CLOUD-SERVICES@FRAUNHOFER

HIFIS Conference -- Hamburg, 18.10.2019

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AGENDA

- About Fraunhofer
- Corporate IT Services at Fraunhofer
- Fraunhofer Private Cloud
  - Infrastructure as a Service
  - Sync and Share
  - S3 Storage
- Public Cloud Services – the way to a hybrid cloud
- Establishing Office 365 at Fraunhofer – Software as a Service in the public cloud
- Conclusion / Lessons learned

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ABOUT FRAUNHOFER

- About Fraunhofer
- Corporate IT Services at Fraunhofer
- Fraunhofer Private Cloud
  - Infrastructure as a Service
  - Sync and Share
  - S3 Storage
- Public Cloud Services – the way to a hybrid cloud
- Establishing Office 365 at Fraunhofer – Software as a Service in the public cloud
- Conclusion / Lessons learned

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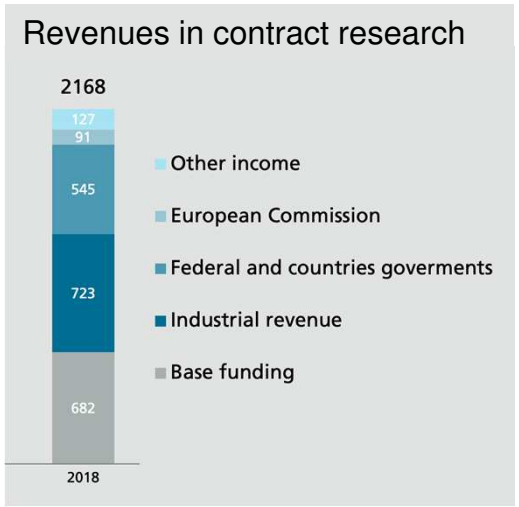
The Fraunhofer-Gesellschaft

- 72 institutes and research units
- 26,600 staff
- € 2.6 bn research volume



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Fraunhofer-Gesellschaft, the largest organization for applied research in Europe

- Application-oriented research for immediate benefit to the economy and to the benefit of society
- 72 institutes and research units
- 26,600 staff
- €2.6 billion annual research budget totaling. Of this sum, more than €2.2 billion is generated through contract research
  - Roughly two thirds of this sum is generated through contract research on behalf of industry and publicly funded research projects
  - Roughly one third is contributed by the German federal and Countries governments in the form of base funding

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Our Guiding Principles
Mission

Applied research is the foundation of our organization. We partner with companies to transform original ideas into innovations that benefit society and strengthen both the German and the European economy.

Our employees shape the future – in ambitious positions at Fraunhofer or in other areas of science and business. Fraunhofer therefore places great importance on their professional and personal development.

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Our Guiding Principles
Vision

Fraunhofer is the international leader of applied research.

As an innovation driver, we lead strategic initiatives to master future challenges and thus achieve technological breakthroughs.

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Our Guiding Principles
Principles

- Through our research we contribute to the sustainable development of an ecologically sound environment, and an economically successful and socially balanced world. We are strongly committed to this responsibility.
- We promote a well-balanced combination of excellent research and application-oriented development. This unique characteristic motivates us and achieves added value for our partners.
- We understand our clients and know their challenges of tomorrow. Together we develop integrated solutions for their long-term success.

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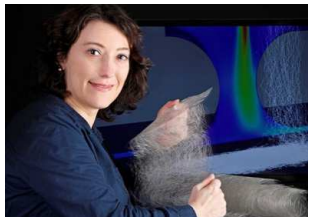
Our Guiding Principles
Principles

- We cooperate with the world's best in science and business. This strengthens our own innovative capacity and that of the German and European economy.
- We emphasize the great variety and interdisciplinary cooperation of our institutes. Faithful collaboration and team work promote synergies and enhance our performance.
- Our success relies on the knowledge and enthusiasm of our employees for applied research. Fraunhofer offers its staff excellent work conditions paired with a high degree of autonomy.



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Joseph von Fraunhofer (1787 – 1826)

Researcher

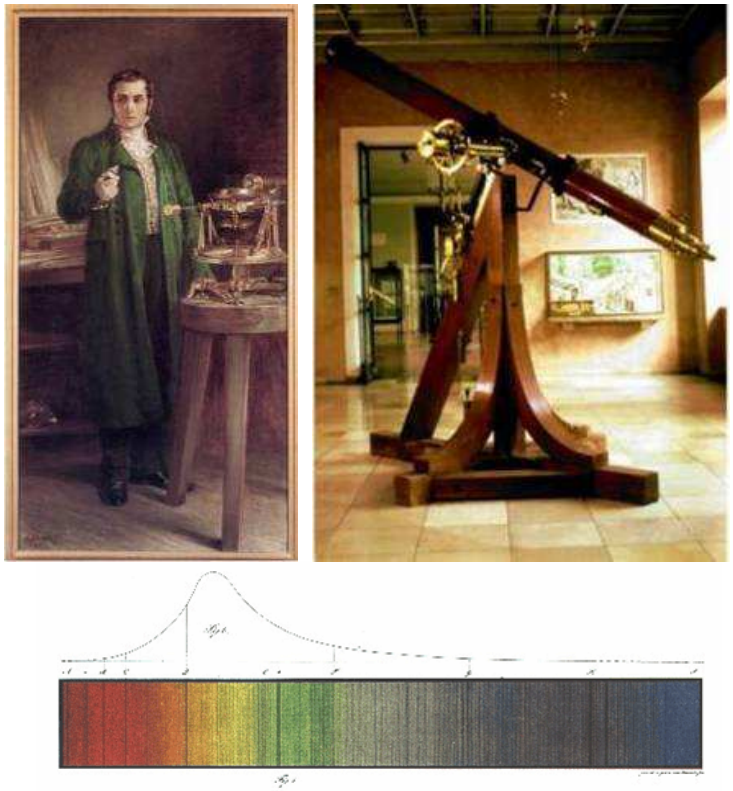
- Discovery of the »Fraunhofer lines« in the solar spectrum

Inventor

- New methods for processing lenses

Entrepreneur

- Director and partner in a glassworks



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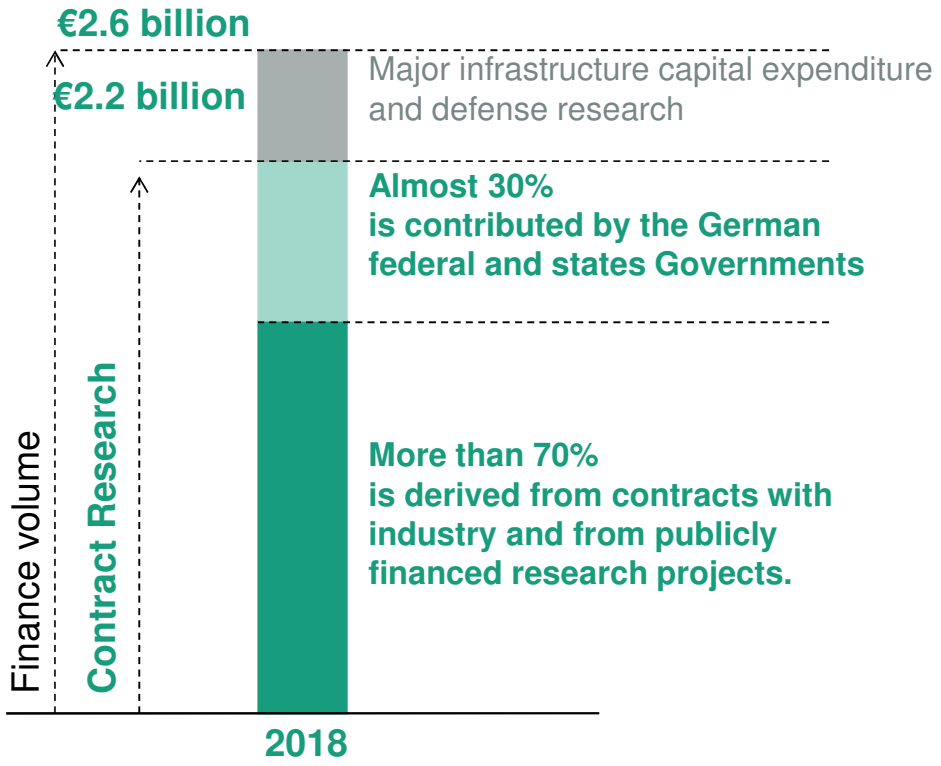
The Fraunhofer-Gesellschaft at a Glance

The Fraunhofer-Gesellschaft undertakes applied research of direct utility to private and public enterprise and of wide benefit to society.

26,600 staff

72 institutes and research units



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Joseph von Fraunhofer

The Fraunhofer-Gesellschaft

Discovery of the »Fraunhofer lines« in the solar spectrum	Researcher	Research and development on behalf of industry and state
New methods for processing lenses	Inventor	mp3 music format, white LED, high-resolution thermal camera
Director and partner in a glassworks	Entrepreneur	Research volume: approx. €2.5 billion annually

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Executive Board of the Fraunhofer-Gesellschaft

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Andreas Meuer

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Prof. Dr.
Ralf Boris Wehrspohn

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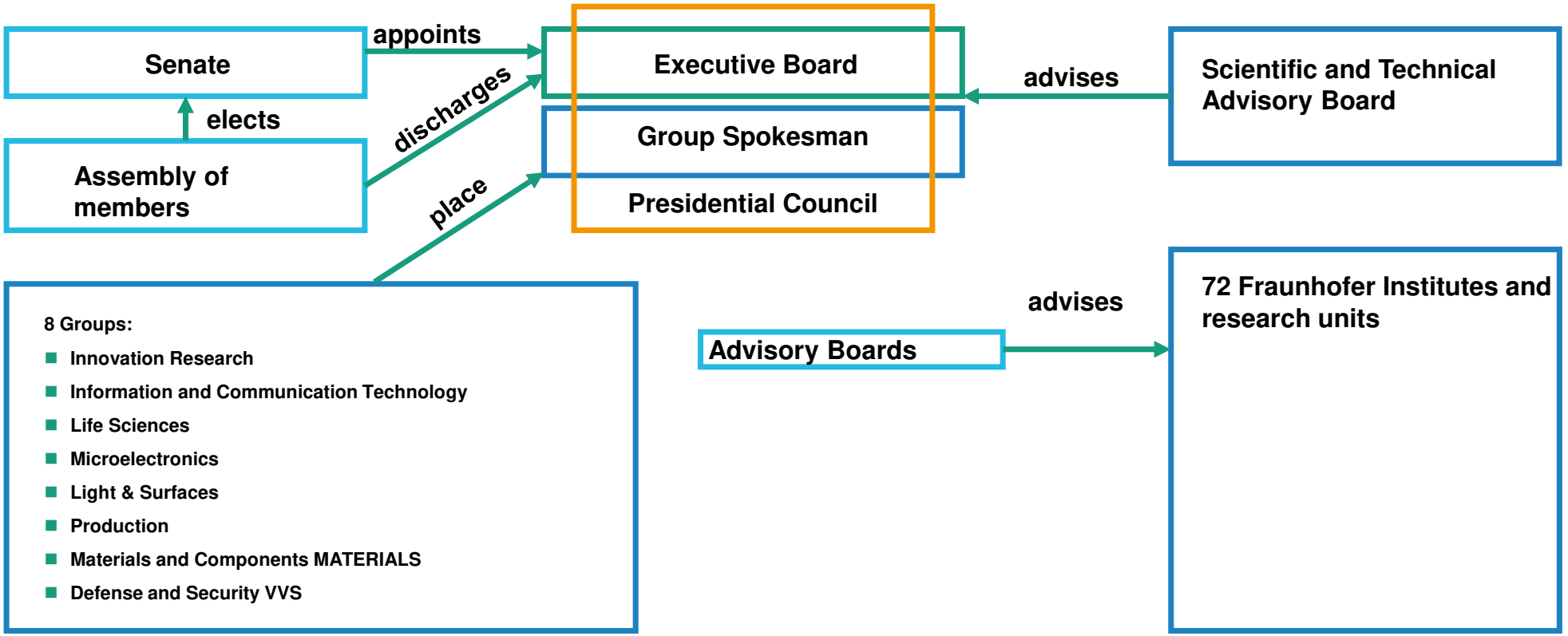
Structure of the Fraunhofer-Gesellschaft



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The Fraunhofer-Gesellschaft
Locations in Germany

- 72 institutes and research units
- 26,600 staff
- € 2.6 bn research volume

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Fraunhofer-Gesellschaft Worldwide

- 8 Affiliates
- 16 Center
- 12 Project Center
- 10 ICON
- 6 Representative Offices + BRU
- 7 Senior Advisor

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Fraunhofer Subsidiaries and Centers Worldwide

Fraunhofer Austria
- Geschäftsbereich Produktions- und Logistikmanagement, Wien
- Geschäftsbereich Visual Computing, Graz

Fraunhofer Italia
- Fraunhofer Innovation Engineering Center IEC, Bozen

Fraunhofer Portugal
- Fraunhofer Center for Assistive Information and Communication Solutions AICOS, Porto

Fraunhofer Schweden
- Fraunhofer-Chalmers Research Center for Industrial Mathematics FCC, Göteborg

Fraunhofer UK
- Fraunhofer Centre for Applied Photonics CAP, Glasgow

Fraunhofer USA
- Fraunhofer Center for Coatings and Diamond Technologies CCD, East Lansing
- Fraunhofer Center for Experimental Software Engineering CESE, College Park
- Fraunhofer Center for Laser Applications CLA, Plymouth
- Fraunhofer Center for Manufacturing Innovation CMI, Boston
- Fraunhofer Center for Molecular Biotechnology CMB, Newark
- Fraunhofer Center for Sustainable Energy Systems CSE, Boston
- Fraunhofer Center for Energy Innovation CEI, Storrs

Fraunhofer Chile
- Fraunhofer Center for Systems Biotechnology CSB, Santiago de Chile
- Fraunhofer Center for Solar Energy Technologies CSET, Santiago de Chile

Fraunhofer Singapore
- Fraunhofer Center for Interactive Digital Media IDM, Singapur

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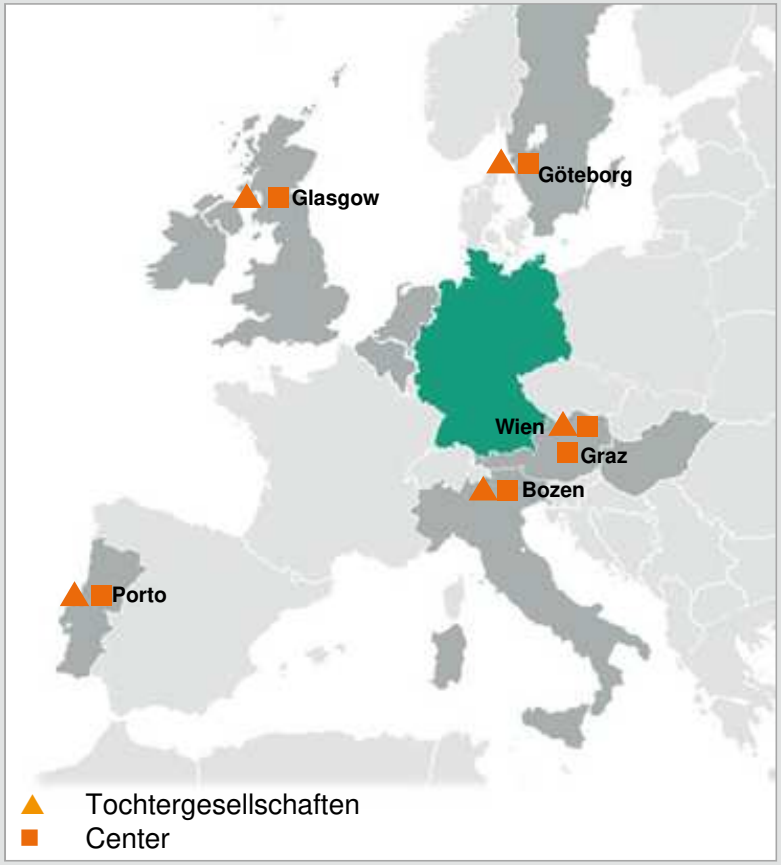
Fraunhofer Subsidiaries and Centers in Europe



Fraunhofer Austria Research
- Geschäftsbereich Produktions- und Logistikmanagement, Wien
- Geschäftsbereich Visual Computing, Graz

Fraunhofer Italia Research
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Fraunhofer Portugal Research
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Fraunhofer Chalmers Centrum
- Fraunhofer Chalmers Research Center for Industrial Mathematics FCC, Göteborg

Fraunhofer UK Research
- Fraunhofer Centre for Applied Photonics CAP, Glasgow

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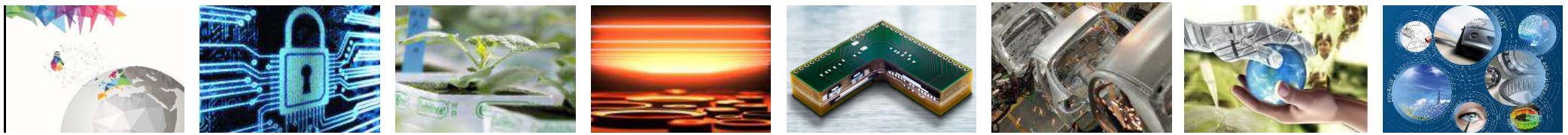
Fraunhofer Groups
Pooling expertise



Institutes working in related subject areas cooperate in Fraunhofer Groups and foster a joint presence on the R&D market. They help to define the Fraunhofer-Gesellschaft's business policy and act to implement the organizational and funding principles of the Fraunhofer model.

- Innovation Research
- Information and Communication Technology
- Life Sciences
- Light & Surfaces
- Microelectronics
- Production
- Defense and Security
- Materials and Components – MATERIALS

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Fraunhofer Groups

Innovation Research

IAO, IMW, INT, IRB, ISI

Information and Communication Technology

AISEC, ESK, FIT, FKIE, FOKUS, IAIS, IDMT, IESE, IGD, IOSB, ISST, ITWM, IVI, MEVIS, SCAI, SIT
Guests: HHI, IAO, IEE, IEM, IIS

Life Sciences

EMB, IBMT, IGB, IME, ITEM, IVV, IZI

Light & Surfaces

FEP, ILT, IOF, IPM, IST, IWS

Microelectronics

EMFT, ENAS, FHR, HHI, IAF, IIS, IISB, IMS, IPMS, ISIT, IZM
Guests: AISEC, ESK, FOKUS, IMWS, IZFP

Production

IAPT, IEM, IFF, IGCV, IGP, IML, IPA, IPK, IPT, IWU, UMSICHT

Defense and Security

EMI, FHR, FKIE, IAF, ICT, INT, IOSB
Guests: IESE, IIS, LBF

Materials and Components – MATERIALS

EMI, IAP, IBP, ICT, IEE, IFAM, IKTS, IMM, IMWS, ISC, ISE, IWES, IWKS, IWM, IZFP, LBF, WKI
Guests: IGB, IIS, ISI, ITWM

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Fraunhofer Alliances
Pooling expertise

The Fraunhofer Alliances facilitate customer access to the services and research results of the Fraunhofer-Gesellschaft. Common points of contact for groups of institutes active in related fields provide expert advice on complex issues and coordinate the development of appropriate solutions.

Adaptronics

Additive Manufacturing

AdvanCer

Ambient Assisted Living

AutoMOBILE Production

Battery

Big Data

Building Innovation

Cleaning Technology

Cloud Computing

Digital Media

Energy

Food Chain Management

Lightweight Structures

Nanotechnology

Polymer Surfaces

Simulation

Space

Technical Textiles

Traffic and Transportation

Vision

Water Systems (SysWasser)

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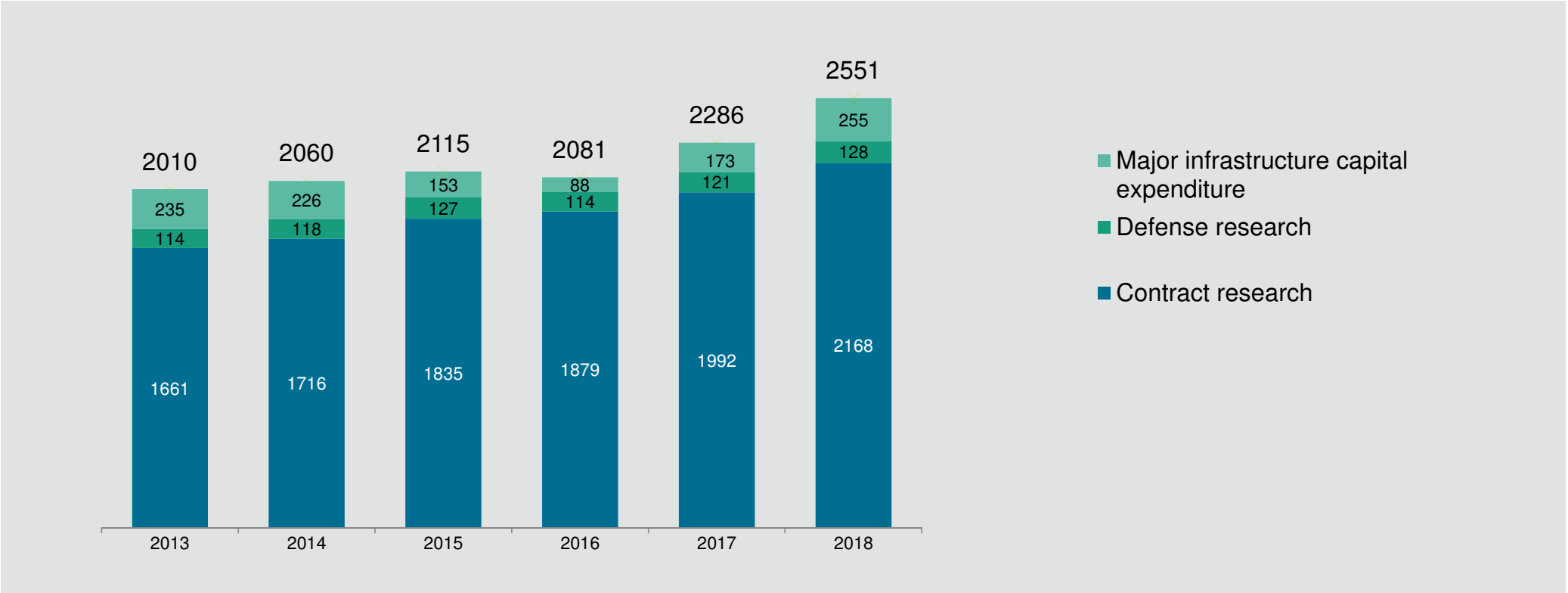
Financial volume of the Fraunhofer-Gesellschaft 2013 - 2018 in Mi €



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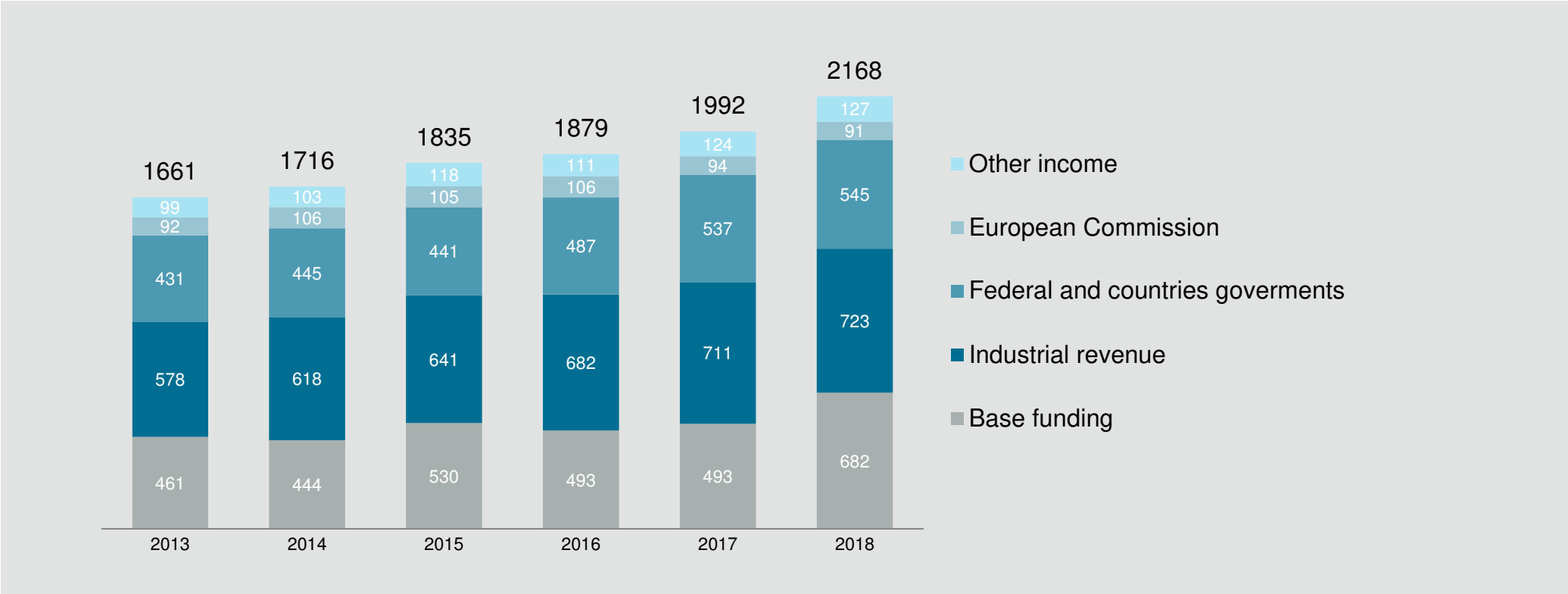
Revenues from Fraunhofer-Gesellschaft in Contract Research 2013 - 2018 in Mi €



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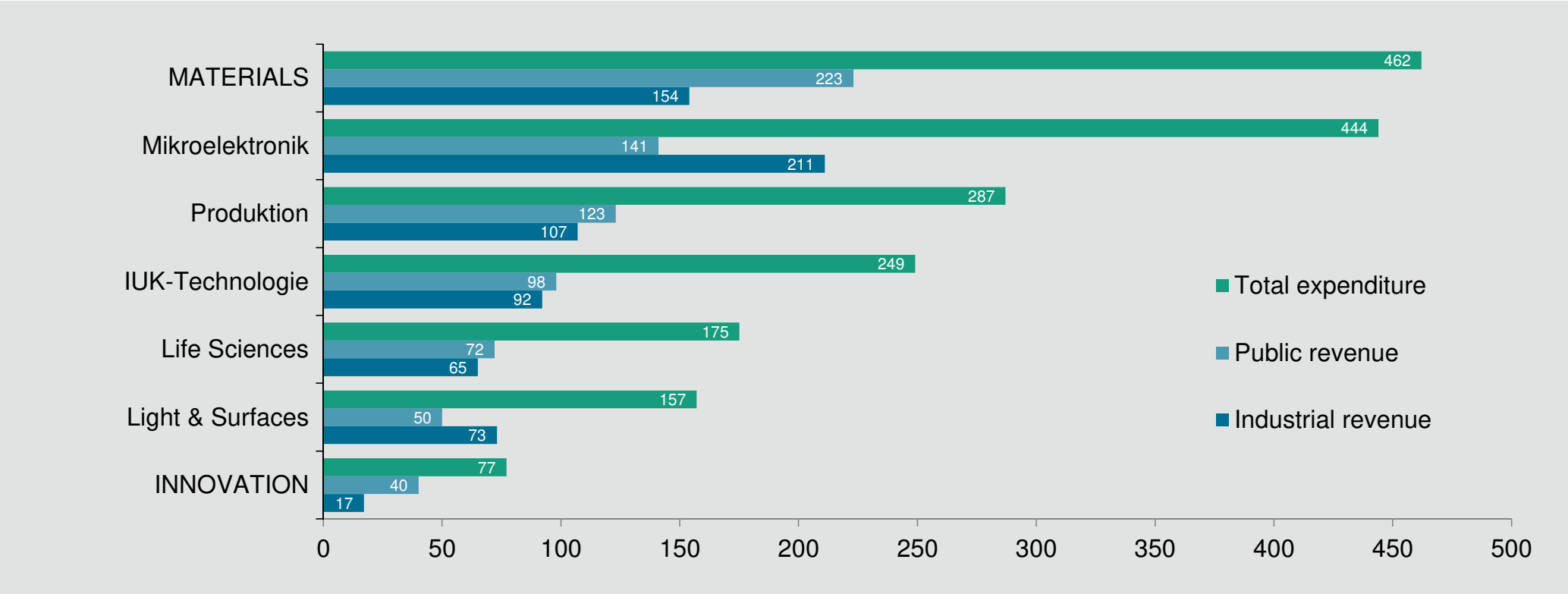
Fraunhofer Groups
Expenses and income in the performance area Contract research 2018 Mi €



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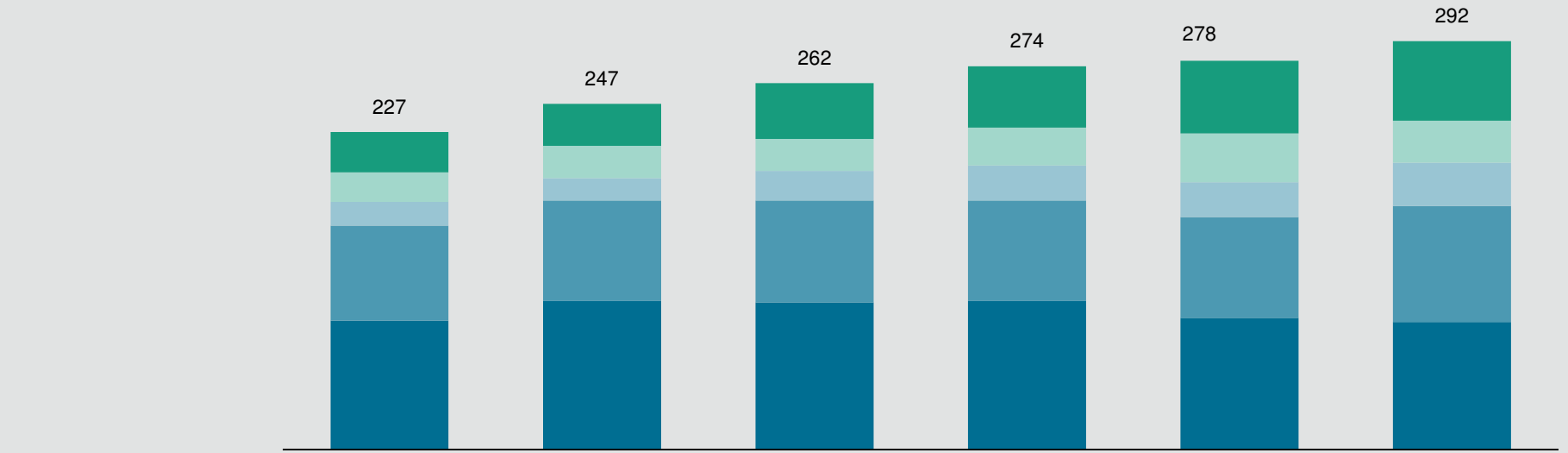
Cooperation with international clients and partners: Revenue from 2013 - 2018 in Mi €*



	2013	2014	2015	2016	2017	2018
Asia	29	30	40	44	52	57
North and South America	21	23	23	27	35	30
Non-EU-Countries in Europe	17	16	21	25	25	31
European Countries	68	72	73	72	72	83
European Commision	92	106	105	106	94	91

* Without revenues from daugther companies abroad

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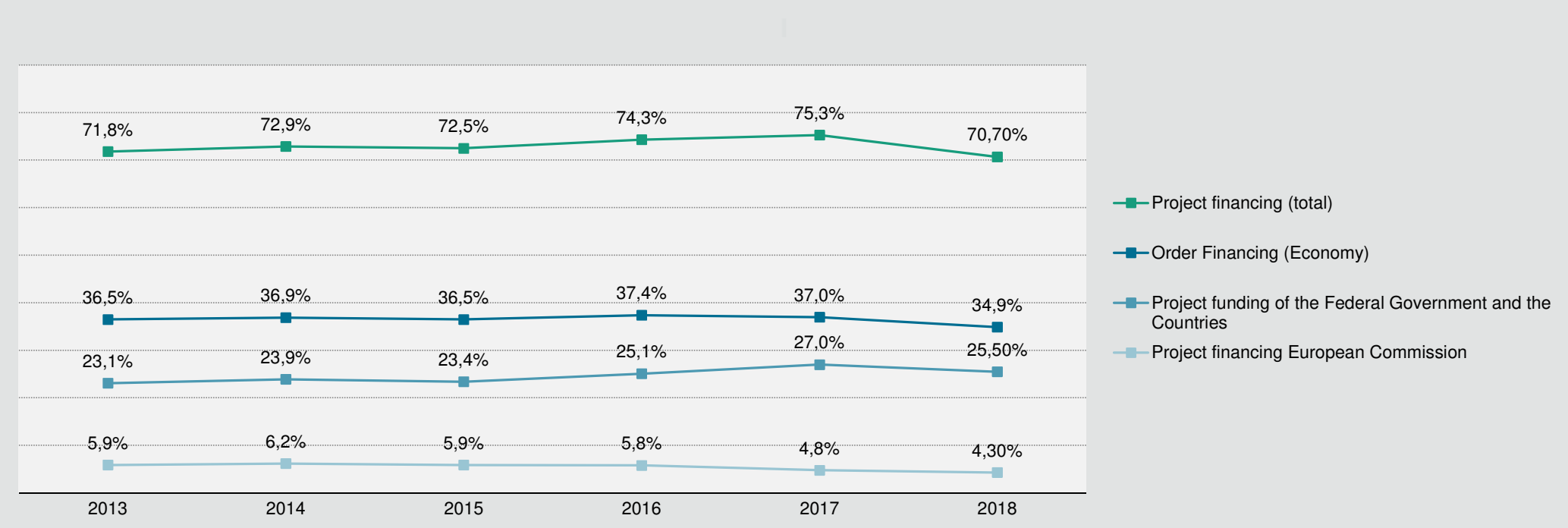
External financing shares in contract research 2013 - 2018[1]



1 Shares in the financing of the operating budget, including depreciation on investments (without facilities under construction, without change in reserves).
2 This portion of the other project financing of 6.7 percent (previous year: 5.9 percent).

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Fraunhofer fields of research

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Fraunhofer as a preferred employer

Universum Study university students 2018

Natural Sciences	Engineering sciences	IT/Informatics
1. Max-Planck-Gesellschaft	1. Porsche	1. Google
2. Bayer	2. Audi	2. Microsoft
3. Fraunhofer-Gesellschaft	3. Daimer/Mercedes-Benz	3. Apple
4. BASF	4. BMW Group	4. SAP
5. Merck	5.Siemens	5. BMW Group
6. Novartis Pharma	6. Bosch	6. Audi
7. Roche	7. Airbus	7. Porsche
8. DLR (Zentrum für Luft- & Raumfahrt)	8. Vokswagen	8. Amazon
9. Boehringer Ingelheim Pharma	9. Lufthansa Technik	9. Daimer/Mercedes-Benz
10. Bundesinstitut für Risikobewertung	10. Google	10. Facebook
11. Porsche	11. DLR (Zentrum für Luft- & Raumfahrt)	…
12. Audi	**12. Fraunhofer-Gesellschaft**	**19. Fraunhofer-Gesellschaft**

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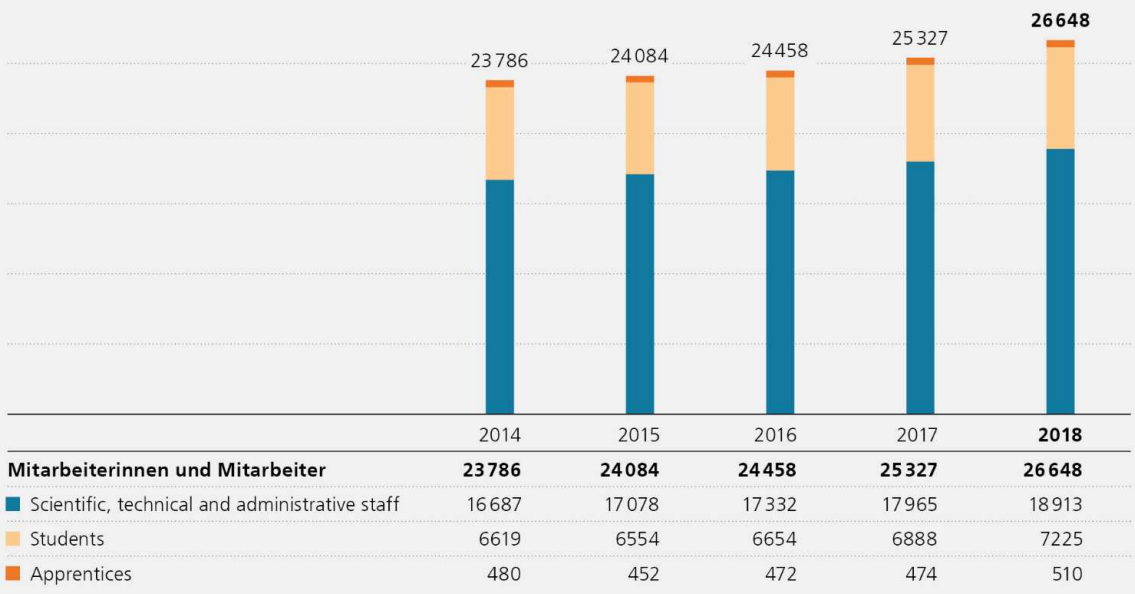
Human Resources



	2014	2015	2016	2017	2018
Mitarbeiterinnen und Mitarbeiter	**23 786**	**24 084**	**24 458**	**25 327**	**26 648**
Scientific, technical and administrative staff	16 687	17 078	17 332	17 965	18 913
Students	6619	6554	6654	6888	7225
Apprentices	480	452	472	474	510

Headcounts as of 31 December p.a.

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Support for spin-offs from Fraunhofer Venture

Services

- Central point of contact for all Fraunhofer Institutes and founders in questions of business or law
- Analysis of proposals for founding new companies and help in developing budgets and business plans, as well as in setting up contracts
- Two internal funding programs, Fraunhofer Fosters Entrepreneurship (FFE) and Fraunhofer Fosters Management (FFM), amounting to around 2 million euros a year
- Network of financing partners
- Management of all Fraunhofer equity investments
- Establishment of a spirit of entrepreneurship at the Fraunhofer Institutes through
  FFI – Fraunhofer Fosters Innovation

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Growth in inventions and patents 2013 – 2018

	2013	2014	2015	2016	2017	2018
Active patent families at year end*	6407	6625	6573	6762	6695	6874
Invention disclosures reports per year	733	736	670	798	756	734
Patent applications per year	603	563	506	608	602	612
Brands (New registrations)	55	55	56	48	42	47

* Portfolio of active rights (patents and utility models) and patent applications at year end.

Deutsches Patent- und Markenamt

2017: Fraunhofer
- ➔ **17th place** of the most active patent applicants and
- ➔ **8th place** among the most active trademark applicants at the DPMA

Europäisches Patentamt
European Patent Office
Office européen des brevets

2018: Fraunhofer is one of the 100 largest applicants at the European Patent Office (rank 44)

2018: According to a study by the international group Clarivate Analytics, Fraunhofer is one of the »Top 100 Global Innovators«.
(3 other German companies: BASF, Bayer, Merck)

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CORPORATE IT SERVICES AT FRAUNHOFER

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Corporate IT Services at Fraunhofer
Portfolio

Methods

- ERP-System
- Digital Business Processes
- CRM
- Big Data

Knowledge

- Expert Information
- Publications
- Patent Management

Infrastructure

- Cloud Services (Private – Public)
- DataCenter
- Networks and CNS
- Standard Software, License Mgmt.

Communication

- E-Mail and Messaging
- Groupware
- Voice and Video Communication

Security

- Information Security
- Identity & Access Management
- Public Key Infrastructure
- Date Governance

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FRAUNHOFER PRIVATE CLOUD

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Fraunhofer Private Cloud
Motivation

Automation and Agility

High level of automation increases agility and reduces delivery time of IT resources

Transparency

Full information about resource usage increases transparency

Flexibility

Scalability increases flexibility and efficiency

High availability

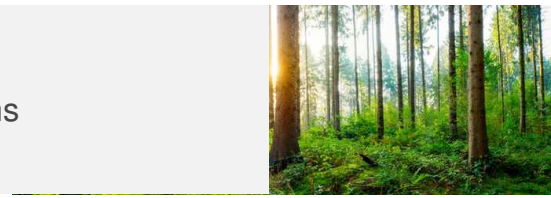
Redundancy increases availability of IT Services

Cost reduction

Economies of scale allow cost optimization

Sustainability

High utilization of few locations increases sustainability



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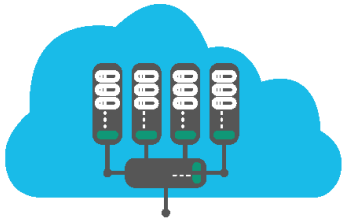
intern

Fraunhofer Private Cloud
Portfolio



IaaS-Cloud – Virtual Data Center

- Infrastructure-as-a-Service Cloud
- Self-Service for VMs, Network, IPs, …

Object Storage – S3

- Object storage with S3 and Swift interface
- High available and geo-redundant

OwnCloud – Sync & Share

- Share data with intern and extern partners
- Syncronize between devices

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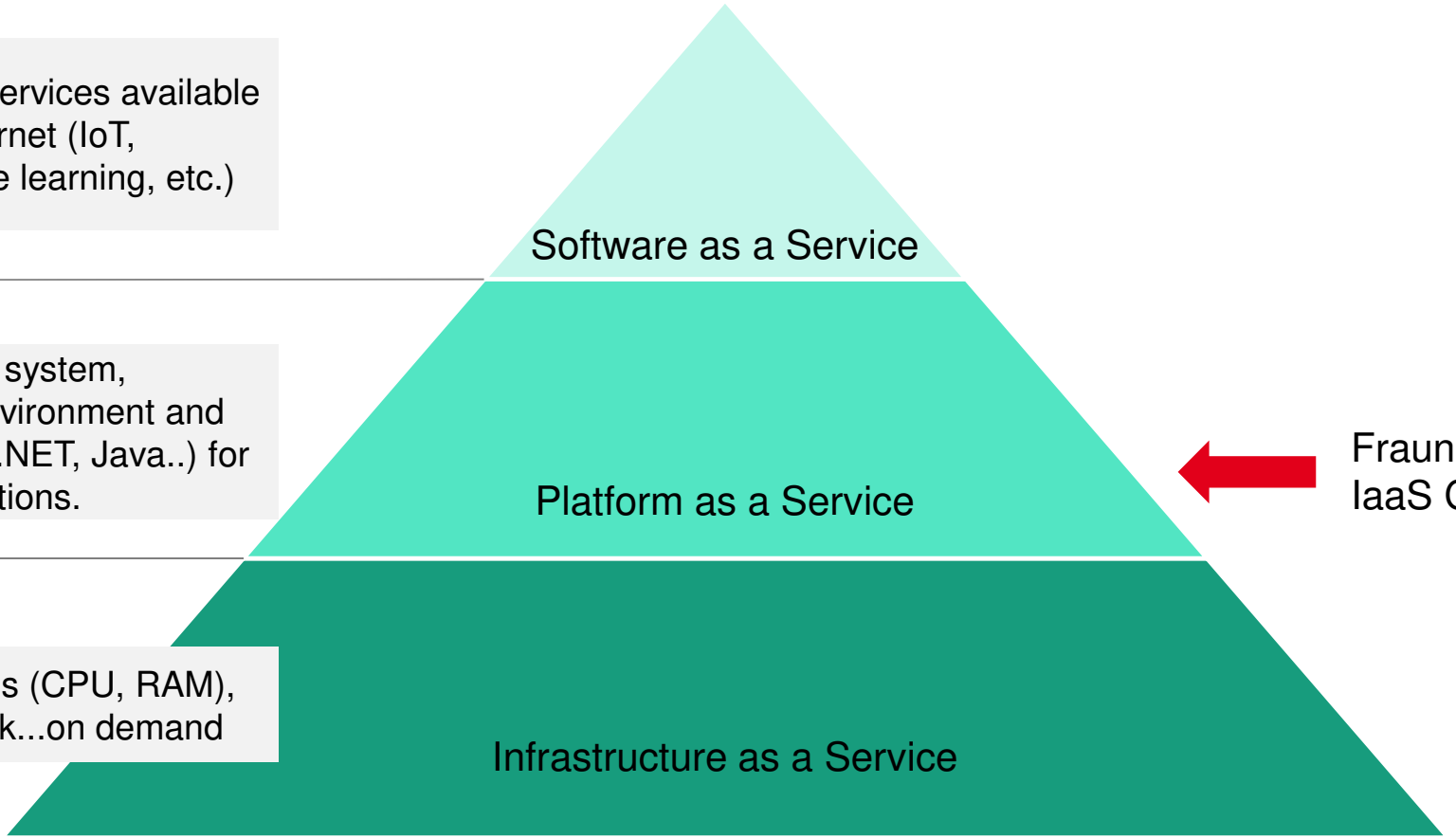
Fraunhofer Private Cloud – Infrastructure as a service
Service depth

Applications and Services available on the internet (IoT, big data, machine learning, etc.)

Operating system, programming environment and runtime platform (.NET, Java..) for applications.

Virtuelle machines (CPU, RAM), Storage, Network...on demand



Fraunhofer IaaS Cloud

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Fraunhofer Private Cloud – Infrastructure as a service
Facts and figures

Technical Information

- CloudStack orchestration (Accelerite), VMWare & KVM hypervisor
- 2 Fraunhofer locations (on prem), Fraunhofer operated systems
- GUI and REST interface, VPC provisioned within ~3 minutes

Utilization

- ~1100 running VMs, ~350 virtual networks

Current size

- 1324 CPU cores, ~19 TByte RAM, ~500 TByte data

Pricing & billing

- Pay per use, full transparency, …and yes, Amazon's cheaper – but we are close

Productive since mid 2015

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Fraunhofer Private Cloud – Infrastructure as a service
Lessons learned

Organization

- Fast purchasing processes required
- More generalists needed in services teams, less specialists
- Private cloud does not (significantly) reduce cost, but it increases quality

Users

- Users get more possibilities and responsibilities
- Training and onboarding required
- Fast growing adaption of Cloud-Features (e.g. automation, instant availability)

Migration (from traditional infrastructure)

- No lift-and-shift-migration
- Migration as chance for cloudification of services

Adaption

- Scientists understand cloud as opportunity
- IT teams of institutes sometimes are more cautious

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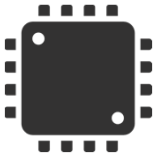
Fraunhofer Private Cloud – Infrastructure as a service
Basic parameters

2 locations

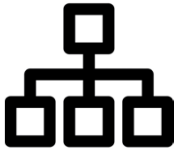


1324 CPU Cores

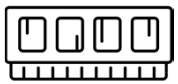
~500 Tbyte data

VMWare & KVM hypervisor

~1100 running VMs



~350 virtual networks



~19 TByte RAM

CloudStack orchestration

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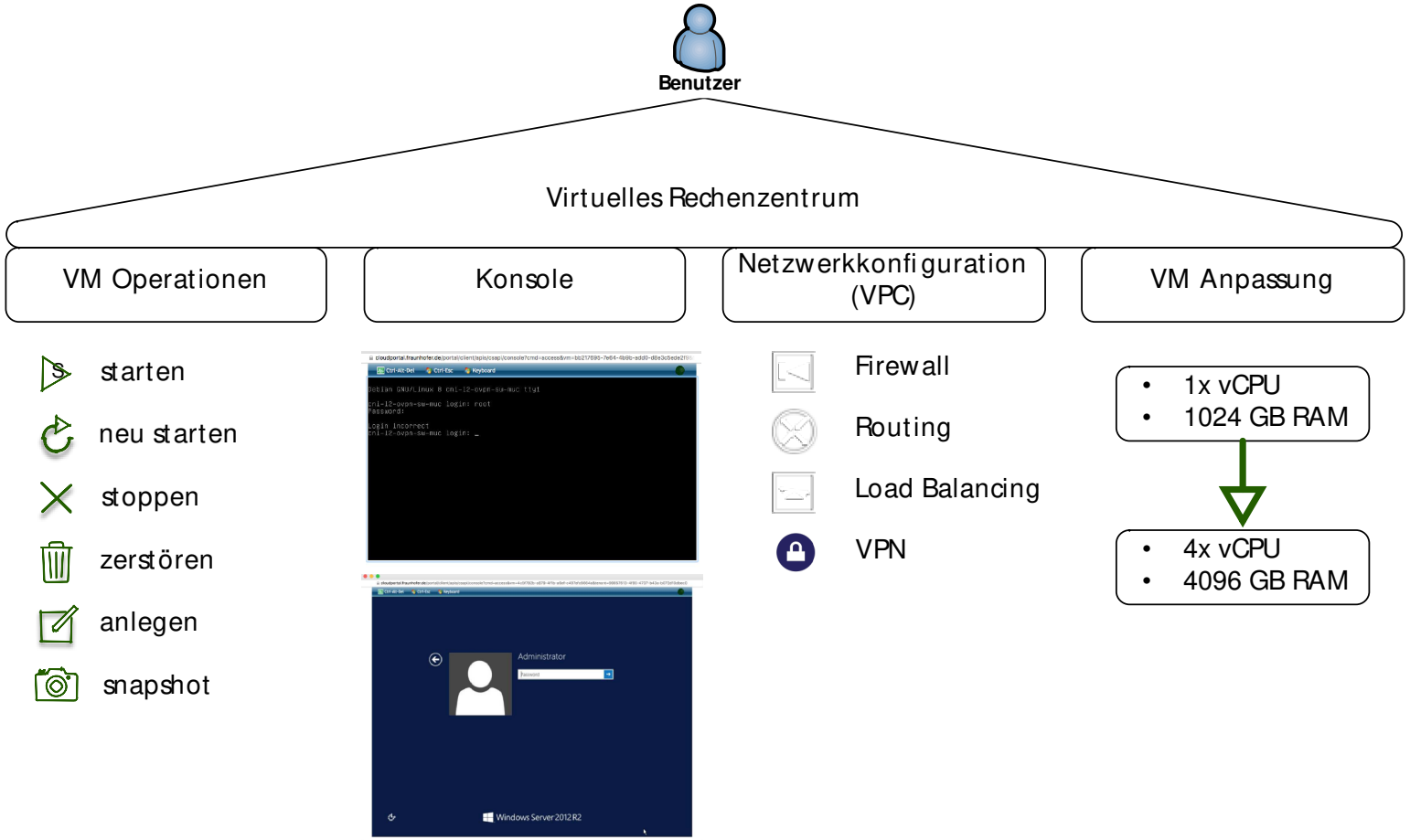
Fraunhofer Private Cloud - IaaS



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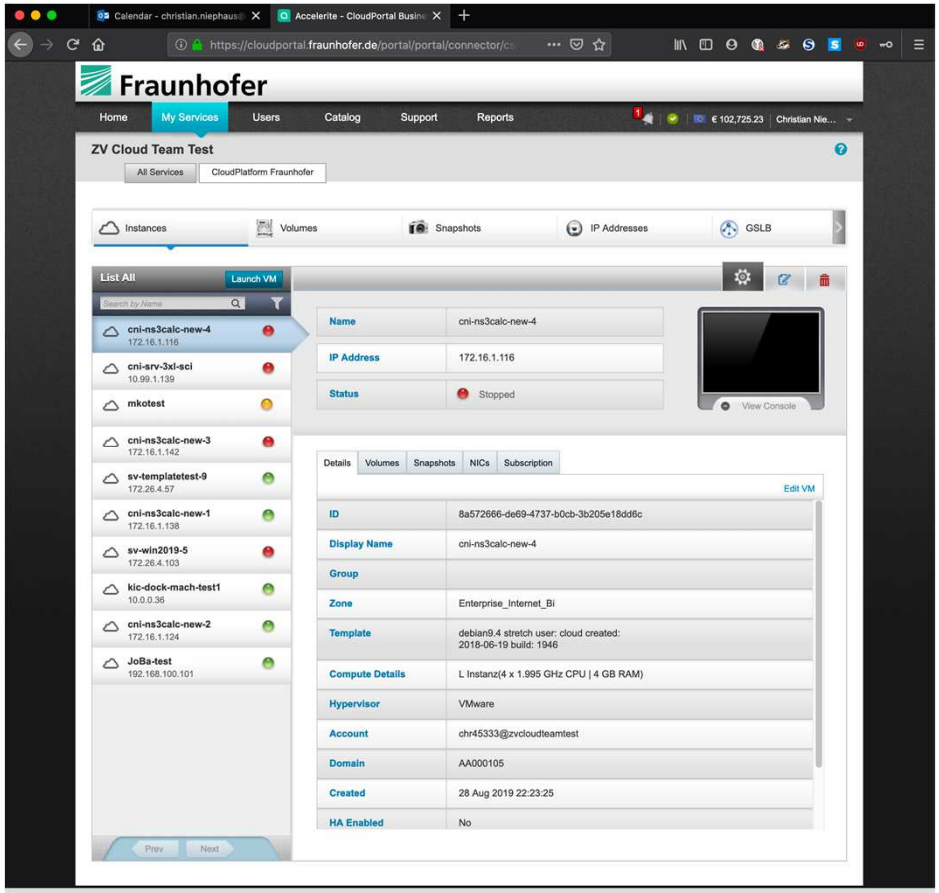
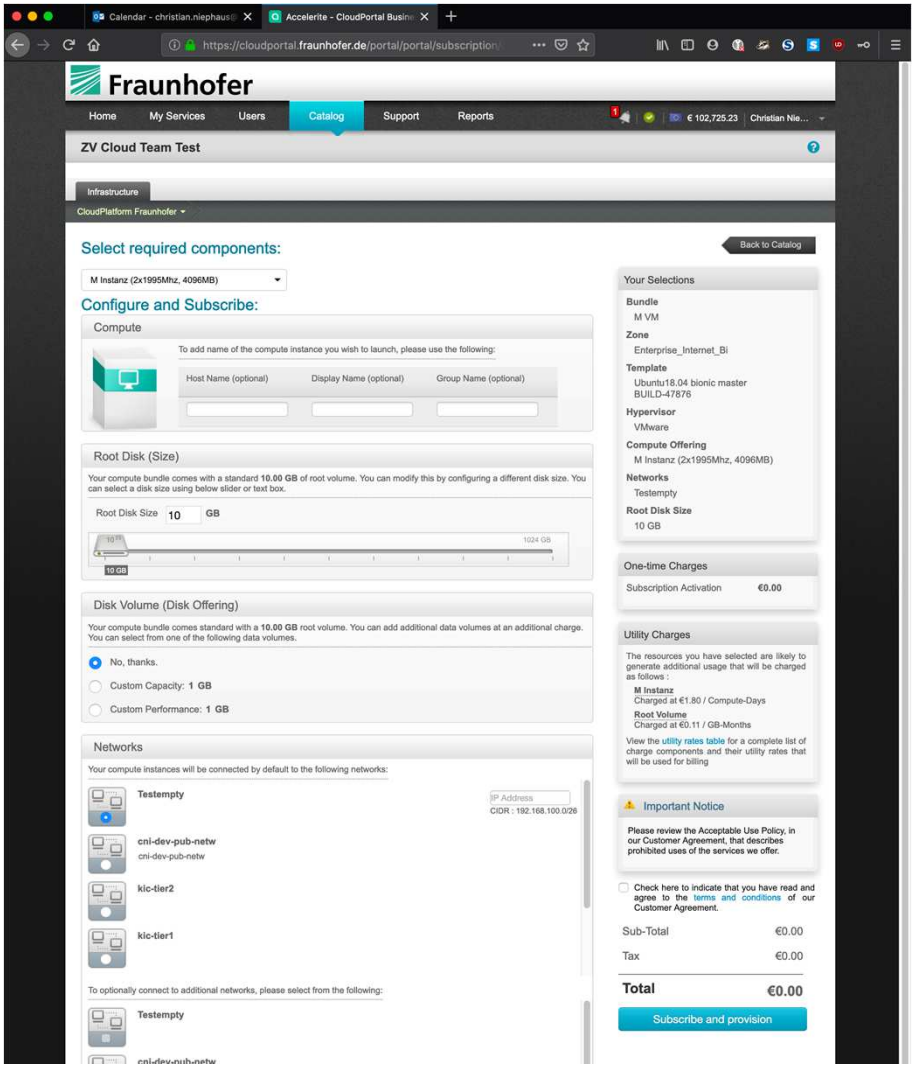
Fraunhofer Private Cloud – IaaS Portal





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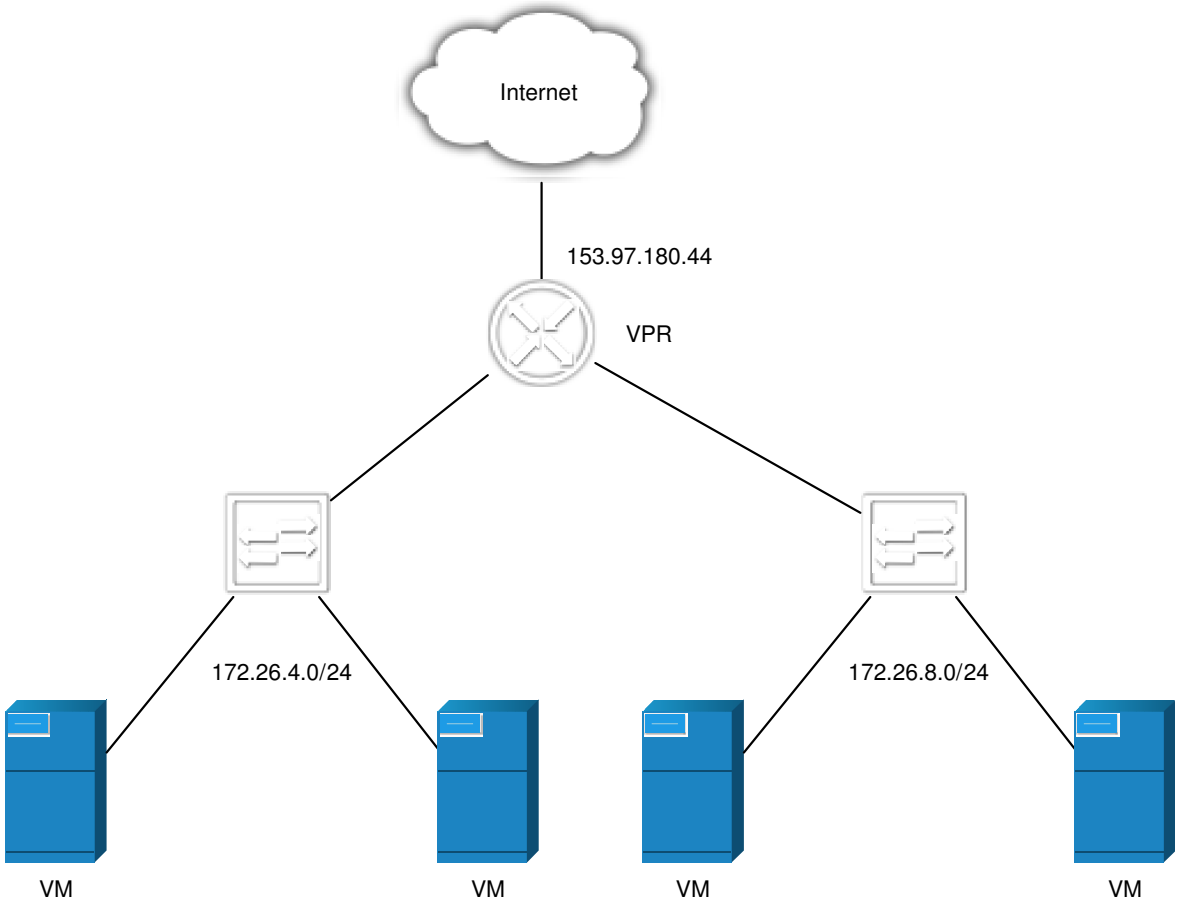
Fraunhofer Private Cloud – IaaS
Virtual Private Cloud (VPC)

- Nutzer können Multi-Tier Netzstrukturen in der Cloud aufbauen
  - Z.B. Datenbank-Tier, Frontend-Tier und Backend-Tier
  - Zugriffssteuerung zwischen Netzen
  - Bereitstellungszeit für Nutzer im Self-Service in ca. 3 Minuten



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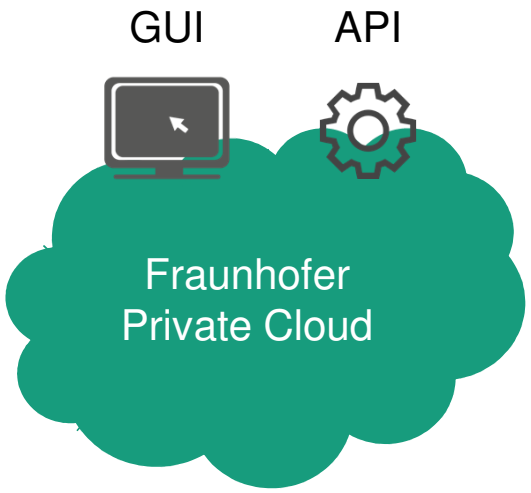
Fraunhofer Private Cloud – IaaS
Automatisierung

- Fraunhofer Private Cloud bietet
  - grafischen Nutzerschnittstelle
  - REST-basierte Programmierschnittstelle
- Ermöglich
  - Programmierbare Infrastrukturen (Infrastruktur-as-Code)
  - Umfangreiche Automatisierung
  - Hohe Dynamik
  - Nutzungen von gängigen Tools, z.B. Ansible, Terraform, etc.
- Kontinuierlich steigende Nutzung der API zu erkennen



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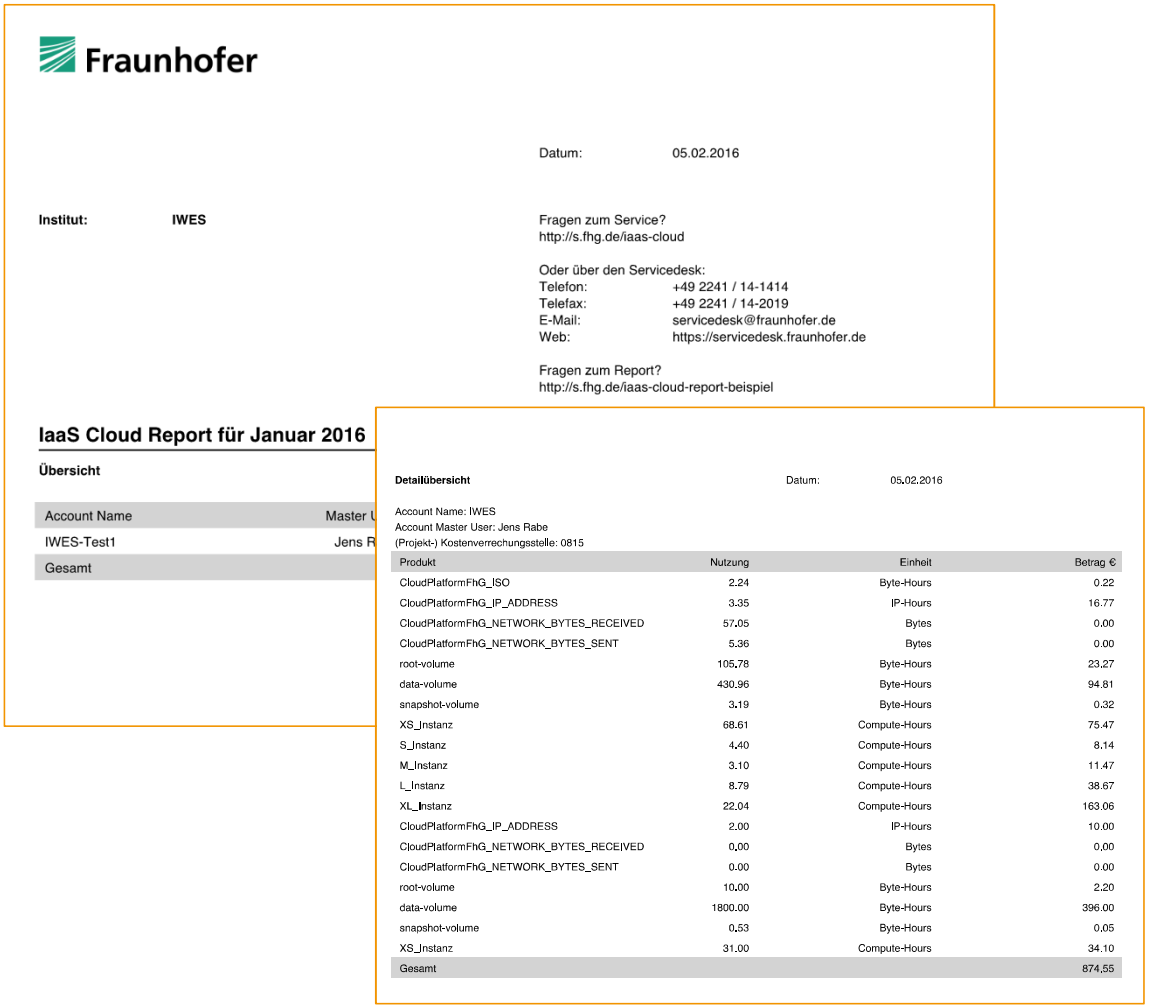
Fraunhofer Private Cloud – IaaS
Transparente Kosten

- Kosten für Fraunhofer Institute sind
  - transparent,
  - im Voraus klar,
  - können dediziert bei Projekten eingeplant werden.
- Abrechnung ressourcengenau für
  - Compute (CPU/RAM)
  - Storage
  - Netz



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Datum: 05.02.2016

Institut: **IWES**

Fragen zum Service?
http://s.fhg.de/iaas-cloud

Oder über den Servicedesk:
Telefon: +49 2241 / 14-1414
Telefax: +49 2241 / 14-2019
E-Mail: servicedesk@fraunhofer.de
Web: https://servicedesk.fraunhofer.de

Fragen zum Report?
http://s.fhg.de/iaas-cloud-report-beispiel

IaaS Cloud Report für Januar 2016

Übersicht

Account Name	Master U
IWES-Test1	Jens R
Gesamt	

Detailübersicht Datum: 05.02.2016

Account Name: IWES
Account Master User: Jens Rabe
(Projekt-) Kostenverrechnungsstelle: 0815

Produkt	Nutzung	Einheit	Betrag €
CloudPlatformFhG_ISO	2.24	Byte-Hours	0.22
CloudPlatformFhG_IP_ADDRESS	3.35	IP-Hours	16.77
CloudPlatformFhG_NETWORK_BYTES_RECEIVED	57.05	Bytes	0.00
CloudPlatformFhG_NETWORK_BYTES_SENT	5.36	Bytes	0.00
root-volume	105.78	Byte-Hours	23.27
data-volume	430.96	Byte-Hours	94.81
snapshot-volume	3.19	Byte-Hours	0.32
XS_Instanz	68.61	Compute-Hours	75.47
S_Instanz	4.40	Compute-Hours	8.14
M_Instanz	3.10	Compute-Hours	11.47
L_Instanz	8.79	Compute-Hours	38.67
XL_Instanz	22.04	Compute-Hours	163.06
CloudPlatformFhG_IP_ADDRESS	2.00	IP-Hours	10.00
CloudPlatformFhG_NETWORK_BYTES_RECEIVED	0.00	Bytes	0.00
CloudPlatformFhG_NETWORK_BYTES_SENT	0.00	Bytes	0.00
root-volume	10.00	Byte-Hours	2.20
data-volume	1800.00	Byte-Hours	396.00
snapshot-volume	0.53	Byte-Hours	0.05
XS_Instanz	31.00	Compute-Hours	34.10
Gesamt			874,55

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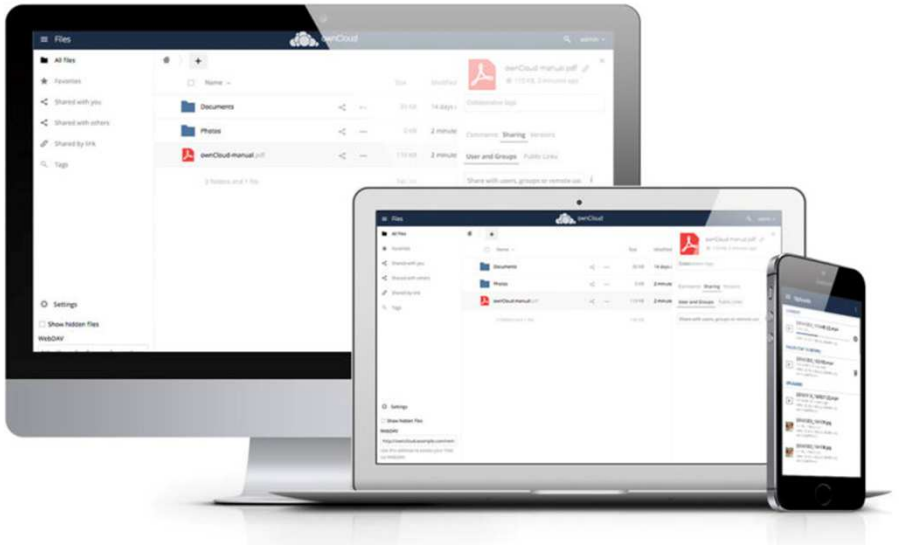
Fraunhofer Private Cloud – Sync and Share OwnCloud

- Sync & Share Service for Fraunhofer employees
- Synchronize Files between multiple devices
- Share Files with internal and external partners
- On Premises, operated by Fraunhofer
- No quotas for users
- Integrated with Identity & Access Management
- Productive since 2014
  - Started with OpentText »Tempo Box«
  - Migration to OwnCloud in Q4/2018
    (Share by link!)



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Fraunhofer Private Cloud

- Object based
  - Access by object id
  - Meta data is added
- Data available worldwide
  - HTTP-(S3)-interface
- Optimized for
  - scalability
  - Large amount of unstructured data
  - Access by systems and applications, not people
- Productive since 2013

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Fraunhofer Cloudspeicher Architecture

Architecture

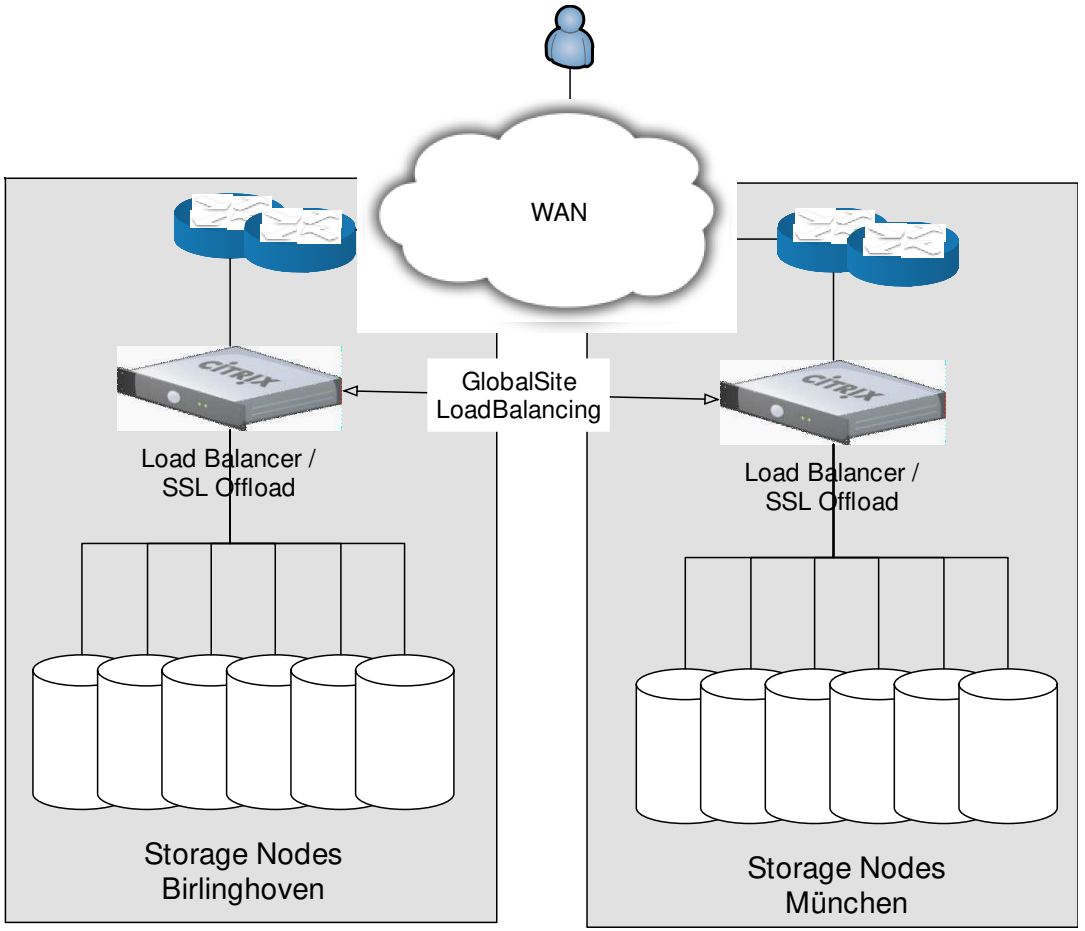
- NetApp StorageGrid system with 500 TByte
- Data stored geo redundant (Munich and Birlinghoven / Bonn)
- High available architecture
- On Prem, now operated in-house (since Q1/2019)

Typical use cases

- Backup, sensor data, media management

Lessons learned

- Support for S3 storage growing slowly and used to be buggy in the beginning
- Adaption slower than expected
- »Pay as you go« important for acceptance



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PUBLIC CLOUD SERVICES
The Way to a Hybrid Cloud

- About Fraunhofer
- Corporate IT Services at Fraunhofer
- Fraunhofer Private Cloud
  - Infrastructure as a Service
  - Sync and Share
  - S3 Storage
- Public Cloud Services – the way to a hybrid cloud
- Establishing Office 365 at Fraunhofer – Software as a Service in the public cloud
- Conclusion / Lessons learned

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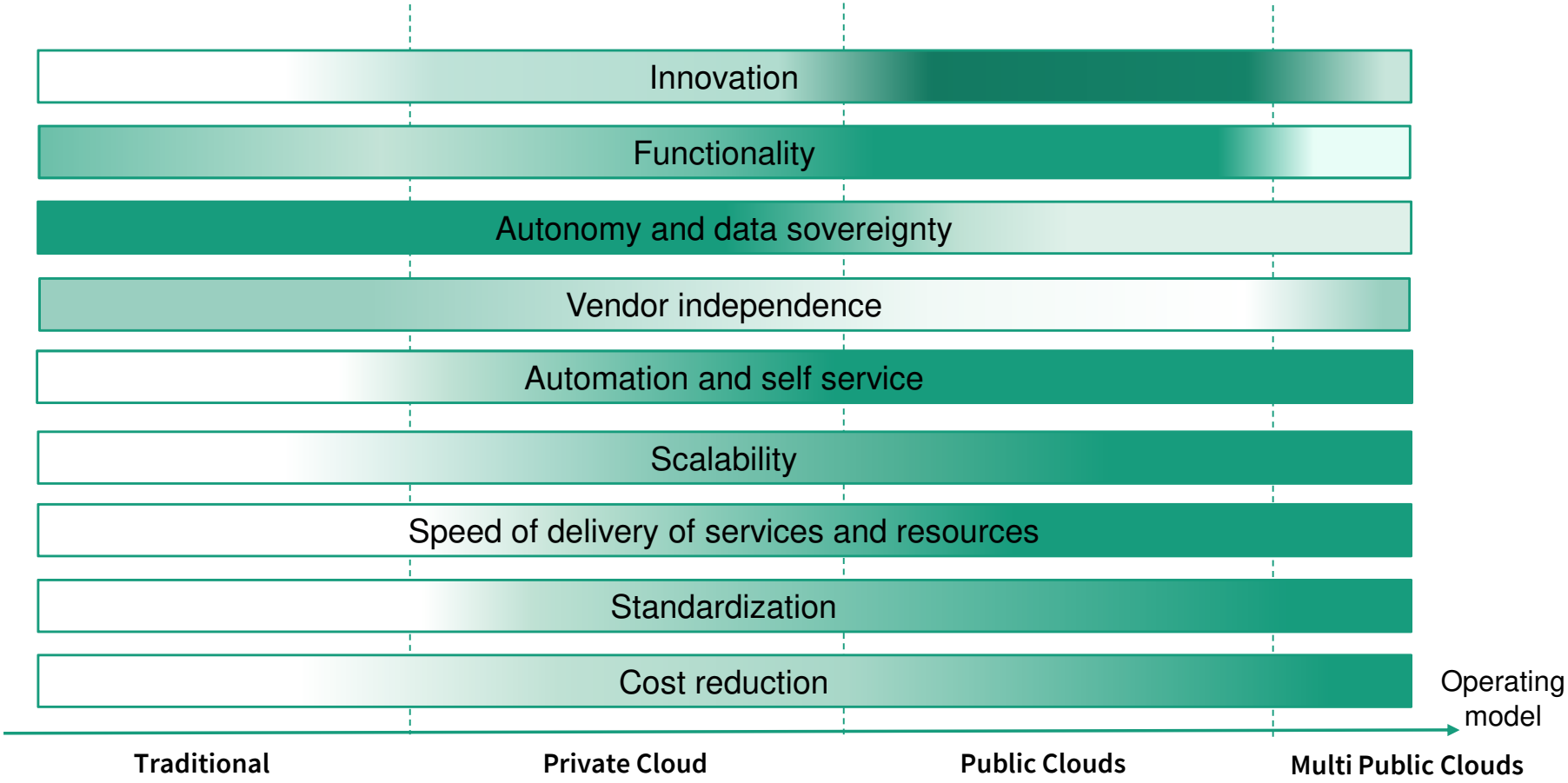
Private or Public Cloud?
Strength and weaknesses of different operating models



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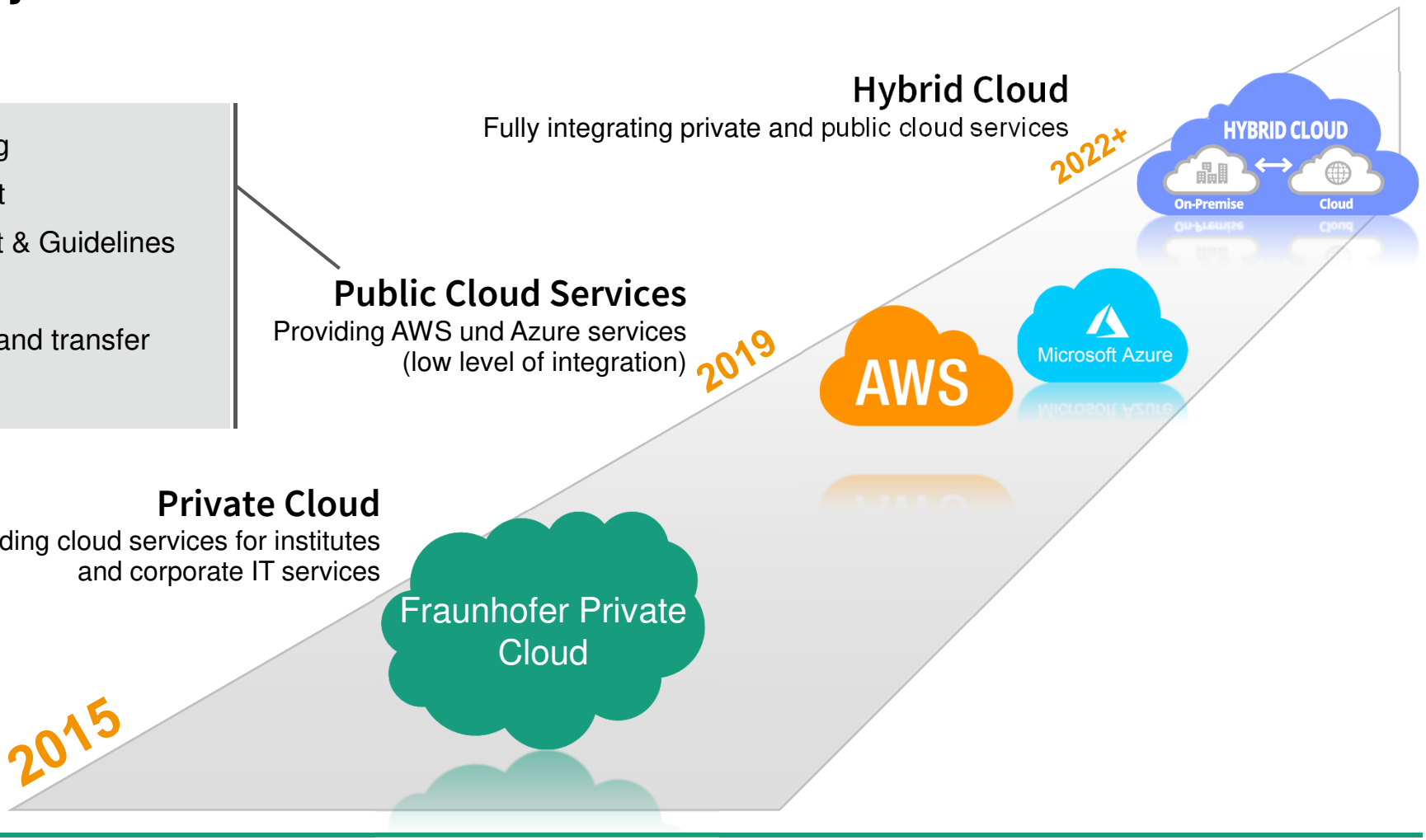
Fraunhofer Hybrid Cloud Services

- Procurement & billing
- Identity Management
- Security Assessment & Guidelines
- Working Agreement
- Knowledge building and transfer
- …



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Fraunhofer Private Cloud
Benutzergruppen

Wissenschaftler/innen

- IT-Infrastruktur zur Realisierung von Projekte
- Anforderungen:
  - Schnelle Bereitstellung von Ressourcen
  - Self-Service
  - Einfache Nutzung
  - Zuverlässige Trennung von Mandaten

Lokale IT-Abteilungen

- Infrastruktur für Institut oder Projekte
- Anforderungen:
  - Kostentransparenz
  - Integration in Institutsnetzwerke

Zentrale Serviceteams

- Infrastruktur für zentrale Dienste
- Anforderungen:
  - Hohe Verfügbarkeit
  - Hohe Flexibilität
  - Große Ressourcenpools
  - APIs

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ESTABLISHING OFFICE 365 AT FRAUNHOFER
Software-as-a-Service in the public cloud

- About Fraunhofer
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- Conclusion / Lessons learned

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Office 365 – Motivation
New Tools for a new Ways of Collaboration

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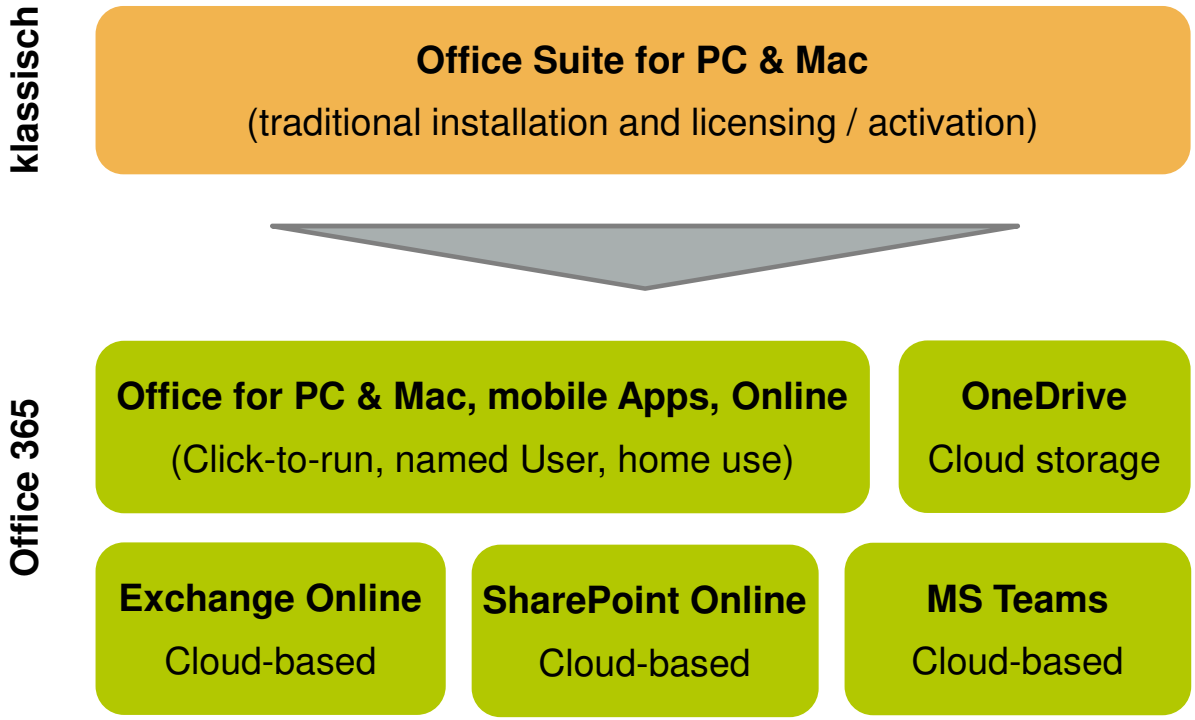
Quelle: https://www.avanade.com/en/blogs/avanade-insights/collaboration/microsoft-teams-supercharges-collaboration-for-millennials-to-boomers

Office 365 bei Fraunhofer
Übersicht zum Produktumfang



Office Applications

- Office Pro Plus for PC / Mac

  only »click-to-run-installation «
  (also for MS Project and Visio)
- additionally: Online and mobile devices
- Home use option (5+5+5)

Online Services

- Exchange online
- MS Teams
- SharePoint and OneDrive
- …

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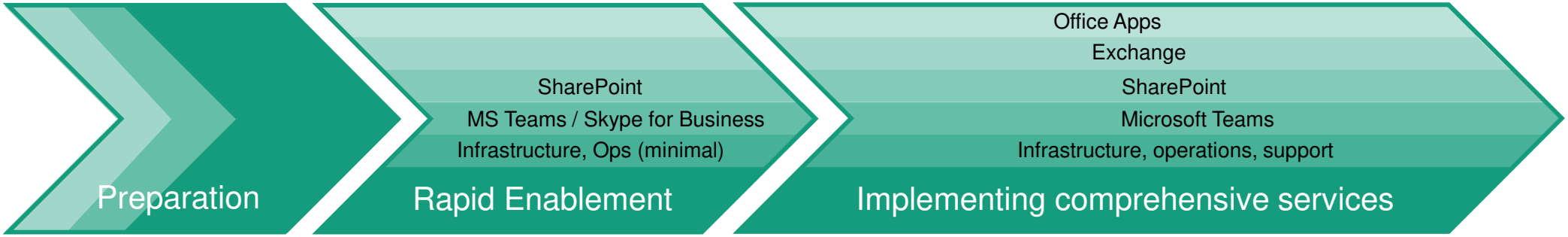
Office 365 at Fraunhofer
Status Quo and next steps

today

1st go live



- Coordination within Fraunhofer
- Procurement
- Building project organization
- Defining goals and procedures

- Providing O365 with »Out-of-the-Box«-Features
- Base infrastructure
- Data trustee Fraunhofer / Security assessment
- Minimal Ops and support
- Target group: early adoptors

- Providing fully functional, highly integrated services
- Broad use of Exchange Online
- Self services and automation
- Full user support and operations
- Additional backup (outside MS cloud)
- Risk management and exit strategy
- Replacing on prem systems

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CONCLUSION / LESSONS LEARNED

- About Fraunhofer
- Corporate IT Services at Fraunhofer
- Fraunhofer Private Cloud
  - Infrastructure as a Service
  - Sync and Share
  - S3 Storage
- Public Cloud Services – the way to a hybrid cloud
- Establishing Office 365 at Fraunhofer – Software as a Service in the public cloud
- Conclusion / Lessons learned

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Lessons Learned

- Maturity of cloud solutions lower than promised (and perceived)
  - Private cloud as well as public cloud
- Extensive (and still ongoing) debate to find Fraunhofer's position about public cloud services
  - Caveats: (Data) autonomy, vendor dependency, information security and untrustworthy presidents
- Highly dynamic, hard to keep up to date
- Using private cloud services (in a compliant way) still feels like pioneering work
  - Risk assessment / new risks (--> exit strategy more relevant)
  - Legal questions (eg. GDPR vs. Cloud Act)
  - Long discussions with workers' council / works agreement
  - Challenging purchasing procedures / contract management

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BACKUP

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Fraunhofer Cloudspeicher
Objekt- vs. Dateispeicher

Objekt-basiert
(“Parkservice”)

- Ticket 53
- Object UID 53

Datei-basiert
(“Parkhaus”)

- Garage 1 Ebene 4 Reihe N Stellplatz 53
- /auto/garage1/ebene4/reihen/stellplatz53.file

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Fraunhofer Cloudspeicher
Objekt- vs. Dateispeicher

Objekt-basiert	Datei-basiert
Skalierbarkeit	Hierarchie (Ordner und Dateinamen)
Site-übergreifende Zugriffe	Granulare Zugriffsreche
Single Namespace	High-Performance
	Multi-User-Access / Locking
Geeignet für: - große Mengen (unstrukturierter) Daten - maschinengenerierte Daten	Geeignet für: - Home- und Gruppenlaufwerke - „menschengenerierte“ Daten

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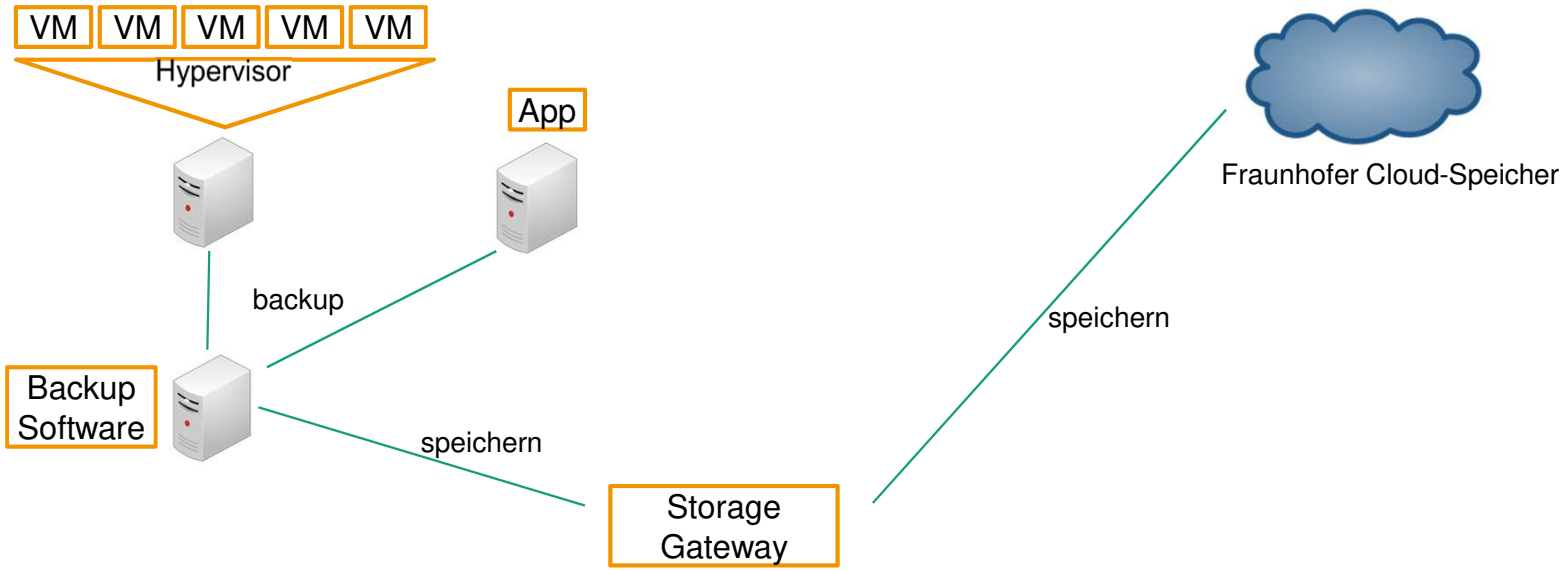
Fraunhofer Cloud Speicher
Anwendungsfall Backup



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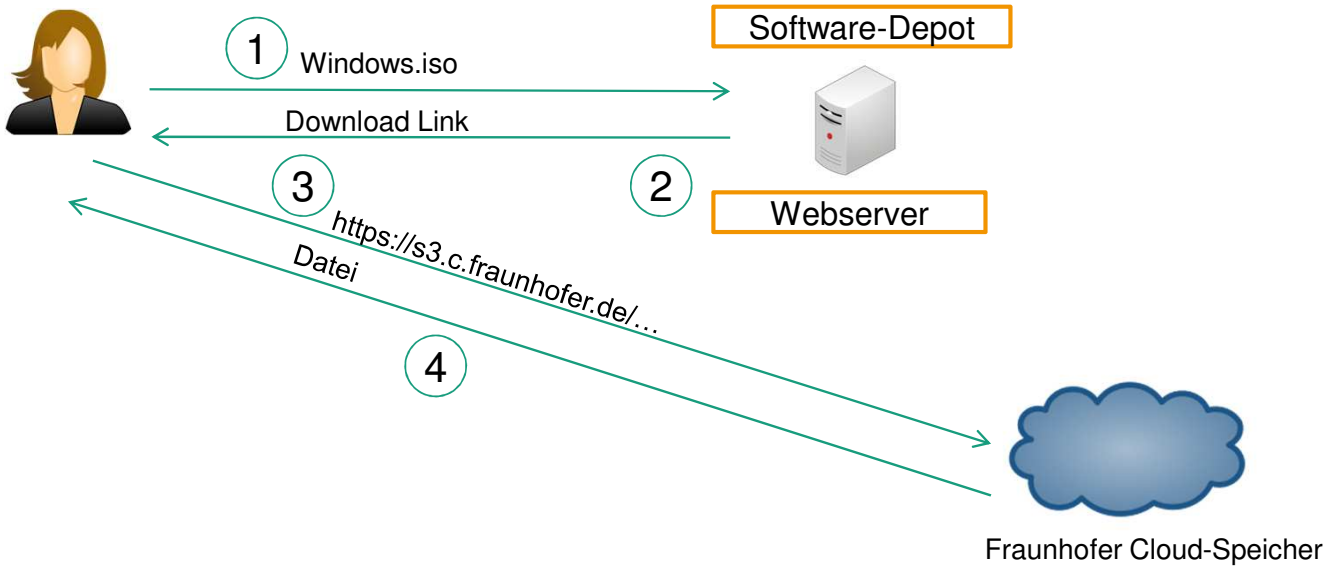
Fraunhofer Cloud Speicher
Anwendungsfall Dateiverteilung



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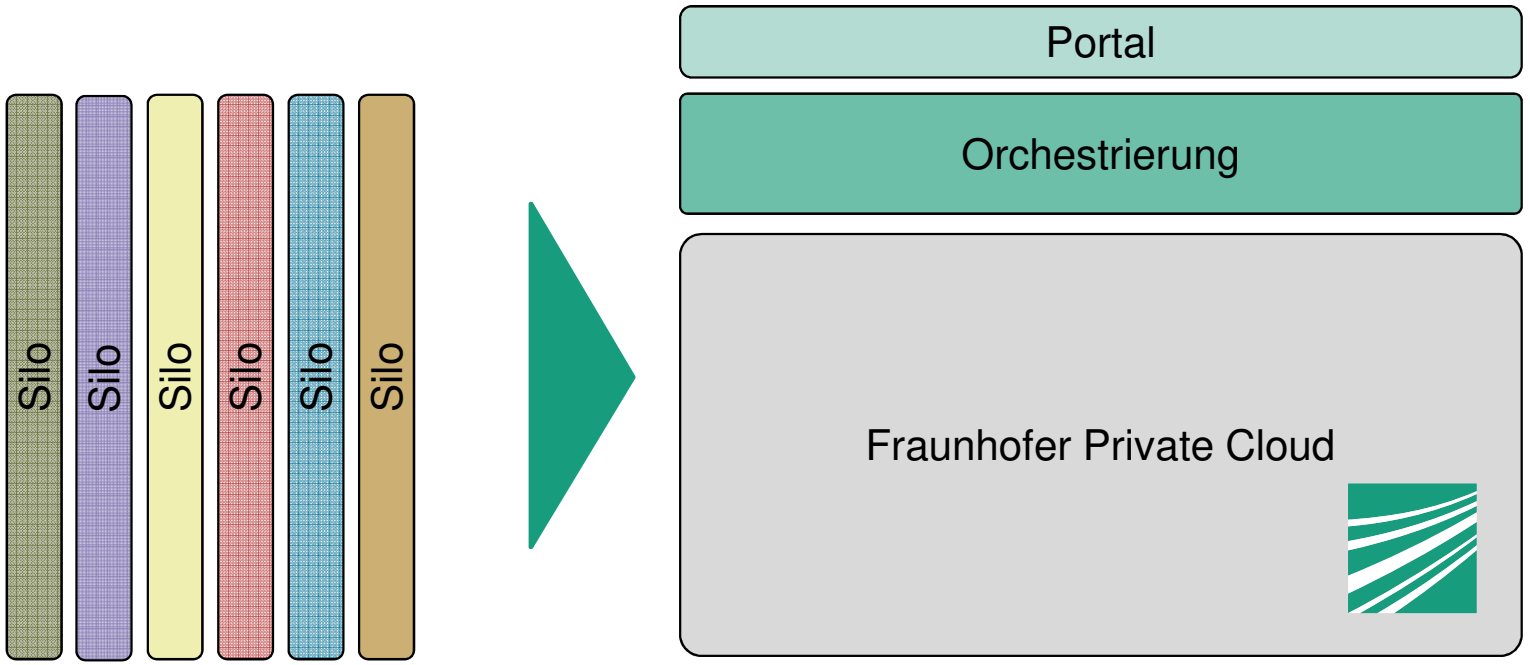
Fraunhofer Private Cloud - IaaS
Rückblick: Transformation der Datacenter-Architektur



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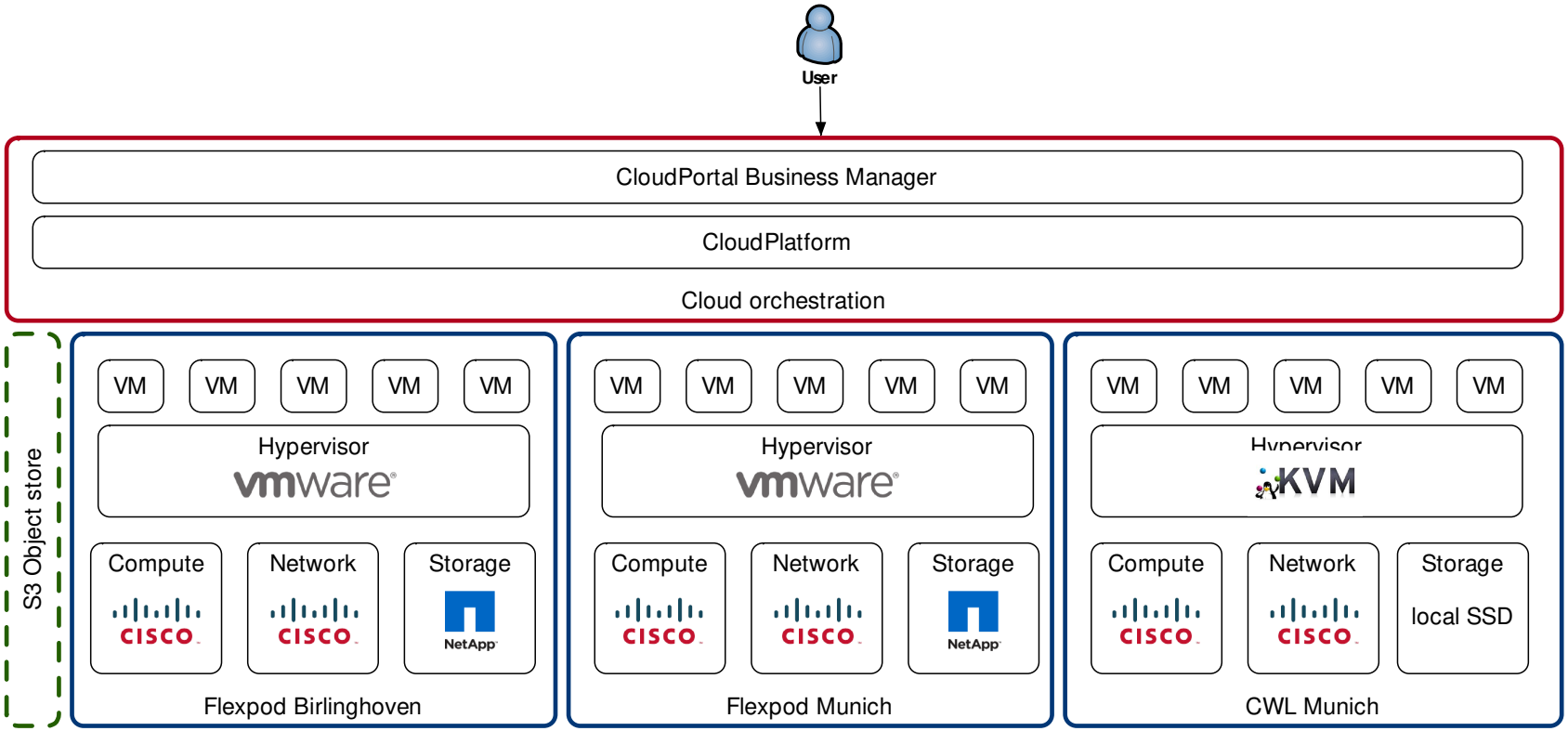
Fraunhofer Private Cloud – IaaS
Technischer Aufbau



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Fraunhofer Private Cloud – IaaS“
Preise

Virtuelle Maschinen

Instanz-Typ	Virtuelle Kerne	RAM	Preis pro Tag
XS VM	1	1	€ 0,65 (€ 20,15/Monat)
S VM	1	2	€ 0,90 (€ 27,90/Monat)
M VM	2	4	€ 1,80 (€ 55,80/Monat)
L VM	4	4	€ 2,50 (€ 77,50/Monat)
XL VM	4	8	€ 3,60 (€ 111,60/Monat)
XXL VM	8	16	€ 7,20 (€ 223,20/Monat)
3 XL VM	8	32	€ 12,00 (€ 372,00/Monat)
4 XL VM	8	64	€ 24,00 (€ 744,00/Monat)
4 XL_R VM	4	64	€ 23,00 (€ 713,00/Monat)
5 XL VM	24	120	€ 50,00 (€ 600,00/Monat)

Storage

Storage-Typ	Preis pro GB/Monat
Performance (SSD/SAS)	€ 0,11
Capacity (SATA)	€ 0,05
Snapshots	€ 0,05
Template/ISO	€ 0,05

Netzwerk

	Preis pro Monat
1 x Public-IP-Adresse	€ 2,00
Netzverkehr eingehend	-
Netzverkehr ausgehen	-

- Es wird minutengenau abgerechnet.
- MS Windows Lizenzen inkludiert

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Speicherdienste: Technische Sicht

- Produkt:
  NetApp Storage Grid
- Kapazität: 2x250TByte
- Geo-redundanter Speicher
  (Birlinghoven+München)
- Schnittstelle: S3 / Swift

- Storage Birlinghoven:
  1 RZ
- Produkt: NetApp FAS
- Kapazität: 285TByte
- Schnittstelle: NFS / VMWare

- Storage München:
  2 RZs → Storage Redundanz
- Produkt: NetApp FAS
- Kapazität: 300TByte
- Schnittstelle: NFS / VMWare

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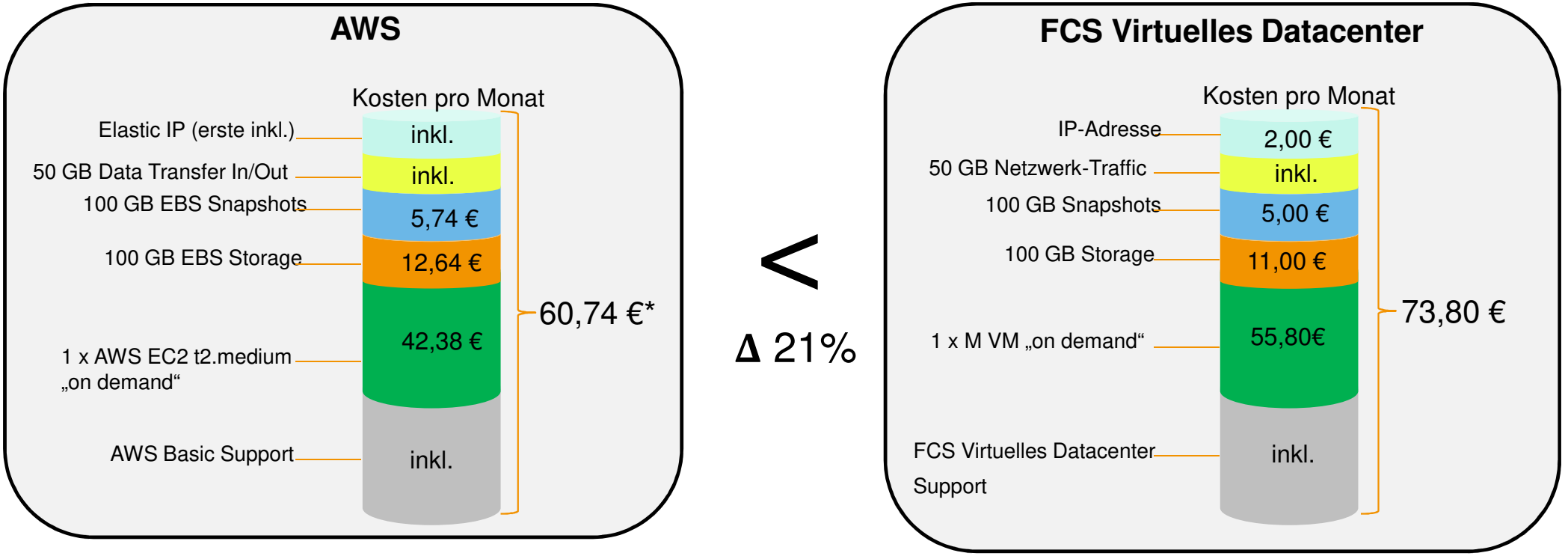
Kostenvergleich FCS Virtuelles Datacenter vs AWS (2 CPU, 4 GB RAM)



*+ ggf. zusätzliche Kosten, abhängig von der gewählten Support Variante (Development, Business, Enterprise)

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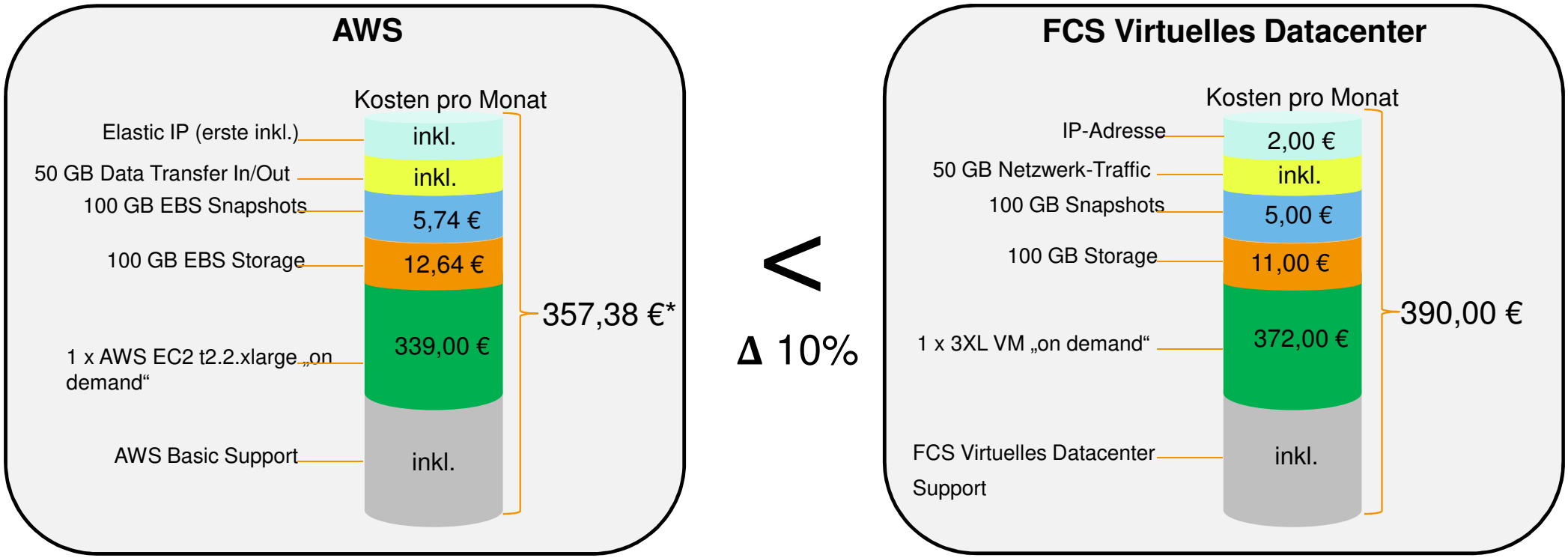
Kostenvergleich FCS Virtuelles Datacenter vs AWS (8 CPU, 32 GB RAM)



*+ ggf. zusätzliche Kosten, abhängig von der gewählten Support Variante (Development, Business, Enterprise)

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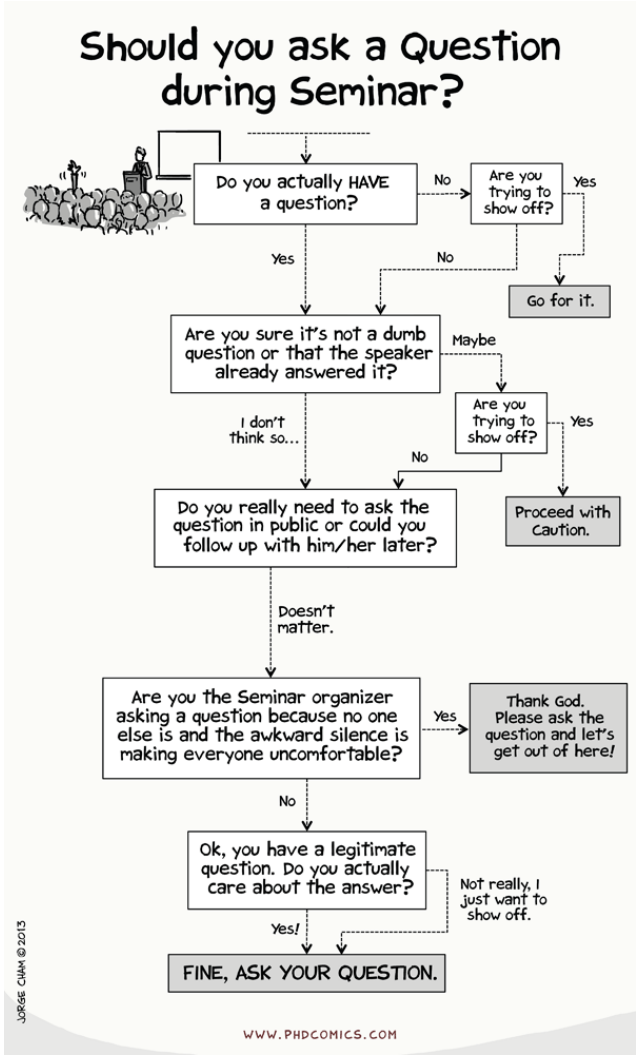

Should you ask a Question during Seminar?
Do you actually HAVE a question?
No
Are you trying to show off?
Yes
Yes
No
Go for it.
Are you sure it's not a dumb question or that the speaker already answered it?
Maybe
I don't think so...
Are you trying to show off?
Yes
No
Do you really need to ask the question in public or could you follow up with him/her later?
Proceed with Caution.
Doesn't matter.
Are you the Seminar organizer asking a question because no one else is and the awkward silence is making everyone uncomfortable?
Yes
Thank God. Please ask the question and let's get out of here!
No
Ok, you have a legitimate question. Do you actually care about the answer?
Not really, I just want to show off.
Yes!
FINE, ASK YOUR QUESTION.
JORGE CHAM © 2013
WWW.PHDCOMICS.COM

© Fraunhofer

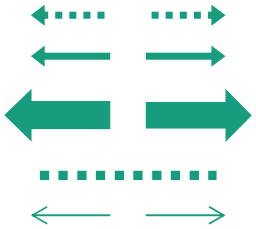
Graphische Elemente
Kästen, Pfeile, Verbindungen und Linien (Auswahl)

! DIESE FOLIE AUS FINALER PRÄSENTATION LÖSCHEN !

Folgende Elemente können hier per Rechtsklick kopiert und an gewünschter Stelle in der neuen Präsentation per Rechtsklick wieder eingesetzt werden:

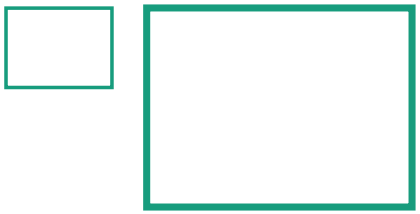
Kasten gefüllt

- Grau



Pfeile und Verbindungen

- Fraunhofer-Grün



Kasten mit Outline

- Fraunhofer-Grün
- Linienstärke je nach Größe 0.75, 1.5, 3 pt
- Je größer der Kasten, desto stärker die Linie

Linien

- Fraunhofer-Grün, bis 0.75 pt auch Schwarz
- Linienstärke gestrichelt: 0.75 pt
- Linienstärke durchgezogen: 0.75, 1.5, 3 und 4.5 pt

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Schrift
Schriftschnitt, Größe, Anwendung

! DIESE FOLIE AUS FINALER PRÄSENTATION LÖSCHEN !

Die Vorlage verwendet die Schrift »Frutiger LT Com «
in den Schriftschitten 55 und 65.

Die folgenden Varianten sind möglich:

Hauptüberschrift

Zwischenüberschrift

Standardtext

Graphiken und Bilder

- Hauptüberschrift:
  32, 28 und 24 Punkt
- Zwischenüberschriften:
  28 und 24 Punkt
- Standardtext:
  18 Punkt
- Graphiken und Bilder:
  18 und 14 Punkt

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Diagramme/Tabellen
Hinweise zur Gestaltung/zum Umgang

! DIESE FOLIE AUS FINALER PRÄSENTATION LÖSCHEN !

Beispiele für Balken-, Linien- und Tortendiagramme.
Diese sind bearbeitbar und per Rechtsklick kopier- und einfügbar.

Hintergrundfläche/Linien:

- Tabellen, Graphiken und Diagramme werden mit einer hell gerasterten Farbfläche unterlegt. Erlaubt sind Hellgelb, Hellblau und Hellgrau; siehe unter Farben
- Gitternetzlinien sind schwarz, gestrichelt und 0,75 pt stark. Es gibt entweder ein waagerechtes oder ein senkrechtes Gitternetz (je nach Diagramm)

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Diagramme/Tabellen
Hinweise zur Gestaltung/zum Umgang

! DIESE FOLIE AUS FINALER PRÄSENTATION LÖSCHEN !

Diagrammfarben:

- Möglichst nur eine der definierten Graphikfarben aus der Farbpalette verwenden; zur Differenzierung Abstufungen aus dieser gewählten Farbe nutzen

Generelle Verwendung:

- Möglichst Balken- und Liniendiagramme verwenden;
  Tortendiagramme sind möglich, sollten aber die Ausnahme bleiben
- Die Diagramme wurden so gestaltet, dass diese einfach mit Excel erstellt werden können

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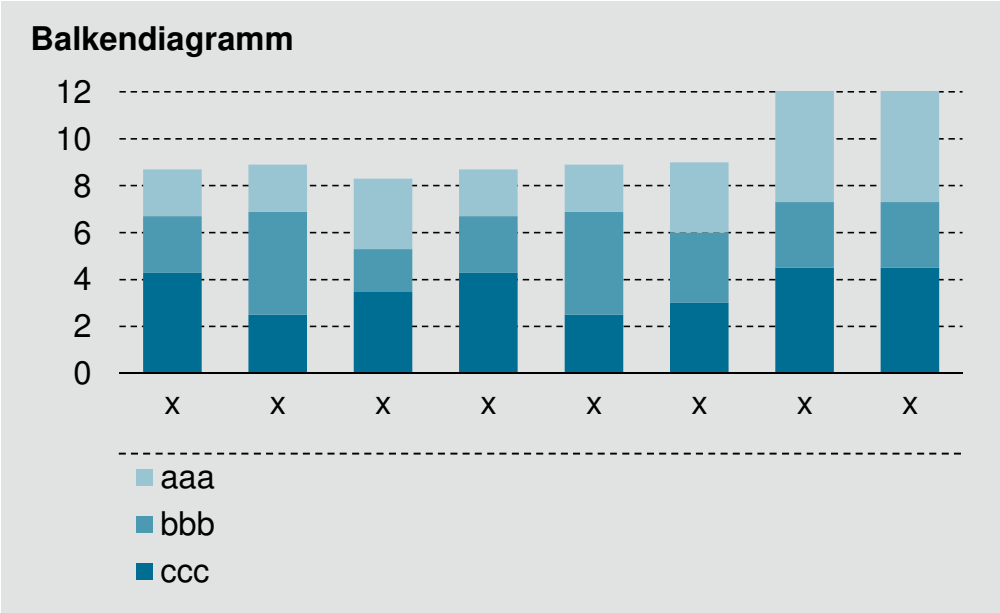
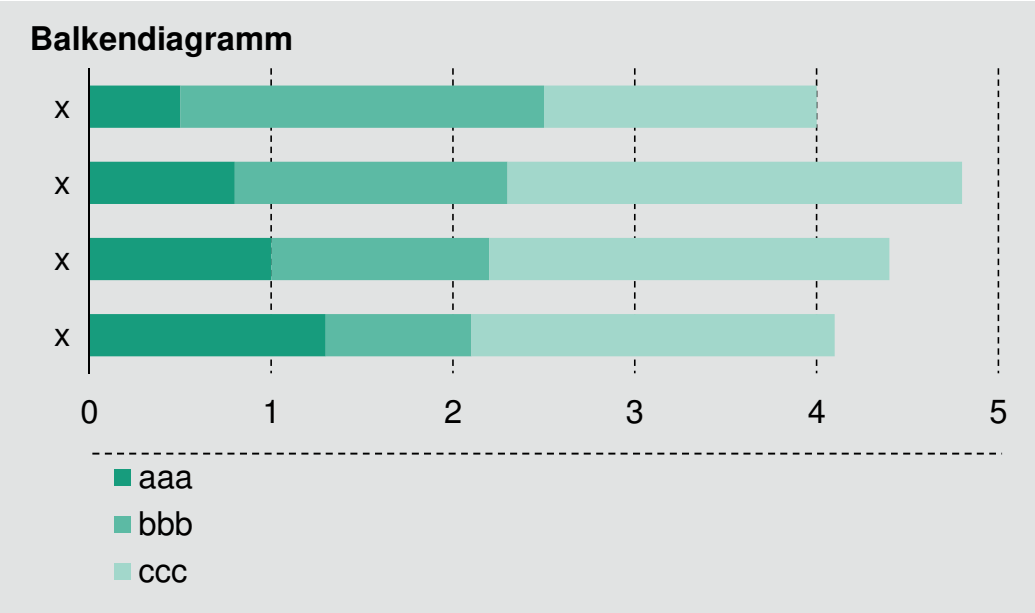
intern

Diagramme/Tabellen
Balkendiagramm

! DIESE FOLIE AUS FINALER PRÄSENTATION LÖSCHEN !

Diese Diagramme/Tabellen sind bearbeitbar und per Rechtsklick kopier- und einfügbar. Wenn sich dabei Farben/Formatierung ändern sollten, einfach auf das kleine »(Strg)«-Feld klicken und unter »Einfügeoptionen > Ursprüngliche Formatierung beibehalten« wählen.





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Diagramme/Tabellen
Liniendiagramm, Tortendiagramm

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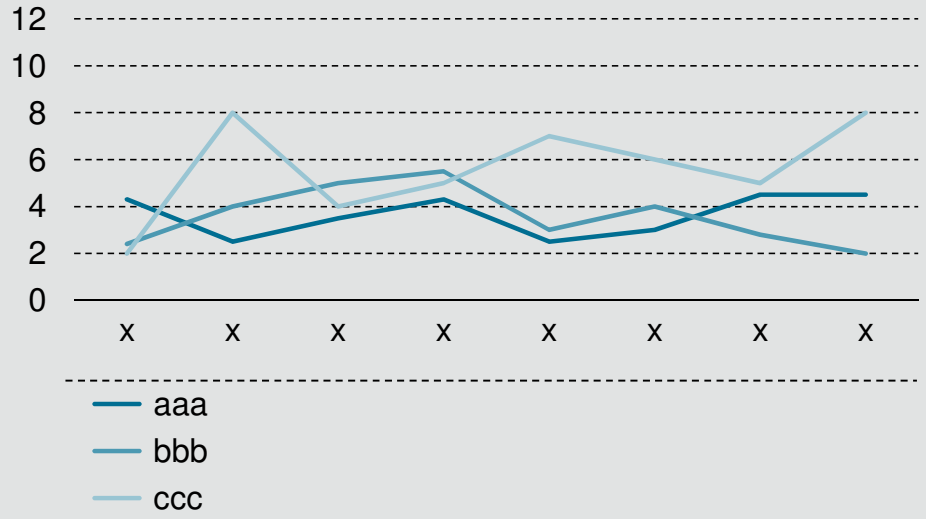
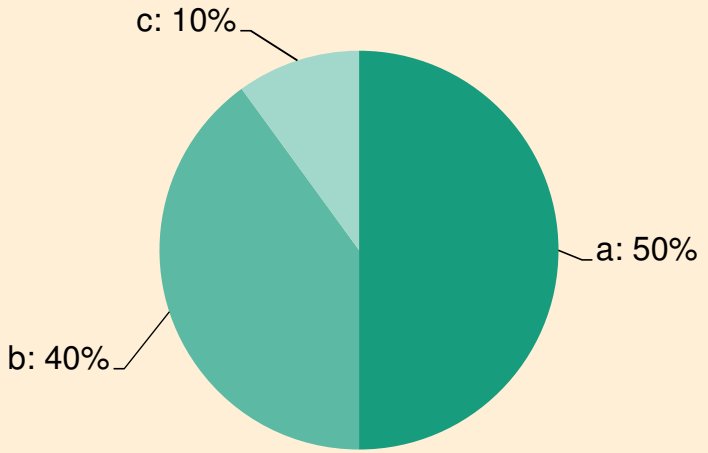
Diese Diagramme/Tabellen sind bearbeitbar und per Rechtsklick kopier- und einfügbar. Wenn sich dabei Farben/Formatierung ändern sollten, einfach auf das kleine »(Strg)«-Feld klicken und unter »Einfügeoptionen > Ursprüngliche Formatierung beibehalten« wählen.

Liniendiagramm



Tortendiagramm



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Diagramme/Tabellen
Tabellen

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Diese Tabelle ist bearbeitbar und per Rechtsklick kopier- und einfügbar.
Wenn sich dabei Farben/Formatierung ändern sollten, einfach
auf das kleine »(Strg)«-Feld klicken und unter »Einfügeoptionen >
Ursprüngliche Formatierung beibehalten« wählen.

Tabelle

Lorem ipsum dolor	**Sit amet**	**consetetur**
At vero et justo	Magna aliquyam	123
Eos et accusam	No sea	456
Duo dolores	At vero et justo	789
Stet clita kasd	Labore et dolore	123
Gubergren	Lorem ipsum dolor	456
No sea	Eos et accusam	123
Labore et dolore	Gubergren	456
Total:		**2.526**

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Diagramme
Technische Hinweise (nur für Office 2010)

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Im Gegensatz zu Office 2003 kann das Diagramm direkt bearbeitet werden, ohne zwischen Bearbeitungs- und Realmodus zu wechseln. Durch Rechtsklick auf das Diagramm:

- »Daten bearbeiten«: Werte und Beschriftungen in Excel-Liste ändern
- »Diagrammbereich formatieren«: Hintergrundfläche des Diagramms ändern

Balken-/Linien-/Tortenflächen direkt anklicken, dann Rechtsklick:

- »Datenbeschriftung formatieren«: Eigenschaften der Beschriftung ändern
- »Datenreihen formatieren«: Eigenschaften der Flächen ändern
  (u. a. kann man hier unter »Reihenoptionen« auch die Balkenbreite durch Erhöhung oder Reduktion der Abstandsbreite verändern)

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Tabellen
Technische Hinweise (nur für Office 2010)

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Durch Ziehen des Mauszeigers können einzelne Zellen der Tabelle markiert oder durch Klicken auf den Rand der kompletten Tabelle kann alles markiert und durch Rechtsklick bearbeitet werden (»Zeilen/Spalten einfügen/löschen«, »Zellen verbinden/teilen« und »Form formatieren«).

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Farben – allgemeine Farbpalette

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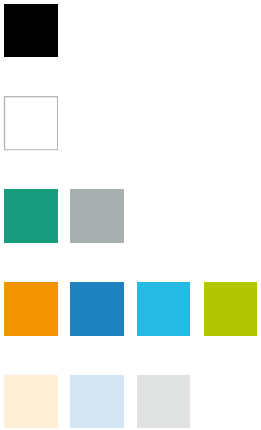
Fraunhofer-Farben können über die Powerpoint-Farbauswahl aufgenommen und in der neuen Präsentation angewendet werden:

- Überschriften/Fließtext/Quellenangaben/ Bildunterschriften/Graphikauszeichnungen
- Graphikauszeichnungen
- Aufzählungen/Nummerierungen erster Ebene/ graphische Elemente
- Graphiken
- Fonds hinter Graphiken



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Sonderzeichen – zum Kopieren

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