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CMAD Adv III

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Server Push

- Web has traditionally been pull based. Can be made kind of a push by using these approaches
  - Long polling
  - Server Side Events
  - WebSockets

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Stock Price Update

- Lets implement a servlet for stock price quote.
- Create a page to render the updated stock price every 30 seconds

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Async Servlets

- Async servlets allow us to unblock the request processing thread pool while the servlet performs its long running task in another thread
- Its like putting the request in cold storage and returning the thread till the request processing is done
- AsyncContext class maintains the state of the request thats dormant now
- Client browser sees it as just another long running request
- Helps in design patterns that dont need polling.

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Example AsyncServlet

```
ExecutorService serv = Executors.newFixedThreadPool(5);

protected void doGet(HttpServletRequest request, HttpServletResponse
response) throws ServletException, IOException {
   request.setAttribute("org.apache.catalina.ASYNC_SUPPORTED", true);
   final AsyncContext context = request.startAsync();
   Callable<String> c = new Callable<String>() {
      public String call() throws Exception {
         context.getRequest().setAttribute("asyncdata","Hello World");
         context.dispatch("/asyncdone.jsp");
         return "Hello World";
      }
   };
   serv.submit(c);
}
```

Stock Price With Long Poll

- Change the stock price update to be a long poll on client side and make it an async servlet on server side

Node.js

- Node.js is server side framework for javascript that runs on google’s chrome V8 engines.
- Node.js is single threaded event based server framework
- Comes with a lot of functionality “compiled” and bundled into the runtime beyond the basic JS spec

Modules

- All of Node’s functionality is bundled into modules and we have to require the modules to be able to use them.
- “fs” module contains a lot of operations related to the filesystem.
- Using the below functions, write a function that gets a list of files in a directory and another to make directory (http://nodejs.org/api/fs.html)

```
var fs = require(“fs");
fs.existsSync(path);
fs.statSync(path);
fs.readdirSync(path);
fs.mkdirSync(newDir);
```

Make It Event-Driven

- Use the corresponding async versions of the methods

```
fs.exists
fs.stat
fs.readdir
```

- Write a web server on these lines:

```
var http = require("http");
var server = http.createServer(function(request, response) {
  response.writeHead(200, {"Content-Type": "text/html"});
  response.write("<html>");
  response.write("<head>");
  response.write("<title>Hello World Page</title>");
  response.write("</head>");
  response.write("<body>");
  response.write("Hello World!");
  response.write("</body>");
  response.write("</html>");
  response.end();
});

server.listen(8080);
console.log("Server is listening");
```

WebSockets

- Its a protocol now standardised for full duplex communication
- Its only relationship to HTTP is that its handshake is interpreted by HTTP servers as an Upgrade request.
- WebSocket protocol client implementations try to detect if the user agent is configured to use a proxy when connecting to destination host and port and, if it is, uses HTTP CONNECT method to set up a persistent tunnel.

Create Static Http Server

```
var http = require('http');

var finalhandler = require('finalhandler');
var serveStatic = require('serve-static');

var serve = serveStatic("./public");

var server = http.createServer(function(req, res) {
  var done = finalhandler(req, res);
  serve(req, res, done);
});
server.listen(8080);
console.log("Server started");
```

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Setup Websockets

```
var WebSocketServer = require('websocket').server;
server.listen(8080);

// create the server
wsServer = new WebSocketServer({
    httpServer: server
});

// WebSocket server
wsServer.on('request', function(request) {
    var connection = request.accept(null, request.origin);
    console.log("Web socket connection...");
    // This is the most important callback for us, we'll handle
    // all messages from users here.
    connection.on('message', function(message) {
        console.log("Web socket message: "+message);
        if (message.type === 'utf8') {
            // process WebSocket message
            console.log(message.utf8Data);
            connection.sendUTF("Server response");
        }
    });

    connection.on('close', function(connection) {
        // close user connection
    });
});
```

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Web Client

```
<script type="text/javascript">
   var sock = new WebSocket("ws://localhost:8080");
   sock.onopen = function(event) {
      sock.send("Hello from client");
   };
   sock.onmessage = function(event) {
      console.log("Got server response");
      document.getElementById('content').innerHTML = event.data;
      sock.close();
   }
</script>
```

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HTML 5

- HTML5 is an umbrella term for many new browser based features introduced as a standards update to previous HTML 4

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Scalable Vector Graphics

- A way of representing images without providing pixel level information

```
<svg id="svgelem" height="200" xmlns="http://www.w3.org/2000/svg">
      <circle id="redcircle" cx="50" cy="50" r="50" fill="red" />
      <defs>

         <radialGradient id="gradient" cx="50%" cy="50%" r="50%"
       fx="50%" fy="50%">
             <stop offset="0%"
       style="stop-color:rgb(200,200,200); stop-opacity:0" />
             <stop offset="100%"
       style="stop-color:rgb(0,0,255); stop-opacity:1" />
         </radialGradient>

      </defs>

      <ellipse cx="100" cy="50" rx="100" ry="50"
       style="fill:url(#gradient)" />

   </svg>
```

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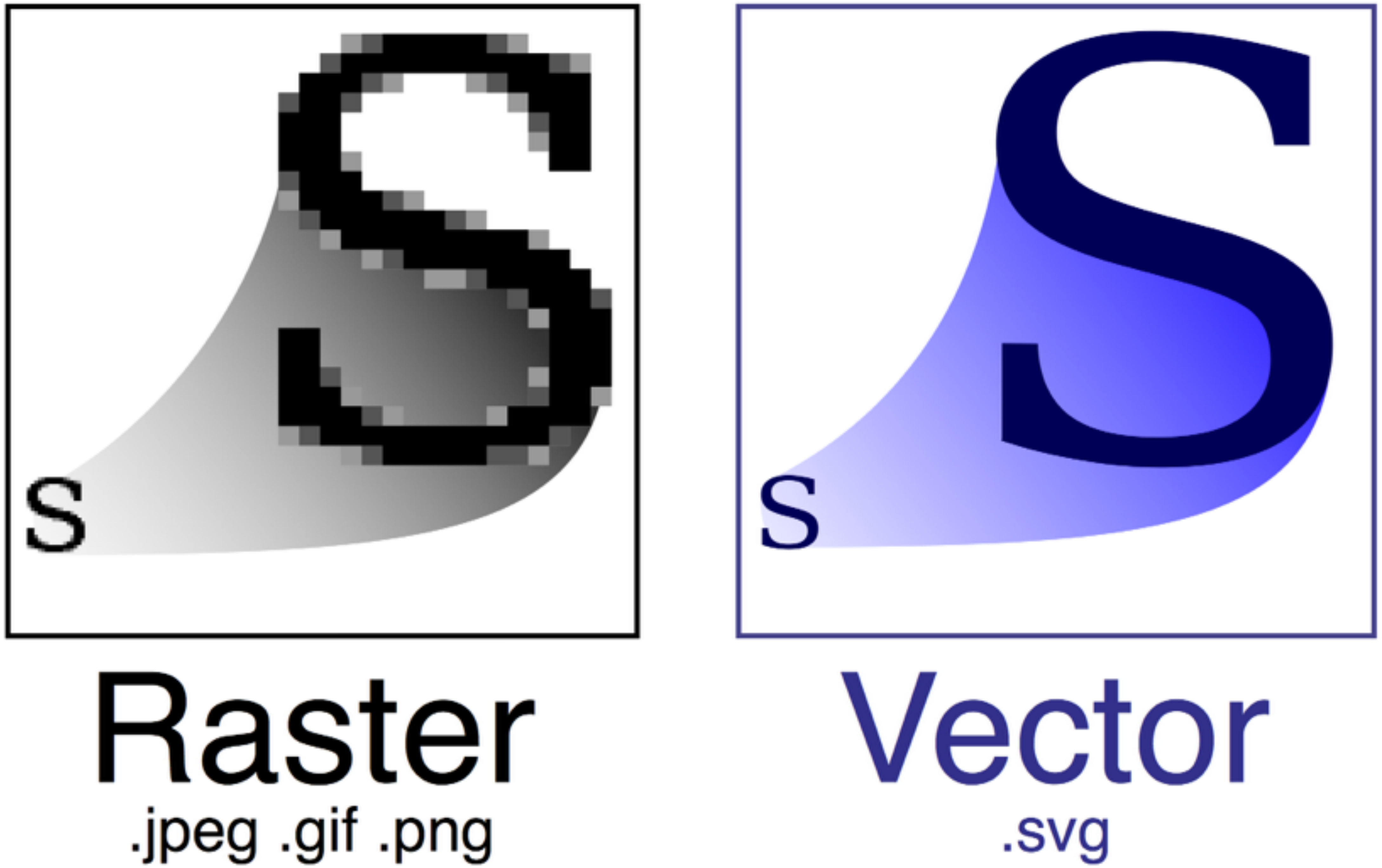
SVG Images



MathML

- Mathml supports embedding math symbols in html text:

```
<math xmlns="http://www.w3.org/1998/Math/MathML">

    <mrow>
      <msup><mi>a</mi><mn>2</mn></msup>
      <mo>+</mo>

      <msup><mi>b</mi><mn>2</mn></msup>
      <mo>=</mo>

      <msup><mi>c</mi><mn>2</mn></msup>
    </mrow>

  </math>
```

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Session and LocalStorage

- Session and Local storage are used to store info on the browser without using cookies or sessions to go to the server

```
<script type="text/javascript">
      /* localStorage.clear();
      sessionStorage.clear(); */
      if(localStorage.visitCount){
         localStorage.visitCount= localStorage.visitCount+1;
      }else{
         localStorage.visitCount=1;
      }
      if(sessionStorage.visitCount){
         sessionStorage.visitCount = sessionStorage.visitCount+1;
      }else{
         sessionStorage.visitCount=1;
      }
      alert(localStorage.visitCount);
      alert(sessionStorage.visitCount);
</script>
```

Canvas

- Canvas lets you create graphics directly with javascript

```
if (canvas.getContext){
   var ctx = canvas.getContext('2d');
   // drawing code here
   console.log("Lines...");
   ctx.beginPath();
    ctx.arc(75,75,50,0,Math.PI*2,true);  // Outer circle

    ctx.moveTo(110,75);
    ctx.arc(75,75,35,0,Math.PI,false);   // Mouth

    ctx.moveTo(65,65);
    ctx.arc(60,65,5,0,Math.PI*2,true);  // Left eye

    ctx.moveTo(95,65);
    ctx.arc(90,65,5,0,Math.PI*2,true);  // Right eye

    ctx.stroke();
}
else {
   // canvas-unsupported code here
   alert("Canvas not supported");
}
```

- http://code.tutsplus.com/articles/21-ridiculously-impressive-html5-canvas-experiments--net-14210

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Responsive Web Design

- This is a generic term for web sites that are able to scale and render well on different display sizes without code changes

- Bootstrap is a CSS library that allows for this to happen

Web Page Structure

- HTML - identifies structure of the page
- CSS - specifies styling of the page
- Javascript - specifies behaviour of the page

container class

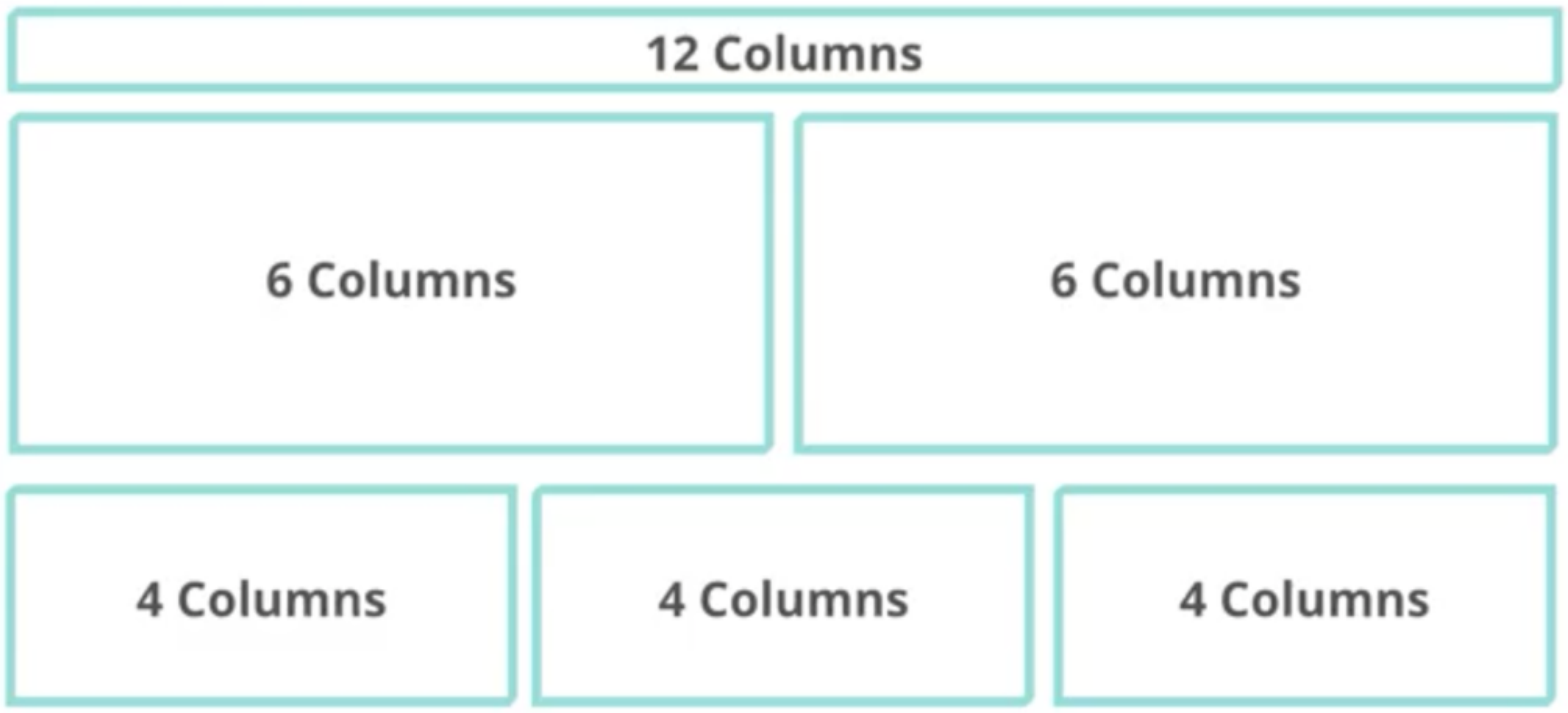
- Container class adds margins and centers content on the page

- Container also resizes the margins whenever the window size is changed so that it crosses the small/medium/large thresholds

- container-fluid class allows for stretching to near the edges of the screen

Thinking In Grid

- containers can divide horizontal space into 12 columns and a site can be laid out like this:



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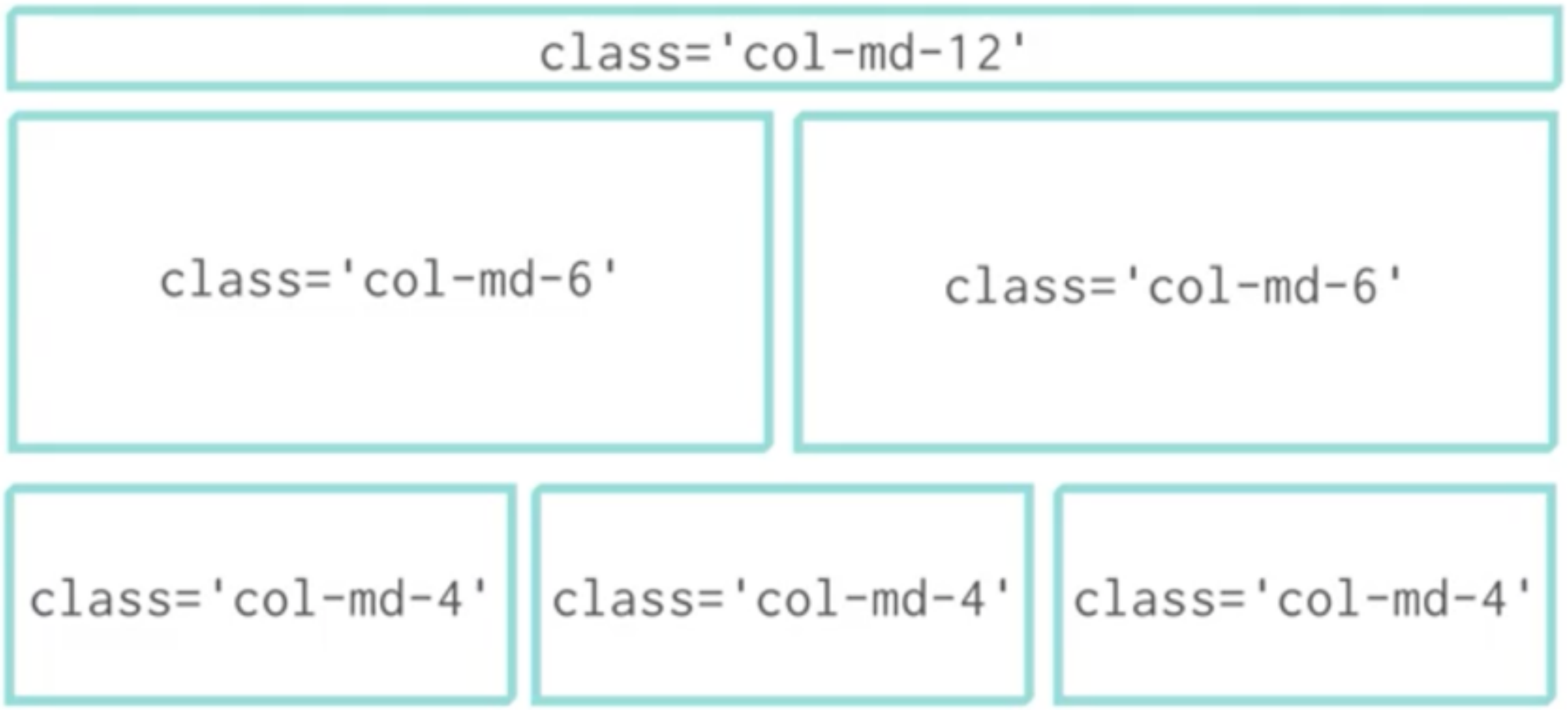
Creating Columns

- col-md-* class identifies the number of columns an element is going to take up horizontally
- md means medium size screens



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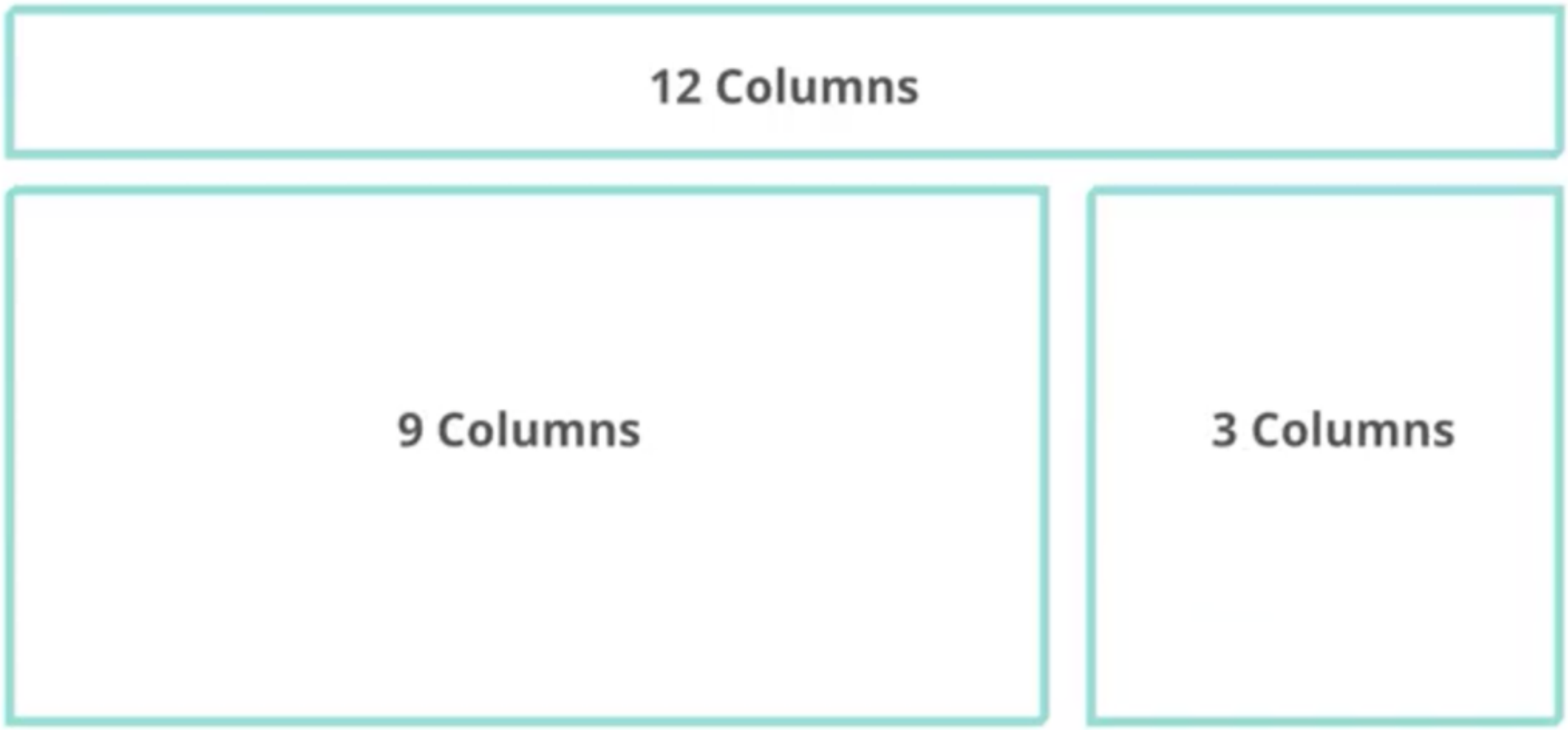
Popular Layouts - Sites with Sidebars



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Organising

- column divs are placed inside rows to aid readability and some extra padding
- col-md-offset-* adds * columns offset to any div
    - Three column div with one column offset <div class='col-md-3 col-md-offset-1'>
- Rows that contain a div that stretches beyond 12 columns will wrap

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Working With Smaller Screens

- col-lg-* large mode works on 1200 pixels and above
- col-md-* medium mode works with a min of 992 pixel width
- col-sm-* small mode will work with 768+ pixels
- col-xs-* - extra small mode will work with 0+ pixels
- We can add multiple of these classes to control how the same layout renders on different screen sizes
- A higher level setting overrides a lower level. Example col-sm-offset-0 will override col-xs-offset-1 on small and above devices

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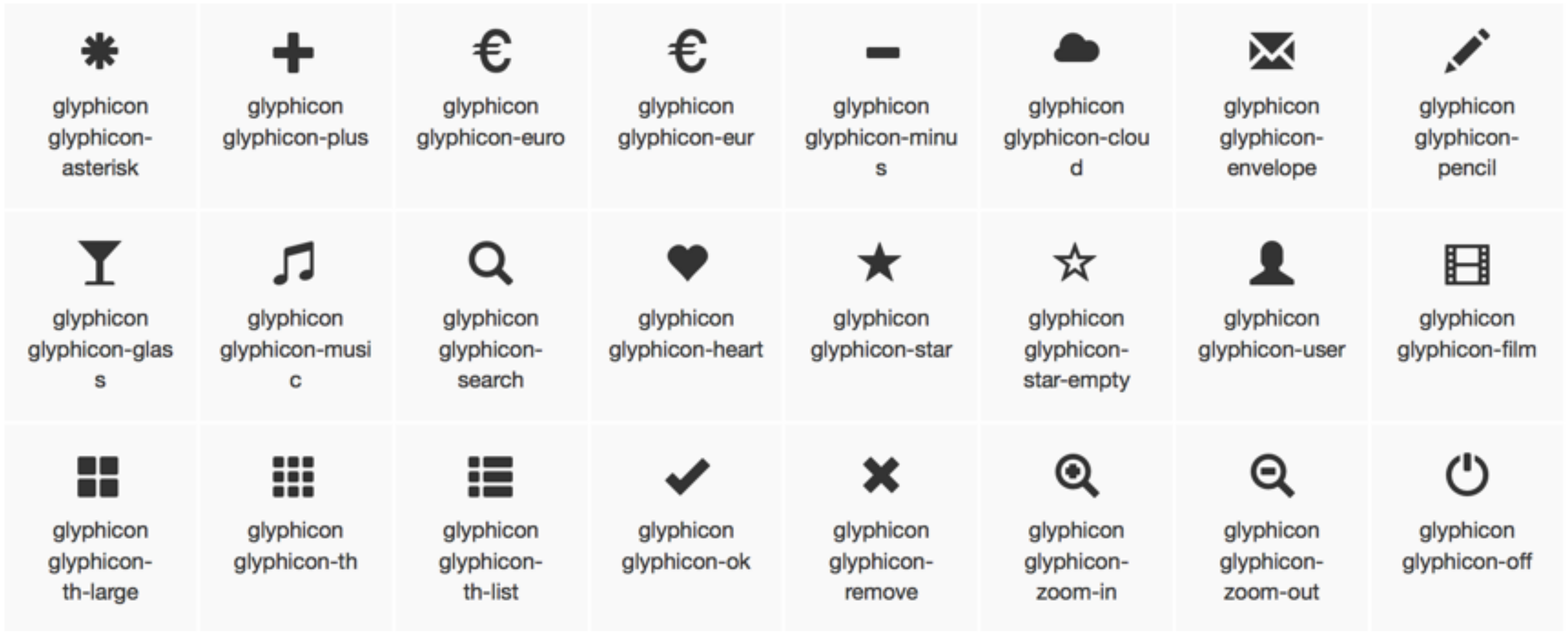
Hiding elements

- Elements can be hidden for certain screen sizes: hidden-sm, hidden-md, etc…
- Showing elements for certain screen sizes is done with visible-sm, visible-lg, etc

Glyphicons

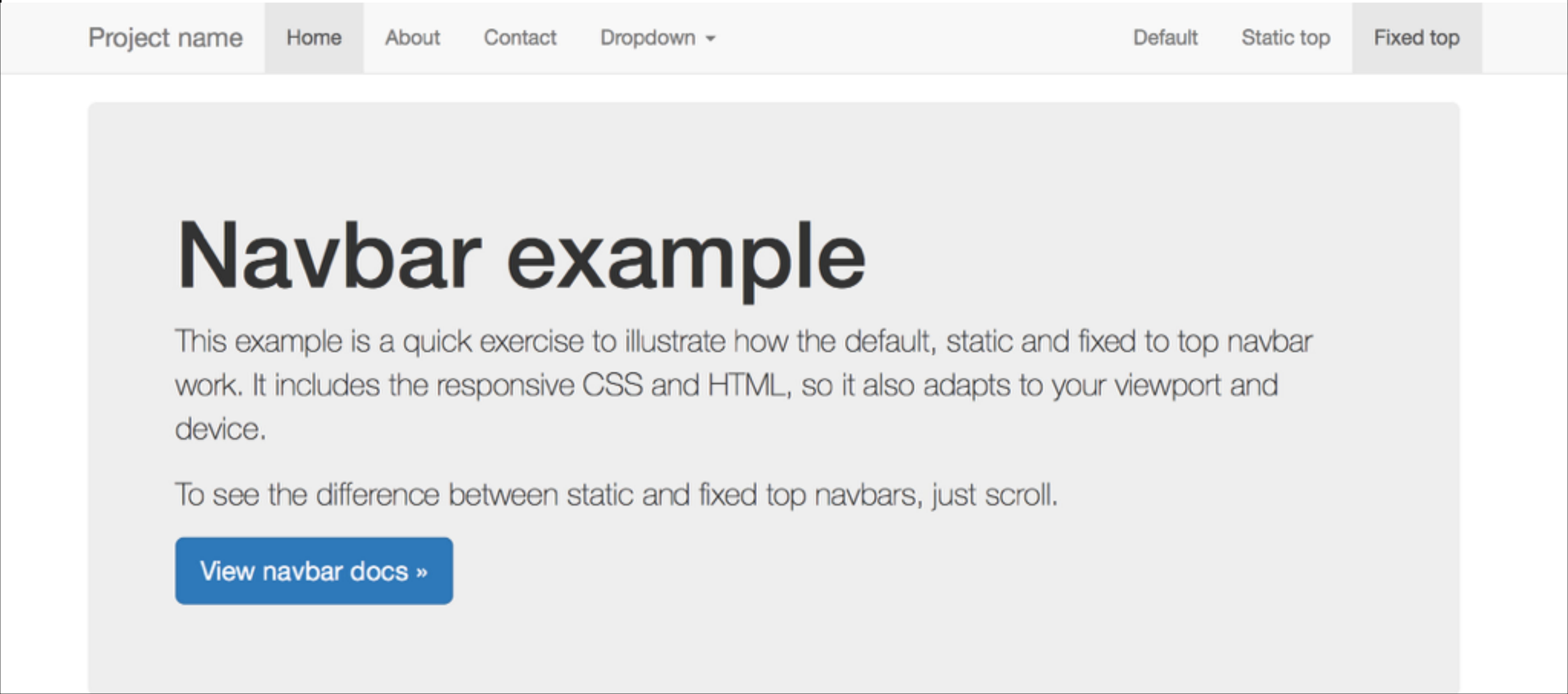
- Glyphicons are fonts supplied with bootstrap
- <i class="glyphicon glyphicon-euro"></i>



glyphicon glyphicon-asterisk	glyphicon glyphicon-plus	glyphicon glyphicon-euro	glyphicon glyphicon-eur	glyphicon glyphicon-minus	glyphicon glyphicon-cloud	glyphicon glyphicon-envelope	glyphicon glyphicon-pencil
glyphicon glyphicon-glass	glyphicon glyphicon-music	glyphicon glyphicon-search	glyphicon glyphicon-heart	glyphicon glyphicon-star	glyphicon glyphicon-star-empty	glyphicon glyphicon-user	glyphicon glyphicon-film
glyphicon glyphicon-th-large	glyphicon glyphicon-th	glyphicon glyphicon-th-list	glyphicon glyphicon-ok	glyphicon glyphicon-remove	glyphicon glyphicon-zoom-in	glyphicon glyphicon-zoom-out	glyphicon glyphicon-off

Navigation

- Bootstrap offers special classes designed to make navigational menus look classy on multiple screen sizes



Navbar example

This example is a quick exercise to illustrate how the default, static and fixed to top navbar work. It includes the responsive CSS and HTML, so it also adapts to your viewport and device.

To see the difference between static and fixed top navbars, just scroll.

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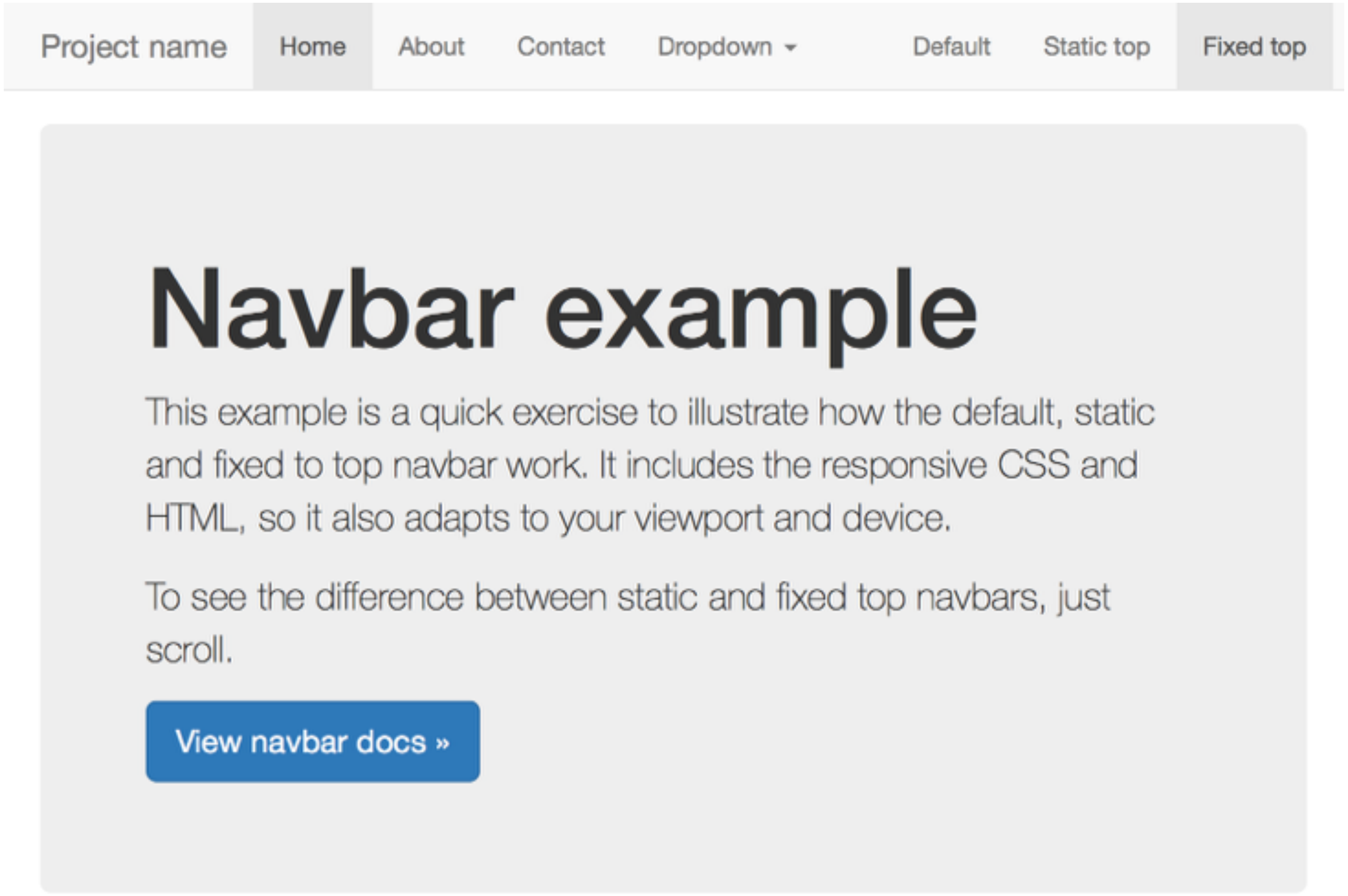
Shrinking…



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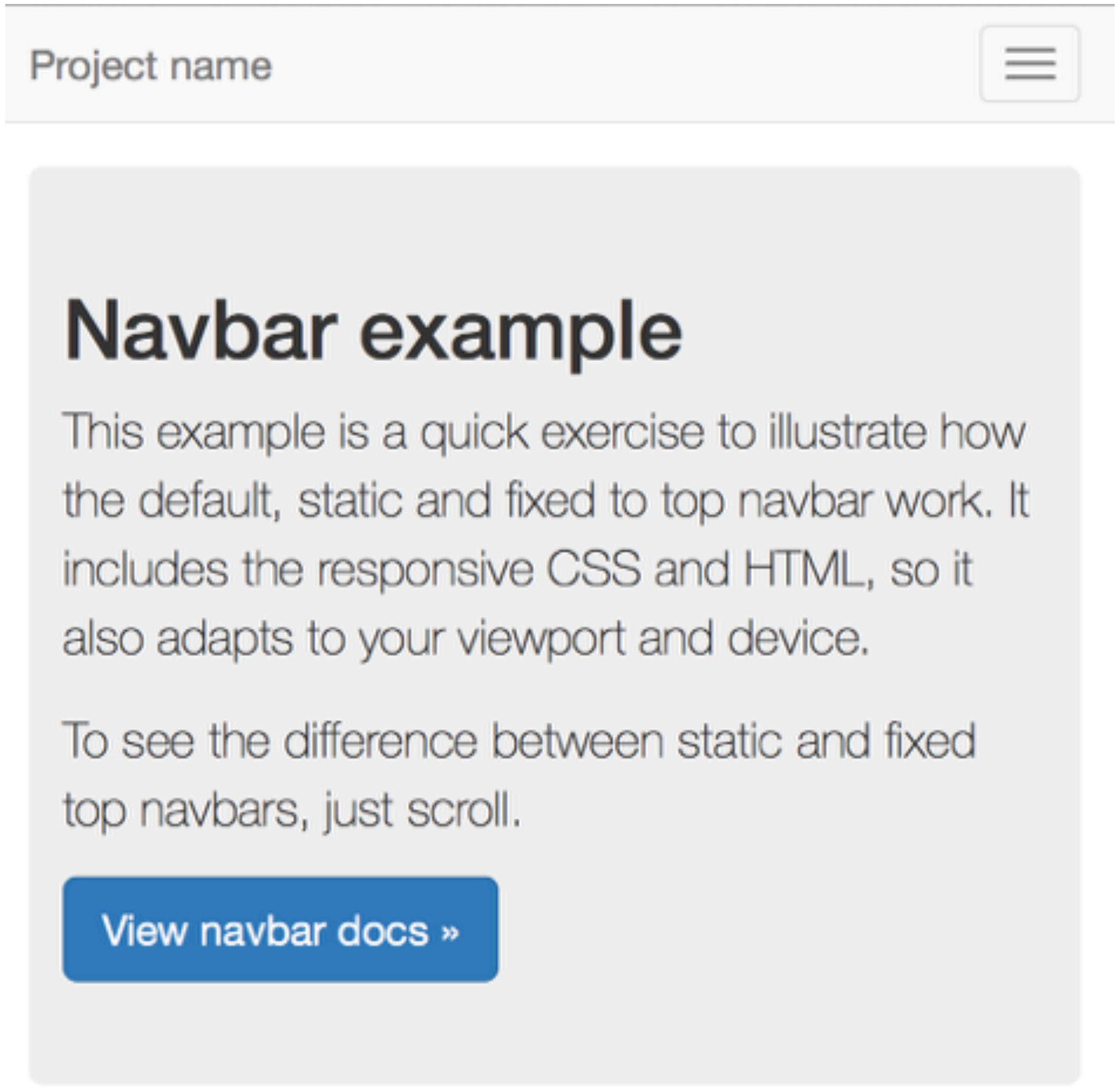
Shrinking…


Project name

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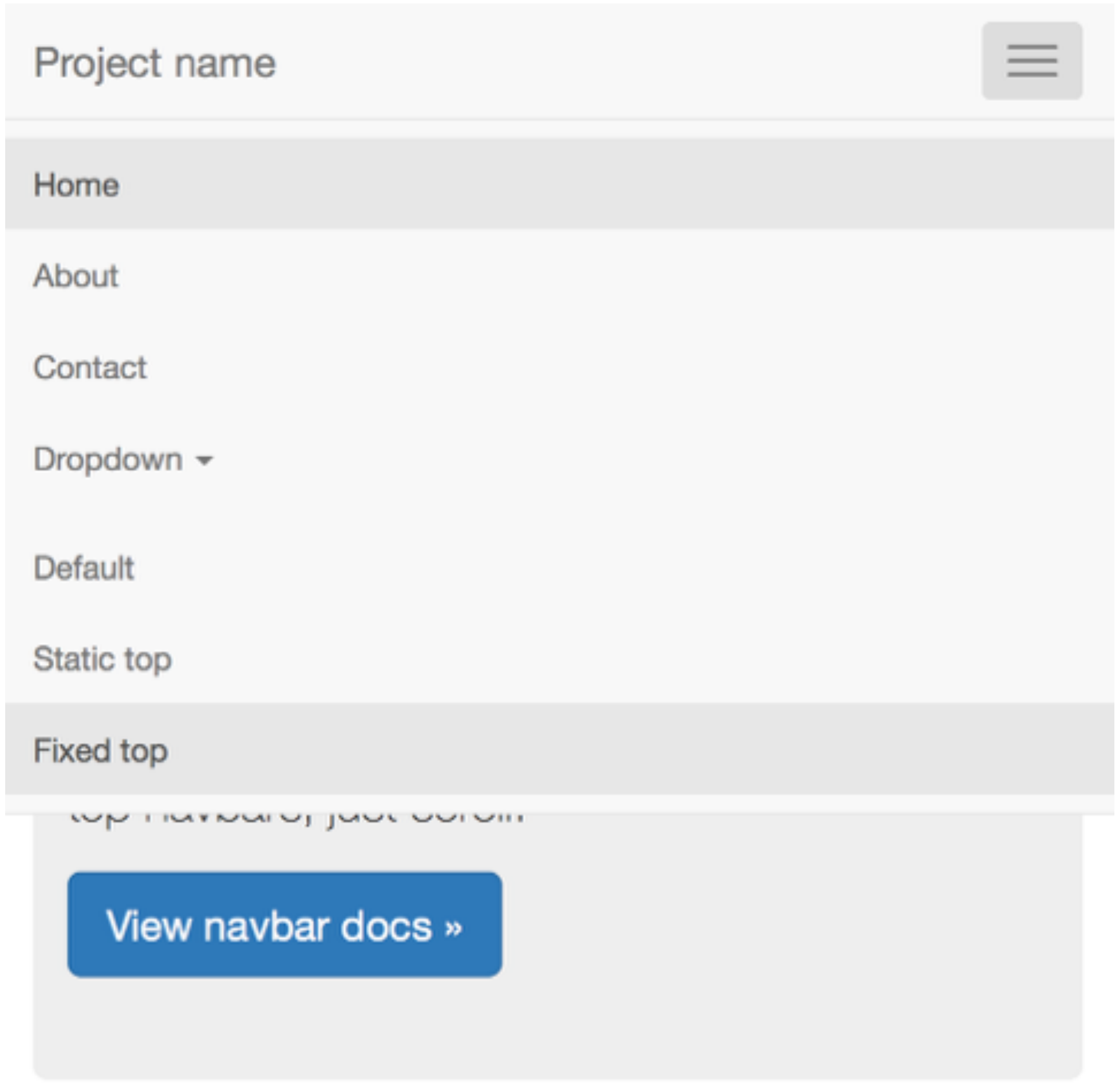

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Isomorphic

- Isomorphic JavaScript apps are JavaScript applications that can run both client-side and server-side.
- The backend and frontend share the same code
- The API boundary is not visible.
    - This raises questions over non browser clients. Meteor addresses many of these concerns

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Meteor

- Get meteor:
  - On Mac: curl https://install.meteor.com/ | sh
  - On windows: download and install from meteor site
- Create an app:
  - meteor create users
  - cd users
  - meteor
  - Navigate to: localhost:3000/

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Examine created files and architecture

- Notice on dev console how files are loaded.
    - Update the html and see it getting reloaded without a poll
    - Meteor server keeps a WebSocket connection open

Create A User List: users.html

```
<body>
   <h1>Users List</h1>
   {{> userList}}
</body>

<template name="userList">
   <table>
      {{#each users}}
         {{> userTempl}}
      {{/each}}
   </table>
</template>

<template name="userTempl">
   <tr><td>{{name}}</td><td>{{age}}</td></tr>
</template>
```

Create A User List

```
if (Meteor.isClient) {

  Template.userList.helpers({
   users: function () {
      return [{name:'Hari',age:22},{name: 'Kelly', age:42},{name: 'Will', age:46}];
    }
  });

  Template.userList.events({
    'click button': function () {
      // increment the counter when button is clicked
      Session.set('counter', Session.get('counter') + 1);
    }
  });
}

if (Meteor.isServer) {
  Meteor.startup(function () {
    // code to run on server at startup
  });
}
```

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Separate Server and Client

- Create separate folders “server” and “client” and copy user.js into these folders
- In each of them remove the other side of code. Such as: in client folder, remove the server side code

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Data Drive using Mongo

- On server and client:
    - var users = new Meteor.Collection(“users");
- On client in the helpers

```
users : function() {
    return users.find();
}
```

- Test app.
- On console use this to insert data: meteor mongo

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Web Components

- Web Components are a suite of specifications that help with implementing custom HTML elements:

- Custom elements: an API for registering your own implementations for HTML elements.

- Shadow DOM: Encapsulates and hides the innards of a custom element inside a nested document.

- Templates: enable you to store HTML data inside an HTML document. The content of a <template> element is parsed without interpreting it (no loading of images etc.).

- HTML Imports: let you import other HTML documents into the current one. That way, HTML documents become bundles of HTML, CSS and JavaScript.

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Custom Elements

- Custom elements allow you to:
  - Define new HTML/DOM elements
  - Create elements that extend from other elements
  - Logically bundle together custom functionality into a single tag
  - Extend the API of existing DOM elements

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Create a Custom Element for User Form

```
//Create the element from the form element
var UserFormElementProto = Object.create(HTMLFormElement.prototype);

//Define the html of the element
UserFormElementProto.createdCallback = function() {
   this.innerHTML = '<form class="userForm"><input type="text" name="name" 
placeholder="User Name" /><input type="number" name="age" placeholder="Age" /
><input type="submit" value="Save" id="userSave"></form>';
};

//Register the element
var UserFormElement = document.registerElement('user-form', {prototype: 
UserFormElementProto});

//Now use it either by document.body.append(new UserFormElement()) or 
declaratively as <user-form></user-form>
```

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Make this work with polyfills

- webcomponents.js polyfills the functionality of web components on browsers where it isnt supported
  - Copy webcomponents.js in client\scripts folder
  - Test on FireFox