

Network Technology R&D Program - Overview 2012.



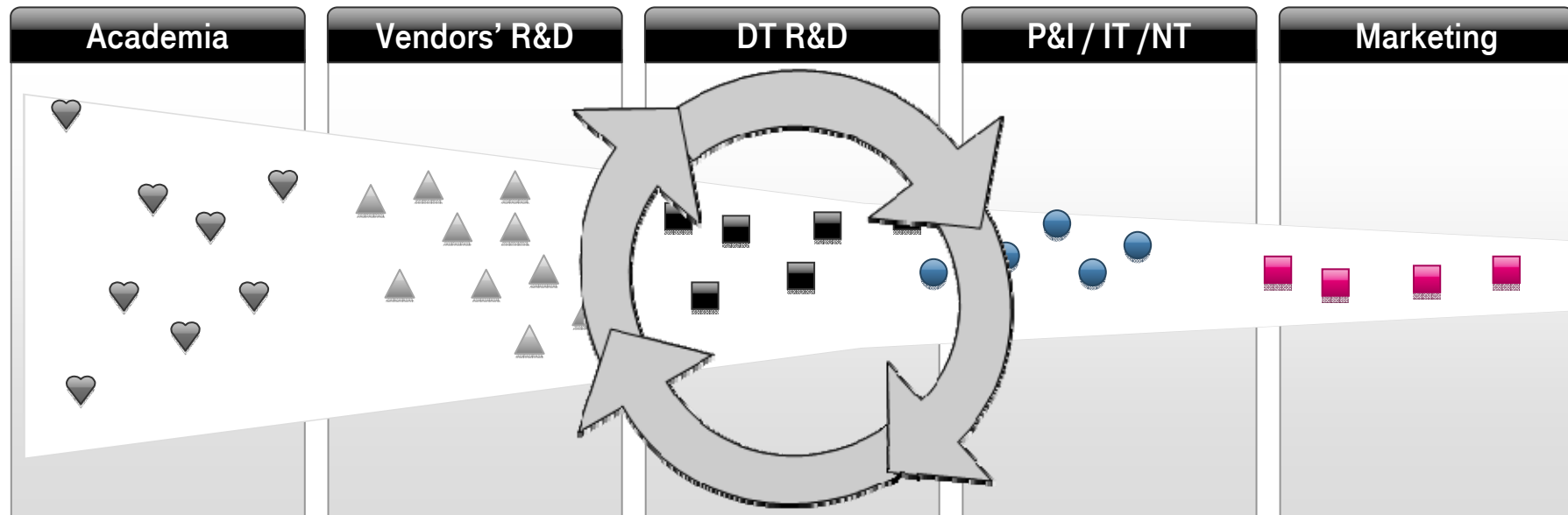
Life is for sharing.

Motivation for Network Technology R&D



DT Network Technology R&D in Innovation Environment.

R&D extends DT's view on innovation by scouting and assessment of technology options.



Deutsche Telekom R&D

Managing increasing degree of

- technology options under consideration
- anticipated period

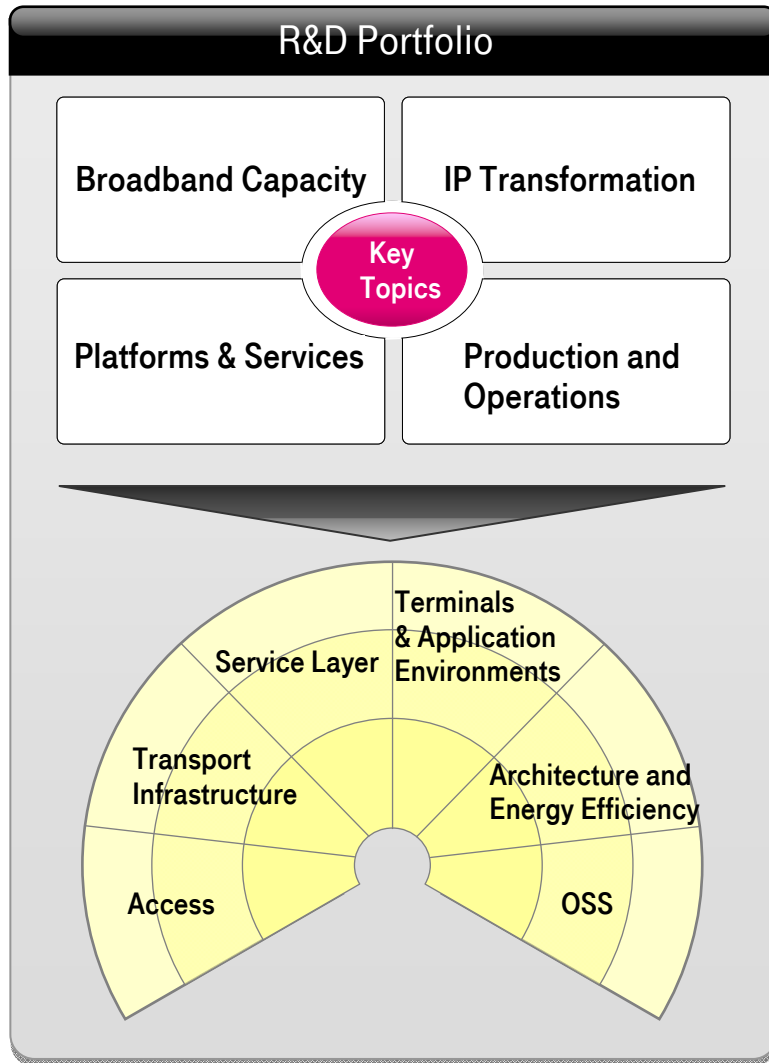
.....by making use of

- external (vendors and internat. R&D projects) and
- internal know how.



Objectives of Network Technology R&D.

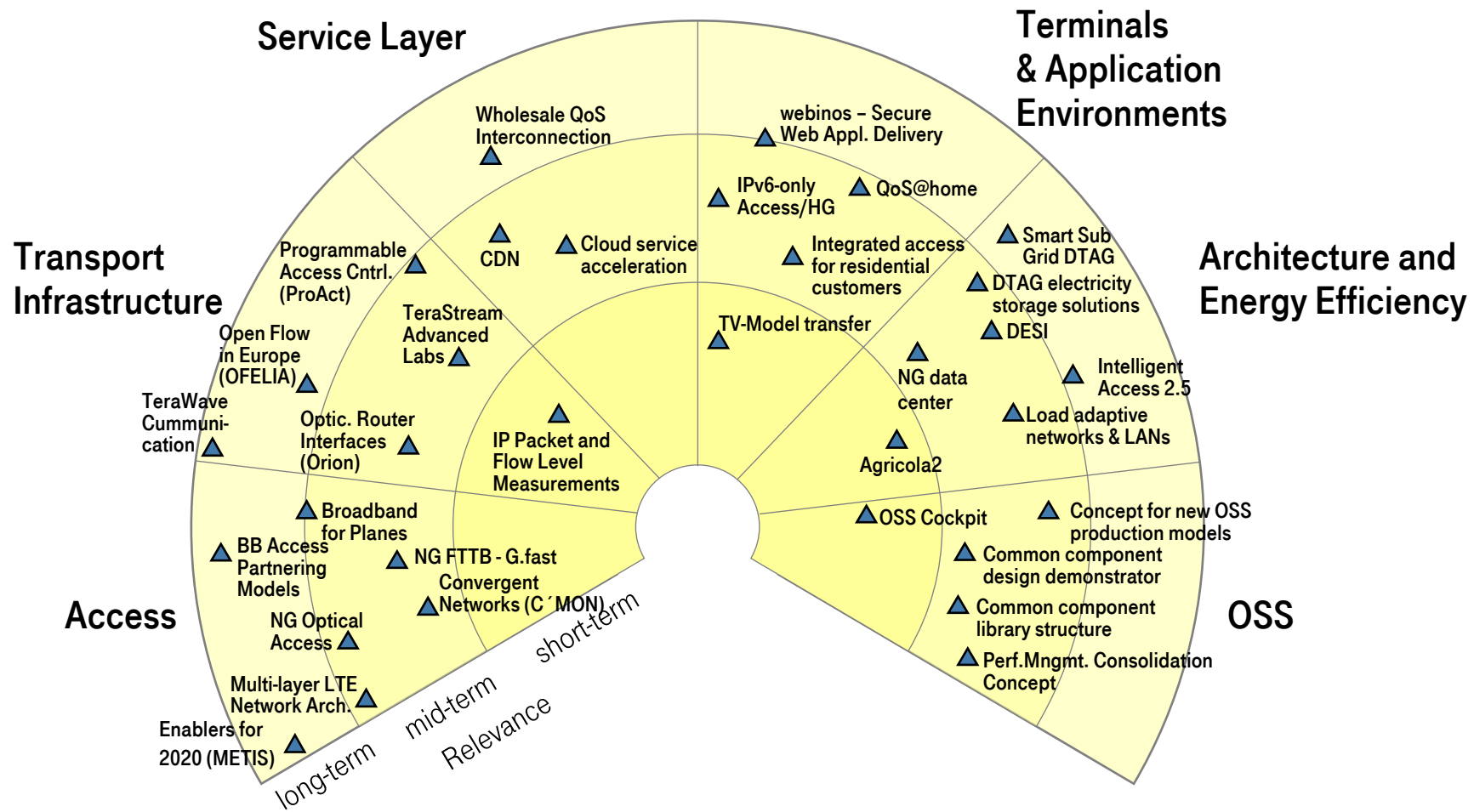
R&D portfolio and project contributions to be relevant.



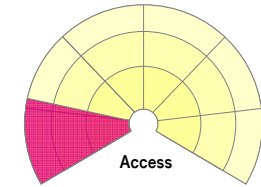
- ### Contributions of R&D
- R&D project portfolio addresses technology innovations of various maturity levels, in order to identify and determine their relevance for Deutsche Telekom, by
 - scouting and initial assessment of new technology developments
 - techno-economic assessment of technology options and providing guidance on their strategic implications
 - Nurturing, developing and shaping innovations with vendors in pre-commercial phase
 - Individual R&D projects contribute to overall R&D portfolio
 - Governance process and stakeholder involvement on project level ensures relevance of
 - entire R&D portfolio
 - individual project results and transfer



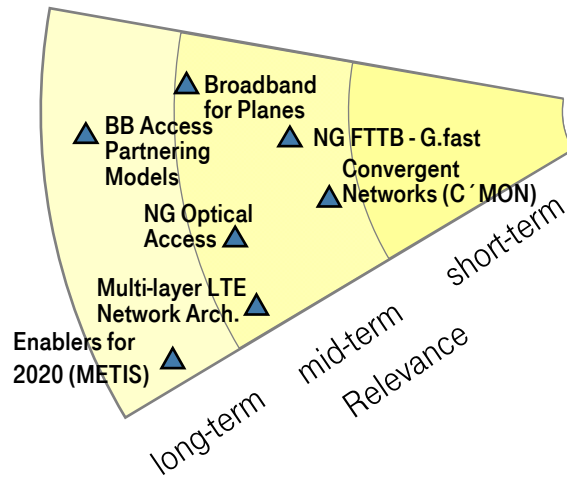
Network Technology R&D Program Overview. Projects Running in 2012.



Technology Sector “Access”.



Access



Mobile

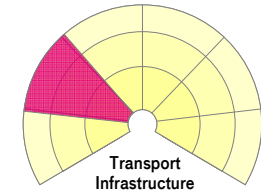
- **Multi-layer LTE Network Architecture** (06/09 – 06/12)
capacity and coverage optimization by multi-layer LTE networks and field trial Pico4Real at outdoor DSLAM locations
- **Convergent Heterogeneous Mobile Networks (C`MON)** (09/12 – 12/13)
Performance and techno-economic analysis of advanced HetNets concepts.
- **Mobile communication Enablers for 2020 (METIS)** (11/12 – 04/15)
EU-funded project exploring technology developments towards “5G” mobile networks.
- **Broadband for Planes** (03/09 – 03/12)
system concept, regulatory framework and field trial for Direct Air-to-Ground Communication for aircraft based on LTE (with Airbus, ALU)

Fixed

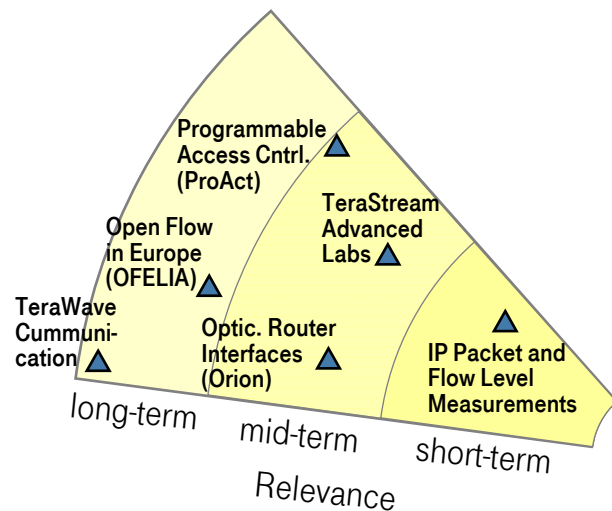
- **Next Generation Optical Access** (05/2009 – 12/2013)
beyond GPON: technology analysis, techno-economic impact and vendor HW tests
- **Next Generation Fiber-to-the-Building (G.fast)** (01/2012 – 12/2013)
close the gap between the fiber access technology and the copper in-house network
- **Broadband Access Partnering Models** (05/2011 – 04/2013)
tools and methods to evaluate cooperation and competition models for FTTH and DSL rollout



Technology Sector “Transport Infrastructure”.



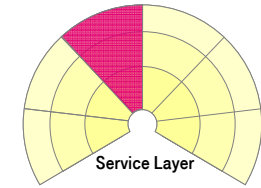
Transport Infrastructure



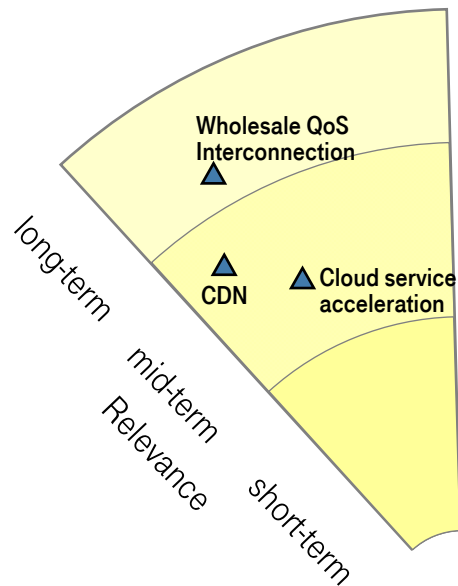
- **Open Flow in Europe** (01/2010 – 12/2012)
analysis of Open Flow and split architecture with regard to carrier class requirements and validation in experimental facility
- **Programmable Access Control (ProAct)** (01/2012 – 12/2013)
OpenFlow-based soft-BNG network element based on ATCA-hardware
- **Optical Packet Integration (ORION)** (01/2012-12/2013)
integration of optical functions into router interfaces (incl. linecards and buffer optimization)
- **TeraStream Advanced Lab** (07/2012 – 06/2014)
laboratory infrastructure for implementation and tests of alternative TeraStream functions, e.g. stateless IPv6
- **IP Packet and Flow Level Measurements** (06/2011 – 05/2013)
traffic statistics of real network, in Berlin and Frankfurt
- **TeraWave Communication** (05/2011 – 04/2012)
assess applicability of 300GHz-3THz spectrum for communications



Technology Sector “Service Layer”.



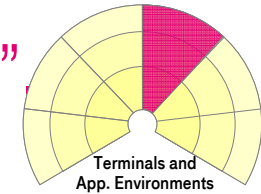
Service Layer



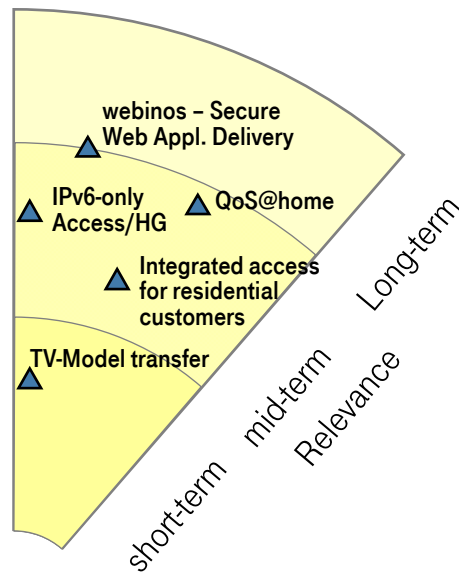
- **Wholesale QoS Interconnection** (01/2010 – 12/2013)
control for QoS-based interconnection models between operator domains and trials (recipient: Wholesale)
- **Cloud Service Acceleration** (05/2011 – 04/2012)
performance improvement tools to either SME content providers, hosting providers or end users
- **Content Delivery Network (CDN)** (11/11 – 10/12)
CDN services, architectures & implementation



Technology Sector “Terminals & Application Environments”



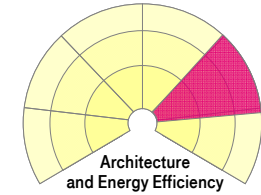
Terminals & Application Environments



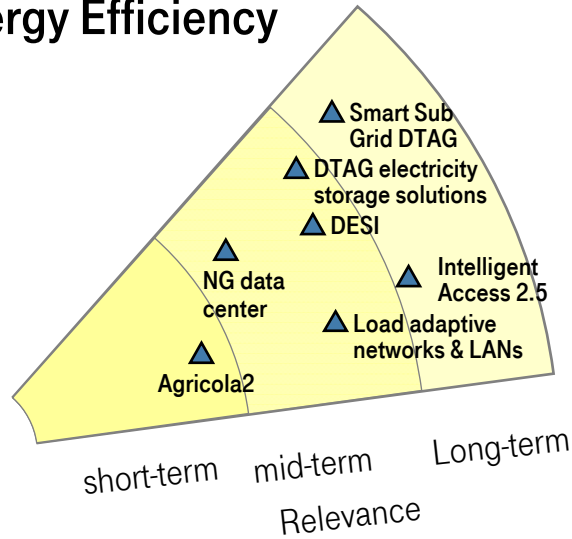
- **webinos** (07/2010– 09/2013)
enablers for future WebOS to drive portability and secure use of web applications across mobile/fix/TV/automotive terminal platforms
- **TV-Model transfer** (02/2011 – 07/2012)
Prototyping and transfer of project results to standardization bodies: methods for quality assessment of multimedia streaming
- **QoS@home** (07/2011 – 07/2012)
end-to-end Quality of Service assurance incl. different home network segments
- **Integrated Access for Residential Customers (INAR)** (06/12 – 11/13)
Customer experience will be increased by adding mobile access as “booster” for DSL
- **IPv6-only Access/HG** (12/2011 – 09/2012)
IPv6 home gateway complying to TeraStream architecture



Technology Sector “Architecture & Energy Efficiency”.



Architecture and Energy Efficiency



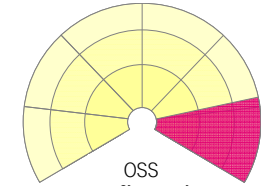
Energy Efficiency

Architecture Efficiency

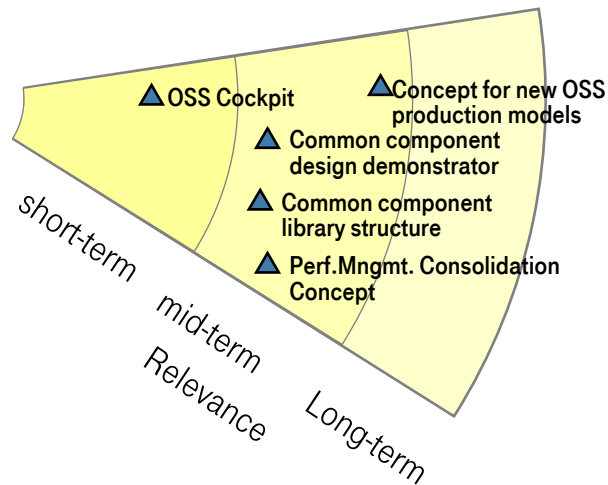
- **Load Adaptive Networks and LANs** (10/2010 – 10/2012) concepts for operation of load-adaptive carrier and enterprise networks to limit energy consumption and costs
- **E2E Load adaptive ICT network (DESI)** (06/2011 – 05/2014) DT UPS-plants’ contribution to load adaptive operation of carrier network by electrical power storage/buffering
- **Smart Sub-Grid DTAG** (03/2010 –05/2012) proof of economic viability of management of DTAG battery parks
- **Intelligent Access 2.5** (01/2010 – 02/2013) energy efficiency in RAN by aware management of access.
- **Distributed Storage Optimization** (09/2010 – 09/2012) planning and designing efficient storage distribution for P&I services
- **NG Data center (Odyssey)** (10/2011 – 03/2013) simplify datacenter networks using software-defined networking and allow improved mgmt and provisioning functions
- **Aggregation and Resilience cost optimization (Agricola2)** Optimization of the number sites according to the current fiber rollout-strategy



Technology Sector “OSS”.



OSS



- **Concept for new OSS production models (07/2012 – 11/2012)**
Recommendation of new production models per OSS cluster, taking into account OSS architectural, operational and network dependencies
- **OSS Cockpit (08/2012 – 12/2012)**
Definition of new KPI models for investments in OSS landscape
- **Extend Common Component Design Demonstrator (05/2012 – 12/2012)**
Concrete OSS implementations are investigated and modules as candidates for potential reuse are implemented according to the CCDD principles
- **NGOSS – Common Component Library Structure (09/2012-12/2012)**
Define and Develop an OSS Library Structure for Common Components in OSS
- **Performance Management Consolidation Concept (06/2012 – 12/2012)**
Definition of DT group wide standard for end-to-end resource performance management (RPM) over all NGN planes in an All IP fixed/mobile converged environment

