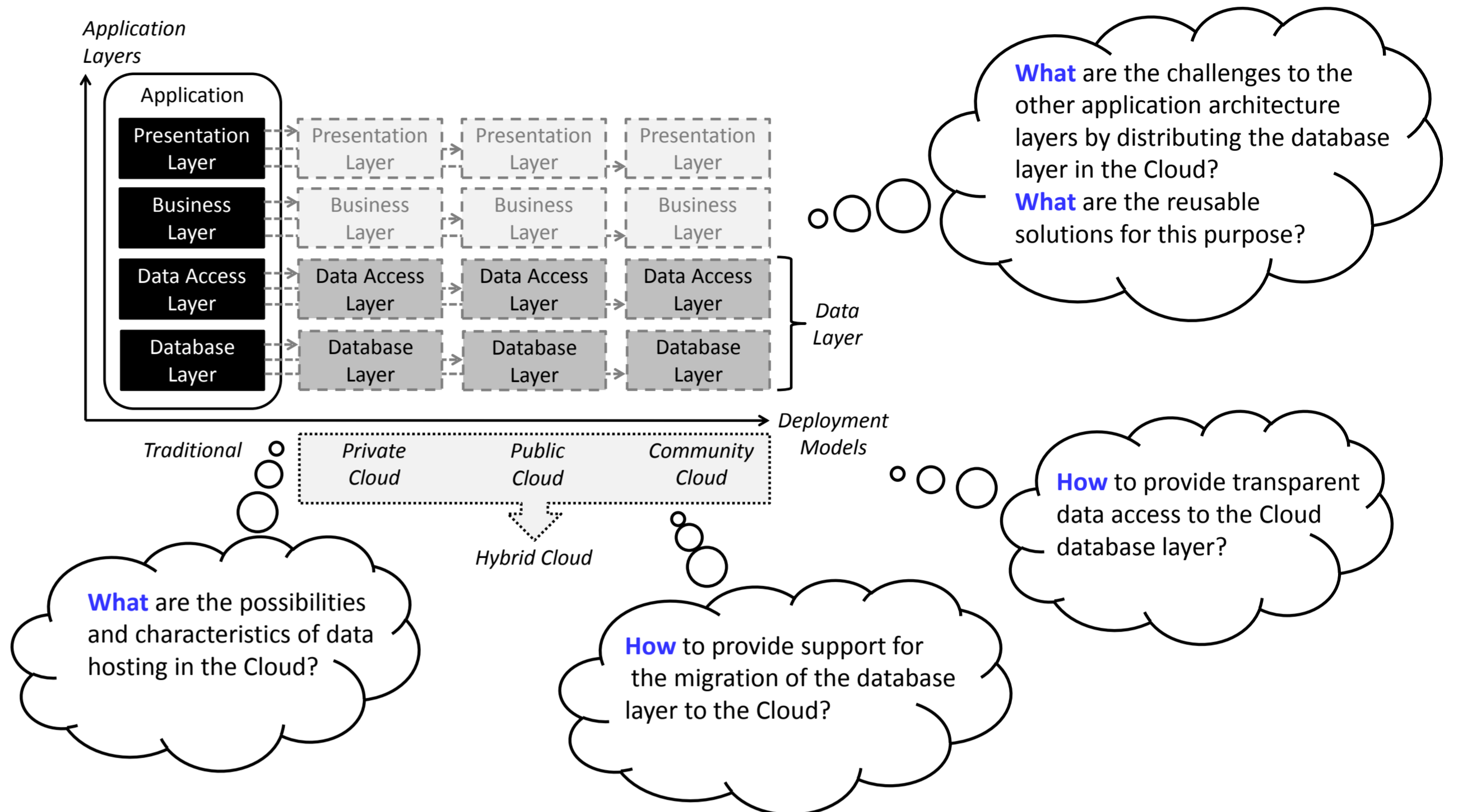# Non-Functional Data Layer Patterns for Cloud Applications

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Problem Description and Research Questions

Cloud computing has become increasingly popular with the industry due to the clear advantage of reducing capital expenditure and transforming it into operational costs. To take advantage of Cloud computing, an existing application may be moved to the Cloud or designed from the beginning to use Cloud technologies. Until today the migration of applications has been limited to the migration of the whole application, i.e., by using virtualization technology. The advent of various Cloud services enabled the migration of applications on the granularity of application layers.

This work focuses on the **migration of the data layer** to the Cloud. **Using Cloud technology leads to challenges** such as incompatibilities with the database layer previously used or the accidental disclosing of critical data by e. g., moving them to a Public Cloud. An application relying on such functionalities cannot therefore have its data moved to the Cloud without **deep changes to its implementation**. We identify such challenges focusing on enabling **data store scalability** and **ensuring data confidentiality** and provide a set of **Cloud Data Patterns** as the best practices to deal with them.
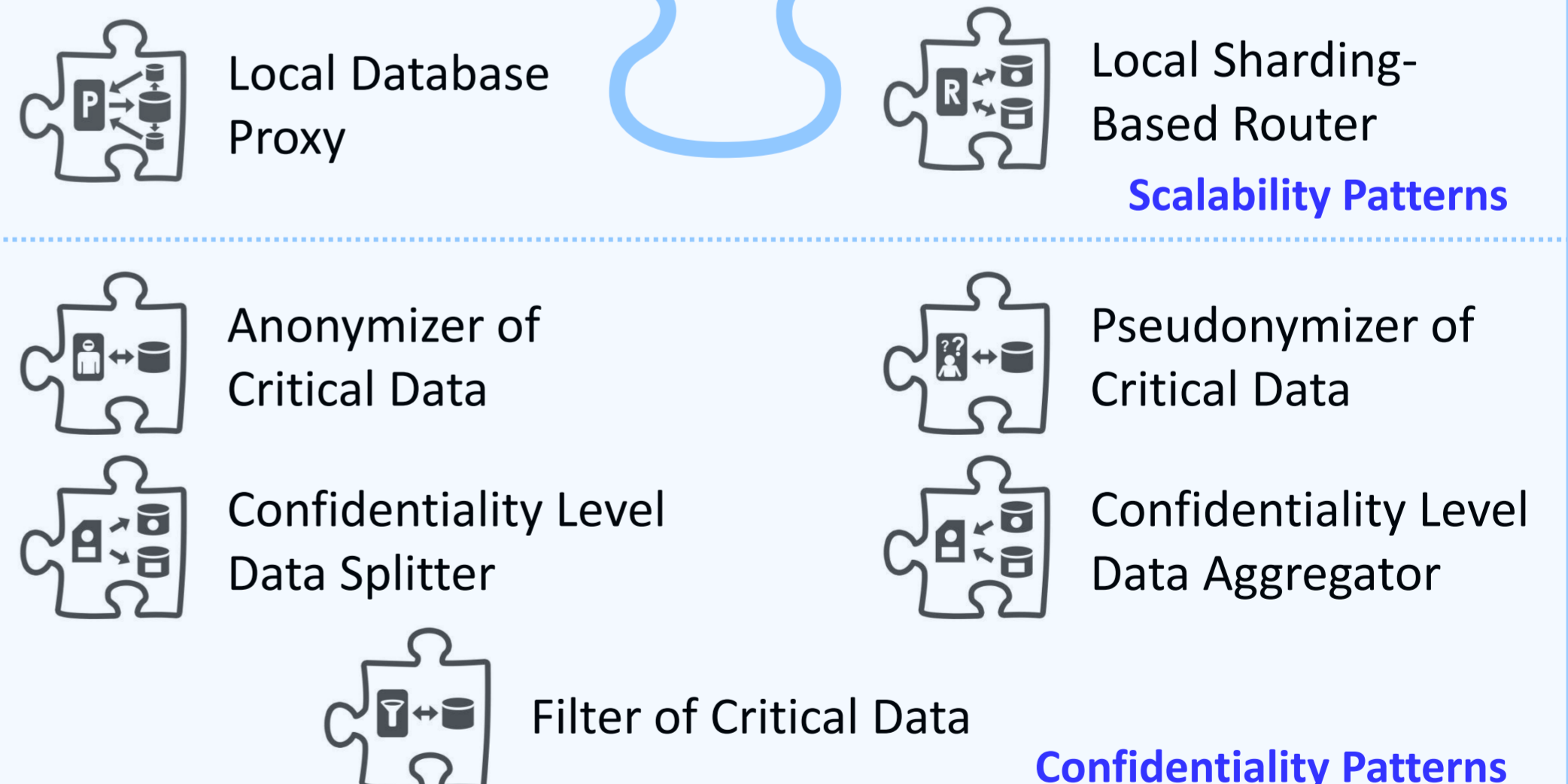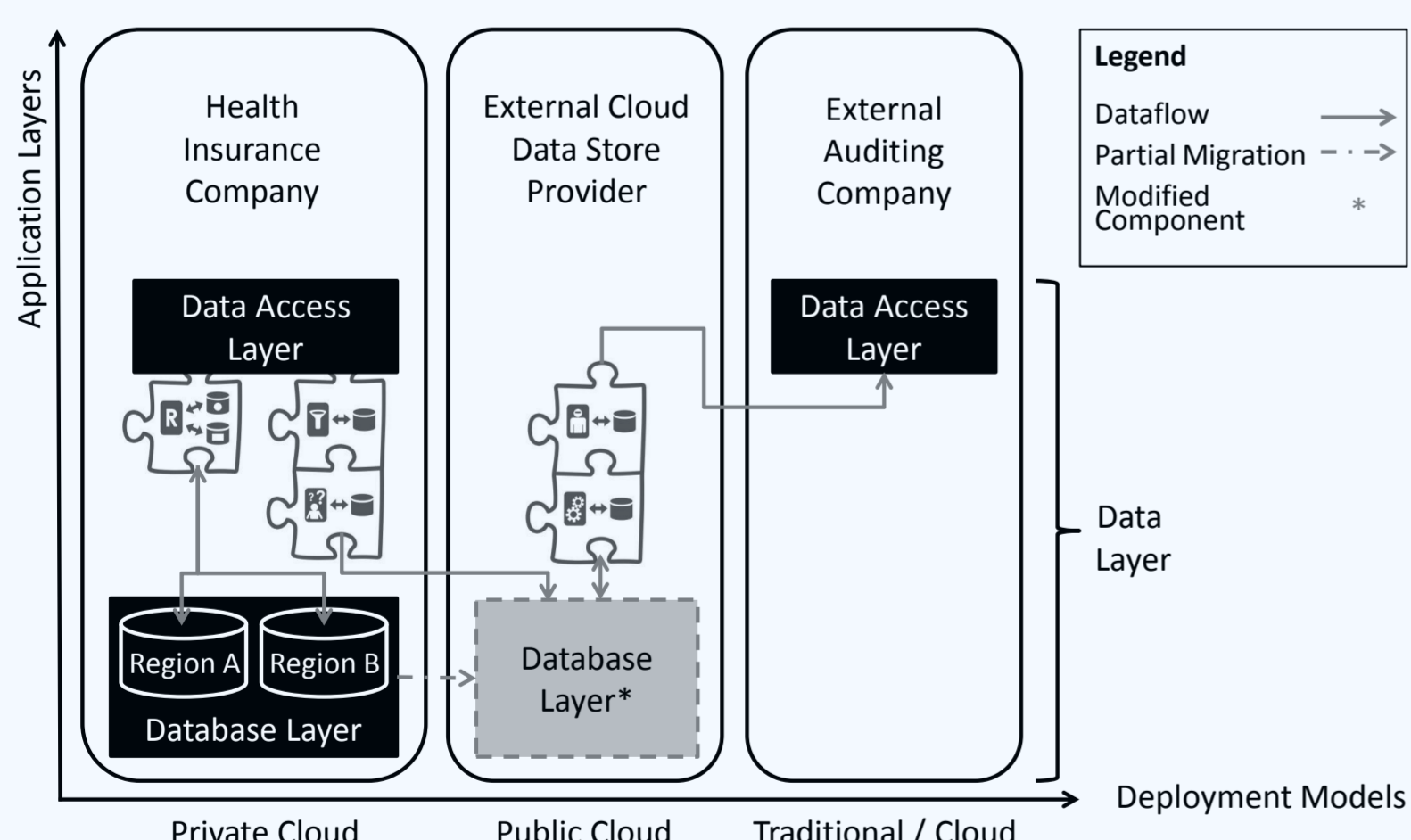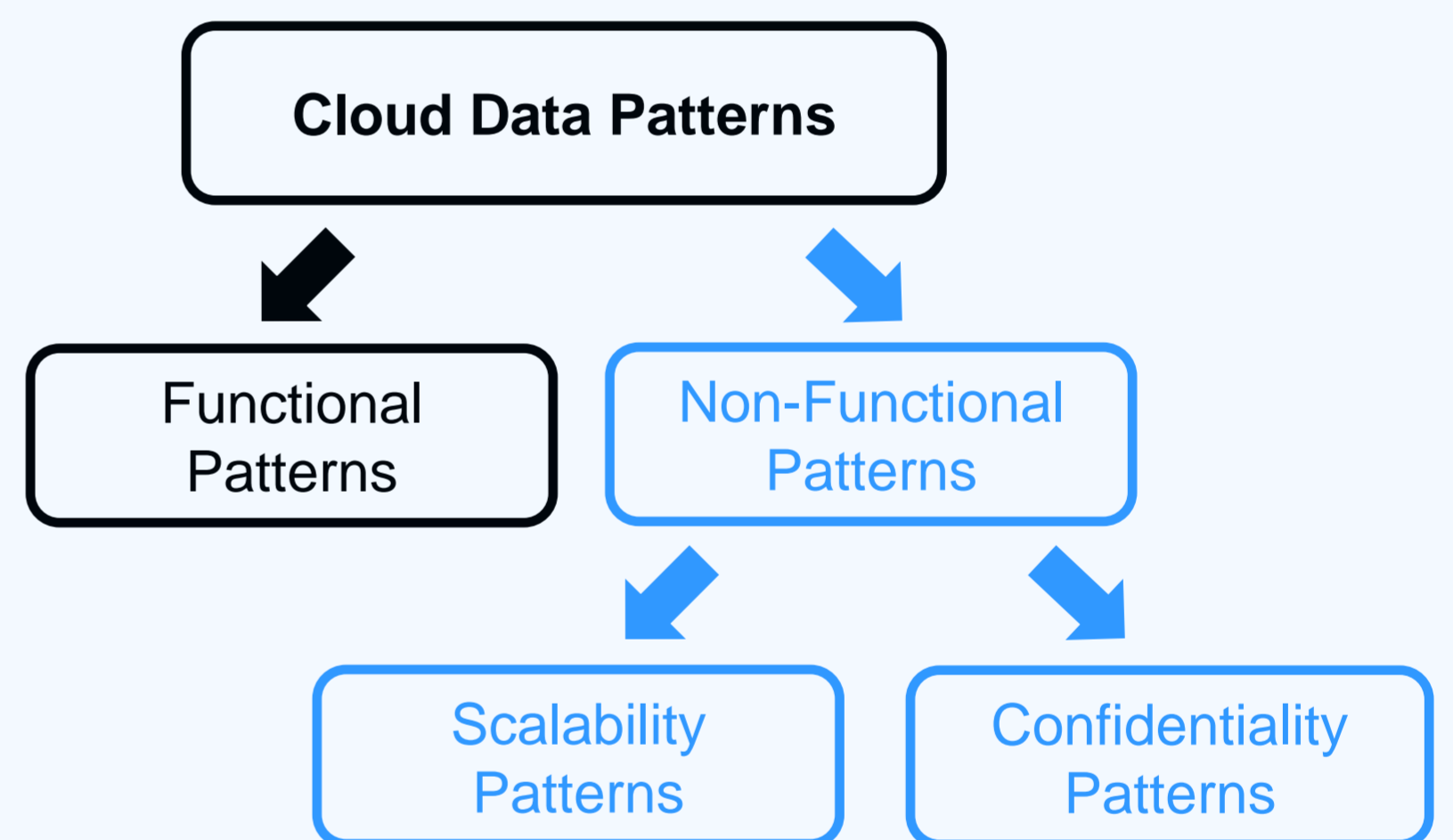

What are the challenges to the other application architecture layers by distributing the database layer in the Cloud?
What are the reusable solutions for this purpose?

How to provide transparent data access to the Cloud database layer?

What are the possibilities and characteristics of data hosting in the Cloud?

How to provide support for the migration of the database layer to the Cloud?

Overview

Definition of Cloud Data Pattern

A Cloud Data Pattern describes a reusable and implementation technology-independent solution for a challenge related to the data layer of an application in the Cloud for a specific context.

Patterns of a pattern language are related to each other, they have to be considered as a whole and to be composable (Hohpe and Woolf, 2003). Thus, we have chosen the form of a piece of a puzzle for the pattern icons.

Cloud Data Patterns

Functional Patterns

Non-Functional Patterns

Scalability Patterns

Confidentiality Patterns

Local Database Proxy

Local Sharding-Based Router

Scalability Patterns

Anonymizer of Critical Data

Pseudonymizer of Critical Data

Confidentiality Level Data Splitter

Confidentiality Level Data Aggregator

Filter of Critical Data

Confidentiality Patterns

Further Information

Selected Publications

Strauch, S., Kopp, O., Leymann, F., Unger, T.: A Taxonomy for Cloud Data Hosting Solutions. In: Proceedings of CGC '11. IEEE Computer Society (2011)

Strauch, S., Breitenbuecher, U., Kopp, O., Leymann, F., Unger, T.: Cloud Data Patterns for Confidentiality. In: Proceedings of CLOSER '12. SciTePress (2012)

Andrikopoulos, A., Binz, T., Leymann, F., Strauch, S.: How to Adapt Applications for the Cloud Environment – Challenges and Solutions in Migrating Applications to the Cloud. In: Springer Computing (to appear, 2013)

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