The Twelve-Factor App

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What is 12-Factor App?

The 12 factors

What is 12-Factor App?

Problem

Making applications that run at web-scale is hard work.

Systems that claim to be **web-scale** are able to handle rapid growth efficiently and not have bottlenecks that require re-architecting at critical moments

What is 12-Factor App

- The 12 Factor App methodology is an influential pattern to designing scalable application architecture.
- published in 2011 by **Adam Wiggins**
- a set of design principles for making application horizontally scalable

Source: https://12factor.net

Who

Any developer building applications which run as a service. Ops engineers who deploy or manage such applications.

Why

- scalable
- enable modern agile workflows
- portability
- set baseline expectations for others
- avoid common problems

The 12 factors

Overview

Codebase
One codebase tracked in revision control, many deploys

Dependencies
Explicitly declare and isolate dependencies

Configuration
Store config in the environment

Backing Services
Treat backing services as attached resources

Build, release, run
Strictly separate build and run stages

Processes
Execute the app as one or more stateless processes

Port binding
Export services via port binding

Concurrency
Scale out via the process model

Disposability
Maximize robustness with fast startup and graceful shutdown

Dev/prod parity
Keep development, staging, and production as similar as possible

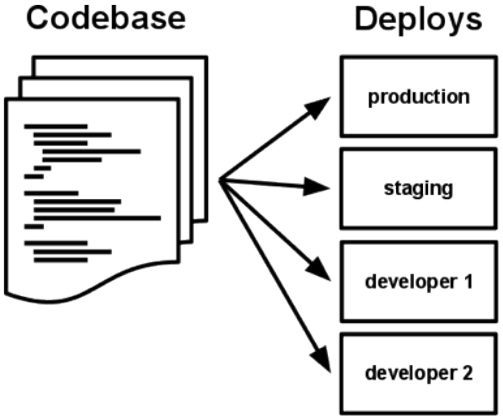
Logs
Treat logs as event streams

Admin processes
Run admin/management tasks as one-off processes

1. Codebase

One codebase tracked in revision control, many deploys

- Only one codebase per app
  - If there are multiple codebases, it's not an app
  - Multiple apps sharing the same code is a violation of twelve-factor.
- Many deploys of one app



1. Codebase - Q

- Example of violation?
- Odoo EE vs Odoo CE?
- Git submodules?

2. Dependencies

Explicitly declare and isolate dependencies

- Never relies on implicit existence of system-wide packages
- Declares all dependencies, completely and exactly, via a dependency declaration manifest
- Dependency declaration and isolation must always be used together

2. Dependencies

Explicitly declare and isolate dependencies

```
$ sudo apt install postgresql postgresql-client

$ sudo apt install python3-dev libxml2-dev libxslt1-dev libldap2-dev libsasl2-dev
    libtiff5-dev libjpeg8-dev libopenjp2-7-dev zlib1g-dev libfreetype6-dev \
    liblcms2-dev libwebp-dev libharfbuzz-dev libfribidi-dev libxcb1-dev libpq-dev

$ pip3 install setuptools wheel
$ pip3 install -r requirements.txt
```

3. Config

Store config in the environment

Strict separation of config from code

An app's config is everything that is likely to vary between deploys:

- resource handles to database, memory
- credentials to external services
- per-deploy values

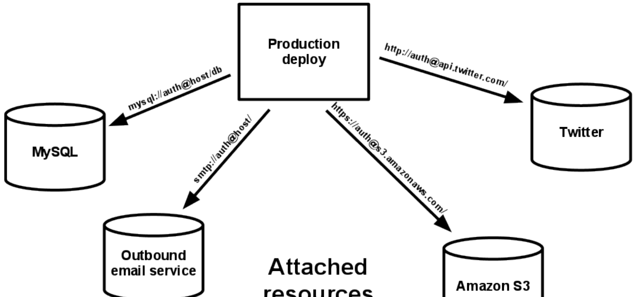
4. Backing Services

Treat backing services as attached resources

Backing service is any service the app consumes over the network as part of its normal operation.

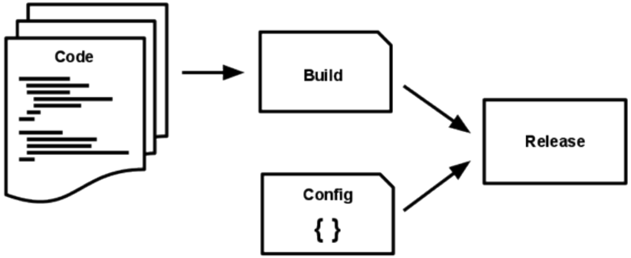
The code for a twelve-factor app makes no distinction between local and third party services.

Swap the application from one provider to another without making any further modifications to the code base



5. Build, Release, Run

Strictly separate build and run stages



maximize your delivery speed while keeping high confidence through automated testing and deployment.

8. Concurrency

Scale out via the process model

Unix process model for running service daemons

The developer can architect their app to handle diverse workloads by assigning each type of work to a process type. Adding more concurrency is a simple and reliable operation.

8. Concurrency

Scale out via the process model

- Worker Types
- Worker Recycling

```
--limit-memory-soft
--limit-memory-hard
--limit-time-cpu
--limit-time-real
--limit-time-real-cron
--limit-request
```

11. Logs

Treat logs as event streams

- Logs should be treated as event streams, that is, logs are a sequence of events emitted from an application in time-ordered sequence.
- A twelve-factor app never concerns itself with routing or storage of its output stream.
- You should consider the aggregation, processing, and storage of logs as a nonfunctional requirement that is satisfied not by your applica tion, but by your cloud provider or some other tool?

11. Logs

Treat logs as event streams

```
--log-level
--log-handler
--logfile
--syslog
--log-db
--log-db-level
```