



# GAIA-X Technical Deep Dive 2021-02-17

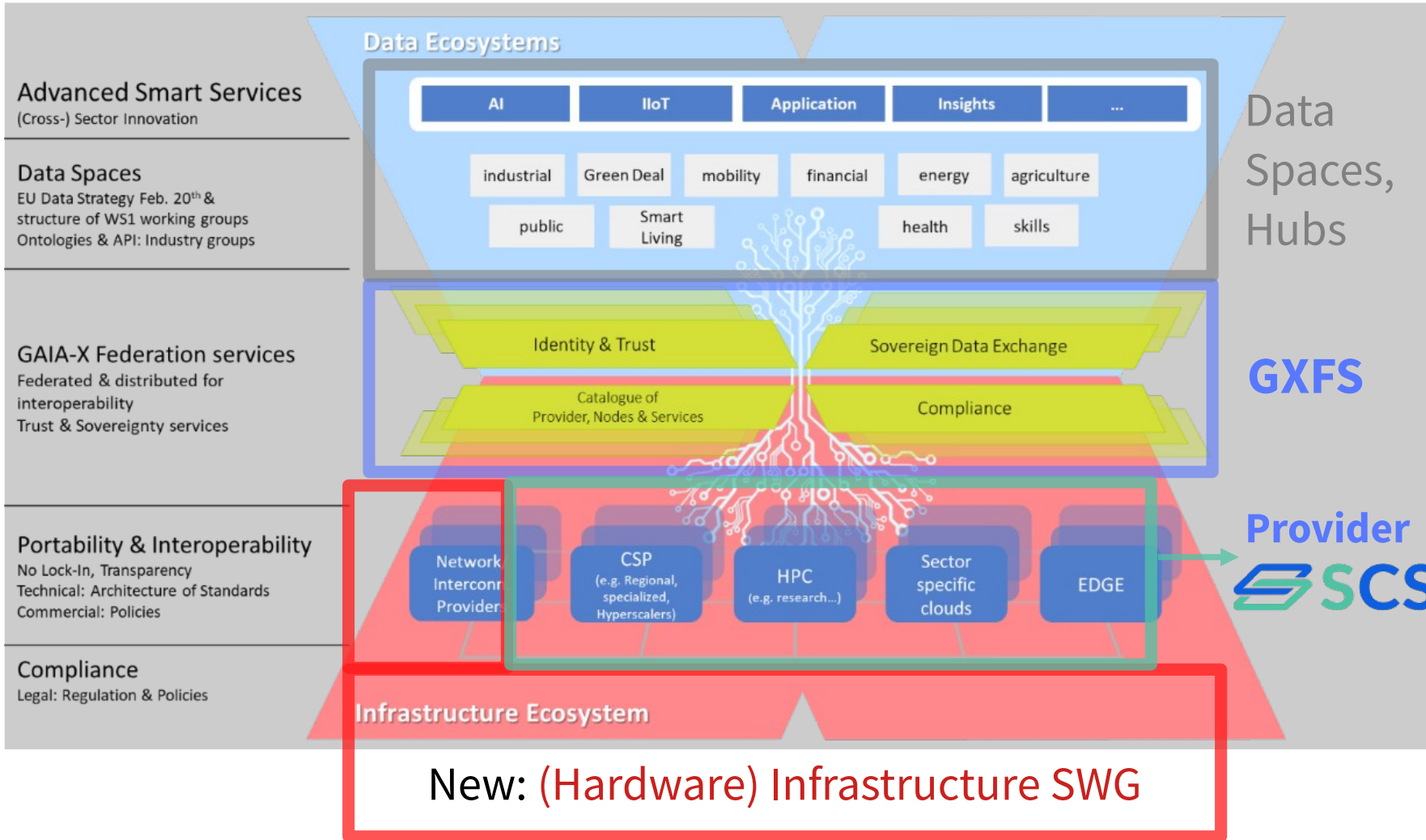
## Sovereign Cloud Stack

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# GAIA-X Map



GAIA-X's mission is to strengthen digital sovereignty for business, science, government and society by empowering the development of innovation ecosystems. Digital sovereignty means that these individuals, organizations and communities stay in complete control over stored and processed data and are enabled to decide independently who is permitted to have access to it.

Source: (w/o frames)

[https://www.data-infrastructure.eu/GAIA-X/Redaktion/EN/Publications/gaia-x-the-european-project-kicks-of-the-next-phase.pdf?\\_\\_blob=publicationFile&v=7](https://www.data-infrastructure.eu/GAIA-X/Redaktion/EN/Publications/gaia-x-the-european-project-kicks-of-the-next-phase.pdf?__blob=publicationFile&v=7)



GAIA-X

# Sovereign Cloud Stack vision & mission

We imagine the desired IT landscape to be under the control of the developers and users, supported by a broad set of providers that deliver modern IT infrastructure and data services in certifiable interoperable and federated ways respecting their users' rights, data protection and security requirements. The easy availability of such compliant services enables digital innovation across the industry, research and public sector.

Sovereign Cloud Stack empowers IT developers and users to innovate on modern, self-service automated IT infrastructure that is sovereign, i.e. under their own control or under control of federatable providers that they can choose according to their technical, strategic and regulatory needs from a broad set of choices.



# SCS Goals & Vision



## Standardization

- Of the offered interfaces (compatibility for users)
- Operator – Focus: Configuration, Operations Tooling, Continuous Ops Processes
- Create scale advantages for all

## Certification

- Verifiable Compatibility/Interoperability, Quality, Security

## Transparency

- Completely Open Source Software, Open Community, Open Design and Development
- Open Ops: Configuration, Operational Processes and Operations Knowledge (new!)
- GAIA-X Self-Descriptions

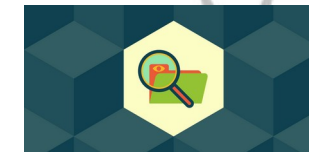
## Sustainability

- Long-term existence of SCS
- Contribute back to existing upstream projects
- Efficient usage of resources

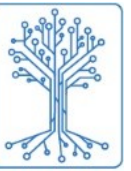
## Federation

- Network of federated, compatible providers is better than monolithic structure
- Allows for specialization and differentiation

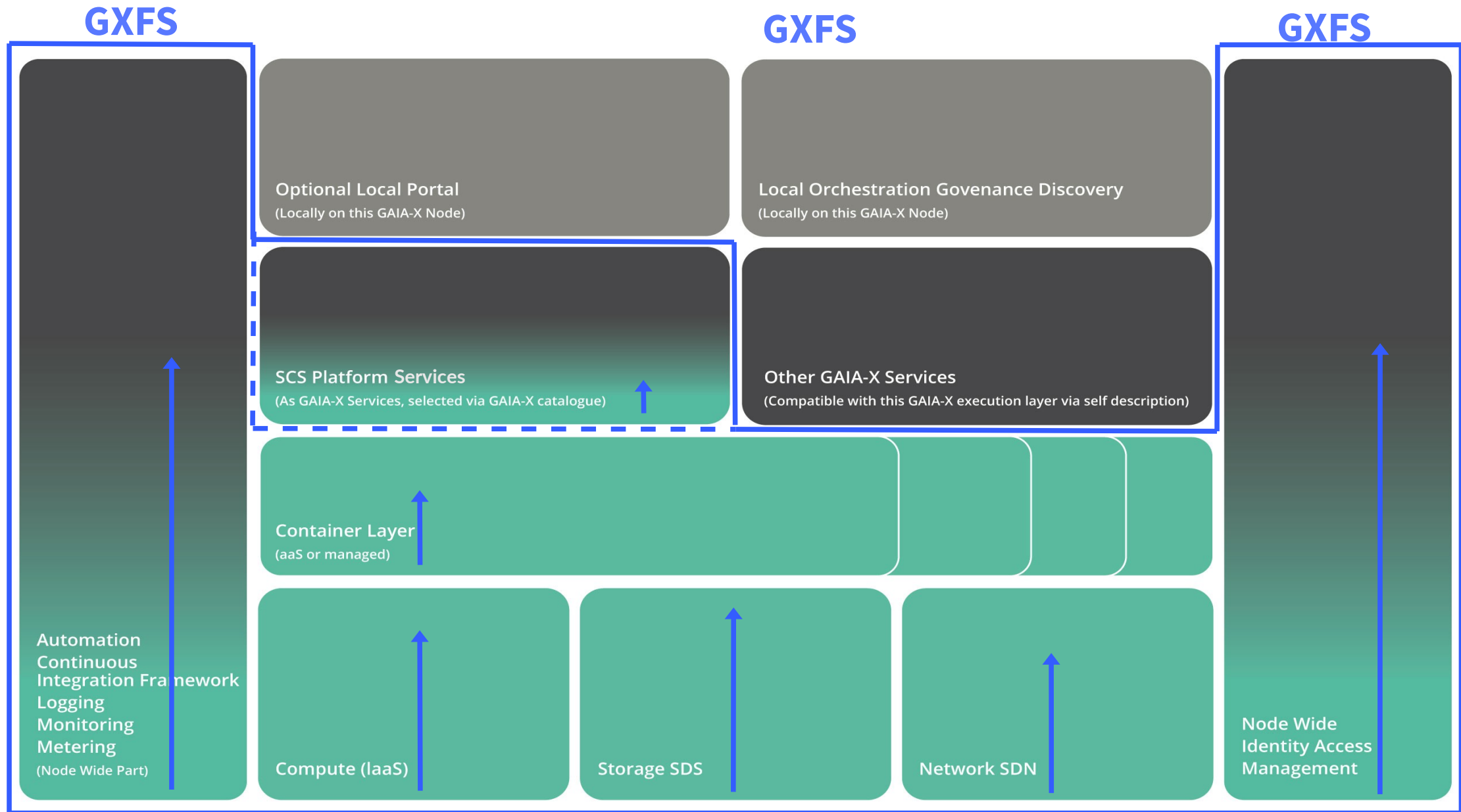
=> Relevance as one federated platform



# Building the SCS architecture bottom up



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# SCS project status



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## Organization

- Project team started in early 2020 with SPRIN-D funding
- Part of GAIA-X (WS2/SWG 1.4 → GAIA-X Community Project under iTC Provider WG)
- BMWi funding requested (tentative start Mar 1, 2021, team @ OSB Alliance e.V. coordinating partners)
- Homepage (<https://scs.community/>), source code on [github/SovereignCloudStack](#)
- ~15 engineers from partners regularly contributing code/artifacts, weekly sprints

## Standardization & Ecosystem

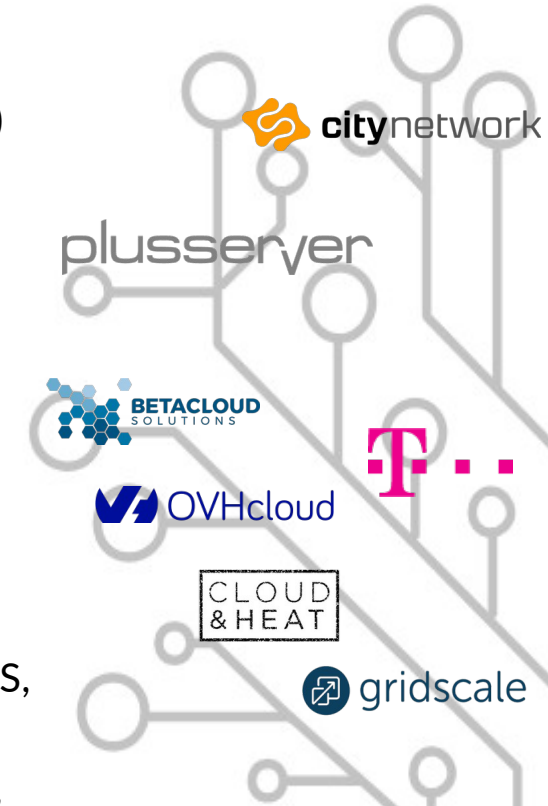
- Working with existing providers: Betacloud Solutions, PlusServer, CityNetwork, T-Systems, OVH, Cloud&Heat, gridscale, StackHPC, IONOS, ...
- Working with industry (private clouds @ e.g. automobile, HPC)
- Working with public sector (Germany)

## Implementation

- Automated deployment of federatable IAM, Ops Tooling (LCM, Monitoring, CI, Security, telemetry), SDS, SDN, IaaS (OpenStack) – [daily deployments \(CI/CD\) on virtual environments \(city, plus, ...\)](#)
- KaaS is WIP (k8s cluster API + Gardener), CNI+CSI, Container tooling (helm, mesh, registry, monitoring, tracing)
- PaaS => ecosystem, standardized base in 2022
- Release Plan: R0: End of 3/2021, R1: 9/2021, R2: 3/2022, ...

## Transparency & Certification

- GAIA-X self descriptions exist (rudimentary)
- TBD: Convert chosen standards (all open source!) into automated standards compliance tests





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# SCS in GAIA-X

## PlusServer hosts first open SCS development platform

- open for GAIA-X developers that interface infra
- more to come (OSBA, possibly virtual @OTC, OVH, CityNetwork, ...)

## Test & validate GXFS concepts/pilots on SCS

- ideally, using SCS to test that concepts can be implemented (PoC)
- iterative refinement
- implement IAM (both SP and IdP sides)

## Ensure license compatibility

## Develop Self-Descriptions together

- Need to develop standard vocabulary to achieve service orchestration and composition (TOSCA?)
- SCS fully transparent – which properties do we want to expose?
  - Functional (Features, API, ...)
  - Non-functional (SLA, quality, security, data protection, control, monitoring, legislation, ...)
- Develop (automated) conformance tests → CI

## Future: Standard SCS platform services definition



# Webpage

<https://scs.community/>

&

# github

[github/SovereignCloudStack](https://github.com/SovereignCloudStack)

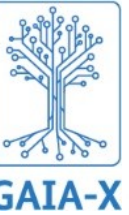


The screenshot shows the homepage of the Sovereign Cloud Stack community. At the top left is the logo for Sovereign Cloud Stack. Below the logo are navigation icons for home, mail, phone, refresh, document, and code. A list of roles and locations is provided, including Product Owner Container Technologies (Mar 21, Home Office / Berlin), Knowledge Management Engineer (Mar 21, Home Office / Berlin), Product Owner IaaS and Operations (Jun 21, Home Office / Berlin), Community Manager (Aug 21, Home Office / Berlin), and Staff / Project Management/Documentation (Mar 21, Berlin / Home Office). A contact note for Kurt Garloff is included. The bottom section, titled 'Supporting companies', features logos for 23 Technologies, B1 SYSTEMS, BETA CLOUD SOLUTIONS, citynetwork, CLOUD & HEAT, dilossacon, GONICUS, gridscale, OSB Open Source Business ALLIANCE, OX, OSF, OVHcloud, plusserver, SPRIN-D, Stackable, and StackHPC, along with the univention logo.

The screenshot shows the GitHub repository page for Sovereign Cloud Stack. The repository name is 'testbed-gx-scs'. The description is 'GAIA-X Sovereign Cloud Stack (SCS) testbed'. It shows 0 forks, 0 stars, 0 issues, and 0 pull requests, updated 9 days ago. Below this are three other repositories: 'website' (Base content for scs.community, 1 fork, 0 stars, 2 issues, 0 pull requests, updated 9 days ago), 'testbed' (Forked from osism/testbed, Hyperconverged infrastructure (HCI) testbed based on OpenStack and Ceph, 5 forks, 2 stars, 0 issues, 0 pull requests, updated 10 days ago), and 'poc-gardener' (Automatically set up SAP Gardener on SCS compliant IaaS, 0 forks, 0 stars, 0 issues, 0 pull requests, updated 12 days ago). At the bottom, 'Design-Docs' (Design Documents, Architecture etc. for SCS and related technology, 0 forks, 1 star, 2 issues, 1 pull request, updated 13 days ago) and 'k8s-gatekeeper' are listed.



# Discussion & Call to Action



**Join us! Help us to define and implement an open source federated sovereign cloud stack together!**

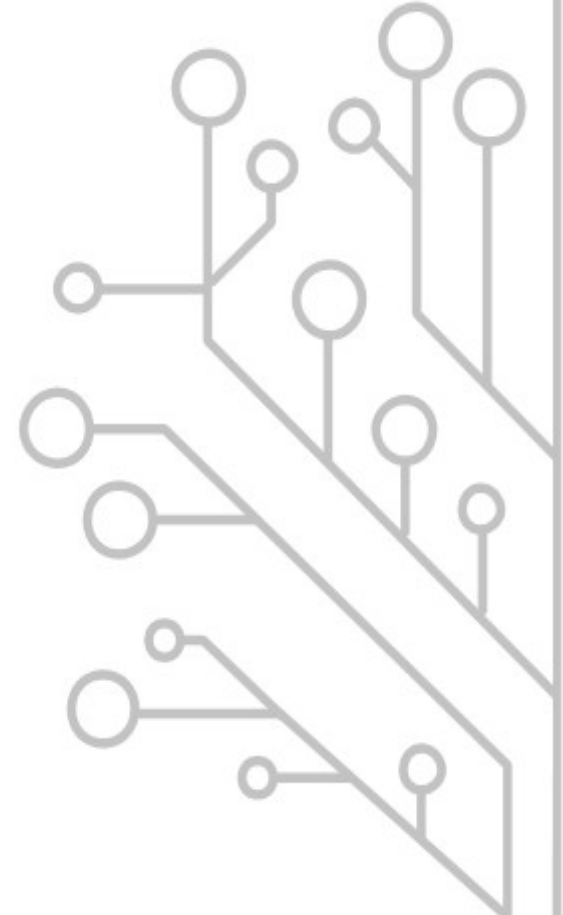
**We're looking for hands-on architects, developers, quality engineers, ... (Jobs @ OSBA and with partners)**

**We're looking for requirements and for growing the set of SCS providers.**

**GAIA-X: <https://www.data-infrastructure.eu/>**

**SCS Project: <https://scs.community/>**

**EMail: [project@scs.sovereignit.de](mailto:project@scs.sovereignit.de)**



Backup

# SCS Deliverables



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Ecosystem

- CSPs: Share Ops Best Practices
- Transparency on Quality, RCAs
- Open Ops
- One set of interfaces for ISVs, Operators, Consultants, ...
- **Stretch goal: Cross-reselling**



Software

Standards

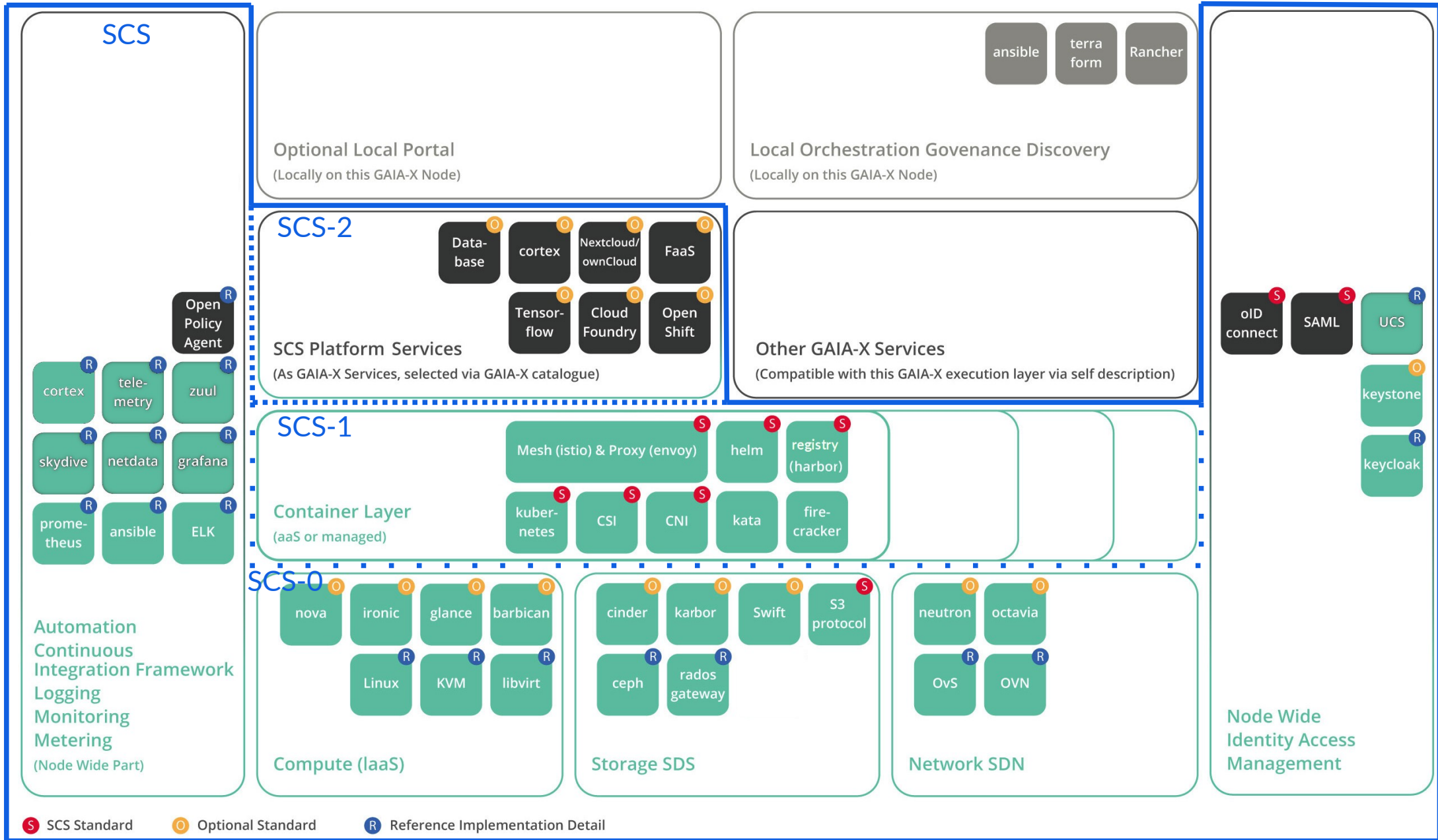
- Complete Stack: IaaS, KaaS, (PaaS)
- Including Ops: Lifecycle Mgmt, Infra, CI, Moni
- Including Federatable IAM
- Modular
- Open (4x)

- Strict standards: IaaS, k8s, k8s cluster mgmt Behavior (e.g. AZ definition), roles
- Ops standards (e.g. updating!)
- SLAs
- GAIA-X Self-Desc

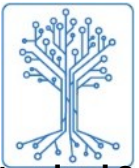
# SCS Architecture (current status)



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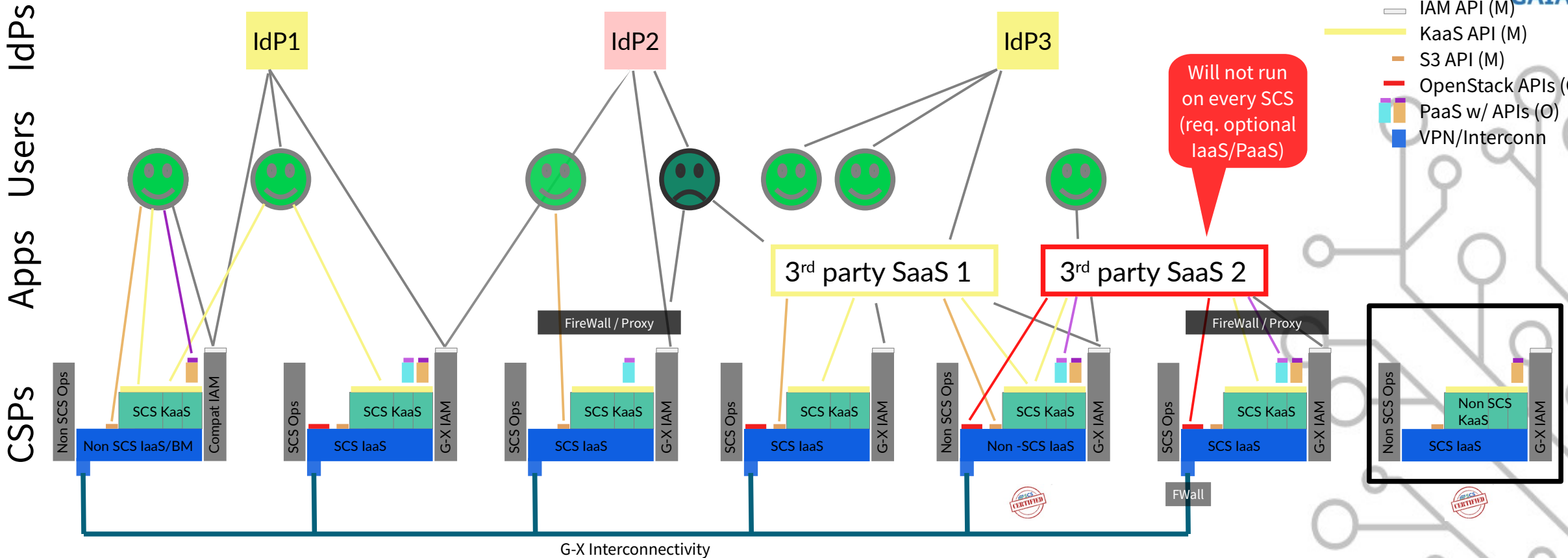
S SCS Standard   
 O Optional Standard   
 R Reference Implementation Detail



# CSP ecosystem target (examples)

## Legend: Standard SCS

- IAM API (M)
- KaaS API (M)
- S3 API (M)
- OpenStack APIs (O)
- PaaS w/ APIs (O)
- VPN/Interconn



Prov1: (public)	Prov2: (public)	Prov3: (priv/comm)	Prov4: (public)	Prov5: (public)	Prov6: (priv/corp)	Prov7: (gov/mil)
Using preex IaaS or BM, not exposing IaaS, Non-Std Ops, Compat IAM	Standard SCS Ops, IaaS (exposed), IAM, KaaS, S3, PaaS 1+2	Extra protection (limit users/IdPs)	Standard SCS Ops, IaaS (exposed), IAM, KaaS, S3	Non-Standard Ops, IaaS (but certified & exposed as std)	Extra protection for Interconnect, limited federation	Air-Gap protected Own KaaS, but compatible (cert)
Standard SCS KaaS, S3, PaaS 2		Standard SCS Ops, IaaS (not exposed), IAM, KaaS, S3, PaaS 1		Standard SCS IAM, KaaS, S3, PaaS 1+2	Standard SCS Ops, IaaS (exp), IAM, KaaS, S3, PaaS 1+2	Still using std SCS Ops, IaaS (not exp), IAM, S3, PaaS 2

# Flow of automated deployment

(currently covering: Infra, IaaS, Ops)

Physical SCS can of course host virtual SCS  
Nested virtualization support recommended



## Physical deployment

Production („Live“)

Server buying, racking, cabling

MaaS  
Netbox  
zabbix

Ansible: Setup Mgr, Nodes:  
- Infra: Database, MemCache, rabbitMQ  
- Infra: ceph+radosgw, OvS/OVN  
- OpsTooling: ARA, ELK, netdata, prometheus, patchman  
- IaaS: OpenStack Core (nova, keystone, ...)  
- Validation (WIP): Smoke tests, confest, RefStack, OPA

## Virtual (testbed) deployment

Dev, Testing / CI („Ref/Test“)  
Demo, Explore, Debug, ...

Bootstrap:  
terraform  
(on IaaS)

Ansible: Setup Mgr, Nodes:  
- Infra: Database, MemCache, rabbitMQ  
- Infra: ceph+radosgw, OvS/OVN  
- OpsTooling: ARA, ELK, netdata, prometheus, patchman  
- IaaS: OpenStack Core (nova, keystone, ...)  
- Validation (WIP): Smoke tests, confest, RefStack, OPA



<https://github.com/OSISM>

<https://docs.osism.de/>

<https://docs.osism.de/testbed/>

<https://github.com/OSISM/testbed>

<https://github.com/SovereignCloudStack/testbed>

