

Privacy vs. Data: Business Models in the digital, mobile Economy

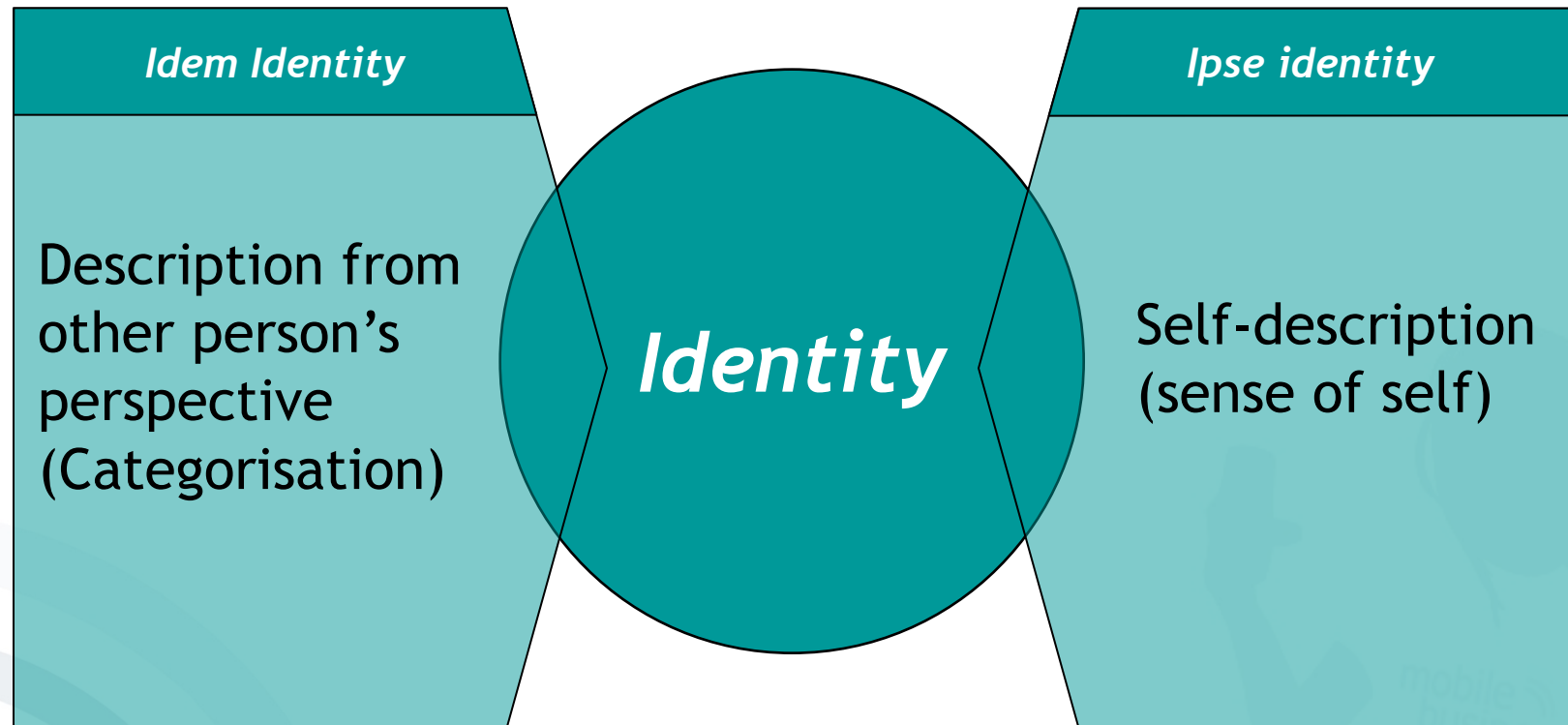
Lecture 11 (Mobile) Identity Management & Overview of Digitalisation Backbone Technologies

SS 2017

Dr. Andreas Albers



- (Mobile) Identity Management
 - The Identity Concept
 - Digital Identities
 - Identity Management and Identity Management Systems
 - Mobile Devices as Digital Identities
 - Identity Threats
- Backbone Technologies for the Digitalisation
 - Cloud Computing
 - Big Data
 - Artificial Intelligence
 - Information Security



- **Mental identity** (ipse, I)
 - Researched by social/psychological sciences
 - Dynamically changing configuration reflecting, and shaped by, interactions between an individual and its environment
 - Private and endless task to go deeply in ones' own description:
 - “Only I can be responsible for acts done by me.”
 - “I remain myself by being faithful to my promises.”

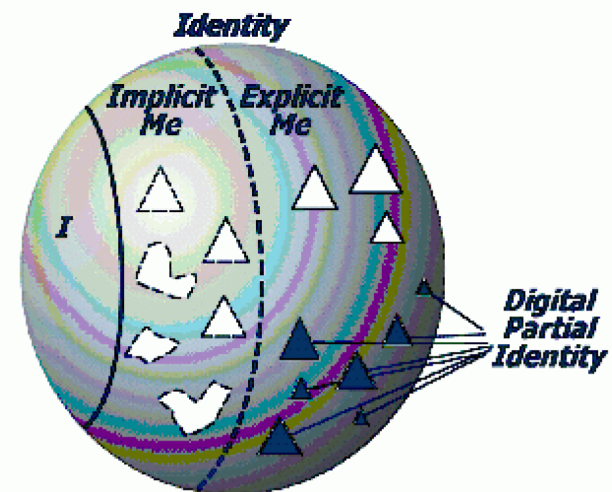
Source: Bogdanowicz and Beslay (2001)

- **Procedural identity** (idem, Me)
 - Used by technical/administrative sciences
 - Collection of formalized characteristics, which enable identification and authentication necessary for social and economic relations, as well as dealings with the authorities.
 - E.g., a person's name, marital status, date of birth, height, colour of skin or eyes, number of children, nationality, educational and professional qualifications, etc.
 - The choice of these characteristics may depend on the context, i.e. controlling authority, functional needs, etc.

Source: Bogdanowicz and Beslay (2001)

The procedural identity (**Me**) can be further differentiated

- **The I**
the indeterminate first person perspective
- **Implicit Me**
how a person perceives her-/himself
- **Explicit Me**
how this person is perceived and represented

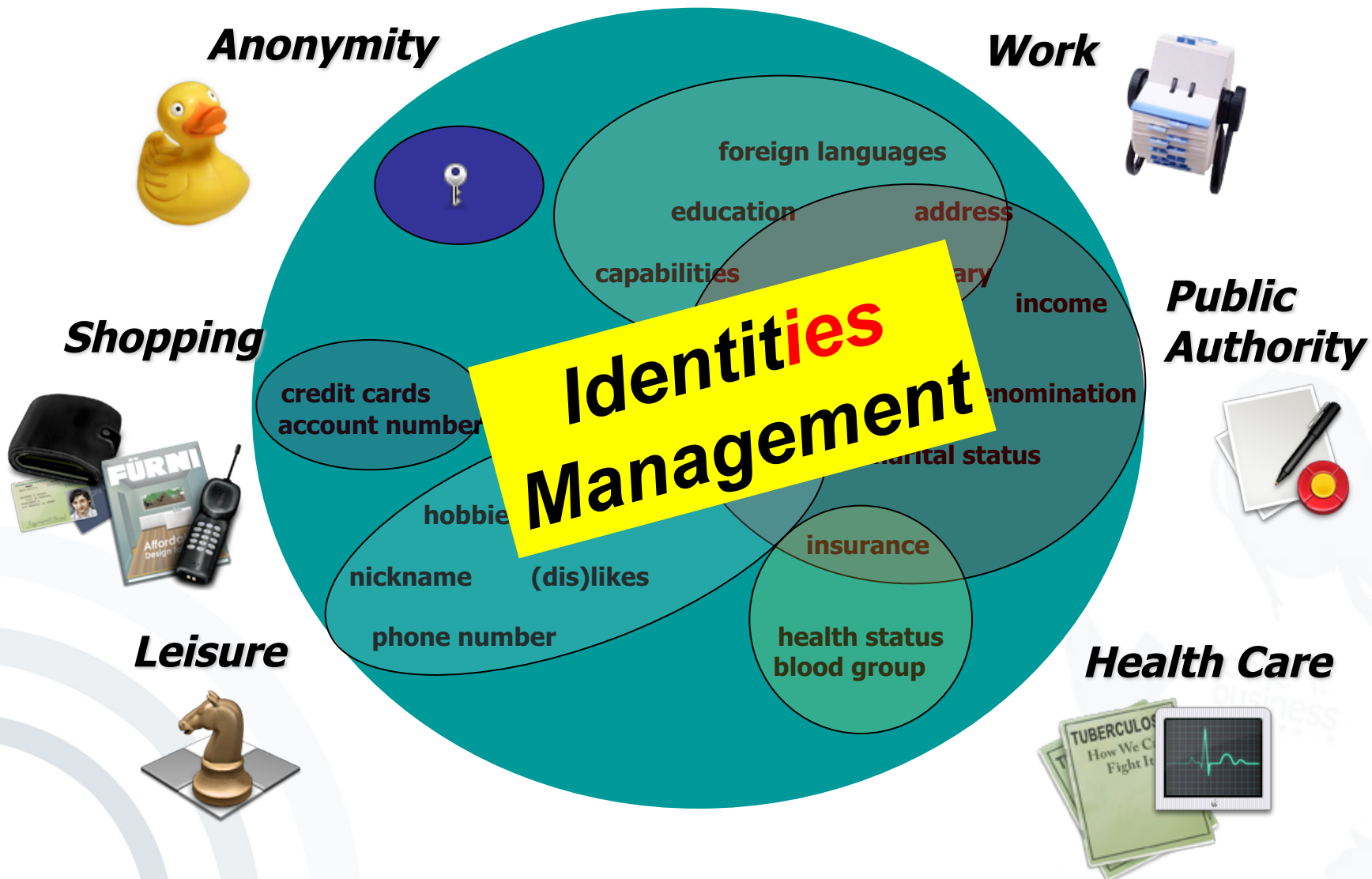


- **Identity:**
The characteristics (attributes) representing an acting entity
- **Partial identity:**
A subset of the characteristics of an identity

Why are partial identities important ?

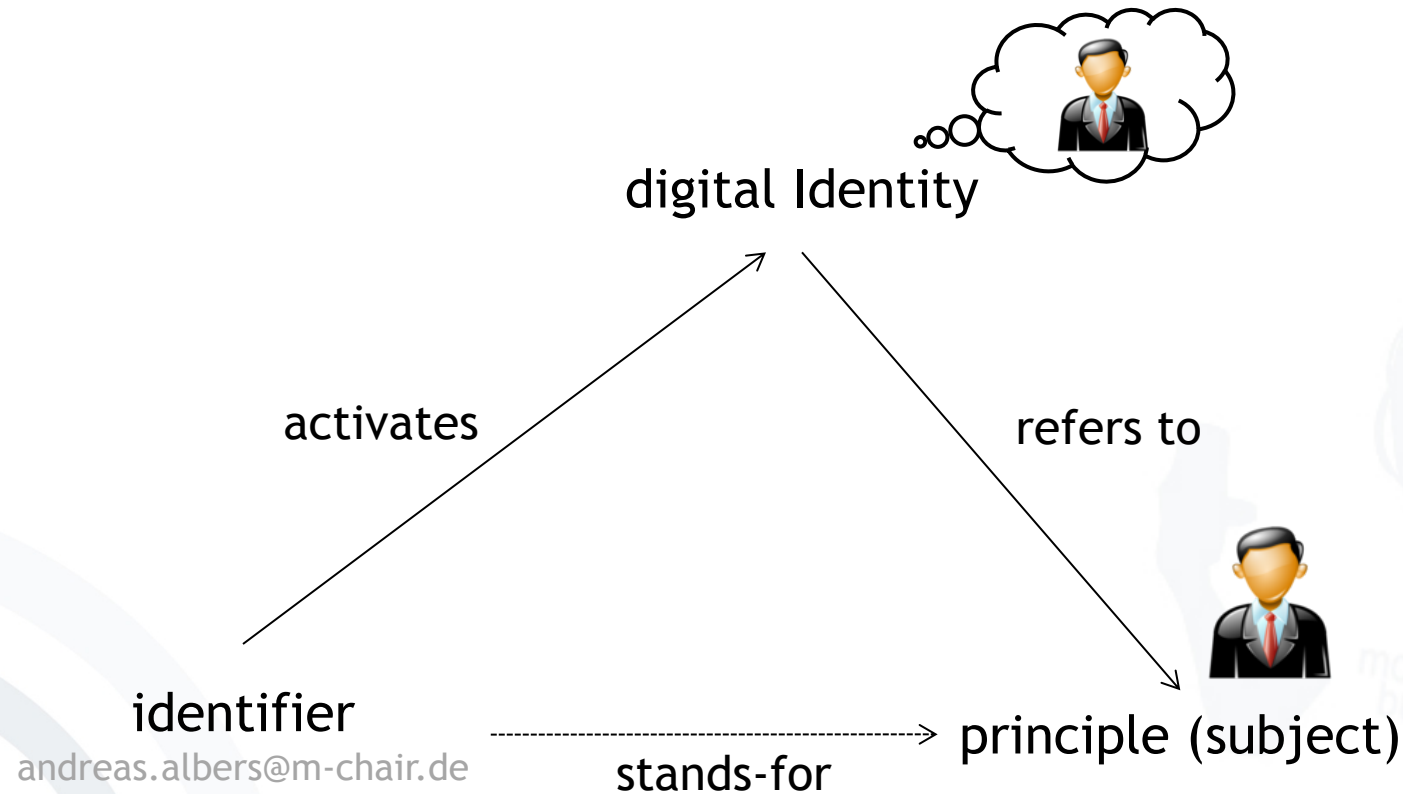
- Different partial identities are assigned to and abstracted from an entity.
- The identity of an entity consists of partial identities distributed over different partners of the entity.

Source: Bauer and Meints (2005)



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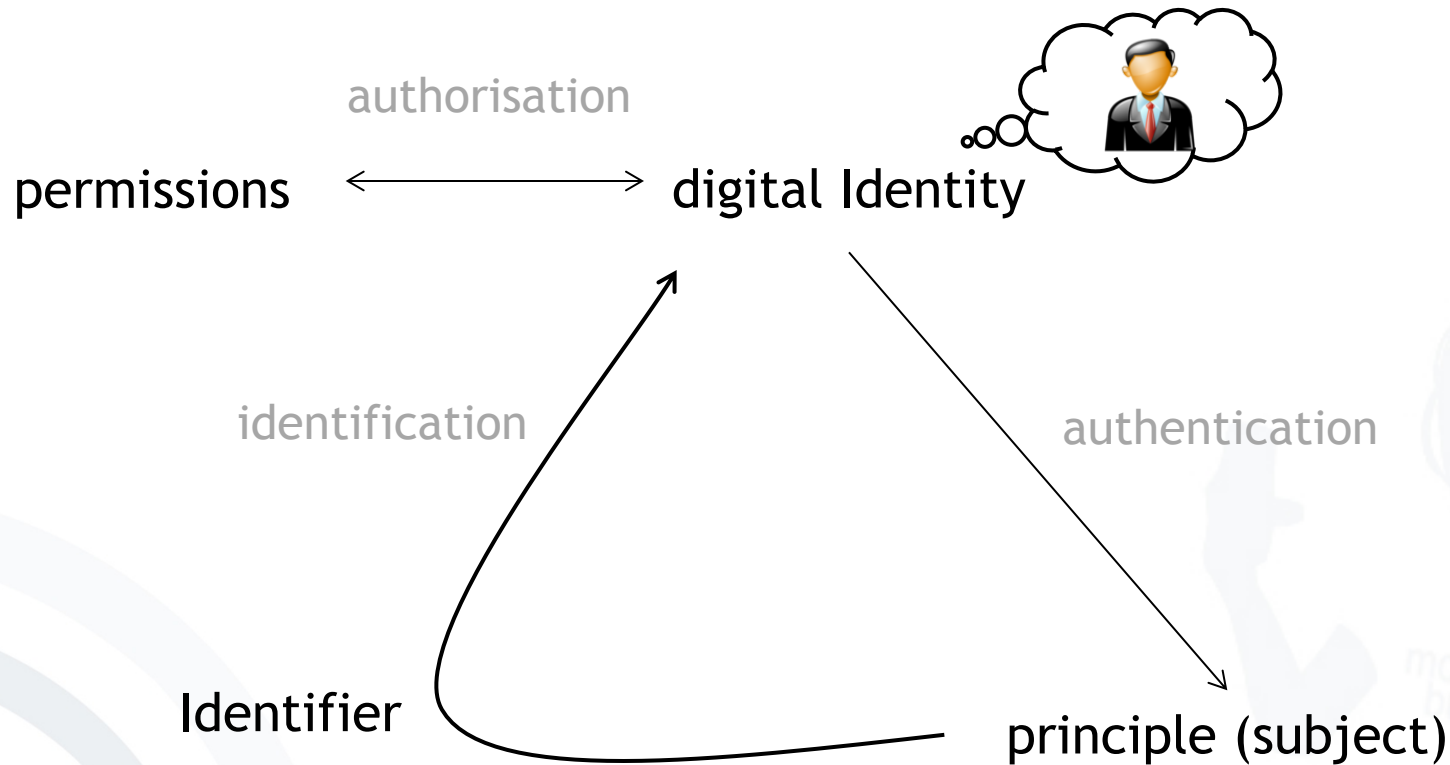
■ Digital Identity Triangle



Source: GINI (2011)

Concepts for Digital Identities

- Identification, Authentication, Authorization



Source: GINI (2011)

- Identification
 - The association between a personal characteristic and a subject representing various attributes (e.g. “Andreas Albers” identifies the person “Andreas Albers”)
- Authentication
 - The process of verifying a subject’s identity or other claim, e.g. one or more attributes.
- Authorisation
 - Through authorisation, rights are assigned to a digital identity.
- Identification without Authentication
 - E.g. subject is processing data that is linked to a different individual than the subject (e.g. a physician processing a patient’s identity data)
- Authentication without Identification
 - Anonymous credentials (e.g. verifying to be at least 18 years old without disclosing other attributes such as name and address).

Source: GINI (2011)

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Identity Management (IdM) is often used as a ***buzz word*** that can have many meanings such as:

- The management of accounts for employees, customers or citizens. These accounts contain those parts of an identity relevant for an organisation (attributes, access rights, roles, ...) → Trend towards federations between organisations
- The collection and analysis of data about individuals allowing for the extraction of useful knowledge on these individuals (profiling): → E.g., for marketing or law enforcement purposes
- The possibility of an individual to manage its procedural identities with different organisations (partial identities) and in this way allowing → To build a “healthy” virtual socio-psychological identity.

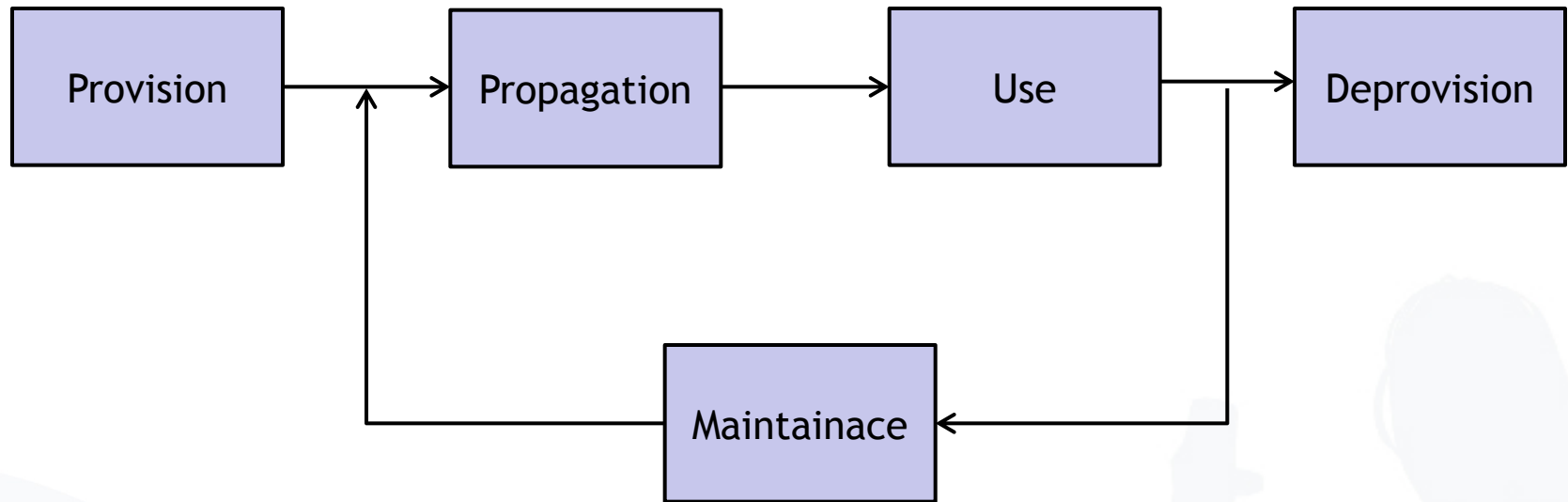
- Identity Management Systems (IdMS) are tools that support Identity Management activities.
- We distinguish
 1. Pure IMS main objective is the support of identity management functionality, e.g. MS Live, Liberty, Shibboleth, OpenID, password managers, form fillers
 2. Systems/applications with another core functionality, but basing on some identity management functionality, e.g. GSM, PGP, eBay
 3. Systems/applications independent from identity management functionality, with some identity management functionality as add-on, e.g., HTML browsers, chat clients

Source: Bauer and Meints (2005)

- Provisioning, Enrolling, Choosing
- Binding with Attributes
- Certifying
- Changing
- Unbinding of Attributes
- Deleting
- ...?



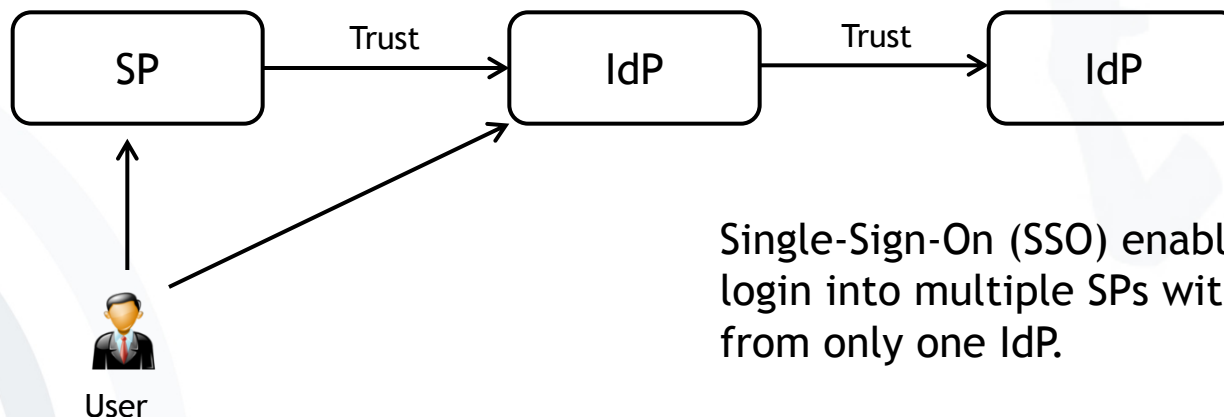
Identity Management Life Cycle





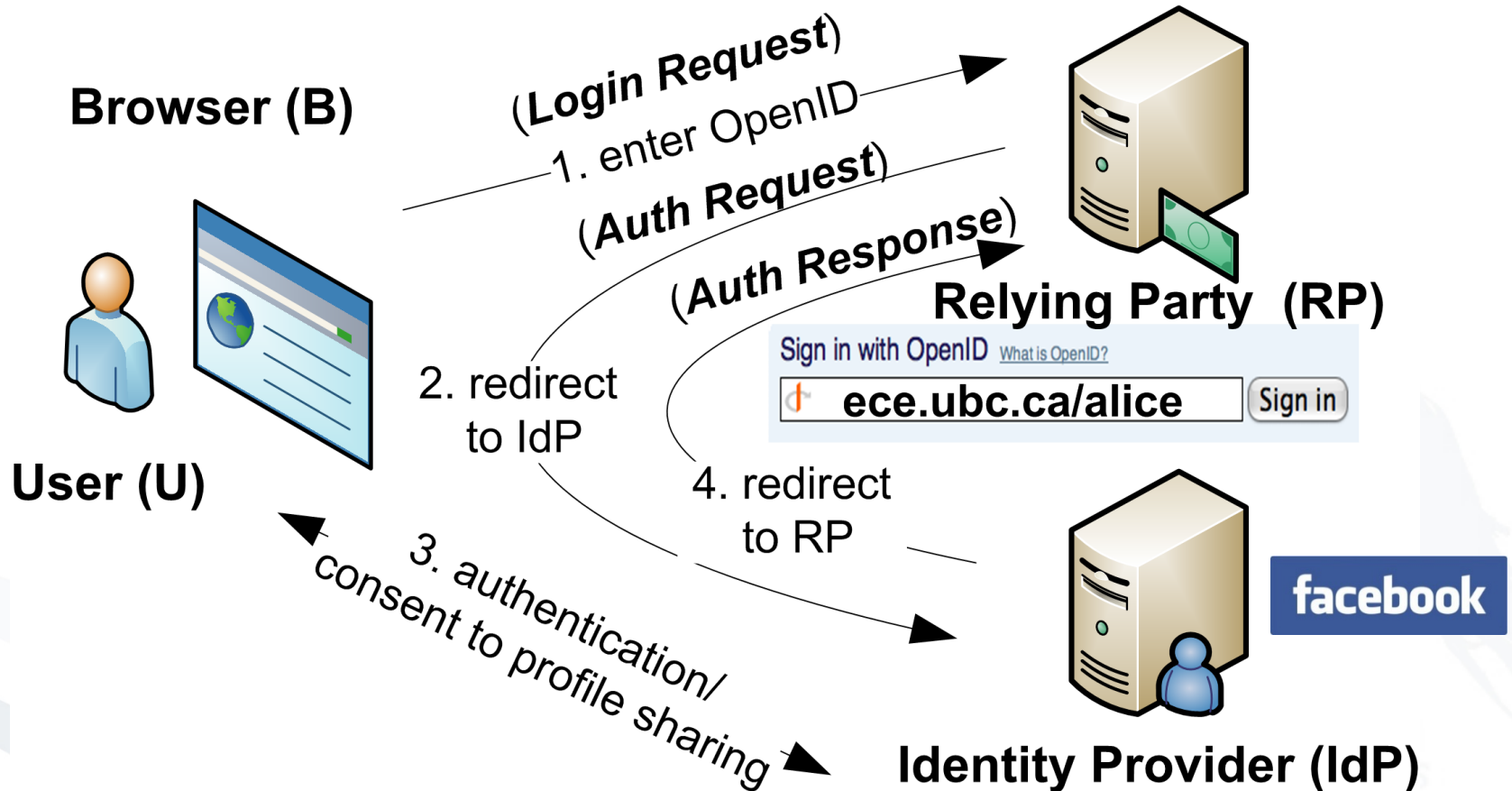
- **Partial Identities**
 - Part of the attributes of an identity of a subject or person
 - Note: Complete identities are typically not used in real-life since an application only requires certain but not all attributes of a person
- **Pseudonymous Identities**
 - Pseudonymisation decouples a digital identity from its real-world identity but linking is possible
- **Anonymous Identities**
 - Digital identity can not be linked in any way to its real-world identity

- Local
 - Local identity in a closed environment (e.g. Windows PC)
- Global
 - Global identity serves to identify entities in a broader context (e.g. passport of an individual)
- Federated
 - Identity federation is based on the conceptual separation between service providers (SP) and identity providers (IdP).



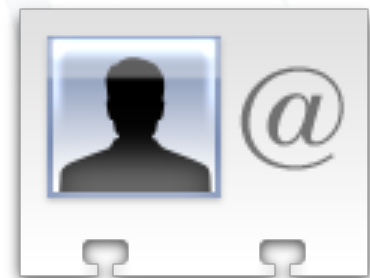
Single-Sign-On (SSO) enables users to login into multiple SPs with credentials from only one IdP.

Simplified Single Sign-On Process (based on OpenID)



Source: Based on konstantin.beznosov.net

- User Centric Model
 - User is in control of his identity (e.g. identity information is stored on the mobile phone)
- Service Provider Model
 - Identity service provider controls a user's identity on his behalf (e.g. Microsoft LiveID)



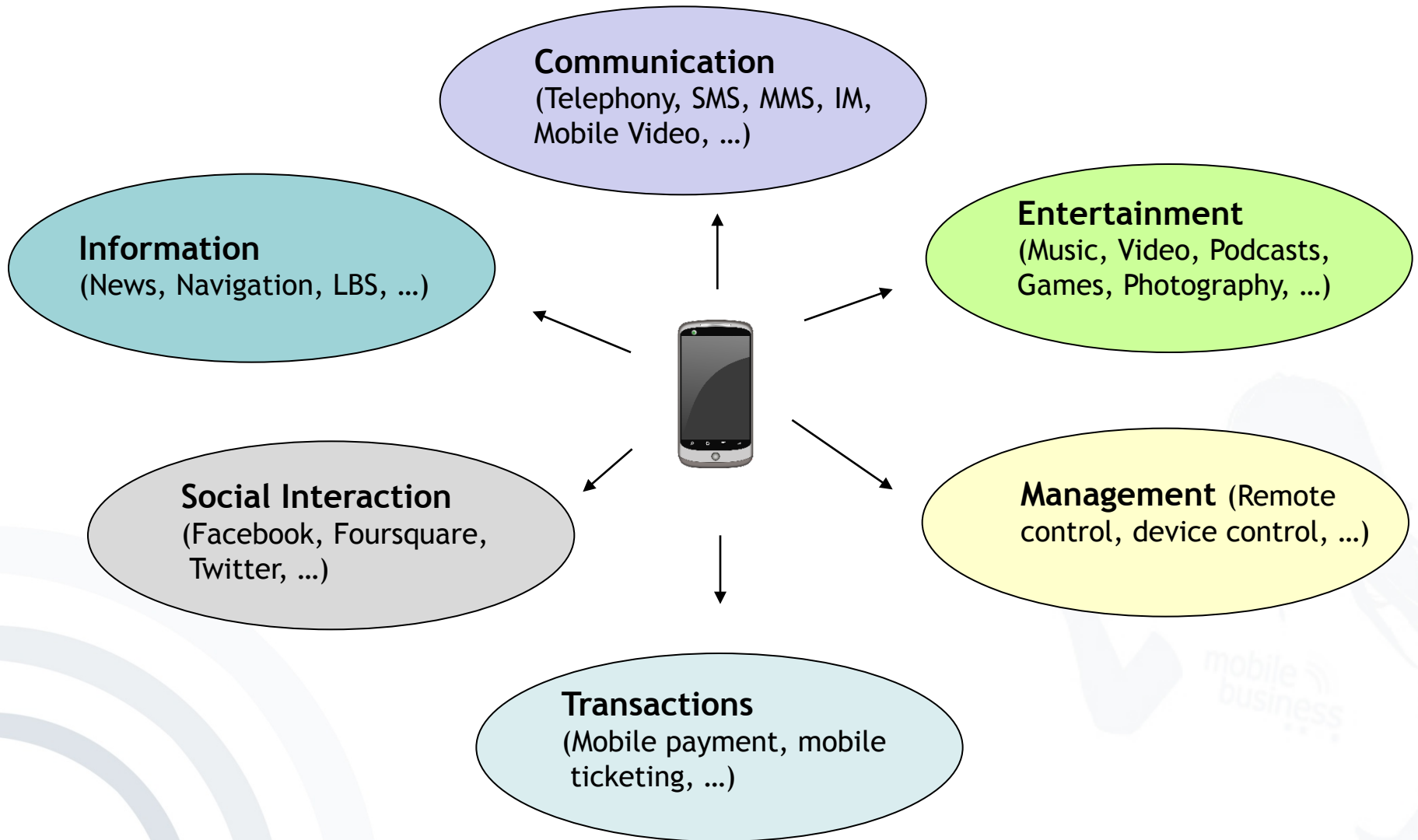
- ORM is the act of monitoring, addressing, or rectifying undesirable/or negative search engine results or mentions in online media.
- ORM Tools or Service Providers
 - Vanity Search (e.g. via Google or Bing)
 - Service Providers e.g.,
 - Reputation.com (Web)
 - Secure.me (free Facebook app)
 - Free data aggregators (e.g. 123people.de)
- Basic Approach
 - Use personal identifiers (e.g. name, birthdate, etc.) in order to monitor and report about published online content related to a person or organisation
 - If needed, ORM providers offer support for individuals or organisations to rectify or to take down unwanted content



Source: apexwallpapers.com

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Mobile Phone in the centre of Mobile Services



- Mobile phones ...

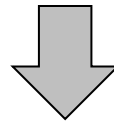
- are always carried with (besides wallet and keys)
- on average turned on 14 hours per day
- usually belong only to a single person
- are usually not lend to other persons
- allow a 1:1 communication
- can be used time or location independent
- are instant-on and always online





- Mobile phones...
 - store, manage and process sensitive, personal data of their users
 - Contacts, photos, videos, text messages, mails, account credentials, etc.
 - provide context information about the current usage situation of their users
 - GPS data, time of usage, unique user ID, noise- and light information, ...
 - receive high attention and interaction from their owners
 - Text messages, push-mails, IM messages, ...

- Mobile phones ...
 - are personal devices
 - manage personal data and
 - enable the access to (mobile) services



- Mobile phone represent the **digital identities** of their users in everyday life



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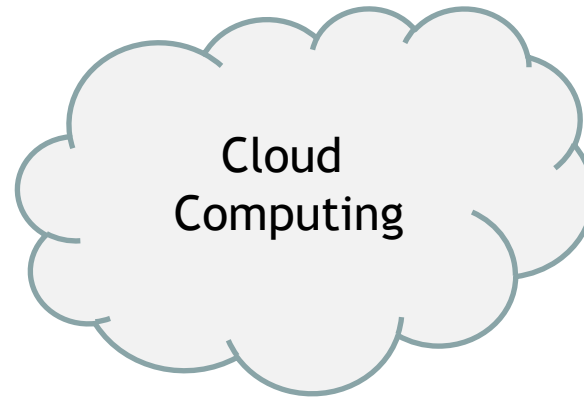
- Security of identities and surveillance, e.g.
 - Hacking attacks on service providers to steal credit card details
 - Unauthorised communication surveillance
- Persistence of identities over time, e.g.
 - The Internet does not forget any published information
 - Wrong or out-dated personal data remains available
- Incapacitated data controllers, e.g.
 - Data controllers under the control of governments for the purpose of censorship
- Over-sharing of personal information , e.g.
 - Users posting too many personal details on Social Networks
 - Service providers asking for more than necessary information from its users
- Impairment of rights by digital services, e.g.
 - Personal data is sold without user authorisation to Third Parties



Source: GINI (2011)

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Overview of selected Backbone Technologies for the Digital Age



Information Security



Big Data



Artificial Intelligence

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What is Cloud Computing?

Too many cloud definitions ...

- A model for delivering information technology services in which resources are retrieved from the internet through web-based tools and applications, rather than a direct connection to a server. Data and software packages are stored in servers. However, cloud computing structure allows access to information as long as an electronic device has access to the web. This type of system allows employees to work remotely. (*Source: Investopia*)
- Cloud computing refers to applications and services offered over the Internet. These services are offered from data centers all over the world, which collectively are referred to as the "cloud." This metaphor represents the intangible, yet universal nature of the Internet. (*Source: TechTerms*)
- Computing services provided over the Internet (or "cloud"), whereby shared resources, software, and information are provided to computers and other devices on demand (*Source: Wiktionary*)

Cloud Computing Providers Some Examples



Cloud Software Providers

Some Examples



iCloud



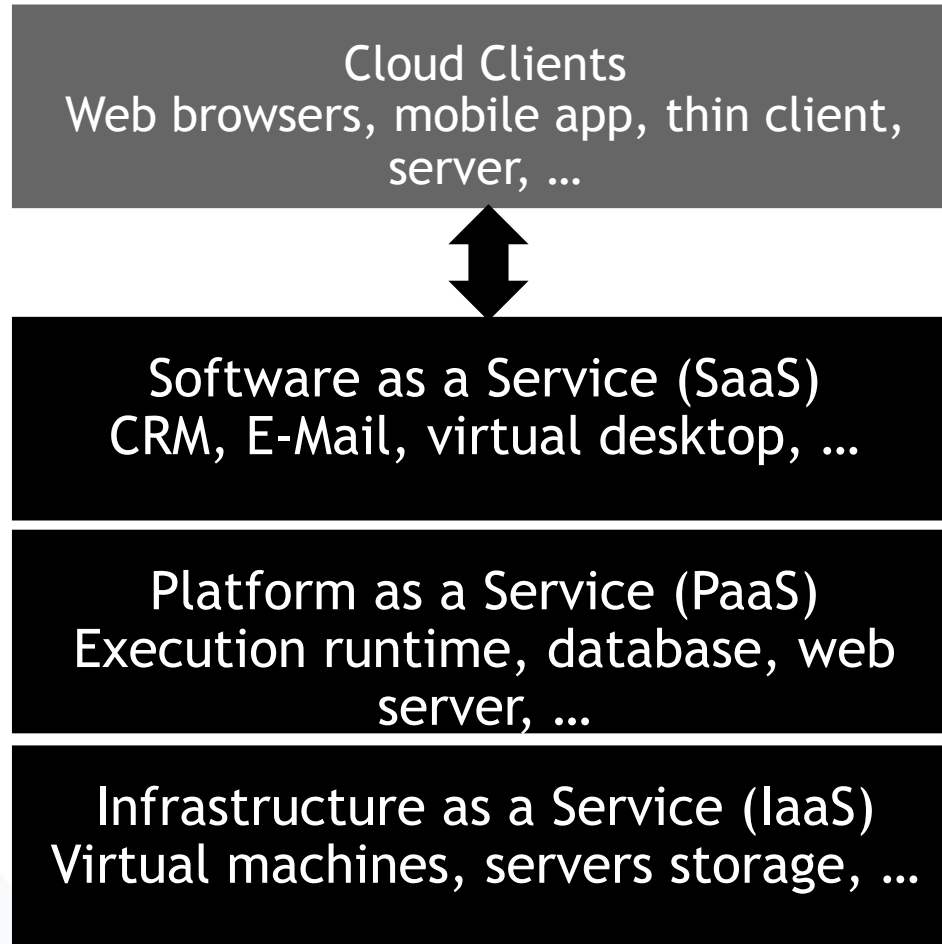
Flinkster
Mein Carsharing



Microsoft Azure

Cloud Computing Characteristics / Difference to traditional IT-Services

- Provisioning of IT-services (e.g. computing, storage, software applications) via Internet/Intranet
- Virtualised resources hiding physical infrastructure from the consumer/user
- Access to cloud IT-resources via Application Programming Interfaces (API) or Web Browser
- User controls the provision and administration of required IT-services (Self-Service)
- Multi-tenancy of underlying IT-resources
- Option for usage-based billing (e.g. based on allocated storage)
- Device and location independence of cloud services
- High scalability & reliability
- Cost effectiveness to due resource sharing at specialised providers



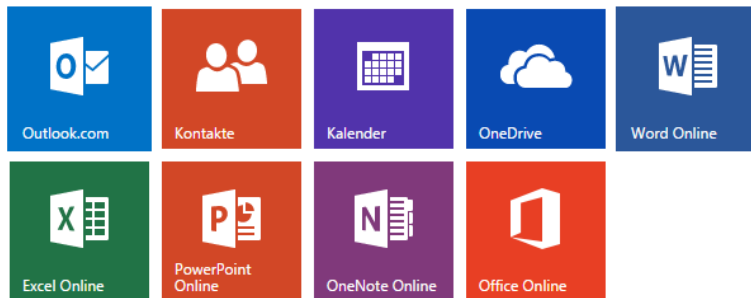
... Public, Private or Hybrid Cloud ...

Key SaaS Characteristics

- Software runs in a stationary or mobile web browser (no local installation needed)
- Data processing and storage rendered in the infrastructure of the cloud provider
- Software foundation: HTML, JavaScript, CSS (Frontend)

Example: Microsoft O365

 Office 365



SaaS Benefits

- Location and platform independence
- Works even on low performance devices
- Effective collaboration due to central DB
- No local software updates required
- No local software installation required
- Ubiquitous access to software
- Centralized controlling and monitoring of software
- Usage-based billing for software
- Improved data security

SaaS Risks/Drawbacks

- (Still) restricted browser access to device capabilities - limits software features
- Software requires permanent network connection to cloud provider
- No local data storage offered by software
- Software performances depends on available network bandwidth
- Data privacy risks
- Potential integration issues of SaaS apps with traditional software

Some Key Characteristics

- Computing power, storage, application platforms as cloud infrastructure
- Pay per Usage / zero cost for idle applications
- High scalability, fast deployment of applications

Example Services



Microsoft Azure



Benefits

- Almost infinite computing power & storage
- Mitigation of traffic/capacity peaks
- Easy, high scalability
- Pay per Usage / zero cost for idle applications
- Rarely used application do not require their own infrastructure
- Platforms allow rapid setup, testing and deployment
- Multiple application instances due to virtualization technology
- Perfect companion for mobile devices

Risks/Drawbacks

- Possible data privacy issues
- Possible vendor lock-in
- Requires permanent network connection to cloud provider
- Potential integration issues of applications with traditional software

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- Big data is considered as large data sets which render traditional data processing methods inappropriate
- Big data characteristics
 - Volume
 - Variety
 - Velocity
 - Variability
 - Veracity

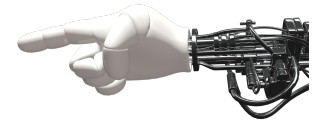
What drives Big Data?



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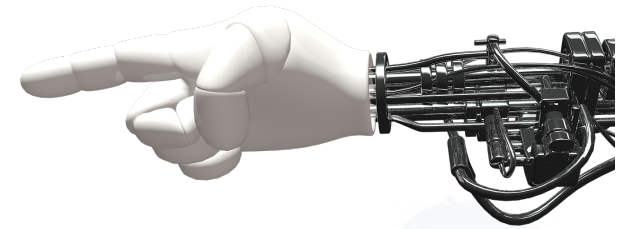
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- Machines performing intelligent tasks
 - reasoning, use strategy, making decisions under uncertainty
 - represent knowledge, including commonsense knowledge;
 - plan and learn
 - communication in natural language
 - ...
- Current main application: Machine Learning

Source: Russell, Stuart J.; Norvig, Peter (2003), Artificial Intelligence

- Traditional Programming
 - Problem → Instructions (Programming) → Solution
 - Solution is always 100% accurate
- Machine Learning
 - Problem → Solution → Iterative Learning
 - Correctness of solution with likelihood
- Popular Applications
 - Voice Recognition, Language Processing
 - Face Recognition, Visual data processing
 - Game Play (Chess, Go)
 - Stock trading
 - Information security
 - Medical examination



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- **Information security** is the practice of defending information from unauthorized access, use, disclosure, disruption, modification, perusal, inspection, recording or destruction. (Source: law.cornell.edu)

- **Key InfoSec concepts**

- Integrity
- Availability
- Accountability
- Confidentiality



Threats

- Computer Crime
- Vulnerability
- Eavesdropping
- Exploits
- Trojans
- Viruses and Worms
- Ransom Ware
- Mal Ware
- Denial of Service
- Payloads
- Rootkits
- Keyloggers

- Major online applications/services of today
 - highly complex
 - mainly cloud-based
 - require 24/7 availability
 - strongly interconnected with other services
 - accessible via the public Internet
 - collect, process and maintain sensitive (personal) data

→ **Information Security as absolute critical aspect in the digital economy**



Big Data / Connectivity

- <http://www.faz.net/aktuell/technik-motor/computer-internet/risiken-des-vernetzten-zuhauses-die-smarte-kapitulation-13995637.htm>
- <http://www.computerwoche.de/a/mckinsey-ueber-das-internet-of-things,3212889>
- <http://www.slideshare.net/HolgerSchmidt/internet-der-dinge-der-nchste-groeschritt-fr-die-digitale-wirtschaft>
- http://www.heise.de/newsticker/meldung/Internet-of-Things-Milliarden-Dinge-haengen-am-Netz-2557750.html?wt_mc=sm.feed.tw.ho
- <http://www.cebitt.de/de/news/aus-datenbergen-lernen.xhtml>

Cloud

- <http://www.techradar.com/news/internet/cloud-services/battle-of-the-public-cloud-aws-vs-microsoft-vs-google-vs-ibm-1309626/>
- <http://www.zdnet.de/88251730/us-firmen-draengen-in-die-deutsche-cloud/>

Artificial Intelligence

- <http://www.heise.de/newsticker/meldung/32C3-Wenn-Algorithmen-entscheiden-und-toeten-3057086.html>
- <http://www.spiegel.de/netzwelt/gadgets/roboter-kuenstliche-intelligenz-uebersetzer-technik-der-zukunft-a-1017501.html>
- http://en.wikipedia.org/wiki/The_Singularity_Is_Near
- <http://t3n.de/news/zukunft-arbeit-roboter-steuern-666473/>
- <https://www.technologyreview.com/s/601051/machine-learning-algorithm-identifies-tweets-sent-under-the-influence-of-alcohol/>

Security

- <http://www.businessinsider.de/microsoft-security-from-worst-to-best-2015-11?r=US&IR=T>
- <http://www.golem.de/news/sexting-vault-apps-sind-das-neue-snapchat-1511-117386.html>
- <http://www.faz.net/aktuell/feuilleton/debatten/hackaktivismus-von-anonymous-prinzip-hoffnung-13921349.html#GEPC;s6>
- http://www.techinsider.io/dark-web-tour-2015-11?utm_content=buffer50656&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer-ti
- <http://t3n.de/news/suchmaschine-internet-dinge-672969/>
- <http://www.spiegel.de/netzwelt/apps/whatsapp-verschluesselung-gut-aber-nicht-komplett-abhoersicher-a-1085726.html>