

Better Custom Components



JDay USA 2026
Herman Peeren

Joomla CMS is not only a CMS...

[Download](#)[Launch](#)[Home](#)[About Joomla!](#)[Benefits & Features](#)[Joomla! 3.9](#)[News](#)[Contribute](#)[Press Enquiries](#)

The Flexible Platform Empowering Website Creators

Joomla! is an award-winning content management system (CMS), which enables you to build web sites and powerful online applications.



Download Joomla!

Download and Install Joomla! in your own server or development environment.

[Download Joomla! →](#)

Use Joomla!

Spin up a free and fully functional Joomla website on launch.joomla.org.

[Launch Joomla! →](#)

Learn Joomla!

Learn how to manage a Joomla website with free video training classes.

[Learn Joomla! →](#)

Joomla also is a toolkit to build web applications



Joomla CMS



User login
(frontend: SaaS)



User
management



Menu
system



CMS pages
for general
info



**Your Custom
Application**
(Custom Component)



Routing /
URLs



Templating

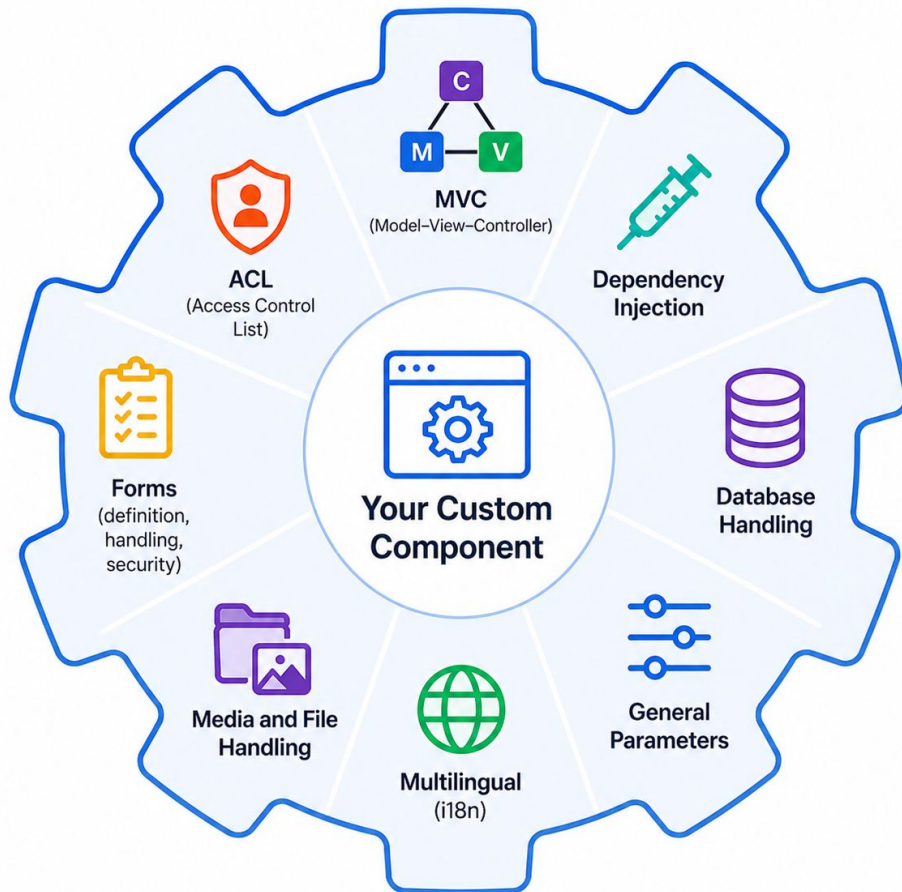


Module
system

Joomla CMS
as “framework”

Building blocks
provided by
Joomla

Your Custom Component - Building Blocks



Your Custom Component – Built-in Optional Features

Optional features provided by Joomla



Some examples of custom components I made

- Management Information System for employment agency franchisers.
- Membership management system for some specific associations.
- Hot air balloon planning system.

Do not customise the organisation to a general computer application, but customise the application to the specific organisation.

Create a custom component

Steps in this presentation:

- Understanding the domain: specific terms and functionality.
- Relations between entities.
- Generating boilerplate code.
- Building blocks: MVC and Dependency Injection.
- Built-in optional features.
- Testing, security and accessibility.



Example: hot air balloons planning system



Hot air balloon



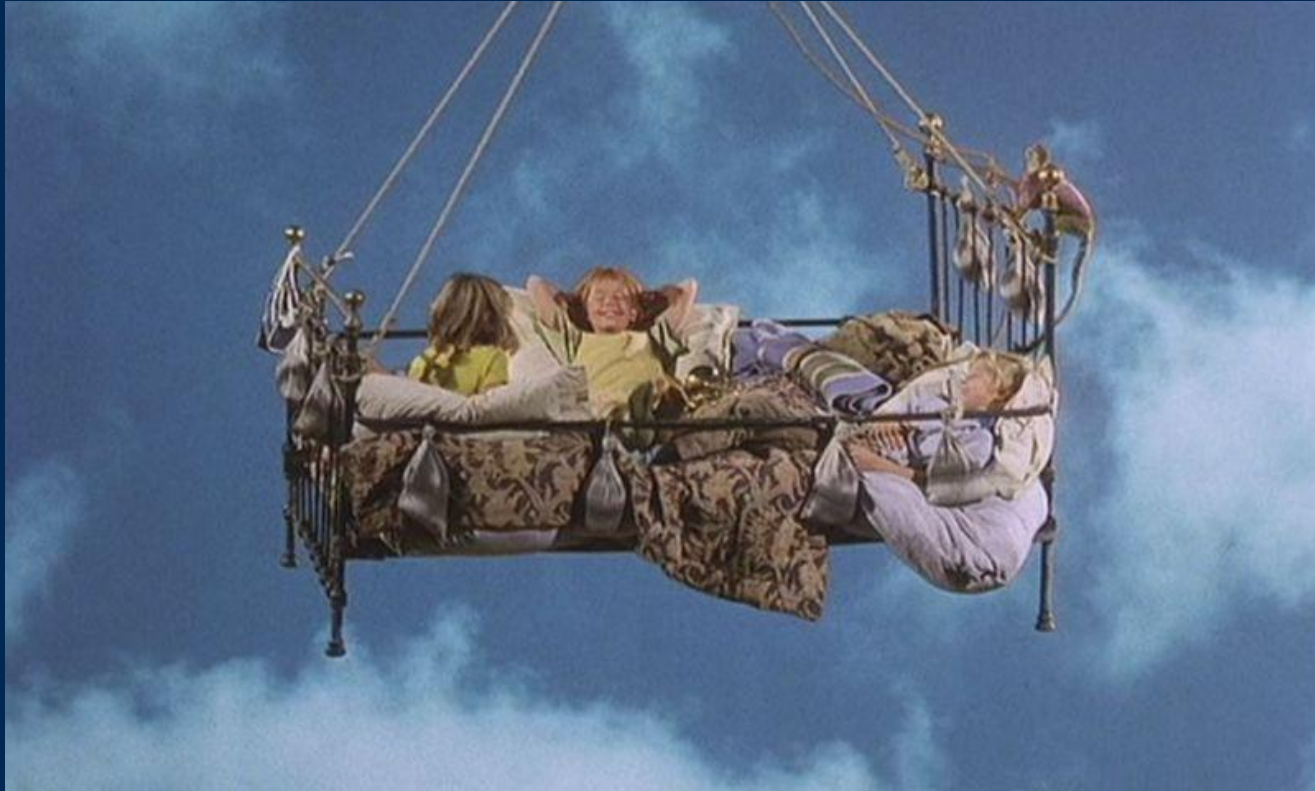
Hot air balloon



Hot air balloon



Hot air balloon



Planned flights

- A company owns balloons. A **balloon** is identified with a **call-sign**. (e.g.: PH-PAF)
- A balloon has a specific **capacity**: how many passengers fit in the basket? (e.g.: 16)
- Because of thermals flights are only possible twice a day: **morning and evening**.
- **Flights** are planned by a planner with a balloon on a date + morning or evening. Mostly from specific departure places.
- Customers can buy a **ticket**, valid for a specific **number of passengers**.
- With a ticket customers can make a **reservation** for a flight.
- Due to wind or rain (or Covid19 measures) a flight can be cancelled.
- Customers have to make a new reservation after a flight was cancelled.

Available places in planned flights



Geplande vertrekplaats is dus slechts een voorkeurslocatie. Zie [hier voor de verschillende mogelijkheden](#) voor een bepaalde locatie of datum.

BALLONVAARTEN ZUID-HOLLAND ▾

CADEAUS ▾

Als je **gegarandeerd opstijgen** vanuit je favoriete plaats, kies dan voor **plaatsing op een oproeplijst**.

We hebben op dezelfde dag meerdere luchtballonnen ingepland, allemaal in dezelfde omgeving. We houden ons altijd het recht voor om passagiers samen te voegen in geval van onderbezetting.
[Reserveer hier](#).

Vrije plaatsen bij geplande ballonvaarten in Zuid-Holland:

Datum	Aantal plaatsen	Geplande opstijgplaats *	Verzameltijd startveld
zondag 19 april	vol	Zoetermeer	17:45
zondag 19 april	vol	Zoeterwoude	17:45
zondag 19 april	1	Leiden	17:45
maandag 20 april	8	Alphen a/d Rijn	17:45
maandag 20 april	8	Bodegraven	17:45
maandag 20 april	6	Papendrecht	17:45
maandag 20 april	4	Hendrik Ido Ambacht	17:45
woensdag 22 april	10	Woerden	17:45
woensdag 22 april	6	Gouda	17:45

Buying tickets and rebooking

- Buy a ticket for a specific flight (for x persons).
- Number of free places has to be updated after the buy.
- Dependent on weather conditions flight goes ahead or is cancelled.
- When a flight is **cancelled**, client has to **rebook** via the site.



Create a custom component

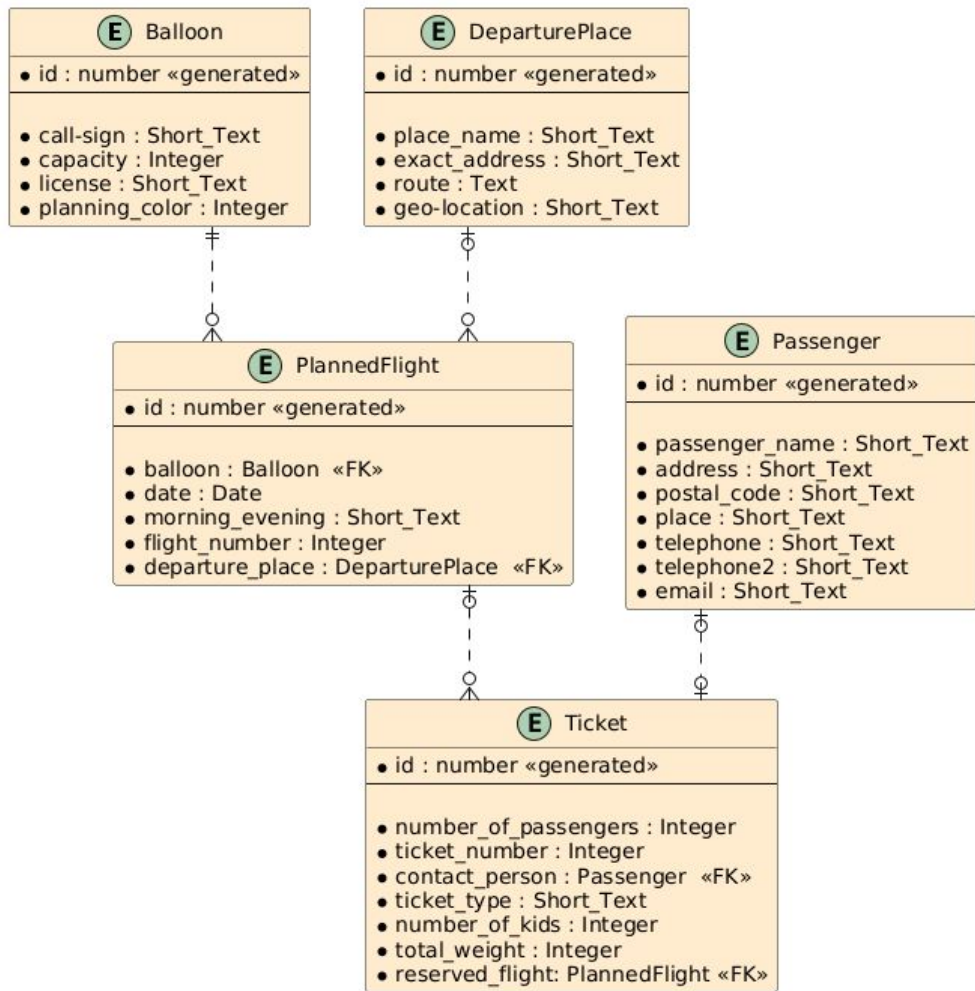
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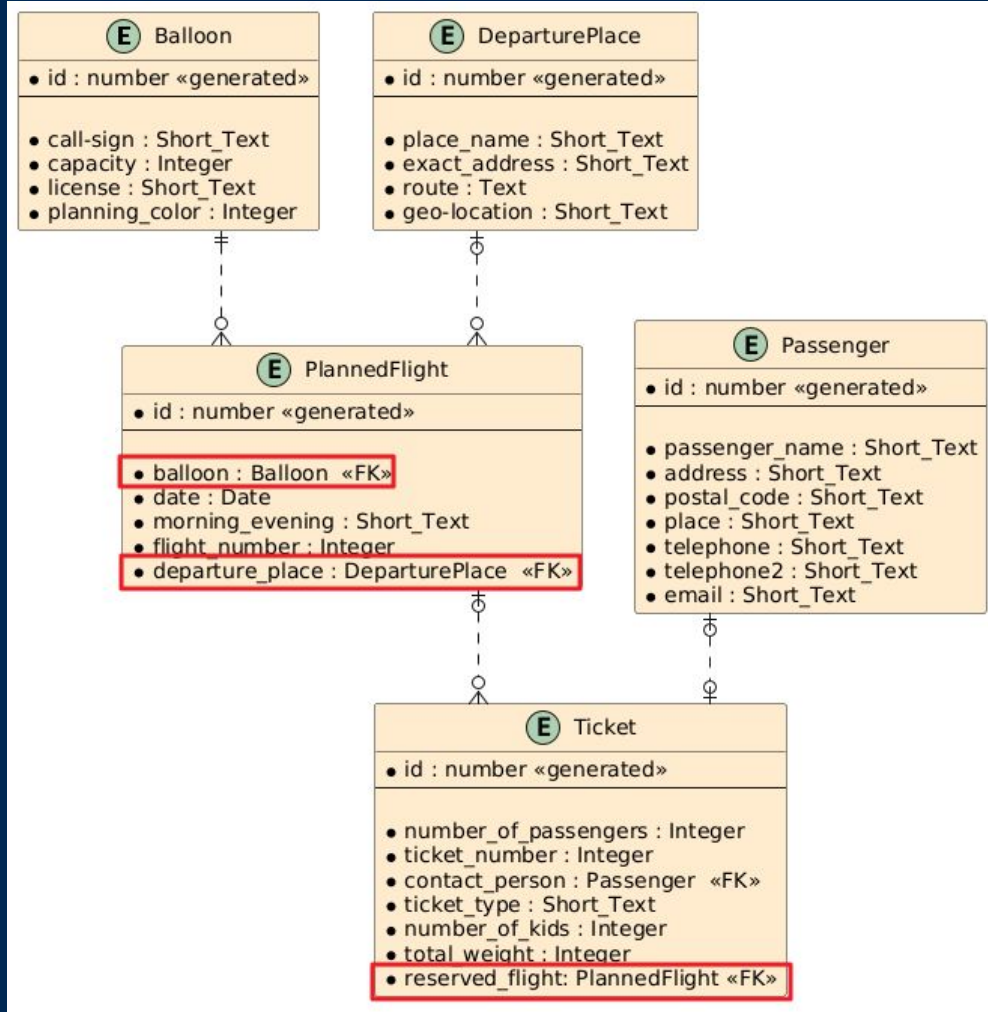


ERD

Entity Relationship Diagram



Many-to-one (n:1) relationship



Many-to-one (n:1) relationship automatically in sql.

```
CREATE TABLE IF NOT EXISTS `#_balloonplanning_plannedflight` (  
  `id` bigint UNSIGNED NOT NULL AUTO_INCREMENT,  
  `balloon_id` bigint(20) UNSIGNED,  
  `date` date,  
  `morning_evening` varchar(255),  
  `flight_number` int NOT NULL DEFAULT 0,  
  `departureplace_id` bigint(20) UNSIGNED,  
  PRIMARY KEY (`id`)  
) ENGINE=InnoDB DEFAULT COLLATE utf8mb4_unicode_ci;
```

Many-to-one (n:1) relationship automatically in list query.

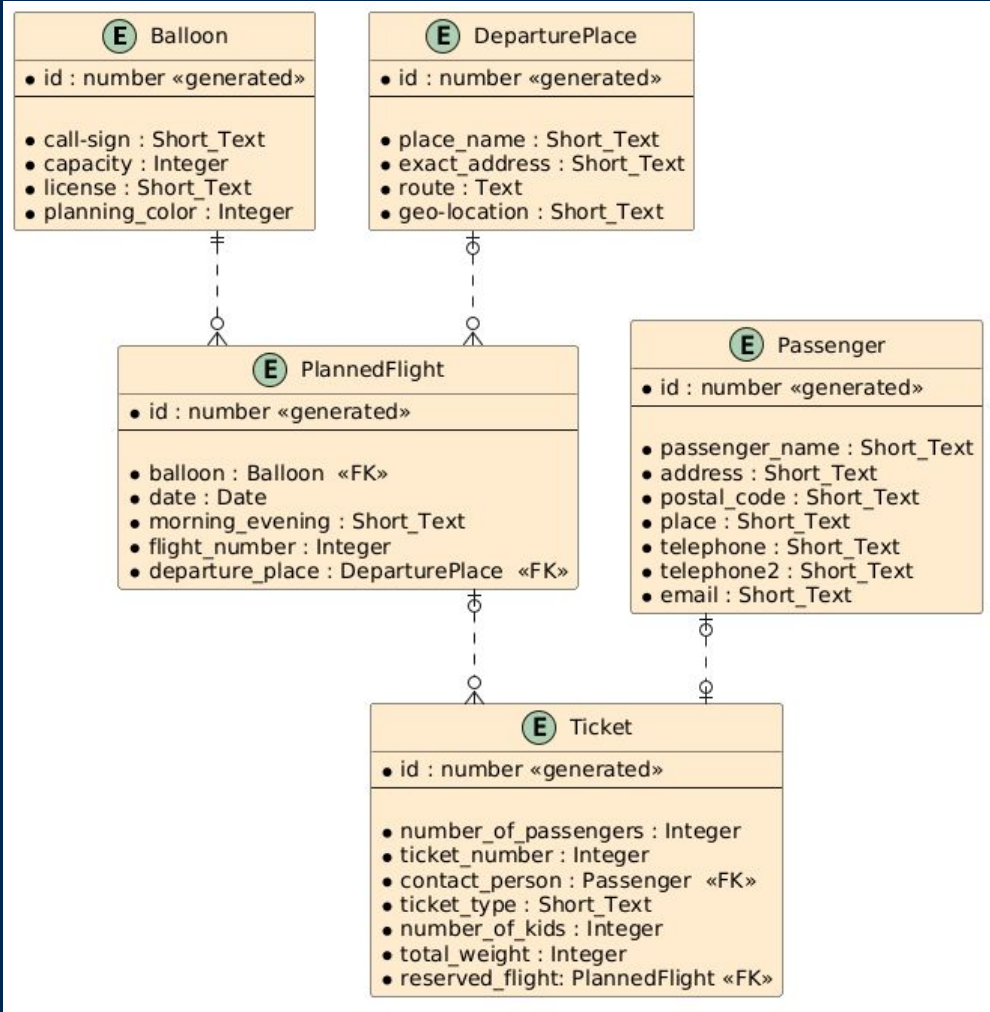
```
// Select the required fields from the table.
```

```
$query->select([
    $db->quoteName( name: 'plannedflight.date'),
    $db->quoteName( name: 'plannedflight.morning_evening'),
    $db->quoteName( name: 'plannedflight.flight_number'),
    $db->quoteName( name: 'plannedflight.id')
]);
$query->from($db->quoteName( name: '#__balloonplanning_plannedflight', as: 'plannedflight'));
```

```
// Add the presentation fields from the joined tables
```

```
$query->select($db->quoteName( name: 'balloon.call-sign', as: 'balloon'));
$query->join(
    type: 'LEFT',
    $db->quoteName( name: '#__balloonplanning_balloon', as: 'balloon'),
    condition: $db->quoteName( name: 'balloon.id') . ' = ' . $db->quoteName( name: 'plannedflight.balloon_id')
);
$query->select($db->quoteName( name: 'departureplace.place_name', as: 'departureplace'));
$query->join(
    type: 'LEFT',
    $db->quoteName( name: '#__balloonplanning_departureplace', as: 'departureplace'),
    condition: $db->quoteName( name: 'departureplace.id') . ' = ' . $db->quoteName( name: 'plannedflight.departureplace_id')
);
```

Only 1 planned flight per ticket



Extending the structure

- Client wants to be able to see history of reservations

Huidige reservering

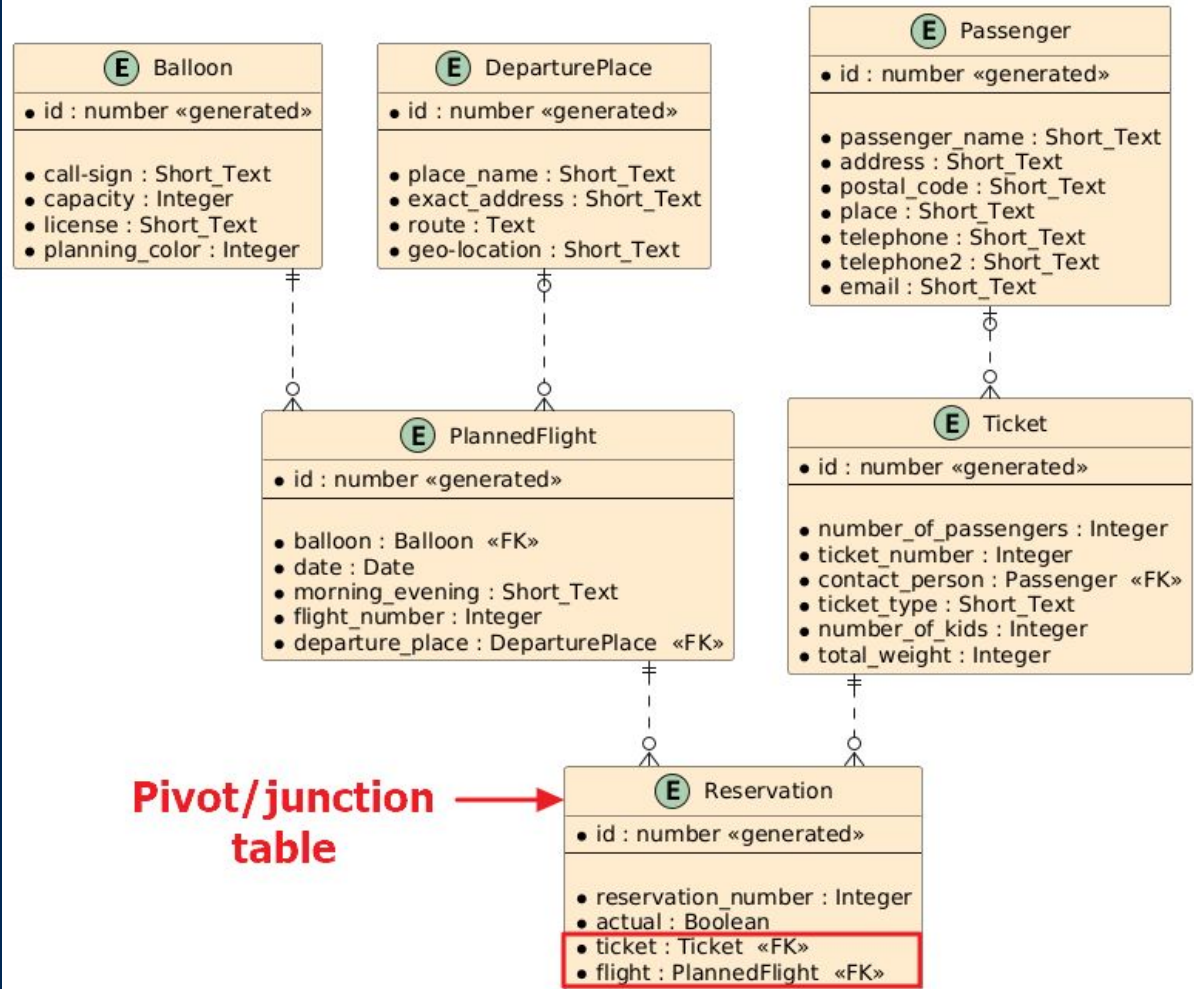
9086: 03-05-2026 Regio Breda (4 vrij) ✕ ▼

Eerdere reserveringen

V 7359: 17-07-2024 Gorinchem		
V 8043: 17-07-2025 Gorinchem		
V 8669: 03-04-2026 Breda		

Many-to-many
(n:n)
relationship:

use a
pivot / junction
table.



Pivot table automatically in sql.

```
CREATE TABLE IF NOT EXISTS `#__balloonplanning_reservation` (  
  `id` bigint UNSIGNED NOT NULL AUTO_INCREMENT,  
  `reservation_number` int NOT NULL DEFAULT 0,  
  `actual` tinyint unsigned NOT NULL DEFAULT 0,  
  `ticket_id` bigint(20) UNSIGNED,  
  plannedflight_id bigint(20) UNSIGNED,  
  PRIMARY KEY (`id`)  
) ENGINE=InnoDB DEFAULT COLLATE utf8mb4_unicode_ci;
```

Magazine article:

[Tools to build a Component - 3: Creating a Component!](#)

And automatically in generated code.

```
public function getSpeakerIds(int $presentation_id = null):array
{
    $db      = $this->getDatabase();
    $query = $db->getQuery(new: true)
        ->select($db->quoteName(name: 'speaker_id'))
        ->from($db->quoteName(name: '#__eventschedule_presentation_speaker', as: 'junction'))
        ->where(conditions: $db->quoteName(name: 'presentation_id') . ' = :thisId')
        ->order(columns: $db->quoteName(name: 'speaker_id') . ' ASC')
        ->bind(key: ':thisId', &value: $presentation_id, dataType: ParameterType::INTEGER);

    $speaker_ids = $db->setQuery($query)->loadColumn() ?: [];

    return $speaker_ids;
}
```

Extending more, and more, and more...

- Client wants to join smaller flights to a bigger one, “flight bundles”.
- Client buys another company: multiple brands and websites.
- BalloonPlanner apart in a SaaS, flights are planned centrally, communicating with sites of several brands, where a list of planned flights is published. Some flights are on multiple sites.
- Tickets are bought on separate sites, each with their own list of flights and available places, but centrally handled in the BalloonPlanner (and then pushed to other sites to adjust the number of available places.
- Different products and prices, all set in the central BalloonPlanner.

It grew and grew, from client wishes. And there are many more plans...





BalloonPlanner

Vaarten Wachtlijsten Tickets Ballonbonnen Waardecheques Facturen Startplaatsen Tarieven Formulier-inzendingen Archief Stats  Synchro

+ Nieuwe vaart plannen

Geplande vaarten

Laat vaarten zien van  en/of  (gemeenschappelijke altijd zichtbaar).

vaartbundel	merk	vaartnummer	week	datum	ochtend/avond	ballon	vertrekplaats	piloot	crew	max.	reserv.	vrij	#vaarten	
22003	X		16	zo. 19-04-2026	avond	PH-MWJ				8	7	1	1	VIP
		9401					Den Haag			7	7	0		
21824	X		17	wo. 22-04-2026	avond	PH-BRB				2	2	0	1	VIP
		9096					Regio Eindhoven			2	2	0		
22027	L		17	zo. 26-04-2026	avond	PH-MWJ				6	6	0	1	VIP
		9451					Vreeland			6	6	0		
21592	L		18	do. 30-04-2026	avond	PH-BRB				2	2	0	1	VIP
		8690					Gouda			2	2	0		
21679	X		18	do. 30-04-2026	avond	PH-TDH			Elena van strien	4	4	0	1	VIP
		8830					Eigen veld van Passagiers			4	4	0		
22022	2		18	vr. 01-05-2026	avond	PH-PDB				10	2	8	3	
		9432					Regio Zundert			10	2	8		
		9440					Regio Roosendaal			6	0	6		
		9441					Breda			8	0	8		
21815	L		18	vr. 01-05-2026	avond	PH-PAF				16	4	12	5	

Communication with web services

BalloonPlanner

Home | Wie zijn wij | Taken | Balloonvaart | Vliegtuigen | Facturen | Startvelden | Taken | Formulier aanvragen | Actief | Site | Sitemap

Geplande vaarten

Vrijwilliger van de week: [Gerrit-Jan van der Meer](#) (gerritjan@balloon.nl)

Vaartnummer	mark	voortuignummer	week	datum	ochtendavond	halve	vertragsdatum	pijluit	cruw	max.	maxm.	uig	Prisatie
20003	K	301	10	du 15-01-2020	avond	PH-MTU				8	7	6	1 VP
							Den Haag			7	7	3	
22004	K	306	17	ma 22-01-2020	avond	PH-DBB				7	2	3	1 VP
							Regio Zuidholland			2	2	3	
20007	L	301	17	du 20-01-2020	avond	PH-MTU				8	6	3	1 VP
							Voorschoten			6	5	3	
21002	L	302	10	du 16-01-2020	avond	PH-DBB				7	3	3	1 VP
							Goede			2	2	3	
21019	K	302	10	du 16-01-2020	avond	PH-TSH				4	4	3	1 VP
							Eigen veld van Passagen			4	4	3	
20005	K	302	10	du 16-01-2020	avond	PH-TSH				10	2	3	1
							Regio Zandert			10	2	3	
							Regio Noordzandert			8	3	3	
							Brink			8	3	3	
21010	L	301	10	du 16-01-2020	avond	PH-MTU				10	4	10	1

balloonvaarten, startvelden, tarieven & reserveren

Vrijheid in de lucht: boek nu een ballonvaart!

Wie hebben weer volop prachtige ballonvaarten gepland? ontdek snel de mogelijkheden en kies jouw moment. Op zoek naar een origineel cadeau? Onze cadeaubonnen zijn een schot in de roos. Ook privévaarten zijn mogelijk: een eigen luchtballon, op een plek die jij kiest, exclusief en helemaal op maat.

Een ballonvaart geeft een ultiem gevoel van vrijheid. Heb jij het al eens ervaren? Ga met ons mee, vier de vrijheid, bekijk de wereld van boven en laat je meedrijven in een luchtballon. Wij zijn dé Zuid-Holland specialist en kennen deze provincie als geen ander.

Last minutes

- w. 01-05 Waddinxveen € 185
- w. 01-05 Goede € 185
- w. 01-05 Oudewijk € 185
- w. 01-05 Regio Zuidholland € 185
- w. 01-05 Brink € 185
- w. 01-05 Capel € 185

Waddinxveen = Waddinxveen
 Oudewijk = Oudewijk
 Regio Zuidholland = Regio Zuidholland
 Brink = Brink
 Capel = Capel w/d Looze

Ook voor andere vertrekplaatsen zijn onze ballonvaarten! Nijk graag naar onze last-minute pagina!

Vragen?

BALLONVAART BIJ XCLUSIVE BALLONVAARTEN

BOEK NU EEN BALLONVAART. OOK GEWELDIG ALS CADEAU!

Het ballonvaarten is begonnen en maken de prachtige ballonvaarten; kijk graag naar de mogelijkheden. Onze cadeaubonnen zijn ook een fantastisch geschenk. Voor privévaarten zijn er ook mogelijkheden om van bijzondere plekken te vertrekken!

Het is zo mooi om de wereld vanuit een luchtballon onder je te zien voorbijglijden. Kom het ook beleven.

Hopelijk tot snel om een mooie ballonvaart te kunnen maken!

DROMEN WAARMAKEN

Bijna ieder mens droomt er van eens te kunnen vliegen. Met het maken van een ballonvaart komt u heel dicht bij dat gevoel. Omdat wij begrijpen dat een ballonvaart maken een belevenis is die u lang bij zal blijven, zullen wij er alles aan doen om deze overgebragt.

Ballonpon.nl

Vragen? Bel 013-5713140

Ontdek je landje vanuit ons mandje

Onze passie sinds 1982

Ballonvaart boeken

- Onze locaties of jouw woonplaats
- Incl champagne, foto en vervoer
- Ballonnen in kleine gezelschappen

[Bekijk onze tarieven](#)

[Meer info](#)

Ballonvaart cadeau

- Geef een unieke belevenis cadeau
- Incl champagne, foto en vervoer
- Zelf te personaliseren cadeaukaart

[Geef een ballonvaart cadeau](#)

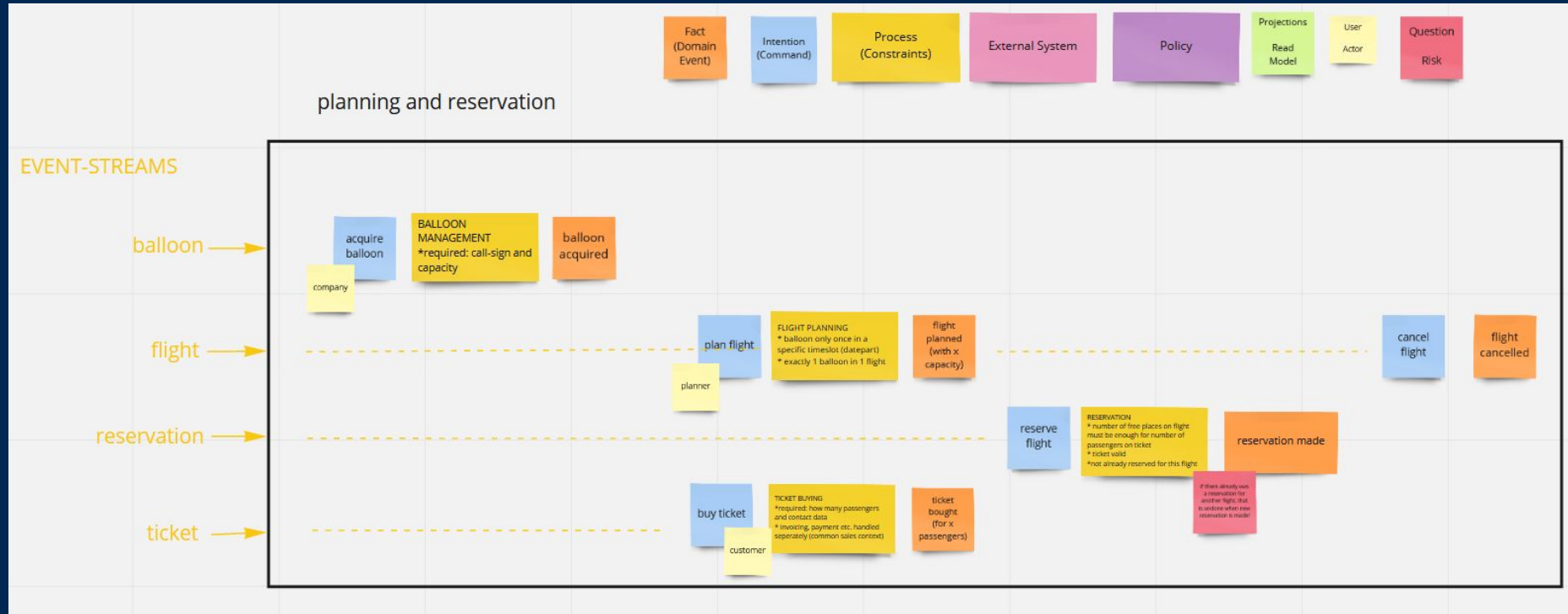
[Meer info](#)

- Clients want new features.
- Adaptations to the code take much time.
- Hence: loose coupling.
- Open-closed principle.

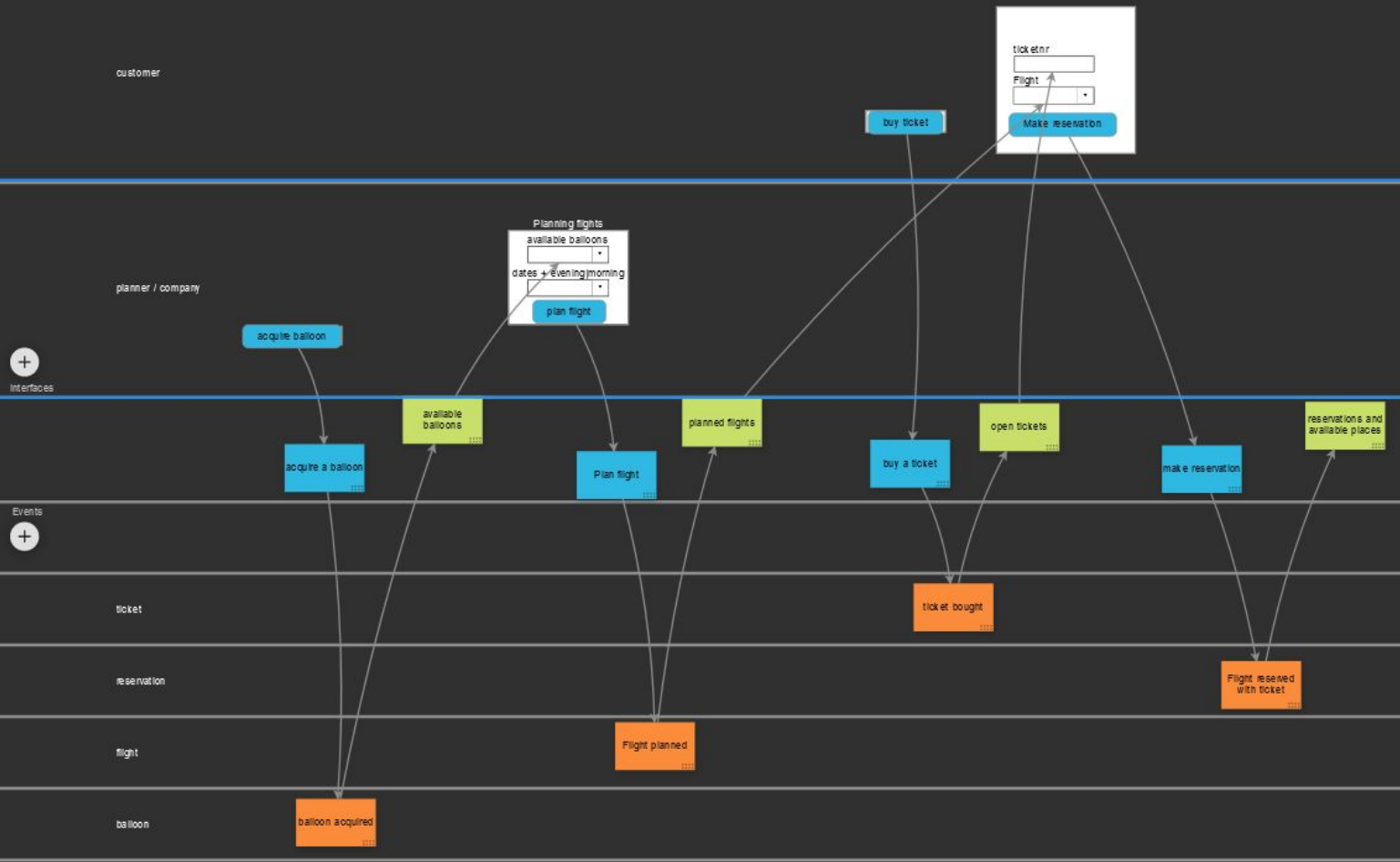
Ideal:
only **adding** code,
changing existing code
as little as possible.



Process modeling: Event storming



Balloon-reservation



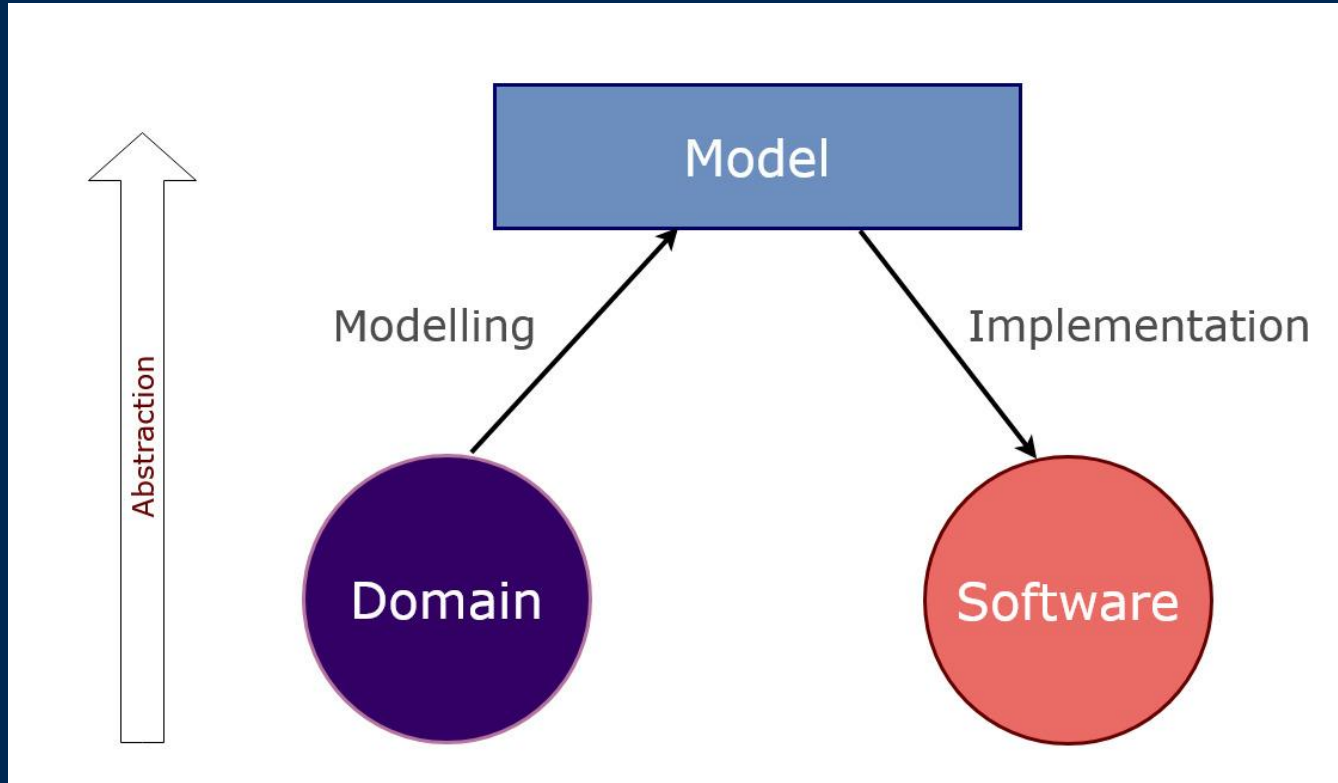
Create a custom component

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Model Driven Engineering (MDE): generating boilerplate



Extension Generator (a Joomla component).

The screenshot shows the Joomla! administrator interface for the Extension Generator component. On the left is a dark sidebar menu with the following items: Menu's, Componenten (expanded), Advertenties, Conference, Contactpersonen, Extension Generator (expanded), Projects, Generators, Project Forms, and Info. The main content area is a light gray table with the following structure:

<input type="checkbox"/>	Project name ▲	Generation	ID ⇅
<input type="checkbox"/>	MyConference MyConference Categorie:	<input type="button" value="Generate"/>	1

Magazine series about [tools to build a component](#):
code generators, a.o. [Component Creator](#), [Joomla Component Builder](#), and [Extension Generator](#)

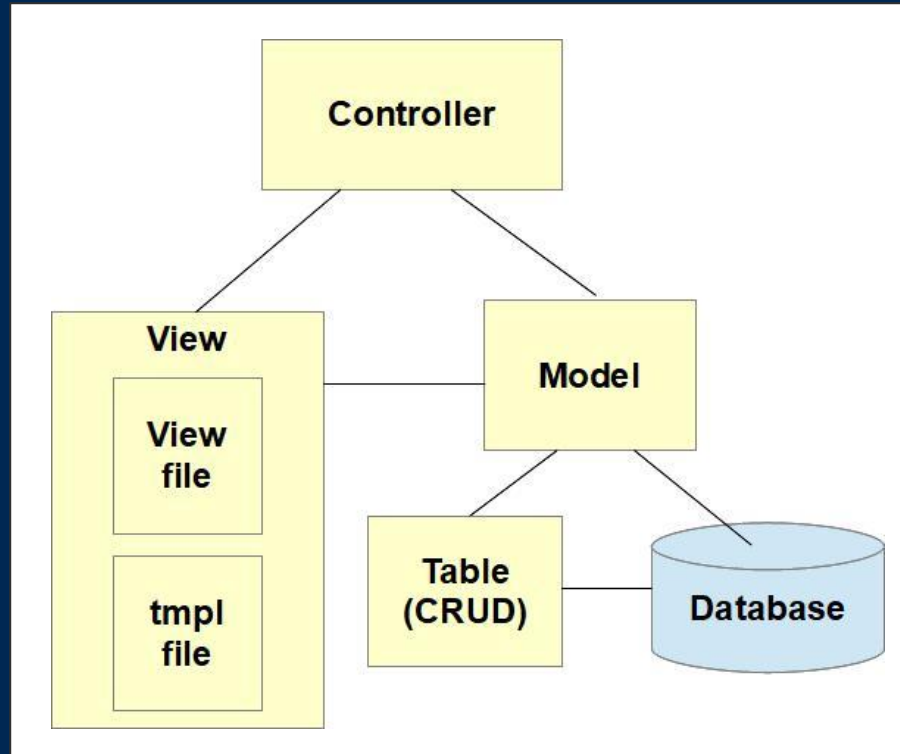
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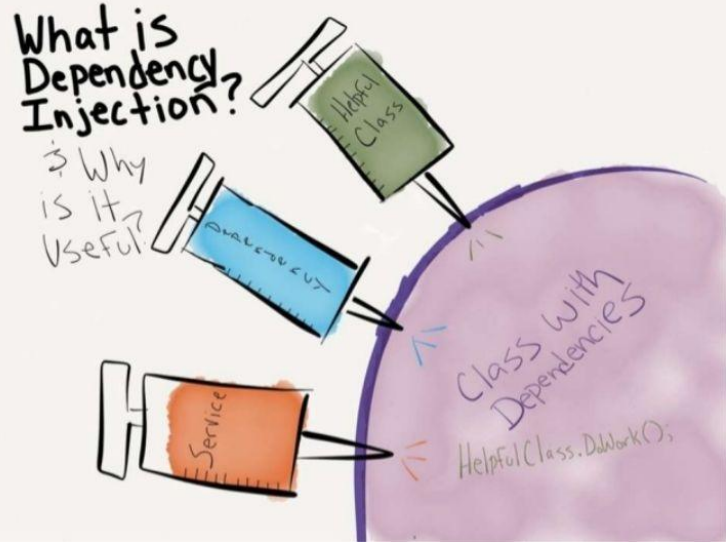
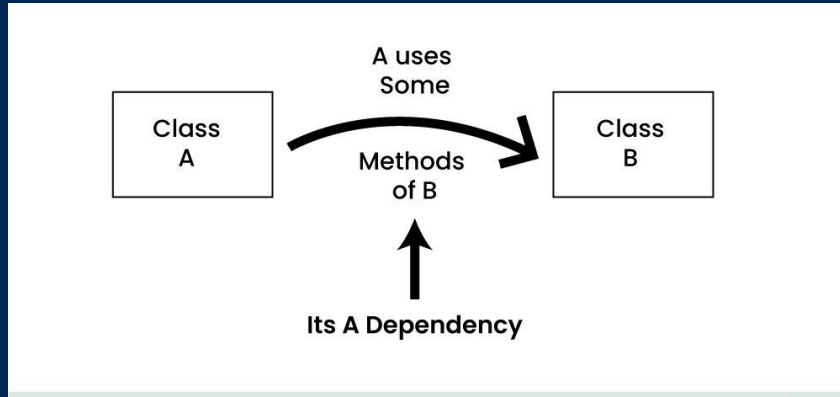


MVC



Controller is an “aggregate root”: the common door to this MVC-triad.

Dependency Injection



Article in magazine: [Dependency Injection: What and Why?](#)

Your Custom Component – Built-in Optional Features

Optional features provided by Joomla



Built-in Bells & Whistles

- Languages and translations:
 - Language strings.
 - Multilingual associations.
- General parameters.
- Locking, check out / check in.
- Explicit item ordering.
- List view features:
 - Filters and search.
 - Sort on column.
 - Hide table columns.
- Access Control Lists (ACL) - users and rights



Magazine article:

[Tools to build a Component - 4: Built-in Extras and some Setup Tools](#)

More built-in Bells & Whistles

- Transversal = orthogonal = horizontal features
= features provided by another component:
 - Categories.
 - Tags.
 - Additional (Custom) Fields.
 - Routing, SEF URLs, alias handling.
 - Workflows.
 - Versioning.
 - Email templates.
 - Caching.
 - Scheduler, Task plugins.
 - Finder plugins.
 - Action logs.



And more built-in Bells & Whistles...

- Web services API.
- Custom Form Fields.
- Form validation.
- Custom Toolbar buttons.
- Batch processing.
- Pagination.
- Structured Content, schema.org.
- (Un)Publish, Trash and Archive.
- Utilities, like file handling, email cloak, etc.
- Modules as extra view.
- Plugins as decoupled extensions.
- etc.



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Setting up your repo for testing

- See [weblinks](#) repo for an example.
- Add via composer:
 - PHP Codesniffer, PHP CS Fixer
 - PHPUnit (unit tests), PHPStan (static analysis)

```
"require-dev": {  
    "joomla-projects/jorobo": "^0.12.1",  
    "phpunit/phpunit": "^9.6.0",  
    "friendsofphp/php-cs-fixer": "^3.87.1",  
    "squizlabs/php_codesniffer": "^3.13.4",  
    "phpstan/phpstan": "^2.1.22",  
    "phpstan/phpstan-deprecation-rules": "^2.0.3"  
}
```

Setting up your repo for testing

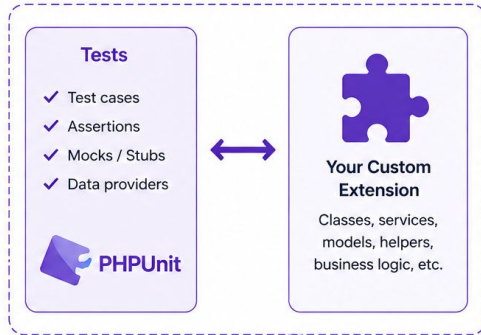
- Add Cypress via npm (package.json)

```
"scripts": {
  "cypress:install": "cypress install",
  "cypress:open": "cypress open",
  "cypress:run": "cypress run"
},
"devDependencies": {
  "cypress": "^14.5.3",
  "joomla-cypress": "^1.3.1",
  "mysql": "^2.18.1",
  "pg": "^8.16.3",
  "smtp-tester": "^2.1.0"
}
```

Unit Testing (with PHPUnit)

Tests your (custom) extension in isolation.
No Joomla required.

Isolated Test Environment



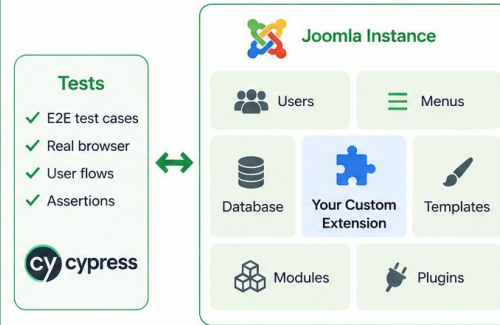
Focus

- Fast feedback
- Tests small units in isolation
- No Joomla bootstrapping
- Verifies logic and behavior

End-to-End Testing (with Cypress)

Tests your extension in a real Joomla instance.
Everything works together.

Test Environment (Full Joomla Instance)



Focus

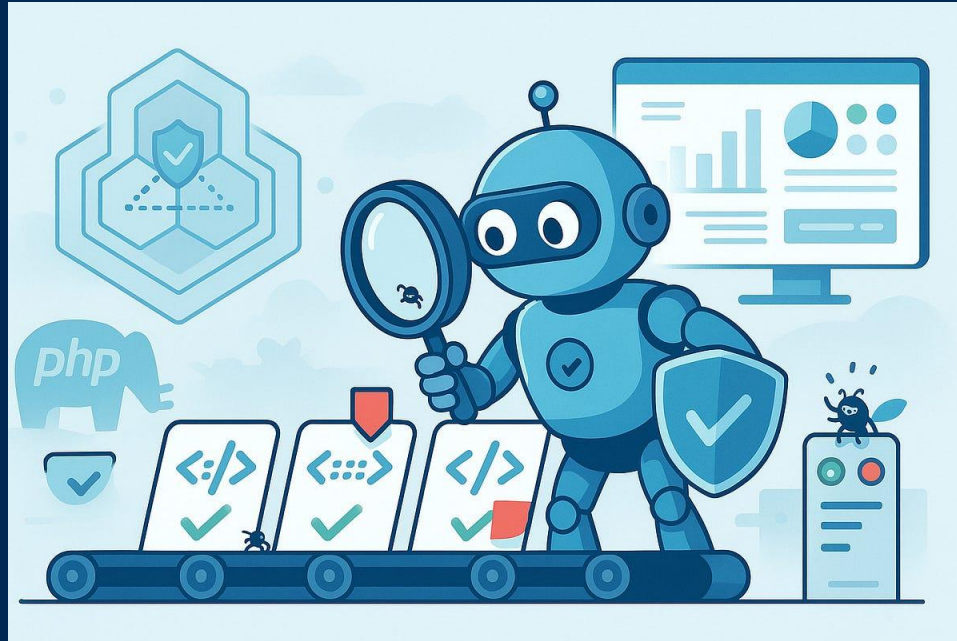
- Tests the full application flow
- Real browser, real requests
- Requires Joomla installation
- Verifies integration and user experience

Magazine articles:

[Test your Extension, Part 1: PHPUnit](#)

[Test your Extension, Part 2: Cypress](#)

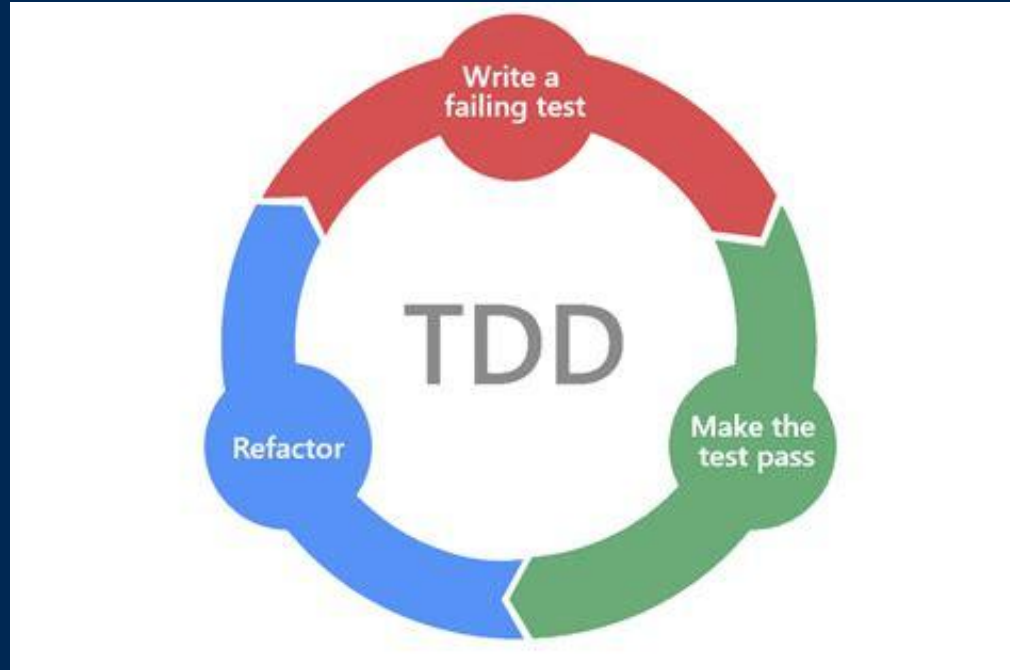
Static analysis with PHPStan



Magazine article:

[Test your Extension, Part 3: PHPStan](#)

Tests firsts and BDD



Tests firsts and BDD

Behaviour Driven Development



(FIXTURE)

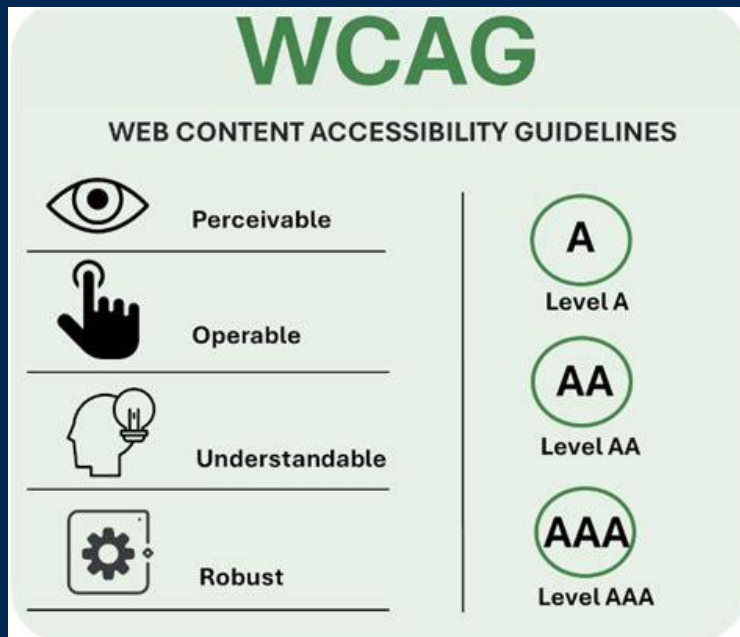


(EXECUTE)



(EXPECT)

Accessibility



Magazine article:

[Test your Extension, Part 4: Accessibility](#)

Accessibility

A New Definition

- Accessibility is the **ability of the system to accommodate the needs of the user**
- Disability is the **mismatch between the user and the interface** provided
- We all experience disability
- Accessible software = better software

Security

- Check all user input!
- Use Prepared statements in SQL.



Magazine article:

[Test your Extension, Part 5: Security](#)

Never done it... so I think I can do it!



Follow your dreams...

Ethics



... but remain aware of the consequences of your actions.

Joomla is more than a CMS.



Joomla also is a toolkit to build web applications.

Articles in Joomla Community Magazine

- Series about [tools to build a component](#):
 - Episode 3 is about [relationships](#) between entities.
 - Episode 4 is about [built-in features](#) that you optionally can use in your component.
 - Episode 4 - 8 about **code generators**, a.o: [Component Creator](#), [Joomla Component Builder](#), and my own [Extension Generator](#).
- Article about [Dependency Injection](#).
- Series about testing your extension:
 - 3 episodes about tools: [PHPUnit](#), [Cypress](#), and [PHPStan](#).
 - Episode 4 about [testing accessibility](#).
 - Episode 5 about [testing security](#).

