Internet of Food
When Food Gets Networked, Life Changes

Patrik Fältström
Johan Jörgensen
Basics

- 9 Billion people need to be fed
- The next 40 years we must produce as much food as in history of man
- In a sustainable way
- The food needs to be healthy
- Otherwise our health budgets will explode
What does the food sector produce?

• Greenhouse gas
• Antibiotics resistance
• Obesity
• Food induced mortal poisoning
• Counterfeit food products
• Massive amounts of waste
• Loads of marketing
• Sometimes even food
30% Cereals Food Losses

In industrialized countries, consumers throw away 286 million tonnes of cereal products.

- 763 billion boxes of pasta
- 3.7 trillion apples

45% Fruit & Vegetables Food Losses

Along with roots and tubers, fruit and vegetables have the highest wastage rates of any food products; almost half of all the fruit and vegetables produced are wasted.

20% Oilseeds & Pulses Food Losses

Every year, 22% of the global production of oilseeds and pulses is lost or wasted.

This is the same as the volume needed to produce enough olive oil to fill nearly 11,000 Olympic swimming pools.

45% Roots & Tubers Food Losses

In North America & Oceania alone, 5,814,000 tonnes of roots and tubers are wasted at the consumption stage alone.

20% Dairy Food Losses

In Europe alone, 29 million tonnes of dairy products are lost or wasted every year.

This is the same as 574 billion eggs.

30% Fish & Seafood Food Losses

8% of fish caught globally is thrown back into the sea. In most cases, they are dead, dying or badly damaged.

This is equal to almost 2 billion Atlantic salmon.

20% Meat Food Losses

Of the 263 million tonnes of meat produced globally, over 20% is lost or wasted.

This is equivalent to 79 million cows.
What happens when...
...when we can see...
...whether the meat in the lasagna..
...comes from Dario Checcini...
...and connect with quantified self?
Quantified Food!
Ability to trace the food...
...and know what happened!
Framework Vision

• To construct a framework to be used for structuring the discussion around Internet and food, thereby furthering the discussion around how to facilitate openness and innovation in the field of food with the goal to feed the planet in a healthy and sustainable way
Modus operandi

• Step 1: Share the overall framework with basic descriptions to the board and select advisors, then push to the list for open discussion
• Step 2: Make the various posts of the framework subject to discussion
• In each case, questions and comments are included in a continuous feedback loop until general consent settles the framework and individual parts of the framework
Framework Structure

- Identify topical areas for dialogue and discussion
- Identify necessary infrastructure and data – the internet of food framework
- Identify existing standards and infrastructure within the suggested framework
- Identify areas in need of standardization
- Point to potential solutions for standardization
- Identify ways of connecting un-connected infrastructure and data
- Identify interfaces between standards
Initial Areas of Discussion

• Is it one system or two?
  – Production/distribution
  – Content/information

• Decide on possible limitation of the project scope

• Can the former be handled through amendments to current IoT protocols for sensors, machine instructions etc?
Initial Areas of Discussion
– Food Security

• Food security
  – Hacking food systems
  – Food weapons/terrorism (delayed effects)
  – Sensor intelligence
  – Dispenser control
  – Additives
  – Health effects
  – Oligopoly regarding tech (Google-like dominance)
INITIAL FRAMEWORK
Framework Modules

- Addressing
- Metadata
- Data – data structures
- Access
- Trust/signing/verification/validation
Operations

• Search for location
• Lookup data
• Collect and update data and metadata (crowd, db, crawl, spindle, sensors)
• Identify connections between data, standards
• Relate access control/signing/verification/trust to various actions/records/attributes
Addressing

• What would an addressing standard for Internet of Food need to contain?
• Are there existing addressing standards that can be used for Internet of Food?
• Are there existing addressing systems that can be tweaked for Internet of Food?
• Are they accessible, usable without building monoliths, silos or central dependencies?
Metadata

• Is there an existing metadata description covering all aspects of food or are there many metadata descriptions? Missing areas?
• Do these existing descriptions follow a global standard (existing or de facto)?
• Could these descriptive standards be unified into one metadata standard suitable for digital distribution?
• Which fields/field types would need to exist in the metadata standards in order to make for a digitally functioning metadata standard?
• Common file/publishing format?
• Once upon a time, Dublin Core...still?
Data

• Is there an existing data structure for food or are there many?
• Existing and missing areas?
• Do these existing data structures follow a global standard (existing or de facto)?
• Could these existing data structures be unified into one standard suitable for digital distribution?
• Which fields/field types would need to exist in the data standards in order to make for a digitally functioning data standard?
• Common file/publishing format?
Access

• How to construct a structure that allows for both public and closed information publishing (not all data is available to everyone)?
• How to integrate with the plethora of information access control systems?
Trust/signing/verification

- Trust contains various aspects such as product information, product relations (other products from the same manufacturer, etc.), position, chain of positions, detection of fraud and/or manipulation
- Official verification and validation
- Endorsements/crowd annotation
- Digital signatures
NAMING STANDARD
– ELABORATION
Naming Standard

• There probably needs to be a specific naming standard for food in the Internet space
• How does the naming standard for IoT work?
• Both current domain name system and IPv6 have capacity to handle the issue
• Other and better solutions might however emerge from the discussion
• Final decision left for later...
Global Identifier (name space design, abstract level)

IPv6 Food Address Block (IANA)
- RIRs
- NIRs
- ISPs

Food Object, incl Data, Meta Data (internal and outbound links, positioning, etc)

"Food publishers" (producers, manufacturers or distributors)

EAN or Other Common Identifier

Products and services

Trust/signing – of individual data and meta data entries

Information/innovation layer

Inbound links Comments

Tag food, categorize

WHOIS/RDAP – like structures of metadata?

Open

Closed (only for access holders)

DNS-like system

Inbound links Comments
Global Identifier (name space design, abstract level)

IPv6 Food Address Block (IANA)
- RIRs
- NIRs
- ISPs

DNS-like system

"Food publishers" (producers, manufacturers or distributors)

Information/properties
- Open
- Closed (only for access holders)

Inbound links Comments

Food Object, incl Meta Data (internal and outbound links)

Inbound links Comments

Open innovation layer

Products and services
Tentative Structure

External systems and input/annotation add to the food object. An "IMDB for food" could easily be foreseen as one example of new services.
“Scoring” systems to be added regarding various published data. For instance various transparency aspects: Traceable/Unclear/None traceable = TTS (total transparency score)
POLICY
Policy

• Policy
• Policy vs standard
• How to include already existing projects within IoF
• Openness between projects
• Limitation of the IoF project
• Authentication (read/write/validate)
• Authorization (policy)
• Rights to conduct an operation
Philosophy of Openness

• Open data
• Open positioning
• Writeable meta data fields (wiki)
• Open trust
• Open food
• Wide usage of GPL and CC
• Connection with other areas (Quantified self, food, ”shit”)
The Use of Categories

- The value of a quick and dirty grassroots solution for connecting food with the internet as opposed to a more structured approach
- Could there in such case be a categorizing framework for food for usage at the information source and that could hook into already existing infrastructure such as search?
- Vina Albali, Red Wine, Merlot/Pinot Noir. Big data could be used for sorting tags and making connections
- Tag shortener – like Bitly, could be put on food and visualized by app
- Is there a common tag structure/method that can be published and added into publishing systems, Wp, etc.
- This could make for a quick uptake amongst new food and tech companies
- Difficulties vs older food companies and their standards?
- RFC for a Common Descriptive Food Category Format: CDFCF?
- Who to engage in such case?
- A list of --tags published at Internet-of-food.org?
To Consider

- The complexity of combined food products
- Mobility
- Big Data
- Best Practices/”Quantified Food Handling”
- Tech – hygiene factor in the food sector
- Environmental control (sensors – open reporting)
- Instructions to machines/systems (multicast instructions?)
- Layer of security/access/identity
- Mesh nets through farm animals? (sensors)
- IPv6 deployment as factor for improved food competitiveness
- After market (health care/health effects, QF, follow-up)
- New business models from breaking up structures
- Self configuring sensor nets
- Edible sensors