



CONVERGENCE



Enhancing the Internet with an information-centric, publish-subscribe service model, based on a common container for any kind of digital data, including representations of people and Real World Objects

A common container: the Versatile Digital Item (VDI)

- A **standard-based** (ISO-MPEG), self-contained, “all-inclusive” data unit
- A container for **any kind** of digital data, including media, representations of people and virtual or physical objects (Real World Objects - RWOs)
- Binding of:
 - **data** =resources: other VDIs, audio, images, video, text, descriptors of People, descriptors of RWOs, etc.
 - **meta-data**=meta-information describing the content of the item; authentication and protection; rights to use the item; expiry date (supporting “digital forgetting”)
- VDIs have a unique **identifier**, are handled by a Pub/Sub **middleware** and distributed by an Information-Centric **network**
- **Search engines** can exploit VDI description and metadata for indexing

Functionality/advantages for users

1. Create a VDI, defining related licenses and rights
2. Sign and/or encrypt a VDI
3. Search and Retrieve a VDI (with metadata easing semantic searches and operation of search engines)
4. Publish a VDI
5. Subscribe to a VDI (meeting specified criteria)
6. Verify the authenticity of a VDI
7. Monitor the use of published VDIs
8. Communicate with owners of VDIs
9. Versioning a VDI and linking it to other VDIs
10. Update a VDI (e.g., my CV, parts catalogue)
11. Delete a VDI (digital forgetting and garbage collection)

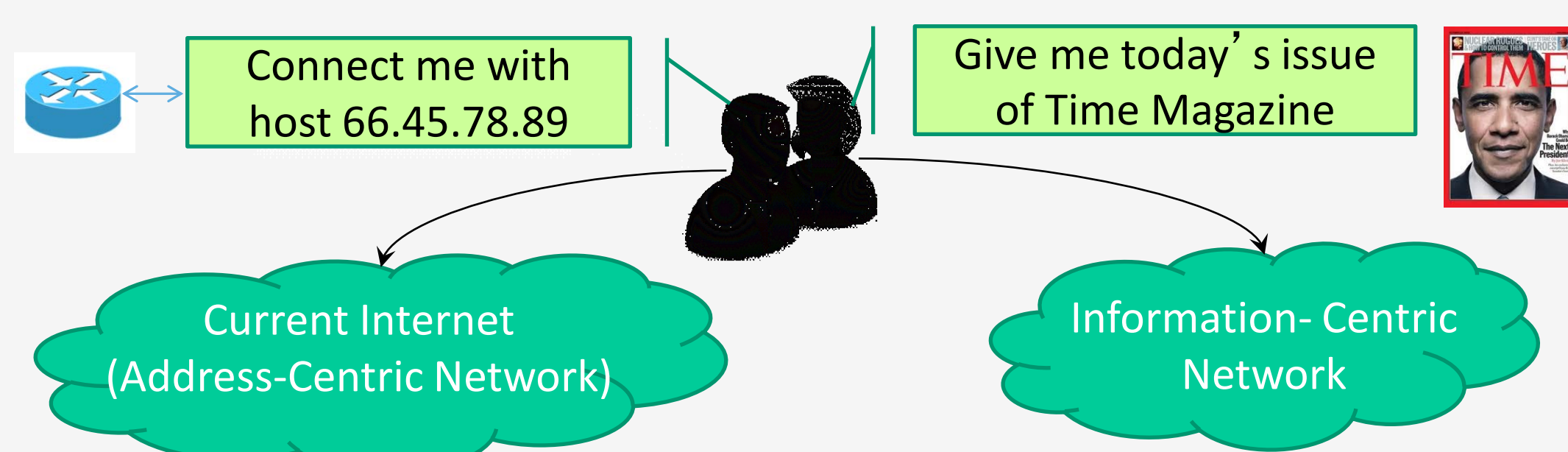
Network

Information Centric Network

- The network layer provides users with named content, instead of communication channels between hosts

Advantages

1. Native content-routing
2. In-network caching
3. Simplified support for mobile, multicast and peer-to-peer communications
4. Support for time/space-decoupled model of communications, including Pub/Sub
 - “pieces” of network can operate autonomously (e.g. sensor networks, social gatherings, trains, planes, vehicles)
5. Content-oriented security model; securing the content itself, instead of securing the communications channels
6. Per-content quality of service differentiation and access control
7. Network awareness of transferred content
 - better control on information transfer and related revenues flows
8. **Simplification of network design and operation, integrating diverse functions, avoiding patches and stopgap solutions**



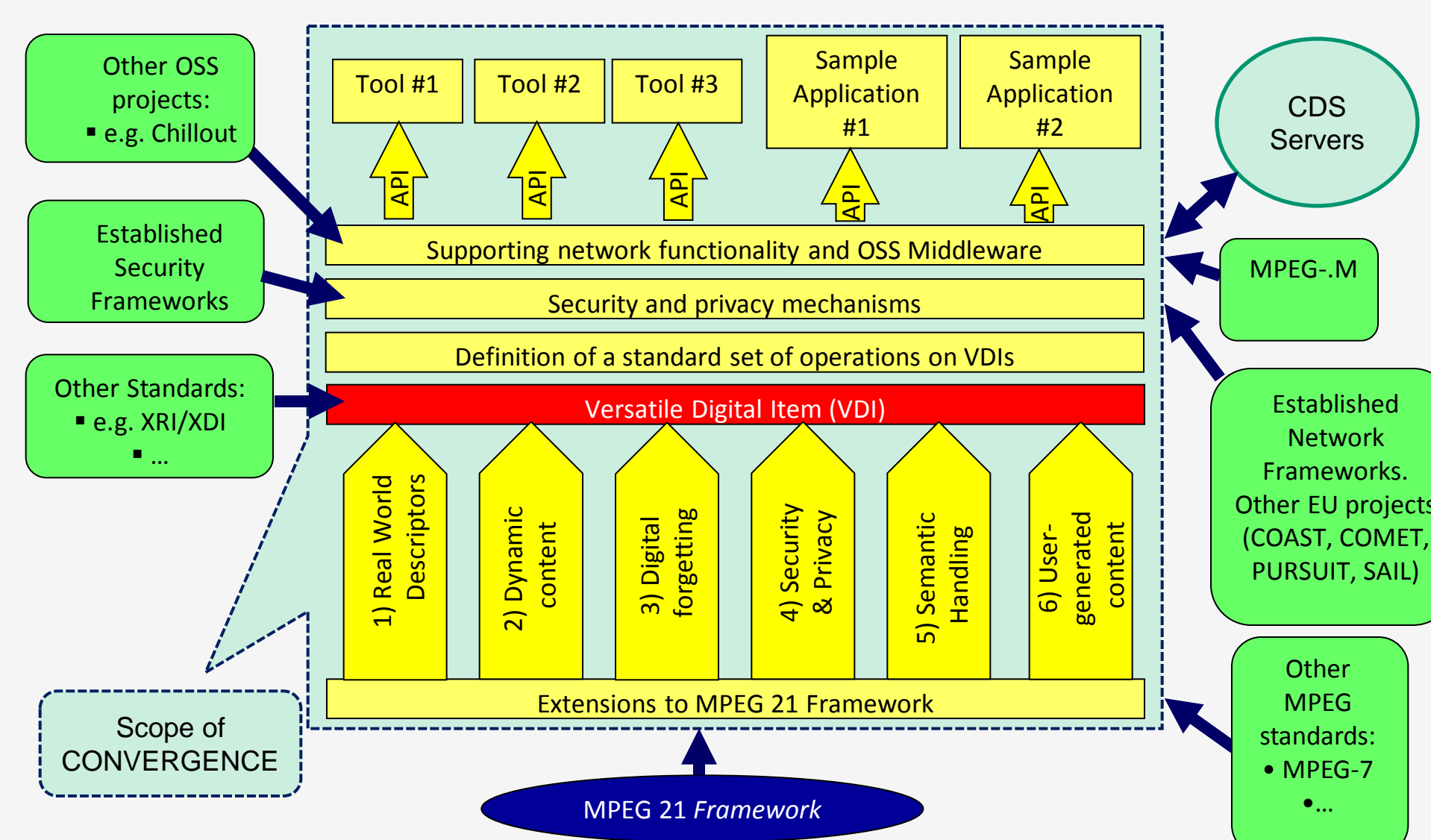
Middleware

ISO-MPEG based (MPEG-M)

- Publish-Subscribe operations
- Semantic searches/matches
- Security functions (exploiting smart cards, and Attribute-Based Encryption)
- Approved contributions to **International Standards**:
 - MPEG-21 DII amendment for Semantic Relationships
 - New MPEG-M services for Post and Revoke Content
 - MPEG-M Reference Software

Advantages

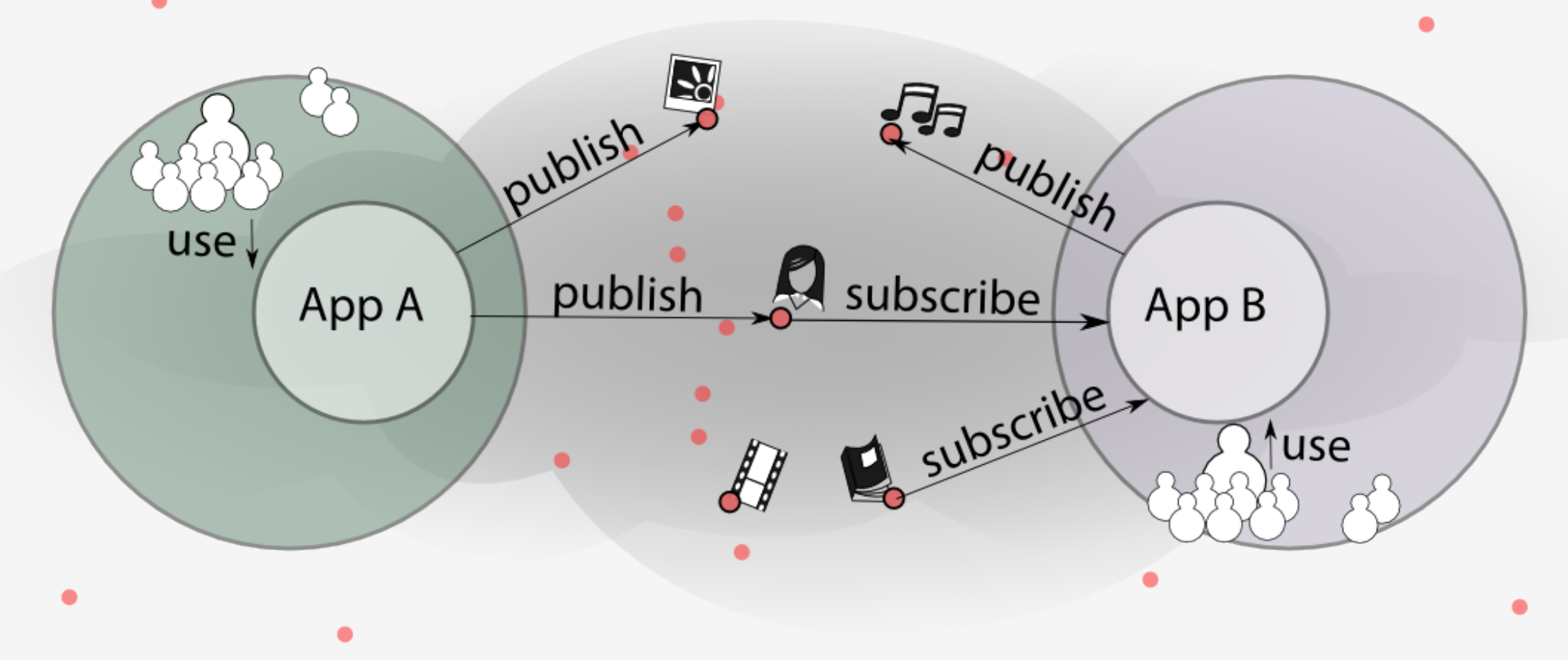
- It allows building applications that exploit and add value to CONVERGENCE functionalities, without having to use proprietary solutions
- It relieves the network layer from complex functions (which are executed on a subset of all nodes) and can operate on any network
- Modular architecture and interfaces allow for a smooth evolution from current networks



Applications

Six real-worlds applications & trials

1. Professional photography, making it easier for photographers to contribute and describe photos, improving access for users and facilitating management
 2. Audiovisual archives, exploiting semantic techniques, when the same videos are used in different contexts
 3. Podcasts with synchronized slides, which are annotated by students in a social learning environment
 4. Retailing supply chain for electronic products; lifecycle management of VDI-enabled Real-World Objects in a large retailer/shopping mall; logistics, in store & on shelf management, warehousing
- Two integrated applications: the first one integrates video and podcasts (2+3); the second one integrates photo and retail (1+4)->they show the power of VDI
 - **Network experiments over OFELIA (OpenFlow) and OpenLab (PlanetLab)**



www.ict-convergence.eu

