

# Application and Network Services Management with TOSCA 2.0



# WHO ARE WE?



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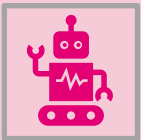
# WHAT IS TOSCA?



TOSCA is an ***OASIS Standard***



That defines a ***Domain-Specific Language*** (DSL)



For automating the ***Lifecycle Management*** of application, network, and infrastructure services.

# WHAT IS TOSCA USED FOR?

## **Infrastructure-as-a-Service Clouds**

Automate the deployment and management of workloads in IaaS clouds such as OpenStack, Amazon Web Services, Google Cloud Platform, Microsoft Azure, and others

## **Network Functions Virtualization**

Define the management of Virtual Network Functions and their composition into complex network services

## **Cloud-native applications**

Deploy containerized applications and micro-services, for example by interfacing to orchestration platforms such as Kubernetes

## **Software Defined Networking**

Support on-demand creation of network services (for example SD-WAN)

## **Functions-as-a-Service**

Define abstract software applications without any deployment or operational considerations

## **IoT and Edge computing**

Deploy services at the network edge with the goal of minimizing latency

## **Process automation**

Support open and interoperable process control architectures

# TOSCA IMPLEMENTATION STORIES

Date	Topic
Jan. 27, 2021	Turandot: A Lightweight Open-Source Orchestrator That Enables TOSCA for Kubernetes <ul style="list-style-type: none"><li>Tal Liron—Red Hat</li></ul>
Feb. 24, 2021	Inter-Cloud Computing: How TOSCA Helps Open Telekom Cloud Users Run Anywhere <ul style="list-style-type: none"><li>Tri Vo—T-Systems</li></ul>
Mar. 31, 2021	C-Plane: Using TOSCA for Automation Industrial Operations <ul style="list-style-type: none"><li>John Casey—CTO</li><li>Brandon Williams—Business Development</li></ul>
Apr. 28, 2021	Ubicity: Pure TOSCA Orchestration <ul style="list-style-type: none"><li>Chris Lauwers—CEO</li></ul>
May 26, 2021	Comcast: Commercial Network Services Lifecycle Management Using Model Driven Software Automation <ul style="list-style-type: none"><li>Gaurav Khandpur—Director, Software Engineering</li><li>Pattabi Ayyasami—Principal Engineer</li></ul>
June 30, 2021	Holistic modeling of HPC, FaaS, and Edge applications with RADON and SODALITE TOSCA extensions <ul style="list-style-type: none"><li>Giuliano Casale—Imperial College</li></ul>

[https://youtube.com/playlist?list=PLaYKtNo\\_BitYlGRp4NtuuPdd5zIrt9ZKV](https://youtube.com/playlist?list=PLaYKtNo_BitYlGRp4NtuuPdd5zIrt9ZKV)

# TOSCA'S UNIQUE FEATURES

Feature	Benefit
Graph-based models	Topology graphs encode service components and their dependencies
Typed language	<ul style="list-style-type: none"><li>• Reusable building blocks</li><li>• Design-time service validation</li></ul>
Requirements and capabilities	<ul style="list-style-type: none"><li>• Service design and service resource requirements specified in the same place</li><li>• Automated resource allocation</li></ul>
Substitution mapping	<ul style="list-style-type: none"><li>• In support of service decomposition</li><li>• In support of abstraction</li></ul>
Automated workflow generation	Based on dependencies defined in the service topology graph
Technology-independent	Plug-in paradigm based on generic and general-purpose artifacts concept

# HOW IS TOSCA DIFFERENT FROM TERRAFORM?



```
1 resource "aws_instance" "example" {
2   ami          = "ami-b374d5a5"
3   instance_type = "t2.micro"
4
5   depends_on = ["aws_s3_bucket.example"]
6
7   provisioner "file" {
8     source      = "script.sh"
9     destination = "/tmp/script.sh"
10  }
11
12  provisioner "remote-exec" {
13    inline = [
14      "chmod +x /tmp/script.sh",
15      "/tmp/script.sh args",
16    ]
17  }
18 }
```

**Infrastructure**

**Non-Infrastructure**

- Hard coding for a specific cloud provider.
- Limitation: cloud workloads may change their infrastructures frequently.



How does Open Telekom Cloud use TOSCA?



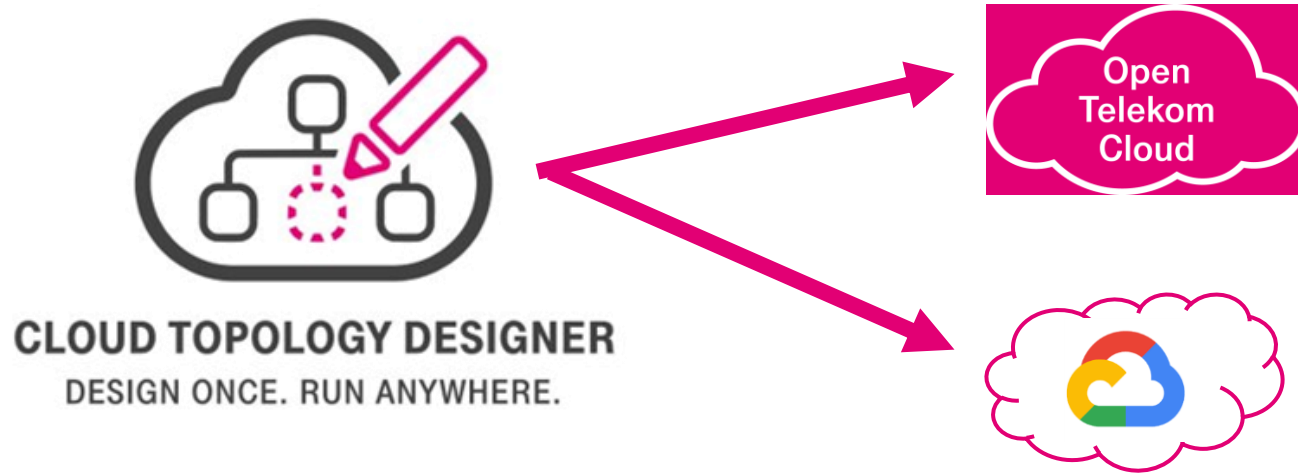
Infrastructure-as-a-Service since 2016

Biggest OpenStack platform in Europe

6000 m<sup>2</sup> = a football field

450 Petabytes of storage





- Based on the open-source projects: **Alien4Cloud** and **Yorc** from ATOS.
- We enhance with Security, Single-Sign-On with OpenStack keystone & Google OAuth, multiple networks, service catalogs, etc.

# WHAT ARE THE LIMITATIONS OF TOSCA 1.3?

Many powerful features are poorly documented (and as a result underappreciated)

- *Substitution mapping*—for service decomposition
- *Requirement fulfillment*—for automated resource allocation
- *Automatic workflow creation*—for desired state orchestration

Simple Profile type definitions are part of the standard

- Tied to Infrastructure-as-a-Service clouds
- Too abstract to be readily usable

Interface between Orchestrator and External Resources is underspecified

- Relies on *artifact processing* (e.g., of shell script artifacts)
- Lack of examples for REST interfaces, Netconf interfaces, Ansible playbooks, etc.

Insufficient support for event-driven paradigms

- Asynchronous orchestration
- FaaS
- Alerts and error handling

# WHAT IS NEW IN TOSCA 2.0?

## TOSCA Version 2.0 removes Simple Profile Types

- TOSCA v2.0 is a pure **language specification** only
- TOSCA v2.0 removes language dependencies on Simple Profile types

## Support for custom **Named Profiles**

- Defined by the community for specific application domains
- E.g., Kubernetes profile

## Clear definition of Orchestrator **Operational Model**

- To guide orchestrator implementors

## Standardized **Membrane** between Orchestrator and External Resource Managers

- In support of a wide variety of interface paradigms
- REST, Netconf, Ansible, etc.

## Support for additional **orchestration paradigms**

- Desired state/intent
- Asynchronous and event-driven

# HOW CAN I CONTRIBUTE TO TOSCA?

Our community depends on participation, as well as use. If you benefit from open source and open standards, consider contributing to help them be successful:

- **OASIS TOSCA Technical Committee**

<https://www.oasis-open.org/committees/tosca>

- **TOSCA LinkedIn Group**

<https://www.linkedin.com/groups/8505536/>

- **TOSCA Simple Profile in YAML v1.3**

<https://docs.oasis-open.org/tosca/TOSCA-Simple-Profile-YAML/v1.3/TOSCA-Simple-Profile-YAML-v1.3.html>

- **TOSCA Version 2.0 (Committee Spec Draft)**

<https://docs.oasis-open.org/tosca/TOSCA/v2.0/TOSCA-v2.0.html>

- **TOSCA Community Contributions**

<https://github.com/oasis-open/tosca-community-contributions>

- **(Partial) List of Known TOSCA Implementations**

<https://github.com/oasis-open/tosca-community-contributions/wiki/Known-TOSCA-Implementations>



An aerial night view of a port or shipping yard, illuminated by bright lights. The foreground is dominated by a large, dense stack of shipping containers. In the background, there are cranes and other port infrastructure. A large, semi-transparent magenta shape covers the left side of the image, serving as a background for the text.

# Q&A

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