Using Chrome’s accessibility tree for manual testing of HTML and ARIA

IAAP Accessibility Considerations Mini-series

Before diving into Chrome's accessibility tree, let’s look at **three concepts associated with HTML elements**:

- Accessible names
- Roles
- Accessible descriptions

Accessible names

Accessible names are short text strings that **provide assistive technology users with a label for the element**.

Accessible names **convey the purpose or intent** of the element.

They also used to **distinguish the element from other elements** on the page.

This is why each accessible name **should be unique**.

Roles

Almost all HTML elements have a ‘role’ that is **used to define their purpose**.

The `<input type="radio">` has the role of `radio`.

The `<a>` element has a role of `link`.

Accessible descriptions

Sometimes, HTML elements may need more than an accessible name to **provide additional context.**

For example, **instructions or error messages** associated with form controls.

If applied correctly, this additional information is referred to as an **accessible description**.

How names, roles and descriptions are announced

Let’s look at a **simple form control** and its associated label:

```
<!-- Accessible name -->

<label for="aaa">Address</label>
<span id="bbb">Include full street address</span>
<input id="aaa" type="text"
  aria-describedby="bbb" required>
```

```
<!-- Role -->

<label for="aaa">Address</label>
<span id="bbb">Include full street address</span>
<input id="aaa" type="text"
  aria-describedby="bbb" required>
```

```
<!-- Accessible description -->

<label for="aaa">Address</label>
<span id="bbb">Include full street address</span>
<input id="aaa" type="text"
  aria-describedby="bbb" required>
```

```
<!-- State -->

<label for="aaa">Address</label>
<span id="bbb">Include full street address</span>
<input id="aaa" type="text"
  aria-describedby="bbb" required>
```

Screen readers announce HTML elements within the accessibility tree **in the following order**:

Windows / NVDA and JAWS

- Accessible name: ‘Address’
- Role: ‘Edit’
- State: ‘Required’
- Description: ‘Include full street address’

OSX / VoiceOver

- Accessible name: ‘Address’
- State: ‘Required’
- Role: ‘Edit text’
- Description: ‘Include full street address’

But how do these screen readers access all of this information? Via **the accessibility tree**.

What is the accessibility tree?

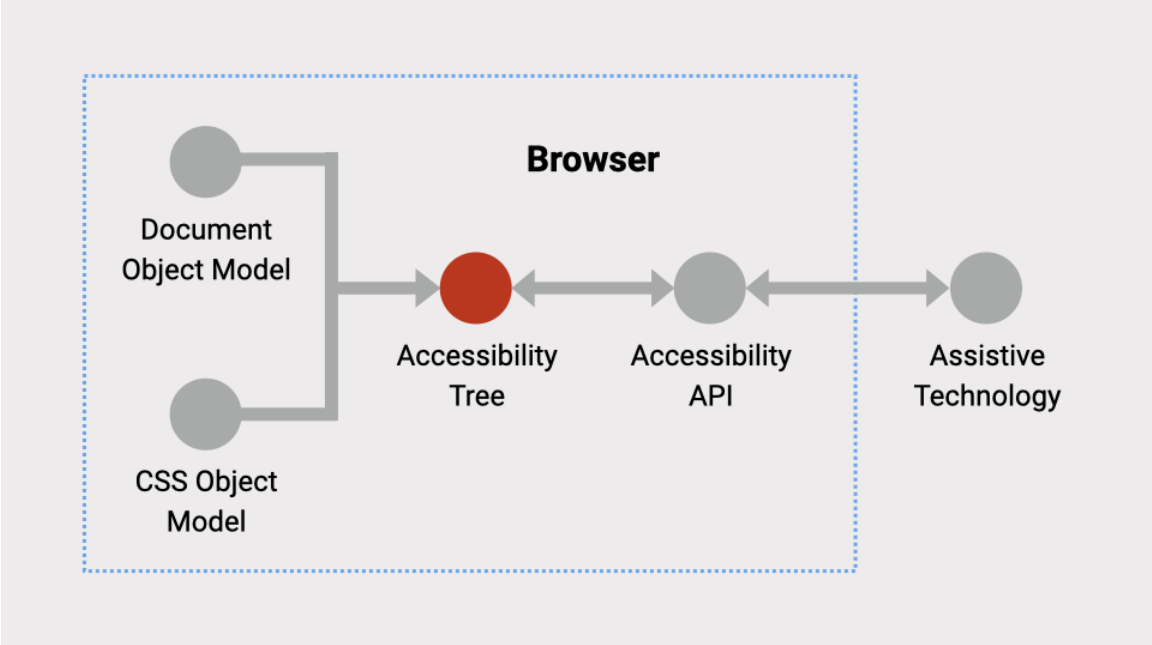
The accessibility tree is a simplified version of the **Document Object Model**.

The accessibility tree consists of **information about specific HTML elements**.

This includes:

- Name
- Role
- Description
- States
- User value

This information is passed on to assistive technologies so that they can **understand, navigate and interact with web documents**.



Each browser creates **its own version of the accessibility tree**. They

also use own their Accessibility APIs.

This means assistive technologies **may have slightly different experiences** in each browser.

Why use Chrome's accessibility tree?

The Chrome browser has an excellent function called the **'Computed properties'** panel.

This panel presents **a range of accessibility information** in one location.

How to access Chrome's accessibility tree

Accessing activity 1:

Go to the All about mammals page.

Step 1: Opening Chrome Developer Tools

- Right-click anywhere on the page.
- Select 'Inspect'.
- This will open Chrome Developer Tools.

Alternatively, you can use:

- Windows: `Control` + `Shift` + `C`.
- Mac: `Command` + `Opt` + `I`

Step 2: Finding the ‘Accessibility’ tab

- The ‘Elements’ tab will be active by default.
- This shows the DOM tree and the ‘Styles’ panel.
- The ‘Accessibility’ tab is to the right of ‘Styles’.
- You may need to click the ‘More tabs’ icon.

Step 3: Select the ‘Accessibility’ tab

- Select the ‘Accessibility’ tab.

This tab displays:

- ‘Accessibility tree’ panel
- ‘ARIA Attributes’ panel
- ‘Computed Properties’ panel
- ‘Source Order Viewer’ panel

We will spend most of our time exploring the **‘Computed Properties’** panel.

Diving into the accessibility tree

1. Inspect the ‘Find out more’ link

In the Computed Properties panel, find the element’s `name` and `role`.

Answer

- Name: *Find out more*
- Role: *link*

All important elements **must have names and roles** so assistive technologies can understand them.
(We will look at accessible names in detail soon.)

2. Inspect the image

In the Computed Properties panel, find the element's `name` and `role`:

Answer

- Name: *A common wombat standing on the forest floor*
- Role: *image*

3. Inspect the 'Full name' `<input>`

In the Computed Properties panel, find the element's `name` and `role`:

Answer

- Name: *Full name*
- Role: *textbox*

4. Inspect the 'What are mammals' heading

In the Computed Properties panel, find the element's `role` and `level`:

Answer

- Role: *heading*
- Level: *1*

5. Inspect the 'Land mammals' table

In the Computed Properties panel, find the `<table>` element's `name` and `role`:

Answer

- Name: *Land mammals*
- Role: *table*

Inside the table, all essential elements **also have roles**:

Answer

- `<tr>` role = *row*
- `<th>` role = *columnheader*
- `<td>` role = *gridcell*

6. Inspect the 'Vombatus' content

Does this element provide any information in the Computed Properties panel:

Answer

- *Accessibility node not exposed*

Some less important elements are **not exposed in the accessibility tree**.

7. Inspect the 'Phone' `<input>`

In the Computed Properties panel, find the element's `description`:

Answer

- Description: *Include area code*

Descriptions are used to **provide additional information** for some elements.
(We will look at accessible descriptions in detail soon.)

8. Inspect the 'Email' `<input>`

Is this element defined as `required` in the Computed Properties panel?

Answer

- Required: *true*

This tells assistive technologies **that the form control is required** and must be filled in before submitting the form.

9. Add text into the 'Email' `<input>`

Does the element now have a `value` in the Computed Properties panel?

Answer

- Value: *"abc@com.au"*

This tells assistive technologies what the user has added to the form field - **allowing the user to review the information** before submitting the form.

10. Select an option from the dropdown

Select ‘Aardvark’ from the ‘Favourite mammal’ dropdown. Does the `<select>` element now have a `value` in the Computed Properties panel?

Answer

- Value: *"Aardvark"*

11. Check a checkbox

Check ‘Yes’ from the ‘Bats’ checkbox group. Does the checkbox now have a `checked` status in the Computed Properties panel?

Answer

- Checked: *true*

This tells assistive technologies that the form control **has been checked**.

12. Click the ‘Submit’ button

This will create some fake form errors. Inspect the ‘Phone’ `<input>`. Is this element defined as `invalid` in the Computed Properties panel?

Answer

- Invalid user entry: *true*

This tells assistive technologies that the form control **is currently invalid**

and needs to be resolved.

Lots of properties

There is a wide range of possible properties that can be presented in Chrome's accessibility tree, **depending on the element**:

```
Name: [ accessible name as a text string ]
Role: [ pre-defined list of roles ]
Description: [ description as a text string ]
Value: [ current value as a text string ]
Required: true | false
Expanded: true | false
Checked: true | false
Disabled: true | false
Described by: [element #id]
Labeled by: [element #id]
```

Using ARIA to alter the accessibility tree

ARIA is a set of custom HTML attributes that **add information to the accessibility tree**.

This information can be used to help assistive technology users understand the **name, role or state** of elements.

Accessing activity 2:

Go to the Testing ARIA page.

We can see how ARIA attributes affect **Chrome's accessibility tree**.

1. Testing `role="button"`

Check the `<div>` element's role in the accessibility tree:

Answer

- Role: *button*

We can use ARIA to **add semantics** to an elements that have none.

2. Testing `role="combobox"`

Check the `<input>` element's role in the accessibility tree:

Answer

- Role: *combobox*

We can use ARIA to **improve the semantics** of elements.

3. Testing `aria-expanded`

Check the `<button>` element's 'Expanded' state in the accessibility tree:

Answer

- Expanded: *true*

We can use ARIA to inform assistive technology users **when an element is expanded or collapsed**.

4. Testing `aria-invalid`

Check the `<input>` element's 'Invalid User Entry' value in the accessibility tree:

Answer

- Invalid User Entry: *true*

We can use ARIA to inform assistive technology users **when an element is currently invalid**.

5. Testing `aria-label`

Check the `<button>` element's name in the accessibility tree:

Answer

- Name: *Dismiss*

We can use ARIA to **improve the accessible names** of elements.

6. Testing `aria-live`

Check the `<div>` element's 'Live region' value in the accessibility tree:

Answer

- Live region: *polite*

We can use ARIA to inform assistive technology users that a region **may contain dynamic content that may change over time**.

Reviewing accessible names in the accessibility tree

As we saw before, Chrome's accessibility tree shows the **accessible name generated for each element**.

The 'Computed Properties' panel shows us:

- All possible names (from strongest to weakest).
- Where the names come from (where relevant).
- Which one wins.

This is very helpful when **reviewing the accessibility of elements**.

Accessing activity 3:

Go to the Input accessible names page.

This `<input>` element has **five possible accessible names** applied.

- An `aria-labelledby` value of ‘Cat’.
- An `aria-label` value of ‘Dog’.
- A `<label>` value of ‘Fish’.
- A `title` value of ‘Rabbit’.
- A `placeholder` value of ‘Fox’.

In this case, the winning accessible name comes from the `aria-labelledby` value of **‘Cat’**.

The sneaky `title` attribute

As we saw before, the `title` can be used to **provide an accessible name** for some elements.

However, it is very weak and will often be **beaten by other methods**.

But the `title` is **very sneaky**!

If it loses the accessible name battle, it will try to **win the accessible description battle**.

Accessing activity 4:

Go to the Testing the `title` attribute page.

In ‘Example 1’, the `title` is the only accessible name option and **will be used** as the accessible name.

```
<input type="text" title="Add your name">

Name: Add your name
Description: N/A
```

In ‘Example 2’, there is a `<label>` present, so the `title` **will not be used** as the accessible name.

However, as there is no other description available, the `title` **will be used** as the accessible description.

```
<label for="name">Name</label>
<input id="name" type="text" title="Add your name">

Name: Name
Description: Add your name
```

In ‘Example 3’, there is an `aria-describedby` present, so the `title` **will not be used** as the accessible description.

In this example, the `title` has **lost both battles** - for accessible name and description.

```
<label for="name">Name</label>
<span id="aaa">Include your full name</span>
<input id="name" type="text" title="Add your name"
aria-describedby="aaa">

Name: Name
Description: Include your full name
```

Too good to be true?

By now, you think that the Chrome accessibility tree is **amazing**.

However, like any tool, it has **strengths and weaknesses**.

For example, Chrome **does not accurately define `required` states** for some of the more recent form controls.

Accessing activity 5:

Go to the Testing the required attribute in Chrome page.

While Chrome's accessibility tree is very useful, it **does not replace**

rigorous accessibility testing.

And it does not replace **screen reader testing** either.

Wrapping up

If you've never used Chrome's accessbility tree, hopefully, this session will give you **the confidence and knowledge to give it a go**!

Time for any questions!