Beyond JavaScript Frameworks: Writing Reliable Web Apps With Elm

Erik Wendel
Jfokus 2018

BEKK

Who is

Jonathan Ive?

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Apple Leadership

Jonathan Ive

Chief Design Officer

Jonathan Ive is Apple's Chief Design Officer, reporting to CEO Tim Cook.

Jony is responsible for all design at Apple, including the look and feel of Apple hardware, user interface, packaging, major architectural projects such as Apple Park and Apple's retail stores, as well as new ideas and future initiatives.

Since 1996, Jony has led Apple's design team, which is widely regarded as one of the world's best.

He holds over 5,000 patents and has been recognized with numerous design awards, including the Design Museum London's first Designer of the Year in 2003, the Design and Art Direction (D&AD) President's Award in 2005 and the Cooper-Hewitt National Design Museum's Product Design Award in 2007.

In 2012, D&AD named Jony and his team the Best Design Studio of the past 50 years. Their work is featured in the permanent collections of museums around the world, including the Museum of Modern Art in New York and the Pompidou in Paris.

Jony earned a Bachelor of Arts degree at Newcastle Polytechnic. As an undergraduate, he twice won the Royal Society of Arts' prestigious Student Design Award, and years later the RSA awarded him the title of Royal Designer for Industry. He also holds honorary doctorates from the Royal College of Art, the Rhode Island School of Design and Northumbria University.

A native of London, Sir Jonathan Ive was made a Knight Commander of the British Empire in 2013 "for services to design and enterprise."

Leadership > Jonathan Ive

Shop and Learn
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Find a Store
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Apple and Education
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For Business
Apple and Business
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Apple Store Account
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Education
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Inclusion and Diversity
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More ways to shop: Visit an Apple Store, call 1-800-MY-APPLE, or find a reseller.

Elm is like *Jonathan Ive* would have designed a programming language – it is **minimalistic**, **user-friendly** and **it just works**

– Peder Korsveien

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How many of you…

…write JavaScript at work?

Did you ever…

…ship an app with confidence it wouldn`t crash in production?

(without loads of QA)

Did you ever…

…feel completely safe after a large refactor of the frontend code?

Did you ever…

…become overwhelmed by the amount of frontend tech in 2018?

Did you ever…

…feel like not all team members are **comfortable** with frontend tasks?

Check, check, check…

✅
JavaScript fatigue

✅
Worrysome refactors

✅
Dedicated frontend devs

✅
Nail-biting deploys

I will argue that Elm addresses these issues while also providing

a dedicated pair-programmer

error messages that actually help

a solid package system

Erik Wendel

User interface expert, experienced with
javascript and single-page apps

Worked with large
Norwegian companies like
SpareBank1 and NSB

Serving Elm in
production to 1M+ users

Web Development Lead at
BEKK Consulting, Oslo
(450 people)

Founder of
Oslo Elm Meetup (2016)
Oslo Elm Day (2017)

Agenda

1. How Elm works

   Compared to the JS of today

2. Live Coding And Examples

   Counter app

3. Does Anyone Use Elm?

   A few stories and examples

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How does Elm compare to React?

Elm is a language compiling to JavaScript

it is *not* another library or a framework

How does Elm compare to React?

Elm and JavaScript are totally different

In terms of syntax and semantics

How does Elm compare to React?

Elm uses pure functions and virtual dom

to create a tree of *components*

How does Elm compare to React?

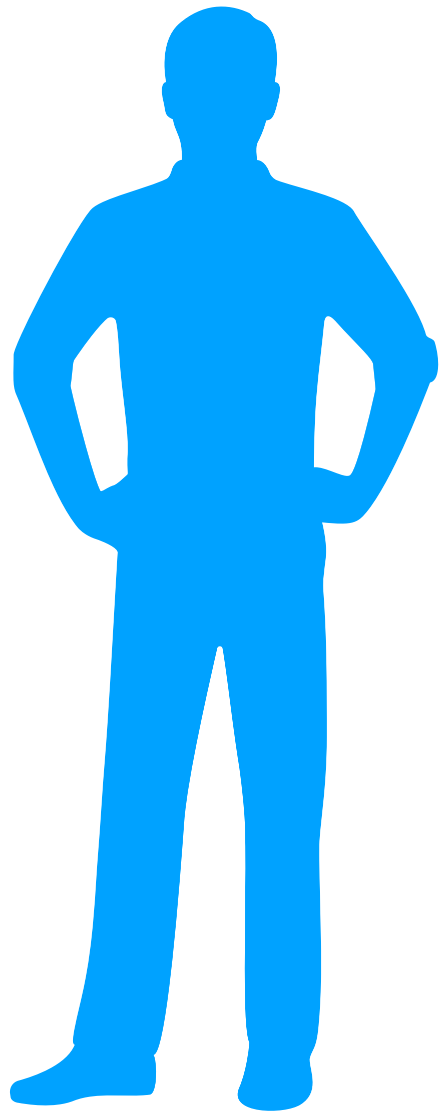
Elm does not allow component state

all state is stored in top-level store, like *Redux*

How does Elm compare to React?

Elm uses the Redux architecture

actually, it is the other way around - Redux was inspired by Elm



"Elm is basically React-Redux with type safety"

This is how it works

```
<div id="container"></div>
<script src=“main.js"></script>

<script>
    var node = document.getElementById('container');
    var app = Elm.Main.embed(node);
</script>
```

A quick overview

1. Correctness, maintainability and developer-friendliness comes first

2. A functional language of the ML family

   (F#, OCaml, Haskell)

3. No run-time errors (!)

4. Heavily opinionated

Key Language Features

1. All data is immutable, and null doesn`t exist

2. Expression-oriented, no statements

   Everything evaluates to a value

3. Pure (side-effects handled by runtime)

   Like redux-saga

4. Architecture as a built-in feature

   Redux is a JavaScript-adaptment of The Elm Architecture

5. Small but expressive feature set

   Fits together like Lego

   Therefore: it’s relatively quickly learned

Let’s see some code!

```
increment x =
    x + 1

five = increment 4
```

Functions

Kind of important in functional programming

```elm
increment : Int -> Int
increment x =
    x + 1

five : Int
five = increment 4
```

Type Inference

Elm is smart, but you’d still want to have explicit types

Data

Constants, tuples og objects

```
-- constant
x : Int
x = 42

-- tuple
position : (Int, Int)
position = (3, 2)

-- object (called record)
person : { name : String, age : Int }
person =
    { name = "Erik"
    , age = 30
    }
```

Type Alias

Allows us to define new types

```
type alias Coordinates = (Int, Int)

playerPosition : Coordinates
playerPosition = (0,0)

type alias Discount = Int

studentDiscount: Discount
studentDiscount = 10
```

```
type alias Customer =
    { name: String
    , age: Int
    }

erik : Customer
erik =
    { name = "Erik"
    , age = 24
    }
```

Type Alias

Works best with objects

```elm
type alias Customer =
    { name: String
    , age: Int,
    , type: String
    , studentDiscount: Int
    }

erik : Customer
erik =
    { name = "Erik"
    , age = 25
    , type = "Student",
    , studentDiscount = 50
    }
```

Example

Three types of customers:
ordinary, students and companies

```
type alias Customer =
    { name: String
    , age: Int,
    , type: String
    , studentDiscount: Int
    , companyName: String
    }

erik : Customer
erik =
    { name = "Erik"
    , age = 30
    , type = "Corporate",
    , studentDiscount = 0
    , companyName = "BEKK Consulting"
    }
```

```
type CustomerType
    = Student
    | Corporate
    | Private
```

Union Types

Surprisingly useful!

```
type CustomerType
    = Student Int
    | Corporate String
    | Private
```

Union Types

Every branch can contain different values

```
type CustomerType = Student Discount | Corporate CompanyName | Private

getDiscount : CustomerType -> Discount
getDiscount class =
    case class of
        Student discount ->
            discount
        Corporate name ->
            0
        Private ->
            0
```

Union Types

Values are unwrapped with pattern matching

```
type Maybe a = Just a | Nothing
```

Maybe

Eliminating the need for null and undefined

```
type Maybe a = Just a | Nothing

type alias Game =
    { highscore: Maybe Int
    }
```

Maybe

Eliminating the need for null and undefined

```
type Maybe a = Just a | Nothing

type alias Game =
    { highscore: Maybe Int
    }

getHighscore : Game -> String
getHighscore game =
    case game.highscore of
        Just score ->
            toString score
        Nothing ->
            "No highscore"
```

Maybe

The compiler will force us to handle all cases (similarly with ajax and other unsafe operations)

HTML

Creating it in Elm

```
<div class="ninja">
    <span>Banzai!</span>
</div>
```

```
main =
    div [ class "ninja" ]
        [ span []
            [ text "Banzai!" ]
        ]
```

HTML

Like React without JSX (hyperscript)

HTML

What does a mean?

```
main : Html a
main =
    div [ class "ninja" ]
        [ span []
            [ text "Banzai!" ]
        ]
```

```
main : Html Msg
main =
    div [ class "ninja" ]
        [ span [ onClick DoSomethingCool ]
            [ text "Banzai!" ]
        ]
```

HTML

The Html-type includes the type that will be created by user interactions (like Redux actions)

The Elm Architecture

```
-- our entire app state (store)
model: Model

-- represent data with html (react)
view: Model -> Html Msg

-- changes to app state (reducers)
update: Msg -> Model -> Model
```

Which JavaScript-libs would you need to get this out of the box?

1. React

   Virtual DOM

2. Redux

   Our built-in architecture

3. ImmutableJS

   For full immutability

4. TypeScript eller Flow

   For (a considerably weaker) type safety

5. ESLint

   Enforcing code style and code-level sanity

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   The JS type system + Elm Counter app

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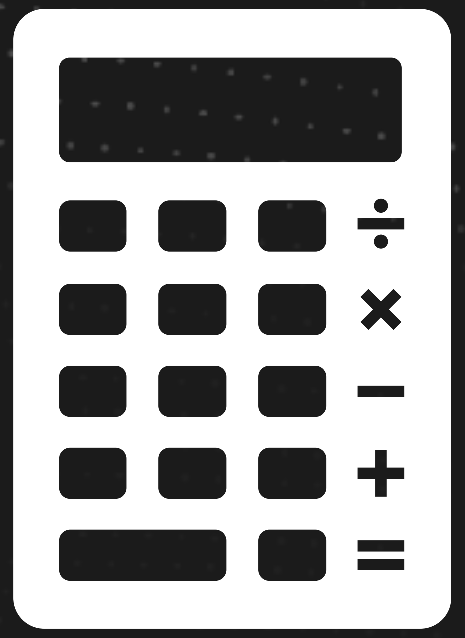
   A few stories and examples



+ 0 -

+ 1 -

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   Counter app

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So…

Elm has been around for quite a few years, attracting attention and generating conference talks, but is it really **ready for production?**

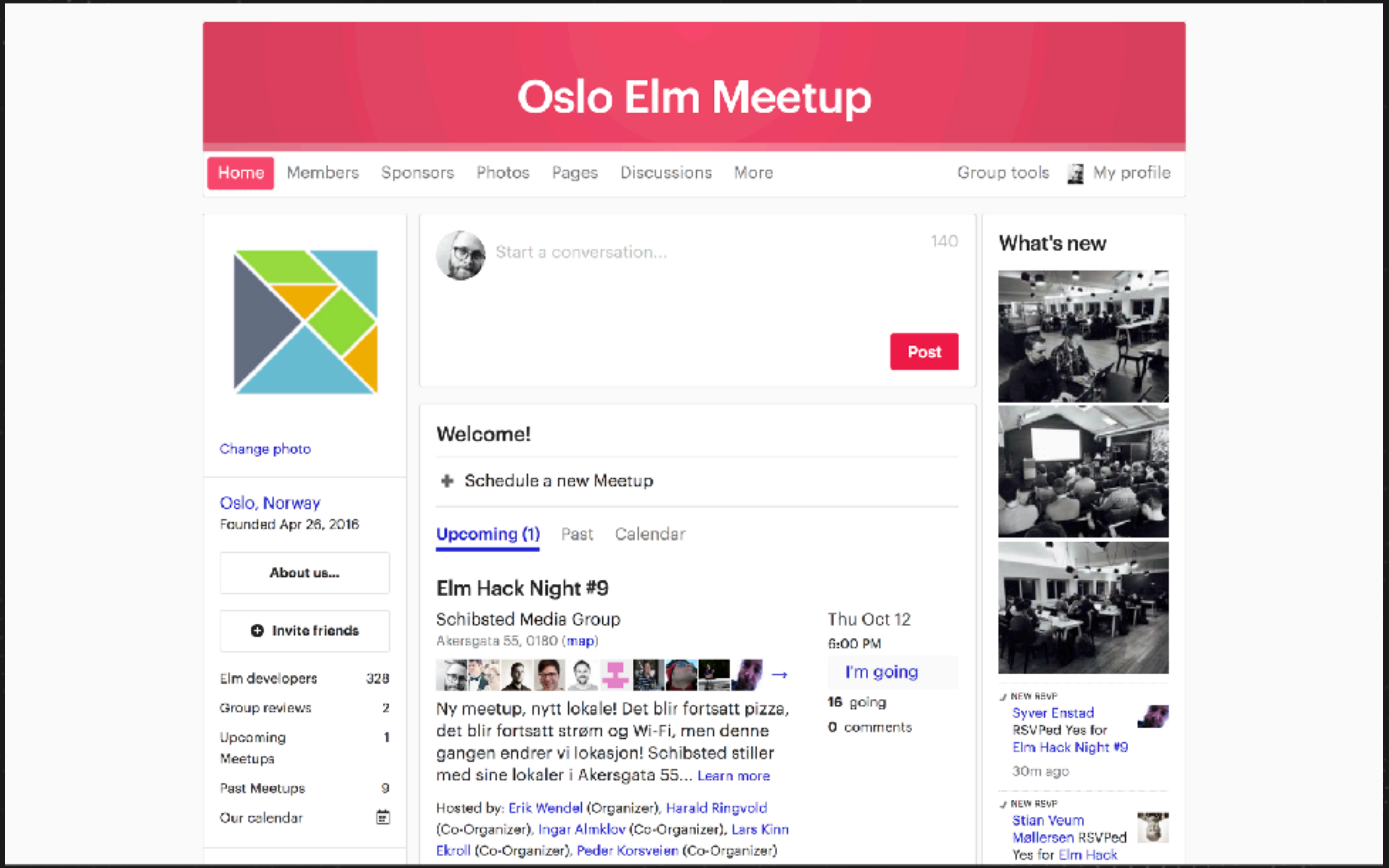
Is anyone using it in their business-critical, user-facing applications? If so, **what’s their stories?**

Oslo Elm Meetup

First meetup in May 2016
Huge interest with no marketing
150 members and 42 attendees

January 2018:
398 medlemmer

Monthly meetups



Oslo, Norway
Founded Apr 26, 2016

Elm developers	328
Group reviews	2
Upcoming Meetups	1
Past Meetups	9
Our calendar	

Welcome!

Elm Hack Night #9

Schibsted Media Group
Akersgata 55, 0180 (map)

Thu Oct 12
6:00 PM

16 going
0 comments

Ny meetup, nytt lokale! Det blir fortsatt pizza, det blir fortsatt strøm og Wi-Fi, men denne gangen endrer vi lokasjon! Schibsted stiller med sine lokaler i Akersgata 55... Learn more

Hosted by: Erik Wendel (Organizer), Harald Ringvold (Co-Organizer), Ingar Almklov (Co-Organizer), Lars Kinn Ekroll (Co-Organizer), Peder Korsveien (Co-Organizer)

NEW RSVP
Syver Enstad RSVPed Yes for Elm Hack Night #9
30m ago

NEW RSVP
Stian Veum Møllersen RSVPed Yes for Elm Hack

Oslo Elm Day

One-day, single-track conference in Oslo, June 2017
105 attendees
10 speakers from 5 countries
All talks are on YouTube

Next edition: most likely fall 2018

Does Anyone Use Elm?

… yes!

Here’s two example apps

written in Elm for different reasons

Switcharoo

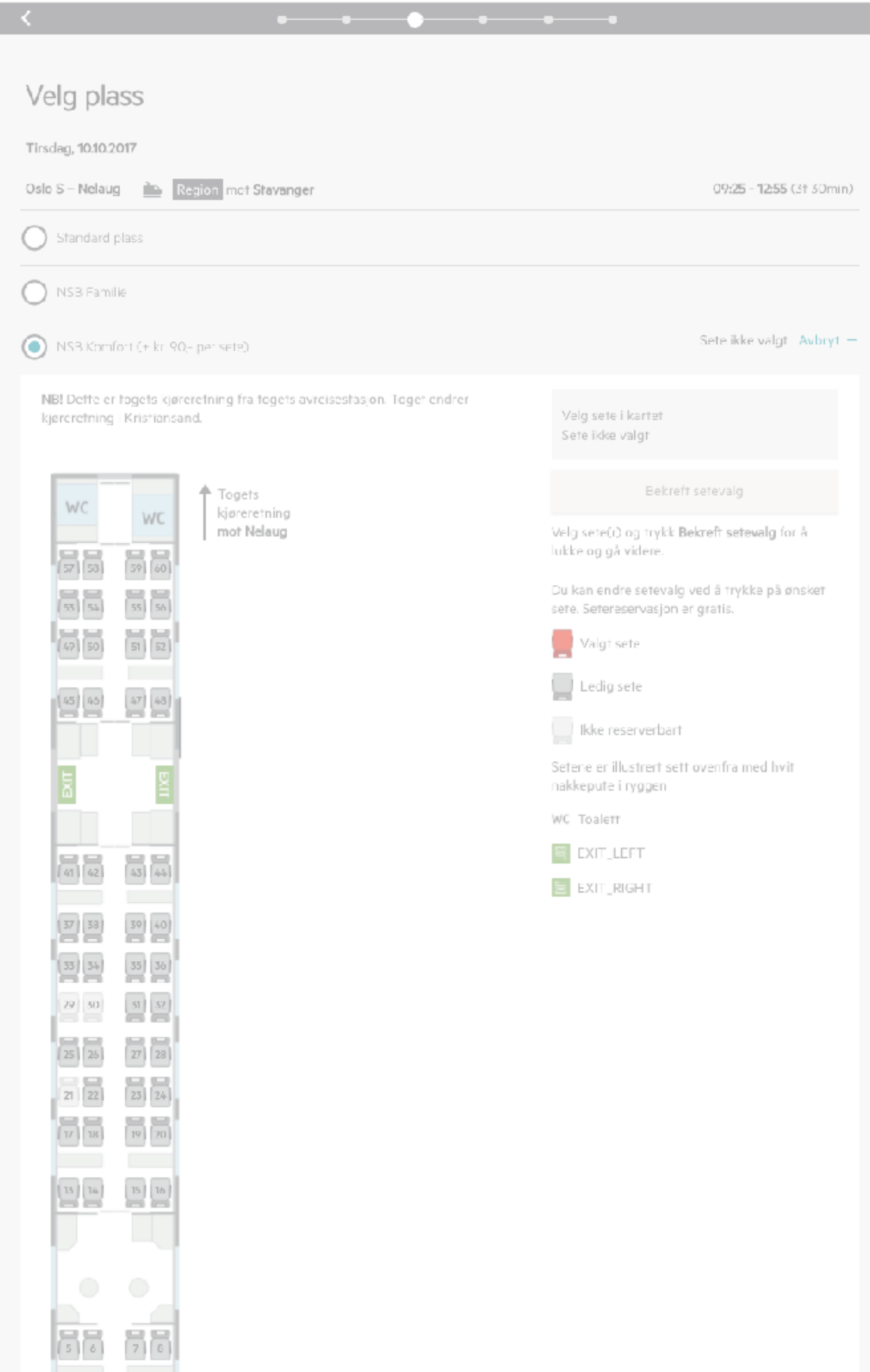
Conference information system

NSB

(Norwegian Railways, like SJ)

Summer interns doing seat reservation app

I rute? Mine reiser



Velg plass

Tirsdag, 10.10.2017

Oslo S – Nelaug Region mot Stavanger 09:25 - 12:55 (3t 30min)

○ Standard plass

○ NSB Familie

● NSB Komfort (+ kr 90,- per sete) Sete ikke valgt Avbryt –

NB! Dette er togets kjøreretning fra togets avreisestasjon. Toget endrer kjøreretning i Kristiansand.

Velg sete i kartet
Sete ikke valgt

Bekreft setevalg

Velg sete(r) og trykk **Bekreft setevalg** for å lukke og gå videre.

Du kan endre setevalg ved å trykke på ønsket sete. Setereservasjon er gratis.

🟥 Valgt sete

▨ Ledig sete

□ Ikke reserverbart

Setene er illustrert sett ovenfra med hvit nakkepute i ryggen

WC Toalett

🟩 EXIT_LEFT

🟩 EXIT_RIGHT

Summary Of Experience Reports

1. Many are experimenting with or using Elm

2. 100% are saying *“would use again”*

3. Easy onboarding, especially for FPers and React-developers

4. World’s biggest adoptor has around 250k LOC

Bad-use cases for Elm:

you're making a prototype

...or something else that's small

when dev speed trumps code quality

you use a lot of third party code (like map libs)

the team doesn't know func. prog. and don't want to learn

Great use-cases for Elm:

you know the refactors are coming

complex domain logic

code correctness is especially important

team has little or no knowledge of javascript

Challenges, adressed!

~~JavaScript fatigue~~

~~Worrysome refactors~~

~~Dedicated frontend devs~~

~~Nail-biting deploys~~

Elm gives you..

a lang without runtime errors
superb refactoring support
frontend for the entire team

en delightful dev experience
with Redux built-in
and React's virtual DOM

a currently small ecosystem
a lang without a huge backer
some boilerplate

Is it a good deal?

I think so!

What do you think?

Did this make you curious?

1. Check out my free workshop material

   github.com/ewendel/elm-workshop

   (shameless plug)

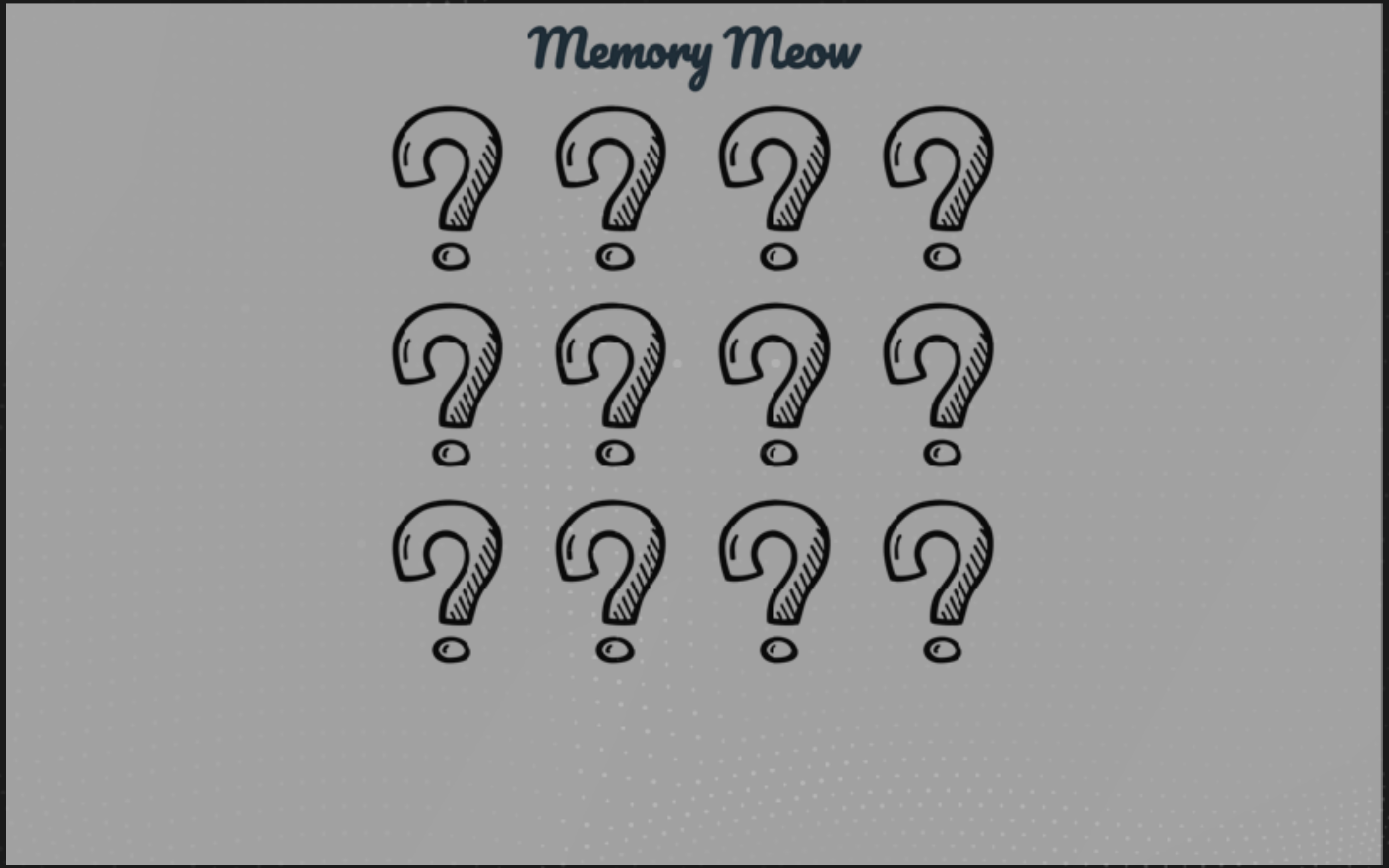
2. Join the Elm slack team

   The elm community is truly amazing

   elmlang.herokuapp.com

3. Check out your local Elm meetup

   meetup.com/topics/elm-programming/



Thanks for listening!

@ewndl

slides and workshop available at

is.gd/jfokus_elm

twitter.com/osloelmday

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