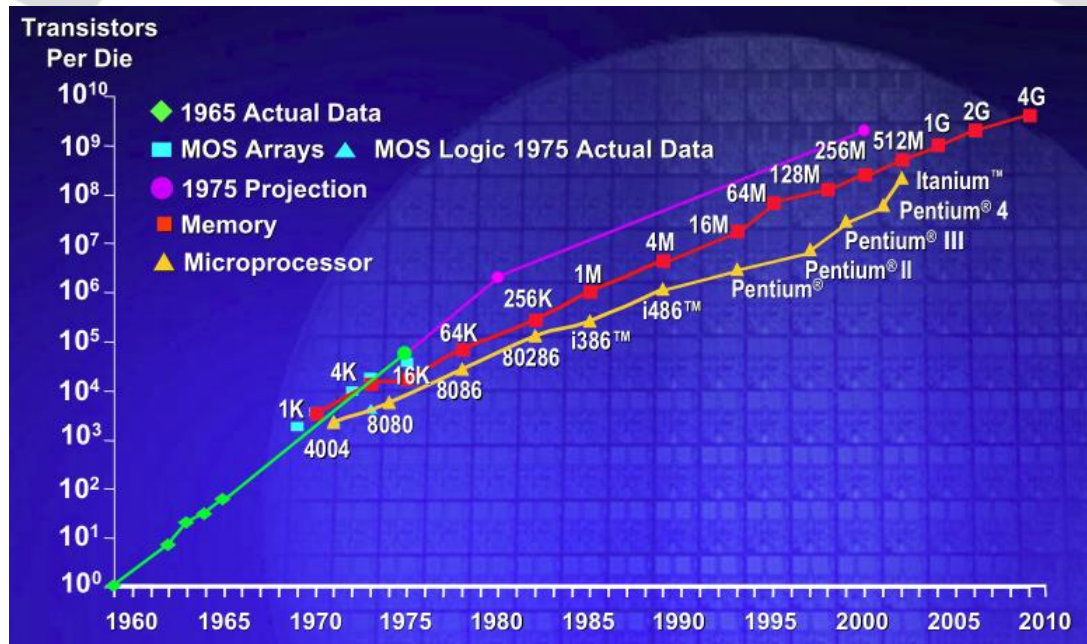# IS THE FUTURE OF MOBILE COMPUTING IN THE CLOUDS? (CLASS-MA)

Domen Verber

Univeristy of Maribor, Slovenia

domen.verber@uni-mb.si

Motivation

- Cloud computing + mobile computing = ?
- Revolution or evolution?

Mobile computing

- Specific user interface
  - Touch
  - Voice and gestures
- Limited resources
  - No massive storage devices
  - Limited processing capabilities
  - No 3D graphic acceleration (for now)
- Specific I/O devices
  - GPS, Compass, Camera, …
- Used mostly for communication and entertainment

Cloud computing

- Cloud computing = server hosting ++
- Main goal: reduced total cost of ownership
- Main characteristics
  - resources are provided as the utility (pay-per-use)
  - elasticity (adaptation to the current demands)
  - online access (access from everywhere)
  - fault-tolerance, 24/7 availability
- Adopted mainly for business and for desktop applications

Cloud computing
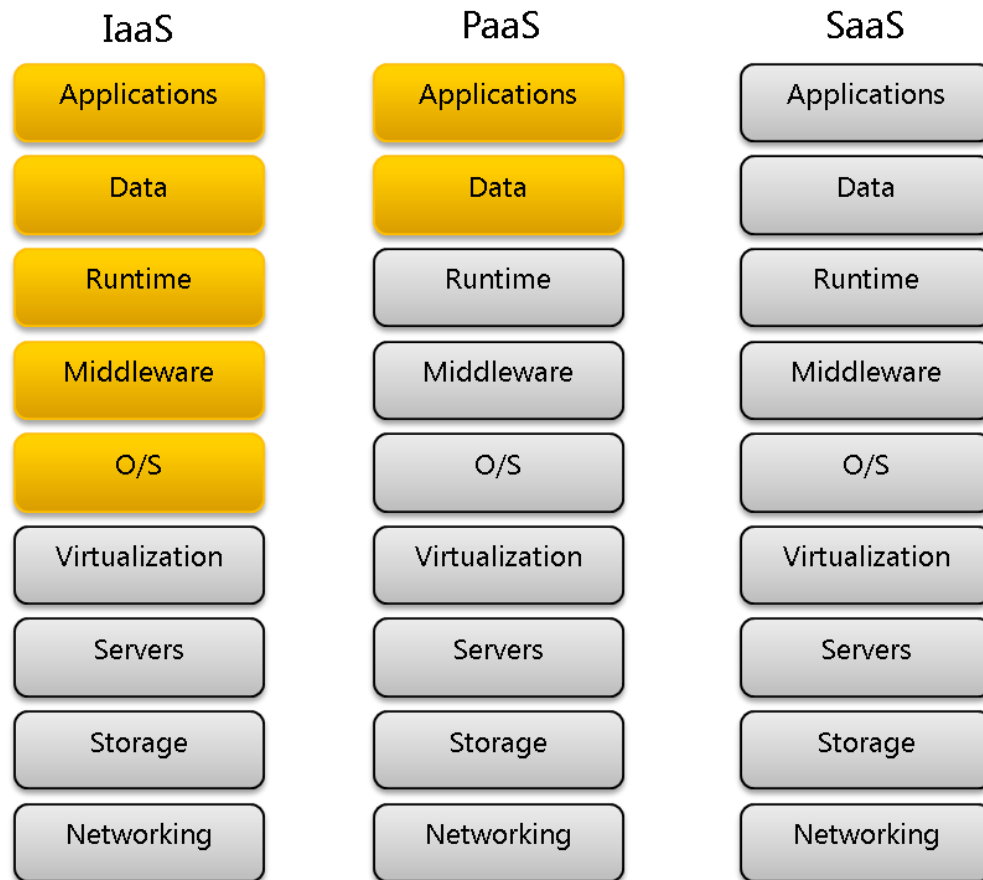
Different levels of cloud resource utilization

Opportunities and challenges - pros

- Extension of storage resources
  - accessible from everywhere, from any device
  - available to a group of users
- Portability – thin client solutions
- Extension of processing capabilities
  - image processing
  - audio processing

Opportunities and challenges - cons

- Broadband Internet connection
  - signal coverage
  - "pay-per-byte"
  - alternative: open Wi-Fi infrastructure
- Safety, security, availability

Main features of cloud services for mobile applications

- Adaptation to the profile of specific mobile device (resolution, colour depth, bandwidth, …)
  - The client provides the profile with each request or during the login
  - Filters for downgrading hi-definition media sources
  - "Virtual mobile devices"

Development of cloud services for mobile applications

- Similar to development of services for desktop applications
  - Design, implementation and testing in the host environment
  - Deployment to the cloud – test configuration
  - Promotion to the production level
- There is no universal development platform for different cloud solutions

Development of mobile applications with cloud-assisted services

- Many programming tools for mobile devices already includes interfaces to common cloud services (e.g. storage services) – vendor dependent

- Alternative: universal interfaces that can be used with different cloud providers

- CLASS-MA services will be vendor independent

HTML5 as a universal platform for mobile applications in the cloud

- HTML5 and CSS3 support mobile devices
  - media queries
  - geo-location API
- No native application required
- Cloud services are accessible through Ajax
- All modern mobile devices includes powerful Web browsers
 - Compatibility issues
  - No off-line mode

Some prototypical cloud services for mobile applications (1/4)

- Services for structured and non-structured data storage, independent of the cloud provider
  - non-structured: multimedia files
  - structured: SQL queries, XML or JSON data formats

Some prototypical cloud services for mobile applications (2/4)

- Geo-location services
  - Convergence of services
  - Unified format
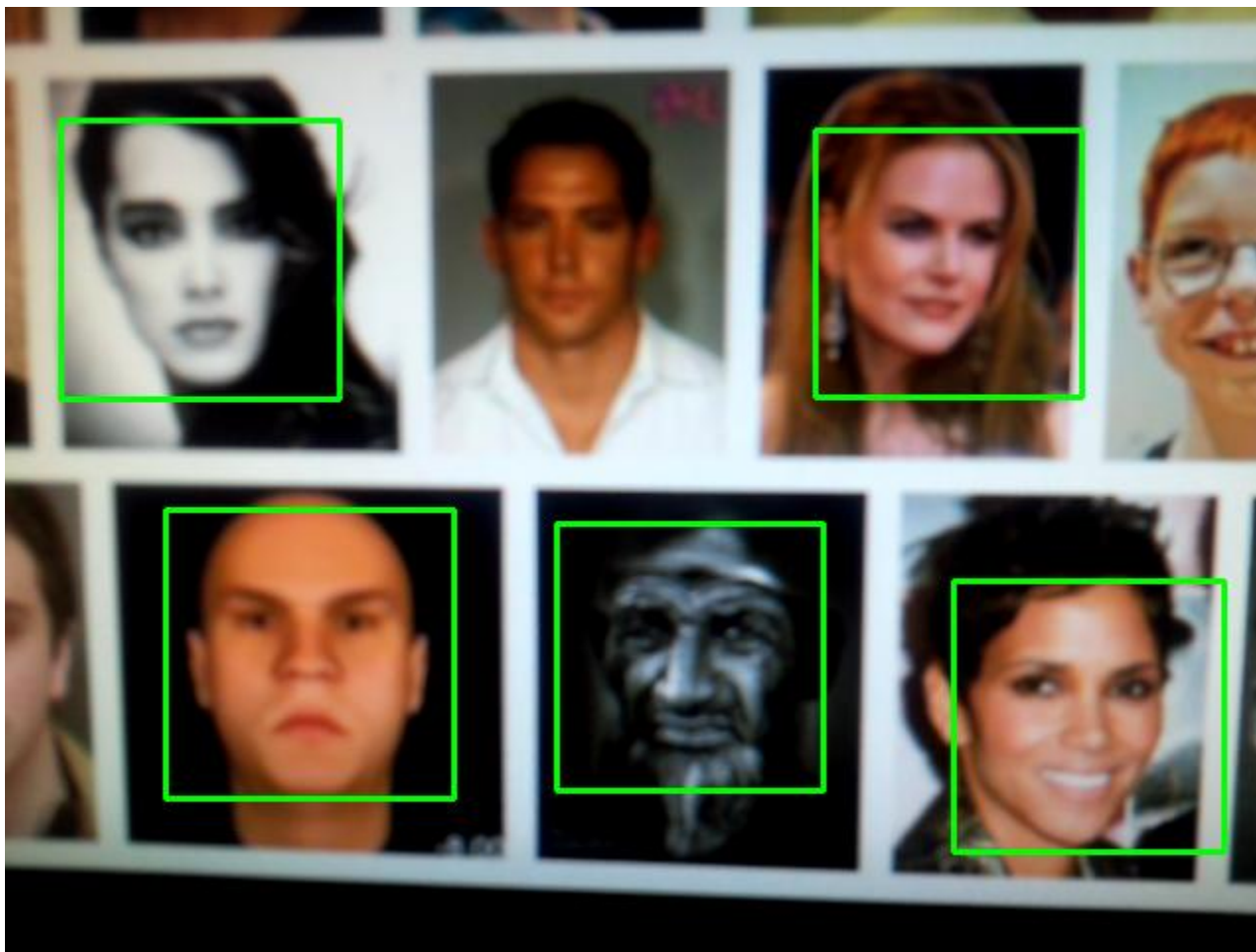 - Parallel queries
  - Consideration of user preferences

Geo-location services
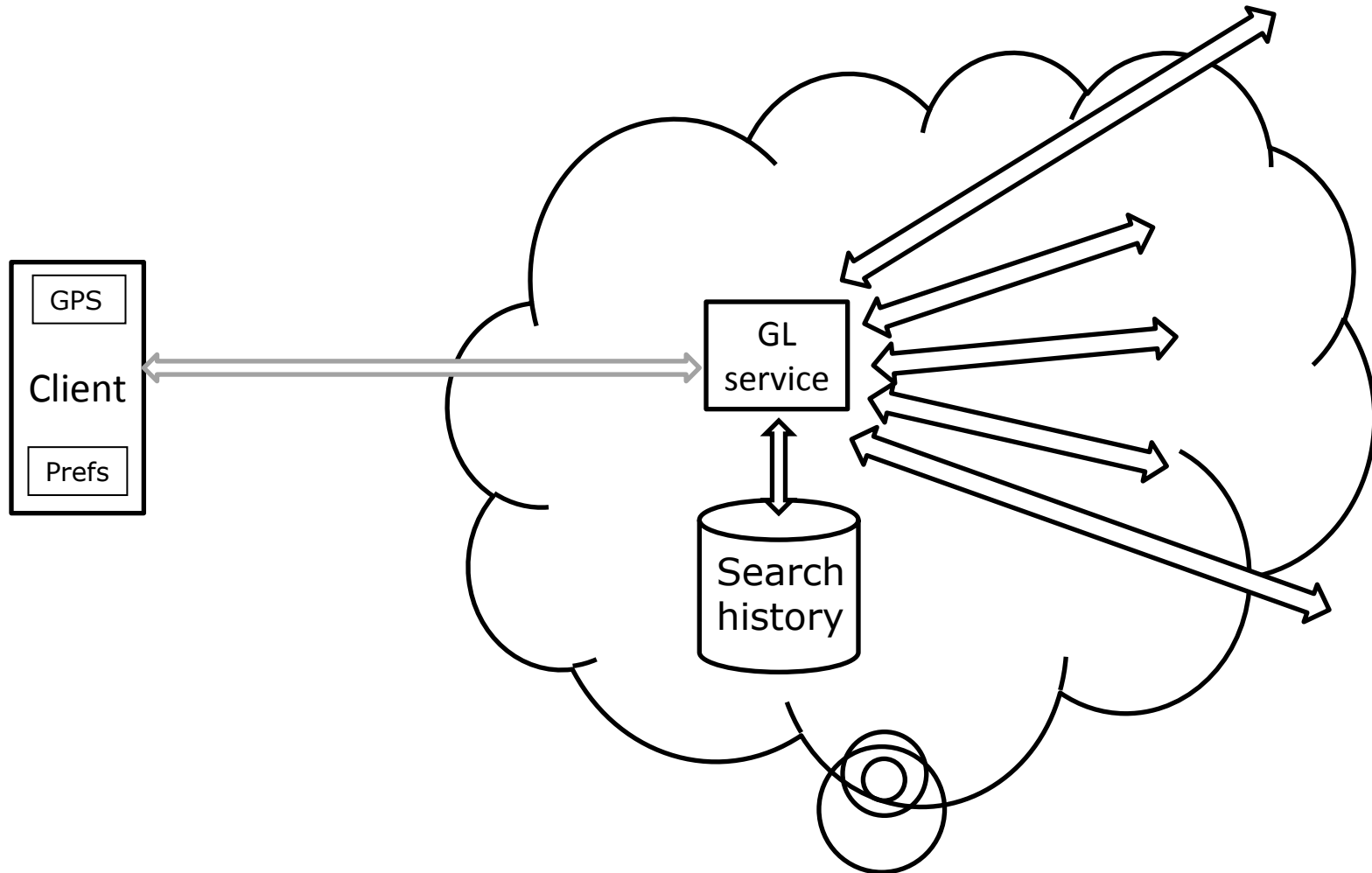
Some prototypical cloud services for mobile applications (3/4)

- Image and audio processing
  - Simple image manipulation and editing
  - Image recognition (biometrics)
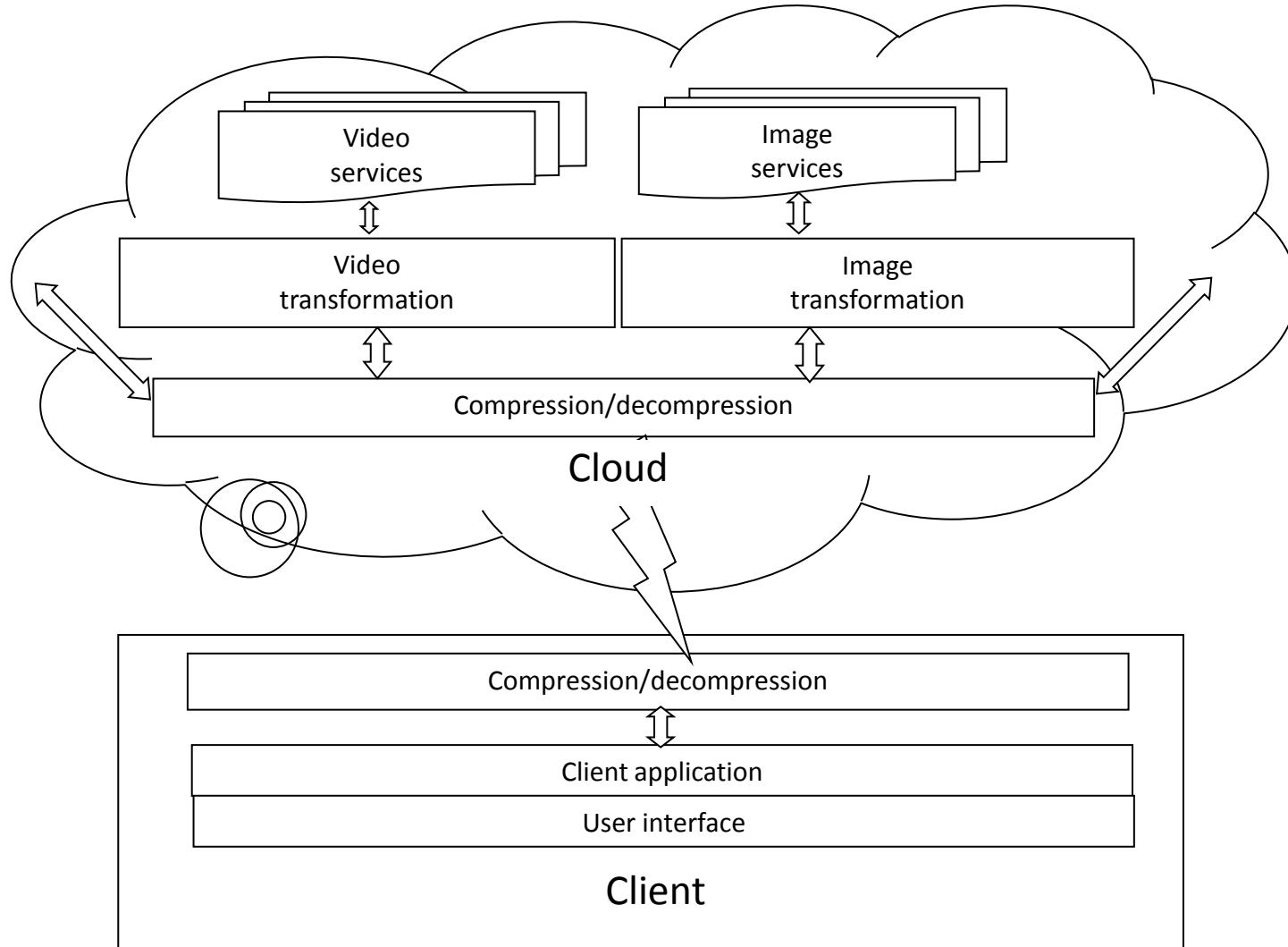 - Voice processing

Image and audio processing

Face detection

Some prototypical cloud services for mobile applications (4/4)

- Data compression and multimedia transformation
  - Data compression/decompression
  - Image and video resolution transformation
  - Progressive downloading

Data compression and multimedia transformation

Video services

Image services

Video transformation

Image transformation

Compression/decompression

Cloud

Compression/decompression

Client application

User interface

Client

Discussion

Is the future of mobile computing in the clouds?

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