Minutes of ICNRG interim meeting, Kista, Stockholm, Sweden, February 14-15, 2013 ¶

During the meeting we used an Etherpad to collect some of the notes, they have all been integrated into the minutes on the Wiki, but the original Eherpad can still (at least for some time) be found at: http://neclab.titanpad.com/icnrg-stockholm

Thursday morning ¶

Agenda

- 09:00 -- 10:30 (Notes: Damien)
  ○ Welcome
  ○ Minutes takers
  ○ Status reports from ICN projects (10 min/each)
    ▪ Focus on experimental results and future plans
    ▪ NDN (Lixia Zhang)
    ▪ PURSUIT (Dirk Trossen)
    ▪ NetInf? (Dirk Kutscher)
  ○ ICNRG Document status (Survey, Challenges, Scenarios) (10 min/each)
    ▪ ICN Survey document
    ▪ ICN Research Challenges
    ▪ ICN Baseline Scenarios
- 11:00 -- 12:30 (Notes: Matthias)
  ○ Topic presentations relevant to documents
    ▪ ICN deployment
    ▪ Deployment potential of ICN. The discussion included ICN stakeholder incentives and the relation to CDN and CDNI. (Spiros Spirou)

Minutes

Börje Intro slides

- Agenda bashing
- assignation of minute takers
- probably a good idea to meet @Orlando for people not to forget what they promised to do :-D

few words about yesterday:

• publishing interface

• nowadays you have to wait that Google crawls the info to have it published.

• Stop thinking about flows

• objects are all over the place, so they can come from all over the place.

• Storage should become first class citizen, not only contents

Summary from Lixia

NDN experimentation

• overlay that can run over anything (IP, Ethernet, cellular) • NDN testbed runs since 2011

• they build applications (small and large scale) to stress the architecture and determine • presentation of the testbed http://netlab.cs.memphis.edu/script/htm/topology.html • demo made march 2012 at GENI conference and show video streaming and link failure/recoverage

• as there is not session semantic, it runs smoothly simply using "random-access"

• a retreat while they made experiments

• video streaming, photo sharing, prioritised dissemination among vehicle, server less chatroom… • since then, demo of a vehicular ames data, NDN javascript library, dropbox like, lightning control

• Link-state routing protocol is designed and will be deployed in the testbed next month

• use ICN directly to exchange routing messages as they are safe

• NDN traceroute (with techniques to bypass caches in the middle) • !! move NDN architecture forward

• develop cutting edge applications • develop the testbed (+ routing, monitoring, and management) • facilitate community

• NSF released the solicitation for "future internet architecture: next phase" • WE need more people in NDN!

Questions

• have you used a particular protocol for vehicular?

• used NDN, trick was to use names (e.g., what street…)

• names give you all the tricks :-D

Summary on PURSUIT

Experiment results

• brief summary of how it works

• works on Mac, Linux, Windows, Android, ns3-emulation

• deployment on 10 sites Europe + MIT in USA and NICT in Japan • dedicated 1Gbps and 10Gbps links for high speed tests (local deployment but accessible from the outside) • + emulation environment with computing clusters • use click such that it is the same code everywhere • fast path sees degradation after 6 pubs so receiver is overwhelmed

• Question

• Kostas: why would you have 6 applications on the same OS requesting the same content? don't you measure OS then?

• probably it comes from memory bandwidth

• Dave: You try to see forwarding efficiency but you are limited by receiver so you don't really test the forwarding efficiency

• right

• slow path when packets are minimum size and subscription to random items

• Question

• Dave: why throughput for fast path and latency with slow path?

• just example, there is more info on the papers

• pointers to other results

• use extended bloom filter to improve intra-domain performance

• Question

• Kostas: do you have only one topology manager? what if I move from one to the other, is there a protocol

• yes, and yes it is possible to have several topology managers

• made some applications over PURSUIT

• multimedia delivery • multi-party video • chat / IM • voice • fairly individual contents (not large but very personalised)

• future

• reduce slow path • provide mobility that use caching • try to see how to port BF to inter-domain • icn over SDN (working on implementation right now) • funding :-)

Question

• Dave: ICN is hot, SDN is hot (ICN + SDN = plasma). Would it be useful for the RG to try to sort this out? • Dave: we will have to face questions about ICN and SDN! • Dirk: well every thing could be made in a controller

• Dave: well I am not sure, forwarding is very different.

• Borje: let's discuss this after the coffee break

Summary NetInf?

• summary (large crowd, reachability, scalability, efficiency, performance, usability (how to publish and find contents …)) • question

• Kostas: what is NNRP?

• NEC platform

• description of a transport protocol (receiver driven AIMD) • made some applications

• web access • video streaming • content directory

• support time lines

• no distinction between live and non live, just chunks (check I am not sure I understood correcly) • netinf in DTN • software is available • new swedish project starting (EFRAIM) funding for new way of media distribution

Thursday afternoon ¶
Research challenges document ¶

Status Research challenges document ¶
Research challenges (Dirk chairing)

• for transport it is really necessary to define clearly the problem to be solved because the assumptions can change a lot the approaches.

• in which way do we want to go there • Dirk T.: maybe look at what was made in multicast, there is many material there

• let's go to read RFCs and papers back in that time, at least we could go faster to a solution doing that way

• Thomas: I would expect from the document first a clear goal and only later derive the challenges without touching the details of possible solutions, propose to go top-down instead of bottom-up as it seems to be right now

• Kostas: right now in the doc it is collective approach so depending on the sections it is different • Dirk T: we might see this document as a road map for what we have to do • Kostas: yes, but you have very different people that might read this document, so let's keep it readable for large audience (researchers, industrials…)

• Dirk: maybe it would be useful to illustrate the challenges • Dirk: What is the right approach??? • Dave: management is important particularly when the invariance of the system is broken.

• in IP, many management tools do not work well when invariants are broken, so we don't have to make the same mistake • Kostas: and when you have caching, it might be completely different, this is a new problem

• Dave: this is a more fundamental question, not just management • Dave: telco took 20 years to understand that routing was not management, so we should not make the same mistake, let's rethink things.

• Dirk: just a collection of inputs but we didn't highlighted anything in particular so far • Dirk: Is there a topic missing?

• ?: if we make the two documents in parallel, then we can eventually compare them and add what is missing or remove what is not necessary

• and converge to a taxonomy

• ?: see how to conciliate the different solutions

• Dave: interconnection mean having the intersection of features, we should not do that…
• Kostas: it is still moving so interconnect will be hard but maybe we can put a few paragraph about this challenge

• Bruno: we should make a system that does not require a lot of management since the beginning

Group work on ICN Research Challenges document ¶

- Thomas: goals instead of problems today
- Ionannis: need some more text mobility?
- Matthias: may need common ICN model?
- Dirk: assumptions
- Thomas: should not describe challenges per approach
- Ioannis: have to align section wrt level of detail
- also need terminology section: NDOs etc.
-
-
- Naming/Security?
  ◦ there may be more security than just naming-related
  ◦ separate naming and security (because linking them is a solution space thing)
- Security
  ◦ separating privacy
    ▪ are there IETF privacy guidelines that could be considered here?
    ▪ privacy considerations for Internet protocol (IAB document)
- Hannu: media distribution as a challenge?
  ◦ Dirk: probably too broad, but we may find specific topics such as DRM
- Dirk: access control & DRM?
  ◦ Damien: is that management and security?
  ◦ Bruno: do we have something about cache/content management?
  ◦
- Caching
  ◦ what are really ICN-specific challenges?
  ◦ in CDNs, there are contracts with content owners and APIs for management
    ▪ what would be the ICN API?
    ▪ reverse direction: logging, counting eyeballs
    ▪ probably needed for making ICN attractive for content owners
  ◦ legal requirements for caching?
    ▪ should formulate this as research issues
    ▪ "law-compliant" caching models?
  ◦
- Interdomain operation
  ◦ may be related to routing
- Business models?
  ◦ check with CDNI?
  ◦ probably better to have this as a separate document (maybe with deployment scenarios)

- ◦
- "Other challenges"
- ◦ list other challenges not dealt with here (business models...)
- ◦ Interop (inter-domain)
- going through document
- 4.1 naming
- ◦ discuss purposes (semantics) of naming
- ◦ Bruno: should explain difference to URLs
- ▪ location independence
- ▪ could be mentioned in the "goals" section
- ◦ challenge: naming semantics: network layer vs. application layer
- ◦ challenge: uniqueness, correspondance
- ◦ challenge: names and dynamic content
- ◦ challenge: persistency/versioning
- security
- ◦ assumption: open access (vs CDN)
- ◦ challenge authenticity
- ▪ name-content binding validation
- ▪ provenance validation
- ▪ trust assessment?
- ◦ data availability: published data is acc essible (resistance against Dos)
- ◦ infrastructure integrity, attacks against caches (posioning &. pollution)
- ◦ non-repudiation? (or application layer?)
- ◦ challenge: perfect forward secrecy (SSL-like confidentiality)
- ▪ privacy could be addressed on higher layer
- ◦ challenge: requestor identification?
- ▪ e.g., for access control
- ▪ does possession of bits represent security violation?
- ◦

Discussion with whole group

- Dave: ICN vs. ICS--ICN doesn't have a computational model, ICS does.
- Lixia: ICN is agnostic to high level content semantics
- Ashok: no ICN approach prescribes how bits are stored. Your'e not building computation into ICN.
- Bruno: in ICN is established this will be baked in for the next 40 years.
- Dave: there's validation and there's the assessment of this validation. Trust assessment
- Dave: in IP integrity and privacy are part of the same layer. In ICN, integrity can be part of the network, while privacy part of the layer above.
- Thomas/Matthias?: security & mobility
- Damien: security

ICN Survey document ¶

Status ICN Survey document ¶
Minute takers: Matthias and Damien

Survey (Dave chairing)

• The world does not need yet another ICN survey

• so what would contribute?

• have survey on background on existing systems to see what are the commonalities/differences? • baseline scenarios

• Owen: really do we need two documents? • Dirk T: Survey of surveys ?

• the question is not to look the space but to look how to look at the space

• we have to go further that just pattern recognition

• Dirk: ICS view is interesting: Information-Centric SYSTEM

• We are not anymore bits and pipes, we have something different. How to deal with that? How to be able to answer correctly people if we don't know exactly what we are talking about

• ?: Make the difference between the "instances" (i.e., the individual projects) and the general paradigm

• Well we need to have the big picture and it must appear in the document

• ?: Example of review: I don't understand what you are saying: too superficial survey. I don't understand what you are saying: it is too technical.

• so noticed that actually, we don't really understand what we are doing

• ?: How to make something that has a general structure when every body is pushing its own "baby"

• it would also be interesting to explain the things that die

• ?: Easy to talk about what has been made, but what about explaining what has not been well stated • Dirk T.: what assumptions about demand and supplies? nobody really talks about that

• Well it seems to be not the summary/survey but the research challenge document

• Lixia: number are not really useful, they prove to be wrong… • Dave: size of the primitive object: some say ~ MTU others try to find a sweet spot (e.g., x MB)

• with a rendezvous point that amortises everything its is completely different assumption
• Lixia: let's do like IP to construct future internet!

• Dave: you are assuming you already know the answer, we don't know yet

• Lixia: do we consider ICN is an information system or an architecture?

• Borje: people have many difference view and it would be nice to hear people

• Dirk T: assumptions are really making differences, we have to try to make a solution that is as independent of assumptions as possible, but we will not be able to make a system that solves everything

• Lixia: we have to follow a pragmatic approach • Dave: this is wrong, a lot of problems and frozen things now because we decided some numbers early when defining IP

• Kostas: we need to make a team whose objective is to break the proposals to be sure we are not biaised

• Dirk T. well but also we have to be sure we can converge to something, be constructive

• what are the implicit and explicit assumption such that we can see if destruction is meaningful or not

• Dave: would this kind of approach help the community?

• Borje: elaborate this in the work groups?

• Borje: lets start with a wiki page and people add and modify and we will converge

Dave gives an update on the survey document.

• Dave: The current surveys discuss each approach separately (e.g., ComMag?). We don't need an additional document in this direction.
• Dirk T.: It is more interesting that the survey discusses how to look on the space like ICN. As an example, how does ICN (naming) contributes to the problem of consistent identification? People from different communities have a different understanding of the problems. Maybe we need a document that tries to define what we are talking about when we are talking about ICN. We have to go beyond "pattern recognition"-like surveys.
• Dirk K.: Information system vs. ICN might be a good contribution to increase understanding between different communities.
• <Discussions of including different communities (database people ...) and make clear how ICN may help.>
• Kostas: Surveys are written by people that are directly involved in the projects. There is bias.
• Dirk T.: Would be interesting to involve external people.
• George X.: Keeping the survey in the ICNRG may involve more people, also from other areas.

- Dirk T.: We should clarify the unspoken assumptions of the different approaches/projects.
- ?: Sounds for me like areas in the research challenges draft.
- Lixia: ICN information system or architecture?
- Dave and Lixia
◦ <Discussion of pragmatic questions (quantitative definitions; e.g., size of packets) vs. fundamental questions. What is fundamental/architectural question? Is the packet size fundamental or pragmatic? Agreement that the question of datagram or not datagram is fundamental.>
- Kostas: Need a attacker team.
- Dave: A separate name space for location and location-independent, is this a fundamental question or not?
- Dirk talks about the research challenges draft:
- Dirk T.: Transport services, most of the questions seem to relate to multicast transport. There seems a strong overlap.
- Thomas: Regarding the perspective of the document. I would expect clear goal that want to be achieved and then later derive the challenges from it (without touching details of the solution space).
- Dirk K.: Difficult to describe challenges on a high level.
- Thomas.: Proposal may follow a top-down approach.
- Kostas: different sections, different degree of details.
- Dave: Network management, management is important when invariances are violated. IP does not work very well when the system is broken. This should be considered.
- ??: A taxonomy would be helpful.
- Gareth: We should also consider inter-networking.
- Dirk K.: This might explode the document.
- ?: Maybe one, two paragraphs to ack that inter-networking is a problem, but note that inter-connection itself is not a challenge specific to ICN.

Group work on ICN Survey document ¶
ICN Baseline Scenarios document = ¶

Status of ICN Baseline Scenarios document ¶

Kostas presents updates on ICN Baseline Scenarios.

- <Discussions on reproducibility and comparability of experiments. So far current ICN papers go separate ways (e.g., simulations use complete different environments/parameters/etc.)>
- <Elwyn may contribute to the section EE and DTN. Gareth will send a pointer to a recently published paper on this topic and may contribute as well.>
- Joerg: What is the point of the Smart City scenario? Should we really consider any bizarre scenario?
- Lixia: What is the point of showing the ndnSIM example topologies.
- Kostas: Currently, if a graduate student tries to learn something about ICN, he/she ends up with this. There are no standard topologies
- Lixia: This is a total misunderstanding of the purpose of these topologies. It is not meant for experiments. You should consider this as a help toperform first trials

with the simulator.

- Kostas: Correct, and we should make sure everyone who's looking at the example topologies on the ndnsim site is fully aware of that
- <Discussions if the draft should cover particular topologies or not.>
- Dirk T.: The baseline scenario draft should give guidance how to setup experiments that can be at least used for meaningful/comparable experiments.
- Kostas: Find topologies that are difficult with IP but simple with ICN.
- Boerje: The objective of this draft is to help to compare different ICN approaches.
- Ashok: How does web (cookies, authentication, ajax,?) work with NDN
- Dirk T.: How do you run existing protocols over NDN (socket)?
- Dirk T.: IP is better when run over ICN (this is an exaggeration, but interesting to look at)
- Dave: Everything we do has to be compared to the new technologies not the old ones. For example we have to see webrtc.

Group work on ICN Baseline Scenarios document ¶

Scenarios breakout session (Borje, Spiros, Jorg, Priya, Kostas): new section 3 proposed (Evaluation Methodology) –Theoretical analysis vs. Simulation vs. Testbed –How to select the topology

•Graph •Topology/Graph? annotations (Bandwidth/delay/storage/ computation) •Dynamicity (mobility, packet loss, link and node failure)

–Load (e.g. user requests) –Traffic metrics

•Application pov (goodput, delay, QoS/QoE, R scores, MOS, …) •Network pov ("resource efficiency", control plane overhead)

–System metrics

•Reliability, scalability, delay and disconnection tolerance

–Resource equivalence and tradeoffs –Technology evolution assumptions

- 15:30 -- 17:00
- ◦ Reports from group works on Documents

Friday morning ¶

Agenda

- 09:00 -- 10:30 (Notes: AndersL)
- ◦ Other specific topic presentations
- ▪ ICN live streaming and interactive services
- ▪ NetInf live streaming (Börje Ohlman)
- ▪ ICN routing and congestion control
- ▪ NetInf routing (Bengt Ahlgren)
- ▪ Congestion control (Ashok Narayanan)

- Name resolution scalability (George Xylomenos)
- Privacy in ICN (George Xylomenos)

Minutes

- 09:00 -- 10:30 (Notes: AndersL
- Other specific topic presentations
- ICN live streaming and interactive services
  - NetInf? live streaming (Börje Ohlman) Slides
    - Comment: So you say "you are not allowed to cache this" - a security person will say "someone WILL do the opposite".
    - Ashok: what happens if you run out of sequence numbers? Maybe use the mpeg dash (sp?) part of the mpeg standard (fetching mpeg chunks over http)
    - Dave: well, this is predicting the chunk numbering, which is somewhat different from dash
    - Dave: not sure that "non-cachable" is the right semantics - we've seen in the web case that people cache anyway
    - Ashok: problem is not someone caching something that won't be asked for again - problem is if someone caches something they shouldn't cache so that a subsequent request gives the wrong result
    - Is a better semantic "expire lifetime"?
    - Börje: if you want to introduce this kind of required feature, you need too introduce it now so that it's not an optional extra addon by some vendor
    - DirkK: would prefer if this is not dependant on everybody participating - prefer immutable objects also for streaming
    - Börje: Another possible is to use Tesla
    - Ashok: problem is that you need all the chunks in the time window to compute the Merkel hashes, so no point in doing this with too short window (and then this soon degrades to non-live)
    - Börje: one problem is that this requires loose time synch between sender and receiver
    - Börje: additional requirements
    - Request aggregation is needed
    - Cut-through forwarding (desireable)
  - ICN routing and congestion control
  - NetInf? routing (Bengt Ahlgren) Slides
    - Dave: so you don't want to carry the list of hints in the request?
    - Bengt: well, you can - configuration issue
    - Fabian: anything that keeps routers from caching the hints?
    - B: no, so you don't have to do the lookup multiple times
    - Q: how to find a router that has your content cached?
    - B: in the DFZ, only on-path caching is supported
    - hints do not depend on who asks for the object

- ▪ Lixia: this is rather forwarding hints than routing hints
- ▪ L: the global lookup structure needs to be secured
- ▪ B: fair point
- ▪ Fabian: Is it a implicit assumption that you will get the location that has all the objects in the aggregate?
- ▪ yes
- ▪ Lixia: where do you cache the lookup results?
- ▪ B: it's like DNS - you do a lookup for the first object in the aggregate and the rest can be used fo all other objects
- ▪ Congestion control (Ashok Narayanan)
- ▪ Lots of discussion regarding whether or not we can know for sure that one interest packet generates one (and only one) data packet in all cases......
- ▪ Q: how does this change if you have broadcast wireless?
- ▪ Ashok: haven't considered that
- ▪
- ▪ Name resolution scalability (George Xylomenos)
- ◦ Privacy in ICN (George Xylomenos)
- ◦ "Distributed Data Warehousing with Information Centric Networking based Data Replication" (Michael Alexander)
- ◦ ICN wireless sensor and actor networks. (Dinh Ngoc Thanh)

Friday afternoon ¶

- • 13:30 -- 15:00 (Notes: Dave)
- ◦ Report on specific topics group work
- ◦ Next steps
- ◦ Next meeting - IETF Orlando?
- • 15.00
- ◦ End of official meeting
- • 15:00 -- 17:00
- ◦ Informal brainstorming for people hanging around

Attachments

- • ICNRG-Stockholm-intro.pdf (651.6 KB) - added by *borje.ohlman@ericsson.com* 11 days ago.
- • Streaming-presentation.pdf (192.6 KB) - added by *borje.ohlman@ericsson.com* 11 days ago. "Börjes presentation of NetInf? streaming"
- • SAIL-NetInf-global-routing-forwarding-15feb2013.pdf (658.9 KB) - added by *borje.ohlman@ericsson.com* 11 days ago. "Bengts presentation of NetInf? global routing"