Component interaction

This cookbook contains recipes for common component communication scenarios in which two or more components share information.

See the live example / download example.

Pass data from parent to child with input binding

`HeroChildComponent` has two ***input properties***, typically adorned with @Input decorations.

component-interaction/src/app/hero-child.component.ts

```
import { Component, Input } from
'@angular/core';

import { Hero } from './hero';

@Component({
  selector: 'app-hero-child',
  template: `
    <h3>{{hero.name}} says:</h3>
    <p>I, {{hero.name}}, am at your
service, {{masterName}}.</p>
  `
})
export class HeroChildComponent {
  @Input() hero: Hero;
  @Input('master') masterName: string;
}
```

The second `@Input` aliases the child component property name `masterName` as `'master'`.

The `HeroParentComponent` nests the child `HeroChildComponent` inside an `*ngFor` repeater, binding its `master` string property to the child's `master` alias, and each iteration's `hero` instance to the child's `hero` property.

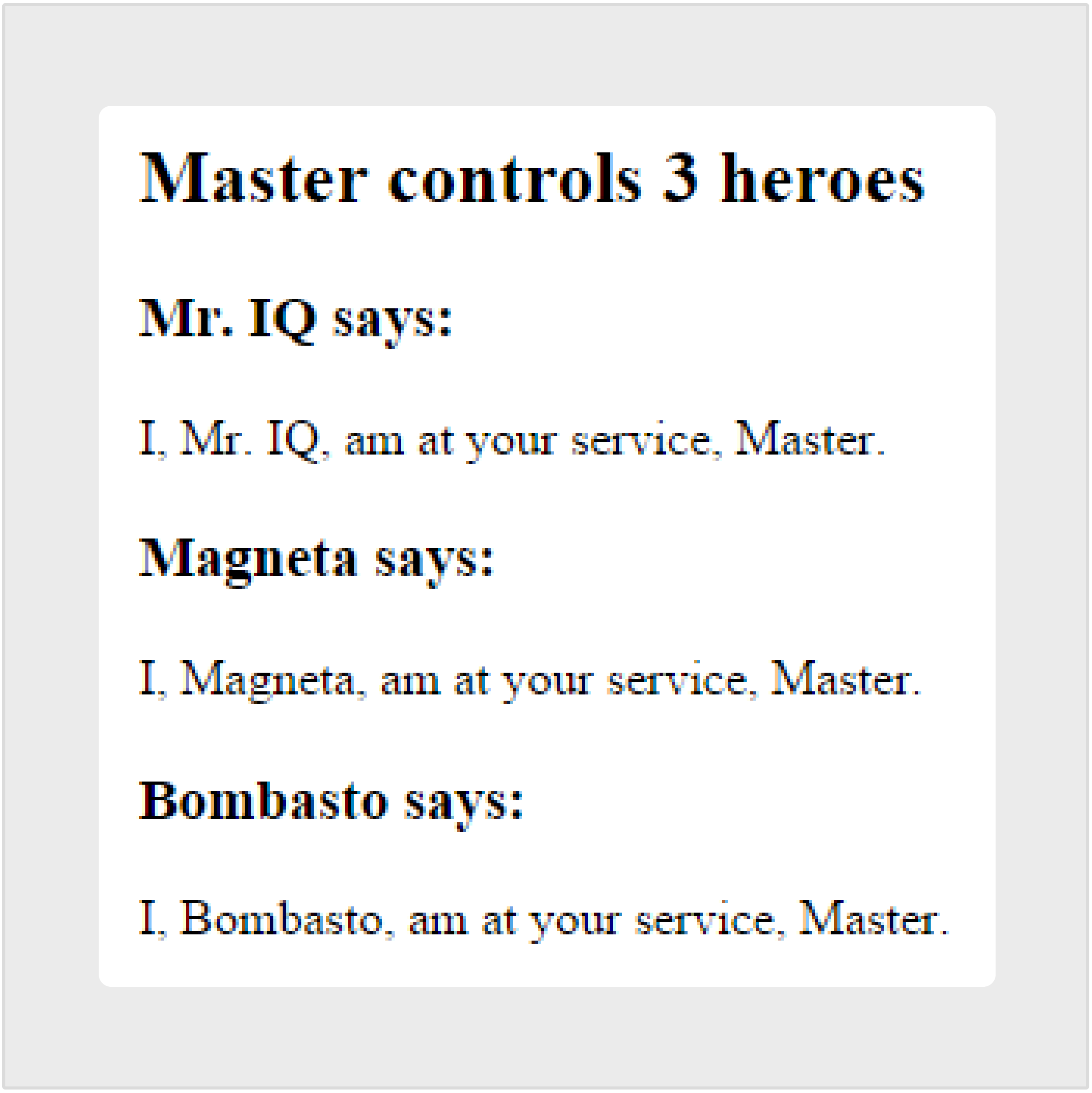
component-interaction/src/app/hero-parent.component.ts

```
import { Component } from
'@angular/core';

import { HEROES } from './hero';

@Component({
  selector: 'app-hero-parent',
  template: `
    <h2>{{master}} controls
{{heroes.length}} heroes</h2>
    <app-hero-child *ngFor="let hero of
heroes"
      [hero]="hero"
      [master]="master">
    </app-hero-child>
  `
})
export class HeroParentComponent {
  heroes = HEROES;
  master = 'Master';
}
```

The running application displays three heroes:



Master controls 3 heroes

Mr. IQ says:

I, Mr. IQ, am at your service, Master.

Magneta says:

I, Magneta, am at your service, Master.

Bombasto says:

I, Bombasto, am at your service, Master.

Test it

E2E test that all children were instantiated and displayed as expected:

component-interaction/e2e/src/app.e2e-spec.ts

```
// ...
let _heroNames = ['Dr IQ', 'Magneta',
'Bombasto'];
let _masterName = 'Master';

it('should pass properties to children
properly', function () {
  let parent =
element.all(by.tagName('app-hero-
parent')).get(0);
  let heroes =
parent.all(by.tagName('app-hero-
child'));

  for (let i = 0; i <
_heroNames.length; i++) {
    let childTitle =
heroes.get(i).element(by.tagName('h3')).

    let childDetail =
heroes.get(i).element(by.tagName('p')).g
expect(childTitle).toEqual(_heroNames[i]
 + ' says:');

expect(childDetail).toContain(_masterNam

  }
});
// ...
```

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Intercept input property changes with a setter

Use an input property setter to intercept and act upon a value from the parent.

The setter of the `name` input property in the child `NameChildComponent` trims the whitespace from a name and replaces an empty value with default text.

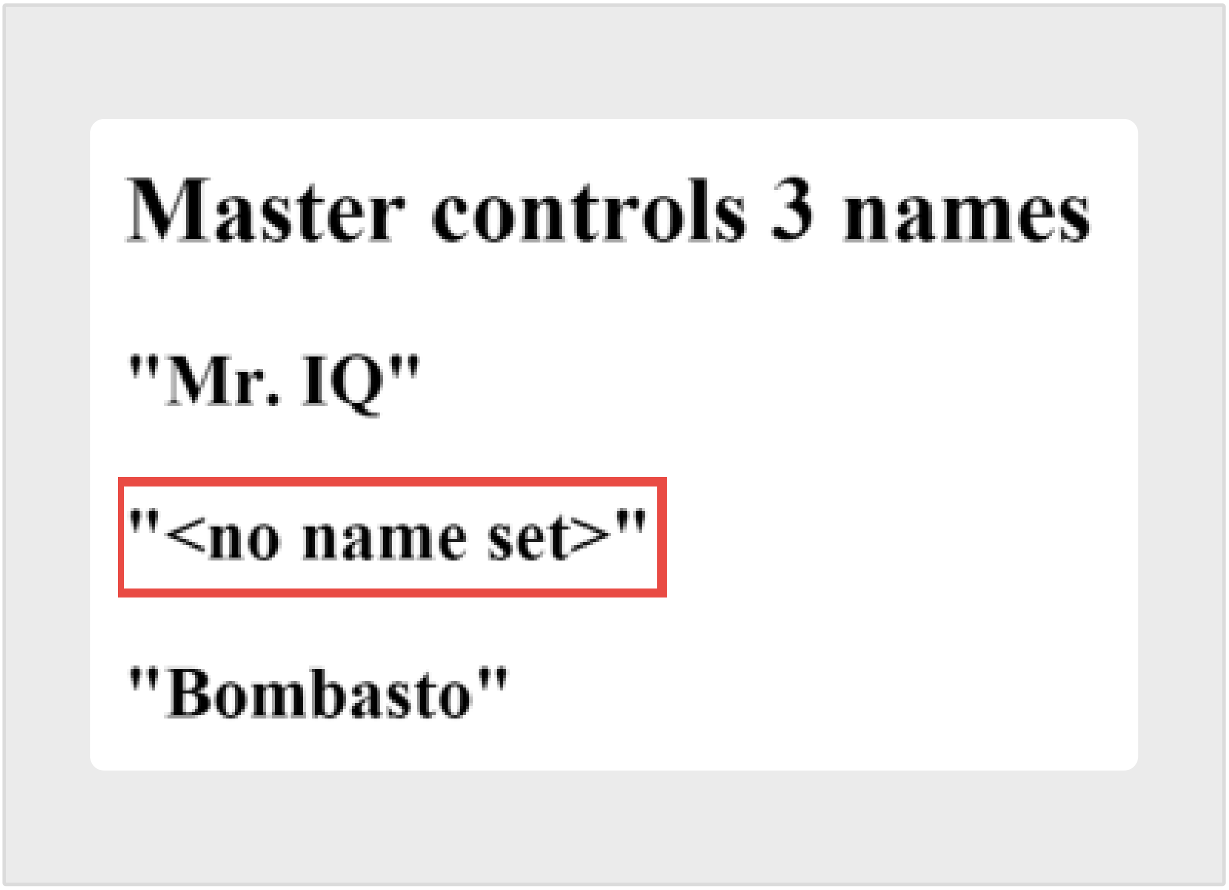
component-interaction/src/app/name-child.component.ts

```
import { Component, Input } from
'@angular/core';

@Component({
  selector: 'app-name-child',
  template: '<h3>"{{name}}"</h3>'
})
export class NameChildComponent {
  private _name = '';

  @Input()
  set name(name: string) {
    this._name = (name && name.trim())
|| '<no name set>';
  }

  get name(): string { return
this._name; }
}
```

Here's the `NameParentComponent` demonstrating name variations including a name with all spaces:

component-interaction/src/app/name-parent.component.ts

```
import { Component } from '@angular/core';

@Component({
  selector: 'app-name-parent',
  template: `
  <h2>Master controls {{names.length}} names</h2>
  <app-name-child *ngFor="let name of names" [name]="name"></app-name-child>
  `
})
export class NameParentComponent {
  // Displays 'Dr IQ', '<no name set>', 'Bombasto'
  names = ['Dr IQ', '   ', '  Bombasto  '];
}
```



Master controls 3 names

"Mr. IQ"

"<no name set>"

"Bombasto"

Test it

E2E tests of input property setter with empty and non-empty names:

component-interaction/e2e/src/app.e2e-spec.ts

```
// ...
it('should display trimmed, non-empty
names', function () {
  let _nonEmptyNameIndex = 0;
  let _nonEmptyName = '"Dr IQ"';
  let parent =
element.all(by.tagName('app-name-
parent')).get(0);
  let hero =
parent.all(by.tagName('app-name-
child')).get(_nonEmptyNameIndex);

  let displayName =
hero.element(by.tagName('h3')).getText()


expect(displayName).toEqual(_nonEmptyNar


});

it('should replace empty name with
default name', function () {
  let _emptyNameIndex = 1;
  let _defaultName = '"<no name set>"';
  let parent =
element.all(by.tagName('app-name-
parent')).get(0);
  let hero =
parent.all(by.tagName('app-name-
child')).get(_emptyNameIndex);

  let displayName =
hero.element(by.tagName('h3')).getText()


expect(displayName).toEqual(_defaultNam

});
// ...
```

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Intercept input property changes with *ngOnChanges()*

Detect and act upon changes to input property values with the `ngOnChanges()` method of the `OnChanges` lifecycle hook interface.

> You may prefer this approach to the property setter when watching multiple, interacting input properties.
>
> Learn about `ngOnChanges()` in the Lifecycle Hooks chapter.

This `VersionChildComponent` detects changes to the `major` and `minor` input properties and composes a log message reporting these changes:

component-interaction/src/app/version-child.component.ts

```
import { Component, Input, OnChanges,
SimpleChange } from '@angular/core';

@Component({
  selector: 'app-version-child',
  template: `
    <h3>Version {{major}}.{{minor}}
</h3>
    <h4>Change log:</h4>
    <ul>
      <li *ngFor="let change of
changeLog">{{change}}</li>
    </ul>
  `
})
export class VersionChildComponent
implements OnChanges {
  @Input() major: number;
  @Input() minor: number;
  changeLog: string[] = [];
  ngOnChanges(changes: {[propKey:
string]: SimpleChange}) {
    let log: string[] = [];
    for (let propName in changes) {
      let changedProp =
changes[propName];
      let to =
JSON.stringify(changedProp.currentValue)

      if (changedProp.isFirstChange())
{
        log.push(`Initial value of
${propName} set to ${to}`);
      } else {
        let from =
JSON.stringify(changedProp.previousValue

        log.push(`${propName} changed
from ${from} to ${to}`);
      }
    }
    this.changeLog.push(log.join(',
'));
```

```
    }
  }
```

The `VersionParentComponent` supplies the `minor` and `major` values and binds buttons to methods that change them.

component-interaction/src/app/version-parent.component.ts

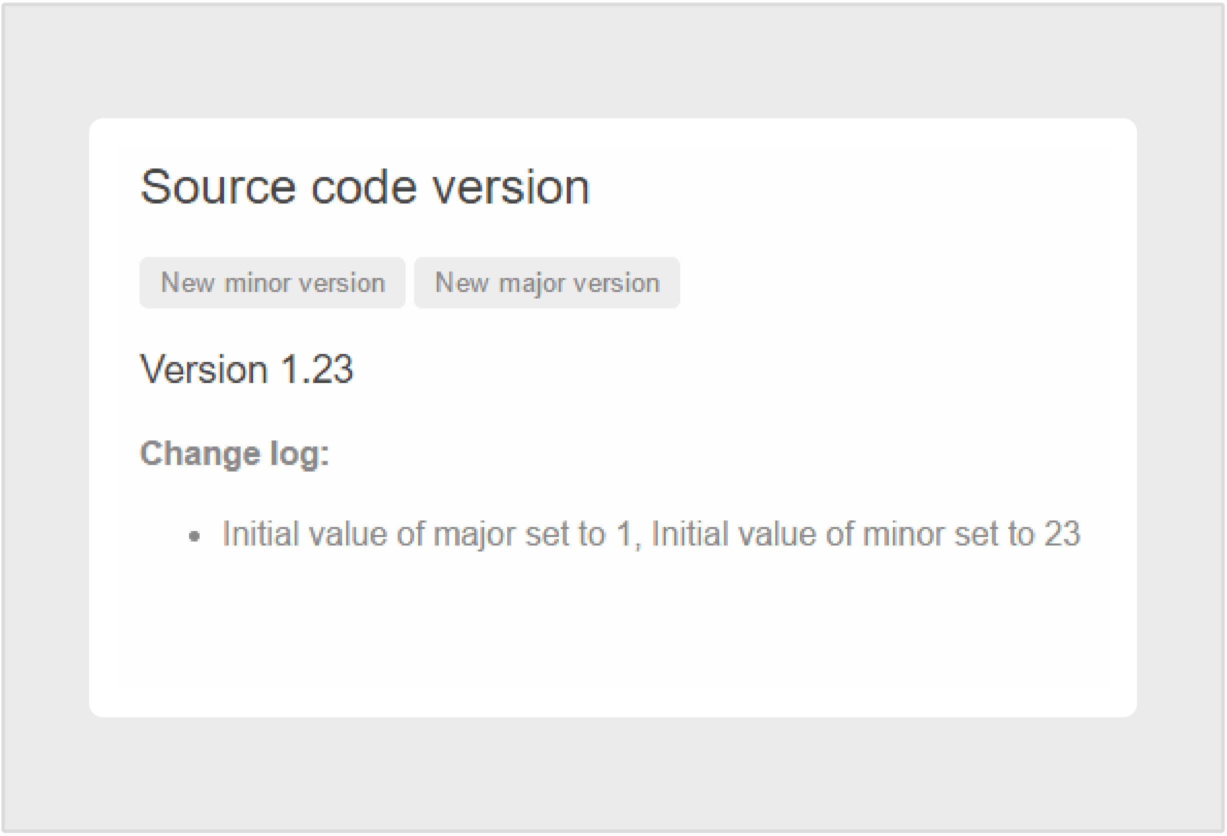
```
import { Component } from '@angular/core';

@Component({
  selector: 'app-version-parent',
  template: `
    <h2>Source code version</h2>
    <button (click)="newMinor()">New minor version</button>
    <button (click)="newMajor()">New major version</button>
    <app-version-child [major]="major" [minor]="minor"></app-version-child>
  `
})
export class VersionParentComponent {
  major = 1;
  minor = 23;

  newMinor() {
    this.minor++;
  }

  newMajor() {
    this.major++;
    this.minor = 0;
  }
}
```

Here's the output of a button-pushing sequence:



Source code version

Version 1.23

Change log:

- Initial value of major set to 1, Initial value of minor set to 23

Test it

Test that *both* input properties are set initially and that button clicks trigger the expected ngOnChanges calls and values:

component-interaction/e2e/src/app.e2e-spec.ts

```
// ...
// Test must all execute in this exact
order
it('should set expected initial
values', function () {
  let actual = getActual();

  let initialLabel = 'Version 1.23';
  let initialLog = 'Initial value of
major set to 1, Initial value of minor
set to 23';


expect(actual.label).toBe(initialLabel);

  expect(actual.count).toBe(1);

expect(actual.logs.get(0).getText()).toB

});
```

```
it('should set expected values after
clicking \'Minor\' twice', function ()
{
  let repoTag =
element(by.tagName('app-version-
parent'));
  let newMinorButton =
repoTag.all(by.tagName('button')).get(0)



newMinorButton.click().then(function()
{

newMinorButton.click().then(function()
{
      let actual = getActual();

      let labelAfter2Minor = 'Version
1.25';
      let logAfter2Minor = 'minor
changed from 24 to 25';
expect(actual.label).toBe(labelAfter2Min

      expect(actual.count).toBe(3);

expect(actual.logs.get(2).getText()).toB

    });
  });
});

it('should set expected values after
clicking \'Major\' once', function () {
  let repoTag =
element(by.tagName('app-version-
parent'));
  let newMajorButton =
repoTag.all(by.tagName('button')).get(1)



newMajorButton.click().then(function()
{
    let actual = getActual();
    let labelAfterMajor = 'Version
2.0';
    let logAfterMajor = 'major changed
from 1 to 2, minor changed from 25 to
0';


expect(actual.label).toBe(labelAfterMajo

    expect(actual.count).toBe(4);

expect(actual.logs.get(3).getText()).toB

  });
});

function getActual() {
  let versionTag =
element(by.tagName('app-version-
child'));
  let label =
versionTag.element(by.tagName('h3')).get

  let ul =
versionTag.element((by.tagName('ul')));
  let logs = ul.all(by.tagName('li'));

  return {
    label: label,
    logs: logs,
    count: logs.count()
  };
}
// ...
```

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Parent listens for child event

The child component exposes an `EventEmitter` property with which it `emits` events when something happens. The parent binds to that event property and reacts to those events.

The child's `EventEmitter` property is an ***output property***, typically adorned with an @Output decoration as seen in this `VoterComponent`:

component-interaction/src/app/voter.component.ts

```
import { Component, EventEmitter,
Input, Output } from '@angular/core';

@Component({
  selector: 'app-voter',
  template: `
    <h4>{{name}}</h4>
    <button (click)="vote(true)"
[disabled]="didVote">Agree</button>
    <button (click)="vote(false)"
[disabled]="didVote">Disagree</button>
  `
})
export class VoterComponent {
  @Input()  name: string;
  @Output() voted = new
EventEmitter<boolean>();
  didVote = false;

  vote(agreed: boolean) {
    this.voted.emit(agreed);
```

```
      this.didVote = true;
    }
  }
```

Clicking a button triggers emission of a `true` or `false`, the boolean *payload*.

The parent `VoteTakerComponent` binds an event handler called `onVoted()` that responds to the child event payload `$event` and updates a counter.

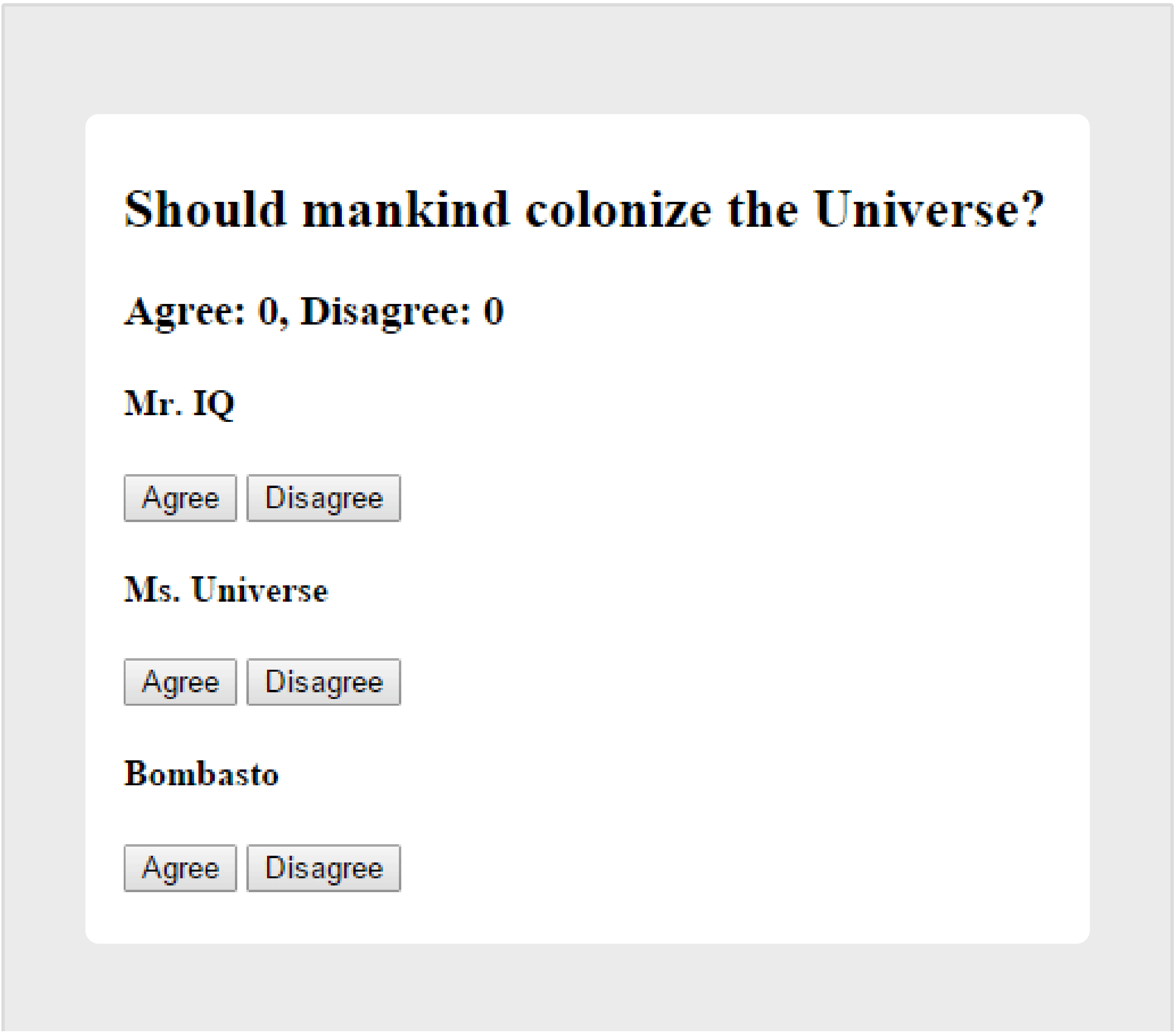
component-interaction/src/app/votetaker.component.ts

```
import { Component }      from
'@angular/core';

@Component({
  selector: 'app-vote-taker',
  template: `
    <h2>Should mankind colonize the
Universe?</h2>
    <h3>Agree: {{agreed}}, Disagree:
{{disagreed}}</h3>
    <app-voter *ngFor="let voter of
voters"
      [name]="voter"
      (voted)="onVoted($event)">
    </app-voter>
  `
})
export class VoteTakerComponent {
  agreed = 0;
  disagreed = 0;
  voters = ['Narco', 'Celeritas',
'Bombasto'];

  onVoted(agreed: boolean) {
    agreed ? this.agreed++ :
this.disagreed++;
  }
}
```

The framework passes the event argument—represented by `$event`—to the handler method, and the method processes it:



Should mankind colonize the Universe?

Agree: 0, Disagree: 0

Mr. IQ

Ms. Universe

Bombasto

Test it

Test that clicking the *Agree* and *Disagree* buttons update the appropriate counters:

component-interaction/e2e/src/app.e2e-spec.ts

```
// ...
it('should not emit the event
initially', function () {
  let voteLabel =
element(by.tagName('app-vote-taker'))

.element(by.tagName('h3')).getText();
  expect(voteLabel).toBe('Agree: 0,
Disagree: 0');
});

it('should process Agree vote',
function () {
  let agreeButton1 =
element.all(by.tagName('app-
voter')).get(0)
    .all(by.tagName('button')).get(0);
  agreeButton1.click().then(function()
{
    let voteLabel =
element(by.tagName('app-vote-taker'))
.element(by.tagName('h3')).getText();
    expect(voteLabel).toBe('Agree: 1,
Disagree: 0');
  });
});

it('should process Disagree vote',
function () {
  let agreeButton1 =
element.all(by.tagName('app-
voter')).get(1)
    .all(by.tagName('button')).get(1);
  agreeButton1.click().then(function()
{
    let voteLabel =
element(by.tagName('app-vote-taker'))

.element(by.tagName('h3')).getText();
    expect(voteLabel).toBe('Agree: 1,
Disagree: 1');
  });
});
// ...
```

Parent interacts with child via *local variable*

A parent component cannot use data binding to read child properties or invoke child methods. You can do both by creating a template reference variable for the child element and then reference that variable *within the parent template* as seen in the following example.

The following is a child `CountdownTimerComponent` that repeatedly counts down to zero and launches a rocket. It has `start` and `stop` methods that control the clock and it displays a countdown status message in its own template.

component-interaction/src/app/countdown-timer.component.ts

```
import { Component, OnDestroy, OnInit
} from '@angular/core';

@Component({
  selector: 'app-countdown-timer',
  template: '<p>{{message}}</p>'
})
export class CountdownTimerComponent
implements OnInit, OnDestroy {

  intervalId = 0;
  message = '';
  seconds = 11;

  clearTimer() {
clearInterval(this.intervalId); }

  ngOnInit()    { this.start(); }
  ngOnDestroy() { this.clearTimer(); }

  start() { this.countDown(); }
  stop()  {
    this.clearTimer();
    this.message = `Holding at
T-${this.seconds} seconds`;
  }

  private countDown() {
    this.clearTimer();
    this.intervalId =
window.setInterval(() => {
      this.seconds -= 1;
      if (this.seconds === 0) {
        this.message = 'Blast off!';
      } else {
        if (this.seconds < 0) {
this.seconds = 10; } // reset
        this.message =
`T-${this.seconds} seconds and
counting`;
      }
    }, 1000);
  }
}
```

The `CountdownLocalVarParentComponent` that hosts the timer component is as follows:

component-interaction/src/app/countdown-parent.component.ts

```
import { Component }
from '@angular/core';
import { CountdownTimerComponent }
from './countdown-timer.component';

@Component({
  selector: 'app-countdown-parent-lv',
  template: `
  <h3>Countdown to Liftoff (via local
variable)</h3>
  <button
(click)="timer.start()">Start</button>
  <button
(click)="timer.stop()">Stop</button>
  <div class="seconds">
{{timer.seconds}}</div>
  <app-countdown-timer #timer></app-
countdown-timer>
  `,
  styleUrls: ['../assets/demo.css']
})
```

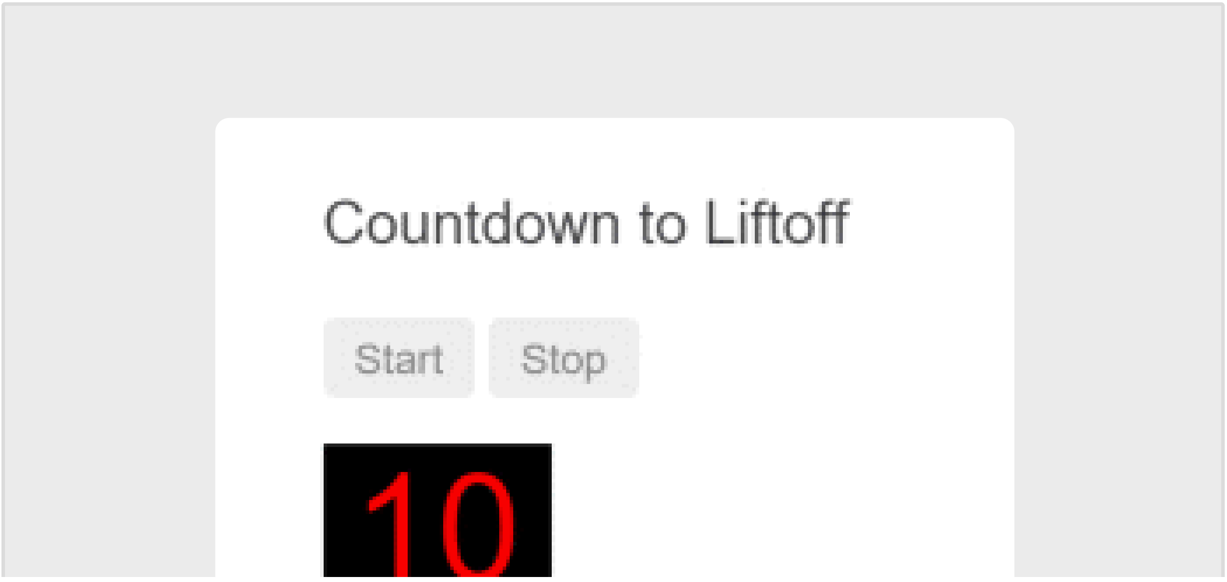
```
export class
CountdownLocalVarParentComponent { }
```

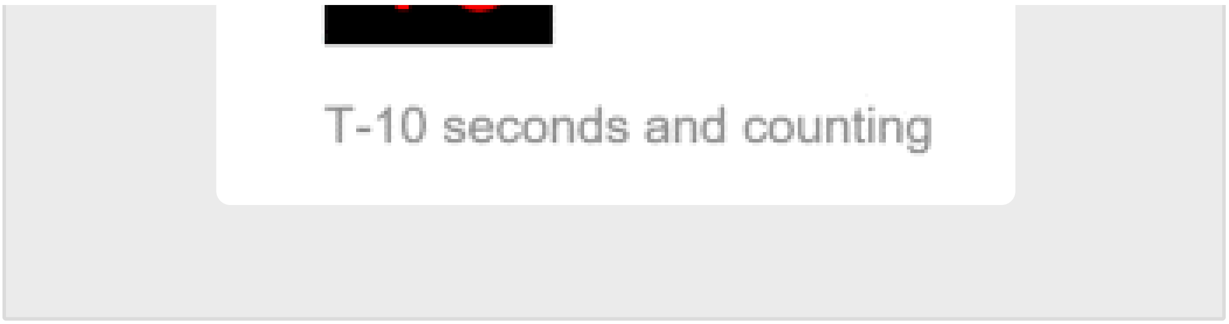
The parent component cannot data bind to the child's `start` and `stop` methods nor to its `seconds` property.

You can place a local variable, `#timer`, on the tag `<countdown-timer>` representing the child component. That gives you a reference to the child component and the ability to access *any of its properties or methods* from within the parent template.

This example wires parent buttons to the child's `start` and `stop` and uses interpolation to display the child's `seconds` property.

Here we see the parent and child working together.





T-10 seconds and counting

Test it

Test that the seconds displayed in the parent template match the seconds displayed in the child's status message. Test also that clicking the *Stop* button pauses the countdown timer:

component-interaction/e2e/src/app.e2e-spec.ts

```
// ...
it('timer and parent seconds should
match', function () {
  let parent =
element(by.tagName(parentTag));
  let message =
parent.element(by.tagName('app-
countdown-timer')).getText();
  browser.sleep(10); // give `seconds`
a chance to catchup with `message`
  let seconds =
parent.element(by.className('seconds')).

  expect(message).toContain(seconds);
});

it('should stop the countdown',
function () {
  let parent =
element(by.tagName(parentTag));
  let stopButton =
parent.all(by.tagName('button')).get(1);



  stopButton.click().then(function() {
    let message =
parent.element(by.tagName('app-
countdown-timer')).getText();

expect(message).toContain('Holding');
  });
});
// ...
```

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Parent calls an *@ViewChild()*

The *local variable* approach is simple and easy. But it is limited because the parent-child wiring must be done entirely within the parent template. The parent component *itself* has no access to the child.

You can't use the *local variable* technique if an instance of the parent component *class* must read or write child component values or must call child component methods.

When the parent component *class* requires that kind of access, ***inject*** the child component into the parent as a *ViewChild*.

The following example illustrates this technique with the same Countdown Timer example. Neither its appearance nor its behavior will change. The child CountdownTimerComponent is the same as well.

> The switch from the *local variable* to the *ViewChild* technique is solely for the purpose of demonstration.

Here is the parent, `CountdownViewChildParentComponent`:

component-interaction/src/app/countdown-parent.component.ts

```
import { AfterViewInit, ViewChild }
from '@angular/core';
import { Component }
from '@angular/core';
import { CountdownTimerComponent }
from './countdown-timer.component';

@Component({
  selector: 'app-countdown-parent-vc',
  template: `
  <h3>Countdown to Liftoff (via
ViewChild)</h3>
  <button
(click)="start()">Start</button>
  <button
(click)="stop()">Stop</button>
  <div class="seconds">{{ seconds() }}
</div>
  <app-countdown-timer></app-countdown-
timer>
  `,
  styleUrls: ['../assets/demo.css']
})
export class
CountdownViewChildParentComponent
implements AfterViewInit {

  @ViewChild(CountdownTimerComponent)
  private timerComponent:
CountdownTimerComponent;

  seconds() { return 0; }

  ngAfterViewInit() {
    // Redefine `seconds()` to get from
the `CountdownTimerComponent.seconds`
...
    // but wait a tick first to avoid
one-time devMode
    // unidirectional-data-flow-
violation error
    setTimeout(() => this.seconds = ()
=> this.timerComponent.seconds, 0);
  }
```

```
    start() {
  this.timerComponent.start(); }
    stop() { this.timerComponent.stop();
  }
  }
```

It takes a bit more work to get the child view into the parent component *class*.

First, you have to import references to the `ViewChild` decorator and the `AfterViewInit` lifecycle hook.

Next, inject the child `CountdownTimerComponent` into the private `timerComponent` property via the `@ViewChild` property decoration.

The `#timer` local variable is gone from the component metadata. Instead, bind the buttons to the parent component's own `start` and `stop` methods and present the ticking seconds in an interpolation around the parent component's `seconds` method.

These methods access the injected timer component directly.

The `ngAfterViewInit()` lifecycle hook is an important wrinkle. The timer component isn't available until *after* Angular displays the parent view. So it displays `0` seconds initially.

Then Angular calls the `ngAfterViewInit` lifecycle hook at which time it is *too late* to update the parent view's display of the countdown seconds. Angular's unidirectional data flow rule prevents updating the parent view's in the same cycle. The app has to *wait one turn* before it can display the seconds.

Use `setTimeout()` to wait one tick and then revise the `seconds()` method so that it takes future values from the timer component.

Test it

Use the same countdown timer tests as before.

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Parent and children communicate via a service

A parent component and its children share a service whose interface enables bi-directional communication *within the family*.

The scope of the service instance is the parent component and its children. Components outside this component subtree have no access to the service or their communications.

This `MissionService` connects the `MissionControlComponent` to multiple `AstronautComponent` children.

component-interaction/src/app/mission.service.ts

```
import { Injectable } from
'@angular/core';
import { Subject }    from 'rxjs';

@Injectable()
export class MissionService {

  // Observable string sources
  private missionAnnouncedSource = new
Subject<string>();
  private missionConfirmedSource = new
Subject<string>();

  // Observable string streams
  missionAnnounced$ =
this.missionAnnouncedSource.asObservable

  missionConfirmed$ =
this.missionConfirmedSource.asObservable
```

```
    // Service message commands
    announceMission(mission: string) {

  this.missionAnnouncedSource.next(mission


    }


    confirmMission(astronaut: string) {


  this.missionConfirmedSource.next(astrona


    }
  }
```

The `MissionControlComponent` both provides the instance of the service that it shares with its children (through the `providers` metadata array) and injects that instance into itself through its constructor:

component-
interaction/src/app/missioncontrol.component.ts

```
import { Component }          from
'@angular/core';

import { MissionService }     from
'./mission.service';

@Component({
  selector: 'app-mission-control',
  template: `
    <h2>Mission Control</h2>
    <button
(click)="announce()">Announce
mission</button>
    <app-astronaut *ngFor="let
astronaut of astronauts"
      [astronaut]="astronaut">
    </app-astronaut>
    <h3>History</h3>
    <ul>
      <li *ngFor="let event of
history">{{event}}</li>
```

```
    </ul>
  `,
  providers: [MissionService]
})
export class MissionControlComponent {
  astronauts = ['Lovell', 'Swigert',
'Haise'];
  history: string[] = [];
  missions = ['Fly to the moon!',
              'Fly to mars!',
              'Fly to Vegas!'];
  nextMission = 0;

  constructor(private missionService:
MissionService) {

missionService.missionConfirmed$.subscri

      astronaut => {
        this.history.push(`${astronaut}
confirmed the mission`);
      });
  }
  announce() {
    let mission =
this.missions[this.nextMission++];

this.missionService.announceMission(miss

    this.history.push(`Mission
"${mission}" announced`);
    if (this.nextMission >=
this.missions.length) {
this.nextMission = 0; }
  }
}
```

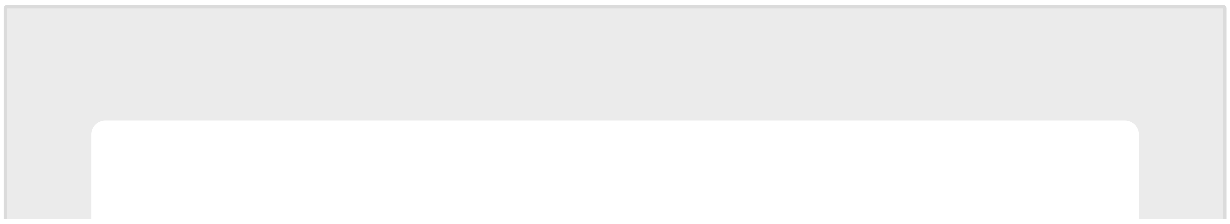
The `AstronautComponent` also injects the service in its constructor. Each `AstronautComponent` is a child of the `MissionControlComponent` and therefore receives its parent's service instance:

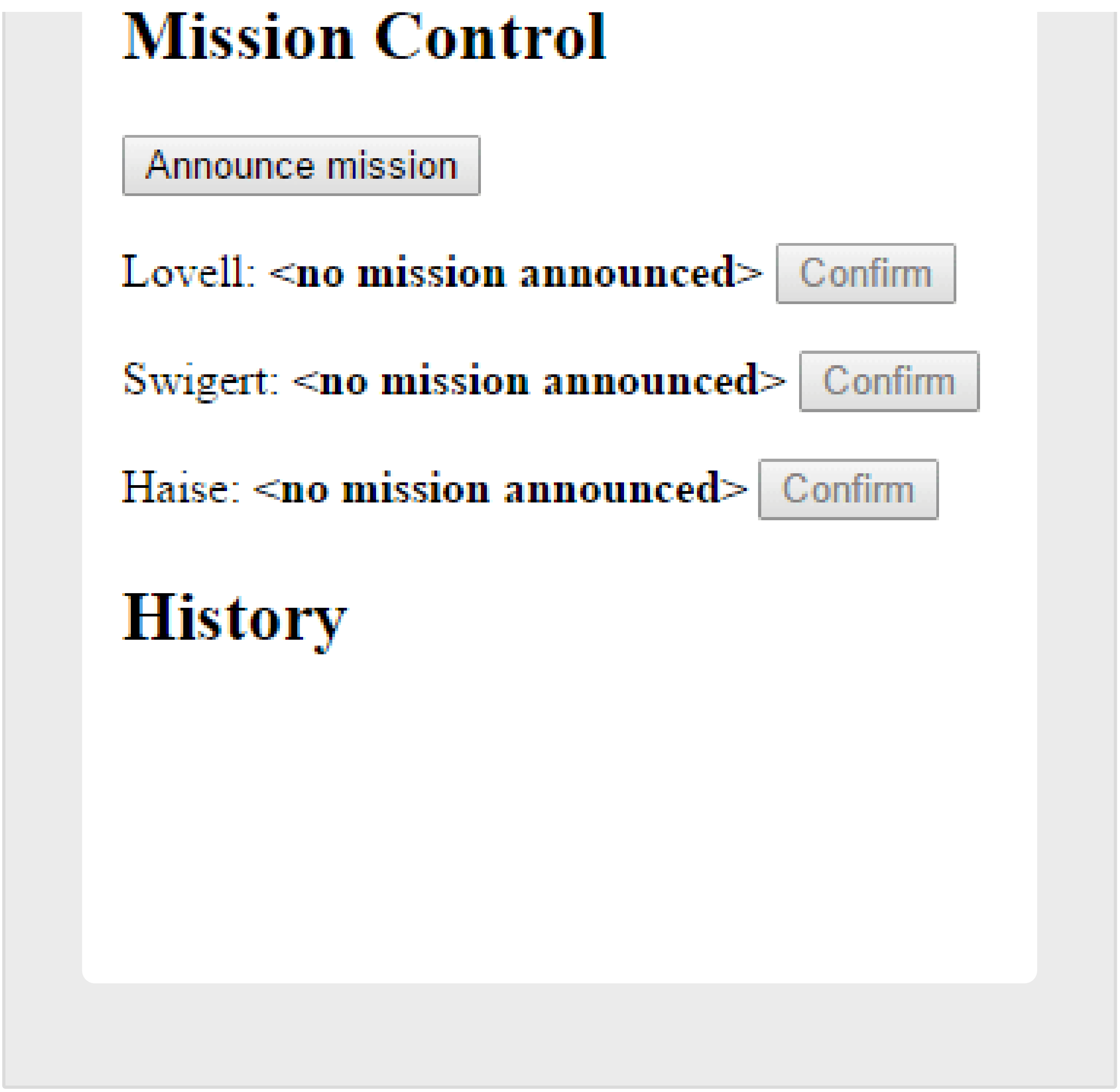
component-interaction/src/app/astronaut.component.ts

```
import { Component, Input, OnDestroy }
from '@angular/core';

import { MissionService } from
'./mission.service';
import { Subscription }   from 'rxjs';

@Component({
  selector: 'app-astronaut',
  template: `
    <p>
      {{astronaut}}: <strong>
{{mission}}</strong>
      <button
        (click)="confirm()"
        [disabled]="!announced ||
confirmed">
        Confirm
      </button>
    </p>
  `
})
export class AstronautComponent
implements OnDestroy {
  @Input() astronaut: string;
  mission = '<no mission announced>';
  confirmed = false;
  announced = false;
  subscription: Subscription;

  constructor(private missionService:
MissionService) {
    this.subscription =
missionService.missionAnnounced$.subscri

      mission => {
        this.mission = mission;
        this.announced = true;
        this.confirmed = false;
    });
  }

  confirm() {
    this.confirmed = true;
this.missionService.confirmMission(this.


  }


  ngOnDestroy() {
    // prevent memory leak when
component destroyed
    this.subscription.unsubscribe();
  }
}
```

> Notice that this example captures the `subscription` and `unsubscribe()` when the `AstronautComponent` is destroyed. This is a memory-leak guard step. There is no actual risk in this app because the lifetime of a `AstronautComponent` is the same as the lifetime of the app itself. That *would not* always be true in a more complex application.
>
> You don't add this guard to the `MissionControlComponent` because, as the parent, it controls the lifetime of the `MissionService`.

The *History* log demonstrates that messages travel in both directions between the parent `MissionControlComponent` and the `AstronautComponent` children, facilitated by the service:




Mission Control
Announce mission
Lovell: <no mission announced> Confirm
Swigert: <no mission announced> Confirm
Haise: <no mission announced> Confirm
History

Test it

Tests click buttons of both the parent `MissionControlComponent` and the `AstronautComponent` children and verify that the history meets expectations:

component-interaction/e2e/src/app.e2e-spec.ts

```
// ...
it('should announce a mission',
function () {
  let missionControl =
element(by.tagName('app-mission-
control'));
  let announceButton =
missionControl.all(by.tagName('button'))

  announceButton.click().then(function
() {
    let history =
missionControl.all(by.tagName('li'));
    expect(history.count()).toBe(1);

expect(history.get(0).getText()).toMatch
 announced/);
  });
});

it('should confirm the mission by
Lovell', function () {
  testConfirmMission(1, 2, 'Lovell');
});

it('should confirm the mission by
Haise', function () {
  testConfirmMission(3, 3, 'Haise');
});

it('should confirm the mission by
Swigert', function () {
  testConfirmMission(2, 4, 'Swigert');
});

function
testConfirmMission(buttonIndex: number,
expectedLogCount: number, astronaut:
string) {
  let _confirmedLog = ' confirmed the
mission';
  let missionControl =
element(by.tagName('app-mission-
control'));
  let confirmButton =
missionControl.all(by.tagName('button'))

  confirmButton.click().then(function
() {
    let history =
missionControl.all(by.tagName('li'));

expect(history.count()).toBe(expectedLog

    expect(history.get(expectedLogCount
- 1).getText()).toBe(astronaut +
_confirmedLog);
  });
}
// ...
```

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