

Towards a Dynamic Web

Today, information and communication belong to the key success factors in nearly every area of developed and developing societies. *Ubiquitous computing* will become reality in the near future in all fields of our daily lives, of business, transport, social relations, research, etc. Real world and the cyber world will tightly integrate. Our world is highly dynamic with huge amounts of information generated at all levels, with frequent changes, with actions and reaction. The current Web with all its facets is too static and not really capable of supporting ubiquitous computing in a dynamic world.

Dynamics and changes play a central role in many important applications with significant impact: Complex Adaptive Systems in technical domains, economy, and ecology; agile business and management systems (BPM, workflow, collaboration support, supply chain management, logistics), and in dynamic social networks.

For these purposes we need a Dynamic Web.

The vision of the Dynamic Web is to enable people, organisations, IT systems, and "smart objects" to work together dynamically on Web scale in a dynamic world - in a seamless, secure, open and controlled way. The Semantic Web is an integral part of this Dynamic Web.

Messages from humans, from information systems or sensors of all kinds will be propagated automatically to the respective recipients, they will be interpreted in their context, they represent changes in the real world or in information systems. Often they have to be combined with other information to *complex events* enabling complex situation assessment. Changes on one side may cause consequences in related areas, they need appropriate reactions, or predict future states that need to be proactively mitigated. Currently, all of these functions are processed in a pre-defined, frequently hard-coded way. This makes it inflexible, labour intensive, and expensive. Ubiquitous computing in a dynamic world needs a Dynamic Web capable of large scale, complex, dynamic information processing and change management in a coherent way.

Dynamic issues in general and dynamic interoperation are not new issues. Many different approaches were developed addressing process and dynamic issues in different ways – from the hardware level with parallel computing, grids, and networks to low level distributed operation systems, network protocols, Message Oriented Middleware, emails, Petri nets, state machines, database transactions, Web services, workflows, and business process models, up to full fledged agent based approaches. Programming languages of all kinds enable programs to manage dynamics and changes. However, this dynamics is hard coded and in-transparent. Interoperation works at the hardware and the operation system level. It is *not* supported adequately at the level of interpretation, of meaning, of context, of change management and ramifications, and of reactions. Currently, there is no dynamic Web – what we have is highly heterogeneous, unsystematic, and unconsolidated. It is not sufficiently integrated with the Web of Data, the Web of services, the Internet of Things, sensor networks, etc.

The Dynamic Web is a challenge of similar size and impact as the building of the current Internet. There is no “one fits all” solution. The Dynamic Web is a holistic, integrated large scale research effort aiming at a coherent set of different approaches to manage dynamics on Web scale.

The goal of dynamics on Web scale needs completely new mechanisms on Web scale like complex events and actions, and Web enabled “practical” agents. In the medium and long term, highly innovative ways of computation like complex adaptive systems, neuro-computing or quantum computing may be needed. As immediate research goals ready-to-use Web scale platforms, dynamic middleware, Web based complex event and action modelling, and human interaction tools with these features should be developed. A representative group of pilot applications in all main dynamic application fields should be built-up as proof of concept.