Helix Nebula – The Science Cloud

Title: A study of governance models for public-private cloud partnerships

Editor: T-Systems (Jurry de la Mar, Bernd Schirpke)

Work Package: WP8

Submission Date: 15.03.2014

Distribution: public

Nature: report, deliverable D8.1

Sources: Hyperlinks on each source name retrace the information's source

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

Revision History		
Date	**Version**	**Contributor(s)**
8 November 2013	V1.1	T-Systems (Bernd Schirpke, Michael Schnelle, Jurry de la Mar)
18 November 2013	V1.2	T-Systems (Jurry de la Mar), BHO (Ingo Baumann) following workshop with intergovernmental organisations
17 December 2013	V1.3	BHO (Ingo Baumann), CGI (Phil Evans)
28 February 2014	V1.4	T-Systems (Jurry de la Mar) Atos (Mick Symonds)
02 March 2014	V1.5	T-Systems (Jurry de la Mar)
15 March 2014	V1.6	CERN (Bob Jones) T-Systems (Jurry de la Mar)
29 March 2014	V1.7	CERN , EMBL and ESA review
30 April 2014	V1.8	ESA (Maryline Lengert)
8 May 2014	V1.9	T-Systems (Bernd Schirpke, Jurry de la Mar)
23 May 2014	V1.10	Atos (Mick Symonds), T-Systems (Bernd Schirpke) following feedback received during GA4

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

Table of Contents

Table of Contents 3

Table of Abbreviations 6

1 Executive Summary 7

2 Terms and Definitions 9

2.1 Governance 9

2.2 Good Governance 9

2.3 Business Model 10

2.4 Business Process 10

2.5 Information Privacy 11

2.6 Public–private partnership 12

3 Helix Nebula Governance 13

3.1 Status of Initiative 13

3.2 Future Business Model Options 14

3.3 Scope of Governance 15

3.4 Barriers and Limitations 16

3.4.1 Antitrust 17

3.5 Analysis Methodology 17

3.5.1 Business model assumption and options 17

3.5.2 Definition of scope of governance 18

3.5.3 Define general governance principles and specific objectives 18

3.5.4 Leveraging from experiences 18

4 Governance Principles and Objectives 19

4.1 Governance Principles 19

4.1.1 Principles of Good Governance 20

4.1.2 Principles of Corporate Governance 21

4.1.3 Helix Nebula Specific Governance Principles 23

4.2 Helix Nebula Governance Objectives and KPIs 24
4.2.1 Enable integration of existing e-Infrastructures with commercial cloud computing effectively and efficiently 24
4.2.2 Ensure alignment with the Digital Agenda for Europe, foster coherence, equitability and inclusiveness 25
4.2.3 Ensure participation of all stakeholders and fair balance of their needs and interests 25
4.2.4 Ensure transparency, openness and responsiveness 26
4.2.5 Ensure value for money and fair incentives and returns 26
4.2.6 Continuously manage legal compliance and other risks 26
4.2.7 Ensure accountability and responsibility of stakeholders and decision makers 27
4.2.8 Manage and retain the identity and brand 27
4.2.9 Ensure sustainable innovation and growth 28
4.2.10 Summary of KPIs 29
5 Governance Model Options 30
5.1 Vision, Mission and Strategy 31
5.2 Overarching Broker Governance 31
5.2.1 Prerequisites and Constraints 32
5.2.2 Processes and Organisation 32
5.2.3 Legal Form of Brokers 34
6 Proposed Governance Approach 35
6.1 General 35
6.2 Key boundaries for Helix Nebula Governance 35
6.3 Typical governance in European science 36
6.3.1 The General Assembly 37
6.4 Proposed Governance Structure for the Helix Nebula Initiative 38
6.4.1 Helix Nebula General Assembly 39
6.4.2 Helix Nebula User Board 40
6.4.3 Helix Nebula Service Provider Board 40

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

6.4.4 Policy and Strategic Advisory Board 41
6.4.5 Scientific and Technical Advisory Board 42
6.4.6 Management Board 43
6.4.7 Secretariat 44
6.4.8 The Helix Nebula Marketplace 45
6.5 Contractual Arrangements for Helix Nebula 46
6.5.1 Initial Phase 46
6.5.2 Operational Phase 46
6.5.3 Legal and Contractual Arrangements for the Operational Phase 48
7 Sustainability 52
7.1 Funding 52
7.2 Costs 53
7.3 Evolution 53
7.4 Identity 54
8 Conclusions and Recommendations 55
9 References 57

Table of Abbreviations

COBIT	Control Objectives for Information and Related Technology
CSP	Cloud Service Provider
ERIC	European Research Infrastructure Consortium
HNX	Helix Nebula Marketplace
ICT	Information and Communication Technology
IPR	Intellectual Property Rights
ISAR	International Standards for Accounting and Reporting
OECD	Organisation for Economic Co-operation and Development
P3	Public-Private Partnership
PPP	Public-Private Partnership
SPV	Special Purpose Vehicle
SME	Small and Medium Enterprises
UNECE	United Nations Economic Commission for Europe

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

1 Executive Summary

The Helix Nebula Initiative started in July 2011. The Helix Nebula Initiative is composed of partners involving several intergovernmental research and space organisations, research institutes, public authorities, large companies and SMEs from European ICT industry across more than nine EU Member States and Associated Countries. The Initiative has direct links to existing and future ICT European e-Infrastructures, i.e., High Performance Computing, Grids and Networks. In order to support the Initiative, ten of the partners jointly applied for funding by the European Commission (EC) under FP7, which was granted by the EC in June 2012. In this document, all activities of these ten partners are referred to as the Helix Nebula Project. Subject of the document however is to design and describe governance models for public-private cloud partnerships in general and the overall Helix Nebula Initiative in particular.

The main aim of the Helix Nebula Initiative is to build-up structures for the sustainable provision of cloud computing services for European Science and beyond. At the same time, it strives to ensure that valuable scientific data is protected by a secure data layer interoperable across all Member States. Cloud computing services will comply with Europe's stringent privacy and security regulations and satisfy the many requirements of policy makers, standardisation bodies, scientific and research communities, industrial suppliers and SMEs. For this reason, a thorough analysis of the future business governance and business models is required. The business models have been analysed in [4]. This document presents background analysis and a draft for the governance model, including options.

This document provides a source of information and support for decision-making regarding the potential governance model for the Helix Nebula Initiative. It shows how the European Science Cloud could be managed and supported, once the business models are chosen and implemented.
Governance describes the control of an enterprise or project, in other words the different bodies with decision-making function and their interplay. Since governance may cover a wide range of principles and objectives, Chapter 2 provides the reader with a guidance, including short common definitions of the key terms used throughout this document.

The following key aspects have been taken into account to develop the governance model:

- Strategy and Mission
- Business Model
- Service Architecture
- Operational principles
- Integration of or links with existing e-Infrastructures
- Identity and brand

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

- Community building
- Sustainability
- Information and IPR management

In Chapter 3, the status and specific requirements for Helix Nebula are discussed. This is followed by Chapter 4 within which general and specific governance principles and objectives for Helix Nebula are presented. These will guide the reader to Chapter 5, where the governance model options are outlined.

The work has led to propose a Governance Model in Chapter 6, that outlines the governance for the overarching Helix Nebula Initiative, the Broker Services for cloud computing resources that are emerging and the cooperation with other e-Infrastructures and projects under the Horizon 2020 framework.

Rationale, motivation and main recommendations provided in the document are:

- Many of the barriers towards realising a European Science Cloud are structural and organizational, rather than technical, in particular when users should be given access to a full-hybrid combination of public-funded and commercial cloud computing infrastructures.
- Governance principles to be applied for should take into account principles of both EU and European intergovernmental organisations as well as Europe-based international enterprises
- A User Forum and Scientific and Policy Advisory Boards should be established for regular consultations and alignment with relevant activities
- It is proposed to initially pilot two Brokers, one operated by a commercial entity with focus on short term sustainability for Generic IaaS cloud computing services and one by an independent neutral entity for best possible uptake in the public sector
- The Broker for cloud computing resources e.g. the newly established Helix Nebula Marketplace should follow successfully pioneered brokerage services and (electronic) processes known from retail industry where possible, maintaining an open competition and implement an innovative approach towards management of user and service provider specific requirements.

Furthermore, the document gives an overview of the sustainability aspects in Chapter 7.

Overall conclusions and recommendations are provided in Chapter 8 followed by a list of references in Chapter 9.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

2 Terms and Definitions

In order to guide the reader through this document, this Chapter provides short common definitions [21] of the key terms used. Further sources can be obtained from [21].

2.1 Governance

There are many different definitions of the term governance. According to Wikipedia [21] for example, "governance relates to consistent management, cohesive policies, guidance, processes and decision-rights for a given area of responsibility". Other definitions of governance, for instance like used in COBIT or the OSIRIS FP7 project [9], explicitly exclude management activities from governance. In OSIRIS, on the other hand even all activities ensuring sustainability are considered a separate aspect of a business model, in parallel to governance. Many publications on governance even do not explicitly define the term governance.

Governance is the act of governing. It relates to decisions that define expectations, grant power, or verify performance. It consists of either a separate process or part of decision-making or leadership processes. In modern nation-states, these processes and systems are typically administered by the government. When discussing governance in particular organisations, the quality of governance within the organisation is often compared to a standard of good governance.

In the case of a business or of a non-profit organization, governance relates to consistent management, cohesive policies, guidance, processes and decision-rights for a given area of responsibility. For example, managing at a corporate level might involve evolving policies on privacy, on internal investment, and on the use of data.

To distinguish the term governance from government: "governance" is what a "governing body" does. It might be a political entity (nation-state), a corporate entity (company), a socio-political entity (chiefdom, tribe, family, etc.), or any number of different kinds of governing bodies. Governance is the way rules are set and implemented. Governance is "the process of decision-making and the process by which decisions are implemented (or not implemented)". The term governance can apply to corporate, international, national, local governance or to the interactions between other sectors of society.

2.2 Good Governance

Good governance is an indeterminate term used in international literature to describe how public institutions conduct public affairs and manage public resources.

The concept of "good governance" often emerges as a model to compare ineffective with viable economies and political bodies. The concept is about the responsibility of governments and governing bodies to meet the needs of the whole of society, as opposed to selected groups only. Governments seen as most successful in good governance are often liberal democratic states in Europe and the Americas. Those countries' institutions often set the standards which other states' institutions are recommended to follow. As the term

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

"good governance" can be focused on any one form of governance, it may imply many different things in many different contexts.

2.3 Business Model

A business model describes the rationale of how an organization creates, delivers, and captures value (economic, social, cultural, or other forms of value). The process of developing a business model is part of the overall business strategy.

In theory and practice, the term business model is used for a broad range of aspects of a business, including purpose, strategies, target customers, product or service offerings, required infrastructure, organizational structures, commercial practices, and operational processes. The literature has provided very diverse interpretations and definitions of a business model. A systematic review and analysis of manager responses to a survey defines business models as "the design of organizational structures to enact a commercial opportunity". Further extensions to this logic emphasize the use of coherent business models as mechanisms by which entrepreneurs create extraordinarily successful growth firms.

"Whenever a business is established, it either explicitly or implicitly employs a particular business model that describes the architecture of the value creation, delivery, and capture mechanisms employed by the business enterprise. The essence of a business model is that it defines the manner by which the business enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit: it thus reflects management's hypothesis about what customers want, how they want it, and how an enterprise can organize to best meet those needs, get paid for doing so, and make a profit".

Business models are used to describe and classify businesses (especially in an entrepreneurial setting), but they are also used by managers inside companies to explore possibilities for future development. Business models are also referred to in some instances within the context of accounting for purposes of reporting.

2.4 Business Process

A business process or business method is a collection of related, structured activities or tasks that produce a specific service or product (serve a particular goal) for a particular customer or customers. It often can be visualized with a flowchart or with a process matrix showing the sequence of activities, the decision-making points and relevance rules.

There are three types of business processes:

1. Management processes the processes that govern the operation of a system. Typical management processes include "corporate governance" and "strategic management".

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

2. Operational processes, processes that constitute the core business and create the primary value stream. Typical operational processes are purchasing, manufacturing, advertising and marketing, and sales.
3. Supporting processes, which support the core processes. Examples include accounting, recruitment, call centre, technical support.

A business process begins with a business objective and ends with its achievement. Process-oriented organizations break down the barriers of structural departments and try to avoid functional silos.

A business process can be decomposed into several sub-processes, which have their own attributes, but also contribute to achieving the goal of the overall business process. The analysis of business processes typically includes the mapping of processes and sub-processes down to activity level.

Business Processes are designed to add value and therefore should not include unnecessary steps or activities. The outcome of a well-designed business process is increased effectiveness (value for the customer) and increased efficiency (less costs for the company).

2.5 Information Privacy

Information privacy, or data privacy, is the relationship between collection and dissemination of data, underlying technologies, the public expectation of privacy, and fundamental rights, often laid down in national constitutions. Privacy concerns arise wherever personally identifiable information is collected, stored, used and distributed– in digital form or otherwise. Improper or non-existent control can be the root cause for infringements. Privacy issues can concern a wide range of data, such as:

- Healthcare records
- Criminal justice investigations and proceedings
- Financial institutions and transactions
- Biological traits, such as genetic material
- Residence and cadastre records
- Ethnicity
- Location-based service and geo-location

The challenge in data privacy is to share data while protecting personally identifiable information. The fields of data security and information security design and utilize software, hardware and human resources to address this issue.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

2.6 Public–private partnership

A Public–Private partnership (PPP) is a venture established, funded and operated through a partnership between a governmental body and one or more private sector companies. The term is quite open and may include many variations of partnerships.

PPP generally involves a contract between a public body and a private party, in which the private party undertakes to build up an infrastructure and to provide a service, assuming substantial financial, technical and operational risks. In some types of PPP, the cost of using the service is borne exclusively by the users of the service and not by the taxpayer (e.g. a toll collect system). In other types, cost for the service is borne wholly (or in part) by the government, often combined with a contribution for infrastructure costs and deployment. Government contributions to a PPP may also be in kind, notably the transfer of existing assets.

Typically, a public sector consortium forms a special company called a "special purpose vehicle" (SPV) to develop, build, maintain and operate the assets and to provide the services for the contracted period. In cases where the government has invested in the project, it is typically (but not always) allotted an equity share in the SPV. The SPV signs the contract with the government and with subcontractors to build the facility and then maintain it. In the infrastructure sector, complex arrangements and contracts that guarantee and secure the cash flows make PPP projects prime candidates for project financing.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

3 Helix Nebula Governance

3.1 Status of Initiative

Helix Nebula is a new, pioneering partnership between big science and big business in Europe that is charting a course towards the sustainable provision of cloud computing - the Science Cloud. This game-changing strategy targets to boost scientific innovation and to bring new discoveries through novel services and products. A Strategic Plan was issued in 2011 and is now in implementation. Over the past 2-year period, the technical solution has been defined and validated.

The scale and complexity of a Science Cloud platform is far beyond what can be provided by any single company. The Helix Nebula Partnership brings together communities of interest with a rich diversity of experience and skills to drive the Helix Nebula Vision.

To steer and control the Initiative a first "light-weight" governance structure was established in the beginning of 2012. The initial objectives were to ensure:

- A common strategy and mission
- Governing structure including demand and supply-side boards and a management team
- Decision-making procedures
- Rules for adding and excluding partners
- Rules for information exchange

These objectives were documented and confirmed in April 2012 by all founding parties, including CERN, EMBL and ESA from the demand-side, and Atos, Cap Gemini, CloudSigma, CSA EMEA, EGI, Interoute, Logica, Orange Business Services, SAP, Sixsq, Telefonica, Terradue, Thales, The Server Labs, Trust-IT, T-Systems and Universidad de Computense Madrid from the supply-side.

Since then, the Initiative has considerably grown. The following new members have joined: CNES, CNR-IREA, DLR, ECMWF, ESO, PIC and UNESCO from the demand-side, and AWST, CNRS, DANTE, Emergence Tech Ltd., Ifremer, Nextworks, Switch, VisioTerra, Memset, Ultimum Technologies, Yandex, Nephos Technologies, INDRA, and CloudEO from the supply-side.

Integration of Helix Nebula with existing e-Infrastructures is one of the key objectives. The preliminary governance structure has supported this towards first achievements e.g. with the joint work performed with EGI.eu on Federated Cloud services and the setup of a pilot communication infrastructure over GEANT to exchange large scientific data-sets between public-funded and commercial cloud data centres.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

To address legal concerns that may arise in the context of competition law, the partners agreed and documented in March 2013 a code of conduct, the Helix Nebula Antitrust Guidelines [22] (see 3.4.1). These are being referred to at every partner meeting.

3.2 Future Business Model Options

In order to determine the requirements for a good governance model, it is important to consider the relevant business model. D7.2 [3] provides a synthesis and analysis for the further development of the Helix Nebula Initiative resulting in seven potential business models. The evaluation of these potential models revealed that the business model with the highest revenue potential is "Information as a Service". The second best revenue potential is represented by "Generic Cloud Computing" which eventually paves the way for a "Worldwide All-In-One Enterprise Cloud" that offers a unique resource to governments, businesses and citizens - an aim defined by the European Union. It can be the long-term model for a partner network of major cloud computing providers consolidating different business activities and strategies, including an ecosystem approach or comprehensive "Software as a Service" model.

Therefore, the work on the governance model mainly focuses on these two business models.

The Generic Cloud Computing Business Model represents the state of Helix Nebula during the Proof of Concept and Pilot Phase, which is now to be transferred into regular operations, procurement and delivery processes. Scientific organisations like CERN, ESA and EMBL can order and consume Infrastructure as a Service, e.g. compute and storage capacity, managed by SLAs and delivered via standardized and unified interfaces by public and commercial cloud providers.

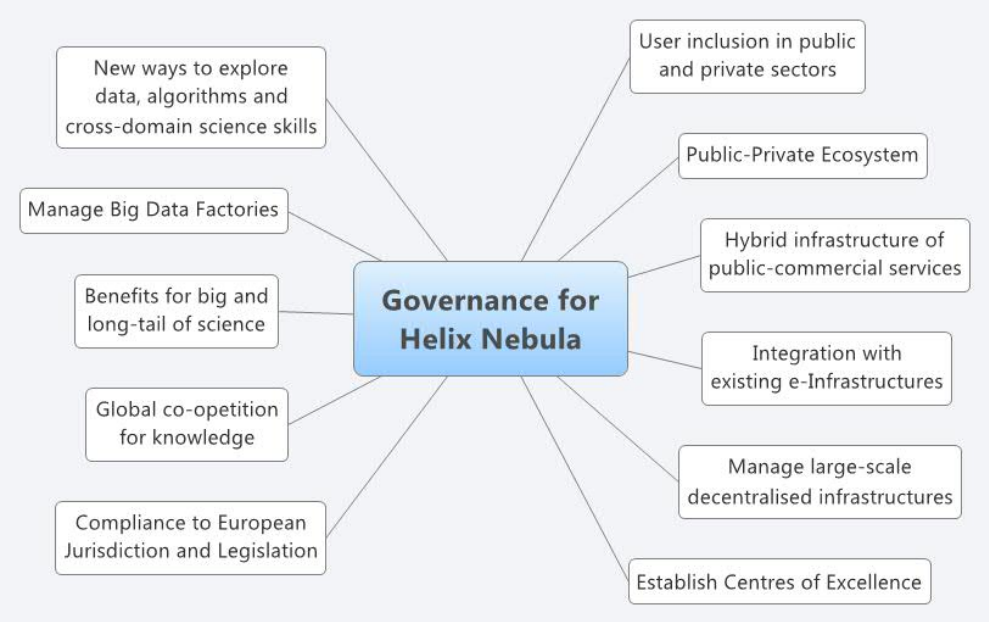
The Information-as-a-Service Business Model significantly extends the Generic Cloud Computing Business Model. Infrastructure as a Service becomes just a means and prerequisite to capture, process, analyse and archive highly attractive data from scientific organisations and to provide the opportunity to cooperate with further data providers in order to enrich the data in its context. "The selling of resulting data sets and knowledge is evaluated as the most promising Business Models in terms of market need, impact on critical mass, differentiation, and thought leadership." [3].

The transformation from the Generic Cloud Computing Business Model to the Information-as-a-Service Business Model will not have significant impacts on the governance model. However, it is to be noted that there are currently only a few European commercial cloud service providers able to provide Infrastructure as a Service at Enterprise level being compliant to EU Jurisdiction and Legislation, and the market will rather consolidate than expand.

3.3 Scope of Governance

The scope for the Governance of Helix Nebula is complex, since the requirements of future data-intensive Science for the implementation of new e-Infrastructures are many-fold. The governance needs to be established and integrated within a complex existing landscape.

A mind map of requirements mentioned in recent reports [5, 6, 7, 11, 12, 13, 15, 16] is depicted in the figure below:



The governance for Helix Nebula therefore needs to provide a well-balanced framework of rules and processes to establish strong leadership, enable good decision-making, integrate a diverse user and stakeholder community, take into account multiple requirements and boundaries and provide flexibility for future growth and diversification. In particular, the building of a large public-private ecosystem with stakeholders from public sector and business calls for new approaches. Examples in the USA, parts of Asia and other European industry sectors (e.g. Aviation) show that good governance amongst public-private stakeholders can be achieved and can lead to innovation. The governance should keep a strong focus on the benefits for all stakeholders, both from public sector and business, and thus on the creation of WIN-WIN scenarios.

3.4 Barriers and Limitations

There is already an extensive ecosystem of public-funded e-Infrastructures and commercial cloud services in Europe [11]. Most countries have advanced national networks for research and education, facilities for high performance computing, high throughput computing, and storage, and various initiatives to provide middleware, tooling, and expertise for the research environment. However, these e-Infrastructures and the organisations managing them have evolved along different functional, geographic, and type-of-user dimensions. As a result, there are often separate organisations for computing, networking, and other e-Infrastructure services, sometimes with very different funding and governance models. Commercial cloud services in Europe have mainly evolved through organic growth in the enterprise market and therefore are represented today by a fair amount of small to medium national IT champions complemented by few large telecom operators and IT services corporations that strive to compete with the large global US-based providers that mainly evolved from consumer demand.

In Europe, many stakeholders find it difficult to navigate in the present landscape of policy-making for e-Infrastructures and cloud computing, as there are numerous advisory bodies and projects aimed at policy development. There is relatively little involvement of user communities in shaping the landscape and its innovation, in particular at the European level [11]. Research communities have difficulties in identifying the most cost-effective solutions among available public-funded and commercial options Clearly, the landscape today is insufficient for the research community to fully cope with the new cloud computing paradigms e.g. on-demand self-service and (large-scale) rapid elasticity. In recent publications of the EIROforum IT working group [5, 6, 7], it is pointed out that e-Infrastructures represent an important and growing budget item for the EU. Therefore, any new infrastructure project must be relevant and sustainable enough to attract participation of the user communities they target.

Many of the barriers towards realising a European Science Cloud are structural and organizational, rather than technical, in particular when users should be given access to a full-hybrid combination of public-funded and commercial cloud computing infrastructures.

Recent publications from stakeholders show a growing common understanding of the issues involved and ways forward, notably the GÉANT Expert Group report [12], EGI2020 [13], the EIROforum IT Working Group [5, 6, 7], the PRACE Roadmap [14], the EUDAT Roadmap [15], the Riding the Wave report [16], as well as the recent e-IRG Strategy report and White Paper 2013 [10, 11].

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

Some of the issues stakeholders are currently facing are:

- Lack of "Visibility" of e-Infrastructure services
- Insufficient coordination and integration of existing e-Infrastructures services;
- Limitations on the use of e-Infrastructures by researchers
- Legal issues, created by disparate legal frameworks in different countries;
- Lack of sustainable funding streams for the use and innovation of e-Infrastructures;
- Limited exchange and collaboration with commercial service providers;
- The lack of coherence between user communities (and long-tail of science)

As concluded by the e-IRG Group there is a significant difference in terms of requirements between flagship user communities, such as the ESFRI-projects and the EIROFORUM-labs, and the „long tail" of individual scientists or smaller research collaborations. Helix Nebula can provide a significant contribution to support this variety of users in European e-Infrastructures.

3.4.1 Antitrust

Knowing, understanding and applying competition law is a major concern for all industrial players within Helix Nebula, especially as many of them are major competitors in European markets. Accordingly, Helix Nebula has adopted its own Antitrust Guidelines [22].

Discussions, communications or any other exchange of information need to comply with competition law and therefore may face limitation in exchanging confidential commercial or financial information.

Membership should be open to new industrial partners and the structures and contractual arrangement should avoid log-in with certain providers and entry barriers for new partners.

Great care must be given to the setting of standards, as non-open, proprietary standards might effectively preclude open competition.

3.5 Analysis Methodology

To identify the best fitting governance model for the Helix Nebula Initiative, this document reflects the approach identified in consultation with partners in a first workshop on Governance for Helix Nebula in February 2013 [1]. This approach also considers the current interim governance implemented.

3.5.1 Business model assumption and options

The governance model has to harmonize with the business model. Therefore, the governance model options have been developed in close coordination with the work on those business models with highest growth potential.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

3.5.2 Definition of scope of governance

It is important to define the scope of governance. For instance, it has to be decided to what extent the service provision, and underlying contractual arrangements, as well as the set-up and operation of the Helix Nebula Platform are to be covered within the governance.

3.5.3 Define general governance principles and specific objectives

General principles of governance meanwhile are best practice within both the public and private sector. However, public and private approaches differ in some respects, and they need to be brought together for the Helix Nebula Partnership. Specific requirements of intergovernmental organisations need to be taken into account.

3.5.4 Leveraging from experiences

To leverage experience from similar initiatives, a number of interviews with representatives from EGI, VENUS-C and other e-Infrastructures have been performed. The results of these interviews are considered for the present analysis, along with results from internal discussions on governance in Helix Nebula, in particular within the Management Team and in the Governance Workshop.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

4 Governance Principles and Objectives

In the context of Helix Nebula, we use the term governance according to the definition given by Mel Gill: "Governance is the processes, structures and organizational traditions that determine how power is exercised, how stakeholders have their say, how decisions are taken and how decision-makers are held to account." [24].

The origin of the term governance is an old Greek word, which was used to describe the steering of a ship. If you compare Helix Nebula with a ship, you may derive the following main governance objectives:

- Keep the ship on course
- Find favourable winds and currents
- Mind the storms and icebergs
- Provide leadership to the crew

4.1 Governance Principles

Helix Nebula is a European public-private partnership initiative. Therefore, three types of governance principles, which are best practice, or even best of breed need to be brought together:

Governance principles that should be applied for Helix Nebula:

- Governance principles of EU and European intergovernmental organisations
- Corporate governance principles of Europe-based international enterprises
- Governance principles for European public-private partnerships

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

4.1.1 Principles of Good Governance

Since 1976, the term governance had been used in the technical language in the US in the sense of sound, systematic corporate governance. Soon it also became a common term in Europe. In 1989, the World Bank introduced the term "good governance" in the meaning of responsible governance of states and international organisations.

Today, the term governance is used again in a more neutral and general way to describe processes and structures to steer and control an organisation. The terms "good governance" and "corporate governance" describe the principles for establishing governance in the public or private sector in an effective, efficient, reliable and sustainable way.

Various international and national institutions have defined good governance principles, amongst them

- The International Monetary Fund
- The United Nations
- The World Bank
- The European Union

According to the UN, good governance has eight characteristics:

- Consensus Oriented
- Participatory
- following the Rule of Law
- Effective and Efficient
- Accountable
- Transparent
- Responsive
- Equitable and Inclusive

The European Union has integrated good governance principles published in a White Paper on European Governance in 2001 [17]. The following principles of good governance are listed there:

- Openness
- Participation
- Accountability
- Effectiveness
- Coherence

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

4.1.2 Principles of Corporate Governance

The OECD released the first version of its Principles of Corporate Governance in 1999 and published a revised version in 2004 [18]. These principles formed also the basis for the corporate governance component of the Report on the Observance of Standards and Codes of the World Bank Group. The main areas of the OECD principles are as follows:

I. *Ensuring the basis for an effective corporate governance framework*
The corporate governance framework should promote transparent and efficient markets, be consistent with the rule of law and clearly articulate the division of responsibilities among different supervisory, regulatory and enforcement authorities.

II. *The rights of shareholders and key ownership functions*
The corporate governance framework should protect and facilitate the exercise of shareholders' rights.

III. *The equitable treatment of shareholders*
The corporate governance framework should ensure the equitable treatment of all shareholders, including minority and foreign shareholders. All shareholders should have the opportunity to obtain effective redress for violation of their rights.

IV. *The role of stakeholders in corporate governance*
The corporate governance framework should recognise the rights of stakeholders established by law or through mutual agreements and encourage active co-operation between corporations and stakeholders in creating wealth, jobs, and the sustainability of financially sound enterprises.

V. *Disclosure and transparency*
The corporate governance framework should ensure that timely and accurate disclosure is made on all material matters regarding the corporation, including the financial situation, performance, ownership, and governance of the company.

VI. *The responsibilities of the board*
The corporate governance framework should ensure the strategic guidance of the company, the effective monitoring of management by the board, and the board's accountability to the company and the shareholders

Based on the work of the OECD, the United Nations Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR) has been established, bringing together experts from international organizations, private sector associations and more than 20 national corporate

governance codes. They produced the Guidance on Good Practices in Corporate Governance Disclosure [19], which consists of more than fifty distinct items across five broad categories:

- Auditing
- Board and management structure and process
- Corporate responsibility and compliance
- Financial transparency and information disclosure
- Ownership structure and exercise of control rights

Most multinational enterprises have formulated Corporate Governance statements in accordance with the above-mentioned principles and their statutory requirements. They report on a regular basis on compliance with their statements.

There are numerous other guidelines and many different models of corporate governance around the world. Even in Europe, there are differences between Continental Europe and the UK. In the UK, the so-called "Anglo-American model" of corporate governance emphasizes the interests of shareholders and relies on a single-tiered Board of Directors that is normally dominated by non-executive directors elected by shareholders. In other European countries like Germany and the Netherlands, a two-tiered Board of Directors is required, where the Executive Board generally runs day-to-day operations while the supervisory board, made up entirely of non-executive directors who represent shareholders and employees, hires and fires the members of the executive board, determines their compensation, and reviews major business decisions. This model is called a multi-stakeholder model, which recognizes the interests not only of shareholders but also of workers, managers, suppliers, customers, and the community.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

4.1.3 Helix Nebula Specific Governance Principles

Helix Nebula is a public-private partnership, not in the narrow legal sense but in a sense of strategic collaboration – therefore it is commonly being referred to as the Helix Nebula Initiative.

In order to agree on governance principles, it is important for all members of Helix Nebula to understand and accept the good governance principles usually applied for partnerships.

> Good governance for a public-private initiative is not just a combination of good governance for public organizations and corporate governance.
>
> The governance principles for Helix Nebula have to ensure that the interest of both public and private members are met and that the initiative becomes sustainably attractive and beneficial for all stakeholders from both sectors.
> The whole is more than the sum of its parts.

Guidance for good governance in PPPs is provided in the UNECE's Guidebook on Promoting Good Governance in Public-Private Partnerships [19]. In chapter 2.1, the following key principles of good governance in PPPs are listed:

- Participation: the degree of involvement of all stakeholders
- Decency: the degree to which the formation and stewardship of the rules is undertaken without harming or causing grievance to people
- Transparency: the degree of clarity and openness with which decisions are made
- Accountability: the extent to which political actors are responsible to society for what they say and do
- Fairness: the degree to which rules apply equally to everyone in society
- Efficiency: the extent to which limited human and financial resources are applied without waste, delay or corruption or without prejudicing future generations

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

4.2 Helix Nebula Governance Objectives and KPIs

Based on the above, the following objectives for the Helix Nebula governance can be derived:

Governance objectives that should be applied to Helix Nebula:

1. Enable integration of existing e-Infrastructures with commercial cloud computing effectively and efficiently
2. Ensure alignment with the Digital Agenda for Europe, foster coherence, equitability and inclusiveness
3. Ensure participation of all stakeholders and fair balance of their needs and interests
4. Ensure transparency, openness and responsiveness
5. Ensure value for money and fair incentives and returns
6. Continuously manage legal compliance and other risks
7. Ensure accountability and responsibility of stakeholders and decision makers
8. Manage and retain the identity and brand of Helix Nebula
9. Ensure sustainable innovation and growth of Helix Nebula

These objectives are discussed in the following chapters. A number of KPIs are suggested to enable measurement of the achievement of these objectives.

4.2.1 Enable integration of existing e-Infrastructures with commercial cloud computing effectively and efficiently

The governance model for Helix Nebula has to enable the integration of existing e-Infrastructures with commercial cloud computing resources services into a seamless Science Cloud.

Examples for existing e-Infrastructures are network, grid and supercomputing infrastructures like GEANT, EGI or PRACE. Examples of commercial cloud computing resources services are cloud computing offerings from Atos, CloudSigma, Interoute or T-Systems.

The governance model also has to provide guidelines and common approaches for the procurement and delivery of such cloud-based e-infrastructure services, depending on the chosen business model. Integration has to be on a technical as well as commercial level, while the requirements of all stakeholders should be fulfilled. The integration shall be efficient, i.e. with low effort and within a short time.

Proposed KPIs:

- End User Experience
- Lead-Time for Decision in Integration of e-Infrastructures or commercial cloud services

4.2.2 Ensure alignment with the Digital Agenda for Europe, foster coherence, equitability and inclusiveness

The Digital Agenda presented by the European Commission forms one of the seven pillars of the Europe 2020 Strategy setting the objectives for the growth of the European Union by 2020. The Digital Agenda proposes to exploit better the potential of Information and Communication Technologies (ICTs) in order to foster innovation, economic growth and progress [20]. Amongst the actions to be taken, the Helix Nebula Initiative supports in particular the following ones:

- Achieving the digital single market
- Enhancing interoperability and standards

Therefore, the Helix Nebula governance model needs to enable fast and simple procurement of standardised cloud computing services across all European countries.

Proposed KPIs:

- Procurement Cycle Time
- Degree of standardisation of Cloud APIs

4.2.3 Ensure participation of all stakeholders and fair balance of their needs and interests

The Helix Nebula stakeholders and actors may have conflicting interests, e.g. in case there will be competition between commercial cloud providers, and users and suppliers may generally have different objectives. In order to make Helix Nebula a success, the governance model needs to ensure that conflicts are recognised and solved at an early stage, and that the interests of all stakeholders are balanced in a fair way. Broad participation and consensus-based decisions are important principles to ensure that the interests of the whole Helix Nebula community are recognised by the decision-making bodies, and that key decisions are well explained to the community.

Proposed KPIs:

- Stakeholder Satisfaction
- Number of solved and unsolved conflicts per year

4.2.4 Ensure transparency, openness and responsiveness

The Helix Nebula governance model has to ensure that the decision-making processes are transparent and that an open communication between the governance bodies and the whole Helix Nebula community takes place. This will create trust between the Helix Nebula members.

Proposed KPIs:

- Stakeholder Satisfaction
- Number of decision conflicts per year

4.2.5 Ensure value for money and fair incentives and returns

In general, an important objective of governance is to maximise the value whilst minimising risks for the respective organisation and its clients. Value for money is a concept about striking the best balance between the "three E's" – economy, efficiency and effectiveness, i.e. to get the maximum benefit from the goods and services an organisation acquires and/or provides, within the resources available to it.

The Helix Nebula governance model should enforce the application of this concept for all stakeholders, i.e. both for users and for suppliers. All stakeholders shall receive fair incentives and returns, and the governance model should have processes and procedures in place to support this.

Proposed KPIs:

- Stakeholder Satisfaction

4.2.6 Continuously manage legal compliance and other risks

Continuous risk management is vital for the Helix Nebula Initiative. Identification, evaluation and mitigation of compliance risks has to be done on a regular basis, as laws and regulations on a global, European and national level change frequently. Furthermore, new risks may arise by new technologies or

just new knowledge about certain facts (like for instance recent reports about NSA activities). The Helix Nebula governance model has to ensure that a proper risk management is established.

Proposed KPIs:
- Key Risk Indicators

4.2.7 Ensure accountability and responsibility of stakeholders and decision makers

The Helix Nebula governance model has to ensure that responsibilities, accountabilities and rights are distributed and assigned in a fair and appropriate way among the Helix Nebula stakeholders. The governance bodies also have to set and enforce clear rules for conflicts in this context.

Proposed KPIs:
- Stakeholder Satisfaction

4.2.8 Manage and retain the identity and brand

The Helix Nebula governance model has to ensure that the identity and the brand of Helix Nebula are properly protected. Whilst Helix Nebula has to evolve, grow and innovate, at the same time it needs to retain its identity in order to be sustainable, attractive and recognisable. This means among others, that the right balance between public and private stakeholders has to be retained. The governance bodies of Helix Nebula have to agree on a set of characteristics, which are unique for Helix Nebula and form its identity. All decisions on evolution, innovation and growths of Helix Nebula have to be done against verification that Helix Nebula's identity is retained. By putting an effective communication and dissemination model in place, the Helix Nebula governance model has to ensure that the identity and brand of Helix Nebula is known and visible to the European and global science communities, to the ICT industry and political stakeholders. Since the brand of Helix Nebula is an essential value, its usage has to be managed and controlled carefully. The Helix Nebula governance model has to ensure that controls are in place to protect and to increase the value of the brand.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

Proposed KPIs:

- Recognition of Helix Nebula in the Science communities
- Helix Nebula brand value

4.2.9 Ensure sustainable innovation and growth

Whilst the identity of the Helix Nebula initiative has to be retained and protected, at the same time it is vital that Helix Nebula can grow and evolve, and lead to innovation. The Helix Nebula governance model has to enable lean procedures for accession of new members. At the same time, an efficient control has to be established avoiding that organisations become members without supporting the essential objectives of the initiative. The same is valid for the addition of new services, user groups etc. Evolution and innovation of Helix Nebula has to be supported by the governance model. Participation of the whole community can be an important measure to achieve this.

Sustainability of the initiative can only be achieved with proper funding for commonly used resources like the Blue Box, the Broker Organisation etc. The Helix Nebula governance model has to ensure funding of these resources in line with growth and evolution of the initiative.

Proposed KPIs:

- Member activity report
- Value of common resources in use

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

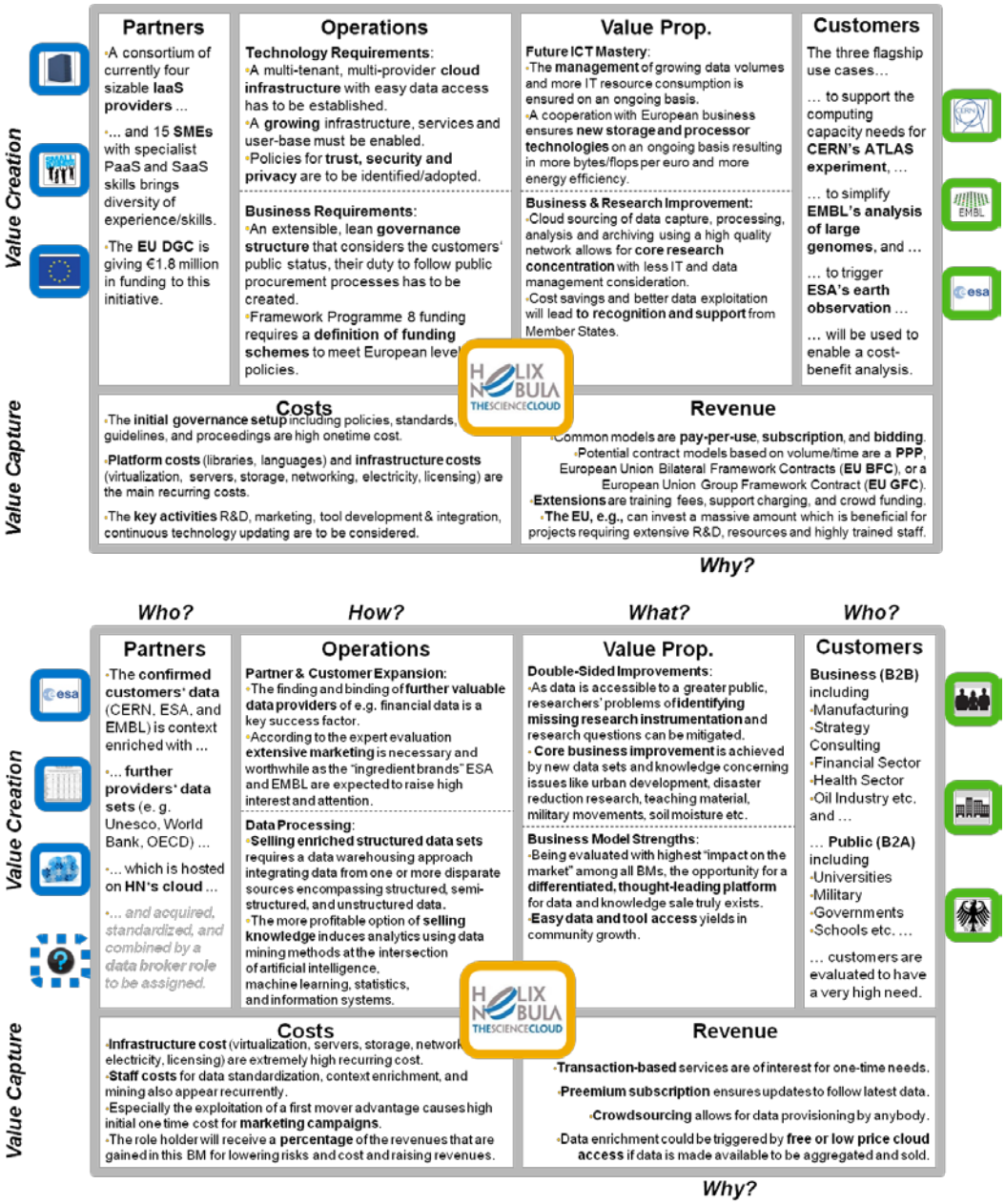
4.2.10 Summary of KPIs

The table below lists the above proposed KPIs and how they relate to the Helix Nebula Governance objectives.

		Governance Objective Nr.								
KPI	**Measurement, Source**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
End User Experience	User Surveys	x								
Lead-Time for Decision in Integration of e-Infrastructures or commercial cloud services	Management Board Reports	x								
Procurement Cycle Time	Broker Business Reports		x							
Degree of standardisation of Cloud APIs	Percentage of standardized APIs		x							
Stakeholder Satisfaction	User Surveys, Provider Surveys			x	x	x		x		
Number of solved and unsolved conflicts per year	Management Board Reports			x						
Number of decision conflicts per year	Management Board Reports				x					
Key Risk Indicators	Risk Management report						x			
Recognition of Helix Nebula in the Science communities	User Surveys								x	
Helix Nebula brand value	Management Board Reports								x	
Partner activity	Management Board Reports									x
Value of common resources in use	Broker Business Reports									x

5 Governance Model Options

In this Chapter, the Governance Model Options are discussed with a focus on the two Business Models with the highest potential for users, stakeholders and business: Generic Cloud Computing [3, chapter 5.3.1] and Information-as-a-Service [3, chapter 5.4.1] as depicted in the figures below:



5.1 Vision, Mission and Strategy

In the current interim governance model for Helix Nebula, the Vision, Mission and Strategic Plan are already established through multiple iterations with users, participating businesses and other stakeholders of the Initiative, including the European Commission.

However, resulting public communication and engagement with future users and stakeholders still needs to be strengthened and encouraged. The Governance Model needs to incorporate a process through which strategy and public communications are regularly reviewed, updated and properly made known to future users, providers and other stakeholders. Users need to understand easily the value proposition(s) of Helix Nebula. Political stakeholders need to verify the effectiveness and sustainability of the initiative and its close link with political programmes and lines of activities. For example, the European Commission has started the European Cloud Partnership with the aims at driving the first steps towards better public procurement of cloud services in Europe, based on common definitions of requirements and possibly eventually going as far as joint procurement across borders. Helix Nebula can significantly benefit from this work by the EC and governance should ensure that Helix Nebula is best aligned with such programmes and activities.

Recommendation #1:
Establish a Helix Nebula User Forum, Scientific and Policy Advisory Boards for regular consultations and alignment with relevant activities.

5.2 Overarching Broker Governance

Both favoured business models include a Broker role and a Cloud Computing Service Provider role. The Broker role is presented in this, the Service Provider role and governance in the next section.

Since Broker roles have been established in various industry sectors, e.g. within the finance sector, best practices for applying good governance principles to a Broker role are available. In the context of Helix Nebula, they lead to a number of prerequisites and constraints.

5.2.1 Prerequisites and Constraints

To establish good governance for the Broker role, it should:

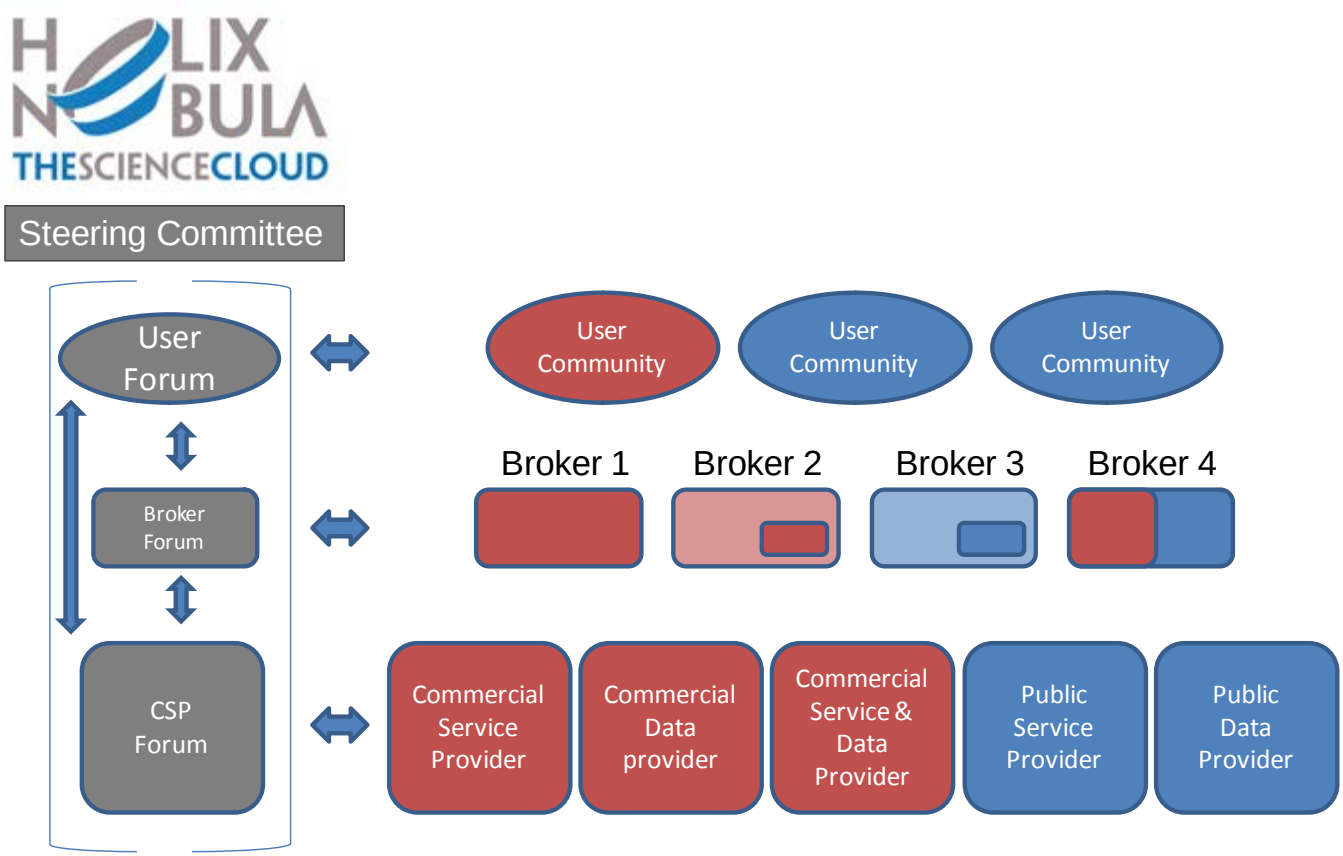
- provide users with transparency and information about the services
- effectively support procurement of services
- provide equal access to both public-funded and commercial resources
- provide fair and equal opportunities to participating service providers
- not unreasonably exclude service providers from participation
- ensure best-possible integration with existing e-Infrastructures
- support consideration of specific user requirements
- take into account high quality e-procurement best practices
- ensure proper risk management
- manage and administer membership and usage fees
- provider support and information to all users (Help Desk)
- operate within EU jurisdiction and legislation

5.2.2 Processes and Organisation

The preferred business models defined for Helix Nebula leave open how many Brokers might be implemented and what types of organisations may take the Broker role. Reports [11] state that innovation in new user services can benefit from competition. Further, taking the diversity of scientific users into account, it may very well be beneficial creating multiple Brokers, which can address the specific service requirements and compete with each other.

Such multiple broker scenario could be outlined as follows:

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301



The picture indicates how individual user communities can access a hybrid ecosystem of public and commercial CSPs through various Brokers e.g. a commercial SPV (Broker 1), a commercial consortium providing a broker function (Broker2), a Public Sector entity providing a broker function (Broker 3) or a public-private partnership (Broker 4).

However, within Helix Nebula a limited number of Broker roles is preferable, at least for the early and mid-term phases of the initiative. One Broker would focus on creating sustainability within a 12-18 months time frame – operated by a commercially independent entity (from the service providers), while the other Broker – operated by a completely neutral and independent entity - would broker resources for the public sector. Taking into account recommendations of the EIROforum [7] to build a network of *Research Accelerators Hubs* and of e-IRG [11] for a coordinated ecosystem, it is suggested to implement the Broker roles within the overall governance model. The Brokers will connect public and commercial service suppliers offering a broad and competitive range of services to the wide scientific user community based on common service definitions, standards and ensured compliance with European jurisdiction and legislation. Such approach could also provide the opportunity to enhance gradually the Broker functions, including for future business models such as generic cloud services and Information as a Service.

It is essential to create and sustain fair competition between the service providers, instead of creating competition among Brokers. Several Brokers could lead to non-transparency and "closed-shops" offerings. In addition, it will become more difficult to oversee the Broker activities under the Helix Nebula governance.

Recommendation #2:
It is proposed to initially pilot two Brokers, one operated by a commercial entity with focus on short term sustainability and one by an independent neutral entity for best possible uptake in the public sector. This will demonstrate the feasibility of the hybrid model and to evaluate the user acceptance of the broker model and new services.

5.2.3 Legal Form of Brokers

This section provides high-level considerations for the legal form of the Broker roles. It does not constitute a comprehensive elaboration of alternatives.

As described in the previous section, there are mainly three scenarios to establish a Broker entity:

- As a public sector entity
- As a commercial entity
- An entity established as Public-Private Partnership

Concerning the Broker role for resources from public institutions, it could be considered whether an existing e-Infrastructures entity e.g. GÉANT or EGI might be used. This may significantly reduce the time for setup and start of operations. Setting up a new dedicated public sector entity might be time-consuming but could be then perfectly tailored towards the objective of creating a hybrid public-commercial science cloud. The European Commission has established in recent years a legal framework that may be applicable: the European Research Infrastructures Consortium (ERIC). This legal framework entered into force on 28 August 2009. This specific legal form is designed to facilitate the joint establishment and operation of research infrastructures of European interest [22].

The setup of the Broker role for commercial services can follow established procedures for company establishment in any of the EU Member States. The process usually can be performed within a short timeframe and with limited costs. Preference should be for a simply structured limited liability company under the laws of a European Member State.

Best legal options for a public-private entity would need further considerations and discussions.

6 Proposed Governance Approach

6.1 General

For a European high-technology partnership initiative such as Helix Nebula there are in principle no binding rules on how to set-up the partnership governance. The governance is dictated only by the needs to

- take all stakeholders and their roles and interests into account, and to
- ensure the effective and successful implementation of the project.

Account should be taken of arrangements and agreements made so far in the early phase of Helix Nebula. As Helix Nebula is supported by several intergovernmental research organisations, the relevant rules for participation and the terms and conditions should also take these into account. In addition, lessons learned can be drawn from other large-scale research initiatives.

6.2 Key boundaries for Helix Nebula Governance

There are some specific characteristics of the Helix Nebula Partnership influencing the governance. Due to its dimension, Helix Nebula generally requires a larger governance structure, while of course observing the principles of efficiency and effectiveness.

Participation to the overall Helix Nebula Initiative is wider than the circle of beneficiaries under the current FP7 project. The governance from the FP7 can therefore not be simply taken over for the whole partnership. Eight service providers have taken the initiative to establish a first commercial broker operator “HNX”, research organisations have requested to make use of broker services established under Helix Nebula and several other Helix Nebula Members are actively pursuing further research into advanced cloud computing federation, and future grants under Horizon 2020 are envisaged. These activities should also be considered for the governance.

Participation to the overall Helix Nebula initiative is open, meaning that a potentially significant number of users on the one side, and service providers on the other side, may enter into the Initiative over time. The Initiative governance must be tailored to facilitate the integration of such new partners without undue restrictions.

Participants in Helix Nebula include intergovernmental organisations operating under specific legal frameworks. This may lead to additional requirements for the governance.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

Most participants are large-scale organisations with their own internal decision-making processes. Key decisions for Helix Nebula may require significant time before being approved by all relevant participants.

Helix Nebula is linked to several EU and Member State policies and closely linked to parallel research initiatives and projects, such as GÉANT. There is a high political visibility of and strong public interest in the Helix Nebula Initiative.

The industrial partners of Helix Nebula are also competitors in European markets. The governance must ensure secrecy of commercial information, level playing field, open competition and avoidance of any competition law issues.

Cloud Computing is a domain of high technical complexity and rapid technological and markets developments.

The above boundaries and characteristics impact on the set-up of the governance and determine the functions and responsibilities of the different governing bodies.

6.3 Typical governance in European science

Since the Helix Nebula Initiative aims to give users better access to a hybrid commercial and public e-Infrastructure, the governance for the Initiative may be to a certain degree determined by the applicable rules for science projects and initiatives governed by the European Commission.

European science is mainly supported under the EU FP7 and now Horizon 2020 Programme. For each project, stakeholders develop and use a consortium agreement to establish the project governance. The DESCA Consortium Agreement is the most widely known and accepted of such models.

The DESCA Consortium Agreement projects foresees the following governing bodies:

- a General Assembly
- an Executive Board
- the Coordinator
- a Management Support Team
- optionally, an External Advisory Board

However, this structure is not mandatory. Smaller projects sometimes only foresee a General Assembly and the Coordinator. Medium projects may foresee an Executive Board, but not an External Advisory Board, and they may not specifically mention the Management Support Team. Very large projects sometimes include even more governance bodies, either for project management (e.g. on Work Package Leaders) or for advice

from external experts (Strategic Advisory Board) or for inclusion of or coordination with external stakeholders (policy coordination, outreach etc.).

It is also to be noted that the terms used for the different governing bodies are not mandatory. There are many variations employed (e.g. the General Assembly might be called Steering Committee, Steering Board or Management Committee). It is recommended to focus on the functions of each governing body and to choose a term indicating such individual function (e.g., a body responsible for day-to-day project management should also bear the word "management" in its term).

Taking into account the legal and contractual framework, the General Assembly is usually a mandatory governance body and has relevance for Helix Nebula governance. Therefore, it is described in more detail in the following section.

6.3.1 The General Assembly

The need for a General Assembly arises from the general principles for consortia and namely the principles of equal rights for each consortium partner. There are also general principles of contract law to be observed.

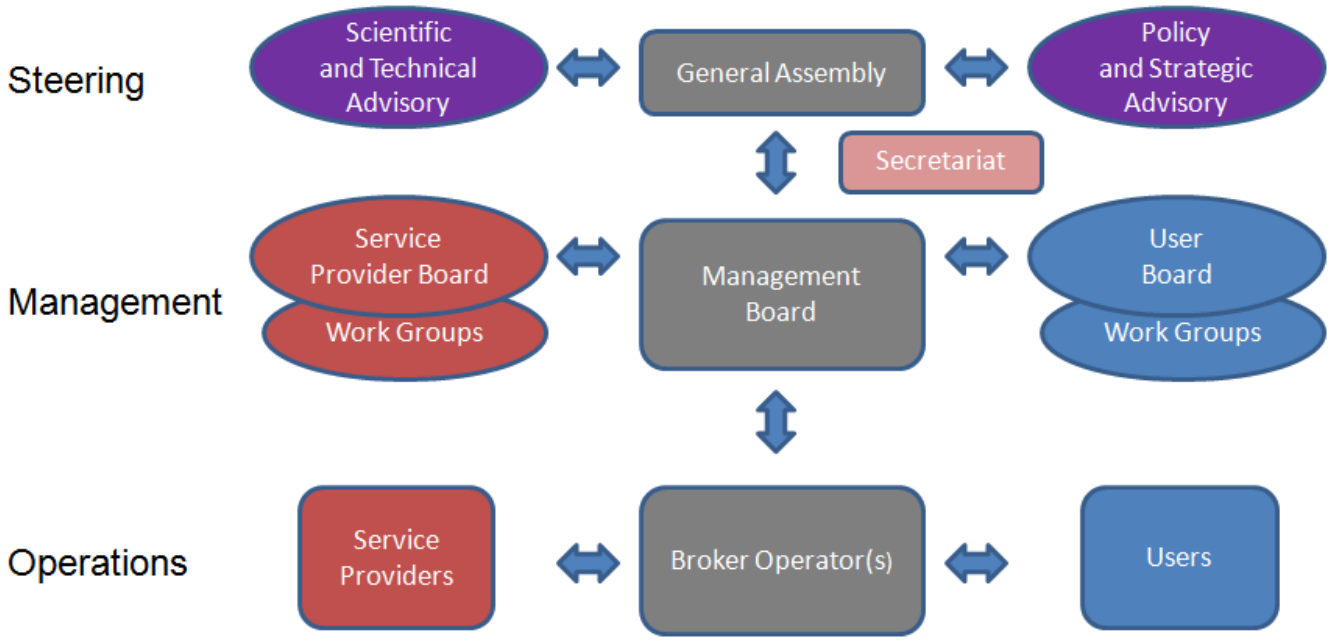
According to the DESCA Consortium Agreement, the General Assembly has certain core functions and responsibilities. It decides namely on:

- Defining the conditions for accession of additional partners
- Deciding on the accession of new partners
- Defining the conditions for withdrawal of a partner
- Deciding on the withdrawal of a partner
- Declaring a Party to be a Defaulting Party
- Deciding on the remedies to be performed by or regarding a Defaulting Party
- Terminating the participation of a Defaulting Party, including deciding on related measures
- Requesting the EC for a change of the Coordinator
- Requesting the EC for termination of the Project
- Terminating the Consortium Agreement
- Deciding on changes to the Consortium Agreement
- Deciding on changes to the Work Plan and the Consortium Budget and requesting corresponding approval from the EC
- Appointing of members to the different lower-level governance bodies (Executive Board, Advisory Board)
- Deciding on key aspects of IPR

The above key decisions cannot (at least in principle) be delegated to lower-level consortium bodies, as they affect the contractual rights and obligations of all partners under the Consortium and/or the Grant Agreement or key aspects of the project. Each partner, as a matter of principle, must have the right to vote on these aspects (not excluding of course rules for such voting, including possibility for decisions by majority).

6.4 Proposed Governance Structure for the Helix Nebula Initiative

Although Helix Nebula is not a project nor a consortium, some of the above considerationscould be used to derive a proposal for and description of the potential governance structure for the Initiative. As it is expected that the Helix Nebula Initiative will rapidly expand in the first years, the proposed steering level may need to be adapted to ensure effectiveness and efficiency in the decision making process. Chapter 8 will expand on the proposed evolution of the governance structure. The proposed governance elements and their relations are shown in the next figure and will be described in more detail in the following sections.



It is to be noted again that the terms used for the different governance bodies are not mandatory. In the following chapters we use the terminology below to describe the elements of the proposed governance structure.

Helix Nebula Initiative, HN Initiative

The overall partnership of public and private entities which have signed all relevant agreements to participate as member in the Initiative e.g. a Membership Agreement.

Partner, Partner entity
A legal entity becomes a partner of the Helix Nebula Initiative upon signature of this Membership Agreement by a duly authorised representative.

User, User entity
A partner who uses services which are provided by a service provider Helix Nebula Initiative. Such a partner can be a public or commercial entity and also be a Service Provider for other users at the same time.

Service Provider, Service Provider entity
A partner who offers and provides services to other partners within the Helix Nebula Initiative. Such a partner can be a public or commercial entity and also be a user of other services at the same time.

Member
This term is mostly used in the context of membership of a partner to a board, a work group or any other element of the governance structure.

6.4.1 Helix Nebula General Assembly

Composition: 1 named representative of each partner
Meeting: 1 time per year, mandatory personal attendance
Votes: 1 vote per representative
Voting: generally by consensus, otherwise by qualified majority
Quorum: ¾ of all partners present at the meeting or legitimately represented by proxy
Minutes: in writing, to be signed by one secretary and approved by all partners

The HN General Assembly should be the principal governing body and should be responsible for all major decisions with political, strategic, legal, contractual or financial impacts. The General Assembly should have the following functions and responsibilities:

- Conclusion of contractual agreements for the HN Initiative
- Changes to these contractual agreements
- Approval of the mid-term and long-term Helix Nebula Strategy
- Approval of multi-annual and/or annual Work Plans
- Appointment of members to the different lower-level governance bodies
- Planning Submission of Proposal(s) for future public grants (e.g. to Horizon 2020)

6.4.2 Helix Nebula User Board

Composition: 1 named representative of each user entity (public research organisation, space agency, inter-governmental organisation, enterprise, SME etc.)
Meeting: twice per year, and according to needs
Votes: 1 vote per representative
Voting: generally by consensus,
Quorum: qualified majority; need for majority decision-making need to be discussed
Minutes: in writing, to be signed by one secretary and approved by all members
Tele- or Videoconference: should be possible, but at least one personal meeting per year recommended

The Helix Nebula User Board should collate the views, needs and requirements of the demand-side of the HN Initiative, thus by the public research organisations, space agencies, intergovernmental organisations etc. who are partners of the HN Initiative. The Helix Nebula User Board should have the following functions and responsibilities:

- Federation of general user feedback to the Cloud Services provided (individual feedback is to be given to the respective service provider)
- Federation of mid-term requirements from those users for Cloud Services
- Identification of long-term needs and requirements for Cloud Services
- Exchange on applicable procurement rules and approach to procurement of Cloud Services
- Where feasible and compliant, agreement on rules and principles for joint procurements
- Review of applicable Data Protection Policies
- Review of applicable Data Security Policies
- Review of applicable Data Preservation Policies
- Promotion of Helix Nebula towards other European and national research organisations and space agencies

6.4.3 Helix Nebula Service Provider Board

Composition: 1 named representative of each Cloud Service provider (public or commercial) or other industrial partner
Meeting: twice per year, and according to needs.
Votes: 1 vote per representative
Voting: generally by consensus
Quorum: double qualified majority (majority of votes representing the majority of financial contributions)
Minutes: in writing, to be signed by one secretary and approved by all partners
Tele- or Videoconference: should be possible, but 1 personal meeting per year recommended

The Helix Nebula Service Provider Board should federate the views and activities of the Cloud service providers and other industrial partners involved in the Helix Nebula Project. The Service Provider Board should have the following functions and responsibilities:

- Development of mid-term and long-term Cloud Services evolution strategy
- Development of an Open Competition Policy and access conditions for additional service providers
- Development of Data Protection Policy
- Development of Data Security Policy
- Development of Data Preservation Policy
- List of definitions for Cloud Services
- Development of a Model Framework Contract for Cloud Services
- Collection of Specific Contract Terms and Conditions of individual service providers
- Comparability matrix for specific contract terms and conditions
- Promotion of Helix Nebula towards other European Cloud customers, service providers and other industry stakeholders.

6.4.4 Policy and Strategic Advisory Board

Composition: mixed composition of partner representatives, representatives from political stakeholders (EU Commission, EU agencies, Member States ministries and agencies, European stakeholder associations, representative from other initiatives, external experts). The candidate members of this board are proposed by the Management Board and elected and confirmed by the General Assembly.
Meeting: 1-2 times per year
Votes: 1 vote per member
Voting: generally by consensus
Quorum: qualified majority; need for majority decision-making needs to be discussed
Minutes: generally yes, in writing
Tele- or Videoconference: should be possible, but one personal meeting per year recommended

The Policy and Strategic Advisory Board should support Helix Nebula Project with regard to policy implications and definition of the overall strategy. The Board should have the following functions and responsibilities:

- Continuous advice to Helix Nebula from a policy and strategy perspective
- Inputs to the mid-term and long-term Helix Nebula Strategy
- Information about political and policy developments
- Links to ongoing initiatives

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

6.4.5 Scientific and Technical Advisory Board

Composition: mixed composition of partner representatives, representatives from European stakeholder associations, external experts . The candidate members of this board are proposed by the Management Board and elected and confirmed by the General Assembly.
Meeting: 1-2 times per year
Votes: 1 vote per member
Voting: generally by consensus
Quorum: qualified majority; need for majority decision-making need to be discussed
Minutes: generally yes, in writing
Tele- or Videoconference: should be possible, but one personal meeting per year recommended

The Scientific and Technical Advisory Board should support the Helix Nebula initiative with regard to the identification of scientific needs and prospects, technical developments and prospective solutions. The Board should have the following functions and responsibilities:

- Continuous advice to Helix Nebula from a scientific and technical perspective
- Inputs to the mid-term and long-term Helix Nebula strategy
- Information about developments in the science "world"
- Collation of information about technical developments e.g. from ICT industry and prospects

6.4.6 Management Board

The Management Board (which under the current governance is titled Management Team) currently consists of a balance of 3 user and 3 service provider representatives that have been elected by their respective boards. Since initially multiple Broker entities might emerge, that will need to prove sustainability, the neutral function of a Management Board seems a good approach until more mature Brokers are established. In any case Management Board members should have executive roles in key elements of the infrastructure to ensure good user satisfaction, service quality and continuity. The election process should takes these aspects into account. An option is whether the Management Board should continue governance of a Broker once it has become an established operational entity or whether the functions of the Management Board shall then be taken over by this legal entity.

In case, eight service provider members of Helix Nebula have started a first commercial broker service with focus on short-term sustainability: the Helix Nebula Marketplace (HNX). Details of current HNX setup and relevance to the governance model are provided in section 6.4.8.

Meeting: as needed, monthly tele-or videoconferences
Votes: 1 vote per member, with an equal number of user and provider members
Voting: generally by consensus
Quorum: double qualified majority (3/4 majority of votes representing more than 60% of user or provider votes)
Minutes: generally yes, in writing
Tele- or Videoconference: possible, but one personal meeting per quarter recommended

The Management Board should have the following functions and responsibilities:

- Manager for the overall Helix Nebula Initiative
- Management of Partners :
    - Accession of new partners
    - Defaults/breaches of a partner
    - Termination for defaulting/breaching partners
- Coordinating inputs, information and deliverables from the User Board
- Coordinating inputs, information and deliverables from the Service Provider Board
- Coordinating the work of the two Advisory Boards
- Preparing and Supporting the General Assembly Meeting
- Ensuring adequate legal support for the Project
- Annual Report to the General Assembly
- Steering committee for projects developed under the initiative e.g. Broker services
- Steering committee for overall work group coordination
- Governance of the Helix Nebula Website
- Preparing Communication and Dissemination Material
- Coordinating participation and partnering in projects that seek government funding

- Outreach activities, information about the project, identifying new partners

6.4.7 Secretariat

The Secretariat fulfils the central administrative or general secretary duties of the Helix Nebula initiative. The secretariat can be a bureaucratic organ or be an organization run by all its members who collectively help to organize the initiative.

Currently the Secretariat function is part of the FP7 coordination activity and therefore, a new organisation needs to be defined before the end of the project on 31st May 2014. It is recommended that the FP7 coordinator will conduct a member survey to determine the most widely accepted model to be adopted and have it confirmed before the FP7 project terminates. The survey will include the financing aspects of the Secretariat work, which is currently estimated at 1 FTE. Members will be requested to commit resources and/or a financial contribution on at least a yearly basis.

Meeting: The secretariat should join all Management Board and General Assembly meetings
Votes: N/A
Voting: N/A
Minutes: a quarterly or bi-annual report on the activities
Presence: External interface and primary contact for the Initiative, supported by all types of communication (web, email, social media, EU forums etc.)

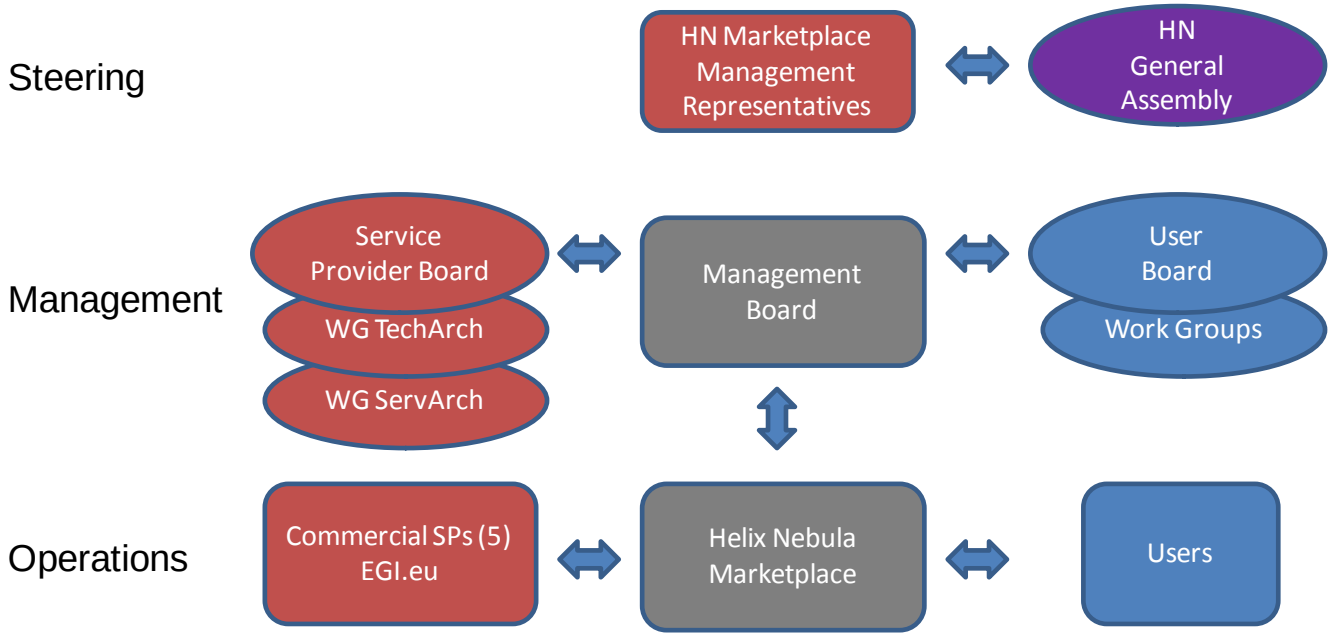
- The Secretariat for the overall Helix Nebula Initiative
- Coordinating all meetings of Boards and General Assembly
  (with optional delegation of user or service provider specific activities)
- Supporting inputs, information and deliverables from the User Board
- Supporting inputs, information and deliverables from the Service Provider Board
- Supporting the work of the two Advisory Boards
- Managing the General Assembly Meeting
- Managing legal support for the Project
- Supporting Annual Report to the General Assembly
- Support for projects developed under the initiative e.g. Broker services
- Support for overall work group coordination
- Setting up, operating and maintaining the Helix Nebula Website
- Managing Communication and Dissemination Material and coordinating approval by partners
  (Brochures, Flyers, Conference Presentations etc.)
- External interface for participation and partnering in projects that seek government funding
- Support outreach activities, information about the project, identifying new partners

6.4.8 The Helix Nebula Marketplace

At the time of submission of this deliverable The Helix Nebula Marketplace (the commercial Broker for science and research applications) is being established by eight service provider members of Helix Nebula, including EGI.eu to ensure integration with the established FedCloud e-Infrastrastructure supported by EGI.eu.

A first pragmatic governance model has been agreed between the existing Helix Nebula Management Team and the service providers, enabling the broker and 3 service providers to take part in the Management Team meeting to provide guidance for governance of the Marketplace under the Helix Nebula Initiative.

There will be a two-phase approach to the commercial Broker role. In the first phase, responsibility for setting-up and operating the Helix Nebula Marketplace will be tasked to an independent company having the required expertise and qualification. Currently, it has been agreed to task CGI with the operations in the interim phase. CGI has committed to remain an independent role vis-a-vis the cloud service providers connected to the Broker service and thus not to provide their own IaaS service. The initial governance structure is shown in the following diagram. The Marketplace operator participates in the weekly Helix Nebula Management Team meetings to manage the project. The Steering function is delegated to management representatives of the eight stakeholders in the Marketplace (Atos, CGI, CloudSigma, EGI.eu, Interoute, SixSq, The Server Labs, T-Systems) and political and strategic advice is currently provided by the existing General Assembly for the Helix Nebula Initiative.



In the second phase, the Helix Nebula Marketplace is planned to be handed over to a dedicated new legal commercial entity under the laws of a selected European Member State (either a limited liability company

(recommended) or a non-profit entity). A Supervisory Board should include selected management-level representatives from all Helix Nebula Partners. The financing initially can be supported by in-kind contributions of the shareholders but have to evolve into a business completely supported by fees from marketplace users and service providers for brokerage and other support services for cloud computing in order to make the marketplace sustainable.

6.5 Contractual Arrangements for Helix Nebula

Helix Nebula shall have a light, effective and flexible governance and structure. It shall be open to new partners and adaptations following evolution of technology, market and needs of the scientific and other user communities. This shall be taken into account by the legal and contractual arrangements for establishing Helix Nebula and framing the provision of Cloud Computing services.

The legal and contractual arrangements will follow a step-wise approach following the different phases:

- Initial phase
- Operational phase
- Long-term evolution

For the long-term evolution please refer to Chapter 7.

6.5.1 Initial Phase

Implementation of the initial phase is already on-going based on the Helix Nebula Strategy. Contractual arrangements in this phase basically include a Non-Disclosure Agreement (NDA) signed by all partners and a Memorandum of Understanding (MoU) between the service provider partners for the Helix Nebula Marketplace.

6.5.2 Operational Phase

The operational phase will start in spring 2014 and will evolve towards an established framework and operational services some time towards the end of 2014. Contractual arrangements for this phase will be on four different levels:

- Helix Nebula Initiative
- Cloud Services Provision
- Helix Nebula Marketplace
- Outreach, Cooperation and supporting projects

Details for the necessary contractual arrangements are provided in the following section 6.5.3.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

6.5.3 Legal and Contractual Arrangements for the Operational Phase

6.5.3.1 Helix Nebula Initiative

Building upon the governance scheme and arrangements for the initial phase, a "Helix Nebula Partnership Agreement" should be concluded by all partners. The Partnership Agreement will become the key contractual document for the Initiative as a whole. It will include provisions on

- purpose of Helix Nebula,
- key definitions
- the different governance bodies including competences, composition and voting mechanisms,
- access by new partners
- exit of partners
- evolution of Helix Nebula Strategy
- funding of the initiative
- key principles for usage rights
- key principles for services provisions (data protection, data security or data preservation policies)
- key principles for open competition
- key principles for the Helix Nebula Broker(s) and procurement of services
- public information and dissemination
- termination and adaptation to long-term structure
- liability among the partners
- dispute resolution
- applicable law
- general clauses and miscellaneous

The Partnership Agreement could include confidentiality clauses to facilitate e.g. the exchange of commercial information between partners in the Initiative. Alternatively, a separate NDA would be maintained. An NDA in any case needs to be signed by each entity interested before entering into discussions and accession process.

The different Policy documents (Open Competition, Data Protection, Data Preservation etc.) should be annexed to the Partnership Agreement.

Relevant documents linked to the Partnership Agreement would be the Helix Nebula Strategy and derived multi-annual and/or annual work plans.

6.5.3.2 Cloud Services Provision

We propose to structure the Cloud Services Provision by the following contractual arrangements.

Cloud Computing Master Services Agreement

There should be a Cloud Computing Master Services Agreement (MSA), which provides the "general terms and conditions" for the provision of Cloud Computing Services. All partners, including acceding partners, should support such contract. It should remain stable over time, with a pre-agreed review e.g. after 3 years.

Once agreed, this contract will be essential for all partners in facilitating the procurement and negotiation process for Cloud Computing Services. As the general terms and conditions are agreed in advance, no negotiations on its elements will be required. In addition, the general terms and conditions will significantly contribute to the transparency and comparability of service conditions.

User Specific Conditions

Each user – when required - should be able to issue a set of specific contractual conditions for the provision of Cloud Computing services. The set of specific conditions should be limited and could take into account e.g. the special status of intergovernmental organisations and requirements resulting from such status (e.g. immunity of archives), special requirements for audits etc.

The users should strive to formulate specific conditions so that they can apply for each demand for services provision and resulting contract. All User Specific Conditions shall be made accessible via the Broker service e.g. the Helix Nebula Marketplace so that all service providers can access them in advance of individual service requests.

Service Provider Specific Conditions

Each Service Provider – when required - should issue a set of specific contractual conditions for the provision of Cloud Computing services. The set of specific conditions should be limited and should namely include the relevant Service Level Agreements (SLAs).

All Service Provider Specific Conditions shall be made accessible via the Broker service so that all users can access them in advance of individual service requests.

Policy Documents

Service provision will be subject to key policies developed and agreed within the Helix Nebula Initiative, including e.g. general aspects of:

- Open Competition Policy
- Data Protection Policy
- Data Security Policy
- Data Preservation Policy

As far as these policy documents are not implemented under the overall Helix Nebula Partnership Agreement, they should become applicable documents to the MSA.

Further Annexes

Further Annexes to the Cloud Computing Services Contracts may need to be tailored for each individual contract, including e.g. Description of Work, Financial Annex, Model Bank Guarantee. Helix Nebula should nevertheless strive to use common templates as much as feasible.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

Guideline Documents

In relation to Service provision, the service providers will prepare a set of guidelines and information documents based on industry standards e.g. NIST or resulting from other communities e.g. ODCA. This will include e.g. a Cloud Computing Definitions documents containing definitions for the most commonly used terms in Cloud Computing.

6.5.3.3 Helix Nebula Marketplace

The third level of contractual arrangements concern the establishment, operations and services of the Helix Nebula Marketplace Services. High level principles and agreements for the Marketplace should be already included in the Helix Nebula Partnership Agreement. In breaking down these principles, the following two elements need contractual arrangements for implementation

- Establishment of the Helix Nebula Marketplace
- Services provided by the Helix Nebula Marketplace

Establishment of the Helix Nebula Marketplace

As presented above, there will be two-step approach for establishment of the Helix Nebula Marketplace.

In the first phase, responsibility for setting-up and operating the Helix Nebula Marketplace will be tasked to an independent company CGI, having the required expertise and qualification. Organisation that want to make use of the Marketplace will need to agree a corresponding services contract with CGI.

In the second phase, the Helix Nebula Marketplace may be transferred to a dedicated new legal entity. Such entity should be established under the laws of a selected European Member State and could be either a limited liability company or a non-profit association. The choice of legal entity should be subject to further evaluation by legal experts from the stakeholders in the Marketplace. Decisions need also to be taken on the composition of shareholders, initial investment and appropriate mechanisms for supervision by the relevant stakeholders. Once these decisions have been taken, the entity needs to be established (Shareholder Agreement, Articles of Association) and registered.

Services provided by the Helix Nebula Marketplace

The Helix Nebula Marketplace will provide commercial brokerage services for the procurement of Cloud Computing Services. For the established Helix Nebula Marketplace the Master Services Agreement and Specific Service Agreements will be concluded directly between each User(s) and each Service Provider(s) and represent the main business relation. The Marketplace provides the tools for initiating electronic requests/procurements from the side of the Users and the identification of Service Providers able and willing to provide the requested services. In addition, the Marketplace provides all the supporting documentation and information, and offers a Help Desk for both Users and Service Providers in case of queries or need for assistance.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

The services of the Marketplace, as currently envisaged, shall be paid for by contributions from Users and/or Service Providers, e.g. split into a general services fee (yearly or quarterly) and a brokerage fee for each service contract successfully brokered. A cloud computing services subcontract shall be concluded between the Broker and each Helix Nebula Marketplace service provider to establish back-to-back service agreements.

Recommendation #3:
Generally speaking, we propose the Broker for cloud computing resources e.g. the Helix Nebula Marketplace to follow successfully pioneered brokerage services and (electronic) processes known from retail industry where possible, maintaining an open competition and to establish an innovative approach towards management of user and service provider specific requirements.

6.5.3.4 Cooperation and supporting projects

The last aspect for contractual arrangements concerns future relations of Helix Nebula with other initiatives, projects, associations or stakeholders (EUDAT, GÉANT, PRACE etc.). Such relations may from time to time be formalized by e.g. MoU, Cooperation Agreements or other types of agreements.

In addition, Helix Nebula Partners may receive public funding under the Horizon 2020 programme or other European or national grant programmes. In such case, Grant Agreements will need to be concluded by individual or a consortium of Partners with the funding authorities, followed as applicable by project-specific Consortium Agreements.

7 Sustainability

Helix Nebula may provide a paradigm shift to performing science since it has the potential to address and change not only the economics of science, but also the societal and environment aspects. In this document we only give a high-level summary of the role Helix Nebula can play in future science and what are some of the short-term aspects to be taken into account for the governance of the initiative.

It seems obvious that in today's complex world of science where e.g. the use and re-use of computing resources and information is far from efficient the introduction of broker services will improve economics significantly. Broker services have proven to be very efficient in various domains to bring together demand and supply in a more efficient way, to increase the demand for services and to lower entry-barriers e.g. for new suppliers. With Helix Nebula, also the societal aspects of science could change, moving the dominant use of computers from processing to discovery and breaking up silos between individual science domains and enabling scientist to work much more in thematic communities as can be observed e.g. in crowd sourcing projects on the internet. Last but not least the environmental impact of a more efficient use of computing resources can be significant.

Summarizing, Helix Nebula can provide a significant contribution to make complex and very compute-intensive science sustainable. Therefore, we give an overview in the following sections of the governance aspects that should be addressed to develop Helix Nebula into a long-term and stable ecosystem.

7.1 Funding

An initial success of Helix Nebula has been that the partners of the initiative quickly identified ways to contribute time, resources, software and infrastructure to develop the basic elements of the ecosystem. And the co-funding of EC could be directed towards establishing the ecosystem within the existing European science environment. Now that a first production platform is being established it becomes eminent that the funding of the ecosystem in near future will be able to rely on the income generated from users. It also has become transparent, that scientist themselves usually do not pay for the use of ICT. They expect that their Institution or the Funding Agency behind them will do so. Thus Helix Nebula needs to engage with those Funding Agencies and propose that, rather than give scientists capital grants for IT equipment, they assign them "credits" for use of facilities within Helix Nebula, and take their appropriate part in its governance.

The partners that have established the Helix Nebula Marketplace have also identified in the product roadmap that in order to provide users with state-of-the-art broker services for various science purposes significant extensions of the basic elements are still needed e.g. for platform tools, data management, service catalogue and supplier management, electronic contracting and advanced reporting functions. Such investments could be facilitated to direct e.g. Horizon 2020 call objectives towards these advanced cloud service functionalities, but also by making the costs for use of Helix Nebula Marketplace eligible for

researchers in other co-funding programs as has been pointed out in the context of the Horizon 2020 public consultation [25].

7.2 Costs

In order to provide sustainability in a competitive market for cloud computing services broker services should not only enable matching of demand and supply, but users must also be able to get access to best possible proposals in terms of price/performance. Therefore, it is important that broker services provide good transparency of prices and performance regarding the use of cloud computing resources.

As has been pointed out in D7.3 [26] the initial assessment of the Helix Nebula Marketplace is that by taking the most cost-efficient proposal (from the 4 European cloud providers currently participating) users can achieve cost savings of up to 300% for IaaS services and up to 70% for SaaS services when compared to Amazon Elastic Cloud services. Resulting, it seems that an opportunity exists for a Marketplace to compete with leading global cloud providers. Although the comparison was done with limited scope and objectives, the comparison also suggests that considering the significant savings achievable a broker will be possible to invest in the further long-term development of the Marketplace functionality.

7.3 Evolution

The models presented in this document have elements that could be used for Helix Nebula Initiative but the adopted governance model needs to be light-weight and have a dynamic structure reflecting the cloud market itself. Indeed, we expect that the federation of partners will be a very attractive model and therefore we can anticipate a fast growing number of partners in the next years. This success will have a strong impact on the decision making process if compared to a governance structure originally designed for project with limited number of participants.
It is also very important that Science remains a main driver for the long-term strategy of the Initiaitve in order to avoid that priorities are given to short-term business objectives only. The Intergovernmental organizations (ESA, CERN, EMBL), founders of the Helix Nebula Initiative, are suppoting and working on the next evolution of the Initiative to cover the full workflow of Science. The governance implemented for the Helix Nebula Initiative shall ensure that it can adapt to a wider scope and include other capabilities than cloud computing.
Hence, it is recommended to revise the governance structure every two years as the Initiative grows and matures.

It may then be also necessary to consider an adaptation of the legal and contractual arrangements. Lessons learned and precedence from other initiatives and projects should be taken into account. As an example, the PRACE Research Infrastructure has evolved towards an international non-profit association with seat in Brussels. A working group of legal experts should evaluate such and other potential options for the long-term governance of Helix Nebula.

7.4 Identity

Helix Nebula – The Science Cloud has been able to capture a lot of awareness in the science community, amongst EU stakeholders, and in the press and media. All activity resulting from Helix Nebula including the setup of broker services therefore can benefit from the new identity considerably to capture new users, suppliers or other participants in the ecosystem. From a governance point of view this means the identity management becomes an important aspect and needs to be taken into account as well.

In the current stage of the Initiative, the Management Team is managing the identity and rules have been defined for the use or reference of the Helix Nebula name. On 5 March 2014 a Community Trade Mark was issued for the Helix Nebula Initiative, i.e. the Helix Nebula name and logo are registered in the EU. A similar process has been started for the Helix Nebula Marketplace name and logo.

8 Conclusions and Recommendations

Helix Nebula is a new, pioneering partnership between big science and big business in Europe that is charting a course towards the sustainable provision of cloud computing - the Science Cloud. This game-changing strategy targets to boost scientific innovation and to bring new discoveries through novel services and products.

There is already an extensive ecosystem of public-funded e-Infrastructures and commercial cloud services in Europe. And many stakeholders find it difficult to navigate in the present landscape of policy-making for e-Infrastructures and cloud computing, as there are numerous advisory bodies and projects aimed at policy development. There is relatively little involvement of user communities in shaping the landscape and its innovation, in particular at the European level. Research communities have difficulties in identifying the most cost-effective solutions among available public-funded and commercial options. Therefore, any new infrastructure project must be relevant and sustainable enough to attract participation of the user communities they target.

Many of the barriers towards realising a European Science Cloud are structural and organizational, rather than technical, in particular when users should be given access to a full-hybrid combination of public-funded and commercial cloud computing infrastructures. The governance for Helix Nebula needs to provide a well-balanced framework of rules and processes to establish strong leadership, enable good decision-making, integrate a diverse user and stakeholder community, take into account multiple requirements and boundaries and provide flexibility for future growth and diversification. In particular, the building of a large public-private ecosystem with stakeholders from public sector and business calls for new approaches.

Since Helix Nebula is a European public-private partnership initiative, three types of governance principles, need to be brought together: the governance principles of EU and European intergovernmental organisations, the corporate governance principles of Europe-based international enterprises and the governance principles for European public-private partnerships. Based on these principles and to ensure a coherent approach nine key principles were derived and presented to stakeholders in a workshop.
The discussion during the stakeholder workshop led to an initial priority ranking of the principles as follows:

1. Ensure value for money, fair incentives and returns
2. Ensure sustainable innovation and growth of the Helix Nebula Initiative
3. Enable integration of public e-Infrastructures and commercial cloud service providers effectively and efficiently
4. Manage and retain the identity and brand of Helix Nebula
5. Continuously manage compliance with EU jurisdiction and legislation and avoid risks
6. Ensure participation of all stakeholders and fair balance of their needs and interests

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

7. Ensure alignment with the Digital Agenda for Europe, foster coherence, equitability and inclusiveness
8. Ensure transparency, openness and responsiveness
9. Ensure accountability and responsibility of stakeholders and decision makers

Individual KPIs have been provided in Chapter 4.2 how these principles can be monitored as part of governance.

To further facilitate good governance key recommendations have been given also with respect to the envisaged business models:

1. To establish a Helix Nebula User Forum, Scientific and Policy Advisory Boards for regular consultations and alignment with relevant activities
2. To maintain a balance of votes between users and providers in the Management Board
3. To initially pilot two Brokers, one operated by a commercial entity with focus on short term availability and one by an independent neutral entity for best possible uptake in the public sector.

This will demonstrate the feasibility of the business model(s) and enable evaluation of the user acceptance of the proposed brokers and new services.

Resulting, all aspects have flown into the proposed governance approach described in Chapter 6, outlining the structure and interaction for steering, management and operations. Furthermore, recommendations are given for contractual arrangements, service provision and sustainability.

Concluding, we propose the Broker for a science cloud ecosystem to be a neutral entity, and follow successfully pioneered brokerage services and (electronic) processes known from e.g. retail industry where possible, maintaining an open competition and to establish an innovative approach towards management of user and service provider specific requirements.

The Helix Nebula project is co-funded by the European Community Seventh Framework Programme (FP7/2007-2013) under Grant Agreement no 312301

9 References

1. MS18 - Report on Governance Model Workshop 1 (MS18)
2. D4.3 Cloud Provisioning Report
3. D6.1 Interoperability requirements report
4. D7.2 Synthesis and Analysis of Overall Business Models
5. EIROforum: A Vision for a European e-Infrastructure for the 21st Century
   https://cds.cern.ch/record/1550136/files/CERN-OPEN-2013-018.pdf
6. EIROforum: Science, Strategy and Sustainable Solutions, a Collaboration on the Directions of E-Infrastructure for Science
   https://cds.cern.ch/record/1545615/files/CERN-OPEN-2013-017.pdf
7. EIROforum: Implementation of a European e-Infrastructure for the 21st Century
   https://cds.cern.ch/record/1562865/files/CERN-OPEN-2013-019.pdf
   http://blog.conmergence.com/david-foster-cern-implementation-of-a-european-e-infrastructure-for-the-21st-century/19/08/2013/
8. Green Paper on PPP
   http://europa.eu/legislation_summaries/internal_market/businesses/public_procurement/l22012_en.htm
9. OSIRIS FP7 Project
   http://www.osiris-online.eu
10. e-IRG Strategy report
    http://www.e-irg.eu/publications/e-irg-strategy.html
11. e-IRG White Paper 2013, 8 July 2013
    http://www.e-irg.eu/images/stories/dissemination/e-irg_white_paper_2013_short_version.pdf
    http://www.e-irg.eu/news/news/505/article.html
12. GÉANT Expert Group report
    http://cordis.europa.eu/fp7/ict/e-infrastructure/geant-expert-group_en.html
13. EGI's Role in 2020
    https://documents.egi.eu/public/DocumentDatabase

14. PRACE Scientific Case for HPC in Europe 2012 - 2020
http://www.prace-ri.eu/PRACE-The-Scientific-Case-for-HPC?lang=en
15. EUDAT Roadmap
http://www.eudat.eu/published-articles
16. Riding the Wave report
http://ec.europa.eu/information_society/newsroom/cf/itemlongdetail.cfm?item_id=6204
17. White Paper on European Governance, 2001
http://eur-lex.europa.eu/LexUriServ/site/en/com/2001/com2001_0428en01.pdf
18. OECD Principles of Corporate Governance, 2004
http://www.oecd.org/daf/ca/corporategovernanceprinciples/31557724.pdf
19. UNECE Guidebook on Promoting Good Governance in Public-Private Partnerships, 2008
http://www.unece.org/fileadmin/DAM/ceci/publications/ppp.pdf
20. Digital Agenda for Europe
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0245:FIN:EN:PDF
21. Wikipedia
www.wikipedia.com
22. Helix Nebula Antitrust Guidelines
www.helix-nebula.eu
23. European Research Infrastructure Consortium
http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=eric
24. Mel Gill - Governing for Results: A Director's Guide to Good Governance (ISBN-10: 1412049385)
25. Helix Nebula – The Science Cloud: A catalyst for change in Europe
26. Helix Nebula – The Science Cloud: FP7 CSA D7.3 - Costing exercise comparing in-house vs. cloud based operation for the CERN flagship use-case and incorporation of qualitative cloud adoption criteria targeting prospect members