

Maps For HTML

Extending the Web with Maps

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Hi! My name is Peter Rushforth. I work for Natural Resources Canada, in the Canada Centre for Mapping and Earth Observation. We are the group historically responsible for, among other things, creating topographic maps of Canada. We have been involved in mapping standards for a long time. We currently promote mapping standards primarily through the Open Geospatial Consortium process, and today's presentation will focus on the Maps for HTML initiative. <http://maps4html.org/>

Maps For HTML Vision: ABC



All of us
Being
Cartographers



Maps for HTML was founded on a vision of standards which will make mapping as simple as ABC. The Web's motto "The Web is for everyone", is how we like to think of maps, too. In this era of open data, Natural Resources Canada's role in mapping is not only one of providing open data; our role also includes ensuring that the benefits of our open data are available to everyone.

Introduction

- Web mapping today is complicated and requires advanced and specialised skills
 - Developer must know how to **program** in a **complex** Web / network environment
 - Many development choices, no obvious best
- Maps4HTML objective: **browser** will have specialised skills
 - Extend HTML to enable declarative maps
 - Author must know / learn how to use basic HTML



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Not only has the Web displaced printed media, the Web is increasingly at the centre of almost everything we do. The beauty of and the reason for that, is because the Web is based on public standards. And in that transformation of society at large, maps too have migrated from the glove box of your car to your computer screen and your phone and your car's screen and probably many other devices that were unforeseen when the Web began. Unfortunately, maps disappeared from the radar screen of the of Web standards makers early on.

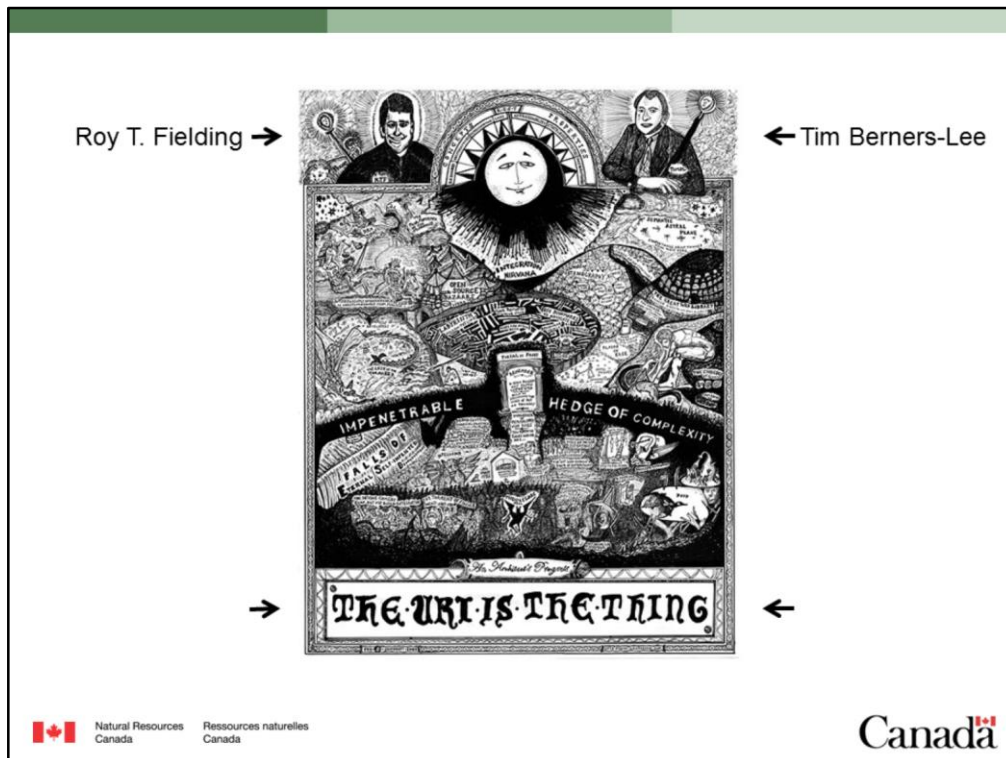
In the intervening years, web mapping has become a garden of diversity. As a result of this Cambrian explosion, Web mapping has become complicated. People often want to put a map in their Web page, but there is typically no go-to standard that supports their use case. There are many development choices with no obvious best path.

In a nutshell, our goal is to extend the standards of the Web, especially including but not limited to HTML, to include maps, so that when people first learn about maps, they learn based on standards, using the tools they already have: Web browsers and the Web itself.

Why Do We Need Maps for HTML?

- Lower the barriers
 - Make it so that everyone who wants to make a map has the tools to do so: kids
 - Make it so that everyone who needs to make a map has tools that scale to their needs: professionals
- Use the standards:
 - HTML, CSS, JavaScript.

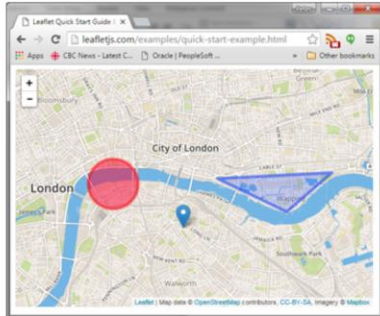
If you were a school teacher today, how would you teach your students about web mapping? I bet there are a lot of different answers to that question, probably some methods are simpler than others. Some might even be based on standards. But probably none would be based on standards and be accessible to everyone.



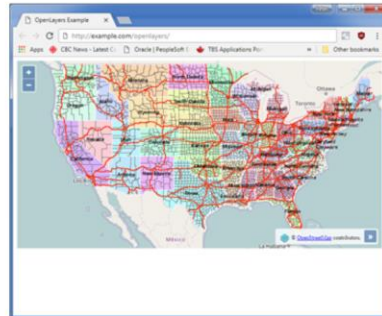
What is it about the Web that allowed the Web to become so ubiquitous and important? I'm personally a bit embarrassed to admit that it has taken me many years of working with the Web to think I may have a glimpse of the answer. Anyway, you probably have understood this long before me, but I'm happy to share my embarrassment with you, because what is a stage in front of so many people for, if not revealing embarrassing things?? In any event, I've come to understand that the Web has exploded thanks to what Roy Fielding described as the "Uniform Interface". That is, the means whereby a browser accesses Web resources is constrained to a small set of "methods" in a standard protocol using a standard addressing scheme. That this is possible is thanks to Web architecture; importantly including hypertext, media types, and URLs. This is the genius of the Web's invention.

Web mapping today

- Modern Web Maps:



OpenLayers



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Web maps have come a long way since Natural Resources Canada's first mapping site hit the Web in 1994. Perhaps it was the addition of JavaScript to the family of Web standards in 1996 which disrupted incorporation of maps into the fabric of the Web. Leaflet and OpenLayers are the most prominent examples of open source JavaScript map libraries which enable the Web maps of today, and they provide interoperability across some of the different ways that maps can be served up.

Atwood's Law

“Everything that can be written in JavaScript,
will be written in JavaScript”.

Rushforth's Corollary:

... multiple times, in different ways, with
different APIs.

JavaScript and the Web platform which it supports are awesome, and getting more awesome every year. But that does not take away from the fact that the environment in which we program JavaScript is possibly the most hostile development environment of all. The different choices made by different devs over the years increases the complexity of getting started.

Mapping Silos



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But even interoperability libraries can't wholly tame the complexity of choices that faces the Web mapping newcomer, be they an experienced programmer, much less a school kid. In the words of Paul Ramsey, many programmers don't know bupkis about Web mapping [1], and they often don't want to. They will reach for the easiest tool they can, or a tool that they already know.


[1] <https://gist.github.com/pramsey/a9b9185f465b4b8eec99>

“How Simplicity Will Save GIS”




Vladimir Agafonkin

Binary code
↓
Assembler
↓
C
↓
JavaScript

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<https://vimeo.com/106112939>



In his 2014 presentation at FOSS4G, Vladimir Agafonkin who most of you will know at least from his creation, spoke of how the evolution of programming languages over time has accelerated technological progress, by abstracting and implementing the behaviour previously definable only with lower level languages [1]. As Atwood’s Law suggests, the Web, driven by JavaScript, is the natural successor to all native platforms.

[1] <https://vimeo.com/106112939>

Simplicity **Will** save GIS



Developers



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If we do want to save GIS, through simplicity or otherwise, we need to step back and look at the big picture. We need to evaluate how to bring the next generation of GIS programmers on board. We also need to think about where and how we would like to start those newcomers on their journey to GIS. As a public agency which has no platform allegiance apart from the public good, Natural Resources Canada and other governmental agencies like ours are uniquely positioned to advocate for mapping standards. And the Web platform represents the ubiquitous standards that we want and need: HTML, CSS and JavaScript.

How Simplicity Will Save GIS

Binary code



Assembler



C



JavaScript



HTML



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In 2017, there is a new level of simplicity available that may have been hidden in plain sight: HTML. In the old days, before JavaScript existed, when the idea of the Web as a platform had not fully taken shape, browser wars were the order of the day. Such a contentious environment meant that change was next to impossible, and was far from democratic. Today, the situation has changed. The browser vendors are more collaborative, perhaps largely thanks to open source culture. The next step in the march of simplicity in GIS will be to incorporate map semantics into HTML. The JavaScript libraries themselves are built around or define web map semantics, and today, thanks to the evolution of Web platform standards, we can more easily use JavaScript to polyfill new HTML behaviours.

The Rule of Least Power

Principle:

Powerful languages inhibit information reuse.

Good Practice:

Use the least powerful language suitable for expressing information, constraints or programs on the World Wide Web.



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A slightly formal statement of the importance of simplicity on the Web is given by the Rule of Least Power. This rule was formulated by Tim Berners-Lee [1] as one of the principles of Web design. What it says is that information on the Web should be encoded in the “least powerful” language possible. It’s another way of saying don’t program stuff when there is an HTML element for it, because if you do, the meaning of that Web resource is hidden except when you run the program.

[1] <https://www.w3.org/2001/tag/doc/leastPower.html>

Evolution of Web media

- Text - `<p>`
- Images - ``
- Vector graphics - `<svg>`
- Audio - `<audio>`
- Video - `<video>`
- Maps - `<map>`



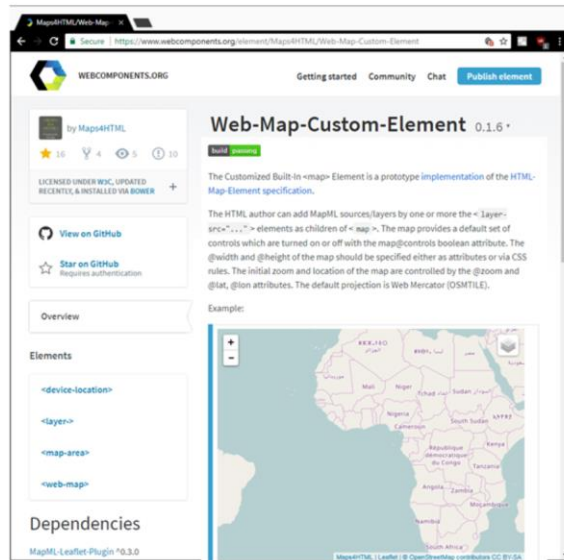
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Over time, HTML and the Web have evolved. In the beginning, there was only text and links. Soon, graphics were added in the form of images. The separation of style and from markup in CSS, led to explosive growth of the Web, and also the ability to keep HTML simple. Eventually, it became clear that the Web was a perfect medium for vector graphics. Ultimately, video and audio were added to HTML. While maps have been on the Web almost from the beginning, they have not had the perceived importance that other media types have, and so have not yet become part of the Web platform. The Web mapping community needs to make the case for them, together.

Web Components: Custom Elements



Today, Web standards are converging towards a powerful new way to create declarative HTML semantics implemented with script, in the set of standards called “Web Components”. The short story is that we are able to use the Web platform standards together in order to mint our own HTML elements. The big idea is that browser wars will be relegated to the past history of the Web, and the best ideas and implementations from the community will surface as elements. Some will be very specific to companies and frameworks, others will be more prone to standardization as HTML.

- [1] <https://www.webcomponents.org/element/Maps4HTML/Web-Map-Custom-Element>
- [2] <http://geogratis.gc.ca/mapml/en/> <http://geogratis.gc.ca/mapml/fr/>
- [3] <http://geogratis.gc.ca/mapml/client/map-carte.html>

Web mapping in the Future

```
<!DOCTYPE html>
<html>
  <head>
    <title>Future Web Map in HTML</title>
    <style>
      #circle {fill: white; stroke: aqua; stroke-width: 5px;fill-opacity: 0.0;}
      #triangle {fill: pink; stroke: blue; stroke-width: 3px;fill-opacity: 0.4;}
    </style>
  </head>
  <body>
    <map zoom="13" lat="51.505" lon="-0.09" width="600" height="400" controls>
      <layer label="Open Street Map" src="http://example.com/mapml/osm/" checked>
    </map>
  </body>
</html>
```



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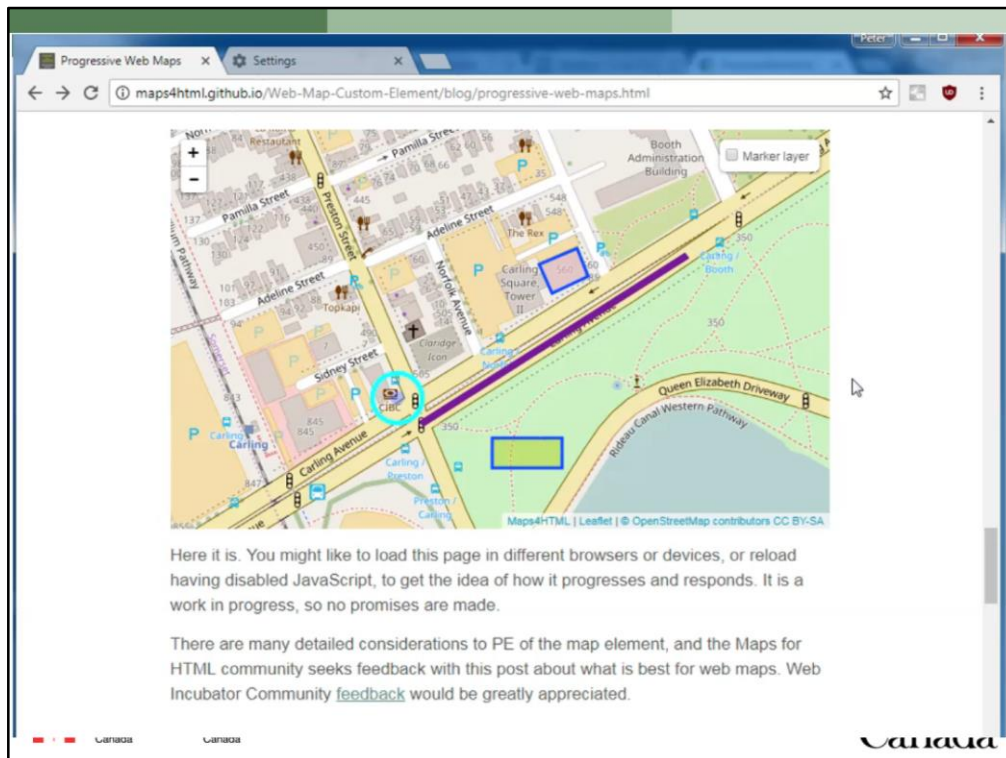
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We've just seen the `<map>` element in action. Here's what we envision it will look like when it is natively implemented by browsers, in its post-Custom Element implementation. In this configuration it is a bit like an SVG image, or perhaps a web video: a rectangular area on screen that is pretty simple to set up and get started with. One really important thing I want to draw your attention to is the use of links. I promised I would talk about hypertext in this presentation and here it is. HTML is hypertext, and it got to the scale it has reached by being built around the Uniform Interface I mentioned earlier. Each of the layers on our map is placed there as easily as you put an image in a Web page.

Hold on, you say, the `<map>` element already exists, and it does nothing like this. I looked once. And, you were right. The `<map>` element has existed for long time already, and it doesn't do very much. What it allows us to do is to use an image as a 2D "map", and to draw hyperlinks of various shapes on top of it. Sort of like map features... hey!!!

Yes, the `<map>` element does have incipient map semantics. If we harken back to the Rule of Least Power, we'll realize that there is value in declaring our semantics in HTML, and one of the key values on the Web is called Progressive Enhancement.



Progressive Enhancement is a principle of Web design which follows from the Rule of Least Power. PE suggests we mark up web page content using semantic html, and we use links to CSS and JavaScript to enhance the user experience with style and behaviour. The objective is to deliver the essential content of our Web page to the most primitive of user agents, across the slimmest of network connections so that everyone gets the message we are trying to send.

The existing narrow semantics of today's `<map>` element are a reasonable starting point for a progressively enhanced map experience. Panning and zooming, among many other map characteristics, can be considered progressive enhancements of the existing `<map>` element.

It's almost as though HTML was designed to evolve this way!

[1] <http://maps4html.github.io/Web-Map-Custom-Element/blog/progressive-web-maps.html>

Maps for HTML Community Group



<http://maps4html.org>

- Free to join
- W3C Licensing
- discourse.wicg.io/c/web-mapping
- Github: Like and fork us
 - Implement MapML in GeoServer, MapServer, TileCache or your favourite
- OGC Testbed 13 / 14






You can help make this vision of the Web happen, in fact, it can't happen without you. We are a W3C Community Group, which is free to join. The purpose of the group is to help ideas mature to the point they can be standardized, in a standards-development-friendly patent environment. We're also on Github. You can drive by our page and Like and/or fork our repos, where we keep software and developing specifications. We would especially like it if you decide to implement support for MapML in your favourite open source software project. If you have an idea, or if you want to comment on any of the concepts or implementations you see in our Web resources, you can discuss with us in the Web Incubator Community Group Discourse forum for web mapping and other Web standards. The importance of that forum is that all the browser development teams use it to discuss / incubate ideas. Web mapping is no different, and it benefits from the light of critical thinking.

Natural Resources Canada is also a principle member of the Open Geospatial Consortium, and we are current and past sponsors of the OGC Innovation Program this year in Testbed 13, where Maps for HTML concepts are being discussed, implemented and documented by Maps for HTML community group and OGC members.

With your help and support, we will continue to sponsor development of these concepts through the OGC process. Get in touch! Thank you for your time today! See you again, I hope and trust.

[1] <https://discourse.wicg.io/c/web-mapping>

Thank you!
À la prochaine!