

**EUROPEAN COMPUTER SCIENCE SUMMIT 2008**  
4th Annual INFORMATICS-Europe Meeting  
9 October 2008, Zurich



# ICT 2020

The Research Program for Boosting Germany's  
Innovation Motor No. 1

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# ICT: The Innovation Motor No. 1 for Germany



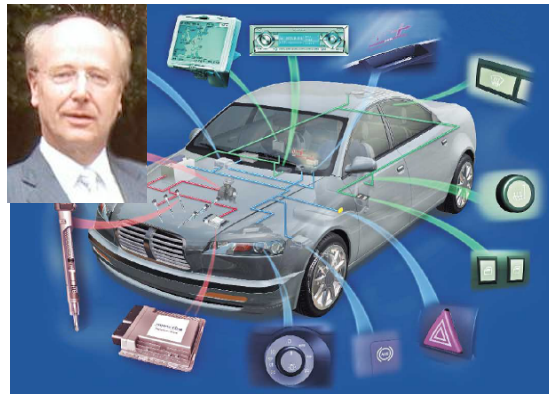
Prof. Dr. E. Reinhardt  
Board of Directors, Siemens

In **medical technologies** ICT is the foundation for more than **80%** of all innovations.



Dr. J. Helbig  
Board of Directors, DHL

The driver of more than **80%** of all innovations in **logistics** is ICT.

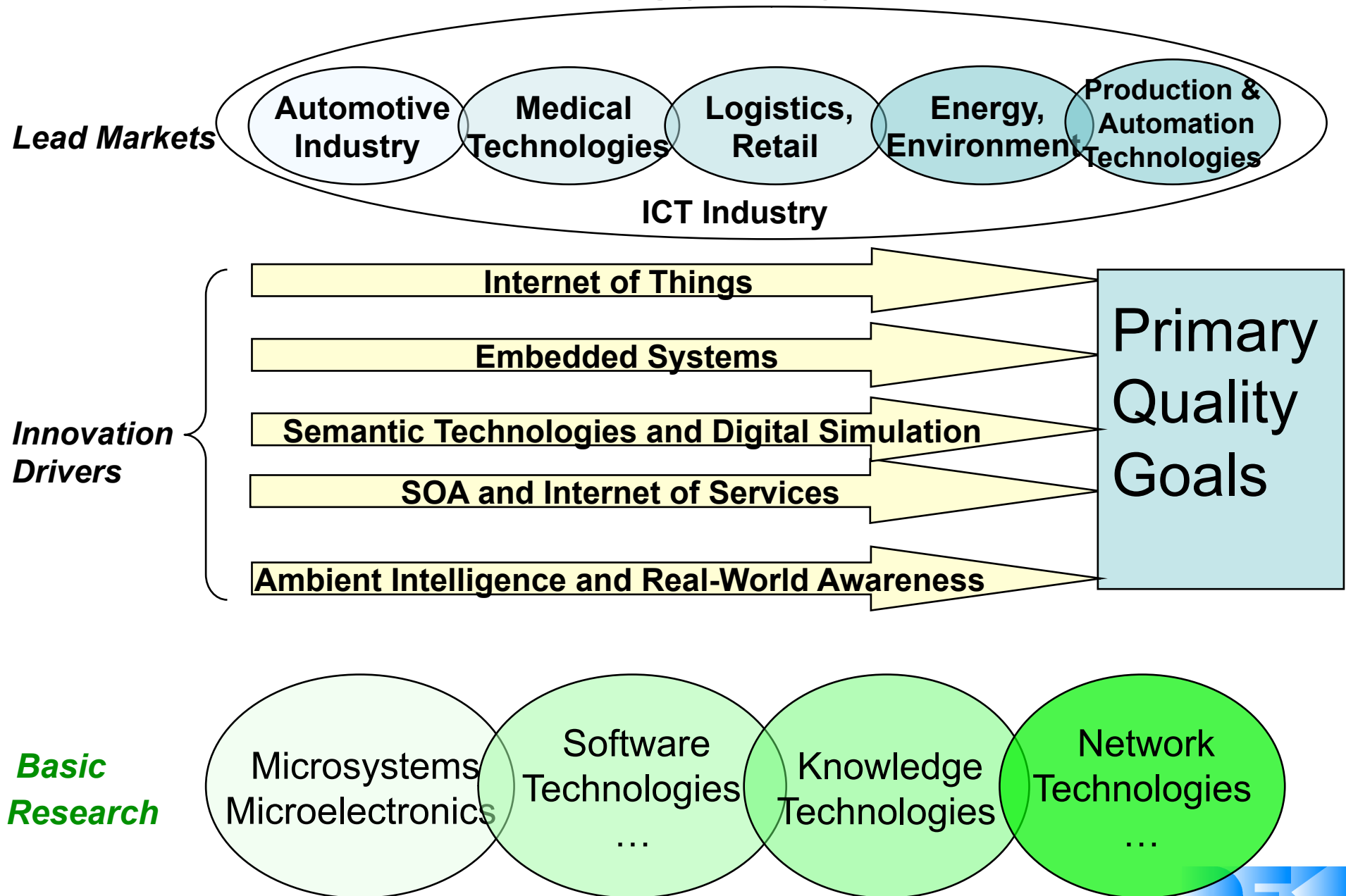


Dr. S. Dais  
Board of Directors, Bosch

More than **80%** of all recent innovations in the **automotive sector** are based on ICT.



# The ICT 2020 Strategy Layers



# Try to Transfer the Fame of German Engineering to German ICT Products



**Primary Quality Goals**  
for German ICT products

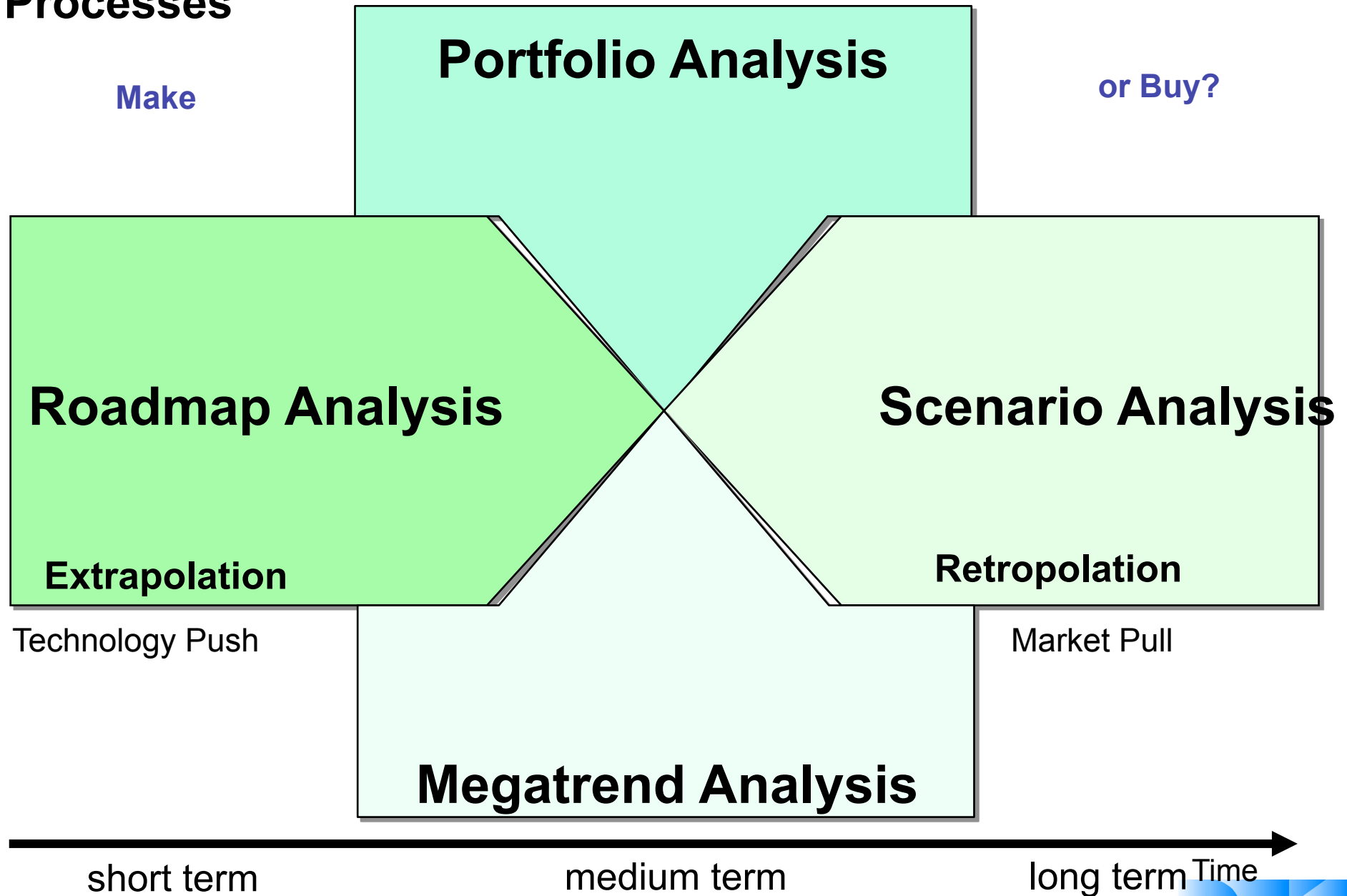
- Reliability and Dependability
- Resource Efficiency
- Ease of Use
- Security

**Very High quality ICT solutions , but more expensive - like BMW and Mercedes**

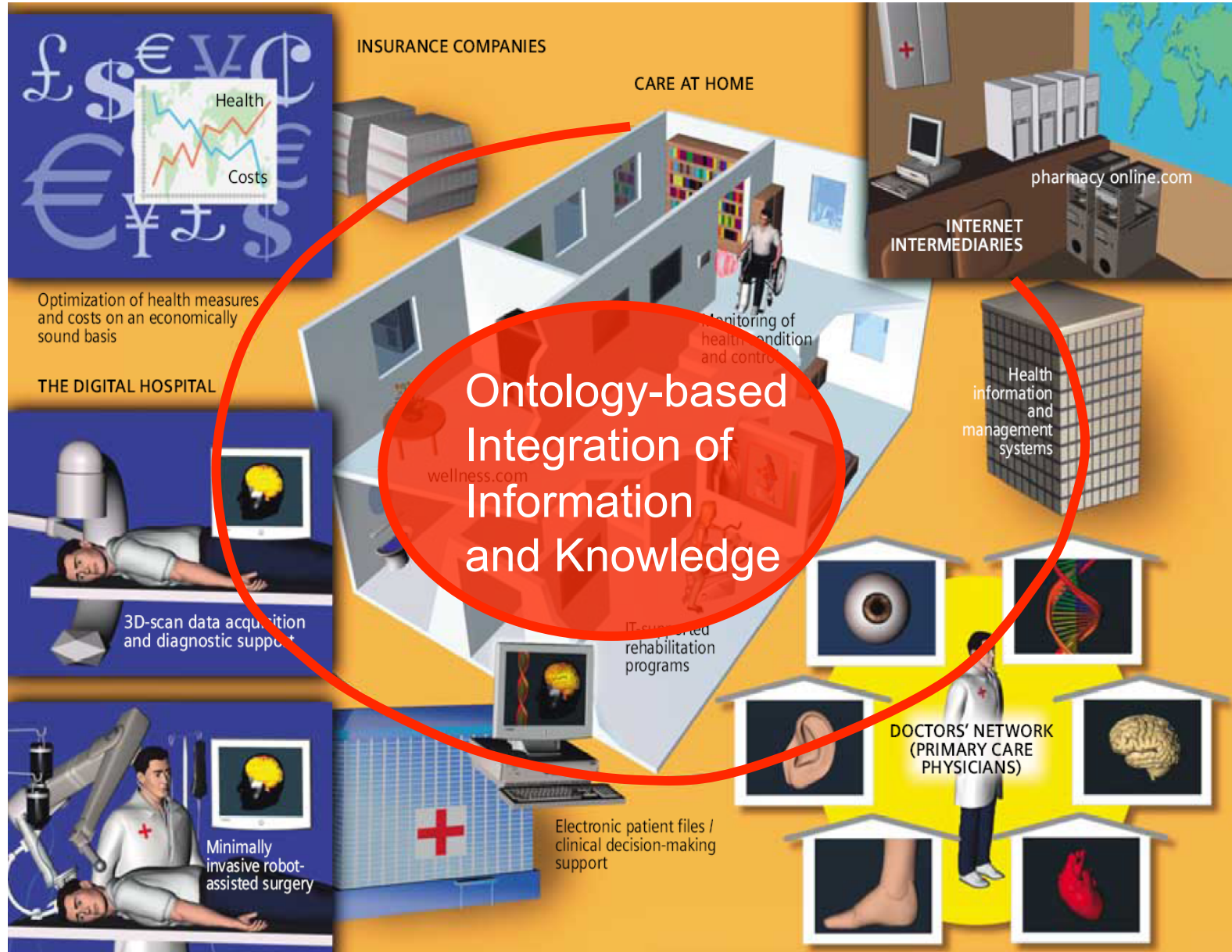
# Outline of the Talk

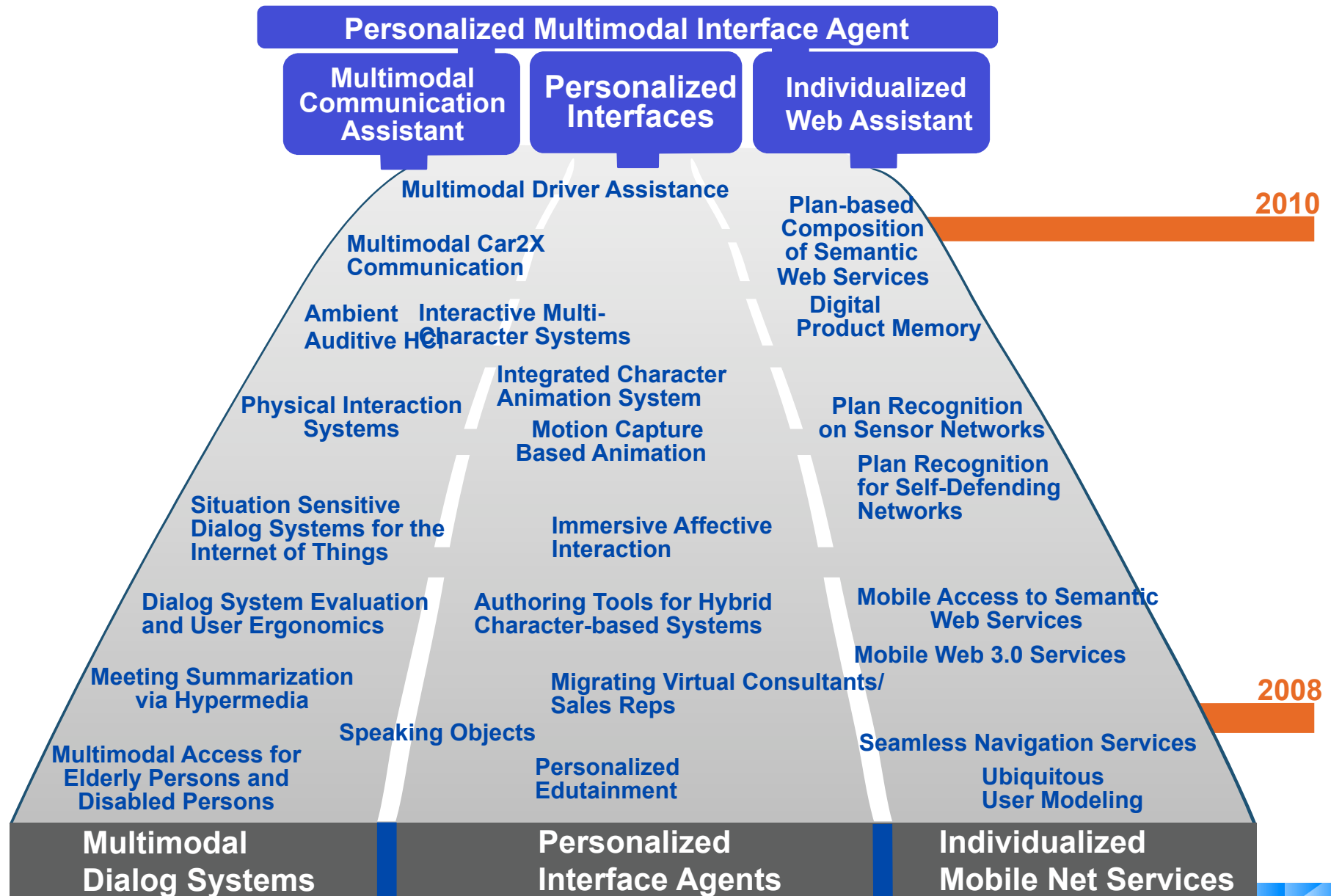
1. The Agenda Process for ICT 2020
3. Dynamic Innovation Clusters and PPP Research
5. Four Examples of Innovation Alliances
  - 100Gbit/s Carrier-Grade Ethernet Technologies
  - Car2x and Advanced Driver Assistance
  - Semantic Product Memories for Logistics
  - SmartFactory: Wireless, Sensor-based Production

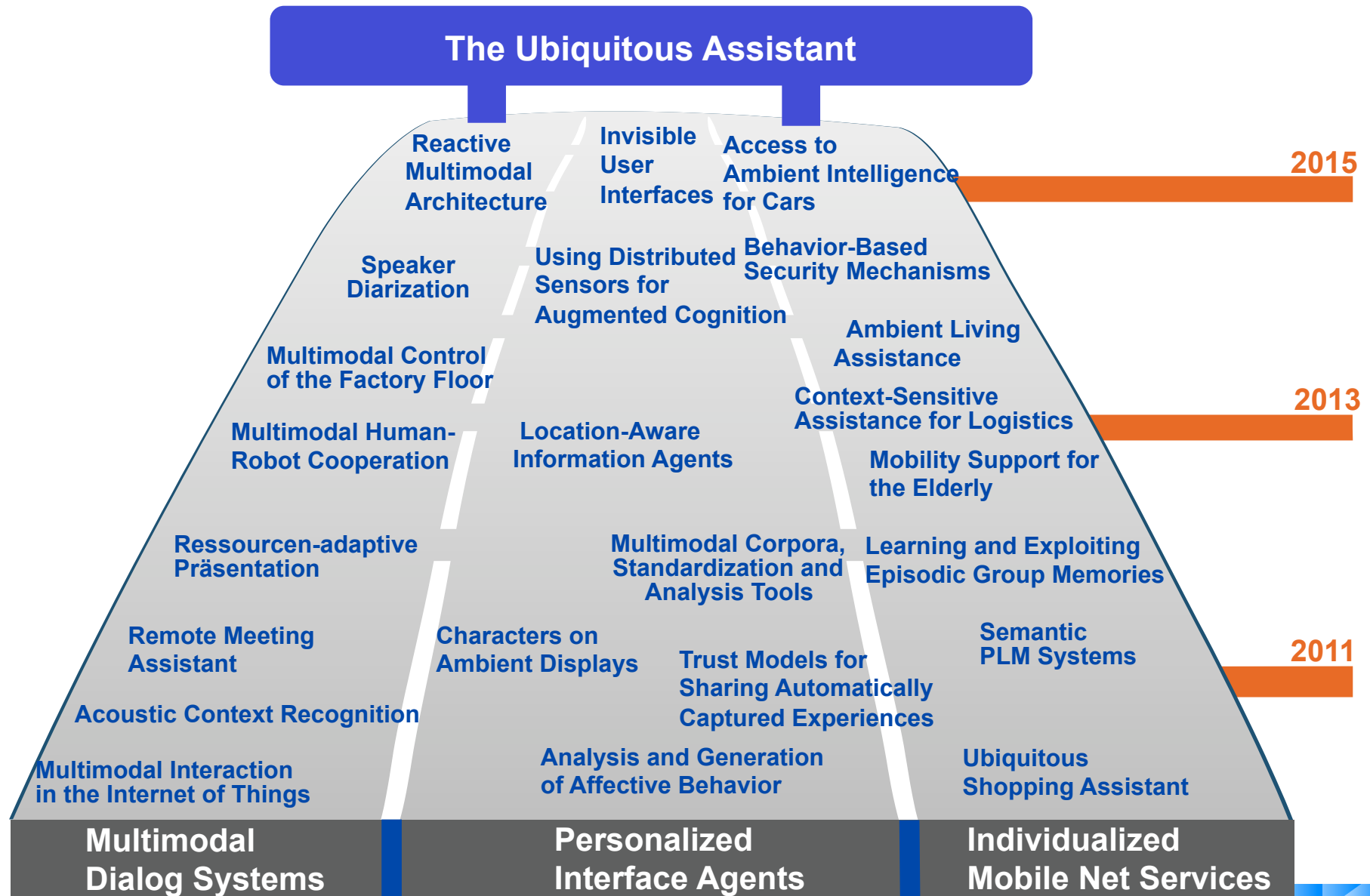
# Systematic Planning of Innovation Processes



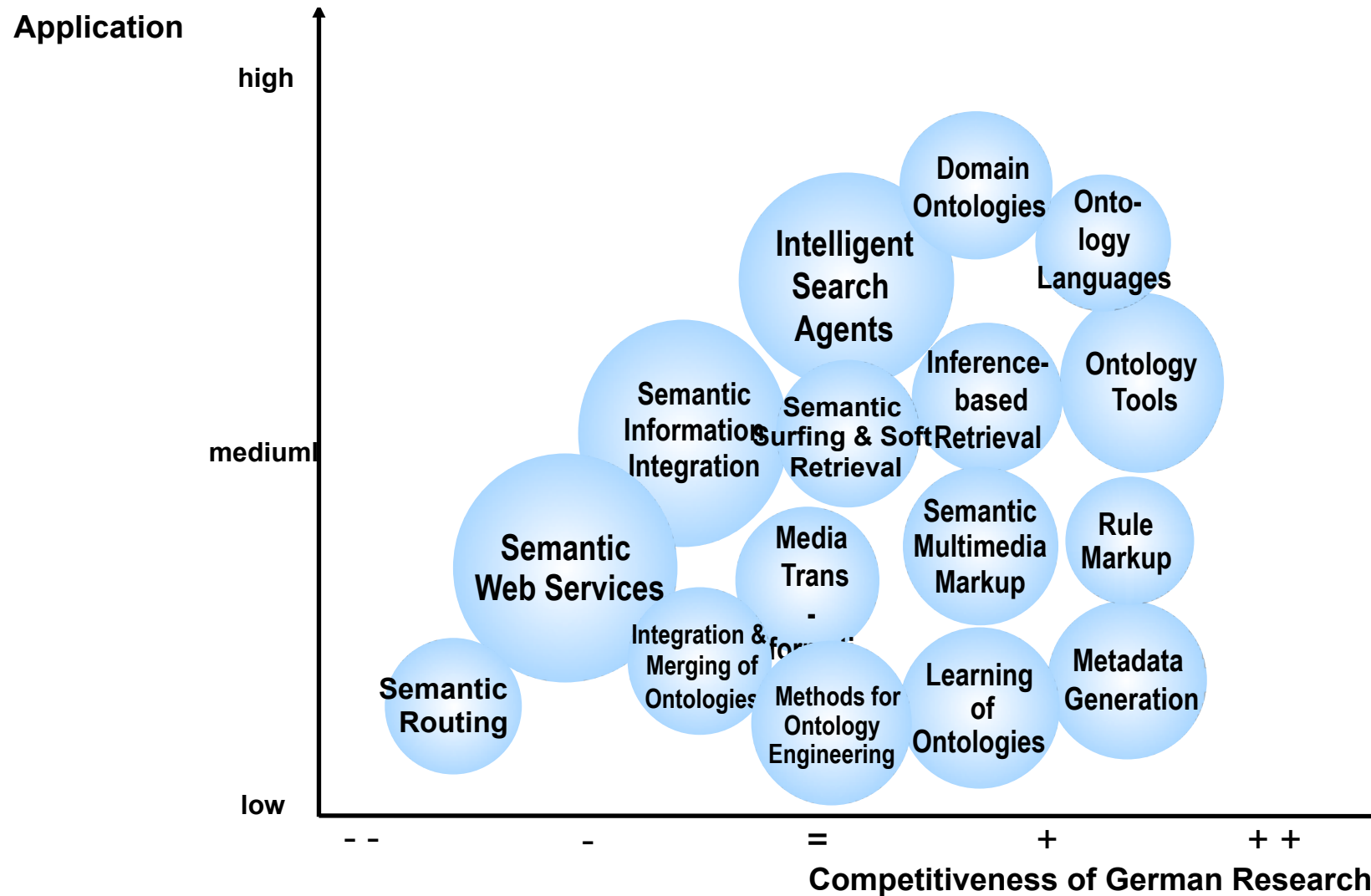
# The Future of Digital Healthcare Based on Semantic Web Services and Ambient Intelligence



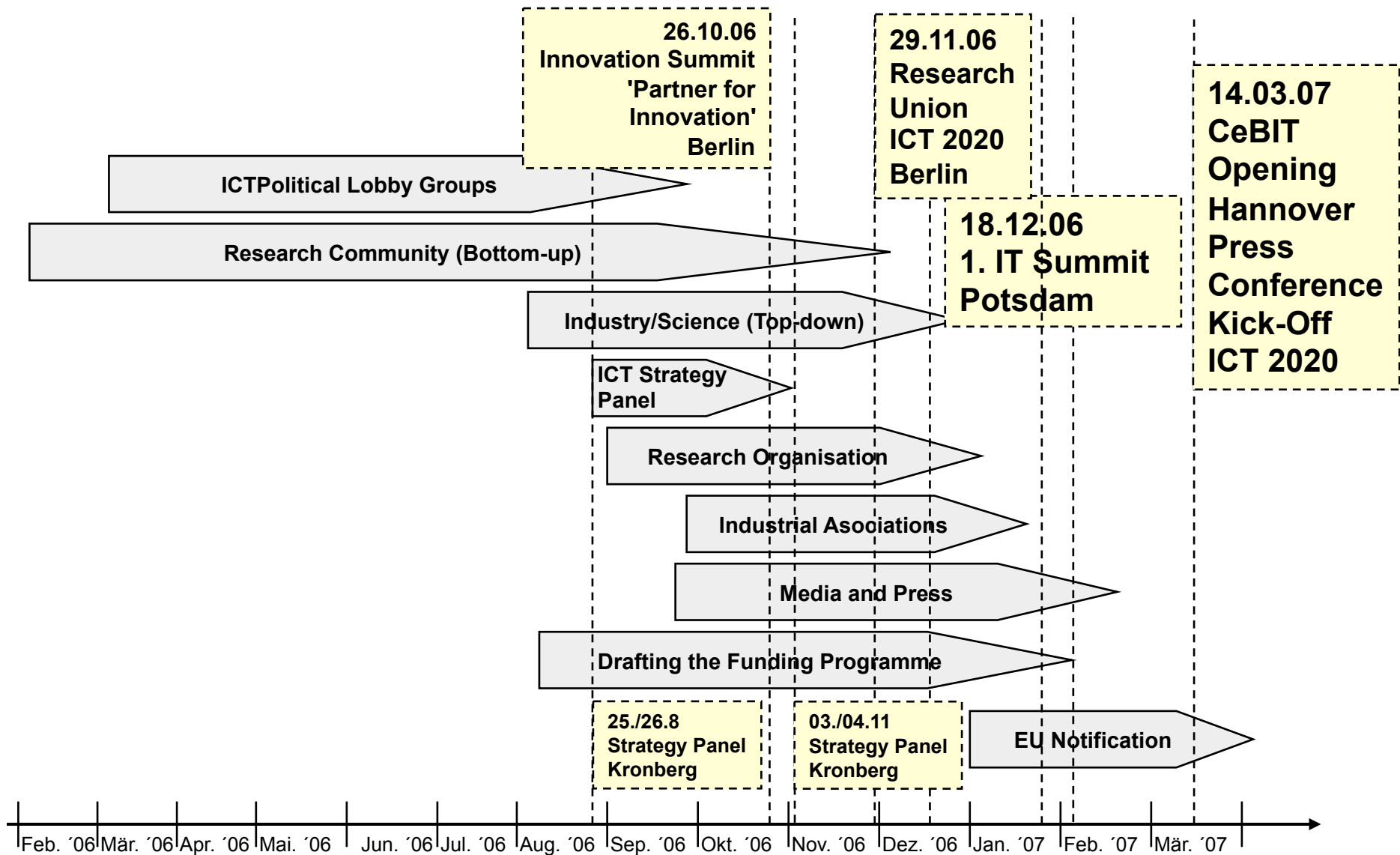




# Megatrend and Portfolio Analysis for the Semantic Web



# Timeline of Planning Process for ICT 2020



# Partner for Innovation: An Initiative by Chancellor Schröder



Fraunhofer Gesellschaft



SIEMENS



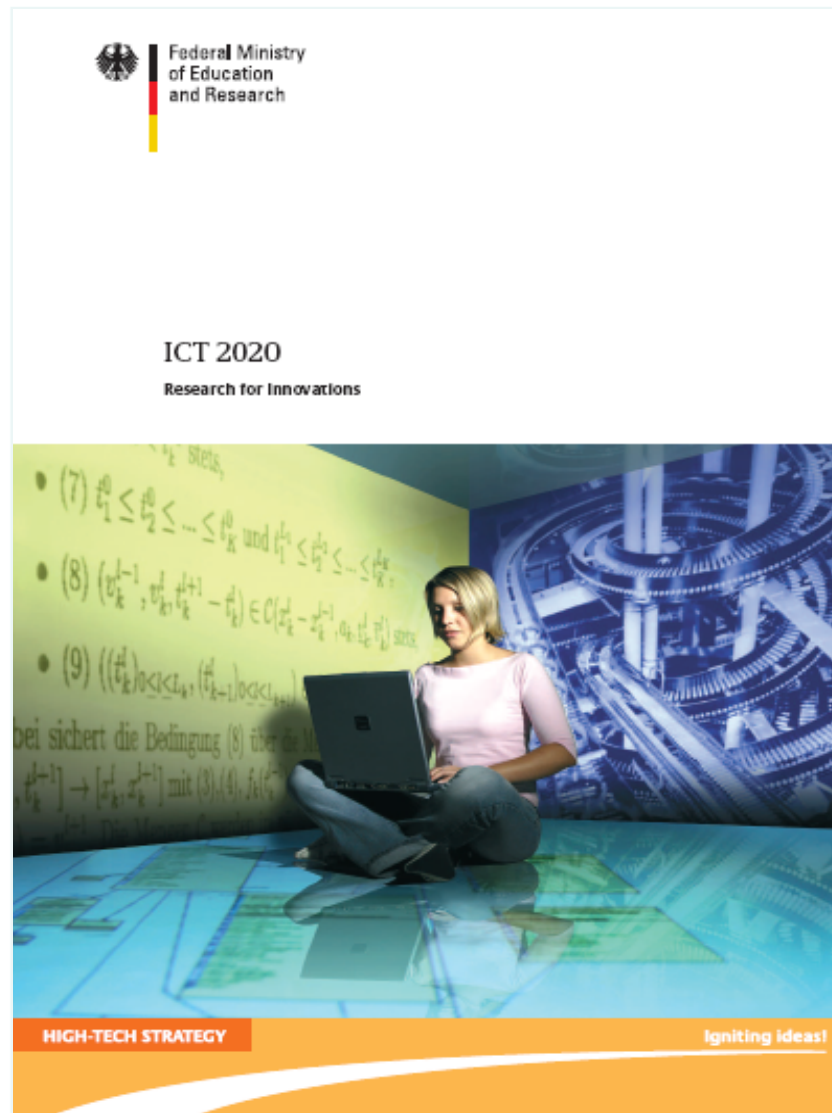
# The Partners for Innovation: Appointed by the Chancellor of Germany



# More than 1 Billion Euro for ICT 2020



1180  
Million  
Euros  
(2006-2009)



Published  
2007, Bonn and  
Berlin

Federal Ministry  
of Education and  
Research  
75 pages

[http://www.bmbf.de/pub/ict\\_2020.pdf](http://www.bmbf.de/pub/ict_2020.pdf)



# Research Union: Academia – Industry (2006-09)

Karl-Heinz Lust (CEO Lust Antriebstechnik GmbH)

Dr. Stefan Marcinowski (Board of Directors BASF)

Prof. Dr. Sigmar Wittig (University of Karlsruhe (TH))

Prof. Dr. Jürgen Mlynek (President Helmholtz-Gemeinschaft Deutscher Forschungszentren)

Manfred Wittenstein (CEO Wittenstein AG)

Prof. Dr. Frieder Meyer-Krahmer (State Secretary Education and Research)



Dr. Dieter Kurz (CEO Carl Zeiss AG),

Willi Berchtold (Board of Directors ZF Friedrichshafen AG)

Prof. Dr. Wolfgang Wahlster (CEO DFKI in Saarbrücken, Kaiserslautern und Bremen)

Dagmar Wöhrl (State Secretary Economics and Technology)

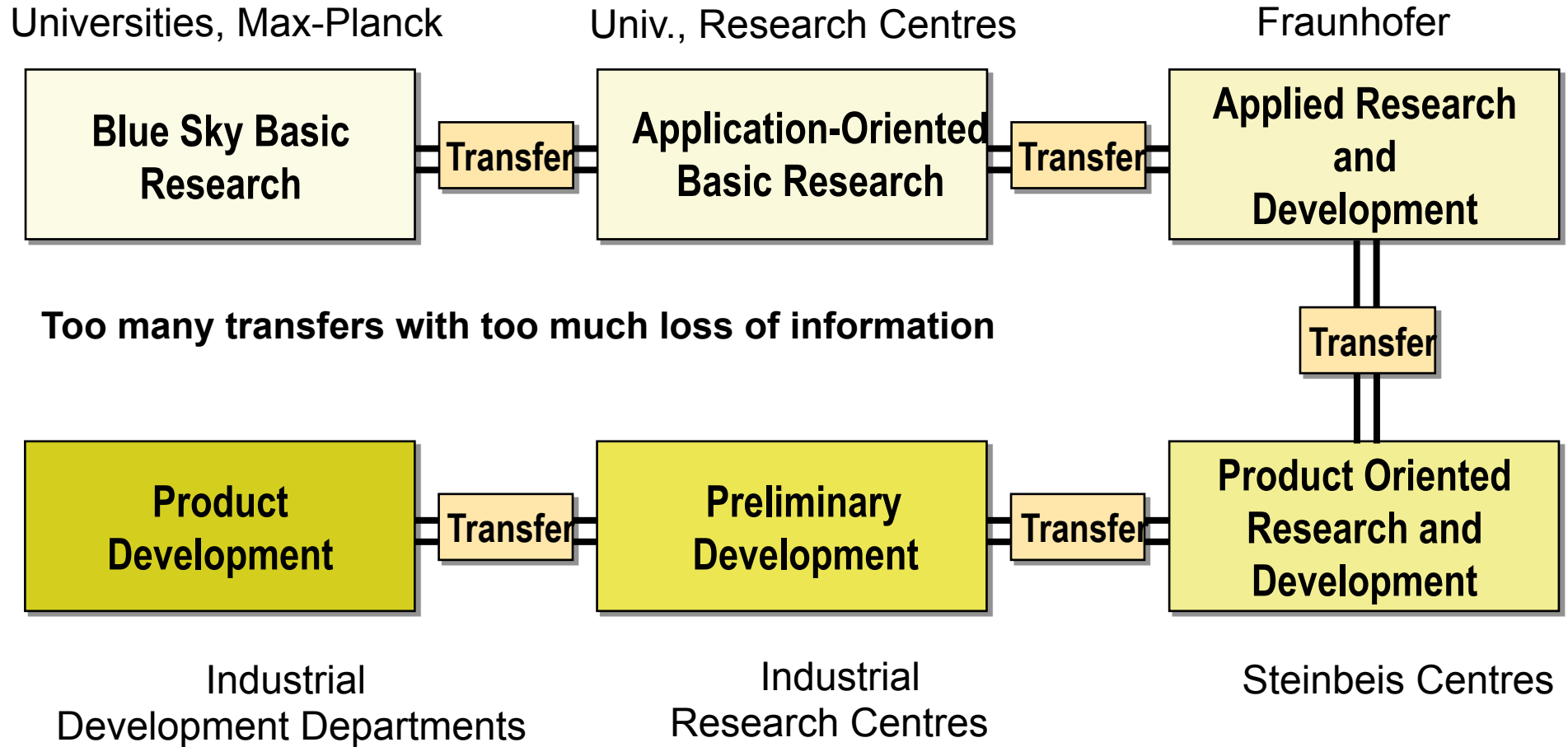
Prof. Dr. Hans-Jörg Bullinger, (President of Fraunhofer-Gesellschaft)

Dr. Annette Schavan, (Federal Minister Education and Research)

Dr. Arend Oetker, (President des Stifterverbandes für die Deutsche Wissenschaft)



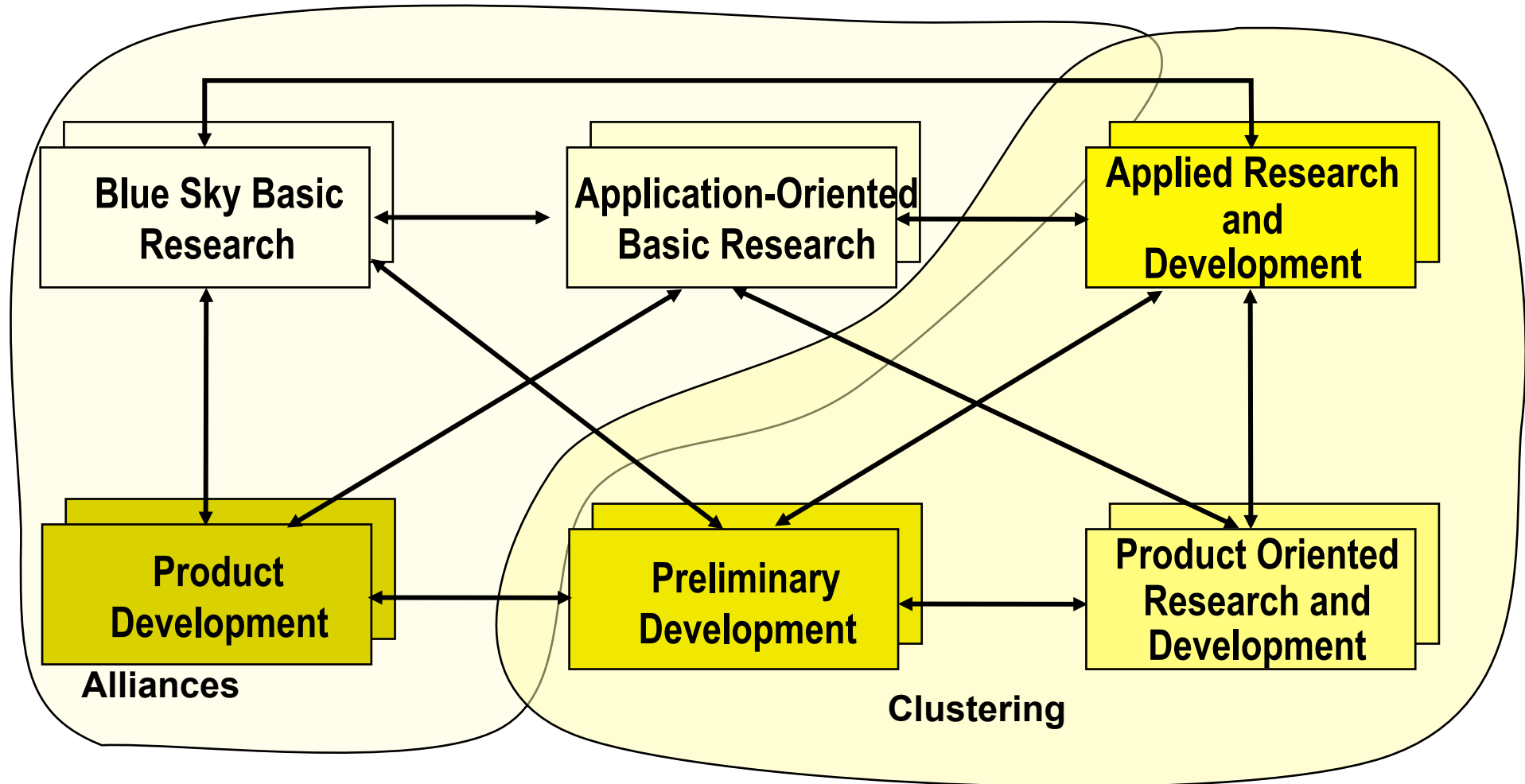
# The Traditional Research Pipeline is a Roadblock to High-Speed Innovation



**1300 German Transfer Centers serve only as Contact and Marketing Centres**

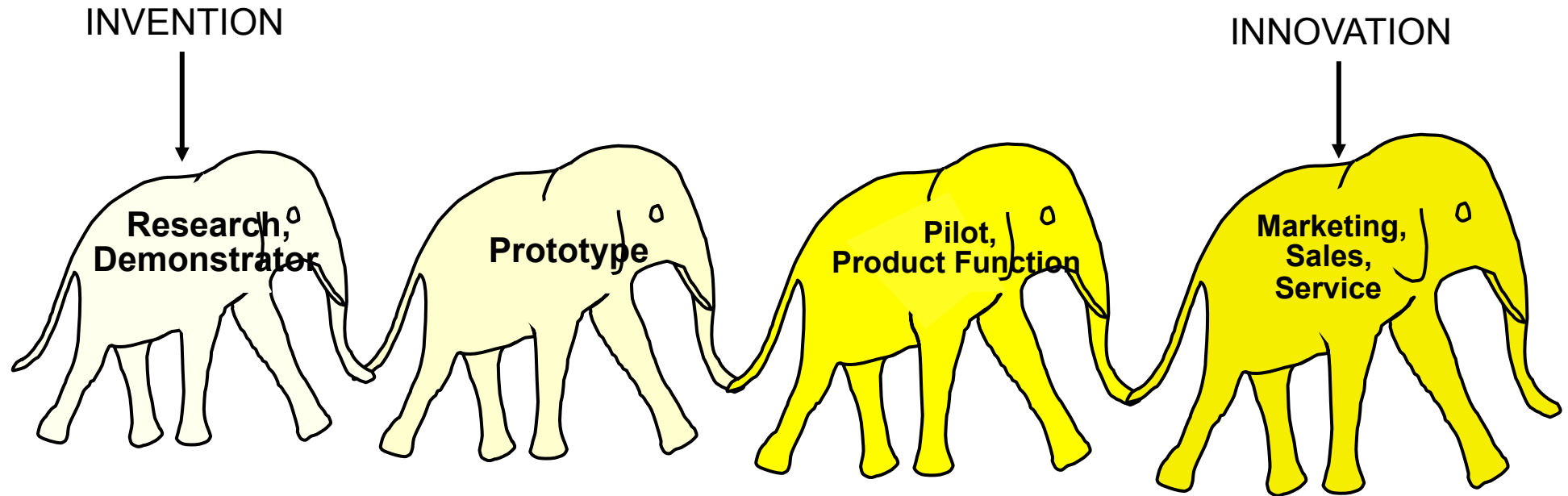
# Dynamic Innovation Networks

## Minimize the Time-to-Market Factor

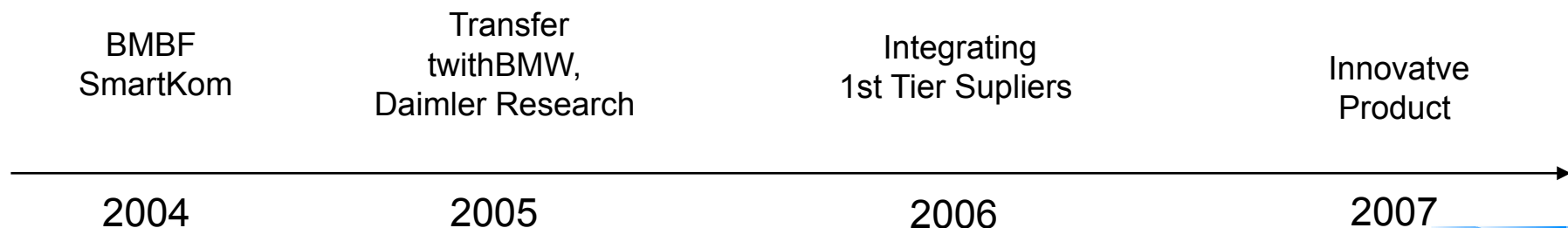


Combining basic and applied research with application development


# Inside Germany Completing the Innovation Chain





## Speech-based Navigation in the Car




# Excellence Initiative of the German Research Foundation (DFG)

 Cluster of Excellence in Computer Science

 Cluster of Excellence with some Computer Scientists

 Graduate School of Excellence in Computer Science

 Cluster of Excellence and Graduate School of Excellence in Computer Science

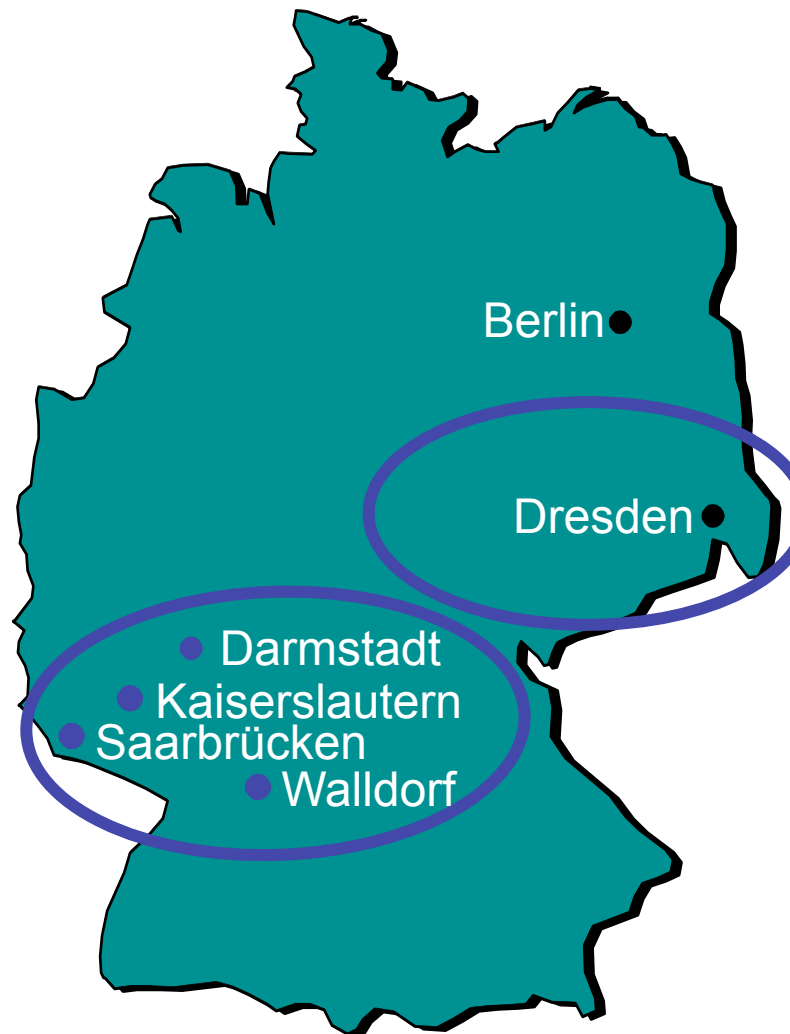


**20 Million Euro per Cluster + Graduate School for 5 years**

 Computer Science at German Universities

# Major ICT Clusters in Germany

SoftWare SouthWest  
SAP, Software AG,  
IDS Scheer,  
MPI, DFKI, FhG,  
Universities  
Software Cluster



Silicon Saxony:  
AMD, Infineon,  
FhG, TU Dresden  
Hardware Cluster

# DFKI as an Example of PPP Research Organisations:



Saarland

DAIMLER



Rhineland-Palatinate



Bremen

RICOH



arvato in the Bertelsmann AG



KIBG



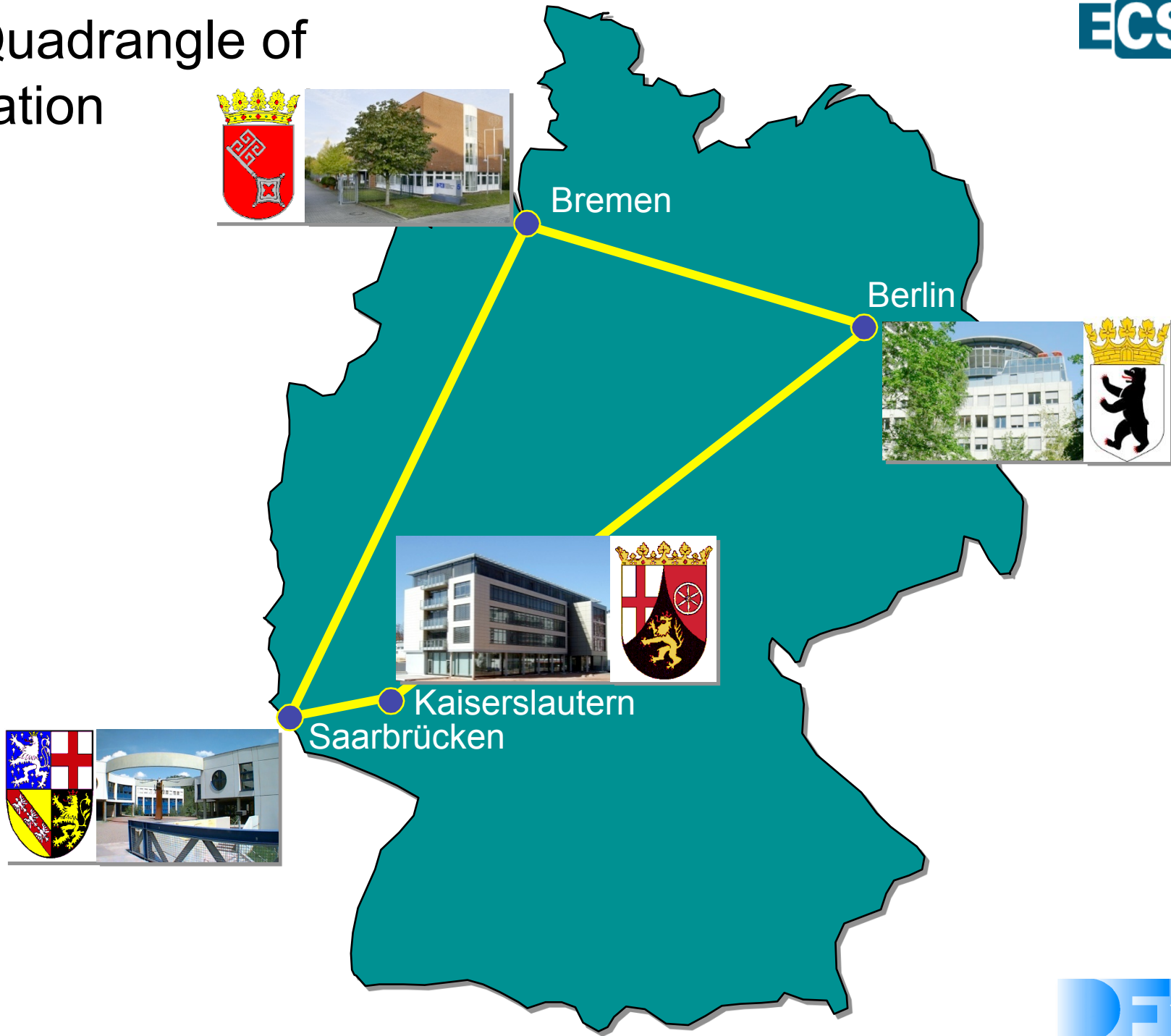
Fraunhofer Gesellschaft



UNIVERSITÄT DES SAARLANDES



# The Quadrangle of Innovation

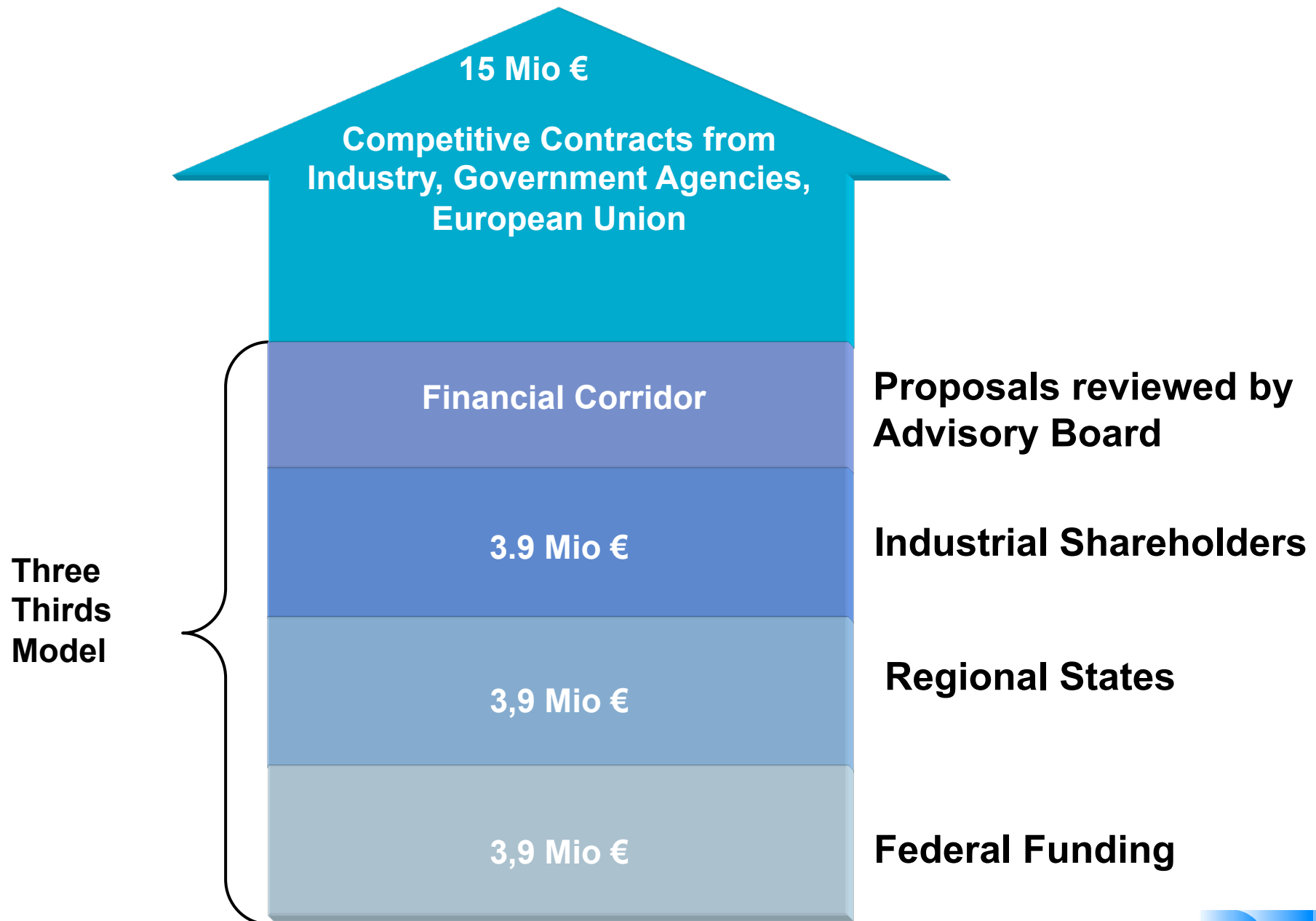


# DFKI as a PPP Research Center



- + 312 Researchers**
- + Revenues 28,6 Million Euro in 2007**
- + Turn-over per Scientist > 144 k €**
- + Average Age: 36 years**
- + Additional part-time researchers**
- + Almost 600 employees**
- + 132 ongoing projects**





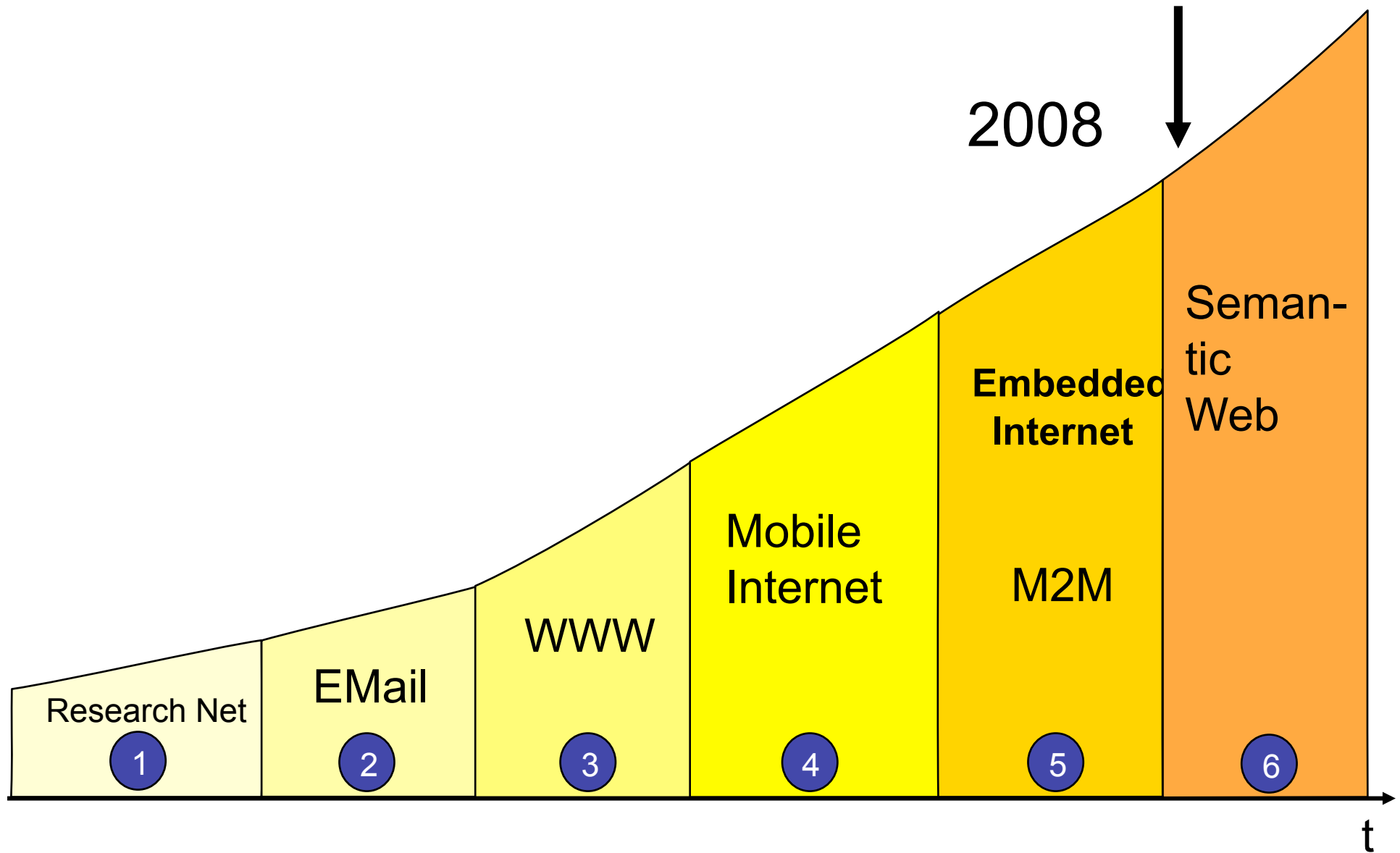
# DFKI has created 52 Spin-Off Companies



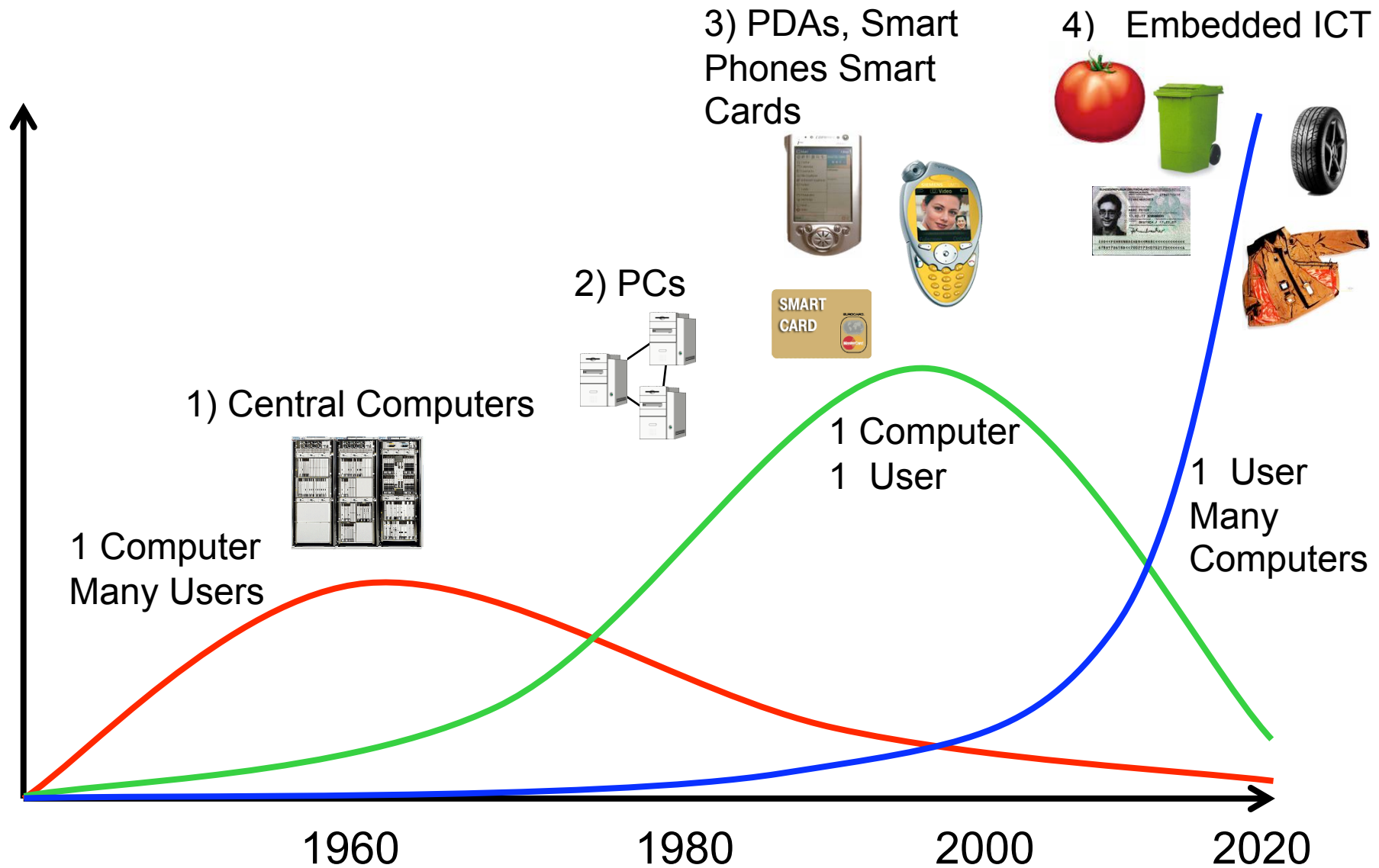
 <b>A-Z Technology AG</b> A-Z Technology <a href="http://www.a-z-technology.de">www.a-z-technology.de</a>	 <b>acrolinx</b> acrolinx <a href="http://www.acrolinx.de">http://www.acrolinx.de</a>	 <b>AH a.Doc.</b> DOCUMENT MANAGEMENT Dr. Andreas Hausmann AHa.Doc <a href="http://www.aha-doc.de/">http://www.aha-doc.de/</a>	 <b>Ascella</b> Webhosting Software IT-Komponenten Ascella <a href="http://www.ascella.de">www.ascella.de</a>	 <b>b</b> we process your process b4 value.net <a href="http://www.b4value.net">www.b4value.net</a>	 <b>brainbot</b> brainbot <a href="http://www.brainbot.com">www.brainbot.com</a>	 <b>Camelot IDPro</b> Intelligently Designed Processes AG Camelot IDPro <a href="http://www.camelot-idpro.de">www.camelot-idpro.de</a>	 <b>CELI</b> CELI <a href="http://www.celi.it">www.celi.it</a>
 DR. ODENDAHL STRATEGY CONSULTING Dr. Odendahl Consulting <a href="http://www.clemens-odendahl-consulting.de">www.clemens-odendahl-consulting.de</a>	 <b>DACOS</b> SOFTWARE DACOS <a href="http://www.dacos.de">www.dacos.de</a>	 <b>deepweb</b> gmbh DeepWeb <a href="http://www.deep-web.de">www.deep-web.de</a>	 <b>DHC</b> Dr. Herterich & Consultants DHC <a href="http://www.dhc-gmbh.com">www.dhc-gmbh.com</a>	 <b>DNC</b> Dr. Netter Consulting Dr. Netter Consulting <a href="http://www.dn-c.de">http://www.dn-c.de</a>	 <b>ebit</b> electronic business institute prof. dr. dieter steinmann <a href="http://www.ebit-online.de">www.ebit-online.de</a>	 <b>empolis</b> arvato empolis <a href="http://www.empolis.de">www.empolis.de</a>	 <b>e.Tell</b> e.tell <a href="http://www.e-tell.de">www.e-tell.de</a>
 <b>eyeled</b> Localized Mobile Systems EYELED <a href="http://www.eyeled.com">www.eyeled.com</a>	 <b>GRIPS</b> Gillen & Partner GbR GRIPS <a href="http://www.grips-net.de">www.grips-net.de</a>	 <b>HRW</b> CONSULTING HRW Consulting <a href="http://www.hrw-consulting.com">www.hrw-consulting.com</a>	 <b>IMAGO</b> INFORMATIONSTECHNOLOGIE GMBH Imago <a href="http://www.imago.de">www.imago.de</a>	 <b>imc</b> Advanced Learning Solutions imc <a href="http://www.im-c.de">www.im-c.de</a>	 <b>INNO P</b> InnoP <a href="http://www.innop.de">www.innop.de</a>	 <b>insiders</b> technologies Insiders Information Management GmbH <a href="http://www.insiders-technologies.de">www.insiders-technologies.de</a>	 <b>INTERACTIVE</b> Inter Active Software Solutions GmbH <a href="http://www.interactive-software.de">www.interactive-software.de</a>
 <b>INTERNET FX</b> INTERNET FX <a href="http://www.internetfx.de">www.internetfx.de</a>	 <b>ITM</b> Informations- und TechnologieManagement Beratungsgesellschaft <a href="http://www.itm-consulting.de">www.itm-consulting.de</a>	 <b>JOKER TECH SYSTEMS</b> Joker Tech Systems <a href="http://www.jts-online.de">www.jts-online.de</a>	 <b>MEDIA NOVA</b> Media Nova Software GmbH <a href="http://www.media-nova.de">www.media-nova.de</a>	 <b>mineway</b> informed decisions mineway <a href="http://www.mineway.de">www.mineway.de</a>	 <b>net sector</b> net sector <a href="http://www.netsector.de">www.netsector.de</a>	 <b>PEDIA PRESS</b> pediapress.com/ <a href="http://pediapress.com/">pediapress.com/</a>	 <b>PentAI</b> The 5 <sup>th</sup> Dimension PantAion Ltd. PantAion Ltd.
 <b>Plansoft</b> Beratung und Entwicklung GmbH Plansoft <a href="http://www.plansoft.de">www.plansoft.de</a>	 <b>ProCAEss</b> ProCAEss <a href="http://www.procaess.de">www.procaess.de</a>	 <b>schwartz&amp;stahl</b> www.indoornavi.com <a href="http://www.indoornavi.com">www.indoornavi.com</a>	 <b>Semantic Edge</b> FIRST CHOICE SEMANTICEDGE <a href="http://www.semanticedge.com">www.semanticedge.com</a>	 <b>semvox</b> semantic technologies and voice solutions Semantic Technologies and Voice Solutions <a href="http://www.semvox.de">www.semvox.de</a>	 <b>SIEDA</b> SIEDA <a href="http://www.sieda.com">www.sieda.com</a>	 <b>SIMPROVE CONSULTING</b> WE MAKE YOUR WORK FLOW SIMPROVE CONSULTING <a href="http://www.simprove.de">www.simprove.de</a>	 <b>Sirrix AG</b> security technologies Sirrix AG <a href="http://www.sirrix.com">www.sirrix.com</a>
 <b>SO FIND</b> Gefunden werden! ... in den Suchmaschinen ganz oben Der SolutionFinder <a href="http://www.sofind.de">www.sofind.de</a>	 <b>softgarden</b> IT-SOLUTIONS softgarden - Recruiting Management and more	 <b>sonicson</b> sonicson <a href="http://www.sonicson.com">www.sonicson.com</a>	 <b>spring</b> infotainment spring <a href="http://www.spring.de">www.spring.de</a>	 <b>TIQQER</b> TIQQER <a href="http://www.tiqqer.com/">www.tiqqer.com/</a>	 <b>TNM</b> Soft <a href="http://www.tnmsoft.com">www.tnmsoft.com</a>	 <b>TransCAT</b> TransCat <a href="http://www.transcat.de">www.transcat.de</a>	 <b>25:hours</b> communications 25:hours communications GmbH <a href="http://www.25h-communications.com">www.25h-communications.com</a>
 <b>VOLCANA</b> business communication architects VOLCANA GmbH <a href="http://www.volcana.de">www.volcana.de</a>	 <b>X-AITMENT</b> X-aitment <a href="http://www.xaitment.net">www.xaitment.net</a>	 <b>XtraMind</b> a living-e company XtraMind <a href="http://www.xtramind.com">www.xtramind.com</a>	 <b>YOCOY</b> YOCOY TECHNOLOGIES GMBH yocoy <a href="http://www.yocoy.com">www.yocoy.com</a>				



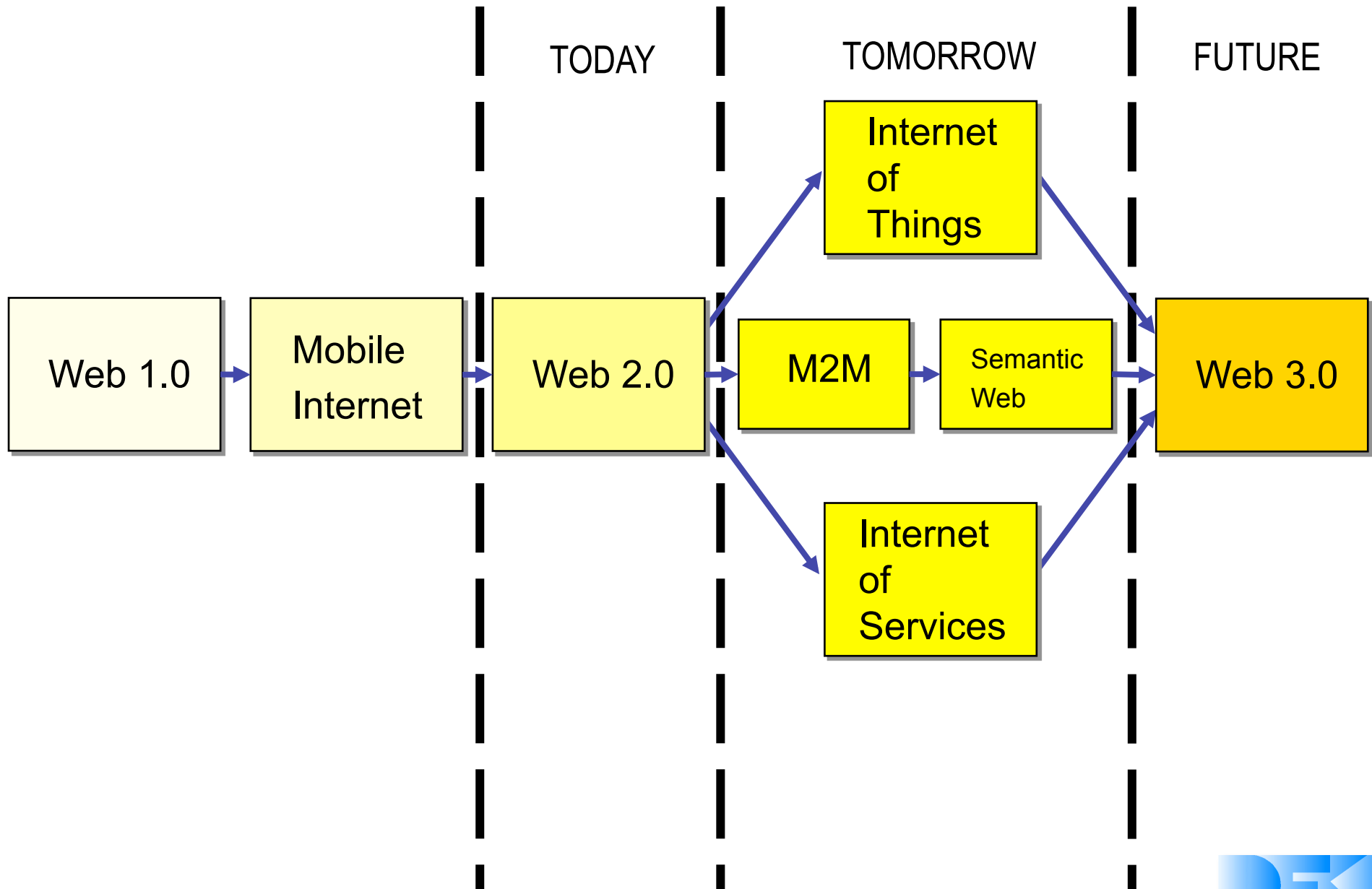
# 6 Phases of Internet Services



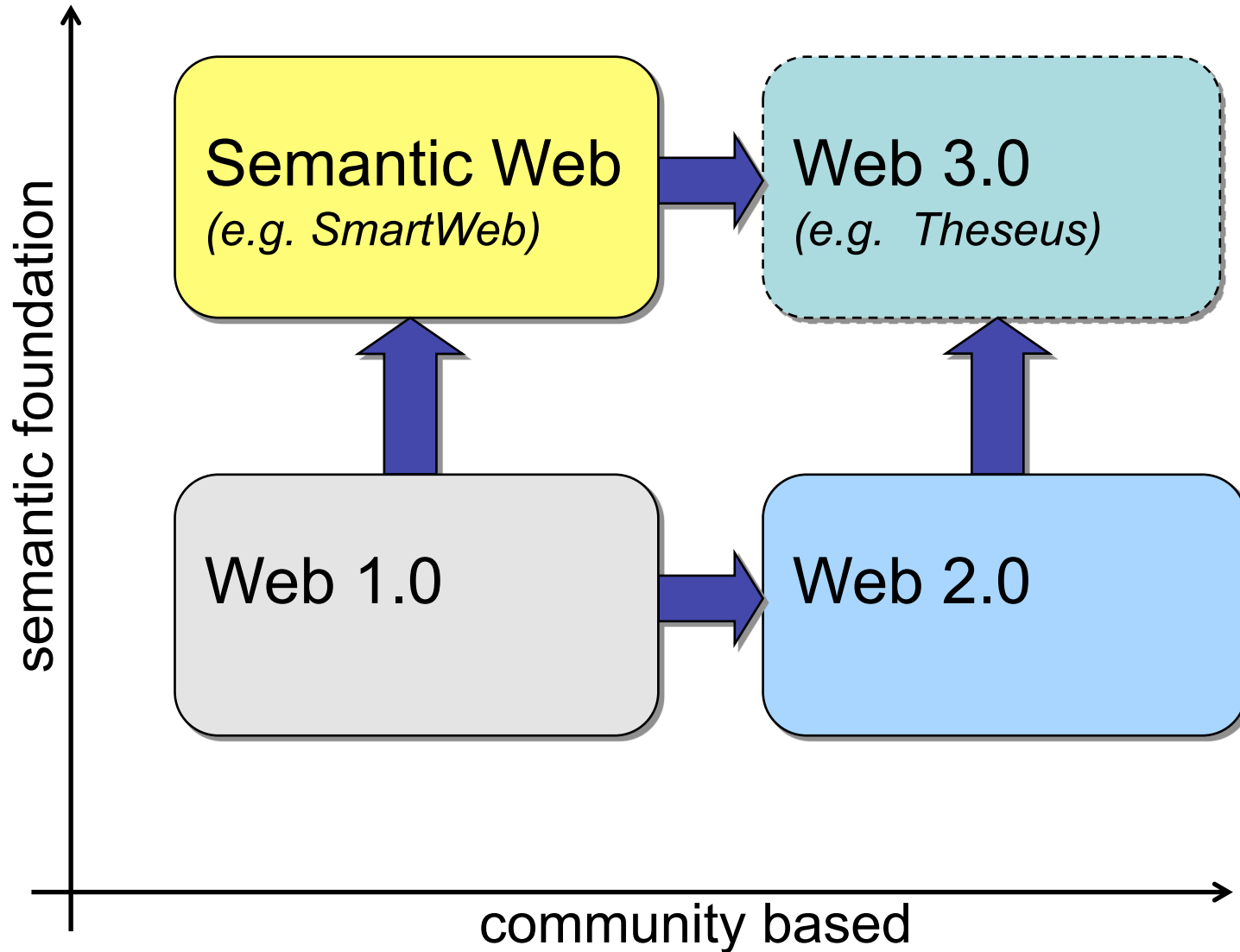
# Towards the Internet of Things: The Post-PC Era



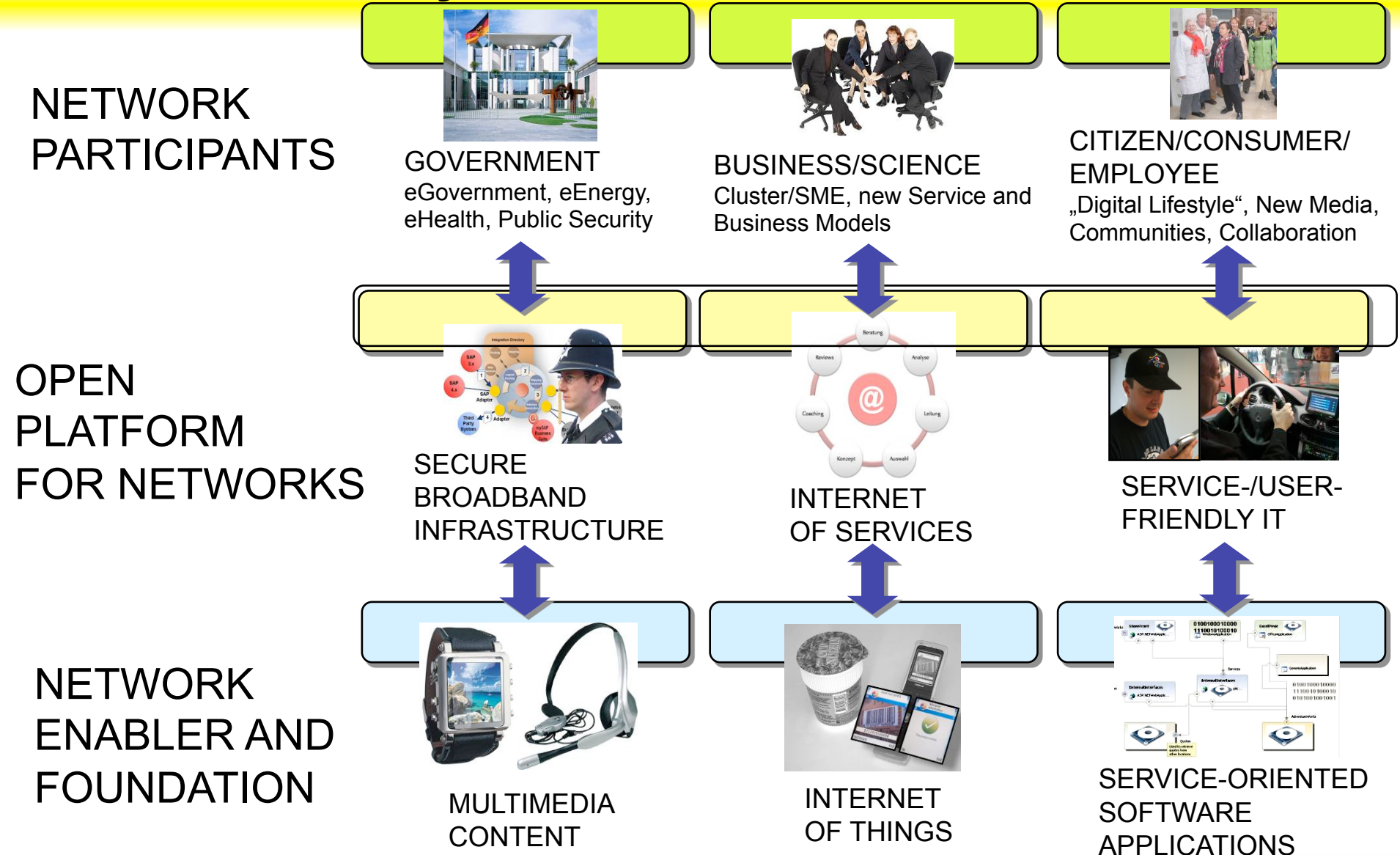
# The Internet of the Future



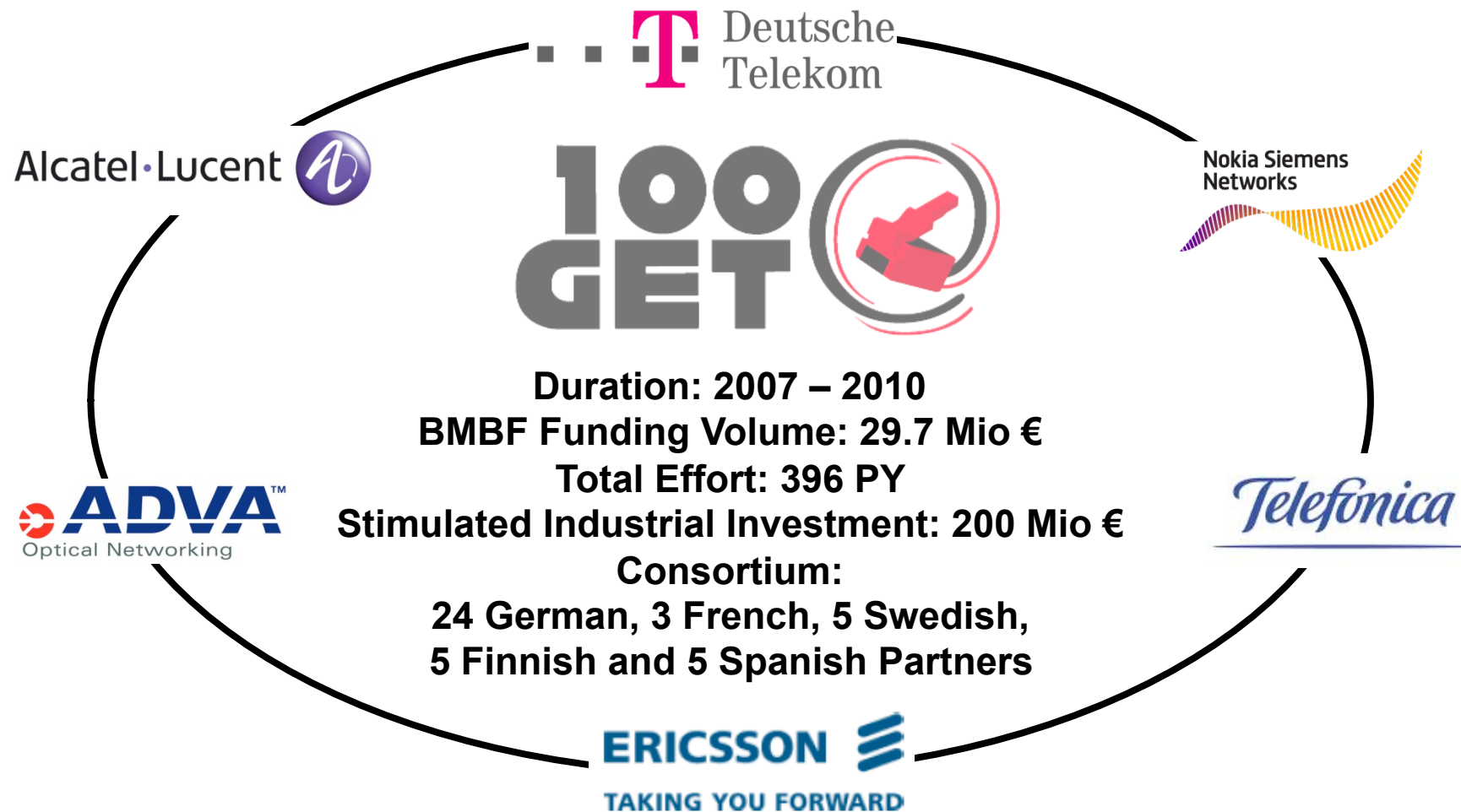
# Web 3.0 = Semantic Web + Web 2.0



# The Big Picture: Vision of a Web-based Service Economy

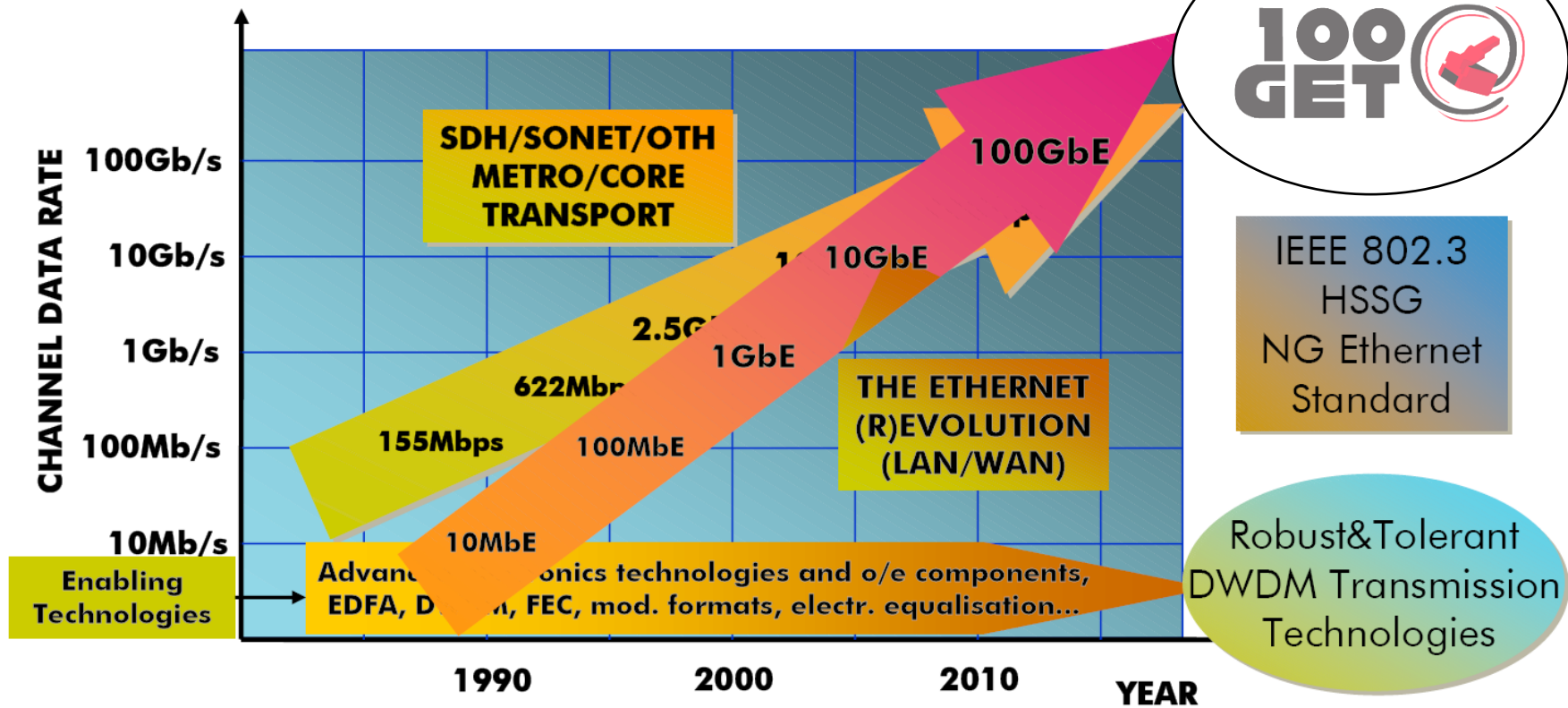


# The Internet of the Future 100Gbit/s Carrier-Grade Ethernet Technologies

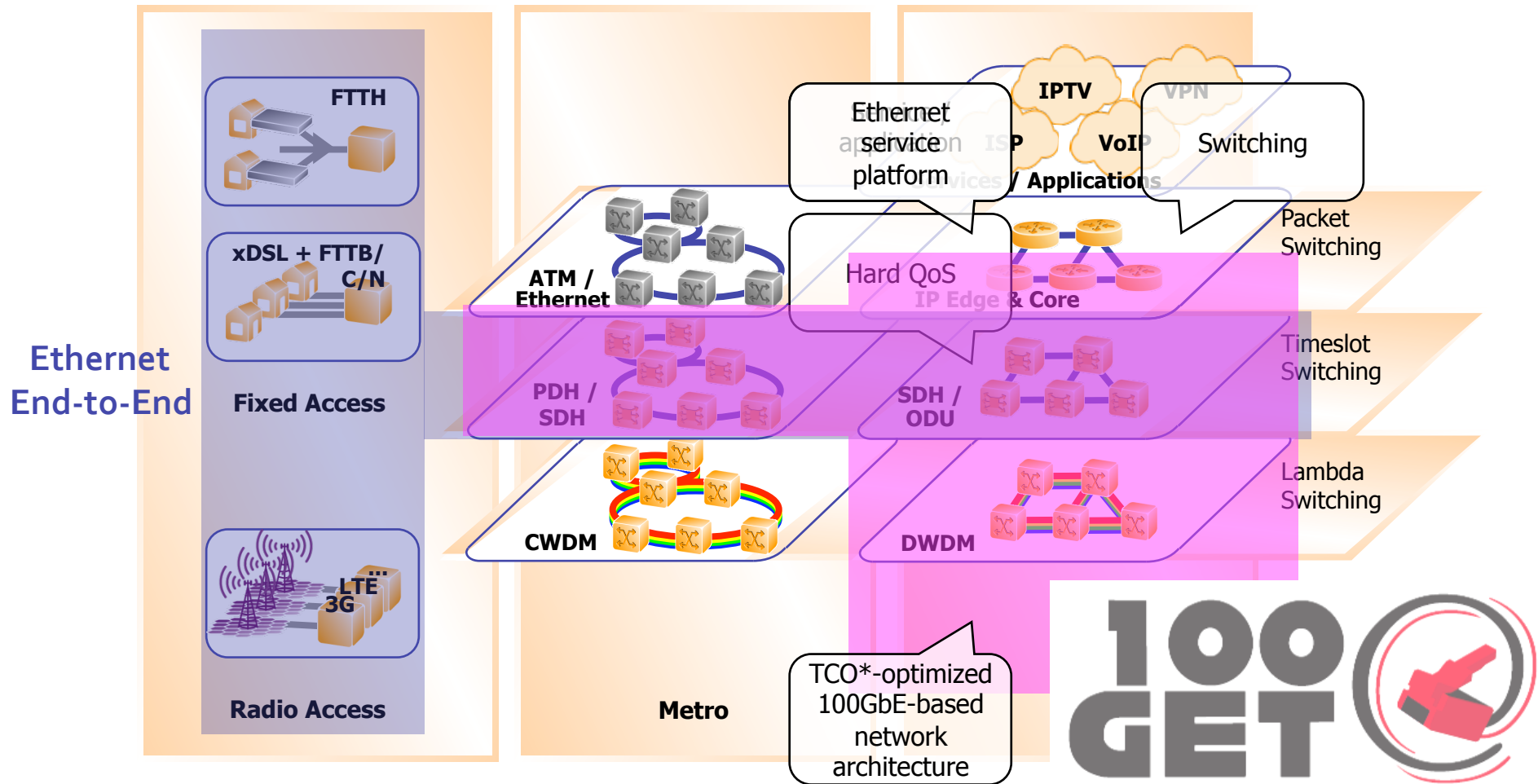


# Roadmap of Optical Transport Technologies

Classical transport technologies vs Ethernet



# Ethernet Evolution into the Core



Minimizing the total costs of ownership



# Future Cars as Mobile Computers, Mobile Sensors and Mobile Internet Nodes

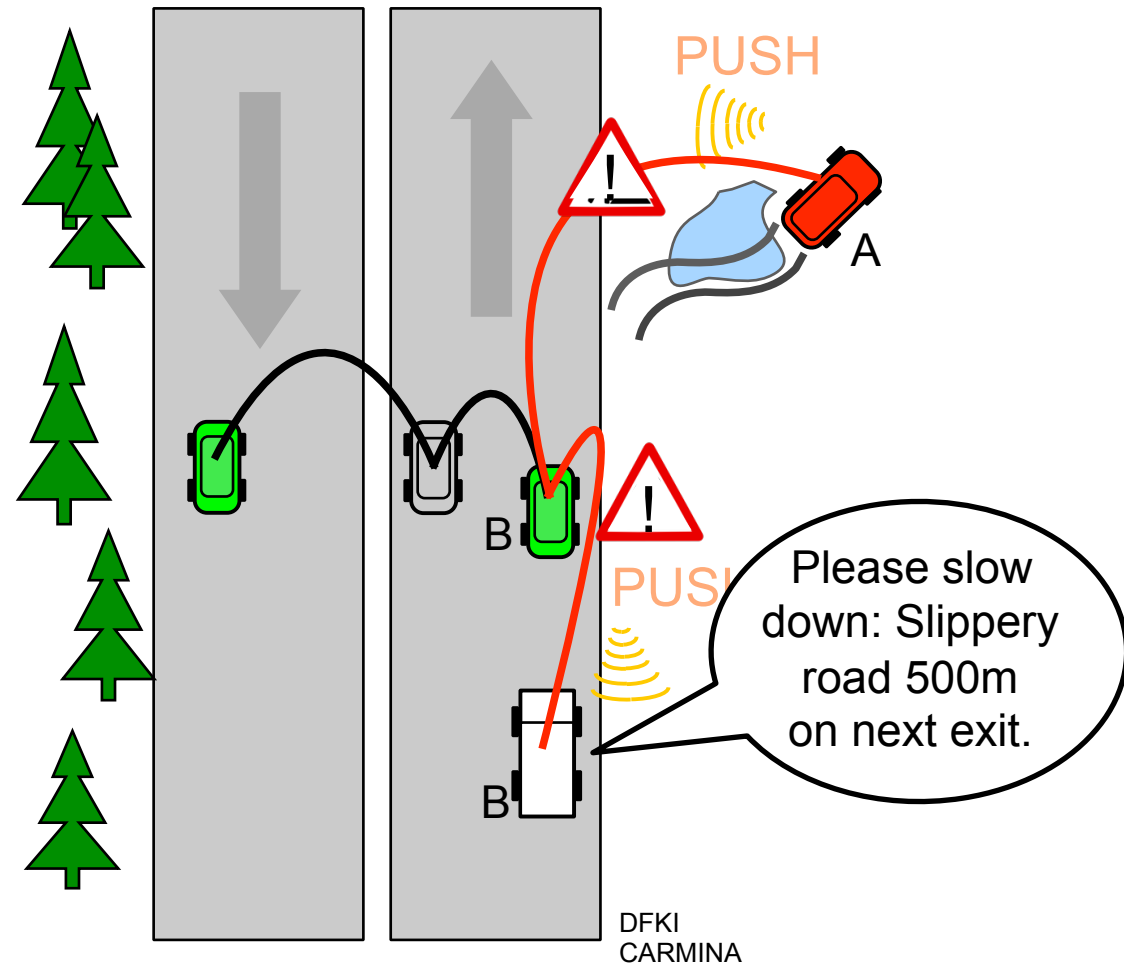


1. More Safety
2. Less Pollution
3. More Efficiency
4. Better Connectivity
5. More Fun

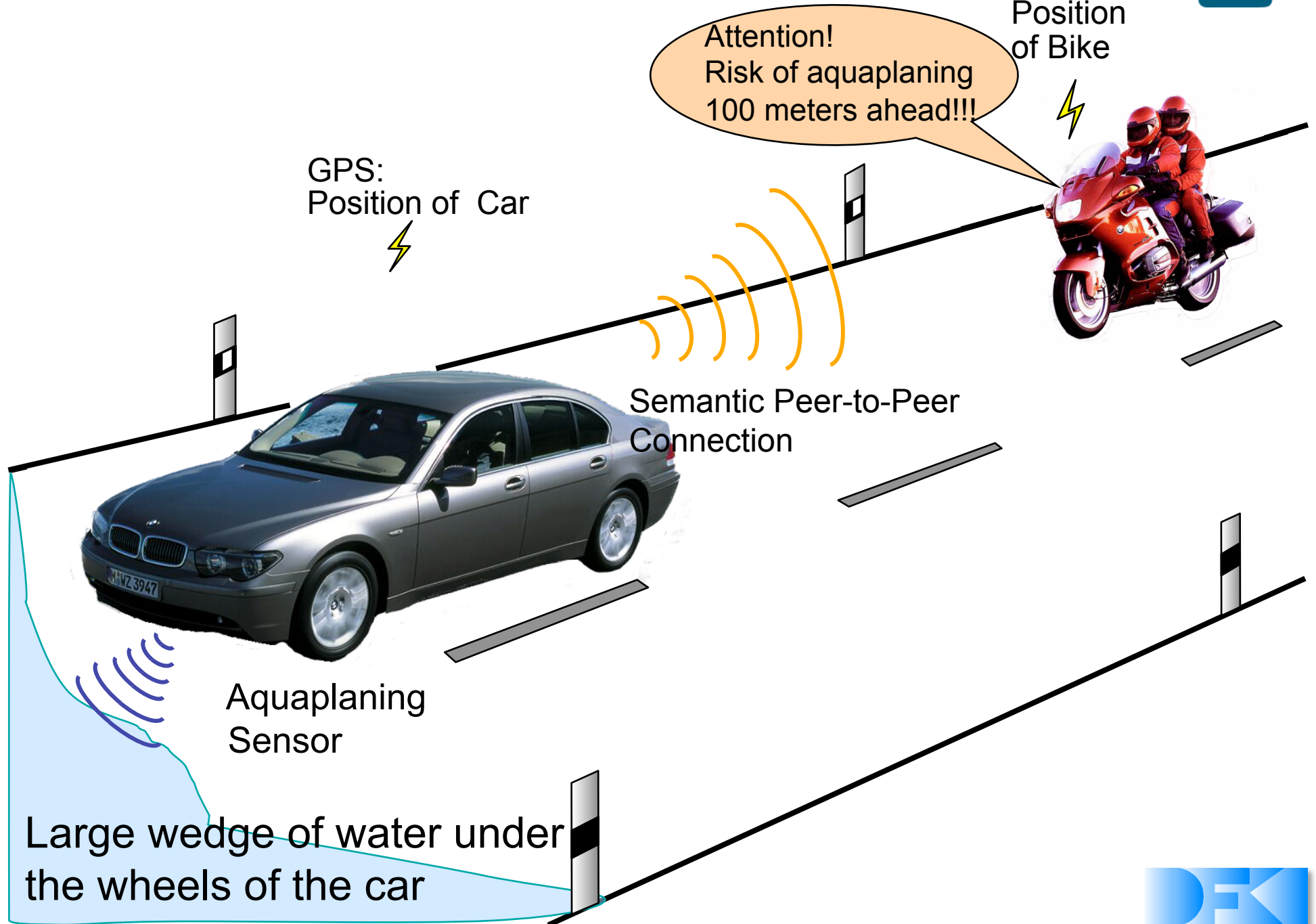
# Current Car2X „PUSH“ Paradigm for Local Danger Warning

Today's, Car2X communication follows a "push" paradigm (e.g. SIM-TD testfield around Frankfurt Airport).

The information is transmitted (pushed) from observer A to receiver B.



# Semantic Peer-to-Peer Communication



# Mobile and Multimodal Internet Access on a BMW K 1200 Motor Bike



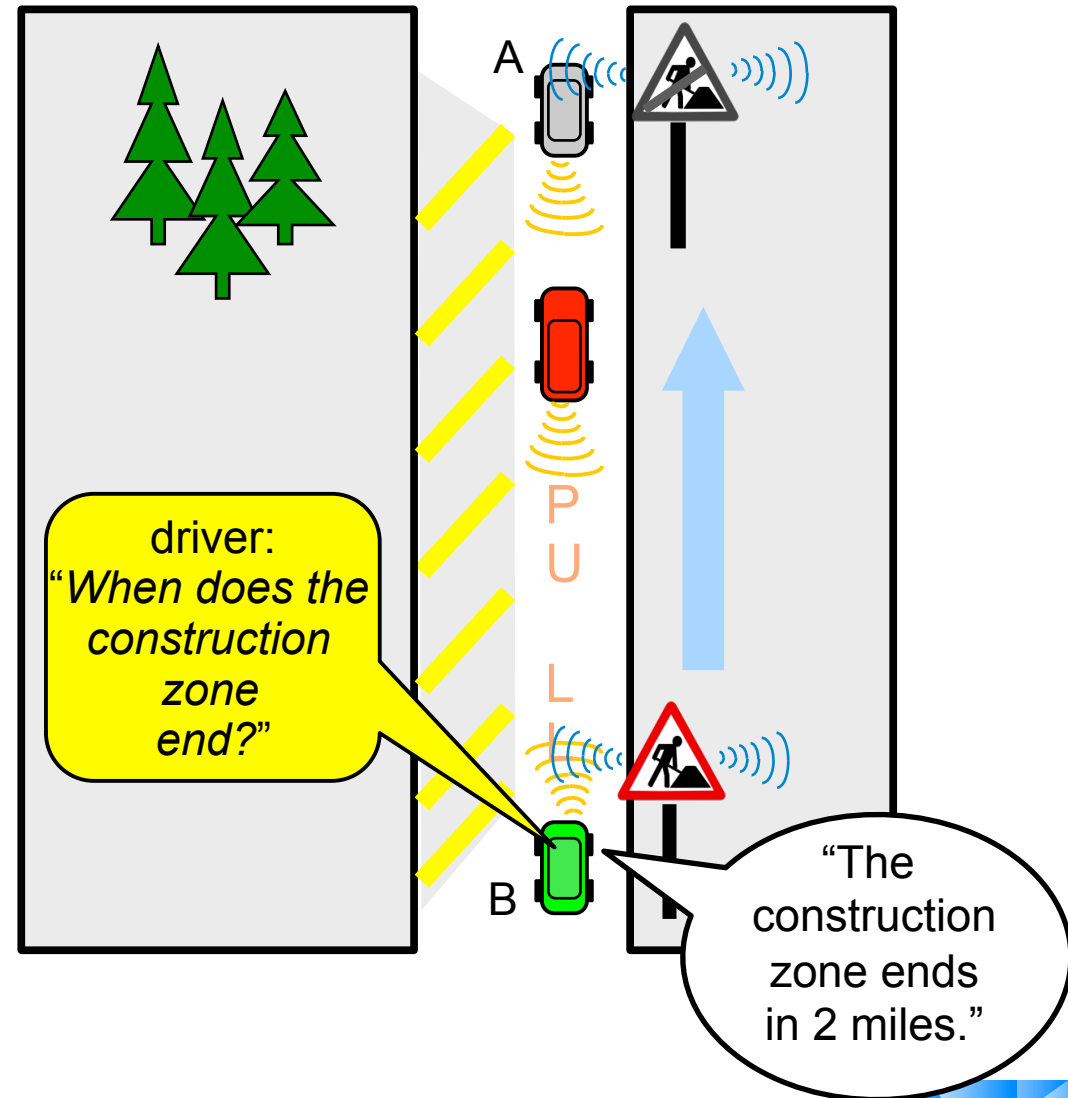
Spoken Question of a motor biker driving  
to Heidelberg  
How's the weather today?

# New Paradigm: Information-Seeking Dialogs using „PULL“ Mechanism

Here, the driver of vehicle B explicitly requests the information.

The system searches a suitable observer over the ad-hoc sensor network.

The answer to the question is generated on the basis of A's position.



# CANSpeech: DFKI's new Speech Interface for the CAN Bus



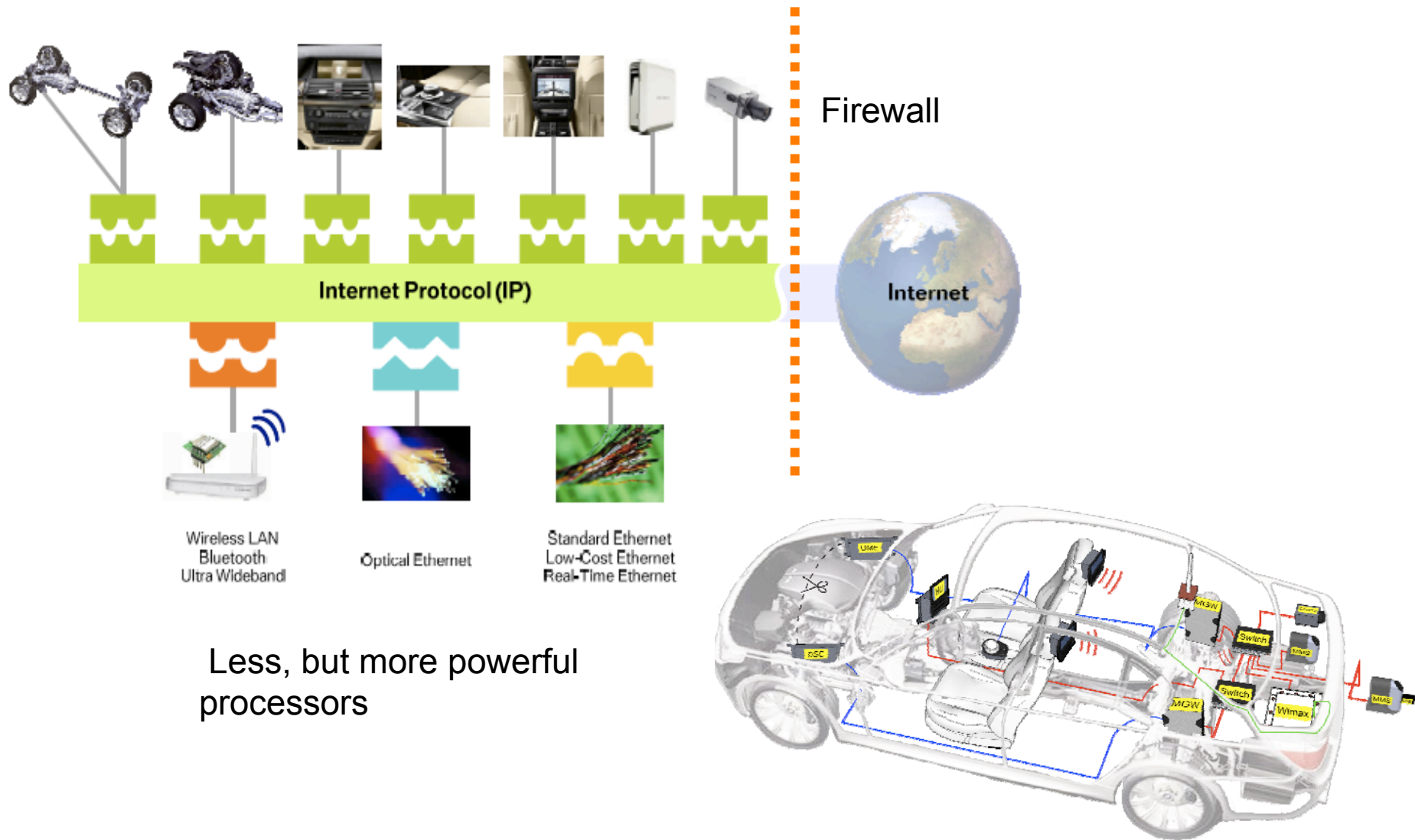
CAN = Controller Area Network, bus for real-time car apps

# Combining Tangible Interfaces and Spoken Interaction



Interpretation and disambiguation of multimodal utterances on the basis of the in-car context:  
selecting a **wiper speed** setting vs changing the speed of **cruise control**

# The All-IP Car: Only one bus system



Less, but more powerful processors

# Semantic Product Memory



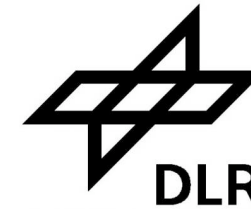
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Federal Ministry  
of Education  
and Research



Products keep a diary



semProM



BMW Group  
Forschung und Technik



Funded in the ICT 2020 Programme of BMBF

Funding Volume: 16,4 Mio. Euro,

100 Mio Euro Industrial Follow-Up Investments

Director: W. Wahlster (DFKI)



Duration: 2008-2011



# Beyond RFID: Smart Wireless Sensors for the Semantic Product Memory

Not machine readable

No information about individual product items

Tomorrow : RFID – No sensors and no M2M communication

**The future: The digital product memory**

In the past: Price tag

DM 99.90

Yesterday: Barcode



Today: RFID



**Tomorrow:  
Smart Sensor Tags**

# From Supplier Benefits to Customer Benefits

Today



- advanced logistics
- supply chain event management,
- digital product memory
- innovative payment systems
- smart customer tracking

**Less Privacy**

Tomorrow



- mixed reality shopping
- automatic comparison shopping,
- cross- and up-selling
- talking products
- proactive product information
- in-shop navigation

**Personalized Service**



# The Semantic Product Memory Serving the Consumer

## Access to the product memory via NFC-enabled Smartphone:

- User Manual
- Warranty Data
- Date of Purchase
- Operating Data
- Maintenance Data



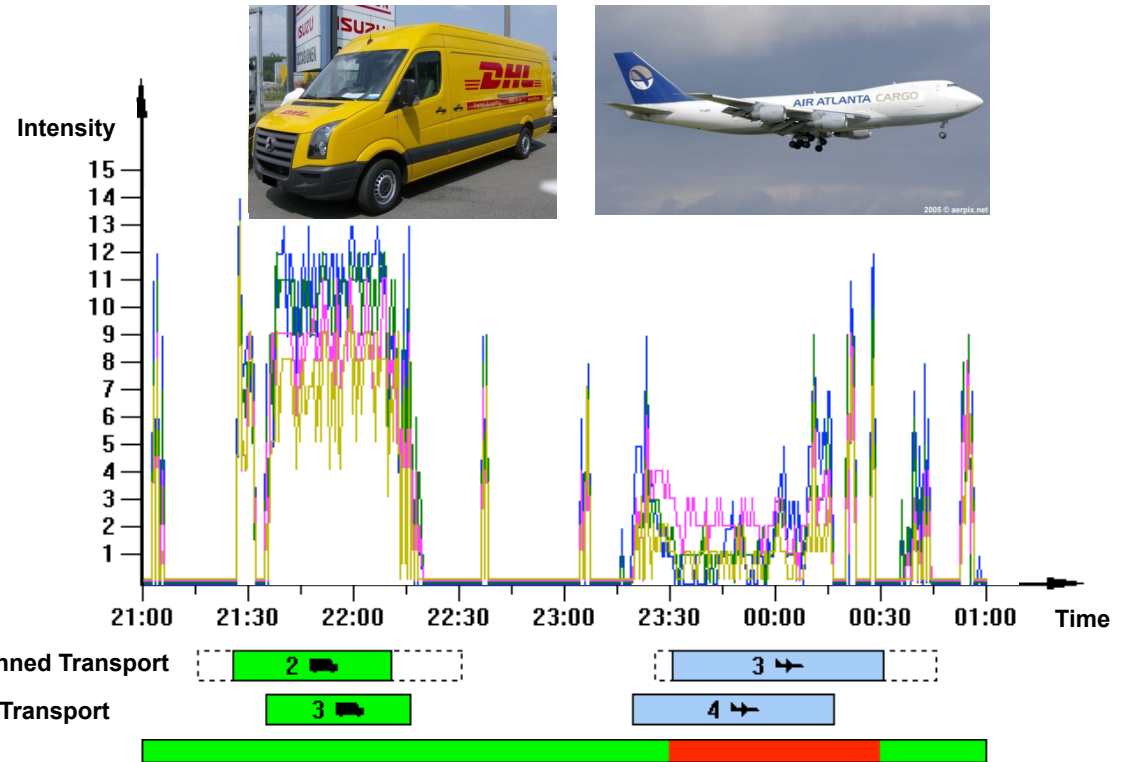
# SemProM: Ontology-based Interpretation of a Black Box Log for Cars



Using semantic technologies to ensure interoperability and end user access to the product memory.



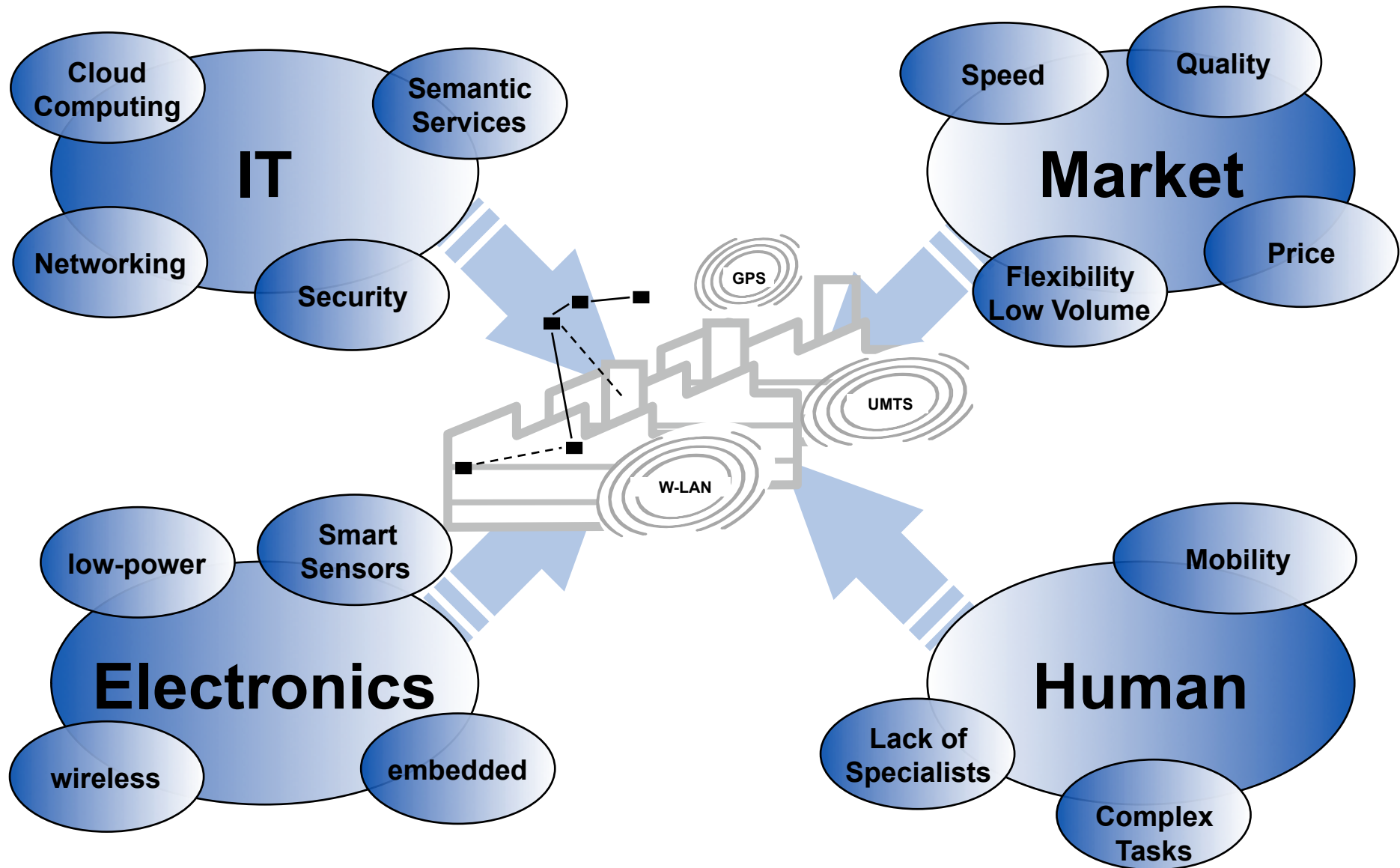
# A Letter, that Keeps a Diary



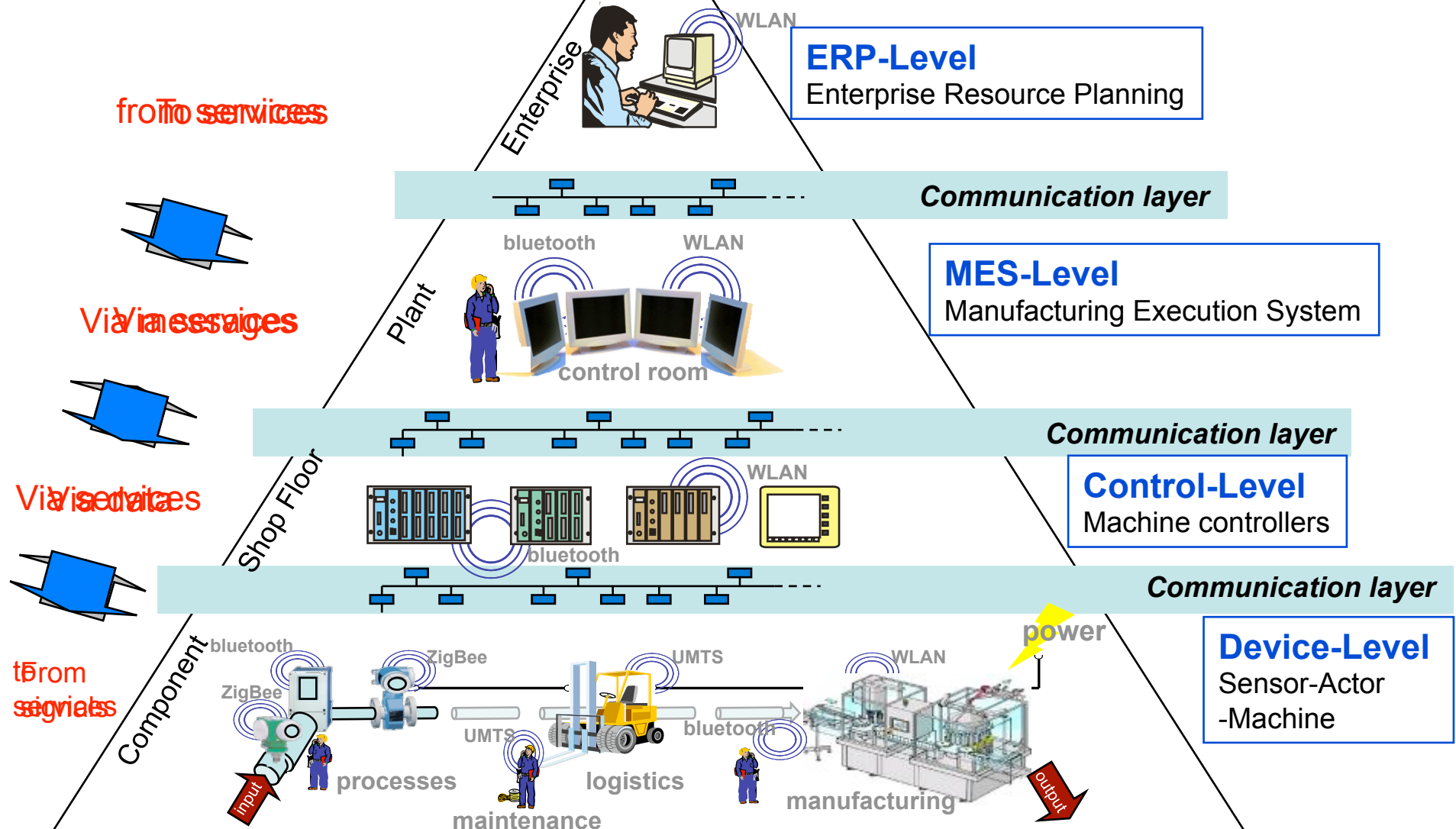
Instrumented letter with highly sensitive GPS chips

# Ambient Shopping Assistance: Navigation and Tangible User Interfaces



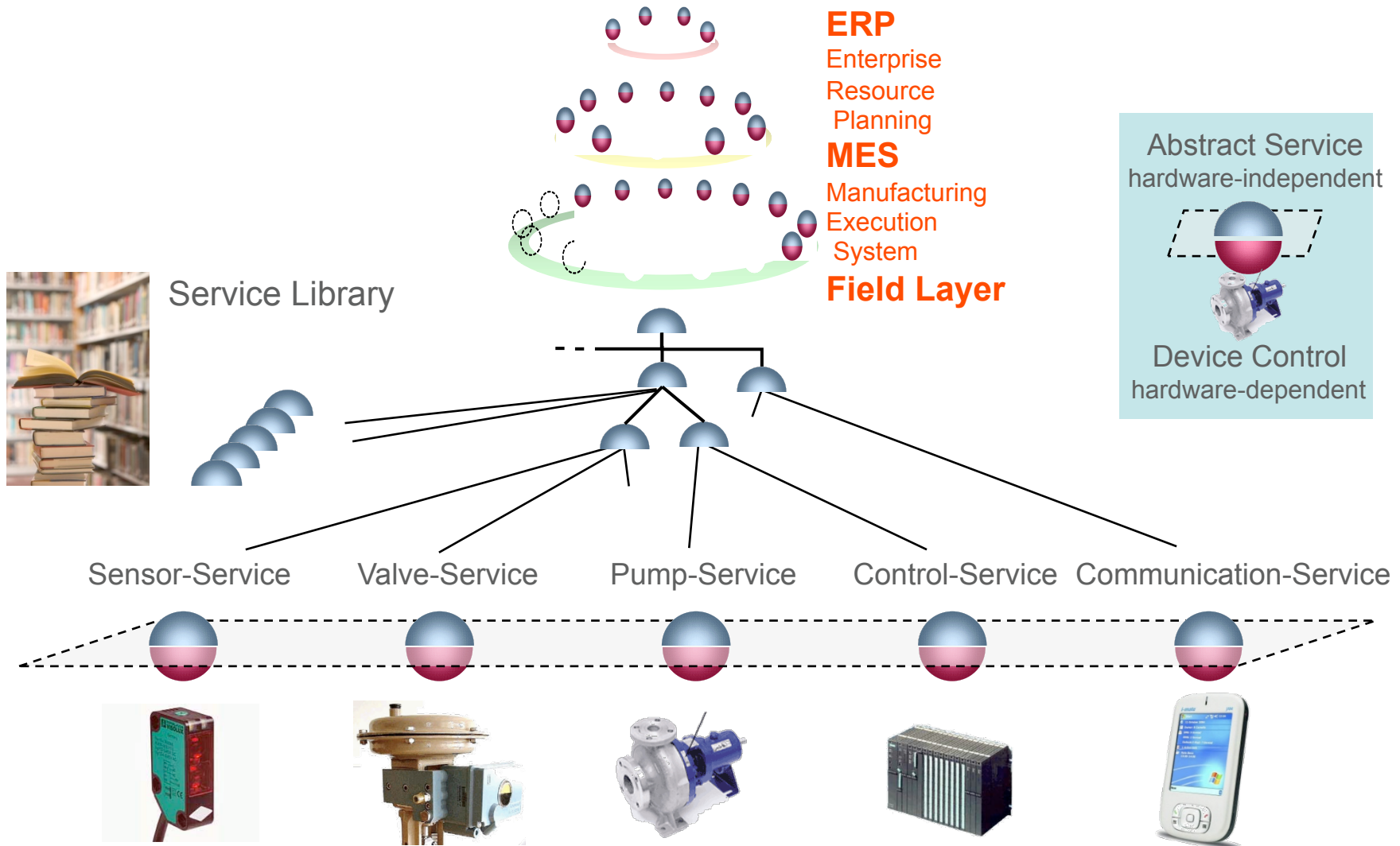


# The Pyramid of Factory Automation



# Service-oriented planning of plant systems

Hardware-independent planning of plant systems



# From Bits and Bytes to Semantics

driven by  
**Electrical Engineering**

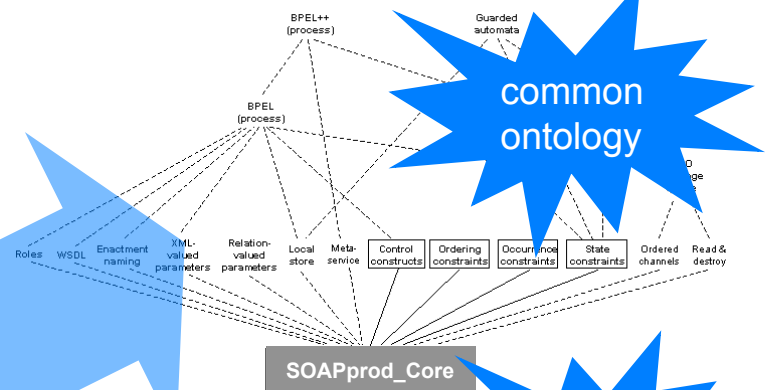
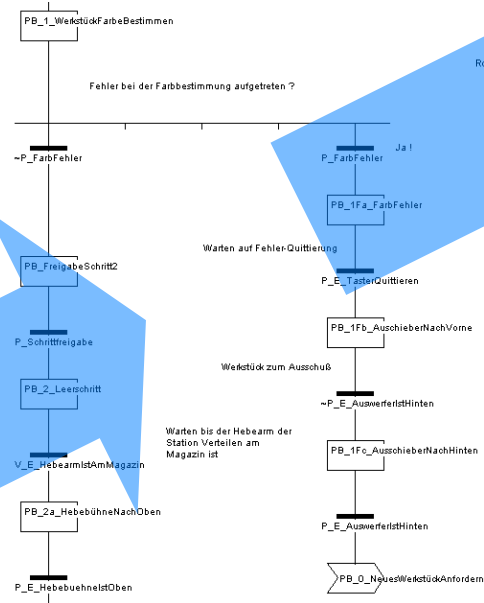
driven by  
**Software Engineering**

To semantic services

From bits and bytes

Antrieb einschalten		
U	E_FERN	;Antrieb auf Fern
UN	E_STOER	;keine Störung
UN	E_NOTAUS	;Not-Aus nicht bet.
U		
UN	HAND	;nicht Hand-PLS
U	AUTO_EIN	;Auto-EIN-Befehl
0		
U	HAND	;Hand-PLS
U		
0	HAND_EIN	;Hand-EIN-Befehl PLS
0	A_EIN	;Selbsthaltung
]		
]		
=	A_EIN	;Antrieb EIN
BE		

Via functions



**Semantic Technologies**  
driven by



# The SmartFactory Shop Floor: Wireless, RFID-, Sensor- and Service-based Architecture

**continuous flow process**  
*colored soap production*



**discrete handling process**  
*bottling, handling, labeling, QC, packaging...*



**Live Webcam: <http://www.smartfactory.de/webcam.de.html>**

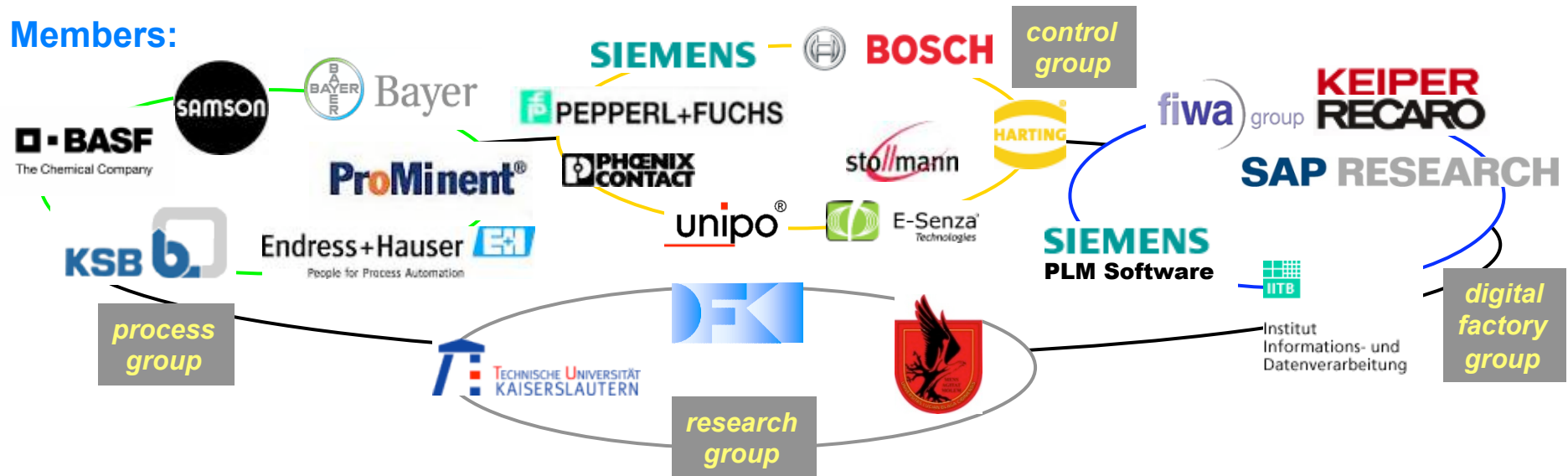


# SmartFactory<sup>KL</sup> : A Living Lab of DFKI



First multi-vendor research, development and demonstration center for the factory of the future: Wireless, RFID-based, Sensor-based, SOA-based: Interoperability Testing of Components from Partners

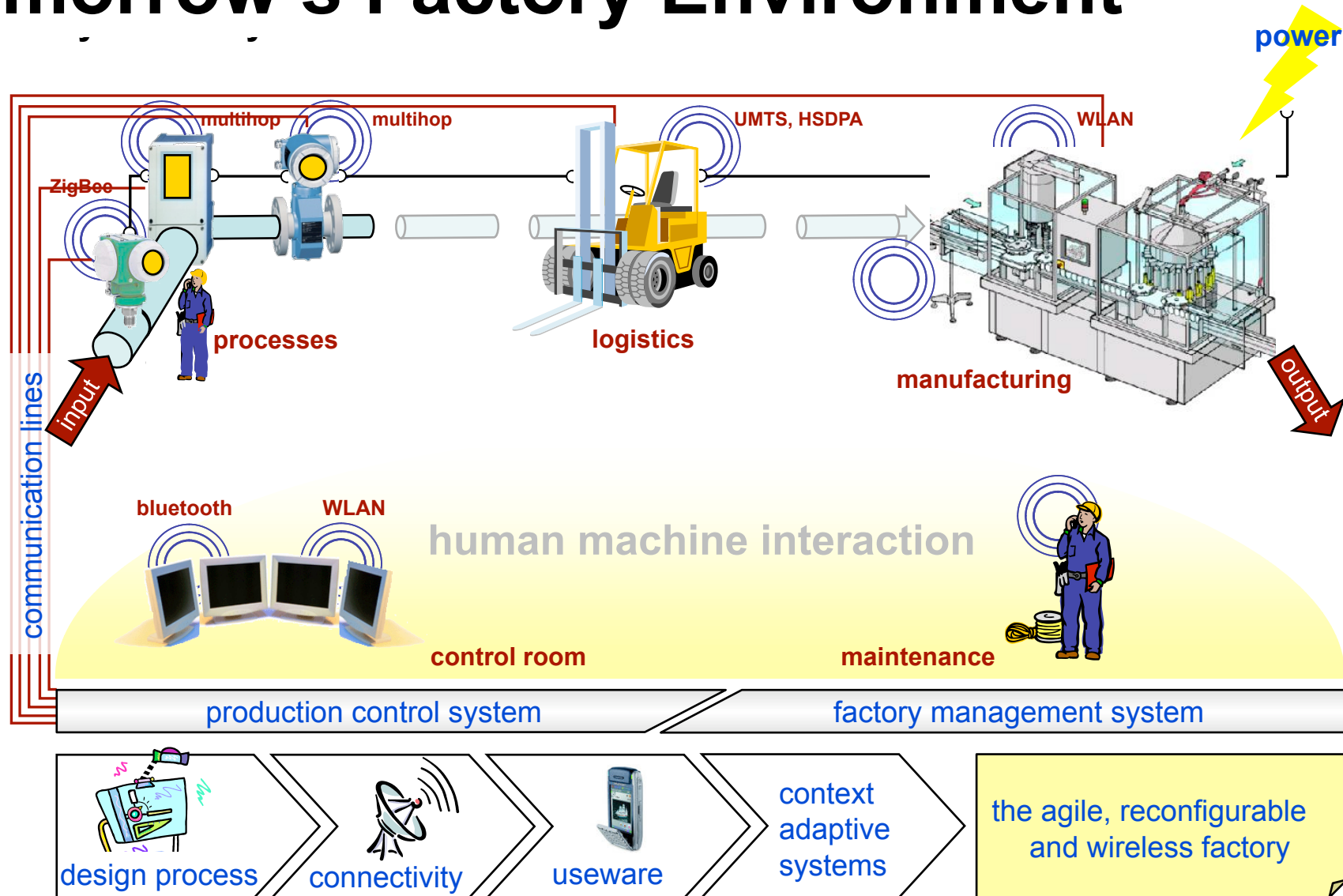
## Members:



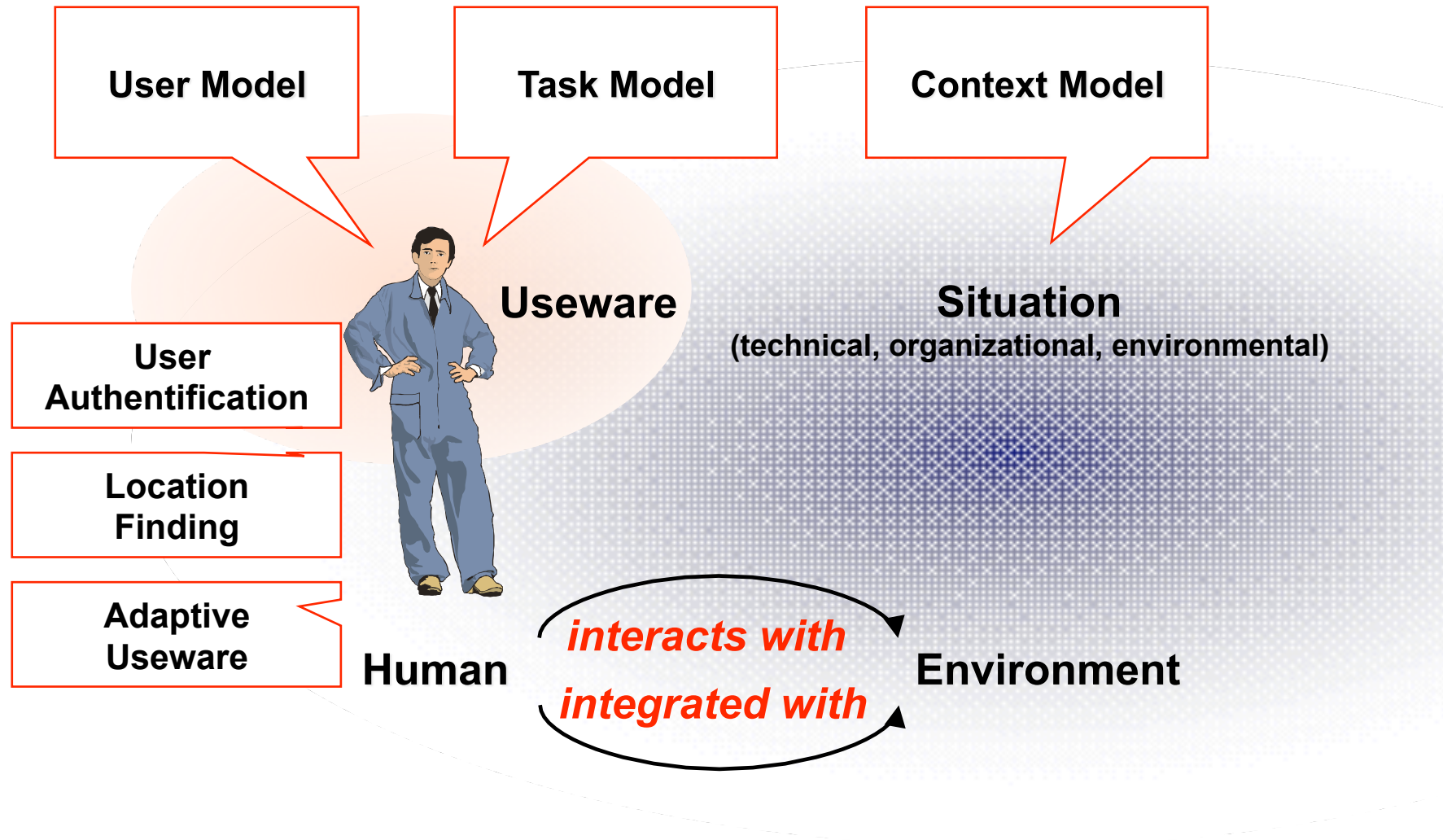
## Sponsors:



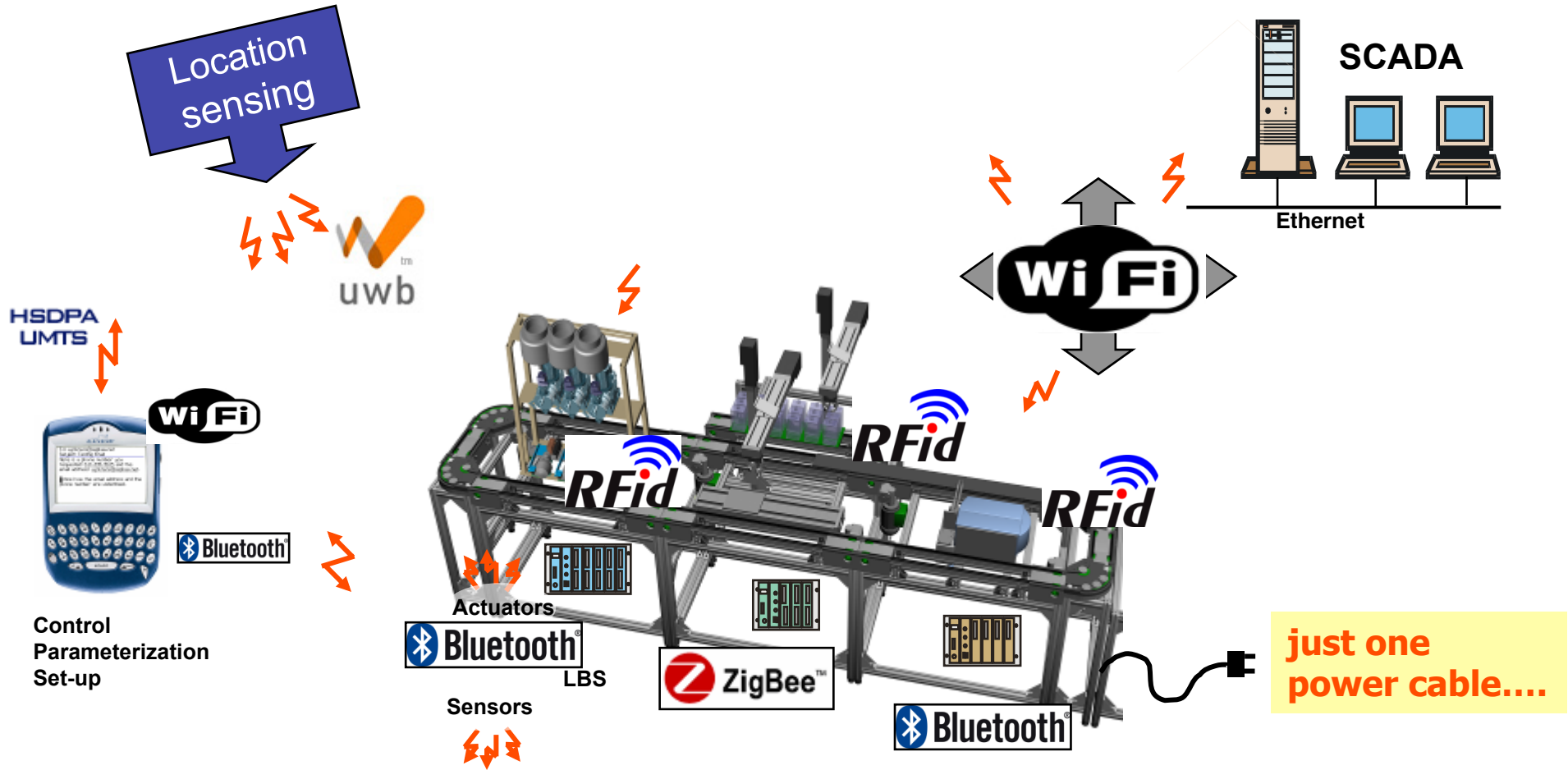
# Tomorrow's Factory Environment



# Model-Based Design for Ambient Intelligence for Factory Workers



# The SmartFactory as a Wireless Factory



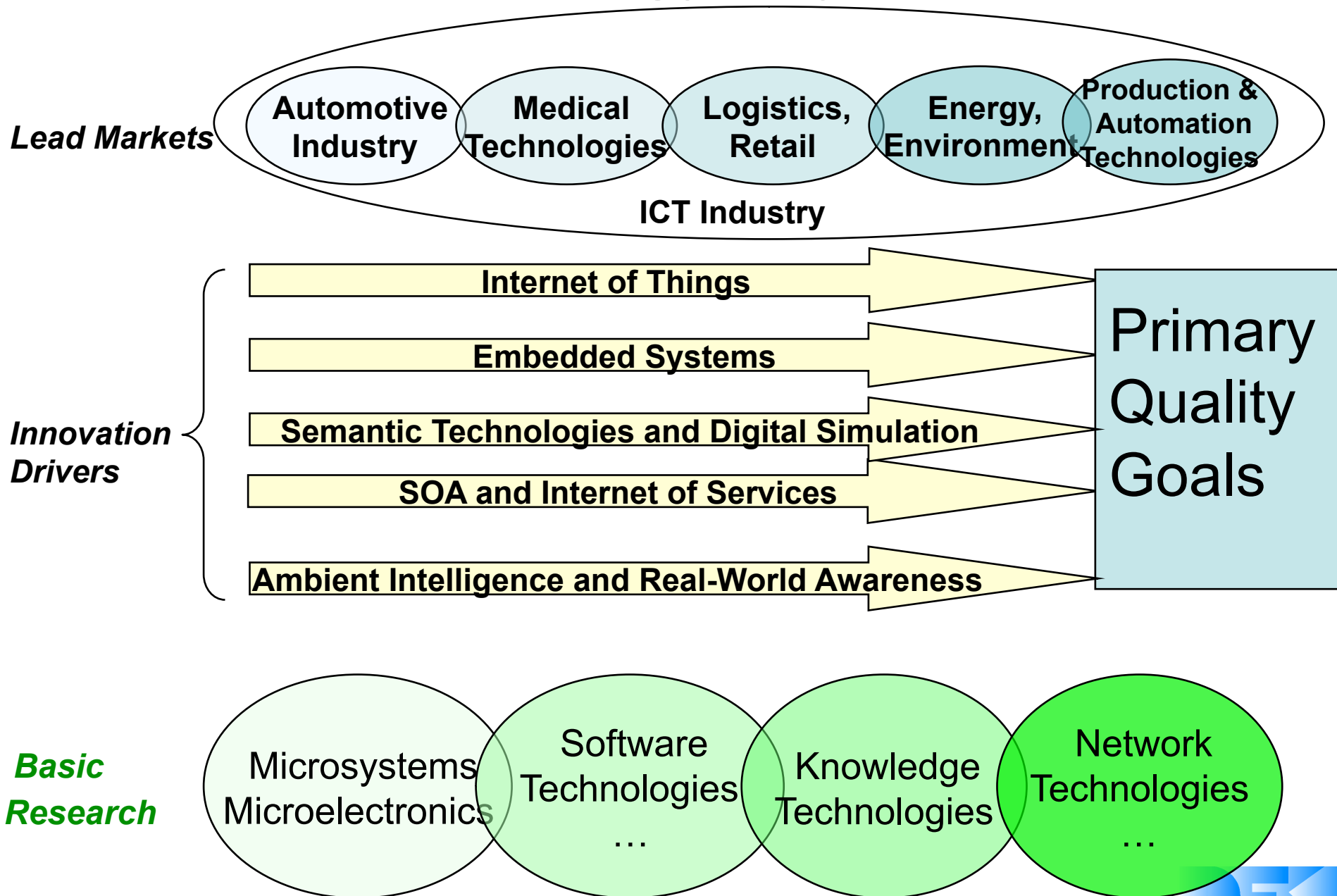
# Second German IT Summit of Chancellor Dr. Merkel, 2008 (Third Summit, Nov. 2008)



Hanover Manifesto, Page 3:  
 „For the European Institute of Innovation and  
 Technology (EIT), the German Government  
 will make an effort to establish a „Knowledge  
 and Innovation Cluster“ (KIC) in Germany  
 with a focus on ICT.“ (Industry: Deutsche  
 Telekom, SAP, Siemens)



# The ICT 2020 Strategy Layers



Thank you very much  
for your attention.

