



Introduction

In this paper we identify three distinct trends that have the potential to have significant impact on the future internet and the services that sit on top of them. We propose strategic innovation programs that have the potential to positively impact these trends to the benefit of the European Union.

In summary these three distinct trends map to three distinct layers on the internet architecture

- 1) Trends in server side infrastructure deployment
- 2) Trends in the management and ownership of valued data
- 3) Trends in the implementation of client side browser technology

What is changing

Cloud infrastructure development

There is, within the market an indisputable move towards the cloud: cloud based infrastructure, cloud based applications, cloud aware/enabled network. The marketing message is clear, what this actually means technically, is somewhat open to debate! One thing that is in common the server side implementation requires highly flexible (virtualised) database and application technologies. Most companies providing cloud hosting services are currently doing little more than providing virtual boxes, with no consistent data scalability or application architecture. Innovative, open technologies in this space (such as hadoop) do exist, and innovative proprietary technology companies are evolving. However, it appears that as many of these innovative disruptive technologies are being rapidly acquired by the dominant (US based) database with the net effect of hampering innovation in this space, and or aggregating the commercial control of these technologies into a minority of US companies.

Data Ownership and Management

There are well known risks associated with the propagation of private data into the cloud. The traceability of this data, and the legal rights and obligations (and risk) are largely opaque to the end users. On the counter side many companies are looking to emulate Google success in monetising the value of the individual and aggregated consumer data. There are government sponsored initiatives to mitigate some of these risks. There are also pre-emptive industry initiatives to dilute potential legislation in this space. The technology, however, is somewhat lagging in its potential to positively influence this area

Web/browser bloat

Web standards are becoming very complicated to implement, due to the multiplicity of sub standards, the ambiguity in some of the standards, and the extensive backward compatibility required for existing content.

The consequences of these trends:

- 1) There are now only 4 viable software stacks (Webkit, Mozilla, IE and Opera) - that can competently implement browsers



- 2) Full web browsers do not run effectively on mid to low end devices.

The promise of web technology is no longer being fulfilled by the execution reality.

What is our Vision , what are the Gaps, What are the solutions

Cloud infrastructure development

Vision:

To develop EU sponsored technology that delivers on the true vision of cloud based elasticity. To reduce costs of deployment, to build up the EU expertise in this area and to increase the utilisation of SMEs and large corporates.

Gaps

Discussed above.

Solutions:

To develop or evolve highly distributed database architectures that are fit for purpose for dynamic scalability. To develop or evolve application development paradigms that work with the cloud friendly database (data management) architectures

Data Ownership and Management

Vision:

To create EU sponsored, innovative technologies that allow end users to exercise control of the distribution and exploitation of their own data.

Gaps

Highlighted above

Solutions:

Either or both of:

- To create innovative cryptographic techniques that place “shared data” in a controlled form
- Create brokerage services or escrow services that allow two or more parties to manage their rights over shared data formed from a long lasting (or short lasting) relationship.

Web/browser bloat

Vision:

To streamline and optimise the UI presentation layer standards and technologies for web that will allow

- 1) More companies to become technology providers of web client software
- 2) To make rich experience of web technology viable on medium and low tier devices, both increasing market size and social inclusion

Gaps:

Already highlighted above



Solution:

Possible solutions, which can be used independently or combined, to form a solution:

- To define a new streamline set of declarative technologies that are designed to
 - Render effectively on low end devices
 - Map directly to hardware based primitives for optimised graphical presentation removing bulky software abstraction layers
- To create middleware that can “transform” legacy HTML content online, to streamlined presentation forms
- To create developer tools to port HTML content offline to streamlined presentation forms

Common thoughts:

Strategies are required that ensure that highly innovative solutions in this area are not simply “bought out” by non- eu organisation. This could be open source or other strategy

The technology approaches and the anticipated ecosystems targeted should be clearly framed to target flat ecosystems, and avoid (if possible) a natural tendency within high technology sectors for a single (or 2-3) company to technical and commercially exploit the entire ecosystem

Left field brainstorming areas

(maybe future of internet services or other?)

Develop non-profit electronic invoicing brokerage house to remove costs fro SMEs

- Machine readable licenses for distribution and monetisation web and other applications
- Define/evolve webs standards to increase the transparency and processing on financial reports and financial transaction.