OPC and MES 2014 Finland

Browser based OPC UA

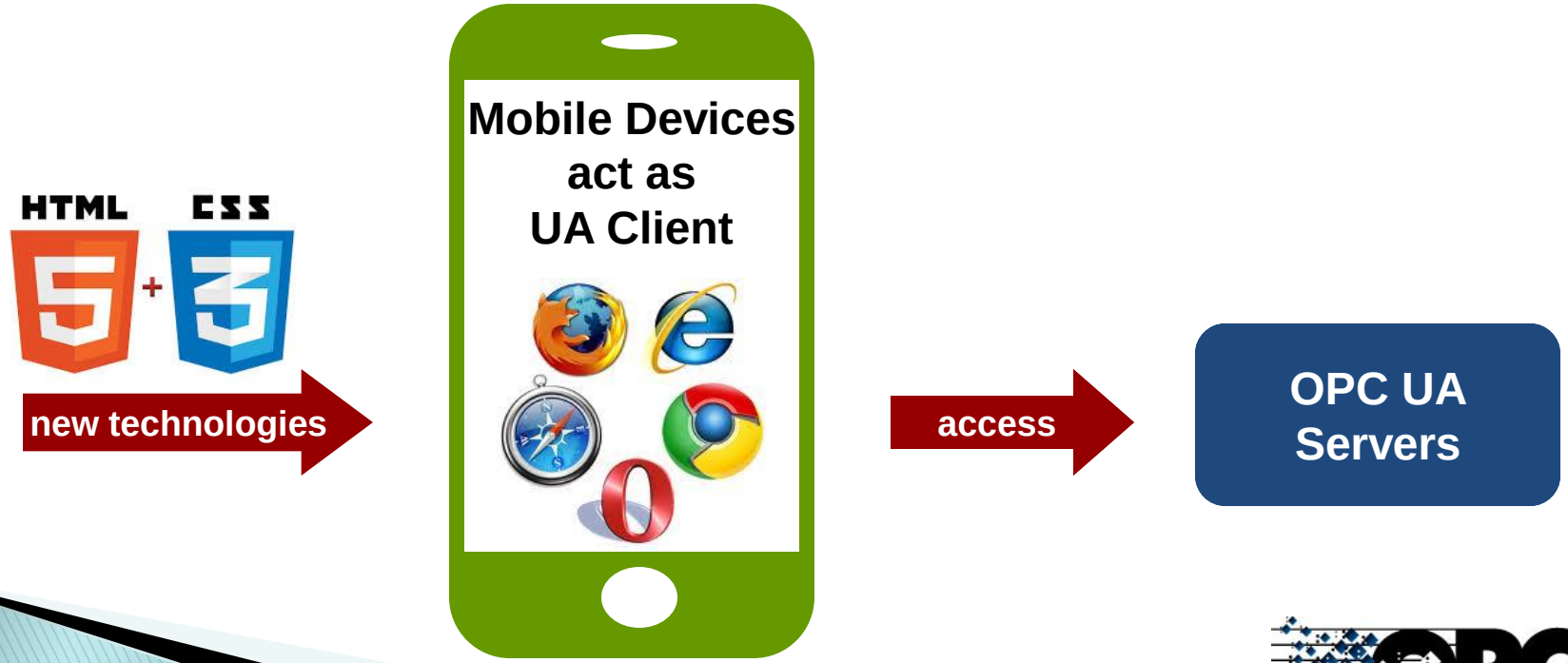
Uwe Steinkrauss (ascolab GmbH)

Content

- Motivation
- Solution
  - Native, WebServer, JavaScript
- JSUA
  - Protocol Selection, Building Blocks, Architecture
- Validation
  - Timing, Speed, different Browsers
- Conclusions and Future Perspective

Motivation

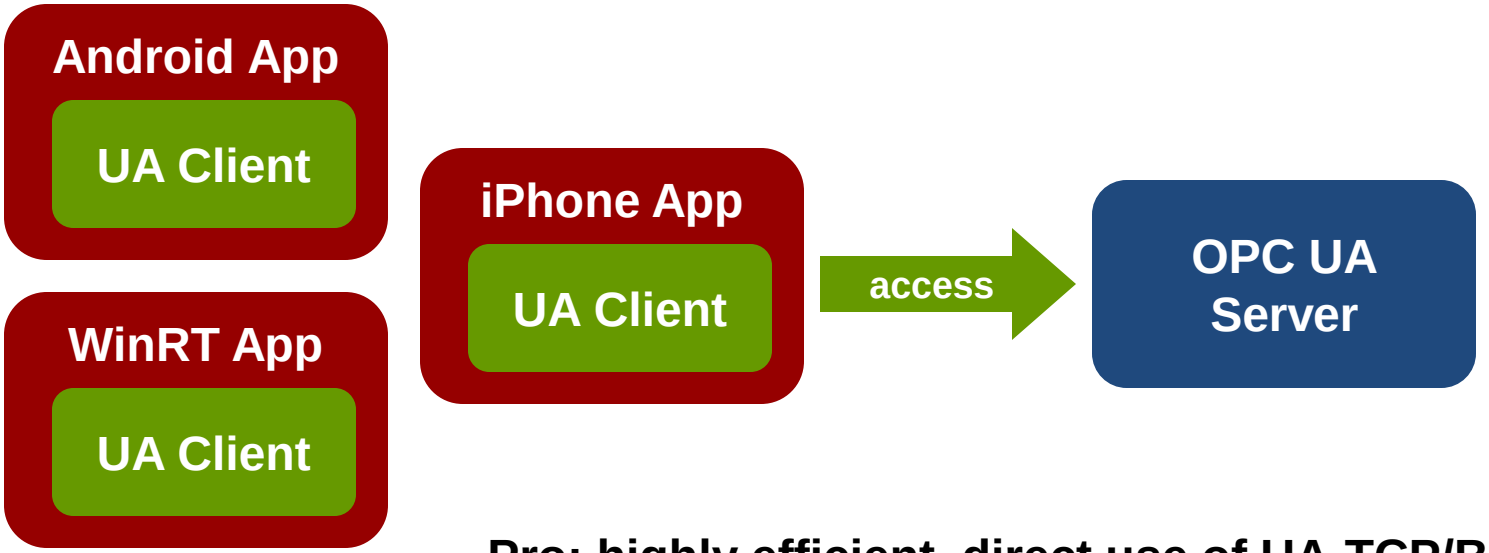
- Mobile devices gain more importance in industrial applications
- New technologies make browser based applications more attractive



source: www.ascolab.com

Solution - native

- Native implementation
  - Requires client-side installation (App-Store)
  - New implementation for each mobile target (iPhone, Android, WinRT, etc.)
  - Use of declarative GUI languages (e.g. QML)



source: www.ascolab.com

Pro: highly efficient, direct use of UA-TCP/Binary

Con: 3 times implementation effort

Solution - WebServer

- Proxy/Gateway
  - Webserver “hides“ the OPC UA Server
  - Webserver generates (dynamic) websites and fills with OPC UA content (Webserver is “native” UA Client)
  - Protocol conversion for e.g. WebSocket

Web

WebSocket Proxy (converter)

UA Client

access

OPC UA Server

source: www.ascolab.com

Pro: sophist. Webserver, capsulate more protocols

Con: need for proxy installation, security, conversion, speed

WebServer - Central Data Portal

Display Device
- PC
- Mobile Phone
- Tablet

running all kind of web browsers

Web Clients

Browser: HTML, SVG and JAVA Script
Data: XML, JSON or Binary
Transport: http or https

Web Server

Web Server

OPC UA Client

Server side scripting:
PHP, Ruby, Perl, Python

OPC UA Server

PLCs

OPC UA Server

PLCs

OPC UA Server

Field Devices

OPC UA Server

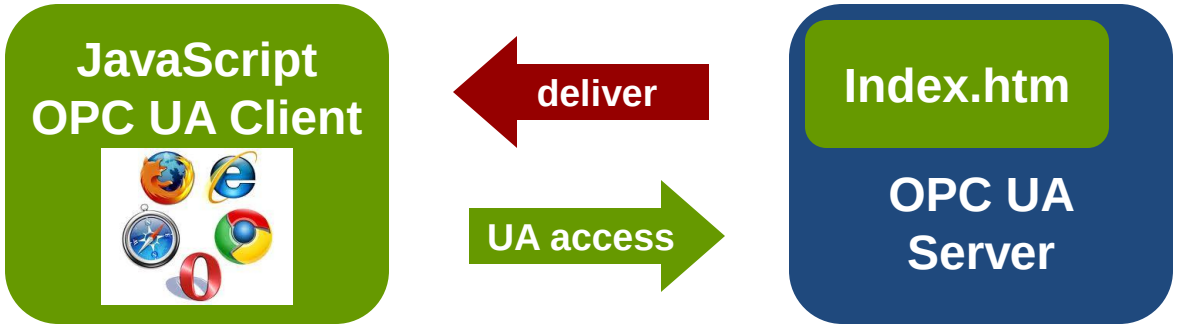
Access Control

source: www.ascolab.com

OPC FOUNDATION

Solution – Java Script

- Java Script
  - UA Server must “deliver” the Script-Code (same origin)
  - Only HTTP(S) possible (no direct access to TCP)
  - No message security in Browser (speed)



source: www.ascolab.com

Pro: No installation on client side, no extra (Proxy)-Webserver required, out of the box functionality

Con: Java Script library for OPC UA Binary Encoding (JSUA) is needed

WebClient - OPC UA Client

native UA Client

Access with native OPC UA clients works too

Data: UA Binary
Protocol: https

HTML, Graphics

Mobile, Laptop, PC

Web Page

JSUA Client

JAVA Script based
OPC UA Client

OPC UA Server

Web Server

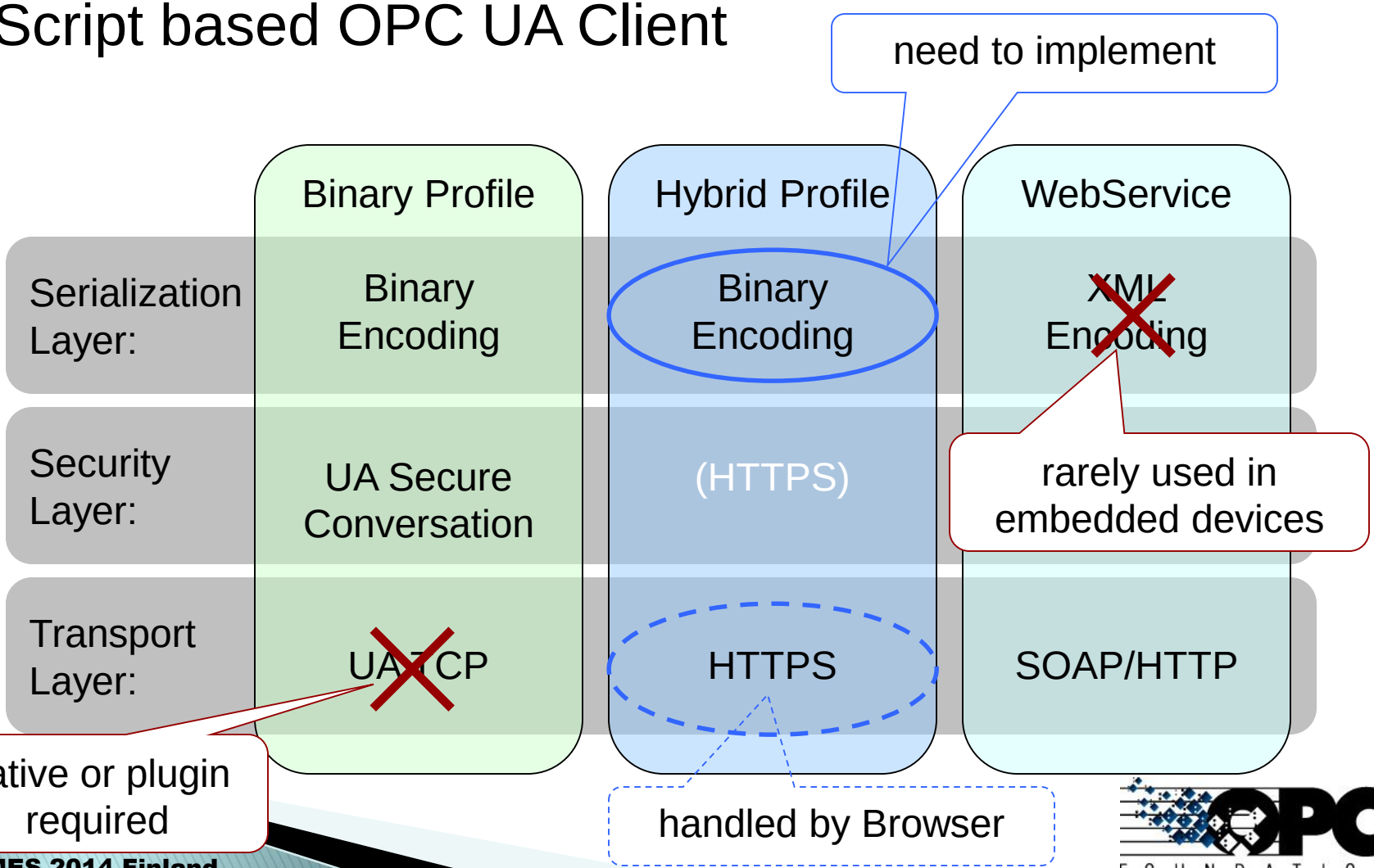
Field Device

source: www.ascolab.com

OPC FOUNDATION

Protocol Selection - JSUA

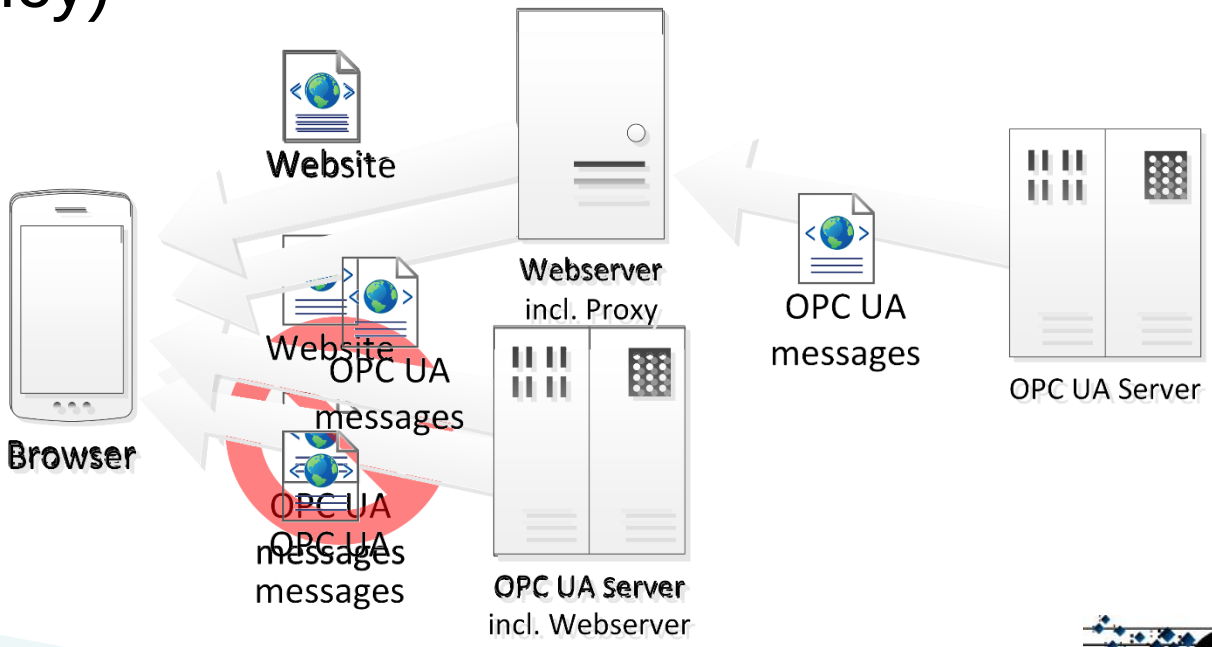
- Hybrid profile is best choice for implementing Java Script based OPC UA Client



source: www.ascolab.com

Building Blocks - JSUA

- OPC UA Hybrid Protocol (https-uabinary)
  - Binary en-/decoding of messages performed in pure JavaScript
  - Security mechanisms (HTTPS) applied by the browser
- Delivery of Webpage including Script Code (same origin policy)

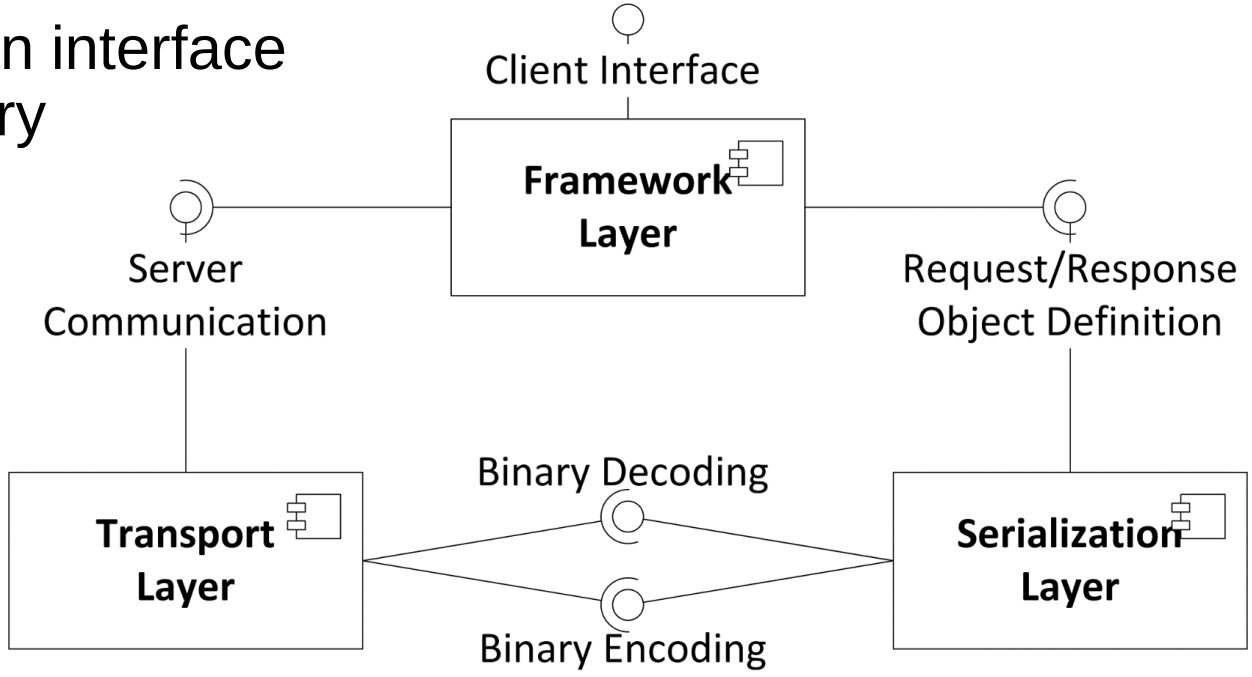


source: www.ascolab.com

OPC FOUNDATION

Architecture - JSUA

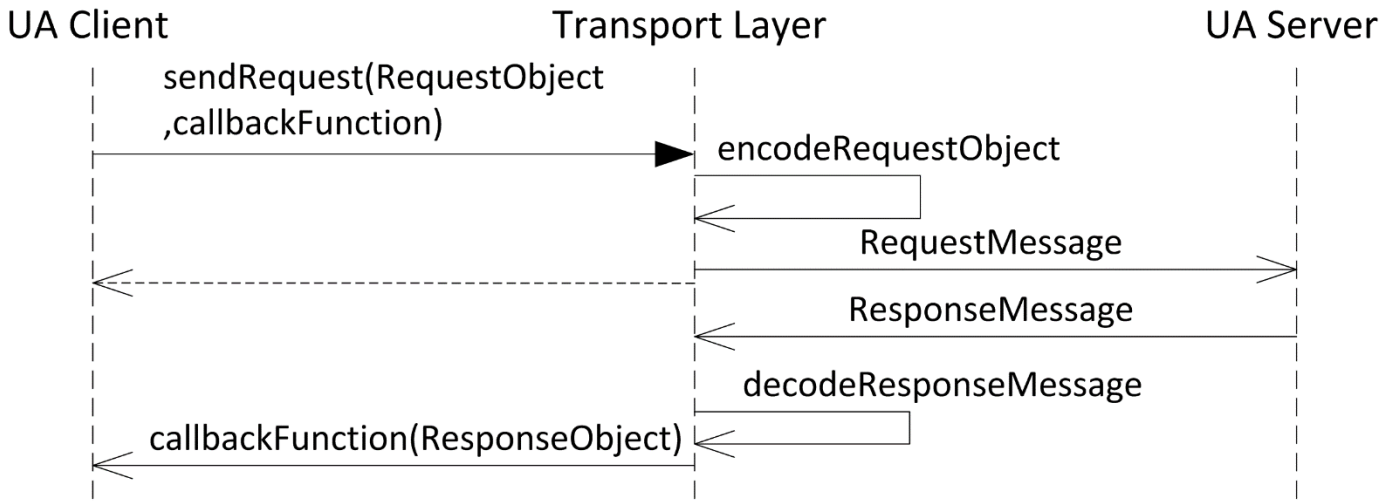
- Framework Layer
  - High-level API
- Serialization Layer
  - JavaScript object definitions for each of the requests and responses
  - object offers an interface to invoke binary en-/decoding



source: www.ascolab.com

Architecture - JSUA

- Transport Layer
  - Sending asynchronous HTTP(S) requests
  - Receiving response messages

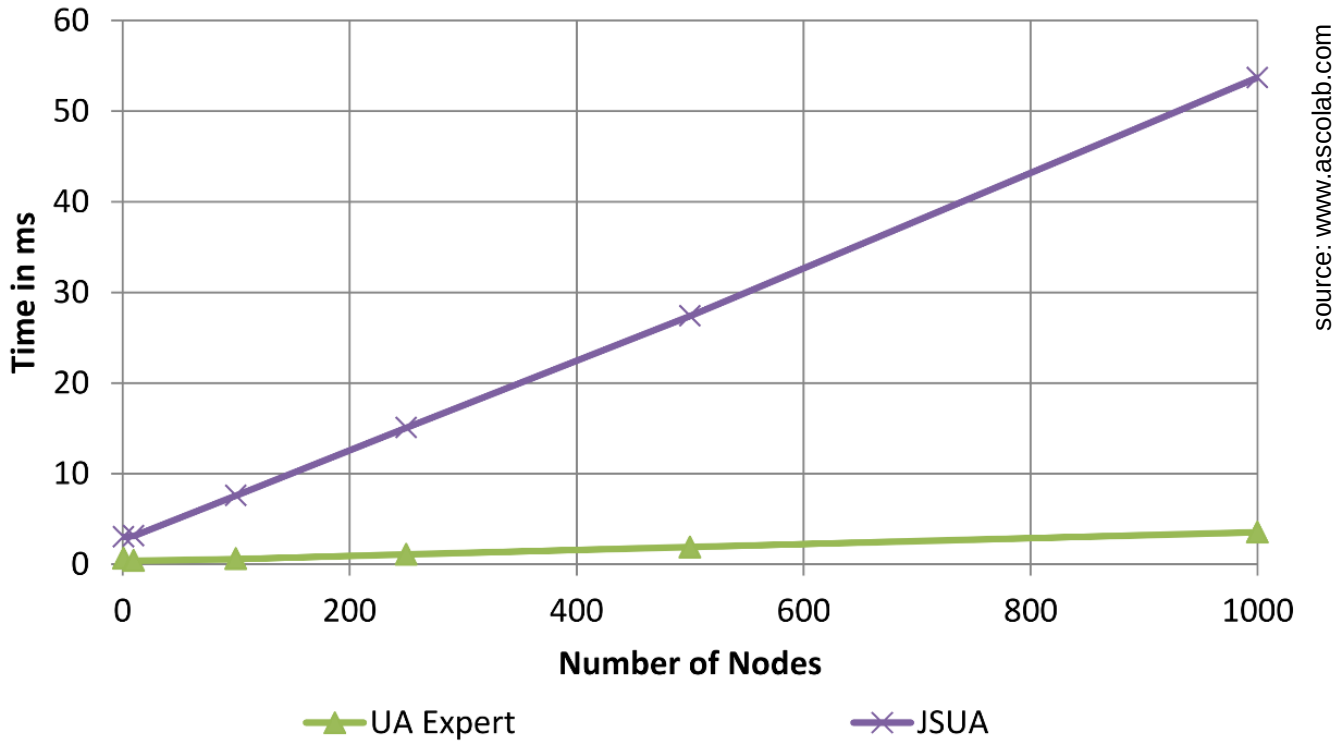


  - Built-in support for long polling (subscriptions)

source: www.ascolab.com

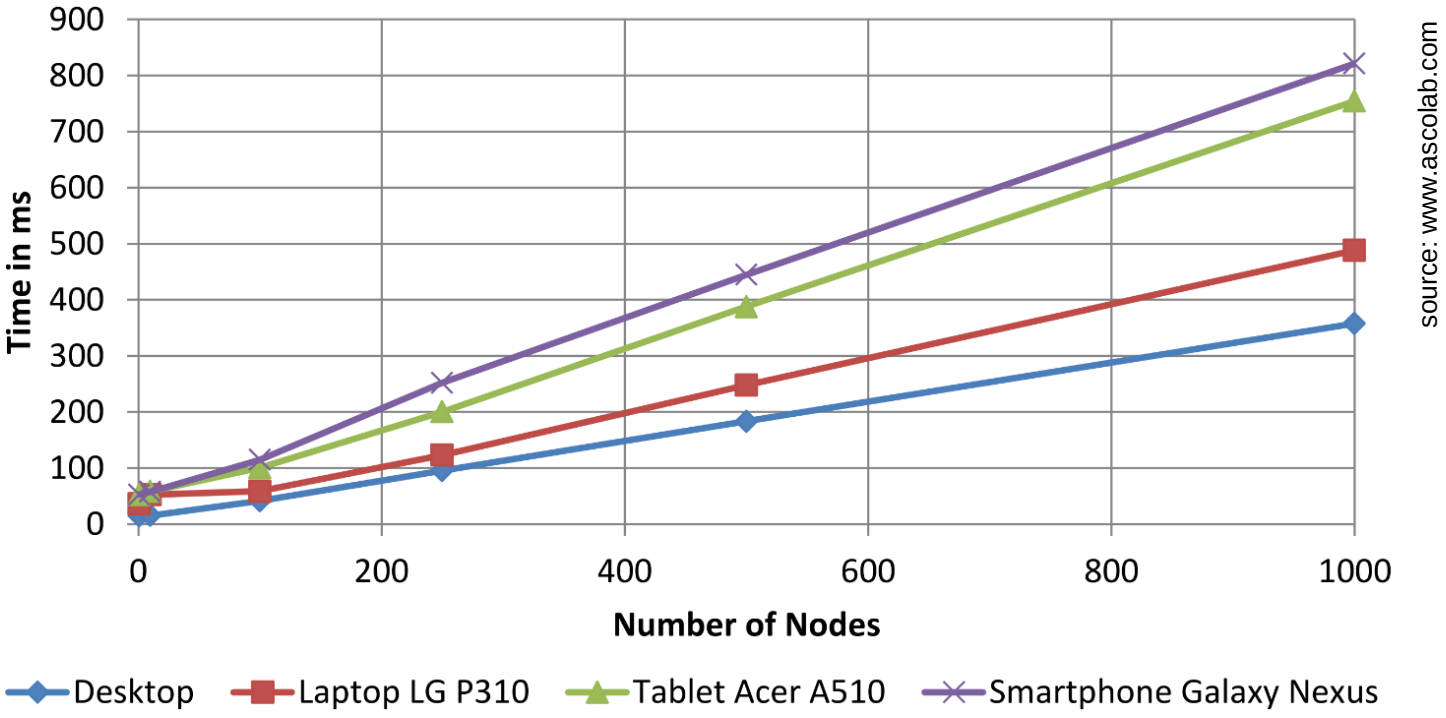
Validation

- Performance (Read Service)
  - Comparison: Native (C++) vs. Browser-based (local setup)



Validation

- Performance (Read Service)
  - Comparison: Different devices (remote setup)

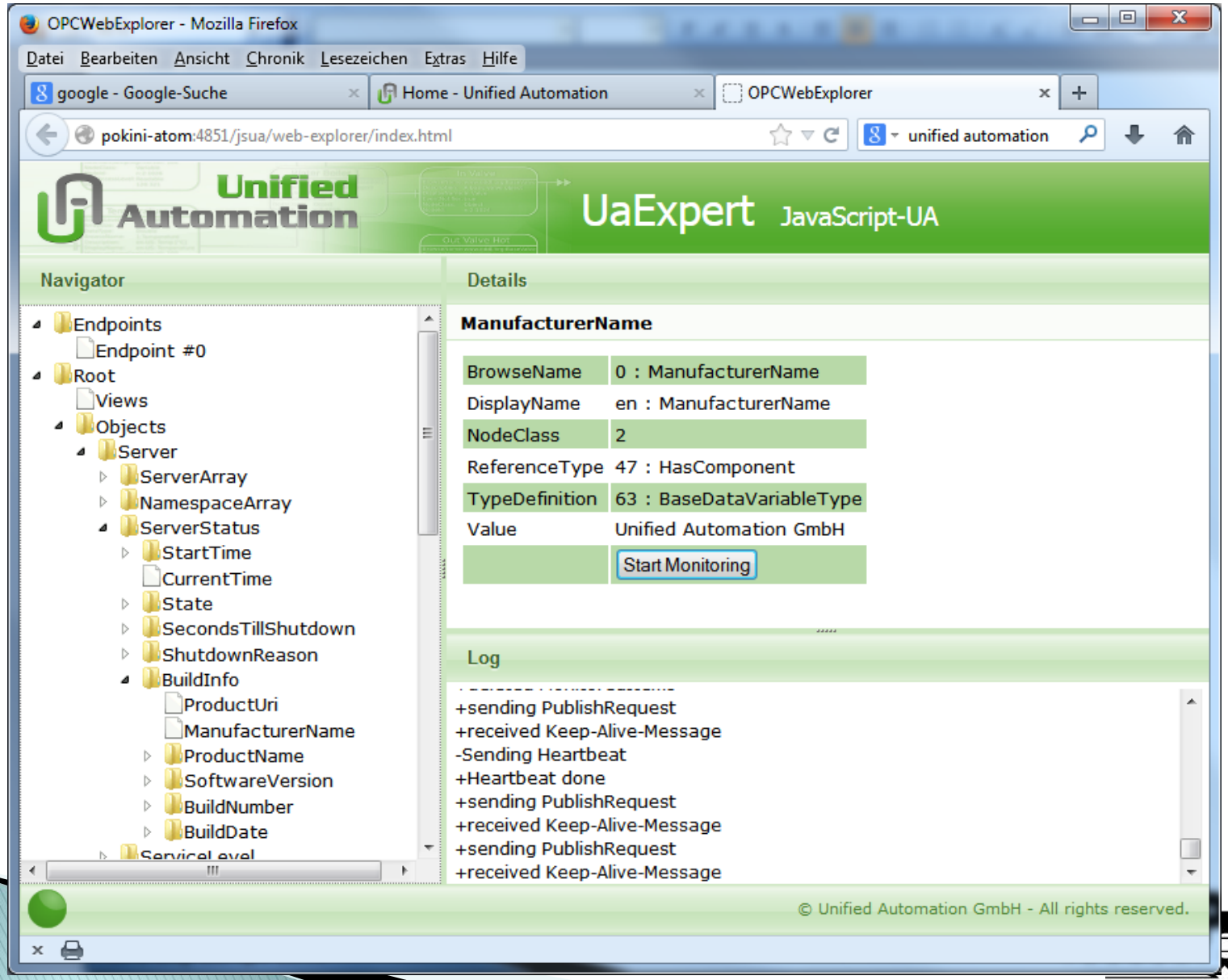


Validation

- Browser compatibility
  - Works with the current versions of all major browsers (desktop and mobile) – including IE10+

- Support of UA-Subscriptions
- Generic OPC UA-Browser built on top of JSUA
  - Browsing address spaces
  - Reading/Subscribing variables
  - Supports commissioning and maintenance tasks

Demonstration



source: www.ascolab.com

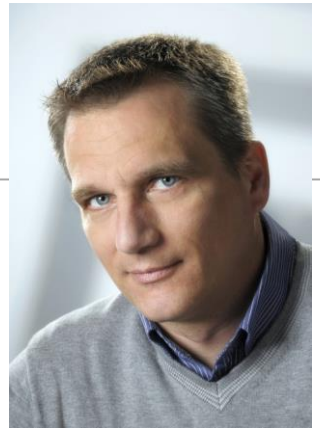
Conclusion

- JSUA enables direct browser-based access to OPC UA servers
  - No plug-ins needed
  - No proxy servers needed…
  - …but supported for use with larger infrastructures/sophisticated web servers
- JavaScript fast enough to handle binary en-/decoding (response time < 100ms)

Future Perspective

- Moore‘s Law
  - Increased CPU speed in mobile devices
  - Acceleration of script engines in browsers
- Server-side JavaScript (e.g. Node.JS)
  - JSUA for OPC UA servers and proxies

Thanks for Your Attention !



Uwe Steinkrauss
Executive Director

ascolab GmbH
Am Weichselgarten 7
D-91058 Erlangen
Phone +49-9131-691-120
info@ascolab.com