# Multi-tenancy in scientific literature from Software as a Service perspective

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#### Research questions and data collection

- 1. How is multi-tenancy defined in scientific literature?
- 2. What is the connection between multitenancy and SaaS business model?
- 3. What challenges the characteristics of multitenancy can cause?

 Search for academic papers → filter out papers → select relevant papers

#### The definition of multi-tenancy

# The characteristics of multi-tenancy

# The characteristics of multi-tenancy

# The characteristics of multi-tenancy

# Multi-tenancy and single-tenancy

Native multi-tenancy (shared application, shared database, shared schema)

Single-tenancy









| App | licat | ion | Inst | tance |
|-----|-------|-----|------|-------|
|-----|-------|-----|------|-------|

**Application Server** 

Middleware

**Database Schema** 

**Database** 

**Database Server** 

Virtual Machine

Operating System

Hardware

Application Instance

**Application Server** 

Middleware

**Database Schema** 

**Database** 

**Database Server** 

Operating System

Virtual Machine

Hardware

Application Instance

**Application Server** 

Middleware

Database Schema

Database

Database Server

Operating System

Virtual Machine

Hardware

[1], [2], [3]

# Multi-tenancy variants and SaaS

Application Instance

**Application Server** 

**Database Schema** 

**Database** 

**Database Server** 

#### Multiple instances multi-tenancy

#### Single-tenancy



Tenant A

Application

Instance A

Application Instance B

Level I: Ad Hoc/Custom



Tenant B

#### Level II: Configurable



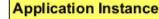


Tenant B

Tenant A

Application Instance

Application Instance



**Application Server** 

Database Schema

**Database** 

**Database Server** 

Operating System

Middleware

Virtual Machine

Hardware

Application Instance

**Application Server** 

Middleware

Database Schema

**Database** 

Database Server

Operating System

Virtual Machine

Hardware

Application Instance

Application Server

Middleware

**Database Schema** 

**Database** 

Database Server

Operating System

Virtual Machine

Hardware

[1], [2], [3], [4]

#### Multi-tenancy variants and SaaS

Level III: Configurable, Multi-Tenant Efficient





Tenant A

Tenant B

Application Instance

Level IV: Configurable, Multi-Tenant Efficient, Scalable





Tenant A

Tenant B

Tenant Load Balancer

Application Instance

Application Instance Native multi-tenancy (shared application, shared database, shared schema)





Application Instance

**Application Server** 

Middleware

**Database Schema** 

**Database** 

**Database Server** 

Operating System

Virtual Machine

Hardware

Semi-multi-tenancy (shared application, separate databases)





Application Instance

**Application Server** 

Middleware

Database Schema

**Database Schema** 

Database

Database

**Database Server** 

Operating System

Virtual Machine

Hardware

#### Conclusion

- 1. Many definitions three main characteristics
- 2. Variants of multi-tenancy attribute of a mature well-defined SaaS application
- 3. Challenges in performance, maintenance and security areas

#### References

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