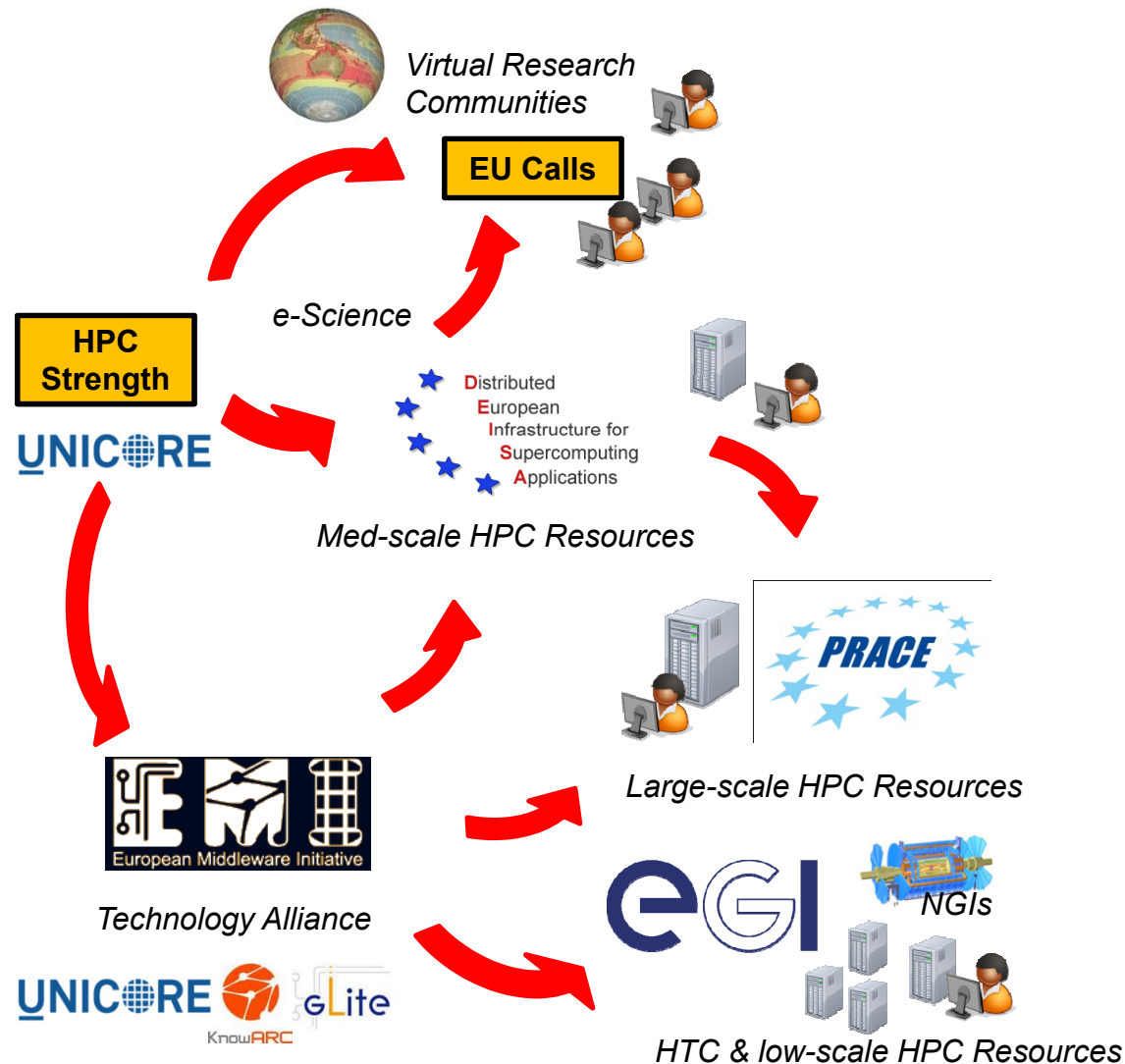
## Review 2010 Roadmap



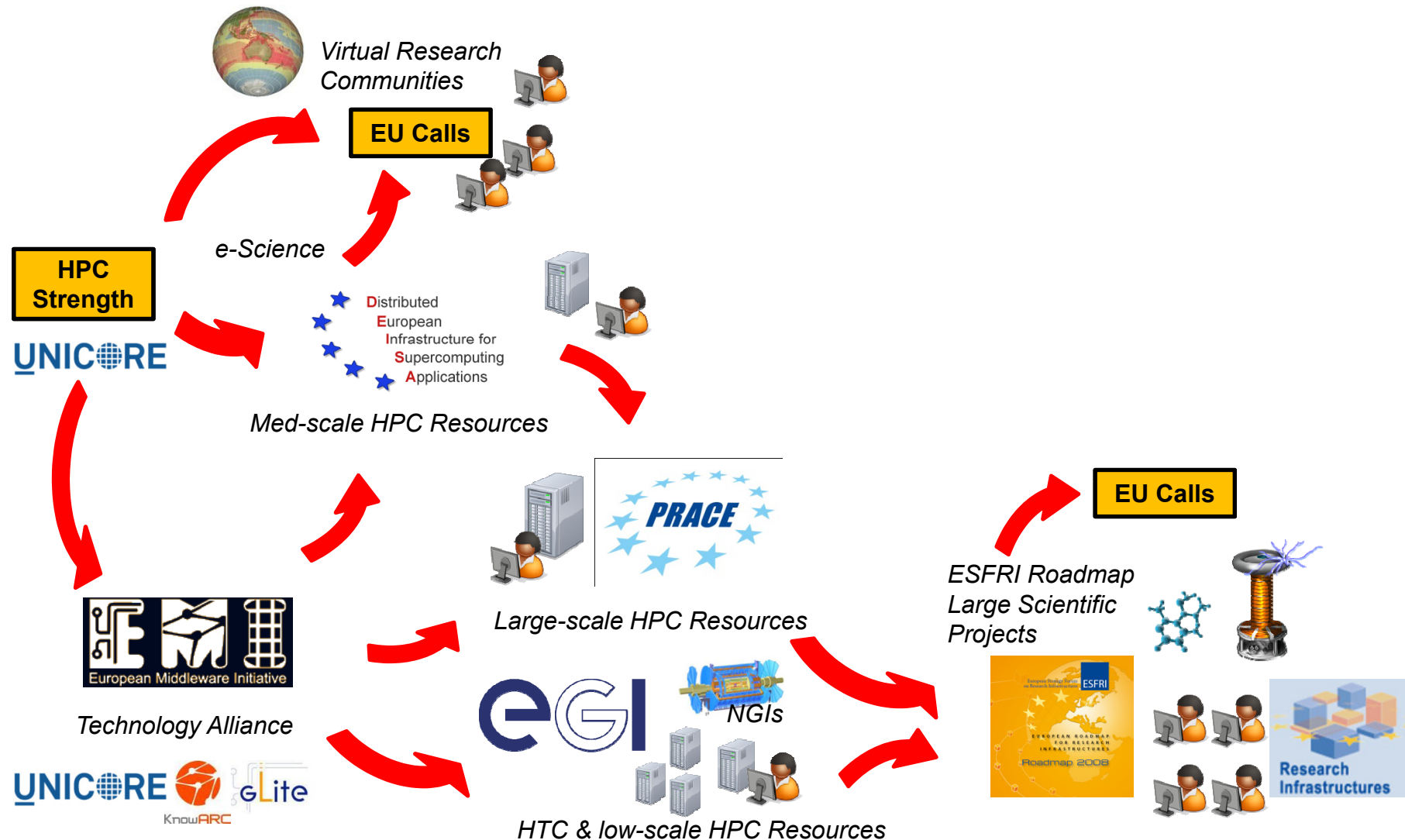
# Roadmap Status: UNICORE, e-Science & VRCs



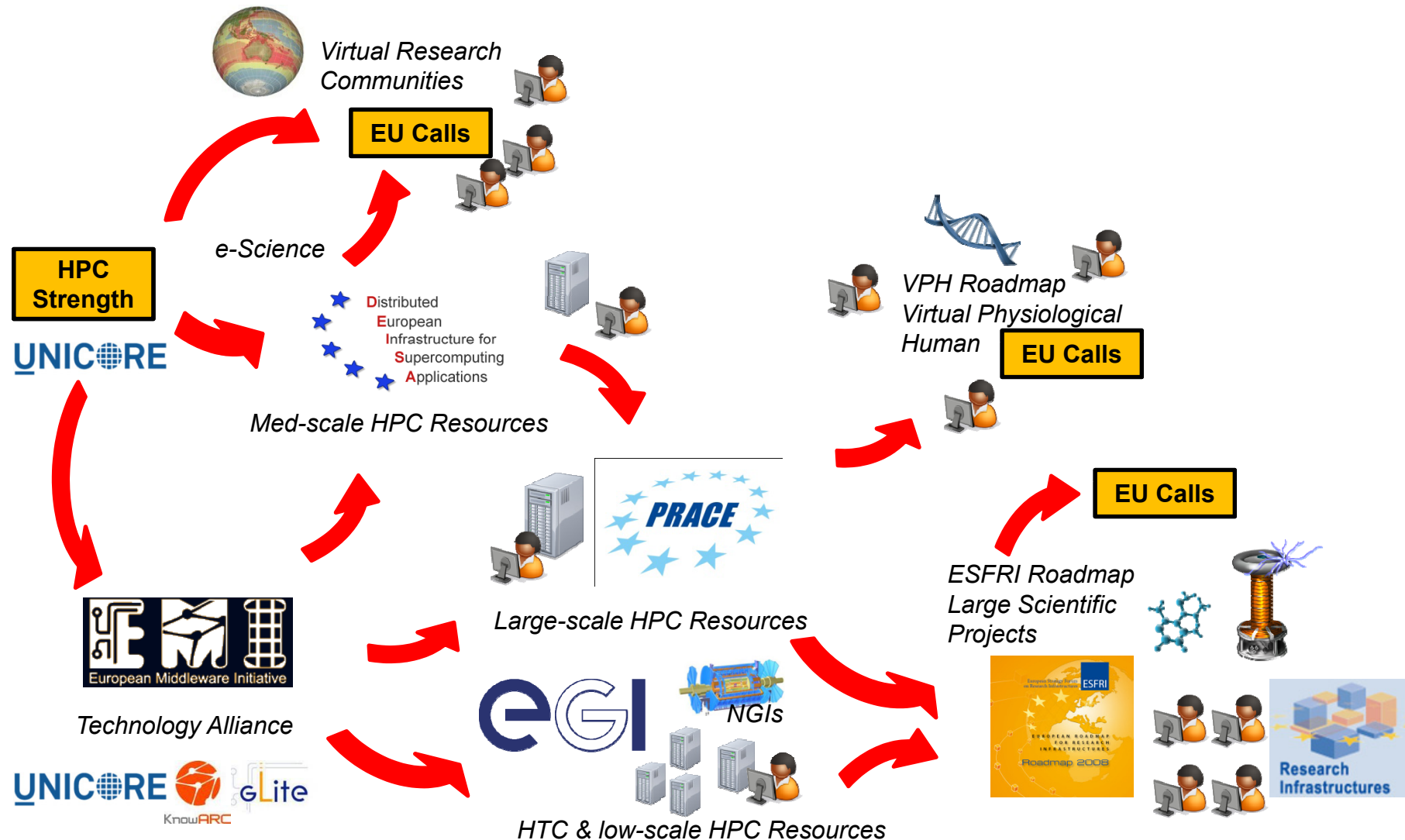
# Roadmap Status: UNICORE, EMI, EGI & PRACE



# Roadmap Status: UNICORE & ESFRI Projects

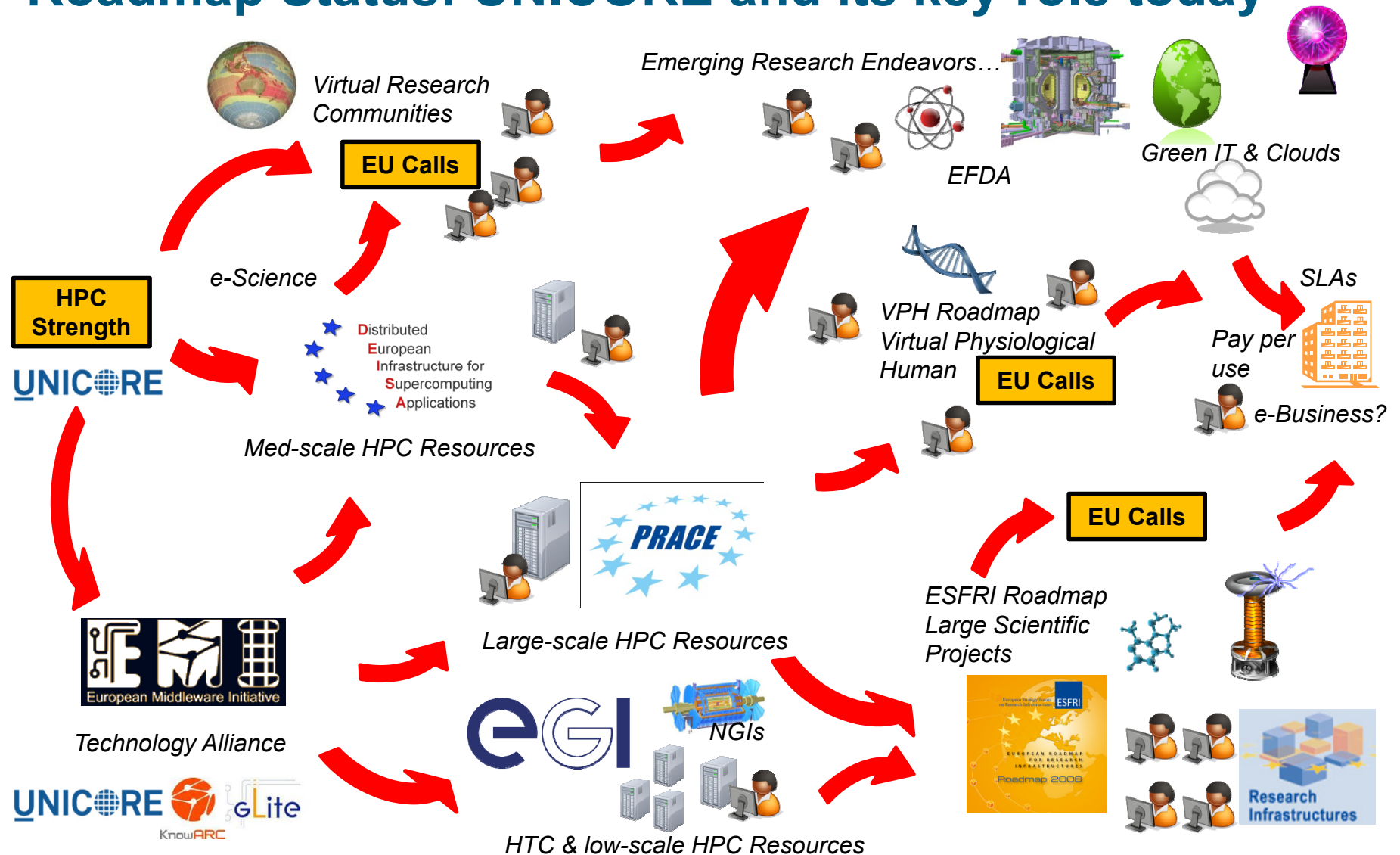


# Roadmap Status: UNICORE & VPH Vision





# Roadmap Status: UNICORE and its key role today

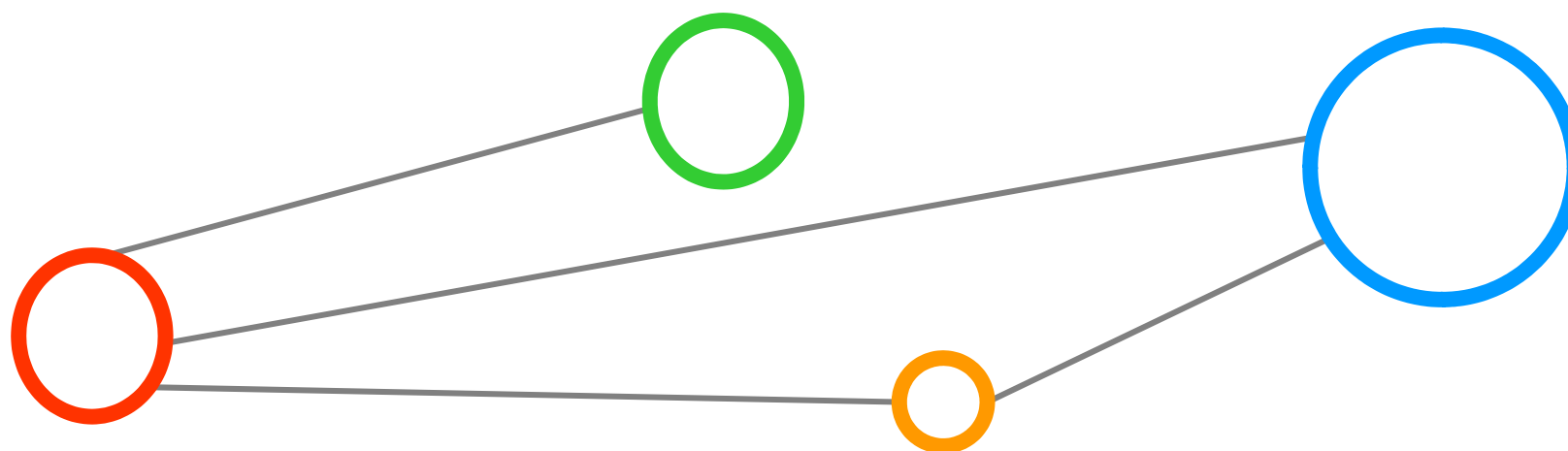


## Progress and Some Key Achievements

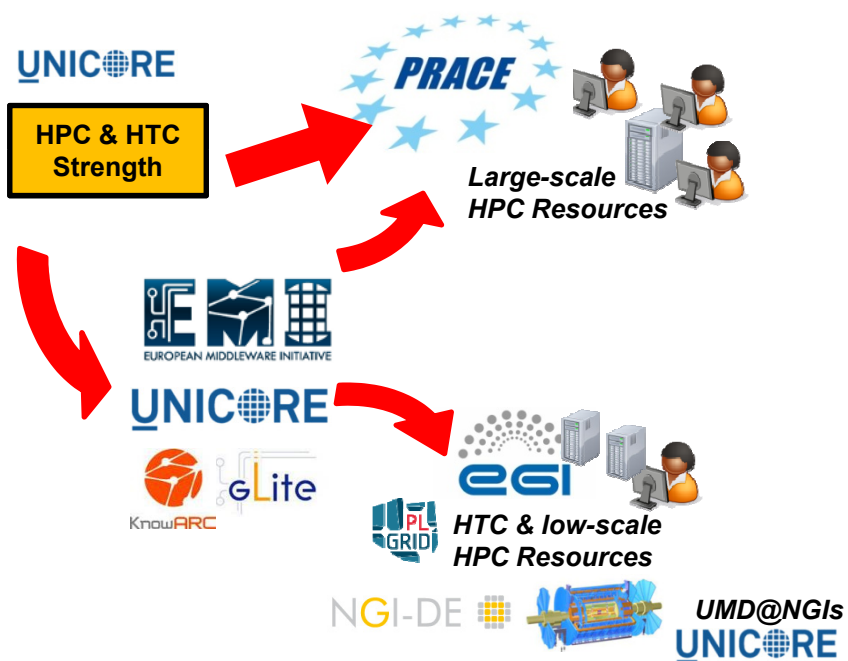
- EMI & EGI Collaborations
  - UNICORE is part of the EGI UMD distribution
  - UNICORE is much more known around the world
  - UNICORE is used within NGIs (Poland, Germany, ...)
- Closer contact with 'lighthouse' user communities
  - UNICORE used by VPH framework and ITER community (EUFORIA)
  - Started to engage in ESFRI projects (CLARIN, DARIAH, SKA, ...)
- Exploration of UNICORE potentials for e-Business
  - SLA4D-Grid – Service Level Agreements around UNICORE
  - SmartLM Project – UNICORE and license management
- Trend prototypes around UNICORE
  - Fit4Green – UNICORE TSI in context of 'Green IT setups'
  - Exploration activities around UNICORE & Clouds in EMI cloud task force



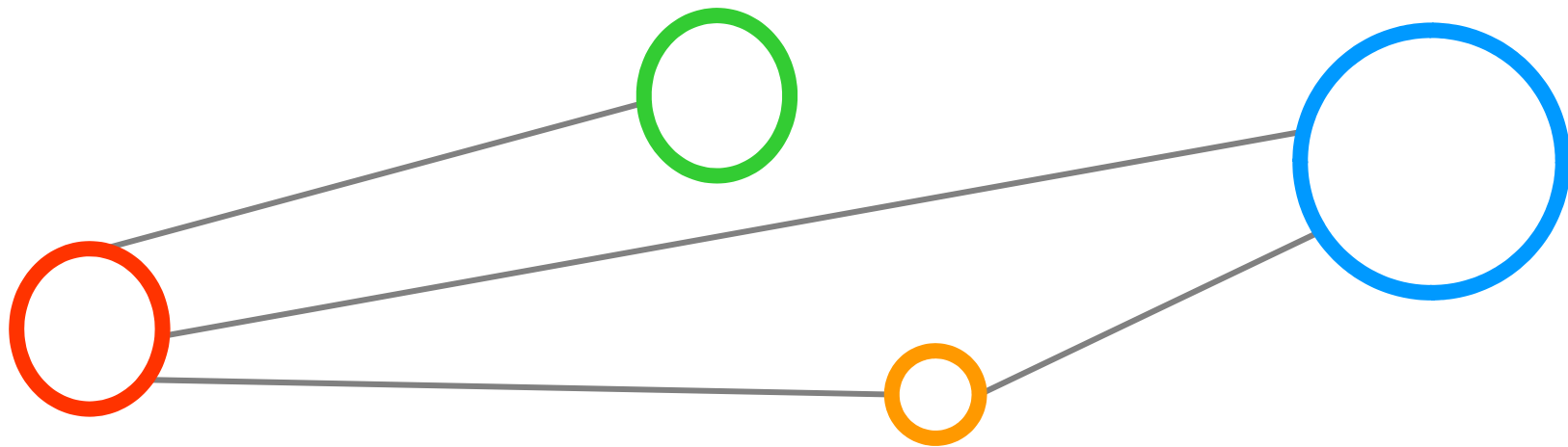
## Roadmap Updates towards 2020



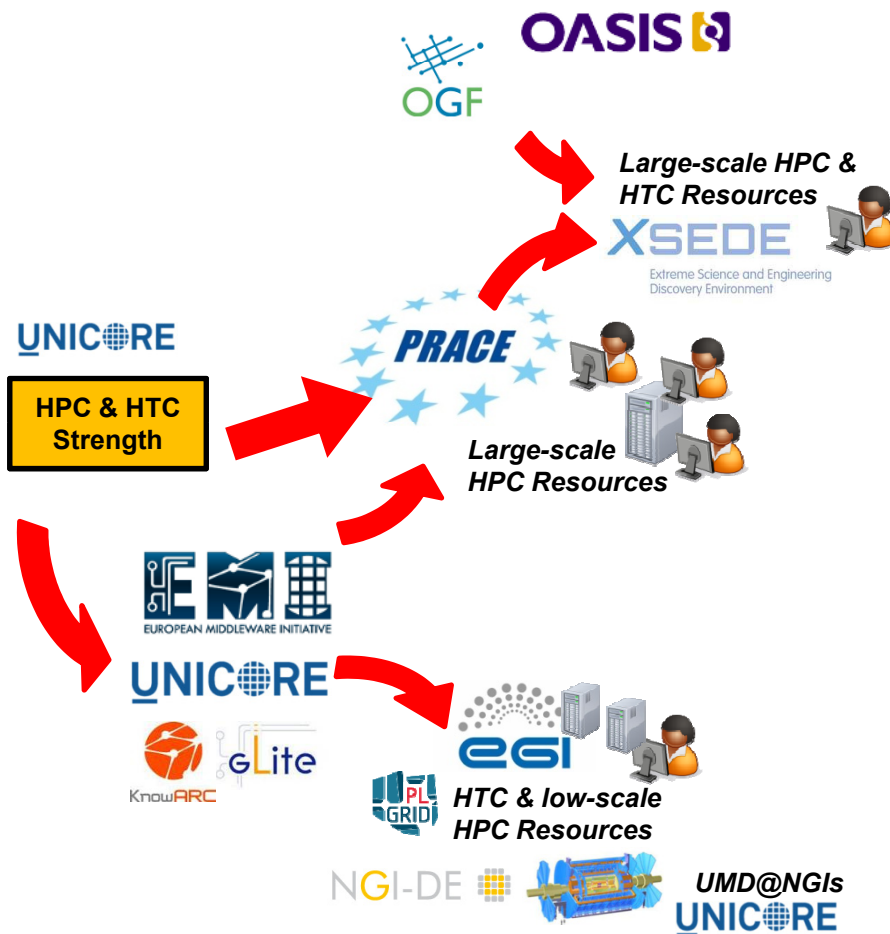
# Strategic Options on the Horizon – State-of-the-Art



## Roadmap Update: With Standards to XSEDE

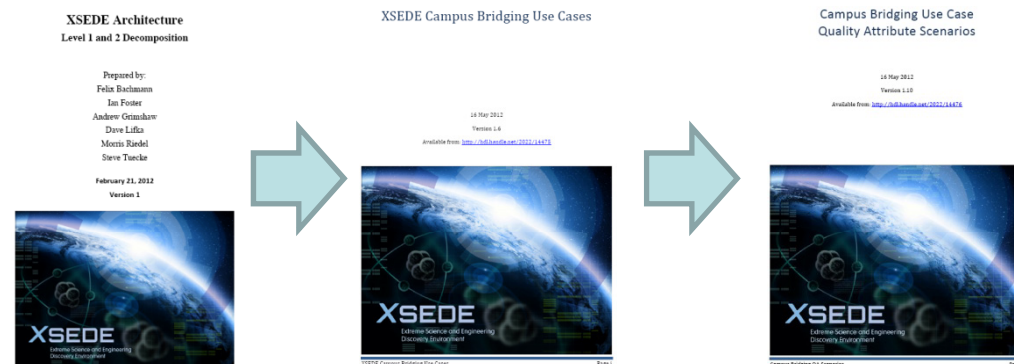


# Roadmap Update: With Standards to XSEDE



# XSEDE: US CyberInfrastructure

- Plan to use UNICORE used at major US supercomputing sites
  - Standard-compliant UNICORE middleware (as road less travelled by...)
  - Fruitful collaboration via standardization activities over years within OGF
- Engage in Software Engineering and Rollout Process
  - Lead by Carnegie Mellon University
  - Architecture team and software development & integration team
  - Computer research & science → XSEDE is a new kind of infrastructure
  - Architecture & campus bridging use cases documents
  - UNICORE tests and harmonization with Genesis

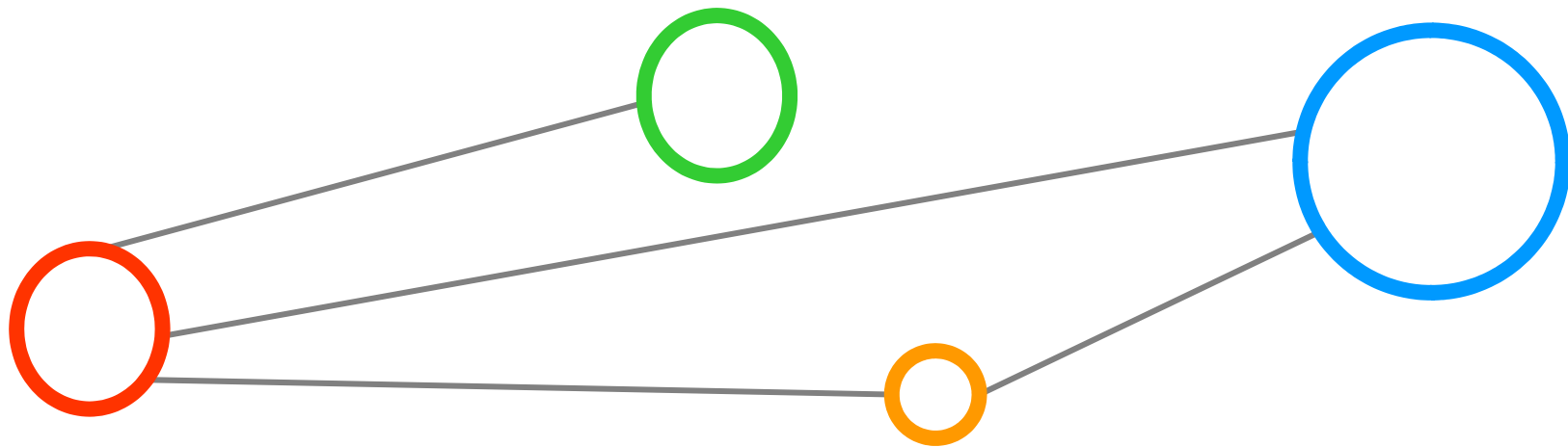


[5] Grimshaw and Foster et al., XSEDE Architecture Level 1 and 2 Decomposition', 2012

[3] Stewart et al., XSEDE Campus Bridging Use Cases', 2012

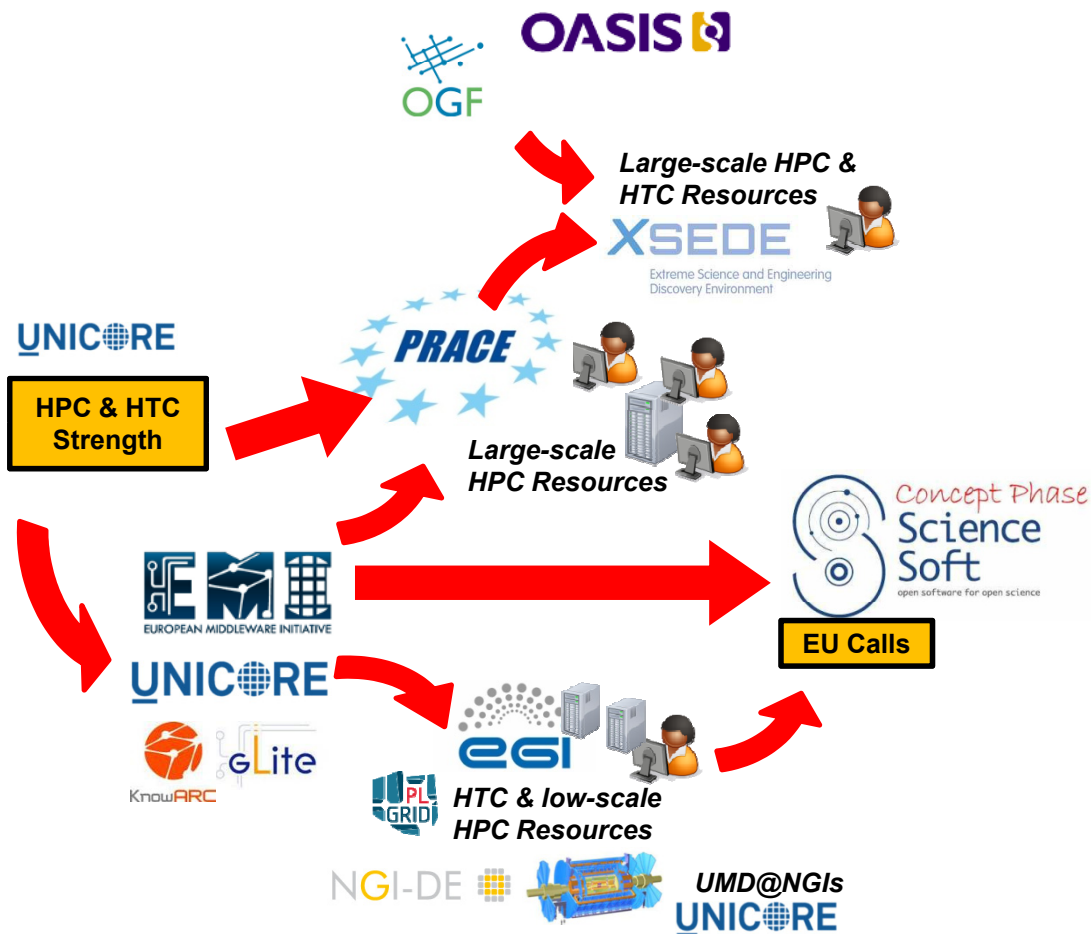
[4] Stewart et al., Campus Bridging Use Case Quality Attribute Scenarios', 2012

## Roadmap Update: EMI Legacy – Science Soft





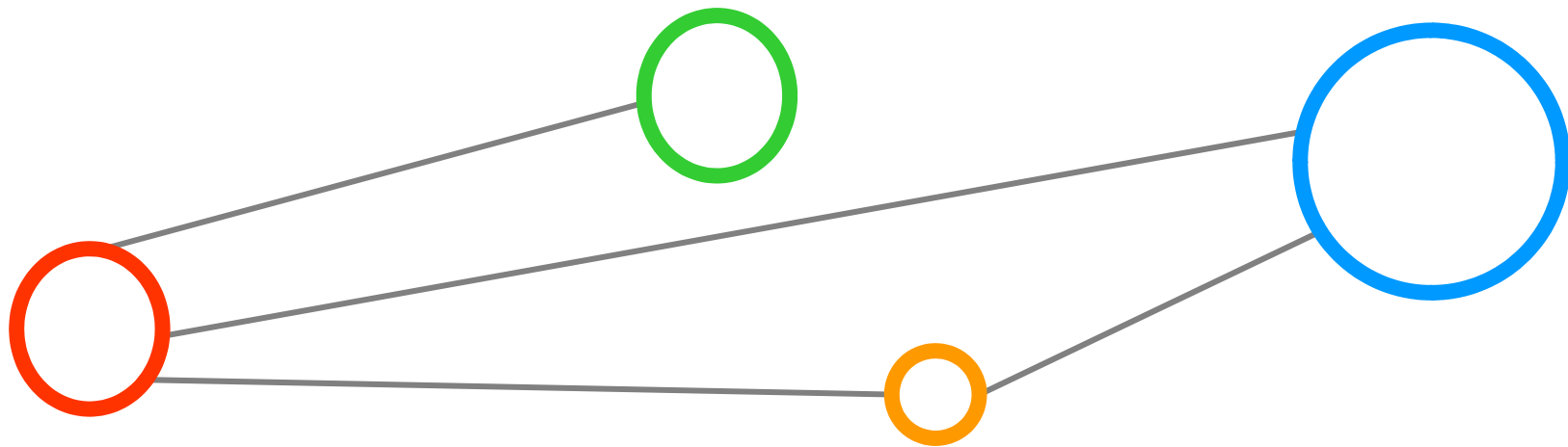
# Roadmap Update: EMI turns into Science Soft



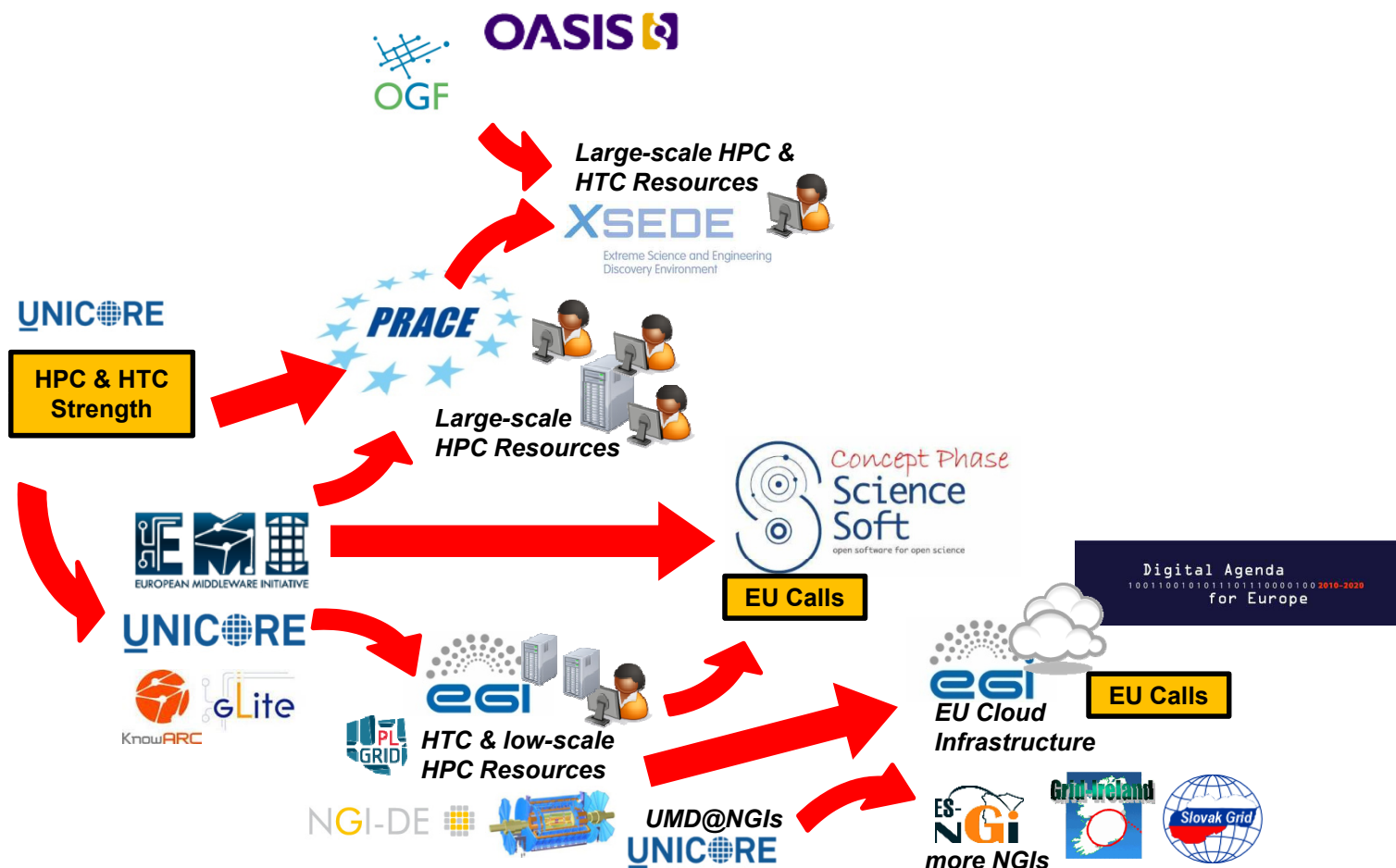
# ScienceSoft – (Maybe) Valuable for UNICORE



## Roadmap Update: Evolution of EGI & NGIs



# Roadmap Update: Evolution of EGI & NGIs



## UNICORE in more National Grid Initiatives (NGIs)

- Extend the usage of UNICORE in NGIs beyond existing countries
  - Many NGIs are tired of gLite and ARC services and configuration hassle
- PL-Grid+ very excellent
  - Applications on top of core infrastructure PL-Grid
  - UNICORE in use at numerous Polish sites
- NGI.DE starting to get up to speed
  - Transformation from D-Grid to NGI.DE finished
  - UNICORE in use at numerous German sites



[7] Polish NGI, PL-Grid, 2012

[8] German NGI, NGI.DE, 2012

- UNICORE Activities in future might include the following
  - Contact old project participants in D-Grid VO projects
  - Get involved with members of other NGIs



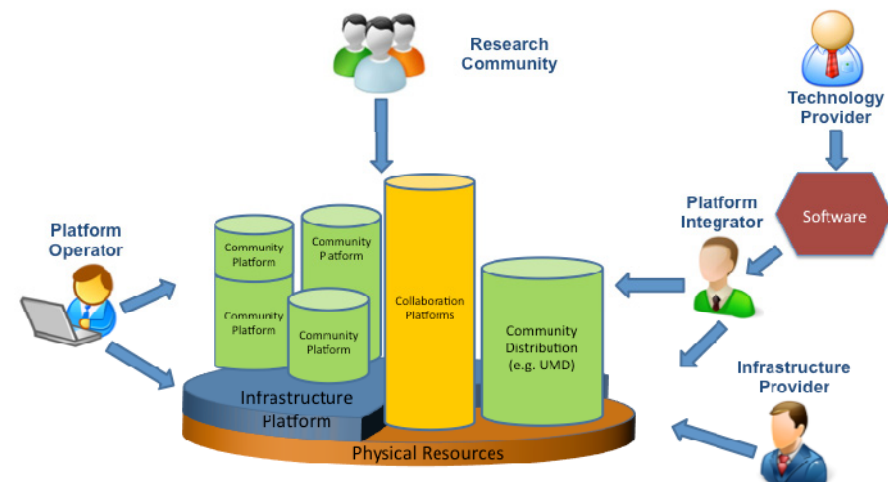
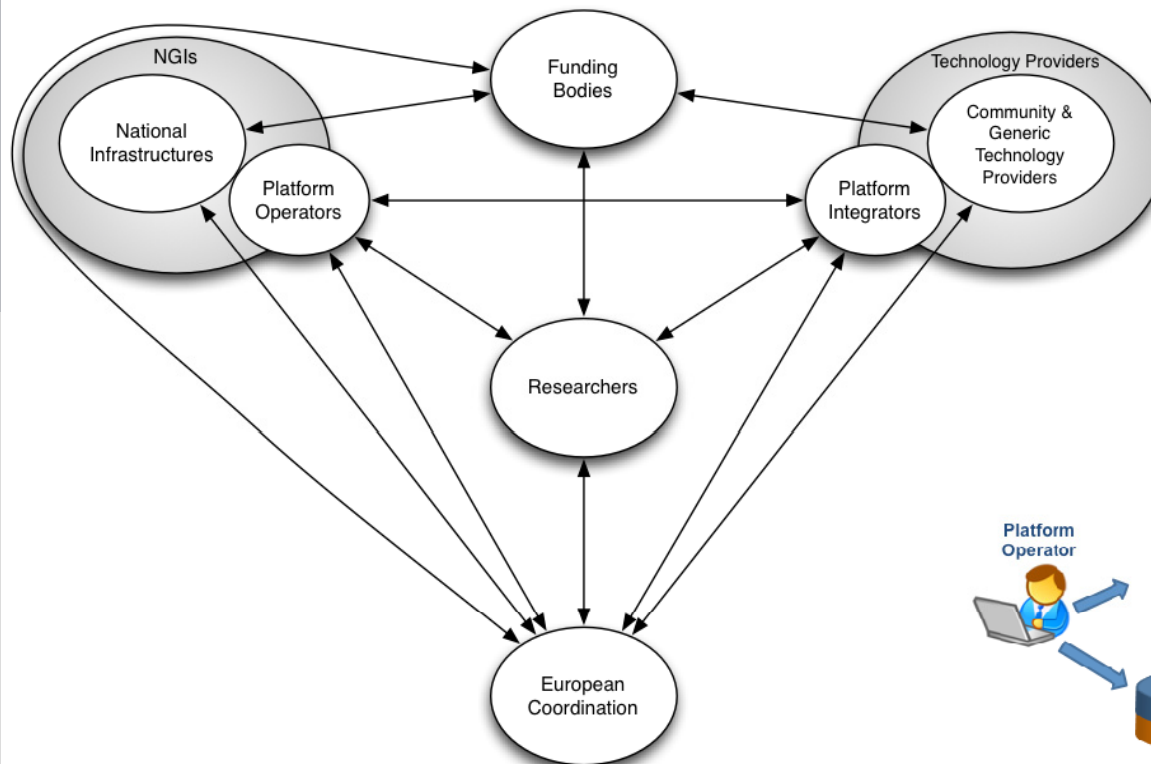
# EGI transforms to EU Cloud Infrastructure

- EC & Digital Agenda: 'Every EU Citizen cloud-enabled in 2020'
- EGI Cloud Platform Profile Activities
  - Not fixed middleware anymore
  - UNICORE might become a 'technology provider'

Digital Agenda  
1001100101011101110000100 2010-2020  
for Europe

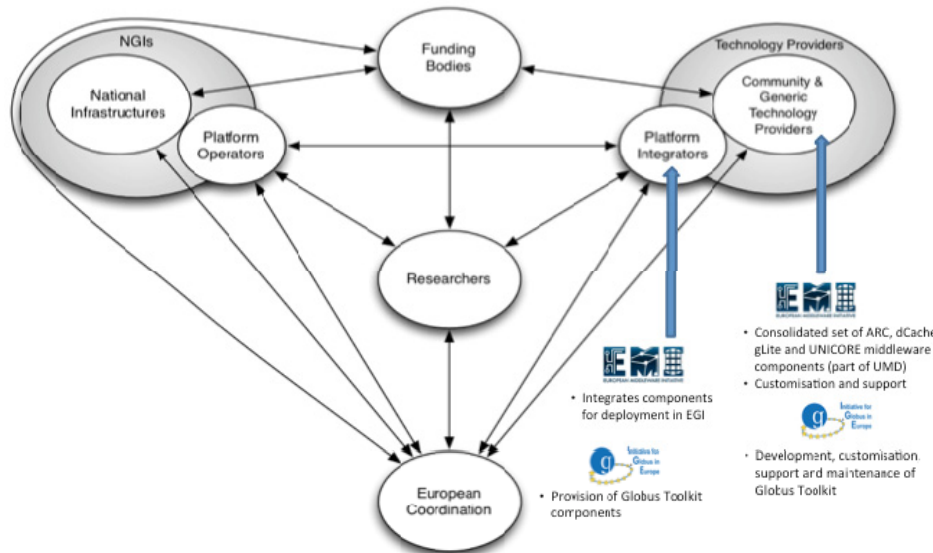
[9] Digital Agenda for Europe, 2010

[10] Seeking new Horizons:  
EGI's Role in 2020, 2012





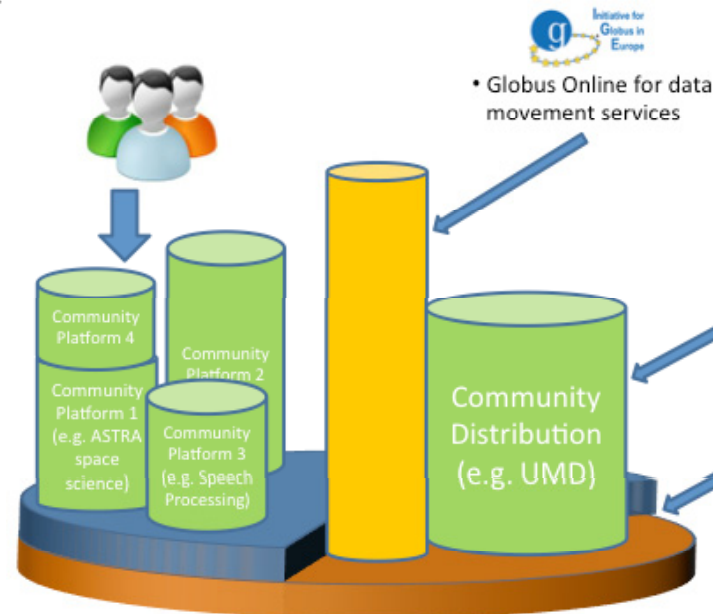
# UNICORE Contributes to the Cloud Platforms



**[10] Seeking new Horizons:  
EGI's Role in 2020, 2012**

**[11] Evolving the EGI Business  
Model, 2012**

- Consolidated set of ARC, dCache, gLite and UNICORE middleware components (part of UMD)
- Customisation and support
- Integrates components for deployment in EGI
- Provision of Globus Toolkit components
- Development, customisation support and maintenance of Globus Toolkit

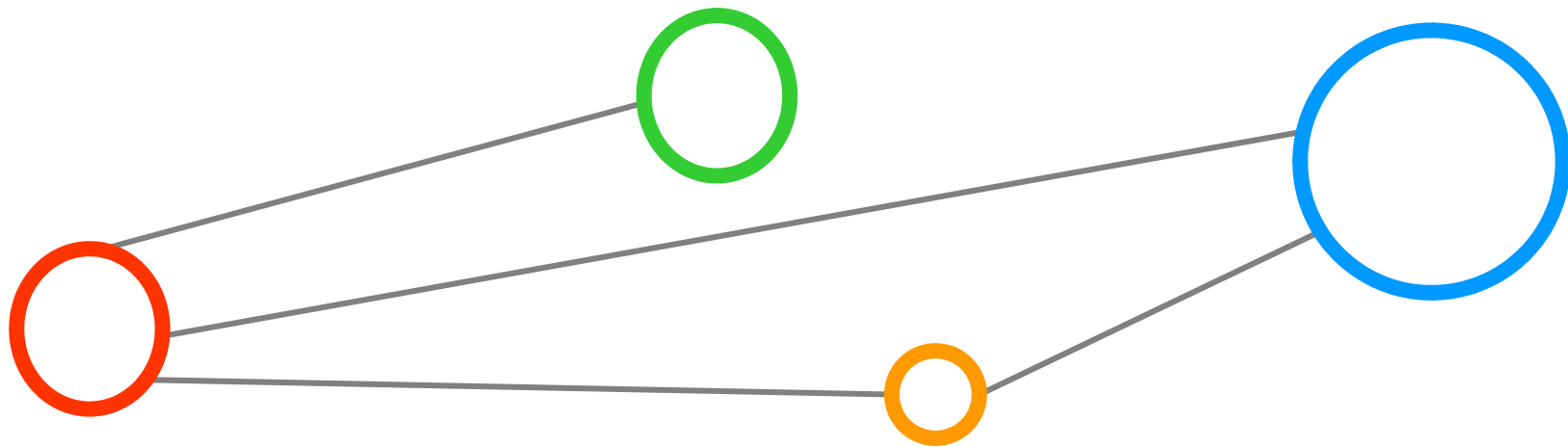


## Technology



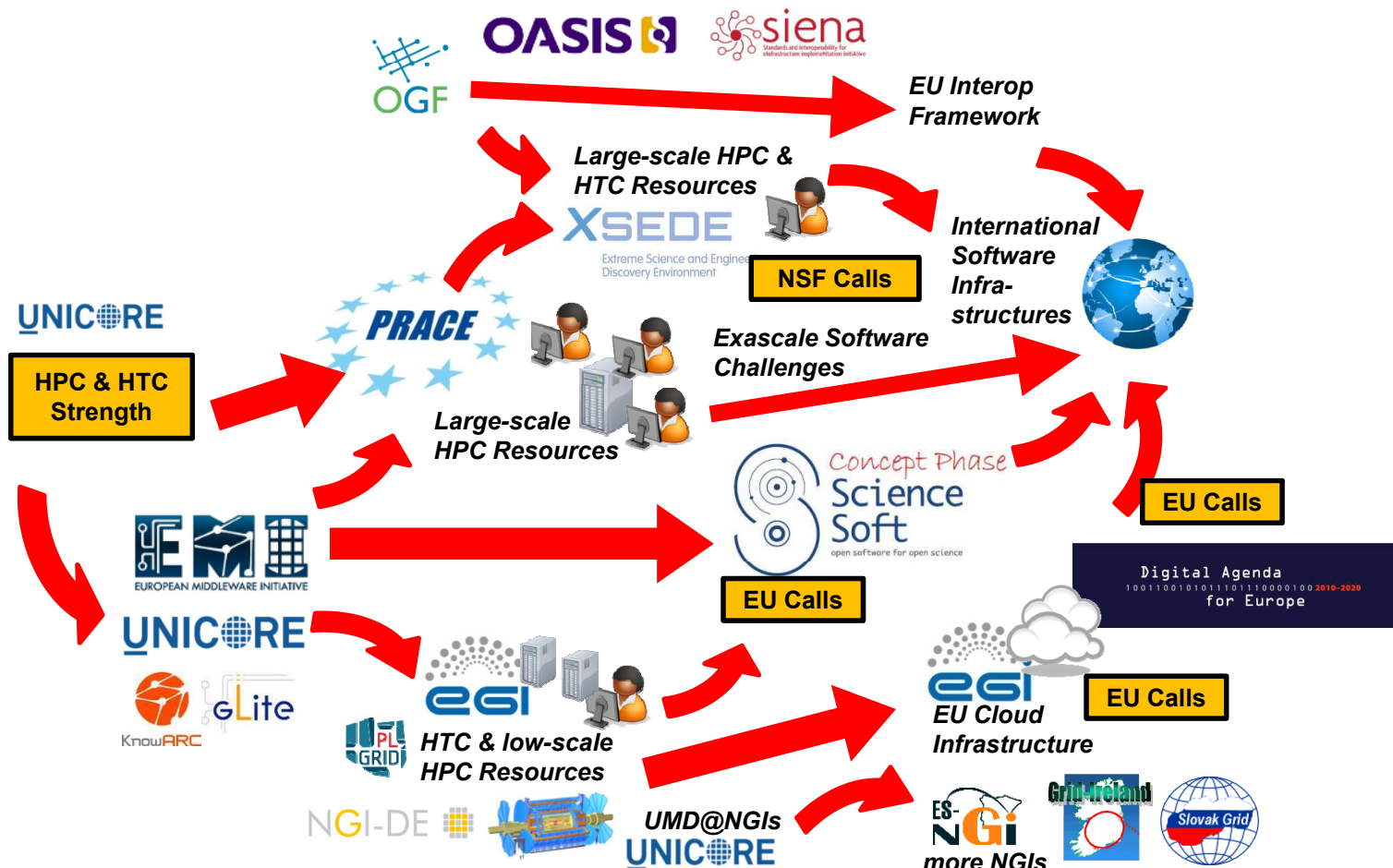
- Globus Online for data movement services
- Provides components for community distributions
- Interfaces used by infrastructure platform tools (e.g. Nagios probes, accounting sensors)

## Roadmap Update: Towards Int. SW Infrastructures





# Roadmap Update: Towards International SW Institutes

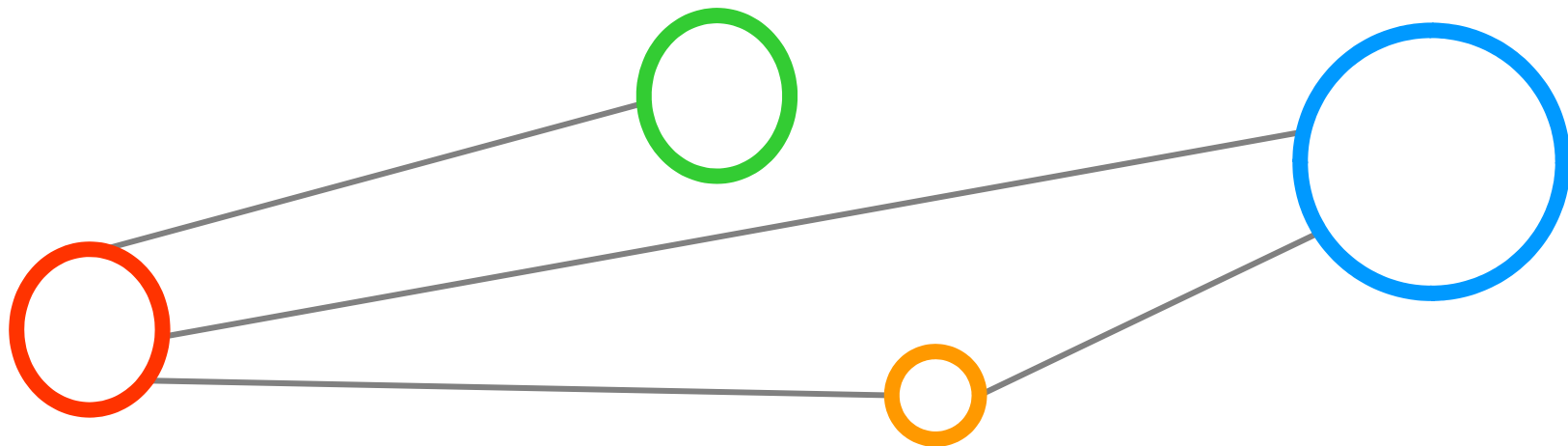


# Sustainability and Standardization of the SW Future

- EC (and NSF) recognises key challenges in Scientific Software
- (1) Standardization and avoiding Work duplication
  - EU Roadmap on Grid and Cloud Standards for e-Science and Beyond
  - All known SDOs involved and key academic players
  - Complementary EU Interoperability Framework
- (2) Sustainability
  - HPC Software faces 'Exascale challenges' → software needs to be adapted
  - Approach of 'OMII' – Open Middleware Infrastructure Institutes returns
  - NSF: Several grants for 'software infrastructure' coming (small, medium, big)
  - EC: Software Initiative towards exascale software and beyond
- Close NSF and EC Collaboration → Towards international SW Institutes
  - Zakopane Meeting (Poland): Grid computing: The Next Decade
  - Flexible joint funding calls known from 'charettes' in US planned (NSF+EC)



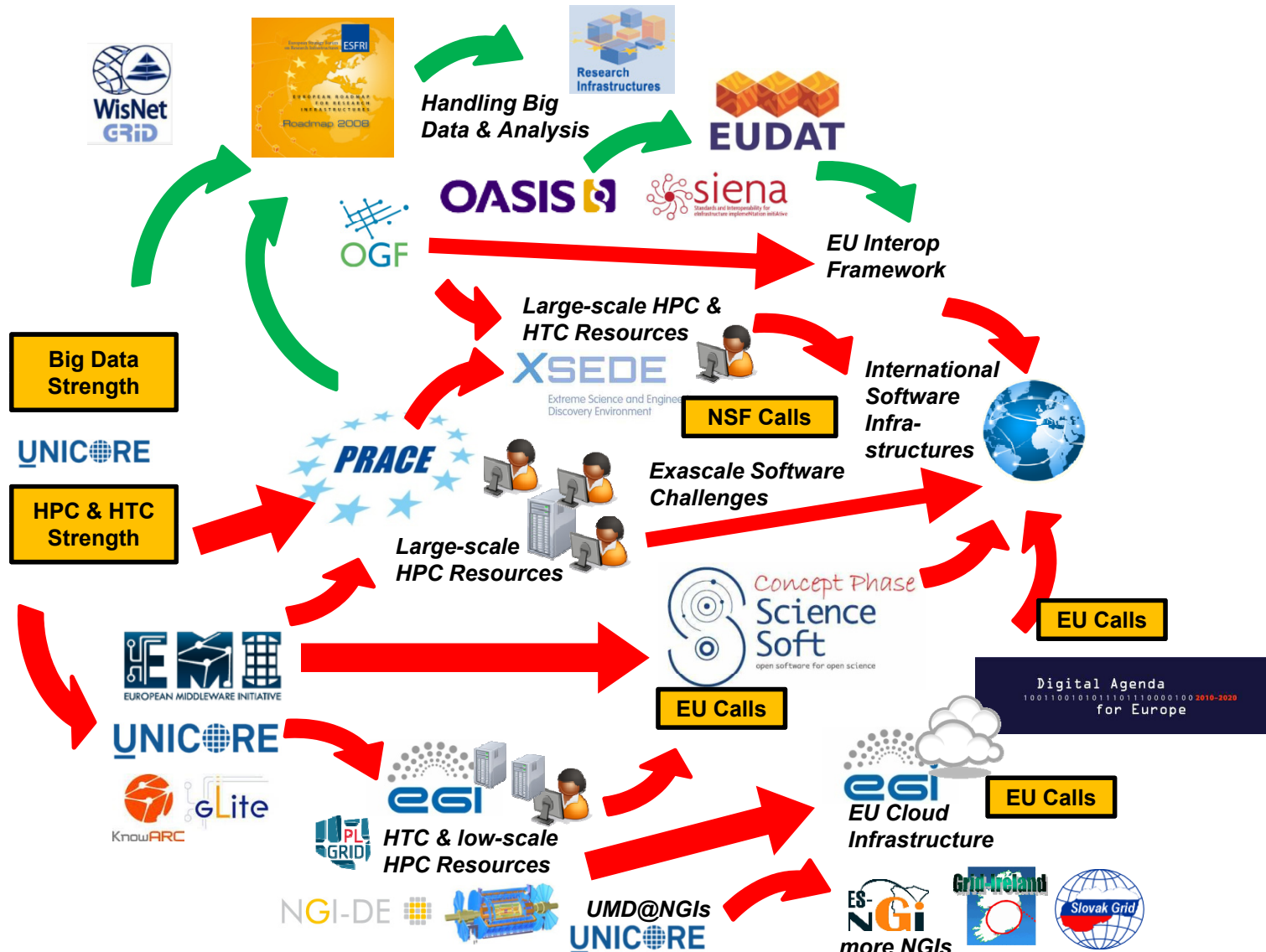
## Roadmap Extension: Processing and 'Big Data'



## Roadmap Extension: Plans for 'Reinforcements'



# Roadmap Extension: EUDAT and 'Big Data'





## UNICORE Community has also 'Big Data Strength'

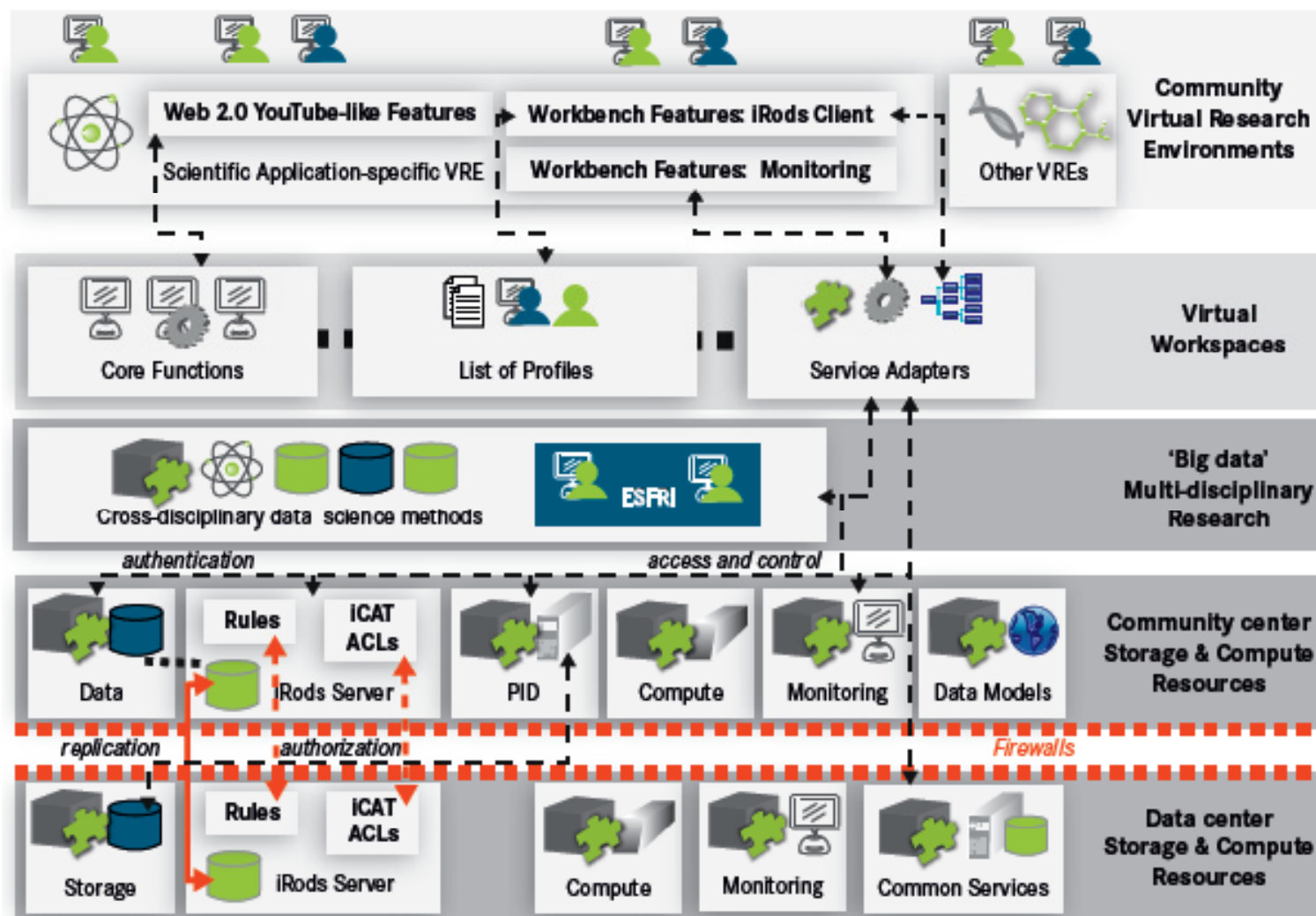
- Distributed Systems research over years included data challenges
  - Data transfer, third-party transfers & delegations, etc.
- Several UNICORE projects work on data challenges already
  - E.g. WISNETGrid Project, iRods UNICORE integration
- Potential key user communities of UNICORE: ~44 ESFRI Ris
  - Require processing power (for many too early)
  - But require also handling of 'big data' (now)
- Data Standardization Activities Starting
  - EUDAT: DAITF ('IETF for data')
  - EUDAT: OASIS oData
  - EUDAT: OGF UR



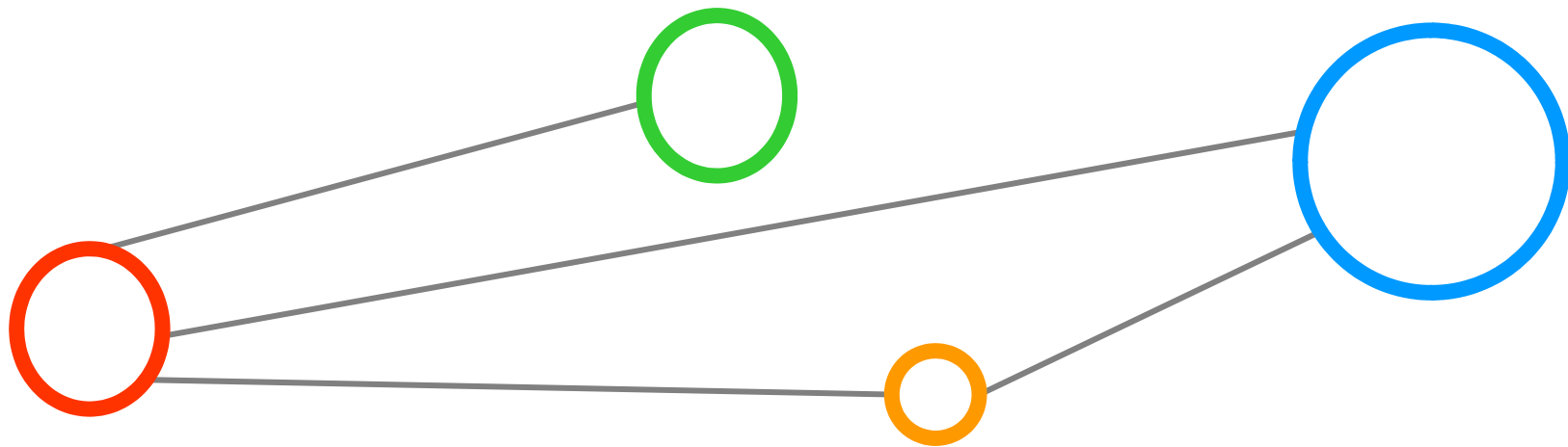
OData  
<http://www.odata.org/media/30002/OData.html>  
 OData URL Conventions  
<http://www.odata.org/media/30002/OData%20URL%20Conventions.html>  
 ABNF for OData  
<http://www.odata.org/media/30002/OData%20ABNF.html>  
 OData Common Schema Definition Language (CSDL)  
<http://www.odata.org/media/30002/OData%20CSDL%20Definition.html>  
 OData ATOM Format  
<http://www.odata.org/media/30002/OData%20Atom%20Format.html>  
 OData Verbose JSON Format  
<http://www.odata.org/media/30002/OData%20JSON%20Verbose%20Format.html>  
 Open Data Protocol (OData) Batch Processing  
<http://www.odata.org/media/30002/OData%20Batch%20Processing%20Format.html>



# EUDAT – Collaborative Federated Data Infrastructure

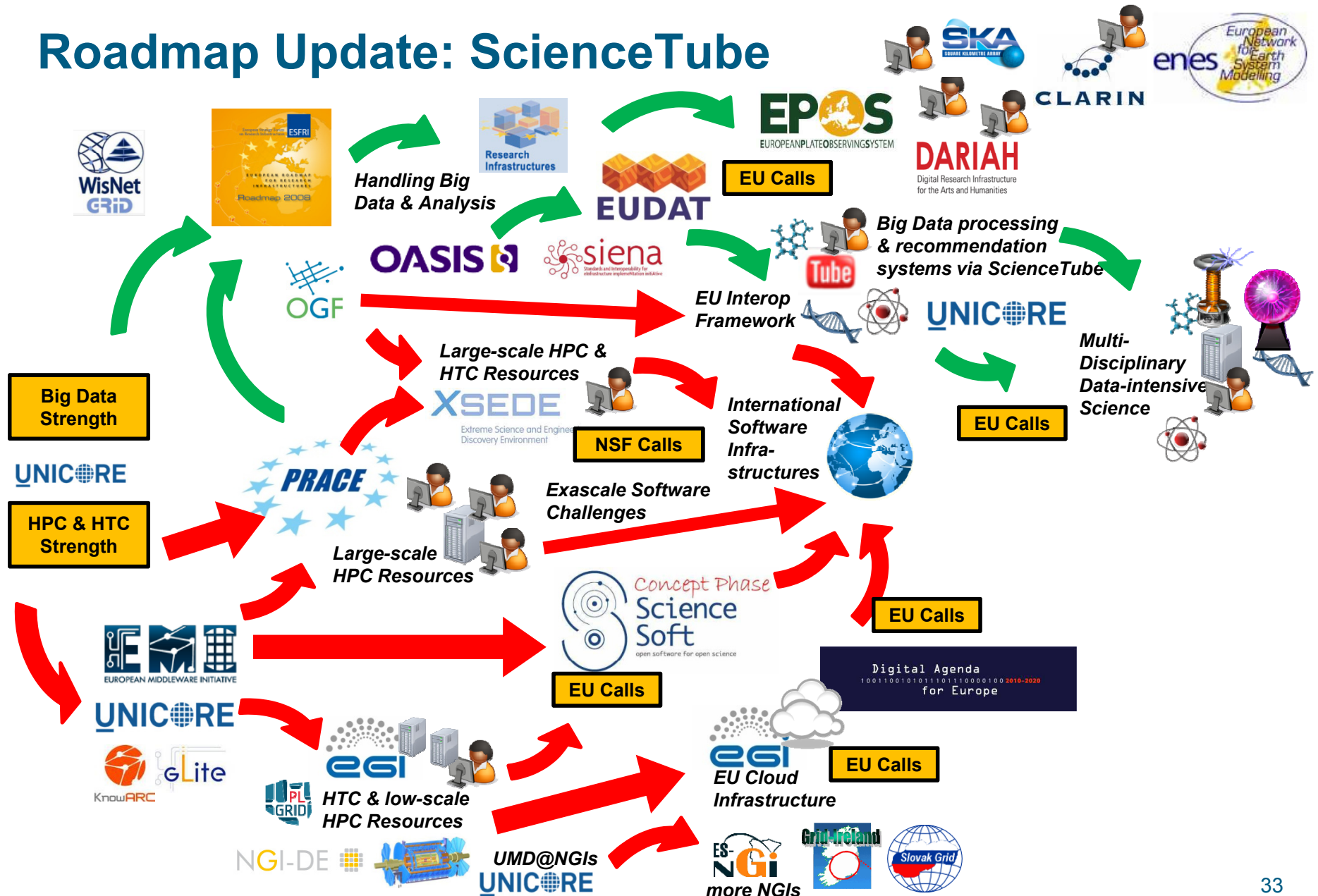


## Roadmap Update: Multi-disciplinary ScienceTube

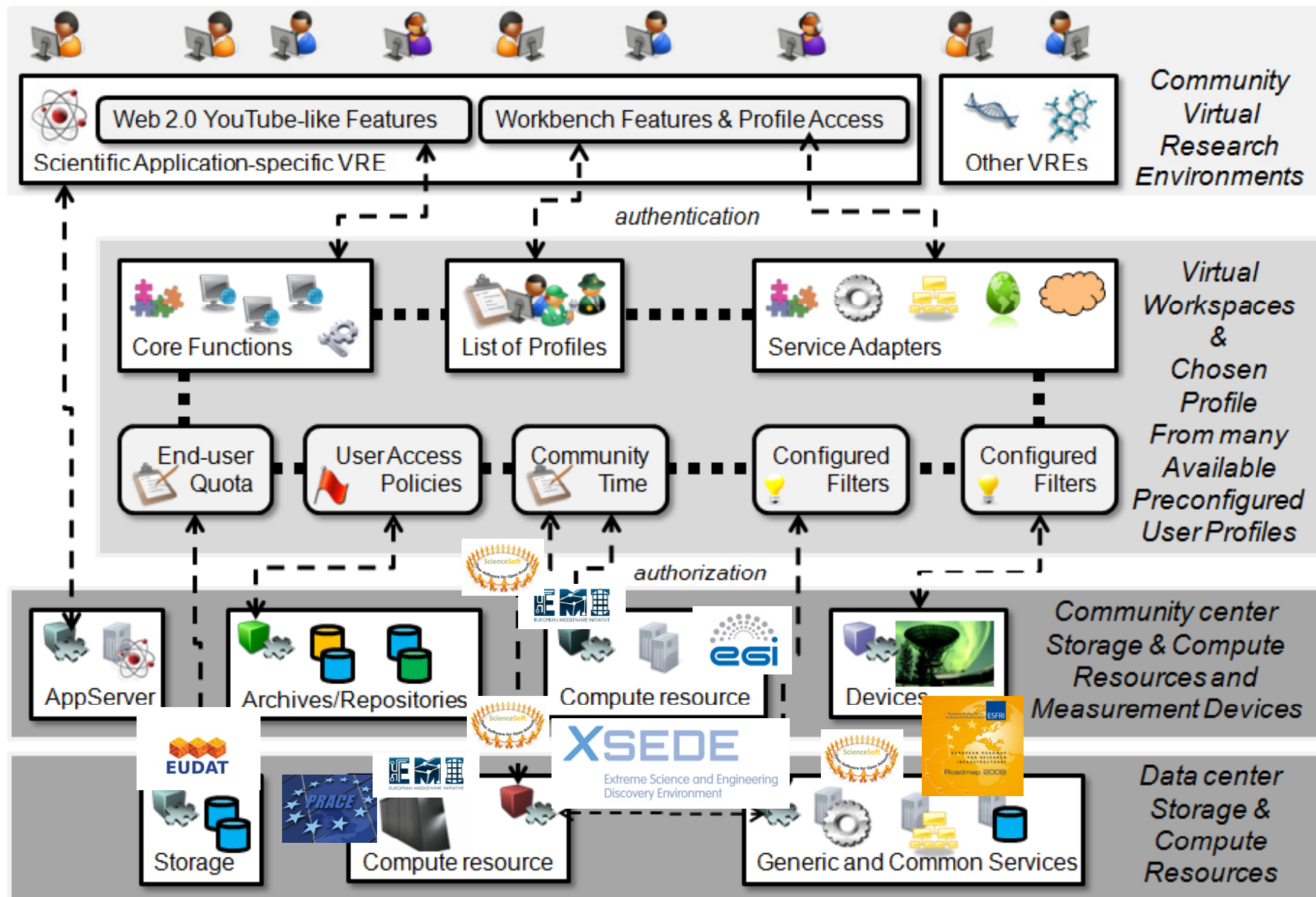




# Roadmap Update: ScienceTube



# 'ScienceTube' (Reference Model View)



[2] Riedel and Wittenburg et al., YouTube for Science, 2010

# 'ScienceTube' (User view)



## Warning

☒ STORAGE: (RZG)

76% of your data in this storage is unused since 90 days – remove data?



## Available Services (Filter #43):

☒ Data-mining service  
☒ Workflow service



## 10:46 - CEST Meetings Today

☒ 9:00 Steering Group, see [Meeting Minutes](#)

## Available Resources (Filter #443):

☒ STORAGE: (JUELICH)  
☒ STORAGE: (RZG)

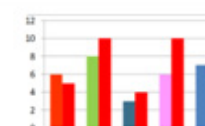
☒ sensor ship #4455  
☒ sensor airplane #4711

☒ HPC: (SARA)  
☒ HPC: (JUELICH)  
☒ HTC: (EGI)  
☒ STORAGE: (JUELICH)  
☒ STORAGE: (RZG)

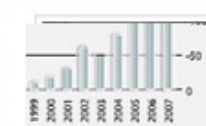
## Most Viewed Today



**MPI toolset usage**  
von DieseSchuleRockt



**Paper about aging**  
von albertoson



**Device #46 data**  
von ElectronicArtsDE

[2] Riedel and Wittenburg et al., YouTube for Science, 2010

Underpinned with strong **federated** infrastructure back-ends of the next decade

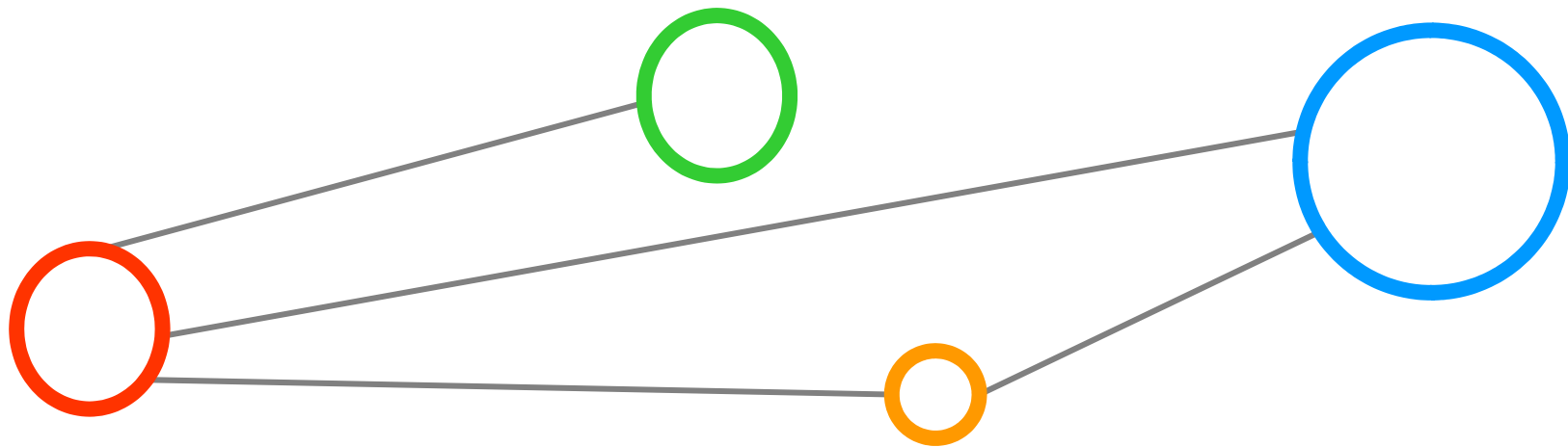
**EUDAT**



**XSEDE**  
Extreme Science and Engineering  
Discovery Environment

**OTHERS**  
(e.g. Clouds)

## Roadmap Update: Towards Horizon 2020

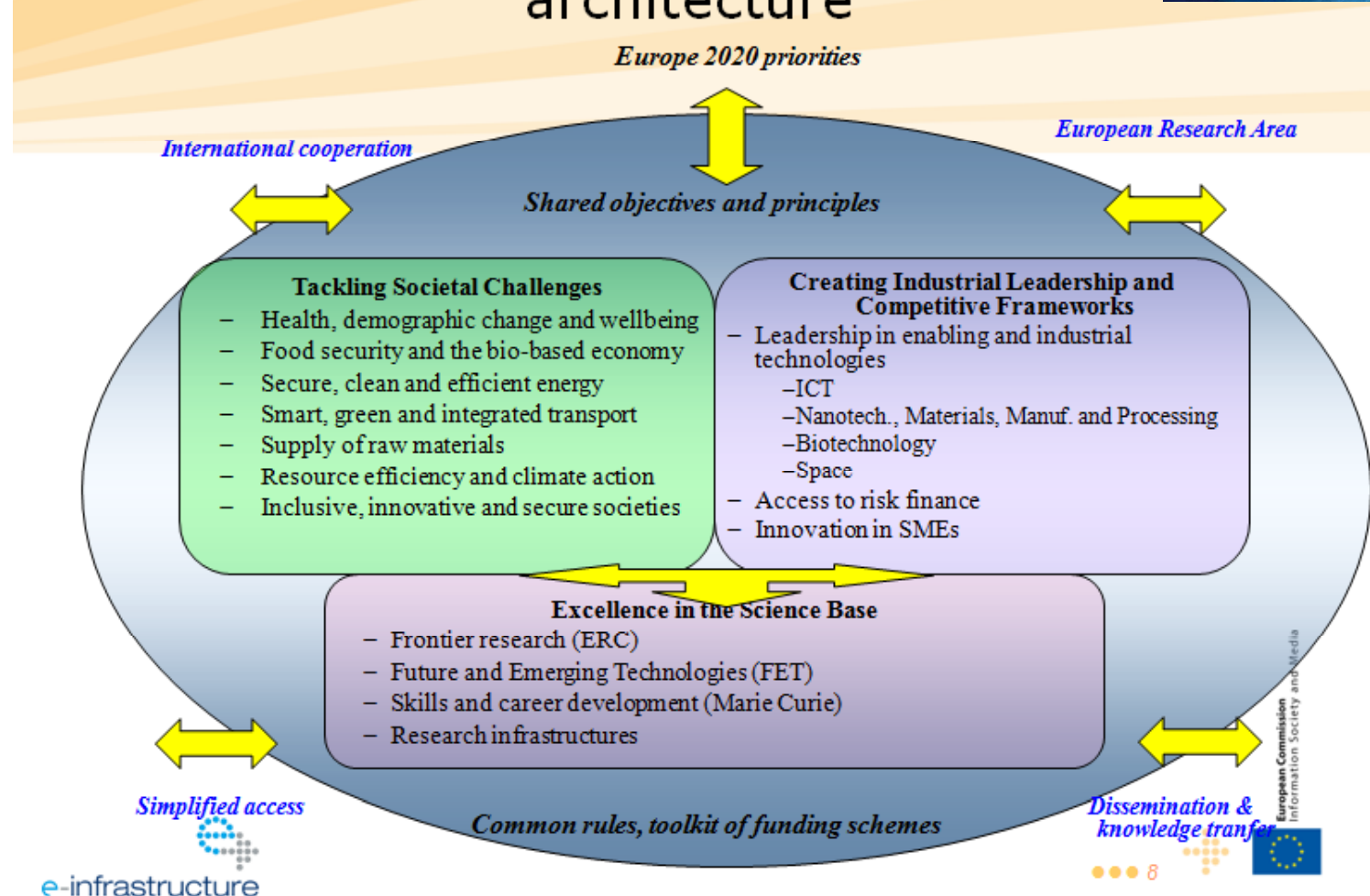






# Europe 2020: New Framework Plans

## Common Strategic Framework architecture

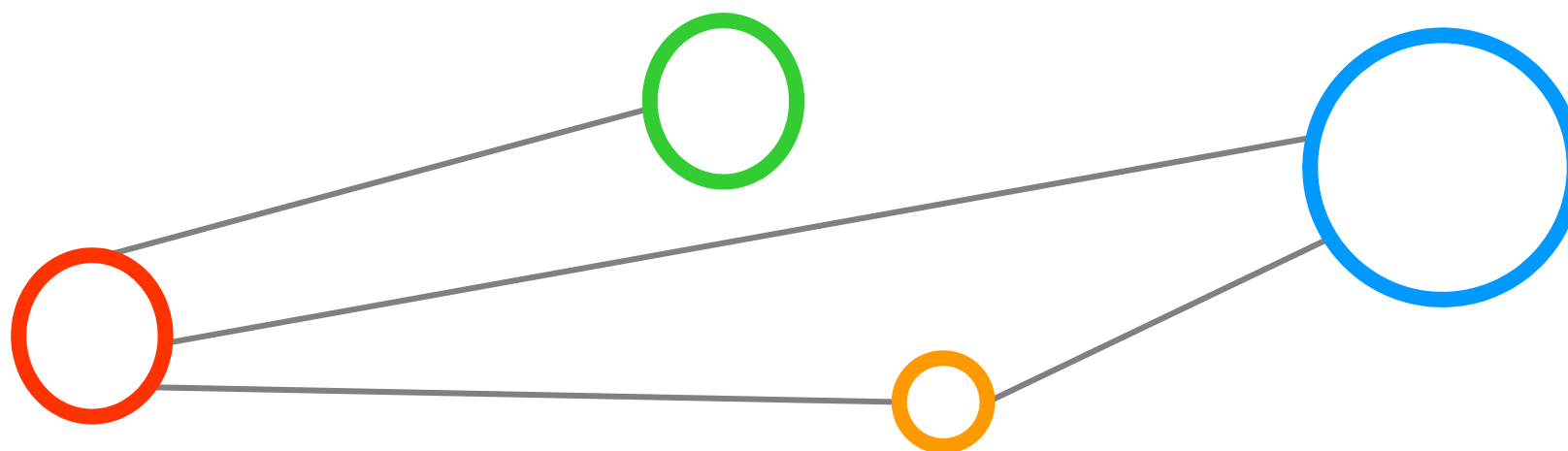


## Many Options to work Towards Horizon 2020

- From gadgets to tools: Communicate UNICORE as commodity tool
- More Application Enabling Activities
  - UNICORE usage can be improved, e.g. work with ESFRI projects
  - e-IRG, EEF, and EC documents have many ESFRI requirements to be implemented (e.g. easy security, citizen scientists support, etc.)
  - (also XSEDE aim: make it as easy as possible for science end-users)
- Activities towards Clouds and Green IT remain interesting for UNICORE
  - Towards 2020 GreenIT will have new impacts in distributed computing/data
  - EC and EGI vision will push the cloud paradigm
  - UNICORE discussions around REST and \*aaS (perhaps UNICORE 7)
  - Virtual environments will getting more and more relevant
  - EMI cloud exploration activities and EGI Cloud Task Force

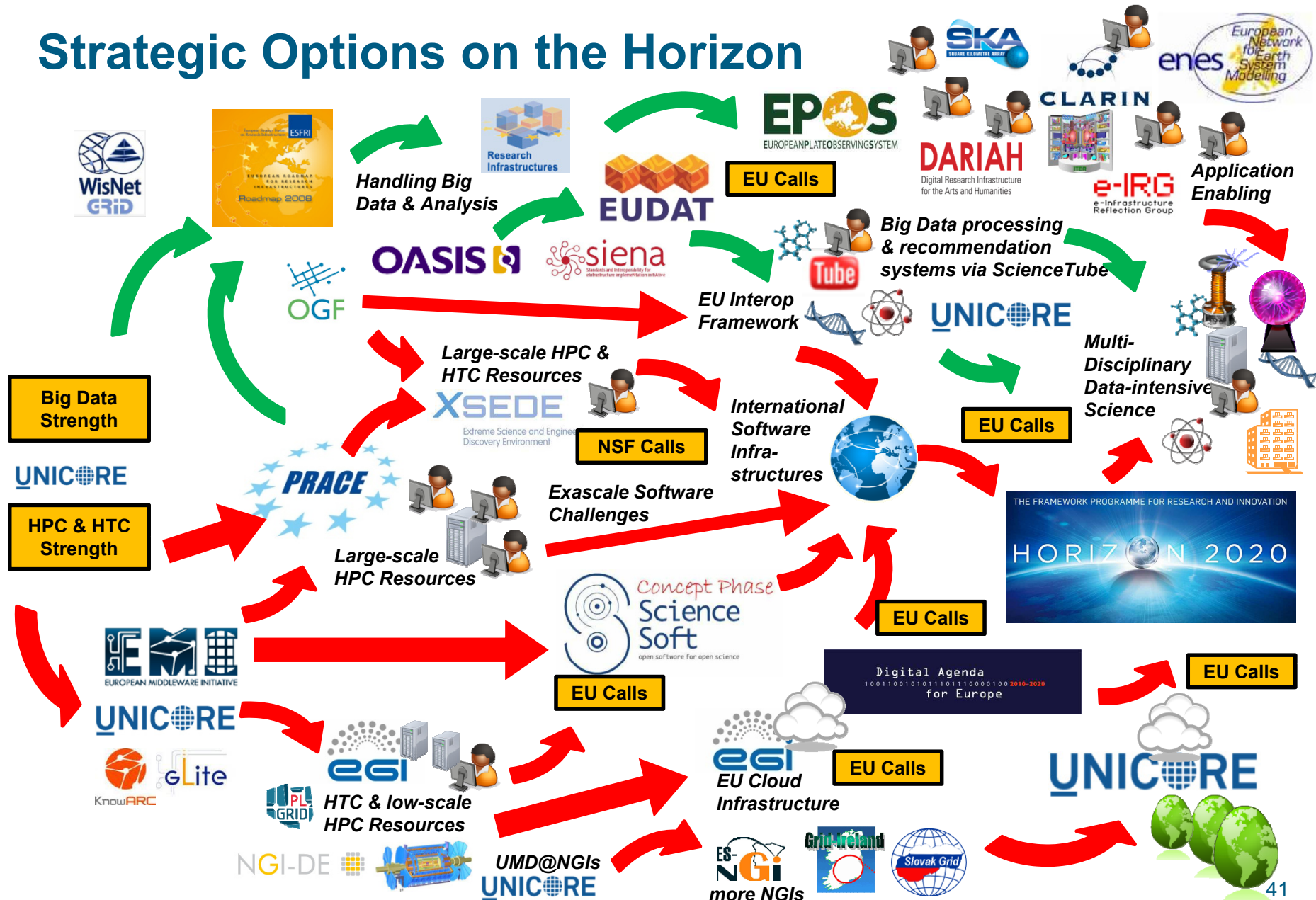


## Summary





## Strategic Options on the Horizon

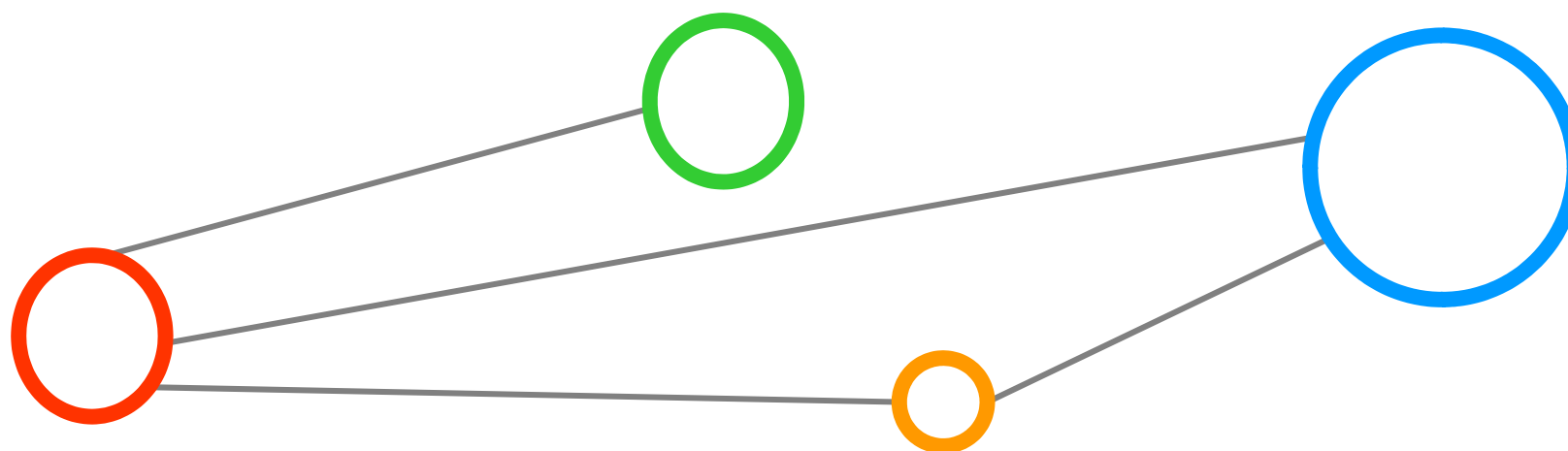


## Summary

- *‘Not anticipating the changes we have to make – but driving them’*
- Adopt more processes for software engineering & distributed systems
- Engage in ‘total multi-disciplinary science & engineering’
- Perform activities with end-users being bottom-up and dispersed
- Collaborate and only slightly coordinate – ‘Science leads the way’!
- Enable application activities around UNICORE use cases & users
- Use ScienceTube as a driver to couple UNICORE with big data analysis
- Focus on ‘lighthouse scientific communities’ and open standards (processes)
- Make sure tasks are linked with broader EU/NSF agendas
- Contribute and ‘form’ joint plans between NSF & EC
- Create Industrial Leadership with our UNICORE commercial partners



## References



## References

- [1] M. Riedel, M.S. Memon, A.S. Memon, S. Holl, D. Mallmann, N. Lamla, A. Streit, Th. Lippert  
*The key role of the UNICORE Technology in European Distributed Computing Infrastructures supporting e-Science Applications in the Decades to Come, UNICORE Summit 2010, Juelich*
- [2] M. Riedel and P. Wittenburg et al. ,Workspaces – Concept and functional aspects - A ‘You-tube for science’ inspired by the High Level Expert Group Report on Scientific Data
- [3] Stewart, C.A., R. Knepper, A. Grimshaw, I. Foster, F. Bachmann, D. Lifka, M. Riedel and S. Tuecke. XSEDE Campus Bridging Use Cases. 2012. Available from: <http://hdl.handle.net/2022/14475>
- [4] Stewart, C.A., R. Knepper, A. Grimshaw, I. Foster, F. Bachmann, D. Lifka, M. Riedel and S. Tuecke. Campus Bridging Use Case Quality Attribute Scenarios. 2012. Available from: <http://hdl.handle.net/2022/14476>
- [5] A. Grimshaw, I. Foster, F. Bachmann, D. Lifka, M. Riedel and S. Tuecke. XSEDE Architecture Level 1 and 2 Decomposition, 2012, Available from:  
<https://www.xsede.org/documents/10157/281380/XSEDE+Architecture+2012-03-03+Level-1-and-2+ver+1.pdf>
- [6] ScienceSoft – Open Software for Open Science, 2012, Available from: <http://sciencesoft.web.cern.ch/>
- [7] Polish NGI, PL-Grid, 2012, <http://www.plgrid.pl/en>
- [8] German NGI, NGI.DE, 2012, <http://www.ngi-de.eu/>
- [9] Digital Agenda for Europe, 2010, Available from:  
[http://ec.europa.eu/information\\_society/digital-agenda/index\\_en.htm](http://ec.europa.eu/information_society/digital-agenda/index_en.htm)
- [10] Seeking New Horizons: EGI’s Role in 2020, 2012, Available from: <http://go.egi.eu/EGI2020>
- [11] Evolving the EGI Business Model, 2012, Available from:  
<https://documents.egi.eu/public/ShowDocument?docid=1040>
- [12] Grid Computing: The Next Decade, 2012, Available From:  
<https://gridlab.man.poznan.pl/Meetings/Zakopane2012/indexman.html>
- [13] K. Glinos, e-Infrastructure in EU, 2012, Available from:  
[https://gridlab.man.poznan.pl/Meetings/Zakopane2012/EU\\_Konstantinos\\_Glinos.ppt](https://gridlab.man.poznan.pl/Meetings/Zakopane2012/EU_Konstantinos_Glinos.ppt)

