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ABSTRACT

CLOUD COMPUTING

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➢ *Cloud Computing represents a computing paradigm shift in which users store, access, and utilize data remotely using the Internet. It can be used to augment and/or replace on-site computing resources. The "cloud" is a network of data centers providing commoditized computing power—software, hardware, and services—to end users in a highly scalable fashion similar to the provision of electricity or water.*

➢ *The characteristics underlying cloud computing place heightened pressure on Congress and the courts. Cloud computing providers and the companies that rely on them can easily move their base of operations to other countries that develop better legal frameworks. Comparatively poor cloud computing policy will drive skilled technical jobs and the companies that rely on them overseas.*

I. Cloud computing represents a paradigm shift in computing services, creating efficiencies and cost savings for customers.

Background: Cloud computing allows users to remotely access high-powered computing resources (both infrastructure and software/services) contained in off-site data centers from modest end-user systems via a broadband connection. Users need not build, maintain, and upgrade on-site IT systems, allowing for substantial cost savings. By commoditizing IT infrastructure and software, providers of cloud services rely on economies of scale to build massive IT resources that can be portioned to clients on an as-needed basis. This shift allows for the more efficient use of computer resources and IT, and allows individuals and small companies access to vast amounts of computing resources they would not have had the means to access in the past.

Innovative Trends Enabled by Cloud Computing:

- **Work product can "follow the sun"***:* By storing resources remotely, companies can enable greater productivity and efficiency by allowing users around the world to collaborate on projects. For multinational companies, when a project team in the United States goes home for the day workers in Europe and Asia can seamlessly pick up where the other team left off.

- **Workloads can "follow the moon"**: Conversely, the actual storage and computation of data can move to locations that require the least energy usage. Computers and servers, especially high-end ones, generate significant amounts of heat and require vast amounts of energy to keep their hardware cool. Having workloads "follow the moon" (i.e., migrate to data centers where it is currently night) means reduced energy consumption and expenditure.

- **Workloads can "follow the law"**: The ease of moving data online allows workloads to be located where the regulatory and legal landscape is best suited for the task at hand. This dynamic places a heightened importance on policy makers in countries seeking to derive the benefits (and profits) associated with cloud computing.

II. The growing demand for cloud computing services will put pressure on existing legal regimes and impact policy considerations.

Policy Considerations:

Free Flow of Data
Cloud computing defies international borders. Information flows seamlessly between data centers around the world and, from a technical perspective, where data is stored is often arbitrary. Therefore, harmonizing the patchwork quilt of laws and regulations that govern information depending upon its physical location is essential. Information discrimination represents a non-tariff trade barrier and must be treated as such by treaties and trade agreements.

Cyber Security
Effective domestic and international cyber security policies are necessary for cloud services to flourish. Users must trust that their critical information is secure even though it is stored off site and transits over the Internet. Policymakers should consider results based standards that allow sufficient flexibility in implementation and preserve industry-led innovation while still achieving a baseline level of security. The current course of collaborating with industry to reform domestic cyber security policy (through legislation and agency action) while also proactively working with international governments and supranational bodies should be maintained.

Broadband Coverage
Quality, high-speed broadband connections are essential to cloud computing because broadband provides the link between the purveyors of cloud computing services and their clients. As major corporations tap into cloud computing to lower their costs and raise productivity, companies without access to quality broadband will be at a competitive disadvantage. An important component of the broadband deployment debate is wireless spectrum policy. In many ways, wireless spectrum holds the key to achieving truly ubiquitous Internet access, which is necessary for maximum utilization of the cloud. The FCC and NTIA should prioritize policy changes that help wireless broadband proliferate, including moving to free up wireless spectrum for broadband.

Liability Rules
Online services such as cloud computing receive frequent demands by various interests to bar problematic third party content under threat of liability for the user's action. The 1996 Telecommunications Act and the 1998 Digital Millennium Copyright Act contain crucial limitations on whether Internet and e-commerce businesses may be held liable for a user's misconduct because these services (many of which deal in petabytes of data each day) lack the control that brick-and-mortar businesses have over individual content. Ensuring that existing statutory protections for online service providers are applied equally to cloud computing services is essential to the future health of the industry.

Nondiscrimination
The basic infrastructure of the cloud (including broadband access) should not discriminate or provide unfair advantages to certain users. As with the Internet, the best ideas and companies will have the greatest ability to succeed if chokepoints are eliminated and market power in key areas of the underlying infrastructure is constrained.

User confidence
Cloud computing depends on storage of data by third parties. As a result, the cloud must achieve high levels of privacy and security if it is to fully realize its potential. Not only must the infrastructure be designed in such a way as to combat hackers, but policies and design must also discourage improper surveillance by foreign and domestic authorities. If privacy protections are eviscerated by political demands, data will migrate to more principled jurisdictions taking economic activity and jobs with it. Changes to laws such as the Electronic Communications Privacy Act (ECPA) and the Communications Assistance for Law Enforcement Act (CALEA) must reflect the expectations cloud computing customers have regarding privacy and security.

Interoperability
Competition and innovation are key to the growth of cloud computing. Ensuring (and protecting) interoperable environments and underlying frameworks is crucial in allowing the proliferation of new applications and services. As the cloud evolves, policymakers must carefully guard against "lock-in" and encourage consumer choice by preventing the inappropriate exercise of market power. Policymakers and regulators can accomplish these goals by setting interoperability guidelines for government procurement of cloud services and enforcing antitrust laws to prevent uncompetitive conduct

Government Procurement
The federal government sees the opportunity for cost savings and increased efficiency from the procurement of cloud services. President Obama's FY 2011 Budget made adopting cloud services a major part of its strategy to achieve efficient and effective IT, and the Administration has announced goals to migrate to the cloud and eliminate 800 federal data centers within five years. Adopting cloud services will allow governments to save costs on IT services in the same way the private sector has, providing for a more efficient use of tax dollars.

CCIA's position: Cloud computing has experienced rapid growth in recent years. While mainly the result of rapid technological innovation and increased high-speed broadband offerings, the recent financial crisis has accelerated deployment as companies seek to trim the large overhead costs associated with in-house IT. Cloud computing puts pressure on many different areas of policy, and action is necessary to create the optimal environment for innovation and growth. Broadband deployment, competition policy, intellectual property reform, privacy, and security are just a few areas that must be addressed to foster rapid innovation and adoption of cloud computing. The very nature of cloud computing raises the stakes for policymakers; providers of cloud services will relocate to the countries and regions that create the optimal legal frameworks for it to thrive. If the U.S. hopes to remain the world's innovation leader long into the future, considerable time and care should be invested in passing laws and regulations that are significantly forward looking and take into account the needs of businesses and governments who will come to rely on the cloud.