W3C Editor's Draft

[contents]

Accessible Rich Internet Applications (WAI-ARIA) 1.0

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Abstract

Accessibility of web content requires semantic information about widgets, structures, and behaviors, in order to allow assistive technologies to convey appropriate information to persons with disabilities. This specification provides an ontology of roles, states, and properties that define accessible user interface elements and can be used to improve the accessibility and interoperability of web content and applications. These semantics are designed to allow an author to properly convey user interface behaviors and structural information in document-level markup, to assistive technologies. This document is part of the WAI-ARIA suite described in the WAI-ARIA Overview.

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1. Introduction

This section is *informative*.

The goals of this specification include:

- expanding the accessibility information that may be supplied by the author;
- requiring that supporting host languages provide full keyboard support that may be implemented in a device-independent way, for example, by telephones, handheld devices, e-book readers, and televisions;
- improving the accessibility of dynamic content generated by scripts; and
- providing for interoperability with *assistive technologies*.

WAI-ARIA is a technical specification that provides a framework to improve the accessibility and interoperability of web content and applications. This document is primarily for developers creating custom widgets and other web application components. Please see the WAI-ARIA Overview for links to related documents for other audiences, such as the WAI-ARIA Primer that introduces developers to the accessibility problems that WAI-ARIA is intended to solve, the fundamental concepts, and the technical approach of WAI-ARIA.

This draft currently handles two aspects of *roles*: user interface functionality and structural *relationships*. For more information and use cases, see the *WAI-ARIA Primer* [*ARIA-PRIMER*] for the use of roles in making interactive content accessible.

The role *taxonomy* is designed in part to support the common roles found in platform *accessibility APIs*. Reference to roles found in this taxonomy by dynamic web content may be used to support interoperability with assistive technologies.

The schema to support this standard has been designed to be extensible so that custom roles can be created by extending base roles. This allows *user agents* to support at least the base role, and user agents that support the custom role can provide enhanced access. Note that much of this could be formalized in *XML Schema* [*XSD*]. However, being able to define similarities between roles, such as baseConcepts and more descriptive definitions, would not be available in XSD. While this extensibility is possible, this version of the specification does not define how this extension is to be achieved.

- *WAI-ARIA Primer* [*ARIA-PRIMER*], a planned W3C Working Group Note, introduces developers to the accessibility problems that WAI-ARIA is intended to solve, the fundamental concepts, and the technical approach of WAI-ARIA.
- *WAI-ARIA Authoring Practices* [*ARIA-PRACTICES*], a planned W3C Working Group Note, describes how web content developers can develop accessible rich internet applications using WAI-ARIA. It provides detailed advice and examples directed primarily to web application developers, yet also useful to user agent and assistive technology developers.
- *WAI-ARIA User Agent Implementation Guide* [*ARIA-IMPLEMENTATION*], a planned W3C Working Group Note, describes how browsers and other user agents should support WAI-ARIA; specifically, how to expose WAI-ARIA features to platform accessibility APIs.
- *WAI-ARIA Roadmap* [*ARIA-ROADMAP*], planned a W3C Working Group Note, defines the path to make rich web content accessible, including steps already taken, remaining future steps, and a time line.

1.1. Rich Internet Application Accessibility

The domain of web accessibility defines how to make web content usable by persons with disabilities. Persons with certain types of disabilities use *assistive technologies* (AT) to interact with content. Assistive technologies can transform the presentation of content into a format more suitable to the user, and can allow the user to interact in different ways. For example, a user may need to, or choose to, interact with a slider widget via arrow keys, instead of dragging and dropping with a mouse. In order to accomplish this effectively, the software needs to understand the *semantics* of the content. "Semantics" is the knowledge of roles, states, and properties that apply to content elements as a person would understand them. For instance, if a paragraph is semantically identified as such, assistive technologies can interact with it as a unit separable from the rest of the content, knowing the exact boundaries of that paragraph. A range slider or collapsible tree *widget* are more complex examples, in which various parts of the widget have semantics that need to be properly identified for the assistive technologies to support effective interaction.

New technologies often overlook the semantics required for accessibility, and new authoring practices often misuse the intended semantics of those technologies. *Elements* that have one defined meaning in the language are used with a different meaning intended to be understood by the user.

For example, web application developers create collapsible tree widgets in HTML using CSS and JavaScript even though HTML lacks an appropriate semantic element. To a non-disabled user, it may look and act like a collapsible tree widget, but without appropriate semantics, the tree widget may not be *perceivable* to or *operable* by a person with a disability because the assistive technologies will not recognize the role.

The incorporation of WAI-ARIA is a way for an author to provide proper semantics for custom widgets to make these widgets accessible, usable, and interoperable with assistive technologies. This specification identifies the types of widgets and structures that are commonly recognized by accessibility products, by providing an *ontology* of corresponding *roles* that can be attached to content. This allows elements with a given role to be understood as a particular widget or structural type regardless of any semantic inherited from the implementing technology. Roles are a common property of platform *accessibility APIs* which assistive technologies uses to provide the user with effective presentation and interaction.

This role *taxonomy* includes interaction *widgets* and elements denoting document structure. The role taxonomy describes inheritance and details the *attributes* each role supports. Information about mapping of roles to accessibility APIs is provided by the *WAI-ARIA User Agent Implementation Guide* [*ARIA-IMPLEMENTATION*].

Roles are element types and should not change with time or user actions. Role information is used by assistive technologies, through interaction with the user agent, to provide normal processing of the specified element type.

States and properties are used to declare important attributes of an element that affect and describe interaction. They enable the *user agent* and operating system to properly handle the element even when the attributes are dynamically changed by client-side scripts. For example, alternative input and output technology such as screen readers, speech dictation software, and on-screen keyboards need to be able to recognize and effectively communicate various states (disabled, checked, etc.) to the user.

While it is possible for assistive technologies to access these properties directly through the *Document Object Model* [*DOM*], the preferred mechanism is for the user agent to map the states and properties to the accessibility API of the operating system. See the *WAI-ARIA User Agent Implementation Guide*. [*ARIA-IMPLEMENTATION*]

Figure 1.0 illustrates the relationship between user agents, accessibility APIs, and assistive technologies. It describes the "contract" provided by the user agent to assistive technologies, which includes typical accessibility information found in the accessibility API for many of our accessible platforms for GUIs (role, state, selection, *event* notification, *relationship* information, and descriptions). The browser DOM, usually HTML, acts as the data model and view in a typical MVC relationship, and JavaScript acts as the controller by manipulating the style and content of the displayed data. The user agent conveys relevant information to the operating system's accessibility API, which can be used by any assistive technologies, such as a screen reader.

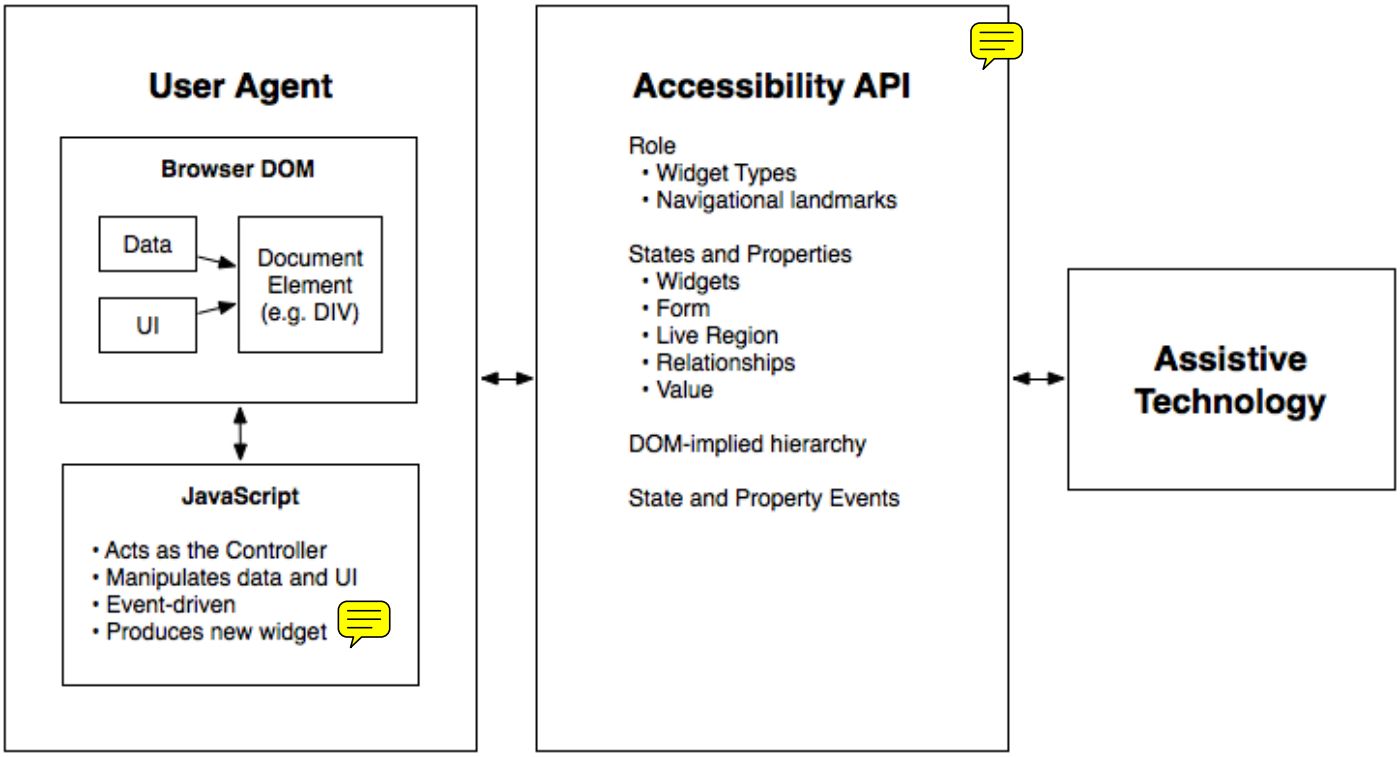


Figure 1: The contract model with accessibility APIs

For more information see the *WAI-ARIA Primer* [*ARIA-PRIMER*] for the use of roles in making interactive content accessible.

In addition to the prose documentation, the role taxonomy is provided in *Web Ontology Language (OWL)* [*OWL*], which is expressed in *Resource Description Framework (RDF)* [*RDF*]. Tools can use these to validate the implementation of roles in a given content document. For example, instances of some roles are expected to be children of a specific parent role. Also, some roles may support a specific state or *property* that another role does not support.

> Note: The use of RDF/OWL as a formal representation of roles may be used to support future extensibility. Standard RDF/OWL mechanisms can be used to define new roles that inherit from the roles defined in this specification. The mechanism to define and use role extensions in an interoperable manner, however, is not defined by this specification. A future version of WAI-ARIA is expected to define how to extend roles.

Users of alternate input devices need *keyboard accessible* content. The new semantics, when combined with the recommended keyboard interactions provided in *WAI-ARIA Authoring Practices* [*ARIA-PRACTICES*], will allow alternate input solutions to facilitate command and control via an alternate input solution.

WAI-ARIA introduces navigation *landmarks* through its taxonomy and the XHTML role landmarks, which helps persons with dexterity and vision impairments by providing for improved keyboard navigation. WAI-ARIA may also be used to assist persons with cognitive learning disabilities. The

additional semantics allow authors to restructure and substitute alternative content as needed.

Assistive technology needs the ability to support alternative inputs by getting and setting the current value of *widgets*. Assistive technologies also need to determine what *objects* are selected and manage widgets that allow multiple selections, such as list boxes and grids.

Speech-based command and control systems can benefit from WAI-ARIA semantics like the role attribute to assist in conveying audio information to a user. For example, by determining that an element has a role of `menu` and that it contains three elements with the role `menuitem` each containing text content representing a different flavor, a speech system might state to the user that, "Select one of three choices: chocolate, strawberry, or vanilla."

WAI-ARIA is intended to be used as a supplement for native language semantics, not a replacement. When the host language provides a feature that is equivalent to the WAI-ARIA feature, use the host language feature. WAI-ARIA should only be used in cases where the host language lacks the needed *role*, *state*, or *property* indicator. First use a host language feature that is as similar as possible to the WAI-ARIA feature, then refine the meaning by adding WAI-ARIA. For instance, a multi-selectable grid could be implemented as a table, and then WAI-ARIA used to clarify that it is a grid, not just a table. This allows for the best possible fallback for user agents that do not support WAI-ARIA and preserves the integrity of the host language semantics.

1.2. Target Audience

This specification defines the basic model for WAI-ARIA, including roles, states, properties, and values. It impacts several audiences:

- *User agents* that process content containing WAI-ARIA features;
- *Assistive technology* that presents content in special ways to user with disabilities;
- Authors who create content;
- Authoring tools that help authors create conforming content; and
- Conformance checkers that verify appropriate use of WAI-ARIA.

Each conformance requirement indicates the audience to which it applies.

Although this specification is applicable to the above audiences, it is not specifically targeted to, nor is it intended to be the sole source of information for, any of these audiences. The following documents provide important supporting information:

- *WAI-ARIA Authoring Practices* addresses authoring recommendations, and is also of interest to developers of authoring tools and conformance checkers.
- *WAI-ARIA User Agent Implementation Guide* addresses developers of user agents and assistive technology.

1.3. User Agent Support

WAI-ARIA relies on user agent support for its features in two ways:

- Mainstream *user agents* use WAI-ARIA to alter how host language features are exposed to *accessibility APIs* in order to improve accessibility. The mechanism for this is defined in the *WAI-ARIA User Agent Implementation Guide* [*ARIA-IMPLEMENTATION*].
- *Assistive technology* uses the enhanced information available in an accessibility API, or uses the WAI-ARIA markup directly, to improve presentation and interaction with the user.

Aside from using WAI-ARIA markup to improve what is exposed to accessibility APIs, user agents mainly behave as they would natively. Assistive technologies react to the extra information in the accessibility API as they already do for the same information on non-web content. User agents that are not assistive technologies, however, need do nothing beyond providing appropriate interaction

with the accessibility API.

Some user agents might enhance native presentation and interaction behaviors on the basis of WAI-ARIA markup. This is particularly true of assistive technologies that use WAI-ARIA directly rather than reference the accessibility API. Yet even mainstream user agents might choose to do so, directly or via user-installed extensions. This is a way user agents can maximize their usefulness to users, including users without disabilities. The WAI-ARIA specification neither requires or forbids this.

User agents that are not assistive technologies are not required to enhance the user experience in this way. WAI-ARIA is intended to bridge markup to render author-modified semantics in an accessible way. Generally, authors using WAI-ARIA will provide the appropriate presentation and interaction features. Furthermore, for many user agents it may be strategically preferable to introduce native support for given WAI-ARIA features only once they become part of the host language. In this case the user agent would support the now native host language feature, but may choose to not provide parallel support for the WAI-ARIA markup (beyond continuing the accessibility API support for legacy content). Developers of host languages that include WAI-ARIA are advised to consider processing WAI-ARIA semantics when defining its host language support as WAI-ARIA semantics reflect the intent of the author when the author deems the host language feature to be inadequate to meet their need.

1.4. Co-Evolution of WAI-ARIA and Host Languages

WAI-ARIA is intended to be a bridging technology. It clarifies semantics to assistive technologies when authors create new types of objects, via style and script, that are not yet directly supported by the language of the page. This is important because the invention of new types of objects is faster than standardized support for them appears in page languages.

It is not appropriate to create objects with style and script when the page language *does* provide semantics for that type of object. While WAI-ARIA can improve the accessibility of these objects, accessibility is best provided by allowing the user agent to handle the object natively.

It is expected that, over time, host languages will evolve to provide semantics for objects that previously could only be declared with WAI-ARIA. This is natural and desirable, as one goal of WAI-ARIA is to help stimulate the emergence of more semantic markup. When native semantics for a given feature become available, it is appropriate for authors to use the native feature and stop using WAI-ARIA for that feature. Legacy content may continue to use WAI-ARIA, however, so the need for user agents to support WAI-ARIA remains.

While specific features of WAI-ARIA may lose importance over time, the general possibility of WAI-ARIA to add semantics to Web pages is expected to be a persistent need. Host languages may not implement all the semantics WAI-ARIA provides, and various host languages may implement different subsets of the features. Furthermore, new types of objects are continually being developed. The goal of WAI-ARIA is to provide a quick way to make such objects accessible, because host language standards tend to be slower to evolve. Thus new types of objects would generally appear first within the Web community, then WAI-ARIA would provide bridging accessibility semantics in the medium term, and finally Web languages would provide native semantics in the longer term. In this way, WAI-ARIA and host languages both evolve together but at different rates.

1.5. Authoring Practices

1.5.1. Authoring Tools

Many of the requirements in the definitions of WAI-ARIA *roles*, *states*, and *properties* can be checked automatically during the development process, similar to other quality control processes

used for validating code. To assist authors who are creating custom widgets, authoring tools may compare widget roles, states, and properties to those supported in WAI-ARIA as well as those supported in related ancestor and descendant elements. Authoring tools may notify authors of errors in widget design patterns, and may also prompt developers for information that cannot be determined from context alone. For example, a scripting library can determine the labels for the tree items in a tree view, but would need to prompt the author to label the entire tree. To help authors visualize a logical accessibility structure, authoring environments may provide an outline view of a web resource based on the WAI-ARIA markup. Authoring tools may also provide additional feedback on important accessibility information for a particular implementation of WAI-ARIA.

In HTML, `tabindex` is an important way browsers support keyboard focus navigation for implementations of WAI-ARIA; authoring and debugging tools may check to make sure `tabindex` values are properly set. For example, error conditions may include cases where more than one treeitem in a tree has a `tabindex` value greater than or equal to 0, where `tabindex` is not set on any treeitem, or where `aria-activedescendent` is not defined when the element with the role tree has a `tabindex` value of greater than or equal to 0.

1.5.2. Testing Practices and Tools

The accessibility of interactive content cannot be confirmed by static checks alone. Developers of interactive content should test for device-independent access to *widgets* and applications, and should verify accessibility API access to all content and changes during user interaction.

1.6. Assistive Technologies

Programmatic access to accessibility semantics is essential for assistive technologies. Most assistive technology interacts with user agents, like other applications, through a recognized accessibility API. Perceivable objects in the user interface are exposed to assistive technologies as accessible objects, defined by the accessibility API interfaces. To do this properly, accessibility information – role, states, properties as well as contextual information – needs to be accurately conveyed to the assistive technology through the accessibility API. The accessibility API provides programmatic access to this information. When a state change occurs, the user agent provides the appropriate event notification to the assistive technology. Contextual information, in many host languages like HTML, can be determined from the DOM itself as it provides a contextual tree hierarchy.

While some assistive technologies interact with these accessibility APIs, others may access the content directly from the DOM. These technologies can restructure, simplify, style, or reflow the content to help a different set of users. Common use cases for these types of adaptations may be the aging population, cognitive impairments, or the situationally disabled. The availability of WAI-ARIA semantics facilitates the adaptation process. For example, the availability of regional navigational landmarks may allow for a mobile device adaptation that shows only portions of the content at any one time based on their semantics. This also reduces the amount of information a user needs to process at any one time. In other situations it may be easier to replace a user interface control with something that is easier to navigate with a keyboard, or touch screen device.

These requirements for semantic programmatic access parallel User Agent Accessibility Guidelines: Programmatic operation of user agent user interface and *Programmatic notification of changes* ([*UAAG*]) except that it applies to content, not just to the *user agent*.

2. Using WAI-ARIA

This section is *informative*.

Complex web applications become inaccessible when *assistive technologies* cannot determine the *semantics* behind portions of a document or when the user is unable to effectively navigate to all parts of it in a usable way (see the *WAI-ARIA Primer* [*ARIA-PRIMER*]). WAI-ARIA divides the semantics into *roles* (the type defining a user interface element) and *states* and *properties* supported by the roles.

Authors need to associate *elements* in the document to a WAI-ARIA role and the appropriate states and properties (aria-* *attributes*) during its life-cycle, unless the elements already have the appropriate implicit ARIA semantics for states and properties. In these instances the equivalent host language states and properties take precedence to avoid a conflict while the role attribute will take precedence over the implicit role of the host language element.

Authors need to associate elements in the document to a WAI-ARIA role and the appropriate states and properties (aria-*) during its life-cycle.

2.1. WAI-ARIA Roles

An WAI-ARIA *role* is set on an *element* using a `role` *attribute*, similar to the `role` attribute defined in the *XHTML Role Attribute Module* [*XHTML-ROLES*].

```
<li role="menuitem">Open file…</li>
```

The roles defined in this specification include a collection of document landmarks and the WAI-ARIA role taxonomy.

The roles in this *taxonomy* and their expected behaviors are modeled using *RDF/OWL* [*OWL*]. Features of the role taxonomy provide the following information for each role:

- an informative description of the role;
- hierarchical information about related roles (e.g., a `directory` is a type of `list`);
- context of the role (e.g., a `listitem` is contained inside a `list`);
- references to related concepts in other specifications;
- use of OWL to provide a type hierarchy allowing for *semantic* inheritance (similar to a *class* hierarchy); and
- supported *states* and *properties* for each role (e.g., a `checkbox` supports being checked via the `aria-checked (state)` attribute).

Attaching a role gives *assistive technologies* information about how to handle each element.

2.2. WAI-ARIA States and Properties

WAI-ARIA provides a collection of accessibility *states* and *properties* which are used to support

platform *accessibility APIs* on the various operating system platforms. *assistive technologies* may access this information through an exposed *user agent* DOM or through a mapping to the platform accessibility API. When combined with *roles*, the user agent can supply the assistive technologies with information to render the information to the user at any instance in time. Changes in states or properties will result in a notification to assistive technologies, which may alert the user that a change has occurred.

In the following example, a list item (`html:li`) has been used to create a checkable menu item, and JavaScript *events* will capture mouse and keyboard events to toggle *value* of `aria-checked`. A role is used to make the behavior of this simple *widget* known to the user agent. *Attributes* that change with user actions (such as `aria-checked`) are defined in the states and properties section.

```
<li role="menuitemcheckbox" aria-checked="true">Sort by Last Modified</li>
```

Some accessibility states, called *managed states*, are controlled by the user agent. Examples of managed state include keyboard focus and selection. Managed states often have corresponding CSS pseudo-classes (such as `:focus` and `::selection`) to define style changes. In contrast, the states in this specification are typically controlled by the author and are called *unmanaged states.* Some states managed by the user agent, such as `aria-posinset` and `aria-setsize`, can be overridden by web application authors, but the author can override them if the DOM is incomplete and would cause the user agent calculation to be incorrect. User agents map both managed and unmanaged states to the platform accessibility APIs.

Most modern user agents support *CSS attribute selectors* ([*CSS*]), and can allow the author to create UI changes based on WAI-ARIA attribute information, reducing the amount of scripts necessary to achieve equivalent functionality. In the following example, a CSS selector is used to determine whether or not the text is bold and an image of a check mark is shown, based on the value of the `aria-checked` attribute.

```
[aria-checked="true"] { font-weight: bold; }
[aria-checked="true"]:before { background-image: url(checked.gif); }
```

> Note: At the time of this writing, this CSS example, while technically correct, will not redraw styles properly in some browsers if the attribute's value is changed dynamically. It may be necessary to toggle a class name, or otherwise force the browser to redraw the styles properly.

If CSS is not used to toggle the visual representation of the check mark, the author could include additional markup and scripts to manage an image that represents whether or not the `menuitemcheckbox` is checked.

```
<li role="menuitemcheckbox" aria-checked="true">
  <img src="checked.gif" role="presentation" alt=""> <!-- additional scripts required to
toggle image source -->
  Sort by Last Modified
</li>
```

2.3. Managing Focus

An `application` should always have an *element* with focus when in use, as applications require users to have a place to provide user input. The element with focus should not be destroyed or

hidden. It should also not be scrolled off-screen unless through user intervention. All interactive objects should be focusable. All parts of composite interactive objects should either be focusable or have a documented alternative method to achieve their function, such as a keyboard shortcut. There should be an obvious, discoverable way, either through tabbing or other standard navigation techniques, for keyboard users to move the focus to any interactive element. See User Agent Accessibility Guidelines, Guideline 9 ([*UAAG*], Guideline 9).

When using standard HTML and basic WAI-ARIA *widgets*, application developers can simply manipulate the tab order or use a script to create keyboard shortcuts to elements in the document. Use of more complex widgets requires the author to manage focus within them. SVG Tiny provides a similar focus mechanism that, by default, follows document source code order and which should be implemented using system dependent input facilities (the `TAB` key on most desktop computers). SVG authors may place elements in the navigation order by manipulating the focusable property and they may dynamically specify the navigation order by modifying elements' navigation attributes.

WAI-ARIA includes a number of "managing container" widgets, also known as "composite" widgets. Typically, the container is responsible for tracking the last descendant which was active (the default is usually the first item in the container). When a previously focused container is refocused, the new active descendant should be the same element as the active descendant when the container was last focused. For example, if the second item of a tree group was the active descendant when the user tabbed out of the tree group, then the second item of the tree group remains the active descendant when the tree group gets focus again. The user may also activate the container by clicking on one of the descendants within it.

When something in the container has focus, the user may navigate through the container by pressing additional keys such as the arrow keys to move relative to the current item. Any additional press of the main navigation key (generally the Tab key) will move out of the container to the next widget.

For example, a `grid` may be used as a spreadsheet with thousands of `gridcell` elements, all of which may not be present in the document at one time. This requires their focus to be managed by the container using the `aria-activedescendant` *attribute*, on the managing container element, or by the container managing the `tabindex` of its child elements and setting focus on the appropriate child. For more information, see *Providing Keyboard Focus in WAI-ARIA Authoring Practices* ([*ARIA-PRACTICES*]).

Containers that manage focus in this way are:

- `combobox`
- `grid`
- `listbox`
- `menu`
- `menubar`
- `tree`
- `treegrid`
- `tablist`
- `toolbar`

More information on managing focus can be found in the Using Tabindex to Manage Focus Among Widgets section of the *WAI-ARIA Authoring Practices* [*ARIA-PRACTICES*].

This Web page is part of Accessible Rich Internet Applications (WAI-ARIA) 1.0. The entire document is also available as a single HTML file. See the WAI-ARIA Overview for an explanation of how this document fits in with other WAI-ARIA documents.

3. Normative Requirements for WAI-ARIA

This section is *normative*.

This specification indicates whether a section is *normative* or *informative*. Classifying a section as normative or informative applies to the entire section. A statement "This section is normative" or "This section is informative" applies to all sub-sections of that section.

Normative sections provide requirements that authors, user agents, and assistive technology **MUST** follow for an implementation to conform to this specification. The keywords **MUST**, **MUST NOT**, **REQUIRED**, **SHALL**, **SHALL NOT**, **SHOULD**, **RECOMMENDED**, **MAY**, and **OPTIONAL** in this document are to be interpreted as described in *Keywords for use in RFCs to indicate requirement levels* [*RFC2119*]. RFC-2119 keywords are formatted in uppercase and contained in a `strong` element with `class="2119"`. When the keywords shown above are used, but do not share this format, they do not convey formal information in the RFC 2119 sense, and should be understood as merely explanatory, i.e., informative. As much as possible such usages are avoided in this specification.

Informative sections provide information useful to understanding the specification. Such sections may contain examples of recommended practice, but it is not required to follow such recommendations in order to conform to this specification.

4. Important Terms

While some terms are defined in place, the following definitions are used throughout this document.

Accessibility API

Operating systems and other platforms provide a set of interfaces that expose information about *objects* and *events* to *assistive technologies*. Assistive technologies use these interfaces to get information about and interact with those *widgets*. Examples of this are the Java Accessibility API [JAPI], Microsoft Active Accessibility [MSAA], the Mac OS X Accessibility Protocol [AXAPI], the Gnome Accessibility Toolkit (ATK) [ATK], and IAccessible2 [IA2].

Accessible Name

The accessible name is the name of a user interface element. Each platform *accessibility API* provides the accessible name property. The value of the accessible name may be derived from a visible (e.g., the visible text on a button) or invisible (e.g., the text alternative that describes an icon) property of the user interface element.

A simple use for the accessible name property may be illustrated by an "OK" button. The text "OK" is the accessible name. When the button receives focus, assistive technology may concatenate the platform's role description with the accessible name. For example, a screen reader may speak "push-button OK" or "OK button". The order of concatenation and specifics of the role description (e.g. "button", "push-button", "clickable button") are determined by each platform accessibility API.

Assistive Technologies

Hardware and/or software that acts as a *user agent*, or along with a mainstream user agent, to meet the interface requirements of users with disabilities beyond those offered by the mainstream *user agents*.

Services provided by assistive technologies include alternative presentations (e.g., synthesized speech or magnified content), alternative input methods (e.g., speech recognition), additional navigation or orientation mechanisms, and content transformations (e.g., to make tables more accessible).

Assistive technologies often communicate with mainstream user agents by using and monitoring *accessibility APIs*.

The distinction between mainstream user agents and assistive technologies is not absolute. Many mainstream user agents provide some features to assist individuals with disabilities. The basic difference is that mainstream user agents target broad and diverse audiences that usually include people with and without disabilities, assistive technologies target users with specific disabilities. The assistance provided by assistive technologies is

more specific and appropriate to the needs of its target users.

Examples of assistive technologies that is important in the context of this document include the following:

- screen magnifiers, which are used to to enlarge and improve the visual readability of rendered text and images;
- screen readers, which are most-often used to convey information through synthesized speech, sound iconography, or Braille;
- text-to-speech software, which is used to convert text into synthetic speech;
- speech recognition software, which is used to allow spoken control and dictation;
- alternate input technologies (including head pointers, on-screen keyboards, single switches, and sip/puff devices), which are used to simulate the keyboard;
- alternate pointing devices, which are used to simulate mouse pointing and clicking.

Attribute

In this specification, attribute is used as it is in markup languages. Attributes are structural features added to *elements* to provide information about the *states* and *properties* of the *object* represented by the element.

Class

An abstract type of *object*.

Element

In this specification, element is used as it is in markup languages. Elements are the structural elements in markup language that contains the data profile for *objects*.

Event

A programmatic message used to communicate discrete changes in the *state* of an *object* to other objects in a computational system. User input to a web page is commonly mediated through abstract events that describe the interaction and can provide notice of changes to the state of a document object. In some programming languages, events are more commonly known as notifications.

Hidden

Indicates that the *element* is not visible or *perceivable* to *any* user.

> Note: Authors are reminded that visibility:hidden and display:none apply to *all* CSS media types; therefore, use of either will hide the content from all renderers, regardless of modality. Authors using other techniques (for example, opacity or off-screen positioning) to visibly 'hide' content should ensure the `aria-hidden` attribute is updated accordingly.

Informative

Content provided for information purposes and not required for conformance. Content required for conformance is referred to as *normative*.

Keyboard Accessible

Accessible to a user using a keyboard or *assistive technologies* that mimic keyboard input, such as a sip and puff tube. References in this document relate to *WCAG 2 Guideline 2.1; "Make all functionality available from a keyboard"* [*WCAG20*].

Landmark

A type of region on a page to which a user may want quick access. Content in such a region meets a specific purpose, different from that of other regions on the page and relevant to specific user purposes, such as navigating, searching, perusing the primary content, etc.

Managed State

A *state* that is relevant to *accessibility APIs* but whose value is read and set by the *user agent*. The application author does not always manage these states, but needs to be aware that the user agent will do so. In some cases the application author does manage these states as well. Common managed states include focus and selection.

Normative

Required for conformance. By contrast, content identified as *informative* or "non-normative" is not required for conformance.

Object

A "thing" in the perceptual user experience, instantiated in markup languages by one or more *elements*, and converted into the object-oriented pattern by *user agents*. Objects are instances of *classes*, which define the general characteristics of object instances. A single DOM object may or may not correspond with a single object in an *accessibility API*. An object in an accessibility API may encapsulate one or more DOM objects.

Ontology

A description of the characteristics of *classes* and how they relate to each other.

Operable

Usable by users in ways they can control. References in this document relate to *WCAG 2 Principle 2; content must be operable* [*WCAG20*]. See *Keyboard Accessible*.

Owned Element

An 'owned element' of a WAI-ARIA *role* is any DOM descendant of the *element*, any element specified as a child via `aria-owns`, or any DOM descendant of the owned child.

Perceivable

Presentable to users in ways they can sense. References in this document relate to *WCAG 2 Principle 1; content must be perceivable* [*WCAG20*].

Property

Attributes that are essential to the nature of a given *object*. As such, they are less likely to change than *states*; a change of a property may significantly impact the meaning or presentation of an object. Properties mainly provide limitations on objects from the most general case implied by *roles* without properties applied. See clarification of states versus properties.

Relationship

A connection between two distinct, articulable things. Relationships may be of various types to indicate which *object* labels another, controls another, etc.

Role

An indicator of type. The object's role is the class of *objects* of which it is a member. This *semantic* association allows tools to present and support interaction with the object in a manner that is consistent with user expectations about other objects of that type.

Semantics

The meaning of something as understood by a human, defined in a way that computers can process a representation of an *object*, such as *elements* and *attributes*, and reliably represent the object in a way that various humans will achieve a mutually consistent understanding of the object.

State

A state is a dynamic *property* expressing characteristics of an *object* that may change in response to user action or automated processes. States do not affect the essential nature of the object, but represent data associated with the object or user interaction possibilities. See clarification of states versus properties.

Taxonomy

A hierarchical definition of how the characteristics of various *classes* relate to each other, in which classes inherit the properties of ancestor classes in the hierarchy. A taxonomy can comprise part of the formal definition of an *ontology*.

Understandable

Presentable to users in ways they can construct an appropriate meaning. References in this document relate to *WCAG 2 Principle 3; Information and the operation of user interface must be understandable* [*WCAG20*].

User Agent

Any software that retrieves and renders web content for users, such as web browsers, media players, plug-ins, and other programs including *assistive technologies*.

Value

A literal that concretizes the information expressed by a *state* or *property*, or text content.

Widget

Discrete user interface object with which the user can interact. Widgets range from simple objects that have one value or operation (e.g., check boxes and menu items), to complex objects that contain many managed sub-objects (e.g., trees and grids).

available as a single HTML file. See the WAI-ARIA Overview for an explanation of how this document fits in with other WAI-ARIA documents.

5. The Roles Model

This section is *normative*.

This section defines the WAI-ARIA *role taxonomy* and describes the characteristics and properties of all *roles*. A formal RDF/OWL representation of all the information presented here is available in Schemata Appendix.

The roles, their characteristics, the states and properties they support, and specification of how they may be used in markup, shall be considered normative. The RDF/OWL representation used to model the taxonomy shall be considered to be informative. The RDF/OWL taxonomy may be used as a vehicle to extend WAI-ARIA in the future or by tools manufacturers to validate states and properties applicable to roles per this specification.

Roles are element types and authors **MUST NOT** change role values over time or with user actions. Platform accessibility APIs typically do not provide a vehicle to notify assistive technologies that a role has changed. Due to this and document caching, assistive technologies are unlikely to process a change in role attribute value. In order to reflect the content in the DOM, user agents **SHOULD** map the role attribute to the appropriate value in the implemented accessibility API, and user agents **SHOULD** update the mapping when the role attribute changes. However, it is unlikely that assistive technologies will process this change, so authors wishing to change a role **SHOULD** do so by deleting the associated element and its children and replacing it with a new element with the appropriate role.

5.1. Relationships Between Concepts

The *role taxonomy* uses the following relationships to relate WAI-ARIA roles to each other and to concepts from other specifications, such as HTML and XForms.

5.1.1. Superclass Role

RDF Property
rdfs:subClassOf

The *role* that this role extends in the *taxonomy*. This extension causes all the properties and constraints of the superclass role to propagate to the subclass role. Other than well known stable specifications, inheritance may be restricted to items defined inside this specification so that items cannot be changed and affect inherited *classes*.

Inheritance is expressed in RDF using the RDF Schema *subClassOf* ([*RDFS*]) property.

5.1.2. Subclass Roles

RDF Property
<none>

Informative list of *roles* for which this role is the superclass. This is provided to facilitate reading of the specification but adds no new information.

5.1.3. Related Concepts

RDF Property
role:relatedConcept

Informative data about a similar or related idea from other specifications. Concepts that are related are not necessarily identical. Related concepts do not inherit properties from each other. Hence if the definition of a type changes, the properties, behavior, and definition of a related concept is not affected.

For example, a progress bar is like a status indicator. Therefore, the `progressbar` *widget* has a `role:relatedConcept` value which includes `status`. However if the definition of `status` is modified, the definition of a `progressbar` will not be affected.

5.1.4. Base Concept

RDF Property
role:baseConcept

Informative data about *objects* that are considered prototypes for the *role*. Base concept is similar to type, but without inheritance of limitations and properties. Base concepts are designed as a substitute for inheritance for external concepts. A base concept is like a relatedConcept except that base concepts are almost identical to each other.

For example, the `checkbox` defined in this document has similar functionality and anticipated behavior to a checkbox defined in HTML. Therefore, a `checkbox` has an HTML `checkbox` as a `baseConcept`. However, if the original HTML checkbox baseConcept definition is modified, the definition of a `checkbox` in this document will not be not affected, because there is no actual inheritance of the respective type.

5.2. Characteristics of Roles

Roles are defined and described by their characteristics. Characteristics define the structural function of a role, such as what a role is, concepts behind it, and what instances the role can or must contain. In the case of *widgets* this also includes how it interacts with the *user agent* based on mapping to HTML forms and XForms. States and properties from WAI-ARIA that are supported by the role are also indicated.

The Roles *Taxonomy* defines the following characteristics. These characteristics are implemented in RDF as properties of the OWL *classes* that describe the roles.

5.2.1. Abstract Roles

RDF Property
N/A
Values
Boolean

Abstract *roles* are the foundation upon which all other WAI-ARIA roles are built. Content authors **MUST NOT** use abstract roles because they are not implemented in the API binding. User agents **MUST NOT** map abstract roles to the standard role mechanism of the accessibility

API. Conformance checkers **SHOULD** raise an error when abstract roles are used. Abstract roles are provided to help with the following:

1. Organize the role *taxonomy* and provide roles with a meaning in the context of known concepts.
2. Streamline the addition of roles that include necessary features.

5.2.2. Required States and Properties

RDF Property
role:requiredState
Values
Any valid RDF object reference, such as a URI or an RDF ID reference.

States and *properties* specifically required for the *role* and child roles. Content authors **MUST** provide *values* for required states and properties.

When an *object* inherits from multiple ancestors and one ancestor indicates that property is supported while another ancestor indicates that it is required, the property is required in the inheriting object.

> Note: An element with the appropriate implicit ARIA semantic fulfills this requirement.

5.2.3. Supported States and Properties

RDF Property
role:supportedState
Values
Any valid RDF object reference, such as a URI or an RDF ID reference.

States and *properties* specifically applicable to the *role* and child roles. *User agents* **MUST** map all supported states and properties for the role to an accessibility API. Content authors **MAY** provide *values* for supported states and properties, but may not in all cases because default values are sufficient.

> Note: An element with the appropriate implicit ARIA semantic fulfills this requirement.

5.2.4. Inherited States and Properties

Informative list of properties that are inherited onto a *role* from ancestor roles. *States* and *properties* are inherited from ancestor roles in the role *taxonomy*, not from ancestor *elements* in the DOM tree. These properties are not explicitly defined on the role, as the inheritance of properties is automatic. This information is provided to facilitate reading of the specification. Inherited states and properties that are required are indicated as such in this field as well. The set of supported states and properties combined with inherited states and properties forms the full set of states and properties supported by the role.

5.2.5. Required Owned Elements

RDF Property
role:mustContain

Values
Any valid RDF object reference, such as a URI or an RDF ID reference.

Any *element* that will be *owned* by the element with this *role*. For example, an element with the role `list` will own at least one element with the role `group` or `listitem`.

When multiple roles are specified as *Required Owned Elements* for a role, at least one instance of one required owned element is expected. This specification does *not* require an instance of each of the listed owned roles. For example, a `menu` should have at least one instance of a `menuitem`, `menuitemcheckbox`, *or* `menuitemradio`. The `menu` role does not require one instance of each.

There may be times that required owned elements are missing, for example, while editing or while loading a data set.

> Note: A role that has 'required owned elements' does not imply the reverse relationship. While processing of a role may be incomplete without elements of given roles present as descendants, elements with roles in this list do not always have to be found within elements of the given role. See required context role for requirements about elements in which elements of a given role must be contained.

> Note: An element with a subclass role of the 'required owned element' *does not* fulfill this requirement.

> Note: An element with the appropriate implicit ARIA semantic fulfills this requirement.

5.2.6. Required Context Role

RDF Property
role:scope
Values
Any valid RDF object reference, such as a URI or an RDF ID reference.

The required context role defines the owning container where this *role* is allowed. If a role has a required context, authors **MUST** ensure that an element with the role is contained inside (or owned by) an element with the required context role. For example, an element with role `listitem` is only meaningful when contained inside (or owned by) an element with role `list`.

> Note: A role that has 'required context role' does not imply the reverse relationship. While an element with the given role needs to appear within an element of the listed role(s) in order to be meaningful, elements of the listed roles do not always need descendant elements of the given role in order to be meaningful. See required owned elements for requirements about elements that require presence of a given descendant to be processed properly.

> Note: An element with the appropriate implicit ARIA semantic fulfills this requirement.

5.2.7. Accessible Name Calculation

RDF Property
role:nameFrom
Values
One of the following values:

1. author: name comes from values provided by the author in explicit markup features such as the `aria-label` *attribute*, `aria-labelledby` attribute, or the HTML `title` attribute.
2. contents: name comes from the text value of the *element* node. Although this may be allowed in addition to "author" in some *roles*, this is used in content only if "author" features are not provided.

5.2.7.1. Name Computation

An *accessible name* is computed using a number of methods. Please refer to the *WAI-ARIA User Agent Implementation Guide* [*ARIA-IMPLEMENTATION*] Name Computation to determine how this computation is performed.

5.2.7.2. Description Computation

An accessible description may be computed by concatenating the text alternatives for nodes pointed to by an `aria-describedby` attribute on the current node.

5.2.7.3. Text Alternative Computation

The text alternative computation outlined below is a description of how user agents acquire a name or description that they then publish through the accessiblity API. User agent implementers are referred to the *WAI-ARIA User Agent Implementation Guide* [*ARIA-IMPLEMENTATION*] for a complete description of the algorithm. Authors can use the current section as a guide for creating names and descriptions in their markup. Checker tools can implement a name and/or description generator based on this algorithm such that authors can use the generated text equivalent to confirm that names and descriptions are as the author intended.

> Note: Though a user agent may make efforts to compute a text alternative from CSS-generated text in the absence of text content determinable from the DOM, authors should not provide text through a style sheet, as a user agent may incorrectly determine the text alternative.

The text alternative is reused in both the name and description computation, as described above. There are different rules provided for several different types of nodes and combinations of markup. Text alternatives are built up, when appropriate, from all the relevant content contained within an *element*. This is accomplished via rule 2C (which is recursive), using the full set of rules to retrieve text from its own children.

The text alternative for a given node is computed as follows:

1. Skip *hidden* elements unless the author specifies to use them via an `aria-labelledby` or `aria-describedby` being used in the current computation. By default, users of *assistive technologies* won't receive the hidden information, but an author will be able to explicitly

override that and include the hidden information.

2. For any non-skipped elements:
   A. Authors **MAY** specify an element's text alternative in content *attributes*, used in this order of preference:
      - The `aria-label` attribute, which defines an explicit text string, takes precedence as the element's text alternative.
      - If `aria-label` is empty or undefined, the `aria-labelledby` attribute is used unless this computation is already occurring as the result of a recursive `aria-labelledby` declaration (in other words, `aria-labelledby` is not recursive, so it will not cause loops). The text alternatives for all the elements referenced will be computed using this same set of rules. User agents will then trim whitespace and join the substrings using a single space character. Substrings will be joined in the order specified by the author (IDREF order in the `aria-labelledby` attribute).
      - If `aria-label` and `aria-labelledby` are empty or undefined, check for the presence of an equivalent host language attribute or element for associating a label, and use those mechanisms to determine a text alternative. For example, in HTML, the `img` element's `alt` attribute defines a label string and the `label` element references the form element it labels.

   B. Authors sometimes embed a control within the label of another widget, where the user can adjust the embedded control's value. For example, consider a check box label that contains a text input field: "Flash the screen [input] times". If the user has entered "5" for the embedded text input, the complete label is "Flash the screen 5 times". For such cases, include the value of the embedded control as part of the text alternative in the following manner:
      - If the embedded control is a text field, use its value.
      - If the embedded control is a menu, use the text alternative of the chosen menu item.
      - If the embedded control is a select or combobox, use the chosen option.
      - If the embedded control is a range (e.g. a `spinbutton` or `slider`), use the value of the `aria-valuetext` attribute if available, or otherwise the value of the `aria-valuenow` attribute.

   C. Otherwise, if the attributes checked in rules A and B didn't provide results, text is collected from descendant content if the current element's *role* allows "Name From: contents." The text alternatives for child nodes will be concatenated, using this same set of rules. This same rule may apply to a child, which means the computation becomes recursive and can result in text being collected in all the nodes in this subtree, no matter how deep they are. However, any given descendant subtree may instead collect their part of the text alternative from the preferred markup described in A and B above. These author-specified attributes are assumed to provide the correct text alternative for the entire subtree. All in all, the node rules are applied consistently as text alternatives are collected from descendants, and each containing element in those descendants may or may not allow their contents to be used. Each node in the subtree is consulted only once. If text has been collected from a child node, and is referenced by another IDREF in some descendant node, then that second, or subsequent, reference is not followed. This is done to avoid infinite loops.

   D. The last resort is to use text from a tooltip attribute (such as the `title` attribute in HTML). This is used only if nothing else, including subtree content, has provided results.

3. Text nodes are often visited because they are children of an element that uses rule 2C to collect text from its children. However, because it is possible to specify textual content using the CSS `:before` and `:after` pseudo-elements, it is necessary for user agents to combine such content with the text referenced by the text nodes to produce a complete

text alternative.

The purpose of the flat text alternative string is to create a perceivable label in alternative presentations. At each step of the algorithm, an implementation will trim the existing text equivalent string and the string to be added, then join those two strings with a single space. For example, a space character may be inserted between the text of two elements used one after the other in a description.

5.2.7.4. Text Alternative Computation Example #1

- **aria-labelledby (Rule 2A):** The label of the first menuitem in the menubar example markup above is "File" based on rule 2A. The element has an `aria-labelledby` attribute that picks out the `span` element with `id="fileLabel"` The `span` contains the label text.
- **Namefrom: contents (Rule 2C):** The label of the first item in the file menu is "New" based on rule 2C. Since `menuitem` elements can acquire their label by the "Namefrom: content" technique, the textual content of the `menuitem` element itself is sufficient. Note that this menuitem has no attributes such as aria-label, aria-labelledby, alt, or title from which to acquire a label.

```
<ul role="menubar">

 <!-- Rule 2A: "File" label via aria-labelledby -->
  <li role="menuitem" aria-haspopup="true" aria-labelledby="fileLabel"><span
id="fileLabel">File</span>
    <ul role="menu">

      <!-- Rule 2C: "New" label via Namefrom:contents -->
      <li role="menuitem" aria-haspopup="false">New</li>
      <li role="menuitem" aria-haspopup="false">Open…</li>
      …
    </ul>
  </li>
  …
</ul>
```

5.2.7.5. Text Alternative Computation Example #2

- **native `label` element (Rule 2A):** Use of a native element, is illustrated in first checkbox where its label is defined by the HTML `label` element.
- **embedded input (Rule 2C):** The third checkbox illustrates an embedded control adding to a larger label (Rule 2B). Here the label is "Flash the screen 3 times", where "3" is taken from the value of the embedded text `input`.
- **aria-label (Rule 2A):** Rule 2A, using aria-label, is shown for this embedded text `input`. The rationale is to give a label to this element, but in a way that does not interfere with the enclosing label of the checkbox. The label is needed by a screen reader when focus is on the text input.

```
<fieldset>
  <legend>Meeting alarms</legend>

  <!-- Rule 2A: "Beep" label given by native HTML label element -->
  <input type="checkbox" id="beep"> <label for="beep">Beep</label> <br>
  <input type="checkbox" id="mtgTitle"> <label for="mtgTitle">Display the meeting
title</label> <br>

  <!-- Rule 2B: Full label of checkbox includes value ("3") of embedded text input, "Flash
the screen 3 times" -->
```

```
  <input type="checkbox" id="flash">
  <label for="flash">
    Flash the screen

    <!-- Rule 2A: label of text input given by aria-label, "Number of times to flash
screen" -->
    <input type="text" value="3" size="2" id="numTimes" aria-label="Number of times to
flash screen">
    times
  </label>
</fieldset>
```

5.2.8. Presentational Children

RDF Property

role:childrenArePresentational

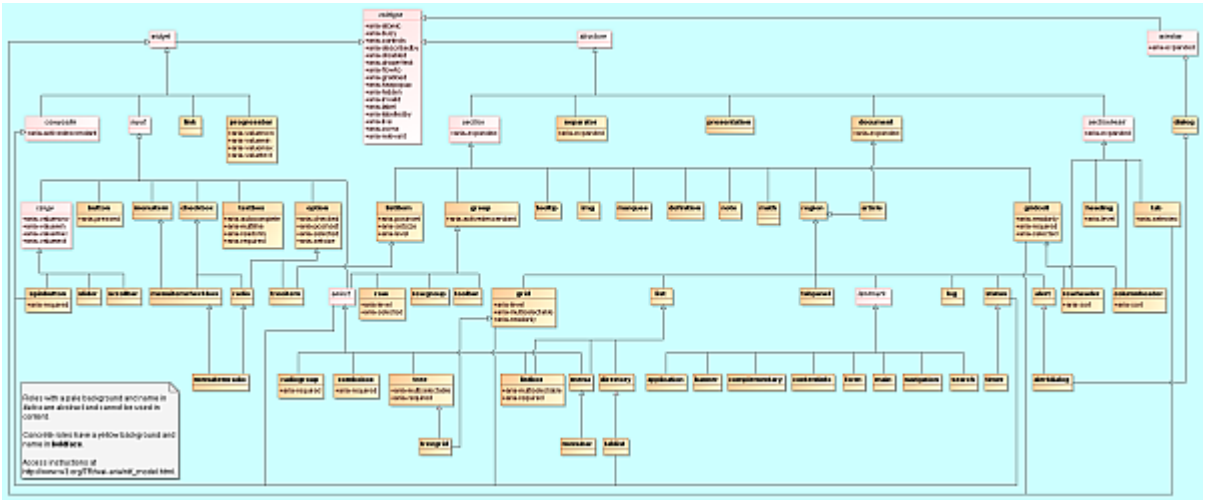
Values

Boolean (true | false)

The DOM descendants are presentational. *User agents* **SHOULD NOT** expose tdescendants of this *element* through the platform *accessibility API*. If *user agents* do not hide the descendant nodes, some information may be read twice.

5.3. Categorization of Roles

To support the current user scenario, this specification categorizes *roles* that define user interface *widgets* (sliders, tree controls, etc.) and those that define page structure (sections, navigation, etc.). Note that some assistive technologies provide special modes of interaction for regions marked with with role `application` or `document`.



Class diagram of the relationships described in the role data model.

SVG class diagram | PNG class diagram | Class diagram description

Roles are categorized as follows:

1. Abstract Roles
2. Widget Roles
3. Document Structure Roles
4. Landmark Roles

5.3.1. Abstract Roles

The following *roles* are used to support the 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.

- 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)

5.3.2. Widget Roles

The following roles act as user interface widgets that do not provide a defined structure.

- alert
- alertdialog
- button
- checkbox
- combobox
- dialog
- gridcell
- link
- log
- marquee
- menuitem
- menuitemcheckbox
- menuitemradio
- option
- progressbar
- radio
- radiogroup
- scrollbar
- slider
- spinbutton
- status
- tab
- tabpanel
- textbox
- timer
- tooltip
- treeitem

The following roles act as composite user interface widgets that provide a defined structure. These roles typically act as containers that manage other, contained widgets.

- grid
- listbox

- menu
- menubar
- tablist
- toolbar
- tree
- treegrid

5.3.3. Document Structure

The following *roles* describe structures that organize content in a page. Document structures are not usually interactive.

- article
- columnheader
- definition
- directory
- document
- group
- heading
- img
- list
- listitem
- math
- note
- presentation
- region
- row
- rowheader
- separator

5.3.4. Landmark Roles

The following *roles* are regions of the page intended as navigational *landmarks*. All of these roles inherit from the `landmark` base type and, with the exception of `application`, all are imported from the *XHTML Role Attribute Module* [*XHTML-ROLES*]. The roles are included here in order to make them clearly part of the WAI-ARIA Role *taxonomy*.

- application
- banner
- complementary
- contentinfo
- form
- main
- navigation
- search

5.4. Definition of Roles

Below is an alphabetical list of WAI-ARIA *roles* to be used by rich internet application authors.

Abstract roles are used for the ontology. Authors **MUST NOT** not use abstract roles in content.

alert
: A message with important, and usually time-sensitive, information. Also see alertdialog

and status.

alertdialog
: A type of dialog that contains an alert message, where initial focus goes to the dialog or an element within it. Also see alert and dialog.

application
: A region declared as a web application, as opposed to a web document.

article
: A section of a page that consists of a composition that forms an independent part of a document, page, or site.

banner
: A region that contains mostly site-oriented content, rather than page-specific content.

button
: An input that allows for user-triggered actions when clicked or pressed.

checkbox
: A checkable input that has three possible values: true, false, or mixed.

columnheader
: A cell containing header information for a column.

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. Also see listbox.

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.

composite (abstract role)
: A widget that may contain navigable descendants or owned children.

contentinfo
: A large perceivable region that contains information about the parent document.

definition
: A definition of a term or concept.

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. Also see alertdialog.

directory
: A list of references to members of a group, such as a static table of contents.

document
: A region containing related information that is declared as document content, as opposed to a web application.

form
: A region of the document that represents a collection of form-associated elements, some of which can represent editable values that can be submitted to a server for processing.

grid
: A grid contains cells of tabular data arranged in rows and columns, like a table.

gridcell
: A cell in a grid or treegrid.

group
: A set of user interface objects which are not intended be included in a page summary or table of contents by assistive technologies.

heading
: A heading for a section of the page.

img
: A container for a collection of elements that form an image.

input (abstract role)
: A generic type of widget that allows user input.

landmark (abstract role)
: A region of the page intended as a navigational landmark.

link
: An interactive reference to an internal or external resource that, when activated, causes the user agent to navigate to that resource.

list
: A group of non-interactive list items. Also see listbox.

listbox
: A widget that allows the user to select one or more items from a list of choices. Also see combobox and list.

listitem
: A single item in a list or directory.

log
: A type of live region where new information is added in meaningful order and old information may disappear. Also see marquee.

main
: The main content of a document.

marquee
: A type of live region where non-essential information changes frequently. Also see log.

math
: An element that represents a mathematical expression.

menu
: A type of widget that offers a list of choices to the user.

menubar
: A presentation of menu that usually remains visible and is usually presented horizontally.

menuitem
: An option in a group of choices contained by a menu or menubar.

menuitemcheckbox
: A checkable menuitem that has three possible values: true, false, or mixed.

menuitemradio
: A checkable menuitem in a group of menuitemradio roles, only one of which can be checked at a time.

navigation
: A collection of navigational elements (usually links) for navigating the document or related documents.

note
: A section whose content is parenthetic or ancillary to the main content of the resource.

option
: A selectable item in a select list.

presentation
: An element whose implicit native role semantics will not be mapped to the accessibility API.

progressbar
: An element that displays the progress status for tasks that take a long time.

radio
: A checkable input in a group of radio roles, only one of which can be checked at a time.

radiogroup
: A group of radio buttons.

range (abstract role)
: An input representing a range of values that can be set by the user.

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.

roletype (abstract role)
: The base role from which all other roles in this taxonomy inherit.

row
: A row of cells in a grid.

rowgroup
: A group containing one or more row elements in a grid.

rowheader
: A cell containing header information for a row in a grid.

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.

search
: A landmark region that contains one or more widgets used to define and execute a search.

section (abstract role)
: A renderable structural containment unit in a document or application.

sectionhead (abstract role)
: A structure that labels or summarizes the topic of its related section.

select (abstract role)
: A form widget that allows the user to make selections from a set of choices.

separator
: A divider that separates and distinguishes sections of content or groups of menuitems.

slider
: A user input where the user selects a value from within a given range.

spinbutton
: A form of range that expects a user to select from amongst discrete choices.

status
: A container whose content is advisory information for the user but is not important enough to justify an alert. Also see alert.

structure (abstract role)
: A document structural element.

tab
: A grouping label providing a mechanism for selecting the tab content that is to be rendered to the user.

tablist
: A list of tab elements, which are references to tabpanel elements.

tabpanel
: A container for the resources associated with a tab, where each tab is contained in a tablist.

textbox
: Input that allows free-form text as their value.

timer
: A numerical counter which indicates an amount of elapsed time from a start point, or the time remaining until an end point.

toolbar
: A collection of commonly used function buttons represented in compact visual form.

tooltip
: A contextual popup that displays a description for an element.

tree
: A type of list that may contain sub-level nested groups that can be collapsed and expanded.

treegrid
: A grid whose rows can be expanded and collapsed in the same manner as for a tree.

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.

widget (abstract role)
: An interactive component of a graphical user interface (GUI).

window (abstract role)
: A browser or application window.

---

alert **(role)**

A message with important, and usually time-sensitive, information. Also see `alertdialog` and `status`.

Alerts are used to convey messages to alert the user. In the case of audio warnings this is an accessible alternative for a hearing-impaired user. The `alert` *role* goes on the node containing the alert message. Alerts are specialized forms of the `status` role, which will be processed as an atomic live region.

Alerts are assertive live regions and will be processed as such by assistive technologies. Neither authors nor user agents are required to set or manage focus to them in order for them to be processed. Since alerts are not required to receive focus, content authors **SHOULD NOT** require users to close an alert. If the operating system allows, the *user agent* **MAY** fire a system alert *event* through the accessibility API when the WAI-ARIA alert is created. If an alert requires focus to close the alert, then content authors **SHOULD** use `alertdialog` instead.

> Note: Elements with the role `alert` have an implicit `aria-live` value of `assertive`.

Characteristics of alert

Characteristic	Value
Superclass Role:	`region`
Subclass Roles:	`alertdialog`
Related Concepts:	XForms alert

Inherited States and Properties:	`aria-atomic`
	`aria-busy` (state)
	`aria-controls`
	`aria-describedby`
	`aria-disabled` (state)
	`aria-dropeffect`
	`aria-expanded` (state)
	`aria-flowto`
	`aria-grabbed` (state)
	`aria-haspopup`
	`aria-hidden` (state)
	`aria-invalid` (state)
	`aria-label`
	`aria-labelledby`
	`aria-live`
	`aria-owns`
	`aria-relevant`

Name From:	author
Implicit Value for Role:	Default for `aria-live` is `assertive`.

`alertdialog` (role)

A type of dialog that contains an alert message, where initial focus goes to the dialog or an *element* within it. Also see `alert` and `dialog`.

Alert dialogs are used to convey messages to alert the user. The `alertdialog` *role* goes on the node containing both the alert message and the rest of the dialog. Content authors

SHOULD make alert dialogs modal by ensuring that, while the `alertdialog` is shown, keyboard and mouse interactions only operate within the dialog.

Unlike `alert`, `alertdialog` can receive a response from the user. For example, to confirm that the user understands the alert being generated. When the alert dialog is displayed, authors **SHOULD** set focus to an active element within the alert dialog, such as a form edit field or an OK button. The *user agent* **MAY** fire a system alert *event* through the accessibility API when the alert is created, provided one is specified by the intended *accessibility API*.

Authors **SHOULD** use `aria-describedby` on an `alertdialog` to point to the alert message element in the dialog. If they do not, *assistive technologies* will resort to their internal recovery mechanism to determine the contents of an alert message.

> Note: Elements with the role `alertdialog` have an implicit `aria-live` value of `assertive`.

Characteristics of alertdialog

Characteristic	Value
Superclass Role:	`alert` `dialog`
Related Concepts:	XForms alert

Inherited States and Properties:	`aria-atomic`
	`aria-busy` (state)
	`aria-controls`
	`aria-describedby`
	`aria-disabled` (state)
	`aria-dropeffect`
	`aria-expanded` (state)
	`aria-flowto`
	`aria-grabbed` (state)
	`aria-haspopup`
	`aria-hidden` (state)
	`aria-invalid` (state)
	`aria-label`
	`aria-labelledby`
	`aria-live`
	`aria-owns`
	`aria-relevant`

Name From:	author
Accessible Name Required:	True
Implicit Value for Role:	Default for `aria-live` is `assertive`.

`application` (role)

A region declared as a web application, as opposed to a web `document`.

When a user navigates an element assigned the role of `application`, *assistive technology* that typically intercepts standards keyboard events **SHOULD** switch to an application browsing mode, and pass keyboard events through to the web application. The intent is to hint to certain *assistive technology* to switch from normal browsing mode into a mode more

appropriate for interacting with a web application; some *user agents* have a browse navigation mode where keys, such as up and down arrows, are used to browse the document, and this native behavior prevents the use of these keys by a web application.

Authors **SHOULD** set the *role* of `application` on the *element* that encompasses the entire application. If the application role applies to the entire web page, authors **SHOULD** set the role of `application` on the root node for content, such as the `body` element in HTML or `svg` element in SVG.

For example, an email application has a document and an application in it. The author would want to use typical application navigation mode to cycle through the list of emails, and much of this navigation would be defined by the application author. However, when reading an email message the content will appear in a region with a `document` *role* in order to use browsing navigation.

For all instances of non-decorative static text or image content inside an application, authors **SHOULD** either associate the text with a form *widget* or `group` (via `aria-label`, `aria-labelledby`, or `aria-describedby`) or separate the text into an element with role of `document` or `article`.

Authors **SHOULD** provide a title or label for applications. Authors **SHOULD** use label text that suitable for use as a navigation preview or table-of-contents entry for the page section. Content authors **SHOULD** provide the label through one of the following methods:

- If the application includes the entire contents of the web page, use the host language feature for title or label, such as the `title` element in both HTML and SVG. This has the effect of labeling the entire application.
- Otherwise, provide a visible label referenced by the application using `aria-labelledby`.

User agents **SHOULD** treat elements with the role of `application` as navigational *landmarks*.

Authors **MAY** use the `application` role on the main content element of the host language (such as the `body` element in HTML) to define entire page as an application. However, if the main content element is defined as having a role of `application`, user agents **MUST NOT** use the element as a navigational landmark. If assistive technology uses an interaction mode that intercepts standard keyboard events, when encountering the `application` role, assistive technology **SHOULD** switch to an interaction mode that passes keyboard events through to the web application.

Characteristics of application

Characteristic	Value
Superclass Role:	`landmark`
Related Concepts:	Device Independence Delivery Unit

Inherited States and Properties:	`aria-atomic`
	`aria-busy` (state)
	`aria-controls`
	`aria-describedby`
	`aria-disabled` (state)
	`aria-dropeffect`
	`aria-expanded` (state)
	`aria-flowto`
	`aria-grabbed` (state)
	`aria-haspopup`

	aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author
Accessible Name Required:	True

`article` (role)

A section of a page that consists of a composition that forms an independent part of a document, page, or site.

An article is not a navigational *landmark*, but may be nested to form a discussions where an assistive technology could pay attention to article nesting to assist the user in following the discussion. An article could be a forum post, a magazine or newspaper article, a web log entry, a user-submitted comment, or any other independent item of content. It is *independent* in that its contents could stand alone, for example in syndication. However, the *element* is still associated with its ancestors; for instance, contact information that applies to a parent body element still covers the article as well. When nesting articles, the child articles represent content that is related to the content of the parent article. For instance, a web log entry on a site that accepts user-submitted comments could represent the comments as articles nested within the article for the web log entry. Author, heading, date, or other information associated with an article does not apply to nested articles.

When a user navigates an element assigned the role of `article`, *assistive technology* that typically intercepts standards keyboard events **SHOULD** switch to document browsing mode, as opposed to passing keyboard events through to the web application. Assistive technologies **MAY** provide a feature allowing the user to navigate the hierarchy of any nested `article` elements.

Characteristics of article

Characteristic	Value
Superclass Role:	document region
Related Concepts:	HTML 5 article
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live _____

	aria-owns aria-relevant
Name From:	author

---

banner (role)

A region that contains mostly site-oriented content, rather than page-specific content.

Site-oriented content typically includes things such as the logo or identity of the site sponsor, and site-specific search tool. A banner usually appears at the top of the page and typically spans the full width.

User agents **SHOULD** treat elements with the role of banner as navigational *landmarks*.

Within any document or application, the author **SHOULD** mark no more than one *element* with the banner *role*.

> Note: Because document and application elements can be nested in the DOM, they may have multiple banner elements as DOM descendants, assuming each of those is associated with different document nodes, either by a DOM nesting (e.g., document within document) or by use of the aria-owns *attribute*.

Characteristics of banner

Characteristic	Value
Superclass Role:	landmark
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

button (role)

An input that allows for user-triggered actions when clicked or pressed.

Buttons are mostly used for discrete, atomic actions. Standardizing the appearance of buttons enhances a user's recognition of the *widgets* as buttons and allows for a more

compact display in toolbars.

Buttons support the optional *attribute* `aria-pressed`. Buttons with a non-empty `aria-pressed` attribute are toggle buttons. When `aria-pressed` is `true` the button is in a "pressed" *state*, when `aria-pressed` is `false` it is not pressed. If the attribute is not present, the button is a simple command button.

Characteristics of button

Characteristic	Value
Superclass Role:	`input`
Base Concept:	HTML button
Related Concepts:	`link` XForms trigger
Supported States and Properties:	`aria-pressed` (state)

Inherited 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`

Name From:	contents author
Accessible Name Required:	True
Children Presentational:	True

---

checkbox **(role)**

A checkable input that has three possible *values*: `true`, `false`, or `mixed`.

The `aria-checked` *attribute* of a `checkbox` indicates whether the input is checked (`true`), unchecked (`false`), or represents a group of *elements* that have a mixture of checked and unchecked values (`mixed`). Many checkboxes do not use the `mixed` value, and thus are effectively boolean checkboxes.

Characteristics of checkbox

Characteristic	Value
Superclass Role:	`input`
Subclass Roles:	`menuitemcheckbox` `radio`
Related Concepts:	HTML `input[type="checkbox"]` `option`

Required States and Properties:	aria-checked (state)
Inherited 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
Name From:	contents author
Accessible Name Required:	True

---

columnheader **(role)**

A cell containing header information for a column.

columnheader can be used as a column header in a table or grid. It could also be used in a pie chart to show a similar *relationship* in the data.

The columnheader establishes a relationship between it and all cells in the corresponding column. It is the structural equivalent to an HTML th *element* with a column scope.

> Note: Because cells are organized into rows, there is not a single container element for the column. The column is the set of gridcell elements in a particular position within their respective row containers.

Characteristics of columnheader

Characteristic	Value
Superclass Role:	gridcell sectionhead
Base Concept:	HTML th[scope="col"]
Required Context Role:	row
Supported States and Properties:	aria-sort
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup

	aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-readonly aria-relevant aria-required aria-selected (state)
Name From:	contents author
Accessible Name Required:	True

---

combobox **(role)**

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. Also see listbox.

combobox is the combined presentation of a single line text box with a list box popup. The combobox may be editable. Typically editable combo boxes are used for autocomplete behavior, and the aria-autocomplete *property* may be used on the child textbox.

> Note: In *XForms* [*XFORMS*] the same select can have one of 3 appearances: combo-box, drop-down box, or group of radio-buttons. Many browsers allow users to type ahead to existing choices in a drop-down select widget. This specification does not constrain the presentation of the combo box.

To be *keyboard accessible*, authors **SHOULD** manage focus of descendants for all instances of this *role*, as described in Managing Focus.

> Note: Elements with the role combobox have an implicit aria-haspopup value of true.

Characteristics of combobox

Characteristic	Value
Superclass Role:	select
Related Concepts:	HTML select XForms select
Required Owned Elements:	listbox textbox
Required States and Properties:	aria-expanded (state)
Supported States and Properties:	aria-required
Inherited States and Properties:	aria-activedescendant 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
Name From:	author
Accessible Name Required:	True
Implicit Value for Role:	Default for aria-haspopup is true.

---

complementary **(role)**

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.

There are various types of content that would appropriately have this *role*. For example, in the case of a portal, this may include but not be limited to show times, current weather, related articles, or stocks to watch. The complementary role indicates that contained content is relevant to the main content. If the complementary content is completely separable main content, it may be appropriate to use a more general role.

User agents **SHOULD** treat elements with the role of complementary as navigational *landmarks*.

Characteristics of complementary

Characteristic	Value
Superclass Role:	landmark
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

composite (abstract role)

A *widget* that may contain navigable descendants or owned children.

Authors **SHOULD** ensure that a composite widget exist as a single navigation stop within the larger navigation system of the web page. Once the composite widget has focus, authors **SHOULD** provide a separate navigation mechanism for users to navigate to *elements* that are descendants or owned children of the composite element.

> Note: composite is an abstract role used for the ontology. Authors must not use this role in content.

Characteristics of composite

Characteristic	Value
Is Abstract:	True
Superclass Role:	widget
Subclass Roles:	grid select spinbutton status tablist
Supported States and Properties:	aria-activedescendant
Inherited 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
Name From:	author
Children Presentational:	False

---

contentinfo (role)

A large perceivable region that contains information about the parent document.

Examples of information included in this region of the page are copyrights and links to privacy statements.

User agents **SHOULD** treat elements with the role of contentinfo as navigational *landmarks*.

Within any document or application, the author **SHOULD** mark no more than one *element*

with the contentinfo role.

> Note: Because document and application elements can be nested in the DOM, they may have multiple contentinfo elements as DOM descendants, assuming each of those is associated with different document nodes, either by a DOM nesting (e.g., document within document) or by use of the aria-owns attribute.

Characteristics of contentinfo

Characteristic	Value
Superclass Role:	landmark
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

definition **(role)**

A definition of a term or concept.

The WAI-ARIA specification does not provide a *role* to specify the definition term, but host languages may provide such an *element*. If a host language has an appropriate element for the term (e.g. dfn or dt in HTML), authors **SHOULD** include the term in that element. Authors **SHOULD** identify the definition term by using an aria-labelledby *attribute* on each element with a role of definition.

Characteristics of definition

Characteristic	Value
Superclass Role:	section
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state)

	aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

dialog (role)

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. Also see alertdialog.

Authors **SHOULD** provide a dialog label. Labels may be provided with the aria-label or aria-labelledby *attribute* if other mechanisms are not available. Authors **SHOULD** ensure each active dialog has a focused descendant *element* that has keyboard focus.

Characteristics of dialog

Characteristic	Value
Superclass Role:	window
Subclass Roles:	alertdialog
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author
Accessible Name Required:	True

---

directory (role)

A list of references to members of a group, such as a static table of contents.

Authors **SHOULD** use this *role* for a static table of contents, whether linked or unlinked. This includes tables of contents built with lists, including nested lists. Dynamic tables of contents, however, might use a tree role instead.

Characteristics of directory

Characteristic	Value
Superclass Role:	list
Subclass Roles:	tablist
Related Concepts:	DAISY Guide
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	contents author

---

document (role)

A region containing related information that is declared as document content, as opposed to a web application.

When a user navigates an element assigned the role of document, *assistive technology* that typically intercepts standards keyboard events **SHOULD** switch to document browsing mode, as opposed to passing keyboard events through to the web application. The document *role* informs *user agents* of the need to augment browser keyboard support in order to allow users to visit and read any content within the document region. In contrast, additional commands are not necessary for screen reader users to read text within an region with the application role, where if coded in an accessible manner, all text will be *semantically* associated with focusable *elements*. An important trait of documents is that they have text which is not associated with *widgets* or groups thereof.

Authors **SHOULD** set the role of document on the element that encompasses the entire document. If the document role applies to the entire web page, authors **SHOULD** set the role of document on the root node for content, such as the body element in HTML or svg element in SVG.

For example, an email application has a document and an application in it. The author would want to use typical application navigation mode to cycle through the list of emails, and much of this navigation would be defined by the application author. However, when reading an email message, the content will appear in a region with a document role in order to use browsing navigation.

Authors **SHOULD** provide a title or label for documents. Authors **SHOULD** use label text that suitable for use as a navigation preview or table-of-contents entry for the page section.

Content authors **SHOULD** provide the label through one of the following methods:

- If the document includes the entire contents of the web page, use the host language feature for title or label, such as the `title` element in both HTML and SVG. This has the effect of labeling the entire document.
- Otherwise, provide a visible label referenced by the document using `aria-labelledby`.

Characteristics of document

Characteristic	Value
Superclass Role:	`structure`
Subclass Roles:	`article`
Related Concepts:	Device Independence Delivery Unit
Supported States and Properties:	`aria-expanded` (state)

Inherited 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`

Name From:	author
Accessible Name Required:	True

`form` (role)

A region of the document that represents a collection of form-associated elements, some of which can represent editable values that can be submitted to a server for processing.

Authors **SHOULD** provide a visible label for the form referenced with `aria-labelledby`. If an author uses a script to submit a form based on a user action that would otherwise not trigger an `onsubmit` event (for example, a form submission triggered by the user changing a form element's value), the author **SHOULD** provide the user with advance notification of the behavior.

User agents **SHOULD** treat elements with the role of `form` as navigational *landmarks*.

Characteristics of form

Characteristic	Value
Superclass Role:	`landmark`
Base Concept:	HTML form
Inherited States and Properties:	`aria-atomic`

	aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

grid (role)

A grid contains cells of tabular data arranged in rows and columns, like a table.

Grids do not necessarily imply presentation. The grid construct describes *relationships* between data such that it may be used for different presentations. Grids allow the user to move focus between cells using two dimensional navigation. For example, grid might be used as the invisible data model (hidden with CSS but still *operable* by *assistive technologies*) for a presentational chart.

Authors **MUST** ensure that elements with role gridcell are *owned* by elements with role row, which in turn are *owned* by an element with role rowgroup, grid or treegrid. If the author applies any non-global WAI-ARIA states or properties to a native markup element that is acting as a row (such as the tr element in HTML), the author **MUST** also apply the role of row, as stated in @@Host-Language-Integration. Authors **MAY** make cells focusable. Authors **MAY** define grids that are empty, containing no rows or cells. Authors **MAY** provide row and column headers for grids, by using rowheader and columnheader roles.

Since WAI-ARIA can augment an element in the host language, grids can reuse existing functionality of native table grids. When WAI-ARIA grid or gridcell roles overlay host language table elements they reuse the host language *semantics* for that table. For instance, WAI-ARIA does not specify general attributes for gridcell elements that span multiple rows or columns. When the author needs a gridcell to span multiple rows or columns, use the host language markup, such as the colspan and rowspan attributes in HTML.

Authors **MAY** determine the contents of a gridcell through calculation of a mathematical formula. Authors **MAY** make a cell's formula editable by the user. In a spreadsheet application for example, the text alternative of a cell may be the calculated value of a formula. However, when the cell is being edited, the text alternative may be the formula itself.

gridcell elements with the aria-selected *attribute* set can be selected for user interaction, and if the aria-multiselectable attribute of the grid is set to true, multiple cells in the grid may be selected. Grids may be used for spreadsheets like those in desktop spreadsheet applications.

A `grid` is considered editable unless otherwise specified. To make a `grid` read-only, set the `aria-readonly` attribute of the `grid` to `true`. The value of the `grid` element's `aria-readonly` attribute is implicitly propagated to all of its *owned* `gridcell` elements, and will be exposed through the accessibility API. An author may override an individual `gridcell` element's propagated `aria-readonly` value by setting the `aria-readonly` attribute on the `gridcell`.

To be *keyboard accessible*, authors **SHOULD** manage focus of descendants for all instances of this *role*, as described in Managing Focus.

Characteristics of grid

Characteristic	Value
Superclass Role:	composite region
Subclass Roles:	treegrid
Base Concept:	HTML table
Required Owned Elements:	row rowgroup → row
Supported States and Properties:	aria-level aria-multiselectable aria-readonly
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author
Accessible Name Required:	True

`gridcell` (role)

A cell in a grid or treegrid.

Cells may be active, editable, and selectable. Cells may have *relationships* such as `aria-controls` to address the application of functional relationships.

If headers cannot be determined from the DOM structure, authors **SHOULD** explicitly indicate which header cells are relevant to the cell by referencing *elements* with *role* `rowheader` or `columnheader` using the `aria-describedby` *attribute*.

In a _____, authors **MAY** define cells as expandable by using the _____

treegrid aria-expanded attribute. If the aria-expanded attribute is provided, it applies only to the individual cell. It is not a proxy for the container row, which also can be expanded. The main use case for providing this attribute on a cell is pivot table behavior.

Characteristics of gridcell

Characteristic	Value
Superclass Role:	section widget
Subclass Roles:	columnheader rowheader
Base Concept:	HTML td
Required Context Role:	row
Supported States and Properties:	aria-readonly aria-required aria-selected (state)
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	contents author
Accessible Name Required:	True

---

group (role)

A set of user interface *objects* which are not intended be included in a page summary or table of contents by *assistive technologies*.

Contrast with region which is a grouping of user interface objects that will be included in a page summary or table of contents.

Authors **SHOULD** use a group to form logical collection of items in a *widget* such as children in a tree widget forming a collection of siblings in a hierarchy, or a collection of items having the same container in a directory. However, when a group is used in the context of list, authors **MUST** limit its children to listitem elements. Therefore, proper handling of group by authors and assistive technology is determined by the context in which it is provided.

Authors **MAY** nest group elements. If the author believes a section is significant enough to

warrant inclusion in the web page's table of contents, the author **SHOULD** assign the section a *role* of `region` or a standard landmark role.

Characteristics of group

Characteristic	Value
Superclass Role:	`section`

Subclass Roles:	`row`
	`rowgroup`
	`select`
	`toolbar`

Related Concepts:	HTML fieldset
Supported States and Properties:	`aria-activedescendant`

Inherited States and Properties:	`aria-atomic`
	`aria-busy` (state)
	`aria-controls`
	`aria-describedby`
	`aria-disabled` (state)
	`aria-dropeffect`
	`aria-expanded` (state)
	`aria-flowto`
	`aria-grabbed` (state)
	`aria-haspopup`
	`aria-hidden` (state)
	`aria-invalid` (state)
	`aria-label`
	`aria-labelledby`
	`aria-live`
	`aria-owns`
	`aria-relevant`

Name From:	author

`heading` **(role)**

A heading for a section of the page.

Often, `heading` *elements* will be referenced with the `aria-labelledby` *attribute* of the section for which they serve as a heading. If headings are organized into a logical outline, the `aria-level` attribute may be used to indicate the nesting level.

Characteristics of heading

Characteristic	Value
Superclass Role:	`sectionhead`
Related Concepts:	HTML h1 HTML h2 HTML h3 HTML h4 HTML h5 HTML h6 DTD levelhd
Supported States and Properties:	`aria-level`
Inherited States and Properties:	`aria-atomic` `aria-busy` (state)

	aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Accessible Name Required:	True

---

img (role)

A container for a collection of *elements* that form an image.

An img can contain captions and descriptive text, as well as multiple image files that when viewed together give the impression of a single image. An img represents a single graphic within a document, whether or not it is formed by a collection of drawing *objects*. In order for elements with a *role* of img be *perceivable*, authors **SHOULD** provide alternative text or a label determined by the accessible name calculation.

Characteristics of img

Characteristic	Value
Superclass Role:	section
Related Concepts:	DTB imggroup HTML img
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author
Accessible Name Required:	True
Children Presentational:	True

`input` (abstract role)

A generic type of *widget* that allows user input.

Characteristics of input

Characteristic	Value
Is Abstract:	True
Superclass Role:	`widget`

Subclass Roles:	`button`
	`checkbox`
	`menuitem`
	`option`
	`range`
	`select`
	`textbox`

Related Concepts:	XForms input

Inherited 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`

Name From:	author

`landmark` (abstract role)

A region of the page intended as a navigational *landmark*.

Assistive technology **SHOULD** allow the user to quickly navigate to landmark regions. Mainstream *user agents* **MAY** allow the user to quickly navigate to landmark regions.

> Note: `landmark` is an abstract role used for the ontology. Authors must not use this role in content.

Characteristics of landmark

Characteristic	Value
Is Abstract:	True
Superclass Role:	`region`
Subclass Roles:	`application` `banner`

	complementary contentinfo form main navigation search
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	contents author
Accessible Name Required:	False

---

link **(role)**

An interactive reference to an internal or external resource that, when activated, causes the user agent to navigate to that resource.

If this is a native link in the host language (such as an HTML anchor with an `href` *value*), activating the link causes the *user agent* to navigate to that resource. If this is a simulated link, the web application author is responsible for managing navigation.

Characteristics of link

Characteristic	Value
Superclass Role:	widget
Related Concepts:	HTML link
Inherited 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
Name From:	contents author
Accessible Name Required:	True

---

list (role)

A group of non-interactive list items. Also see listbox.

Lists contain children whose *role* is listitem, or *elements* whose role is group which in turn contains children whose role is listitem.

Characteristics of list

Characteristic	Value
Superclass Role:	region
Subclass Roles:	directory listbox menu
Base Concept:	HTML ul HTML ol
Required Owned Elements:	group → listitem listitem
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

listbox (role)

A *widget* that allows the user to select one or more items from a list of choices. Also see combobox and list.

Items within the list are static and, unlike standard HTML `select` *elements*, may contain images. List boxes contain children whose *role* is option.

To be *keyboard accessible*, authors **SHOULD** manage focus of descendants for all instances of this *role*, as described in Managing Focus.

Although `listbox` inherits the *aria-expanded attribute*, if there is a valid reason to expand the `listbox`, the combobox role may be more appropriate.

Characteristics of listbox

Characteristic	Value
Superclass Role:	list select
Related Concepts:	HTML select XForms select
Required Owned Elements:	option
Supported States and Properties:	aria-multiselectable aria-required
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author
Accessible Name Required:	True

`listitem` (role)

A single item in a list or directory.

Characteristics of listitem

Characteristic	Value
Superclass Role:	section
Subclass Roles:	treeitem
Base Concept:	HTML li
Related Concepts:	XForms item
Required Context Role:	list
Supported States and Properties:	aria-level aria-posinset aria-setsize
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby

	aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	contents author
Accessible Name Required:	True

---

log (role)

A type of live region where new information is added in meaningful order and old information may disappear. Also see marquee.

Examples include chat logs, messaging history, game log, or an error log. In contrast to other live regions, in this *role* there is a *relationship* between the arrival of new items in the log and the reading order. The log contains a meaningful sequence and new information is added only to the end of the log, not at arbitrary points.

> Note: Elements with the role log have an implicit aria-live value of polite.

Characteristics of log

Characteristic	Value
Superclass Role:	region
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author
Accessible Name Required:	True
Implicit Value for Role:	Default for aria-live is polite.

`main` (role)

The main content of a document.

This marks the content that is directly related to or expands upon the central topic of the document. The `main` *role* is a non-obtrusive alternative for "skip to main content" links, where the navigation option to go to the main content (or other *landmarks*) is provided by the *user agent* through a dialog or by *assistive technologies*.

User agents **SHOULD** treat elements with the role of `main` as navigational landmarks.

Within any `document` or `application`, the author **SHOULD** mark no more than one *element* with the `main` role.

> Note: Because `document` and `application` elements can be nested in the DOM, they may have multiple `main` elements as DOM descendants, assuming each of those is associated with different document nodes, either by a DOM nesting (e.g., `document` within `document`) or by use of the `aria-owns` attribute.

Characteristics of main

Characteristic	Value
Superclass Role:	`landmark`

Inherited States and Properties:	`aria-atomic`
	`aria-busy` (state)
	`aria-controls`
	`aria-describedby`
	`aria-disabled` (state)
	`aria-dropeffect`
	`aria-expanded` (state)
	`aria-flowto`
	`aria-grabbed` (state)
	`aria-haspopup`
	`aria-hidden` (state)
	`aria-invalid` (state)
	`aria-label`
	`aria-labelledby`
	`aria-live`
	`aria-owns`
	`aria-relevant`

Name From:	author

`marquee` (role)

A type of live region where non-essential information changes frequently. Also see `log`.

Common usages of `marquee` include stock tickers and ad banners. The primary difference between a `marquee` and a `log` is that logs usually have a meaningful order or sequence of important content changes.

Note: Elements with the role `marquee` maintain the default `aria-live` value of `off`.

Characteristics of marquee

Characteristic	Value
Superclass Role:	section
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Accessible Name Required:	True

`math` **(role)**

An *element* that represents a mathematical expression.

The math *role* is used to indicate sections that represent math. Authors **SHOULD** use a formal mathematical language such as MathML to express mathematical concepts. However, since there exists significant amounts of legacy content that use images and textual approximations using ASCII art or HTML tags (eg, `sub` and `sup`) to represent mathematical expressions, the `math` role also allows assistive technologies to deliver to the user the text alternative provided which could be converted to Braille or text-to-speech. In order for images to be perceivable, authors **SHOULD** label them with text that describes the math formula as it would be spoken in plain language, using the `aria-label` or `aria-labelledby` attribute. If using the `aria-label` attribute, authors **SHOULD NOT** include any special markup used to control a speech device. When providing extended descriptions, either as the contents of the element or associated by use of the `aria-describedby` attribute, authors **SHOULD** use valid MathML or TeX as the description for images.

MathML example:

```
<div role="math" aria-label="6 divided by 4 equals 1.5">
  <math xmlns="http://www.w3.org/1998/Math/MathML">
    <mfrac>
      <mn>6</mn>
      <mn>4</mn>
    </mfrac>
    <mo>=</mo>
    <mn>1.5</mn>
  </math>
</div>
```

TeX example:

```
<div role="math" aria-label="6 divided by 4 equals 1.5">
  \frac{6}{4}=1.5
</div>
```

Characteristics of math

Characteristic	Value
Superclass Role:	section
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author
Children Presentational:	True

---

menu (role)

A type of *widget* that offers a list of choices to the user.

A menu is often a list of common actions or functions that a user can invoke. The menu *role* is appropriate when a list of menu items is presented in a manner similar to a menu on a desktop application.

To be *keyboard accessible*, authors **SHOULD** manage focus of descendants for all instances of this *role*, as described in Managing Focus.

Characteristics of menu

Characteristic	Value
Superclass Role:	list select
Subclass Roles:	menubar
Related Concepts:	DTB sidebar XForms select JAPI MENU
Required Owned Elements:	group → menuitemradio menuitem menuitemcheckbox

	menuitemradio
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author
Accessible Name Required:	True

---

menubar (role)

A presentation of menu that usually remains visible and is usually presented horizontally.

The menubar *role* is used to create a menu bar similar to those found in Windows, Mac, and Gnome desktop applications. A menu bar is used to create a consistent set of frequently used commands. Authors **SHOULD** ensure that menubar interaction is similar to the typical menu bar interaction in a desktop graphical user interface.

To be *keyboard accessible*, authors **SHOULD** manage focus of descendants for all instances of this *role*, as described in Managing Focus.

Characteristics of menubar

Characteristic	Value
Superclass Role:	menu
Related Concepts:	toolbar
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live

	aria-owns aria-relevant
Name From:	author

---

menuitem (role)

An option in a group of choices contained by a menu or menubar.

Authors **MAY** disable a menu item with the aria-disabled attribute. If the menu item has its aria-haspopup attribute set to true, it indicates that the menu item may be used to launch a sub-level menu, and authors **SHOULD** display a new sub-level menu when the menu item is activated.

Authors **SHOULD** ensure that menu items are *owned* by an element with role menu or menubar in order to identify that they are related *widgets*. Authors **MAY** separate menu items into groups by use of a separator or an element with an equivalent role from the native markup language.

Characteristics of menuitem

Characteristic	Value
Superclass Role:	input
Subclass Roles:	menuitemcheckbox
Related Concepts:	JAPI MENU_ITEM listitem option
Required Context Role:	menu menubar
Inherited 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
Name From:	contents author
Accessible Name Required:	True

---

menuitemcheckbox (role)

A checkable menuitem that has three possible *values*: true, false, or mixed.

The aria-checked *attribute* of a menuitemcheckbox indicates whether the menu item is

checked (`true`), unchecked (`false`), or represents a sub-level menu of other menu items that have a mixture of checked and unchecked values (`mixed`).

Authors **SHOULD** ensure that menu item checkboxes are *owned* by an element with role `menu` or `menubar` in order to identify that they are related widgets. Authors **MAY** separate menu items into groups by use of a `separator` or an element with an equivalent role from the native markup language.

Characteristics of menuitemcheckbox

Characteristic	Value
Superclass Role:	`checkbox` `menuitem`
Subclass Roles:	`menuitemradio`
Related Concepts:	`menuitem`
Required Context Role:	`menu` `menubar`

Inherited States and Properties:	`aria-atomic`
	`aria-busy` (state)
	`aria-checked` (state) **(required)**
	`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`

Name From:	contents author
Accessible Name Required:	True

`menuitemradio` **(role)**

A checkable `menuitem` in a group of `menuitemradio` *roles*, only one of which can be checked at a time.

Authors **SHOULD** enforce that only one `menuitemradio` in a group can be checked at the same time. When one item in the group is checked, the previously checked item becomes unchecked (its `aria-checked` *attribute* becomes `false`).

Authors **SHOULD** ensure that menu item radios are *owned* by an element with role `menu` or `menubar` in order to identify that they are related widgets. Authors **MAY** separate menu items into groups by use of a `separator` or an element with an equivalent role from the native markup language.

If a `menu` or `menubar` contains more than one group of `menuitemradio` elements, or if the menu contains one group and other, unrelated menu items, authors **SHOULD** nest each

set of related menuitemradio elements in an element using the group role, and authors **SHOULD** delimit the group from other menu items with an element using the separator role.

Characteristics of menuitemradio

Characteristic	Value
Superclass Role:	menuitemcheckbox (see structure) radio
Related Concepts:	menuitem
Required Context Role:	menu menubar
Inherited States and Properties:	aria-atomic aria-busy (state) aria-checked (state) **(required)** 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-posinset aria-relevant aria-selected (state) aria-setsize
Name From:	contents author
Accessible Name Required:	True

---

navigation **(role)**

A collection of navigational *elements* (usually links) for navigating the document or related documents.

User agents **SHOULD** treat elements with the role of navigation as navigational *landmarks*.

Characteristics of navigation

Characteristic	Value
Superclass Role:	landmark
Related Concepts:	nav element
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state)

	aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

note (role)

A section whose content is parenthetic or ancillary to the main content of the resource.

Characteristics of note

Characteristic	Value
Superclass Role:	section
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

option (role)

A selectable item in a select list.

Authors **MUST** ensure *elements* with *role* option are contained in, or *owned* by, an element the role listbox. Options not associated with a listbox might not be correctly mapped to an *accessibility API*.

Characteristics of option

Characteristic	Value
Superclass Role:	input

Subclass Roles:	radio treeitem
Base Concept:	HTML option
Related Concepts:	listitem XForms item
Required Context Role:	listbox
Supported States and Properties:	aria-checked (state) aria-posinset aria-selected (state) aria-setsize
Inherited 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
Name From:	contents author
Accessible Name Required:	True

---

presentation **(role)**

An *element* whose implicit native role semantics will not be mapped to the *accessibility API*.

The intended use is when an element is used to change the look of the page but does not have all the functional, interactive, or structural relevance implied by the element type, or may be used to provide for an accessible fallback in older browsers that do not support WAI-ARIA.

Example use cases:

- An element whose content is completely presentational (like a spacer image, decorative graphic, or clearing element);
- An image that is in a container with the `img` role and where the full text alternative is available and is marked up with aria-labelledby and (if needed) aria-describedby;
- An element used as an additional markup "hook" for CSS; or
- A layout table and/or any of its associated rows, cells, etc.

For any element with a role of presentation and which is not focusable, the user agent **MUST NOT** expose the implicit native semantics of the element (the role and its role-specific states and properties) to accessibility APIs. However, the user agent **MUST** expose content and descendant elements that do not have an explicit or inherited role of presentation. Thus, the `presentation` role causes a given element to be treated as having

no role, but does not cause the content contained within the element to be removed from the accessible tree.

For example, according to an accessibility API, the following markup elements would appear to have identical role semantics (no role) and identical content.

```
<!-- 1. [role="presentation"] negates the implicit 'heading' role semantics but does
not affect the contents. -->
<h1 role="presentation"> Sample Content </h1>

<!-- 2. There is no implicit role for span, so only the contents are exposed. -->
<span> Sample Content </span>

<!-- 3. This role declaration is redundant. -->
<span role="presentation"> Sample Content </span>
```

The `presentation` role is used on an element that has implicit native semantics, meaning that there is a default accessibility API role for the element. Some elements are only complete when additional descendant elements are provided. For example, in HTML, `table` elements (matching the `grid` role) require `tr` descendants (the `row` role), which in turn require `th` or `td` children (the `gridcell`, `columnheader`, `rowheader` roles). Similarly, lists require list item children. The descendant elements that complete the semantics of an element are described in WAI-ARIA as required owned elements.

When an explicit or inherited role of `presentation` is applied to an element with the implicit semantic of a WAI-ARIA role that has required owned elements, in addition to the element with the explicit role of `presentation`, the user agent **MUST** apply an inherited role of presentation to any owned elements that do not have an explicit role defined. For any element with an explicit or inherited role of presentation and which is not focusable, user agents **MUST** ignore role-specific WAI-ARIA states and properties for that element. For example, in HTML, a `table` element with a role of `presentation` will have the implicit native semantics of its `tr` element removed because the `grid` role to which the `table` corresponds has a required owned element of `row`. In turn, the implicit native semantics of the `th` and `td` elements will also be removed, because the `row` has required owned elements of role `gridcell`/`columnheader`/`rowheader`, which correspond to `th` and `td` elements. The same principle applies to `list` elements with required owned `listitem` elements: `ul` and `ol` elements with a role of `presentation` will have the implicit semantics of their `li` children removed as well.

> Note: Only the implicit native semantics of elements that correspond to WAI-ARIA required owned elements are removed. All other content remains intact, including nested tables or lists, unless those elements also have a explicit role of `presentation` applied.

For example, according to an accessibility API, the following markup elements would appear to have identical role semantics (no roles) and identical content.

```
<!-- 1. [role="presentation"] negates the implicit 'list' and 'listitem' role
semantics but does not affect the contents. -->
<ul role="presentation">
  <li> Sample Content </li>
  <li> More Sample Content </li>
</ul>

<!-- 2. There is no implicit role for span, so only the contents are exposed. -->
```

```
<span>
  <span> Sample Content </span>
  <span> More Sample Content </span>
</span>
```

> Note: There are other WAI-ARIA roles with required children for which this situation is applicable (e.g., radiogroups and listboxes), but tables and lists are the most common real-world cases in which the presentation inheritance is likely to apply.

For any element with an explicit or inherited role of `presentation`, user agents **MUST** apply an inherited role of `presentation` to all host-language-specific labeling elements for the presentational element. For example, a `table` element with a role of `presentation` will have the implicit native semantics of its `caption` element removed, because the caption is merely a label for the presentational table.

For any element with an explicit or inherited role of presentation, user agents **MUST** ignore any non-global, role-specific WAI-ARIA states and properties. However, the user agent **MUST** always expose global WAI-ARIA states and properties to accessibility APIs, even if an element has an explicit or inherited role of `presentation`.

For example, `aria-hidden` is a global attribute and would always be applied; `aria-level` is not a global attribute and would therefore only apply if the element was not in a presentational state.

```
<!-- 1. [role="presentation"] negates the implicit 'heading' role semantics but does
not affect the global hidden state. -->
<h1 role="presentation" aria-hidden="true"> Sample Content </h1>

<!-- 1. [role="presentation"] negates the both the implicit 'heading' and the non-
global level. -->
<h1 role="presentation" aria-level="2"> Sample Content </h1>
```

If an element with a role of presentation is focusable, user agents **MUST** ignore the normal effect of the role and expose the element with implicit native semantics, in order to ensure that the element is both *understandable* and *operable*.

In the following code sample, the containing `div` element has a WAI-ARIA role of `img` and is appropriately labeled by the caption paragraph. In this example the `img` element can be marked as presentation because the role and the text alternatives are provided by the containing element.

```
<div role="img" aria-labelledby="caption">
  <img src="example.png" role="presentation" alt="">
  <p id="caption">A visible text caption labeling the image.</p>
</div>
```

In the following code sample, because the anchor (HTML *a* element) is acting as the treeitem, the list item (HTML `li` element) is assigned an explicit WAI-ARIA role of presentation to override the user agent's implicit native semantics for list items.

```
<ul role="tree">
  <li role="presentation">
    <a role="treeitem" aria-expanded="true">An expanded tree node</a>
  </li>
```

```
  …
</ul>
```

Characteristics of presentation

Characteristic	Value
Superclass Role:	structure
Inherited 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

---

progressbar (role)

An *element* that displays the progress status for tasks that take a long time.

A progressbar indicates that the user's request has been received and the application is making progress toward completing the requested action. The author **SHOULD** supply *values* for aria-valuenow, aria-valuemin, and aria-valuemax, unless the value is indeterminate, in which case the author **SHOULD** omit the aria-valuenow attribute. Authors **SHOULD** update these values when the visual progress indicator is updated. If the progressbar is describing the loading progress of a particular region of a page, the author **SHOULD** use aria-describedby to point to the status, and set the aria-busy attribute to true on the region until it is finished loading. It is not possible for a user to alter the value of a progressbar because it is always readonly.

Characteristics of progressbar

Characteristic	Value
Superclass Role:	widget
Related Concepts:	status
Supported States and Properties:	aria-valuemax aria-valuemin aria-valuenow aria-valuetext
Inherited 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
Name From:	author
Accessible Name Required:	True
Children Presentational:	True

---

radio (role)

A checkable input in a group of radio *roles*, only one of which can be checked at a time.

Authors **SHOULD** ensure that *elements* with role radio are explicitly grouped in order to indicate which ones affect the same value. This is achieved by enclosing the radio elements in an element with role radiogroup. If it is not possible to make the radio buttons DOM children of the radiogroup, authors **SHOULD** use the aria-owns *attribute* on the radiogroup element to indicate the *relationship* to its children.

Characteristics of radio

Characteristic	Value
Superclass Role:	checkbox option
Subclass Roles:	menuitemradio
Related Concepts:	HTML input[type="radio"]
Inherited States and Properties:	aria-atomic aria-busy (state) aria-checked (state) **(required)** 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-posinset aria-relevant aria-selected (state) aria-setsize
Name From:	contents author
Accessible Name Required:	True

---

radiogroup (role)

A group of radio buttons.

A radiogroup is a type of select list that can only have a single entry checked at any one time. Authors **SHOULD** enforce that only one radio button in a group can be checked at the same time. When one item in the group is checked, the previously checked item becomes unchecked (its aria-checked *attribute* becomes false).

Characteristics of radiogroup

Characteristic	Value
Superclass Role:	select
Related Concepts:	list
Required Owned Elements:	radio
Supported States and Properties:	aria-required
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author
Accessible Name Required:	True

---

range (abstract role)

An input representing a range of values that can be set by the user.

> Note: range is an abstract role used for the ontology. Authors must not use this role in content.

Characteristics of range

Characteristic	Value
Is Abstract:	True
Superclass Role:	input
Subclass Roles:	scrollbar slider spinbutton

Supported States and Properties:	aria-valuemax aria-valuemin aria-valuenow aria-valuetext
Inherited 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
Name From:	author

---

region **(role)**

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.

The 'page summary' summary referenced above is a structure created dynamically from the page after it is loaded as a means of quickly describing its overall organization. It may be created by the author using a script, or by assistive technology.

Authors **SHOULD** ensure that a region has a heading referenced by aria-labelledby. This heading is provided by an instance of the standard host language heading element or an instance of an element with role heading that contains the heading text.

When defining regions of a web page, authors are advised to consider using standard document landmark *roles*. If the definitions of these regions are inadequate, authors can use the region role and provide the appropriate *accessible name*.

Characteristics of region

Characteristic	Value
Superclass Role:	section
Subclass Roles:	alert article grid landmark list log status tabpanel
Related Concepts:	HTML Frame Device Independence Glossary perceivable unit section

Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

roletype (abstract role)

The base *role* from which all other roles in this *taxonomy* inherit.

Properties of this role describe the structural and functional purpose of *objects* that are assigned this role (known in RDF terms as "instances"). A role is a concept that can be used to understand and operate instances.

> Note: roletype is an abstract role used for the ontology. Authors must not use this role in content.

Characteristics of roletype

Characteristic	Value
Is Abstract:	True
Subclass Roles:	structure widget window
Related Concepts:	XHTML role HTML link (rel & rev) Dublin Core type
Supported States and Properties:	Placeholder for global properties
Inherited 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

---

row (role)

A row of cells in a grid.

Rows contain gridcell *elements*, and thus serve to organize the grid.

In a treegrid, authors **MAY** mark rows as expandable, using the aria-expanded *attribute* to indicate the present status. This is not the case for an ordinary grid, in which the aria-expanded attribute is not present.

Characteristics of row

Characteristic	Value
Superclass Role:	group
Base Concept:	HTML tr
Required Context Role:	grid rowgroup treegrid
Required Owned Elements:	columnheader gridcell rowheader
Supported States and Properties:	aria-level aria-selected (state)
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	contents author

---

rowgroup (role)

A group containing one or more row elements in a grid.

The rowgroup role establishes a *relationship* between *owned* row elements. It is a structural

equivalent to the `thead`, `tfoot`, and `tbody` elements in an HTML `table` *element*.

> Note: This role does not differentiate between types of row groups (e.g. `thead` vs. `tbody`), but an issue has been raised for WAI-ARIA 2.0.

Characteristics of rowgroup

Characteristic	Value
Superclass Role:	group
Base Concept:	HTML thead, tfoot, and tbody
Required Context Role:	grid
Required Owned Elements:	row
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	contents author

`rowheader` (role)

A cell containing header information for a row in a grid.

Rowheader can be used as a row header in a table or grid. The rowheader establishes a *relationship* between it and all cells in the corresponding row. It is a structural equivalent to setting `scope="row"` on an HTML `th` *element*.

Characteristics of rowheader

Characteristic	Value
Superclass Role:	gridcell sectionhead
Base Concept:	HTML th[scope="row"]
Required Context Role:	row
Supported States and Properties:	aria-sort
Inherited States and Properties:	aria-atomic aria-busy (state)

	aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-readonly aria-relevant aria-required aria-selected (state)
Name From:	contents author
Accessible Name Required:	True

---

search **(role)**

A landmark region that contains one or more widgets used to define and execute a search.

User agents **SHOULD** treat elements with the role of search as navigational *landmarks*.

Characteristics of search

Characteristic	Value
Superclass Role:	landmark
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

section **(abstract role)**

A renderable structural containment unit in a document or application.

> Note: `section` is an abstract role used for the ontology. Authors must not use this role in content.

Characteristics of section

Characteristic	Value
Is Abstract:	True
Superclass Role:	`structure`

Subclass Roles:	`definition`
	`gridcell`
	`group`
	`img`
	`listitem`
	`marquee`
	`math`
	`note`
	`region`
	`tooltip`

Related Concepts:	DTB frontmatter DTB level SMIL par
Supported States and Properties:	`aria-expanded` (state)

Inherited 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`

Name From:	contents author

`sectionhead` (abstract role)

A structure that labels or summarizes the topic of its related section.

> Note: `sectionhead` is an abstract role used for the ontology. Authors must not use this role in content.

Characteristics of sectionhead

Characteristic	Value

Is Abstract:	True
Superclass Role:	structure
Subclass Roles:	columnheader heading rowheader tab
Supported States and Properties:	aria-expanded (state)
Inherited 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
Name From:	contents author

`select` (abstract role)

A form *widget* that allows the user to make selections from a set of choices.

Authors **SHOULD** ensure *elements* with *role* `option` are contained in an element using one of the non-abstract child roles of `select`, such as `combobox`, `listbox`, `menu`, `radiogroup`, or `tree`. Selects may be empty, containing no rows or cells.

> Note: `select` is an abstract role used for the ontology. Authors must not use this role in content.

Characteristics of select

Characteristic	Value
Is Abstract:	True
Superclass Role:	composite group input
Subclass Roles:	combobox listbox menu radiogroup tree
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby

	aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

separator **(role)**

A divider that separates and distinguishes sections of content or groups of menuitems.

This is a visual separator between sections of content. For example, separators are found between groups of menu items in a menu or as the moveable separator between two regions in a split pane.

Characteristics of separator

Characteristic	Value
Superclass Role:	structure
Related Concepts:	HTML hr
Supported States and Properties:	aria-expanded (state)
Inherited 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
Name From:	author
Children Presentational:	True

---

scrollbar **(role)**

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.

A scrollbar represents the current value and range of possible values via the size of the

scrollbar and position of the thumb with respect to the visible range of the orientation (horizontal or vertical) it controls. Its orientation represents the orientation of the scrollbar and the scrolling effect on the viewing area controlled by the scrollbar. It is typically possible to add or subtract to the current value by using directional keys such as arrow keys.

Authors **MUST** set the `aria-controls` attribute on the scrollbar element to reference the scrollable area it controls.

Characteristics of scrollbar

Characteristic	Value
Superclass Role:	range
Required States and Properties:	aria-controls aria-orientation aria-valuemax aria-valuemin aria-valuenow
Inherited 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-valuetext
Name From:	author
Accessible Name Required:	False
Children Presentational:	True

`slider` (role)

A user input where the user selects a value from within a given range.

A slider represents the current value and range of possible values via the size of the slider and position of the thumb. It is typically possible to add or subtract to the value by using directional keys such as arrow keys.

Characteristics of slider

Characteristic	Value
Superclass Role:	range
Required States and Properties:	aria-valuemax aria-valuemin aria-valuenow
Inherited 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-valuetext
Name From:	author
Accessible Name Required:	True
Children Presentational:	True

---

spinbutton **(role)**

A form of range that expects a user to select from amongst discrete choices.

A spinbutton typically allows the user to select from the given range through the use of an up and down button on the keyboard. Visibly, the current value is incremented or decremented until a maximum or minimum value is reached. Authors **SHOULD** ensure this functionality is accomplished programmatically through the use of up and down arrows on the keyboard.

Although a spinbutton is similar in appearance to many presentations of select, it is advisable to use spinbutton when working with known ranges (especially in the case of large ranges) as opposed to distinct options. For example, a spinbutton representing a range from 1 to 1,000,000 would provide much better performance than a select *widget* representing the same values.

Characteristics of spinbutton

Characteristic	Value
Superclass Role:	composite range
Required States and Properties:	aria-valuemax aria-valuemin aria-valuenow
Supported States and Properties:	aria-required
Inherited States and Properties:	aria-activedescendant 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-valuetext
Name From:	author
Accessible Name Required:	True

---

status (role)

A container whose content is advisory information for the user but is not important enough to justify an alert. Also see alert.

Authors **MUST** provide status information content within a status *object*. Authors **SHOULD** ensure this object does not receive focus.

Status is a form of live region. If another part of the page controls what appears in the status, authors **SHOULD** make the *relationship* explicit with the aria-controls *attribute*.

Assistive technologies **MAY** reserve some cells of a Braille display to render the status.

> Note: Elements with the role status have an implicit aria-live value of polite.

Characteristics of status

Characteristic	Value
Superclass Role:	composite region
Subclass Roles:	timer
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Implicit Value for Role:	Default for aria-live is polite.

`structure` (abstract role)

A document structural *element*.

Roles for document structure support the accessibility of dynamic web content by helping *assistive technologies* determine active content versus static document content. Structural roles by themselves do not all map to *accessibility APIs*, but are used to create *widget* roles or assist content adaptation for assistive technologies.

> Note: `structure` is an abstract role used for the ontology. Authors must not use this role in content.

Characteristics of structure

Characteristic	Value
Is Abstract:	True
Superclass Role:	`roletype`

Subclass Roles:	`document`
	`presentation`
	`section`
	`sectionhead`
	`separator`

Inherited 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`

`tab` (role)

A grouping label providing a mechanism for selecting the tab content that is to be rendered to the user.

If a `tabpanel` or item in a `tabpanel` has focus, the associated `tab` is the currently active tab in the `tablist`, as defined in Managing Focus. `tablist` elements, which contain a set of associated `tab` elements, are typically placed near a series of `tabpanel` elements, usually preceding it. See the *WAI-ARIA Authoring Practices Guide* [*ARIA-PRACTICES*] for details on implementing a tab set design pattern.

Authors **SHOULD** ensure the `tabpanel` associated with the currently active tab is *perceivable* to the user:

- For a single-selectable `tablist`, authors **SHOULD** hide other `tabpanel` *elements*

from the user until the user selects the tab associated with that tabpanel.
- For a multi-selectable `tablist`, authors **SHOULD** ensure each visible `tabpanel` have its `aria-expanded` (state) *attribute* set to `true`, and that the remaining hidden `tabpanel` elements have their `aria-expanded` attributes are set to `false`.

In either case, authors **SHOULD** ensure that the currently active tab has its `aria-selected` attribute set to `true`, that other tab elements have their `aria-selected` attribute set to `false`, and that the currently selected tab provides a visual indication that it is selected. In the absence of an `aria-selected` attribute on the current tab, *user agents* **SHOULD** indicate to *assistive technology* through the platform *accessibility API* that the currently focused tab is selected.

Characteristics of tab

Characteristic	Value
Superclass Role:	`sectionhead` `widget`
Required Context Role:	`tablist`
Supported States and Properties:	`aria-selected` (state)

Inherited States and Properties:	`aria-atomic`
	`aria-busy` (state)
	`aria-controls`
	`aria-describedby`
	`aria-disabled` (state)
	`aria-dropeffect`
	`aria-expanded` (state)
	`aria-flowto`
	`aria-grabbed` (state)
	`aria-haspopup`
	`aria-hidden` (state)
	`aria-invalid` (state)
	`aria-label`
	`aria-labelledby`
	`aria-live`
	`aria-owns`
	`aria-relevant`

Name From:	contents author

`tablist` (role)

A list of `tab` *elements*, which are references to `tabpanel` elements.

To be *keyboard accessible*, authors **SHOULD** manage focus of descendants for all instances of this *role*, as described in Managing Focus.

`tablist` elements are typically placed near, usually preceeding, a series of `tabpanel` elements. See the *WAI-ARIA Authoring Practices Guide* [*ARIA-PRACTICES*] for details on implementing a tab set design pattern.

Characteristics of tablist

Characteristic	Value
Superclass Role:	`composite`

	directory
Related Concepts:	DAISY Guide
Required Owned Elements:	tab
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

tabpanel (role)

A container for the resources associated with a tab, where each tab is contained in a tablist.

Authors **SHOULD** associate a tabpanel *element* with its tab, either by using the aria-controls *attribute* on the tab to reference the tab panel, or by using the aria-labelledby attribute on the tab panel to reference the tab.

tablist elements are typically placed near, usually preceeding, a series of tabpanel elements. See the *WAI-ARIA Authoring Practices Guide* [*ARIA-PRACTICES*] for details on implementing a tab set design pattern.

Characteristics of tabpanel

Characteristic	Value
Superclass Role:	region
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live

	aria-owns aria-relevant
Name From:	author
Accessible Name Required:	True

---

textbox (role)

Input that allows free-form text as their value.

If the aria-multiline *attribute* is `true`, the *widget* accepts line breaks within the input, as in an HTML textarea. Otherwise, this is a simple text box. The intended use is for languages that do not have a text input *element*, or cases in which an element with different *semantics* is repurposed as a text field.

> In most user agent implementations, the default behavior of the ENTER or RETURN key is different between the single-line and multi-line text fields in HTML. When user has focus in a single-line `<input type="text">` element, the keystroke usually submits the form. When user has focus in a multi-line `<textarea>` element, the keystroke inserts a carriage return. The WAI-ARIA `textbox` role differentiates these types of boxes with the aria-multiline attribute, so authors are advised to be aware of this distinction when designing the field.

Characteristics of textbox

Characteristic	Value
Superclass Role:	input
Related Concepts:	XForms input HTML textarea HTML input[type="text"]
Supported States and Properties:	aria-autocomplete aria-multiline aria-readonly aria-required
Inherited 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
Name From:	author
Accessible Name Required:	True

`timer` (role)

A numerical counter which indicates an amount of elapsed time from a start point, or the time remaining until an end point.

The text contents of the timer *object* indicate the current time measurement, and are updated as that amount changes. The timer value is not necessarily machine parsable, but authors **SHOULD** update the text contents at fixed intervals, except when the timer is paused or reaches an end-point.

A timer is a form of live region. The default value of `aria-live` for `timer` is `off`.

Characteristics of timer

Characteristic	Value
Superclass Role:	`status`

Inherited States and Properties:	`aria-activedescendant`
	`aria-atomic`
	`aria-busy (state)`
	`aria-controls`
	`aria-describedby`
	`aria-disabled (state)`
	`aria-dropeffect`
	`aria-expanded (state)`
	`aria-flowto`
	`aria-grabbed (state)`
	`aria-haspopup`
	`aria-hidden (state)`
	`aria-invalid (state)`
	`aria-label`
	`aria-labelledby`
	`aria-live`
	`aria-owns`
	`aria-relevant`

Name From:	author
Accessible Name Required:	True

`toolbar` (role)

A collection of commonly used function buttons represented in compact visual form.

The toolbar is often a subset of functions found in a `menubar`, designed to reduce user effort in using these functions.

To be *keyboard accessible*, authors **SHOULD** manage focus of descendants for all instances of this *role*, as described in Managing Focus.

Characteristics of toolbar

Characteristic	Value
Superclass Role:	`group`
Related Concepts:	`menubar`
Inherited States and Properties:	`aria-activedescendant`

	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant
Name From:	author

---

tooltip (role)

A contextual popup that displays a description for an element.

The tooltip typically becomes visible in response to a mouse hover, or after the owning element receives keyboard focus. In each of these cases, authors **SHOULD** display the tooltip after a short delay. The use of a WAI-ARIA tooltip is a supplement to the normal tooltip behavior of the user agent.

> Note: Typical tooltip delays last from one to five seconds.

Authors **SHOULD** ensure that elements with the *role* tooltip are referenced through the use of aria-describedby by the time the tooltip is displayed.

Characteristics of tooltip

Characteristic	Value
Superclass Role:	section
Inherited States and Properties:	aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-live aria-owns aria-relevant

Accessible Name Required:	True

`tree` (role)

A type of `list` that may contain sub-level nested groups that can be collapsed and expanded.

To be *keyboard accessible*, authors **SHOULD** manage focus of descendants for all instances of this *role*, as described in Managing Focus.

Characteristics of tree

Characteristic	Value
Superclass Role:	`select`
Subclass Roles:	`treegrid`
Required Owned Elements:	`group` → `treeitem` `treeitem`
Supported States and Properties:	`aria-multiselectable` `aria-required`

Inherited States and Properties:	`aria-activedescendant`
	`aria-atomic`
	`aria-busy` (state)
	`aria-controls`
	`aria-describedby`
	`aria-disabled` (state)
	`aria-dropeffect`
	`aria-expanded` (state)
	`aria-flowto`
	`aria-grabbed` (state)
	`aria-haspopup`
	`aria-hidden` (state)
	`aria-invalid` (state)
	`aria-label`
	`aria-labelledby`
	`aria-live`
	`aria-owns`
	`aria-relevant`

Name From:	author
Accessible Name Required:	True

`treegrid` (role)

A `grid` whose rows can be expanded and collapsed in the same manner as for a `tree`.

A `treegrid` is considered editable unless otherwise specified. To make a `treegrid` read-only, set the `aria-readonly` attribute of the `treegrid` to `true`. The value of the `treegrid` element's `aria-readonly` attribute is implicitly propagated to all of its owned `gridcell` elements, and will be exposed through the accessibility API. An author may override an individual `gridcell` element's propagated `aria-readonly` value by setting the `aria-readonly` attribute on the `gridcell`.

To be *keyboard accessible*, authors **SHOULD** manage focus of descendants for all instances of this *role*, as described in Managing Focus.

Characteristics of treegrid

Characteristic	Value
Superclass Role:	grid tree
Required Owned Elements:	row
Inherited States and Properties:	aria-activedescendant aria-atomic aria-busy (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state) aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-level aria-live aria-multiselectable aria-owns aria-readonly aria-relevant aria-required
Name From:	author
Accessible Name Required:	True

`treeitem` **(role)**

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 `treeitem`s.

A collection of `treeitem`s to be expanded and collapsed are enclosed in an element with the `group` *role*.

Characteristics of treeitem

Characteristic	Value
Superclass Role:	listitem option
Required Context Role:	tree
Inherited States and Properties:	aria-atomic aria-busy (state) aria-checked (state) aria-controls aria-describedby aria-disabled (state) aria-dropeffect aria-expanded (state) aria-flowto aria-grabbed (state)

	aria-haspopup aria-hidden (state) aria-invalid (state) aria-label aria-labelledby aria-level aria-live aria-owns aria-posinset aria-relevant aria-selected (state) aria-setsize
Name From:	contents author
Accessible Name Required:	True

`widget` (abstract role)

An interactive component of a graphical user interface (GUI).

Widgets are discrete user interface objects with which the user can interact. Widget *roles* map to standard features in *accessibility APIs*.

> Note: `widget` is an abstract role used for the ontology. Authors must not use this role in content.

Characteristics of widget

Characteristic	Value
Is Abstract:	True
Superclass Role:	roletype
Subclass Roles:	composite gridcell input link progressbar tab
Inherited 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

window (abstract role)

A browser or application window.

Elements with this *role* have a window-like behavior in a graphical user interface (GUI) context, regardless of whether they are implemented as a native window in the operating system, or merely as a section of the document styled to look like a window.

> Note: window is an abstract role used for the ontology. Authors must not use this role in content.

Characteristics of window

Characteristic	Value
Is Abstract:	True
Superclass Role:	roletype
Subclass Roles:	dialog
Supported States and Properties:	aria-expanded (state)
Inherited 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
Name From:	author

6. Supported States and Properties

This section is *normative*.

6.1. Clarification of States versus Properties

This section is *informative*.

The terms "states" and "properties" refer to similar features. Both provide specific information about an *object*, and both form part of the definition of the nature of *roles*. In this document, states and properties are both treated as aria-prefixed markup *attributes*. However, they are maintained conceptually distinct to clarify subtle differences in their meaning. One major difference is that the *values* of properties (such as `aria-labelledby`) are less likely to change throughout the application life-cycle than the values of states (such as `aria-checked`) which may change frequently due to user interaction. See the definitions of *state* and *property* for more information.

6.2. Characteristics of States and Properties

States and properties have the following characteristics:

6.2.1. Related Concepts

Advisory information about features from this or other languages that correspond to this *state* or *property*. While the correspondence may not be exact, it is useful to help understand the intent of the state or property.

6.2.2. Used in Roles

Advisory information about roles that use this *state* or *property*. This information is provided to help understand the appropriate usage of the state or property. Use of a given state or property is not defined when used on roles other than those listed.

6.2.3. Inherits into Roles

Advisory information about roles that inherit the *state* or *property* from an ancestor role.

6.2.4. Value

Value type of the*state* or *property*. The value may be one of the following types:

boolean
: Value representing either true or false

ID reference
: Reference to the ID of another *element* in the same document

ID reference list
: A list of one or more ID references

integer
: A numerical value without a fractional component

number
: Any real numerical value

string
: Unconstrained value type

token
: One of a limited set of allowed values

token list
: A list of one or more tokens

The "undefined" value, when allowed on a state or property, is an explicit indication that the state or property is not set.

These are generic types for states and properties, but do not define specific representation. See State and Property Attribute Processing for details on how these values are expressed and handled in host languages.

6.3. Values for States and Properties

Many *states* and *properties* accept a specific set of tokens as *values*. The allowed values and explanation of their meaning is shown after the table of characteristics. The default value, if defined, is shown in **strong** type. When a value is indicated as the default, the user agent **MUST** follow the behavior prescribed by this value when the state or property is empty or undefined. Some *roles* also define what behavior to use when certain states or properties, that do not have default values, are not provided.

6.4. Global States and Properties

Some *states* and *properties* are applicable to all host language *elements* regardless of whether a *role* is applied. The following global states and properties are supported by all roles and by all base markup elements.

- 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

Global states and properties are applied to the role roletype, which is the base role, and therefore inherit into all roles. To facilitate reading, they are not explicitly identified as either

supported or inherited states and properties in the specification. Instead, the inheritance is indicated by a link to this section.

6.5. Taxonomy of WAI-ARIA States and Properties

States and properties are categorized as follows:

1. Widget Attributes
2. Live Region Attributes
3. Drag-and-Drop Attributes
4. Relationship Attributes

6.5.1. Widget Attributes

This section contains *attributes* specific to common user interface *elements* found on GUI systems or in rich internet applications which receive user input and process user actions. These attributes are used to support the widget roles.

- aria-autocomplete
- aria-checked (state)
- aria-disabled (state)
- aria-expanded (state)
- aria-haspopup
- aria-hidden (state)
- aria-invalid (state)
- aria-label
- aria-level
- aria-multiline
- aria-multiselectable
- aria-orientation
- aria-pressed (state)
- aria-readonly
- aria-required
- aria-selected (state)
- aria-sort
- aria-valuemax
- aria-valuemin
- aria-valuenow
- aria-valuetext

Widget attributes might be mapped by a *user agent* to platform *accessibility API states*, for access by *assistive technologies*, or they might be accessed directly from the DOM. User agents **MUST** provide a way for assistive technologies to be notified when states change, either through DOM attribute change *events* or platform accessibility API events.

6.5.2. Live Region Attributes

This section contains *attributes* specific to live regions in rich internet applications. These attributes may be applied to any *element*. The purpose of these attributes is to indicate that content changes may occur without the element having focus, and to provide *assistive technologies* with information on how to process those content updates. Some *roles* specify a default *value* for the aria-live attribute specific to that role. An example of a live region is a ticker section that lists updating stock quotes.

- aria-atomic
- aria-busy (state)
- aria-live
- aria-relevant

6.5.3. Drag-and-Drop Attributes

This section lists *attributes* which indicate information about drag-and-drop interface *elements*, such as draggable elements and their drop targets. Drop target information will be rendered visually by the author and provided to *assistive technologies* through an alternate modality.

- aria-dropeffect
- aria-grabbed (state)

For more information about using drag-and-drop, see *Drag-and-Drop Support in the WAI-ARIA Authoring Practices* ([*ARIA-PRACTICES*]).

6.5.4. Relationship Attributes

This section lists *attributes* that indicate *relationships* or associations between *elements* which cannot be readily determined from the document structure.

- aria-activedescendant
- aria-controls
- aria-describedby
- aria-flowto
- aria-labelledby
- aria-owns
- aria-posinset
- aria-setsize

6.6. Definitions of States and Properties (all aria-* attributes)

Below is an alphabetical list of WAI-ARIA *states* and *properties* to be used by rich internet application authors. A detailed definition of each WAI-ARIA state and *property* follows this compact list.

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

aria-atomic
: Indicates whether the assistive technology will present all, or only parts of, the changed region based on the change notifications defined by the aria-relevant attribute. Also see aria-relevant.

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

aria-busy (state)
: Indicates whether a live region is currently being updated.

aria-checked (state)
: Indicates the current "checked" state of checkboxes, radio buttons, and other widgets. Also see aria-pressed and aria-selected.

aria-controls
: Identifies the element (or elements) whose contents or presence are controlled by the current element. Also see aria-owns.

aria-describedby
: Identifies the element (or elements) that describes the object. Also see aria-labelledby.

aria-disabled (state)
: Indicates that the element is perceivable but disabled, so it is not editable or otherwise operable. Also see 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 an assistive technology to convey the possible drag options available to them 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 an expandable/collapsible group of elements is currently expanded or collapsed.

aria-flowto
: Identifies the next element (or elements) in the recommended reading order of content, overriding the general default to read 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 is not visible or perceivable to any user. Also see 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 when included as an attribute of the current element. Also see aria-labelledby.

aria-labelledby
: Identifies the element (or elements) that labels the current element. Also see 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 only a single line, or if it can accept multiline input.

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

aria-orientation
: Indicates whether the element and scrolling 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. Also see 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. Also see aria-setsize.

aria-pressed (state)
: Indicates the current "pressed" state of toggle buttons. Also see aria-checked and aria-selected.

aria-readonly
: Indicates that the element is not editable, but is otherwise operable. Also see aria-disabled.

aria-relevant

Indicates what user agent change notifications (additions, removals, etc.) assistive technology will monitor within a live region. Also see 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. Also see 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. Also see 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. Also see aria-valuetext.

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

`aria-activedescendant` **(property)**

Identifies the currently active descendant of a `composite` *widget*.

This is used when a composite widget is responsible for managing its current active child to reduce the overhead of having all children be focusable. Examples include: multi-level lists, trees, and grids. In some implementations the *user agent* may use `aria-activedescendant` to tell *assistive technologies* that the active descendant has focus.

Authors **SHOULD** ensure that the *element* targeted by the `activedescendant` *attribute* is either a descendant of the container in the DOM, or is a logical descendant as indicated by the `aria-owns` attribute. The user agent is not expected to check that the active descendant is an actual descendant of the container. Authors **SHOULD** ensure that the currently active descendant remains visible and in view. Authors **SHOULD** capture changes to the `activedescendant` attribute, which may occur if the assistive technologies or user agents set focus directly.

Characteristics of aria-activedescendant

Characteristic	Value
Related Concepts:	*SVG* [*SVG*] and *DOM* [*DOM*] active
Used in Roles:	`composite` `group`
Value:	ID reference

`aria-atomic` **(property)**

Indicates whether the *assistive technology* will present all, or only parts of, the changed region based on the change notifications defined by the `aria-relevant` attribute. Also see `aria-relevant`.

Both *accessibility APIs* and the *Document Object Model* [*DOM*] provide events to allow the assistive technologies to determine changed areas of the document.

When the content of a live region changes, user agents **SHOULD** examine the changed *element* and traverse the ancestors to find the first element with `aria-atomic` set, and apply the appropriate behavior for the cases below.

1. If none of the ancestors have explicitly set `aria-atomic`, the default is that `aria-atomic` is `false`, and assistive technology will only present the changed node to the user.
2. If `aria-atomic` is explicitly set to `false`, assistive technology will stop searching up the ancestor chain and present only the changed node to the user.
3. If `aria-atomic` is explicitly set to `true`, assistive technology will present the entire contents of the element.

When `aria-atomic` is `true`, assistive technology **MAY** choose to combine several changes and present the entire changed region at once.

Characteristics of aria-atomic

Characteristic	Value
Used in Roles:	All elements of the base markup
Value:	boolean

Values of aria-atomic

Value	Description
true:	Assistive technology will present the entire region as a whole.
false (default):	A change within the region may be processed by the assistive technologies on its own.

`aria-autocomplete` **(property)**

Indicates whether user input completion suggestions are provided.

For a `textbox` with the `aria-autocomplete` *attribute* set to either `inline` or `both`, authors **SHOULD** ensure that the auto-completion text is selected and comes previously typed character, so the user can type over it. The `aria-haspopup` attribute can be used in conjunction with this to indicate that a popup containing choices appears, notwithstanding the fact that it is a simple text box.

For an *element* which already has a drop-down (i.e., a `combobox`), it is assumed that the dropdown behavior is still present. This means that if `autocomplete` is `true`, `aria-haspopup` will also be true on a combobox.

Characteristics of aria-autocomplete

Characteristic	Value
Related Concepts:	XForms selection attribute in select
Used in Roles:	`textbox`
Value:	token

Values of aria-autocomplete

Value	Description
inline:	The system provides text after the caret as a suggestion for how to complete the field.
list:	A list of choices appears from which the user can choose, but the edit box retains focus.
both:	A list of choices appears and the currently selected suggestion also appears inline.
none (default):	No input completion suggestions are provided.

`aria-busy` **(state)**

Indicates whether a live region is currently being updated.

The default is that `aria-busy` is `false`. If authors know that multiple parts of the same live region need to be loaded, they can set `aria-busy` to `true` when the first part is loaded, and then set `aria-busy` to `false` or remove the *attribute* when the last part is loaded. If there is an error updating the live region, set the `aria-invalid` attribute to `true`.

Characteristics of aria-busy

Characteristic	Value
Used in Roles:	All elements of the base markup
Value:	boolean

Values of aria-busy

Value	Description
true:	The live region is still being updated.
false (default):	There are no more expected updates for that live region.

`aria-checked` **(state)**

Indicates the current "checked" *state* of checkboxes, radio buttons, and other *widgets*. Also see `aria-pressed` and `aria-selected`.

The `aria-checked` *attribute* indicates whether the *element* is checked (`true`), unchecked (`false`), or represents a group of other elements that have a mixture of checked and unchecked *values* (`mixed`). Most inputs only support values of `true` and `false`, but the `mixed` value is supported by certain tri-state inputs such as a `checkbox` or `menuitemcheckbox`.

The `mixed` value is **not** supported on `radio` or `menuitemradio` or any element that inherits from these in the *taxonomy*, and *user agents* **MUST** treat a `mixed` value as equivalent to `false` on those *roles*.

Examples using the `mixed` value of tri-state inputs are covered in *WAI-ARIA Authoring*

Practices [*ARIA-PRACTICES*]

Characteristics of aria-checked

Characteristic	Value
Used in Roles:	option
Value:	token

Values of aria-checked

Value	Description
true:	The element is checked.
false:	The element supports being checked but is not currently checked.
mixed:	Indicates a mixed mode value for a tri-state checkbox or menuitemcheckbox.
undefined (default):	The element does not support being checked.

---

aria-controls **(property)**

Identifies the *element* (or elements) whose contents or presence are controlled by the current element. Also see aria-owns.

For example:

- A table of contents tree view may control the content of a neighboring document pane.
- A group of checkboxes may control what commodity prices are tracked live in a table or graph.
- A tab controls the display of its associated tab panel.

Characteristics of aria-controls

Characteristic	Value
Related Concepts:	*XML Events* [*XML-EVENTS*] object hyperlink target in *HTML* [*HTML*]
Used in Roles:	All elements of the base markup
Value:	ID reference list

---

aria-describedby **(property)**

Identifies the *element* (or elements) that describes the *object*. Also see aria-labelledby.

This is very similar to labeling an object with aria-labelledby. A label provides the user with the essence of what the object does, whereas a description is intended to provide additional detail that some users might need.

The element or elements referenced by the aria-describedby comprise the entire description. Include ID references to multiple elements if necessary, or enclose a set of

elements (e.g., paragraphs) with the element referenced by the ID.

Characteristics of aria-describedby

Characteristic	Value
Related Concepts:	Related concepts: Hint or Help in *XForms* [*XForms*] Label in XForms Label in *HTML* [*HTML*] online help HTML table cell headers HTML label element, and HTML table cell headers are de facto describedby values.
Used in Roles:	All elements of the base markup
Value:	ID reference list

`aria-disabled` (state)

Indicates that the *element* is *perceivable* but disabled, so it is not editable or otherwise *operable*. Also see `aria-hidden` and `aria-readonly`.

For example, irrelevant options in a radio group may be disabled. Disabled elements might not receive focus from the tab order. For some disabled elements, applications might choose not to support navigation to descendants. In addition to setting the `aria-disabled` attribute, authors **SHOULD** change the appearance (grayed out, etc.) to indicate that the item has been disabled.

The *state* of being disabled applies to the current element and all focusable descendant elements of the element on which the `aria-disabled` *attribute* is applied.

Characteristics of aria-disabled

Characteristic	Value
Used in Roles:	All elements of the base markup
Value:	boolean

Values of aria-disabled

Value	Description
true:	The element and all focusable descendants are disabled and its value cannot be changed by the user.
false (default):	The element is enabled.

`aria-dropeffect` (property)

Indicates what functions can be performed when the dragged object is released on the drop target. This allows an assistive technology to convey the possible drag options available to them 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.

More than one drop effect may be supported for a given *element*. Therefore, the *value* of this *attribute* is a space-delimited set of tokens indicating the possible effects, or `none` if there is no supported operation. In addition to setting the `aria-dropeffect` attribute, authors **SHOULD** show a visual indication of potential drop targets.

Characteristics of aria-dropeffect

Characteristic	Value
Used in Roles:	All elements of the base markup
Value:	token list

Values of aria-dropeffect

Value	Description
copy:	A duplicate of the source object will be dropped into the target.
move:	The source object will be removed from its original location and dropped into the target.
link:	A reference or shortcut to the dragged object will be created in the target object.
execute:	A function supported by the drop target is executed, using the drag source as an input.
popup:	There is a popup menu or dialog that allows the user to choose one of the drag operations (copy, move, link, execute) and any other drag functionality, such as cancel.
none (default):	No operation can be performed; effectively cancels the drag operation if an attempt is made to drop on this object.

`aria-expanded` **(state)**

Indicates whether an expandable/collapsible group of *elements* is currently expanded or collapsed.

For example, this indicates whether a portion of a tree is expanded or collapsed. In other instances, this may be applied to page sections to mark expandable and collapsible regions that are flexible for managing content density. Simplifying a user interface by collapsing sections may improve usability for all, including those with cognitive or developmental disabilities.

Characteristics of aria-expanded

Characteristic	Value
Related Concepts:	Tapered prompts in voice browsing. Switch in *SMIL* [*SMIL*].
Used in Roles:	`document`

	section sectionhead separator window
Value:	token

Values of aria-expanded

Value	Description
true:	The group is expanded.
false:	The group is collapsed.
undefined (default):	The group is neither expandable nor collapsible; all its child elements are shown or there are no child elements.

---

aria-flowto (property)

Identifies the next *element* (or elements) in the recommended reading order of content, overriding the general default to read in document source order.

When aria-flowto has a single IDREF, it allows *assistive technologies* to, at the user's request, forego normal document reading order and go to the targeted *object*. aria-flowto in subsequent elements would follow a process similar to *next focus in XHTML2* ([*XHTML*]). However, when aria-flowto is provided with multiple IDREFS, assistive technology **SHOULD** present the referenced elements as path choices.

In the case of one or more IDREFS, *user agents* or assistive technologies **SHOULD** give a user the option of navigating to any of the elements targeted. The name of the path can be determined by the name of the target element of the aria-flowto *attribute*. *accessibility APIs* can provide named path *relationships*.

Characteristics of aria-flowto

Characteristic	Value
Related Concepts:	*XHTML 2* [*XHTML2*] :nextfocus :prevfocus
Used in Roles:	All elements of the base markup
Value:	ID reference list

---

aria-grabbed (state)

Indicates an element's "grabbed" *state* in a drag-and-drop operation.

When it is set to true it has been selected for dragging, false indicates that the *element* can be grabbed for a drag-and-drop operation, but is not currently grabbed, and undefined (or no *value*) indicates the element cannot be grabbed (default).

When aria-grabbed is set to true, authors **SHOULD** update the aria-dropeffect *attribute* of all potential drop targets. When an element is not grabbed (the value is set to false, undefined, or the attribute is removed), authors **SHOULD** revert the aria-dropeffect attributes of the associated drop targets to none.

Characteristics of aria-grabbed

Characteristic	Value
Used in Roles:	All elements of the base markup
Value:	token

Values of aria-grabbed

Value	Description
true:	Indicates that the element has been "grabbed" for dragging.
false:	Indicates that the element supports being dragged.
undefined (default):	Indicates that the element does not support being dragged.

`aria-haspopup` **(property)**

Indicates that the *element* has a popup context menu or sub-level menu.

This means that activation renders conditional content. Note that ordinary tooltips are not considered popups in this context.

A popup is generally presented visually as a group of items that appears to be on top of the main page content. When presenting a menu, authors **SHOULD** ensure that the menu is completely visible on screen.

Characteristics of aria-haspopup

Characteristic	Value
Related Concepts:	This is a sub-level property of `aria-controls`. *User Agent Accessibility Guidelines* [*UAAG*] conditional content
Used in Roles:	All elements of the base markup
Value:	boolean

Values of aria-haspopup

Value	Description
true:	Indicates the object has a popup, either as a descendant or pointed to by `aria-owns`.
false (default):	The object has no popup.

`aria-hidden` **(state)**

Indicates that the *element* is not visible or *perceivable* to *any* user. Also see `aria-disabled`.

If a menu is only visible after some user action, authors **SHOULD** set the `aria-hidden`

attribute to `true`. When the menu is presented, authors **SHOULD** set the `aria-hidden` attribute to `false` or remove the attribute, indicating that the menu is visible. Some assistive technologies access WAI-ARIA information directly through the DOM and not through platform accessibility supported by the browser. Authors **SHOULD** set `aria-hidden="true"` on content that is not displayed, regardless of the mechanism used to hide it. This allows *assistive technology* or *user agents* to properly skip *hidden* elements in the document.

It is recommended that authors key visibility of *objects* off this attribute, rather than change visibility and separately have to remember to update this *property*. CSS 2 provides a way to *select on attribute values* ([*CSS*]). The following CSS declaration makes content visible unless the `aria-hidden` attribute is `true`; scripts need only update the *value* of this attribute to change visibility:

```
[aria-hidden="true"] { visibility: hidden; }
```

> Note: At the time of this writing, this CSS example, while technically correct, will not redraw styles properly in some browsers if the attribute's value is changed dynamically. It may be necessary to toggle a class name, or otherwise force the browser to redraw the styles properly.

> Note: Authors are reminded that visibility:hidden and display:none apply to *all* CSS media types; therefore, use of either will hide the content from all renderers, regardless of modality. Authors using other techniques (for example, opacity or off-screen positioning) to visibly 'hide' content should ensure the `aria-hidden` attribute is updated accordingly.

Characteristics of aria-hidden

Characteristic	Value
Used in Roles:	All elements of the base markup
Value:	boolean

Values of aria-hidden

Value	Description
true:	Indicates that this section of the document and its children are hidden from the rendered view.
false (default):	Indicates that this section of the document is rendered.

`aria-invalid` **(state)**

Indicates the entered value does not conform to the format expected by the application.

If the value is computed to be invalid or out-of-range, the application author **SHOULD** set this *attribute* to `true`. *User agents* **SHOULD** inform the user of the error. Application authors **SHOULD** provide suggestions for corrections if they are known. Authors **MAY**

prevent form submission when an associated form element has its `aria-invalid` attribute set to `true`.

When the user attempts to submit data involving a field for which `aria-required` is `true`, authors **MAY** use the `aria-invalid` attribute to signal there is an error. However, if the user has not attempted to submit the form, authors **SHOULD NOT** set the `aria-invalid` attribute on required *widgets* simply because the user has not yet entered data.

For future expansion, the `aria-invalid` attribute is an enumerated type. Any value not recognized in the list of allowed *values* **MUST** be treated by user agents as if the value `true` had been provided. If the attribute is not present, or its value is `false`, or its value is an empty string, the default value of `false` applies.

Characteristics of aria-invalid

Characteristic	Value
Related Concepts:	*XForms* [*XForms*] 'invalid' event http://www.w3.org/TR/2006/REC-xforms-20060314/slice4.html#evt-revalidate. Note: This state is `true` if a form field is required but empty. However, the XForms `valid` property would be set to `false`.
Used in Roles:	All elements of the base markup
Value:	token

Values of aria-invalid

Value	Description
grammar:	A grammatical error was detected.
false (default):	There are no detected errors in the value.
spelling:	A spelling error was detected.
true:	The value entered by the user has failed validation.

`aria-label` (property)

Defines a string *value* that labels the current element when included as an *attribute* of the current *element*. Also see `aria-labelledby`.

The purpose of `aria-label` is the same as that of `aria-labelledby`. It provides the user with a recognizable name of the object. The most common *accessibility API* mapping for a label is the *accessible name* property.

If the label text is visible on screen, authors **SHOULD** use `aria-labelledby` and **SHOULD NOT** use `aria-label`. There may be instances where the name of an element cannot be determined programmatically from the content of the element, and there are cases where providing a visible label is not the desired user experience. Most host languages provide an attribute that could be used to name the element (e.g. the *title attribute in HTML* [*HTML*]), yet this may present a browser tooltip. In the cases where a visible label or visible tooltip is undesirable, authors **MAY** set the accessible name of the element using `aria-label`.

Characteristics of aria-label

Characteristic	Value
Related Concepts:	A related concept is title in *HTML* [*HTML*].
Used in Roles:	All elements of the base markup
Value:	string

`aria-labelledby` (property)

Identifies the *element* (or elements) that labels the current element. Also see `aria-label` and `aria-describedby`.

The purpose of `aria-labelledby` is the same as that of `aria-label`. It provides the user with a recognizable name of the object. The most common *accessibility API* mapping for a label is the *accessible name* property.

If the label text is visible on screen, authors **SHOULD** use `aria-labelledby` and **SHOULD NOT** use `aria-label`. Use `aria-label` only if the interface is such that it is not possible to have a visible label on the screen.

The `aria-labelledby` attribute is very similar to describing an object with `aria-describedby`, where a description is intended to provide additional information that some users might need.

> Note: The expected spelling of this property in U.S. English is "labeledby." However, the *accessibility API* features to which this property is mapped have established the "labelledby" spelling. This property is spelled that way to match the convention and minimize the difficulty for developers.

Characteristics of aria-labelledby

Characteristic	Value
Related Concepts:	A related concept is label in *XForms* [*XForms*] and *HTML* [*HTML*].
Used in Roles:	All elements of the base markup
Value:	ID reference list

`aria-level` (property)

Defines the hierarchical level of an *element* within a structure.

This can be applied inside trees to tree items, to headings inside a document, to nested grids, and to other structural items that may appear inside a container or participate in an ownership hierarchy. The *value* for `aria-level` is an integer greater than or equal to 1.

Levels increase with depth. If the DOM ancestry does not accurately represent the level, authors **SHOULD** explicitly define the `aria-level` *attribute*.

Unless supported on a grouping element (such as in the case of the `row`), this attribute is applied to leaf nodes (elements that receive focus), not to the parent grouping element, even when all siblings are at the same level. This means that multiple elements in a set

may have the same value for this attribute. Although it would be less repetitive to provide a single value on the container, restricting this to leaf nodes ensures that there is a single way for *assistive technology* to use the attribute.

If the DOM ancestry accurately represents the level, the *user agent* can calculate the level of an item from the document structure. This attribute can be used to provide an explicit indication of the level when that is not possible to calculate from the document structure or the `aria-owns` attribute. User agent support for automatic calculation of level may vary; authors **SHOULD** test with *user agents* and assistive technologies to determine whether this attribute is needed. If the author intends for the user agent to calculate the level, the author **SHOULD** omit this attribute.

> Note: In the case of a `treegrid`, `aria-level` is supported on elements with the role `row`, rather than on the leaf node `gridcell`. In all other instances, `aria-level` is applied on the leaf nodes; for example, on a `treeitem` in a `tree`.

Characteristics of aria-level

Characteristic	Value

Used in Roles:	`grid`
	`heading`
	`row`
	`listitem`

Value:	integer

`aria-live` (property)

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.

The *values* of this *attribute* are expressed in terms of politeness levels. Regions specified as `polite` will notify users of updates but generally do not interrupt the current task, and updates take low priority. Use the `assertive` value when the update needs to be communicated to the user more urgently, for example, warning or error messages in a form that does immediate validation for each form field.

Politeness levels are essentially an ordering mechanism for updates and serve as a strong suggestion to user agents or assistive technologies. The value may be overridden by user agents, assistive technologies, or the user. For example, if assistive technologies can determine that a change occurred in response to a key press or a mouse click, the assistive technologies may present that change immediately even if the value of the `aria-live` attribute *states* otherwise.

Since different users have different needs, it is up to the user to tweak his or her assistive technologies' response to a live region with a certain politeness level from the commonly defined baseline. Assistive technologies may choose to implement increasing and decreasing levels of granularity so that the user can exercise control over queues and interruptions.

When the *property* is not set on an *object* that needs to send updates, the politeness level is the value of the nearest ancestor that sets the `aria-live` attribute.

The *aria-live* attribute is the primary determination for the order of presentation of changes to live regions. Implementations will also consider the default level of politeness in a *role* when the *aria-live* attribute is not set in the ancestor chain (e.g. log changes are polite by default). Items which are *assertive* will be presented immediately, followed by polite items. User agents or assistive technology **MAY** choose to clear queued changes when an assertive change occurs. (e.g. changes in an assertive region may remove all currently queued changes)

Characteristics of aria-live

Characteristic	Value
Used in Roles:	All elements of the base markup
Value:	token

Values of aria-live

Value	Description
off (default):	Updates to the region will not be presented to the user.
polite:	(Background change) Assistive technology **SHOULD** announce updates at the next graceful opportunity, such as at the end of speaking the current sentence or when the user pauses typing.
assertive:	This information has the highest priority and assistive technology **SHOULD** notify the user immediately. Because an interruption may disorientate users or cause them to not complete their current task, authors **SHOULD NOT** use the assertive value unless the interruption is imperitive.

---

aria-multiline (property)

Indicates whether a text box accepts only a single line, or if it can accept multiline input.

> In most user agent implementations, the default behavior of the ENTER or RETURN key is different between the single-line and multi-line text fields in HTML. When user has focus in a single-line <input type="text"> element, the keystroke usually submits the form. When user has focus in a multi-line <textarea> element, the keystroke inserts a carriage return. The WAI-ARIA textbox role differentiates these types of boxes with the aria-multiline attribute, so authors are advised to be aware of this distinction when designing the field.

Characteristics of aria-multiline

Characteristic	Value
Used in Roles:	textbox
Value:	boolean

Values of aria-multiline

Value	Description
true:	This is a multi-line text box.
false (default):	This is a single-line text box.

`aria-multiselectable` **(property)**

Indicates that the user may select more than one item from the current selectable descendants.

Lists, trees, and grids may allow users to select more than one item at a time.

Authors **SHOULD** ensure that selected descendants have the `aria-selected` *attribute* set to `true`, and selectable descendant have the `aria-selected` attribute set to `false`. Authors **SHOULD NOT** use the `aria-selected` attribute on descendants that are not selectable.

Characteristics of aria-multiselectable

Characteristic	Value

Used in Roles:	`grid`
	`listbox`
	`tree`

Value:	boolean

Values of aria-multiselectable

Value	Description
true:	More than one item in the widget may be selected at a time.
false (default):	Only one item can be selected.

`aria-orientation` **(property)**

Indicates whether the element and scrolling orientation is horizontal or vertical.

Characteristics of aria-orientation

Characteristic	Value
Used in Roles:	`scrollbar`
Value:	token

Values of aria-orientation

Value	Description
horizontal:	The element is oriented horizontally and controls horizontal scrolling.
vertical (default):	The element is oriented vertically and controls vertical scrolling.

---

aria-owns (property)

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. Also see aria-controls.

The *value* of the aria-owns *attribute* is a space-separated list of IDREFS that reference one or more elements in the document by ID. The reason for adding aria-owns is to expose a parent/child contextual relationship to *assistive technologies* that is otherwise impossible to infer from the DOM.

Authors **SHOULD NOT** use aria-owns as a replacement for the DOM hierarchy. If the relationship is represented in the DOM, do not use aria-owns. Authors **MUST** ensure that an element's IDREF is not specified in more than one other element's aria-owns' attribute at any time. In other words, an element can have only one explicit owner.

Characteristics of aria-owns

Characteristic	Value
Used in Roles:	All elements of the base markup
Value:	ID reference list

---

aria-posinset (property)

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. Also see aria-setsize.

If all items in a set are present in the document structure, it is not necessary to set this *attribute*, as the *user agent* can automatically calculate the set size and position for each item. However, if only a portion of the set is present in the document structure at a given moment, this *property* is needed to provide an explicit indication of an element's position.

The following example shows items 1 through 4 in a set of 16.

```
<h2 id="label_fruit"> Available Fruit </h2>
<ul role="listbox" aria-labelledby="label_fruit">
  <li role="option" aria-setsize="16" aria-posinset="1"> apples </li>
  <li role="option" aria-setsize="16" aria-posinset="2"> bananas </li>
  <li role="option" aria-setsize="16" aria-posinset="3"> cantalopes </li>
  <li role="option" aria-setsize="16" aria-posinset="4"> dates </li>
</ul>
```

Authors **MUST** set the *value* for aria-posinset to an integer greater than or equal to 1, and less than or equal to the size of the set. Authors **SHOULD** use aria-posinset in conjunction with aria-setsize.

Characteristics of aria-posinset

Characteristic	Value
Used in Roles:	listitem option
Value:	integer

`aria-pressed` (state)

Indicates the current "pressed" *state* of toggle buttons. Also see `aria-checked` and `aria-selected`.

Toggle buttons require a full press-and-release cycle to change their *value*. Activating it once changes the value to `true`, and activating it another time changes the value back to `false`. A value of `mixed` means that the values of more than one item controlled by the button do not all share the same value. Examples of mixed-state buttons are described in *WAI-ARIA Authoring Practices* [*ARIA-PRACTICES*]. If the *attribute* is not present, the button is not a toggle button.

The `aria-pressed` attribute is similar but not identical to the `aria-checked` attribute. Operating systems support `pressed` on buttons and `checked` on checkboxes.

Characteristics of aria-pressed

Characteristic	Value
Used in Roles:	`button`
Value:	token

Values of aria-pressed

Value	Description
true:	The element is pressed.
false:	The element supports being pressed but is not currently pressed.
mixed:	Indicates a mixed mode value for a tri-state toggle button.
undefined (default):	The element does not support being pressed.

`aria-readonly` (property)

Indicates that the *element* is not editable, but is otherwise *operable*. Also see `aria-disabled`.

This means the user can read but not set the value of the *widget*. Readonly elements are relevant to the user, and application authors **SHOULD NOT** restrict navigation to the element or its focusable descendants. Other actions such as copying the value of the element are also supported. This is in contrast to disabled elements, to which applications might not allow user navigation to descendants.

Examples include:

- A form element which represents a constant.
- Row or column headers in a spreadsheet grid.
- The result of a calculation such as a shopping cart total.

Characteristics of aria-readonly

Characteristic	Value
Related Concepts:	*XForms* [XForms] Readonly
Used in Roles:	grid gridcell textbox
Value:	boolean

Values of aria-readonly

Value	Description
true:	The user cannot change the value of the element.
false (default):	The user can set the value of the element.

`aria-relevant` **(property)**

Indicates what user agent change notifications (additions, removals, etc.) assistive technology will monitor within a live region. Also see `aria-atomic`.

The *attribute* is represented as a space delimited list of the following *values*: `additions`, `removals`, `text`; or a single catch-all value `all`.

This is used to describe *semantically* meaningful changes, as opposed to merely presentational ones. For example, nodes that are removed from the top of a log are merely removed for purposes of creating room for other entries, and the removal of them does not have meaning. However, in the case of a buddy list, removal of a buddy name indicates that they are no longer online, and this is a meaningful *event*. In that case `aria-relevant` will be set to `all`. When the `aria-relevant` attribute is not provided, the default is to assume that text modifications and node additions are relevant, and that node removals are irrelevant.

> Note: `aria-relevant` values of removals or all are to be used sparingly. Assistive technologies only need to be informed of content removal when its removal represents an important change, such as a buddy leaving a chat room.

`aria-relevant` is an optional attribute of live regions. This is a suggestion to *assistive technologies*, but assistive technologies are not required to present changes of all the relevant types.

Both *accessibility APIs* and *Document Object Model Level 2 Events* [DOM] provides events to allow assistive technologies to determine changed areas of the document.

When `aria-relevant` is not defined, an element's value is inherited from the nearest ancestor with a defined value. Although the value is a token list, inherited values are not additive; the value provided on a descendant element completely overrides any inherited value from an ancestor element.

When text changes are denoted as relevant, user agents **MUST** monitor any descendant node change that affects the text alternative computation of the live region as if the accessible name were determined from contents (nameFrom: contents). For example, a text change would be triggered if the HTML `alt` attribute of a contained image changed.

However, no change would be triggered if there was a text change to a node outside the live region, even if that node was referenced (via aria-labelledby) by an element contained in the live region.

Characteristics of aria-relevant

Characteristic	Value
Used in Roles:	All elements of the base markup
Value:	token list

Values of aria-relevant

Value	Description
additions:	Nodes are added to the DOM within the live region.
removals:	Nodes within the live region are removed from the DOM.
text:	Text is modified within any DOM descendant nodes of the live region.
all:	Equivalent to the combination of all values, "additions removals text".
additions text (default):	Equivalent to the combination of values, "additions text".

---

aria-required (property)

Indicates that user input is required on the *element* before a form may be submitted.

For example, if a user needs to fill in an address field, the author will need to set the field's aria-required attribute to true.

> Note: The fact that the element is required is often presented visually (such as a sign or symbol after the *widget*). Using the aria-required *attribute* allows the author to explicitly convey to *assistive technologies* that an element is required.

Unless an exactly equivalent native attribute is available, host languages **SHOULD** allow authors to use the aria-required attribute on host language form elements that require input or selection by the user.

Characteristics of aria-required

Characteristic	Value
Used in Roles:	combobox gridcell listbox radiogroup spinbutton textbox tree
Value:	boolean

Values of aria-required

Value	Description
true:	Users need to provide input on an element before a form is submitted.
false (default):	User input is not necessary to submit the form.

`aria-selected` (state)

Indicates the current "selected" *state* of various *widgets*. Also see `aria-checked` and `aria-pressed`.

This *attribute* is used with single-selection and multiple-selection widgets:

1. Single-selection containers where the currently focused item is not selected. The selection normally follows the focus, and is managed by the *user agent*. Authors need only explicitly specify `aria-selected` when the focused item is not selected. Otherwise the currently focused item is considered to be selected so `aria-selected="true"` is redundant.
2. Multiple-selection containers. Authors **SHOULD** ensure that any selectable descendant of a container in which the `aria-multiselectable` attribute is `true` specifies a value of either `true` or `false` for the `aria-selected` attribute.

Characteristics of aria-selected

Characteristic	Value

Used in Roles:	`gridcell`
	`option`
	`row`
	`tab`

Value:	token

Values of aria-selected

Value	Description
true:	The selectable element is selected.
false:	The selectable element is not selected.
undefined (default):	The element is not selectable.

`aria-setsize` (property)

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. Also see `aria-posinset`.

This *property* is marked on the members of a set, not the container element that collects the members of the set. To orient a user by saying an element is "item X out of Y," the *assistive technologies* would use X equal to the `aria-posinset` *attribute* and Y equal to the `aria-setsize` attribute.

If all items in a set are present in the document structure, it is not necessary to set this

property, as the *user agent* can automatically calculate the set size and position for each item. However, if only a portion of the set is present in the document structure at a given moment (in order to reduce document size), this property is needed to provide an explicit indication of set size.

The following example shows items 1 through 4 in a set of 16.

```
<h2 id="label_fruit"> Available Fruit </h2>
<ul role="listbox" aria-labelledby="label_fruit">
  <li role="option" aria-setsize="16" aria-posinset="1"> apples </li>
  <li role="option" aria-setsize="16" aria-posinset="2"> bananas </li>
  <li role="option" aria-setsize="16" aria-posinset="3"> cantalopes </li>
  <li role="option" aria-setsize="16" aria-posinset="4"> dates </li>
</ul>
```

Authors **MUST** set the *value* for `aria-setsize` to an integer greater than or equal to 1, and less than or equal to the size of the set. Authors **SHOULD** use `aria-setsize` in conjunction with `aria-posinset`.

Characteristics of aria-setsize

Characteristic	Value
Used in Roles:	listitem option
Value:	integer

`aria-sort` (property)

Indicates if items in a table or grid are sorted in ascending or descending order.

Authors **SHOULD** only apply this *property* to table headers or grid headers. If the property is not provided, there is no defined sort order. For each table or grid, authors **SHOULD** apply `aria-sort` to only one header at a time.

Characteristics of aria-sort

Characteristic	Value
Used in Roles:	columnheader rowheader
Value:	token

Values of aria-sort

Value	Description
ascending:	Items are sorted in ascending order by this column.
descending:	Items are sorted in descending order by this column.
none (default):	There is no defined sort applied to the column.
other:	A sort algorithm other than ascending or descending has been applied.

aria-valuemax (property)

Defines the maximum allowed value for a range *widget*.

A range widget may start with a given value, which can be increased until a maximum value, defined by this *property*, is reached.

Declaring the minimum and maximum *values* allows alternate devices to react to arrow keys, validate the current value, or simply let the user know the size of the range. If the aria-valuenow has a known maximum and minimum, the author **SHOULD** provide properties for aria-valuemax and aria-valuemin. The value of aria-valuemin SHOULD be less than or equal to the value of aria-valuemax. If not, or the aria-valuemax is indeterminate, this is considered to be an error condition that will be handled by assistive technologies resulting in undesirable results.

Characteristics of aria-valuemax

Characteristic	Value
Related Concepts:	*XForms* [*XForms*] range
Used in Roles:	progressbar range
Value:	number

aria-valuemin (property)

Defines the minimum allowed value for a range *widget*.

A range widget may start with a given value, which can be decreased until a minimum value, defined by this *property*, is reached.

Declaring the minimum and maximum *values* allows alternate devices to react to arrow keys, validate the current value, or simply let the user know the size of the range. If the aria-valuenow has a known maximum and minimum, the author **SHOULD** provide properties for aria-valuemax and aria-valuemin.

Characteristics of aria-valuemin

Characteristic	Value
Related Concepts:	*XForms* [*XForms*] range
Used in Roles:	progressbar range
Value:	number

aria-valuenow (property)

Defines the current value for a range *widget*. Also see aria-valuetext.

Used, for example, on a range widget such as a slider or progress bar.

If the current value is not known (for example, an indeterminate progress bar), the author **SHOULD NOT** set the aria-valuenow *attribute*. If the aria-valuenow attribute is absent,

no information is implied about the current value. If the `aria-valuenow` has a known maximum and minimum, the author **SHOULD** provide properties for `aria-valuemax` and `aria-valuemin`.

The value of `aria-valuenow` is a decimal number. If the range is a set of numeric values, then `aria-valuenow` is one of those values. For example, if the range is [0, 1], a valid `aria-valuenow` is 0.5. A value outside the range, such as -2.5 or 1.1, is invalid.

When the rendered value cannot be accurately represented as a number, authors **SHOULD** use the `aria-valuetext` attribute in conjunction with `aria-valuenow` to provide a user-friendly representation of the range's current value. For example, a slider may have rendered values of `small`, `medium`, and `large`. In this case, the values of `aria-valuenow` could range from 1 through 3, which indicate the position of each value in the value space, but the `aria-valuetext` would be one of the strings: `small`, `medium`, or `large`.

Characteristics of aria-valuenow

Characteristic	Value
Related Concepts:	*XForms* [*XForms*] range, start
Used in Roles:	`progressbar` `range`
Value:	number

`aria-valuetext` (property)

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

Used, for example, on a range widget such as a slider or progress bar.

If the `aria-valuetext` *attribute* is set, authors **SHOULD** also set the `aria-valuenow` attribute, unless that value is unknown (for example, on an indeterminate `progressbar`).

Authors **SHOULD** only set the `aria-valuetext` attribute when the rendered value cannot be accurately represented as a number. For example, a slider may have rendered values of `small`, `medium`, and `large`. In this case, the values of `aria-valuenow` could range from 1 through 3, which indicate the position of each value in the value space, but the `aria-valuetext` would be one of the strings: `small`, `medium`, or `large`. If the `aria-valuetext` attribute is absent, the *assistive technologies* will rely solely on the `aria-valuenow` attribute for the current value.

Characteristics of aria-valuetext

Characteristic	Value
Related Concepts:	*XForms* [*XForms*] range, start
Used in Roles:	`progressbar` `range`
Value:	string

This Web page is part of Accessible Rich Internet Applications (WAI-ARIA) 1.0. The entire document is also available as a single HTML file. See the WAI-ARIA Overview for an explanation of how this document fits in with other WAI-ARIA documents.

7. Implementation in Host Languages

This section is *normative*.

The *roles*, *states*, and *properties* defined in this specification do not form a complete web language or format. They are intended to be used in the context of a host language. This section discusses how host languages are to implement WAI-ARIA, to ensure that the markup specified here will integrate smoothly and effectively with the host language markup.

Although markup languages look alike superficially, they do not share language definition infrastructure. To accommodate differences in language-building approaches, the requirements are both general and modularization-specific. While allowing for differences in how the specifications are written, we believe we have maintained consistency in how the WAI-ARIA information looks to authors and how it is manipulated in the DOM by scripts.

WAI-ARIA roles, states, and properties are implemented as *attributes* of *elements*. Roles are applied by placing their names among the tokens appearing in the *value* of a host-language-provided `role` attribute. States and properties each get their own attribute, with values as defined for each particular state or property in this specification. The name of the attribute is the aria-prefixed name of the state or property.

7.1. Role Attribute

An implementing host language will provide an *attribute* with the following characteristics:

- The attribute name **MUST** be `role`;
- The attribute *value* **MUST** allow a token list as the value;
- The appearance of the name literal of any concrete WAI-ARIA *role* as one of these substrings **MUST NOT** in and of itself make the attribute value illegal in the host-language syntax; and
- The first name literal of a non-abstract WAI-ARIA role in the list of tokens in the role attribute defines the role according to which the user agent **MUST** process the element. User Agent processing for roles is defined in the *WAI-ARIA User Agent Implementation Guide* [*ARIA-IMPLEMENTATION*].

7.2. State and Property Attributes

An implementing host language **MUST** allow *attributes* with the following characteristics:

- The attribute name is the name of any state or property identified in the Supported States and Properties section, such as `aria-busy`, `aria-selected`, `aria-activedescendant`, `aria-valuetext`;
- The syntax does **NOT** prevent the attribute from appearing anywhere that it is applicable, as specified in this specification;
- When these attributes appear in a document instance, the attributes will be processed as defined in this specification.

Following the *Namespaces Recommendation* [*XML-NAMES*], the namespace name for these attributes *has no value*. The names of these attributes do not have a prefix offset by a colon; in the terms of namespaces they are *unprefixed attribute names*. The ECMAScript binding of the DOM interface `getAttributeNS` for example, treats an empty string (`""`) as representing this condition, so that both `getAttribute("aria-busy")` and `getAttributeNS("", "aria-busy")` access the same `aria-busy` attribute in the DOM.

7.3. Focus Navigation

An implementing host language **MUST** provide support for the author to make all interactive elements focusable, that is, any renderable or event-receiving elements. An implementing host language **MUST** provide a facility to allow web authors to define whether these focusable, interactive elements appear in the default tab navigation order. The `tabindex` *attribute* in HTML 5 is an example of one implementation.

7.4. Implicit WAI-ARIA Semantics

WAI-ARIA is designed to provide *semantic* information about objects when host languages lack native semantics for the object. WAI-ARIA is designed, however, to provide additional semantics for many host languages. Furthermore, host languages over time can evolve and provide new native features that correspond to ARIA features. Therefore, there are many situations in which WAI-ARIA semantics are redundant with host language semantics.

These host language features can be viewed as having "implict WAI-ARIA semantics". User agent processing of features with implict WAI-ARIA semantics would be similar to the processing for the WAI-ARIA feature. The processing might not be identical because of lexical differences between the host language feature and the WAI-ARIA feature, but generally the user agent would expose the same information to the accessibility API. Features with implicit WAI-ARIA semantics satisfy WAI-ARIA structural requirements such as required owned elements, required states and properties, etc. and do not require explicit WAI-ARIA semantics to be provided.

For example, if an element with the functionality already exists, such as a checkbox or radio button, use the native semantics of the host language. WAI-ARIA markup is only intended to be used to enhance the native semantics (e.g., indicating that the element is required with `aria-required`), or to change the semantics to a different purpose form the standard functionality of the element.

Implicit WAI-ARIA semantics affects the conflict resolution procedures in the following section, Conflicts with Host Language Semantics. Therefore, implicit WAI-ARIA semantics need to be defined in a normative specification, such as the host language specification or the *WAI-ARIA User Agent Implementation Guide* [*ARIA-IMPLEMENTATION*].

7.5. Conflicts with Host Language Semantics

WAI-ARIA is intended to add *semantic* information to objects when native host language elements are not available with these semantics. It is generally used on elements that have no native semantics of their own with respect to user interface objects. At times, however, it is used on elements that have similar but not identical semantics to the intended object (for instance, nested list elements might be used to represent a tree structure). This is usually done as part of a fallback strategy, or because native presentation of the repurposed element reduces the amount of style and script the author needs to use. In these cases, the user agent **MUST** use the WAI-ARIA semantics to define how it exposes the element to accessibility APIs,

not the native semantics.

Notwithstanding these normal situations in which WAI-ARIA is expected to override native semantics, there are elements that are inappropriate to override with WAI-ARIA. This may be because native semantics already exist so WAI-ARIA is not needed, or because semantics from WAI-ARIA directly conflict with host language semantics. When features in the host language are available for a given type of object, authors **SHOULD** use those features rather than repurpose other elements with WAI-ARIA. Conformance checkers **SHOULD** issue a notification when WAI-ARIA is used to provide semantics if features with the same implicit WAI-ARIA semantic is available in the host language.

When WAI-ARIA states and properties correspond to host language features that have the same implicit WAI-ARIA semantic, it can be particularly problematic to use the WAI-ARIA feature. If the WAI-ARIA feature and the host language feature are both provided but their values are not kept in sync, it is uncertain which one is correct. Therefore, user agents **MUST** ignore WAI-ARIA states and properties when a host language feature with the same implicit WAI-ARIA semantic is provided on the same object. Conformance checkers **SHOULD** signal an error when WAI-ARIA states and properties are used on the same object as a host language feature with the same implicit WAI-ARIA semantic.

Although host languages can also have features that have implicit WAI-ARIA semantics corresponding to roles, the above rule does not apply to roles. When a WAI-ARIA role is provided, user agents **MUST** use the semantic of the WAI-ARIA role for processing, not the native semantic. This is because values for roles do not conflict in the same way as values for states and properties, and because authors are expected to have good reason to provide a WAI-ARIA role even on elements that would not normally be repurposed.

Host languages **MAY** document features that should not be overridden with WAI-ARIA (these are called "strong native semantics"). These can be features that have implicit WAI-ARIA semantics, as well as features where the processing would be uncertain if the semantics were changed with WAI-ARIA. Conformance checkers **SHOULD** signal an error or warning when a WAI-ARIA role is used on features with strong native semantics, even though user agents process the feature as described above.

7.6. State and Property Attribute Processing

State and property attributes are included in host languages, and therefore syntax for representation of their value types is governed by the host language. For each of the value types defined in Value, an appropriate value type from the host language is used. Recommended correspondences between WAI-ARIA value types and various host language value types are listed in Mapping WAI-ARIA Value types to languages. This is a non-normative mapping in order to accommodate new host languages supporting WAI-ARIA.

The list value types—ID reference list and token list—allow more than one value of the given type to be provided. The values are separated by delimiter characters recognized by the host language for list attributes, such as space characters, commas, etc. Some languages may require a specific, single delimiter, while others may allow various delimiters.

Global states and properties are supported on any element in the host language. However, authors **MUST** use a WAI-ARIA role on an element in order to use non-global states and properties on that element. When a role attribute is added to an element, the *semantics* and behavior of the element, including support for WAI-ARIA states and properties, are augmented or overridden by the role behavior. User agents **MUST** ignore non-global states and properties used on an element without a WAI-ARIA role.

When WAI-ARIA roles are used, supported states and properties that are not present in the DOM are treated according to their default value, unless they are required. For token states and properties, an attribute value that is a zero-length string ("") also corresponds to the default value. Therefore, user agents **SHOULD** treat token state and property attributes with a value of "" the same as they treat an absent attribute. Normally this corresponds to the default value (usually "undefined"), but if it is a required attribute, they signal an error (because a null value is the same as failing to provide the required attribute).

Contents	**Previous:** 6. Supported States and Properties	**Next:** 8. Conformance

8. Conformance

This section is *normative*.

8.1. Non-interference with the Host Language

WAI-ARIA processing by the *user agent* **MUST NOT** interfere with the normal operation of the built-in features of the host language.

If a CSS selector includes an ARIA attribute (e.g. `input[aria-invalid="true"]`), user agents **MUST** immediately update the visual display of any elements matching (or no longer matching) the selector any time the attribute is added/changed/removed in the DOM. The user agent **MAY** alter the mapping of the host language features into an *accessibility API*, but the user agent **MUST NOT** alter the DOM in order to remap WAI-ARIA markup into host language features.

8.2. All WAI-ARIA in DOM

A conforming *user agent* which implements a Document Object Model **MUST** include the WAI-ARIA roles, states, and properties in the DOM as specified by the author, even though processing may affect how the elements are exposed to accessibility APIs. Doing so ensures that each role attribute and all WAI-ARIA states and properties, including their values, are in the document in an unmodified form so other tools, such as assistive technologies, can access them. A conforming W3C DOM meets this criteria.

8.3. Web Application Notification of DOM Changes

When a web application maintains a local representation of accessibility information through WAI-ARIA *roles*, *states*, and *properties*, the *user agent* **MUST** provide a method to notify the web application when a change occurs to any of the states or properties. For example, if any software other than the web application (such as user agents, *assistive technologies*, or plug-ins) were to change the `aria-activedescendant` *attribute* of a `tablist`, the user agent could fire a change *event* so that the web application can be notified and display the appropriate `tabpanel`. Likewise, web application authors **SHOULD** detect DOM changes when possible and update the web application appropriately.

8.4. Conformance Checkers

Any application or script verifying document conformance or validity **SHOULD** include a test for all of the normative author requirements in this specification.

available as a single HTML file. See the WAI-ARIA Overview for an explanation of how this document fits in with other WAI-ARIA documents.

9. References

This section is *normative*.

9.1. Normative References

Resources referenced normatively are considered part of ARIA. Implementations of ARIA **MUST** implement the requirements of these resources.

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Resources referenced informatively provide useful information relevant to ARIA, but do not comprise a part of the ARIA requirements.

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10. Appendices

This section is *informative*.

10.1. Schemata

WAI-ARIA roles, states, and properties are available in a number of machine-readable formats to support validation of content using WAI-ARIA attributes. WAI-ARIA is not finalized, however, so these files are subject to change without notice.

It is not appropriate to use these document types for live content. These are made available only for download, to support local use in development, evaluation, and validation tools. Using these versions directly from the W3C server could cause automatic blockage, preventing them from loading.

If it is necessary to use schemata in content, follow guidelines to avoid excessive DTD traffic. For instance, use caching proxies to avoid fetching the schema each time it is used, or ensure software uses a local cache, such as with XML catalogs.

10.1.1. Roles Implementation

The taxonomy for WAI-ARIA expressed in RDF is available from http://www.w3.org/WAI/ARIA/schemata/aria-1.rdf.

10.1.2. WAI-ARIA Attributes Module

This module declares the WAI-ARIA *attributes* as a module that can be included in a modularlized DTD. A sample XHTML DTD using this module follows. Note the WAI-ARIA attributes are in no namespace, and the attribute name begins with "aria-" to reduce the likelihood of collision with existing attributes.

This module is available from http://www.w3.org/MarkUp/DTD/aria-attributes-1.mod.

10.1.3. XHTML plus WAI-ARIA DTD

This DTD extends XHTML 1.1 and adds the WAI-ARIA *state* and *property attributes* to all its *elements*. In order to provide broader keyboard support and conform with the Focus Navigation section above, it also adds the `tabindex` attribute to a wider set of elements.

This is not a formal document type and may be obsoleted by future formal XHTML DTDs that support WAI-ARIA.

The XHTML 1.1 plus WAI-ARIA DTD is available from http://www.w3.org/WAI/ARIA/schemata/xhtml-aria-1.dtd.

10.1.4. SGML Open Catalog Entry for XHTML+ARIA

This section contains the SGML Open Catalog-format definition [CATALOG] of the public identifiers for XHTML+ARIA 1.0.

```
-- ..................................................................... --
-- File catalog  ....................................................... --

--  XHTML+ARIA Catalog Data File

    Revision:  $Revision: 1.6 $

    See "Entity Management", SGML Open Technical Resolution 9401 for detailed
    information on supplying and using catalog data. This document is available
    from OASIS at URL:

        <http://www.oasis-open.org/html/tr9401.html>

--


-- ..................................................................... --
-- SGML declaration associated with XHTML  ............................. --

OVERRIDE YES

SGMLDECL "xml1.dcl"

-- ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::: --

-- XHTML+ARIA modules          ........................................... --


PUBLIC "-//W3C//DTD XHTML+ARIA 1.0//EN" "xhtml-aria-1.dtd"


PUBLIC "-//W3C//ENTITIES XHTML ARIA Attributes 1.0//EN" "aria-attributes-1.mod"

-- End of catalog data  ................................................ --
-- ..................................................................... --
```

10.1.5. WAI-ARIA Attributes XML Schema Module

This module declares the WAI-ARIA *attributes* as an XML Schema module that can be included in a modularlized schema. Note the WAI-ARIA attributes are in no namespace, and the attribute name begins with "aria-" to reduce the likelihood of collision with existing attributes.

This module is available from http://www.w3.org/MarkUp/SCHEMA/aria-attributes-1.xsd.

10.1.6. HTML 4.01 plus WAI-ARIA DTD

This standalone DTD adds WAI-ARIA *state* and *property attributes* to all *elements* in HTML 4.01, as well as a `role` attribute. In order to provide broader keyboard support, it also adds the `tabindex` attribute to a wider set of elements.

The DTD is based on the HTML 4.01 Transitional DTD, and includes all entity references needed to make it a standalone file. *This is not an official W3C DTD* and should be considered a derivative work of HTML 4.01.

The HTML Working Group is incorporating WAI-ARIA into HTML 5. Official support for WAI-

ARIA in HTML will be provided in that specification. This DTD is made available *only* as a bridging solution for applications requiring DTD validation but not using HTML 5.

This module is available from http://www.w3.org/WAI/ARIA/schemata/html4-aria-1.dtd.

10.2. Mapping ARIA Value types to languages

Editor's note: This section may be moved to an external resource.

The table below provides recommended mappings between ARIA state and property types and attribute types from HTML 5, *XML Schema Datatypes* [*XSD*], SVG, and SGML.

Languages not listed below might have appropriate value types defined in the language. If they do not, we recommend XML Schema Datatypes for general purpose XML languages. Documents using DTDs instead of schemas will not be able to validate automatically and require additional processing on ARIA attributes.

ARIA type	HTML 5	XML Schema	SVG	SGML
boolean	Keyword and enumerated attributes with allowed values of "true" and "false"	boolean		
number	Real number	decimal		
integer	Non-negative integer	integer		
token	Keyword and enumerated attributes	NMTOKEN with an enumeration constraint		
token list	Space-separated tokens or comma-separated tokens	NMTOKENS with an enumeration constraint		
ID reference	The value of a defined id attribute on another element	IDREF		
ID reference list	The value of one or more defined id attributes on other element(s), represented as Space-separated tokens or comma-separated tokens	IDREFS		
string	No value constraints	string		

10.3. WAI-ARIA Role, State, and Property Quick Reference

The following table provides a quick reference to the supported states and properties for all WAI-ARIA roles that may be used in markup.

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

- 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

Role	Required Properties	Supported Properties
alert		aria-expanded (state)
alertdialog		aria-expanded (state)
application		aria-expanded (state)
article		aria-expanded (state)
banner		aria-expanded (state)
button		aria-pressed (state)
checkbox	aria-checked (state)	
columnheader		aria-sort aria-readonly aria-required aria-selected (state) aria-expanded (state)
combobox	aria-expanded (state)	aria-required aria-activedescendant
complementary		aria-expanded (state)
contentinfo		aria-expanded (state)
definition		aria-expanded (state)
dialog		aria-expanded (state)
directory		aria-expanded (state)
document		aria-expanded (state)
form		aria-expanded (state)
grid		aria-level aria-multiselectable aria-readonly aria-activedescendant aria-expanded (state)
gridcell		aria-readonly aria-required aria-selected (state) aria-expanded (state)
group		aria-activedescendant aria-expanded (state)
heading		aria-level aria-expanded (state)
img		aria-expanded (state)
link		
list		aria-expanded (state)
listbox		aria-multiselectable aria-required aria-expanded (state) aria-activedescendant aria-expanded (state)

listitem		aria-level aria-posinset aria-setsize aria-expanded (state)
log		aria-expanded (state)
main		aria-expanded (state)
marquee		aria-expanded (state)
math		aria-expanded (state)
menu		aria-expanded (state) aria-activedescendant aria-expanded (state)
menubar		aria-expanded (state) aria-activedescendant aria-expanded (state)
menuitem		
menuitemcheckbox	aria-checked (state)	
menuitemradio	aria-checked (state)	aria-posinset aria-selected (state) aria-setsize
navigation		aria-expanded (state)
note		aria-expanded (state)
option		aria-checked (state) aria-posinset aria-selected (state) aria-setsize
presentation		
progressbar		aria-valuemax aria-valuemin aria-valuenow aria-valuetext
radio	aria-checked (state)	aria-posinset aria-selected (state) aria-setsize
radiogroup		aria-required aria-activedescendant aria-expanded (state)
region		aria-expanded (state)
row		aria-level aria-selected (state) aria-activedescendant aria-expanded (state)
rowgroup		aria-activedescendant aria-expanded (state)
rowheader		aria-sort aria-readonly aria-required aria-selected (state) aria-expanded (state)
search		aria-expanded (state)
separator		aria-expanded (state)
scrollbar	aria-controls aria-orientation aria-valuemax aria-valuemin	aria-valuetext

	aria-valuenow	
slider	aria-valuemax aria-valuemin aria-valuenow	aria-valuetext
spinbutton	aria-valuemax aria-valuemin aria-valuenow	aria-required aria-activedescendant aria-valuetext
status		aria-activedescendant aria-expanded (state)
tab		aria-selected (state) aria-expanded (state)
tablist		aria-activedescendant aria-expanded (state)
tabpanel		aria-expanded (state)
textbox		aria-autocomplete aria-multiline aria-readonly aria-required
timer		aria-activedescendant aria-expanded (state)
toolbar		aria-activedescendant aria-expanded (state)
tooltip		aria-expanded (state)
tree		aria-multiselectable aria-required aria-activedescendant aria-expanded (state)
treegrid		aria-level aria-multiselectable aria-readonly aria-activedescendant aria-expanded (state) aria-multiselectable aria-required aria-activedescendant aria-expanded (state)
treeitem		aria-level aria-posinset aria-setsize aria-expanded (state) aria-checked (state) aria-posinset aria-selected (state) aria-setsize

10.4. Acknowledgments

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6. Michael Cooper (W3C/MIT)
7. James Craig (Apple, Inc.)
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10.4.2. Other previously active PFWG participants and other contributors to the Accessible Rich Internet Applications specification

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