Global Knowledge®

Angular Fundamentals

Data binding

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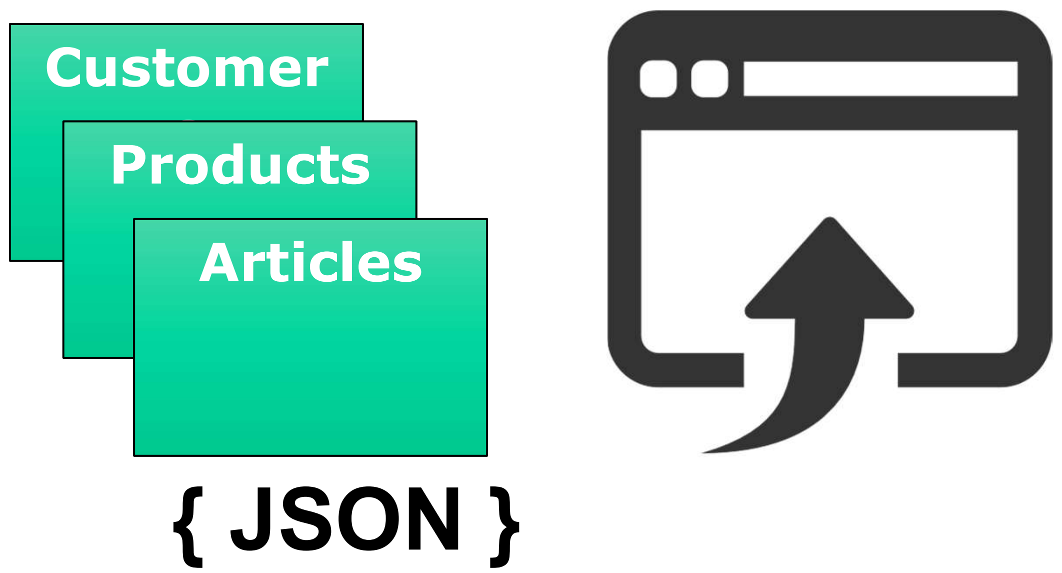
Wat is databinding

- Show – all kinds of – data in User Interface
- Data can come from:
  - Controller / class
  - Database
  - User input
  - Other systems



Declaratieve syntaxis

- Four (4) kinds of databinding
- Angular specific notation in HTML templates

    1. Simple data binding
    2. Event binding
    3. One-way data binding (Attribute binding)
    4. Two-way data binding

1. Simple Data binding

Class-properties binden in de template

1. Simple data binding syntax

Double curly braces:

```
<div>City: {{ city }}</div>

<div>First name: {{ person.firstname }}</div>
```

Always: in conjunction with component/class

```
import {Component} from '@angular/core';
@Component({
   selector: 'hello-world',
   template: `<h1>Hello Angular 2</h1>
      <h2>My name is : {{ name }}</h2>
      <h2>My favorite city is : {{ city }}</h2>
   `
})
export class AppComponent {
   name = 'Peter Kassenaar';
   city = ‘Groningen'
}
```

Or: properties via constructor

```
export class AppComponent {
   name: string;
   city: string;

   constructor() {
      this.name = '…';
      this.city = '…';
   }
    ngOnInit() {
      this.name = 'Peter Kassenaar';
      this.city = 'Groningen';
   }
}
```

BEST PRACTICE:

use `ngOnInit()`

Binding using a loop: `*ngFor`

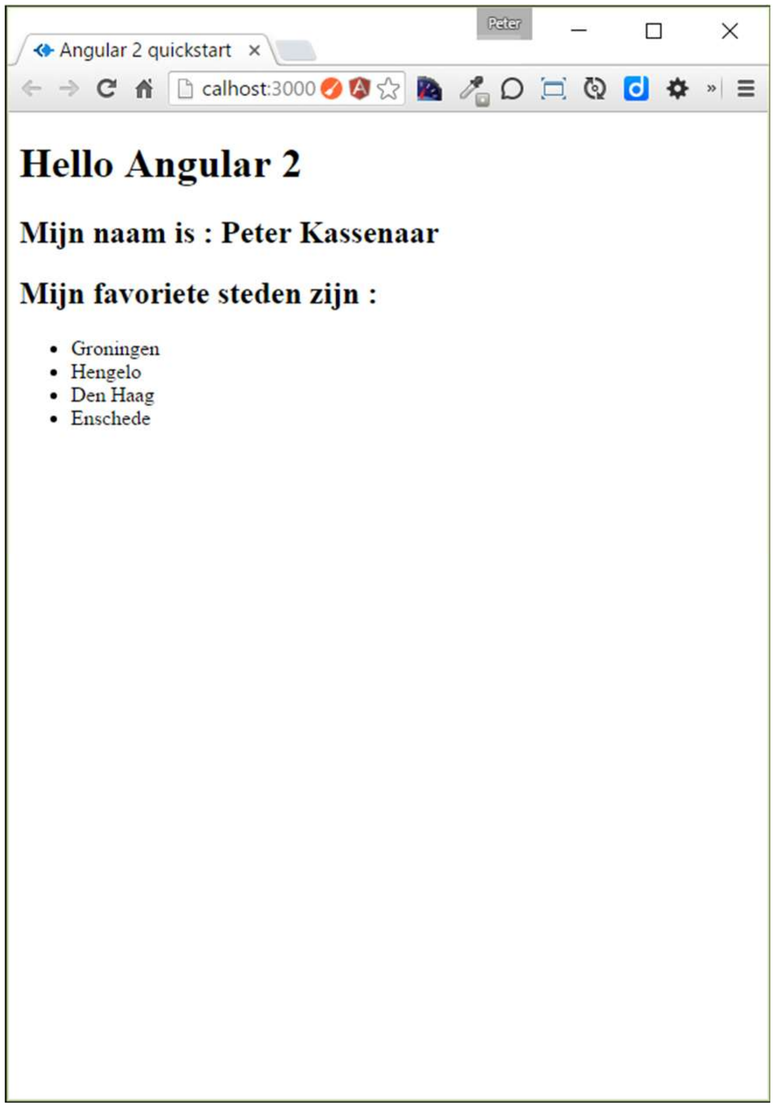
Template:

```
<h2>Mijn favoriete steden  are :</h2>
<ul>
   <li *ngFor="let city of cities">{{ city }}</li>
</ul>
```

Class:

```
// Class met properties, array met cities
export class AppComponent {
   name:string;
   cities:string[];

   ngOnInit() {
      this.name   = 'Peter Kassenaar';
      this.cities = ['Groningen', 'Hengelo', 'Den Haag', 'Enschede']
   }
}
```



Hello Angular 2

Mijn naam is : Peter Kassenaar

Mijn favoriete steden zijn :

- Groningen
- Hengelo
- Den Haag
- Enschede

Meer info:

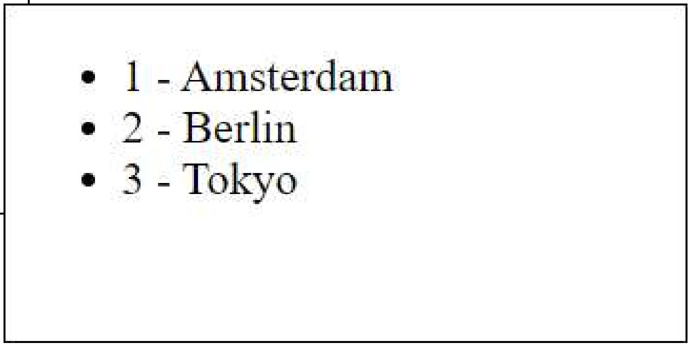
https://angular.io/guide/displaying-data

NEW Syntax, Repeating items: `@for`

- Previously: `*ngFor="let item of items"`
- New: `@for (item of items; track item.id) {…}`
- ONLY: in Angular 17+

```
cities : City[] = [
  {id: 1, name: 'Amsterdam', country: 'NL'},
  {id: 2, name: 'Berlin', country: 'GER'},
  {id: 3, name: 'Tokyo', country: 'JAP'},
]
```

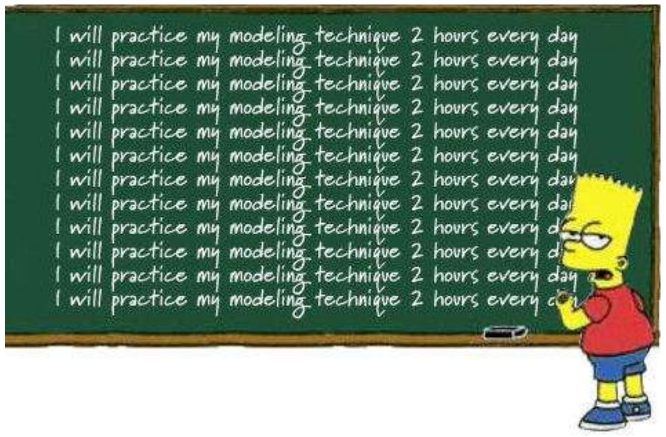
```
<ul>
  @for (city of cities; track city.id) {
    <li>{{ city.id }} - {{ city.name }}</li>
  }
</ul>
```



- 1 - Amsterdam
- 2 - Berlin
- 3 - Tokyo

Workshop

- Expand your app from the previous lab (`Hello World`) with a field/property. Bind the property in the template being used.
  - First, use direct initialization of variables, like name: string = '<your-name>'.
  - Second, use separate declaration and initialize in the constructor. Code can look like:
  - Third, use the (recommended) approach using ngOnInit().
- The user interface will always be the same! The latter (`ngOnInit()`) approach is just the best practice.
- Use additional properties.
- Demo `../101-databinding`


I will practice my modeling technique 2 hours every day
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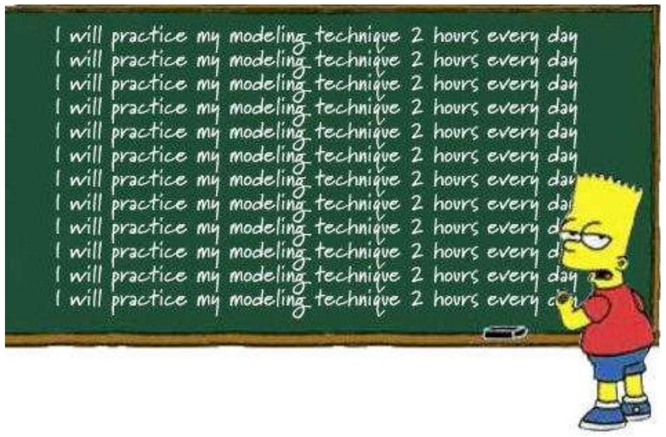
Workshop

- Create an array of properties. Bind them in the template using the directive `*ngFor`
  - Then, use the newer syntax `@for()`
  - What do you need to import for that?
- Use TypeScript to explicitly declare the property as an array of strings.
  - `cities: string[];` OR
  - `cities: Array<string>;`
- Of course you can use other data than cities, for example persons, products, and so on.
- Demo `../101-databinding`.



Checkpoint

- Simple data binding `{{ … }}`
- Properties of the class are bound
- You can bind them to the template
- Use an array of data to bind to the template
  - Use `*ngFor` or `@for()` to loop over data

Creating a Model (as in: MVC)

A Model as a class with exported public properties:

```
export class City{
   constructor(
      public id: number,
      public name: string,
      public province: string,
   ){ }
}
```

Notice shorthand notation `public id : number`

1. Defines a private/local parameter
2. Defines a public parameter with the same name
3. Initializes parameter at instantiation of the class with `new`

Using the Model

1. Import model class

```
import {City} from './city.model'
```

2. Update component

```
export class AppComponent {
      name   = 'Peter Kassenaar';
      cities =[
         new City(1, 'Groningen', 'Groningen'),
         new City(2, 'Hengelo', 'Overijssel'),
         new City(3, 'Den Haag', 'Zuid-Holland'),
         new City(4, 'Enschede', 'Overijssel'),
      ]
}
```

3. Update View

```
<li *ngFor="let city of cities">{{ city.id}} - {{ city.name }}</li>
```

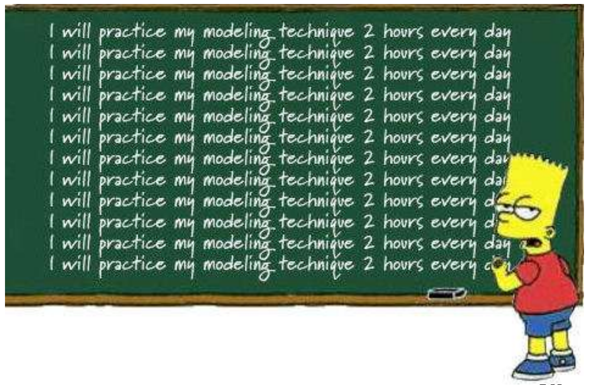
Another option: `interface`

- `Interface` only describes the structure of the data
- No keyword `new`
- No functionality in the ‘instances’
- Mostly – personal preference!

```
interface ICity {
  id: number;
  name: string;
  province: string;
}
```

Workshop

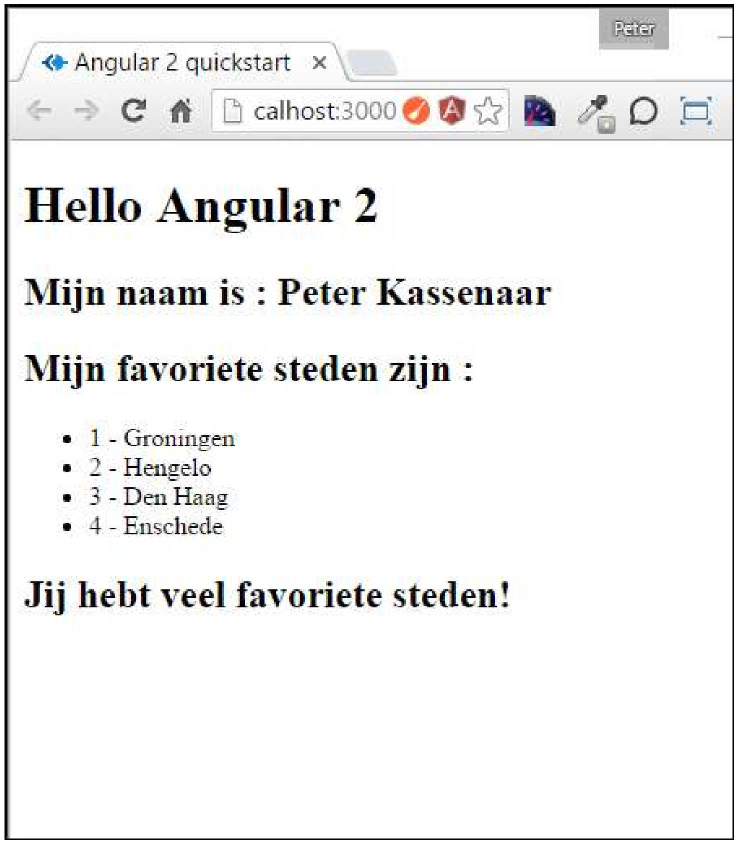
- Create a Model for the contents of your array. The model consists of an object with one or more properties.
    - See for instance app/shared/city.model.ts as an example.
- Update the signature of the array so it looks like cities: `City[]` or cities: `Array<City>`.
- Rewrite your array, so the content now are properties of type `<YourModel>`.
- Advanced: instead of using a class for the Model you can also use the TypeScript-construct `interface` or `type`.
    - Look up for yourself how this can be done.



Using `*ngIf` to show conditionally

Use the `*ngIf` directive (pay attention to the asterisk!)

```
<h2 *ngIf="cities.length > 3">There are a lot of favorite cities!</h2>
```



Hello Angular 2

Mijn naam is : Peter Kassenaar

Mijn favoriete steden zijn :

- 1 - Groningen
- 2 - Hengelo
- 3 - Den Haag
- 4 - Enschede

Jij hebt veel favoriete steden!

NEW Syntax, Control Flow : `@if`

- Previously: `*ngIf="…"`
- New: `@if (condition) { … }`
- ONLY : `Angular 17+`

Invalid

```
<div @if="showTitle">
  {{  title }}
</div>
```

Valid

```
@if (showTitle){
  <div>
    {{  title }}
  </div>
}
```

External templates

If you don't like inline HTML :

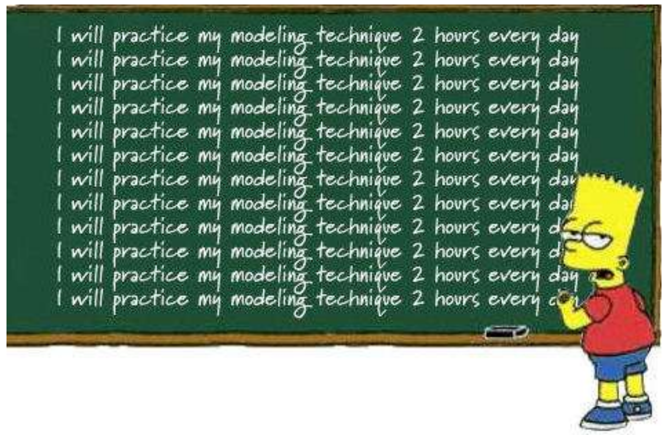
```
@Component({
   selector   : 'hello-world',
   templateUrl: 'app.component.html'
})
```

File `app.html`

```
<!-- HTML in external template -->
<h1>Hello Angular</h1>
<p>This is an external template</p>
<h2>My name is : {{ name }}</h2>
<h2>My favorite cities :</h2>
…
```

Workshop

- Create a `<div>` on the page that is only shown if your array has three or more objects in it.
  - The code can look like `<div *ngIf="cities.length > 3">…</div>`.
- Create one more use case of `*ngIf` for yourself.
  - Next: use `@if()` modern syntax.
- Move the expression to the TypeScript-part of the application (where it belongs!). Let it evaluate to a true | false value and bind this value via a property in the UI.



User input and event binding

React to mouse, keyboard,

hyperlinks and more

Event binding syntax

Angular: use parentheses for events:

Angular 1:

```
<div ng-click=“handleClick()”>…</div>
```

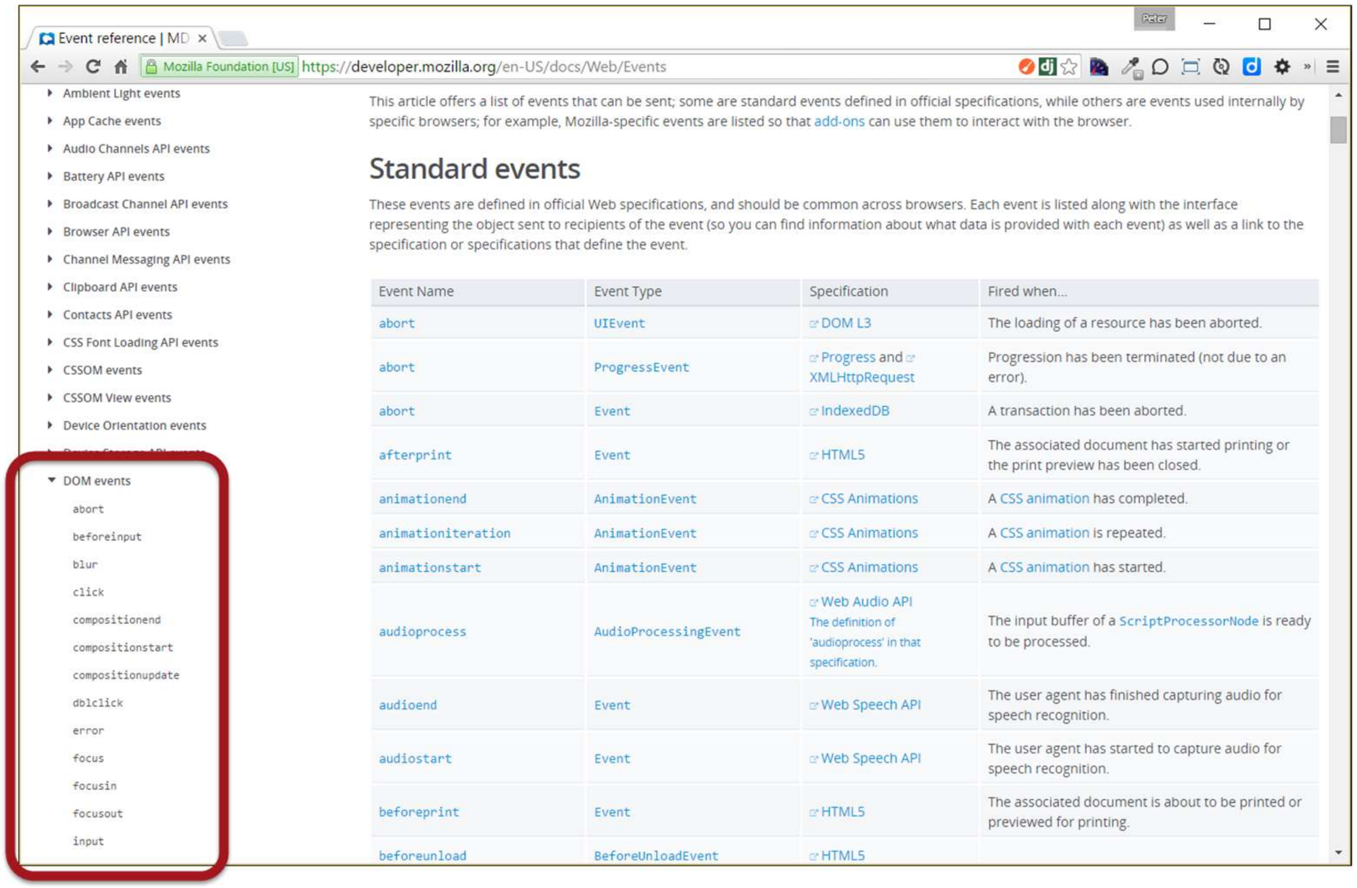
Angular 2:

```
<div (click)=“handleClick()”>…</div>

<input (blur)=“onBlur()” />
```

DOM-events

- Angular can listen to *any* DOM-event without needing different directives:



Event reference | MD

Mozilla Foundation [US] https://developer.mozilla.org/en-US/docs/Web/Events

- Ambient Light events
- App Cache events
- Audio Channels API events
- Battery API events
- Broadcast Channel API events
- Browser API events
- Channel Messaging API events
- Clipboard API events
- Contacts API events
- CSS Font Loading API events
- CSSOM events
- CSSOM View events
- Device Orientation events
- Device Storage API events
- DOM events
  - abort
  - beforeinput
  - blur
  - click
  - compositionend
  - compositionstart
  - compositionupdate
  - dblclick
  - error
  - focus
  - focusin
  - focusout
  - input

This article offers a list of events that can be sent; some are standard events defined in official specifications, while others are events used internally by specific browsers; for example, Mozilla-specific events are listed so that add-ons can use them to interact with the browser.

Standard events

These events are defined in official Web specifications, and should be common across browsers. Each event is listed along with the interface representing the object sent to recipients of the event (so you can find information about what data is provided with each event) as well as a link to the specification or specifications that define the event.

Event Name	Event Type	Specification	Fired when...
abort	UIEvent	DOM L3	The loading of a resource has been aborted.
abort	ProgressEvent	Progress and XMLHttpRequest	Progression has been terminated (not due to an error).
abort	Event	IndexedDB	A transaction has been aborted.
afterprint	Event	HTML5	The associated document has started printing or the print preview has been closed.
animationend	AnimationEvent	CSS Animations	A CSS animation has completed.
animationiteration	AnimationEvent	CSS Animations	A CSS animation is repeated.
animationstart	AnimationEvent	CSS Animations	A CSS animation has started.
audioprocess	AudioProcessingEvent	Web Audio API The definition of 'audioprocess' in that specification.	The input buffer of a ScriptProcessorNode is ready to be processed.
audioend	Event	Web Speech API	The user agent has finished capturing audio for speech recognition.
audiostart	Event	Web Speech API	The user agent has started to capture audio for speech recognition.
beforeprint	Event	HTML5	The associated document is about to be printed or previewed for printing.
beforeunload	BeforeUnloadEvent	HTML5	

https://developer.mozilla.org/en-US/docs/Web/Events

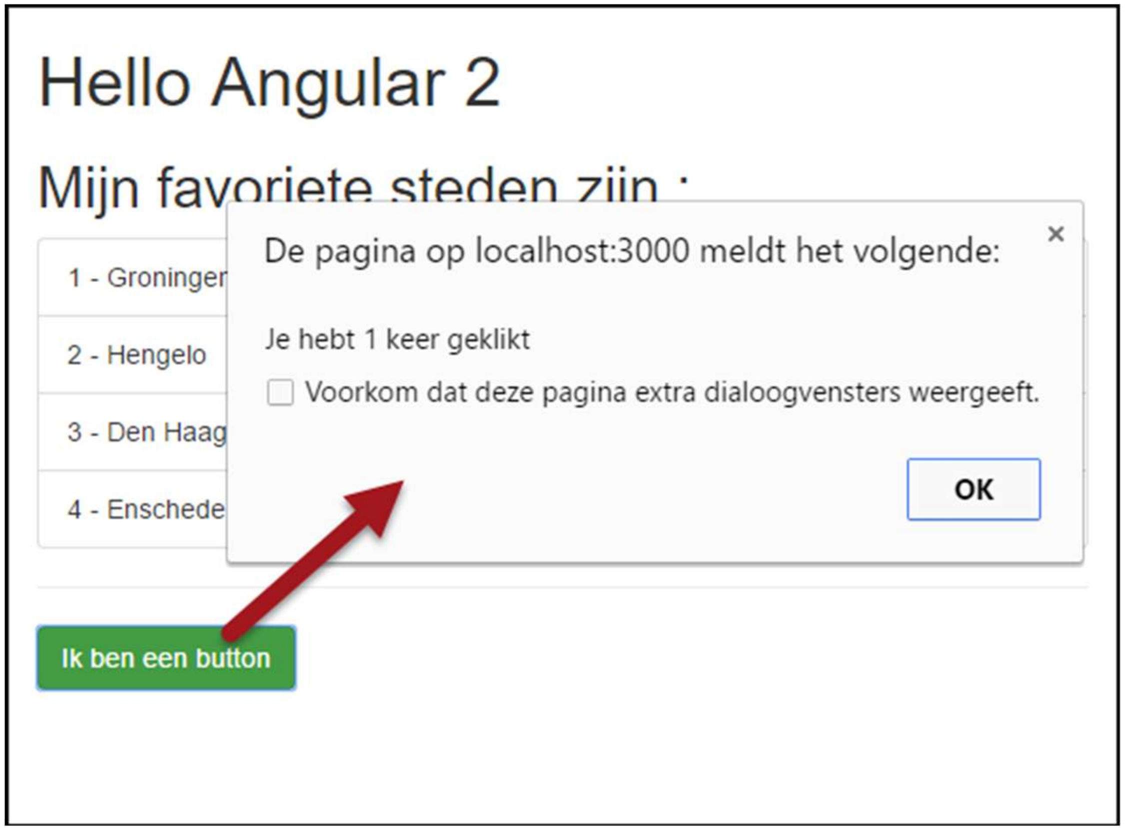
Example event binding

HTML

```
<!-- Event binding on button -->
<button class="btn btn-success"
      (click)="btnClick()">I am a button</button>
```

```
export class AppComponent {
   …
   counter: number =0;

   btnClick(){
      alert(‘You clicked '+ ++this.counter +’ times');
   }
 }
```



Hello Angular 2

Mijn favoriete steden zijn :

1 - Groningen
2 - Hengelo
3 - Den Haag
4 - Enschede

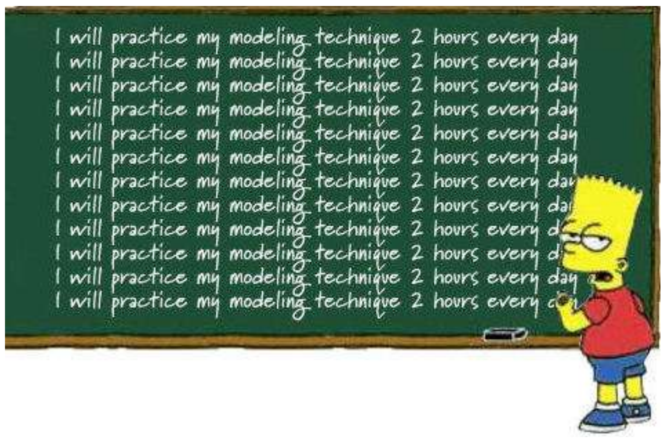
De pagina op localhost:3000 meldt het volgende:

Je hebt 1 keer geklikt

Voorkom dat deze pagina extra dialoogvensters weergeeft.

Workshop

- Add an element with event-binding to the application. For instance, create a button to capture a `click` event.
- Call an event handler in the component if the event occurs.
  - For example, write a function `handleClick() { alert('message…')}` or show a `console.log()`-text.
- Next: show the the message via a variable in the UI. It should read something like '`you clicked on <your-entity-name>`'.
- Demo .../`103-eventbinding`..



Checkpoint

- Event binding is done with `(eventname)="…"`
- Events are always notated in lowercase.
- You can bind multiple events to the same element.
- Events are *not* rendered in the browser DOM-tree
- Events are handled by an event handler-function on the component

Reading values from text fields

Creating a variable from your text field

A) Event parameters: $event

HTML

```
<input type="text" class="input-lg" placeholder=“City..."
      (keyup.enter)="onKeyUp($event)"><br>
<p>{{ txtKeyUp}}</p>
```

```
// 2. Bind to keyUp-event in the textbox
onKeyUp(event:any){
   this.txtKeyUp = event.target.value + ' - ';
}
```

B) Event parameters local template variable

Declare *local template variable* with # → The complete element is passed to the component

```
<input type="text" class="input-lg" placeholder=”City..."
      #txtCity (keyup)="betterKeyUp(txtCity)">
<h3>{{ txtCity.value }}</h3>
```

Class:

```
 // 3. Bind to keyUp-event via local template variable
betterKeyUp(txtCity){
   //... Handle txtCity as desired
}
```

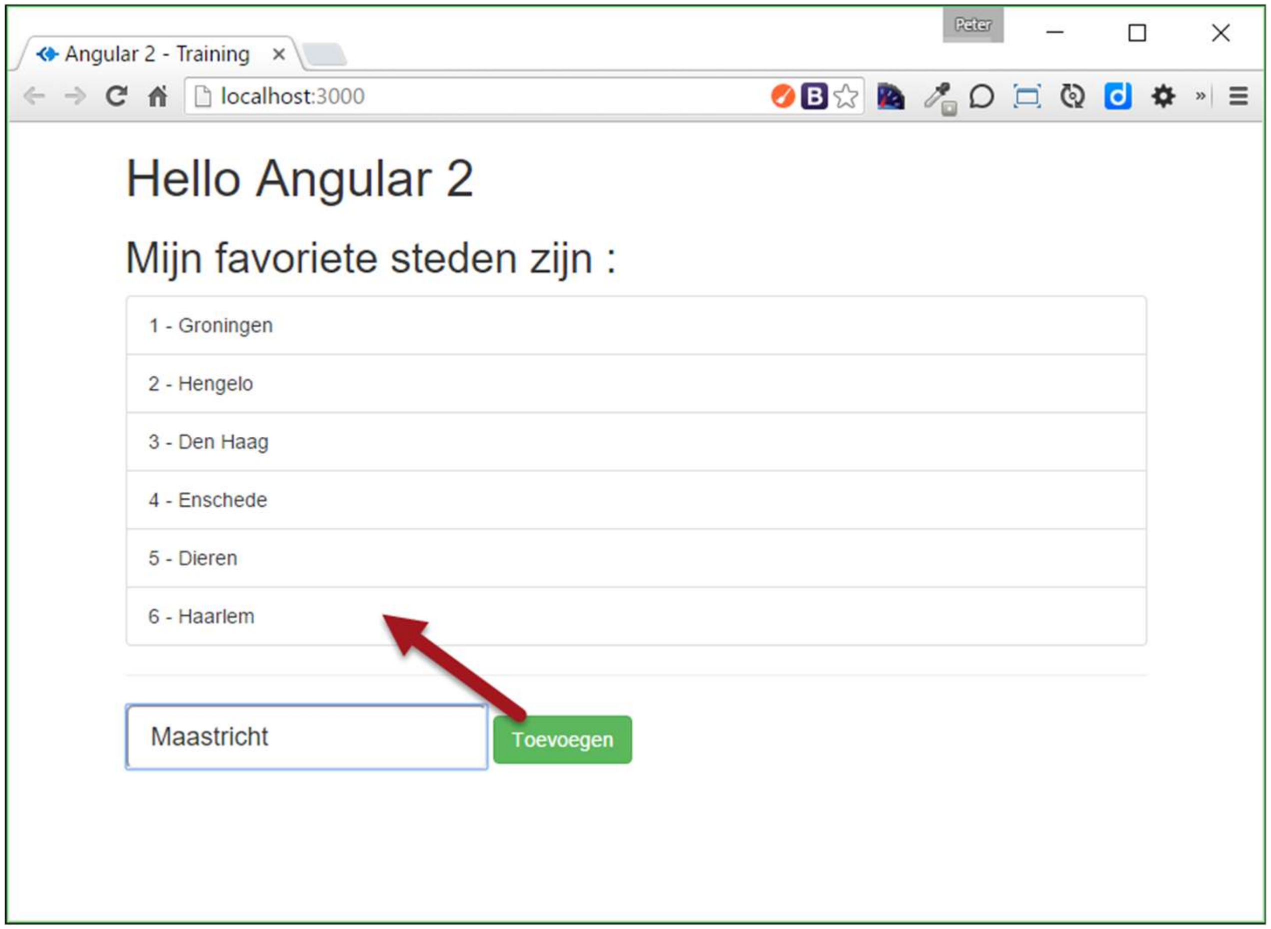
Putting it all together…

HTML

```
<input type="text" class="input-lg" placeholder="City..." #txtCity>
<button class="btn btn-success"
      (click)="addCity(txtCity)">Add city
</button>
```

Class

```
export class AppComponent {
   // Properties on component/class
   …
   addCity(txtCity) {
      let newID   = this.cities.length + 1;
      let newCity = new City(newID, txtCity.value, 'Unknown');
      this.cities.push(newCity);
      txtCity.value = '';
   }
}
```



Hello Angular 2

Mijn favoriete steden zijn :

1 - Groningen

2 - Hengelo

3 - Den Haag

4 - Enschede

5 - Dieren

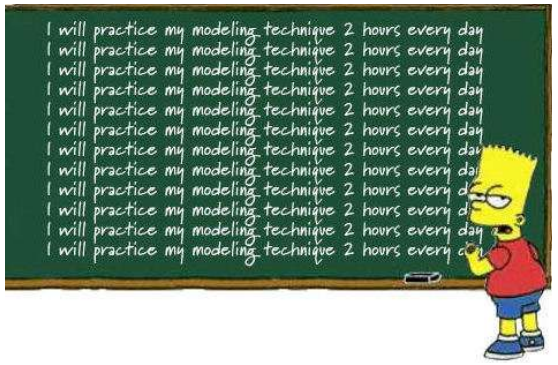
6 - Haarlem

Maastricht

Further reading : https://angular.io/docs/ts/latest/guide/user-input.html

Workshop

- Create a text field with a local template variable.
- Pass the variable to an event handler using an event of your liking (for example click or keyup) and show the value in an alert() or console.log()
- Create another textbox on the page. The user can type numbers in the textbox.
  - Pass the number to an event handler and add the number to a property `total`.
  - Show the addition of all numbers (i.e. the total value) in the page.
- Remember to use `parseInt()` to convert the stringvalue of the textbox to a number!
- Demo …`/103-eventbinding`.



Checkpoint

- Event binding is addressed with `(eventname)="…"`
- Events are being handled by a function inside the component
- Optional: use `$event` to pass data to the class
- Or: use a local template variable `#` to pass value to the class
- You can create simple, client sided CRUD-operations this way.

Attribute & property binding

Bind values dynamically to HTML attributes and DOM-properties

Attribute binding syntax

- Bind directly to properties of HTML-elements.
- Also know as *one-way binding.*
- Use square brackets syntax

Angular 1:

```
<div ng-hide=“true|false”>…</div>
```

Angular 2+:

```
<div [hidden]=“true”>…</div>
```

Or :

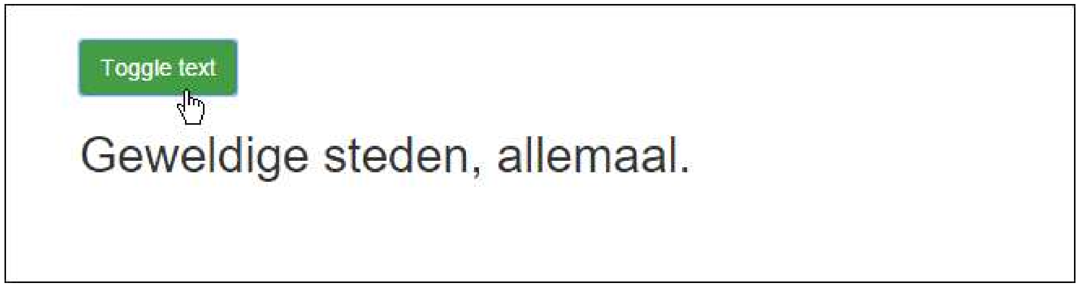
```
<div [hidden]=“person.hasEmail”>…</div>
<div [style.background-color]=“’yellow’”>…</div>
```

Example attribute binding

HTML

```
<!-- Attribute binding -->
<button class="btn btn-success" (click)="toggleText()">Toggle text</button>
<h2 [hidden]="textVisible">I love all these cities!</h2>
```

```
// Toggle attribute: show or hide text.
toggleText(){
   this.textVisible = !this.textVisible;
}
```



Geweldige steden, allemaal.

For instance...

HTML

```
<li *ngFor=”let city of cities" class="list-group-item"
   (click)="updateCity(city)">
   {{ city.id}} - {{ city.name }}
</li>
```

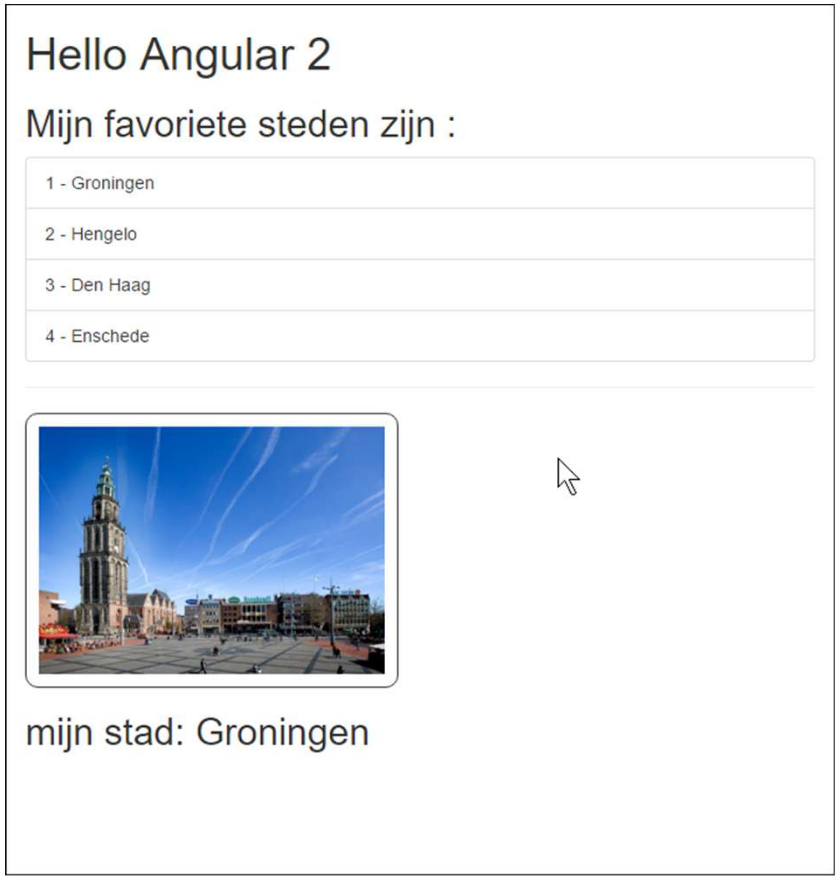
Class

```
export class AppComponent {
   // …
   currentCity:City    = null;
   cityPhoto:string    = '';

   // Update selected city in the UI. New: ES6 String interpolation
   updateCity(city:City) {
      this.currentCity = city;
      this.cityPhoto   = `img/${this.currentCity.name}.jpg`;
   }
}
```

Demo:

`..\103-attributebinding\src\app\app.component.ts`



Hello Angular 2

Mijn favoriete steden zijn :

1 - Groningen

2 - Hengelo

3 - Den Haag

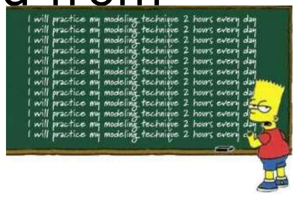
4 - Enschede

mijn stad: Groningen

More information : https://angular.io/docs/ts/latest/guide/template-syntax.html#!#property-binding

Workshop

- Create a button on the page. If the button is clicked, a `<div>` with a text is shown.
- If the button is clicked again, the text is hidden.
  - Demo code available at …`/103-attributebinding`
- Optional: create a component with a textbox.
  - If the user types an English color in the box and clicks a button, a corresponding <div> receives this color as a background color.
  - Hint: use [style.backgroundColor]="bgCcolor" on the div. Create a bgCcolor property on the class.
- Optional: create a second textbox to set the text/foreground color.
- Advanced: investigate how this works if the color can be picked from a series of radio buttons or from a dropdown list.

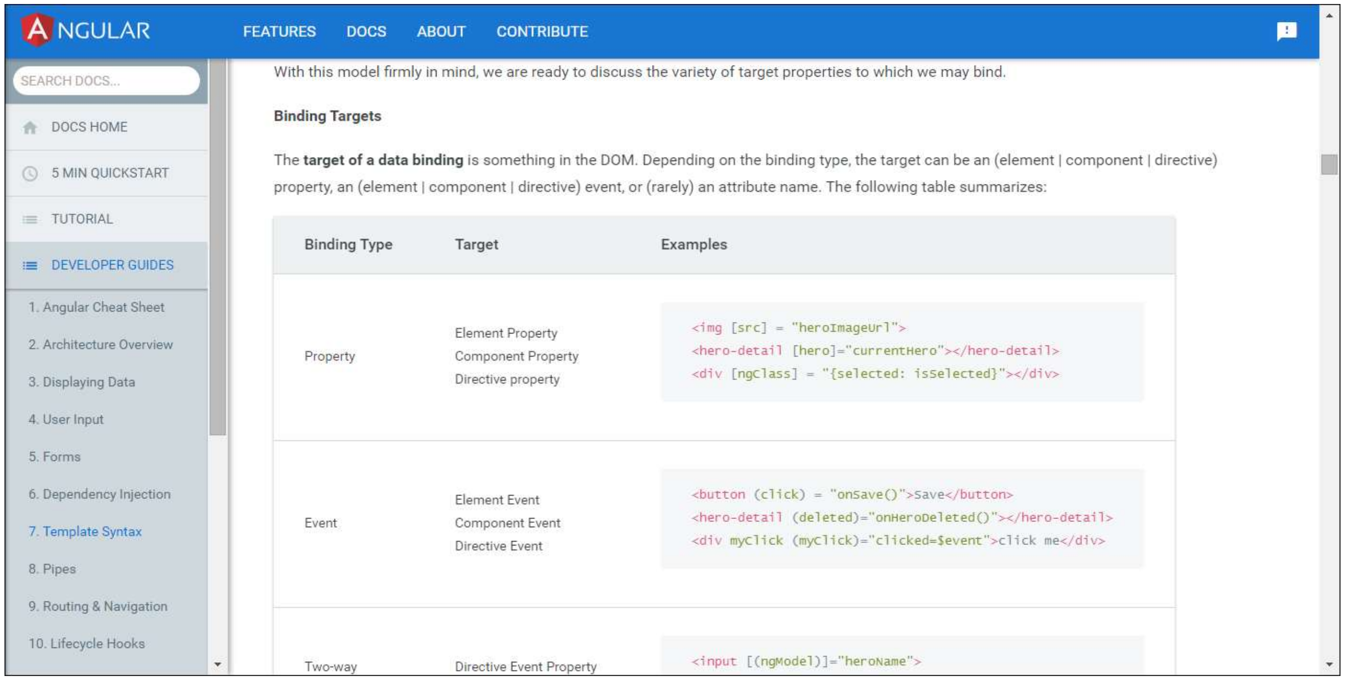


Checkpoint

- Attribute binding is addressed with `[attrName]="…"`
- Attributes are bound to a variable on the class.
- You can calculate the variable in the `.ts`-file

More binding-options

- Attribute binding and DOM-property binding: `[…]`
- Class binding : `[ngClass]`
- Style binding : `[ngStyle]`
- https://angular.io/docs/ts/latest/guide/template-syntax.html



With this model firmly in mind, we are ready to discuss the variety of target properties to which we may bind.

Binding Targets

The **target of a data binding** is something in the DOM. Depending on the binding type, the target can be an (element | component | directive) property, an (element | component | directive) event, or (rarely) an attribute name. The following table summarizes:

Binding Type	Target	Examples

Property	Element Property
	Component Property
	Directive property
		`<img [src] = "heroImageUrl">`
		`<hero-detail [hero]="currentHero"></hero-detail>`
		`<div [ngClass] = "{selected: isSelected}"></div>`

Event	Element Event
	Component Event
	Directive Event
		`<button (click) = "onSave()">Save</button>`
		`<hero-detail (deleted)="onHeroDeleted()"></hero-detail>`
		`<div myClick (myClick)="clicked=$event">click me</div>`

Two-way	Directive Event Property	`<input [(ngModel)]="heroName">`

Two-way binding

Updating user interface and class variables at the same time

Two way binding syntaxis

Was removed from Angular for a while, but returned after complaints from the community:

Angular 1:

```
<input ng-model=“person.firstName” />
```

Angular 2+: similar, but notation is a little bizar:

```
<input [(ngModel)]=“person.firstName” />
```

Using [(ngModel)]

```html
<input type="text" class="input-lg" [(ngModel)]="newCity" />
<h2>{{ newCity }}</h2>
```

Which is shorthand-notation for:

```html
<!-- Two-way binding with extended syntax -->
<input type="text" class="input-lg"
      [value]="newCityExtended"
      (input)="newCityExtended = $event.target.value" />
<h2>{{ newCityExtended }}</h2>
```

FormsModule importeren

- Two-way binding used to be in the Angular Core – now in it’s own module
- Import `FormsModule` in `app.module.ts!`

- `import {FormsModule} from "@angular/forms";`
- …
- `imports      : [BrowserModule, FormsModule],`

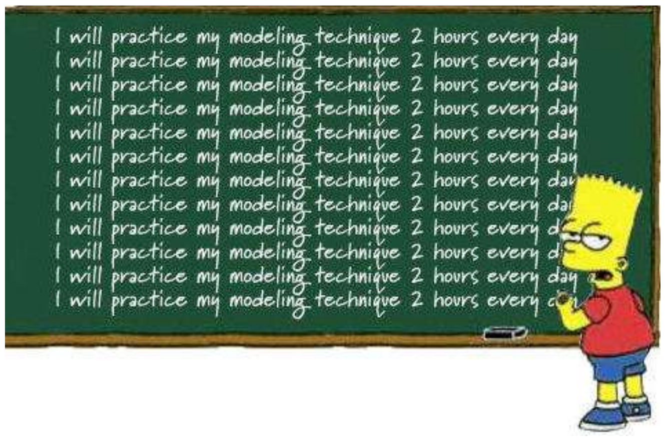
So: passing data from View to Controller,

lots of options:

1. Using `$event`
2. Using a Local Template Variabele `#NameVar`
3. Using `[(ngModel)]` (to be used in simple situations, mostly not on complex forms)
4. HostBinding/`@HostListener` (via @-decorators)
5. Use `@ViewChild()` …

Workshop

- Create a text field in your component that uses two-way binding.
  - Use `[(ngModel)]` as a directive on the `<input>` box. Bind the value of the typed text directly to the page.
- Create a copy-function. Create two text boxes on the page.
  - Text that is typed into the first textbox, should also appear in the second textbox.
- Demo …`/104-twowaybinding`



Checkpoint

- Two-way binding is addressed with **`[(ngModel)]="…"`**
- The value of `[(ngModel)]` is updated automagically by Angular.
- It is available in the View/Template and in the TypeScript class.

Declarative syntax

- Four (4) types of databinding
- Angular specific notation in HTML templates
    1. Simple data binding with {{ … }}
    2. Event binding with (…)
    3. One-way data binding (Attribute binding) with […]
    4. Two-way data binding with [(ngModel)]="…"

Checkpoint

- Databinding in Angular 2+ is different from other frameworks
- Learn the new syntax on DOM- and Attribute binding. Also learn event binding en two-way binding.
- Optional: host binding with `@HostListener()`
- Always edit the class and corresponding View
- A lot of concepts are the same, the way to achieve results are different in Angular, compared to AngularJS, Vue, React and other frameworks.