Is Future Computing Driven by Content?

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GUESTS

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- **Panelists:**
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  Douglas Down, McMaster University, Canada
  Paul J. Geraci, TSG/DoD, USA

Content, Service, Technology

- **Is Future Computing Driven by Content?**

- We do have:
  - technology driven computation (p2p, mobile, sensors, ..
  - computing technologies (quantum, optical, neuronal,..
  - scale-oriented (distributed, parallel, cloud...
  - mechanism-oriented (spatial, soft, fuzzy, ..
  - intelligence-drive (ambient, unconventional, ...

  ? Does the 'content of what is processed" influence somehow what kind of approach computation takes?

Is Future Computing Driven by Content?
Expert Panel.

Hans-Werner Sehring, CONTENT 2009, Athens/Glyfada.

Theses Overview.

Introducing myself.

- Scientific work: increasingly applied research

- For many years now: content management, knowledge management

- From research to application: university, technology transfer, industry

- Currently **architect principal** at
  T-Systems Multimedia Solutions GmbH
  → T-Systems International
  → Deutsche Telekom AG

- Company's main expertise:

  - full service for web sites, mobile services, location-based services

  - digital TV

  - VoIP

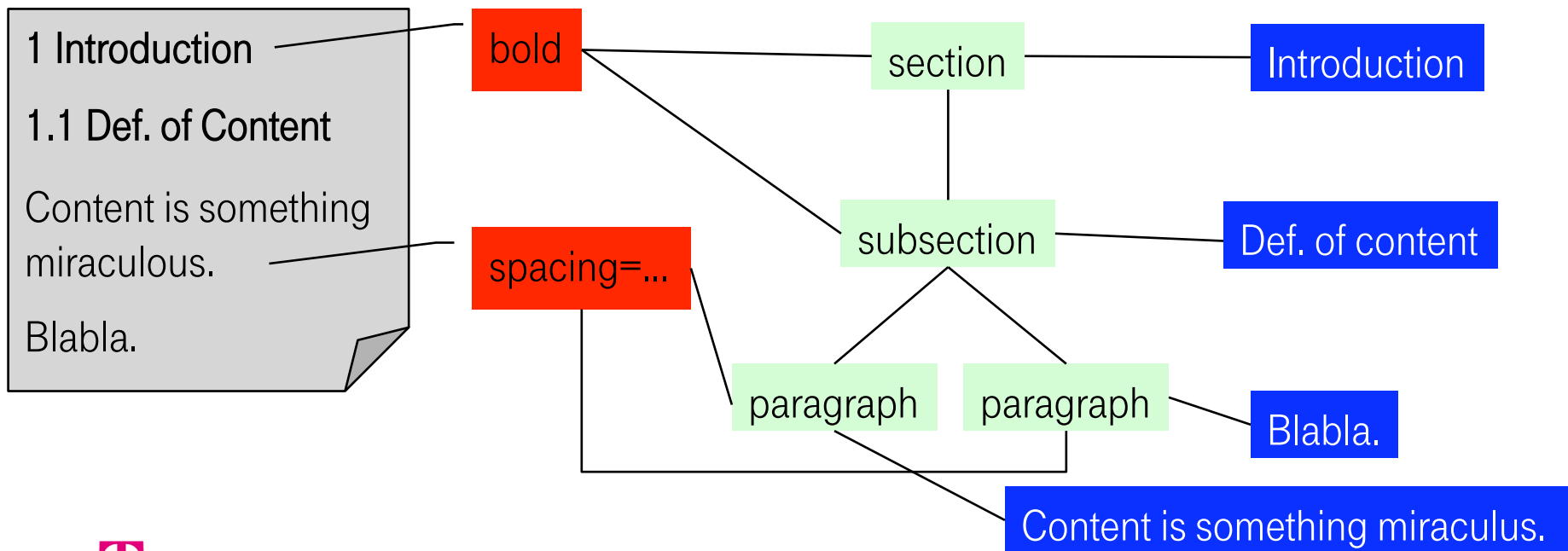# So, What is Content?

- Well known(?): hierarchy of
    - data
    - information
    - knowledge
- Content?
    - technical definition
    - pragmatic definition
    - Epistemic definition

Technical View on Content.

- Initial idea of content management: separation of documents'
  - content,
  - structure, and
  - layout

Content is data: media independent, used for document production.

1 Introduction

1.1 Def. of Content

Content is something miraculous.

Blabla.

bold

spacing=...

section

subsection

paragraph   paragraph

Introduction

Def. of content

Blabla.

Content is something miraculus.

Pragmatic View on Content.

- If we see content management as the discipline of *database publishing*:
  content is data with the purpose of being
  - created in an editorial process

  - quality assured

  - rendered into a *document*

  - published / played out / sold

  - syndicated

  - perceived

  - ...

Content is a good, subject to value-adding processes.

Epistemic View on Content.

- Inspired by Ernst Cassirer:
  content is the *meaningful* and *purposeful* representation of entities.

- **Meaningful:** symbol (semiotics: sign) composed of

  - something perceivable

  - some concept for a class of (important) perceptions

- Indivisible aspects of content
  (see critics on, e.g., Kant's categories; Ontology vs. Epistemology in philosophy)

- => not just "typed data"

- **Purposeful:** depending on some context

  - perceiver's knowledge

  - perceiver's task

  - ...

> Content is a knowledge structure, concepts as well as evidence.

Contextual Content and Content Use.

- Context is perceived / consumed / used in certain contexts.
- Purposes: entertainment, information, infotainment, e-commerce, e-government, e-...
- New forms of contexts have appeared, e.g.,
    - **Geo-referenced content:** connected to a certain region, in the real or some virtual world
        - simple: associating content with coordinates for display on some geographical map, cooperation of a CMS and a GIS
        - additionally: references to topological, political, etc. entities like countries or cities
        - temporal changes of topologies, political systems, etc.
        - semantic relationships between regions, between content and the regions, etc.
    - **Mobility:** not only content connected to some geographic region, but also its utilization

Contextualization of content requires deep service integration and orchestration.

Media on Which to Publish.

- There is a trend to break the separation of the "digital world" and the real world.

- Digital world:

    - original digitally produced content

    - content describing real-world entities

- No "virtual world", but making the digital world part of real life:

    - *mixed media*

    - *augmented reality*

    - *web of things*

- Content is/will not only displayed in artificial environments like a computer screen, but also in real or virtually real scenarios, e.g., using head-up displays, glasses, retina implants, ...

> May lead to ubiquitous / pervasive computing, first just availability and modality of content.

> **Content representing real-world entities and purely digital content have to mix.**
> **New output devices have to bring the digital and the real world together.**

Content Openness and Dynamics.

- The utility of content, like that of information, depends on the contexts users are in. Contexts – of content and of its utilization – change over time.

- **State of the art:** generic CMSs equipped with content structures for foreseeable contexts

- For changing contexts some form of adaptability / adaptivity is required.

- **Claim:** content management should be based on dynamic model-driven development.

  - The core functionality of content management systems is, by and large, rather uniform.

  - The power of content management lies in adequate content models.
    These have to be *open* for changes.

  - The *dynamic* application of model-driven transformations generates CMSs accordingly.

Content management needs openness and dynamics.
Model-driven software development is a way to achieve this.

Content Editing in Web 2.0 / Mobile 2.0 / Enterprise 2.0.

- Content management started with the idea of a (small) "editorial board" that prepares content for a (large) audience.

- This does not hold anymore:
  content is used as a *communication medium* in many scenarios.

- Extreme approach: Web 2.0.

- Claim: current approaches (Wikis etc.) allow document management, not content management in the sense of

    - editable content

    - editable structure

    - editable layout

> **We need processes and technology to equally support editors and consumers of content. In particular, structure needs to be handled as a first class citizen.**

SaaS: "Content Management as a Service".

- Private users:
  - first wave: (personal) homepages
  - now: many individuals aim for content management, but utilize simple and cheap solutions like Blog software, tiny CMSs deployed on a web hosting service, etc.
- Small Business:
  - same holds for small businesses
  - no easy means for product catalogues, using payment services, logistics interfaces, ...
- SAAS, Cloud Computing: business model meeting needs of low-end content publication?
  - but: no stand-alone solutions, but integrated services
  - that also allow to integrate existing processes.

There is a demand for "content management as a service" so that individuals and small businesses can participate in the value-adding chain of content production.

Media's Impact on Data Transmission: Distribution / Cloud.

- Contemporary CMSs are build as centralized systems, designed for scalability.

- They work well for time-independent media like texts and images.

- Video, in particular, raises new demands:

  - larger amounts of data be transferred

  - QoS parameters, in particular timely delivery and synchronization

- Video playout cannot be handled by a centralized system:

  - broadcast / multicast not yet established on internet scale

  - typical output of video streaming service exceeds capacity of every network segment

- Needs distribution, based on replication and caching. Today typically: CDN.

Time-dependent, synchronous media require distributed playout.

Content Editing Processes.

- CMSs mimic the working processes of editorial boards:

  - distributed content creation

  - quality assurance

- In this point CMSs differ from databases and information systems
  → cooperative editing (no isolation), versioning, staging process, ...

- Distributed editorial processes not understood, but required:

  - Web 2.0

  - distributed content editing for media like video, "real" multimedia

    - distributed CMSs

    - content creation requires specific tools and knowledge

    - missing integration of authoring tools with core CMS functionality

New media require to rethink processes and integration.
We need a better understanding of kinds of content and the support they require.

Quality Assurance for Legal Issues.

- When a large, possibly open set of content producers is cooperating, there is no ultimate quality assurance institution.

- Legal issues often make publication of cooperatively edited content a challenging task.

- With the typical amount of content being produced, manual quality assurance is not feasible.

- Means for (semi-) automatic support:

    - content-based retrieval, auto classification, Semantic Web technology (ontologies, reasoners) to help finding illegitimate content

    - technologies are required for automatic content selection, filtering, etc.

- Alternative: community approaches (self-control, collaborative filtering)?

Reliable (semi-) automatic support for content recognition and classification is required for content-based communication.

Thank you. Let's discuss.

Is Future Computing Driven by Content?

Paul J. Geraci

Chair, Emerging Technolgies

Probably – *but...*

Paul J. Geraci

Chair, Emerging Technolgies

Majority of internet usage is content and service driven

Is Future Computing Driven by Content?

Internet Computing Expectations...

➢ **Increased Efficiency**

➢ **Enhanced user experience with regard to media**

➢ **Enhanced mobility**

➢ **Enhanced interaction**

Is Future Computing Driven by Content?

- ➢ **Increased Efficiency**

- ➢ **Enhanced user experience with regard to media**

- ➢ **Enhanced mobility**
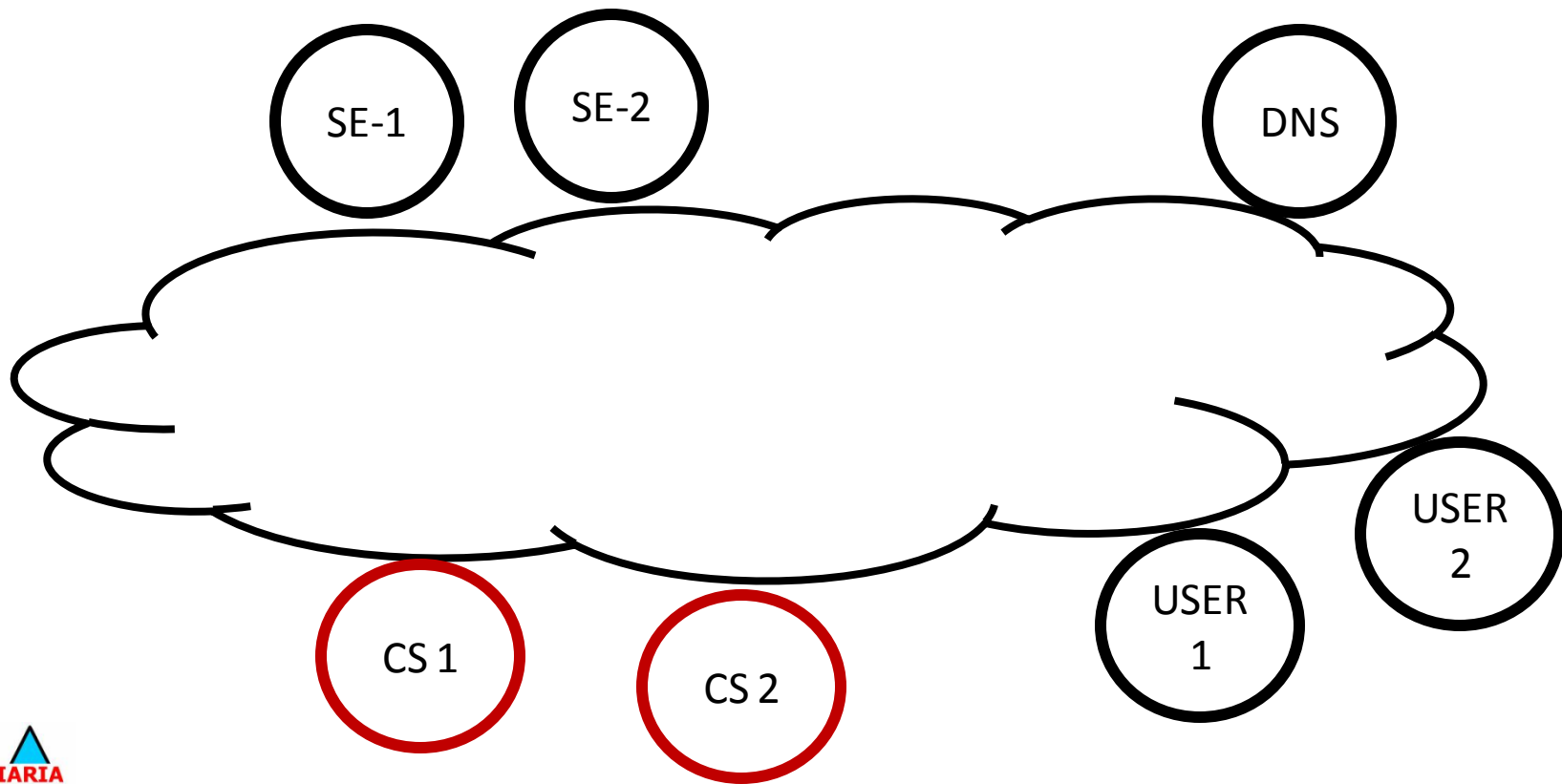
- ➢ **Enhanced interaction**

Is Future Computing Driven by Content?

E m o t i o n

Is Future Computing Driven by Content?

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Considerations...

➢ **Engineering - storing, coding, etc.**

➢ **Semantics – how do we find it?**

➢ **Security -** *trust*

Is Future Computing Driven by Content?

Considerations…

- ➢ **Engineering - storing, coding, etc.**

- ➢ **Semantics – how do we find it?**

- ➢ **Security -** *trust*

Is Future Computing Driven by Content?

Probably -
at least for the immediate Future….

However-
we are starting to see trends towards
Content + Services…

Thank you

Paul J. Geraci

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Expert Panel
Is Future Computing Driven by Content ?

Comments on the panel discussion at the First Int. Conference on Advanced Service Computing
Athens, November 17, 2009

There is a variety of notions related to the term "Content"

- Content as part of a document consisting of structure, layout and data (data = content)
- Content as a good which can be offered and traded on markets
- Content as a structure representing knowledge

You may also distinguish between syntax, semantics, and pragmatics of content.
From my point of view the panel discussion addressed mainly semantics. The corresponding question is "Will Future Computing Focus on Solutions Based on *Understanding* the Content of a Data Structure, a Document, a Database, etc.?"

Semantics of content depends in many cases on the *context* the content is used in. So, the user, the situation, the business process, the presentation media, etc. influence the semantics of content.

Also, people creating, structuring, modifying, using, delivering content are part of the context. These people may build communities working on contents and thinking about new contents. Web 2.0 technologies can help to build and keep alive such communities.

A crucial issue of content management is adaptability of contents to new contexts or vice versa, i.e., adaptability of contexts to new contents.
So, *content management* is concerned with *context management*.

More challenges for future computing based on content come with new technologies and new forms of content representations. Examples are geo-referenced contents, mixed media, augmented reality, intelligent things, and networked contents. Real-world entities and virtual entities build a new semi-virtual or semi-real content and context.

Future computing will bring these two worlds of real objects and virtual content together. New technologies, new media and devices (head-up displays, glasses, retina implants, etc.) will help to manage this mixed reality.

Beyond new technologies you will need new processes to support content management. Future computing has also to address this challenge and provide process support. Activities within processes are often content related and of course context related.

As a conclusion these processes are at the same time based on content management and supporting content management. They deliver services for human agents (employees, customers, etc.). So, future computing will provide e-services based on content and context. Thus, future computing helps to create and add value in application scenarios having any kind of content. You may coin the term "CMaaS" = Content Management as a Service.

Paul's view:

Future computing will neither be driven by content, *nor* will it be driven by service; rather, they will compliment one another. As discussed during my keynote, as well as by several other presenters, the future of computing will see increased efficiency, enhanced user experience, mobility, and a greater interaction than witnessed before. As such, I believe we will see an *interdependence* between the two in order to realize the aforementioned.

Therefore, I believe that Future Computing will be driven by both Content _and_ Services. However, we need to consider the engineering aspects, (Coding and Storage, etc.), the Semantics applied in order to *use* the service to best *find* the content, and last - but certainly not least, we cannot avoid the myriad Security issues that are *bound* to confront us as we move towards our "*Contented Services*" future."

Hans-Werner's view:

Contextual Content and Content Use
Contextualization of content is becoming increasingly important for value-added services. Integration of content sources with information systems offering context information is not well-understood, though. Integration of content management systems with geographic information systems is an example.

In addition to context information assigned to content, the context of the user consuming the content is also of importance in many scenarios. Mobile applications are a prominent example for adding context to content utilization, e.g., the current location of the user (plus eventually: time, language, preferences, etc.).

Media on which to publish
In contrast to the idea of virtual reality, there are now attempts to bring content to the "real world" and to relate physical entities with information and digital content.

Content Openness and Dynamics
These insights are related to my research of concept-oriented content management systems targeted and the "epistemic" content definition.

One primary issue is support for individual (personalizable) content representations, while maintaining a (common) content base and preserving content-based communication between users with personalized content models.

Our approach is based on model-driven software development and suitable software architectures.

Content Editing in Web 2.0 / Mobile 2.0 / Enterprise 2.0
The striking success of Web 2.0 lead to other "2.0" applications. Usuallly, every intranet nowadays is also not read-only, but includes Web 2.0 functionality. This can range from simple Web 2.0 contributions like ratings and comments to functionality based on user generated content (or, in the case of concept-oriented content management, even content structures and domain models).

SaaS: "Content Management as a Service"
I see a demand for easy to use, out-of-the box content management solutions. Requirements are adaptable presentations and (at least for companies) the possibility to integrate content production and use with other processes.

Media's Impact on Data Transmission: Distribution / the Cloud
Large-scale projects, in particular ones dealing with live video streams showed the need for distributed content delivery. This distribution has an impact on the architectural design of content-based information systems as well as on editorial processes.

Content Editing Processes
Value-adding processes of content management systems are typically based on some usage patterns that do not hold completely anymore. In particular, enlarging the group of editors in Web/Enterprise 2.0 scenarios requires new means of quality assurance (if one can not rely on self-healing powers as assumed for, e.g., Wikipedia), and distribution calls for new forms of cooperation between editors.

Quality Assurance for Legal Issues
The experience is that content-based systems have a high probability of failure because of legal issues. Content usage is typically constrained by rights, and user-generated content poses a problem for those hosting it.