slices DE

A Digital Research Infrastructure for Computing and Communication in Germany and Europe

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Communication and Computation Experimental Research

Current situation: highly hetereogenous research infrastructures

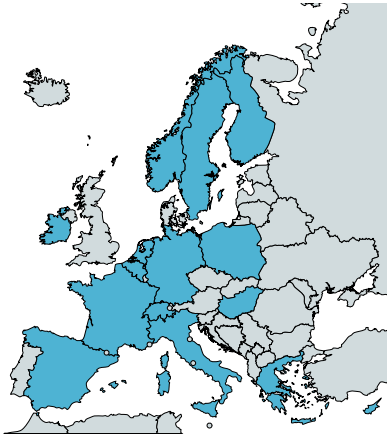
- Purpose-built setups
- Difficulty to modify or extend experiments of other researchers

Demo session @ 6G Platform Conference in Berlin

SLICES-RI (Research Infrastructure)

SLICES-RI

- Scientific Large Scale Infrastructure for Computing/Communication Experimental Studies (SLICES)
- Goal: Create a European research infrastructure for computing and communication by the community for the community
- Funding framework: European Strategy Forum on Research Infrastructures (ESFRI)
  - Long-term funding framework (**>10 years**) for large-scale infrastructures (e.g., telescopes or particle accelerators)
  - SLICES became part of the European ESFRI roadmap in **2021**
  - SLICES is the first **digital** RI not as a provider for others but for the digital community itself
  - Shared funding between EU (focus on coordination projects) and national funding agencies (focus on infrastructure resources)



Partner countries of SLICES-RI

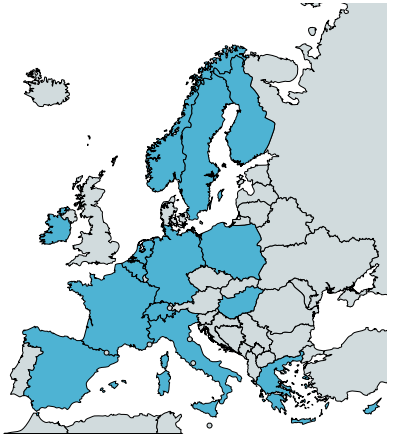
SLICES-RI (Research Infrastructure)

SLICES-RI milestones

- 2020–2022 SLICES-DS (design study) H2020 project
- 2021–2024 SLICES-SC (starting communities) H2020 project
- 2024 Start of the pre-operation of SLICES-RI
- 2023–2025 SLICES-PP (preparatory phase) H2020 project

Planned steps

- Starting in 2026: SLICES-IP (implementation phase) H2020 project
- Founding of the SLICES-ERIC (European Research Infrastructure Consortium), the legal entity for SLICES-RI
  - Only countries can become member of ERICs
  - National nodes organize the national activities



Partner countries of SLICES-RI

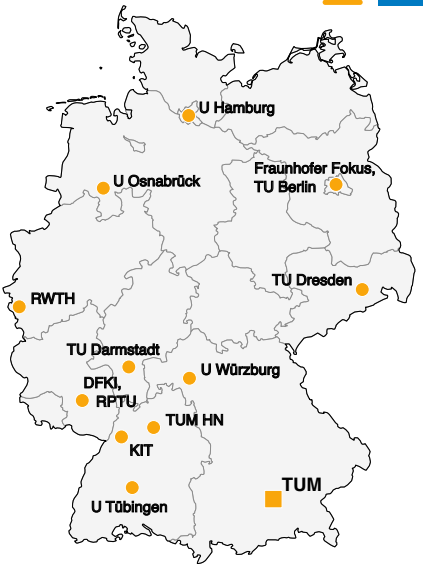
SLICES-DE

SLICES-DE

- TUM is the designated national node for Germany
- Goal: Create the German national research infrastructure aligned with the other infrastructures in SLICES-RI
- Coordination of activities in Germany with SLICES-RI
- Technically: Connecting German testbeds to SLICES services, with authentication (OpenID) and reproducibility (with pos)

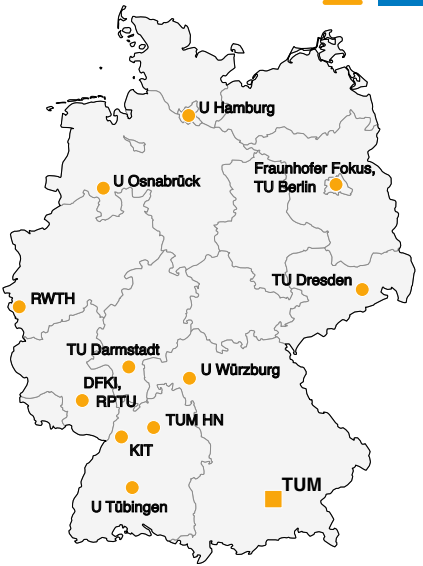
Milestones

- 2020 Uni Würzburg signs SLICES LoI
- 2021 TUM joins SLICES-SC project
- 2024 Submission of draft proposal for SLICES-DE at the BMFTR
- July 8, 2025, Dorothee Bär, Minister of BMFTR announces SLICES-DE to become part of the German national roadmap for large-scale FIS (Forschungsinfrastrukturen)



SLICES-DE

Organization	Participants	Selected Reserach Areas
TUM	G. Carle, S. Gallenmüller, J. Ott, W. Kellerer, I. Weber a. o.	NFV, Performance-Measurement, 6G, Edge, PQ-Crypto, AI for HPC
Fraunhofer FOKUS	Thomas Magedanz	6G RIC, AI for 6G
TU Berlin	Falko Dressler	Wireless Networks
dfki RPTU	Hans Schotten	6G RAN, Digital Twinning und KI
TU Dresden	Frank Fitzek, Giang Nguyen, Matthias Wählisch	6G Core und RAN, IoT, Quanten-Netzwerke, resilienter Internetbetrieb
RWTH Aachen	Klaus Wehrle	Vernetzte cyber-physische Systeme
TU Darmstadt	Björn Scheuermann, Matthias Hollick	Sichere Kommunikation, Mobilität
KIT	Thorsten Strufe, Martina Zitterbart	Hochleistungsnetze, KI für Netzwerke, Sicherheit
U Würzburg	Tobias Hoßfeld	Netzwerk-Performance
U Hamburg	Mathias Fischer, Hannes Federrath, Janick Edinger	Secure Networks, Privacy, Edge AI, Security and Privacy for AI
TUM	Stephan Günther a. o.	Coded Networks
U Osnabrück	Nils Aschenbruck	Hybrid NTNs
U Tübingen	Michael Menth	Network Softwarization



SLICES: Technical Background

Infrastructure

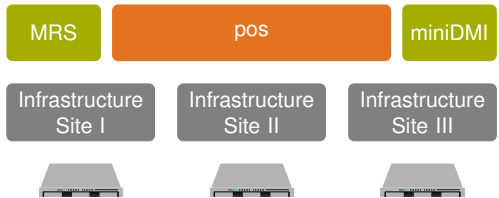
- Shared testbed resources (Europe & Germany)
- Basic services for access and reservation
- Connectivity between different testbeds

[0] [1] S. Gallenmüller*, D. Scholz*, H. Stubbe, and G. Carle, „The pos Framework: A Methodology and Toolchain for Reproducible Network Experiments“, in CoNEXT '21: The 17th International Conference on emerging Networking EXperiments and Technologies, Virtual Event, Munich, Germany, December 7 - 10, ACM, 2021. DOI: 10.1145/3485983.3494841

SLICES: Technical Background

Reproducibility and Data Management

- Reproducibility and data management are an integral part of SLICES-RI
- Plain orchestrating service (pos)[1]
  - Framework to ensure reproducible experiments through a well-structured experiment workflow
  - Developed at our research group at TUM
  - Already part of SLICES-RI pre-operation (Nov. 2024)
- Data management
  - Automated collection of data and metadata for experiments
  - Compliance with FAIR principles:
    Findable, Accessible, Interoperable, Reusable
  - Alignment with European and German initiatives:
    - European Open Science Cloud (EOSC)
    - Nationale Forschungsdateninfrastruktur (NFDIxCS)
  - SLICES services for data management
    - MRS (metadata registry service)
    - miniDMI (mini data management infrastructure)



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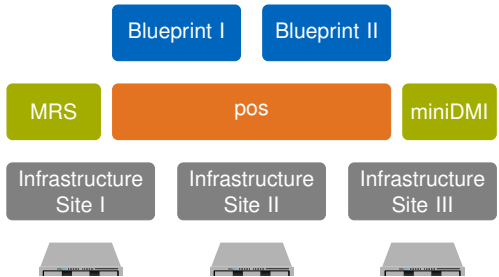
SLICES: Technical Background

Blueprints

- Fundamental building principle of SLICES
- Blueprints represent a reference experiment for a specific community (e .g., 6G, Cloud-edge continuum)
- Scientific communities create and extend blueprints
- Blueprints allow to focus on the actual experiment rather than infrastructure maintenance

Differences to other testbeds

- Testbeds typically focus on providing resources
- SLICES offers a platform for experiments offering additional services
  - Reproducibility through pos
  - Services for data management
  - Reference experiments (blueprints)



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SLICES: Technical Background

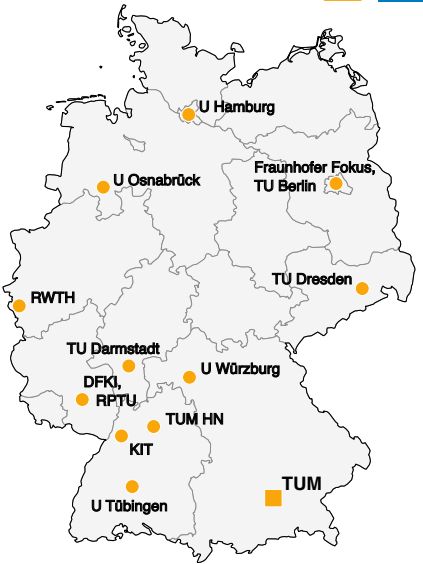
Planned usage scenarios

- Research
  - On-demand experiments, e.g., benchmarks
  - Long-running experiments and observations, e.g., longitudinal measurements, monitoring
- Training & Teaching
  - SLICES-DE platform can be used to host a virtual infrastructure for lab courses or lectures
  - Each participants gets their own resources (VM or container)
- Collaboration with industry
  - Different collaboration models possible:
    - Direct collaboration: Industry directly uses testbed resources
    - Shared components: Integration of new resources into testbed
    - Replicated testbed: Industry partner creates separate testbed (using SLICES/pos toolchain and API)
    - Joint projects: Academia and industry share common testbed for joint projects

SLICES-DE Community

Benefits of SLICES-DE

- SLICES-DE is planned to be available for the whole community
- . . . for academia:
  - **Research:** Access to state-of-the-art hardware & software for experiments
  - **Teaching & education:** Individual resources for each student
- and industry:
  - **Collaboration Models:** Flexible cooperation opportunities with academia and research institutions.
  - **Reuse of results:** Simplified transfer of results from academia to industry through joint infrastructure.

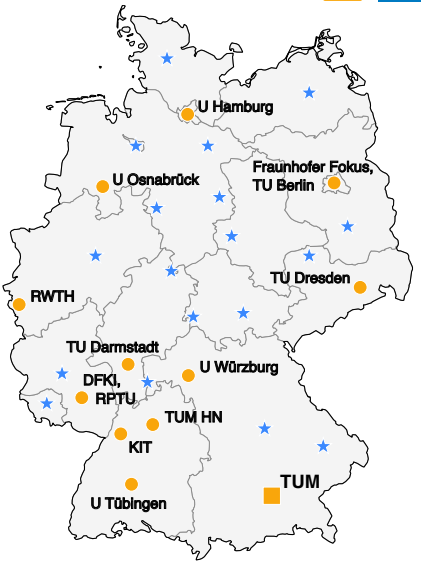


SLICES-DE Community

How to participate?

- SLICES-DE concept will be evaluated before creation starts
- A strong community participation (universities (of applied sciences), organizations, companies) will help to secure the success of SLICES-DE
- Send us an LoI stating:
  - Field & expertise,
  - Planned use of SLICES-DE, and
  - Contribution interest.

https://slices-de.org/community/



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Bibliography

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