The Silicon Flatirons Center held its annual Digital Broadband Migration conference at the University of Colorado Law School on February 12 & 13, 2012. This year's conference was entitled, "The Challenges of Internet Law and Governance." In addition to panels surrounding this theme, Silicon Flatirons was pleased to host U.S. Senators Michael Bennett and Mark Udall, FCC Chairman Julius Genachowski, IAC & Expedia, Inc. Chairman Barry Diller, and Vint Cerf, Vice President and Chief Internet Evangelist at Google.

Technology Overview, Vint Cert
by Nereus Lobo

The introduction to the conference was given by Vinton (Vint) Cerf. Vint began discussing a long-term trend toward digital- and packet-based communication, with cable and fiber will play a big role, even at the edges. Wireline communication is on its way out, he said. Wireless has evolved from only carrying voice to providing many other data-related services. The services have increased as the technology moves away from the POTS (Plain Old Telephone Service) to IP-based services like VoIP for their core network. He expects the POTS, in its traditional form, will still exist for at least a decade or so. Despite the increasing popularity of end to end VoIP systems, Vint Cerf explained that the POTS likely won't go away immediately, just eventually "evaporate."

As systems do increasingly rely on IP, interconnection issues will increase in importance and must be done at high speeds. Quality of Service (QoS) issues will become less important as speeds increase, but standards will continue to be fundamental to success.

Other changes Mr. Cerf predicted included more effective IP based E911 services (including additional features), enhanced captioning services, and improved speech recognition technologies. But with these benefits come privacy and safety issues, as the Internet is still often un-secure. Internet service providers, as well as application providers/developers, should share the responsibility of securing the networks, Cerf said. International agreements and strong authentication practices will also play a very critical role in privacy and Safety. He concluded by pointing out, "Privacy is not just a matter of technology, it's what we decide to do."

Tech Tutorial Backdrop: An All IP Network and Its Policy Implications
by Nereus Lobo

Phil Weiser, Dean of Colorado Law, began the panel with a discussion on whether IP interconnection will be mandated, as it is with telephone systems. Vint Cerf said it is possible and even exists in some form today, but that government intervention is required if it will be effective. Ed Felton, Chief Technologist for the Federal Trade Commission, agreed that established players won't have the incentive to interconnect independently and a nudge on the government's path would help things along. Jack Waters, Chief Technology Officer for Level 3 Communications, felt that there are economic incentives to move towards interconnection. Dan Reed, Corporate Vice President of Technology Policy and Strategy at Microsoft, pointed out that there are multiple varieties of

transcoding involved in interconnection and some of them add additional content which adds complexity to interconnection.

Reed and Cerf also discussed E911 services and how they will change. Reed pointed out that reliability is important, but it not always easy to decide which network is the most reliable. Cerf greed that the E911 services are vital, but argued that we must change the way we use the service. He suggested creating a new Global Identifying plan (much like the IP address) as a better way of providing E911 services.

Dean Weiser also asked about cybersecurity by mentioning a New York Times article suggesting that people go "electronically naked" while travelling to other countries. He asked what other best practices could be taken to mitigate risks of losing sensitive data. Mr. Felten responded by calling for increased robustness in potentially compromised systems. He suggested using engineers and technical solutions to protect compromised systems. Mr. Waters pointed out the seriousness of the cybersecurity threat due to the implications of an interconnected Internet, creating the need to incorporate more security features in DNS and routing infrastructure. He also mentioned the importance of the physical network security.

The panel then turned to network neutrality, an issue Mr. Waters believed to be policy and competition heavy. Mr. Reed pointed out that is I event more complex when one considers all relevant layers, including geo-political and technical competition. Dean Weiser discussed the tension between broadband providers and application providers. Broadband providers claim that application providers use bandwidth greedily without thinking about the impact. Vint Cerf pointed out that it's not the application providers but the users who use the bandwidth for content. To overcome the bandwidth problem, application and content providers could use the limited capacity they have, or they could obtain additional capacity while determining how to make their content more efficient in terms of size and delivery.

Timothy Wu, a Professor of Law from Columbia University, asked from the audience about reasonable network management practices, particularly about blocking certain application that the ISP feels puts a strain on the network. The panel thought that it was a little difficult to determine pretext and that an ISP has the freedom of protecting itself and its customers from attacks. Mr. Cerf stated that he would rather have the content delivery mechanism (like the email server) check for threats than the ISP. Of course, there should not be any anticompetitive or unfair service delivery to users. Dean Weiser then asked Mr. Waters whether the question of "reasonable" network management practices could be decided by an independent group like the BiTAG or if it must be done on a case by case basis. Waters responded that a blend of both would be the best.

Opening Address: U.S. Senator Michael Bennet
by Julie Cuypers, J.D./MBA candidate, 2015

U.S. Senator Michael Bennet began the opening address on innovation apologized for the dysfunction happening now in Washington D.C. and pointing out that there are good

things to come. The FAA Reauthorization Act, the No Child Left Behind Waiver, the possibility of a Regional Patent Office in Colorado, and bipartisan support for a wind production tax credit extension are all on the horizon. Additionally, positive trends in GDP, productivity, and unemployment signify economic recovery from the recession. He explained that education, and its human capital benefits, are necessary to keep this momentum. Entrepreneurs, supported by broadband and the Internet, innovate and help drive up wages. These and other technologies educate our children and empower other countries. This generation of children is growing up in a technological revolution, but he explained that many poor children have access to only limited technology. As a result, an educational gap exists, to the detriment of U.S. productivity and growth.

Senator Bennet then turned to recent government initiatives supporting innovation. He mentioned proposed legislation to allow increased crowdfunding of early stage companies by removing government impediments to investment. He said that crowdfunding is one of the many ways that the Internet is revolutionizing businesses and access to capital. He suggested that securities laws be updated so that people can invest in small businesses through crowdfunding platforms like the "kickstarter" model.

Despite the many enormous benefits the Internet provides, Senator Bennet acknowledged the increased security threat and potential for intellectual property infringement. Protecting government information and intellectual property is vital to ensure national security and economic competitiveness. He said that China alone has gathered over 10 terabits of information about U.S. government and infrastructure, and he called on both the private and public sectors to work together to solve this problem. He concluded by asking those in attendance to contact their representatives and share their ideas.

The Digital Broadband Migration in Perspective
by Marissa Johnson, J.D. candidate, 2013

The panel discussion began with a look at the United States' status as a leader in technology competitiveness and innovation. Various panelists identified education as a key method of maintaining a competitive edge, and one idea advanced by several panelists was to make it easier for U.S. educated foreigners to obtain work visas in the United States. Brad Feld of the Foundry Group reminded listeners that geography is no longer a barrier to global communication and that the national frame of reference must change – especially in the context of innovation and competitiveness. He also stated that America sets the tone for the world policy, and he encouraged us to use technologies to advocate for individual freedoms internationally. Dale Hatfield, of the Silicon Flatirons Center, agreed David L. Cohen of Comcast that we must fix the educational system. Hatfield championed a return to strong work ethics in STEM fields by students, and mentioned a concern about lower-income kids who may not have the opportunity to enter into meaningful fields.

Larissa Herda of TW Telecom re-focused the discussion on innovation and competition. She lamented that policy and competition are driven by money and power, especially in the telecommunications industry. Many of the smaller industry players, including

Herda's own TW Telecom, have no ability to compete with the bigger players due to limited lobbying resources. To increase American innovation, she recommended that we develop a more robust policy system based on facts and data instead of regulatory capture.

Dean Weiser asked a follow-up question regarding the relationship between public policy and competition – specifically in regards to new entrants to the market - as well as regarding the relationship between politics and innovation. Cohen cited the Bell Telephone monolith as one example where incumbents used regulations to prevent new entrants. He also argued in favor of limited government intervention at every level without a strong economic case (i.e., as market failure) demonstrating the need for regulation. He noted that Comcast and many other members of the cable industry prefer "deregulatory parity" – the lifting of regulatory burdens to even the playing field – over "regulatory parity," except in situations where the market requires otherwise. Cohen also noted that government technology solutions are often three years too late. Therefore, government intervention harms the United States' global competitiveness and technological leadership. Feld noted that he has never asked for government regulation. His portfolio companies operate within existing regulation and their small size allows them to innovate where larger companies have difficulty. He pointed out that innovation is no longer a hierarchical phenomenon, but a networked phenomenon—broadly-based, loosely-connected and/or disconnected.

Dean Weiser again asked about interconnection with new entrants, as the market has failed to promote it? Herda referenced Ed Felten's previous point that incumbent carriers have an incentive to act "strategically," especially in interconnection. Herda believes the FCC can "give a nudge" to the incumbents to increase interconnection, although she agreed with Cohen that little intervention is preferable. Cohen seconded Herda's comments and recognized that Comcast has dealt with some of the same market failures in its own IP voice interconnection services, although he disagreed that government is the best option for solving IP peering issues. Cohen recommended using a multi-stakeholder processes to create new fair standards for the industry. He also added that if the standards recommended by the collaborative process are not voluntarily adopted, there may be a place for top-down government regulation. Hatfield seconded Cohen's proposal for a multi-stakeholder process and focused on the need to have engineers drive the process to work through the technical specifications first. Once the technical issues are off the table, certain normative decisions involving what's acceptable to society can be made through the political process.

Opening Address: Larry Strickling
by Marissa Johnson, J.D. candidate, 2013

After the panel discussion, Larry Strickling, Assistant Secretary for Communications and Information at the National Telecommunications and Information Administration (NTIA), provided an overview of the various challenges facing the multi-stakeholder process in the near future. Strickling described the multi-stakeholder process as a matter of great focus inside the NITA because it reflects the way the Internet functions, with

many people interacting at different levels. He noted that, in general, regulatory processes are aimed at industry members, not citizen groups or other participants. When looking toward a multi-stakeholder process, the first question is one of participation: how can we make sure that the right people are participating, especially with the diversity of interests on the Internet? Other considerations include where to meet, how often to meet, and how to assign responsibilities. These logistical issues influence who can participate and to what extent. Because success requires a meaningful opportunity for civil society and academic experts to participate, the debate must include more than incumbents and new entrants.

Achieving consensus presents a second challenge in the multi-stakeholder process. As opposed to a court proceeding where a judge renders an opinion after hearing both sides' arguments, a multi-stakeholder process requires agreement by many parties. It is also often hard to determine when consensus is reached? Strickling referenced ICANN's struggle to recognize consensus and its final determination that consensus occurs when there is an option to which no one openly objects. This is a very fragile standard.

A third challenge in the multi-stakeholder process comes from international governments who want to co-opt the process and subject the discourse to top-down government regulation. Strickling expressed his opinion that this challenge presents "a huge threat to the free and open Internet as we understand it," and it will affect the continued growth of Internet and of national economies. He suggested a possible solution would be to support today's Internet governance process that allows Internet stakeholders to make the decisions. For more information on this topic, Strickling pointed listeners to previous papers he has written on the subject.

Dean Weiser then suggested that regulations, especially in an international context, are a bit like boiling a frog: throwing the amphibian into boiling water causes it to leap out, but placing it in cold water and turning up the heat is a more successful tactic. In the same way, regulatory activity by the ITU can surreptitiously take over the system. Strickling followed up by pointing out that many regulators believe the Internet is within their purview because it appears to be a natural evolution of old circuit-switched networks. He did not necessarily agree. Instead, he believes the regulatory jurisdiction question is open for discussion. He also suggested the need to discuss which tools should be used for regulation. Once the jurisdictional question decided, the regulator will determine whether to use a multi-stakeholder process or the traditional regulatory process.

<u>IP Rights and the Digital Migration</u>
by Martina Hinojosa, J.D. candidate, 2013

Speakers: Mark Lemley, Gigi Sohn, Jonathan Taplin, Michael Fricklas, Michael Gallagher, the Honorable Stephen Williams

Paul Ohm, Professor at Colorado Law, opened the panel on copyright rights by saying that although SOPA and PIPA are no longer viable pieces of legislation, much can be

learned from them. He challenged the panelists to use the discussion as an opportunity to say something they had never said before.

Professor Ohm gave a short presentation on the legislation, highlighting the essential issue—reproduction and distribution of copyrighted works without a license over the Internet. Because current solutions may be insufficient to address "rogue" websites that enable copyright infringement, SOPA and PIPA sought to enable a few key changes, including granting the attorney general the right to bring *in rem* proceedings against alleged infringers.

Mark Lemley, Professor of Law at Stanford University, focused on the "SOPA that already exists,"—the current seizure of domain names. The United States current seizes domain names based on reasonable suspicion under civil forfeiture authority. Lemley argued that these seizures raise cybersecurity, due process, and First Amendment issues. Lemley closed his presentation by describing the Internet as "robust and delicate," and warning that legislation like SOPA/PIPA can fracture it.

Although Jonathan Taplin, Director of the Annenberg Innovation Lab at University of Southern California, agreed that SOPA/PIPA was not strong legislation, he took a slightly different perspective. Taplin focused on the incentives—or lack thereof—for artists to create new material because there is not enough protection for their work. Taplin characterized the U.S. as an information society, in which our primary export is creativity. Taplin proposed two solutions to the issue of online copyright infringement: (1) ISP's should take voluntary measures to fight copyright infringement (e.g., refuse to link to website that cannot prove that they have a legitimate content license), and (2) A global content fee should be imposed on all broadband subscribers to pay for "lost" content.

Gigi Sohn, President and Co-Founder of Public Knowledge, gave an overview of proposed and enacted legislation comparable to SOPA/PIPA between 2002 and 2012. Sohn pointed out that content platforms tend to reinforce, instead of challenge, old business models. Sohn stated that when you create scarcity, people will find a way to get the product. She challenged content providers to explain how their products are accessible to the consumer.

Michael Gallagher, President and CEO of the Entertainment Software Association, responded to Sohn by stating that there are a variety of business models being used in the content industry, as evidenced by diverse revenue streams. He stated that the U.S. should provide a toolkit for law enforcement and for the government to take action against infringers. Michael Fricklas, Executive Vice President, General Counsel and Secretary of Viacom Inc., agreed on the many ways content is made available. He stated that his company offers several modes of access to content and has used the Internet to deliver products to consumers since the mid-1990s. Fricklas stated that copyright is about creating free markets for creative works, and that copyright should be a democratic process. Judge Williams, a Judge on the D.C. Circuit, tied several discussion threads

together by stating that the debate is fairly limited to academic circles. He also challenged the panelists on the viability of their proposed solutions.

Multistakholder Bodies and Internet Governance
by Lauren Ramirez, J.D. candidate, 2013

Pierre de Vries, a Silicon Flatirons Senior Adjunct Fellow, moderated the final panel of the day titled "Multistakeholder Bodies and Internet Governance." Panelists discussed the role multistakeholder organizations play in Internet governance, focusing specifically on collaborative methods of Internet regulation. To give context to the discussion, Joe Waz, Deirdre Mulligan, and Mark Cooper presented information on the development and current state of Internet regulation.

Establishing a framework for the conversation, Waz, Former Senior Vice President of Comcast Corporation, provided a large-scale overview of what it means to be a multistakeholder organization in the current digital age. Using collaboration and innovation, multistakeholder organizations establish Internet regulation standards and best practices. Waz also described some of the benefits of multistakeholder organizations, which tend to be responsive, centered on problem solving, and focused on quality outputs.

Mulligan, Professor of Law at the University of California- Berkeley School of Information and the Faculty Director at the Berkeley Center for Law & Technology, spoke about the need for interdisciplinary training to bridge the gap between policy and technological developments. She advocated for innovated technologies designed with specific policy values in mind. To illustrate this concept, Mulligan discussed the notion of "privacy by design," meaning inventors actively think about ways to embed privacy protection features into technology systems during the development stage.

Mark Cooper, Director of Research for the Consumer Federation of America, addressed the global digital revolution we are currently experiencing, framing the discussion in terms of the benefits of self-regulation in the technology realm. He argued that self-regulation has many advantages, including transparent and open participation, fair and efficient outcomes, and legitimacy. In addition, Cooper argued that in order for the digital revolution to thrive a balance must be struck between Internet governance and individual freedoms.

After the presenters shared their thoughts, Kathryn Brown, Douglas Sicker, and Daniel Weitzner added their perspectives to the discussion. Reinforcing some of the ideas the presenters shared, Brown, Senior Vice President, Public Policy & Corporate Responsibility at Verizon, contended that in order to increase the legitimacy of current approaches to Internet governance, multistakeholder organizations must approach regulation in a way that is both collaborative and representative of the diverse perspectives in the industry. Sicker, Chief Technology Officer and Senior Advisor for Spectrum at the National Telecommunications and Information Administration, discussed the need for multistakeholder organizations to share best practices. Weitzner, Deputy

Chief Technology Officer for Internet Policy in the Office of Science and Technology Policy at The White House, weighed in on the important role government can play in legitimizing the Internet governance process. Concluding the discussion, Brown challenged students to find new, creative, and collaborative approaches to address digital governance.

Closing Keynote: Senator Mark Udall
by Walker Williams, J.D. candidate, 2014

Dean Phil Weiser introduced United States Senator Mark Udall, re-iterating his challenge to the audience to find two Senators who could match Colorado's Senators for intellectual rigor, honesty, integrity, and good nature, as well as recounting the broad and varied contributions of the Udall family to Colorado. Senator Udall began by expressing his gratitude for a break from the contentiousness in Washington to come home for a true winter day in Colorado. He jokingly described himself as a "broken down mountain climber who found his way into the United States Senate."

Senator Udall went on to praise the mission of the Silicon Flatirons Broadband Migration Conference. He lauded Boulder's crucible of national labs and the spinoff businesses they attract as the envy of the country. He mentioned the importance of NREL to Colorado's having ranked 3rd nationally for clean-tech venture capital investment. He then called for duplication of the thirty mile corridor populated by tech companies of all sizes that has been built in Colorado. He attributed the success of Colorado's tech economy both to Colorado's quality of life, and to Silicon Flatirons because of its role as a hub and research center. Both help attract bright students and national attention to CU Boulder. He went on to discuss Dean Weiser's various contributions both in Boulder and beyond, as well as Brad Feld's role as a driving force behind Colorado's tech startup community.

Shifting to a substantive discussion, Senator Udall described subtle similarities between his leadership work with the Outward Bound School, and the challenges presented in tech innovation. He described his encounters with telecom and technology companies through national political work, and he outlined the key relationship between successful tech ventures and government policies that can augment success. He acknowledged that Congress' public image has been suffering lately, saying that both political parties tend to drag each other down. He brought up the fact that Congress has pushed policies that most of the tech industry views as destructive, such as PIPA and SOPA.

Moving forward, the Senator outlined three things that need to happen to promote technology innovation in the United States. First, the technology sector needs more talented engineers and scientists than the US produces. Immigration policy exacerbates the problem by interfering with efforts to hire talented workers from abroad, as demonstrated by the US slipping dramatically in world patents over the last decade. One partial solution is the Startup Visa Act, which would give qualified entrepreneurs routes to citizenship. Comprehensive solutions would deal with immigration policy more broadly. Second, American students need to develop the skills required to make them competitive in the STEM fields globally. This challenge will require years of hard work

and investment in education. Senator Udall discussed blueprints provided by programs such as the Intel School of Distinction, and called for national support of such creative STEM education programs. Third, Senator Udall called for close cooperation between the US Senate and the attendees of the conference. He expressed the need for the tech sector to get its important ideas into the hands and minds of government representatives, and for Congress to focus on pushing only policies that will benefit tech and innovation long term.

Senator Udall went on to examine the history of PIPA and SOPA in detail, stating that while everyone can recognize the need to protect intellectual property, Congress failed to include important decision-makers from the tech community in writing the bills. He also, however, admonished the tech sector for what he sees as a failure to engage Congress until the bill was expected to move to the floor and win by an overwhelming margin. He said there is a simple lesson – Congress can write better laws if the tech sector vocally opposes bad legislation and supports valuable legislation from the start of the legislative process. He concluded by re-iterating the importance of tech to the future of the United States, expressing gratitude for his ongoing relationship with the tech sector, and calling for a stronger relationship in the future.

Competition Policy in the Internet Environment

by Daniel Henry, J.D. candidate, 2014

Jon Nuechterlein, Partner at WilmerHale, kicked off the discussion with a brief history of competition and anti-competitive behavior on the Internet. He then shifted the discussion toward the way government intervention can support competition in the Internet marketplace. He spoke of the Computer Inquiries - efforts by FCC to prevent local exchange carriers (such as the Bell System) from using their position in local markets to prevent the spread of nascent information exchange markets. Moving back to historical examples, Nuechterlein explained that many of the leveraging issues now involve platform monopolists outside the physical layer, such as Microsoft Windows and its Internet Explorer browser's battle with Netscape.

Timothy Wu, Professor of Law at Columbia University, presented on so-called "supermonopolies" (i.e. when a company controls multiple markets) and asked the question, "should our antitrust analysis be different when the company at hand possesses multiple monopolies?" Mr. Wu spoke of two types of supermonopolies: supermonopolies where a company occupies complimentary markets, and conglomerate monopolies–firms with monopolies in two markets that *aren't* necessarily connected. He also spoke of an emerging trend of supermonopolies that combined the two forms, such as Microsoft's current form–vertically integrated Windows, Office, and Explorer, but also conglomerate features such as XBox Live.

Wu then moved on to how conglomerate monopolists use their power to control, perhaps unfairly, the markets in which they are involved. As an example, Wu described the battle between AT&T and MCI. Another tactic conglomerate monopolists use include directing

the profits from one monopoly to feed another business venture, then undercutting competitors in the second monopoly's market. Howard Shelanski, Professor of Law at Georgetown University, offered a slight counterpoint to Mr. Wu's presentation, focusing on the possibility of a virtuous supermonopoly, or at least a supermonopoly with virtuous characteristics. He also spoke of the increased difficulty in determining violations in digital marketplaces, e.g. distinguishing competitive maneuvers from practical engineering modifications.

Shelanski also discussed the market entry difficulties by new entrants caused by the spread and entrenchment of popular digital utilities and platforms. According to Shelanski, digital platforms present a special problem because without interoperability, they can lead to dominance as users increase in numbers. Examples of this include Microsoft Word and iTunes. Shelanski then spoke of the government's role in enforcing rules for promoting competition in digital markets. He outlined particular difficulties in present and future regulation, namely (1) identifying when a company actually commits a violation, and (2) creating solutions to fix and prevent violations of internet antitrust regulations. Shelanski then submitted a perplexing question that has yet to be answered: is an algorithmic change in a search engine a competitive attempt to quash market rivals, or is it just an attempt at improved efficiency? Even more difficult to answer is the follow-on question: What can the government do to discern this and prevent it?

Jonathan Sallet, Partner at O'Melveny & Myers LLP, discussed the economics of the Internet and "Markets of Origin," focusing on the new pathways between unlikely competitors in the Internet market. He also discussed value circles in the internet marketplace. Sallet submitted that antitrust analysis must "open the aperture" and take note of the effects of complementary markets when creating and implementing regulations. The job of the FCC is going to get more and more difficult as the rate of innovation continues its rapid increase. He concluded with a recommendation for improving regulation by stating that we must determine "the real facts" of complementary markets before we can "separate out dominance from competition; innovation from control."

After the presentations, Mark Chandler, Senior Vice President, General Counsel, & Secretary at Cisco, proffered his assessment of the presenters' arguments. He also offered alternative solutions to the problems presented. Christine Varney, Former Assistant Attorney General for Antitrust at the U.S. Department of Justice, then gave a brief history of the topics discussed, focusing on the FCC's rulemaking processes and its evolution in the face of the ever-changing internet marketplace.