From Pages on the Fly to Workflows in the Cloud

EVOLUTION OF THE WEB ARCHITECTURES

Dr. Vassil Vassilev
London Metropolitan University
1 World Wide Web in perspective

◆ **First Generation Web** – Tim Berners-Lee (CERN, 1993-1995)

    *Easy representation of information stored in various files in different formats on a local net*

◆ **Second Generation Web** – W3C (MIT, 1995-2001)

    *A giant collection of static and dynamically generated data, preconfigured and dynamically discovered services*


◆ **Tomorrow’s Web** (2020-)

    *AI on the Cloud?*
From the initial Web 0.99…

… with the simple set of Web pages
... through Web 1.0 ...

... with full-blown Web Applications
... and Web 2.0 ...

... with integration of components, services and live feeds
... towards Web 3.0, but which way?

1. **Technological route**: Micro Services, Container Orchestration and Workflow Management

2. **Conceptual route**: Ontologies, Knowledge Graphs and Logical Inference

3. **Combined**: Semantic Web Services, AI on Demand and Knowledge Management
2 Data Centres, Cloud Services and Application Containerization

- IaaS, PaaS, SaaS, FaaS: **AWS, Google Cloud, MS Azure** clouds
- Container Management tools: **Oracle VM, VMWare, Docker** containers
- DevOps Repositories for agile development: **Slak, Jira, GitHub, GitLab**
What is the most recent in the cloud age?

- **Private and Hybrid clouds:** Kubernetes infrastructure – cloud computing behind firewalls
- **FaaS:** Lambdas, Functions – serverless computing with session maintenance
- **Workflow Management:** AirFlow – composition, execution and control of containerized services
Orchestration Languages in DevOps

**JSON** for data specification – data formats, programming binding, persistent storage

**YAML** for serialization – resources, communication protocols, type mapping

**TerraForm** for Infrastructure as a code

**CWL** for workflow description – process steps, parameters binding, infrastructure configuration, process execution, concurrency control
Logical Analysis and Knowledge Processing in the Cloud
Offline Data Analysis in the Cloud
Real-time Data Analysis in the Cloud
3 Knowledge Technologies, Machine Learning and Intelligent Systems

- Ontologies and Semantic Disambiguation
- Knowledge Representations and Logical Constraints
- Commonsense and Expert Rules and Logical Inference
What is the most recent in the AI age?

- **AI on demand**: Containerized services which apply their own algorithms to their own data
- **Knowledge Graphs**: Merging knowledge representation and logical analytics
- **Chatbots**: Interaction through speech recognition and natural language generation
- **Deep Learning**: Incorporating domain-specific knowledge into the data models
Combine Knowledge and Data Analytics Containers
Intelligence Graphs for Security Analytics in Dynamic Systems
Any questions?