

Regulatory Issues for Mobile Grid Computing in Europe

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Abstract

Regulatory issues for communications and value-added services determine a key requirement of study to ensure that a competitive and fair commercial usage within a legal domain can be achieved. Therefore, this paper pursues a comprehensive study identifying the key mobile grid regulations on a European level, while such grid services are considered to be of major importance for upcoming value-added services. The focus is put mainly on those regulatory determinations affecting areas neglected by the eCommunications framework, namely the areas of value-added services in mobile grids and of determinations governing relations among service providers and between service consumers and service providers.

Thus, the major achievement here outlines the potential for open and unregulated mobile grid applications as well as services markets. Due to the lack of eCommunications determinations—as shown in a previous study [38]—, this new work ensures the careful consideration of fundamental consumer rights and competition efficiency for value-added services.

1. Introduction and Motivation

With the ongoing development of grid systems from research-driven high-performance computing towards mobile grids [1]—essentially next-generation business grids that allow for pervasive access—, technical implementation efforts need to be complemented by identifying the key set of relevant regulatory determinations. The uprise of an integrative technology and new systems require existing regulations to be revisited with a widened perspective. This is mainly due to the fact that mobile grids integrate many different regulatory viewpoints on telecommunications, grid computing, and end-consumer markets [35]. Thus, in addition to telecommunications and data conveyance regulations, which are typically determined in a service-neutral manner, abstracted from application domains, regulations on value-added services have to be investigated as well.

Careful analysis of relevant regulatory issues for communications and value-added services provided through the mobile grid is of high importance, since these services are targeted at offerings in a competitive environment [37]. End-consumers conclude contractual agreements with mobile grid application providers. Such a contractual relation—technically implemented by Service Level Agreements (SLA) and Service Level Specifications (SLS)—forms the legal frame governing the general set-up for legal compliance of commercially offered mobile grid services. While communications services have a long tradition to be offered in a commercial context, value-added grid services lack this background.

Accordingly, the preliminary study [38] on regulatory issues for mobile grid computing in the European Union (EU) performed a comprehensive relevance assessment of the EU regulatory framework for electronic communications (eCommunications framework¹). The eCommunications framework was selected as a candidate for the relevance assessment as it constitutes the most prominent set of directives applicable to communications networks and services covering the areas of competition, market access, and universal service as well as consumer and privacy protection.

This initial study provided indications on whether the regulatory framework covers grid-based service provision in a meaningful way. Moreover, an assessment was conducted on how well stakeholder requirements are reflected in the framework. This resulted in formalized relations between regulatory principles and corresponding mobile grid business roles. Stakeholders were grouped into two distinct roles types, a service consumer and a service provider role type. The first type subsumes service user, requestor, and customer roles, whereas the latter includes mobile grid-specific provider roles for network service, grid services, and grid applications.

The conducted relevance assessment revealed that those provisions outlined in the eCommunications framework most significantly affect network service providers. This is due to the framework's exclusive focus on communications and network services, whereas value-added services—also referred to as Information Society services [14][15]—are addressed marginally. Consequently, grid service providers, grid application providers as well as the respective service user, requestor, and customer roles are affected by the regulatory framework in side-aspects only. This led to the overall conclusion that the eCommunications framework is only partially relevant for mobile grids, so that further European legislations need to be investigated in order to determine the full set of relevant regulations.

Driven by those insights gained, this paper pursues a comprehensive study identifying the key mobile grid regulations on a European level. Focus is put on regulatory determinations affecting those areas neglected by the eCommunications framework, namely the areas of value-added services in mobile grids and of determinations governing relations among service providers and between service consumers and service providers. This study, thus, addresses the potential for open and unregulated mobile grid applications and services markets as it was indicated in the previous study due to the lack of eCom-

1. The eCommunications framework consists of five directives, the framework directive 2002/21/EC [22], the authorization directive 2002/20/EC [21], the access directive 2002/19/EC [20], the universal service directive 2002/22/EC [23], and the directive on the processing of personal data and privacy in the telecommunications sector 2002/58/EC [24].

munications determinations ensuring fundamental consumer rights and competition efficiency for value-added services. Such unregulated markets may challenge business opportunities and chances for a European leadership in mobile grid services.

Consequently, the remainder of this work is structured as follows: Section 2 presents existing work relevant for this study. This includes characteristics of mobile grids, European Union law, and an overview of results gained in the preliminary study that this study succeeds. Based on this foundation, Section 3 lays down the specific applied methodology to conduct this study. The respective results are presented and discussed in Section 4, whereas this work is summarized and concluded in Section 5.

2. Related Work

As a basis for the relevance assessment to be conducted in this study, the necessary background information on existing work of interest is given in this section. This embraces an introduction to mobile grids and the respective applicable role model (*cf.* Section 2.1), an overview of European Union law sources (*cf.* Section 2.2), and those results found from the preliminary relevance assessment study conducted on the eCommunications framework (*cf.* Section 2.3). Section 2.4 presents the respective impact these considered areas of related work show on this study, determining the foundation of the applied study methodology.

2.1 Mobile Grid Characteristics

Mobile grid systems as designed and prototypically implemented in the EU-funded research project Akogrimo [1] determine the main application domain for this regulations relevance assessment study. For that reason, mobile grid characteristics need to be outlined.

Mobile grids are essentially grid systems that allow for the provision of value-added services which are offered in a commercial context to potentially mobile users and which are aggregated from several basic (grid) services [35][37][38]. Mobile grids leverage the concept of Virtual Organizations (VO), whereas support of device, user, and session mobility is seen as the main driver for context changes in the VO what in turn leads to a high degree of dynamics in the VO—both, with respect to business process execution and to grid service providers bound to the VO on demand. As mobility and dynamics constitute two key enhancements over the typically static and mobility-unaware VO concept, the respective term of Mobile Dynamic Virtual Organizations (MDVO) was introduced [39]. Whilst mobile grids and MDVOs are described in full detail in the preliminary study [38], the following set of attributes determines the key set of characteristics relevant for this study:

- *Value-added service provisioning:* Since most mobile grid application scenarios focus on the provision of enriched services composed from basic services, legislation governing content and information services—termed by the EU as Information Society services—are of relevance. This includes in particular determinations on copyright, intellectual property, and related rights.

- *VO and MDVO concept:* Service provisioning across administrative borders in a VO/MDVO is at the heart of the respective mobile grid organization model. In a VO, legally independent organizations collaborate. It is assumed in this study that (a) VO members exist as independent, well-established organizations before they join a VO, and that (b) a VO itself does not constitute a new legal body, but that it is represented legally by one VO member organization. Based on these assumptions, legislation in the area of forming a legal entity and running an existing business, *e.g.*, requirements on financial accounting, are not considered in this study. On the other hand, any legislation determining the legal frame of behavior applicable to VOs is of importance. This covers in particular rules of vertical agreements concluded among VO members and competition law in general.
- *Commercial offerings addressing consumer markets:* Commercial offerings base on contracts to be concluded between a supplier and a customer. Customers are in most mobile grid application scenarios consumers so that regulatory acts on Business-to-Consumer (B2C) relations are of central interest for mobile grids. Consequently, any legislation in the areas of consumer rights (*e.g.*, on unfair commercial practices) and electronic commerce will be considered.

In accordance with those main mobile grid characteristics outlined, Figure 1 depicts the respective basic role model applicable to electronic service provisioning in VOs [35] and, thus, also in MDVOs, as MDVOs are seen as an extension of the VO concept. The role model focuses on commer-

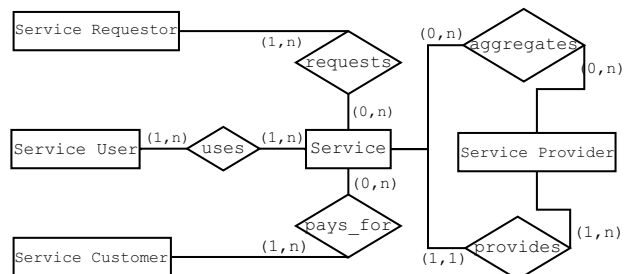


Figure 1: Basic Role Model for Electronic Service Provision in VOs [35]

cial provisioning of electronic value-added services. Commercialization is expressed by a three-fold service consumer role. The model foresees distinct roles for separate entities requesting (Service Requestor, SR), using (Service User, SU), and remunerating (Service Customer, SC). In a B2C environment, these roles, however, are typically adopted by a single natural person. The characteristic of value-added service provisioning is supported by a two-fold service provider role. It differentiates between the provision of a basic grid service, reflected by the role of a Grid Service Provider (GSP), and the composition and aggregation of basic services into value-added services, reflected by the role of a Grid Application Provider (AP). In addition to those roles that are directly derived from the role model, the respective role of a Network Service Provider (NSP) is present in mobile grid application scenarios. NSP and AP are roles that were found to be of commercial interest to mobile telecommunications operators [36]. Either NSP or AP qualifies typi-

cally to maintain direct B2C relations while GSPs are not assumed to maintain customer relations but to focus on Business-to-Business (B2B) relations within the VO [38]. As these roles were introduced and used in the preliminary relevance assessment study [38], the same roles are used for the relevance assessment to be conducted in this study.

2.2 European Union Law

European Union law knows three types of legislation. These are primary law, secondary law, and supplementary law [8]. While primary law embraces sources in terms of treaties, secondary law includes sources that are derived from primary law and that are divided into two sub-categories, namely unilateral acts and agreements. Supplementary law comprises general principles of law, international law and case law of the Court of Justice.

For this study, secondary law sources are relevant, since the study aims to identify regulatory aspects of interest for a specific application domain, the domain of mobile grids. Focus is set in particular on unilateral acts, whereas agreements are not investigated in detail. Article 249 of the Treaty establishing the European Community [34] lists the following five main instruments as unilateral acts: Regulations, directives, decisions, opinions, and recommendations. These acts are complemented by sources that are not explicitly mentioned in the Treaty. These are communications, recommendations, white papers, and green papers.

Those mentioned secondary law sources differ with respect to application, for which party they are binding, and whom they address. Accordingly, Article 249 of the Treaty [34] determines regulations, directives, decisions, opinions, and recommendations as “A regulation shall have general application. It shall be binding in its entirety and directly applicable in all Member States. A directive shall be binding, as to the result to be achieved, upon each Member State to which it is addressed, but shall leave to the national authorities the choice of form and methods. A decision shall be binding in its entirety upon those to whom it is addressed. Recommendations and opinions shall have no binding force.”

2.3 Results from the eCommunications Framework Relevance Assessment

The preliminary regulation relevance assessment study [38] was conducted on the eCommunications regulatory framework which consists of five directives. It was performed on those roles described in Section 2.1. Table 1 presents its main results in condensed form.

Legislation on appeal and consulting, personal data and privacy, and security were the only areas found to be relevant for the full set of mobile grid roles. Similarly, determinations on harmonization issues were assessed as partly relevant for all roles. The respective rules on competition and universal service were deemed relevant and partially relevant, respectively, for the service consumer roles. The remaining set of determinations, determining the vast majority of rules under the eCommunications framework, however, was found to be relevant for NSPs only, while the other roles are concerned marginally only. This is mainly due to

Table 1: Relevance Assessment of eCommunications Framework Provisions for Mobile Grid Roles (“+” relevant, “(+)” partly relevant, “-” not relevant; adapted from [38])

Principle of Law	SU	SC	SR	NSP	GSP	AP
Appeal and Consultation	+					
Reporting		-		+		-
Harmonization	(+)					
Competition		+				-
Resource Allocation		-		+		-
Significant Market Power		-		+		-
Standardization		-		+		-
Disputes		-		+		-
General Authorizations		-		+		-
Access and Interconnection		-		+		-
Universal Service		(+)		+		-
Personal Data and Privacy	+					
Security	+					

the fact that the eCommunications framework addresses communications networks and services exclusively, whereas value-added services, so-called Information Society services, are not focused. The lack of a consistent European regulatory framework for value-added service regulations is the main driver for this study as it aims to identify legislation relevant for the complete set of mobile grid roles. In doing so, the complete collection of European secondary legislation forms in the first place the basic set of choice.

2.4 Impact of Related Work

Those three main areas of related work investigated determine the main frame for this regulatory relevance assessment study. Content-wise, those presented mobile grid characteristics, grouped into three main attributes (*cf.* Section 2.1), will serve as the key criteria for selecting legislation of interest. Accordingly, those insights gained from the preliminary study (*cf.* Section 2.3) will result content-wise in the exclusion of already investigated legislation, while, this time, the full range of European legislation needs to undergo a pre-screening. Thus, the initial starting point for this study embraces a much larger set of legislation than for the preliminary study [38] which focused on the eCommunications framework only. On the other hand, the introduced hierarchy of different European law sources (*cf.* Section 2.2) will provide a means to draw a manageable sub-set of legally binding law sources with strong impact. This sub-set will undergo the detailed relevance assessment for the outlined set of mobile grid roles, including the role of an NSP (*cf.* Section 2.1).

3. Methodology

In order to gain comparable results, an approach similar to the preliminary study [38] is adopted. That approach was structured into three parts, namely legislation candidate selection, grouping of detailed determinations into so-called principles of law, and conducting the relevance assessment of these principles of law for the determined set of mobile

grid roles. As outlined in Section 2.4, this study sees a different initial position with regard to legislation candidate selection. Consequently, this part is adapted and extended as it gains more weight in the overall study. Section 3.1 explains required adaptations in further detail, while Section 3.2 revisits the procedures of grouping detailed determinations and conducting the relevance assessment.

3.1 Legislation Candidate Selection Procedure

Whilst the preliminary study was performed on a well defined, limited set of European law sources—the eCommunications regulatory framework, consisting of five directives—for this study, the respective set of candidate legislation is a different, much larger one. This is due to the fact that the eCommunications framework focuses on communications networks and services, but neglects value-added services. For mobile grids, however, both service categories are of importance so that the initial range of candidate legislation is at this point determined by the complete law compilation of the EU, except those law sources covered by the eCommunications framework.

Given the wide range of legislation candidates, a two-step selection process is introduced. Firstly, a prescreening of the complete European law compilation is performed. In this step, a pre-selection of relevant legislation is conducted. In the second step, a sub-set out of these identified and pre-selected law sources is built and used for the detailed relevance assessment. This two-step procedure, thus, provides for a trade-off between the identification of a most complete list of relevant legislation and a manageable sub-set of relevant legislation with high impact. In general, a given law source needs to satisfy all of the following formal criteria in order to be pre-selected:

- It is published in the Official Journal of the European Communities.
- It constitutes primary or secondary European law (*cf.* Section 2.2).
- It constitutes law of direct relevance for the European Union. Thus, international agreements, such as WTO (World Trade Organization) conventions, are not considered.

In particular, a given law source is pre-selected if one or multiple out of the three mobile grid attributes as presented in Section 2.1 are addressed by the legislation. This means that a law source is pre-selected if at least one of the following clauses is fulfilled, and if the law source is not part of the eCommunications framework:

- It applies to *value-added services* (*Clause A*).
- It governs the collaboration of legally independent organizations in a *VO* or *MDVO* (*Clause B*).
- It governs the provision of *commercial offerings addressing consumer markets* (*Clause C*).

The prescreening is conducted based on two official web portals, the European Commission’s Information Society policies portal [7] and the European Commission’s listing of summaries of legislations [9]. The first portal lists legislation relevant for the Information Society, whereas the selection of legislation relevant for the Information Society is based on

the respective inclusion/exclusion criteria adopted by the European Commission. These criteria are not fully documented on the portal. In contrast, the second portal provides for the comprehensive collection of European law. The collection is structured into 32 subject areas which directly reflect the so-called Activities of the European Union [2]. For each subject area, an overview of relevant legislation is given. Even though the presented list of legislation per activity is comprehensive, it has to be noted that there is a chance that these lists are not exhaustive in strict terms. It is assumed, however, that the probability of missing, *i.e.*, not listed legislation relevant for this study is minimal—especially for law sources ranking high in the presented law source hierarchy (see Section 2.2). For that reason, the sub-set of law sources to be assessed in detail is built exclusively from the respective range of the two highest ranked secondary European law sources:

- Regulation
- Directive

3.2 Relevance Assessment Procedure

In contrast to those adapted, two-step procedures applied to legislation candidate selection, the respective procedures for analyzing, grouping, and assessing selected law sources of relevance remain unchanged. Accordingly, those selected regulations and directives are analyzed in detail and specific determinations deemed relevant for at least one of the introduced mobile grid roles (including the role of an NSP) are collected. For purposes of clarity, single collected determinations of relevance are grouped into so-called principles of law, determining groups of comparable determinations. Finally, collected and grouped determinations undergo the detailed relevance assessment. For each principle of law, and for the full role set, a three-level grading scheme is applied:

- “–”: The principle of law in question is not relevant for the considered mobile grid role.
- “(+)”: The principle of law in question is only partly relevant for the considered mobile grid role.
- “+”: The principle of law in question is relevant for the considered mobile grid role.

4. Relevance Assessment

Based on those methodological steps outlined, the full set of legislation relevant for mobile grids is identified in Section 4.1, whereas the detailed relevance assessment is conducted on the respective sub-set of selected regulations and directives in Section 4.2.

4.1 Legislation of Interest

In accordance with the methodology introduced, a prescreening of those two considered EU legislation portals [7][9] was conducted. Law sources were deemed relevant if they satisfied all outlined formal criteria and at least one of the mobile grid-specific clauses. Table 2 presents, thus, the according complete list of legislation of interest for mobile grids in Europe.

Table 2: Overview of Pre-selected Legislation of Interest and Reason for Pre-selection

Area ^a	Legislation of Interest	Pre-selection Reason
Audiovisual and Media	Recommendation of the European Parliament and of the Council of 20 December 2006 on the protection of minors and human dignity and on the right of reply in relation to the competitiveness of the European audiovisual and on-line information services industry (2006/952/EC) [26]	Clause A. ^b
	Council Resolution of 19 December 2002 on interactive media content in Europe (2003/C 13/04) [33]	Clause A.
Competition	Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty [32]	Clause B.
	Consolidated Version of the Treaty Establishing the European Community [34]	Clause B. ^c
	Communication from the Commission - Guidelines on the application of Article 81(3) of the Treaty (2004/C 101/08) [6]	Clause B.
	Commission Notice on agreements of minor importance which do not appreciably restrict competition under Article 81(1) of the Treaty establishing the European Community (de minimis) (2001/C 368/07) [4]	Clause B.
	Regulation No 19/65/EEC of the Council of 2 March 1965 on application of Article 85 (3) of the Treaty to certain categories of agreements and concerted practices [27]	Clause B.
	Commission Notice Guidelines on Vertical Restraints (2000/C 291/01) [3]	Clause B.
Consumers	Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices in the internal market and amending Council Directive 84/450/EEC, Directives 97/7/EC, 98/27/EC and 2002/65/EC of the European Parliament and of the Council and Regulation (EC) No 2006/2004 of the European Parliament and of the Council (“Unfair Commercial Practices Directive”) [25]	Clause C. ^d
	Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market (Directive on electronic commerce) [17]	Clauses A and C.
	Directive 97/7/EC of the European Parliament and of the Council of 20 May 1997 on the protection of consumers in respect of distance contracts [12]	Clause C.
	Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts [29]	Clause C.
	Directive 98/6/EC of the European Parliament and of the Council of 16 February 1998 on consumer protection in the indication of the prices of products offered to consumers [13]	Clause C.
Enterprise	<i>Cf. consumers and competition legislation.</i>	<i>Cf. consumers and competition legislation.</i>
	Directive 2001/29/EC of the European Parliament and of the Council of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society [18]	Clause A.
	Council Directive 93/98/EEC of 29 October 1993 harmonizing the term of protection of copyright and certain related rights [30]	Clause A.
	Directive 2001/84/EC of the European Parliament and of the Council of 27 September 2001 on the resale right for the benefit of the author of an original work of art [19]	Clause A.
	Council Directive 92/100/EEC of 19 November 1992 on rental right and lending right and on certain rights related to copyright in the field of intellectual property [28]	Clause A.
	Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases [11]	Clause A.
	Commission Recommendation of 18 May 2005 on collective cross-border management of copyright and related rights for legitimate online music services [5]	Clause A.
Information Society	<i>Cf. consumers legislation.</i>	<i>Cf. consumers legislation</i>
	Council Framework Decision 2005/222/JHA of 24 February 2005 on attacks against information systems [31]	Clause B.
	Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data [10]	Clause C.
	Directive 1999/93/EC of the European Parliament and of the Council of 13 December 1999 on a Community framework for electronic signatures [16]	Clause C.
Internal Market	<i>Cf. enterprise legislation.</i>	<i>Cf. enterprise legislation.</i>

a. The following legislation areas were excluded (ordered in alphabetical order): Agriculture; budget; culture; customs; development; economic and monetary affairs; education, training, youth; employment and social policy; energy; enlargement; environment; external relations; external trade; fisheries; food safety; foreign and security policy; fight against fraud; human rights; humanitarian aid; institutional affairs; justice, freedom and security; public health; regional policy; research and innovation; taxation; transport.

b. Even though legislation in this area focuses mostly on digital television—an area that is not regarded as primarily relevant for mobile grid systems—the recommendation on protection of minors constitutes legislation of interest as it outlines recommendations applicable to all types of audiovisual and on-line information services.

c. Articles 81 to 86 lay down competition rules applicable to undertakings, including vertical agreements.

d. Mobile grid application scenarios typically envisage mass consumer markets as the targeted audience. Most scenarios foresee that one member of the VO, usually the player acting as AP, maintains exclusive end consumer/customer contact. Hence, legislation governing Business-to-Consumer relations is of interest for mobile grids.

For each legislation, reason for selection—in terms of clauses A, B, and C—is given. Legislations of interest are grouped into legislation areas that reflect the official Activities of the European Union. Those formal and material, *i.e.*, mobile grid-specific selection criteria result on one hand in focusing legislation in the areas of copyright, competition, consumer protection, electronic commerce, and data protection, and on the other hand, they result in a number of areas excluded *ex ante* (*cf.* Table 2, footnote a). In particular, legislation covered by the eCommunications framework and law sources governing software, counterfeiting, patents, designs, digital TV, electronic payments, banking issues, and company law are not considered.

The second step in identifying legislation of interest for the detailed relevance assessment consists in building a subset from the pre-selected legislation as documented in Table 2. For that purpose, law sources of type regulation and directive are selected. These 14 selected regulations and directives are marked by light grey background coloring in Table 2.

4.2 Relevance Assessment Results

Table 3 presents detailed results of the relevance assessment conducted on those 14 selected regulations and directives. In accordance with the outlined methodology regarding relevance assessment procedures (*cf.* Section 3.2), a list of relevant determinations is given and grouped into thematic areas, introduced as principles of law. These principles do not constitute official European Union terminology. They are used as a grouping element for determinations originating from different law sources addressing inter-related subjects. To each principle, the introduced three-level grading is applied, determining a given principle as either relevant, partly relevant, or irrelevant for a mobile grid role in question.

The conducted relevance assessment reveals that the role of an AP is affected by the complete set of assessed legislation. This is mainly due to the AP's central position as a service aggregator within a VO, maintaining both B2C and B2B relations. GSPs and NSP are affected by those determinations laying down the legal frame for agreements and concerted actions between undertakings—thus, addressing aspects of potential interest for vertical agreements as possible in VOs and MDVOs. Rules governing free movement of Information Society services as well as copyright and data protection for Information Society services are of high interest for GSPs as the main providers of basic grid services to the VO. In contrast, Information Society services are of limited interest for the NSP only so that the according determinations are deemed either irrelevant or partly relevant. On the other hand, NSPs are highly affected by those rules governing commercial practices and contracts in B2C relations, since they qualify to maintain B2C relations, in particular for the provision of communications and network services. Similarly, SU, SC, and SR roles are fully affected by determinations on commercial practices and contracts in B2C relations, whereas roles for free movement of Information Society services and copyright and data protection for Information Society services are of partial relevance, as these

rules address service user roles mostly indirectly in terms of the respective adopted service provider behavior.

5. Summary, Conclusions, and Outlook

Driven by those insights gained from the initial relevance assessment conducted for the European eCommunications regulatory framework and the determined set of mobile grid roles, this study aimed at identifying the key regulatory issues affecting areas neglected by the eCommunications framework. Accordingly, focus was put on regulatory issues relevant for value-added services in mobile grids and on determinations governing relations between service consumers and service providers and setting the legal frame for B2B relations in a VO.

The first key contribution of this study consists in the full set of legislation relevant for mobile grids as identified and characterized according to a prescreening performed on the complete European law compilation. Policies governing consumer protection, electronic commerce, competition, copyright and related rights, and data protection constitute the main range for relevant determinations, while policies on communications services, mobile devices, and equipment are not considered in order to avoid overlapping with the first study. The selection of legislation of interest for mobile grids was based on the respective specified set of clear formal and material criteria. In total, the list of relevant European legislation contains 22 identified law sources.

The second key contribution of this study is found in a detailed relevance assessment for the same role set as used in the preliminary study conducted on those 14 law sources of type regulation or directive as determined from the full list of relevant legislation. Grouped into subject areas, this relevance assessment revealed that the role of an AP is equally affected by all identified determinations, while GSPs are mainly addressed by determinations focusing on free movement of value-added services and copyright provisions. GSPs and NSPs are also affected by those regulations determining the legal frame for agreements among undertakings, thus, laying down rules of potential interest for VOs. In addition, NSPs and service consumer roles (SU, SC, and SR) are mainly affected by determinations governing B2C relations.

Thus, this study provides for the complementary exhaustive set of relevant legislation and principles of law for mobile grids. Together with the first study, this results in a comprehensive overview of relevant legislation plus a detailed relevance assessment on selected regulations and directives on European level. The latter allows for the overall conclusion that regulatory issues for mobile grids are well covered by European law, even though not by a consistent single regulatory framework or a limited, manageable number of regulations and directives, but rather by a high amount of single relevant sources originating from a large set of the Activities of the European Union.

Accordingly, future work may include the detailed assessment of identified legislation not included in the detailed relevance assessment so far. Furthermore, legislation on international level (*e.g.*, WTO agreements) and national Member State rules relevant for mobile grids may be considered in upcoming studies.

Table 3: Detailed Relevance Assessment Results

Principle of Law	SU	SC	SR	NSP	GSP	AP
<p>Agreements and Concerted Actions Between Undertakings</p> <p>Articles 81 and 82 of the Treaty [34] prohibit in general agreements, decisions, and concerted actions between undertakings that result in competition distortion within the European common market. Inter alia, agreements are prohibited which address purchase/selling prices, limit or control production, share supply markets, or apply inequalities for equal transactions.</p> <p>The Council regulation 1/2003 [32] details rules of applying Treaty articles 81 and 82. In particular, the regulation lays down the following determinations:</p> <ul style="list-style-type: none"> • Burden of proof rests on the party alleging an infringement ([32], Article 2). • Means of investigation include the right of the Commission to require undertakings to provide requested information ([32], Article 18), to conduct interviews with consenting legal or natural persons ([32], Article 19), and to conduct inspections on site ([32], Article 20). • Penalties can be non-recurring fines or periodic penalty payments. Rules for determining the first (upper limits in percentage of the turnover of the preceding business year) are defined in [32], Article 23, for determining the latter in [32], Article 24. <p>In addition, the Council regulation 19/65/EEC [27] addresses cases where the Commission may provide exemption from application of Articles 81 and 82. Exemptions may be granted in form of regulation with retroactive and time-limited effect, specifying agreement types it applies to ([27], Articles 1-4).</p>		-			+	
<p>Commercial Practices and Contracts in B2C Relations</p> <p>The purpose of the Unfair Commercial Practices Directive is found in laying down rules for avoiding unfair commercial practices against consumers' interests ([25], Article 1). It, thus, applies to all B2C practices deemed unfair ([25], Article 3). An unfair commercial practice, which is prohibited, is defined as ([25], Article 5):</p> <ul style="list-style-type: none"> • It is against "<i>requirements of professional diligence</i>" and • It distorts (or is likely to do so) the economic behavior of the average consumer (or a group of consumers). • Especially, a practice is unfair if it qualifies as being misleading or aggressive. <p>[25], Article 6 determines specific criteria under which a practice is misleading. In particular, this is the case if the main product characteristics contain false, untruthful, confusing, or deceptive information in its overall presentation so that it is likely to cause a consumer to "<i>to take a transactional decision that he would not have taken otherwise</i>".</p> <p>[25], Article 7 determines criteria for misleading practices that would likely lead to distorted consumer behavior. This is the case if "<i>it omits material information that the average consumer needs</i>".</p> <p>[25], Article 8 determines criteria for aggressive practices, which are practices that limit the freedom of choice of an average consumer significantly.</p> <p>Member States are responsible for enforcement ([25], Article 11), administrative authorities' powers ([25], Article 12) and penalties ([25], Article 13).</p> <p>Directive 97/7/EC aims at harmonizing Member State rules regarding distance contracts for consumers ([12], Article 1). It determines the necessary level of information to be provided to consumers prior to contract conclusion ([12], Article 4), which are those typical material parts in an offer, such as price and characteristics, payment terms, and delivery costs. Consumers must receive a written confirmation on a "<i>durable medium</i>" (which includes electronic mail) ([12], Article 5), and they are granted the right of withdrawal within at least seven working days after contract conclusion ([12], Article 6). Providers are required to execute received orders within 30 days, maximum ([12], Article 7). Member States have to take measures that prohibit supply of unordered goods or services ([12], Article 9) and that restrict distance communication towards consumers, such as unsolicited marketing through automated calling systems ([12], Article 10).</p> <p>Directive 93/13/EEC aims at harmonizing Member State rules regarding unfair terms in consumer contracts ([29], Article 1). Contractual terms are deemed unfair under the following circumstances ([29], Article 3):</p> <ul style="list-style-type: none"> • A not individually negotiated term results in unbalanced rights and obligations of the contract parties. • A term falls under the list presented in [29], Annex. <p>Consumers' interest protection is expressed explicitly in so far as that written terms must be in "<i>plain, intelligible language</i>", whereas the most favorable interpretation for the consumer shall be assumed in case of ambiguous terms ([29], Article 5).</p> <p>Directive 98/6/EC determines the minimum level of price information required to be communicated to consumers ([13], Article 1). Selling price and unit price constitute the most important price types. The first is defined as "<i>the final price for a unit of a product, or a given quantity of a product, including VAT and all other taxes</i>" ([13], Article 2). The latter is defined as the final price including all taxes according to a unit of quantity typically used for that product type, such as a kilogram ([13], Article 2). Both prices need to be indicated in general, whereas the unit price can be omitted if it is identical to the selling price ([13], Article 3). Both prices must be "<i>unambiguous, easily identifiable and clearly legible</i>" ([13], Article 4).</p> <p>Directive 1999/93/EC lays down rules for applying electronic signatures in commercial transactions so that electronic signatures "satisfy the legal requirements of a signature" and that they constitute "evidence in legal proceedings" ([16], Article 5). Certification service providers are the primary parties to be kept liable for issued, certificates-based electronic signatures ([16], Article 6).</p>		+			- ^a	+

Table 3: Detailed Relevance Assessment Results

Principle of Law	SU	SC	SR	NSP	GSP	AP
<p>Copyright and Data Protection for Information Society Services</p> <p>Directive 2001/29/EC aims at protecting copyright and related rights for Information Society services ([18], Article 1). It addresses the respective rights of distribution, communication to the public, and distribution, each attributing with those parties (e.g., authors) to whom Member States may grant or prohibit the right in question ([18], Articles 2-4). Exceptions and limitations are addressed in [18], Article 5, most prominently stating that a “transmission in a network between third parties” produces a temporary act of reproduction only, which shall not fall under those determinations laid down in Article 2.</p> <p>Member States shall provide legal means to protect from circumventing any technical means for copyright, which includes manufacture and any type of distribution of products with the purpose of circumvention ([18], Article 6). Accordingly, Member States shall take legal means against persons that remove or alter knowingly rights-management information or that distribute works with removed rights-management information ([18], Article 7).</p> <p>Directive 93/98/EEC [30] lays down rules for the duration of granted rights for several types of work:</p> <ul style="list-style-type: none"> • For literary or artistic works, which subsumes also photographs, author’s rights expire 70 years after the author’s death ([30], Article 1). • For audiovisual works, rights expire 70 years after the death of the last survivor out of the group of the principal director, the author of the screenplay, the author of the dialogue, and the composer of music ([30], Article 2). <p>Directive 2001/84/EC requires Member States to provide a resale right, by which authors of an original work of art receive “a royalty based on the sale price obtained for any resale of the work” ([19], Article 1). Member States shall determine a minimum price subject to resale right, whereas this minimum price may not be lower than 3000 EUR ([19], Article 3). The royalty ranges from 4% to 0.25% of the sale price, but may not exceed 12500 EUR ([19], Article 4).</p> <p>Directive 92/100/EEC [28] addresses rights in relation to rental or lending of copyrighted material. In general, the right to authorize or prohibit rental or lending lies with the author of the work ([28], Article 2). Authors granting rental right shall receive remuneration ([28], Article 4).</p> <p>Directive 96/9/EC is concerned with copyright and databases, whereas databases are defined as a “collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means” ([11], Article 1). Databases constitute the author’s own creation and are, thus, protected by copyright ([11], Article 3), whereas the natural person or the according group of natural persons that created a given database is deemed author ([11], Article 4).</p> <p>Directive 95/46/EC protects rights of individuals in the areas of privacy and processing of personal data ([10], Article 1). The first criteria to determine lawful processing is data quality. Data is required to be collected for a specific purpose, it has to be relevant and not excessive, kept up to date, and anonymized as soon as possible ([10], Article 6). The second criteria addresses processing legitimacy, whereas data processing is legitimate only if “the data subject has unambiguously given his consent” ([10], Article 7). Data processing in special categories is prohibited, such as for data revealing ethnic origin and political opinions ([10], Article 8). The subject of data processing is granted a number of rights:</p> <ul style="list-style-type: none"> • Information from whom data originates, information about the collector and the purpose of a collection ([10], Article 10). • Right of access to data, including the right to correct, delete, and exclude data ([10], Article 12). • Right to object to data processing ([10], Article 14). <p>Controllers must ensure confidentiality of processing ([10], Article 16), security of processing ([10], Article 17), and must inform the supervising authority “before carrying out any wholly or partly automatic processing operation” ([10], Article 18).</p>						
<p>Free Movement of Information Society Services</p> <p>The directive on electronic commerce aims at free movement of Information Society services in the internal market ([17], Article 1). Accordingly, Member States are in general not allowed to restrict Information Society services provided by a service provider in another Member State, whereas exceptions from that rule are only possible under specific circumstances, such as to ensure public security ([17], Article 3 and Annex). An Information Society service provider does not require prior authorization ([17], Article 4), however, general information about the service provider needs to be available permanently and in an easy accessible form for the recipient of a service ([17], Article 5). Any type of commercial communication is required to be “identifiable clearly and unambiguously as such” ([17], Article 6). Unsolicited commercial communication is not prohibited, but providers are required to respect opt-out registers ([17], Article 7).</p> <p>The directive provides the foundation for electronic contracts as it urges Member States to “ensure that their legal system allows contracts to be concluded by electronic means” ([17], Article 9). Moreover, it lays down the minimum contractual information to be provided prior to an order by a recipient of the service ([17], Article 10). Service providers are required to acknowledge any order received by electronic means ([17], Article 11). Service providers are in general not liable for conveyed, user initiated information ([17], Article 12) nor for cached information ([17], Article 13) or hosted information, as long as the provider does not have any knowledge of illegal activity ([17], Article 14). Service providers are not required to monitor conveyed information for illegal activity ([17], Article 15).</p>						

a. Assuming that a GSP does not maintain direct B2C relations.

b. Assuming that a NSP does not provide Information Society services

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