# Dependency Injection

# DI

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133 FOLGT

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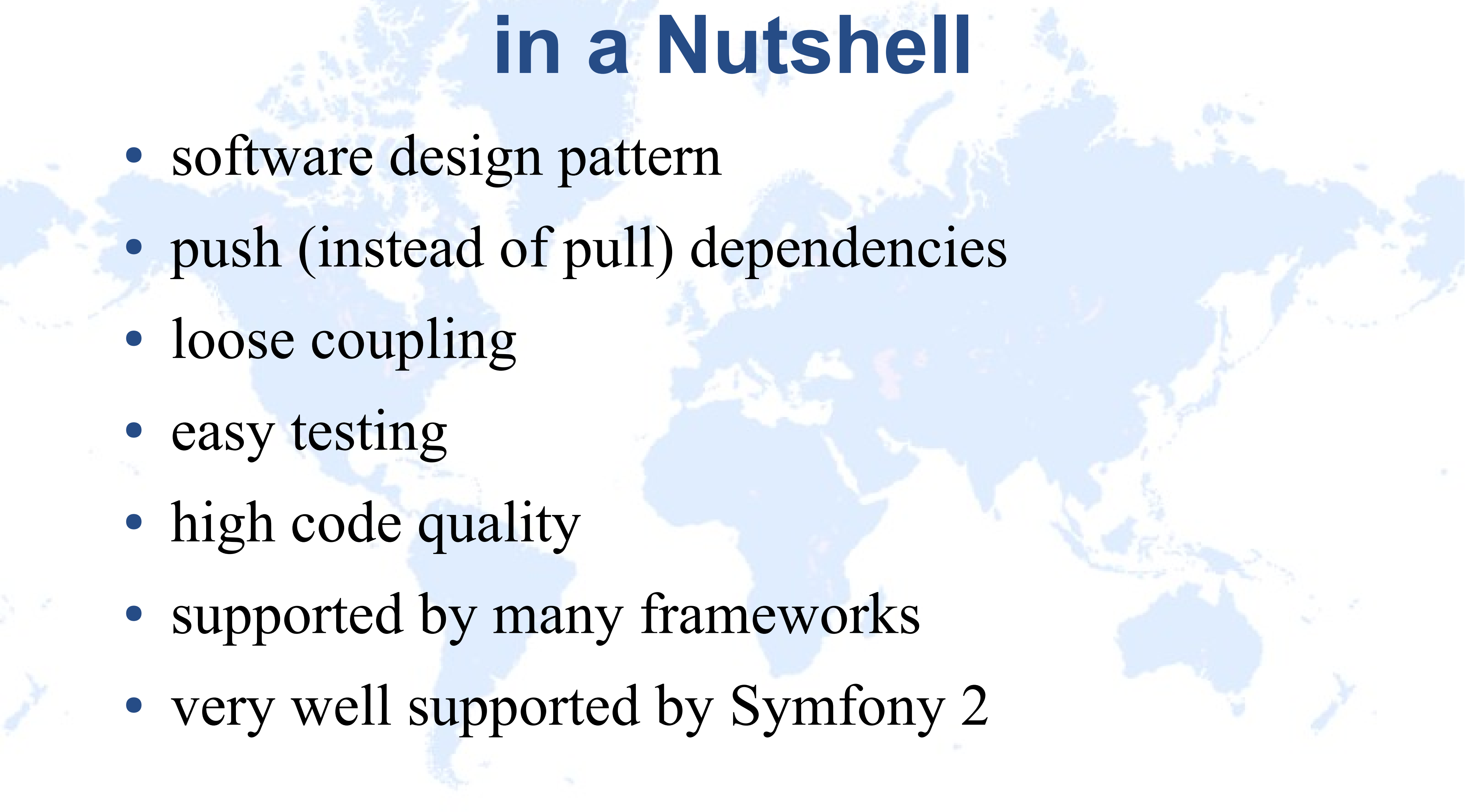
- Developer & Consultant: PHP, Symfony 2 etc.
  - www.php-entwickler-berlin.de
- Trainer & Coach: Symfony 2 workshops 1-5 days
  - www.php-schulung.de
- Available for Your project
  - timon.schroeter@gmail.com

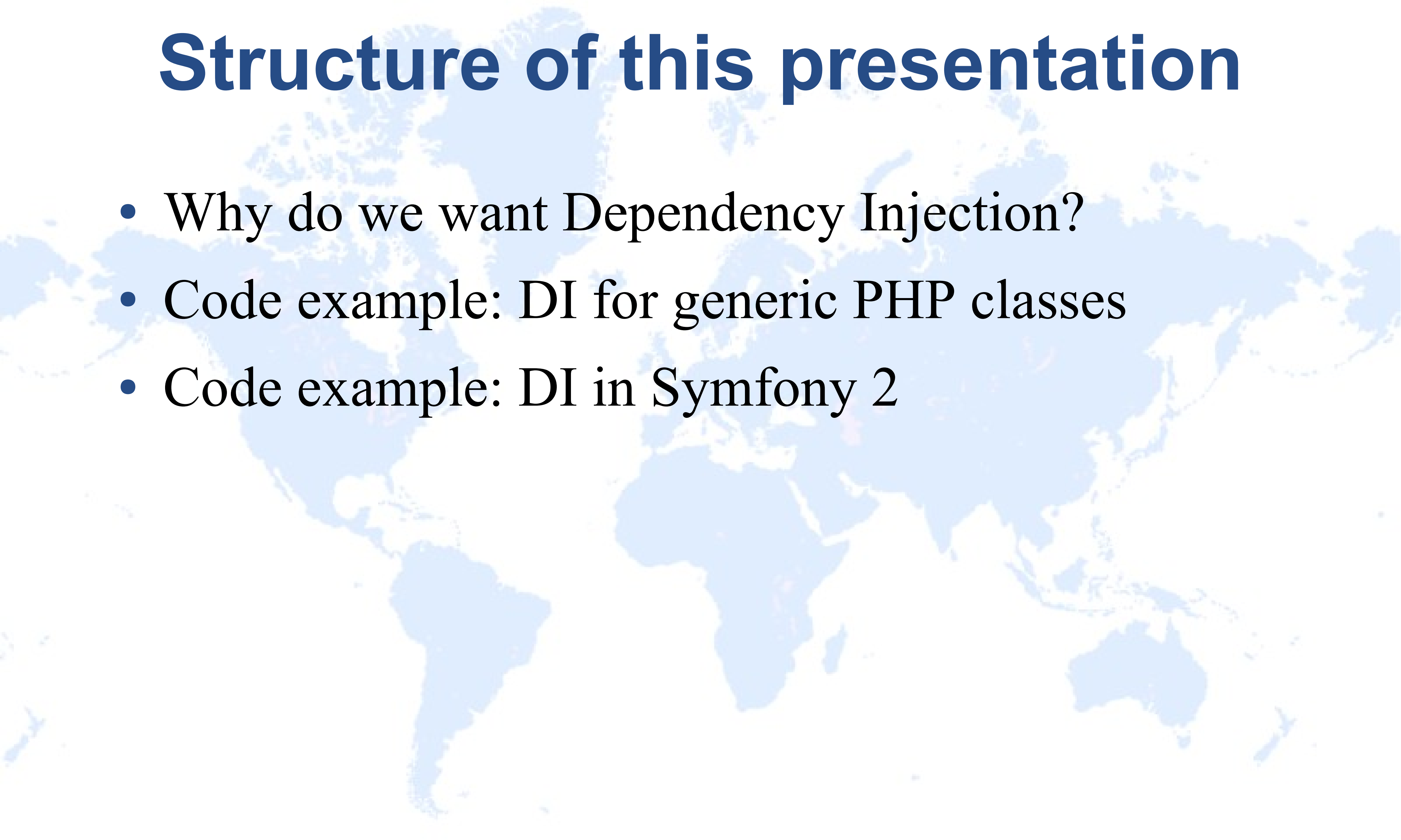
## What is Dependency Injection?

- Your answer?



## Dependency Injection in a Nutshell

- software design pattern
- push (instead of pull) dependencies
- loose coupling
- easy testing
- high code quality
- supported by many frameworks
- very well supported by Symfony 2



## Structure of this presentation

- Why do we want Dependency Injection?
- Code example: DI for generic PHP classes
- Code example: DI in Symfony 2

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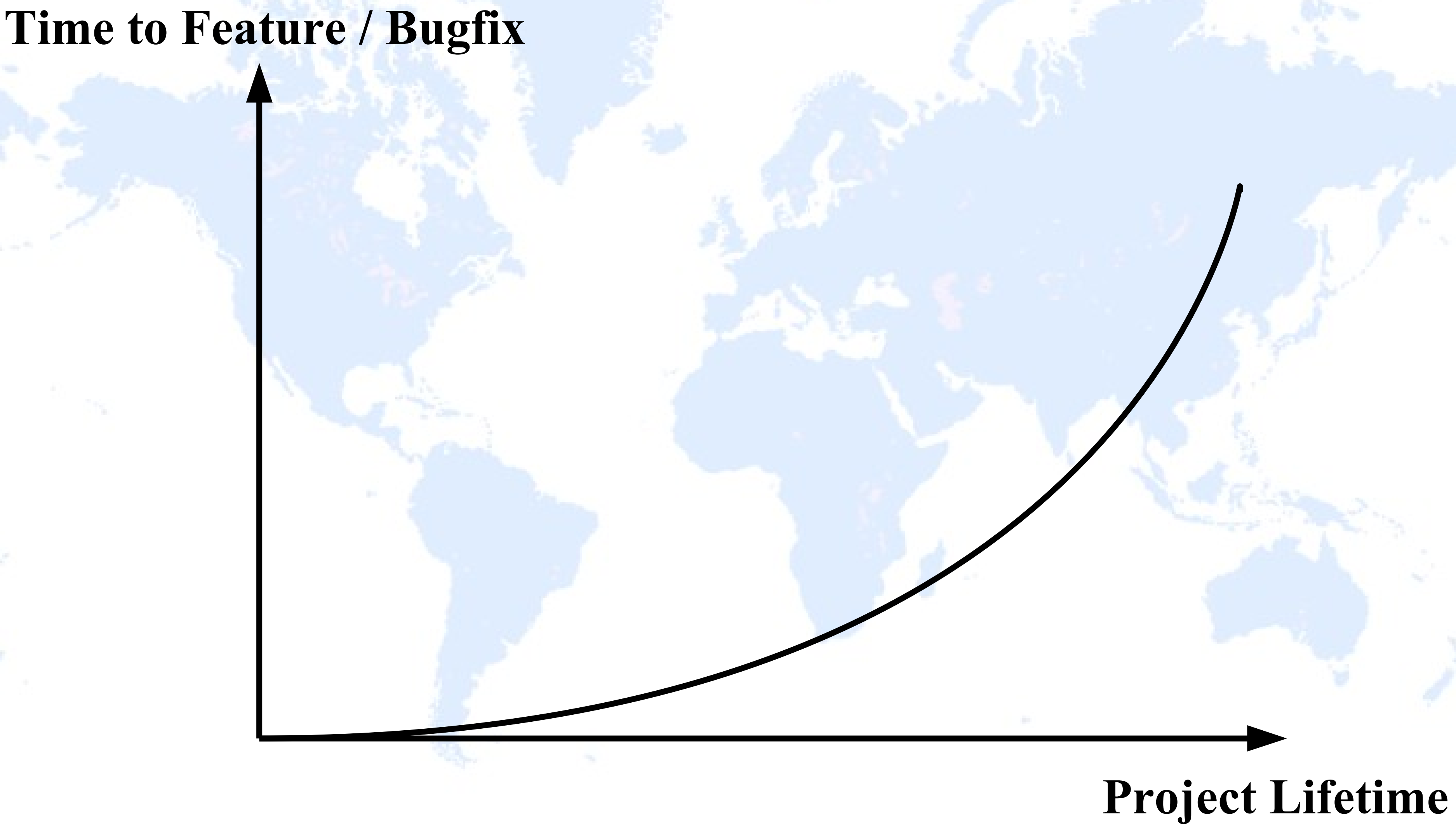
## Why do we want to use Dependency Injection?

- Who has ever worked on a project that was more than 2 years old?

## Project without a really good QA and testing strategy



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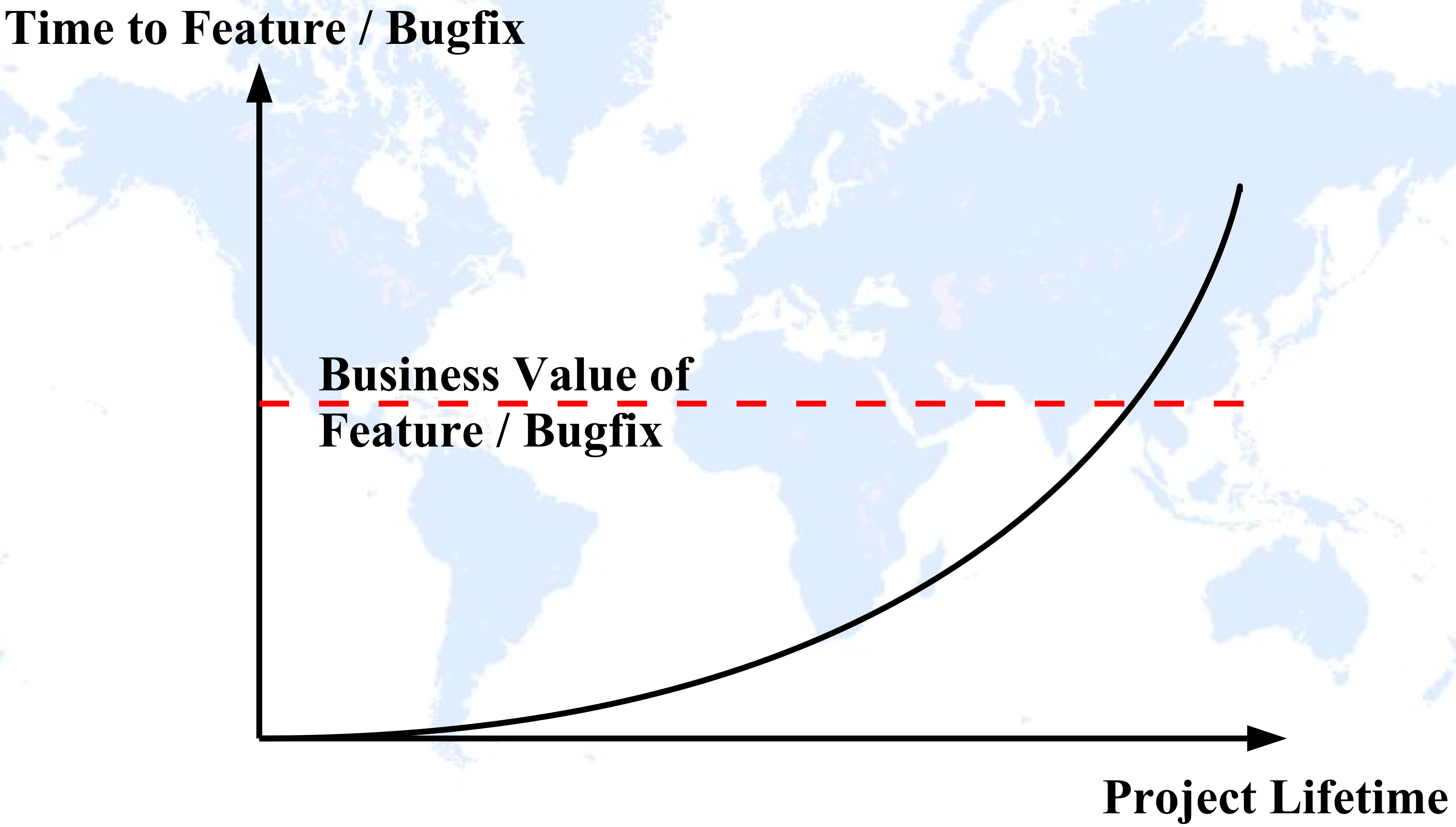

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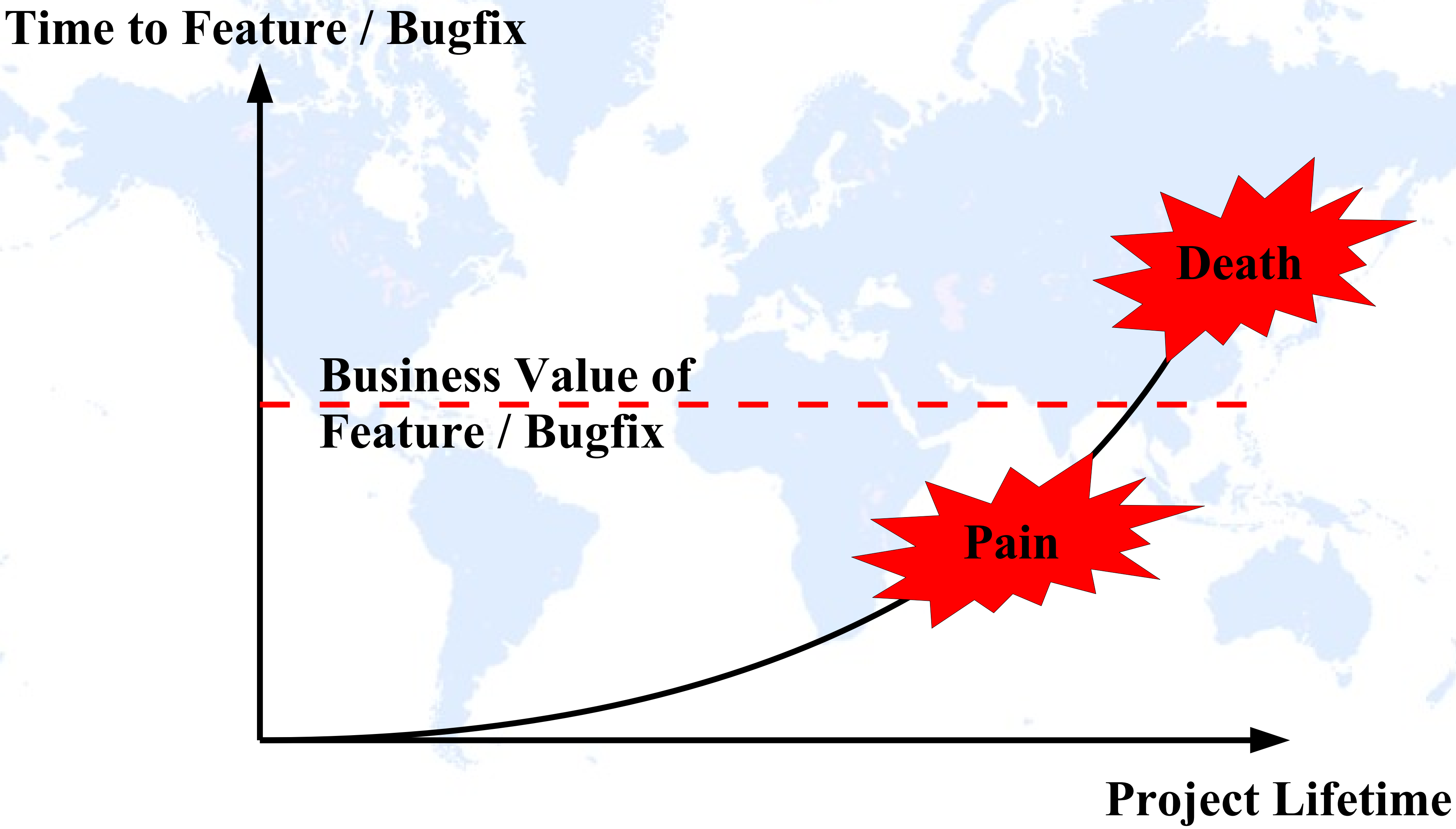

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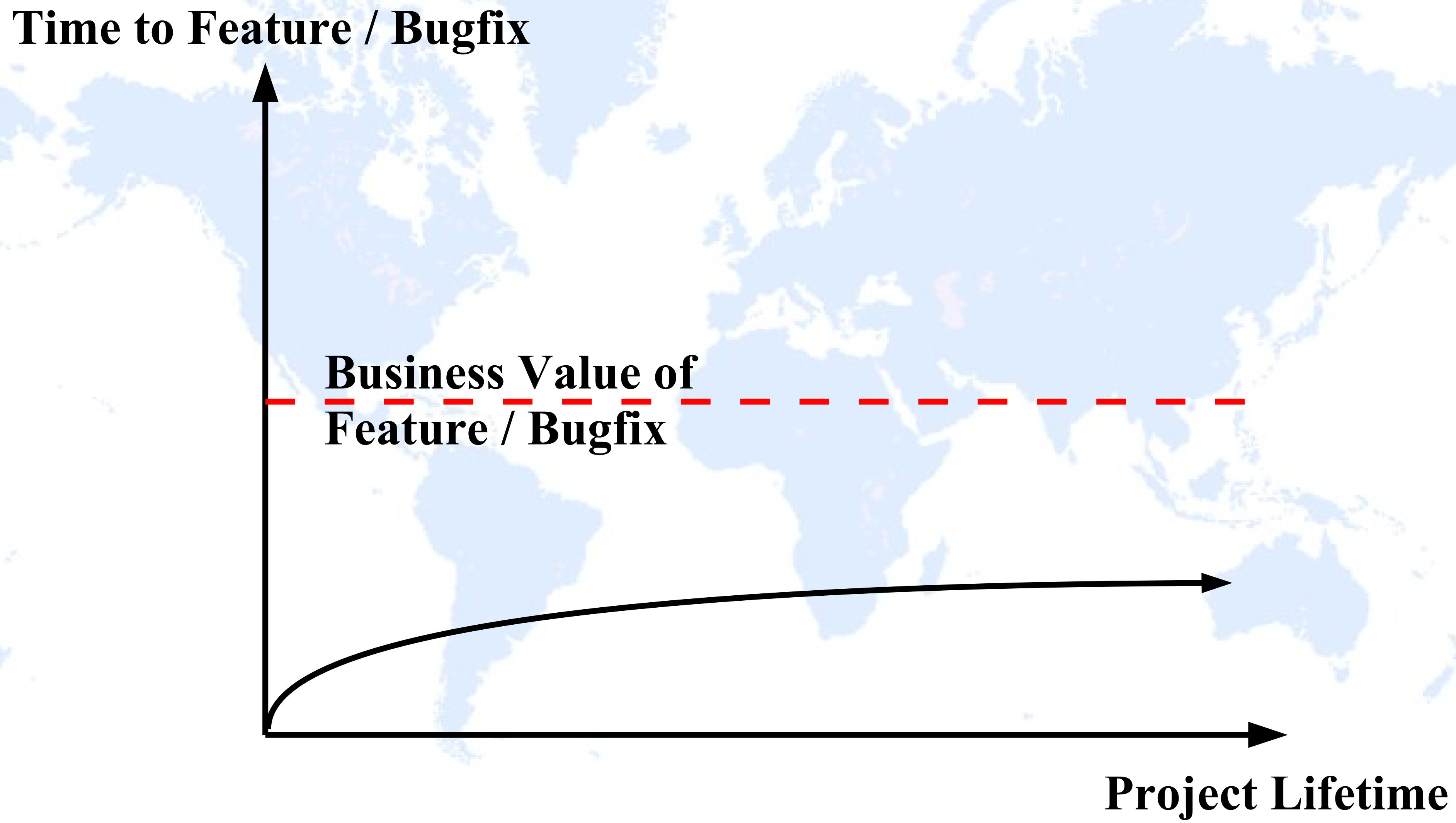

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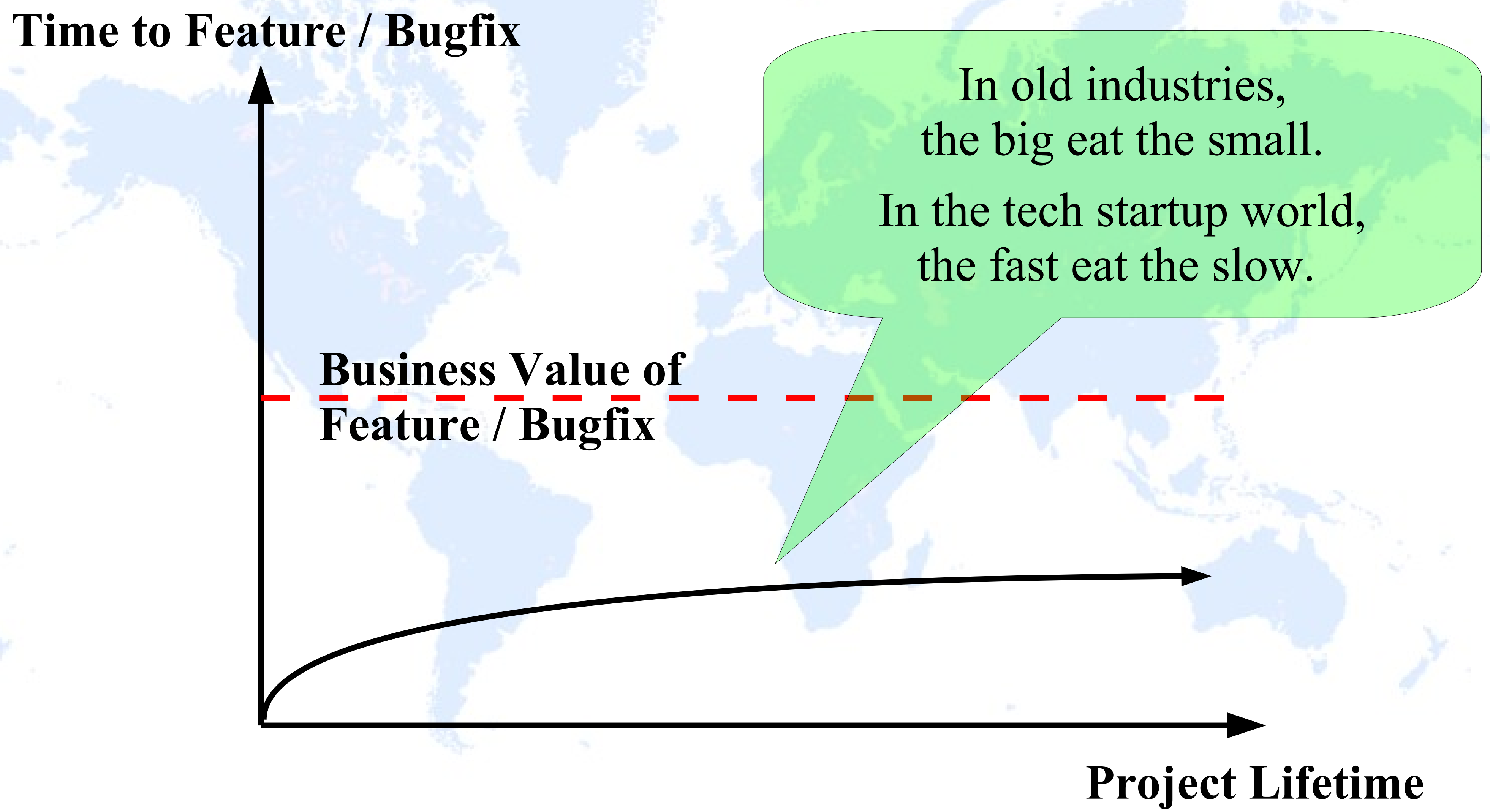

## Good QA and Testing Strategy includes a mix of:

- Acceptance Tests
  - Manual testing by real users
- Functional Tests
  - Automated backbox test (Selenium etc.)
- Integration Tests
  - Tests two or more classes together
- (real) Unit Tests
  - Tests one(!) class

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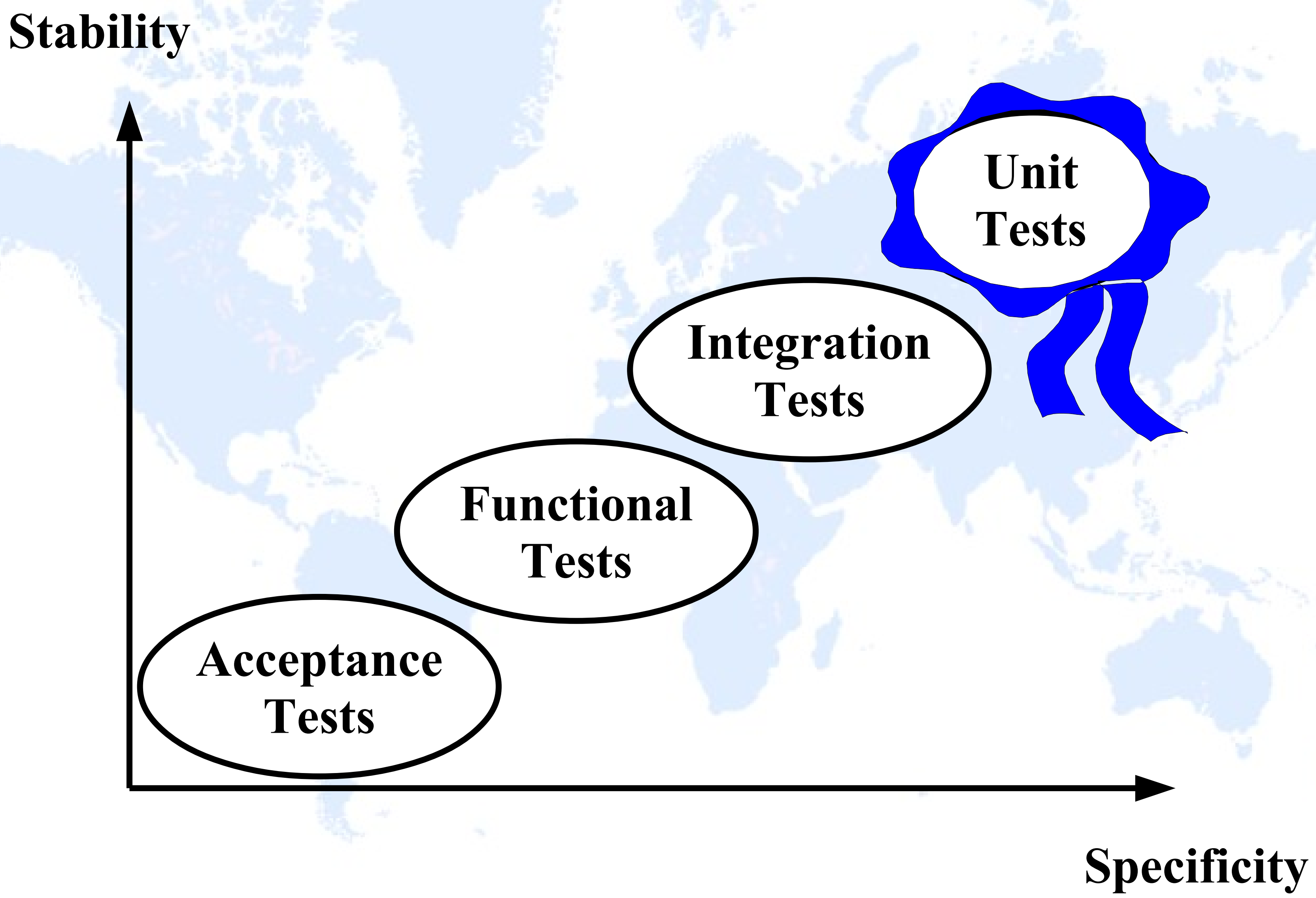
**Testing can be hard.**

**Reality check:**

**How do You test?**

## Not all tests are created equal



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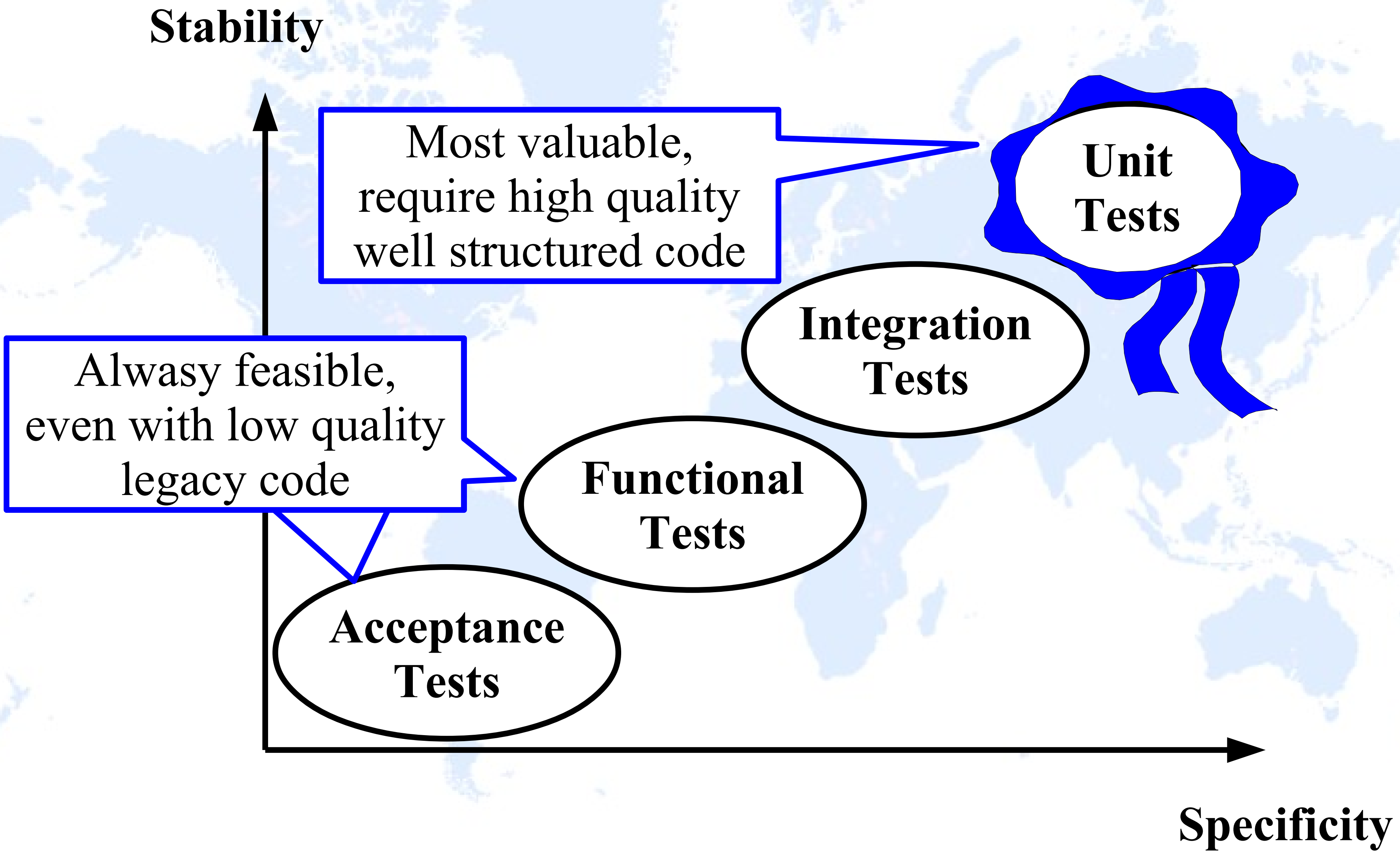
Stability
Most valuable, require high quality well structured code
Unit Tests
Integration Tests
Alwasy feasible, even with low quality legacy code
Functional Tests
Acceptance Tests
Specificity

## (Real) Unit Tests

- Test a single unit of code, i.e. a **single class**
- Validate correct functionality and API of each class
- Help avoid regressions
- Facilitate migrations (server, PHP version etc.)
- Ensure backwards compatability of new code

small dedicated classes & methods

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We need to be able to **replace** (mock/stub) **dependencies dynamically**

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- Code example: DI for generic PHP classes ← You are here
- Code example: DI in Symfony 2

Why is this class difficult to unit test?

```
<?php
use Guzzle\Http\Client;
use Acme\Logger\XmlLogger;

private $client;
private $logger;

class FeedAggregator {
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What if we ever want to use a different log format?

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Dependencies are **pulled**.
=> Replacing requires refactoring
=> Dynamic replacing (only for testing) is **impossible**

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Any questions?

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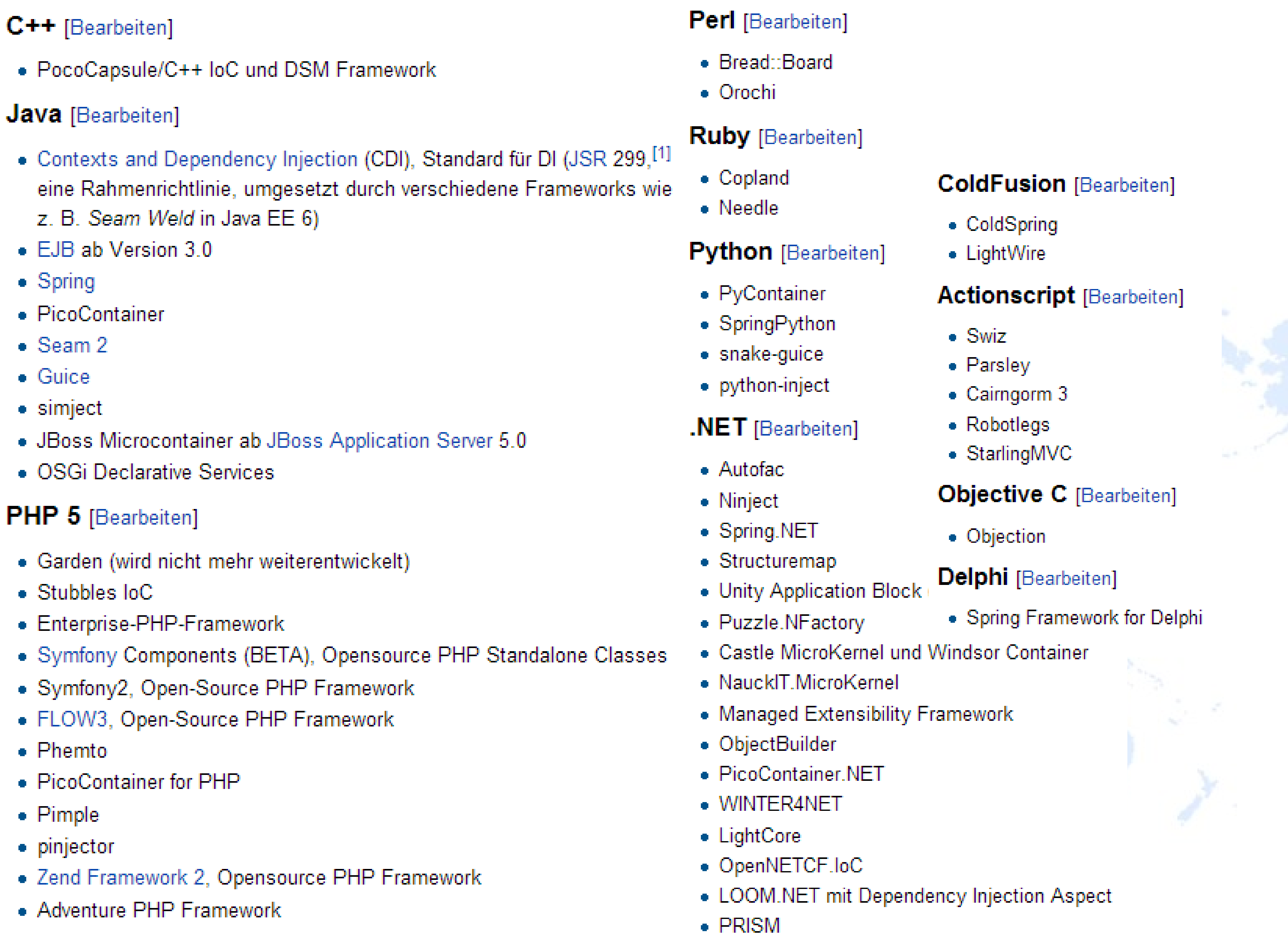
Who constructs and pushes all the dependencies?

## Dependency Injection Container

"DI Container", "DIC", "Service Container", "the Container"



## C++ [Bearbeiten]

- PocoCapsule/C++ IoC und DSM Framework

## Java [Bearbeiten]

- Contexts and Dependency Injection (CDI), Standard für DI (JSR 299,[1] eine Rahmenrichtlinie, umgesetzt durch verschiedene Frameworks wie z. B. *Seam Weld* in Java EE 6)
- EJB ab Version 3.0
- Spring
- PicoContainer
- Seam 2
- Guice
- simject
- JBoss Microcontainer ab JBoss Application Server 5.0
- OSGi Declarative Services

## PHP 5 [Bearbeiten]

- Garden (wird nicht mehr weiterentwickelt)
- Stubbles IoC
- Enterprise-PHP-Framework
- Symfony Components (BETA), Opensource PHP Standalone Classes
- Symfony2, Open-Source PHP Framework
- FLOW3, Open-Source PHP Framework
- Phemto
- PicoContainer for PHP
- Pimple
- pinjector
- Zend Framework 2, Opensource PHP Framework
- Adventure PHP Framework

## Perl [Bearbeiten]

- Bread::Board
- Orochi

## Ruby [Bearbeiten]

- Copland
- Needle

## Python [Bearbeiten]

- PyContainer
- SpringPython
- snake-guice
- python-inject

## .NET [Bearbeiten]

- Autofac
- Ninject
- Spring.NET
- Structuremap
- Unity Application Block
- Puzzle.NFactory
- Castle MicroKernel und Windsor Container
- NauckIT.MicroKernel
- Managed Extensibility Framework
- ObjectBuilder
- PicoContainer.NET
- WINTER4NET
- LightCore
- OpenNETCF.IoC
- LOOM.NET mit Dependency Injection Aspect
- PRISM

## ColdFusion [Bearbeiten]

- ColdSpring
- LightWire

## Actionscript [Bearbeiten]

- Swiz
- Parsley
- Cairngorm 3
- Robotlegs
- StarlingMVC

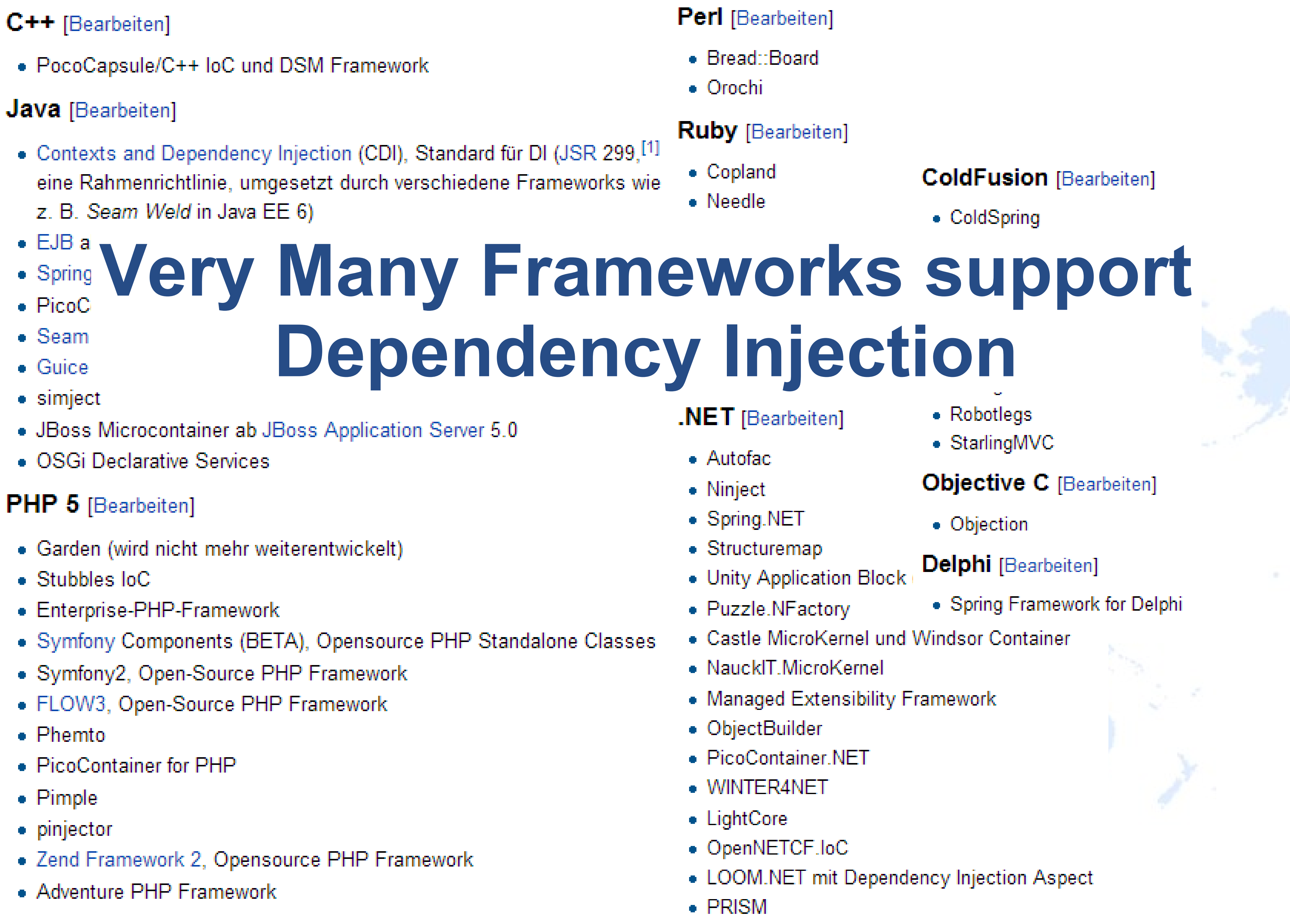
## Objective C [Bearbeiten]

- Objection

## Delphi [Bearbeiten]

- Spring Framework for Delphi

# Very Many Frameworks support Dependency Injection



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Objective C [Bearbeiten]

- Objection

Delphi [Bearbeiten]

- Spring Framework for Delphi

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- Code example: DI for generic PHP classes
- Code example: DI in Symfony 2 ← You are here

## DI ist very easy in Symfony 2

Symfony

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# app/config/config.yml
# ...
services:
    my_service:
        class:    Acme\MyBundle\Service\AwesomeClass
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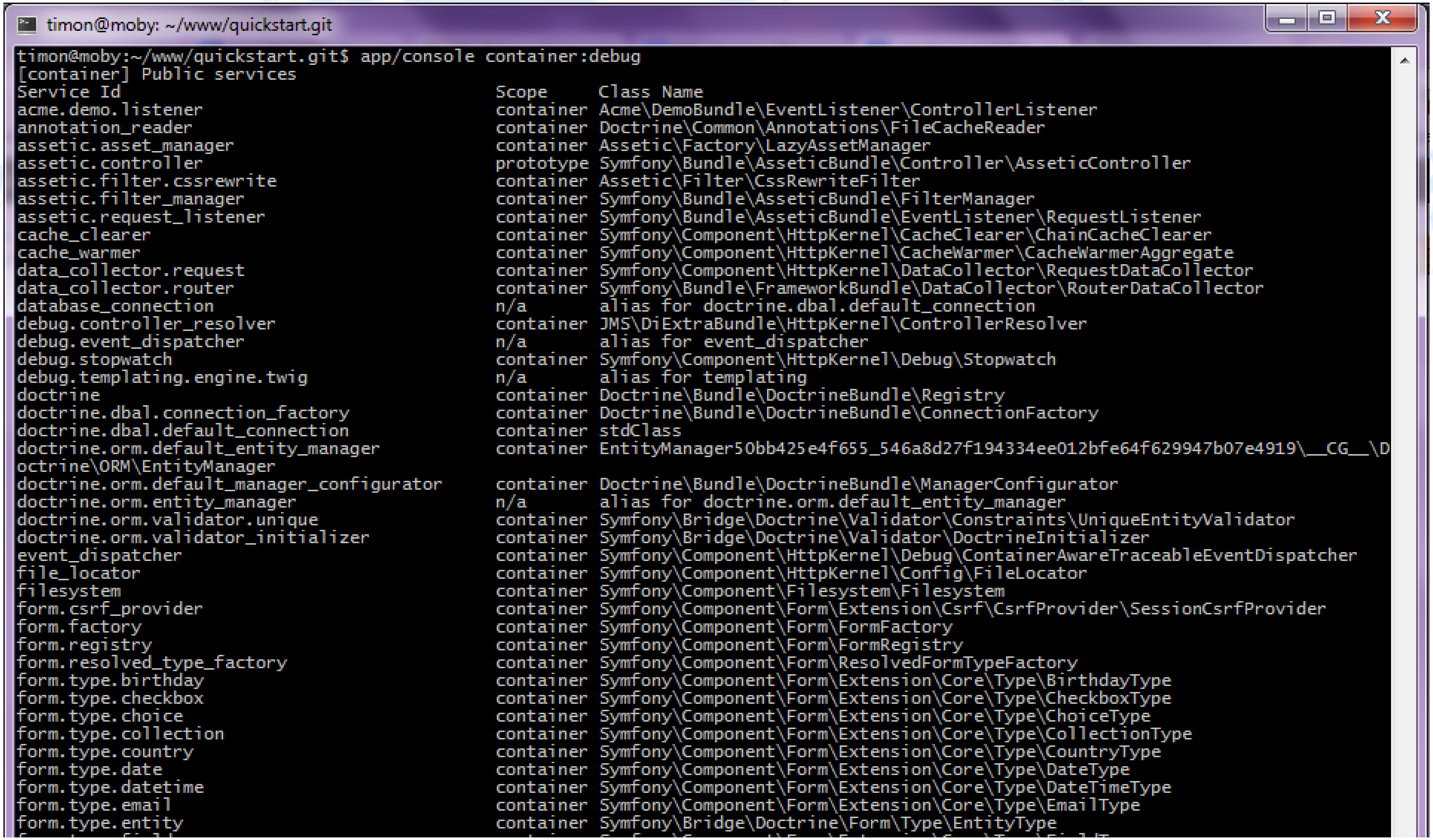
Class to manage

Name of the new service

# # php app/console container:debug



timon@moby: ~/www/quickstart.git

```
timon@moby:~/www/quickstart.git$ app/console container:debug
[container] Public services
Service Id                              Scope     Class Name
acme.demo.listener                      container Acme\DemoBundle\EventListener\ControllerListener
annotation_reader                       container Doctrine\Common\Annotations\FileCacheReader
assetic.asset_manager                   container Assetic\Factory\LazyAssetManager
assetic.controller                      prototype Symfony\Bundle\AsseticBundle\Controller\AsseticController
assetic.filter.cssrewrite               container Assetic\Filter\CssRewriteFilter
assetic.filter_manager                  container Symfony\Bundle\AsseticBundle\FilterManager
assetic.request_listener                container Symfony\Bundle\AsseticBundle\EventListener\RequestListener
cache_clearer                           container Symfony\Component\HttpKernel\CacheClearer\ChainCacheClearer
cache_warmer                            container Symfony\Component\HttpKernel\CacheWarmer\CacheWarmerAggregate
data_collector.request                  container Symfony\Component\HttpKernel\DataCollector\RequestDataCollector
data_collector.router                   container Symfony\Bundle\FrameworkBundle\DataCollector\RouterDataCollector
database_connection                     n/a       alias for doctrine.dbal.default_connection
debug.controller_resolver               container JMS\DiExtraBundle\HttpKernel\ControllerResolver
debug.event_dispatcher                  n/a       alias for event_dispatcher
debug.stopwatch                         container Symfony\Component\HttpKernel\Debug\Stopwatch
debug.templating.engine.twig            n/a       alias for templating
doctrine                                container Doctrine\Bundle\DoctrineBundle\Registry
doctrine.dbal.connection_factory        container Doctrine\Bundle\DoctrineBundle\ConnectionFactory
doctrine.dbal.default_connection        container stdClass
doctrine.orm.default_entity_manager     container EntityManager50bb425e4f655_546a8d27f194334ee012bfe64f629947b07e4919\__CG__\D
octrine\ORM\EntityManager
doctrine.orm.default_manager_configurator      container Doctrine\Bundle\DoctrineBundle\ManagerConfigurator
doctrine.orm.entity_manager             n/a       alias for doctrine.orm.default_entity_manager
doctrine.orm.validator.unique           container Symfony\Bridge\Doctrine\Validator\Constraints\UniqueEntityValidator
doctrine.orm.validator_initializer      container Symfony\Bridge\Doctrine\Validator\DoctrineInitializer
event_dispatcher                        container Symfony\Component\HttpKernel\Debug\ContainerAwareTraceableEventDispatcher
file_locator                            container Symfony\Component\HttpKernel\Config\FileLocator
filesystem                              container Symfony\Component\Filesystem\Filesystem
form.csrf_provider                      container Symfony\Component\Form\Extension\Csrf\CsrfProvider\SessionCsrfProvider
form.factory                            container Symfony\Component\Form\FormFactory
form.registry                           container Symfony\Component\Form\FormRegistry
form.resolved_type_factory              container Symfony\Component\Form\ResolvedFormTypeFactory
form.type.birthday                      container Symfony\Component\Form\Extension\Core\Type\BirthdayType
form.type.checkbox                      container Symfony\Component\Form\Extension\Core\Type\CheckboxType
form.type.choice                        container Symfony\Component\Form\Extension\Core\Type\ChoiceType
form.type.collection                    container Symfony\Component\Form\Extension\Core\Type\CollectionType
form.type.country                       container Symfony\Component\Form\Extension\Core\Type\CountryType
form.type.date                          container Symfony\Component\Form\Extension\Core\Type\DateType
form.type.datetime                      container Symfony\Component\Form\Extension\Core\Type\DateTimeType
form.type.email                         container Symfony\Component\Form\Extension\Core\Type\EmailType
form.type.entity                        container Symfony\Bridge\Doctrine\Form\Type\EntityType
```

## DI ist very easy in Symfony 2

- Any ordinary PHP class can be managed by DIC
- Only 2 lines of configuration per class are needed
- Any class managed by the DIC is called a “Service”

```
# app/config/config.yml
# ...
services:
    my_service:
        class:    Acme\MyBundle\Service\AwesomeClass
```

## DI ist very easy in Symfony 2

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```
# app/config/config.yml
# ...
services:
    my_service:
        class:    Acme\MyBundle\Service\AwesomeClass
        arguments:
            some_arg:    “string”
            another:
                - arry_member
                - arry_member
            even_more:   @another_service
```

# DI ist very easy in Symfony 2

- Any ordinary PHP class can be managed by DIC
- Only 2 lines of configuration per class are needed
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```
# app/config/config.yml
# ...
services:
    my_service:
        class:     Acm                         neClass
        arguments:
            some_arg:    “string”
            another:
                - arry_member
                - arry_member
            even_more:   @another_service
```

Arguments can be strings, numbers, arrays, placeholders, and many more ...

Any other service can be injected as as argument

```php
<?php
// src/Acme/FeedBundle/Service/FeedAggregator.php

use Acme\Http\ClientInterface;
use Acme\Logger\LoggerInterface;

private $client;
private $logger;

class FeedAggregator {
   __construct (ClientInterface $client, LoggerInterface $logger) {
      $this->client = $client;
      $this->logger = $logger;
   }

   public function retrieveFeed ($baseurl, $path) {
      $request = $this->client->setBaseUrl($baseurl)->get($path);
      $response = $request->send();
      if (200 != $response->getStatusCode()) {
         $this->logger->log('Could not get: '.$host.$path);
         return null;
      }

      return $response->getBody();
   }
   // ...
}
```

```
<?php
// src/Acme/FeedBundle/Service/FeedAggregator.php

use Acme\Http\ClientInterface;
use Acme\Logger\LoggerInterface;

private $client;
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```

```
# app/config/config.yml
# ...
services:
    feed_aggregator:
        class:    Acme\FeedBundle\Service\FeedAggregator
        arguments:
            client:         @http_client
            logger:         @logger
```

```
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```

```
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            client:         @http_client
            logger:         @logger
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```

## Different Config for Testing?

- app/config/config.yml
- app/config/config_dev.yml
- app/config/config_test.yml

Put it here here

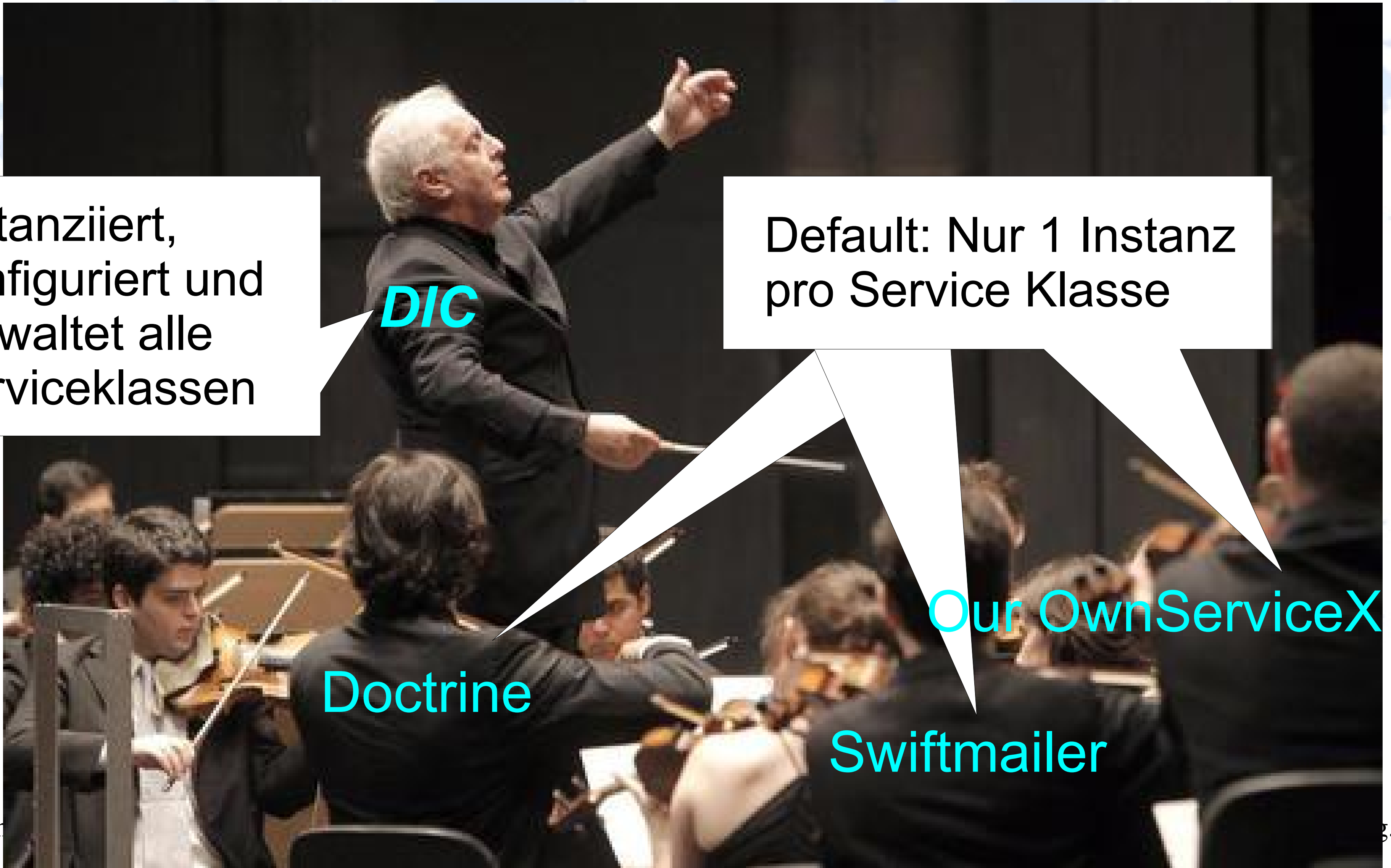
## Dependency Injection Container

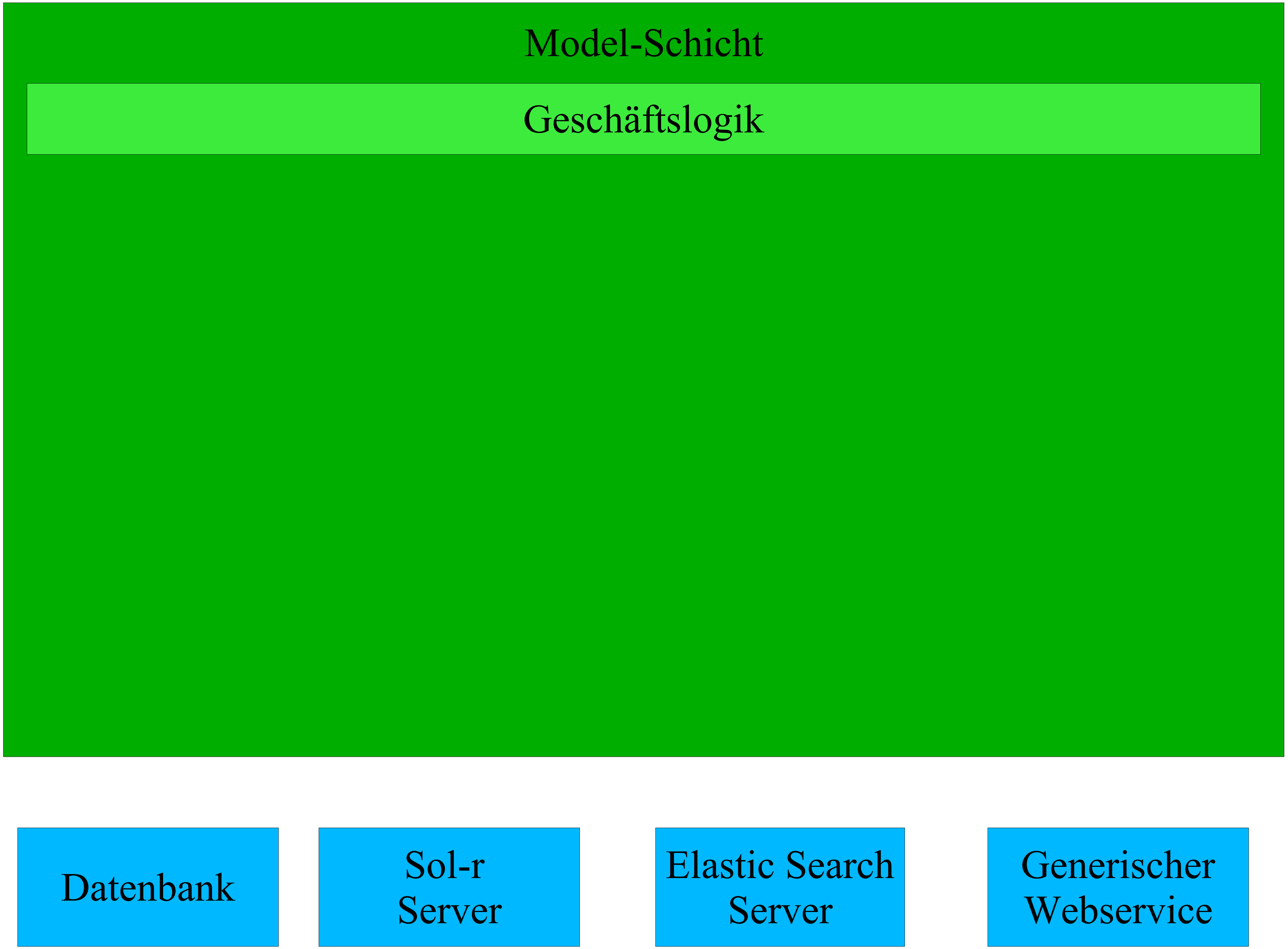
Instanziiert, konfiguriert und verwaltet alle Serviceklassen

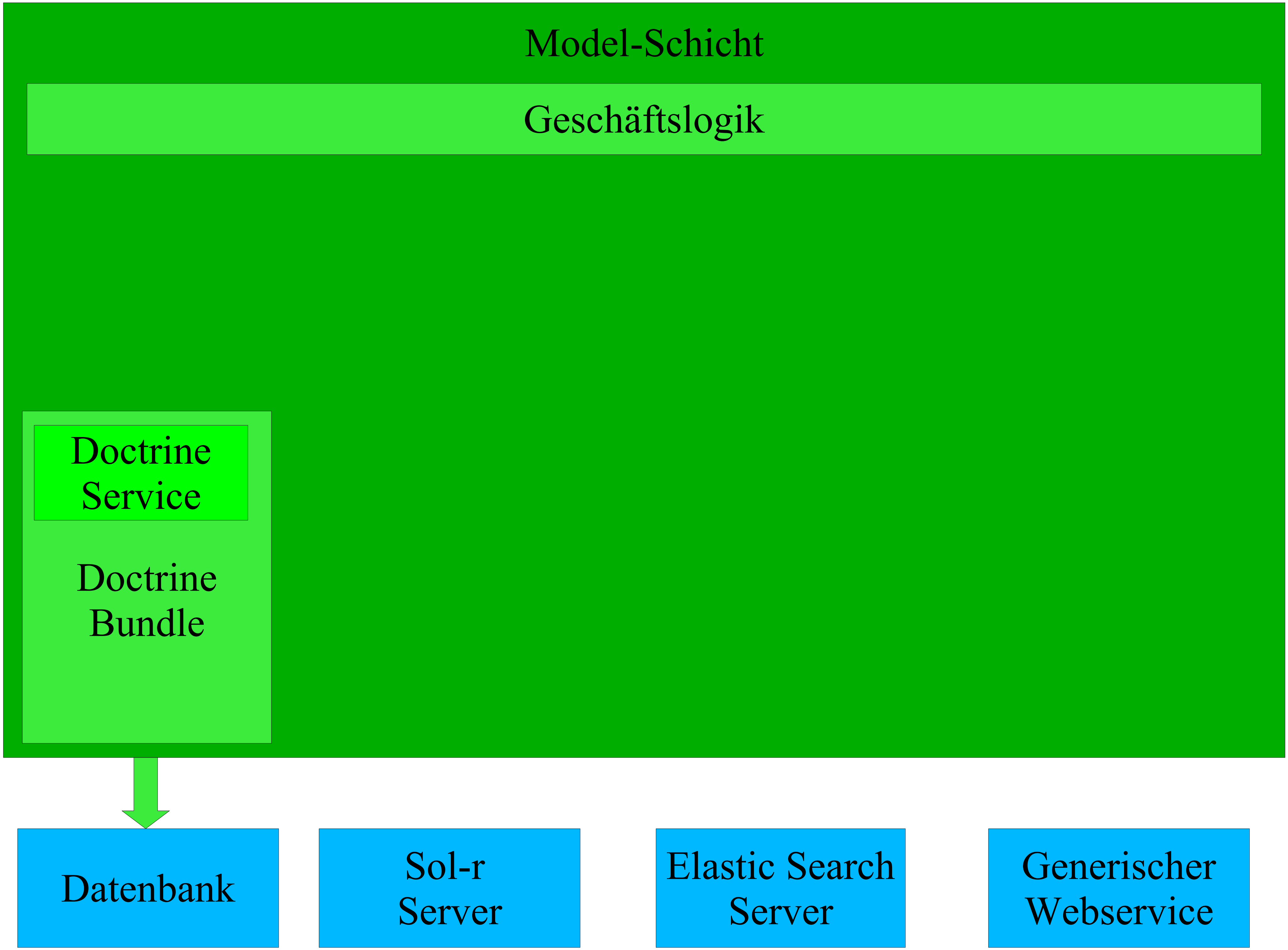
# Dependency Injection Container

Instanziiert, konfiguriert und verwaltet alle Serviceklassen

# Dependency Injection Container


Instanziiert, konfiguriert und verwaltet alle Serviceklassen
DIC
Default: Nur 1 Instanz pro Service Klasse
Doctrine
Swiftmailer
Our OwnServiceX


Model-Schicht
Geschäftslogik
Datenbank
Sol-r Server
Elastic Search Server
Generischer Webservice


Model-Schicht
Geschäftslogik
Doctrine Service
Doctrine Bundle
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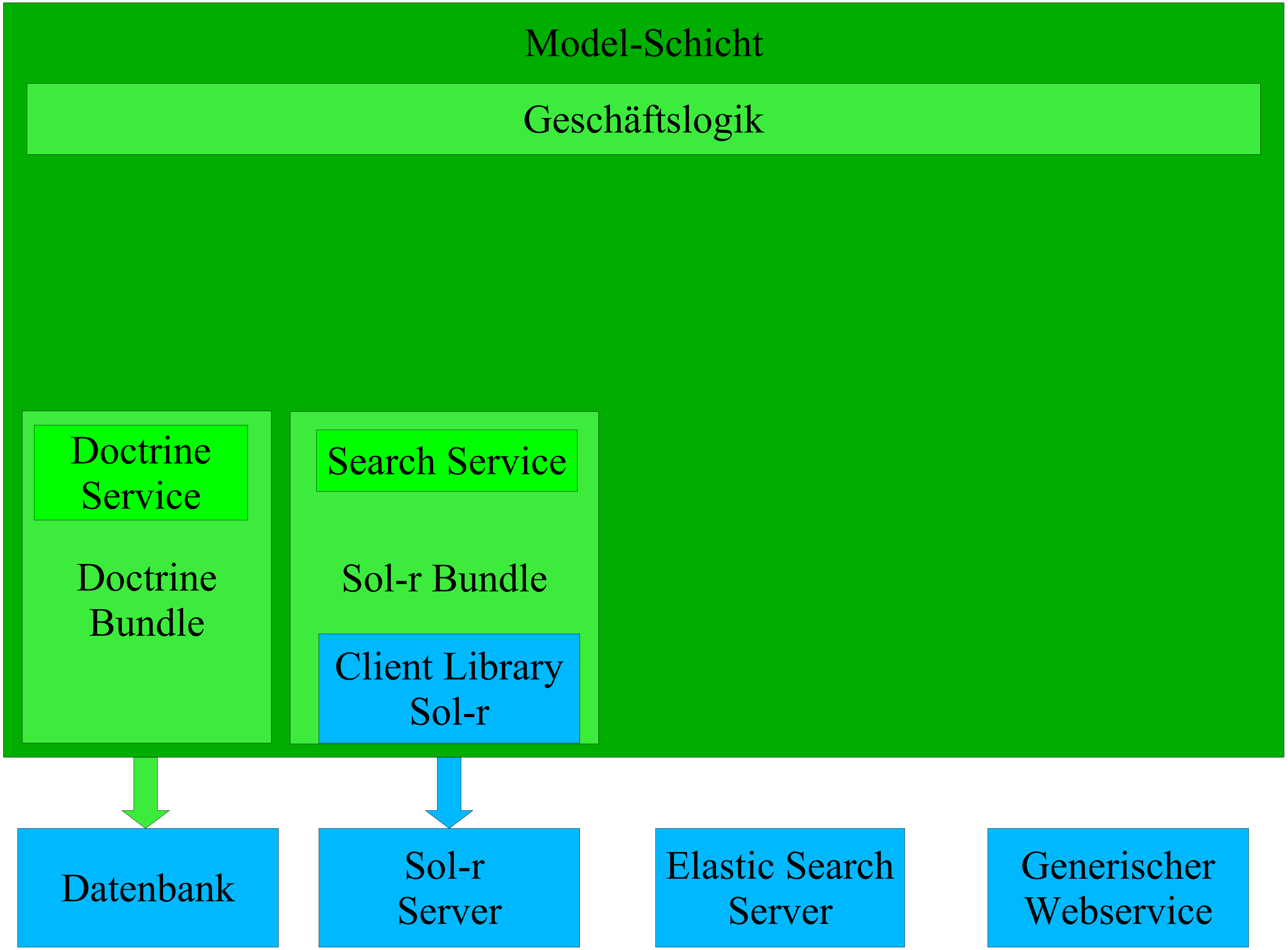
Model-Schicht
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Doctrine Service
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Search Service
Sol-r Bundle
Client Library Sol-r
Datenbank
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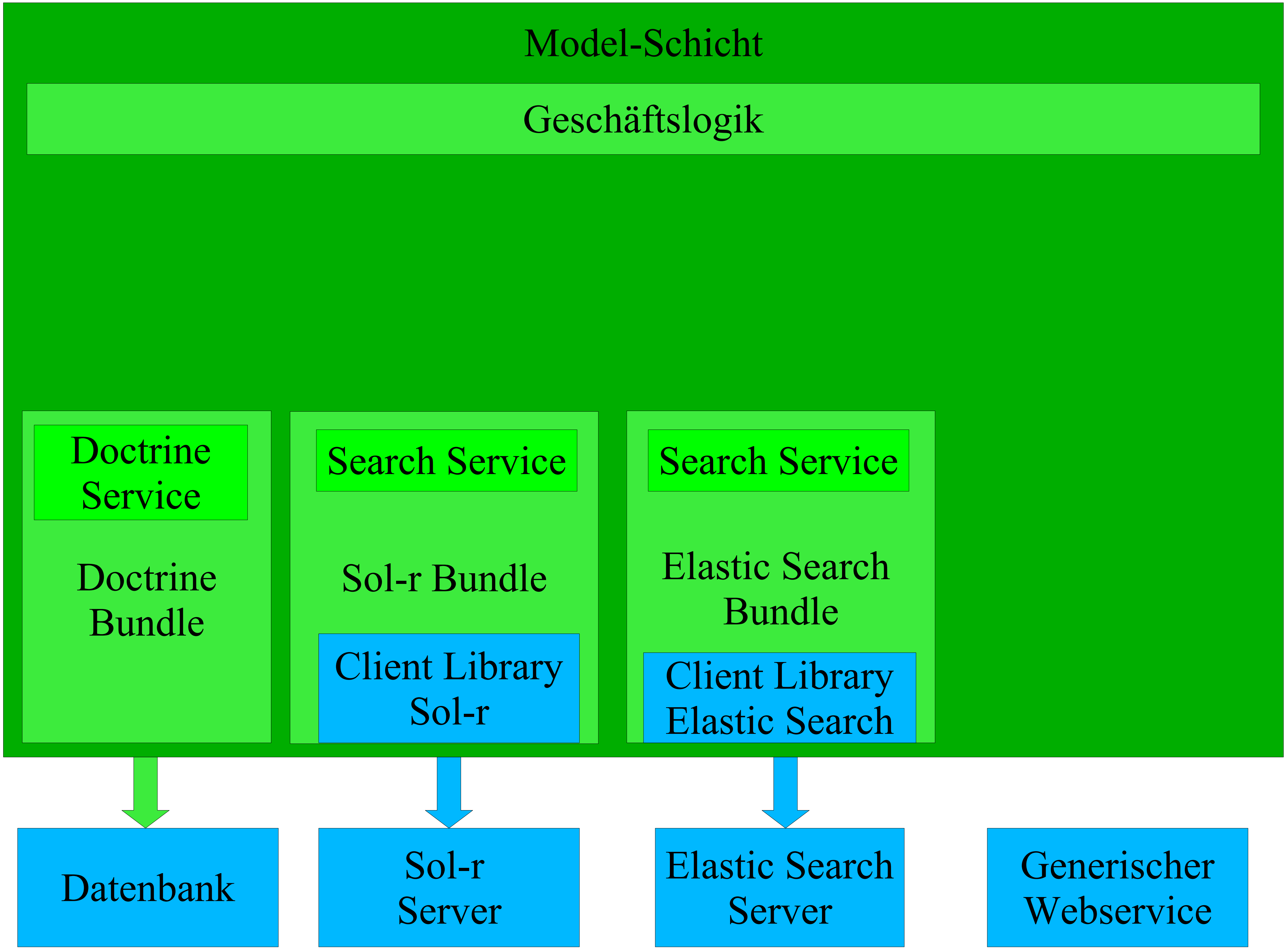
Model-Schicht
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Doctrine Service
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Search Service
Sol-r Bundle
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Search Service
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Datenbank
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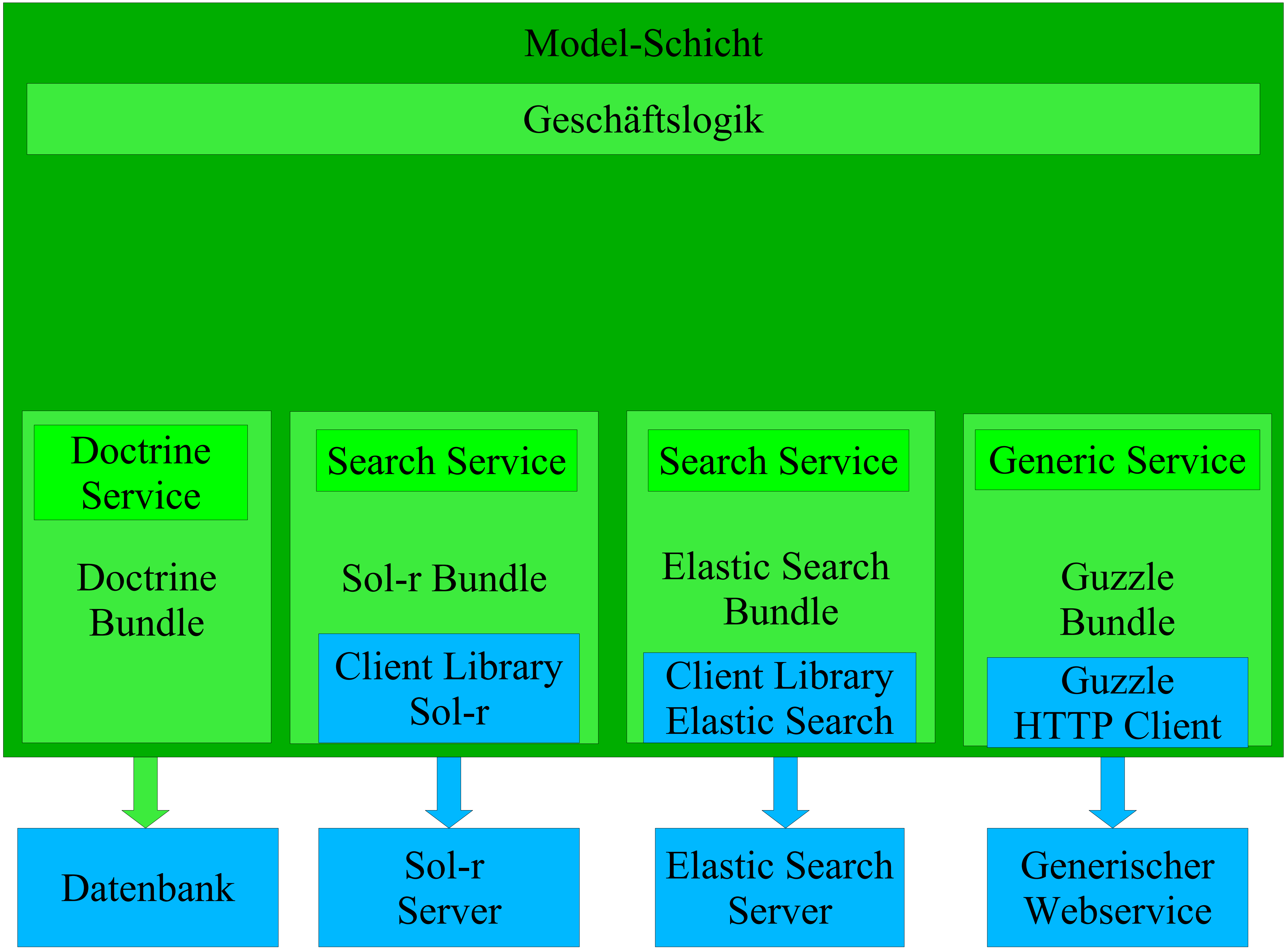
Model-Schicht
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Doctrine Service
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Search Service
Sol-r Bundle
Client Library Sol-r
Search Service
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Generic Service
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Guzzle HTTP Client
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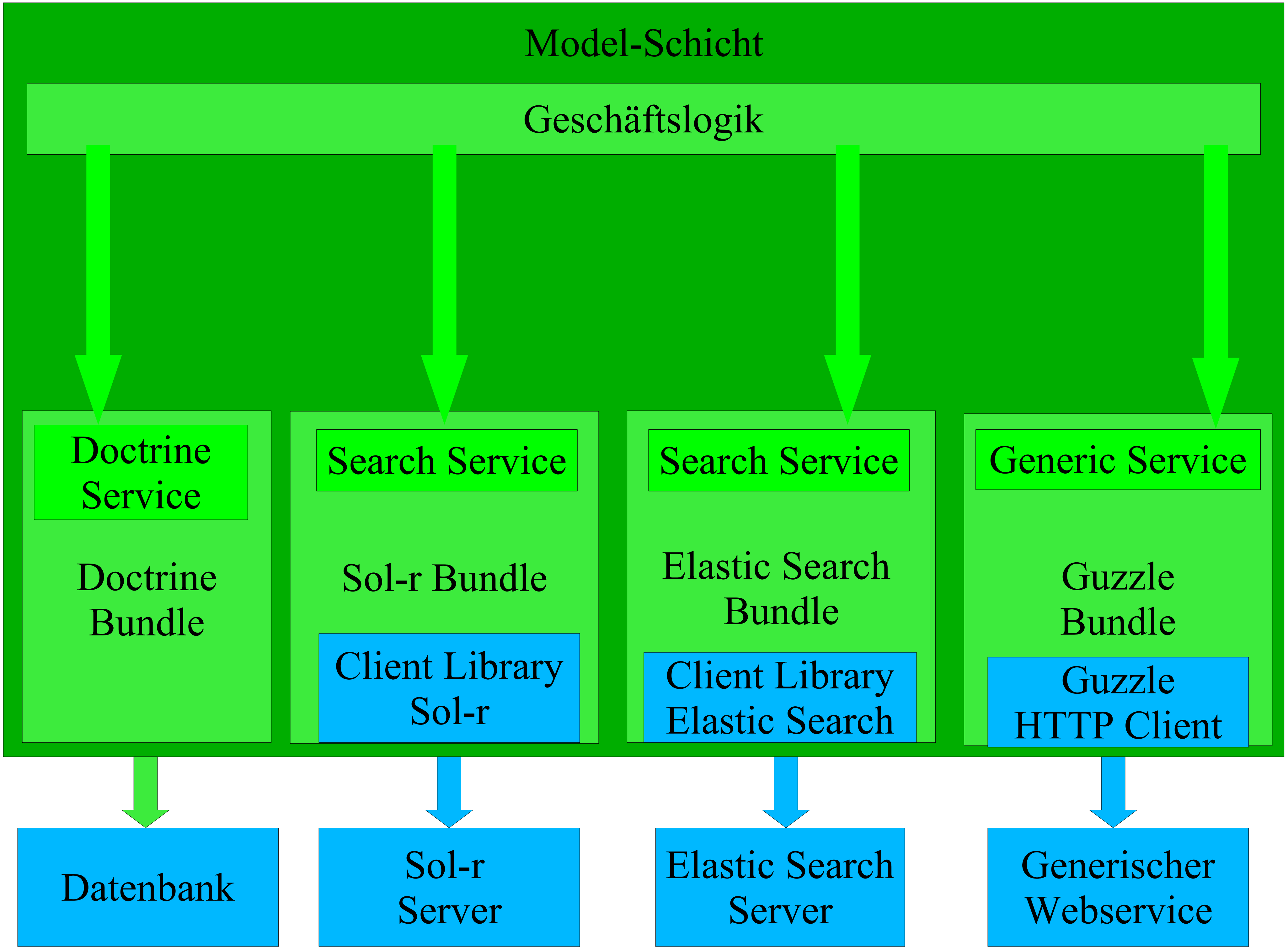
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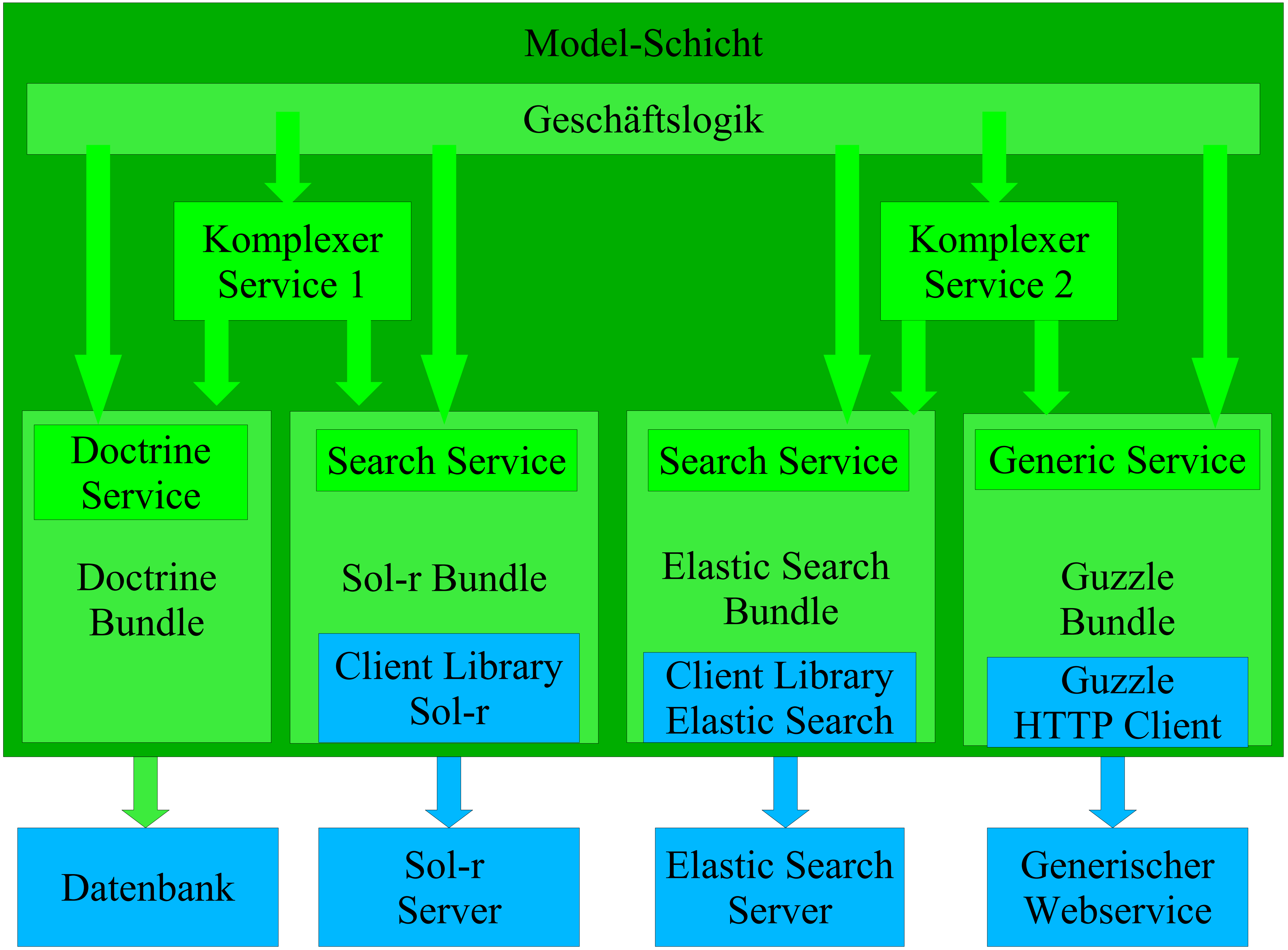
Model-Schicht
Geschäftslogik
Komplexer Service 1
Komplexer Service 2
Doctrine Service
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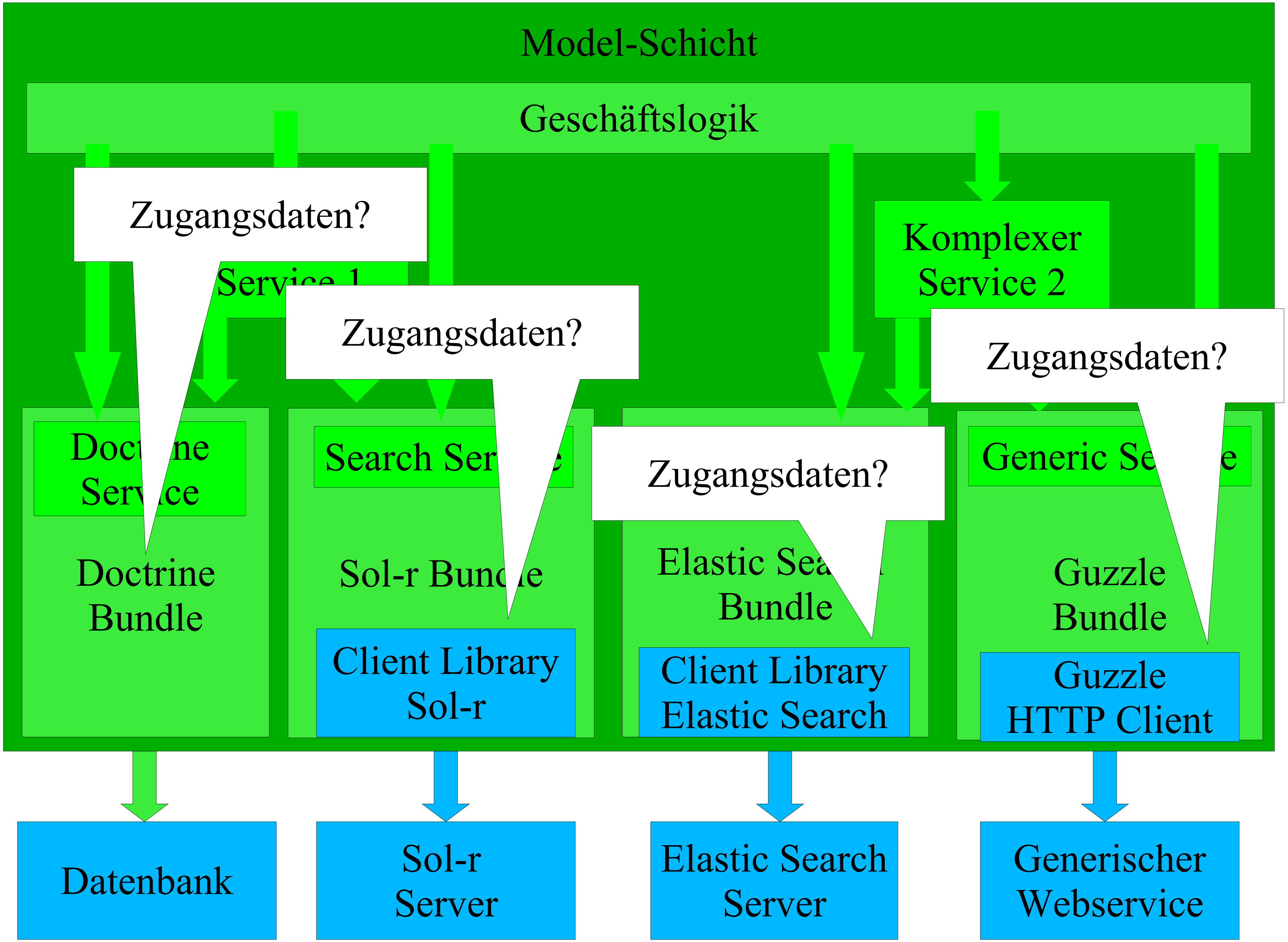
Model-Schicht
Geschäftslogik
Zugangsdaten?
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Zugangsdaten?
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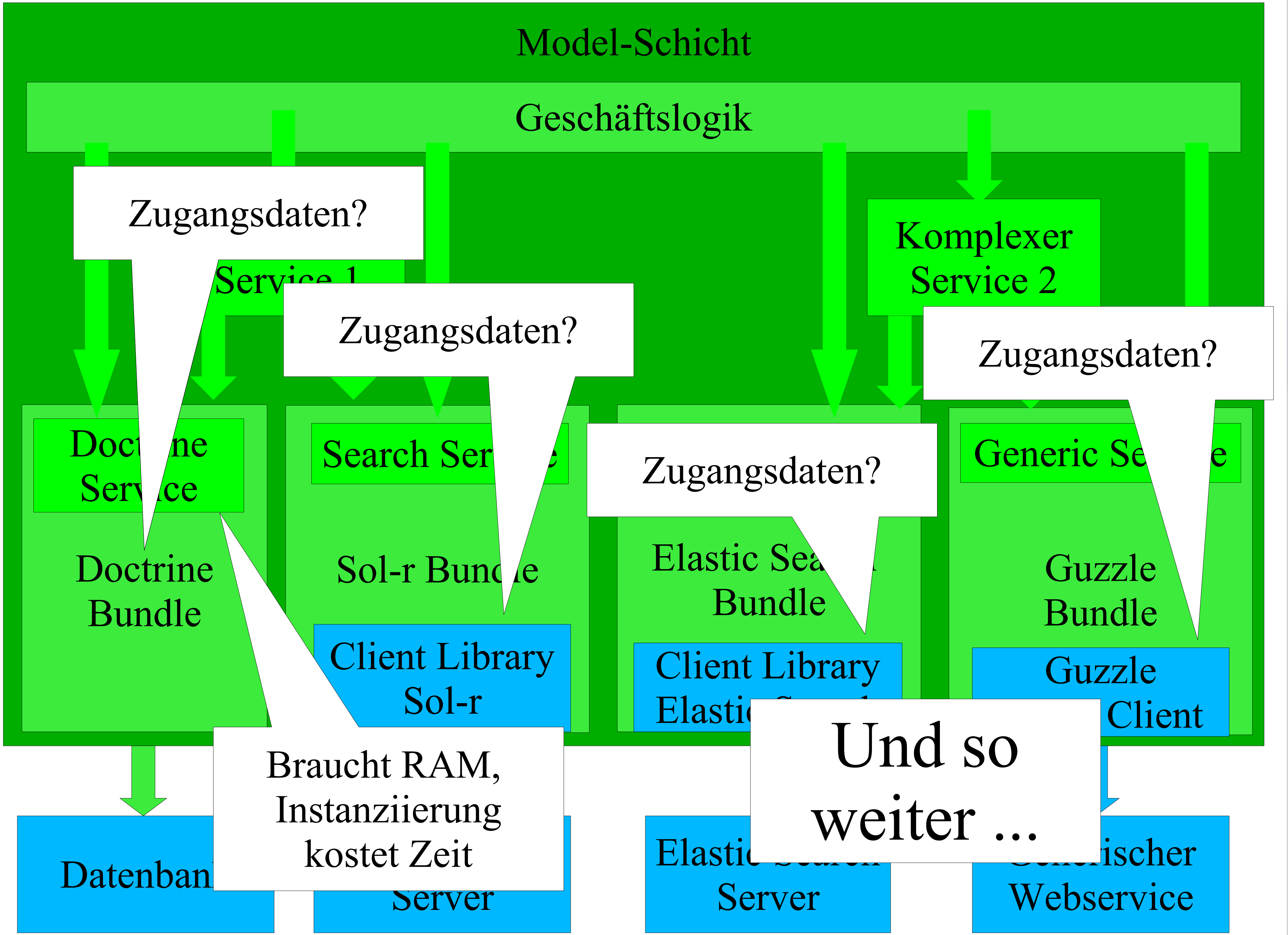
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Client Library Elastic Search
Guzzle Client
Und so weiter ...
Braucht RAM, Instanziierung kostet Zeit
Datenbank
Server
Elastic Search Server
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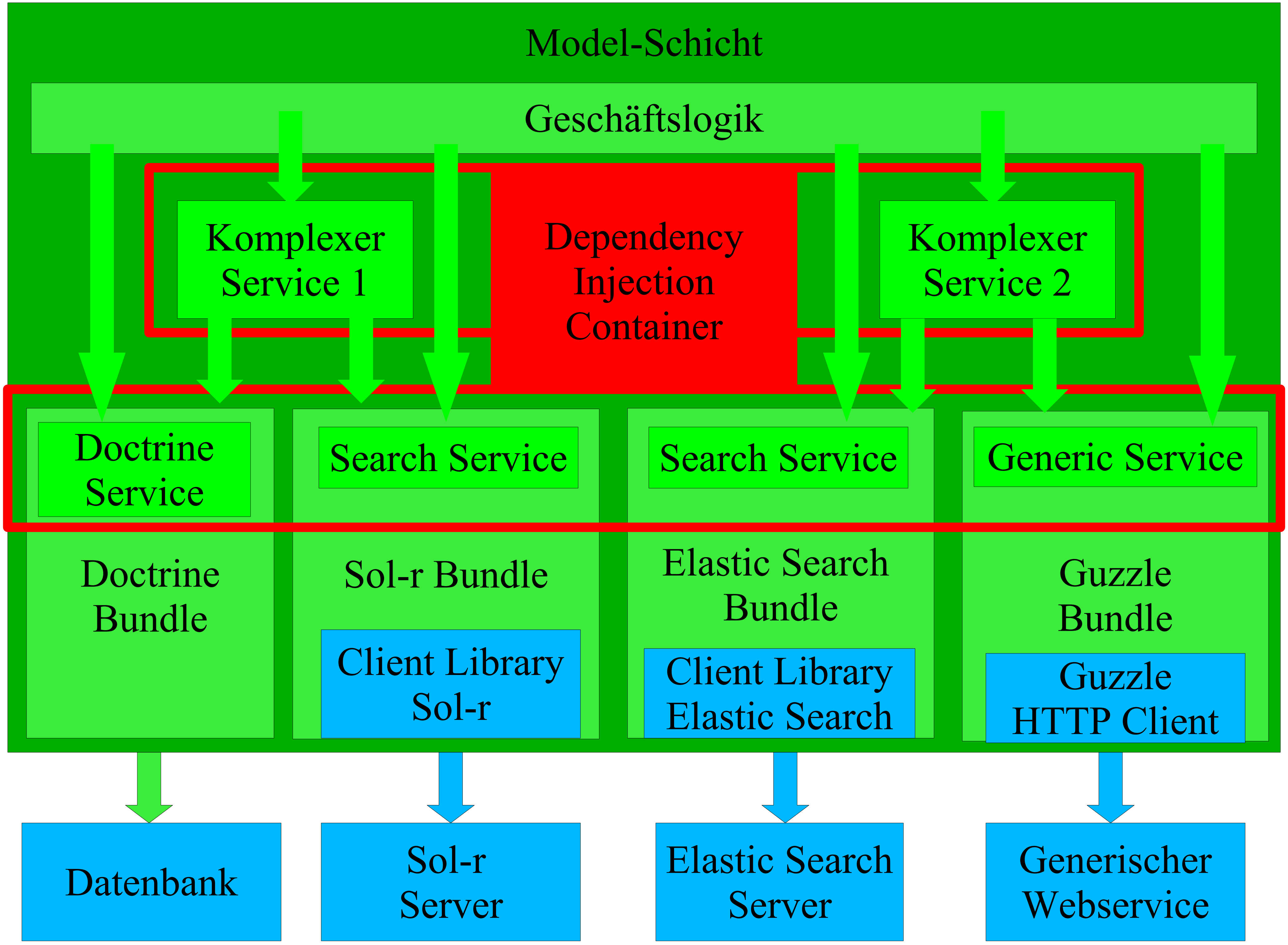
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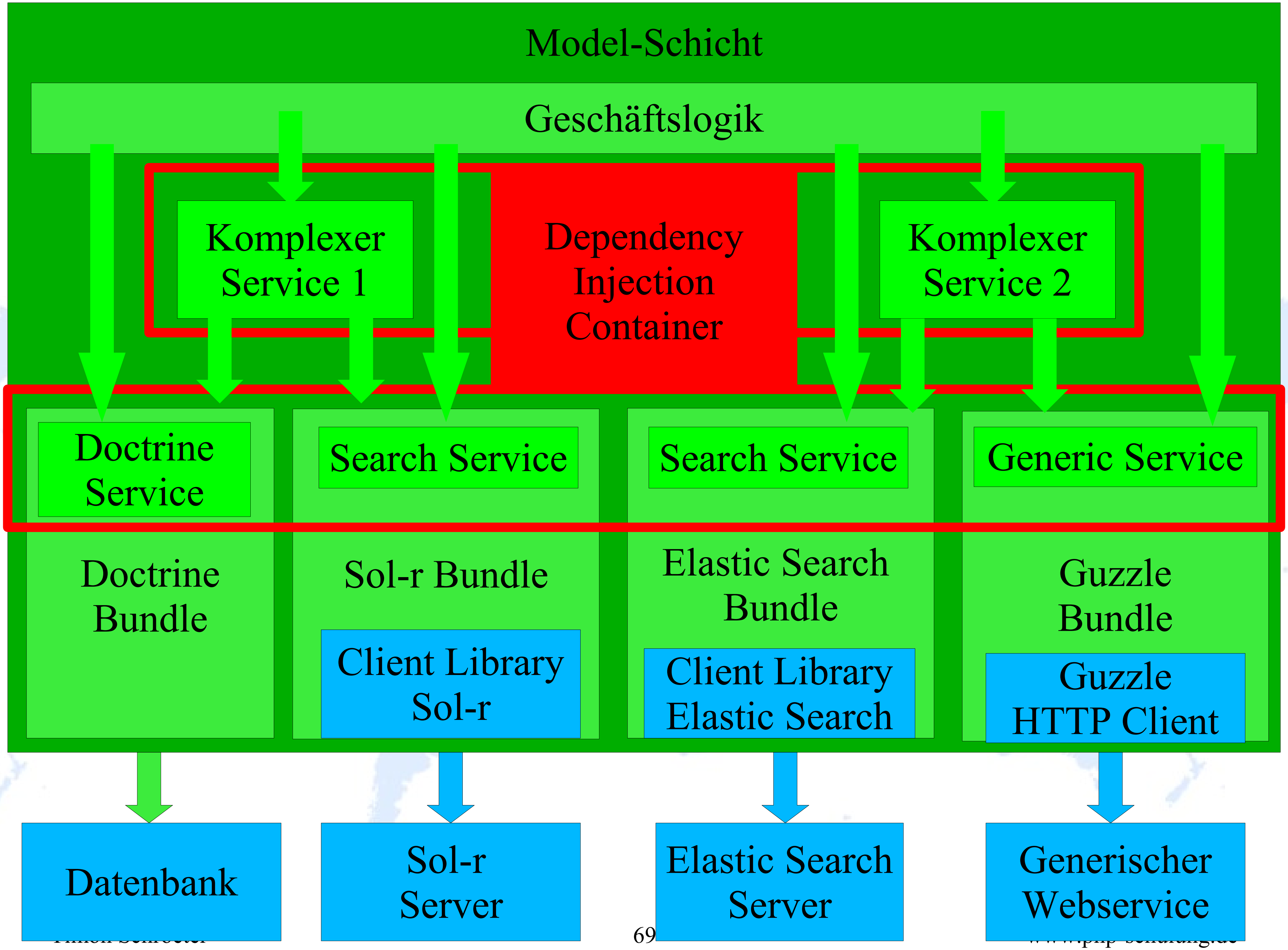
Generischer Webservice

## DIC und Performance

- Kompilierter Container:

```
app/cache/dev/appDevDebugProjectContainer.php
app/cache/prod/appProdProjectContainer.php
```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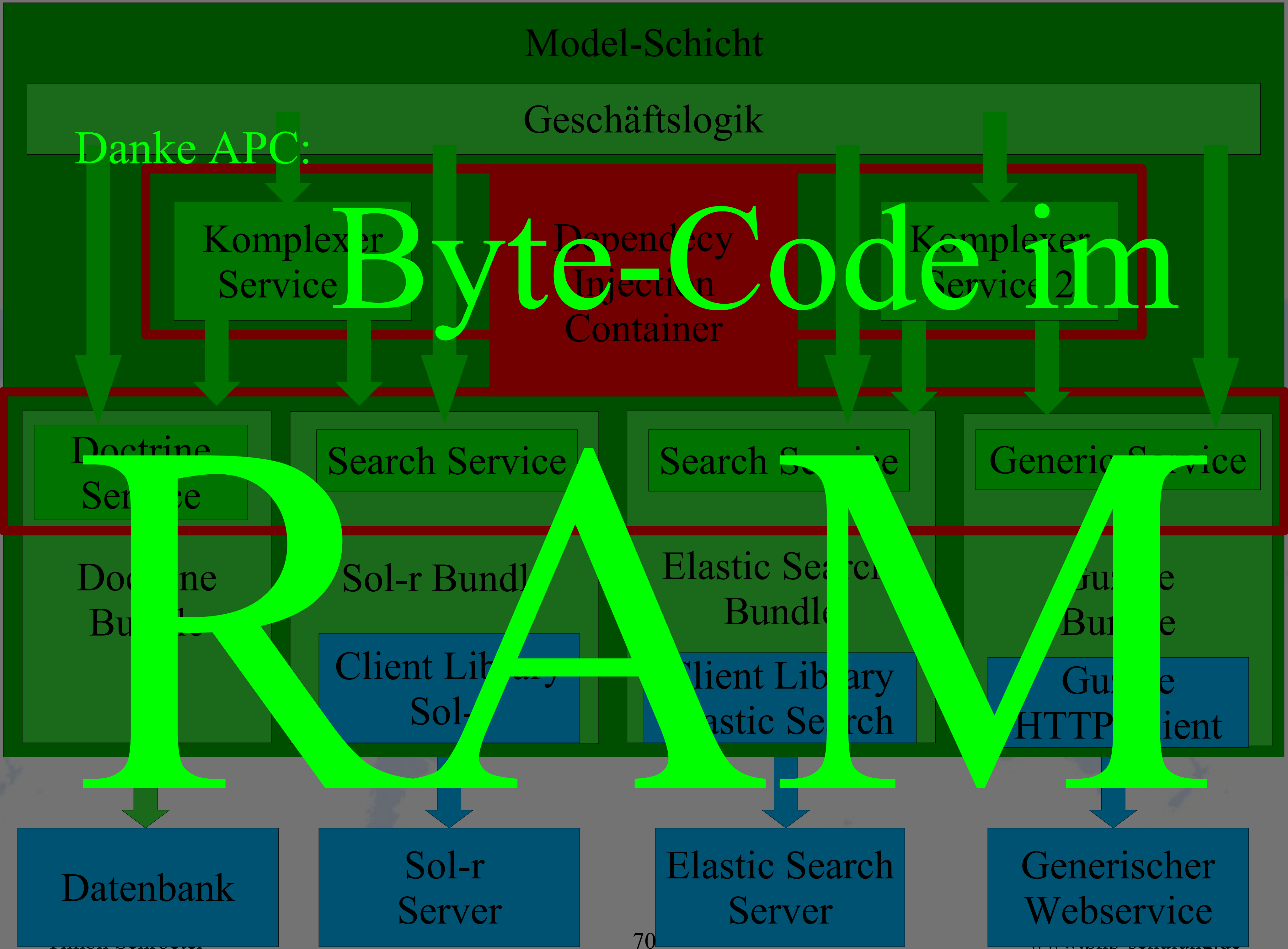
Danke APC:

Byte-Code im RAM



## Summary

- Our classes only depend on interfaces
- All implementation classes are instanciated and provided (injected) by the DIC
- Our classes create only value objects and exceptions
- The DIC is not passed to any model / value class
- Controllers can access the DIC to obtain services

## Further Reading

- http://fabien.potencier.org/article/11/what-is-dependency-injection
- http://symfony.com/doc/current/components/dependency_injection/compilation.html
- http://symfony.com/doc/current/cookbook/service_container/compiler_passes.html
- Use the source ...

# Thank you very much

## for your attention!

# Questions?

## Ideas, wishes, suggestions?

## I'm ready to support Your Project!

- Developer & Consultant: PHP, Symfony 2 etc.
  - www.php-entwickler-berlin.de
- Trainer & Coach: Symfony 2 workshops 1-5 days
  - www.php-schulung.de

## SOLID

- S Single Responsibility Principle
- O Open / Close Principle
- L Liskov Substitution Principle
- I Interface Segregation Principle
- D Dependency Inversion Principle