

## Niagara<sup>AX</sup> Weather Guide

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**Note:** See *“U.S. Environmental Protection Agency (EPA) AIRNow Data Exchange Guidelines”* on page 31 for important EPA Guidelines.

This document provides information on the NiagaraAX weather module in AX-3.7, as well as previous AX-3.6 and AX-3.5 releases, and contains the following main sections:

- “Weather overview” on page 2
  - “What’s new in the AX-3.7 weather module” on page 2
  - “What’s new in the AX-3.6 weather module” on page 2
  - “Using weather components in Px views” on page 3
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## Weather overview

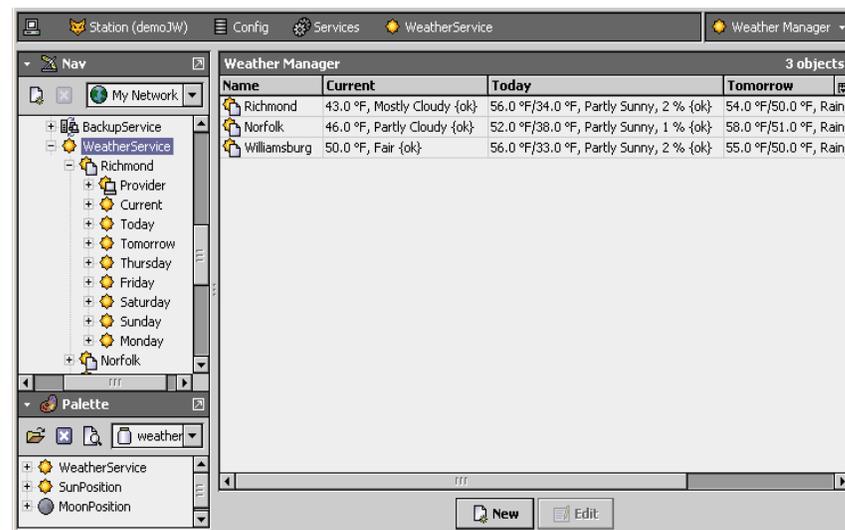
The weather module provides a [WeatherService](#) that you can copy into your station's ServiceContainer. Providing that the station has Internet connectivity, or is on a NiagaraNetwork with a Supervisor using the WeatherService, this can provide current weather conditions, as well as forecast conditions, for one or more locales. Other components to calculate current solar and lunar data are also included.

Starting in AX-3.6, *air quality* properties and views are also provided, and additional weather advisory enhancements were made. See [“What's new in the AX-3.6 weather module”](#) for an overview.

**Note:** *Typical usage is for U.S. locales, where weather information comes from the U.S. NWS (National Weather Service), a division of NOAA (National Oceanic and Atmospheric Administration). See [“National Weather Service notes”](#) on page 29 for additional technical details. However, starting in AX-3.7 (build 3.7.104 or later), international weather support is available. See [“What's new in the AX-3.7 weather module”](#).*

[Figure 1](#) shows a WeatherService that contains three different U.S. locales, or [WeatherReports](#).

**Figure 1** WeatherService example with 3 WeatherReports, as viewed in Nav side bar



In this example, the Nav side bar shows one of the three WeatherReports (“Richmond”) expanded, showing child weather components listed. These components are typical to most WeatherReport locales.

**Note:** *While an NWS WeatherReport (locale) has an active advisory, it appears in the Weather Manager view in alarm, with a red colored row.*

### What's new in the AX-3.7 weather module

If you are already familiar with the AX-3.6 weather module, the following summary of changes may be helpful in using the AX-3.7 or later version.

- Starting in build 3.7.104 or later (3.7U1 or Update 1), a new weather provider type is available, providing that the station's host platform has both the *weather* and *weatherUnderground* modules installed. The **Wunderground Weather Provider** interfaces to XML feeds from the Weather Underground® (wunderground.com), appropriate for locations outside of the United States (and its NWS). A developer account (and key ID) is needed from the Weather API of wunderground.com. For related details, see [“weatherUnderground-WundergroundWeatherProvider”](#) on page 23.
- Starting in AX-3.7, a WeatherReport's “CurrentConditions” component includes an “Observed” property, as a timestamp of when reported conditions were last observed (U.S. NWS providers only). If this time is more than two hours in the past, other Current data values are given status “stale”.

### What's new in the AX-3.6 weather module

If you are already familiar with the AX-3.5 weather module, the following summary of changes may be helpful in using the AX-3.6 or later version.

- Enhancements were made to the handling of advisories, such as those issued by the National Weather Service (NWS): warning, watch, advisory. Changes in the WeatherService architecture were made for this. Now, advisories are modeled as dynamic “Advisory” *components*, in an “**Advisories**” container under a WeatherReport's “Current” component. An “Advisory Manager” view on this container provides all the provider-issued details for any selected advisory.

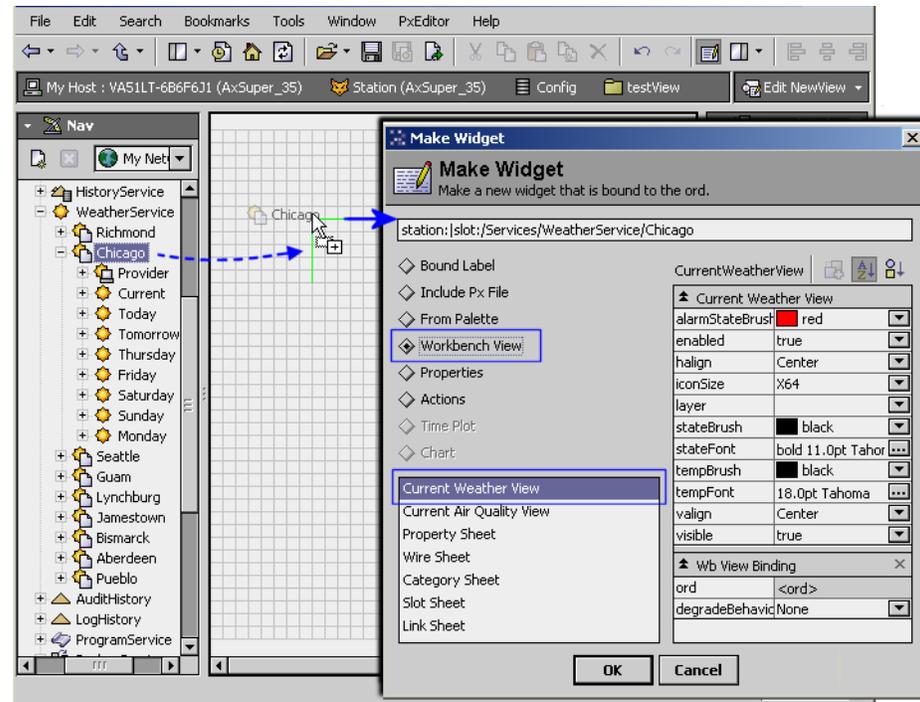
By default, advisories also result in Niagara alarms (as in AX-3.5). However, this is configurable, in case advisory alarms are not desired.

- Properties for “Ozone” (ppm) and “Particulate Matter” (ug/m<sup>3</sup>) values were added in a NWS WeatherProvider’s CurrentConditions (“**Current**”) component, as well as in Forecast child components (“**Today**”, “**Tomorrow**”, and so on).
- Related “air quality views” became available for both “**Current**” and Forecast components, including support for use on Px pages. Air quality views provide color indication of air quality, based on an “AQI” (air quality index) calculation.

### Using weather components in Px views

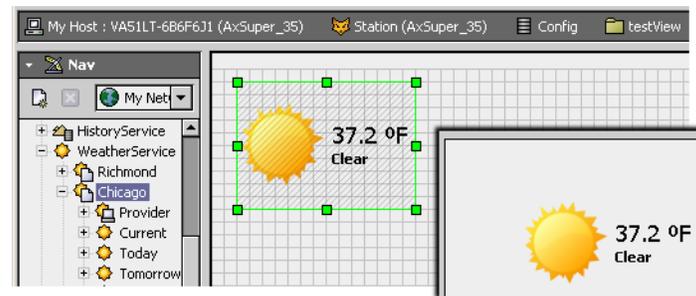
The weather module supports “drag and drop” usage of some weather components directly onto Px pages, providing iconic views.

**Figure 2** Drag and drop component on Px view example (WeatherReport for Current Weather View)



**Figure 2** above shows a WeatherReport dragged onto a Px page, with the resulting “Make Widget” dialog and default selection (Current Weather View). After adding and at runtime this appears as in [Figure 3](#).

**Figure 3** Current Weather View in Px editor, and runtime



Icons change with weather conditions (along with text) as needed to track characteristics like cloudy, rain, wind, night time, and so on. The following weather components provide this “drag and drop” Px support:

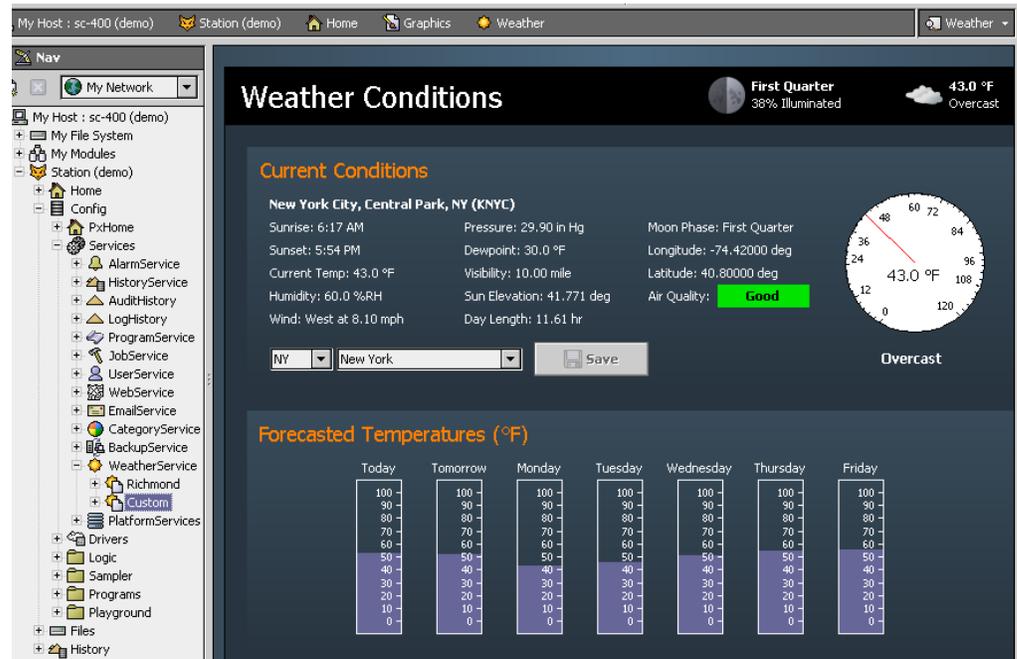
- WeatherReport — for the **Current Weather View** (as shown in example above). For more details, see “[weather-WeatherReport](#)” on page 8 and “[weather-CurrentWeatherView](#)” on page 26. **Note:** Starting in AX-3.6, a WeatherReport also provides a “**Current Air Quality View**”, including drag-and-drop support onto a Px page. See “[weather-CurrentAirQualityView](#)” on page 26.
- Current, Today, Tomorrow, <daysOfWeek> — for a **Forecast View**. For more details, see “[weather-ForecastView](#)” on page 28.

- MoonPosition — for a Moon View. This component is unrelated to any specific WeatherReport. For more details see “weather-MoonPosition” on page 22.

### Demo station example of Px support

Starting in AX-3.5, the standard “demo” station database (distributed with Niagara Workbench) was modified to include an example “Custom” WeatherProvider under its WeatherService. It has a Px view that provides a “dashboard” of Weather Conditions, demonstrating various Px techniques and bindings to slots under the configured NwsWeatherProvider (adjustable). Figure 4 shows this view in Workbench.

Figure 4 Demo station example of Px view for WeatherService data



If you run the demo station on your computer, you can see this Px interface by pointing your browser to <http://localhost/ord?station:|slot:/Services/WeatherService/Custom>

The example shown above is using AX-3.6, as evidenced by the included “Air Quality” entry, using the color-based “Current Air Quality View”. If running the demo station on an AX-3.5 host, this Px view (on its “Custom” NwsWeatherProvider) is nearly identical, but without this air quality entry.

### Advisories

Starting in AX-3.5, a WeatherReport using a provider that issues advisories (such as a NwsWeatherProvider) are enabled to receive these advisories, for example a warning, watch, or advisory. Such advisories are reflected in a report’s “Current Weather View”, “CurrentConditions” component, and can also result in Niagara alarms.

Components under the WeatherReport provide this functionality. See the following sections for details:

- AX-3.6 and later: “Configuring for advisories (AX-3.6 and later)” on page 5 and “weather-Advisory-Container” on page 13.
- AX-3.5: “Configuring for advisories (AX-3.5)” on page 6 and “weather-NwsAdvisoryAlarmExt” on page 17.

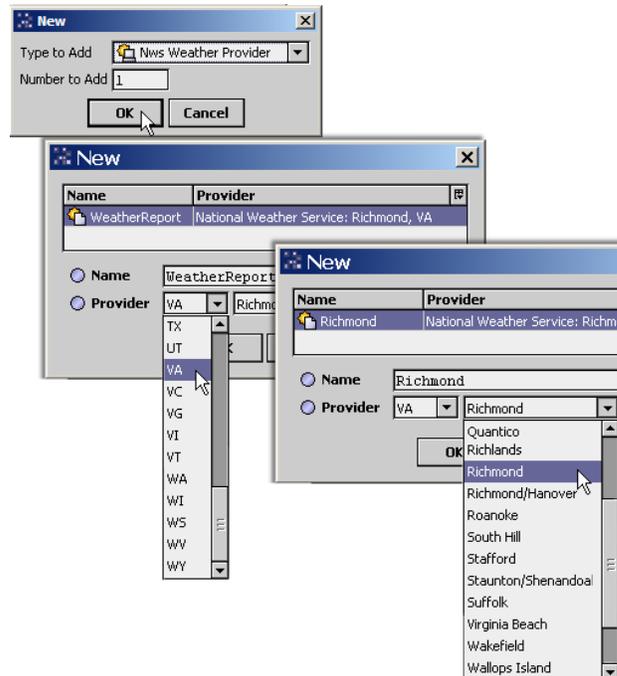
## Adding WeatherReports

To add a report, in the **Weather Manager** click the **New** button, which produces the **New** dialog. Select the number to add, then for each one, select a provider.

**Note:** This example describes adding an NWS provider (type `NwsWeather Provider`), typical for a Supervisor and any JACE station that has direct Internet connectivity. Starting in AX-3.5, a JACE station that is subordinate to a Supervisor in a NiagaraNetwork can alternatively use the “Fox Weather Provider” type of Weather Report. For related details, see “[weather-FoxWeatherProvider](#)” on page 19.

**Note:** Starting in AX-3.7 (build 3.7.104 or later), you may have a third provider option: `Wunderground Weather Provider`, for “international weather” support. For related details, see “[weatherUnderground-WundergroundWeatherProvider](#)” on page 23.

**Figure 5** Adding New WeatherReport



As shown in [Figure 5](#), for an `NwsWeatherProvider` the **New** dialog shows two fields:

- 2-character region code — typically the U.S. postal code for a *state*.  
**Note:** *Locale codes in the latest weather module also include several ISO country codes, in addition to states. See “[Updated NWS stations list](#)” on page 30 for related details.*
- Name of the locale in that region, possibly an area, city, town, or a combination using a slash “/” delimiter, sometimes using one or more abbreviations.

Enter a unique name for each report (typically, you type in the area or city name as the report name). For further details, see “[National Weather Service notes](#)” on page 29.

**Note:** After adding a `WeatherReport`, you can get immediate weather data by right-clicking it and issuing the action “**Update Weather Report**,” or by issuing the same action at the `WeatherService` level. Starting in AX-3.5, you may also wish to review the default setup for NWS advisories. See the next sections “[Configuring for advisories \(AX-3.6 and later\)](#)” and “[Configuring for advisories \(AX-3.5\)](#)”.

### Configuring for advisories (AX-3.6 and later)

(AX-3.6 and later) After adding a `WeatherReport`, you may wish to review the default settings for handling advisories. If a NWS provider (typical), advisories are included by default.

### Configuring advisory alarming (AX-3.6 and later)

With the station opened in Workbench:

- Step 1 In the Nav tree, expand the `WeatherReport`’s **Provider** to reveal its **Advisories Alarm Ext.**  
**Note:** This extension is specific to a NWS (National Weather Service) provider, that is a `NwsWeatherProvider`. If configuring advisories for some other weather provider type, skip ahead to [Step 4](#).
- Step 2 Double-click the **Advisories Alarm Ext** for its property sheet.

- Step 3 By default, NWS advisories are enabled. If you wish no NWS advisories (essentially pre-AX-3.5 operation), set the Enabled property to `false`, and click **Save**. Skip the remaining steps.
- Step 4 In the Nav tree, expand the WeatherReport's "**Current**" component to reveal its "**Advisories**" container, then right-click it and select its *property sheet* view.  
By default, "Alarm Enable" for advisories is set to `true`. This means a *Niagara alarm* is generated for each new advisory, routed (and formatted) as specified in the "**Alarm Properties**" settings.  
If you wish no NiagaraAX alarming (but still want advisories modeled as Advisory components), set the Alarm Enable property to `false`, and click **Save**. Skip the remaining steps.
- Step 5 Expand the  **Alarm Properties** (Advisory Alarm Source Info) container and specify the alarm class to use in the station for alarms from this WeatherReport.  
**Note:** *The "Default Alarm Class" is used by default. However, typically you create one or more alarm classes to use for WeatherReport advisory alarms, and specify one of these here.*
- Step 6 Remaining properties are optional and often left at defaults. Click **Save** when finished.  
For further details, see the following sections:
- "[weather-AdvisoryContainer](#)" on page 13.
    - "[About advisories and alarms](#)" on page 15.
    - "[Current Weather view \(Px\) effects](#)" on page 15.
    - "[Weather provider data in Advisory and alarm](#)" on page 15.

### Configuring for advisories (AX-3.5)

(AX-3.5 only) After adding a WeatherReport using the `NwsWeatherProvider`, you may wish to review the default settings for handling National Weather Service advisories.

#### Configuring advisory alarming (AX-3.5 only)

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With the station opened in Workbench:

- Step 1 In the Nav tree, expand the WeatherReport's  **Provider** to reveal its  **Advisories Alarm Ext**.
- Step 2 Double-click the **Advisories Alarm Ext** for its property sheet.
- Step 3 By default, NWS advisory alarming is enabled. If you wish no NWS advisories (essentially pre-AX-3.5 operation), set the Enabled property to `false`, and click **Save**. Skip the remaining steps.
- Step 4 Review and possibly change the "**Urgency**" property setting, from the default "**Immediate**" to another setting, shown in the selection list ordered highest priority at top, to lowest at bottom.  
For example, select "**Expected**" to include advisories with that urgency level, along with "**Immediate**", but to filter out advisories with urgency levels "**Future**", "**Past**", and "**Unknown**". This may include "warnings" but filter out "watches".
- Step 5 Expand the  **Alarm Properties** (Alarm Source Info) container and specify the alarm class to use in the station for alarms from this WeatherReport.  
**Note:** *The "Default Alarm Class" is used by default. However, typically you create one or more alarm classes to use for WeatherReport advisory alarms, and specify one of these here.*
- Step 6 Remaining properties are optional and often left at defaults. Click **Save** when finished.  
For further details, see the following sections:
- "[weather-NwsAdvisoryAlarmExt](#)" on page 17.
    - "[NwsAdvisoryAlarmExt properties](#)" on page 17.
    - "[About NWS alarms](#)" on page 18.
    - "[NWS data in alarm record](#)" on page 18.

## Weather components

**Note:** As shown in [Figure 1](#) on page 2, the WeatherService is one of three components the weather palette. The other two components on the palette are SunPosition and MoonPosition, which function independently of “weather provider” (online) data and other Weather components.

Weather components not shown on the palette are typically created as a result of using the [Weather Manager](#) view of the WeatherService.

The following components are in the weather module:

- [WeatherService](#)
- [NwsWeatherProvider](#)
- [WeatherReport](#)
- [CurrentConditions](#)
- [Forecast](#)
- [Advisory](#) (AX-3.6 and later)
- [AdvisoryContainer](#) (AX-3.6 and later)
- [AdvisoryAlarmSourceInfo](#) (AX-3.6 and later)
- [NwsAdvisoryAlarmExt](#)
- [FoxWeatherProvider](#)
- [SunPosition](#)
- [MoonPosition](#)

Starting in AX-3.7 (build 3.7.104 and later) this additional component is available, sourced from the weatherUnderground module:

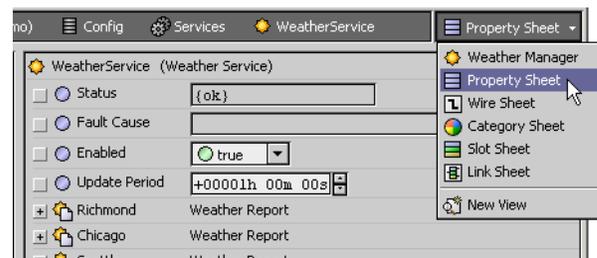
- [WundergroundWeatherProvider](#)

### weather-WeatherService

☀ The WeatherService is the service container for all other weather components—it holds child [WeatherReport](#) components, which vary by locale. To use, copy the WeatherService from the **weather** palette into your station’s ServiceContainer. The default view of the WeatherService is the [Weather Manager](#).

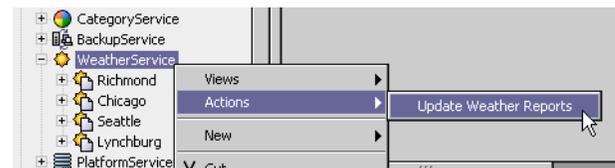
Configuration of the WeatherService includes the ongoing Update Period, which you can adjust from the property sheet ([Figure 6](#)). The default update interval is every hour.

**Figure 6** WeatherService property sheet



The WeatherService also has an action to manually **Update Weather Reports** ([Figure 7](#)).

**Figure 7** WeatherService action



This action globally updates all child [WeatherReports](#).

### weather-NwsWeatherProvider

☀ Each WeatherReport component has a “Provider” child that interfaces with the weather data source. When adding a new WeatherReport (locale), the default type is the **Nws Weather Provider**, for the NWS (National Weather Service). You select a specific NWS station using two drop-down selection lists, typically specifying a state, then city.

**Note:** Apart from the default Nws Weather Provider, one or more other providers may be available.

- Starting in AX-3.5, another “Fox Weather Provider” type is available—useful if a JACE station without Internet access, but on a NiagaraNetwork with a Supervisor station using the WeatherService.
- Starting in AX-3.7 (build 3.7.104 or later), an additional “Wunderground Weather Provider” is available, providing both the weather module and weatherUnderground module is installed.

For related details, see “[weather-FoxWeatherProvider](#)” on page 19 and “[weatherUnderground-WundergroundWeatherProvider](#)” on page 23.

NwsWeatherProvider properties include the “station ID” for the selected weather station, the number of outlook days for the weather report, as well as read-only properties reflecting the locale’s longitude and latitude. Also included is an “Advisories Alarm Ext” that allows for alarms when hazardous conditions exist or are expected.

For more details, see the following sections:

- [NwsWeatherProvider properties](#)
- “[weather-NwsAdvisoryAlarmExt](#)” on page 17

## NwsWeatherProvider properties

Property sheet access of an NwsWeatherProvider shows the NWS station ID for the selected locale, along with days outlook and other read-only properties, as shown in [Figure 8](#).

**Figure 8** NwsWeatherProvider (property sheet)



These properties are:

- **Station Id**  
Station ID is automatically determined when you pick a report (location), using the [Weather Manager](#) view.
- **Outlook**  
Number of days outlook—by default, 7 days. The maximum recommended Outlook value is 7 (days). Any greater number generates additional [Forecast](#) components upon a report update, however, they do not contain usable data.
- **Location**  
Read-only “Location” property with a string value for the selected location.
- **Longitude**  
Read-only geographical longitude for the selected location, in decimal degrees.  
*Note:* Values for longitude and latitude are useful if using a “SunPosition” component for this location—you must enter them in corresponding properties of that component. For related details, see “[weather-SunPosition](#)” on page 21.
- **Latitude**  
Read-only geographical latitude for this location, in decimal degrees. See the note above.

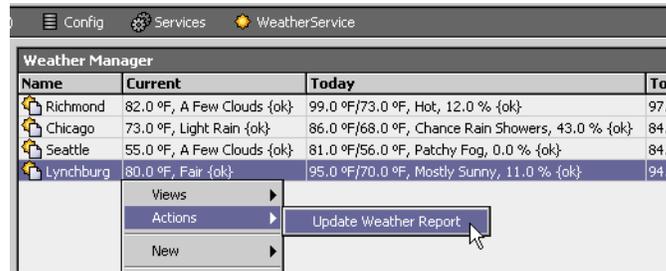
## weather-WeatherReport

A WeatherReport is a child of the [WeatherService](#) and represents a particular *locale*. It acts as a container for components WeatherProvider (e.g. [NwsWeatherProvider](#)), [CurrentConditions](#), and up to 7 [Forecast](#) components. The default view of the WeatherReport is the [Current Weather View](#).

- Add a WeatherReport using the **New** button in the WeatherService’s [Weather Manager](#) view. See “[Adding WeatherReports](#)” on page 5.
- Drag any WeatherReport component onto a Px page for an iconic-based [Current Weather View](#).
- Starting in AX-3.6, a WeatherReport also has an available [Current Air Quality View](#), as does its child [CurrentConditions](#) component.

As shown in [Figure 9](#), an **Update Weather Report** action refreshes data in its child components.

**Figure 9** WeatherReport action

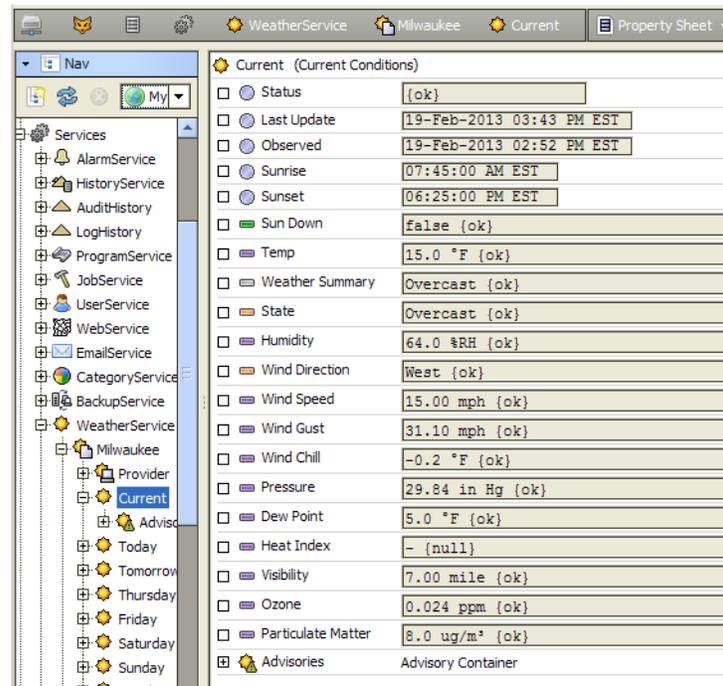


If a newly-added WeatherReport, this action creates the needed child Forecast components. Note also that a global action (to update *all* WeatherReports) is available at the [WeatherService](#) level.

### weather-CurrentConditions

Each WeatherReport component has a Current Conditions child component that contains a number of read-only status [properties](#) for up-to-date weather statistics, as well as sunrise and sunset times ([Figure 10](#)).

**Figure 10** Current Conditions (property sheet)



An *iconic summary* is also available, on the parent [WeatherReport](#)'s default [Current Weather View](#).

Starting in AX-3.6, a child **“Advisories”** container provides management of received weather advisories, for use in the station’s alarming subsystem, and an air quality view is also available. For related details, see [“weather-AdvisoryContainer”](#) on page 13 and [“weather-CurrentAirQualityView”](#) on page 26.

### CurrentConditions properties

The following properties are included under CurrentConditions:

- **Status**  
Typically “ok” if a connection was made. Other possible statuses include:
  - alarm — if a hazardous condition is imminent/detected in an NWS provider-issued advisory. If alarm, related information is also in properties **Weather Summary** and **State**.
  - fault — if the weather provider references an invalid weather station.
  - stale — if a weather update connection fails, or (starting in AX-3.7) for a NwsWeatherProvider, if the reported observation time (“Observation” property) is more than 2 hours in the past. All other properties with status (Sundown, Temp, State, Humidity, and so on) also assume this stale status. Prior to AX-3.7, the timeout for this “failed connection at update attempt” to a NWS provider is fixed at 15 seconds.

- **Last Update**  
Date/timestamp of the station's last weather report update, in Baja AbsTime format.
  - **Observed**  
(AX-3.7 and later only) Date/timestamp of when the NWS reported the observed values in the last update, in Baja AbsTime format.
  - **Sunrise**  
Timestamp for sunrise, in Baja Time format.
  - **Sunset**  
Timestamp for sunset, in Baja Time format.
  - **Sundown**  
StatusBoolean value that is "true" when the sun is down, else "false" when the sun is up. This dynamically updates whenever current time matches the "Sunrise" and "Sunset" times.
  - **Temp**  
Current temperature as a StatusNumeric value.
  - **Weather Summary**  
Text descriptor summarizing current weather conditions, as a StatusString value. This text string is evaluated and converted to a "State" enumerated value (next property). If CurrentConditions has an "alarm" status, this will describe the alarm condition.
  - **State**  
StatusEnum value derived from the received "weather summary" text. Starting in AX-3.5, enumerations were added for hazardous conditions, such as received in provider-issued advisories. For more details, see the next section "[About weather State](#)".
  - **Humidity**  
Current humidity as a StatusNumeric value.
  - **Wind Direction**  
StatusEnum value derived from received text. For more details, see the section "[About weather Wind Direction](#)".
  - **Wind Speed**  
Current wind speed value, as a StatusNumeric.
  - **Wind Gust**  
Reported wind gust speed (if available), as a StatusNumeric. Possibly "null" if not available.
  - **Wind Chill**  
This is calculated by Niagara using a NOAA formula, providing that the:
    - temperature is between -50 and 50 degrees F, *and*
    - wind speed is between 3 and 110 mph (and is specific to the NWS provider).Otherwise, this value is "null". Note that humidity is also utilized. Currently, this formula is at: <http://www.nws.noaa.gov/om/windchill/index.shtml>
  - **Pressure**  
Current barometric pressure, as a StatusNumeric value.
  - **Dew Point**  
Current dew point reading, as a StatusNumeric value.
  - **Heat Index**  
This is calculated by Niagara using a NOAA formula, providing that the:
    - temperature > 80 degrees F, *and*
    - dew point > 60 degrees F, *and*
    - humidity > 40% (and is specific to the NWS provider).Otherwise, this value is "null". Currently, this formula is at: [http://www.nws.noaa.gov/jkl/?n=heat\\_index\\_calculator](http://www.nws.noaa.gov/jkl/?n=heat_index_calculator)
  - **Visibility**  
Current visibility distance value, as a StatusNumeric value.
  - **Ozone**  
(AX-3.6 and later) Level of ozone in the air, in parts per million (ppm), as a StatusNumeric value.
  - **Particulate Matter**  
(AX-3.6 and later) Level of particulate matter in the air, in micrograms per cubic meter (ug/m<sup>3</sup>), as a StatusNumeric value.
- Related to these last two properties, the CurrentConditions component also has a "Current Air Quality View". See "[weather-CurrentAirQualityView](#)" on page 26.
- The WeatherService retrieves air quality metrics by connecting to a U.S. EPA (Environmental Protection Agency) server. For more details, see "[About EPA connections](#)" on page 30.

**About weather State** The State value of [CurrentConditions](#) and any [Forecast](#) component is a status enumeration derived from received weather summary text, using a best effort approach.

**Note:** This summary text appears in the CurrentConditions property sheet as the “Weather Summary” value. You can link from the State slot of CurrentConditions or a Forecast component to a StatusEnum type slot of a control point, if needed. Facets of a linked point should be set to the frozen range (EnumRange) of “WeatherState” in the weather module to capture all 28 possible states (see Figure 11).

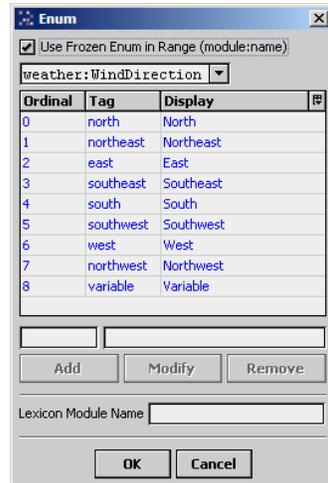
**Figure 11** WeatherState enumerations seen in Facets, range Enum dialog



**Note:** Starting in AX-3.5, some enumerations were added for hazardous weather conditions, as received in provider-issued watches, warnings, and advisories—for example: tsunami, tornado, flood, and so on. These are reflected in the State property of CurrentConditions only if its Status is “alarm”. For related details, see “weather-NwsAdvisoryAlarmExt” on page 17.

**About weather Wind Direction** The Wind Direction value of CurrentConditions is a status enumeration derived from received text. You can link from the Wind Direction slot to a StatusEnum type slot of a control point, if needed. Facets of a linked point should be set to the frozen range (EnumRange) of “windDirection” in the weather module to capture all 8 possible states (see Figure 12).

**Figure 12** WindDirection enumerations seen in Facets, range Enum dialog



### weather-Forecast

Each WeatherReport component contains some number of "Forecast" components. At any time, children "Today" and "Tomorrow" are available. Depending on the current day of week, the remaining children are named appropriately for that day of the week.

For the NWS provider, 7 Forecast components are created by default, based upon the "Outlook" value specified in the NwsWeatherProvider component. Each Forecast component contains a number of read-only status properties for predicted weather items, as well as sunrise and sunset times

You can drag any Forecast component onto a Px page for an iconic-based Forecast View.

### Forecast properties

The following properties are included under any Forecast day (Today, Tomorrow, and so on):

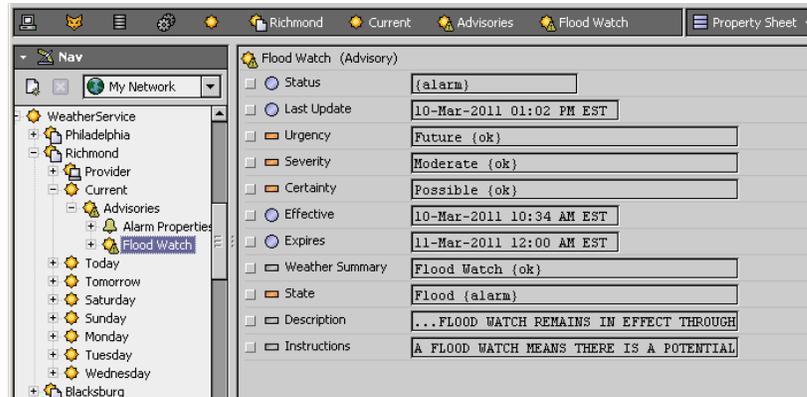
- **Status**  
Typically "ok" if a connection was made, or else "fault" if the provider references an invalid weather station.  
*Note:* A "stale" status occurs if a weather update fails, including the status of all other properties with status (High, Low, Weather Summary, State). Currently, the timeout for this "failed connection at update attempt" to a provider is fixed at 15 seconds.
- **Last Update**  
Date/timestamp of last weather report update, in Baja AbsTime format.
- **Sunrise**  
Timestamp for predicted sunrise, in Baja Time format.
- **Sunset**  
Timestamp for predicted sunset, in Baja Time format.
- **High**  
Predicted high temperature as a StatusNumeric value.
- **Low**  
Predicted low temperature as a StatusNumeric value.
- **Weather Summary**  
Text descriptor from provider summarizing predicted weather conditions, as a StatusString value.
- **State**  
StatusEnum value derived from the received "weather summary" text. For more details, see the section "About weather State" on page 10.
- **Ozone**  
(AX-3.6 and later) Level of ozone in the air, in parts per million (ppm), as a StatusNumeric value.
- **Particulate Matter**  
(AX-3.6 and later) Level of particulate matter in the air, in micrograms per cubic meter (ug/m<sup>3</sup>), as a StatusNumeric value.

*Note:* Related to the ozone and particulate matter properties added starting in AX-3.6, each Forecast component also has a "Forecast Air Quality View". See "weather-ForecastAirQualityView" on page 28.

## weather-Advisory

 (AX-3.6 and later) Starting in AX-3.6, weather advisories are dynamically modeled as “Advisory” *components* under the “**Advisories**” ([AdvisoryContainer](#)) child of the WeatherReport’s “**Current**” (CurrentConditions) component. [Figure 13](#) shows an example Advisory and its (default) property sheet view.

**Figure 13** Example Advisory component in Nav tree (and default property sheet view)



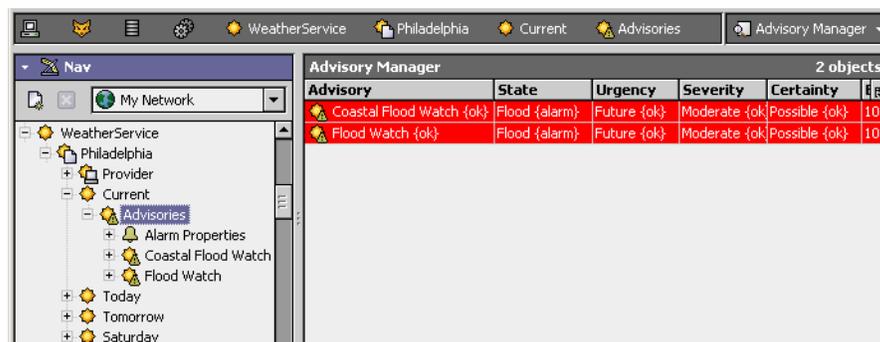
Advisory components exist only for the duration of the provider-issued watch, warning, or advisory of a hazardous weather condition. When a weather advisory expires, the corresponding Advisory component is automatically removed from the station.

Typical access of Advisory components is via the “**Advisory Manager**” view of the parent “**Advisories**” container. For details, see sections “[weather-AdvisoryContainer](#)” and also “[weather-AdvisoryManager](#)” on page 27.

## weather-AdvisoryContainer

 (AX-3.6 and later) Starting in AX-3.6, each “**Current**” ([CurrentConditions](#)) component of any [NwsWeatherProvider](#) (locale) has a child “**Advisories**” container. Providing that the “Enabled” property of the Provider’s “AdvisoriesAlarmExt” is true (the default), NWS weather advisories are dynamically modeled as “Advisory” *components* under this container.

**Figure 14** AdvisoryContainer (Advisories) under CurrentConditions of NWS WeatherProvider



Such advisories are initiated by provider-issued watches, warnings, and advisories of hazardous weather conditions, for that provider’s locale. When a weather advisory expires, the corresponding Advisory component is automatically *removed* from this container. Note that sometimes, there may be more than one weather advisory at a time, as shown in [Figure 14](#).

**Note:** While any advisory is effective, under the WeatherReport for this locale, the [CurrentConditions](#) component reflects an alarm in its “Status” property. During this period, that WeatherReport also appears in alarm (and is colored red) in the Weather Manager view of the WeatherService,

The AdvisoryContainer’s default view is the “**Advisory Manager**”, a tabular listing of current advisories. Double-click an advisory for a popup showing all advisory properties, including the complete text “Description” and “Instructions” issued by the provider. See [Figure 18](#) on page 16 for an example.

In addition to holding child Advisory components, the AdvisoryContainer has an “Alarm Enable” property and a related child  **Alarm Properties** container. See “[AdvisoryContainer properties](#)”.

## BoundLabel to AdvisoryContainer notes

You can also bind a Px BoundLabel widget to the AdvisoryContainer, to display the most urgent, severe, certain, or recent weather advisory, using special BFormat syntax. This syntax is:

```
%mostUrgent.weatherSummary% or  
%mostSevere.weatherSummary% or  
%mostCertain.weatherSummary% or  
%mostRecent.weatherSummary%
```

The BoundLabel will display the advisory name, such as “Flood Warning” or “Wind Advisory”.

**Note:** To avoid BFormat errors when advisories do not exist, append an “alternate” variable onto the BFormat syntax examples listed above. For example, you can use the following:

```
%mostUrgent.weatherSummary.value?parent.weatherSummary.value%
```

This will display either the most certain advisory—or if no advisories exist, the current weather summary.

**About the Common Alerting Protocol (CAP)** The NWS uses the “Common Alerting Protocol” (CAP) in advisory messages, noting “urgency”, “severity”, and “certainty”. Urgency relates to “time available to prepare”, severity to “intensity of impact”, and certainty to “confidence in the observation or prediction”.

At the time of this document, more details about CAP in general can be found at:

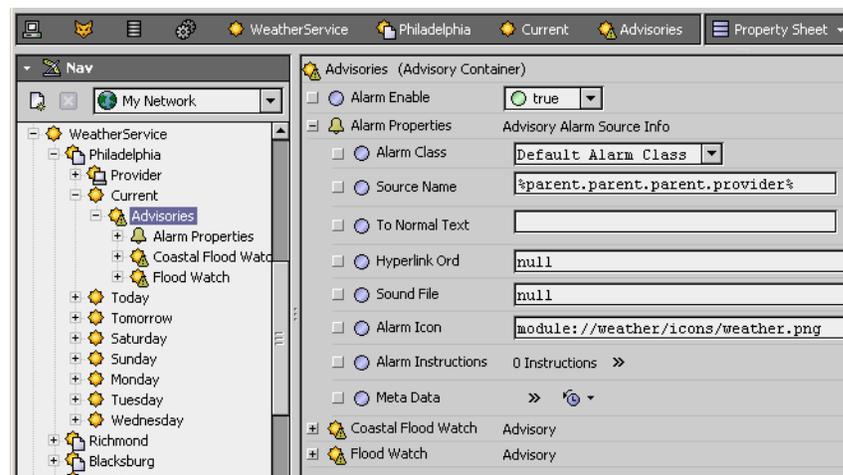
[http://en.wikipedia.org/wiki/Common\\_Alerting\\_Protocol](http://en.wikipedia.org/wiki/Common_Alerting_Protocol)

<http://docs.oasis-open.org/emergency/cap/v1.2/CAP-v1.2-os.pdf>

## AdvisoryContainer properties

Property sheet access of an AdvisoryContainer shows its single “Alarm Enable” configuration property and a child “AdvisoryAlarmSourceInfo” (**Alarm Properties**) container, as shown in Figure 15.

**Figure 15** AdvisoryContainer (property sheet) showing expanded Alarm Properties



Configuration properties are:

- **Alarm Enable**  
By default, this property is enabled (`true`).
  - If true, each weather advisory results in a Niagara alarm, routed using the Alarm Properties below. Note this differs from AX-3.5 alarm setup in the “AdvisoriesAlarmExt”, where an “Urgency” property existed, configurable to a “lower” urgency level (“Future”, “Past”, or “Unknown”).
  - If set to `false`, Niagara alarming does not occur from weather advisories. However, dynamic modeling of weather advisories using Advisory components *does* continue (in the case of a NwsWeatherProvider, the “Enabled” property of its “AdvisoriesAlarmExt” must be true).
- **Alarm Properties**  
Contains typical “Alarm Source Info” child properties, two of which are described below.
  - Alarm Class — (default is “Default Alarm Class”) Often, you create one or more alarm classes expressly for weather-related alarms, and specify one here. See the *User Guide* section “About alarm class” for alarm class details.
  - Source Name — Specifies the “sourceName” seen in an alarm record, where the default value (as shown in Figure 20) results in the name of the parent WeatherReport (locale).

Remaining alarm properties operate as in similar alarm extensions for devices or points. For more details, see “About alarm extension properties” in the *User Guide*.

### About advisories and alarms

(AX-3.6 and later behavior) The presence of an Advisory component under the **Advisories** container (**AdvisoryContainer**) results in a changed iconic Current Weather view (Px), along with an alarm status for both the CurrentConditions component and its parent NwsWeatherProvider.

If the “Alarm Enable” property of the AdvisoryContainer is true (the default), each advisory results in a Niagara alarm routed to the specified AlarmClass, containing weather provider data. See the following sections:

- [Current Weather view \(Px\) effects](#)
- [NWS data in alarm record](#)

**Current Weather view (Px) effects** (Applies to advisories in both AX-3.6 and AX-3.5).

During an alarm condition for a WeatherReport (locale), the iconic Px widget for its CurrentConditions (Current Weather view) reflects the weather advisory, including changed text color. [Figure 16](#) shows an example Current Weather view for a locale in a flood warning.

**Figure 16** Example Current Weather view during weather advisory



The default alarm text color is red, configurable in the Px editor (property `AlarmStateBrush`).

When the alarm condition clears (all provider-issued watches, warnings, and advisories have been canceled or expired), the Current Weather view returns to its normal state (see [Figure 17](#) example).

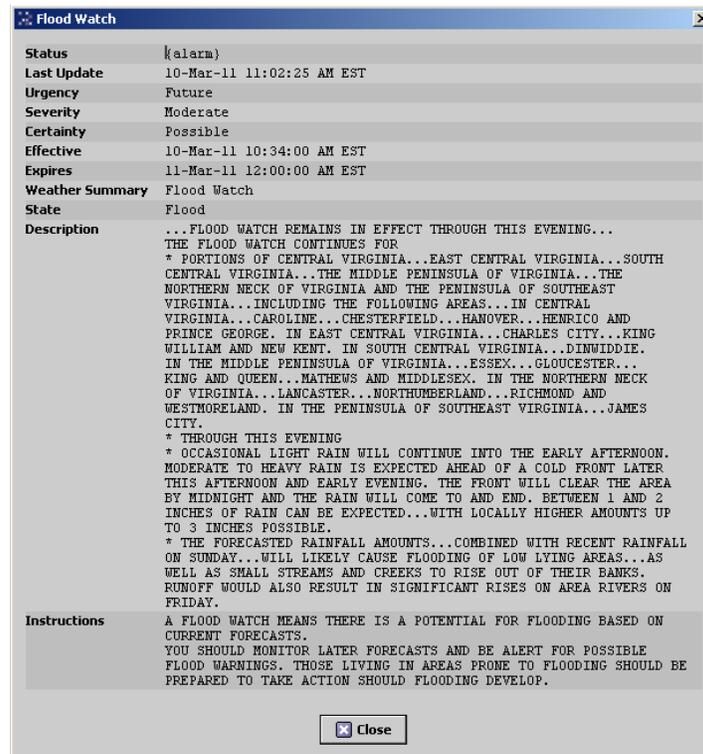
**Figure 17** Example Current Weather view returned to normal



In this case, there are no Advisory components under the AdvisoryContainer of the CurrentConditions component.

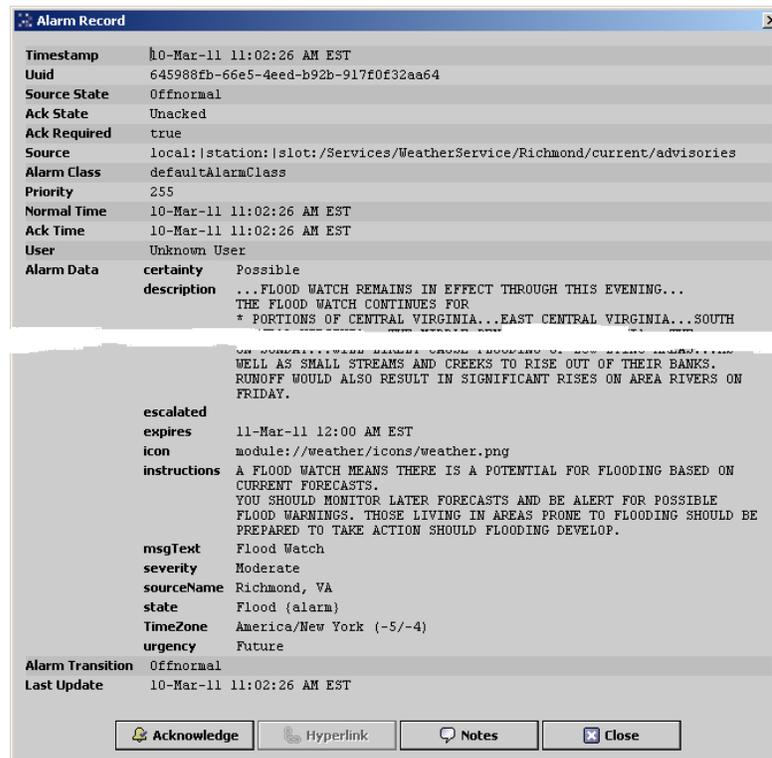
**Weather provider data in Advisory and alarm** In AX-3.6 and later, a weather advisory results in an Advisory component created under the AdvisoryContainer. Typical access is from the Advisory Manger view of the AdvisoryContainer, where a double-click provides a popup dialog, as shown in [Figure 18](#).

**Figure 18** Example Advisory details (popup) from double-click in Advisory Manager view



If the AdvisoryContainer’s “Alarm Enable” property is true, a corresponding Niagara alarm is routed to the specified AlarmClass in the station. Figure 19 shows the alarm record details for an alarm associated with the advisory above.

**Figure 19** Example alarm details popup (alarm record) of NiagaraAX alarm from weather advisory



Among the entries in the Alarm Data portion of the AX-3.6 or later alarm record are the following:

- certainty — the enumerated value of the “Certainty” property received from the provider, for exam-

- ple “Possible”, “Likely”, and so on.
- description — text string from the provider that provides a complete description of the advisory.
- expires — date/timestamp of when the weather advisory expires.
- instructions — text instructions from the provider on what to do because of this advisory.
- msgText — the enumerated value of the CurrentConditions “state” property.
- severity — the enumerated value of the “Severity” property received from the provider, for example “Moderate”, “Minor”, and so on.
- sourceName — typically the name of the parent WeatherReport (locale), such as “Richmond”, etc. (unless “Source Name” under the “Alarm Properties” container has been edited from defaults).
- state — the alarm state and status of the CurrentConditions component.
- urgency — the enumerated value of the “Urgency” property received from the provider, for example “Immediate”, “Expected”, “Future”, and so on.

Once all weather watches, warnings, and advisories have been canceled or expired, the AdvisoryContainer alarm source returns the offnormal alarm to a normal condition.

### weather-AdvisoryAlarmSourceInfo

(AX-3.6 or later) AdvisoryAlarmSourceInfo (**Alarm Properties**) is a container slot under the **AdvisoryContainer** child of **CurrentConditions**. It specifies the AlarmClass and other parameters used for Niagara alarming from weather advisories, providing that “Alarm Enable” in the AdvisoryContainer is true. For related details, see “AdvisoryContainer properties” on page 14.

### weather-NwsAdvisoryAlarmExt

**Note:** Starting in AX-3.6, the WeatherService architecture for NWS advisories changed—this extension has minimal impact (single property, “Enabled”, and no other slots). For more details, see “weather-Advisory-Container” on page 13. The remainder of this section applies to an AX-3.5 station only.

In AX-3.5, each NwsWeatherProvider has a child “Advisories Alarm Ext” extension. This provides for NiagaraAX alarms initiated by NWS-issued watches, warnings, and advisories of hazardous weather conditions, for the locale of this provider. By default, this extension is enabled.

A child **Alarm Properties** container holds typical “Alarm Source Info” properties used to specify which alarm class is used, plus other standard alarm parameters. See the following for more details:

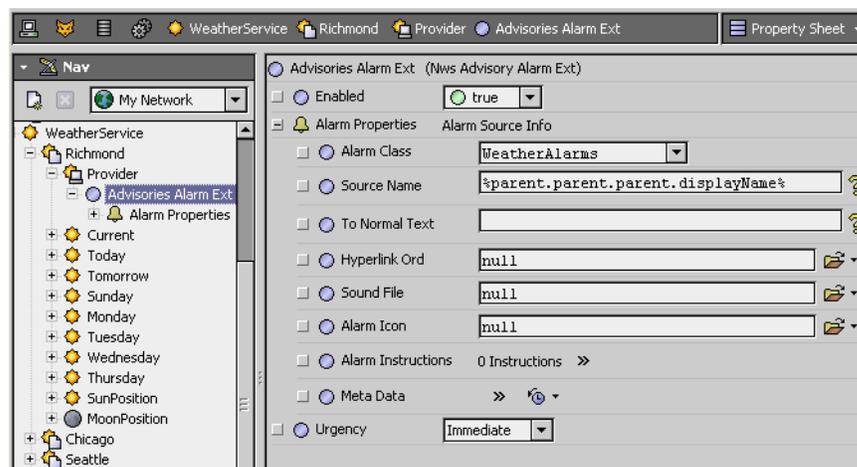
**Note:** Under the WeatherReport for this locale, the **CurrentConditions** component reflects a related alarm in its “Status” property, with its “State” property reflecting an enumerated value for the hazardous condition. The “Weather Summary” property reflects a subject description received from the NWS.

- [NwsAdvisoryAlarmExt properties](#)
- [About NWS alarms](#)

### NwsAdvisoryAlarmExt properties

Property sheet access of a AX-3.5 NwsAdvisoryAlarmExt shows its configuration properties and the child “Alarm Source Info” container, as shown in Figure 20.

**Figure 20** NwsAdvisoryAlarmExt (property sheet) showing expanded Alarm Properties



Configuration properties are:

- **Enabled**  
By default, this extension is enabled (`true`). If set to `false`, NiagaraAX alarming does not occur from NWS watches, warnings, and advisories, and **CurrentConditions** remains unaffected.
- **Alarm Properties**  
Contains typical “Alarm Source Info” child properties, two of which are described below.
  - **Alarm Class** — (default is “Default Alarm Class”) Often, you create one or more alarm classes expressly for NWS related alarms, and specify one here. See the *User Guide* section “About alarm class” for alarm class details.
  - **Source Name** — Specifies the “sourceName” seen in an alarm record, where the default value (as shown in [Figure 20](#)) results in the name of the parent [WeatherReport](#) (locale).  
Remaining alarm properties operate as in similar alarm extensions for devices or points. For more details, see “About alarm extension properties” in the *User Guide*.
- **Urgency**  
Determines the sensitivity of alarming. NWS advisories include a “Urgency” property, with enumerated values reflected in choices available in the drop-down control, in order of descending priority (highest at top):
  - Immediate
  - Expected
  - Future
  - Past
  - UnknownThis property determines which incoming advisories will trigger alarms. Only advisories with an urgency equal or higher than the chosen value generate an alarm. (The NWS issues advisories for non-emergency conditions, just like a weather forecast—this allows filtering on urgency level).  
Note that among various alarm data facets (fields) in an alarm record, an “nwsUrgency” facet will reflect one of the values above. For related details, see the next section “[About NWS alarms](#)”.

### About NWS alarms

An alarm from the AX-3.5 **Advisories Alarm Ext** ([NwsAdvisoryAlarmExt](#)) results in a changed iconic Current Weather view (Px) as well as an alarm record with NWS data. See the following section, “[NWS data in alarm record](#)”.

**Note:** Also see “[Current Weather view \(Px\) effects](#)” on page 15.

**NWS data in alarm record** An NWS-initiated advisory in a AX-3.5 system results in an Offnormal alarm with several NWS-specific facets in its “Alarm Data”, as shown in [Figure 21](#) (facet “nwsDescription” reduced in this example).

**Figure 21** Example Niagara alarm record from NwsAdvisoryAlarmExt of NwsWeatherProvider



Included in the Alarm Data of the alarm record are the following:

- msgText — the enumerated value of the CurrentConditions “state” property
- nwsCertainty — the enumerated value of the “Certainty” property received from the NWS, for example “Possible”, “Likely”, and so on.
- nwsDescription — text string from the NWS that provides a complete description of the advisory.
- nwsExpires — date/timestamp of when the NWS advisory expires.
- nwsInstructions — text instructions from the NWS on what to do because of this advisory.
- nwsSeverity — the enumerated value of the “Severity” property received from the NWS, for example “Moderate”, “Minor”, and so on.
- nwsUrgency — the enumerated value of the “Urgency” property received from the NWS, for example “Expected”, “Future”, and so on. Corresponds to the “Urgency” property among the [NwsAdvisoryAlarmExt properties](#).
- sourceName — typically the name of the parent WeatherReport (locale), such as “Richmond”, etc. (unless “Source Name” under the “Alarm Properties” container has been edited from defaults).

Once all NWS watches, warnings, and advisories have been canceled or expired, the [NwsAdvisoryAlarmExt](#) alarm source returns the alarm to a normal condition.

### weather-FoxWeatherProvider

 Starting in AX-3.5, the **Fox Weather Provider** is an available type when adding a **Weather-Report** in the **Weather Manager**, as an alternative to the default [NwsWeatherProvider](#) and/or (starting in AX-3.7) a [WundergroundWeatherProvider](#). See it in the drop-down “Type to Add” field in the **New** dialog when adding a new WeatherReport ([Figure 22](#)).

**Figure 22** Fox Weather Provider in initial New dialog, type selection



**Note:** Usage is intended for a JACE station without Internet access, but which is a subordinate of a Supervisor station already using the WeatherService. Otherwise, you can the default type: NwsWeather Provider, or if applicable, the Wunderground Weather Provider.

To use, the following must already be configured:

- An enabled NiagaraStation in its NiagaraNetwork, representing the remote Supervisor station.
- The remote Supervisor station must have an enabled NiagaraStation representing the JACE station.
- The remote Supervisor's WeatherService must have one or more working WeatherReports.

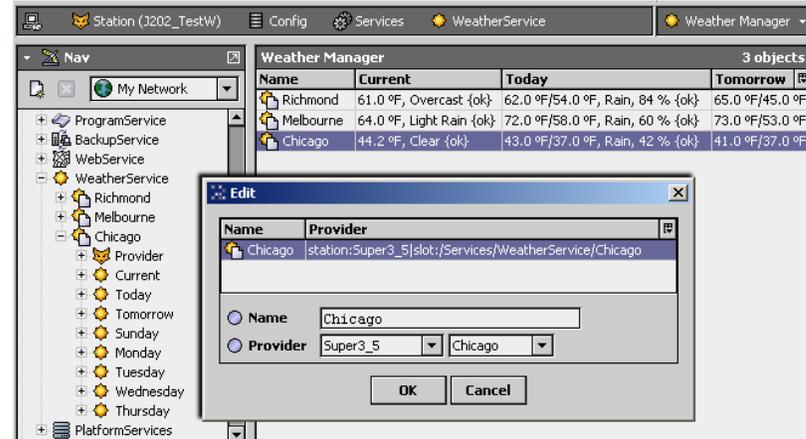
When adding, in a secondary **New** dialog, you select the NiagaraStation that represents the Supervisor, and then a specific WeatherReport in that remote station's WeatherService. **Figure 23** shows an example.

**Figure 23** Secondary New dialog, selecting Supervisor station, then WeatherReport



Once added, the JACE station gets updated weather data by connecting to the Supervisor and “pulling” the values from the Supervisor's WeatherService.

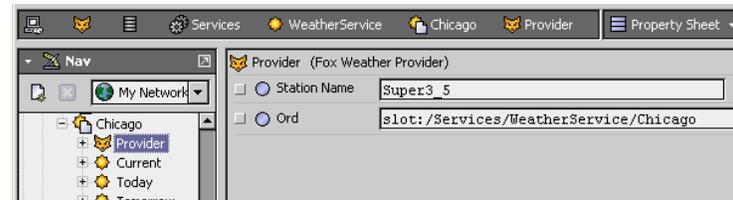
**Figure 24** Edit dialog of added WeatherReport shows FoxWeatherProvider selections



### FoxWeatherProvider properties

Property sheet access of a FoxWeatherProvider shows values that represent the two selections made when adding (or editing) the WeatherReport, as shown in **Figure 25**.

**Figure 25** FoxWeatherProvider property sheet



These properties are:

- **Station Name**  
Name of the selected NiagaraStation that represents the remote Supervisor station.
- **Ord**  
Path in the remote Supervisor station for the source WeatherReport component.

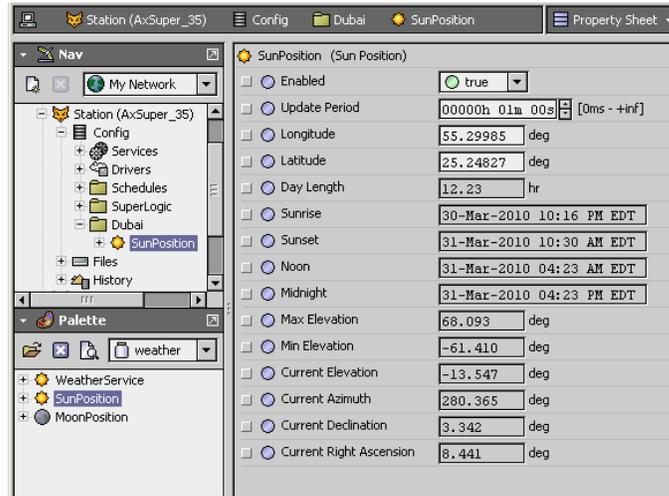
**Note:** Typically, you do not edit these properties, but instead use the **New** or **Edit** dialog in the **Weather Manager** to make selections from the two drop-down controls in the “Provider” field. See **Figure 24**.

### weather-SunPosition

☀ SunPosition provides a variety of solar calculations, and is found on the *weather palette* along with a similar [MoonPosition](#) component. From the palette, copy (drag and drop) the SunPosition component into *any* station location.

**Note:** Like the [MoonPosition](#) component, but unlike other weather components, *SunPosition* does not require the station host (JACE) to have the *WeatherService*, nor to have Internet connectivity. Output calculations are mathematically derived and executed solely within the station. Usage applies to any geographic location, and not just the U.S. or North America.

**Figure 26** Example SunPosition copied into station



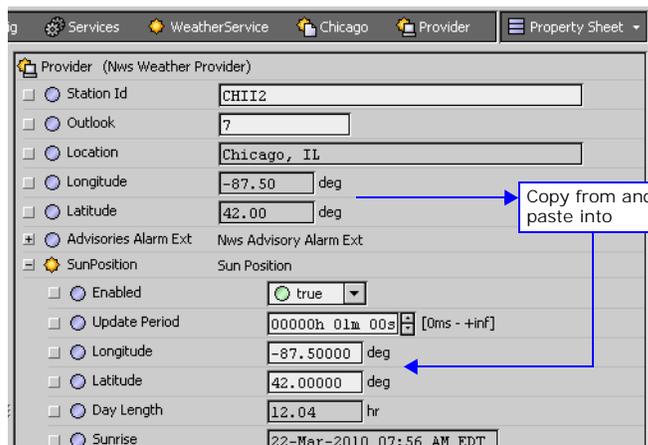
To use, enter **Longitude** and **Latitude** values in decimal degrees (that is, both minutes and seconds in decimal format) into the SunPosition component, and **Save**.

**Note:** At the time of this document, an online converter for going from degrees, minutes, seconds, to decimal degrees can be found at: <http://www.fcc.gov/mb/audio/bickel/DDDMSS-decimal.html>

Based on these values, along with the station's date and time, solar calculations are available in [SunPosition properties](#). Unlike the [MoonPosition](#) component, there is no special (iconic) view for SunPosition.

**Note:** If using the *WeatherService* and *NwsWeatherProviders*, to simplify setup, copy it under the **Provider** of a *WeatherReport*, as shown in the following [Figure 27](#). This lets you easily copy its longitude and latitude values, if desired. Or, if needed, enter these values independently.

**Figure 27** Example SunPosition copied under an NwsWeatherProvider



### SunPosition properties

**Note:** In addition to properties below, *SunPosition* has an available **Recalculate** action, to immediately recalculate all read-only properties.

A [SunPosition](#) component has the following properties:

- **Enabled**  
By default, `true` for enabled. If set to `false` (disabled), calculations stop and other properties remain unchanged.
- **Update Period**  
Interval at which ongoing calculations are made, reflected in properties below. The default update period is every (1) minute.
- **Longitude**  
Geographical longitude for the location, in decimal degrees. You must enter appropriate values for both this and the next (Latitude) property.  
*Note:* *Default values for longitude and latitude apply only to the Richmond VA NWS provider. For any NwsWeatherProvider, these unique values are on its property sheet. See [Figure 27](#).*
- **Latitude**  
Geographical latitude for the location, in degrees. You must enter appropriate values for both this and the previous (Longitude) property.  
*Note:* *Remaining properties are all read-only types. Properties with degree values use data type of Baja Double.*
- **Sunrise**  
Timestamp for calculated sunrise, in Baja Time format.
- **Sunset**  
Timestamp for calculated sunset, in Baja Time format.
- **Noon**  
Timestamp for calculated astronomical noon (sun at highest point for the day), in Baja Time format.
- **Midnight**  
Timestamp for calculated astronomical midnight (sun at nadir for the day), in Baja Time format.
- **Max Elevation**  
Calculated maximum angle of solar elevation in degrees, from center of sun to horizon. Occurs at astronomical noon.
- **Min Elevation**  
Calculated minimum angle of solar elevation in degrees, (a negative value). Occurs at astronomical midnight.
- **Current Elevation**  
Calculated current angle of solar elevation in degrees, between the Max and Min Elevation values.
- **Current Elevation**  
Calculated current angle of solar elevation, between the Max and Min Elevation values.
- **Current Azimuth**  
Calculated current azimuth angle of the sun, in degrees clockwise from North.
- **Current Declination**  
Calculated solar declination angle, in degrees.
- **Current Right Ascension**  
Calculated solar right ascension angle, in degrees.

### weather-MoonPosition

● MoonPosition is found on the *weather palette* along with a similar [SunPosition](#) component. From the palette, simply drag and drop the MoonPosition component in any station location. Based upon the station's date and time, this component calculates the current moon phase, age, and percent illumination.

**Note:** *Like the [SunPosition](#) component, but unlike other weather components, MoonPosition does not require the station host (JACE) to have the WeatherService, nor to have Internet connectivity. Output calculations are mathematically derived and executed solely within the station. Usage applies to any geographic location, and not just the U.S. or North America.*

You can drag any MoonPosition component onto a Px page for an iconic-based [Moon View](#).

### MoonPosition properties

The following properties are accessible in the property sheet for a MoonPosition component:

- **Enabled**  
By default, `true` for enabled. If set to `false` (disabled), calculations stop and other properties remain unchanged.
- **Update Period**  
Interval at which ongoing calculations are made, reflected in output properties. The default update period is every (1) minute.

- **Phase**  
Current calculated phase in the moon cycle, as one of the following:
  - New Moon — Moon’s unilluminated side is facing the Earth, and appears completely dark.
  - Waxing Crescent — Moon less than one half illuminated; illuminated portion is increasing.
  - First Quarter — Moon is one half illuminated; illuminated portion is increasing.
  - Waxing Gibbous — Moon more than one half illuminated; illuminated portion is increasing.
  - Full Moon — Moon’s illuminated side is facing the Earth, and is completely illuminated.
  - Waning Gibbous — Moon more than one half illuminated; illuminated portion is decreasing.
  - Last Quarter — Moon is one half illuminated; illuminated portion is decreasing.
  - Waning Crescent — Moon less than one half illuminated; illuminated portion is decreasing.
- **Age**  
Calculated duration since first entering New Moon phase, in days, hours, and minutes.
- **Illumination**  
Calculated illumination percentage, where Full Moon tops at 100%, and New Moon bottoms at 0%.

### weatherUnderground-WundergroundWeatherProvider

**Note:** At the time of this document, you can find related developer-level details at the following blog URL on Niagara-Central: <https://www.niagara-central.com/ord?portal:blog/BlogEntry/267>

Starting in AX-3.7U1 (build 3.7.104 or later), the **Wunderground Weather Provider** is an available type when adding a **WeatherReport** in the **Weather Manager**, providing that the weatherUnderground module is installed (along with the weather module). See it in the drop-down “Type to Add” field in the **New** dialog when adding a new WeatherReport (Figure 28).

**Figure 28** Wunderground Weather Provider in initial New dialog, type selection



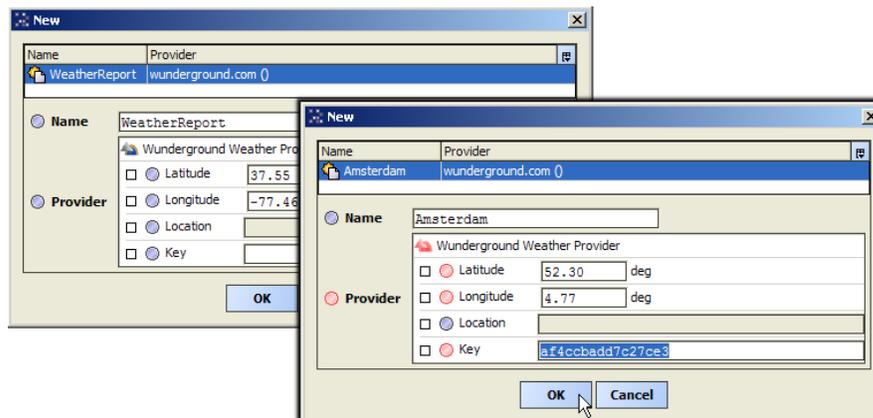
Usage is intended for “international weather”, meaning locales *outside* of the U.S. (and/or areas served by U.S. NWS reports). Otherwise, it is recommend to use the default type: NwsWeatherProvider.

The following requirements and limitations apply when using the Wunderground Weather Provider:

- You require a Weather API “key ID” from wunderground.com, received after opening a developer account. Costs range from *free* to some tiered monthly fee, based on usage (calls/day and calls/minute). At the time of this document, find more details at: [www.wunderground.com/weather/api](http://www.wunderground.com/weather/api)
- When adding a new Wunderground Weather Provider, you enter your key ID string.
- Although forecasting components and current conditions are available, currently there is no Niagara support for *advisories* issued through a Wunderground Weather Provider. Thus, the AdvisoryContainer component under the CurrentConditions of such a WeatherReport will remain empty.
- Air quality properties (Ozone, Particulate Matter) and Heat Index of CurrentConditions also remain at null values. Thus, the [Current Air Quality View](#) remains at “unknown”.

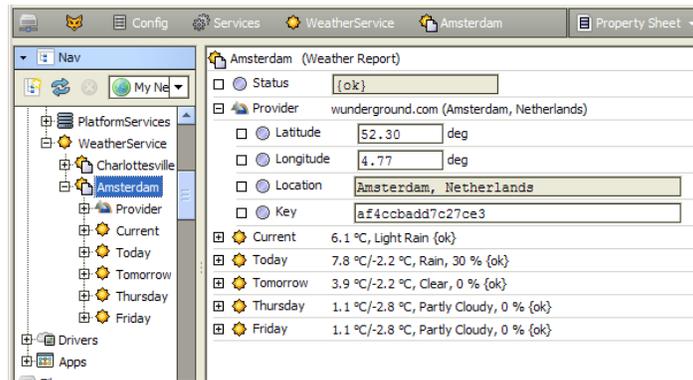
When adding, in a secondary **New** dialog, you enter a weather report name, the known latitude and longitude for the location (in decimal degrees), your unique key ID string. Figure 29 shows an example.

**Figure 29** Secondary New dialog, with latitude, longitude, and API “key ID” issued by wunderground.com



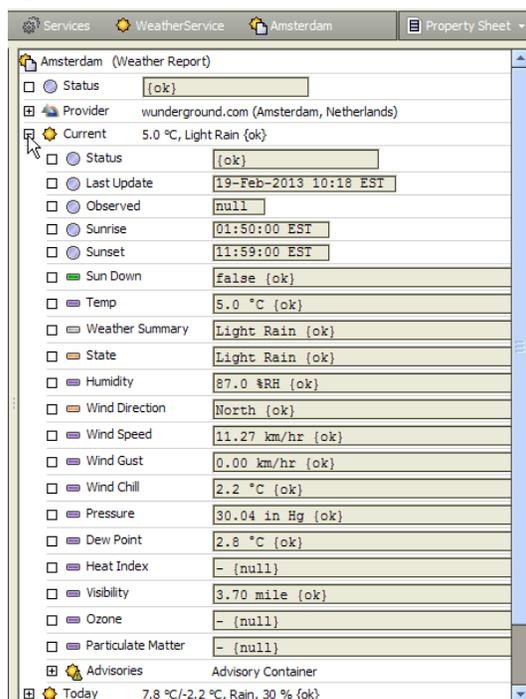
Once added, a connection is made to the weather API at wunderground.com, the location is resolved, and the report is updated, including current conditions and some number of forecast days (Figure 30).

**Figure 30** Example property sheet of WeatherReport based on WundergroundWeatherProvider



Note values display in Workbench converted to metric units (as shown above) only if the Workbench user's options are set for metric, otherwise values appear in English units (degrees F, mph). Web browser access displays values in units according to the user's Facets, Unit Conversion setting.

**Figure 31** Example CurrentConditions property sheet for report based on WundergroundWeatherProvider

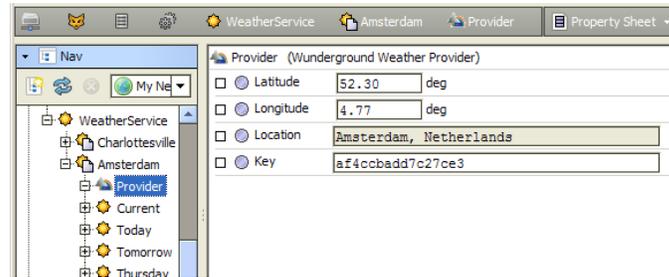


At the time of this document update, a few CurrentConditions properties may be fixed in English values or units—for example “Pressure” (in Hg) vs. millibars (mb) or “Visibility” (mile) vs. kilometers (km).

### WundergroundWeatherProvider properties

Property sheet access of a WundergroundWeatherProvider shows values that represent the three selections made when adding (or editing) the WeatherReport, as well as the resolved location (Figure 32.).

**Figure 32** WundergroundWeatherProvider property sheet



These properties are:

- **Latitude**  
Latitude of target location in decimal degrees (both minutes and seconds in decimal format).  
*Note:* An online converter for going from degrees, minutes, seconds, to decimal degrees can be found at: <http://www.fcc.gov/mb/audio/bickel/DDDMSS-decimal.html> (at this document time).
- **Longitude**  
Longitude of target location in decimal degrees (both minutes and seconds in decimal format).
- **Location**  
(Read-only) Location text string received from the wunderound.com weather API, resolved for the latitude and longitude values entered.
- **Key**  
Your unique Key ID string value received from wunderground.com, for your project account (can be used for multiple different WeatherReports).  
*Note:* If you regenerate this API key using wunderground.com’s Weather API site, you also need to update this property string to match in your WundergroundWeatherProviders.

## Weather plugins (views)

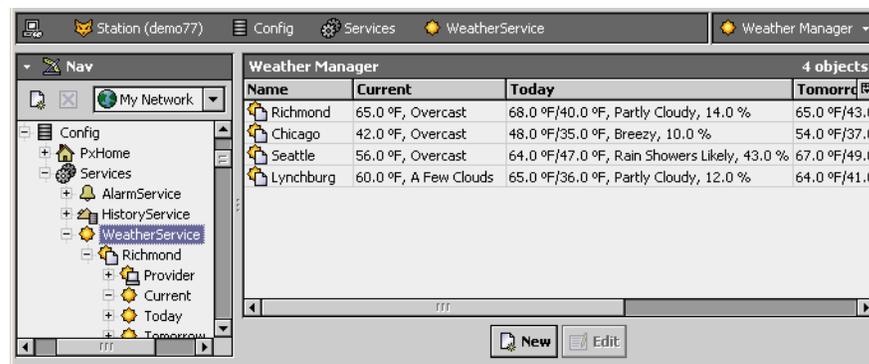
The following views are found in the weather module:

- [Weather Manager](#)
- [Current Weather View](#)
- [Current Air Quality View](#)
- [Forecast View](#)
- [Forecast Air Quality View](#)
- [Moon View](#)

### weather-WeatherManager

- The Weather Manager is the default view of the WeatherService—double-click the [WeatherService](#) to see it. You use this view to add or edit one or more child [WeatherReports](#) (one for each locale of interest). See [“Adding WeatherReports”](#).

**Figure 33** WeatherManager



Like other managers, the WeatherManager is a table view listing defined child components (Figure 33). The Weather Manager table has the following available data columns:

- **Name**  
Name for the WeatherReport (by convention, edited to be the locale for the report).

- **Current**  
Current temperature, and summary text descriptor (“Overcast,” “Sunny,” “A Few Clouds,” etc.).
- **Today**  
Today’s forecast data, including temperature high/low, text summary, and precipitation chance (%).
- **Tomorrow**  
Tomorrow’s forecast data, including same values as in Today.
- **Sunrise/Sunset**  
Predicted time of day for sunrise/sunset.
- **Status**  
Current status of weather report.
- **Provider**  
Text descriptor of the locale providing the weather report, for example, “Richmond, VA”. Typically this is the same provider descriptor used when selecting a provider in the **New** dialog.

### weather-CurrentWeatherView

 The Current Weather View provides an iconic summary of current weather conditions. This is the default view of each [WeatherReport](#) (locale) under the station’s [WeatherService](#).

**Figure 34** Current Weather View example



On a Px page, add this iconic summary by dragging a [WeatherReport](#) (locale) onto the Px canvas. In the resulting **Make Widget** dialog, select: Workbench View, then: Current Weather View.

**Note:** Starting in AX-3.5, the Current Weather View can reflect an active NWS (National Weather Service) advisory as an alarm condition. See “[About NWS alarms](#)” on page 18.

### weather-CurrentAirQualityView

 (AX-3.6 and later) The **Current Air Quality View** provides color indication of the current air quality, along with a (text) description of the air quality state. It is an available view of each [WeatherReport](#) (locale) in the station’s [WeatherService](#), as well as a WeatherReport’s [CurrentConditions](#) child. Usage is intended for WeatherReports using a [NwsWeatherProvider](#).

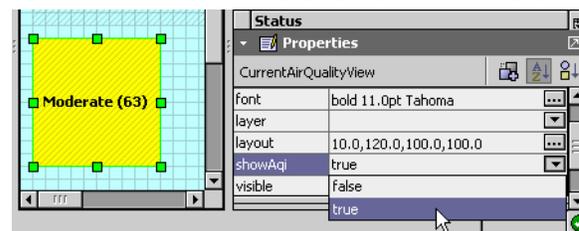
**Figure 35** Current Air Quality View example



On a Px page, to add this view, drag a [WeatherReport](#) (locale) or its **Current** child onto the Px canvas. In the resulting **Make Widget** dialog, select: Workbench View, then: Current Air Quality View.

You can resize the rectangle provided for the view, and optionally change the widget’s “showAqi” property from the default `false` to `true`, as shown in [Figure 36](#).

**Figure 36** Setting “showAqi” property to true to display numerical AQI



If “showAqi” is true, the numerical AQI value (air quality index) displays after the air quality state text descriptor, in parentheses. The example “moderate” air quality state above relates to an AQI of 63.

Possible air quality states are listed in [Table 1-1](#), by default descriptor, color, and AQI range.

**Table 1-1** Air Quality View (Current and Forecast) states, colors, AQI range

State Descriptor	Color (EPA)	AQI range
Good	Green 	0 - 50
Moderate	Yellow 	51 - 100
USG*	Orange 	101 - 150
Unhealthy	Red 	151 - 200
Very Unhealthy	Purple 	201 - 300
Hazardous	Maroon 	301 - 500
Unknown	White	unknown

\*USG is “Unhealthy for Sensitive Groups”. State descriptors are editable in the `weather.lexicon` file. At the time of this document, more information about the Air Quality Index (AQI) can be found on the U.S. Environmental Protection Agency’s website at <http://www.airnow.gov/index.cfm?aqbasics.aqi>



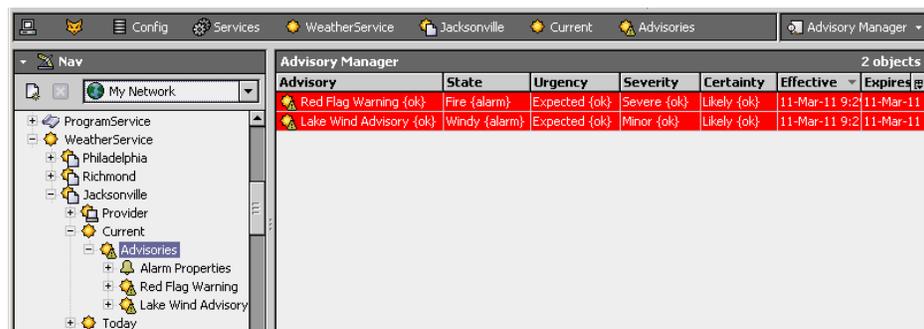
**Caution** *Air quality data is preliminary and unvalidated; it should not be used to formulate or support regulation, ascertain trends, act as guidance, or support any other government or public decision-making.*

Also starting in AX-3.6, a WeatherReport’s [CurrentConditions](#) component and each of its Forecast components have two related properties: “Ozone” and “Particulate Matter”.

### weather-AdvisoryManager

This is the default view of the “Advisories” (AdvisoryContainer) child of a WeatherReport’s “**Current**” (CurrentConditions) component—double-click the [AdvisoryContainer](#) to see it. Use this view to review current weather advisories (if any) for this weather provider.

**Figure 37** Advisory Manager



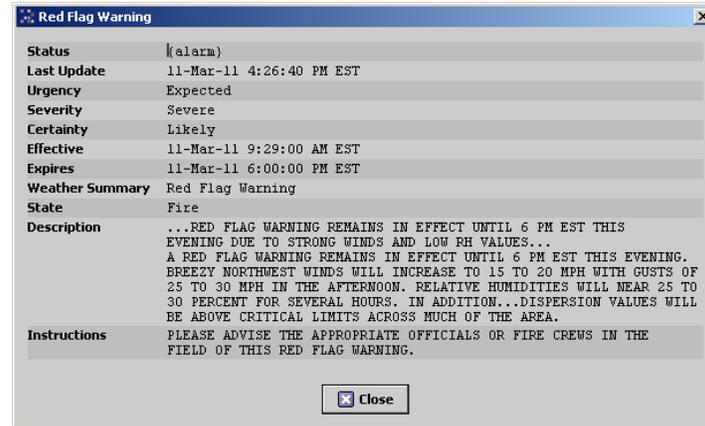
Like other managers, the **Advisory Manager** is a table view listing active child [Advisory](#) components (Figure 37). The manager’s table has the following available data columns:

- **Advisory**  
Name for the Advisory, typically the advisory type (Flood Watch, Blizzard Warning, and so on).
- **State**  
Enumerated value derived from the “weather summary” text, which include descriptors for hazardous conditions.
- **Urgency**  
The provider-assigned urgency for each advisory, which may be “Immediate”, “Expected”, “Future” or less likely “Past” or “Unknown”.
- **Severity**  
The provider-assigned severity for each advisory, which may be “Extreme”, “Severe”, “Moderate”, “Minor” or “Unknown”.
- **Certainty**  
The provider-assigned certainty for each advisory, which may be “Observed”, “Likely”, “Possible”, “Unlikely” or “Unknown”.

- **Effective**  
Date/timestamp of when the weather provider issued this advisory.
- **Expires**  
Date/timestamp of when the this advisory is expected to expire, at which time this Advisory component is dynamically removed from the station.

Double-click any advisory row to see a popup dialog showing details for that advisory (Figure 38).

**Figure 38** Advisory details popup (from Advisory Manager view)



Advisory details include a text description and instructions, plus the “Last Update” time for the advisory.

### weather-ForecastAirQualityView

 (AX-3.6 and later) The **Forecast Air Quality View** provides color indication of forecasted air quality, along with a (text) description of a forecasted air quality state. It is an available view of each child **Forecast** component (Today, Tomorrow, <daysOfWeek>) under a WeatherReport (locale).

**Figure 39** Forecast Air Quality View example



On a Px page, to add this view, drag a Forecast component onto the Px canvas. In the resulting **Make Widget** dialog, select: Workbench View, then: Forecast Air Quality View.

You can resize the rectangle provided for the view, and optionally change the widget’s “showAqi” property from the default false to true. If “showAqi” is true, the numerical AQI value (air quality index) displays after the air quality state text descriptor, in parentheses.

**Note:** Depending on the specific WeatherReport (locale), some number of Forecast components may have an “unknown” air quality state. Otherwise, this view operates the same as the [Current Air Quality View](#) on the WeatherReport or its CurrentConditions child component. See [Table 1-1](#) on page 27 for possible air quality states and color indication.

### weather-ForecastView

 A Forecast view is available on each **Forecast** child component under any WeatherReport component (Today, Tomorrow, <daysOfWeek>). Each provides an iconic summary of forecasted weather conditions.

**Figure 40** Forecast view example



On a Px page, add this iconic summary by dragging a **Forecast** (Today, Tomorrow, <dayOfWeek>) onto the Px canvas. In the resulting **Make Widget** dialog, select: Workbench View, then: Forecast View.

### weather-MoonView

 (AX-3.5 and later) A Moon view is available on any [MoonPosition](#) component in the station. It provides an iconic summary of the current Moon phase and percent illumination.

**Figure 41** Moon view example



On a Px page, add this iconic summary by dragging a MoonPosition component onto the Px canvas. In the resulting **Make Widget** dialog, select: Workbench View, then: Moon View.

**Note:** *If a locale in the Southern Hemisphere, in the Px editor for MoonView properties, change the default value of the “northernHemisphere” property from true to false. This corrects the crescent side position.*

## National Weather Service notes

**Note:** *Starting in AX-3.6, the NwsWeatherProvider also accesses an EPA-hosted server, to retrieve air quality metrics. See “[About EPA connections](#)” on page 30 for related details.*

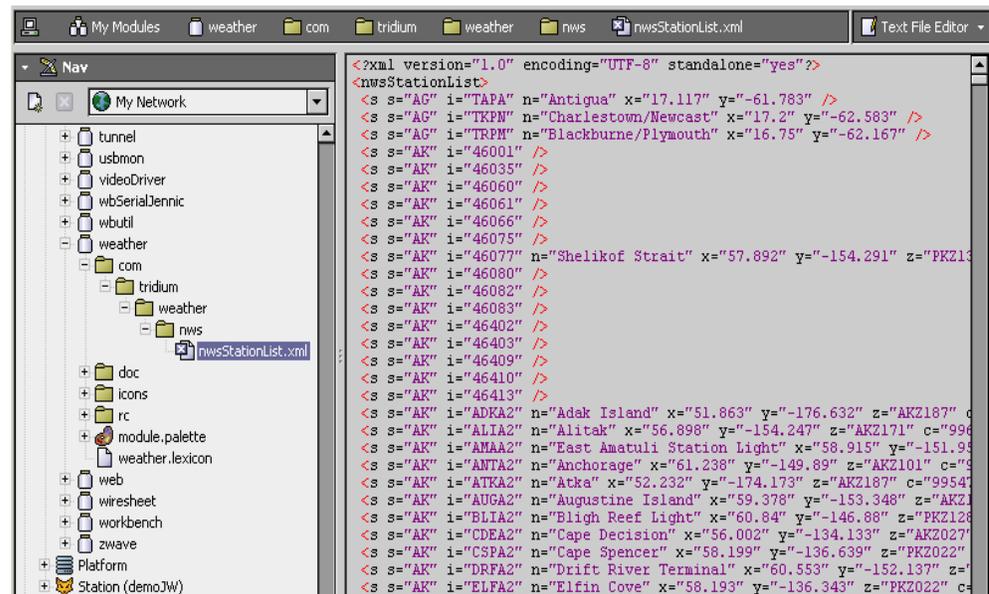
The U.S. National Weather Service (NWS) provides a weather.gov website, allowing access to a variety of meteorological data. Included are current weather conditions, as well as forecasts for selected locales.

In its internal operation, the NiagaraAX WeatherService accesses some of these same NWS HTTP servers to update the weather report for any NWS locale. See “[About NWS connections](#)” on page 30 for related details. Two methods are used to retrieve weather data for any locale: a URL-based query to a specific “station ID” for current weather conditions, and a SOAP query for weather forecast conditions, using that locale’s longitude/latitude coordinates.

In these two queries to an NWS locale, Niagara uses the “station ID” as well as the longitude/latitude data found in the “nwsStationList.xml” file inside the station’s local weather module. Each locale entry in that file also includes a 2-character region code (typically a U.S. state), and the text name/descriptor for that locale.

[Figure 42](#) shows some example contents of the nwsStationList.xml file in the weather module.

**Figure 42** nwsStationList.xml in the weather module contains NWS weather locales



When adding a new NWS report, this list is the source for region code and name/descriptor choices in drop-down selection lists, as shown in [Figure 5](#) on page 5. After adding a report, you also see its four-character “station ID” on the NwsWeatherProvider property sheet, as shown in [Figure 8](#) on page 8.

Also see the next section “[Updated NWS stations list](#)”.

## Updated NWS stations list

In weather module builds starting in the AX-3.4 development timeframe, the module's internal `nwsStationsList.xml` file was updated at build time, replacing the file used in the initial 2005 release. Since then, each updated file reflected new weather stations brought online by the NWS, as well as others that were subsequently dropped. At the time of this document update (just before the AX-3.6 release), this NWS list currently contains about 2550 available stations. Additional information has been added to provide for weather advisories.

In the stations list, in addition to U.S. states there are entries for a few U.S. territories and several island countries. In order of locale code, these include Antigua (AG), American Samoa (AS), Aruba (AW), Barbados (BB), Bermuda (BH), Dominica (DM), Fiji (FJ), Micronesia (FM), Granada (GD), Guam (GU), Kiribati (KB), Niue (NU), Saint Lucia (LU), Marshall Islands (MH), Martinique (MQ), Mexico, Cancun (MX), New Caledonia (NL), French Polynesia (PF), Puerto Rico (PR), Palau (PW), Tonga (TO), Trinidad and Tobago (TT), Tuvalu (TV), Saint Vincent (VC), Virgin Islands, British (VG), Virgin Islands, U.S. (VI), and Samoa (WS).

As an updated weather module (with newer stations list) becomes available for any NiagaraAX release, it is recommended to obtain it and install it in any host running a station using the WeatherService.

## Verifying NWS station IDs

Independent of Niagara, you can make a quick verification of the “current weather” status for any NWS station, providing you know its four-character station ID. Use a browser and this URL syntax:

<http://weather.noaa.gov/weather/current/stationID.html>

For example, to verify the Anchorage, Alaska station “PANC”, point a browser to

<http://weather.noaa.gov/weather/current/PANC.html>

This may be useful if trying to isolate a problem—say to verify that a station listed in the weather module's `nwsStationList.xml` is still currently available.

## About NWS connections

The `NwsWeatherProvider` gets initial data (requested on outbound port 80) from `www.weather.gov` and `www.nws.noaa.gov` (NWS) by domain name URLs, and requires such addresses to be resolved to IP addresses. On a Supervisor or a Workbench engineering workstation, the host Windows PC is typically configured to obtain DNS servers automatically. In this case, these DNS addresses are resolved and the WeatherService starts normally. Subsequent weather updates typically use cached (previously resolved) IP addresses, however, at times the domain name URLs may be used again.

For any embedded (QNX-based) JACE using a static IP address (typical), where its station needs to use the WeatherService, starting in AX-3.5 there are now a couple of connection options:

- If the JACE is part of a NiagaraNetwork with a Supervisor station also running the WeatherService, each WeatherReport in the JACE station can use the “FoxWeatherProvider” to obtain weather updates from an existing WeatherReport in the Supervisor station, rather than directly over the Internet from the NWS. This can simplify IP setup in the JACE, and typically avoids firewall issues. For details, see “weather-FoxWeatherProvider” on page 19.
- If the JACE is “standalone”, or, for some reason needs to use the WeatherService with direct NWS connections, its platform TCP/IP Configuration must specify a *default gateway* and one or more *DNS servers*. This applies to the weather module in all releases of NiagaraAX.

If these settings are unknown, you can ask the local IT manager for them. Or, if you have a Windows PC operating on the same subnet as the JACE, you can obtain these settings by opening a DOS command prompt window and entering the command:

```
ipconfig/all
```

This returns a list of information, including the active Default Gateway and DNS Servers.

**Note:** Starting in AX-3.4, the net module's `HttpProxyServer` also provides support for a “non-transparent” proxy server, allowing configuration of proxy server settings and open proxy connections.

For related details, see `HttpProxyServer` in the “Component Guides” section of the NiagaraAX User Guide.

## About EPA connections

Starting in AX-3.6, for WeatherReports using the default `NwsWeatherProvider`, air quality metrics are retrieved for current and forecast conditions, including values for ozone and particulate matter levels. From this data, an AQI (Air Quality Index) is calculated, which is used in the WeatherReports' air quality views.

The NwsWeatherProvider gets this data from a U.S. EPA (Environmental Protection Agency) server, at: [www.airnowgateway.org](http://www.airnowgateway.org)

Installations behind a firewall may need to add a rule (exception) to allow access to this information, in addition to rules to allow access to NWS servers. See “[About NWS connections](#)” on page 30.

## U.S. Environmental Protection Agency (EPA) AIRNow Data Exchange Guidelines

The EPA AIRNow Data Exchange Guidelines apply to data available from the AIRNow program, which includes these data portals: AIRNow.gov, AIRNow-Tech, and AIRNow Gateway. The purpose of the guidelines is to make all interested parties aware of the nature and objective of real-time air quality information.

- AIRNow observational data are not fully verified or validated; these data are subject to change and should be considered preliminary. Data and information reported to AIRNow from federal, state, local, and tribal agencies are provided for the express purpose of reporting and forecasting the Air Quality Index (AQI). As such, they should not be used to formulate or support regulation, ascertain trends, act as guidance, or support any other government or public decision-making. Official regulatory air quality data must be obtained from EPA’s Air Quality System (AQS).
- Only validated data should be used for reports and data analysis whenever possible. AIRNow data are raw data and should never be substituted for validated data stored in the AQS archive.
- Credit should first be given to the appropriate source—federal, state, local, and tribal air quality agencies and the EPA AIRNow program—in products, publications, presentations, or any other related distribution. These federal, state, local, and tribal air quality agencies are the owners of the data and the authorities for the data. A list of state/local/tribal agencies can be found at: <http://www.airnow.gov/index.cfm?action=airnow.partnerslist>
- Air quality data, forecast values, and advisory statements should not be altered in any way and should be disseminated as received.
- Federal, state, local, and tribal air quality agencies are the authority for issuing air quality forecasts and advisories. Forecasts, advisories, advisory names, and notifications should not be altered in any way.
- Air quality observed and forecast values should be disseminated in accordance with the AQI and corresponding RGB colors as directed in the Guideline for Reporting of Daily Air Quality-Air Quality Index (AQI)  
<http://www.epa.gov/ttn/oarpg/t1/memoranda/rg701.pdf>
- All end-users who receive these data should be provided with the most current data available, in particular, advisories issued by federal, state, local, and tribal air quality agencies. The AIRNow program updates all data feeds several times per hour.
- If observational data are used for analyses, displayed on web pages, or used for other programs or products, the analysis results, displays, or products must indicate that these data are preliminary.
- That publications, analyses, products, and/or derived information rely on these data must be made known to the relevant federal, state, local, and tribal air quality agencies and the EPA AIRNow program.
- Data users’ contact information must be kept current for the purposes of informing users of these data about any program or product updates and/or problems
- Questions about AIRNow data, forecasts, and advisories should be directed to [AIRNowDMC@sonomatech.com](mailto:AIRNowDMC@sonomatech.com) and [white.johne@epa.gov](mailto:white.johne@epa.gov).

## Document change log

Updates (changes/additions) to this *NiagaraAX Weather Guide* document are listed below.

- Revised: September 13, 2013  
Updated the document to make the following change:
  - Added “[U.S. Environmental Protection Agency \(EPA\) AIRNow Data Exchange Guidelines](#)” on page 31.
- Revised: February 19, 2013  
Updated document to reflect weather module changes concurrent with the first 3.7 “update” (3.7U1) build 3.7.104 or later. The following is a brief summary of document changes:
  - The “[Weather overview](#)” section includes a new subsection “[What’s new in the AX-3.7 weather module](#)” on page 2.
  - The “[Adding WeatherReports](#)” section now notes that other providers may be available apart from the default Nws Weather Provider, see the second [Note](#): on page 5

- The “Weather components” subsection “CurrentConditions properties” on page 9 has an updated screen capture and details on the new “Observed” property (AX-3.7 and later).
- A new “Weather components” entry for the (AX-3.7 and later) Wunderground Weather Provider was added. See “weatherUnderground-WundergroundWeatherProvider” on page 23.
- Revised: March 17, 2011  
Modified document to reflect NiagaraAX-3.6 changes to the weather module, such that it covers the weather module in both AX-3.6 and AX-3.5. Where needed, differences in operation between the two release levels of NiagaraAX are noted. The following is a summary of document changes:
  - The “Weather overview” section includes a new subsection “What’s new in the AX-3.6 weather module” on page 2, and the “Using weather components in Px views” has a new subsection “Demo station example of Px support” on page 4.
  - The “Adding WeatherReports” section now has two different sections on reviewing NWS advisories configuration: “Configuring for advisories (AX-3.6 and later)” and “Configuring for advisories (AX-3.5)”, as the WeatherService architecture for advisories changed in AX-3.6.
  - The “Weather components” section has new entries for components introduced starting in AX-3.6, including `Advisory`, `AdvisoryContainer`, and `AdvisoryAlarmSourceInfo`, and the component sections on the `CurrentConditions` and `Forecast` components were modified to include new air quality properties (Ozone and Particulate Matter).
  - The “Weather plugins (views)” section has a new `Advisory Manager` entry.
  - A section “About EPA connections” on page 30 was added to explain how air quality data (in AX-3.6) is obtained by the WeatherService.
- Revised: March 31, 2010  
Reworked entire document to reflect NiagaraAX-3.5 changes to the weather module, and omitted many previous references to earlier releases, except for a few that pertain to AX-3.4. Therefore, this is now a “versioned” document that applies to the weather module in AX-3.5 and later. Many screen-captures were updated from the previous document, and various minor changes were made that are too numerous to mention.  
The basic focus of this document remains unchanged—to describe the weather module. The following provides a summary of changes in this document update:
  - The “Weather overview” section includes new subsections “Using weather components in Px views” and “Advisories”.
  - The “Adding WeatherReports” section was reordered to come before component description sections, and includes a “Configuring for advisories (AX-3.5)” procedure.
  - The “Weather components” section has new subsections for components introduced in AX-3.5, including `FoxWeatherProvider`, `MoonPosition`, `NwsAdvisoryAlarmExt`, and `SunPosition`, and components are now ordered in a more hierarchical (versus alphabetical) manner.
  - The “Weather plugins (views)” section has a new `Moon View` subsection.
  - The “About NWS connections” subsection was edited to mention the `FoxWeatherProvider`.