



Schriften der Albrecht Mendelssohn  
Bartholdy Graduate School of Law

6

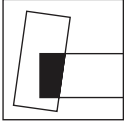
Xenofon Kontargyris

# IT Laws in the Era of Cloud Computing

A Comparative Analysis between EU and US Law  
on the Case Study of Data Protection and Privacy



**Nomos**



Albrecht Mendelssohn Bartholdy  
Graduate School of Law

Schriften der Albrecht Mendelssohn Bartholdy  
Graduate School of Law

edited by

**Prof. Dr. Stefan Oeter,**  
Lehrstuhl für Öffentliches Recht, Völkerrecht und ausländisches  
öffentliches Recht, Universität Hamburg

**Prof. Dr. Tilman Reppen,**  
Lehrstuhl für Deutsche Rechtsgeschichte, Privatrechtsgeschichte der  
Neuzeit und Bürgerliches Recht, Universität Hamburg

**Prof. Dr. Hans-Heinrich Trute,**  
Lehrstuhl für Öffentliches Recht, Medien- und Telekommunikations-  
recht, Universität Hamburg

Band 6

Xenofon Kontargyris

# IT Laws in the Era of Cloud Computing

A Comparative Analysis between EU and US Law  
on the Case Study of Data Protection and Privacy



**Nomos**

Gefördert durch einen Druckkostenzuschuss der Albrecht Mendelssohn Bartholdy Graduate School of Law.

Funded by a print subsidy from Albrecht Mendelssohn Bartholdy Graduate School of Law.

**The Deutsche Nationalbibliothek** lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the Internet at <http://dnb.d-nb.de>

a.t.: Hamburg, Univ., Diss., 2018

Original title: "ICT LAWS IN THE ERA OF CLOUD COMPUTING – A comparative analysis between EU and US law on the case study of data protection and privacy"

ISBN 978-3-8487-5362-8 (Print)  
978-3-8452-9562-6 (ePDF)

#### **British Library Cataloguing-in-Publication Data**

A catalogue record for this book is available from the British Library.

ISBN 978-3-8487-5362-8 (Print)  
978-3-8452-9562-6 (ePDF)

#### **Library of Congress Cataloging-in-Publication Data**

Kontargyris, Xenofon

IT Laws in the Era of Cloud Computing

A Comparative Analysis between EU and US Law on the Case Study of Data Protection and Privacy

Xenofon Kontargyris (ed.)

378 p.

Includes bibliographic references and index.

ISBN 978-3-8487-5362-8 (Print)  
978-3-8452-9562-6 (ePDF)

1st Edition 2018

© Nomos Verlagsgesellschaft, Baden-Baden, Germany 2018. Printed and bound in Germany.

This work is subject to copyright. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage or retrieval system, without prior permission in writing from the publishers. Under § 54 of the German Copyright Law where copies are made for other than private use a fee is payable to "Verwertungsgesellschaft Wort", Munich.

No responsibility for loss caused to any individual or organization acting on or refraining from action as a result of the material in this publication can be accepted by Nomos or the author and editors.

***To my parents, who have been my greatest supporters even at times that I did not believe so strongly in myself.***

*Στους γονείς μου, που πιστεύουν πάντα σε μένα ακόμα κι όταν ο ίδιος δεν πιστεύω τόσο δυνατά στον εαυτό μου.*

***To my brother, who made sure that over the past three years no emergency would distract me from my goal.***

*Στον αδερφό μου, που τα τρία αυτά χρόνια δεν επέτρεψε σε απρόοπτα να με αποσπάσουν από το στόχο μου.*



## Foreword

I do not consider myself a genius. Over the course of my studies I have had the good fortune to meet and collaborate with colleagues and teachers who have razor sharp minds for science; I certainly do not feel I am one of them. Therefore, I am not one of those researchers who had been confident that they would sit down and conduct a PhD since their first day at University. Nevertheless, I have been lucky enough to be inspired and encouraged in the course of my academic life by friends, colleagues and teachers who saw potential in me and made me believe that everything is possible with hard, systematic work. Through this note, I would like to express my heartfelt gratitude firstly to Prof. Trute for giving me the chance to undertake this particular project despite the interdisciplinary challenges it posed for a lawyer; to Prof. Schulz for being an excellent second supervisor helping me to maintain the dual approaches between law and IT and between EU and US law that the challenge I had set up for myself necessitated; to Prof. Papadopoulou from my alma mater, the Aristotle's University of Thessaloniki, for offering me as much help and support as possible in order to remain academically sharp while I was looking for a suitable opportunity to conduct a project as demanding as an interdisciplinary PhD; to my ex-colleagues at Apogee Information Systems, my first full-time employer and at the Directorate General for Media at the European Commission for facilitating my curiosity to get to know the real meaning of terms such as 'software', 'data processes', 'cloud-based systems' etc., which are always intriguing for an IT lawyer but require a lot more than a strong legal background in order to tackle regulatory challenges associated to them. And last but not least, I wish to cordially thank all those classmates and teachers from my school years and the colleagues, friends and teachers from my university years who helped me build the confidence it took to make it from high school to my LLB study, then on to my LLM and further onwards to my PhD term. Regardless of degrees and titles, all these people and experiences have taught me that everything is possible if you are determined to fight for it. And this is a lesson I will cherish for life!

*Foreword*

This work has been finalized on 27 September 2017. All its contents and arguments should be read in light of the legal status quo applicable at that time.

PS: Grandma, I know you are happy about this. I promise you I will not stop here!

Hamburg, 27. September 2017

# Table of Contents

List of abbreviations	19
CHAPTER 1. Introduction	21
a. Reasoning of the project and current state of affairs	21
i. The European state of affairs	25
ii. The US state of affairs	27
iii. Current state of affairs in other countries	29
b. Research question and structure of the project	30
CHAPTER 2. Cloud computing; a historical and technical overview	33
a. Introduction – scope of this chapter	33
b. A brief history of the cloud	34
c. The NIST definition of cloud computing; a starting point	36
d. The technologies that preceded cloud computing; a brief overview and comparison	39
i. Cloud computing compared to traditional IT – Their main differences and why the cloud matters	39
ii. Cloud computing environments compared to client-server systems	41
iii. Cloud computing compared to outsourcing – The key differences	42
e. Data handling needs and the parallel technological evolution – How developing computational requirements led to technological progress	44
f. Explaining cloud computing and its predecessors – what did the cloud replace and what is now done different than before?	45
i. File hosting	46
ii. Clustering	46
iii. Grid Computing	47
iv. Virtualization	48
g. Cloud computing: its core philosophy and structural features	48
i. The cloud’s business model	49

ii. The architecture of cloud computing systems	49
h. The resource management aspects of the cloud	50
i. The cloud's compute model	50
ii. Virtualization	51
iii. Monitoring	52
iv. Provenance	53
i. The application model of the cloud	53
j. The security model of the cloud	54
k. What is cloud computing after all and why does it merit a new regulatory approach?	56
CHAPTER 3. EU vs. US: the two major schools of thought regarding internet and privacy regulation and why they took divergent paths. Can this distance be bridged in the context of a regulatory framework for the cloud?	58
a. Introduction – scope of the chapter	58
b. How extensive is the influence of European data privacy standards outside Europe? Is it EU law that has been so influencing or is it more the entire European legal thinking?	59
c. What is the main difference from Europe in USA's arrangement of their regulatory framework for privacy and the internet?	63
d. The 'privacy collision' between Europe and the USA: a brief historical overview	64
e. Personal data privacy in Europe and the US: a pragmatic and an articulate approach	70
f. Cyber challenges and state-of-the-art in Europe and the USA	73
i. EU's approach towards cyber challenges	73
ii. The US approach towards cyber challenges	75
g. Can cloud computing be a tipping point for regulating and thinking about privacy in the US or Europe?	76
i. Privacy under the effect of the cloud in the US	77
ii. Judicial obstacles	78
iii. Legislative obstacles	79
iv. Societal obstacles	80
h. Europe's combined approach towards the cloud and economic growth	81

i.	A close look on how the EU and the US currently handle sensitive consumer data on the cloud. Is the current regime adequate and efficient enough?	82
i.	Regulating privacy and security of consumer sensitive data in the cloud; the US current status quo	84
ii.	Regulating privacy and security of consumer sensitive data in the cloud; the EU current status quo	85
iii.	The need for efficient protection of sensitive data also points towards regulatory reform in the cloud	86
CHAPTER 4.	An introduction to the definition of cloud computing under EU law and the challenges it poses	89
a.	Introduction – scope of this chapter	89
b.	The most important policy views on aspects of cloud computing brought out so far and why they are not yet sufficient	92
c.	The European Data Protection Directive 95/46/EC; an assessment of its effects on the prevalent views about data protection and related IT technologies; are things different under the GDPR?	96
d.	Focus on the General Data Protection Regulation: is the European Union’s brand new law already insufficient to effectively regulate the cloud?	101
i.	Does the GDPR set up a truly universal legal framework for data transfer law?	103
ii.	What does the spirit of GDPR tell us about the longevity of the current overall EU data protection regime?	105
e.	GDPR and its readiness to respond to big scale uses of data in the cloud; the case of machine learning	109
f.	Vision for a cloud-based future	112
g.	The road from data privacy to cloud computing regulation	113
i.	Privacy and security viewed through the years and across major jurisdictions	113
ii.	Privacy issues particular to cloud computing technologies	115
iii.	Why does cloud computing call for a new regulatory framework?	116

CHAPTER 5. Legal pluralism and harmonization – how can we reach a common minimum understanding on how to regulate the cloud?	118
a. Introduction – scope of this chapter	118
b. Internet Regulation: a paramount of unilateralism	119
c. From governments to governance; learning to do laws for a borderless world	122
d. So far, existing laws about cyberspace are bad laws. Lessons learnt?	125
e. Lex informatica: The formulation of policy rules for the web through applied technology. Can it offer any useful insight for the conceptualization of a dedicated cloud computing regime?	129
f. Sectoral codes of conduct: the most dedicated attempt to come up with cloud computing laws so far and how it could be improved	131
g. Efforts undertaken so far on the front of sector-based regulation of IT and their common weakness	136
h. Seeking the way forward on cloud computing regulation in the field of global administrative law	138
i. Defining global administrative law	138
ii. The general theory on global administrative law and its principles	140
iii. Theoretical foundations of global administrative law based on US and EU administrative law	141
i. Legal pluralism in global administrative law	143
i. The proposal	143
ii. The problems of legal pluralism	146
j. Can effective cloud computing regulation be achieved through international law? Not really.	148
k. A comparatist approach and synthesis is the only way; moving forward to regulate cloud computing through legal pluralism	151
CHAPTER 6. Jurisdiction and accountability in the cloud	153
a. Introduction – scope of this chapter	153
PART I: Jurisdiction in the era of cloud computing	153

a.	The currently prevailing legal norms in EU law for claiming jurisdiction over cases involving data transfer and processing	153
	i. Establishment – Art. 4 para. 1(a) DPD	154
	ii. International law – Art. 4 para. 1(b) DPD	157
	iii. Equipment – Art. 4 para. 1(c) DPD	158
	iv. Changes to current status quo by the upcoming GDPR	158
b.	Technology and internet jurisdiction: a process of parallel ‘give and take’	161
c.	From data protection law to international jurisdiction on the internet; adapting laws to modern needs and reality	164
d.	What is the problem with asserting jurisdiction over cloud-related cases under current EU laws?	168
e.	Steps to reduce jurisdictional disputes from the perspective of EU law	170
f.	The internet jurisdiction risk of cloud computing under US law	173
	i. The basics about determining jurisdiction under US law	173
	ii. Jurisdiction under the influence of technological evolution; practices for alleviating jurisdiction risks in the US and internationally over IT-related cases	176
g.	Corporate strategy as a pre-emptive measure for facing the long arm of cloud jurisdiction	178
	i. Virtual and physical environments	178
	ii. Accepting the inherent nature of cloud jurisdiction risk	179
h.	Where are cloud data centers located? How jurisdiction plays a major part in deciding on geographic location, economic and environmental parameters in cloud computing	179
	PART II: Accountability on the cloud	181
a.	Accountability: the essentials from data protection to cloud computing	181
b.	Accountability is not self-regulation; clearing the picture between two comparable but critically different concepts	183
c.	Accountability in the cloud cannot be sufficiently settled with existing EU laws	185
d.	Providing answers to the privacy challenges of cloud computing under US law; the importance of the Fourth Amendment principles	187

e. Achieving effective regulation of the cyberspace: discussing particularities of the web and how these should be mirrored in modern laws about aspects of the digital world	190
f. Tackling the issue of perspective in internet law; an essential step towards a pragmatic accountability regime	193
g. The road to an accountable cloud computing goes through the road to an accountable internet: how to achieve a sound internet governance	196
h. Effective accountability for cloud computing	197
i. Accountability as a way to further reinforce privacy in the cloud	199
CHAPTER 7. Risks and compliance in cloud computing environments – views from Europe and the USA	202
a. Introduction – scope of this chapter	202
PART I: THE RISKS ASSOCIATED WITH CLOUD COMPUTING	202
a. Privacy issues raised on the cloud: existent for all kinds of data across all types of cloud networks	202
i. United States v. Miller	205
ii. The Electronic Communications Privacy Act (ECPA) – a step ahead but obscurity lingers	206
iii. The USA PATRIOT Act	207
iv. The HIPAA and compelled disclosures	207
v. The Fair Credit Reporting Act	209
b. Threats to privacy means threats to security: the two prominent issues that go hand in hand in cloud computing environments	210
c. Privacy risks posed by the cloud put into question cornerstone elements of information privacy laws	213
d. The other side of the coin: how cloud computing’s architectural advantages can turn into threats for privacy	216
e. The affluence of consumer data on cloud computing and particular threats to them because of the cloud’s specificities	218
f. Reviewing security, privacy and trust issues on the cloud from an EU perspective	221
PART II: CLOUD COMPLIANCE	224

a. Introductory remarks on the concept of ‘cloud compliance’	224
b. Effective regulation of technology: the need to define policy tools and policy actors	225
c. Incorporating users’ privacy concerns into the rules governing design and deployment of cloud environments	227
d. Pragmatic answers regarding the deployment of secure and privacy-proof cloud networks	231
e. Incentivizing privacy and security by encouraging the adoption of privacy enhancing technologies	232
<b>CHAPTER 8. Principles for regulating the cloud (1); conclusions from the ontology of cloud computing networks</b>	<b>234</b>
a. Introduction – scope of this chapter	234
b. Constructing the ontology of the cloud; is the cloud one and only thing after all?	235
i. The Firmware/Hardware layer	238
ii. The Software Kernel layer	238
iii. The Cloud Software Infrastructure layer	240
iv. The Cloud Software Environment layer	242
v. The Cloud Application layer (SaaS)	242
c. Different uses but the same ontology: what does this mean for cloud computing regulatory principles?	243
d. Mapping the life cycle of data on cloud computing networks: risks, security and privacy issues as indicators for the nature of cloud computing regulation rules	245
i. Data generation	246
ii. Transfer	247
iii. Use	247
iv. Sharing	248
v. Storage	249
vi. Archival	251
vii. Destruction	251
e. Regulatory principles derived from the ontology of cloud computing	252
i. On the hardware/firmware layer	252
ii. On the software/kernel layer	255
iii. On the cloud software infrastructure layer	256
iv. On the PaaS and SaaS layers	257

v. On the SaaS layer in particular	258
CHAPTER 9. Principles for regulating the cloud (2); based on the roles and functions across the cloud workflow	261
a. Introduction – scope of this chapter	261
b. Viewing cloud computing from the outside; what else is the cloud apart from its infrastructure and the science behind it?	262
c. Completing the picture of the inner side of the cloud; regulatory challenges stemming from the cloud network’s business workflow	267
i. The customer (or user) of cloud computing services	270
ii. The service provider	272
iii. Infrastructure providers	275
iv. Aggregate services providers (aggregators)	277
v. The platform provider	278
vi. The cloud services consultant	278
d. The innovative nature of cloud computing business and the legal challenges raised as a result thereof	279
e. Summarizing the issues raised by the new modus operandi established in IT market by cloud computing; where is there a need for new cloud computing rules and what precisely should their content be?	282
i. Data protection	282
ii. Data Security	283
iii. Data retention	284
iv. Consumer protection	285
v. Intellectual Property	286
vi. Competition	286
vii. Trade	287
viii. Jurisdiction, applicable law, enforcement	288
ix. Compliance	289
x. Transparency	289
xi. Responsibility and liability	290
xii. Infrastructure	290
f. What challenges lie ahead in designing cloud computing regulation rules?	291
i. Challenges in conceptualizing cloud computing regulation	291

ii. Challenges in implementing cloud computing regulation	294
iii. Projecting challenges in the assessment phase of a regulation on the cloud	297
CHAPTER 10. Principles for regulating the cloud (3); the adoption of cloud computing regulation as the big leap forward from governing to governance in IT law	301
a. Introduction – scope of this chapter	301
b. Doing laws based on the local and global experience: the differences in approach and the need to combine both perspectives in the case of cloud computing	301
c. The ability of law to learn and evolve; how to achieve law evolution in the case of cloud computing	309
d. How proportionality and teleological reasoning can help cloud computing regulation make IT laws overall more efficient	313
e. How technology itself can help establishing a sound system of governance in the field of cloud computing	316
f. The key to achieving a sound system of governance in cloud computing regulation: legal interoperability and its significance as a concept in transnational law	321
g. A brief summary of the trends on privacy regulation through time in a global context; the transit to a cloud computing regulation governance regime is not a free fall into the unknown	325
h. Making a long-lasting governance regime a choice not a necessity	327
i. Can the transatlantic divide on privacy be bridged? Why the extensive use of cloud computing technologies makes the call for convergence an urgent one?	329
CHAPTER 11. Conclusion	335
a. The driving forces that make the need for cloud computing regulation a pressing one	335
b. Overview of solutions and suggestions towards the development of sound cloud computing regulation regimes	338
i. Normative proposals	338
ii. Governance proposals	345

*Table of Contents*

iii. Policy proposals	347
c. Future challenges – insights for further research	349
List of laws and statutes	353
List of case law	351
Bibliographical index	355

# List of abbreviations

(in alphabetical order)

Amazon Web Services	AWS
Application Programming Interface	API
Application Service Provision	ASP
Artificial Intelligence	AI
Asian-Pacific Economic Cooperation	APEC
Binding Corporate Rules	BCR
Charter of Fundamental Rights of the European Union	CFREU
Chief Executive Officer	CEO
Cloud Service Provider	CSP
Communication as a Service	CaaS
Communications Decency Act	CDA
Community Based Participatory Research	CBPR
Customer Relationship Management	CRM
Data as a Service	DaaS
Data Protection Directive (European)	DPD
Digital Millennium Copyright Act	DMCA
Electronic Communications Privacy Act	ECPA
European Convention on Human Rights	ECHR
European Economic Area	EEA
European Union	EU
Fair Credit Reporting Act	FCRA
Federal Trade Commission (US)	FTC
Foreign Intelligence and Surveillance Act	FISA
General Data Protection Regulation (European)	GDPR
Hardware as a Service	HaaS
Health Insurance Portability and Accountability Act	HIPAA
Information & Communications Technology	ICT
Information Technology	IT
Infrastructure as a Service	IaaS

*List of abbreviations*

Internet Corporation for Assigned Names and Numbers	ICANN
Internet of Things	IoT
Internet Service Provider(s)	ISP(s)
Local Area Network	LAN
National Institute of Standards and Technology	NIST
Official Journal (of the European Union)	OJ
Operating System	OS
Organization for Economic Co-operation and Development	OECD
Platform as a Service	PaaS
Platform for Privacy Preferences Project	P3P
Privacy Enhancing Technologies	PETs
Remote Computing Service	RCS
Secure Sockets Layer	SSL
Service Oriented Architecture	SOA
Service as a Service	SaaS
Software as a Service	SaaS
Stored Communications Act	SCA
Terms of Service (agreement)	ToS (agreement)
Transport Layer Security	TLS
Treaty on the European Union	TEU
United Nations Commission on International Trade Law	UNCITRAL
United Nations Universal Declaration of Human Rights	UDHR
United States (of America)	US(A)
United States of America: Uniting and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism Act	USA PATRIOT Act
Virtual Machine(s)	VM(s)