

# Advanced Web Technologies

Dr. Stephan Steglich | Open Distributed Systems | lecture winterterm 2016/17

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# Agenda

1. Fraunhofer FOKUS
2. Prüfung, Scheine
3. Ziele der Vorlesung
  1. BA, MA, und Projekt Themen
4. Resources
5. Übersicht Themen
6. Web Technologies - Einleitung und Motivation
7. World Wide Web Consortium - W3C



# Fraunhofer FOKUS

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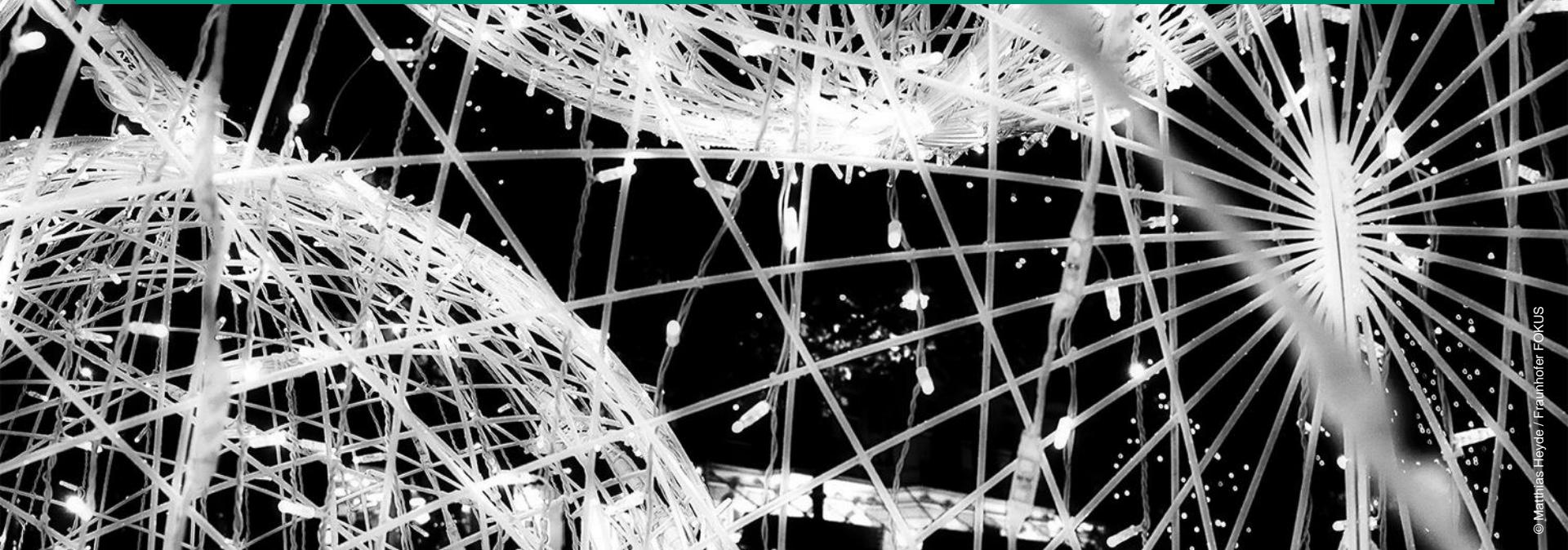
[www.fokus.fraunhofer.de](http://www.fokus.fraunhofer.de)



# FRAUNHOFER FOKUS

# FRAUNHOFER FOKUS

## INSTITUTE FOR OPEN COMMUNICATION SYSTEMS



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# THE FRAUNHOFER-GESELLSCHAFT

## Locations in Germany

- 67 institutes and research units
- Nearly 24,000 staff
- About 2 billion € annual research budget



# THE EPONYM JOSEPH VON FRAUNHOFER

## Researcher

- Discovery of the "Fraunhofer lines" in the solar spectrum

## Inventor

- New methods for processing lenses

## Entrepreneur

- Director and partner in a glass factory



© Deutsches Museum

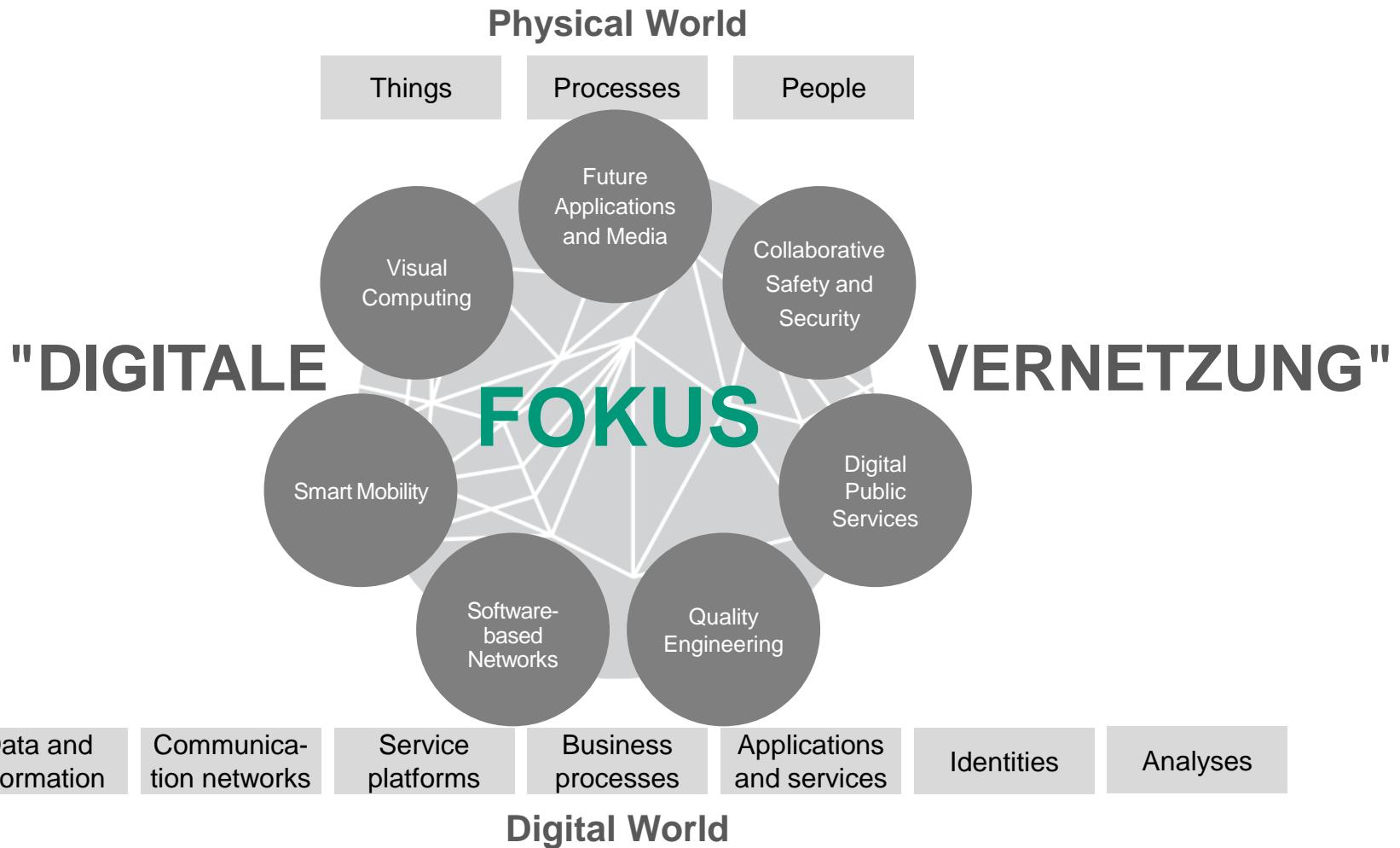
# FIGURES 2015 (SELECTION)



- 434 employees
- Established in 1987
- 56 EU projects
- Approx. 100 industry partners
- Approx. 200 industry projects
- 6 patents granted

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# OUR BUSINESS UNITS



# FUTURE APPLICATIONS AND MEDIA – FAME

Mission:

- research and develop technologies for web based media applications
- build prototypes and early prove of concept implementations
- promote interoperability and convergence of heterogeneous technologies

R&D Topics: Internet Delivered Media

- 360° Video Streaming
- Multiscreen Interaction und Media Synchronization
- SmartTV & HbbTV
- Protected adaptive video streaming
- Personalization



# FAME – FUTURE APPLICATIONS AND MEDIA

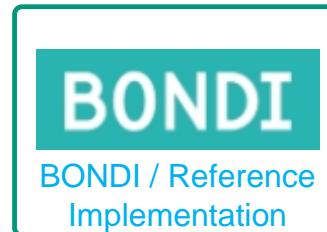
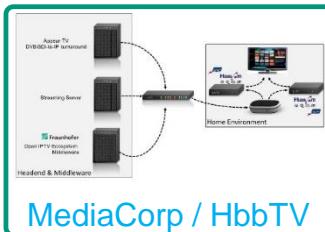
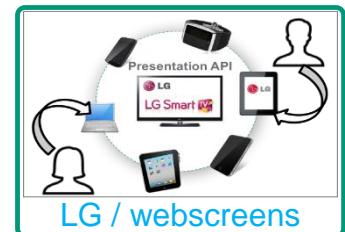
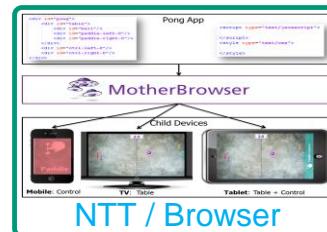
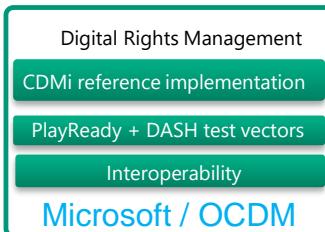
- Web-Technologien für verteilte Anwendungen, Dienste und Daten:
  - Multiscreen Interaction und Synchronisierung
  - Web of Things (WoT / IoT)
  - Application Frameworks für PC, TV, Mobilgeräte, Embedded
- Internet Delivered Media:
  - Smart und Connected TV
  - Interaktiver Multi-Screen Content
  - Protected video streaming (DRM)
- Personalisierung:
  - Analytics, Data-Mining, Empfehlungssysteme
  - Multiscreen Advertisement



FAME entwickelt Web-Technologien mit Schwerpunkten auf SmartTV und interaktiven, personalisierten Medienanwendungen.

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# INTERNATIONAL PROJECTS



# FAME LABORATORIES



## Fraunhofer FOKUS SmartTV Lab

The Smart TV Lab bundles Fraunhofer FOKUS expertise in the area of hybrid TV, connected TV, IPTV, future web technologies and rich media convergence.

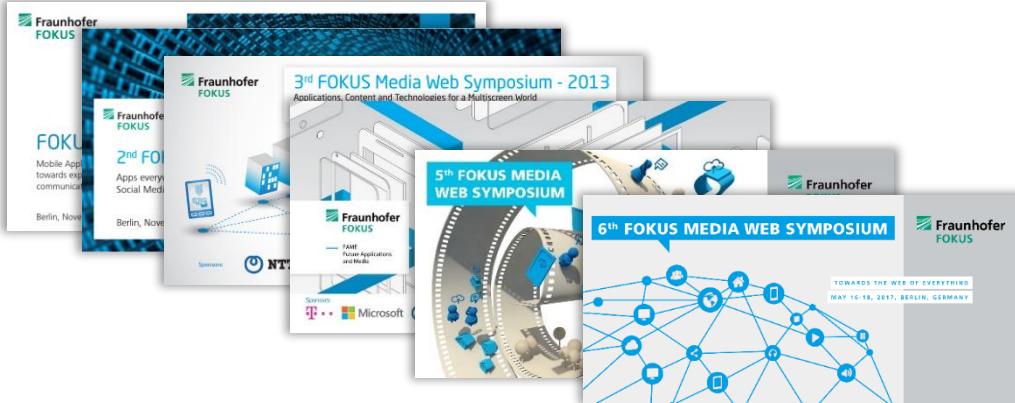


## Future Applications and Media Lab

FAMElab – The testbed and marketing platform for components developed by the Business Unit Future Applications and Media

<https://www.fokus.fraunhofer.de/en/fame/laboratories>

# FOKUS MEDIA WEB WEEK



**May 15-19, 2017, Berlin**



## 6<sup>th</sup> FOKUS Media Web Symposium: Towards the Web of Everything

The 6<sup>th</sup> FOKUS Media Web Symposium focuses on the convergence of the Media Web and the Internet of Things. Within the conference, several workshops and tutorials offer the latest insights in internet delivered media such as 360° VR Streaming, multiscreen interaction, media sync, SmartTV/HbbTV, protected adaptive streaming, related standardization and market developments.



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# BA, MA and Projects Topics

Advanced Web Technologies

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# BA, MA and Projects Topics

Lehrveranstaltung:

→ [http://www.ods.tu-berlin.de/menue/lehre/wintersemester/pj\\_advanced\\_web\\_technologies/](http://www.ods.tu-berlin.de/menue/lehre/wintersemester/pj_advanced_web_technologies/)

Themen:

→ <https://www.fokus.fraunhofer.de/student-projects-theses-1cd1e612e72e5690>

About FAME

Working Areas

Solutions

Laboratories

References

Projects

Publications

News

Events

Information Material

Student Projects & Theses

Web Technologies

TV Apps

Multiscreen

Data Mining

Media Streaming

360° Video

Web of Things

## Student Projects & Theses

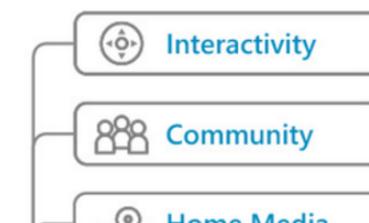
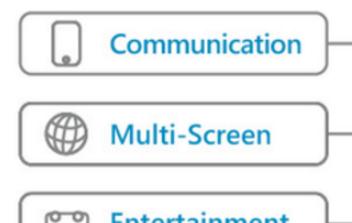
Fraunhofer FOKUS Business Unit FAME cooperates with universities such as the Technische Universität Berlin, Beuth Hochschule für Technik Berlin and Design Akademie Berlin. We are a dynamic, motivated team and always on the lookout for student assistants.

You get the possibility to learn about interactive media, improve coding skills and establish contacts to prominent companies of the media industry. Additionally, we provide support for your bachelor or master thesis.

The menu to the left sorts themes by working areas. Catch up on open projects and possibilities for your bachelor or master thesis. We are looking forward to your apply!

### Search by Categories

- [Web and Media](#)
- [TV Apps](#)
- [Multiscreen](#)
- [Data Mining](#)
- [Media Streaming](#)



# Modulinformation Advanced Web Technologies

Open Distributed Systems | TEL 4-1 | © Heike Fischer 2016

[heike.fischer@tu-berlin.de](mailto:heike.fischer@tu-berlin.de)

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# Modul Advanced Web Technologies –

## Prof. Dr. Manfred Hauswirth

Advanced Web Technologies (6 LP)				
	Titel der LV	LP	P / WP	Turnus
VL	Advanced Web Technologies	3	P	WS
SE	Linked Data & Semantic Web Technologies	3	P	SoSe

- Das Modul ist ein Portfoliomodul, d.h., es besteht aus mehreren Modulbestandteilen (eine Vorlesung, ein Seminar).
  - AWT ist ein Mastermodul (Masterstudiengänge). Studierende im Bachelor können das Modul als Zusatzmodul im Prüfungsamt anmelden und später für das Masterstudium anrechnen lassen.
  - Für das Modul erhalten Studierende 6 ECTS/ LP.
- 
- The module is a portfolio module, ie, it consists of several module components (a lecture, a seminar).
  - AWT is a Master module (Master's course of studies). Students in the Bachelor Program can register for the module as an additional module in the examination office and later get credited it for the Master Program.
  - For this module students receive 6 ECTS / LP .

# Ziele der Vorlesung

- Das Word Wide Web: erfolgreichste und am weitesten verbreiteste Plattform für das Anbieten online Diensten und Anwendungen
  - Gestartet als (aus heutiger Sicht) einfache Plattform für verlinkte Dokumente
  - heute für sämtliche Arten von verteilten Diensten und Anwendungen
- Web Technologien haben in vielen anderen Technologie-Bereichen radikal Einzug gehalten, z.B.
  - Protokolle und Schnittstellen für Medien- und Telekommunikationsanwendungen, sowie auch für standardisierten Datenaustauschen zwischen Systemen
  - Hybrid Broadcast Broadband (HbbTV) Standard für interaktive Fernsehsendungen vollständig auf Web Technologien.
  - Web Technologien werden daher heute als die relevante Basis zur Realisierung von interoperablen Systemen, Schnittstellen gesehen.
- Web Technologien werden vom dem World Web Consortium (W3C), mit über 400 Mitgliedern (Firmen), entwickelt und standardisiert. Diese beinhalten neben HTML, als die grundlegende Seitenbeschreibungssprache, auch Protokolle und APIs (z.B. Geolocation API), auf deren Grundlage basierend Web Anwendungen entwickelt werden können.
- **Dieses Modul vermittelt Wissen über relevante Web Technologien sowie gibt Ausblicke auf die zukünftige Entwicklung, z.B. aus Forschungsprojekten und der derzeitigen Standardisierung.**

# Resources

1. [http://www.ods.tu-berlin.de/menue/lehre/wintersemester/vl\\_advanced\\_web\\_technologies](http://www.ods.tu-berlin.de/menue/lehre/wintersemester/vl_advanced_web_technologies)
2. Folien auf <http://smartlearning.fokus.fraunhofer.de>
3. [www.w3.org](http://www.w3.org)
4. [www.w3schools.org](http://www.w3schools.org)
5. Internet Search... ☺
6. Fragt uns



# Agenda

Datum		Inhalt
KW 43	27.10.2016	Introduction and framework
KW 44	3.11.2016	Web and Media I
KW 45	10.11.2016	Web and Media II
KW 46	17.11.2016	Web Technologies Basics
KW 47	24.11.2016	TV Apps
KW 48	1.12.2016	Multiscreen Technologies and Standards I
KW 49	8.12.2016	Multiscreen Technologies and Standards II
KW 50	15.12.2016	Data Mining & Recommender Systems
KW 51		Thema IX (oder Weihnachtsquiz)
KW 52		-
19.12.2016 - 02.01.2017		Weihnachtsferien
KW 01	5.1.2017	Web Of Things
KW 02	12.1.2017	WebSecurity and Privacy
KW 03	19.1.2017	Exkursion zum Fraunhofer FOKUS
		<a href="#">Treffpunkt um ### Uhr am Fraunhofer Institut FOKUS</a>
KW 04	26.1.2017	Große Übung
KW 05 oder 06	9.2.2017	Schriftlicher Test (ca. 60 min)

Updates:

Per mail / in den VL Terminen

[http://www.ods.tu-berlin.de/menue/lehre/wintersemester/vl\\_advanced\\_web\\_technologies/](http://www.ods.tu-berlin.de/menue/lehre/wintersemester/vl_advanced_web_technologies/)



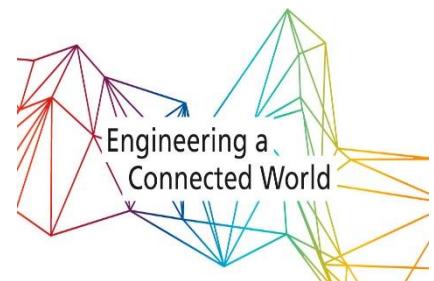
# THE SMART LEARNING PLATFORM

## A MOBILE LEARNING COMPANION APPLICATION

| Fraunhofer FOKUS

**Christopher Krauss**

Fraunhofer FOKUS, Kaiserin-Augusta-Allee 31, 10589 Berlin, Germany



# LEARNING COMPANION APPLICATION

- Entrypoint for Learners and Teachers
- Responsive **Web App** (HTML5, JS, CSS3)  
on various Devices (SmartPhone, Tablet, Computer)
- Presents Top-N Learning **Recommendations**
- Allows Filtering, Sorting & Searching  
by LO Metadata & predicted Learning Need
- Will allow **Personalization** of User Interface in the Future



# LEARNING COMPANION APPLICATION

powered by  
 **Screencastify Lite**



The screenshot shows the Lernbegleiter application interface. On the left is a dark blue sidebar with the following items:

- SLHw (Logo)
- Lernbegleiter
- christopher.krauss@fokus.fraun...
- Willkommen
- Lernempfehlungen (highlighted with a white cursor icon)
- Kurs
- Suche
- Hilfe
- Impressum
- Datenschutzhinweise
- Abmelden

At the bottom of the sidebar is a toolbar with icons for search, edit, and other functions.

## Herzlich Willkommen zur Lernbegleiter-Webapp

Die Lernbegleiter-Webapp unterstützt Sie aktiv beim Lernen für Blended Learning und e-Learning Kurse. Das Tool wird im Rahmen des Forschungsvorhabens „Smart Learning“ entwickelt und bietet eine Reihe von innovativen Features für Ihre Lernpraxis.

- Sie zeigt Ihnen die aktuellen verfügbaren Lernmaterialien an.
- Sie zeigt Ihnen den Bearbeitungsstand Ihrer Lernmaterialien an und speichert den Status.
- Mit Videos, Animationen und interaktiven Aufgaben machen wir das Lernen abwechslungsreich.
- Die Lernbegleiter-Webapp verfolgt dabei Ihren Lernprozess durch eine Learning Analytics-Software und empfiehlt Ihnen digitale Medien.
- Alle Medien können Sie auch auf dem Smartphone nutzen, das heißt auch im Bus oder U-Bahn ist das Lernen möglich.

Weitere Informationen zur Funktionsweise der Lernbegleiter-Webapp finden Sie unter dem Menupunkt / Hilfe.

Da sich das Projekt noch in der Entwicklungsphase befindet, bitten wir Sie, eventuelle Fehler zu entschuldigen. Wir denken jedoch, dass der aktuelle Prototyp bereits einen großen Mehrwert beim Lernen bietet.

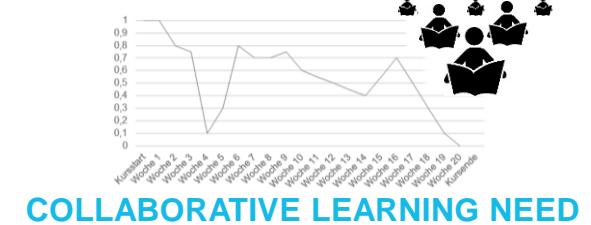
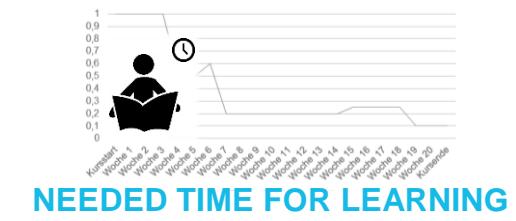
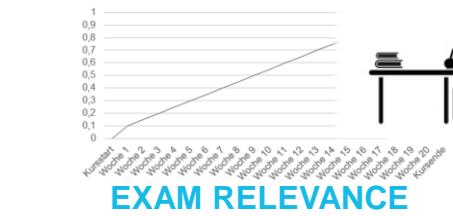
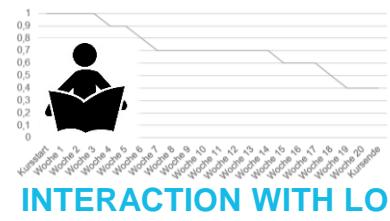
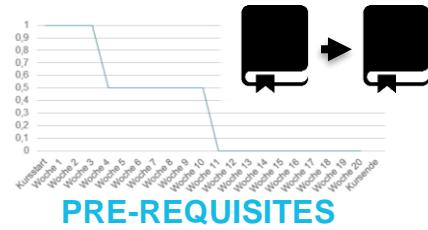
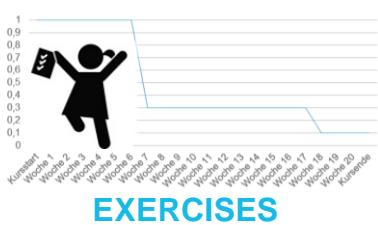
Außerdem bitten wir Sie, uns bei der Evaluation der App zu helfen. Nehmen Sie dafür bitte an dieser kurzen [Umfrage](#) teil.

Wir wünschen Ihnen viel Spaß und Erfolg!

Ihr Smart Learning-Team im Fraunhofer FOKUS



# LEARNING RECOMMENDATIONS – FACTOR TYPES

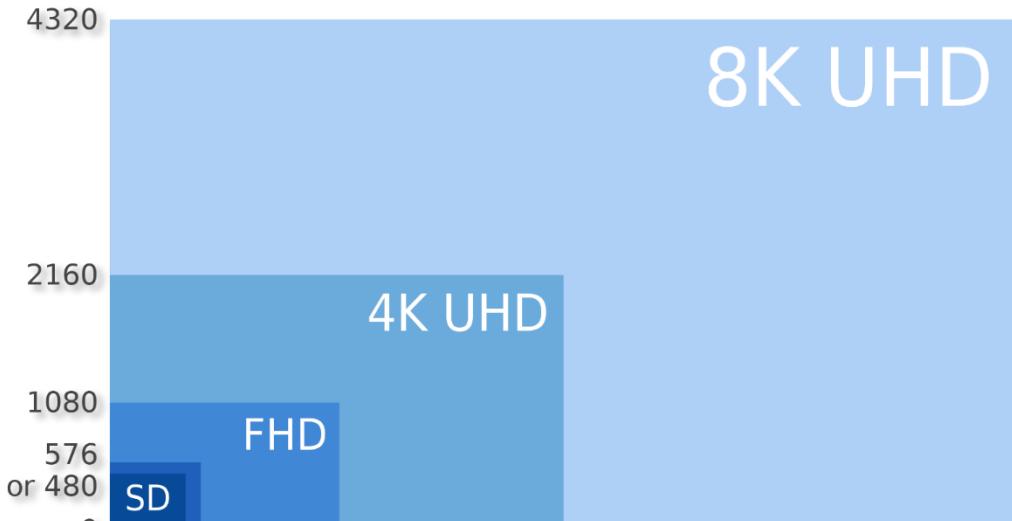


# VIDEO DRIVES THE INTERNET

- In 2020, the gigabyte equivalent of **all movies ever made** will cross Germany's IP networks every 1 hours.
- In Germany, total Internet video traffic (business and consumer, combined) will be **81% of all Internet traffic** in 2020, up from 63% in 2015.
  - In Germany, consumer Internet video traffic will be **84% of consumer Internet traffic** in 2020, up from 69% in 2015.
  - In Germany, business Internet video traffic will be **67% of business Internet traffic** in 2020, up from 42% in 2015.
- In Germany, 107 billion minutes (**202,796 years**) of video content will cross the Internet each month in 2020. That's **40,559 minutes** of video streamed or downloaded every second.

Source: CISCO VNI

# WHY VIDEO IS BIG, AND WILL CONTINUE TO GROW



By Libron - Own work, CC0, <https://commons.wikimedia.org/w/index.php?curid=25976260>

4K has arrived / HD is commodity  
→ 6-25 Mbit/s per single receiver

two 4K livestreams congest a 50Mbit/s VDSL connection

Olympics 2020 will be filmed and broadcast in 8K (in Japan)

Youtube/FB recently started to support mobile live video streaming

VR/360 adds an order of magnitude  
→ 10-16x !!!

# NEW TRENDS: INTERACTIVE VIDEO & VR/360° VIDEO

Virtual reality / 360° Video

## Interactive on demand Video & SmartTVs

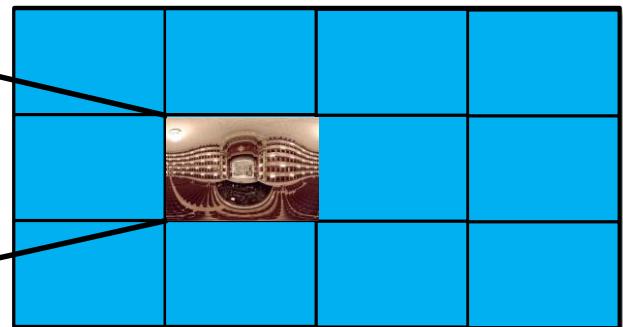




# 4K RESOLUTION FOV?



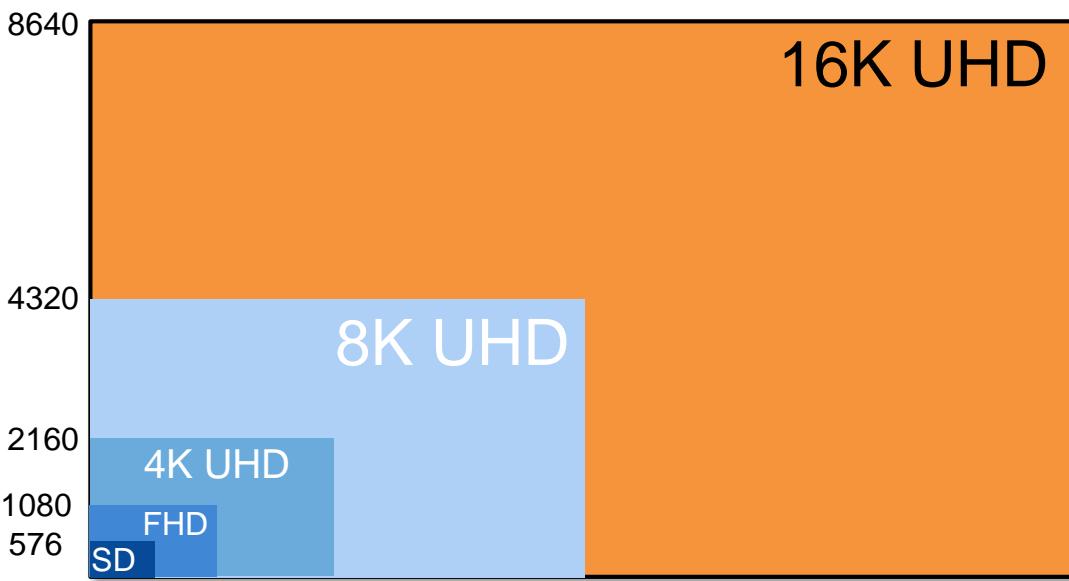
4K - 20 Mbit/s Stream



16K - ~300 Mbit/s Stream

**Size ratio FOV ↔ Full 360° Video 1:12**

## 4K FOV → 16K SOURCE



To get 4K FOV, 12K Video or higher is required

4k video bandwidth = 16-20 Mbit/s

16k video bandwidth= 320 Mbit/s

6k,10k and 12k are not industry standard.

2k(FHD),4k,8k are standard resolution.

# TV APPS (1/2)

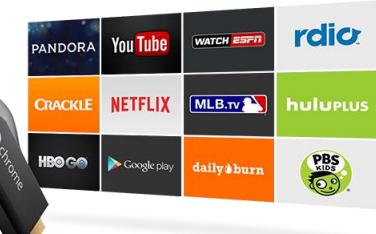
Motivation: How is the TV market structured?



\*www.apple.com



\*www.sony.com



\*www.google.com



\*www.amazon.com



\*www.microsoft.com



\*www.sony.com



\*www.microsoft.com

## TV APPS (2/2)

### Motivation: How to develop native and standardized TV Apps?

Source: <http://www.netrange.com/>



Source: <http://www.yozzo.com/>



#### – Broadcast-independent application

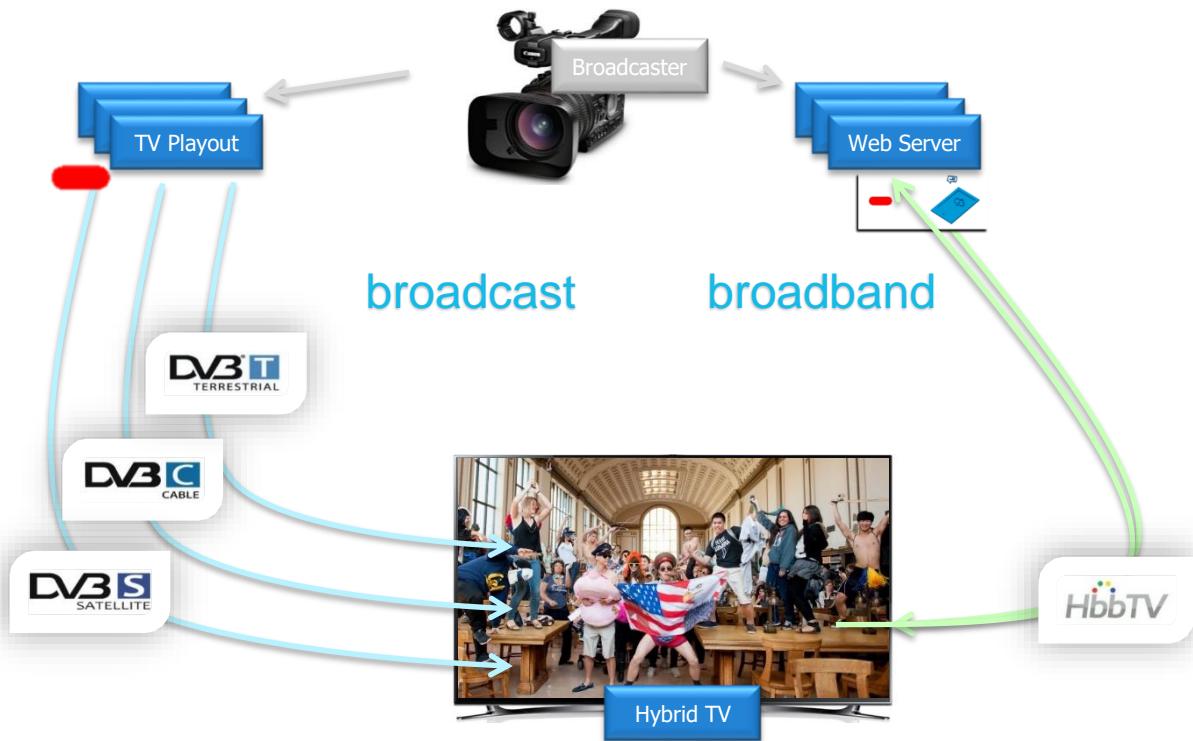
- not associated with any broadcast service
- downloaded via broadband and accesses all of its associated data via broadband

#### – Broadcast-related application HbbTV

- associated with one or more broadcast services or one or more broadcast events within a service
- may be launched automatically ("autostart") or explicitly upon user request.
- may be downloaded broadband or broadcast and may access its data via either



# HBBTV – BROADCAST-RELATED APP DELIVERY



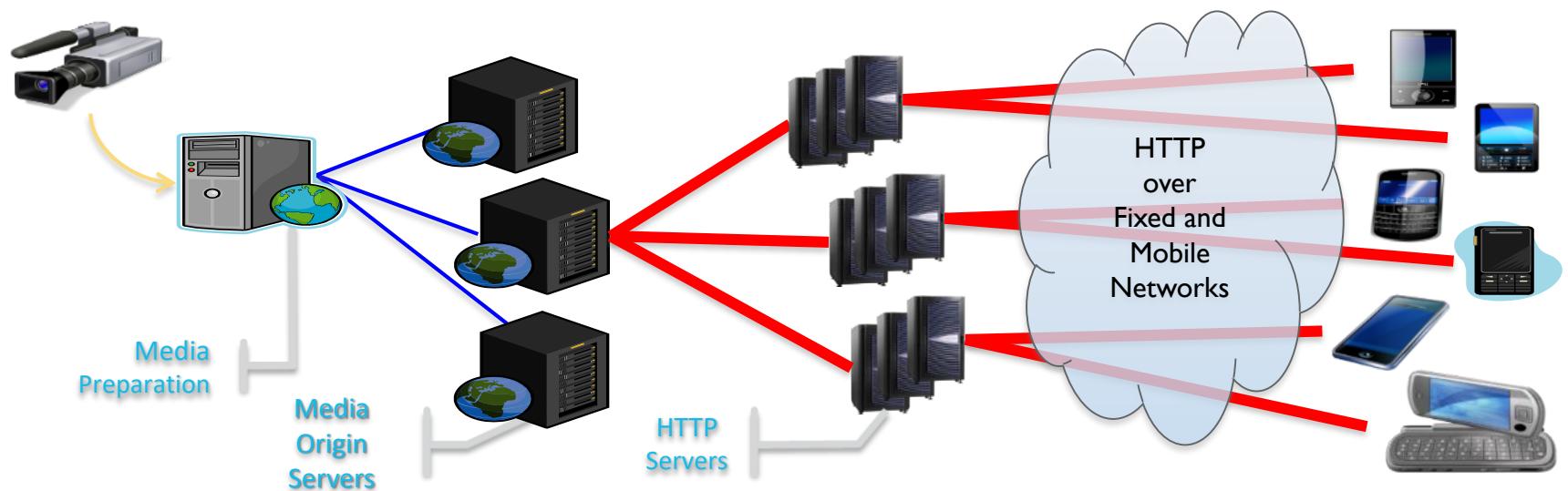
# INTERNET DELIVERED MEDIA INTERACTIVE MULTI-SCREEN CONTENT

- Some examples...



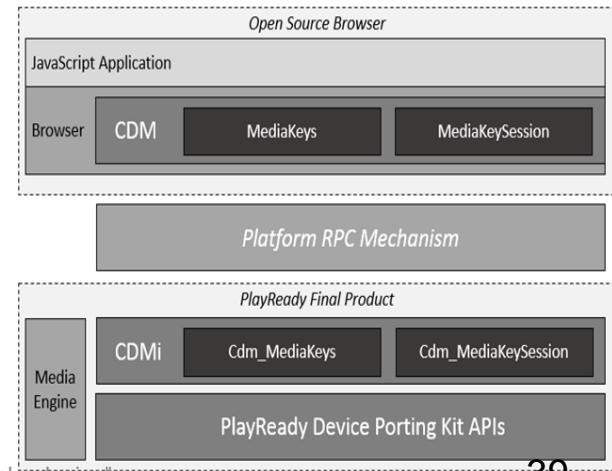
# OVERVIEW OF HTTP STREAMING

- Short segments of video stored as movie fragments, requested with HTTP and spliced together by client.
  - Uses existing Internet CDNs
  - traverses NAT/Firewalls
  - fixed-mobile convergence.



# DELIVERING MEDIA: TECH TO UNDERSTAND

- **DASH** – Adaptive Streaming for live and on demand
- **CENC** – Common Encryption for many DRM & delivery channels
- **MSE** – Media Source Extension to trick-function HTML5 video-objects via JavaScript (control AV media streams)
- **EME** – Encrypted Media Extension to play back DRM-protected media in standard browsers w/o the use of proprietary plug-ins
- **CDM** – Content Decryption Module - addition to the browser that provides functionality for one or more Key Systems
- **CDMI** – logical mapping of the EME methods and events to the PlayReady Device Porting Kit APIs



# INTERNATIONAL RELEVANCE

- **DASH/CFF/CENC**
  - part of HbbTV1.5 / TNT 2.0 / OIPF / DASHIF spec
  - Integrated by many TV/STB vendors today
  - Supported by growing number of streaming solutions
  - Global relevance
- **MSE/EME/CDM**
  - All browser vendors are currently integrating those specs
  - Seen as enabler for additional services, e.g. VoD, ad insertion
  - Mandatory feature in next gen CE devices from OTT players & managed IPTV players world wide to enable HTML5 based client implementations

# MULTISCREEN: SETTING THE SCENE



TV and Companion Devices



Streaming Devices



In-Vehicle Infotainment



Wearables



Companion devices



PC and companion devices



# W3C

- Mission: Leading the Web to its Full Potential
- Directed by Web inventor Tim Berners-Lee since 1994
- 25+ years track record of success
- Standards: HTML5, Web APIs, XML, Web Services, RDF, VoiceXML, ...
- Consortium with ~380 members
- International organization (Europe, US, Japan, China, W3C offices (Brazil, ...))



**W3C®**

# Web Standards

## World Wide Web Consortium - W3C



- ***The*** Web standardisation organisation
- Formed in 1994
- is led by [Tim Berners-Lee](#), inventor of the World Wide Web
- Currently (September, 23<sup>rd</sup>, 2015) [399 members](#)
- Does not (formally) create binding standards, just "recommendations"...
- ... which are however strong de-facto standards
- Such as HTML, CSS, DOM, XML, SOAP, SVG

# W3C Patent Policy

- In February 2004, W3C adopted a [Patent Policy](#) for Working Groups to enable continued innovation and widespread adoption of Web standards developed by the World Wide Web Consortium. The W3C Patent Policy is designed to:
  - Facilitate the development of W3C Recommendations by W3C Working Groups;
  - Promote the widespread implementation of those Recommendations on a Royalty-Free (RF) basis;
  - Address issues related to patents that arise during and after the development of a Recommendation.
- In August 2011, W3C adopted a [Community Contributor License Agreement](#) with Royalty-Free patent licensing terms and permissive copyright for [W3C Community and Business Groups](#). See also the [Final Specification Agreement](#), which further increases patent protection around Community and Business Group Specifications.

# Web Standards

## World Wide Web Consortium - W3C



- Process is (used to be ?) quite slow
- Standard example: HTML5
  - HTML 4 was standardized in 1997, updated to 4.01 in 2000
  - Work on HTML5 started in 2004
  - Four stages
    - Working Draft
    - Candidate Recommendation
    - Proposed Recommendation
    - W3C Recommendation
  - [HTML5](#) Recommendation completed in October 2014
- But specifications are quite stable and usable (and used) early on



# Web Standards

## World Wide Web Consortium - W3C



- Things might speed up (at least practically)
- W3C **really** likes working examples
- Many industry groups are now aimed at providing a specification and implementation
- While later changes are possible, what goes into W3C is already quite mature
- And often backed by a reference implementation  
(which is useful for a Candidate Recommendation)
  
- W3C is very strict on being implementable on a Royalty-Free (RF) basis
- So sorting licensing/patent claims out in advance helps -> industry interest groups

# Web Standards

## World Wide Web Consortium - W3C



- [Working Groups](#) typically produce deliverables (e.g., standards track technical reports, software, test suites, and reviews of the deliverables of other groups).
- The primary goal of an [Interest Group](#) is to bring together people who wish to evaluate potential Web technologies and policies. An Interest Group is a forum for the exchange of ideas.

There are several W3C Working Groups working on Web API standardization

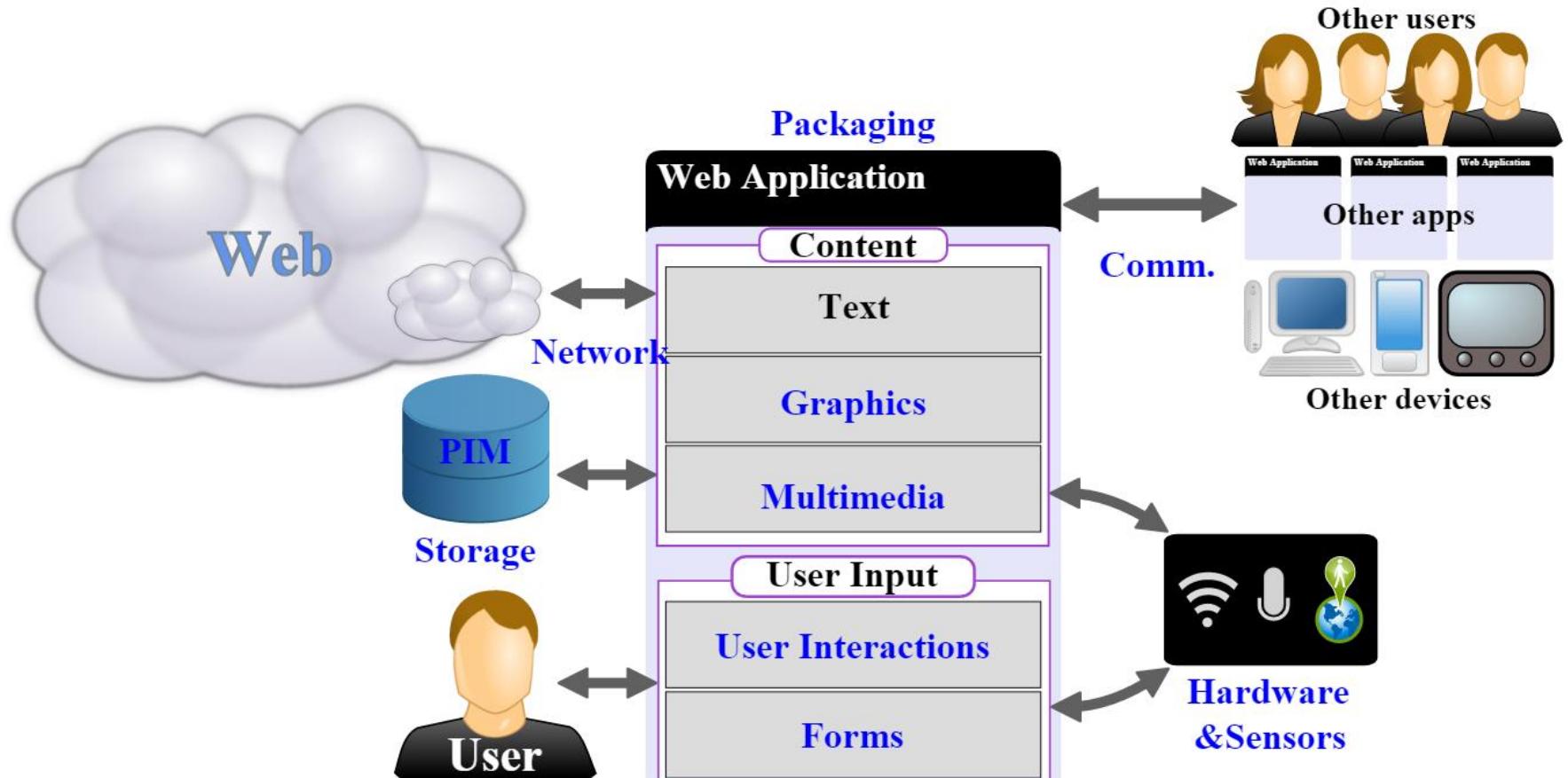
- WebApps WG
- WHAT WG (Web Hypertext Application Technology Working Group)
- DAP (Device API)
- Geolocation WG
- Web and TV
- Web of Things

# Standards W3C

## WebApps WG

- The WebApps Working group takes care of:
  - W3C Widget Family of Specifications
  - New HTML5 features such as Canvas, Web workers, Web Sockets, CORS (Cross-Origin Resource Sharing)
  - Additional Device APIs
    - FileReader API
    - FileWriter API
    - Directories and Systems API

# The Web as an application development platform



<http://www.w3.org/2015/08/mobile-web-app-state/>

# Standards W3C

## WebApps WG: W3C Widgets

- W3C Widgets (<http://www.w3.org/TR/widgets/>) are packaged standalone Web applications
  - Widget applications typically consist of commonly used browser technologies such as HTML, Ajax, JavaScript, SVG and CSS.
  - All mandatory components of a Widget application are included in the package (offline capable)
  - A Widget can be installed at local devices for recurring executions
- A Widget package consists of
  - a config.xml file that must be placed in root of the widget package
    - <widget xmlns="http://www.w3.org/ns/widgets" />
  - An application entry point (e.g. index.html)
  - Optional application icons
- Assigned Mime type: application/widget
- Specified filename for local storage \*.wgt (case-insensitively)
- Signature support to identify a widget's origin and to validate the package content
  - XML Signature Syntax and Processing Version 1.1 (<http://www.w3.org/TR/widgets-digsig/>)

# Standards W3C

## WebApps WG: W3C Widgets

```
<?xml version="1.0" encoding="UTF-8"?>
<widget xmlns = "http://www.w3.org/ns/widgets"
  id = "http://example.org/exampleWidget"
  version = "2.0 Beta" height = "200" width = "200"
  viewmodes = "widget">
  <name short="Example 2.0"> The example Widget! </name>
  <feature name="http://example.com/camera">
    <param name="autofocus" value="true"/>
  </feature>
  <preference name = "apikey" value = "ea31ad3a23fd2f" readonly = "true" />
  <description>
    Sample widget to demonstrate some of the possibilities.
  </description>
  <author href = "http://foo-bar.org/" email = "hi@foo-bar.org">
    Foo Bar Corp
  </author>
  <icon src="icons/icon.png"/>
  <content src="myWidget.html"/>
  <license>
    Example license Copyright (c) 2008 The Foo Bar Corp
  </license>
</widget>
```

# Standards W3C

## Device API Working Group

- Origin
  - W3C Workshop on “Security for Access to Device APIs from the Web” in December 2008. “The goal of this workshop was *to gather information and experiences in the device API space, to start building community consensus about possible standardization work within W3C, and to gather requirements to guide such work.*”
  - WS attendees discussed the need for standardization and identified four high priority topics that are addressed in the W3C DAP WG charter (July 2009, expected end 31. July 2011)
- Various contributing companies
  - ACCESS Co., AT&T, Deutsche Telekom AG , ETRI, France Telecom, Google, Intel Corporation, Mozilla Foundation, Nokia, OMTP Limited, Opera Software, Samsung Electronics, SK Telecom, Sony Ericsson Mobile Communications, Sun Microsystems, Telecom Italia SpA , Telefónica de España, Vodafone, W3C
  - Plus invited Experts

# Standards W3C

## Device API Working Group: Scope

- DAP WG tasks
  - Declaration of APIs, i.e., the mechanisms by which a widget or Web Application can declare a dependency (with possible security consequences) on an API
  - API Patterns, What should be similar across the different API specifications
  - Concrete APIs that should be standardized (desktop PCs, laptops, mobile internet devices (MIDs), cellular phones, etc.)
- Priority is to develop simple and consensual APIs while leaving more complex features to future versions.
- Plus a comprehensive test suite for the specifications

# Standards W3C

## Device API Working Group: API Set

- Priority APIs
  - Battery Status
  - Contacts (reading from addressbook)
  - HTML Media Capture (camera/microphone interactions through HTML forms)
  - Messaging (SMS, MMS, eMail)
  - Networking Information API
- Other APIs
  - Calendar API
  - Sensor API
  - Vibration API
  - Menu API
- At Risk
  - Audio Volume
  - Beep
  - Gallery
  - System Infos and Events
  - Tasks
- Exploratory
  - Discovery

# W3C and TV

- Web and TV Work started in 2010
- HTML5 video plays key role but ...
  - ... needs to meet broadcaster/TV requirements
- Mission Statement
  - The **mission** of the Web and TV Interest Group is to provide a forum for Web and TV technical discussions, to review existing work, as well as the relationship between services on the Web and TV services, and to identify requirements and potential solutions to ensure that the Web will function well with TV.
- Web+TV IG
  - 159 participants from 59 organizations
  - Chairs: Opera (Europe), Comcast/NBC (US), Tomo-Digi (Japan)
  - Active participants include: BBC, NBC, ATT, CableLabs, Comcast, Netflix, Opera, EBU, Fraunhofer FOKUS, Google, Microsoft, MovieLabs, Samsung, Sony

# Standards W3C

## Standards Web: W3C Web and TV

- Origin
  - First W3C Web and TV Workshop in Tokyo (September 2010), second in Berlin (February 2011), third in Hollywood (September 2011).
  - Interest Group was founded in February 2011.
- Mission Statement
  - The **mission** of the Web and TV Interest Group is to provide a forum for Web and TV technical discussions, to review existing work, as well as the relationship between services on the Web and TV services, and to identify requirements and potential solutions to ensure that the Web will function well with TV.
- Some of the participating companies
  - AT&T, BBC, Cisco, Comcast, Deutsche Telekom, ETRI, Ericsson, EBU, France Telecom, **Fraunhofer**, Google, ITRI, Intel, LG, Microsoft, Netflix, NTT, Nokia, Opera, Samsung, Sony, Telefonica, Toshiba

# Second W3C Web and TV Workshop

- First W3C Web and TV Workshop in Tokyo (September 2010), second in Berlin (February 2011), third in Hollywood (September 2011).
- Interest Group was founded in February 2011.
- March: 4th Web and TV Workshop hosted by IRT in Munich



**8-9 February 2011**

**Hosted by Fraunhofer-FOKUS, Berlin, Germany**

# Standards W3C

## Standards Web: W3C Web and TV

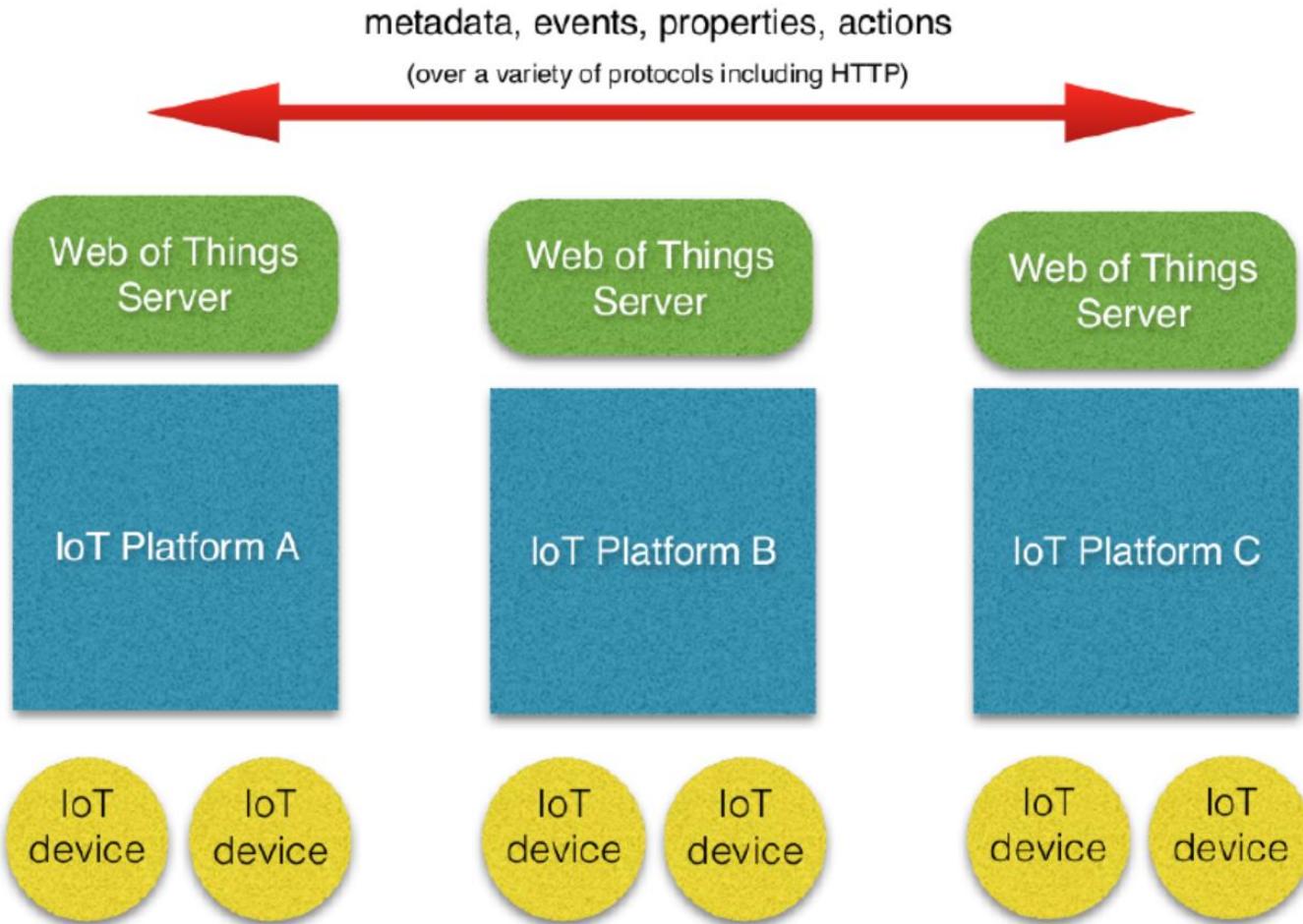
- Two main work areas (task forces)
  - Home Network TF — identify gaps to enable discovery and control of devices and services in the local area IP network.
  - Media Pipeline TF — discuss requirements placed on the HTML5 video, audio and media interface by media formats that will be used for Web and TV
- Does:
  - Identify and categorize topics of interest for the Web and TV in terms of standardization needs.
  - List requirements
  - Suggest solutions
- Does not:
  - Perform standardisation
  - *"The development of Web standards, when required, takes place in other working groups. "*

# W3C Web of Things Framework

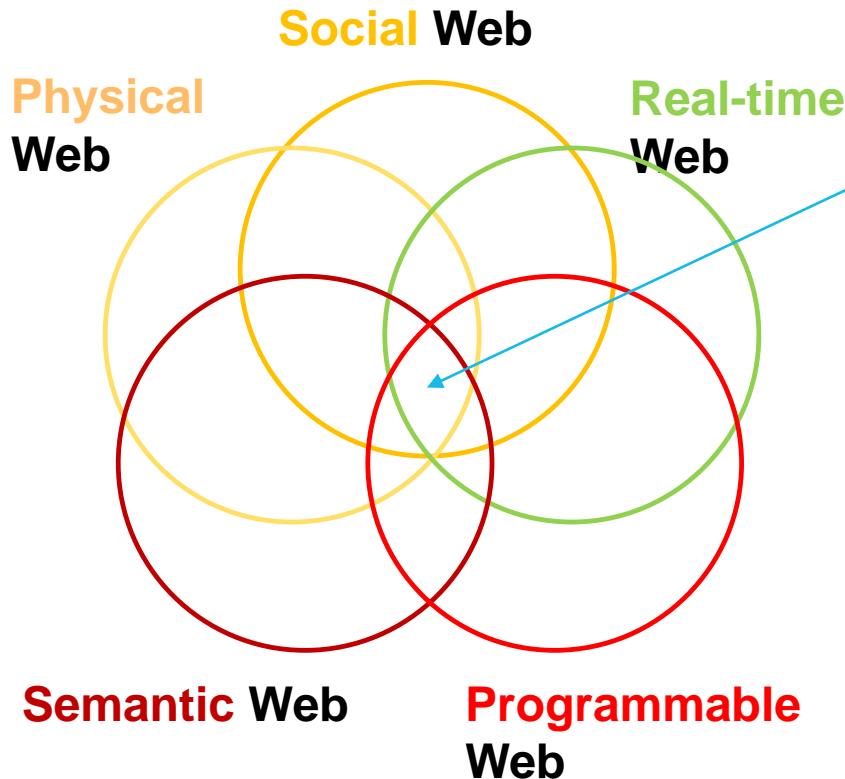
- We expect one hundred billion IoT devices to be deployed within ten years
- But, the Internet of Things is currently beset with problems
  - A sign of market immaturity
  - Product silos that don't interoperate with each other
  - Plethora of approaches & incompatible platforms
  - This is blocking the benefits of the network effect
- This is painful for developers
  - Hard to keep track of who is doing what
  - Expensive to learn and port to different platforms
  - Challenging to create services that span domains and platforms
- Platform developers seeking to unlock the commercial potential
  - To reduce development costs for IoT applications and services
  - To fulfil customer demand for services requiring integration with other platforms
  - To grow the size of the overall markets
    - A small share of a huge market is better than a big share of a small market

# The Web as the Solution

“Things” as virtual objects acting as proxies for physical and abstract entities



# The web as the solution



## Web of Things

- Development of composite applications on top of the **open and simple standards** that made the Web so successful (REST, XML, HTTP, or Atom)
- Reuse of **existing Web standards** will allow any device to finally "speak" the same language as other resources on Web
- Real-world objects will become first class citizens of the World Wide Web, which will make them **linkable, discoverable, searchable**, and therefore usable just like **any other data** available on the Web.

Source: [webofthings.org](http://webofthings.org) – Web of Things Community

# The Web of Things

**The Internet connects Things, the Web connects data & applications.**

- Physical Web. L. Bassbouss
- „Application architecture for physical objects“. D. Guinard, V. Trifa, E. Wilde, D. Raggett

Web of Things

How applications connect with things.

- OSI Layer 7 + REST, JSON
- Social networks, semantics
- Mashups

- “Uniquely identifiable objects and their virtual representations in an Internet-like structure”. Auto-ID Labs (K. Ashton, S. Sarma, F. Mattern)

How things connect to the Internet

- OSI Layer 4 EPC, IPv6 lowpan, WiFi, ZigBee, BLE, etc.

Internet of Things