CFP FALL 2012 PLENARY NOTES

Thursday, November 15, 2012

Cooperative Innovation in the Communications Industry
Notes by Sergey Naumov

- Charlie Fine, MIT: Value Chain Dynamics: When Technology and Business Models Collide
- Dave Clark, MIT: Cooperative Innovation: Defining the Concept
- David Yacobucci, USPS: The Postal Service and Cooperative Innovation

David Clark

Today we want to talk about the approach to innovation called cooperative innovation. We explain the ideas and give some illustrations.

Charles Fine

I will be setting the stage for cooperative innovation. There are two dimensions of disruption - Technology vs. Industry disruption. They don't necessary happen at the same time.
Examples:

- Digital music – technology disruption, industry disruption. Sony music share fell, Apple iTunes share grew.
- Electric vehicles – technology disruption, no industry disruption. There are few entrants, but existing players are providing powertrains as well.
- Linux vs. Windows – no technology disruption, no industry disruption. In the desktop market at least.

We explore the disruption in the work started by Chintan Vaishnav and is being continued by Sergey Naumov. In this work, innovation comes from interplay of entrants and incumbents. We consider innovations in the context of entrants and incumbents.

Today, we want to have new framing – cooperative innovation. Coopetition happens in the context of both horizontal and vertical innovation. Examples:

- Horizontal
  - AT&T vs. Verizon as wireless providers.
  - Apple Phone vs. Samsung Phone vs. Google Nexus Phone

- Vertical
  - Samsung manufacture chips for all handsets, not only for Samsung phones
  - Android is operating system for all handsets, not only Google handsets
  - Intel and IBM – vertical suppliers, but they compete in how much value they get.
- Sometime we see both.

Question is - in more mature networks, how does innovation happen? There are virtually no new entrants due to high barriers to entry. Innovation ideas require answer to question how we cooperate and how we compete - horizontally or vertically.

In other words, there are more complex challenges for innovation in mature competition networks. We will hear US Postal service provides example in the second half of our talk.

Question: Some people observed there is re-verticalization of the industry. Apple feels need to design its own ships. Google controls values chain from content creation to user experience. Is this trend more towards verticalization before going the other way?

Charles Fine: We are in the oscillatory process – there are periods of vertical firms, and then that structure becomes vulnerable because of the complexity, niche competitors come in and cause disruption that causes disintegration, small players they become powerful and start integrating again. Clockspeed defines rates at which it happens.

Where are we here now? Apple innovated initially, but integrated a lot now offering iPod, iPhone, and iTunes. Google invented search, but it integrates now etc. They all are headed towards the disintegration. I argue that there is temporary advantage of everything from Ford to Apple. The faster the clockspeed the shorter the reign. The length of time you can dominate is shorter in fast clockspeed environment.

Complex value chains are not that stable for that long in our industry – communication and media, as the rate of innovations is high. What form does innovation take? One form is entrants vs. incumbents. Other is cooperation that allows evolution.

Question: One of the inhibitions of innovation is that creates the distraction. What are you doing now is more profitable than you might get from innovations. Large companies are based on quarterly results. Innovation may mean results are going to drop. How do you reconcile it?

Charles Fine: Kodak had nice margin of 90% on films. Kodak invented digital photography and gave up its margin of 90%. So, Kodak was unable to continue its business. This is a challenge for all public firms. We got new inventions. But there is a period of worse before it gets better. In a public company, when things get worse, CEO gets fired. What do you do? It's an ongoing challenge. It creates conservatism in more mature firms. This is one of the reasons why innovation often comes from entrants. They have less to loose. The dynamic is partially because of technological innovation, but partially because of the way the players in the value chain act, financial opportunities etc.

Question: Maybe it's not only because of financial mechanisms you mentioned, but also because in the new s-curve there is different set of capabilities that incumbent doesn't have.
Charles Fine: It's a great point. Interesting thing about the Kodak case that it invented all new technology in the new s-curve, but still couldn't do it, but in many case entrant creates new set of

capabilities that entrant doesn't have. But today we want to focus not on new entrant vs. incumbent, but on new model.

David Clark

The dialogic around incumbent vs. entrant story is the dialogue of competition and displacement. I want to talk about cooperation. What disruption looks like in this context?

Small companies do not usually change the world. Usually entrants find a niche and move in. Mostly startups don't change the world. People coming in the double helix disintegration phase, are looking for the niches.

There are times where you want to shift the landscape. What do old firms do? Sometime they disappear. Sometimes they buy small companies. But when you do, you only get innovation from small companies, that is you are only buying a niche. It's hard when you dominate the market to get more market share. You need to make the pie bigger. You have to change the work. Cisco's Chambers said Cisco cannot grow by mergers and acquisitions because they don't make pie bigger. We need a research and innovation that we can do.

One company cannot change the world on its own. Cooperation has to occur both horizontally and vertically. Alignment is necessary for cooperative innovation.

Examples
- **Emergence of secure web SSL.** It wasn't the one actor who did it. A lot of people had to work together. Web servers software, business of certificates, people who run websites etc. There were a lot of individual people who took actions. And it worked. Important to notice: by these collective actions they enabled e-commerce.
- If you are trying to look at the story, it is not clear if you can focus here on incumbents and entrants.
- **Spam.** Rise and fall of Goodmail. The proposal was if you are bulk mailer, you register and say what you are – spammer, commercial bulk mailer etc. Individual recipients decide where they get email from. But they don't filter the content. As long as mailers comply, you don't inspect the content. If mailer doesn't register, they will filter it or strip images and active codes etc. The problem here is that people who did this decided to make mailer to pay a fee. The minute it happens, bulk mailers said it would destroy non-profitable groups. A lot of e-mailers objected. Google said the power to filter should be in the hands of users. Email providers abandoned the idea.
- Lessons learned. Email providers have terminating monopoly. If I send email to Gmail, I have to talk to Google. This people have market power. If somebody puts together proposal of actions along the value chain, that changes the traditional market power scheme, it will be rejected.
- **QoS.** In 1990, the allocation of revenue wasn't thought through for Internet. We didn't have the model how to move the money around. There are some technical problems.

- o We have to agree on the definition of service.
- o Necessity to increase information sharing.
- o Partial deployment would be ineffective (all ISPs have to agree).
- o Money routing scheme, business models, not technical.
- o You have to deal with all people to move at once. You couldn't do prove of concept without everybody going. In horizontal competition, if you have they in your room, lawyers prevent open conversations.
- **IPv6:** Perhaps not an innovation. Slow progress, despite many ISPs and most OS and service support it. Barrier is upgrading all Web servers. Less than 1% is upgraded so far.
- Lessons: why people upgraded to SSL, not to IPv6? There was a benefit in SSL - e-commerce. With IPv6 you have to spend money to upgrade, but you don't get any money from it. Others get benefits, but not you. Why should you do it? We have to find the scheme to make money for people, but there are many people.

Generalities.
- You need a leader for the scheme. Sometime a leader doesn't have to have market power. Just in the right position.
- You need a financial model. All actors have to have incentives to act.
- Shifting revenue along the value chain to balance incentives is not practical
- Need balance of power and control along the value chain
- Need an approach that allows incremental deployment

We need case studies from you to try to better understand lessons. Examples can be historical or future.

Question: How does the utility model play with the cooperative model? The key resources like roads, sewer, or water infrastructure. The actor that provides the glue, underpins the whole system, but what if it is not a profit making enterprise?

David Clark: It's clearly a very important variant of the story. It's a good point to make. The reason you have government is that individuals cannot do some things on their own. Governments are different. Broadband access is a potential candidate. US government decided to let private sectors do it, Australian government decided they have to take it over from the private sector.

Bill Lehr: I think the public utility is a model we need to look at it. We also need to consider other models. Roads are important, but gas stations are necessary. We need a discussion about other models, why and if telecommunication is unique and if this is a public utility.

Comment: Taxation is a money routing protocol.

Comment: Telco is an interesting case. It is a natural monopoly.

David Yacobucci, USPS

Normally USPS is not thought of as either cooperative or innovative. However, earlier they did innovate with pneumatic mail tubes and even rocket mail. How does the boring mundane postal economics fit into media communication futures? Postal has some excellent fit and case studies.

Mailing industry is really big and dynamic. There is over a trillion dollars of economic activity. 8.4 million jobs. Postal service is just one player. There are private carriers. FedEx is another player and there are complex relations between.

FedEx
- Competitor: in overnight, 2/3 days and ground packages.
- Customer: uses postal service to deliver over 30 percent of its ground volume (no surcharges)
- Supplier & Partner: provides the postal service air transportation for expedited letters ($1.5bn in 2011). FedEx Drops boxes at over 5000 post offices.

Pitney Bowes
- Competitor: Presorts over 14 bn letters per year. Digital mail services with online bill pay.
- Customer: Processing and delivery.
- Supplier & Partner: Postage meters.

Newspapers and Amazon
- Competitors: Advertising dollars. Content distribution (Kindle). Parcel delivery (in some areas).
- Customer: Process and delivery.

Question, Prof Fine: Is postal service a proactive platform that invites competitors? How proactive you are vs. reactive? Physical distribution is not going to go away. To what extent you are going to market it as a platform and complementary capability to electronic distribution?

David Yacobucci: Traditionally, postal service is reactive.

Question: Does USPS restrict its product planning to physical domain or you think about electronic domain?

David Yacobucci: Head of the digital services have stated they are not interested in email per se. I hope they can change. They need to link physical and digital platforms. But they focused away from email. They want to offer other digital services. But they are focused on physical mail.

Charles Fine
I want to talk about two other case studies on the coopetition.
First is shared spectrum. Are there different models for spectrum allocations that would be radically different in terms how wireless communication works?

Recent PCAST report concludes spectrum scarcity "an illusion".

Incremental suggestions:
- Leverage technology to allow devices share spectrum with federal users.
- Work to make federal users more spectrum efficient

There are three lenses on change:
- Rational – rational. Organizations are machines. Action comes through planning
- Political – emotional. Organizations are contests. Action comes through power.
- Cultural – invisible. Organizations are institutions. Action comes through habit.

If you want to bring the change, the players might engage in political process of lobbying.

Second case study is creation of the SEMATECH in the semiconductor industry. This is the example how coopetition looks when it works. In the 1080s, US semiconductor industry felt threatened by the Japanese, they got together (all of them made their own chips at that time), they coordinated the supply chain (150 suppliers), created the technological roadmaps.

Lesson. How you make industry to move together?
- You have to engage all players. All major players.
- Intellectual value chain.
- Government agencies and regulators.
- Roadmaps, consensus around a common vision and leadership.
- Collaborative processes around projects.

What can we learn from other domains about how to bring the innovation in the complex network - it is still an open question.

Comment: When you look at international context, it can work both ways. You have to leverage other players worldwide.

Charles Fine: There are many jurisdictions and they deal differently with issues. We have to look at it. It's tough to act together. All players have different backgrounds acting.

Comment: In case of Metropolitan Access Exchanges where NAPs fit in, it seems to work pretty well. It is not necessarily because of monetary system, but it organically works well in terms of wired and wireless because of security issues, which is the common interest that motivates innovation.

Charles Fine: The common interest in semiconductor industry was what ended up making things move.

Comment: Another interesting work in progress is DECE for rights locker and reducing transactional frictions for electronic media. When things go off the rails is when common entity that is needed as a catalyst of the system obtains too much power and becomes a king. In the case of Ultraviolet, they got inflated expectations of how much money they will make out of this vs. others.

Charles Fine: It's interesting, because semiconductors makers said that that they collectively are going to make more money than Japanese, but they were not thinking about it as zero sum game where I get more, you get less. I think it's important.

Comment: Interesting examples is about national weather prediction industry. Who played which role, what communication they use? Interesting interplay not only about economics, but regulations as well. It's a complex web of who depends on what, who uses what, who gets to decide, who is having power and control.

Providing for Emergency Services
Notes by Dan Sawanda

George Fosque - Director 911 Service in Cambridge
- Trading room like OPS center
- 40,000 Emergency / 200,000 Non-emergency per year in Cambridge
- 260 centers in MA (75M USD funding for equipment)
- 6000 centers in USA

- 1960-70's -> urban areas
- 1970-90's -> ANI / ALI
- 1990-present -> support for cell phones and VoIP
- Future -> IP based video/text 911 calls

- Location Issue
    - Cell -> Law for telcos to provide lat/lon
        - accuraccy, especially urban areas
        - cell tower triangulation (no access to smartphone GPS)
        - Z axis problem
        - moving callers
    - Landline -> Database update (new buildings) is problematic
    - PBX -> Layers of poilitics between organizations
        - E911 -> Third-party subscriber databse
    - VoIP -> No regulation for subscriber to relabel phone contracts upon address change
            Education issue?
- Call Routing
    - Current: cell sector and caller ID
    - Future: Idealy lat/lon

- IP based 911 (NG911)
    - text -> 911 call takers have IT literacy issues, especially typing speed
    - image -> good for responders, but overload for dispatchers

- accompany data -> medical records, etc.

- Smart routing
  - currently, all calls are taken by main center in framingham and routed based on location
    - highly inefficient
  - idealy, it should be a one step route (bypass main center)

Hannes Tschofenig - NSN / IETF member
- IP based emergency calls in EU
  - Text based 112 (EU emergency number) does not work (language, etc.)

- Cost reduction leads to consolidation (Finland)
  - 160 PSAPs in 1960 to 14 PSAPs present
  - Overload in extreme emergency -> cant understand whats really going on
- Location issue

- Interoperability issues
  - Legacy equipment and infrastructure systems
  - Each country has its own emergency comm number

- Security issues
  - Basic threats of IP and SIP is inherited
  - Resource compsumtions due to false calls (> 50%)
  - Who is liable in case of trouble

- Attribution issues
  - Anonymity of IP based services (e.g. skype) has major problems in emergency calls
- Make stakeholders -> different incentives

Paul Kolodzy - Consultancy in Software Radio / 911 Policy
- Emergency communications backend
  - Locally funded
  - Regionally controlled spectrum
  - National controlled spectrum
  - globally gathered technology

Media Rights Management Online
Notes by Jonathan Speiser

John Cate, Copyright Futures for Broadcast

John Cate spoke about the shift in the consumption of media ("new media"), which has allowed some to benefit off the work of songwriters while cutting them out of the revenue picture. According to Cate, existing royalty existing is outmoded and is out of touch with the realities of new media. [1] Cate cites

number of Cisco on music streaming and extrapolates that value is missing from the songwriters, based on an analysis of consumption patterns. The decline revenue for the music industry has resulted in increased competition among artists. The traditional broadcast reporting system for artist payout does not fit the new broadcast environment. Cate sees the carriers and copyright owners as bearing the costs without benefit.

Dave Clark, The SOCAN Experience

Dave Clark brought an example from the Society of Composers, Authors and Music Publishers of Canada (SOCAN). SOCAN claimed any transmission on the Internet, constituted a public performance, and went to copyright board. SOCAN claimed it was entitled to collect royalties from online transmissions. SOCAN wanted to compel ISPs to be the agents of collection. The two main issues with this approach: 1) how do you set prices 2) how do you track usage.

Instead of trying to get ISPs to track music transmissions, SOCAN wanted to take a different approach. SOCAN wanted ISPs to collect money from users and give it to SOCAN – essentially a music download tariff. They proposed, if ISPs paid them 25 cents per customer, they would indemnify ISPs of any transmissions.

25 cents doesn't sound like that much. Are the artists going to get money?
ISPs would be afraid of having rates jacked up. (Now it's 25 cents, but what about in the future?)
ISPs were afraid of this kind of precedent. The Industry is layered, because technology is layered. Will ISPs soon have to collect money for movies? (where would it end?)
Cable industry, has collected money and given it to programmers.

Two places to extract money:
1) Consumers
2) Ad revenue

SOCAN wanted the money extracted directly from user.
Critical problem though was colliding old models in a new space. Neither side really saw the potential for a new, innovative model to change the equation.

Nancy Baym, Embracing the Flow

Historically, needed a lot of resources to distribute music. Internet has made the distribution flow very easy.

Internet enables:
- Reach
- Direct contact (no middle men)
- Group infrastructure
- Participation
- Fan culture.

The people orient around moral feelings. (e.g. "good" vs. "evil"). People's actions tend to be based on what they feel is fair.

In Sweden, some artists gave their music away for free. ("If it doesn't spread its dead")
What do they get in return?

Non-monetary value:
- Status (with so many options, attention is important)
- Data (if you can make sense of the data: where should we tour, etc)
- Help (audiences are happy to contribute art, social networking, promotion, IT etc)
- Support (encouragement)
- Audience community (important for sustainable community)
- Relationship (making friends)
- Creative life. music creation as an unfinished life before the audience sees it.
- Collaborative culture. remix culture. sharing enables to gather like minded build to build a community.
- Global reach. if you want people to hear your music.
There are other ways to get value from people other than just worrying about collecting money from each person

Big questions:
- What's the broader context of copyright?
- What are the different kinds of value that can be extracted?
- Who provides value and how?
- What's the new "fair"?
- How can we "rehumanize" creativity?

FRIDAY, NOVEMBER 16, 2012

Responses to Coordinated Innovation
Notes by Travis Rich

- Andy starting with video to get people thinking about innovation in a different way
  - Thinking differently – showing a video of a helicopter with a single blade.
  - Inspiration was maple leaf trees – inspiration can come from funny places.
- Andy's Trip report:
  - Went to watch the election in New York this year
  - Has done it a few times in the past with ABC, NBC to watch the technology of how people broadcast about the election.
  - For this election, his host was News Corp
    - Wall street journal
    - Fox News

- The two companies, owned by same company, located in same building – but they absolutely do not talk to each other.
- Individual Innovation
  - Big companies versus entrepreneurs
  - Individuals versus organizations
  - Ecological Considerations
  - What is it that allows individuals to be innovative?
  - There is a trend that entrepreneurship is strongly associated with innovation.
    - Andy doesn't know if this is right, but it is certainly catching on.
    - Does entrepreneurialism make people think small?
- We're at an important cusp of digital understanding
  - We, at the lab, spent most of our lives trying to digitize our lives – sound, pictures, videos, and text
    - At the time, we had no idea what we were doing – we did it out of pure interest
  - But, by the mid and late 1990's most of the digitization had been completed.
  - But there was more than just digitization – the motivation was, once the world was digital, the system could know what the data meant, and act on its meaning – but we haven't reached that.
  - But we are now at that threshold of digital understanding, at the edge where our systems will really be able to understand what the bits are that we create, rather than their raw charge.
- We're at this cusp because of the maturation of 4 main ideas: sensing, analytics, people, and places.
- Examples that come from being beyond this cusp:
  - Autonomous vehicles
  - Supermarket/urgent care data sharing
  - BBC Click emergency response without knowing about the wife
- Tony Tauber from Comcast speaking:
  - Talking about innovation within Comcast, it's a big company that takes a lot to get all the moving parts going and communicating
  - Assets are the network footprint, customer relationships, and content agreements – and these are the themes that they're running with improving.

Darrell Benjamin, USPS
  - Digital 'disruption'
  - The postal service has seen also of disruption
  - Email, electronic payments, music/movie, e-commerce, must open the door
  - Six years ago, there was an all time high of postal demand – but since then, there has been a nose dive.
  - First-class mail delivery is their biggest profit cow
    - But email, eccomerce, etc are starting to chew away at the demand
  - Ecommerce has driven up demand in package delivery, but the USPS network was not designed for package delivery – so it's been a slow road to evolving to match that.
  - Innovation Ideas that they're considering
    - Email Box (national email – like physical address)
      - May be useful as a destination for official documents, high importance documents
    - Hybrid mail (physical to digital and reverse)

- Broadband for rural areas
- Banking services
- Consolidation of Gov't services
- Competition with private industry
    - Despite decline of postal volume, the number of new locations that must be served increases 5million+ per year.
        - Universal service mandate – as outlined by the constitution
    - Q: on a hybrid approach, how do you maintain the guarantee of privacy? Do you?
    - A: It is something that congressional legislation would have to consider. But there is no clear answer for how you would change the 'sanctity of mail'.
    - Q: Is there an opportunity to 'bind the country' in a way that is beyond what commercial players are doing right now. So not just doing package delivery or email delivery, but a new kind of connection.
    - Roberto Minerva from Telecom Italia
        - Telcos live a world of paradox
            - Increases in service (or cost of service) do not lead to an proportional increase in revenue.
            - The services charged by the Telcos are things that are given for free by the Web
        - Reasons for change and telco innovation
            - They are in a decline – but a slow decline. They have time to reinvent themselves
        - There are a few things to do with the 'network'
            - Transform the network to provide better service, sensing capabilities, etc
            - Decompartmentalize Srvices and network capabilities
            - Focus on information centric environments
            - A disruptive shift: defend your customers from too much communication
            - Choose the right role in the value chain: bit carrier, service enabler, or service provider
        - Future Internet: The case for personal data
            - European laws different than US laws, and there is a huge impact on the way technologies can be developed or implemented.
        - Volker from NSN
            - Technology change has been a step function, but revenues remain only incremental
            - How does the ecosystem center change as technology companies grow and evolve.
                - Shifting to Silicon valley as google and apple start to dominate the market
            - Artificial intelligence is growing – siri, IBM Watson, Google Car, and can we use these kinds of technologies to impact how our networks work, how our automation and operations systems work?

The Economic Health of the Broadband Value Chain
Notes by Halil Kiper

Marie-Jose Montpetit, MIT: Why French gets it all for free:

- I'm going to talk about the <u>user</u> and about Innovation in <u>France</u>.
- No social, no life TV, not very technology oriented
- I'd like to give credit to three people … (French names, couldn't catch).
- This study proofs that Chintan's PhD research was right.
- Unbundling of the local loop was a critical endeavor.
- In the 70s in France, people were taking their phone calls at the post office and local bars - hold on to this thought, will get back to it in the context of users.
- In the 70s the government decided to invest lots of tax money to put phone booths everywhere.
- In 1982 Minitel was designed to replace the phone book. Electronic gizmo, every inexpensive (?), always on, very useful services/information (schedule of trains, weather, stocks, reservations, …). Until this year (June 2012) there were still some Minitel services in France.
- Pink Minitel: porn service – extremely lucrative.
- So, at this point keep two things in mind: 1- making phone calls in the local phone booths. 2- Minitel
- Who were the original players?
    o France Telecom, 15% owned by government.
    o SFR (owned by conglomerate Vivendi Universal) a telecom operator.
    o Bouygues Telecom
- The big question that was asked in the EU community: will unbundling create service competition?
- The EU mandated to open the local loop by 1998. The idea behind that was to create market competition within the EU.
- Supply aspect: a lot of the equipment wasn't build in EU, lots of capital investments was going to other parts of the world. They wanted to keep it in EU. Lots of EU operators offered their equipment in open exchanges. However, each EU member created their mandates by themselves (not much coordination).
- What happened with the opening of the loop? Regulators set the tariffs (pricing) by asking local professors.
- Competition in ADSL. What is the differentiation? The ancillary services (best voicemail, best caller ID, …) created the differentiation.
- France telecom (legacy operator) wasn't happy about this; they thought they'd loose a big portion of the market.
- (French name – couldn't catch the name) said "Who looses the control of the network looses control over the network information" – but history proved this statement wrong.
- The three players started sharing information, charged with collusion.

- Free: a startup going after the telecom market.
- Looked at the users and determine why cost so money for the incumbents.
- Same box for many services, low operating cost, and they take user behavior into account.
- Is it really free? They have a hefty deposit fee. No contract, but you pay a penalty if you terminate your account earlier (this is like a contract), questionable level of service, 10 hours during working days.
- Capitalism at work. All the operators are profitable, all offer similar things (boxes), **low cost service expanded the market** (the big contribution of Free to the industry), due to low cost, more people wanted to have broadband access. Market expanded 6% in 3 years. So, Free created a marketplace.

- Free is looking into Washington DC.
- DSL is so good that no one wants to pay for FTTH (fiber to the home).

- Conclusion:
    o Although socialism is usually dominant in France, in broadband they have a capitalistic structure because of these entrepreneurs (Free).
    o I'd pay $100 less for the services that I'm current using if I had access to the Free service.
    o Innovation of Free = Zero Opex, Box with everything included.
    o Can this happen in the US? It is unlikely that the president will tell Comcast how much to charge for its service. But it worked in France because it was created with the end user in mind.

Volker Ziegler, NSN:
- Two comments about the previous talk: Free: innovation is the box. Free doesn't have a legacy architecture, so it easier to do. Free uses IP architecture. It's ubiquitous.

- My talk: Usage-Base Pricing
- Interplay between OTT (the edge) and mobile CSP.
- Usage-based pricing vs. value-based pricing.
- It's about services, not so much about technology. So for value-based pricing you need to link the underlying technology to services.
- Tying a developed technology to a business process (e.g. USPS) is valuable.
- Voice is not dead. Voice over LTE (compared to VoIP has high quality voice, guaranteed BW, better codec), high-quality voice is still very important.

What should CFP and partners do going forward?
Bill:
- I wrote a blog about bb pricing in the US. Flat rate pricing model → traffic increases.
- Looked at this couple years ago with the broadband working group.
- If traffic continues to grow, firms have to invest in additional capacity. If these firms don't expect additional revenue from these investments, why should they invest? The industry needs to talk about this.
- A paper (?) was published that got people talking about this.
- Going forward, should we call the working group MOBILE broadband working group?
- Re-launch the group as mobile. It's not just the mobile infrastructure; it includes fixed broadband as well.
- Who are the players in architecting the value chain, what research would contribute to their work?
- What would the working group do?
- Within CFP we can spin off groups for short-term focused research or we can have long-term groups/project.
- Start with a set of calls (not more than two/month may be only one/month).
- Lots of e-mail coordination.

- Any CFP member can opt in. As a CFP sponsor you can influence our goal of this group.
- Participation shouldn't have to be limited to CFP sponsors, we can ask anyone to participate depending on what we want to do.
- The first deliverable can be a 15-20 white paper (about the length of the original broadband working group papers) in 6-9 months. The content would be solely the author's opinions and it doesn't have to be the official position of the companies they represent.
- The goal of the paper is to frame the debate: here is the problem (traffic growth), it is different, it causes challenges in the pricing model, there are different ways to deal with this → first paper.
- In the research agenda include topics that we already know are important: for example better metrics are needed to understand the trends (what does it mean "traffic grows fast"?). Need to more empirical studies. Present different kinds of pricing models. Pricing in this segment should be more like selling X, pricing in that segment should be more like selling Y. The components of the work can be determined from the conference call.
- How much are people valuing bb. What is their willingness to pay?
- Usage pricing models and the system dynamics models of it.
- These are the kinds of things we'd like to do. I personally believe that mobile bb is complement and substitute for fixed bb. The existence of mobile bb disciplines fixed bb.
- When you shut down PSTN and move to these currently unregulated systems, how do you regulate it? It happens with the FTC (federal trade commission) in US.
- Use the white paper to connect the piece and point out that there is not a single but a number of problems.

Questions:

Marie-Jose Montpetit: When we talk about mobile we talk about devices being mobile. We also need to talk about users being mobile. Every Free box is a hot spot. So, there is an example (Free): looked at the user behavior and decided what to do accordingly. Without considering the user behavior, it would be a dry economic study. So, the users are very important.

Bill: content, user, technology, … all can be included in the work. In the original bb working group we looked at usage when we looked into personalized bb.

Volker: focus on 2 things: 1- Leverage MITs intellectual ability. 2- Leverage each other strength – do things we (CFP members) cannot do individually but we can do together.

Bill: the white paper: let me show you that there is this problem. Then there are these large chunks of issues that need to be addressed. Here are few things that we are doing. Joint workshops to bring together best practices form EU, Asia, US, … Will send an e-mail to whole CFP group and you tell us how you want can contribute to the working group.

Chintan: want to make a point that some of our past work can contribute to this effort.
My work has been about the understanding the underlying conditions when
- Incumbents are displaced by new entrants.

- Incumbents hold on to the market and repel the new entrants.
- Both co-exist.

My work was more theoretical and model based, but Sergey is verifying the models with empirical studies. What we could with Free for example is to ask questions like:
- Are they doing something specific about the network effect?
- Do they have an architecture so that their low cost structure is permanent?

Based on this type of Q/A we can do some predictive work and we are capable of doing that. Something to keep in mind.

Bill: Via e-mails we'll start scheduling the calls.

Introduction to Information Centric Networking, David Clark and Karen Sollins
Notes by Halil Kiper

David:
- Information Centric Networking = ICN
- NSF (National Science Foundation in the US) and EU commission funded a number of projects to look at architectures for the future of the Internet. An initiation that is framed by asking: what the Internet might look like in 15 years (not how to make it better)?
- The projects are motivated by different visions of the future; for example, can you make hand-off seamless across broader ranges of technologies (e.g. Internet to cellular)?
- Today we'll focus on ICN. In today's Internet, IP addresses identify machines and you send packets to machines. This is not what people want to do and the question is can we design a network that connects services and objects rather than machines and focus more on the application of what the user wants to do.
- In ICN there are names for services and information objects and the network knows about those; so network level services are provided in the context of these names. What's the benefit of this? More efficient delivery of content (grossly simplified).
- There is tension going on in the Internet today. If you look at what the network layer does it computes routes using BGP and packets go over them. But today, 2/3 of the consumer traffic is delivered by CDNs (content delivery network) – half from Netflix. The BGP is no longer a router protocol, but it is a connectivity protocol on top of which CDNs operate. These mechanisms are not well coupled; it is difficult to do provisioning if you don't have control over the routing and routes are now driven by CDNs.
- The question that I state for research is that "Can ICNs solve this problem and can the network help with efficient content delivery?"
- If you look at the proposals of the other projects, they have other objectives as well, such as security, resilience, etc.
- ICN in general eliminates the need for CDNs.
- Within ICN there are different ways to solve the problem. For example, should content be positioned explicitly so that it looks more like a CDN or should content be positioned implicitly when forwarded to routers? What is the security model? How do you deal with privacy? With ICN I tell all

the routers along the route what piece of content I wanted – privacy concern. So, privacy models and relationships to CDNs and higher-level services raise many questions.
- I will describe two of ICN schemes:
- Scheme # 1, NDN (named data networking): You take the data and break it into packets. Every packet has a name; the names of the system are the names of the packets. You send the interest into the net and it contains the name of the piece of data that you want. As your interest goes through the network it discovers the data and sends it back. There is strategy layer ("magical" algorithms) that forwards the interest in a useful manner. Every router through which the interest goes makes a note of where the interest came from. So every router has a per packet state – very impressive for the router. Having a per packet state leads to something very interesting: the path along which the interest came is not specified in the packet, it's specified in sort of a per hop basis in a state that is stored in the router. So, you don't need source and destination addresses in the packets.
- Scheme # 2, Publish/Subscriber for Internet (PSIRP): comes from the European side; an entirely different approach for ICN. It uses the scope concept. You specify the name of the machines that you use in the scope and then you publish your content. What does it mean? You tell the scope to take care of my content, define a content ID, which is linked to a scope ID. If someone wants the content (subscribe) it is like interest from the previous scheme in the sense that you send the packet with the name of the content you want. However, it is not routed in a semi-algorithmic "magical" strategy layer, it is explicitly forwarded to the scope, meaning that it is forwarded to one of the machines in the scope. The machine establishes the connection. This scheme has the idea of explicit or managed information placement as a part of its architecture; at least it can support it. In NDN (named data networking), unless you put a CDN on top of it there is no explicit management.
- What's the difference between CDN and scope? Good question!

Karen:
- Additional point: these models are not coupled to a point-to-point communication. So, there is a change in both communication paradigms and what's most effective and efficient. We have never been good at doing multicast in IP. These models may change this story significantly.
- These schemes represent change in the power structure.

Dave (Cisco):
- Another coupling here: in the IP world, congestion control and protection from DoS (denial of service) are treated as separate universes. It appears that in NDN there is a much tighter coupling between congestion control and DDoS (distributed denial of service) because the only difference between them is whether the person sending the traffic is doing so in a malicious manner or not. So the mechanisms to check for DDoS are likely to be the same those for fundamental congestion control.

Hannes Tschofenig (NSN):
- One of my concerns: when we look at the double helix that Prof. Fine presented; we have the link between the application layer and network layer. So, the networks are geared toward application, not generic enough. Now, I get the feeling with these proposals that they are stepping back and

focusing on media, but it doesn't service other contents like real-time traffic, personalized content, etc. Although the proposals are intellectually and architecturally interesting, isn't it a step backward?

David:
- I can respond to that in the context of NDN: I'm referencing Van Jacobson – NDN is a failure unless at a minimum it can do everything Internet can do today. If the strategy layer works, if I want to do Skype, each side simply sends interests and becomes point-to-point communications. They have Skype "cousins" running on top of NDN.

David:
- PSIRP has explicit placement of content and explicit selection algorithm and it looks more like the command-control CDNs have today
- NDN has no such control elements, the "magic" happens with the algorithms in the strategy layer.

Spectrum Sharing Research
Notes by Mohibi Hussain

Hannu Flink, NSN
  - still needs more cleared spectrum- licensed spectrum is the priority-
  - 10 times more spectrum
  - potential roadmap for ten times more spectrum
  - offloading traffic from LTE & MTS network to get us free spectrum
  - intra and inter operator sharing
  - PCAST- 2012 -New Federal spectrum access system
  - incumbent
  - secondary QoS access
  - why ASA (Authorized Shared Access)
  - IMT/Mobile broadband will always prefer exclusive use
  - ASA offers incumbent spectrum use control
  - example ASA architecture shown
  - architecture diagram on slide
  - Key research questions:
  - role of spectrum sharing in mobile industry
  - assessment of value of shared spectrum
  - how spectrum sharing affects collaboration
  - tip pining point of cognitive radio in mobile broadband

Bill Lehr
  - Spectrum management working group and DSA

- Agenda: future is saved spectrum: need commercialize DSA tech business models and policy to support novel ways t share spectrum
- PCAST report: how it plays politically-
- WSRD Planning- wireless spectrum R&D steering committeee- group formed by congress- president- how to use govt spectrum effectively
- Wireless@MIT : technologies to enable 1000+ fold efficiency
- NSN-MIT LSA/ASA CFP Spectrum WG
- Public safety
- TVWS- TV WHILE SPACE, db TUPE MANAGEMENT CONTROL ARCHITECTURE
- Small Cells (DAS sharing, network MIMO, shared Infrastructure)
- physical or application layer sharing or the combo of both
- urban planning needed to facilitate franchising stuff
- Mobile operators getting access to more spectrum….business value: intermediate sharing model
- Policy value: promote novel spectrum sharing, consistent with policy in US/EU
- Leverage regulatory flexibility to transition to market-based regulation

Wireless Group Operating Process:
- convene key stakeholders
- 5-10 conference calls
- webex/ email , file sharing (Wiki?)
- Participants: CFP opt-in…non-CFP- invite only

White paper:
- purpose: frame the isse, set agenda
- 15-20 page " position paper"

Strawman Outline:
- Motivation: what is the problem?
- Bands for deployment/trials
- Roadmap for experiment/plans for progress
- David clark: asks about cooperative innovation to audience?
- 100 times more base stations for 100 times more spectrum: traditional sense; cost mdel that base stations are expensive; every free box could be LTE Hotspot not necessarily wifi hotspot
- cultural differences are significance
- operators resis shared spectrum just like hand off to wifif
- free box in your house: could be the novel idea: the free box is not just a do-it-yourself hand out: how much traffic ; how it plays in rural/dense area…might whack the industry
- Maria: user influence in all of this: another thing to understand is where is the application: LTE world: ppl are re-visiting standard itself: it was made application-blind. Group in europe; inventing LTE again ; video application customized; some errors allowed for video, maybe find application layer

- frees a lot of stuff
- standardization is application and user-blind; maybe its wrong
- BL: MIT looking into the idea:
- Intellectual property rights- standards could be repository for the technology so ppl get compensated for innovation
- Comcast: T-mobile does that in Europe
- users with hotspot in homes could , why providers don't do it now: " we are not going to offload paid traffic to unpaid traffic to wifi"
- T-mobile charges you for voice minutes
- Roberto: telecom italia: addressed David Clark-; look at japan, wifi offload prevalent since 3-5 years now….they do it in a controlled manner
- still docomo etc
- true underlying answer; most fascinating: value of mobility: disruptive ways not full signaling needed
- seamlessness; mobility is the demand; QoS management and measurement; application & content related are some of the elements
- mobility in the age of true broadband: maybe second legacy
- Bill Lehr: good segway to next way: service change and value proposition: who might own that: very practical thing; u can't have wifi without radio frequency which is dependent on government; has to be regulated; downward stack of business model
- Bill Lehr: lot of ways to get involve in spectrum war; research
- liquid value chain innovations: systems are complex, RF antenna, network, power, urban planning- multi-disciplanry- economics and policy involved
- throw stuff out there and play with it and go back and forth- wireless space: take advantage of RESEARCH
- David Clark: take a vote: for NSF