# Using WAI-ARIA in HTML

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## Abstract

This document is a practical guide for developers on how to add accessibility information to HTML elements using the Accessible Rich Internet Applications specification [WAI-ARIA], which defines a way to make Web content and Web applications more accessible to people with disabilities. This document demonstrates how to use WAI-ARIA in [HTML5], which especially helps with dynamic content and advanced user interface controls developed with Ajax, HTML, JavaScript, and related technologies.

## Status of This Document

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NOTE

This document is informative only. Resources are for information purposes only, no endorsement implied.

It was developed through the HTML Accessibility Taskforce, and is published by the HTML Working Group with approval by the Protocols and Formats Working Group.

It is a draft document and its contents are subject to change without notice.

This document was published by the HTML Working Group as a Working Draft.

Following feedback on the last Working Draft, a number of bugs were raised and resolved. A diff file identifying the resulting changes is available. Notable changes include the addition of the Fourth and Fifth rules of ARIA use. If you wish to make comments regarding this document, please send them to public-html@w3.org (subscribe, archives). All comments are welcome. Bugs can also be filed directly into the W3C Bug tracker for this specification.

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## 1. Introduction

This document is a practical guide for developers on how to add accessibility information to HTML elements using the Accessible Rich Internet Applications specification [WAI-ARIA], which defines a way to make Web content and Web applications more accessible to people with disabilities. This document demonstrates how to use WAI-ARIA in HTML5, it especially helps with dynamic content and advanced user interface controls developed with Ajax, HTML, JavaScript, and related technologies.

This document suggests which ARIA attributes are appropriate to use on each of the elements in [HTML5].

For general best-practice information about using ARIA, see the [WAI-ARIA-PRACTICES] document.

The following is a longer list of resources that provide relevant information:

- WAI-ARIA 1.0 Authoring Practices
- Accessible Rich Internet Applications (WAI-ARIA) 1.0
- HTML5
- HTML5 Accessibility

## 2. Notes on ARIA use in HTML

### 2.1 First rule of ARIA use

If you *can* use a native HTML element [HTML5] or attribute with the semantics and behaviour you require **already built in**, instead of re-purposing an element and adding an ARIA role, state or property to make it accessible**, then do so**.

### Under what circumstances may this not be possible?

- If the feature is available in HTML [HTML5] but it is not implemented or it is implemented, but accessibility support is not.
- If the visual design constraints rule out the use of a particular native element, because the element cannot be styled as required.
- If the feature is not currently available in HTML.

### 2.2 Second rule of ARIA use

Do not change native semantics, unless you really have to.

For example: Developer wants to build a heading that's a button.

Do **not** do this:

```
<h1 role=button>heading button</h1>
```

**Do** this:

```
<h1><button>heading button</button></h1>
```

Or if you can't possibly use the correct element, **do** this:

```
<h1><span role=button>heading button</span></h1>
```

**Note:** if a non interactive element is used as the basis for an interactive element, developers have to add the semantics using ARIA and the appropriate interaction behaviour using scripting. In the case of a button, for example, it is **much better** and easier to Just use a (native HTML) button.

**Note:** it is OK to use native HTML elements, that have similar semantics to ARIA roles used, for fallback. For example, using HTML list elements for the skeleton of an ARIA enabled, scripted tree widget.

## 2.3 Third rule of ARIA use

All interactive ARIA controls must be usable with the keyboard.

If you create a widget that a user can click or tap or drag or drop or slide or scroll, a user must also be able to navigate to the widget and perform an equivalent action using the keyboard.

All interactive widgets must be scripted to respond to standard key strokes or key stroke combinations where applicable.

For example, if using `role=button` the element must be able to receive focus and a user must be able to activate the action associated with the element using **both** the `enter` (on WIN OS) or `return` (MAC OS) and the `space` key.

Refer to the keyboard and structural navigation and design patterns sections of the WAI-ARIA 1.0 Authoring Practices

## 2.4 Fourth rule of ARIA use

Do not use `role="presentation"` or `aria-hidden="true"` on a *visible* **focusable** element .

Using either of these on a *visible* **focusable** element will result in some users focusing on 'nothing'.

Do **not** do this:

```
<button role=presentation>press me</button>
```

Do **not** do this:

```
<button aria-hidden="true">press me</button>
```

**Note:** If an interactive element cannot be seen or interacted with, then you can apply `aria-hidden`, for example:

```
button {display:none}

<button aria-hidden="true">press me</button>
```

## 2.5 Fifth rule of ARIA use

All interactive elements must have an accessible name.

An interactive element only has an accessible name when it's Accessibility API *accessible name* (or equivalent) property has a value.

For example, the `input type=text` in the code example below has a visible label 'user name' , but no accessible name:

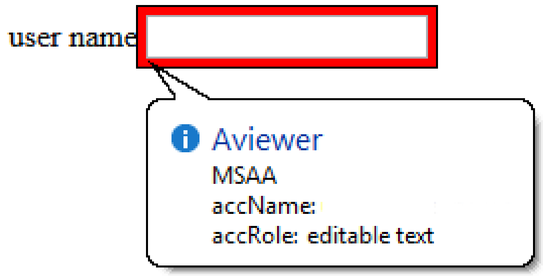
```
    user name <input type="text">

    or

<!-- label element used, but not associated with the control
it is supposed to label -->

    <label>user name</label> <input type="text">
```

The control's MSAA `accName` property is empty:



MSAA
accName:
accRole: editable text

In comparison, the `input type=text` in the code example below has a visible label 'user name' and an accessible name. This example has an accessible name because the `input` element is a labelable element and the `label` element is used correctly to associate the label text with the input.

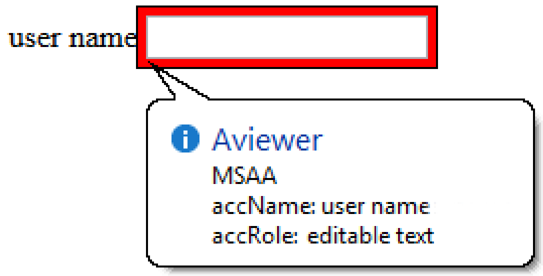
```
<!-- Note: use of for/id or wrapping label around text
and control methods will result in an accessible name -->

<label>user name <input type="text"></label>

or

<label for="uname">user name</label> <input type="text" id="uname">
```

The control's MSAA `accName` property has a value of "user name":



MSAA
accName: user name
accRole: editable text

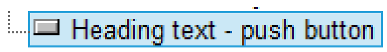
## 2.6 What does adding a role do to the native semantics?

Adding an ARIA role **overrides** the native role semantics in the accessibility tree which is reported via the accessibility API, and therefore ARIA indirectly affects what is reported to a screen reader or other assistive technology.

For example, this code in the HTML tree:

```
<h1 role=button>text</h1>
```

Becomes this in the accessibility tree:



Heading text - push button

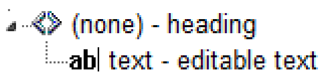
### What adding a role does not do

Adding an ARIA role will not make an element look or act differently for people **not** using assistive technology. It **does not** change the behaviours, states and properties of the host element but only the native role semantics.

For example, this code in the HTML tree:

```
<button role=heading aria-level=1>text</button>
```

Becomes this in the accessibility tree:



(none) - heading
ab text - editable text

**But** it can still be pressed, it is still in the default tab order, still looks like a button and still triggers any associated actions when pressed. That's why it is a HTML5 conformance error to change a button into a heading.

**Note:** Changing the role of an element **does not** add behaviors, properties or states to the role used. ARIA does not change the way it looks or acts in a browser. For instance, when links are used to behave like buttons, adding `role=button` alone is not sufficient. It will also be necessary to make act like a button, by including a key event handler that listens for the `space` key which native buttons do, because native buttons can be activated using the enter key or the spacebar.

## 2.7 Add ARIA inline or via script?

If the ARIA role or aria-* attribute **does not rely** on scripting to provide interaction behaviour, then **it is safe** to include the ARIA markup inline. For example, it is fine to add ARIA landmark roles or ARIA labelling and describing attributes inline.

If the content and interaction is **only supported in a scripting-enabled browsing context**, i.e. Google docs (its applications require JavaScript enabled to work), it **is also safe** to include the ARIA markup inline as the application simply will not work (for anyone) without JavaScript enabled.

**Otherwise** insert, change and remove ARIA via scripting. For instance, a collapsed section of a tree widget might look like this:

```
<li role=treeitem aria-expanded=false ...
```

When the user opens the section, it is changed to this using JavaScript :

```
<li role=treeitem aria-expanded=true ...
```

## 2.8 ARIA validation

The easiest method is to use the HTML5 DOCTYPE with ARIA markup and validate using the W3C Nu Markup Validation Service. ARIA works equally well with any other `DOCTYPE`, but validation tools will produce errors when they encounter ARIA markup as the associated DTDs have not been updated to recognise ARIA markup and it is unlikely they ever will be.

These validation errors in versions of HTML prior of HTML5 are in no way indicative of ARIA creating any real world accessibility problems nor do they mean there will be a negative user experience. They are merely the result of old automated validation tests that do not accommodate ARIA accessibility annotations.

**Note:** The W3C Nu Markup Conformance Checker support for ARIA checking is a work in progress, so cannot be wholly relied upon (though it is pretty *darn* good!)to provide the correct results. It is recommended that if you encounter a result that conflicts with the ARIA conformance requirements in the ARIA specification or the HTML5 specification, please raise a bug report.

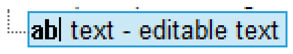
## 2.9 Use of role=presentation

`role=presentation` removes the semantics from the element it is on.

For example, this code in the HTML tree:

```
<h1 role=presentation>text</h1>
```

Becomes this in the accessibility tree:



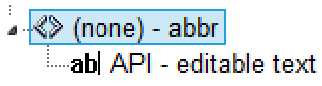
In other words, it is just reported in the accessibility tree as a text string with no semantic meaning.

For elements with no required children, any elements nested inside the element with `role=presentation` preserve their semantics.

For example, this code in the HTML tree:

```
<h1 role=presentation><abbr>API</abbr></h1>
```

Becomes this in the accessibility tree:

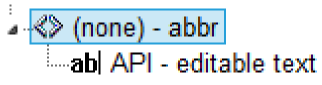


For elements with required children (such as `ul` or `table`) any required child elements nested inside the element with `role=presentation` also have their semantics removed.

For example, this code in the HTML tree:

```
<table role=presentation>
<tr><td><abbr>API</abbr></td><tr>
</table>
```

Becomes this in the accessibility tree:

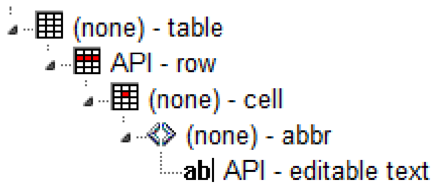


**Note:** Any elements that are not required children of the element with a `role=presentation` keep their semantics. This includes other elements with required children such as nested lists or nested tables.

For example, this code in the HTML tree:

```
<table role=presentation">
<tr><td>
<table>
<tr><td><abbr>API</abbr></td><tr>
</table>
</td><tr>
</table>
```

Becomes this in the accessibility tree:



## 2.10 aria-labelledby and aria-describedby

Currently `aria-labelledby` and `aria-describedby` are more robustly supported for associating text content to a subset of [interactive content] elements. As of this writing they **do not** work correctly on [links] , support on [embedded content] is unknown, but can be safely used on form controls including the many `input` types.

In Internet Explorer, if you use `aria-labelledby` with multiple `id` references or `aria-describedby` with single or multiple `id` references, the referenced elements **must be** what Microsoft terms as accessible HTML elements.

The following example of `aria-labelledby` with multiple references uses a `span` with a `tabindex=-1` added. Refer to [Making Non accessible Elements Accessible](#).

```
<label id="l1" for="f3">label text</label>

<input type="text" id="f3" aria-labelledby="l1 l2">

<p>other content</p>

<span tabindex="-1" id="l2" >more label text</span>
```

Elements also become [accessible HTML elements](#) in Internet Explorer when the element has an ARIA role. For example:

```
<div aria-describedby="test">text</div>

<div id="test" role="tooltip">tooltip text</div>
```

## 2.11 Using ARIA role=application

### How does role="application" affect a screen reader?

On many popular screen readers today, most keystrokes are captured by the screen reader and not the web page when the user is in browse mode. This is necessary for efficient navigation of a page. As of this writing, when application mode is set, many screen reader stop intercepting keystrokes, and pass all keystrokes directly to the browser. Then the user won't be able to navigate the page as easily. For instance they won't be able to skip around the page by headings or read a paragraph of static text line-by-line. However, several screen readers do not behave differently when there is an application role set.

### So when should I use it, and when not?

In determining when to use `role=application`, one should consider, among other things, the advantages of screen reader keyboard shortcuts weighed against the loss of those features. It generally should not be used, and if it is, usability testing with screen reader users should be conducted.

You **do not** use `role="application"` if a set of controls only contains these widgets, that are all part of standard HTML. This also applies if you mark them up and create an interaction model using WAI-ARIA roles instead of standard HTML widgets:

NOTE: It's not recommended that authors develop custom text input widgets. It's almost always best to use the native inputs for these.

- `text box`. This also applies to password, search, tel and other newer input *type* derivatives
- `textarea`
- `check box`
- `button`
- `radio button` (usually inside a fieldset/legend element wrapper)
- `select + option`(s)
- `links`, `paragraphs`, `headings`, and other elements that are classic/native to documents on the Web.

You also do **not** use the `application` role if your widget is one of the following more dynamic and non-native widgets. Screen readers and other assistive technologies that support WAI-ARIA will support switching between browse and focus modes for these by default too:

- `tree view`
- `slider`
- `table` that has focusable items and is being navigated via the arrow keys, for example, a list of e-mail messages where you provide specific information. Other examples are interactive grids, tree grids, etc.
- A list of tabs (`tab, tablist`) where the user selects tabs via the left and right arrow keys. Remember that **you** have to implement the keyboard navigation model for this!
- `dialog` and `alertdialog`. These causes some screen readers to go into a sort of application mode (implicitly) once focus moves to a control inside them. Note that for these to work best, set the `aria-describedby` attribute of the element whose role is `dialog` to the `id` of the text that explains the dialog's purpose, and set focus to the first interactive control when you open it:

```
<div role="dialog" aria-label="login" aria-describedby="log1">

<div id="log1" tabindex="-1">Provide user name and password to login.</div>

...
...

</div>
```

- `toolbar` and `toolbar buttons`, `menus` and `menu items`, and similar.

You **only** want to use `role=application` if the content you're providing consists of `only` focusable, interactive controls, and of those, mostly advanced widgets that emulate a real desktop application. Note that, despite many things now being called a web application, most of the content these web applications work with are still document-based information, be it Facebook posts and comments, blogs, Twitter feeds, or even accordions that show and hide certain types of information dynamically. We primarily still deal with documents on the web, even though they may have a desktop-ish feel to them on the surface.

It is not necessary to use role=application to have control-specific keyboard shortcuts while the user is in forms (focus) mode on their screen reader. For instance, a custom control with ARIA `role=listbox` can easily capture all keys pressed including arrow keys, while the user is interacting with it.

In short: The times when you actually **will** use `role=application` will probably be **very rare**!

### So where do I put `role=application` in the rare cases it is useful?

Put it on the closest containing element of your widget, for example, the parent `div` of your element that is your outer most widget element. If that outer `div` wraps only widgets that need the application interaction model, this will make sure focus mode is switched off once the user tabs out of this widget.

**Only** put it on the body element if your page consists solely of a widget or set of widgets that all need the focus mode to be turned on. If you have a majority of these widgets, but also have something you want the user to browse, use `role=document` on the outer-most element of this document-ish part of the page. It is the counterpart to `role=application` and will allow you to tell the screen reader to use browse mode for this part. Also make this element tabbable by setting a `tabindex=0` on it so the user has a chance to reach it.

As a rule of thumb: If your page consists of over 90 or even 95 percent of widgets, `role=application` **may be** appropriate. Even then, find someone knowledgeable who can actually test two versions of this: One with and one without `role=application` set to see which model works best.

**NEVER** put `role=application` on a widely containing element such as `body` if your page consists mostly of traditional widgets or page elements such as links that the user does **not** have to interact with in focus mode. This will cause huge headaches for any assistive technology user trying to use your site/application.

For further information on the use of `role=application` refer to If you use the WAI-ARIA role "application", please do so wisely!

## 2.12 Recommendations Table:

### legend

**'Should authors explicitly define default ARIA semantics? ' column**

- **NO** = the default semantics are already implemented by browsers, so the default implied role, state or property associated with an element or attribute does not need to be used. There are notes indicating under which circumstances default semantics are useful.
- **N/A** = there are no default ARIA semantics, but there may well be accessibility API semantics implemented by the browser.
- **Yes** = the default semantics are not implemented across browsers, so the default implied role, state, property, or suggested semantics (if no ARIA default) may be used.

**'What Other ARIA roles, states and properties may be used?' column**

**NONE** = the element **does not support** ARIA roles, states and properties. This is usually because the element is not displayed in the document.

**Recommended ARIA usage by HTML language feature**

| HTML language feature | Default ARIA semantics | Should authors explicitly define default ARIA semantics? | What Other ARIA roles, states and properties may be used? |
|---|---|---|---|
| All elements | varies | varies | Role: `presentation`, except focusable elements or those with the warning '**Not** `role=presentation`' or those indicated: **NONE** |
| `a` element with a `href` | `role=link` | **NO** | Roles: `button`, `checkbox`, `menuitem`, `menuitemcheckbox`, `menuitemradio`, `tab`, or `treeitem` |

| | | | |
|---|---|---|---|
| | | | Any global aria-* attributes and any aria-* attributes applicable to the allowed roles<br>**Not** role=presentation |
| address | NONE | **N/A** | Role:contentinfo<br>Any global aria-* attributes |
| area with a href | role=link | **NO** | Any aria-* attributes applicable to the link role. Any global aria-* attributes<br>**Not** role=presentation |
| article | role=article | **YES** **note 0** | Roles: presentation, article, document, application, or main.<br>Any global aria-* attributes and any aria-* attributes applicable to the allowed roles<br>**Note 0: NO** if a child of an article element or being used to mark up comments. |
| aside | role=complementary | **YES** | Roles: note, complementary, or search.<br>Any global aria-* attributes |
| audio | NONE | **N/A** | Role: application<br>Any aria-* attributes applicable to the application role. Any global aria-* attributes |
| base | NONE | **N/A** | **NONE** |
| body | role=document | **NO** | Any global aria-* attributes |
| button | role=button | **NO** **note 0a** | Roles: link, menuitem, menuitemcheckbox, menuitemradio, radio.<br>Any global aria-* attributes and any aria-* attributes applicable to the allowed roles<br>**Note 0a: YES** If the aria-pressed attribute is being used on the button element<br>**Not** role=presentation |
| button type="menu" | role=button with aria-haspopup=true | **NO** **note 0b** | Roles: link, menuitem, menuitemcheckbox, menuitemradio, radio.<br>Any global aria-* attributes and any aria-* attributes applicable to the allowed roles<br>**Note 0b: YES** If button type="menu" is being used in a |

| | | | |
|---|---|---|---|
| | | | scripted polyfill **Not** `role=presentation` |
| `caption` | NONE | **N/A** | Any global `aria-*` attributes |
| `col`, `colgroup` | NONE | **N/A** | **NONE** |
| `datalist` | `role=listbox`, with `aria-multiselectable=false` | **NO** **note 1** | Any global `aria-*` attributes and any `aria-*` attributes applicable to the `listbox` role. **Note 1: YES** If `datalist` is being used in a scripted polyfill. There is no direct ARIA role match for description lists, so it's in appropriate to override the native role in this case unless the author is retrofitting an improper use of the DL element. |
| `dd`, `dt` | NONE | **N/A** | Any global `aria-*` attributes |
| `details` | `role=group` | **YES** | Any global `aria-*` attributes and any `aria-*` attributes applicable to the `group` role. |
| `dialog` element with no `open` attribute | `role=dialog`, with `aria-hidden =true` | **YES** | Any global `aria-*` attributes and any `aria-*` attributes applicable to the `dialog` role. (Recommend using `hidden`/CSS `display:none` instead of `aria-hidden`) **Not** `role=presentation` |
| `div` | NONE | **N/A** | Role: Any Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles **Note:** It is recommended that any scripted widgets use the semantically neutral `div` or `span` elements unless HTML elements with native semantics are being used as fallback. |
| `dl` | `role=list` | **NO** | Any global `aria-*` attributes |
| `embed` | NONE | **N/A** | Role: `application, document,` or `img` Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles |
| `figure` | NONE | **N/A** | Role:Any, recommend `role=group` |

| | | | |
|---|---|---|---|
| | | | Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles |
| `footer` | NONE | **N/A** | Use `contentinfo` role for the main `footer` on a page. Any global `aria-*` attributes |
| `form` | `role=form` | **NO** | Any global `aria-*` attributes |
| grouping content elements not listed elsewhere: `p`, `pre`, `blockquote` | NONE | **N/A** | Role: any **Note:** Although the listed elements do not have any default ARIA semantics they do have *meaning* and this meaning may be represented in roles, states and properties not provided by ARIA, but present in accessibility APIs. It is therefore recommended that authors consider adding a `role` attribute to a semantically neutral element such as a `div` or `span`, rather than overriding the semantics of the listed elements. Refer to the Second rule of ARIA use. Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles |
| `h1` to `h6` element | `role=heading`, with the `aria-level` = element's outline depth | **NO** | Any global `aria-*` attributes |
| `head` | NONE | **N/A** | **NONE** |
| `header` | NONE | **YES** | Use `banner` role for the main `header` on a page. Any global `aria-*` attributes |
| `hr` | `role=separator` | **NO** | Any global `aria-*` attributes and any `aria-*` attributes applicable to the `separator` role. |
| `html` | NONE | **N/A** | **NONE** |
| `iframe` | NONE | **N/A** | Role: `application, document,` or `img` Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles |
| `iframe (seamless)` | EDITOR: okay to override with any general grouping role. | **N/A** | Role: `application, document,` or `img` Any global `aria-*` attributes and any `aria-*` attributes applicable |

| | | | |
|---|---|---|---|
| | | | to the allowed roles |
| img with alt="" | role=presentation | NO | NONE |
| img with alt="*some text*" | role=img | NO | Role: Any<br>Any global aria-* attributes and any aria-* attributes applicable to the allowed roles |
| input type= button | role=button | NO note 1b | Role: link, menuitem, menuitemcheckbox, menuitemradio, radio<br>Any global aria-* attributes and any aria-* attributes applicable to the allowed roles<br>**Note 1a: YES** If the aria-pressed attribute is being used on the input type=button element<br>**Not** role=presentation |
| input type= checkbox | aria-checked=mixed if the element's indeterminate IDL attribute is true, or aria-checked=true if checked attribute is present. | NO note 2 | Any global aria-* attributes<br>**Note 2: YES** If you are using aria-checked="mixed" on an input type=checkbox to convey the 3rd state for a tri-state checkbox.<br>**Not** role=presentation |
| input type = color | NONE | N/A | Any global aria-* attributes<br>**Not** role=presentation |
| input type = date | NONE | N/A | Any global aria-* attributes<br>**Not** role=presentation |
| input type = datetime | NONE | N/A | Any global aria-* attributes<br>**Not** role=presentation |
| input type = email with no list attribute | role=textbox | NO | Any global aria-* attributes<br>**Not** role=presentation |
| input type = file | NONE | N/A | Any global aria-* attributes<br>**Not** role=presentation |
| input type = hidden | NONE | N/A | NONE |
| input type= image | role=button | NO note 2a | Role: link, menuitem, menuitemcheckbox, menuitemradio, radio |

| | | | |
|---|---|---|---|
| | | | Any global aria-* attributes and any aria-* attributes applicable to the allowed roles<br>**Note 2a: YES** If the aria-pressed attribute is being used on the input type=image element<br>**Not** role=presentation |
| input type = month | NONE | **N/A** | Any global aria-* attributes<br>**Not** role=presentation |
| input type = number | role=spinbutton, with the aria-readonly property set to "true" if the element has a readonly attribute, the aria-valuemax property set to the element's maximum, the aria-valuemin property set to the element's minimum, and, if the result of applying the rules for parsing floating-point number values to the element's value is a number, with the aria-valuenow property set to that number | **NO** **note 3** | Any global aria-* attributes and any aria-* attributes applicable to the spinbutton role.<br>Note 3: **YES** If input type=number is being used in a scripted polyfill.<br>It is okay to use aria-valuetext, with or without an explicit role.<br>**Not** role=presentation |
| input type = password | role=textbox | **NO** | Any global aria-* attributes<br>**Not** role=presentation |
| input type = radio | role=radio | **NO** | Role: menuitemradio<br>Any global aria-* attributes and any aria-* attributes applicable to the menuitemradio role.<br>**Not** role=presentation |
| input type = range | role=slider with aria-valuemax property set to the element's maximum, and the aria-valuemin property set to the element's minimum. | **NO** **note 4** | Any global aria-* attributes and any aria-* attributes applicable to the slider role.<br>Note 4: **YES** If input type=range is being used in a scripted polyfill.<br>It is okay to use aria-valuetext, with or without an explicit role.<br>**Not** role=presentation |
| input type= reset | button role | **NO** | Any global aria-* attributes<br>**Not** role=presentation |
| input type = search, with no list attribute | textbox role | **NO** | Any global aria-* attributes<br>**Not** role=presentation |
| input type = submit | button role | **NO** | Any global aria-* attributes |

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|---|---|---|---|
| | | | **Not** role=presentation |
| input type = tel with no list attribute | textbox role | **NO** | Any global aria-* attributes<br>**Not** role=presentation |
| input type = text with no list attribute | textbox role | **NO** | Any global aria-* attributes<br>**Not** role=presentation |
| input type = text, search, tel, url, or email with a list attribute | combobox role, with the aria-owns property set to the same value as the list attribute | **NO** note 5 | Any global aria-* attributes and any aria-* attributes applicable to the combobox role.<br>**Note 5: YES** If input is being used in a scripted polyfill.<br>**Not** role=presentation |
| input type= time | NONE | **NO** | Any global aria-* attributes<br>**Not** role=presentation |
| input type = url with no list attribute | textbox role | **NO** | Any global aria-* attributes<br>**Not** role=presentation |
| input type = week | NONE | **NO** | Any global aria-* attributes<br>**Not** role=presentation |
| ins and del | NONE | **N/A** | Role: any<br>**Note:** Although the listed elements do not have any default ARIA semantics they do have *meaning* and this meaning may be represented in roles, states and properties not provided by ARIA, but present in accessibility APIs. It is therefore recommended that authors consider adding a role attribute to a semantically neutral element such as a div or span, rather than overriding the semantics of the listed elements. Refer to the Second rule of ARIA use.<br>Any global aria-* attributes and any aria-* attributes applicable to the allowed roles |
| keygen | NONE | **N/A** | Any global aria-* attributes<br>**Not** role=presentation |
| label | NONE | **N/A** | Any global aria-* attributes |

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| li element whose parent is an ol or ul | role=listitem | NO note 5a | Role: listitem, menuitem, menuitemcheckbox, menuitemradio, option, tab, or treeitem<br>Note 5a: YES if li element is a child of an ol or ul element with role=presentation |
| link element with a href | role=link | NO | NONE |
| main | role=main | YES | Any global aria-* attributes |
| map | NONE | N/A | NONE |
| math | NONE | YES | Any global aria-* attributes |
| menu type = toolbar | role=toolbar | NO note 7 | Note 7: YES if menu element is being used in a scripted polyfill.<br>Any global aria-* attributes and any aria-* attributes applicable to the toolbar role.<br>**Not** role=presentation |
| menuitem type = command | role=menuitem | NO note 7a | Note 7a: YES if menuitem element is being used in a scripted polyfill.<br>Any global aria-* attributes and any aria-* attributes applicable to the menuitem role.<br>**Not** role=presentation |
| menuitem type = checkbox | role=menuitemcheckbox | NO note 7b | Note 7b: YES if menuitem type = checkbox element is being used in a scripted polyfill.<br>Any global aria-* attributes and any aria-* attributes applicable to the menuitemcheckbox role.<br>**Not** role=presentation |
| menuitem type = radio | role=menuitemradio | NO note 7c | Note 7c: YES if menuitem type = radio element is being used in a scripted polyfill.<br>Any global aria-* attributes and any aria-* attributes applicable to the menuitemradio role.<br>**Not** role=presentation |
| meta | NONE | N/A | NONE |
| meter | role=progressbar | N/A | Any global aria-* attributes |
| nav | role=navigation | YES | Any global aria-* attributes |

| | | | |
|---|---|---|---|
| noscript | NONE | N/A | NONE |
| object | NONE | N/A | Role: application, document, or img<br>Any global aria-* attributes and any aria-* attributes applicable to the allowed roles |
| ol | role=list | NO | Role: directory, group, listbox, menu, menubar, tablist, toolbar or tree<br>Any global aria-* attributes and any aria-* attributes applicable to the allowed roles |
| optgroup | NONE | N/A | Any global aria-* attributes |
| option element that is in a list of options or that represents a suggestion in a datalist | role=option, with aria-selected=true if the selected attribute is present, aria-selected=false otherwise. | NO | Any global aria-* attributes<br>**Not** role=presentation |
| output | role=status | DEPENDS | Role: Any, use in conjunction with aria-live=polite<br>Any global aria-* attributes and any aria-* attributes applicable to the allowed roles<br>Note: If role="status" is added, it will force this to be a broadcasting live region. In some cases, this is fine, but if this is an element whose value changes constantly due to scripted updates rather than explicit user action (like a progressbar), it'd be more appropriate to set aria-live="off". Otherwise some AT users are going to find this very distracting, even impossible to use. Even "polite" live regions can be annoying if they are overused. |
| param | NONE | N/A | NONE |
| picture | NONE | N/A | NONE |
| progress | progressbar role, with, if the progress bar is determinate, the | NO **note 8** | Note 8: **YES** if progress element is being used in a |

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| | aria-valuemax property set to the maximum value of the progress bar, the aria-valuemin property set to zero, and the aria-valuenow property set to the current value of the progress bar | | scripted polyfill. it's okay to use aria-valuetext on this (e.g. "Step 2 of 10"), with or without an explicit role. Any global aria-* attributes and any aria-* attributes applicable to the progressbar role. |
| script | NONE | N/A | NONE |
| section | role=region | NO | Role: alert, alertdialog, application, contentinfo, dialog, document, log, marquee, search, or status Any global aria-* attributes and any aria-* attributes applicable to the allowed roles |
| select element with a multiple attribute | role=listbox, with aria-multiselectable=true | NO | Any global aria-* attributes **Not** role=presentation |
| select element with no multiple attribute | role=listbox, with aria-multiselectable=false | NO | Any global aria-* attributes **Not** role=presentation |
| source | NONE | N/A | NONE |
| span | NONE | N/A | Role: Any Any global aria-* attributes and any aria-* attributes applicable to the allowed roles **Note:** It is recommended that any scripted widgets use the semantically neutral div or span elements, unless HTML elements with native semantics are being used as fallback. |
| style | NONE | N/A | NONE |
| SVG | NONE | N/A | Role: application, document, or img Any global aria-* attributes and any aria-* attributes applicable to the allowed roles |
| summary | NONE | N/A | if summary element is being used in a scripted polyfill - Use role=button with aria-expanded="true" if the parent (details) element's open |

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| | | | attribute is present, `aria-expanded="false"` otherwise. Any global `aria-*` attributes and any `aria-*` attributes applicable to the `button` role. |
| `table` | NONE | **N/A** | Role: any<br>**Note 1:** It is recommended to not override the `table` element with an ARIA role unless it is being used as part of a scripted data grid, then the ARIA `grid` role may be used.<br>**Note 2:** It is recommended that the `table` element not be used for layout purposes, but if it is, it is strongly recommended that `role=presentation` is used to hide the semantics of the `table` and its child elements, `tr` and `td` from assistive technology.<br>Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles |
| `template` | NONE | **N/A** | **NONE** |
| `textarea` | `role=textbox` | **NO** | Any global `aria-*` attributes<br>**Not** `role=presentation` |
| `tbody`, `thead`, `tfoot` | `role=rowgroup` | **No** | Role: any<br>**Note:** addition of roles does not appear to have any effect upon these unrendered elements<br>Any global `aria-*` attributes |
| `title` | NONE | **N/A** | **NONE** |
| `td` | NONE | **N/A** | Role: any<br>**Note:** It is recommended to not override the `td` element with an ARIA role unless it is being used as part of a scripted data grid, then the ARIA `gridcell` role may be used.<br>Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles |
| Text level semantic elements not listed elsewhere: | NONE | **N/A** | Role: any<br>**Note:** Although the listed elements do not have any default ARIA semantics they do have *meaning* and this meaning |

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| em, strong, small, s, cite, q, dfn, abbr, time, code, var, samp, kbd, sub and sup, i, b, u, mark , ruby, rt, rp, bdi, bdo, br, wbr | | | may be represented in roles, states and properties not provided by ARIA, but present in accessibility APIs. It is therefore recommended that authors consider adding a `role` attribute to a semantically neutral element such as a `div` or `span`, rather than overriding the semantics of the listed elements. Refer to the Second rule of ARIA use.<br>Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles |
| th | NONE | **N/A** | Role: any<br>**Note:** It is recommended to not override the `th` element with an ARIA role unless it is being used as part of a scripted data grid, then the ARIA `columnheader` or `rowheader`role may be used.<br>Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles |
| `th` element that is a sorting-capable `th` element whose column key ordinality is 1 | `role=columnheader`, with the `aria-sort` state set to "ascending" if the element's column sort direction is *normal*, and "descending" otherwise. | **NO** | Any global `aria-*` attributes<br>**Not** `role=presentation` |
| tr | NONE | **N/A** | Role: any<br>**Note:** It is recommended to not override the `tr` element with an ARIA role unless it is being used as part of a scripted data grid, then the ARIA `row` role may be used.<br>Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles |
| track | NONE | **N/A** | **NONE** |
| ul | `role=list` | **NO** | Role: `directory, group, listbox, menu, menubar, tablist, toolbar, tree, presentation`<br>Any global `aria-*` attributes and any `aria-*` attributes applicable to the allowed roles |

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|---|---|---|---|
| `video` | NONE | N/A | Role: `application` Any global `aria-*` attributes and any `aria-*` attributes applicable to the `application` role. |
| Element with a `disabled` attribute | `aria-disabled="true"` | **NO** | Use the `disabled` attribute on any element that is allowed the `disabled` attribute in HTML5. Only use the `aria-disabled` attribute for elements that are not allowed to have a `disabled` attribute in HTML5 |
| Element with a `required` attribute | The `aria-required="true"` | **NO** | Use the `aria-required` attribute on any element that is allowed the `required` attribute in HTML5. Also use the `aria-required` attribute for elements that have an attached ARIA role which allows the `aria-required` attribute. |
| Element with a `readonly` attribute | `aria-readonly=true` | **NO** | Use the `readonly` attribute on any element that is allowed the `readonly` attribute in HTML5. Only use the `aria-disabled` attribute for elements that are not allowed to have a `readonly` attribute in HTML5 |
| Element with a `hidden` attribute | `aria-hidden=true` | **NO** | Use the `hidden` attribute in conjunction with the CSS `display:none` property |
| Element is natively focusable (links, buttons, etc.) | NONE | **NO** | **Not** `role=presentation` |
| Element is not natively focusable (li, span, div, etc.) | *DEPENDS* | **YES** | **Not** `role=presentation` For example, `<span tabindex="0">` is focusable but has no role in most rendering engines. Needs a role in many cases. (NEED TO GIVE EXAMPLES). |
| Element that is a candidate for constraint validation | `aria-invalid=true` | **NO** | Only use the `aria-invalid=true` attribute after form has been validated, setting it prior means users think the field is invalid before they even input data or interact with it. |

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| but that does not satisfy its constraints | | | (Editor's NOTE) Provide link to what HTML defines what constitutes the user has interacted with the control "significantly." ARIA defines `aria-invalid="grammar"` and `aria-invalid="spelling"` |

## 2.13 ARIA Role, State, and Property Quick Reference

(Reformatted and reorganized information from: Accessible Rich Internet Applications (WAI-ARIA) 1.0)

In addition to the states and properties shown in the table, the following global states and properties are supported on all roles.

### Global states and properties

- `aria-atomic`
- `aria-busy (state)`
- `aria-controls`
- `aria-describedby`
- `aria-disabled (state)`
- `aria-dropeffect`
- `aria-flowto`
- `aria-grabbed (state)`
- `aria-haspopup`
- `aria-hidden (state)`
- `aria-invalid (state)`
- `aria-label`
- `aria-labelledby`
- `aria-live`
- `aria-owns`
- `aria-relevant`

**ARIA Roles, States and Properties**

| Role | Description | Required Properties | Supported Properties - Global + |
|---|---|---|---|
| `alert` | A message with important, and usually time-sensitive, information. See related alertdialog and status. | NONE | `aria-expanded (state)` |
| `alertdialog` | A type of dialog that contains an alert message, where initial focus goes to an element within the dialog. See related alert and dialog. | NONE | `aria-expanded (state)` |
| `application` | A region declared as a web application, as opposed to a web document. | NONE | `aria-expanded (state)` |

| Role | Description | Required Properties | Supported Properties - Global + |
|---|---|---|---|
| article | A section of a page that consists of a composition that forms an independent part of a document, page, or site. | NONE | aria-expanded (state) |
| banner | A region that contains mostly site-oriented content, rather than page-specific content. | NONE | aria-expanded (state) |
| button | An input that allows for user-triggered actions when clicked or pressed. See related link. | NONE | aria-expanded (state) aria-pressed (state) |
| checkbox | A checkable input that has three possible values: true, false, or mixed. | aria-checked (state) | |
| columnheader | A cell containing header information for a column. | NONE | aria-sort aria-readonly aria-required aria-selected (state) aria-expanded (state) |
| combobox | A presentation of a select; usually similar to a textbox where users can type ahead to select an option, or type to enter arbitrary text as a new item in the list. See related listbox. | aria-expanded (state) | aria-autocomplete aria-required aria-activedescendant |
| complementary | A supporting section of the document, designed to be complementary to the main content at a similar level in the DOM hierarchy, but remains meaningful when separated from the main content. | NONE | aria-expanded (state) |
| contentinfo | A large perceivable region that contains information about the parent document. | NONE | aria-expanded (state) |
| definition | A definition of a term or concept. | NONE | aria-expanded (state) |

| Role | Description | Required Properties | Supported Properties - **Global** + |
|---|---|---|---|
| dialog | A dialog is an application window that is designed to interrupt the current processing of an application in order to prompt the user to enter information or require a response. See related alertdialog. | NONE | aria-expanded (state) |
| directory | A list of references to members of a group, such as a static table of contents. | NONE | aria-expanded (state) |
| document | A region containing related information that is declared as document content, as opposed to a web application. | NONE | aria-expanded (state) |
| form | A landmark region that contains a collection of items and objects that, as a whole, combine to create a form. See related search. | NONE | aria-expanded (state) |
| grid | A grid is an interactive control which contains cells of tabular data arranged in rows and columns, like a table. | NONE | aria-level aria-multiselectable aria-readonly aria-activedescendant aria-expanded (state) |
| gridcell | A cell in a grid or treegrid. | NONE | aria-readonly aria-required aria-selected (state) aria-expanded (state) |
| group | A set of user interface objects which are not intended to be included in a page summary or table of contents by assistive technologies. | NONE | aria-activedescendant aria-expanded (state) |
| heading | A heading for a section of the page. | NONE | aria-level aria-expanded (state) |
| img | A container for a collection of elements that form an image. | NONE | aria-expanded (state) |

| Role | Description | Required Properties | Supported Properties - Global + |
|---|---|---|---|
| link | An interactive reference to an internal or external resource that, when activated, causes the user agent to navigate to that resource. See related button. | NONE | aria-expanded (state) |
| list | A group of non-interactive list items. See related listbox. | NONE | aria-expanded (state) |
| listbox | A widget that allows the user to select one or more items from a list of choices. See related combobox and list. | NONE | aria-multiselectable aria-required aria-expanded (state) aria-activedescendant |
| listitem | A single item in a list or directory. | NONE | aria-level aria-posinset aria-setsize aria-expanded (state) |
| log | A type of live region where new information is added in meaningful order and old information may disappear. See related marquee. | NONE | aria-expanded (state) |
| main | The main content of a document. | NONE | aria-expanded (state) |
| marquee | A type of live region where non-essential information changes frequently. See related log. | NONE | aria-expanded (state) |
| math | Content that represents a mathematical expression. | NONE | aria-expanded (state) |
| menu | A type of widget that offers a list of choices to the user. | NONE | aria-expanded (state) aria-activedescendant |

| Role | Description | Required Properties | Supported Properties - Global + |
|---|---|---|---|
| menubar | A presentation of menu that usually remains visible and is usually presented horizontally. Authors **SHOULD** ensure that menubar interaction is similar to the typical menu bar interaction in a desktop graphical user interface.It is NOT really intended to mark up site navigation list items | NONE | aria-expanded (state) aria-activedescendant |
| menuitem | An option in a group of choices contained by a menu or menubar. | NONE | |
| menuitemcheckbox | A checkable menuitem that has three possible values: true, false, or mixed. | aria-checked (state) | |
| menuitemradio | A checkable menuitem in a group of menuitemradio roles, only one of which can be checked at a time. | aria-checked (state) | aria-posinset aria-selected (state) aria-setsize |
| navigation | A collection of navigational elements (usually links) for navigating the document or related documents. | NONE | aria-expanded (state) |
| note | A section whose content is parenthetic or ancillary to the main content of the resource. | NONE | aria-expanded (state) |
| option | A selectable item in a select list. | NONE | aria-checked (state) aria-posinset aria-selected (state) aria-setsize |
| presentation | An element whose implicit native role semantics will not be mapped to the accessibility API. | NONE | |
| progressbar | An element that displays the progress status for tasks that take a long time. | NONE | aria-valuemax aria-valuemin aria-valuenow aria-valuetext |

| Role | Description | Required Properties | Supported Properties - Global + |
|---|---|---|---|
| radio | A checkable input in a group of radio roles, only one of which can be checked at a time. | aria-checked (state) | aria-posinset aria-selected (state) aria-setsize |
| radiogroup | A group of radio buttons. | NONE | aria-required aria-activedescendant aria-expanded (state) |
| region | A large perceivable section of a web page or document, that the author feels is important enough to be included in a page summary or table of contents, for example, an area of the page containing live sporting event statistics. | NONE | aria-expanded (state) |
| row | A row of cells in a grid. | NONE | aria-level aria-selected (state) aria-activedescendant aria-expanded (state) |
| rowgroup | A group containing one or more row elements in a grid. | NONE | aria-activedescendant aria-expanded (state) |
| rowheader | A cell containing header information for a row in a grid. | NONE | aria-sort aria-readonly aria-required aria-selected (state) aria-expanded (state) |

| Role | Description | Required Properties | Supported Properties - Global + |
|---|---|---|---|
| scrollbar | A graphical object that controls the scrolling of content within a viewing area, regardless of whether the content is fully displayed within the viewing area. | aria-controls aria-orientation aria-valuemax aria-valuemin aria-valuenow | aria-expanded (state) |
| search | A landmark region that contains a collection of items and objects that, as a whole, combine to create a search facility. See related form. | NONE | aria-expanded (state) aria-orientation |
| separator | A divider that separates and distinguishes sections of content or groups of menuitems. | NONE | aria-valuetext |
| slider | A user input where the user selects a value from within a given range. | aria-valuemax aria-valuemin aria-valuenow | aria-orientation aria-valuetext |
| spinbutton | A form of range that expects the user to select from among discrete choices. | aria-valuemax aria-valuemin aria-valuenow | aria-required aria-valuetext |
| status | A container whose content is advisory information for the user but is not important enough to justify an alert, often but not necessarily presented as a status bar. See related alert. | NONE | aria-expanded (state) |
| tab | A grouping label providing a mechanism for selecting the tab content that is to be rendered to the user. | NONE | aria-selected (state) aria-expanded (state) |

| Role | Description | Required Properties | Supported Properties - Global + |
|---|---|---|---|
| tablist | A list of tab elements, which are references to tabpanel elements. | NONE | aria-level aria-activedescendant aria-expanded (state) |
| tabpanel | A container for the resources associated with a tab, where each tab is contained in a tablist. | NONE | aria-expanded (state) |
| textbox | Input that allows free-form text as its value. | NONE | aria-activedescendant aria-autocomplete aria-multiline aria-readonly aria-required |
| timer | A type of live region containing a numerical counter which indicates an amount of elapsed time from a start point, or the time remaining until an end point. | NONE | aria-expanded (state) |
| toolbar | A collection of commonly used function buttons represented in compact visual form. | NONE | aria-activedescendant aria-expanded (state) |
| tooltip | A contextual popup that displays a description for an element. | NONE | aria-expanded (state) |
| tree | A type of list that may contain sub-level nested groups that can be collapsed and expanded. | NONE | aria-multiselectable aria-required aria-activedescendant aria-expanded (state) |

| Role | Description | Required Properties | Supported Properties - Global + |
|---|---|---|---|
| treegrid | A grid whose rows can be expanded and collapsed in the same manner as for a tree. | NONE | aria-level aria-multiselectable aria-readonly aria-activedescendant aria-expanded (state) aria-required |
| treeitem | An option item of a tree. This is an element within a tree that may be expanded or collapsed if it contains a sub-level group of treeitems. | NONE | aria-level aria-posinset aria-setsize aria-expanded (state) aria-checked (state) aria-selected (state) |

## 2.14 Definitions of States and Properties (all aria-* attributes)

Below is an alphabetical list of ARIA states and properties to be used by rich internet application authors. A detailed definition of each ARIA state and property can be found by following the attribute links (to their definitions in Accessible Rich Internet Applications (WAI-ARIA) 1.0.

**aria-activedescendant**
Identifies the currently active descendant of a composite widget.

**aria-atomic**
Indicates whether assistive technologies will present all, or only parts of, the changed region based on the change notifications defined by the aria-relevant attribute. See related aria-relevant.

**aria-autocomplete**
Indicates whether user input completion suggestions are provided.

**aria-busy (state)**
Indicates whether an element, and its subtree, are currently being updated.

**aria-checked (state)**
Indicates the current "checked" state of checkboxes, radio buttons, and other widgets. See related aria-pressed and aria-selected.

**aria-controls**
Identifies the element (or elements) whose contents or presence are controlled by the current element. See related aria-owns.

**aria-describedby**
Identifies the element (or elements) that describes the object. See related aria-labelledby.

**aria-disabled (state)**

Indicates that the element is perceivable but disabled, so it is not editable or otherwise operable. See related aria-hidden and aria-readonly.

`aria-dropeffect`
: Indicates what functions can be performed when the dragged object is released on the drop target. This allows assistive technologies to convey the possible drag options available to users, including whether a pop-up menu of choices is provided by the application. Typically, drop effect functions can only be provided once an object has been grabbed for a drag operation as the drop effect functions available are dependent on the object being dragged.

`aria-expanded (state)`
: Indicates whether the element, or another grouping element it controls, is currently expanded or collapsed.

`aria-flowto`
: Identifies the next element (or elements) in an alternate reading order of content which, at the user's discretion, allows assistive technology to override the general default of reading in document source order.

`aria-grabbed (state)`
: Indicates an element's "grabbed" state in a drag-and-drop operation.

`aria-haspopup`
: Indicates that the element has a popup context menu or sub-level menu.

`aria-hidden (state)`
: Indicates that the element and all of its descendants are not visible or perceivable to any user as implemented by the author. See related aria-disabled.

`aria-invalid (state)`
: Indicates the entered value does not conform to the format expected by the application.

`aria-label`
: Defines a string value that labels the current element. See related aria-labelledby.

`aria-labelledby`
: Identifies the element (or elements) that labels the current element. See related aria-label and aria-describedby.

`aria-level`
: Defines the hierarchical level of an element within a structure.

`aria-live`
: Indicates that an element will be updated, and describes the types of updates the user agents, assistive technologies, and user can expect from the live region.

`aria-multiline`
: Indicates whether a text box accepts multiple lines of input or only a single line.

`aria-multiselectable`
: Indicates that the user may select more than one item from the current selectable descendants.

`aria-orientation`
: Indicates whether the element and orientation is horizontal or vertical.

`aria-owns`
: Identifies an element (or elements) in order to define a visual, functional, or contextual parent/child relationship between DOM elements where the DOM hierarchy cannot be used to represent the relationship. See related aria-controls.

`aria-posinset`
: Defines an element's number or position in the current set of listitems or treeitems. Not required if all elements in the set are present in the DOM. See related aria-setsize.

`aria-pressed (state)`
: Indicates the current "pressed" state of toggle buttons. See related aria-checked and aria-selected.

`aria-readonly`

Indicates that the element is not editable, but is otherwise operable. See related aria-disabled.

`aria-relevant`
: Indicates what user agent change notifications (additions, removals, etc.) assistive technologies will receive within a live region. See related aria-atomic.

`aria-required`
: Indicates that user input is required on the element before a form may be submitted.

`aria-selected (state)`
: Indicates the current "selected" state of various widgets. See related aria-checked and aria-pressed.

`aria-setsize`
: Defines the number of items in the current set of listitems or treeitems. Not required if all elements in the set are present in the DOM. See related aria-posinset.

`aria-sort`
: Indicates if items in a table or grid are sorted in ascending or descending order.

`aria-valuemax`
: Defines the maximum allowed value for a range widget.

`aria-valuemin`
: Defines the minimum allowed value for a range widget.

`aria-valuenow`
: Defines the current value for a range widget. See related aria-valuetext.

`aria-valuetext`
: Defines the human readable text alternative of aria-valuenow for a range widget.

## 2.15 Abstract roles

Do not use the following abstract roles as they **do not do anything**!

> The following roles are used to support the WAI-ARIA role taxonomy for the purpose of defining general role concepts. Abstract roles are used for the ontology. Authors **MUST NOT** not use abstract roles in content.
>
> - `command (abstract role)`
> - `composite (abstract role)`
> - `input (abstract role)`
> - `landmark (abstract role)`
> - `range (abstract role)`
> - `roletype (abstract role)`
> - `section (abstract role)`
> - `sectionhead (abstract role)`
> - `select (abstract role)`
> - `structure (abstract role)`
> - `widget (abstract role)`
> - `window (abstract role)`

# A. References

## A.1 Normative references

**[HTML5]**
Robin Berjon; Steve Faulkner; Travis Leithead; Erika Doyle Navara; Edward O'Connor; Silvia Pfeiffer. *HTML5*. 17 June 2014. W3C Last Call Working Draft. URL:

http://www.w3.org/TR/html5/

**[WAI-ARIA]**
James Craig; Michael Cooper et al. *Accessible Rich Internet Applications (WAI-ARIA) 1.0*. 20 March 2014. W3C Recommendation. URL: http://www.w3.org/TR/wai-aria/

### A.2 Informative references

**[WAI-ARIA-PRACTICES]**
Joseph Scheuhammer; Michael Cooper. *WAI-ARIA 1.0 Authoring Practices*. 7 March 2013. W3C Working Draft. URL: http://www.w3.org/TR/wai-aria-practices/