ICNRG
Survey Draft

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Goal

- The goal is **NOT** to analyze the best way to evolve the building blocks of current ICN approaches.
  - This is the subject of the ICN Research Challenges draft.

- **The goal is to** provide a survey about possible directions for the evolution of ICN solutions, in three steps:
  a) Reach a general consensus about the nature of the ICN paradigm (what are ICNs, what should ICNs be and who are the stakeholders).
  b) Analyze major architectural approaches for the instantiation of the ICN paradigm
  c) Identification of several design choices.

Correlation with other ICNRG drafts:

- Special attention is given to applicability areas described in the ICNRG Baseline Scenarios draft.
- The analyzed design choices may be specified by some of the technologic and scientific challenges to be described in the ICNRG Research Challenges draft.

Structure (1/4)

1. Introduction

This document aims to complement the other two ICNRG drafts, by trying to answer the following questions:

a) What should ICN solutions be and who needs and wants them?

b) Until now the Internet evolved with a focus on "how to transport data”:

- Should the instantiation of the ICN paradigm follow the same flow based approach **OR**
- Should ICNs follow a completely different approach, for instance shifting the attention from the traffic flow control to "what is being transported".
  - This later approach may lead to a different set of design choices, more focus on database queries, semantic memories, distributed systems and software defined networking.

1.1. Scope
1.2. Related effort
1.3. Notation

2. General View on Current ICN Paradigm

This section aims to provide a brief description of what was the motivation to devise an ICN paradigm and what are the currently identified major characteristics.

2.1. Motivation
2.2. ICN Major Characteristics

Structure (2/4)

3. ICN Paradigm Revisited

- We try to address the following critical question: what should ICN be in the future?
- Goal: survey what should be the basic **context**, **system**, **programming** paradigms to support the challenges and scenarios that ICN should target (check relevant ICNRG drafts), as well as who should the **stakeholders** be.

3.1. Stakeholders

- What are the incentives for the stakeholders to implement an ICN architecture?
- How will the ICN architecture impacts the current participants?
- What new stakeholders are being created by the properties of the ICN architecture?
- If we consider prosumer models, which technologic/networking aspects may need to be revised?
- If the user has an active role in networking, which social properties are relevant to be applied to the ICN design/operation: reach, engagement, and influence?

3.2. Context Awareness

- How aware should an ICN system be of its surrounding?
- What in-system and out-system context should be considered in the design and operation of ICNs?

Structure (3/4)

3. ICN Paradigm Revisited

3.3. System Support

- What will be the benefits of increasing the self-organized properties of the ICN architecture?
- How can the performance of an ICN system be improved by having nodes aware of the behavior of their neighbors?
- What would be the relationship between the data processing behavior of individual nodes and the resulting data distribution (structure) and availability (functionality) in the overall system?

3.4. Programming Support

- In ICN related proposals, the system is mostly configured with parameters aiming to optimize performance, given the constraints of specific deployment environments.
- Constraint optimization problems approaches:
  - use imperative languages such as C++ or Java;
  - often result in error-prone programs that are difficult to maintain and customize.
- What would be the benefit of using a programming methodology able to enable developers to concisely specify network protocols and services using a distributed recursive query language, and directly compile these specifications into data flows for execution?
  - The goal is to support an easier specification, and additional optimization benefits.

Structure (4/4)

4. ICN architectural design choices

***TBD**: This section depends on our findings, while working on previous sections. For instance, we may end up agreeing that the way to look at a ICN in the future will be a mix of the described paradigms, so the design choices will reflect that.*

For now the proposed points to be looked at are:

4.1 Focus on the What: Declarative networking approach

Should ICN paradigm help to look at the Internet as a large scale data distributed system?

4.2 Focus on the How: Internetworking approach

Should ICN paradigm help to define an Internet as a control flow system focus on data?

5. Conclusion

Now and Then

Version -00
July 2013

First draft of section 1, 2 and 3

Points for discussion:
- Agree on the general goals and propose of the document
- Collect feedback for each of the sections, namely section 3

Version -01
January 2014

Revise sections 1 to 3
First draft of section 4

Points for discussion:
- What should be the ICN architectural design choices?