LONDON METROPOLITAN UNIVERSITY

AI on Demand through Hybridization and Containerization

Dr. Vassil Vassilev

London Metropolitan University

ICAIA2020, 6-7 Feb 2020, Janakpuri, New Delhi

Content

LONDON METROPOLITAN UNIVERSITY

- Logical Analysis vs. Data Analytics
- Cloud Computing and Application Containerization
- Hybridization through Containerization

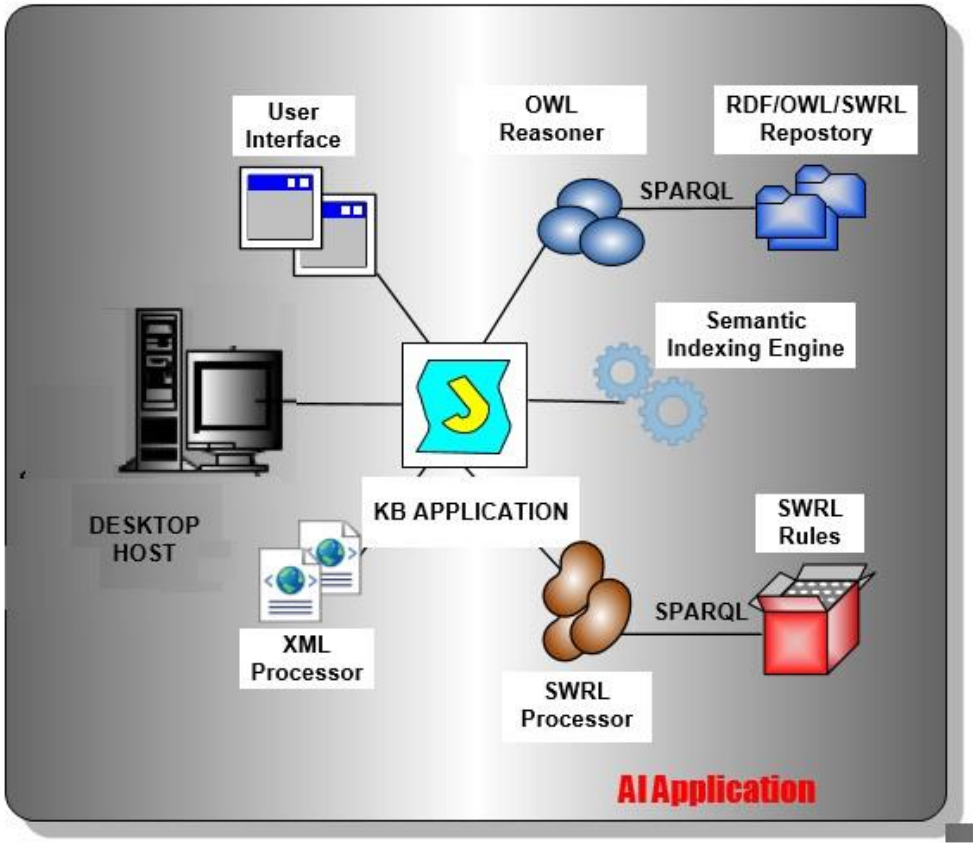
Logical Analysis *vs.* Data Analytics

LONDON METROPOLITAN UNIVERSITY

- **Back to the beginning**: **AI *vs.* ML**
  - Knowledge Representation *vs.* Data Modelling
  - Knowledge Processing *vs.* Data Analysis
  - Logical Inference *vs.* Machine Learning
- **AI today: AI with and without ML**
  - Machine Learning as intelligent data analytics
  - Ontologies as a basis for Knowledge Representation, Interoperability & Explanation
- **Time to reconcile: The Hybrid AI**
  - Knowledge Graphs
  - Cyber-Physical Systems

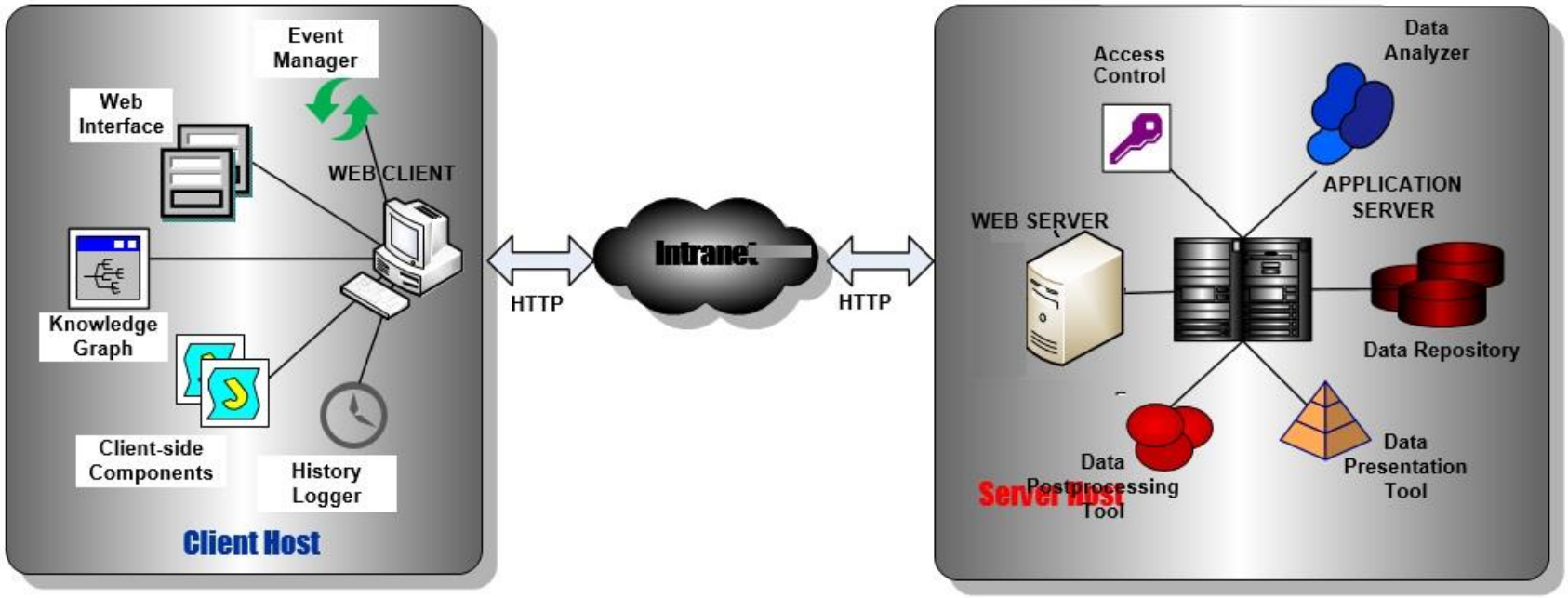
Knowledge-based Systems

LONDON METROPOLITAN UNIVERSITY



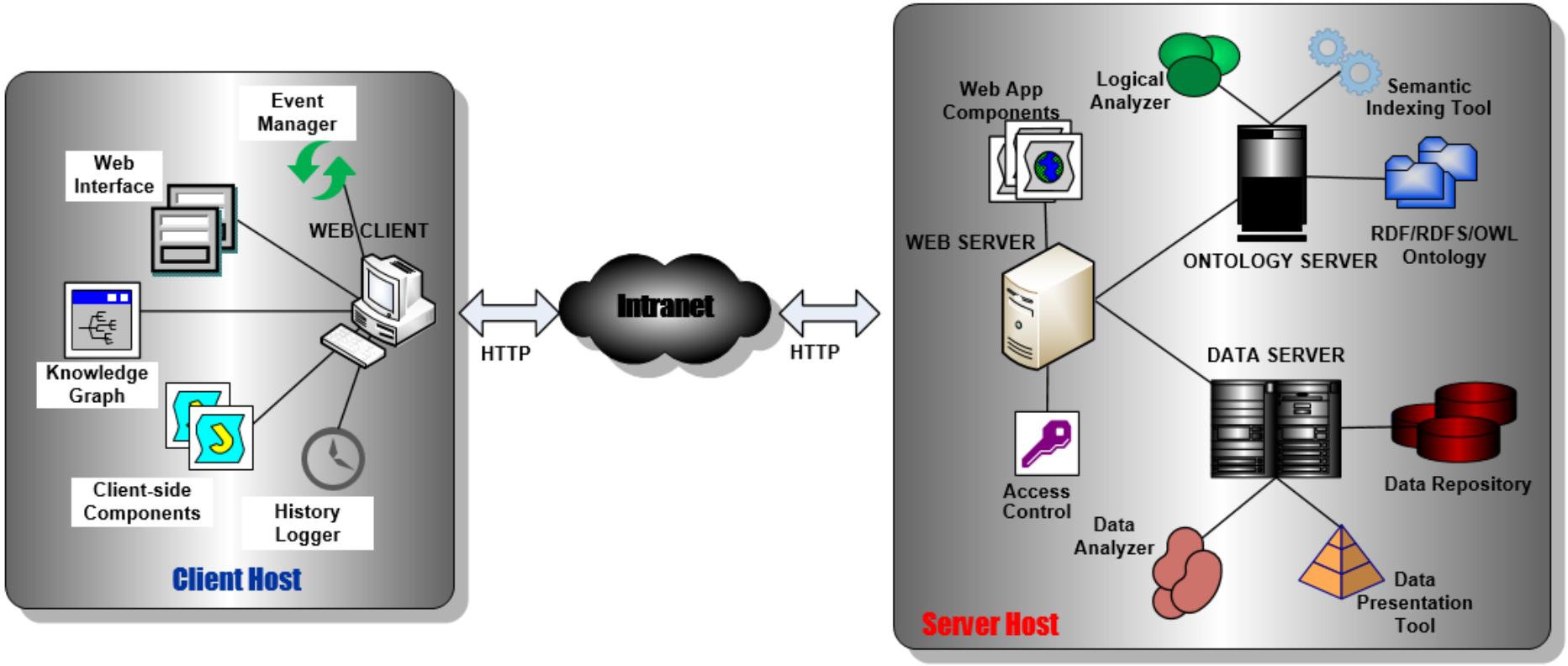
Systems with Machine Learning

LONDON METROPOLITAN UNIVERSITY



Hybrid AI Systems

LONDON METROPOLITAN UNIVERSITY



What is the most recent in the AI age?

LONDON METROPOLITAN UNIVERSITY

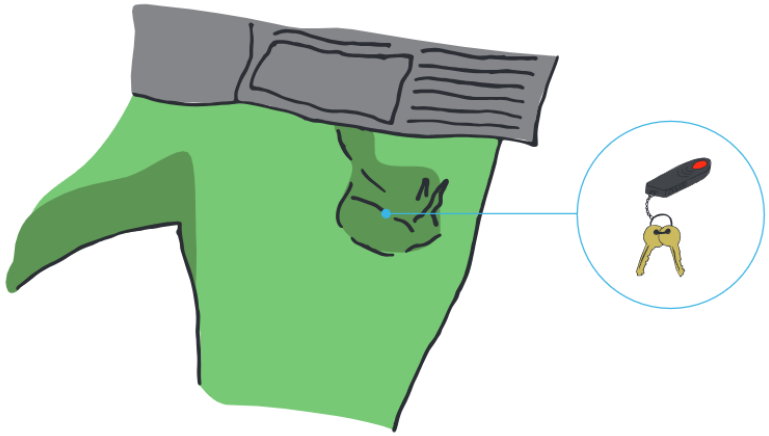
- **Chatbots:** Automating the interactions between the user and the application through Natural Language Processing
- **Deep Learning:** Incorporating domain knowledge directly into the data models to capture specifics of the data
- **AI on Demand:** Event-driven applications for detection, identification, classification, prediction, correction etc. tasks requiring intelligence, which can be executed outside the AI system

Amazon Alexa for Banking

LONDON METROPOLITAN UNIVERSITY

1. USER SPEAKS TO "ALEXA"

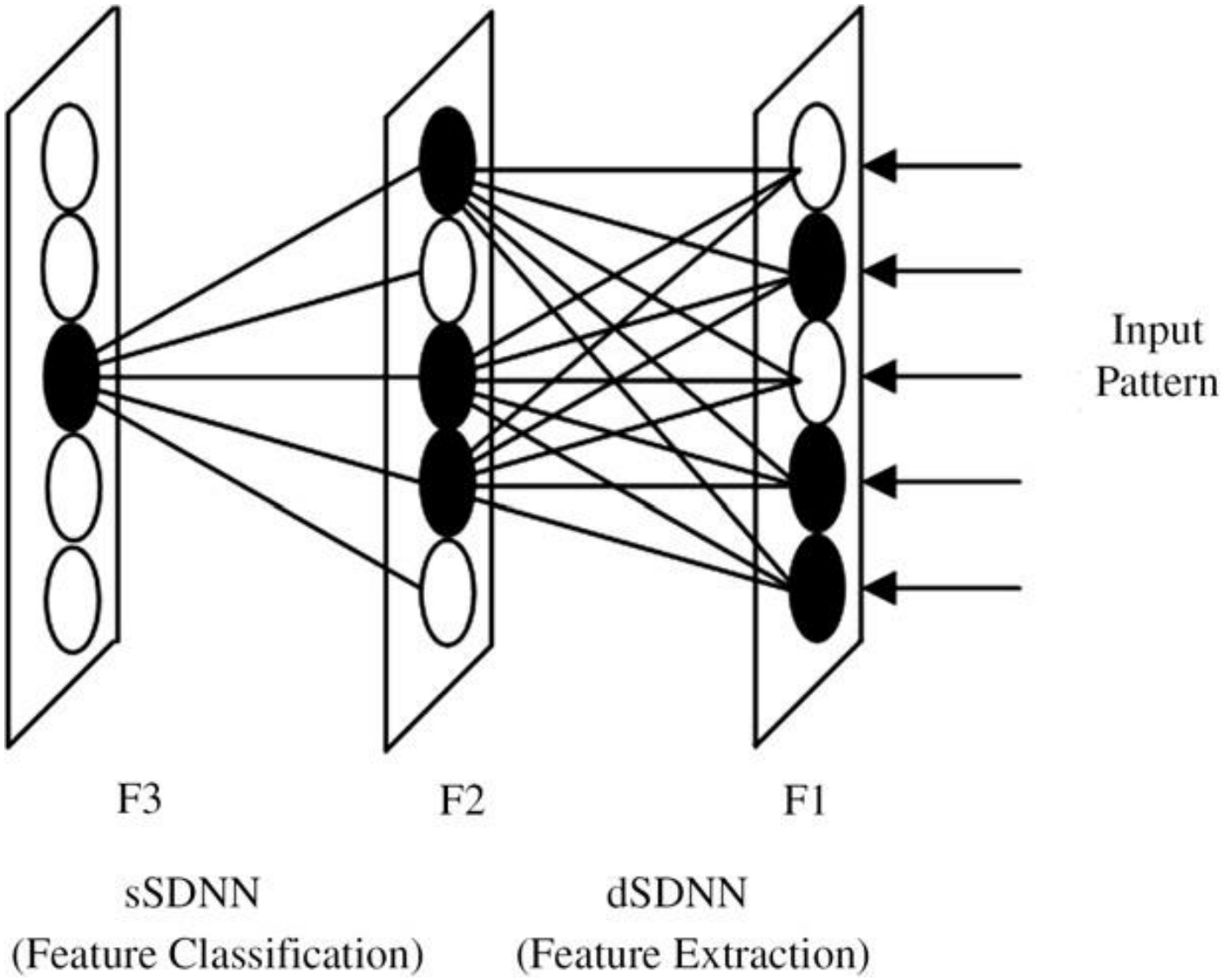
2. USER ASKS "ALEXA" TO SEND MONEY



3. "ALEXA" ASKS USER TO PRESS PERSONAL SECURE KEYFOB TO ACCEPT A TRANSFER

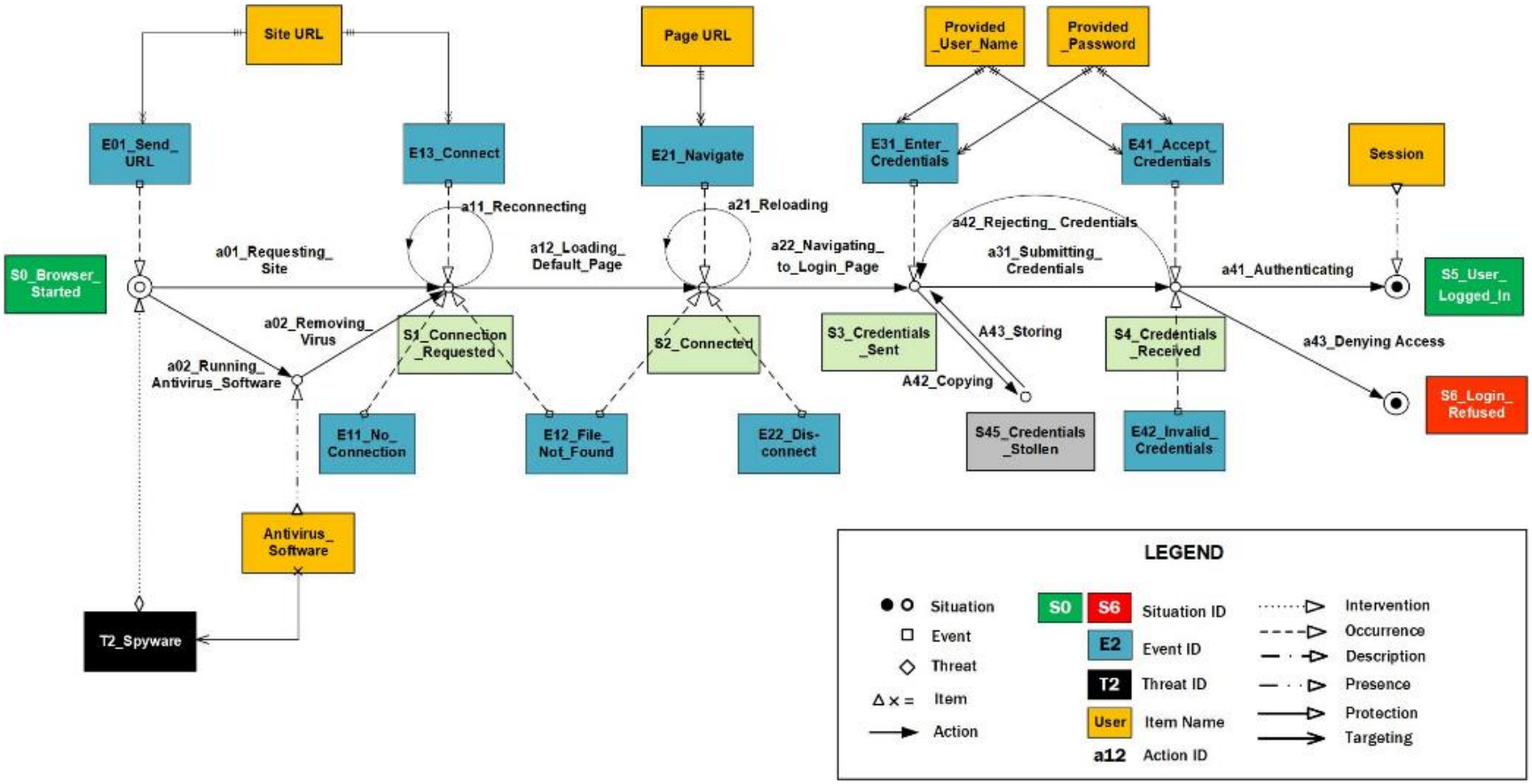
Deep Learning in NN

LONDON METROPOLITAN UNIVERSITY



Intelligence Graphs

LONDON METROPOLITAN UNIVERSITY

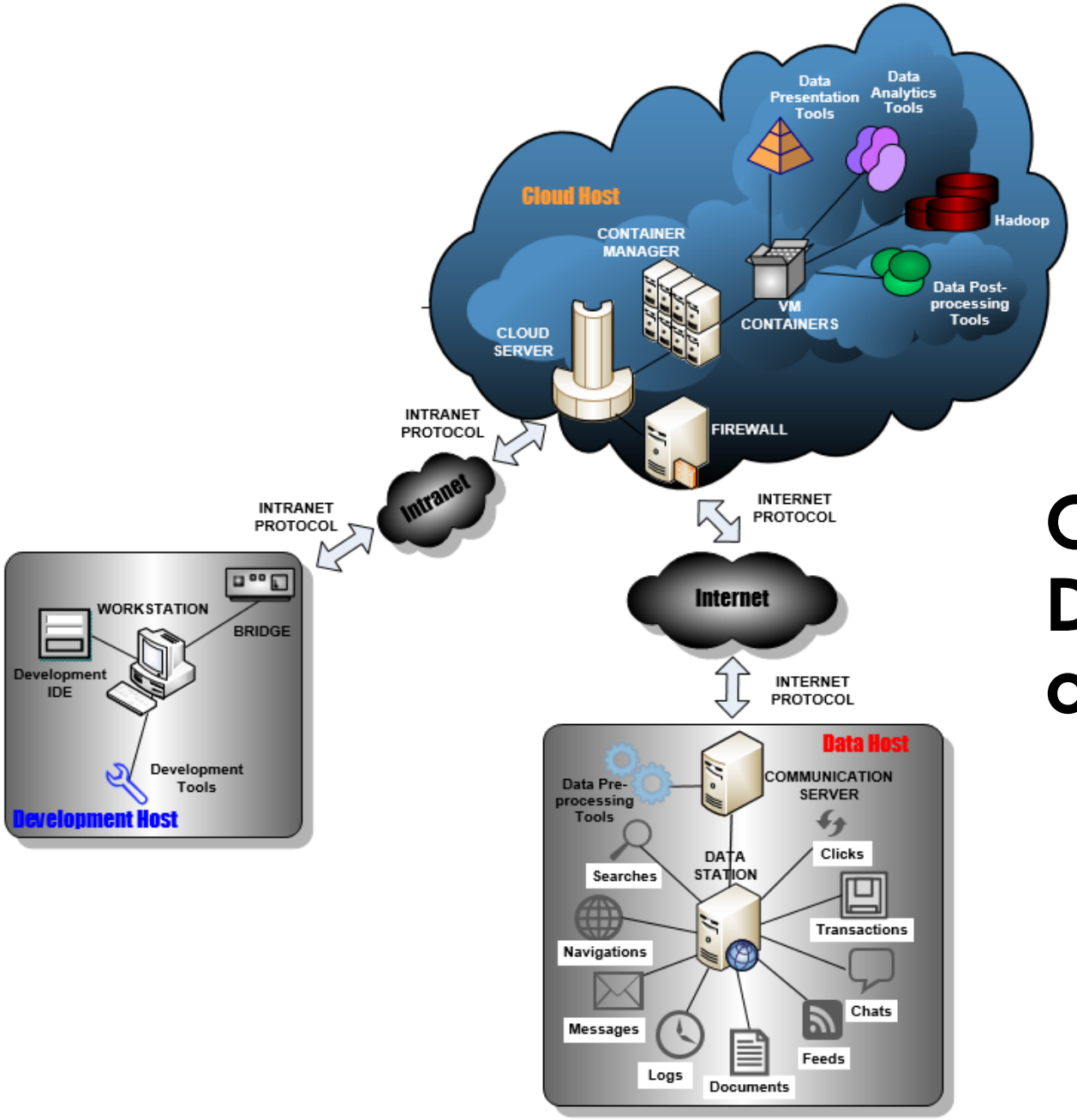


Cloud Computing and Application Containerization

LONDON METROPOLITAN UNIVERSITY

- IaaS, PaaS, SaaS, FaaS: **AWS, Google Cloud, MS Azure**, etc.
- Container Management tools: **Oracle VM**, **VMWare**, **Docker** infrastructure
- DevOps Repositories for agile development: **Slak, Jira, GitHub/GitLab**

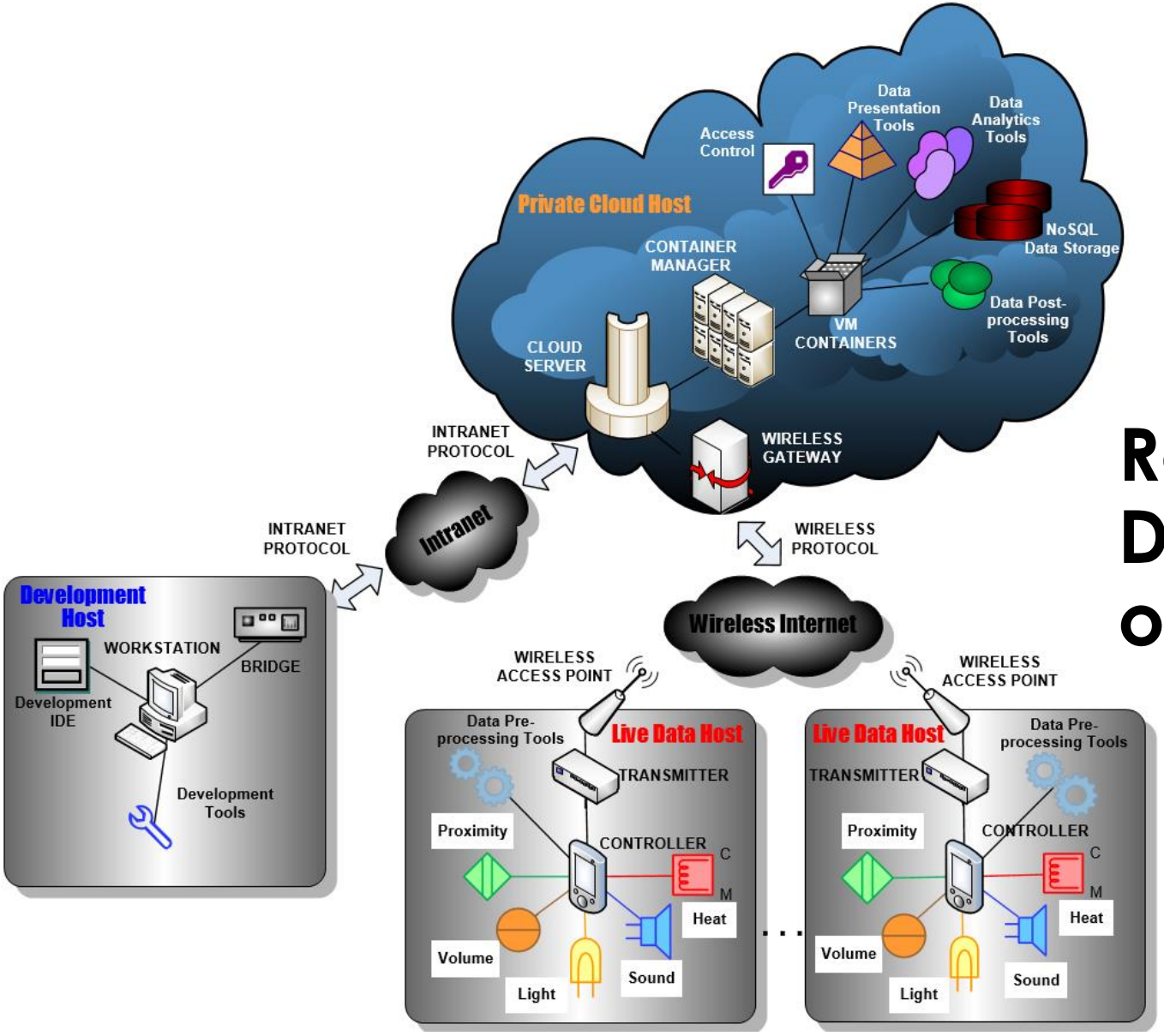
LONDON METROPOLITAN UNIVERSITY



Offline Data Analysis on the Cloud

LONDON METROPOLITAN UNIVERSITY

Real-time Data Analysis on the Cloud



What is the most recent in the cloud age?

LONDON METROPOLITAN UNIVERSITY

- FaaS: **Lambdas, Functions** – serverless computing with session maintenance
- Infrastructure as code: **Terraform** - computing devices, data sources, processor engines and APIs
- Workflow Management: **AirFlow, Camunda** – composition, execution and control of containerized services

Tools for Service Orchestration on the Cloud

LONDON METROPOLITAN UNIVERSITY

JSON for data specification – data formats, programming bindings, storage persistence

YAML for data serialization – data sources, computational engines, communication protocols, type conversion

CWL for workflow description – process steps, parameters binding, infrastructure configuration, process execution, concurrency control

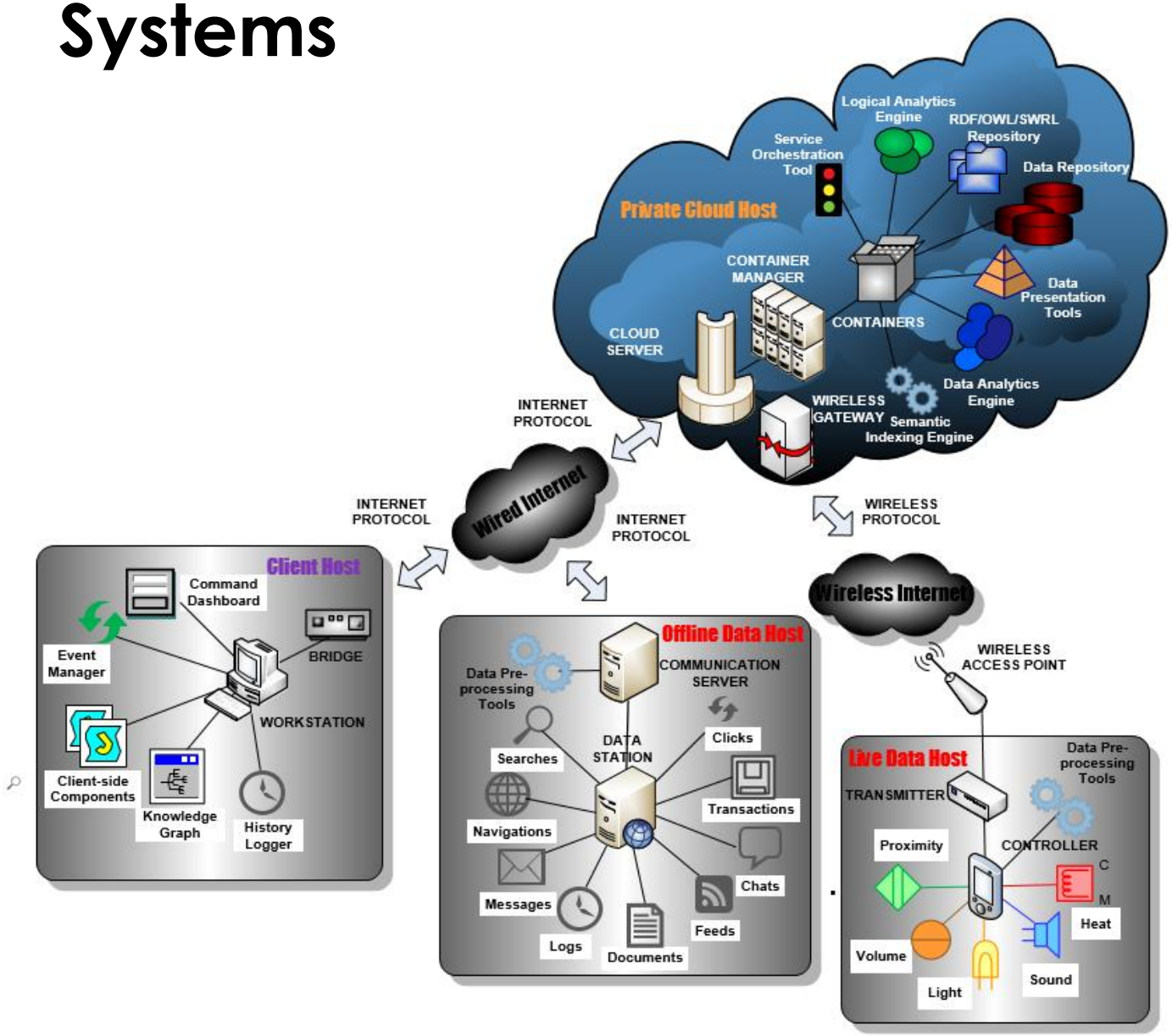
Orchestrating AI: Hybridization through Containerization

LONDON METROPOLITAN UNIVERSITY

- **Multi-layered** software architecture involving public such as Amazon **AWS** or private cloud such as **Kubernetes**
- **Process workflow** for controlling the execution of the tasks using workflow management tool such as **AirFlow**
- **Containerized** AI services for execution within cloud containers such as **Docker**

Hybrid AI for Dynamic Systems

LONDON METROPOLITAN UNIVERSITY



… and happily ever after…

- Multiple **data sources**
- Multiple **models**
- Multiple **languages**
- Multiple **components**
- Multiple **protocols**
- Multiple **behaviours** **…**

LONDON METROPOLITAN UNIVERSITY

Any questions?