Building a Visual Editor for Wikipedia

Trevor Parscal and Roan Kattouw

(Introduce yourself)
(Introduce yourself)
We'd like to talk to you about how we've been building a visual editor for Wikipedia

Trevor Parscal
Lead Designer and Engineer
Wikimedia

Roan Kattouw
Data Model Engineer
Wikimedia

Rob Moen
User Interface Engineer
Wikimedia

Inez Korczynski
Edit Surface Engineer
Wikia

Christian Williams
Edit Surface Engineer
Wikia

James Forrester
Product Analyst
Wikimedia

The People

Open Source Bridge 2012

We are only 2/6ths of the VisualEditor team
Our team includes 2 engineers from Wikia – they also use MediaWiki
They also fight crime in their off time

Parsoid Team

Gabriel Wicke

Lead Parser Engineer
Wikimedia

Subbu Sastry

Parser Engineer
Wikimedia

There's also two remote people working on a new parser
This parser makes what we are doing with the VisualEditor possible

You might recognize this, it's a Wikipedia article
You should edit it!
Seems simple enough, just hit the edit button and be on your way...

W Editing Friday Night Dinner

en.wikipedia.org/w/index.php?title=Friday_Night_Dinner&action=edit

Article Talk

Read Edit View history

Search

Editing Friday Night Dinner

B *I* ▸ Advanced ▸ Special characters ▸ Help ▸ Cite

```
{{Use British English|date=August 2010}}
{{Infobox television
| show_name = Friday Night Dinner
| image = [[File:Friday_night_dinner.png]]
| caption =
| genre = [[Comedy]]
| format = [[Sitcom]]
| creator = [[Robert Popper]]
| writer = Robert Popper
| director = [[Steve Bendelack]]
| starring = [[Tamsin Greig]]<br />[[Paul Ritter (actor)|Paul Ritter]]<br />[[Simon Bird]]<br />[[Tom Rosenthal]]<br />[[Mark Heap]]
| country = [[United Kingdom]]
| language = [[English language|English]]
| num_series = 1
| num_episodes = 6
| executive_producer = [[Nira Park]]<br />Caroline Leddy<br />[[Kenton Allen]]
| producer = Robert Popper
| location =
| runtime = 25 minutes approx
| company = [[Robert Popper|Popper Pictures]]<br />[[Big Talk Productions]]
| composer = "[[Meddle (song)|Meddle]]" by [[Little Boots]]<br /> "Fat Horse" by [[Casiokids]]
```
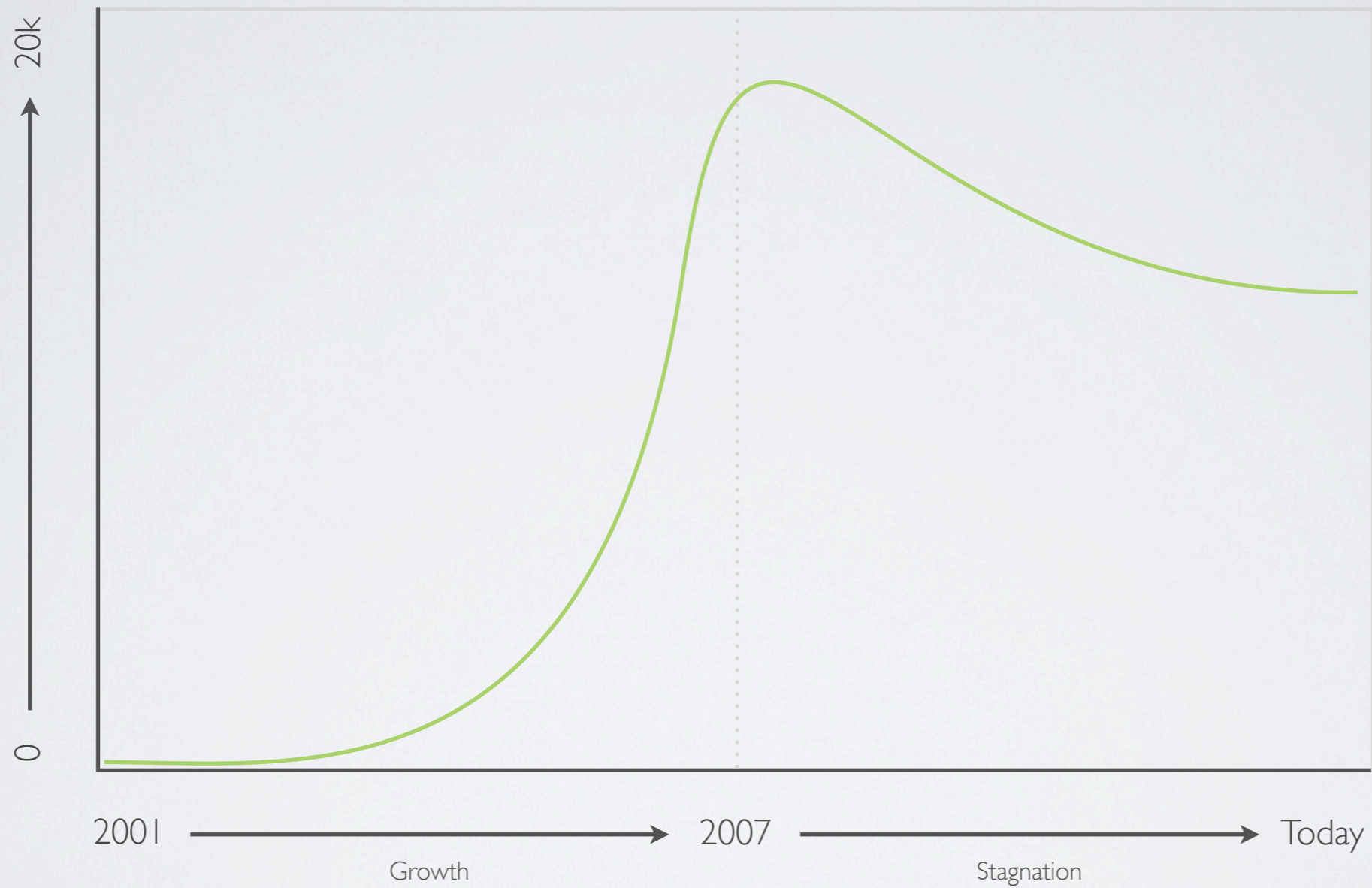
The Complexity Problem

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Or not... What is all this nonsense you may ask? Well, it's called Wikitext!
Even really smart people who have a lot to contribute to Wikipedia find it confusing
The truth is, Wikitext is a lousy IQ test, and it's holding Wikipedia back, severely

Active Editors

20k

0

2001 → Growth 2007 → Stagnation Today

The Complexity Problem

The internet has normal people on it now, not just geeks and weirdoes
Normal people like simple things, and simple things are growing fast
We must make editing Wikipedia easier to use, not just to grow, but even just to stay alive

For the past couple years I've been absolutely obsessed with this problem
Obviously we need a way to make editing more like using a word processor
But after years and years of failed attempts, it was finally time to do it right

First off, editing should be visually similar to viewing
Second, it should be clear what parts are text and what parts are objects
Finally, it should be easy to make things and hard to break things

Most important though, making an edit should be fun!
It should be fast!
It should be awesome!

Friday Night Dinner – Wikipe ×

en.wikipedia.org/wiki/Friday_Night_Dinner

WIKIPEDIA
The Free Encyclopedia

Log in / create account

Article | Talk

Read | Edit | View history

Search

Friday Night Dinner

From Wikipedia, the free encyclopedia

Testing testing 123...

Friday Night Dinner is a British television sitcom written by Robert Popper and starring Tamsin Greig, Paul Ritter, Simon Bird, Tom Rosenthal and Mark Heap.[1] The comedy is focused around the regular dinner experience of an English Jewish family (the Goodmans) on each Friday night. The first series aired from February 2011 on Channel 4. The series began airing in the U.S. on BBC America as of 30 July 2011.[2] A second series has been commissioned by Channel 4.[3] Filming for series 2 began on 12 March 2012, and the series will air autumn 2012.[4]

Contents [hide]

1 Cast and characters
2 Episode list
   2.1 Series 1 (2011)
   2.2 Series 2 (2012)

Friday Night Dinner

Genre	Comedy
Format	Sitcom
Created by	Robert Popper
Written by	Robert Popper
Directed by	Steve Bendelack

The Complexity Problem

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Well, maybe not that awesome.
I think this might be a problem.

The Review Problem

You see, the reason Wikipedia is so accurate is because everything that's changed gets reviewed
The problem is it gets reviewed AFTER it's already changed and made live
Imagine a flood of edits begins to come in, and this is the user interface for reviewing them

Balancing the ecosystem

It turns out that Wikis need balance

Balancing the ecosystem

Difficulty

Editing   Reviewing

If it's easier to edit than to review than the wiki might die of corruption

Balancing the ecosystem

Difficulty →

Editing   Reviewing
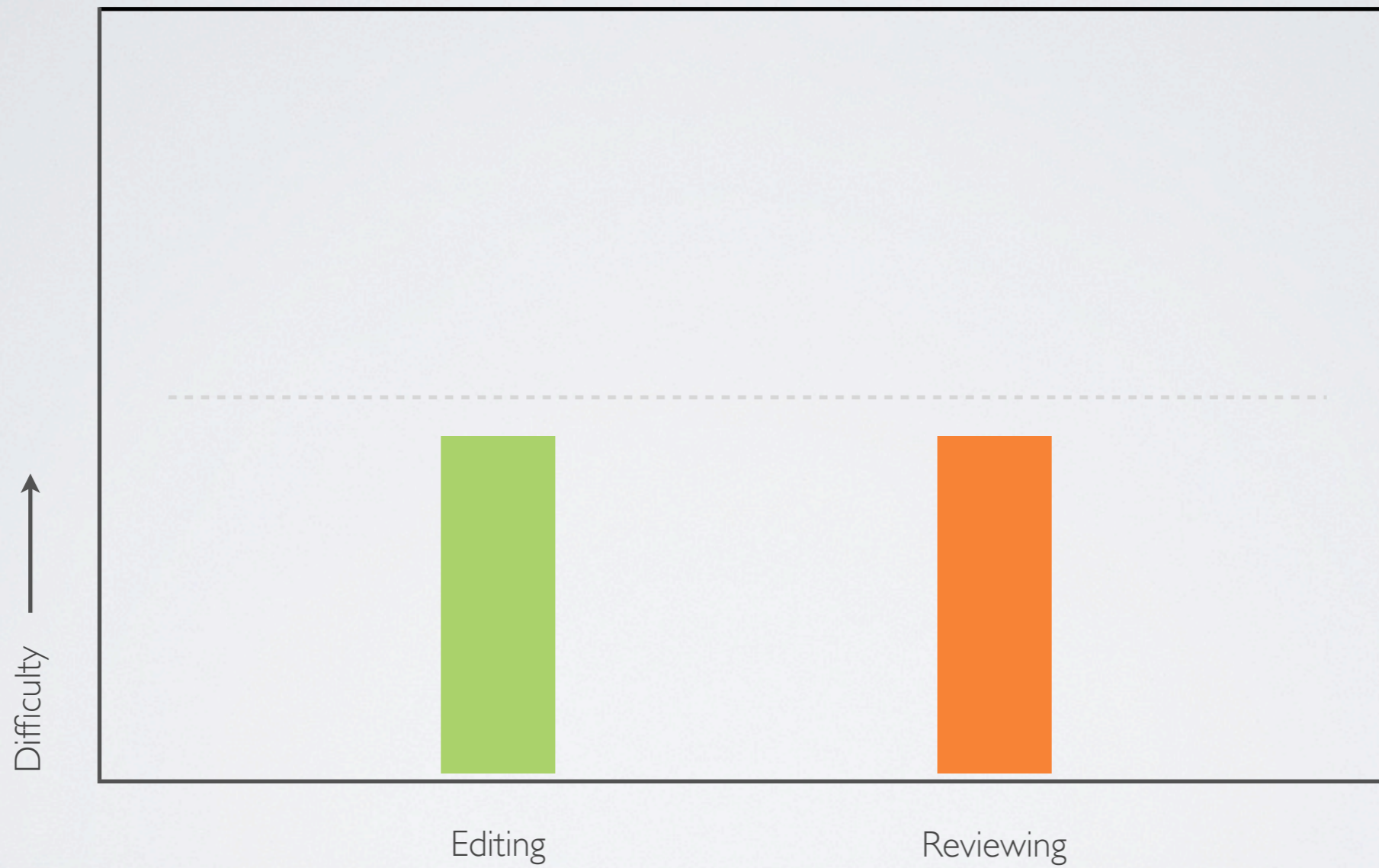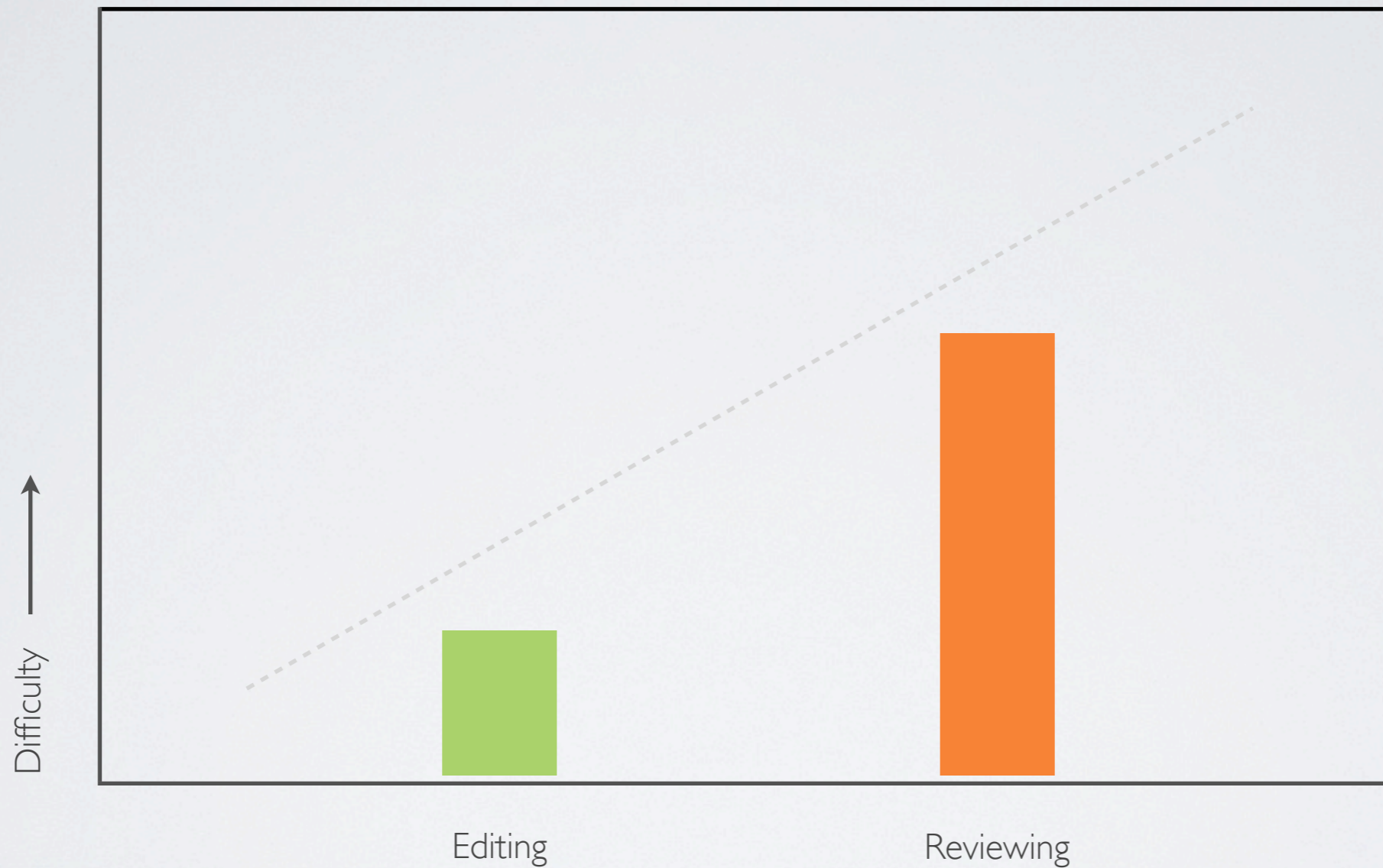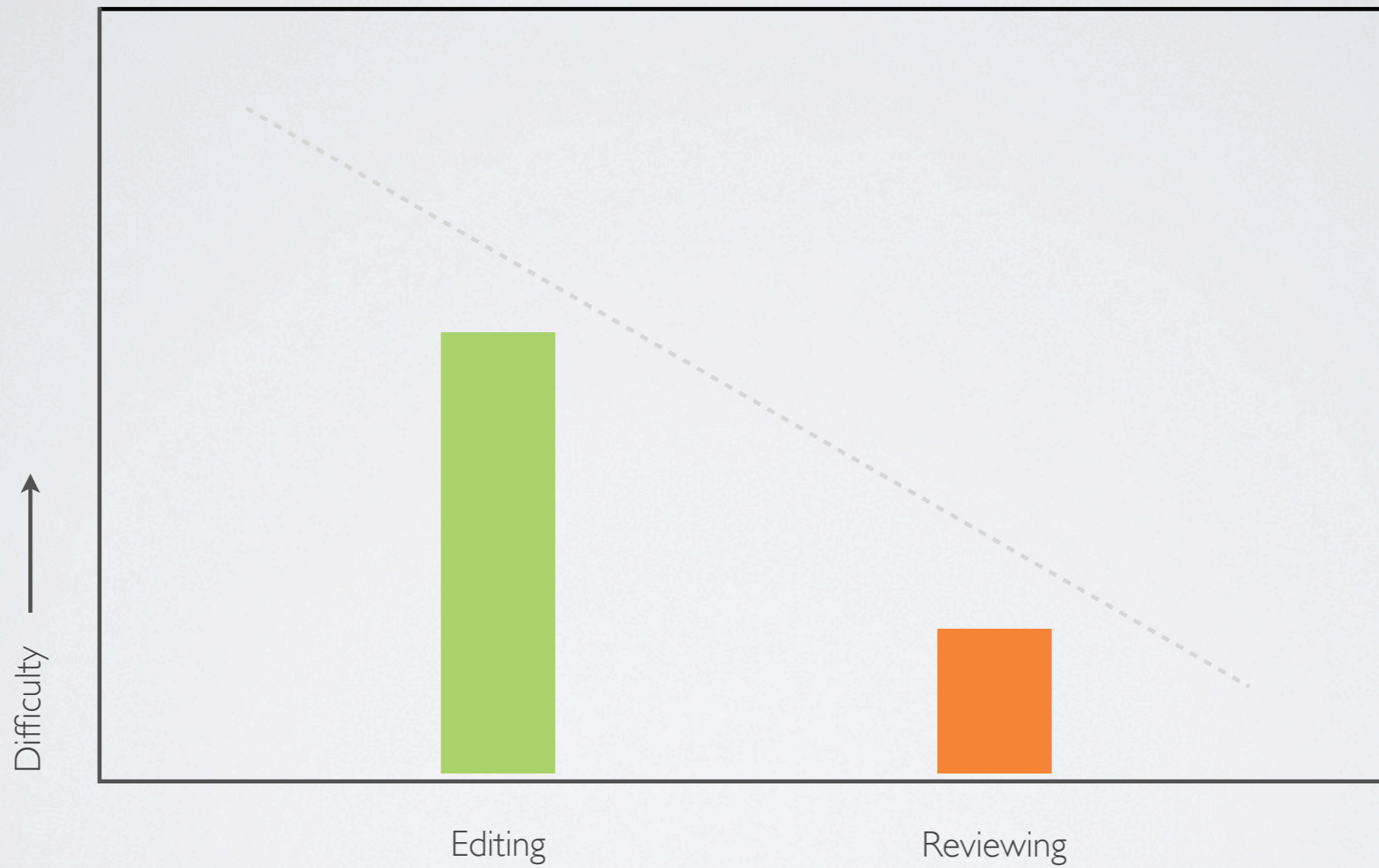
The Review Problem

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If it's easier to review than to edit than the wiki might die of oppression

Balancing the ecosystem

Thankfully there are other teams at Wikimedia working on making reviewing much easier
The details of that however are a different talk

Wikitext enthusiasts

The Expert Problem

Taking Wikitext away from users is like taking guns away from Americans
– You might have to pry it from their cold dead hands
And the truth is, it's going to be a while before we have a full featured alternative

Exit strategy

100%

Preference for
Wikitext

Capabilities of
visual tools

0%

Theoretically when visual tools are equally capable they will be preferred
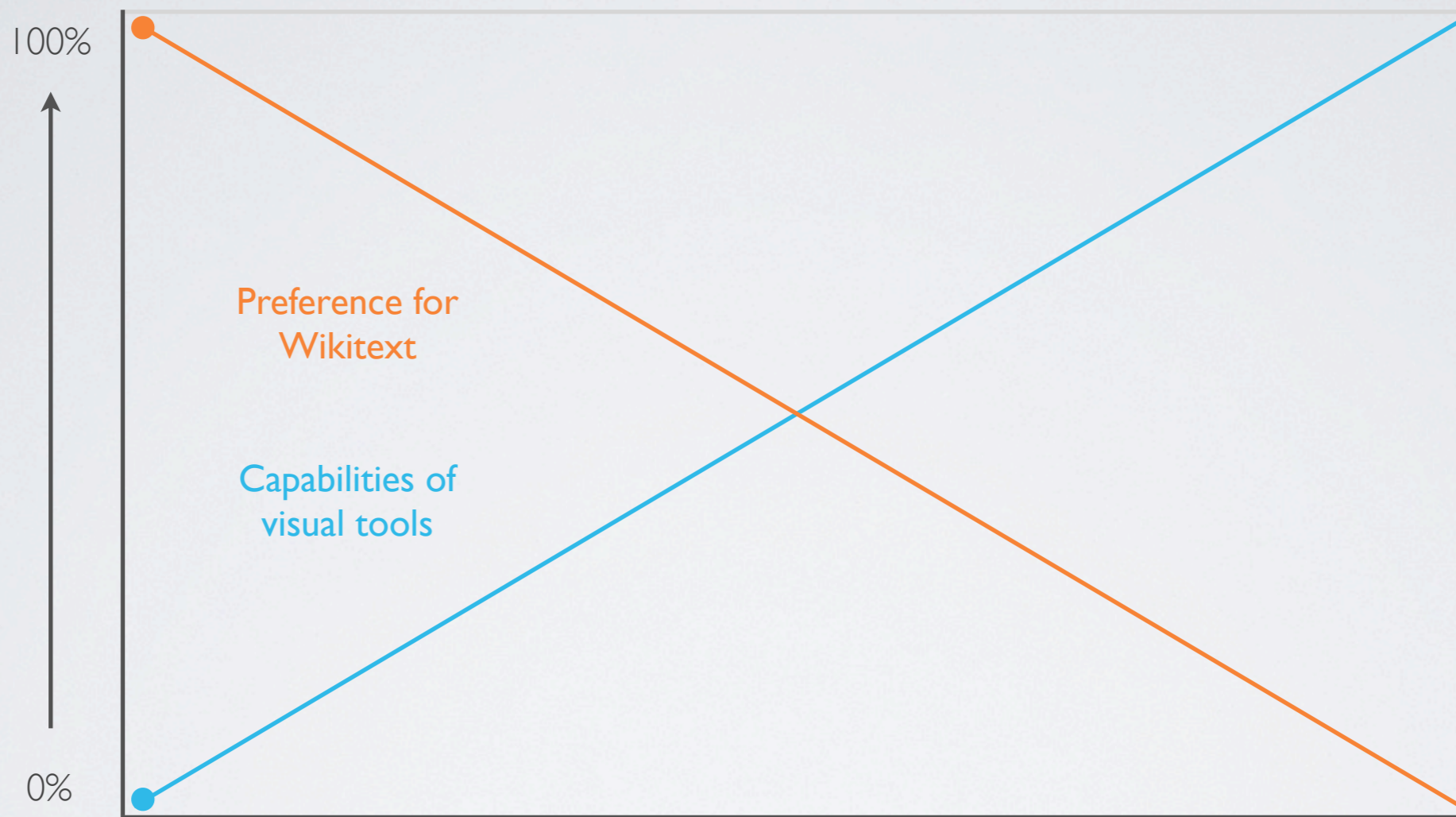
To what extent?

The Expert Problem

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Bringing the MAX to within 4 blocks of any point in town would be awesome, but impractical
We too will end up striking a balance, and some people will have to take the bus (click)
Not every last feature of Wikitext will get the same level of attention, just the most popular ones
But as long as we can gracefully deal with foreign content, we can add new features over time

To what extent?

The Expert Problem

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Here to stay

WIKITEXT

2001 -

LIVES ON IN OUR WIKIS

The Expert Problem

So at this point, we don't really know if, or when, Wikitext will go away completely
So we have to design around the reality that it's here to stay for now

Scale and speed

The Collision Problem

What happens when more people start editing faster than ever? More edit conflicts!
Conflicts occur when the page is changed while you are editing
If our system can't cleanly merge your changes, which is common, than you collide

Scale and speed

The Collision Problem

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Merge often fails
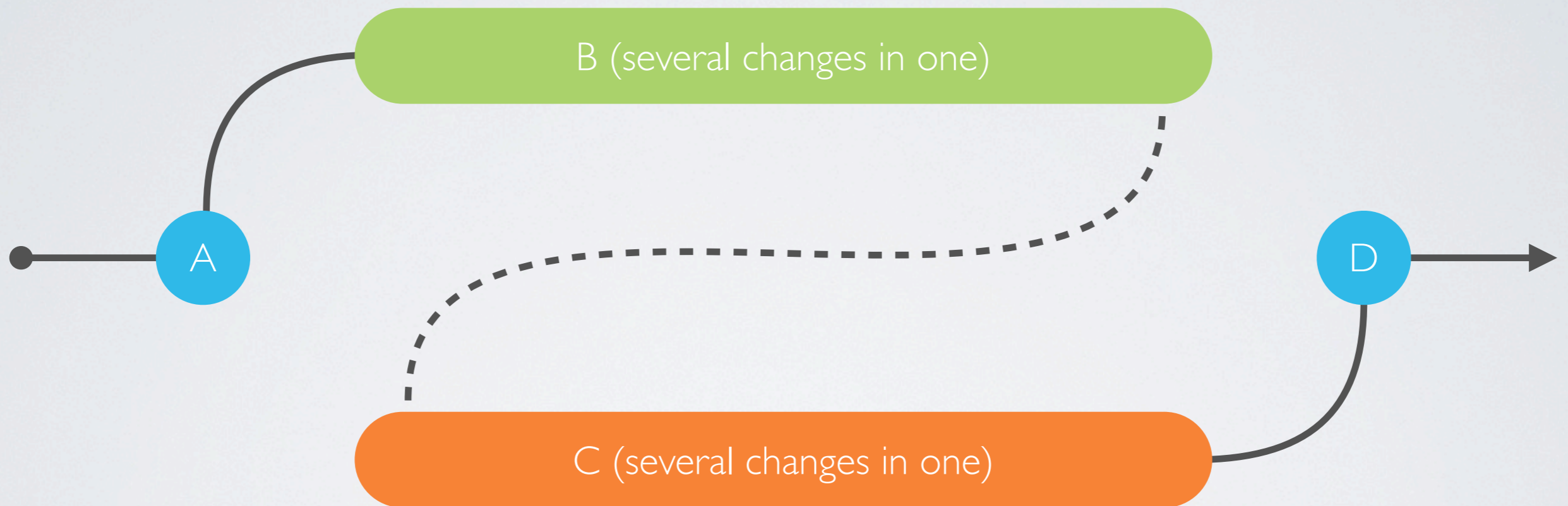
The Collision Problem

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What we need is a fully transactional system
Knowing not just where you ended up, but also how you got there, can make this better
We also need to consider realtime collaboration, which merges changes as you type

Rebase often works

The Collision Problem

What we need is a fully transactional system
Knowing not just where you ended up, but also how you got there, can make this better
We could even help solve the review problem by adding a playback feature
And also we can consider realtime collaboration, which merges changes as you type

Missing Pieces

The Focus

Making editing easier is complex, lots of pieces have to come together
We are focusing on just one piece, and working closely with a team who's focusing on another
A visual editor this is not a silver bullet, many things must come together to solve this problem properly

ve.dm

==A'''b'''c==

Let's talk about Wikitext
Like any markup, it uses special sequences of characters to describe
Structure (click), text content (click) and formatting (click)
People invented it because it's relatively easy to read and write, at least compared to say...

ve.dm

`<h1>A<b>b</b>c</h1>`

The Data Model

HTML, everyone's favorite markup language
While this is commonly written by hand, it's not optimized for that
It's not optimized for visual editing either as it turns out

ve.dm

```
[
  { 'type': 'heading', 'attributes': { 'level': 1 } },
  'A',
  ['b', {
    '{"type":"textStyle/bold"}': { 'type': 'textStyle/bold' }
  }],
  'c',
  { 'type': '/heading' }
]
```

The Data Model

But this is.
What you are looking at is a JSON serialization of our linear data model
It's what our editor is thinking about while you are selecting and typing
It's even more verbose, so we when we are using a whiteboard it looks like this (click)

ve.dm

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ve.dm

The important part about this format is how easy it is to:
Select (click), delete (click) and insert (click) data

ve.dm

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Select (click), delete (click) and insert (click) data

ve.dm

It's especially superior to HTML when selecting arbitrary ranges (click)
And then trying to delete (click)
This format also makes it possible to use linear transactions, let's go back

ve.dm

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ve.dm

retain 13   replace [selection] with []   retain 6

What we actually did to the document can be described as 3 discrete operations (click)
We retained 13 items (click), replaced the selection with nothing (click), and retained to the end (click)
A transaction processor applies these operations to produce the new document (click)
To reverse this, we can simply flip the operations (click), and process again (click)
This is more than undo and redo, it opens the door to rebasing, playback and realtime collaboration

ve.dm

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ve.dm

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Open Source Bridge 2012

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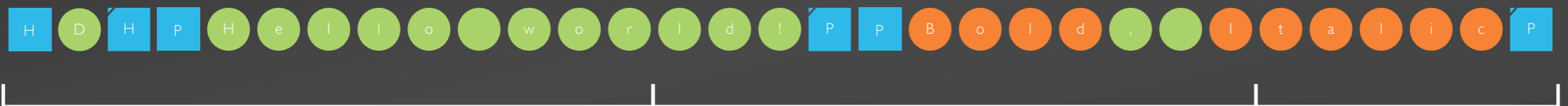
ve.dm

Linear Model

User Interface

Head

Paragraph
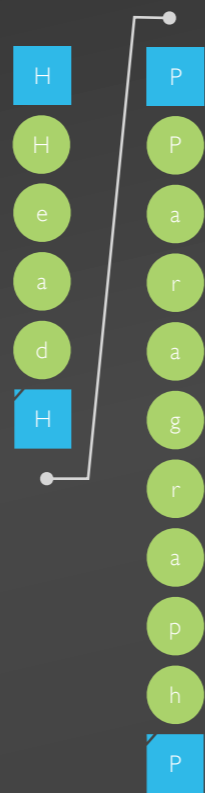
The Node Tree

To keep a structured UI in sync with a linear model, we need a node tree

ve.dm

Linear Model	Node Tree	User Interface

Linear Model:
H
H
e
a
d
H
P
P
a
r
a
g
r
a
p
h
P

Node Tree:

ve.dm.DocumentNode(17)

ve.dm.HeadingNode(6)

ve.dm.TextNode(4)

ve.dm.ParagraphNode(11)

ve.dm.TextNode(9)

User Interface:

Head

Paragraph
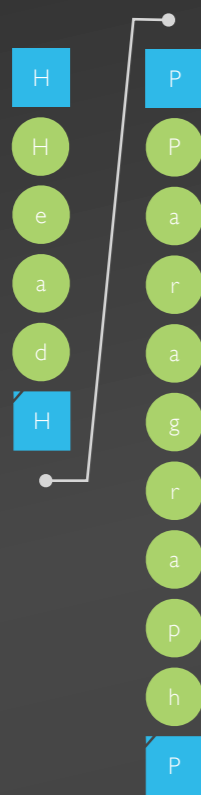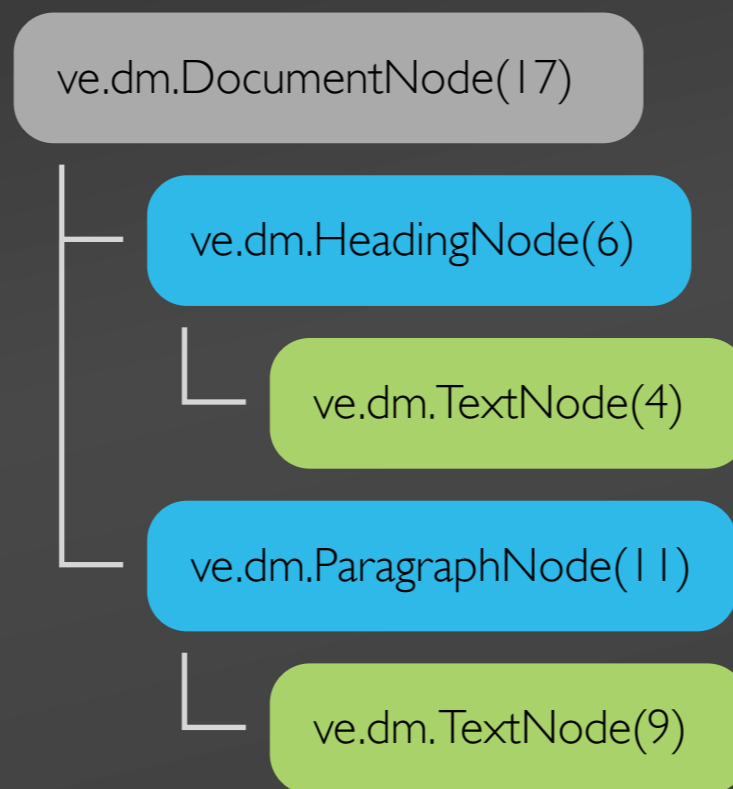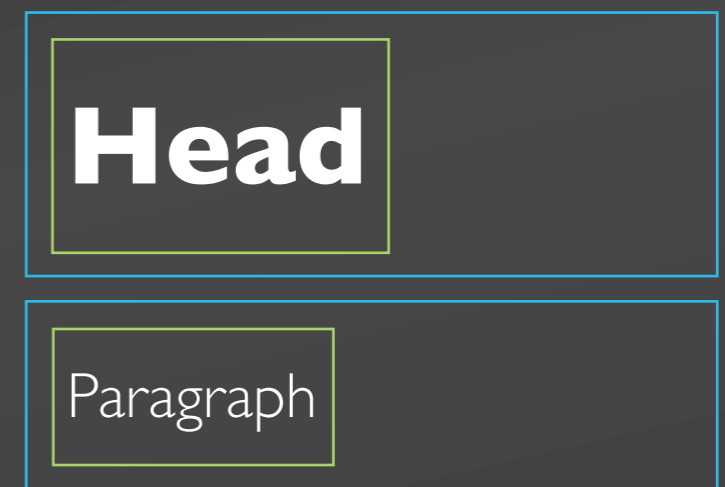
We build it from the linear data, and then build a user interface from there
We also store lengths in the node tree so finding offsets is of elements is fast

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Linear Model
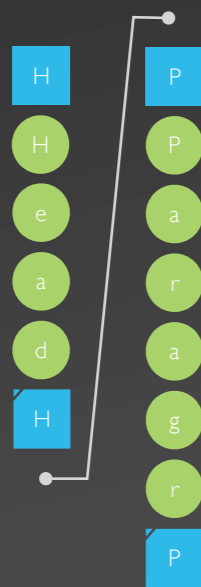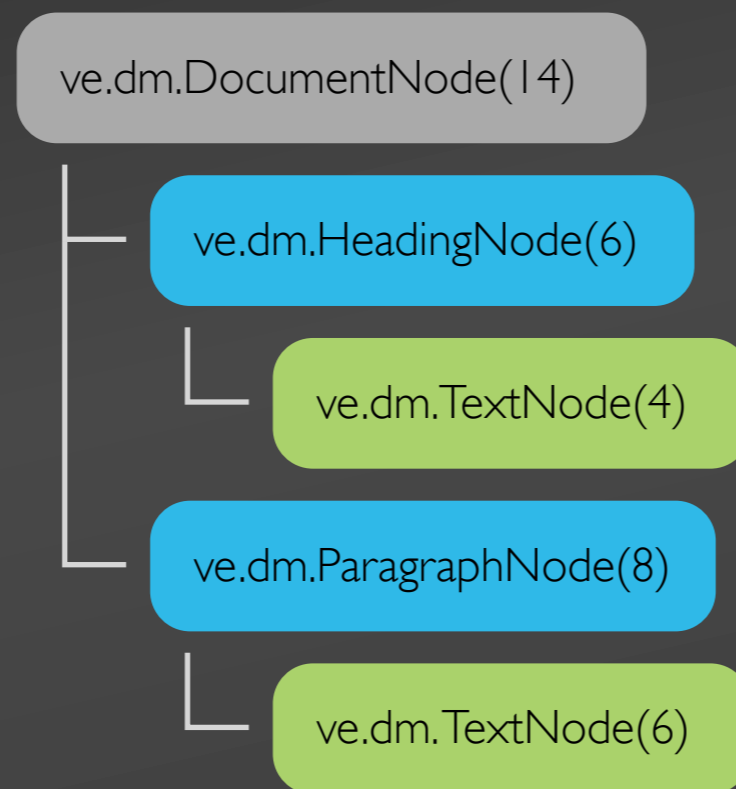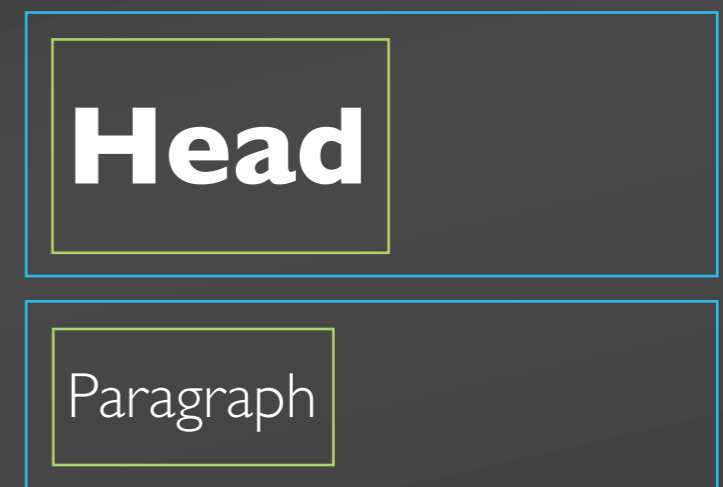
Node Tree

User Interface

ve.dm.DocumentNode(14)

ve.dm.HeadingNode(6)

ve.dm.TextNode(4)

ve.dm.ParagraphNode(8)

ve.dm.TextNode(6)

Head

Paragraph

The Node Tree

This structure is also very efficient when inserting or removing content
– Once the linear model is changed (click)
– A document synchronizer updates the node tree (click)
– Then the user interface responds to events emitted by the node tree (click)

ve.dm

Linear Model
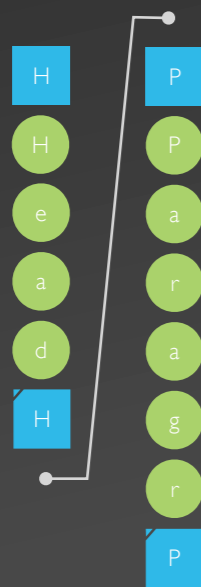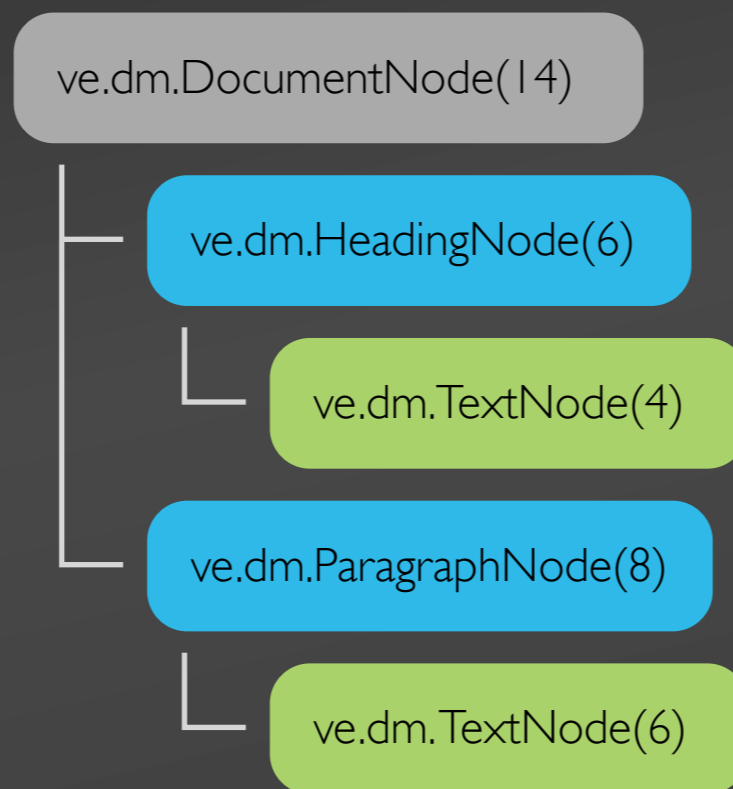
Node Tree

ve.dm.DocumentNode(14)

ve.dm.HeadingNode(6)

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ve.dm.TextNode(6)

User Interface

Head

Paragr

The Node Tree

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– Once the linear model is changed (click)
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Content editable is poison

Native Edit Surface

Custom Edit Surface

Supported Features

Development Effort
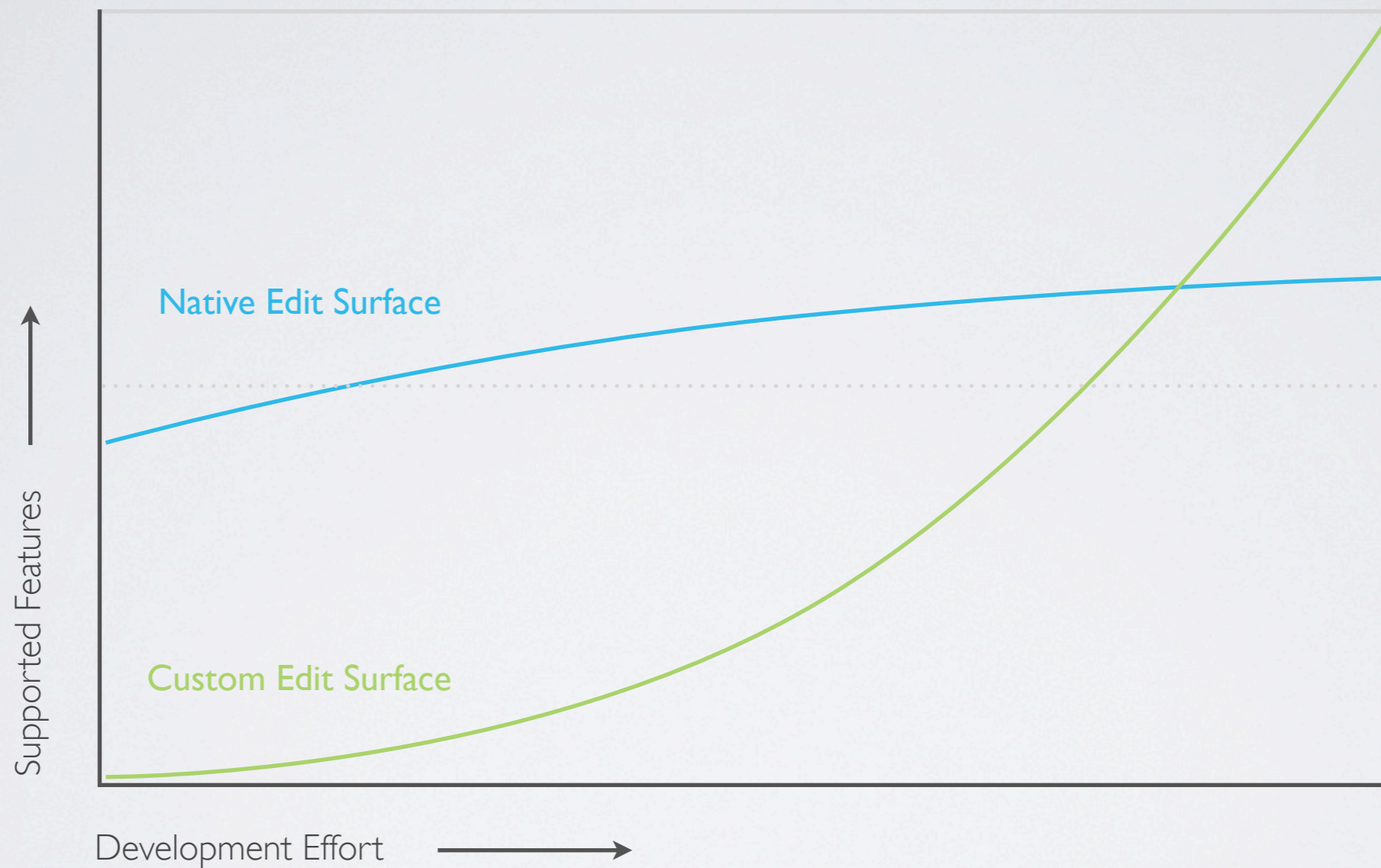
A Theory

Early on we had a theory:
– Content editable might get you up and running fast, but it also limits what you can do
– Google Docs took this route as well, which gave us some confidence
– It appeared that doing everything ourselves was possible, we called it EditSurface

ve.es

A | text-flow | algorithm | can | be | a | tricky | thing | to | write. | Using | a | div | for each | line | requires | measuring | the | line | each | time | a | word | is | added | and | breaking the | line | when | it | no | longer | fits. | It's | also | gotta | be | pretty | darn | fast.

Some Progress

○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ● ○ ○ ○ ○ ○ ○ ○

Some interesting problems we solved while developing EditSurface included:
– Flowing rich text into individual lines
– Make it fast enough to respond to resizing a window (click)

ve.es

A | text-flow | algorithm | can | be | a | tricky | thing | to | write.
Using | a | div | for | each | line | requires | measuring | the | line
each | time | a | word | is | added | and | breaking | the | line | when | it
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Some interesting problems we solved while developing EditSurface included:
– Flowing rich text into individual lines
– Make it fast enough to respond to resizing a window
– Flow the text around floating elements (click)

ve.es

A text-flow algorithm can be a tricky thing to write. Using a div for each line requires measuring the line each time a word is added and breaking the line when it no longer fits. It's also gotta be pretty darn fast.
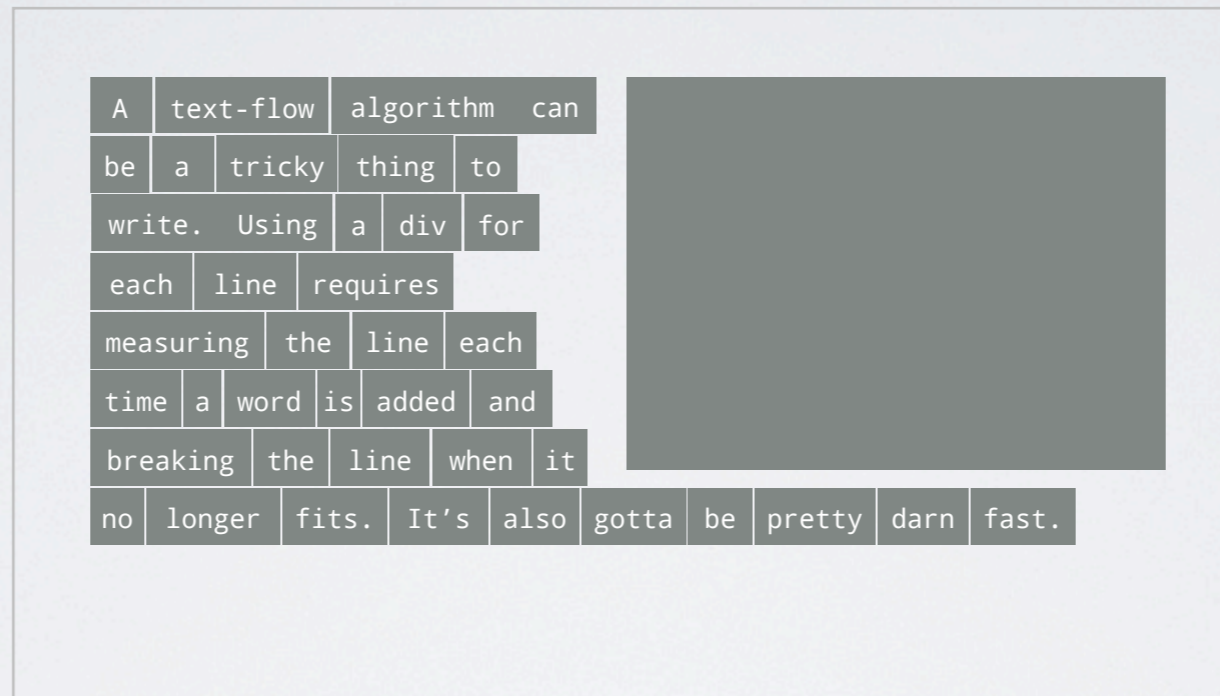
Some Progress

Some interesting problems we solved while developing EditSurface included:
– Flowing rich text into individual lines
– Make it fast enough to respond to resizing a window
– Flow the text around floating elements
– Render selection as a series of divs (click)
– Capture input through an invisible input (click)

ve.es

A | text-flow | algorithm | can
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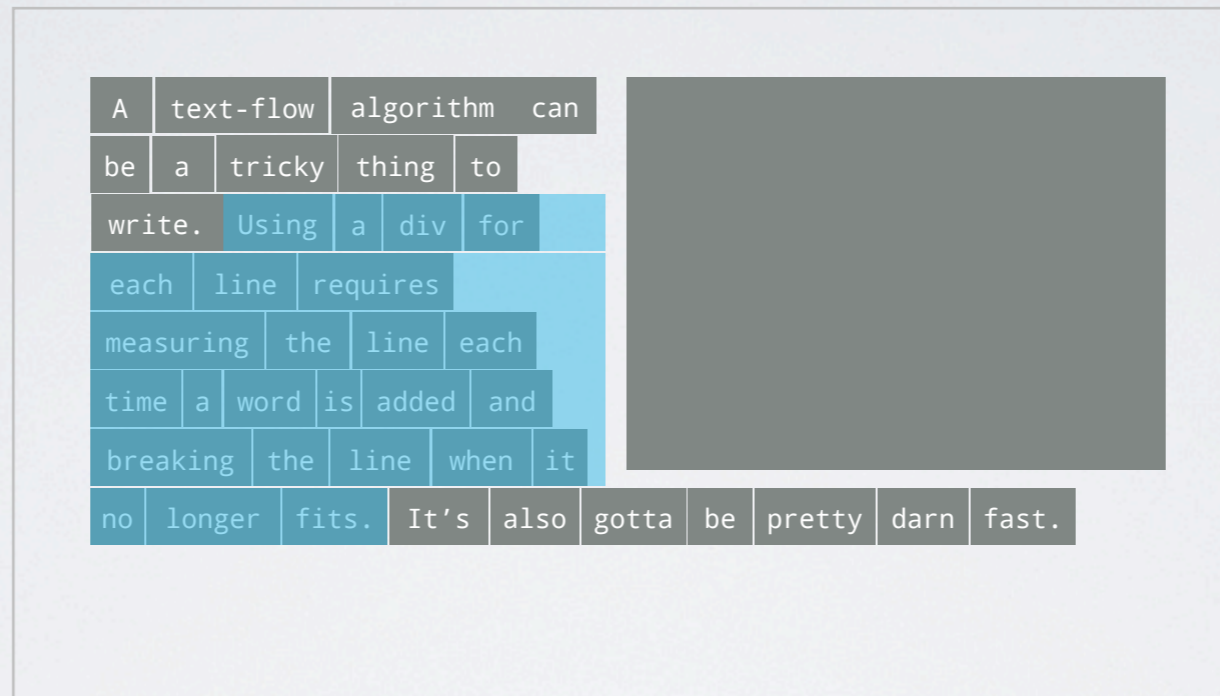– Capture input through an invisible input (click)

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ve.es

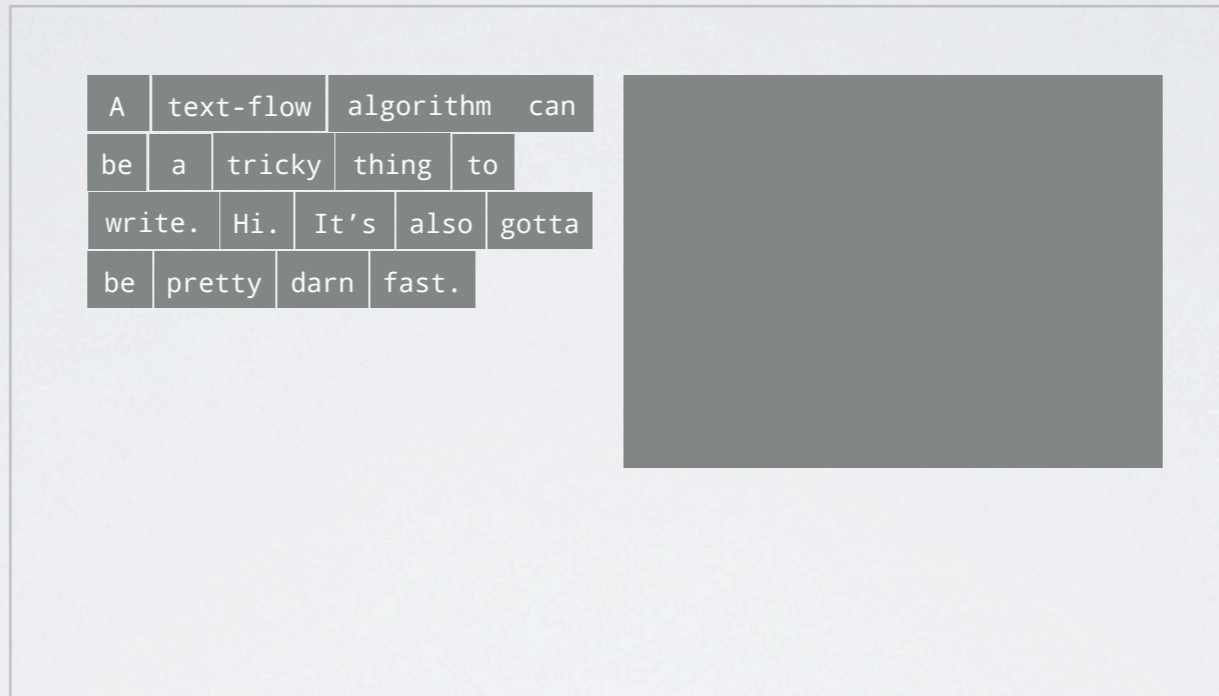A | text-flow | algorithm | can
be | a | tricky | thing | to
write. | Hi. | It's | also | gotta
be | pretty | darn | fast.

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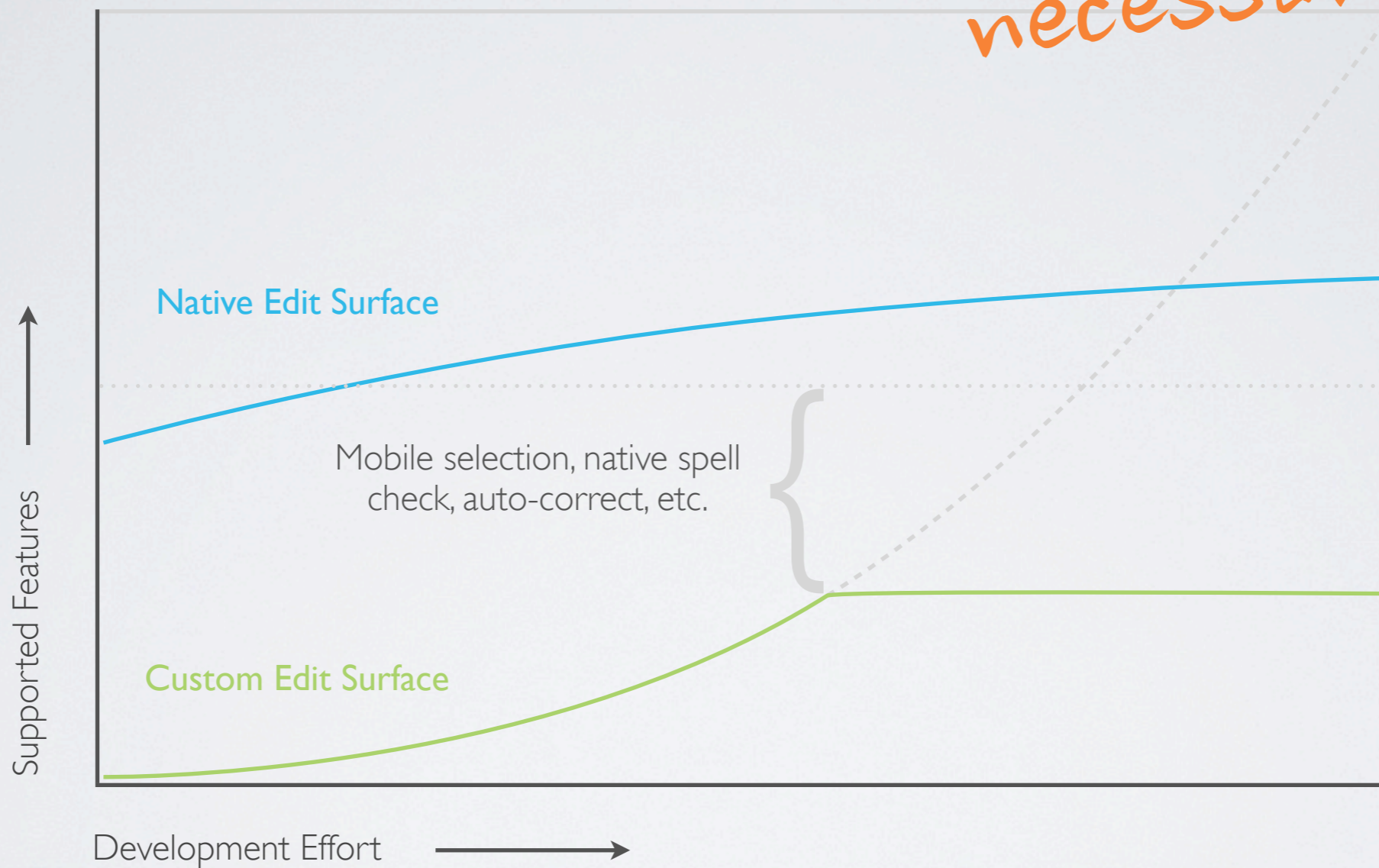– Capture input through an invisible text box (click)

ve.es
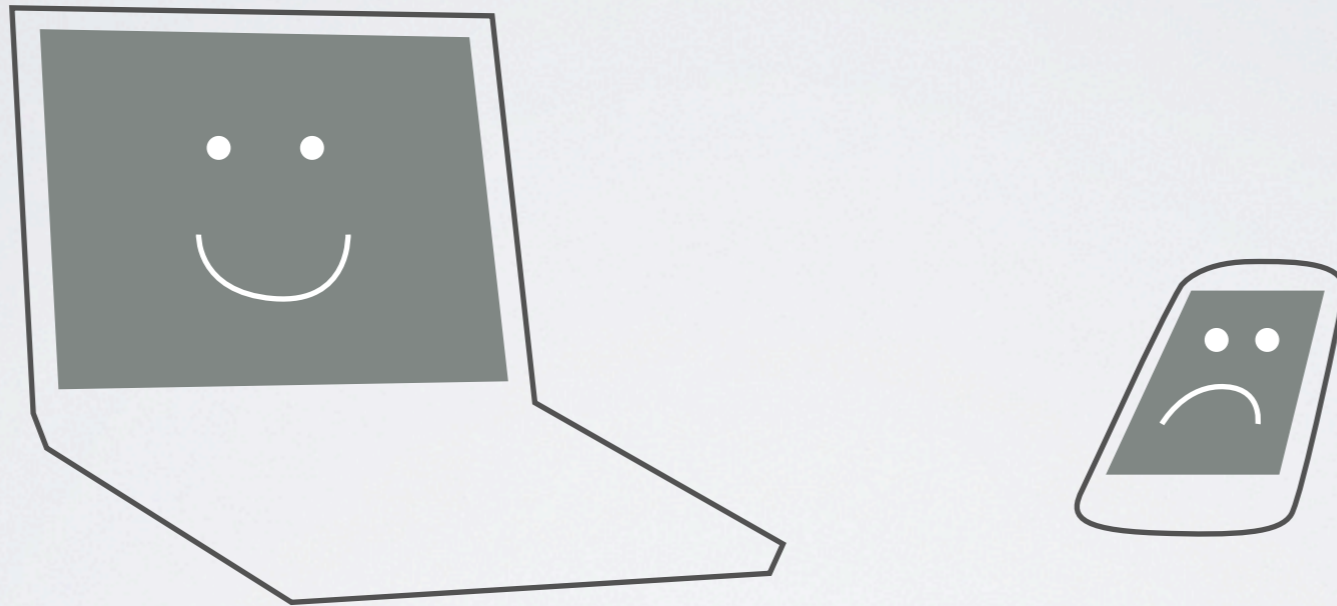
This was awesome and it made our laptops happy
But mobile devices were sad, they needed lots of native support we couldn't get
– Like spell check and auto–correct

Content editable is ~~poison~~ necessary

Native Edit Surface

Mobile selection, native spell check, auto-correct, etc.

Custom Edit Surface

Supported Features

Development Effort

A New Theory

2 members of our team revisited this theory and made some breakthroughs
We still fight content editable every day, but the awesome native features are worth it
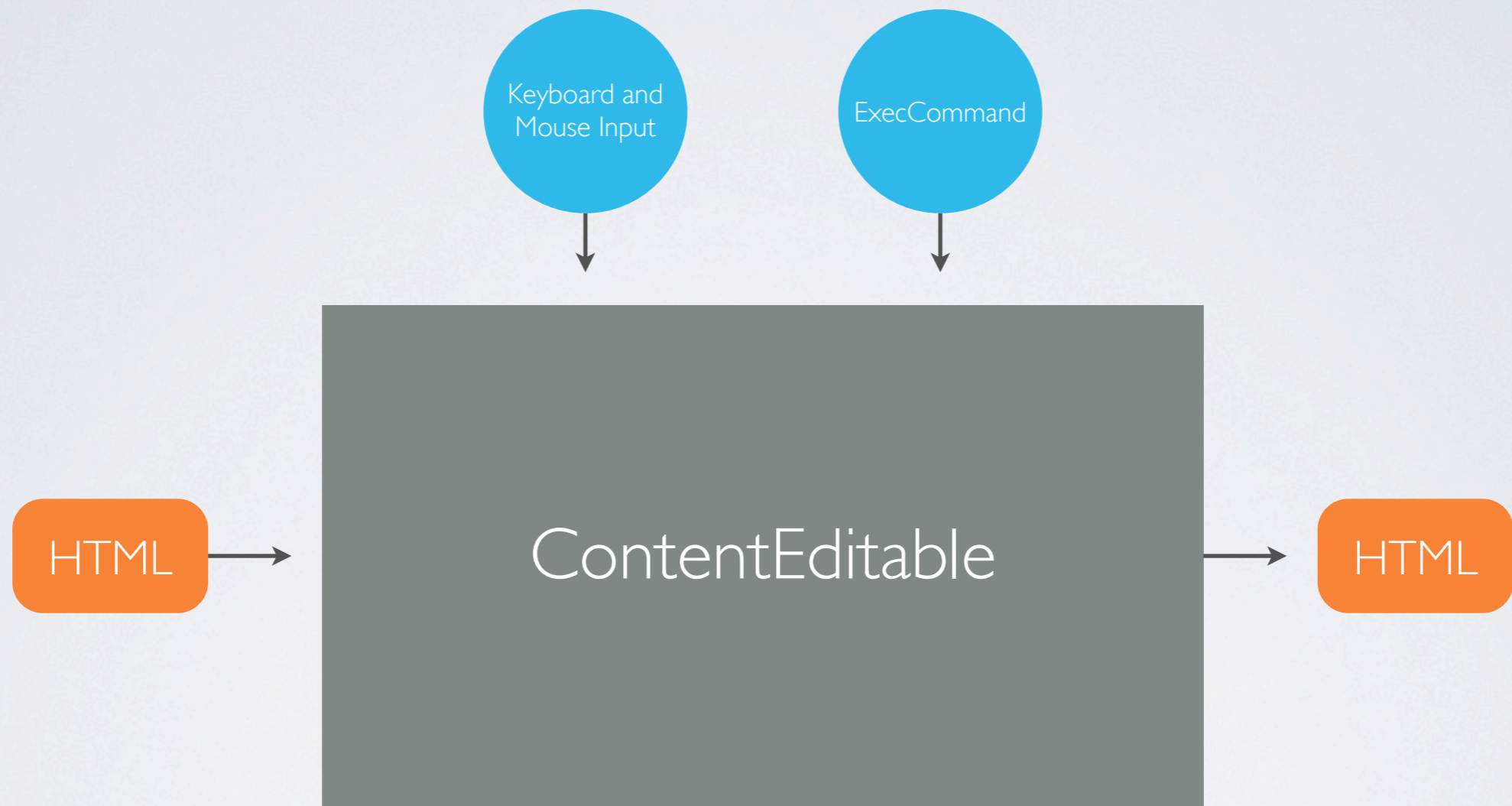
ve.ce

Input & Rendering

ContentEditable
Features

Things worth using
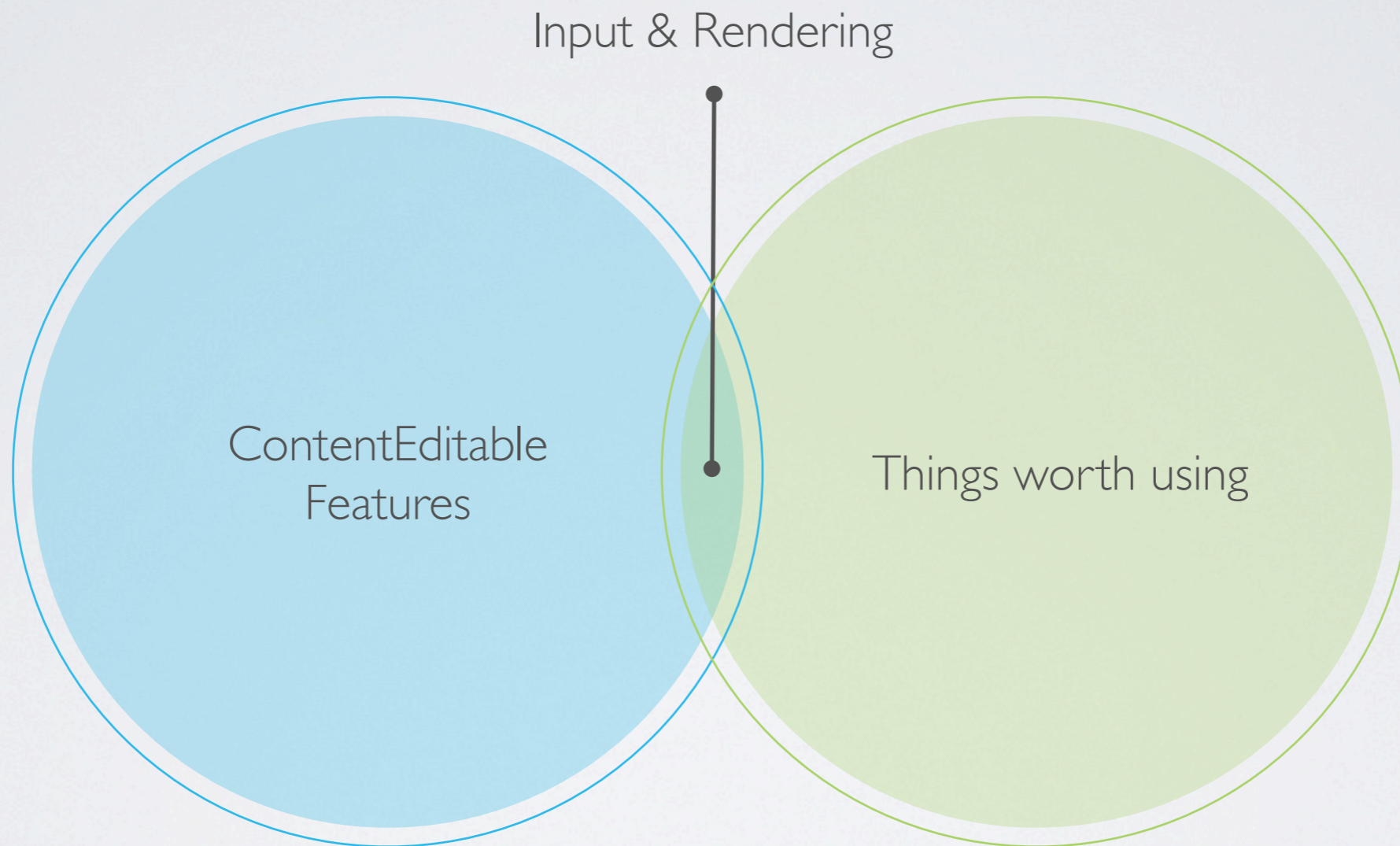
More Progress

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The trick is to make use of native goodness
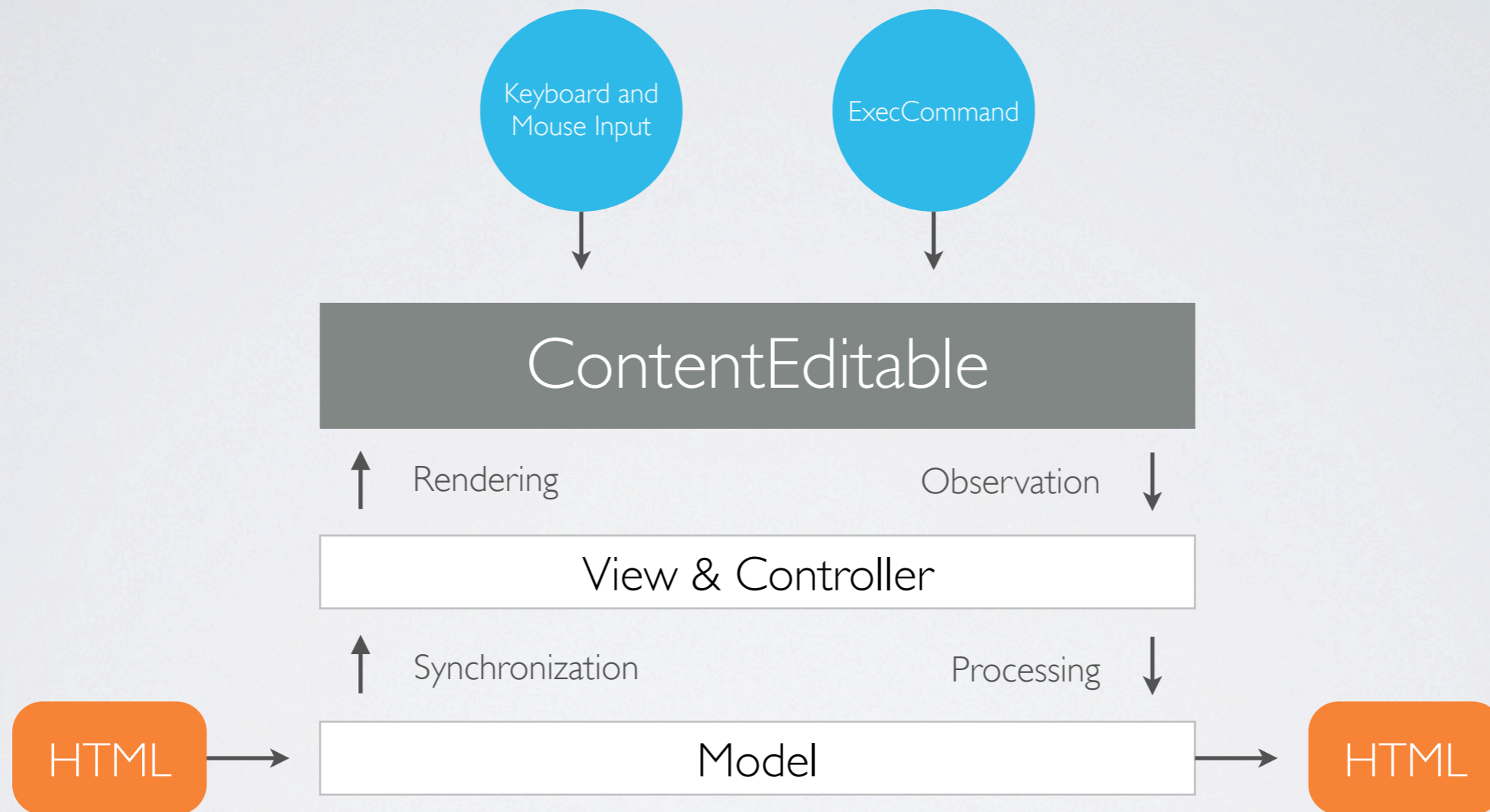– But revoke the browser's decision making capability

ve.ce

Keyboard and Mouse Input

ExecCommand

HTML → **ContentEditable** → **HTML**

More Progress

The trouble with ContentEditable is that it's essentially an unpredictable black box
You give it content as HTML, let the user modify it with a keyboard and mouse, execute some limited commands, and then hope the HTML that comes out is sane
Hint: it won't be – If the user so much as presses enter, your document is going to be trashed
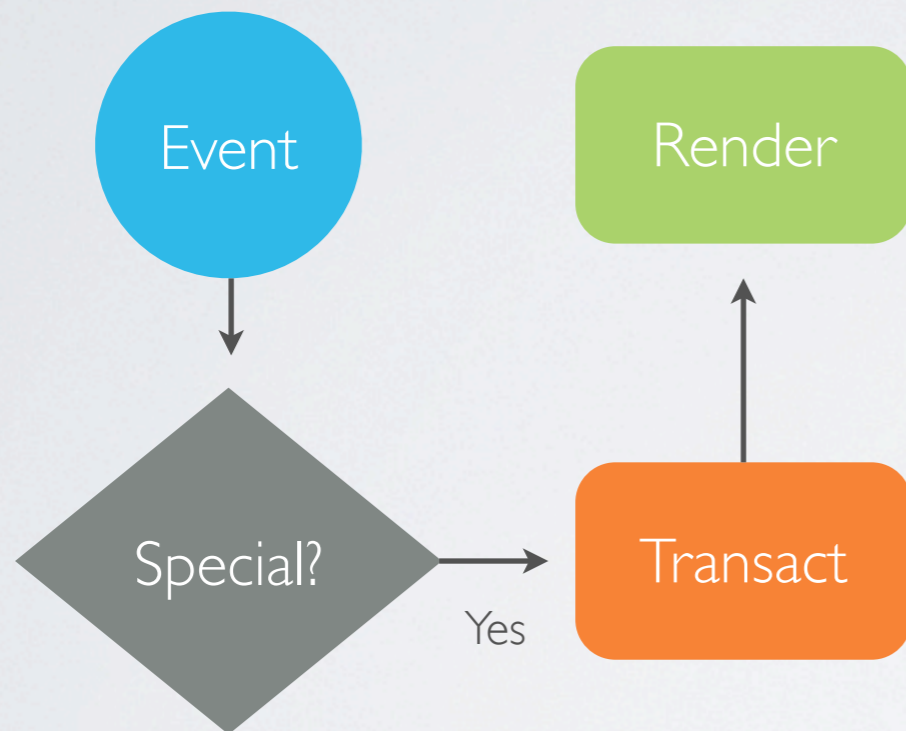
ve.ce

The trick: A custom model and a view and controller that abstract ContentEditable
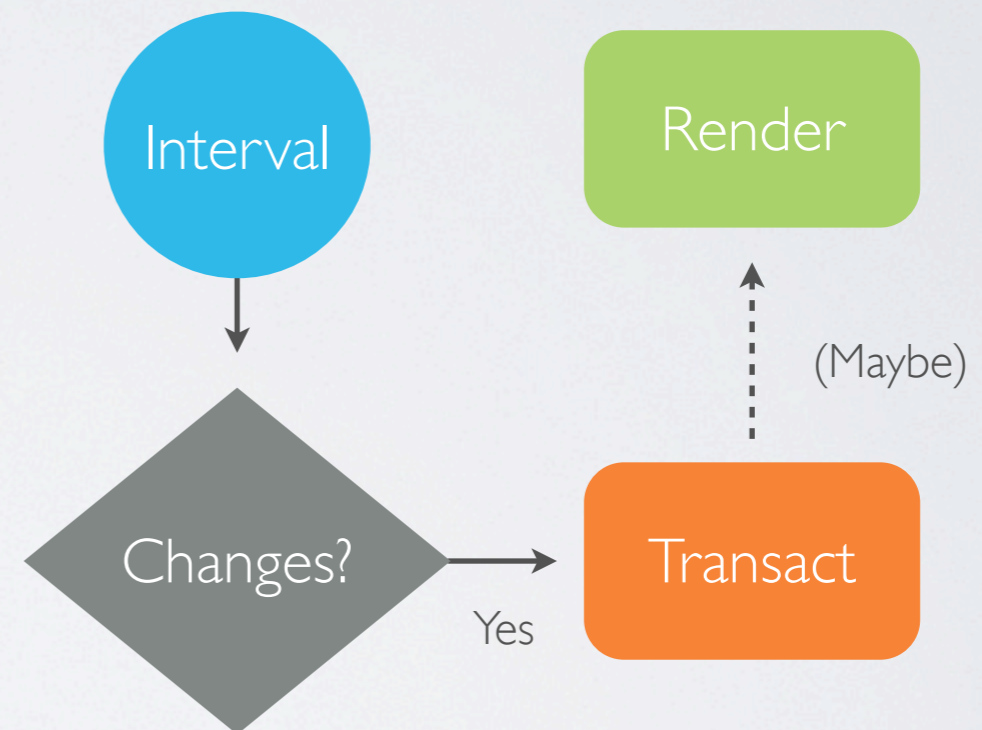The most difficult part of this approach is observation
  – Some systems are eventless, like spell check, autocorrect, or drag and drop
  – The events that are provided rarely contain enough information

ve.ce

Events

Event → Special? —Yes→ Transact → Render

Polling

Interval → Changes? —Yes→ Transact ⇢ (Maybe) Render

More Progress

When handling events, only some are useful – they will lead to model and view changes
To fill in the gaps, we must periodically check to see if something changed
– When you notice a change, you can then update the model
– It can still be tricky to know when it's safe to re-render
– Especially with input method editors, which have their own state

Demo

A Demo

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http://www.mediawiki.org/wiki/VisualEditor:Demo

What's next?

HOVER BOARD

MATTEL

The Future

We have a long way to go, but we've architected the system for enhancement over time
We are also now working on an easy to use API for adding functionality to the editor

More Features

- Nested lists
- Definition lists
- Tables
- Images
- Videos
- Infoboxes
- References

- Image galleries
- Real-time collaboration
- Conflict resolution
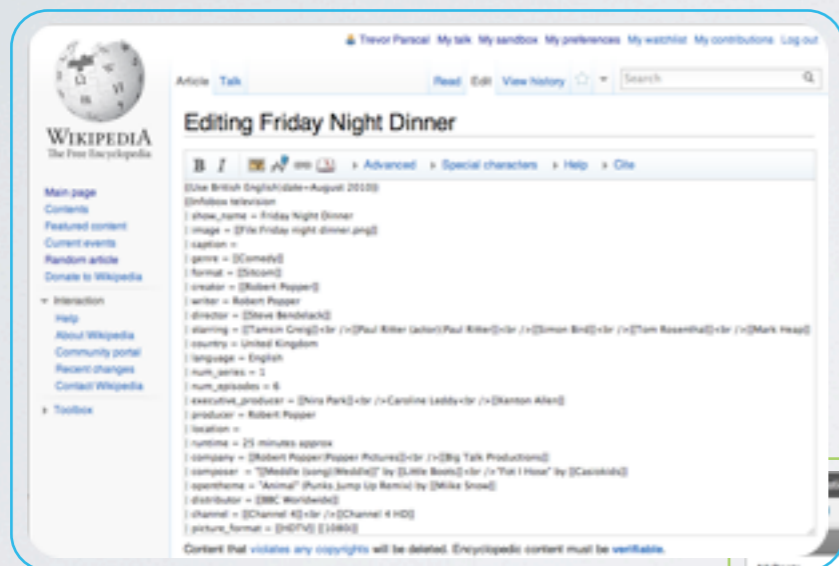- Edit playback
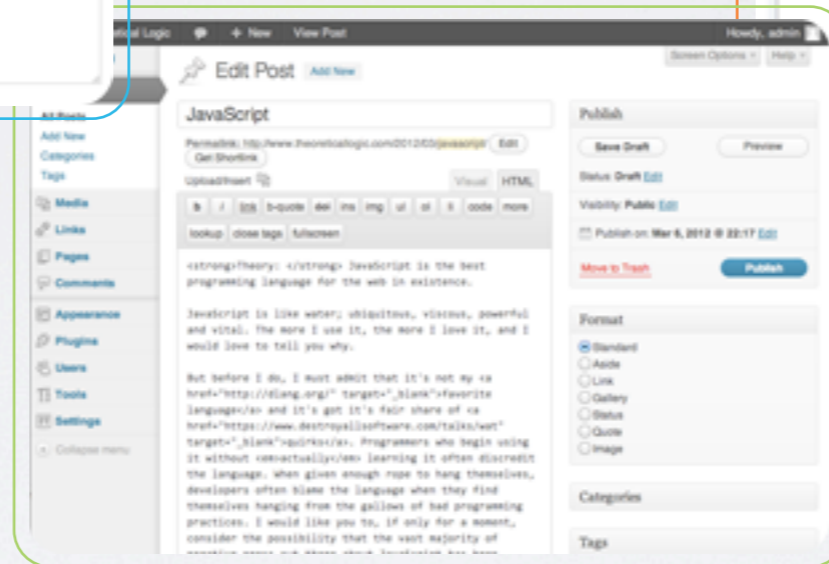- Integration with discussion system

The Future

We have a long way to go, but we've architected the system for enhancement over time
We are also now working on an easy to use API for adding functionality to the editor
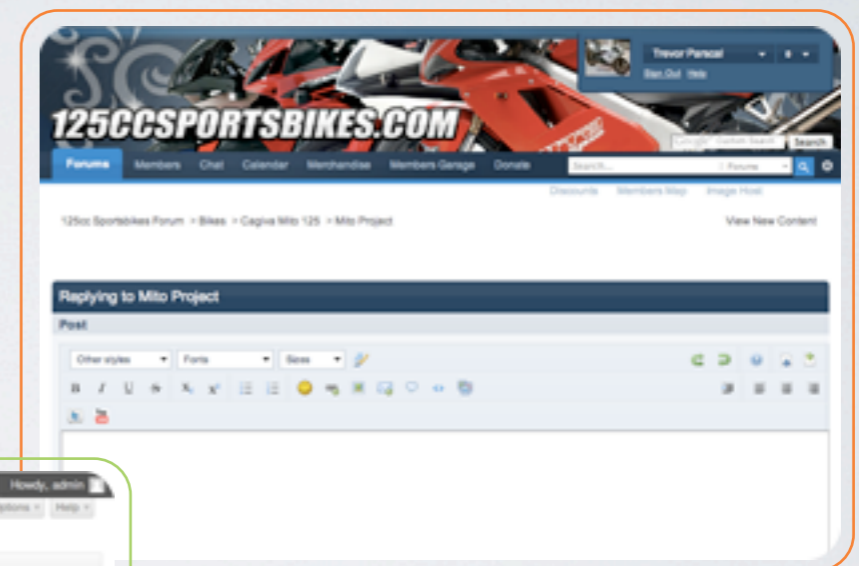
Less Dependency

Blogs

Wikis

Forums

The Future

We have also been working hard to reduce dependencies on external libraries and systems
This editor is at it's core, an HTML editor, and we want people to use it everywhere

Get Involved

Learn more about VisualEditor

http://www.mediawiki.org/wiki/VisualEditor

Swing by the hacker lounge tonight between 6:30pm and 9:30pm

Clone our repository

git clone https://gerrit.wikimedia.org/r/p/mediawiki/extensions/VisualEditor.git

Community Development

If you want to get involved, check out our wiki
You can also clone our repository

Work @ Wikimedia

http://jobs.wikimedia.org

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Wikimedia is also hiring a variety of positions
For more information, checkout jobs.wikimedia.org

Trevor Parscal

trevor@wikimedia.org

@trevorparscal

Roan Kattouw

roan@wikimedia.org

@catrope

Learn more about VisualEditor

http://www.mediawiki.org/wiki/VisualEditor

Swing by the hacker lounge tonight between 6:30pm and 9:30pm

Download these slides

http://wikitech.wikimedia.org/view/Presentations

Thank you!
Any questions?