The Internals of Aspect Signaling with JMRI/PanelPro

Dick Bronson - *RR-CirKits, Inc.*

Clinics in this series:

- Introduction to Aspect Signaling with JMRI/PanelPro

  4:00 PM, Wednesday, July 6th

- The Internals of Aspect Signaling w/Panelpro

  4:00 PM, Thursday, July 7th

Setting the Signal Preferences

Setup your signal hardware according to the information found in the JMRI Help pages. Select 'Help' – 'General Help...' then navigate down to 'Signaling' – 'Signal Aspects'. On the web go to:
http://jmri.org/help/en/html/tools/signaling/AspectSignaling.shtml

Note:

The options and tables for signals are saved in the panels file along with all the other information, both for the layout hardware, and any control panel/s being used.

Be sure to save as you work. Current releases of JMRI automatically make backup panel versions with their names based on your panel name plus the date and time so that you can backtrack easily without starting from scratch if something goes horribly wrong. These files are located in the 'backupPanels' folder in your preferences area.

Signal System types

There are two general methods of signaling in use in the USA. The first is 'Route' based, and the second is 'Speed' based.

Route based signals:

Route based signals in the USA give a general indication of the route condition ahead of the train. Some european route systems may give more exact information. Typically the western railroads used route based signals. The long distances between signals leaves plenty of room for stopping in advance of signals with only one or two signals of advanced warning.

Speed based signals:

Speed based signals in the USA are usually found on the more congested eastern routes where the added cost of signal hardware is justified by denser traffic patterns.

Building a new signal set

- Aspect Signaling
- There are four types of files associated with creating a new set of signals.

Building a new signal set

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  - Images for each mast combination and appearance. These are optional, and as the library of signal types grows it will become easier to use existing images for most if not all required signal options. This is reasonable to expect because there were only a few different signal manufacturers that made the signals for many different railroads.

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  - An Index that gives information about the new signal set.
  - An Aspect file that lists some basic information about each aspect that was used by the railroad.
  - Various Appearance files that describe the specifics of each mast type, which aspects it supports, and when it is used.

- Images

- Images are required for each mast combination and appearance if they will ever be described on the JMRI signaling page or be placed on a panel. That said, these are optional, and as the library of signal types grows it will become easier to use existing images for most if not all required signal options.

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- Currently we have included a complete set of images in its own file folder, even if some are similar to existing images.
- Images need to be of the complete mast shown in each possible configuration of lights as individual files. Most image editors make it easy to do this by copying and moving various pieces. In addition I have coded the shape of each color differently to make life less impossible for the color challanged among us.

Building a new signal set

Images

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Building a new signal set

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Rule 292: Stop

Indication: Stop.

Building a new signal set

Images

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Building a new signal set

Images

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Rule 292: Stop

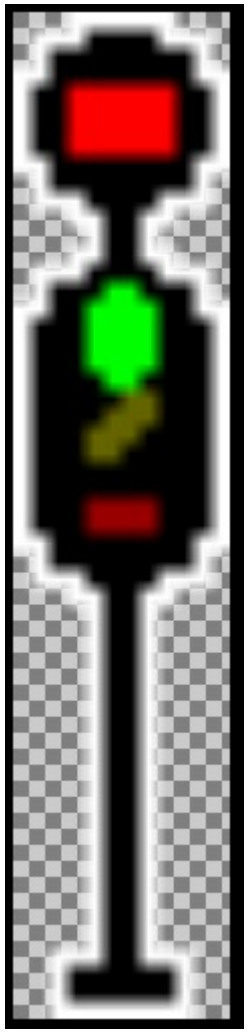
Indication: Stop.

- Other rules have just one way to show their appearance.

Rule 284: Approach Slow

Indication: Proceed, approaching next signal not exceeding slow speed.

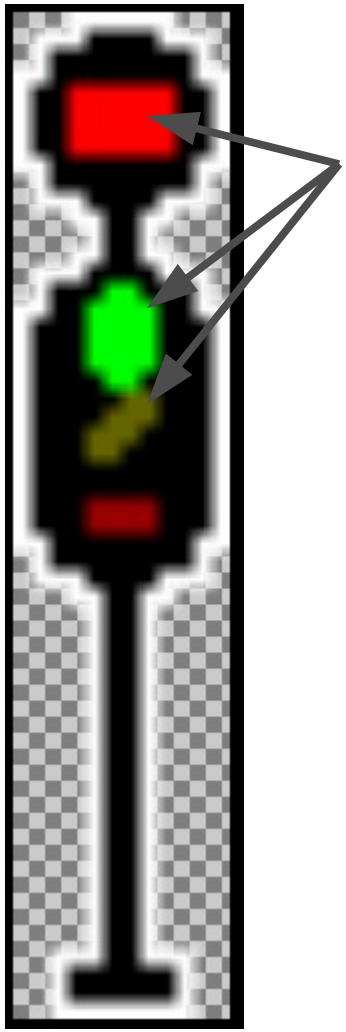
Building a new signal set



- When creating images I have used a few tricks to hopefully improve their visibility in small sizes.

Building a new signal set

Images



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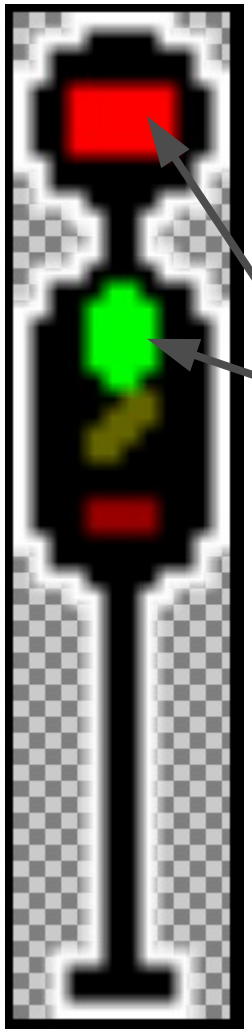
- The color portions are given semaphore shapes to assist folks with color limited vision. Lunar is cross shaped.

Building a new signal set

Images



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Building a new signal set

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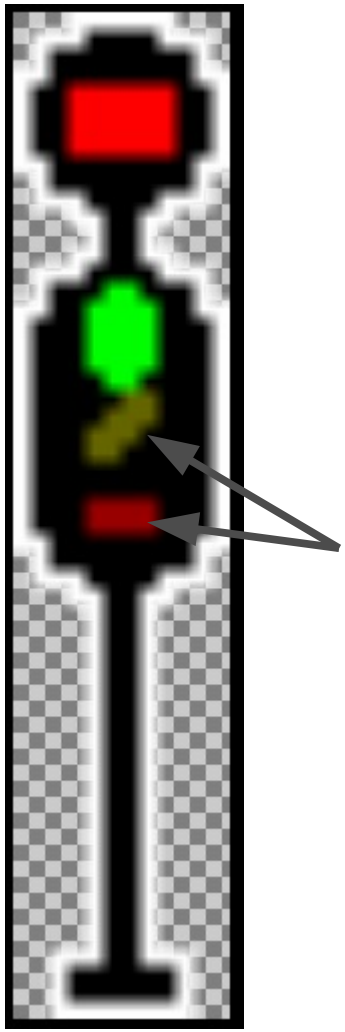

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- The dark portions are smaller and have darker colors..

Building a new signal set

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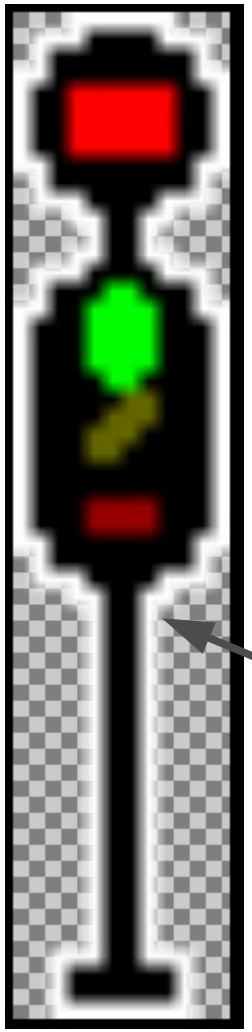

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- A white border is used to make the image work on a black background.

Building a new signal set

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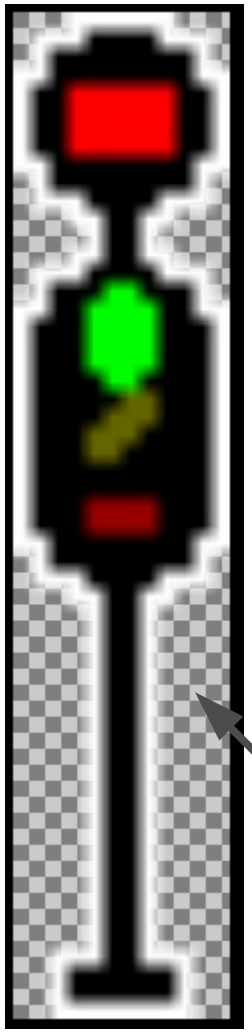

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- All other parts of the image are made transparent.

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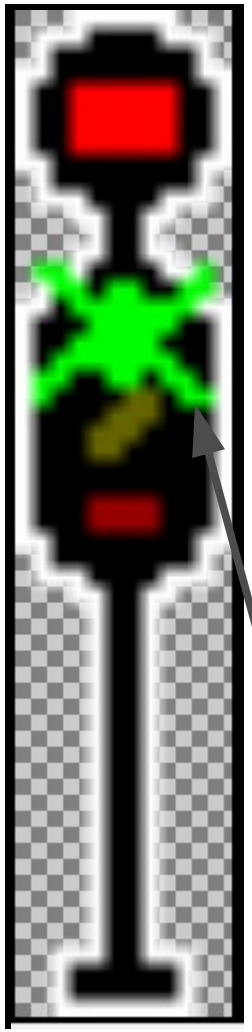

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- The dark portions are smaller and have darker colors.
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- All other parts of the image are made transparent.
- Flashing aspects are given rays,

Building a new signal set

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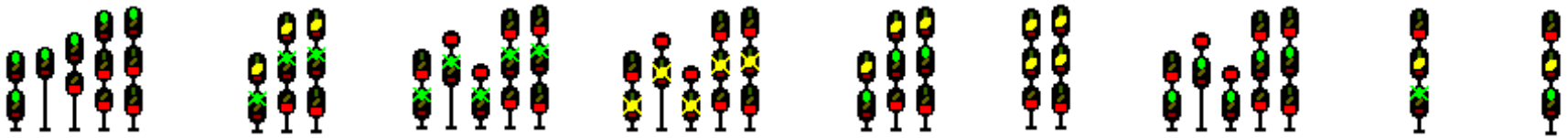

Building a new signal set

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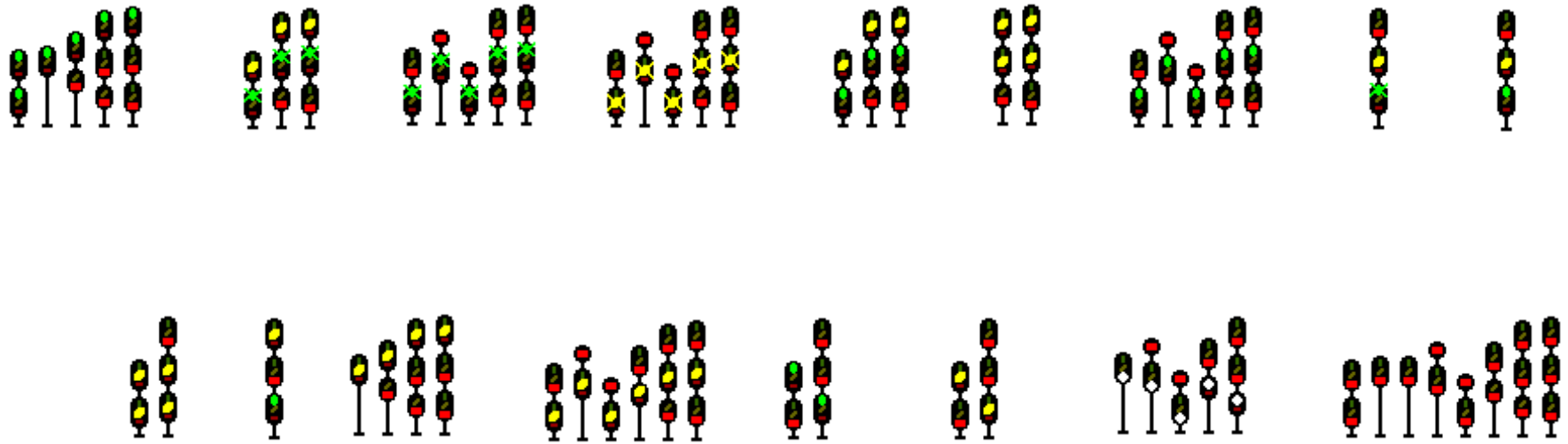

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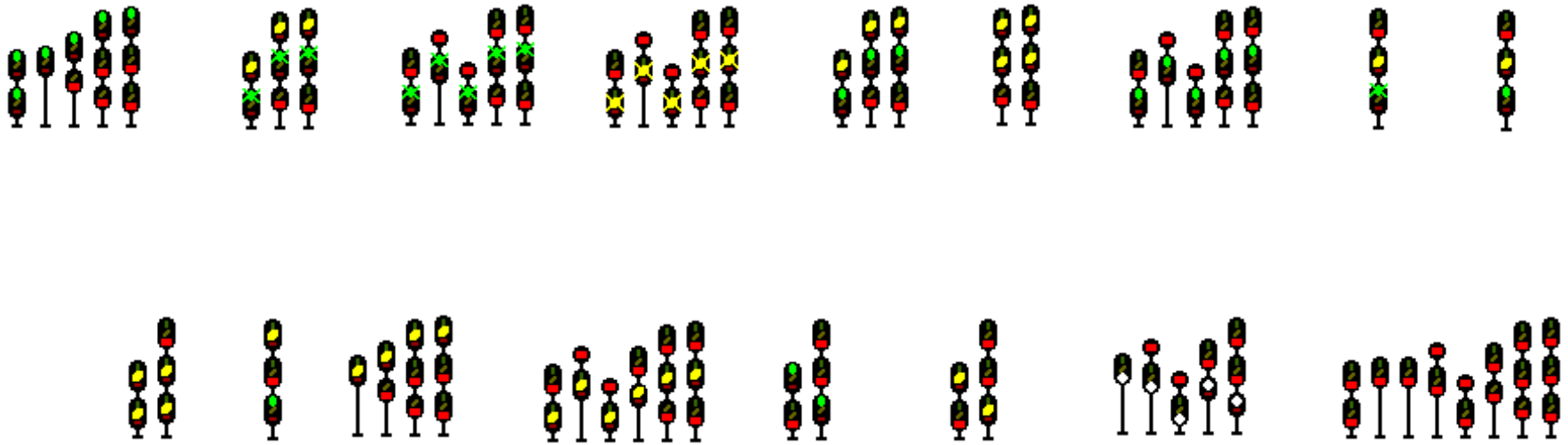
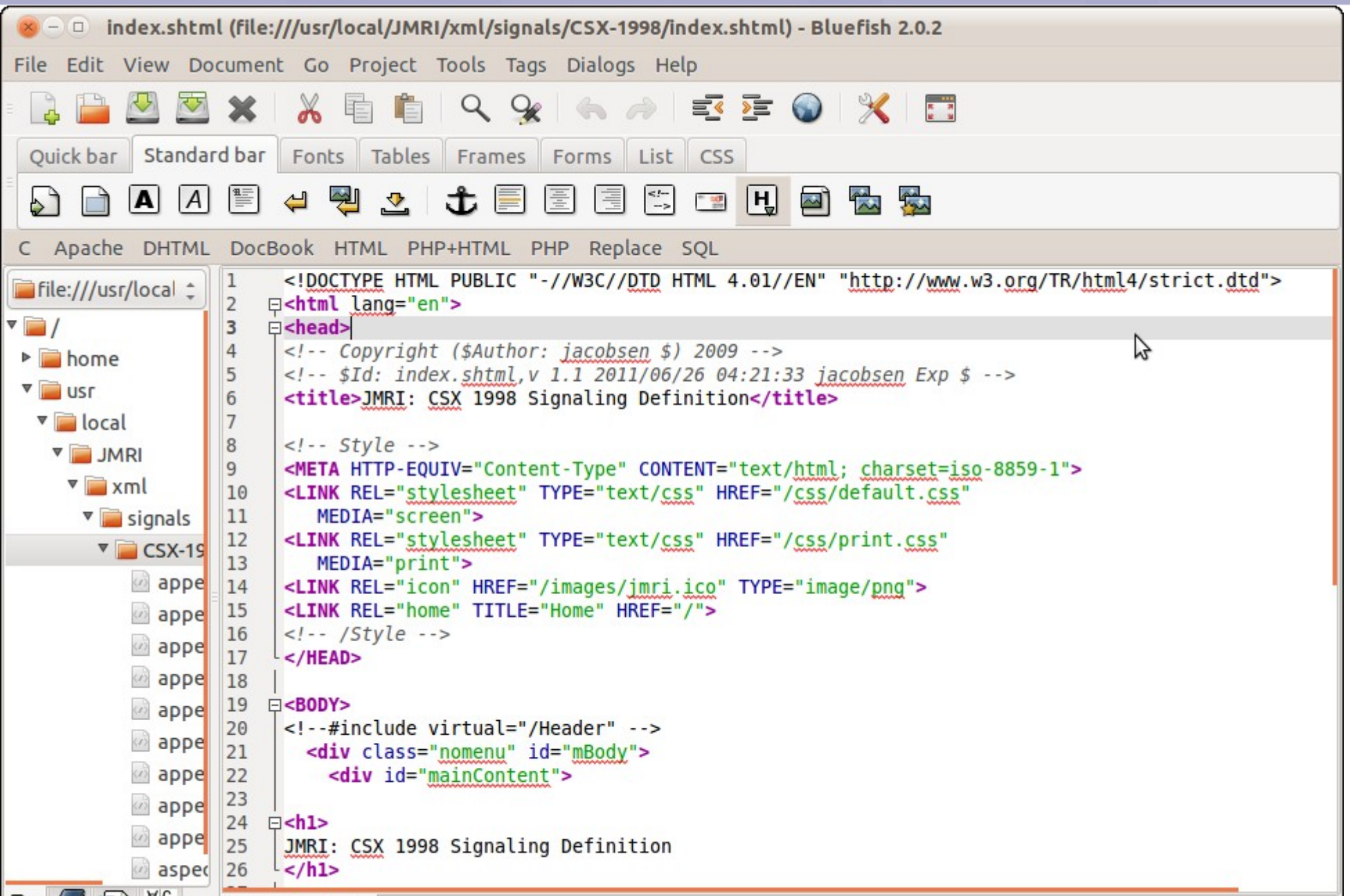


- I discovered after these images were finished that I have missed at least two more combinations in common use. (1 – 1 – 3 and 3 – 2 – 2)

- index.shtml
- Create a new index.shtml file. SHTML is HTML with server side includes. I.e. Your pages get some parts added before the browser displays them.
- This is only a description, but it's important to do it first so that you record the details of what you've done.
- If you're capturing a prototypical system, record what you know about it: The railroad, region/district, year, where you found the information, etc.
- If you're making up your own system, describe it in some detail so that you can come back to it later on and remember what you had in mind.

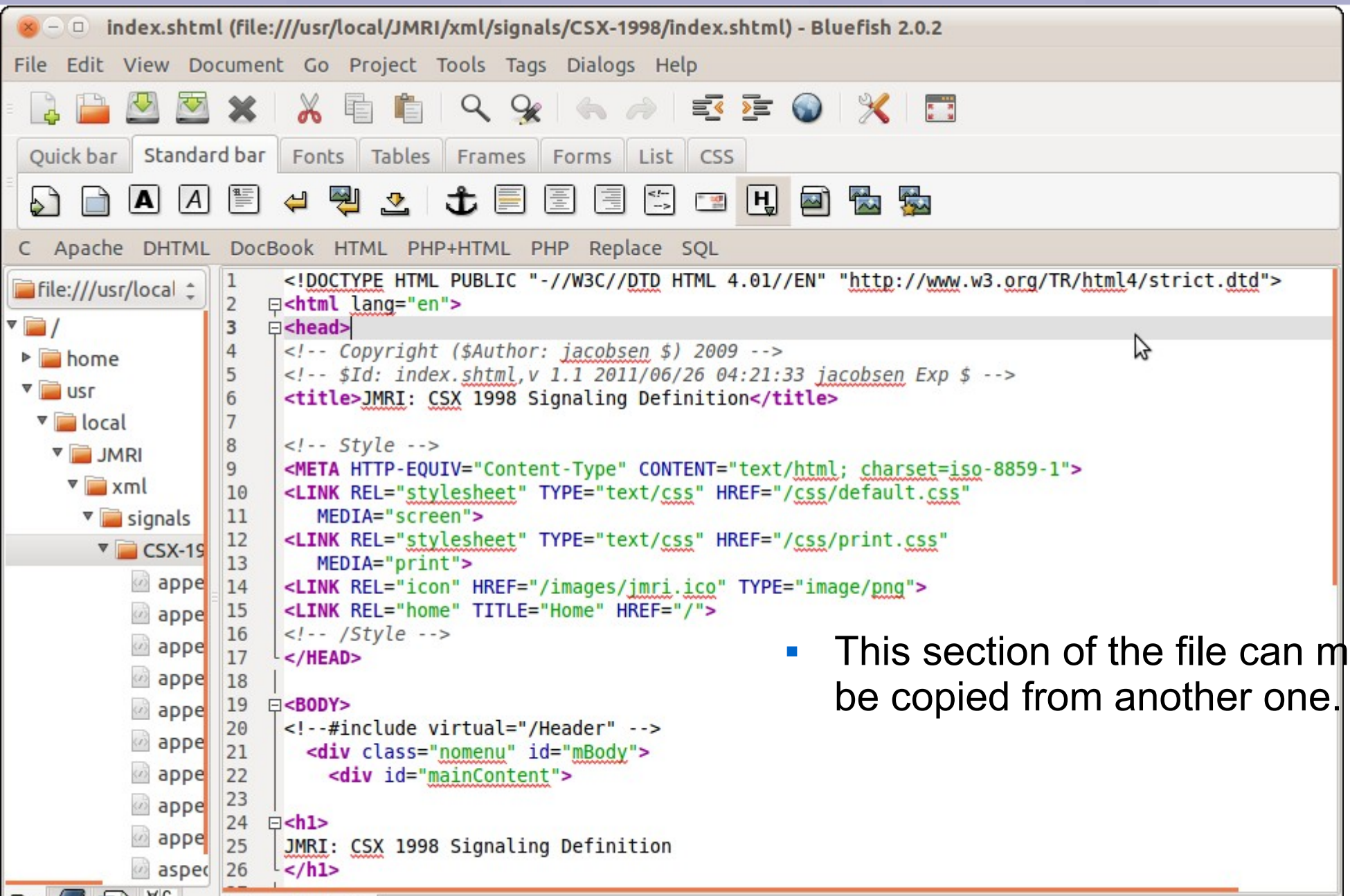
Building a new signal set

Index.shtml



Building a new signal set

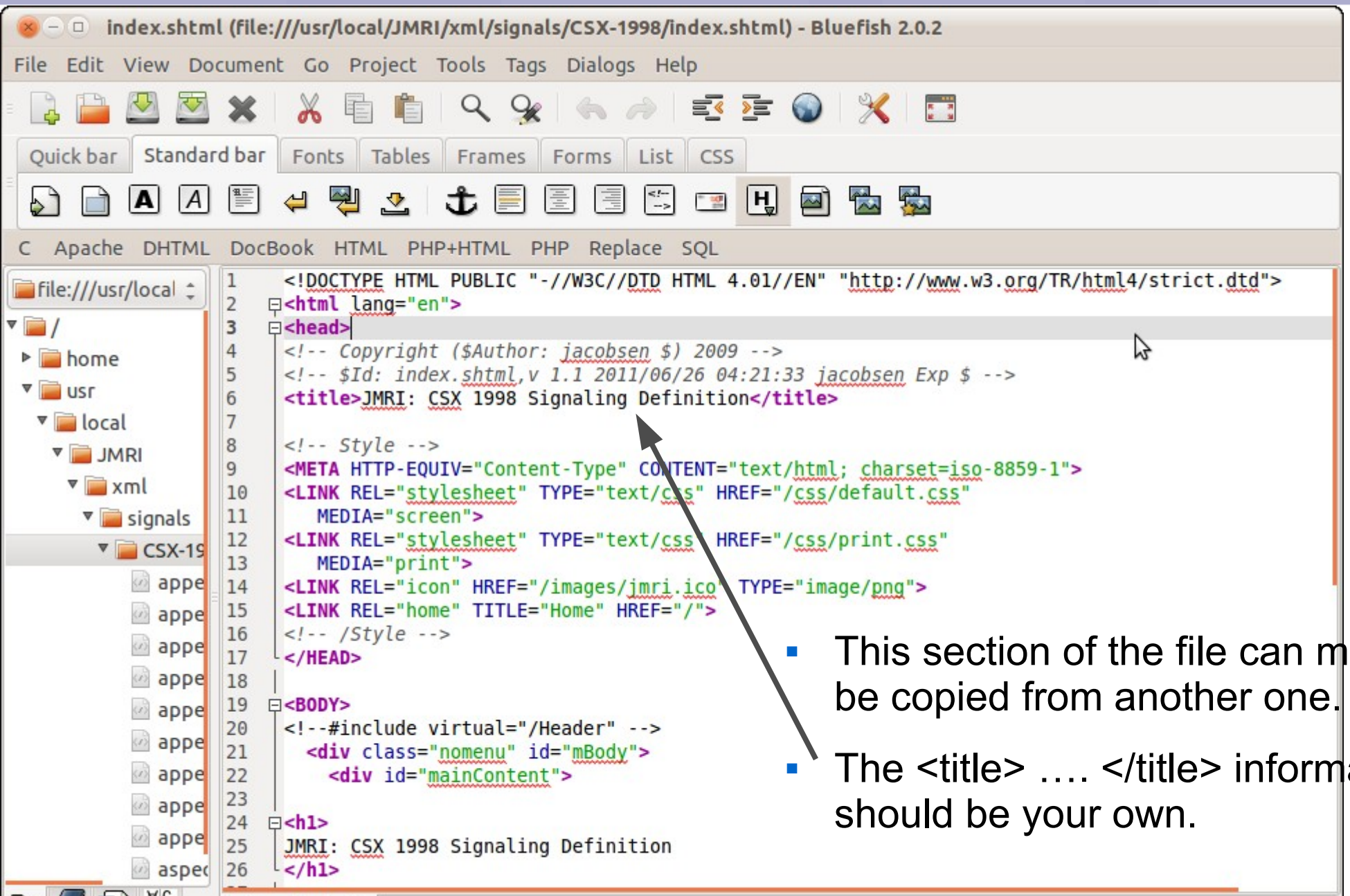
index.shtml



- This section of the file can mostly be copied from another one.

Building a new signal set

index.shtml



- This section of the file can mostly be copied from another one.
- The <title> …. </title> information should be your own.

Building a new signal set

index.shtml (file:///usr/local/JMRI/xml/signals/CSX-1998/index.shtml) - Bluefish 2.0.2

Index.shtml

File Edit View Document Go Project Tools Tags Dialogs Help

Quick bar | Standard bar | Fonts | Tables | Frames | Forms | List | CSS

C Apache DHTML DocBook HTML PHP+HTML PHP Replace SQL

file:///usr/local

- /
  - home
  - usr
    - local
      - JMRI
        - xml
          - signals
            - CSX-19
              - appe
              - appe
              - appe
              - appe
              - appe
              - appe
              - appe
              - appe
              - appe
              - aspec
              - index

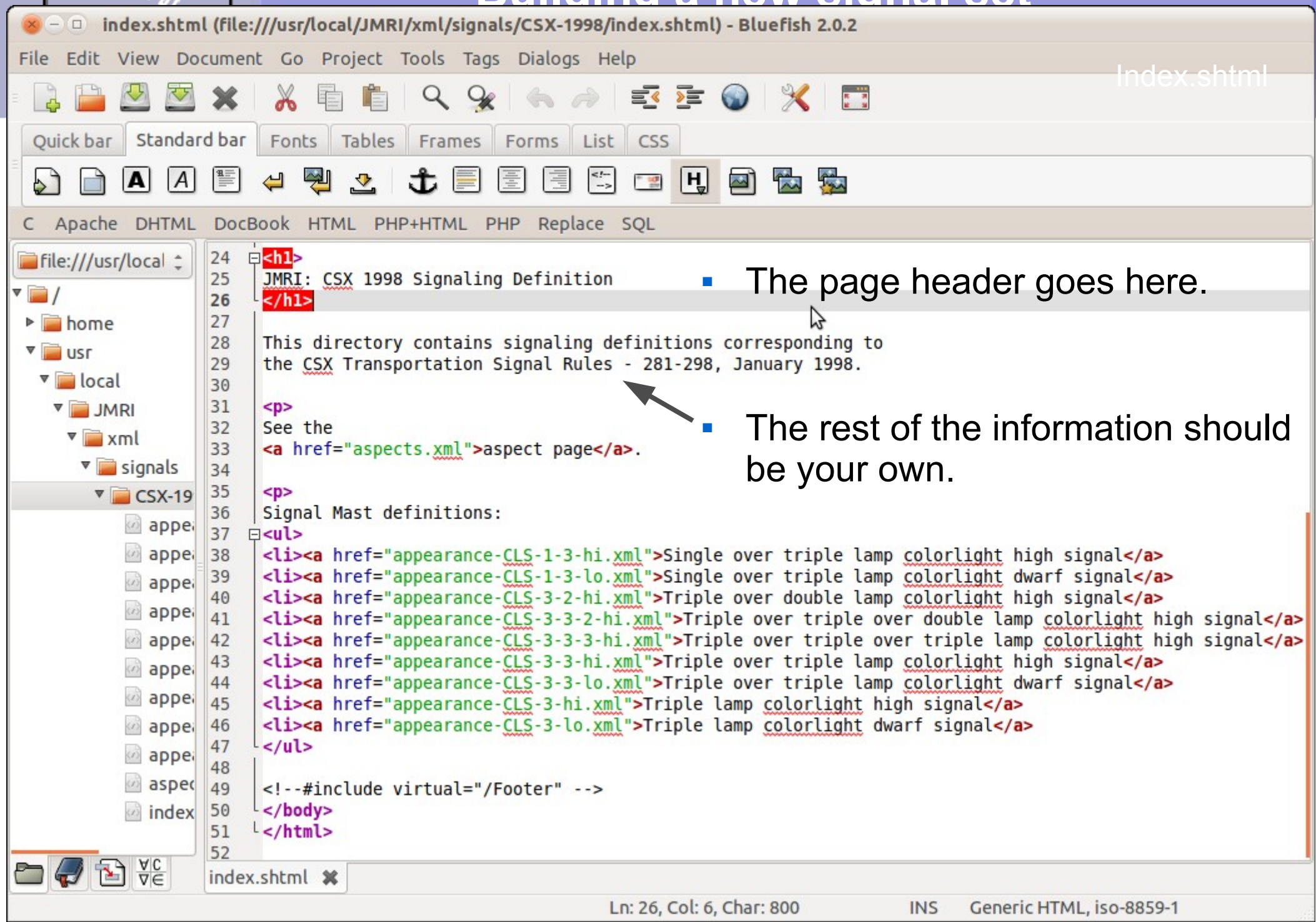
```
24  <h1>
25  JMRI: CSX 1998 Signaling Definition
26  </h1>
27
28  This directory contains signaling definitions corresponding to
29  the CSX Transportation Signal Rules - 281-298, January 1998.
30
31  <p>
32  See the
33  <a href="aspects.xml">aspect page</a>.
34
35  <p>
36  Signal Mast definitions:
37  <ul>
38  <li><a href="appearance-CLS-1-3-hi.xml">Single over triple lamp colorlight high signal</a>
39  <li><a href="appearance-CLS-1-3-lo.xml">Single over triple lamp colorlight dwarf signal</a>
40  <li><a href="appearance-CLS-3-2-hi.xml">Triple over double lamp colorlight high signal</a>
41  <li><a href="appearance-CLS-3-3-2-hi.xml">Triple over triple over double lamp colorlight high signal</a>
42  <li><a href="appearance-CLS-3-3-3-hi.xml">Triple over triple over triple lamp colorlight high signal</a>
43  <li><a href="appearance-CLS-3-3-hi.xml">Triple over triple lamp colorlight high signal</a>
44  <li><a href="appearance-CLS-3-3-lo.xml">Triple over triple lamp colorlight dwarf signal</a>
45  <li><a href="appearance-CLS-3-hi.xml">Triple lamp colorlight high signal</a>
46  <li><a href="appearance-CLS-3-lo.xml">Triple lamp colorlight dwarf signal</a>
47  </ul>
48
49  <!--#include virtual="/Footer" -->
50  </body>
51  </html>
52
```

The page header goes here.

index.shtml

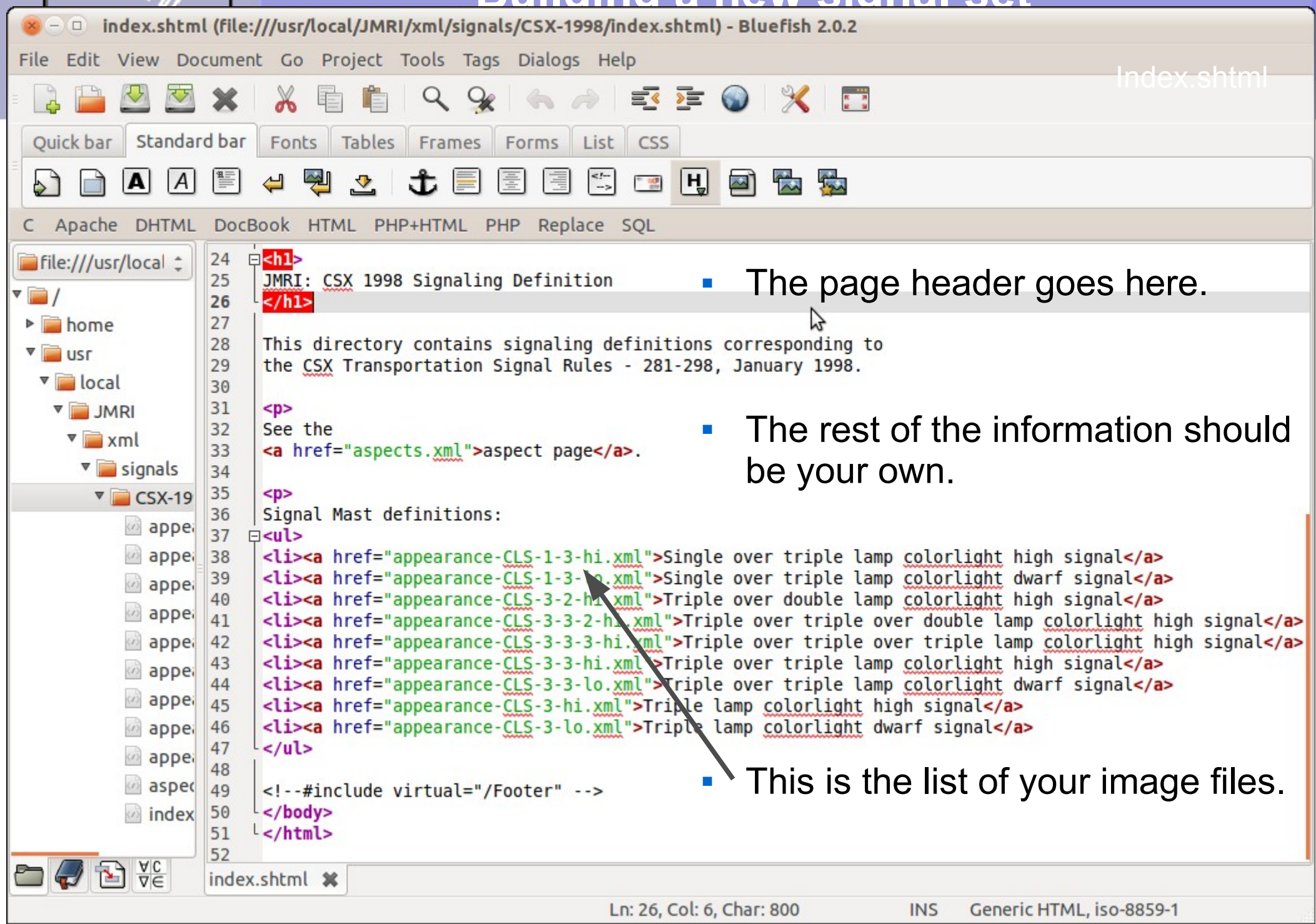
Ln: 26, Col: 6, Char: 800 INS Generic HTML, iso-8859-1

Building a new signal set



- The page header goes here.
- The rest of the information should be your own.

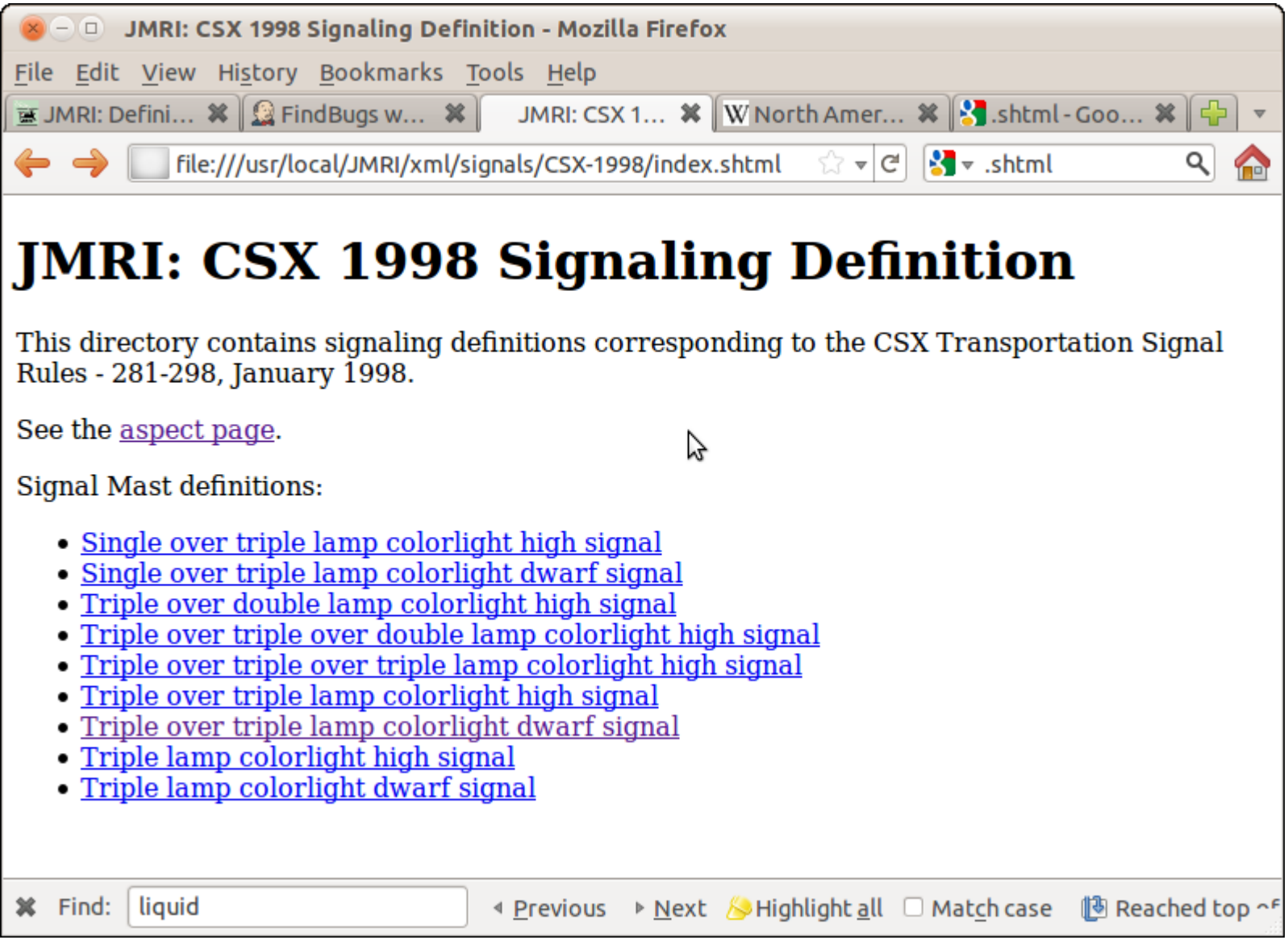
Building a new signal set



- The page header goes here.
- The rest of the information should be your own.
- This is the list of your image files.

Building a new signal set

index.shtml



- The result of this is a web page with links to your information and some descriptive information.

- aspects.xml
- The 'aspects.xml' file defines the complete set of available aspects.

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- The 'aspects.xml' file defines the complete set of available aspects.
- You can come back and add more later if needed, but it's better to enter them all at the beginning because the names will be more consistent, etc. More importantly the mapping portion in the appearance.xml files must list all possible aspects, so adding one later means editing every file in the set. Plan Ahe

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Building a new signal set

aspects.xml

aspects.xml (file:///usr/local/JMRI/xml/signals/CSX-1998/aspects.xml) - Bluefish 2.0.2

File Edit View Document Go Project Tools Tags Dialogs Help

Quick bar | Standard bar | Fonts | Tables | Frames | Forms | List | CSS

C Apache DHTML DocBook HTML PHP+HTML PHP Replace SQL

file:///usr/local/JMRI/

- /
  - home
  - usr
    - local
      - JMRI
        - xml
          - signals
            - CSX-1998
              - appearance
              - appearance
              - appearance
              - appearance
              - appearance
              - appearance
              - appearance
              - appearance
              - appearance
              - aspects.xml
              - index.shtml

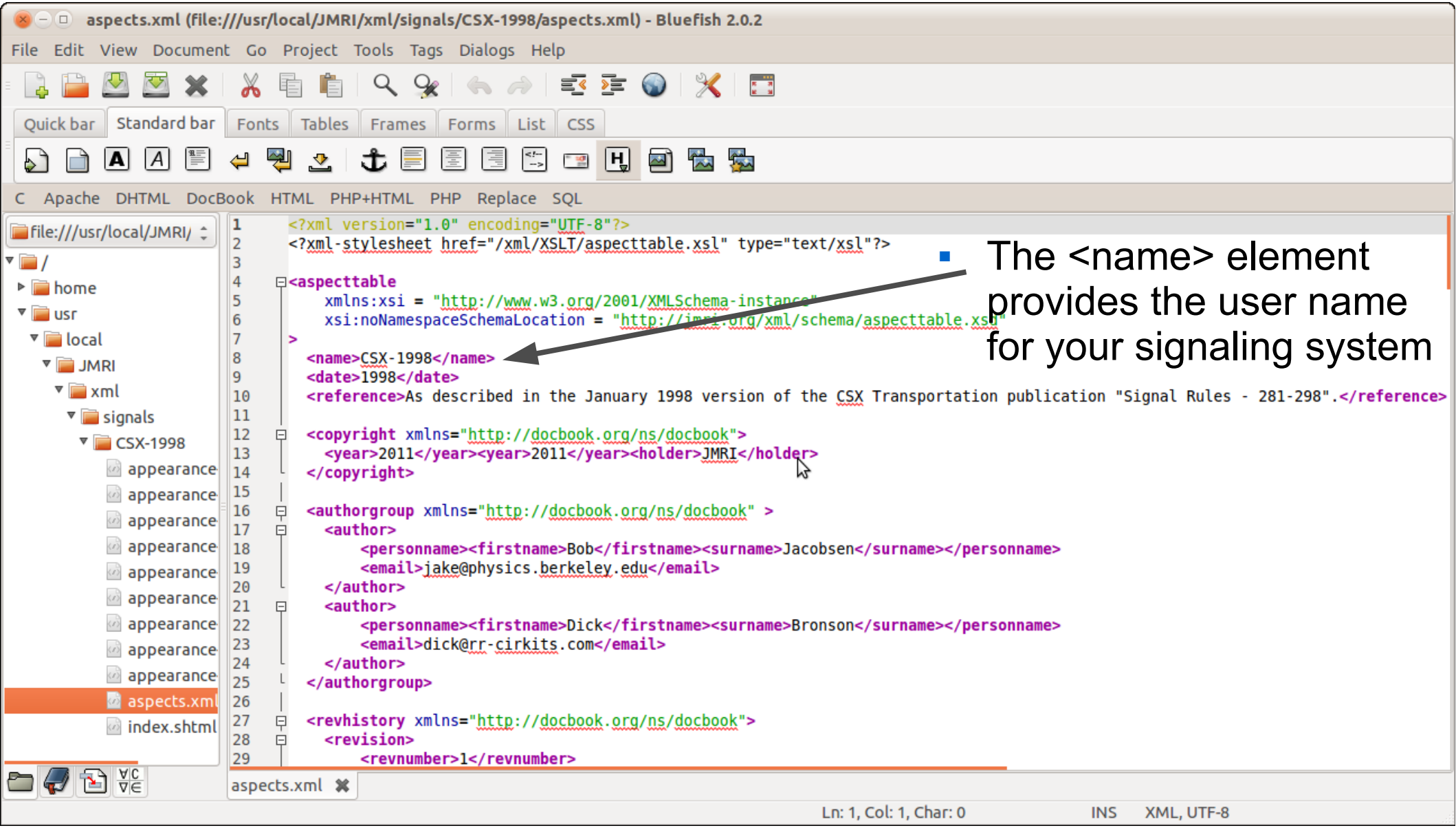
```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <?xml-stylesheet href="/xml/XSLT/aspecttable.xsl" type="text/xsl"?>
3
4  <aspecttable
5      xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"
6      xsi:noNamespaceSchemaLocation = "http://jmri.org/xml/schema/aspecttable.xsd"
7  >
8    <name>CSX-1998</name>
9    <date>1998</date>
10   <reference>As described in the January 1998 version of the CSX Transportation publication "Signal Rules - 281-298".</reference>
11
12   <copyright xmlns="http://docbook.org/ns/docbook">
13     <year>2011</year><year>2011</year><holder>JMRI</holder>
14   </copyright>
15
16   <authorgroup xmlns="http://docbook.org/ns/docbook" >
17     <author>
18         <personname><firstname>Bob</firstname><surname>Jacobsen</surname></personname>
19         <email>jake@physics.berkeley.edu</email>
20     </author>
21     <author>
22         <personname><firstname>Dick</firstname><surname>Bronson</surname></personname>
23         <email>dick@rr-cirkits.com</email>
24     </author>
25   </authorgroup>
26
27   <revhistory xmlns="http://docbook.org/ns/docbook">
28     <revision>
29         <revnumber>1</revnumber>
```

aspects.xml

Ln: 1, Col: 1, Char: 0 INS XML, UTF-8

Building a new signal set

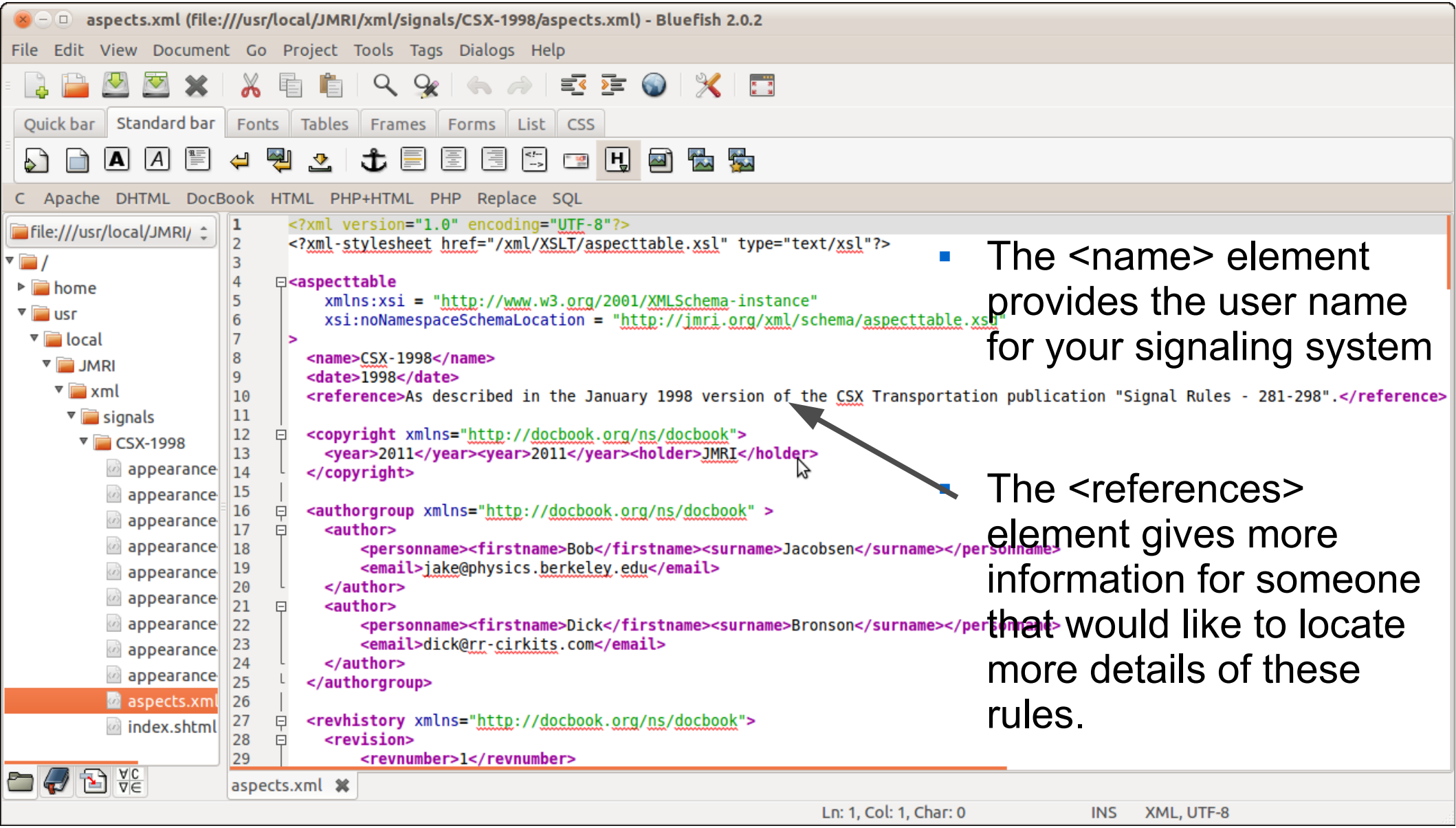
aspects.xml



The <name> element provides the user name for your signaling system

Building a new signal set

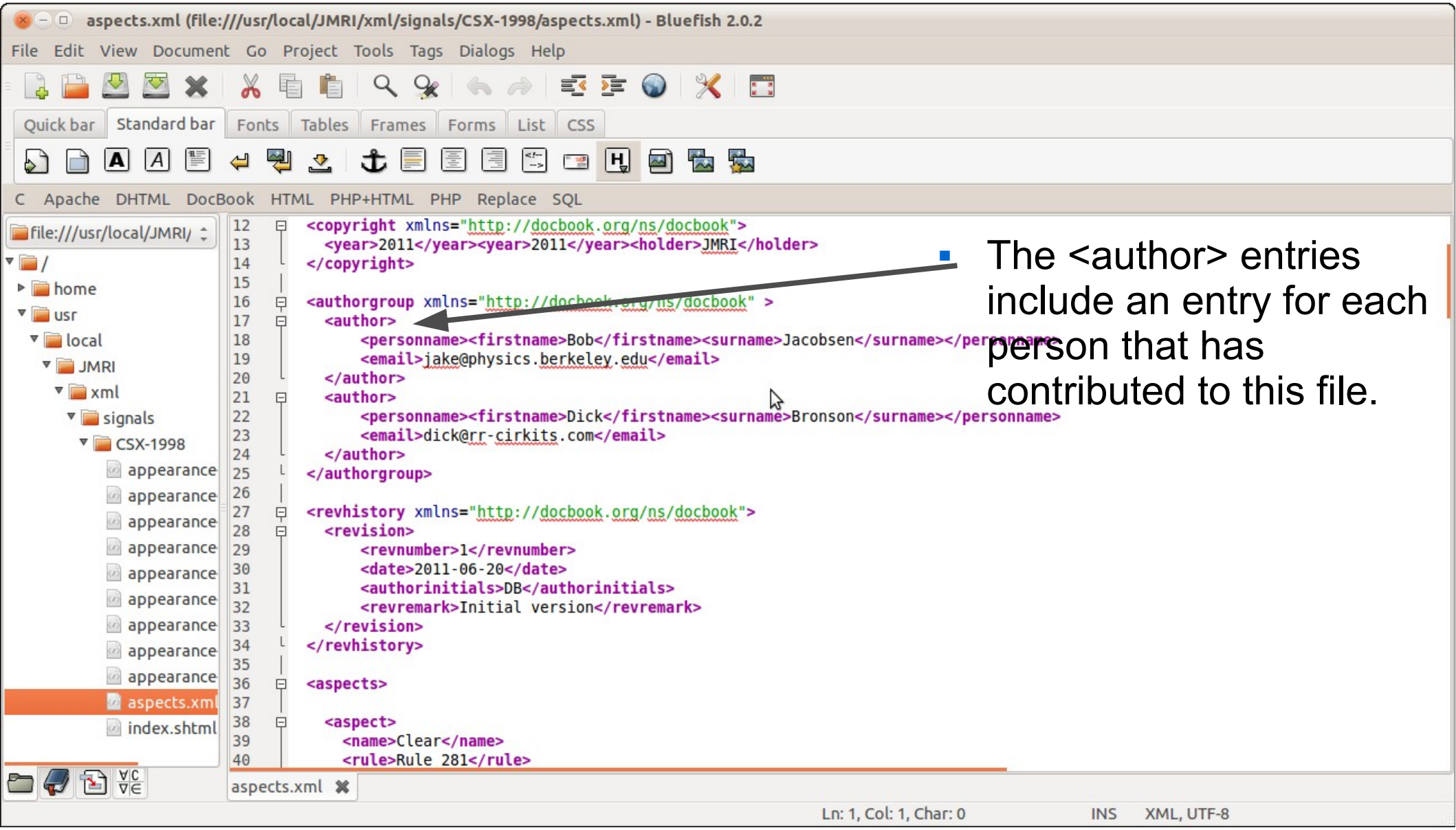
aspects.xml



- The <name> element provides the user name for your signaling system
- The <references> element gives more information for someone that would like to locate more details of these rules.

Building a new signal set

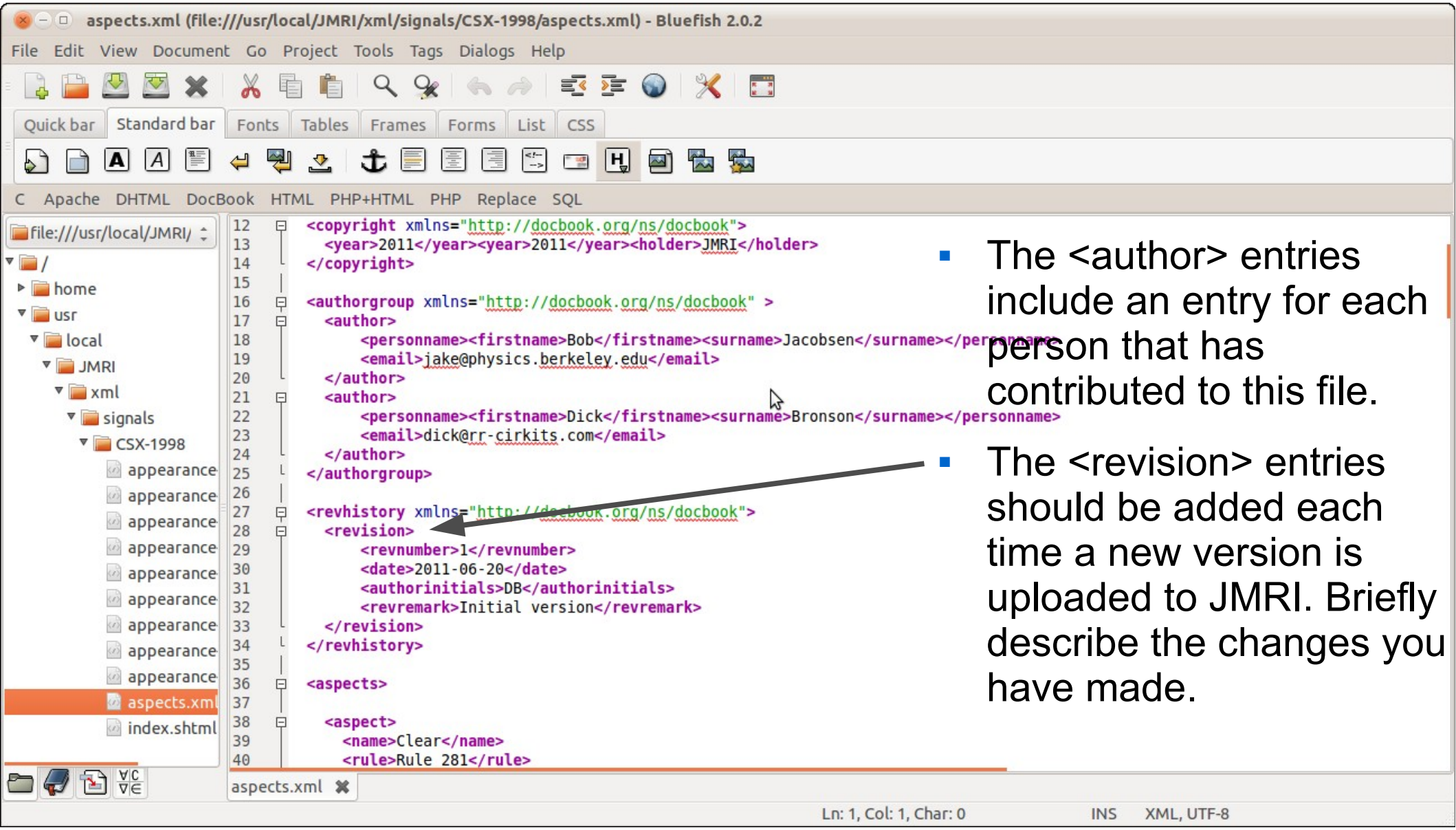
aspects.xml



The <author> entries include an entry for each person that has contributed to this file.

Building a new signal set

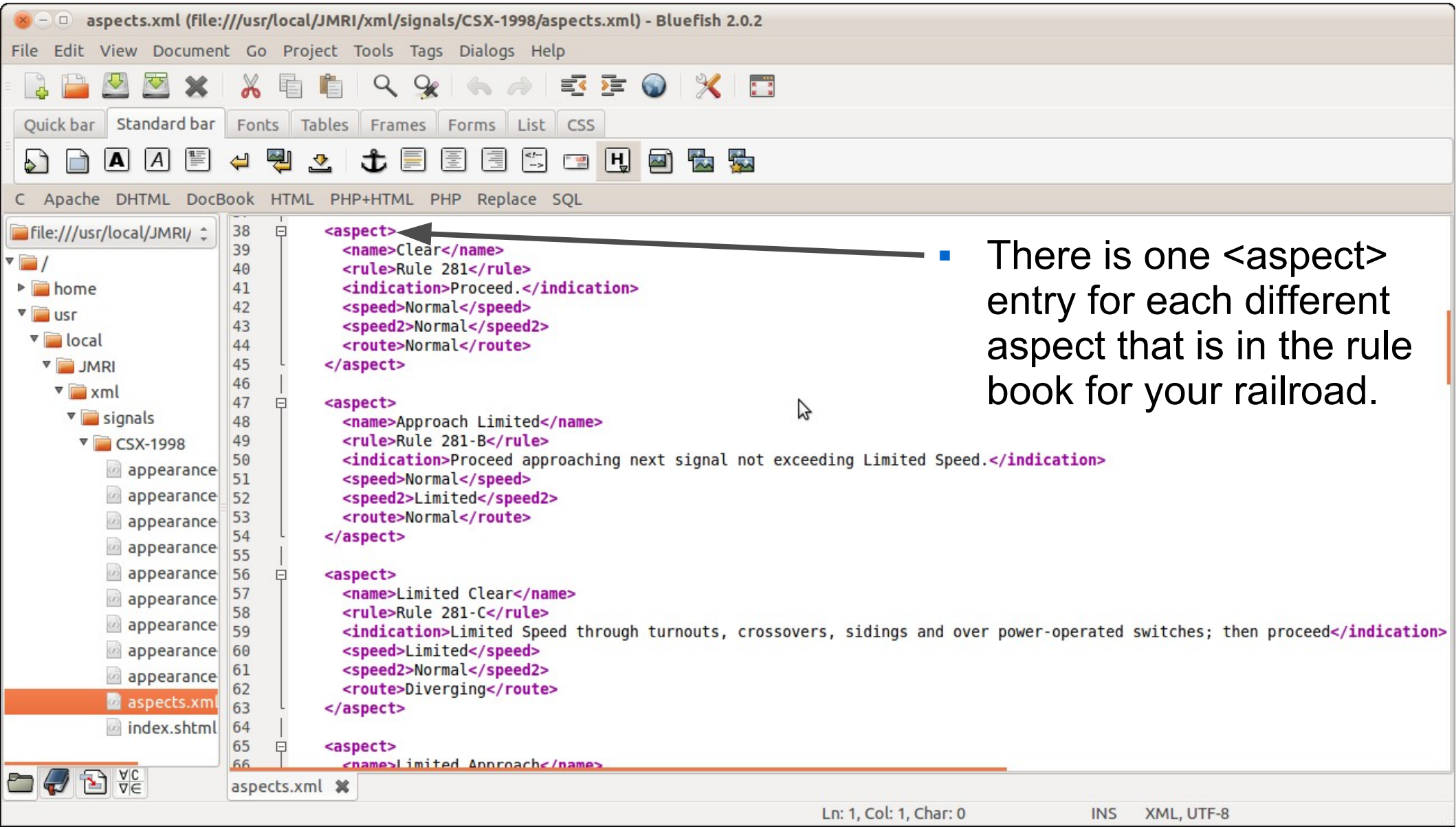
aspects.xml



- The <author> entries include an entry for each person that has contributed to this file.
- The <revision> entries should be added each time a new version is uploaded to JMRI. Briefly describe the changes you have made.

Building a new signal set

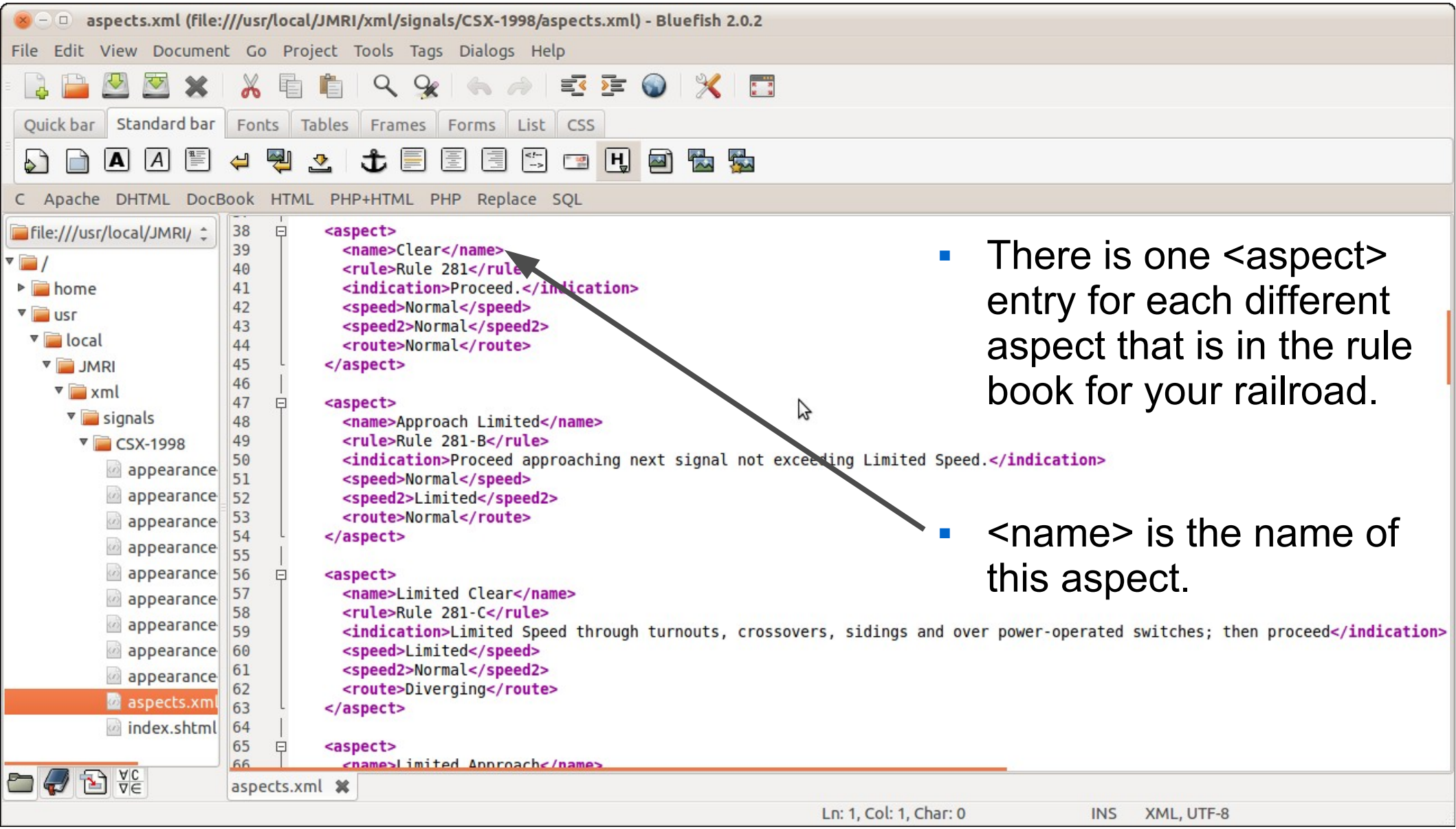
aspects.xml



- There is one <aspect> entry for each different aspect that is in the rule book for your railroad.

Building a new signal set

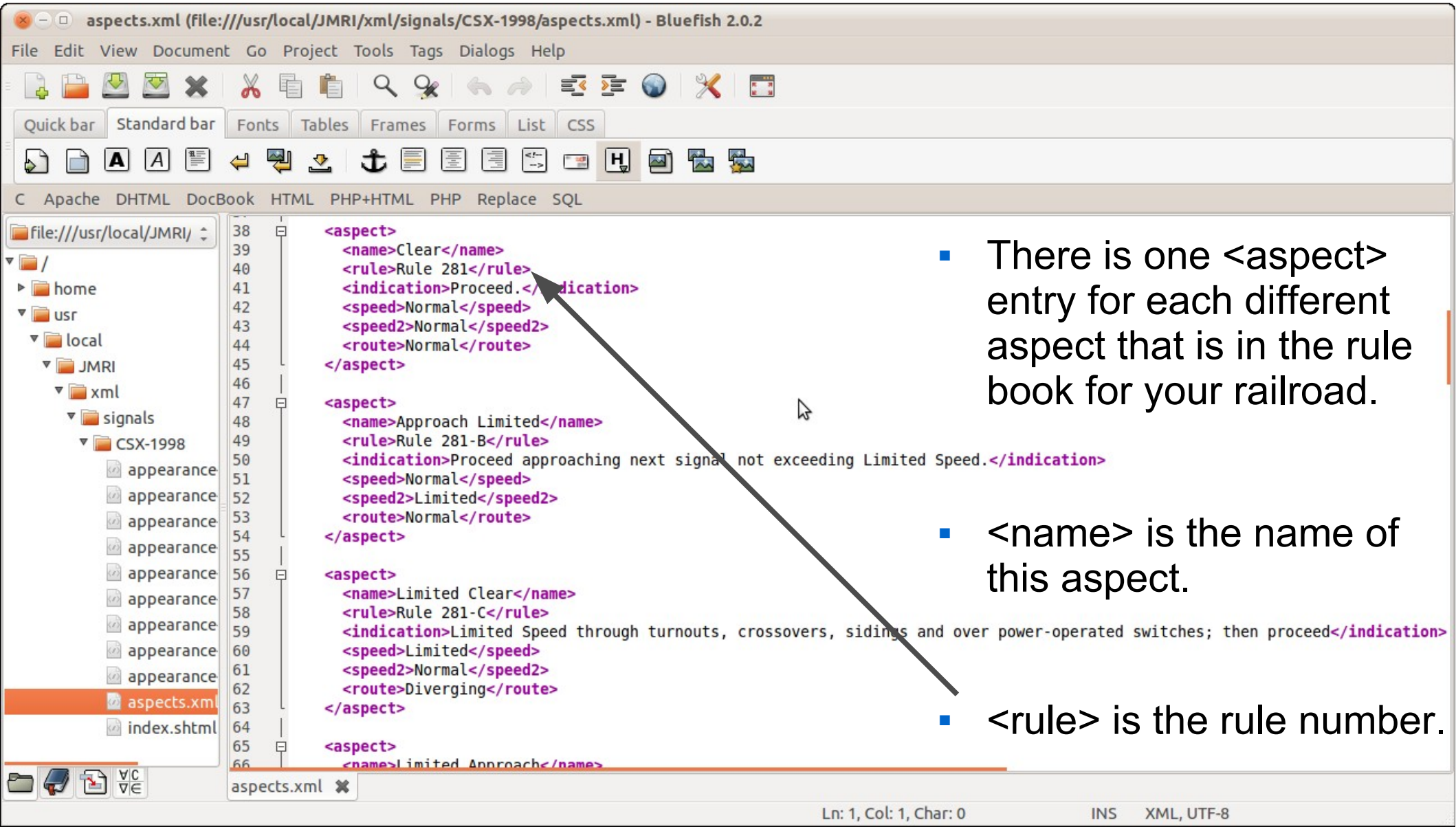
aspects.xml



- There is one <aspect> entry for each different aspect that is in the rule book for your railroad.
- <name> is the name of this aspect.

Building a new signal set

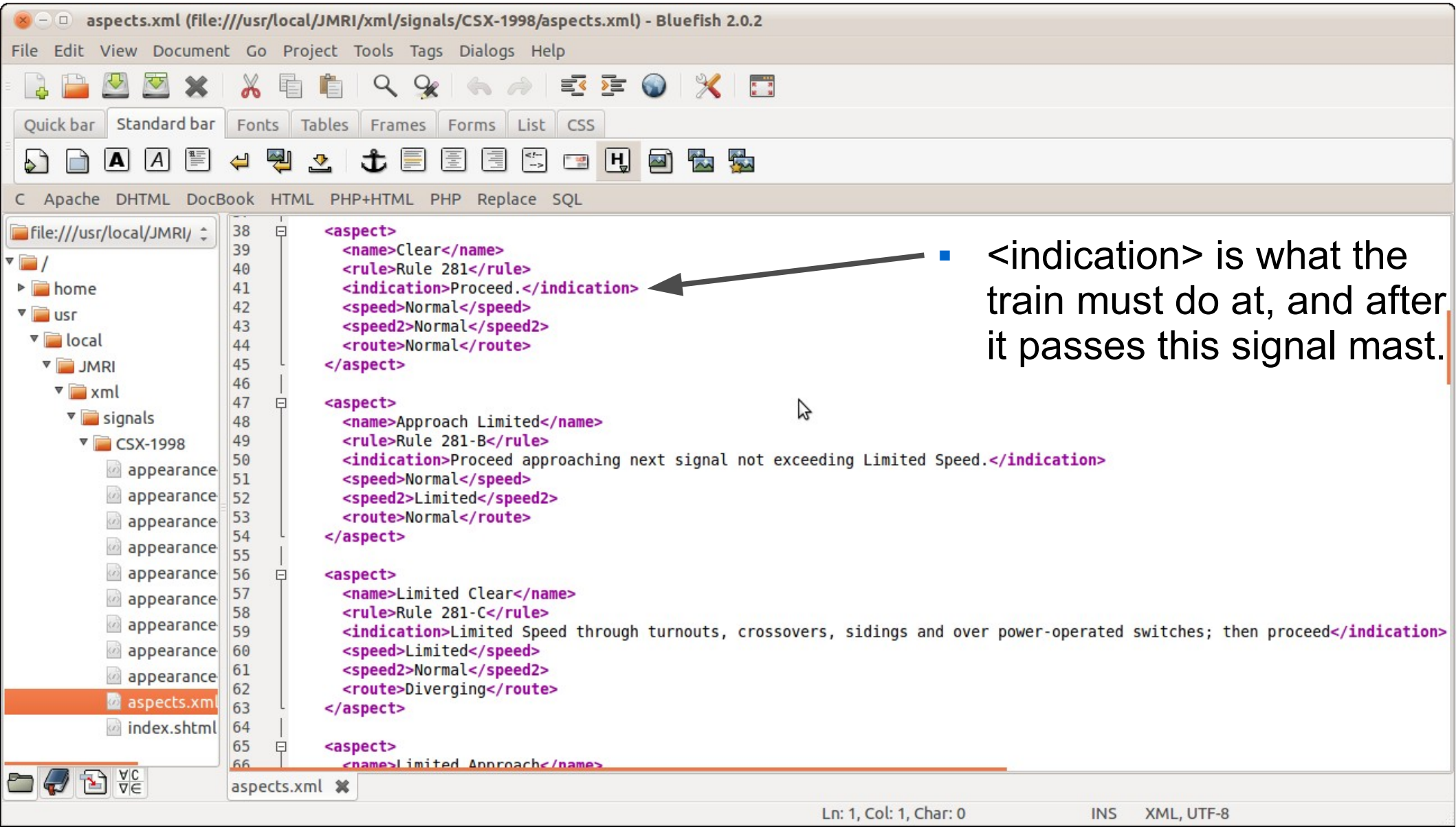
aspects.xml



- There is one <aspect> entry for each different aspect that is in the rule book for your railroad.
- <name> is the name of this aspect.
- <rule> is the rule number.

Building a new signal set

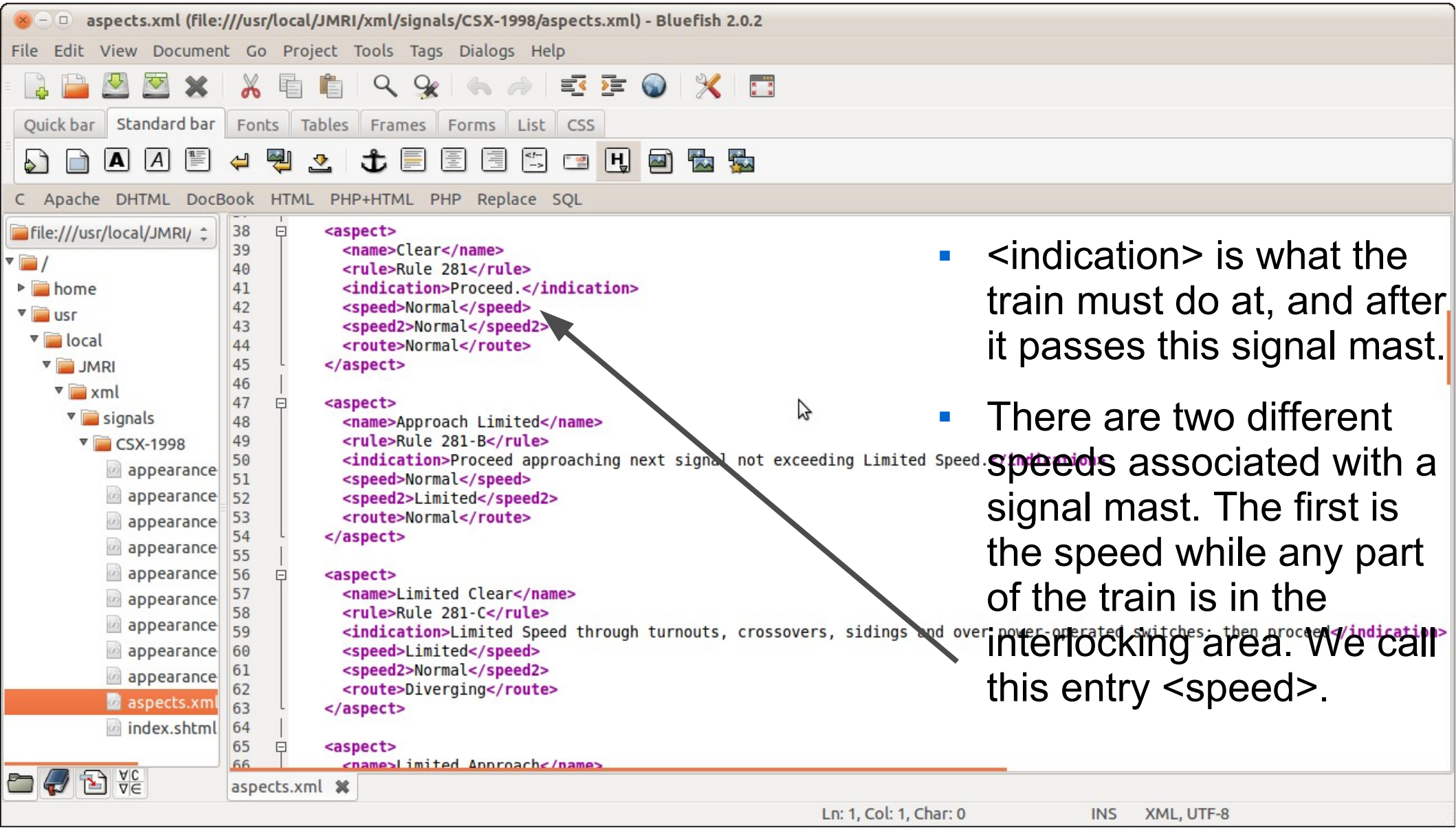
aspects.xml



- <indication> is what the train must do at, and after it passes this signal mast.

Building a new signal set

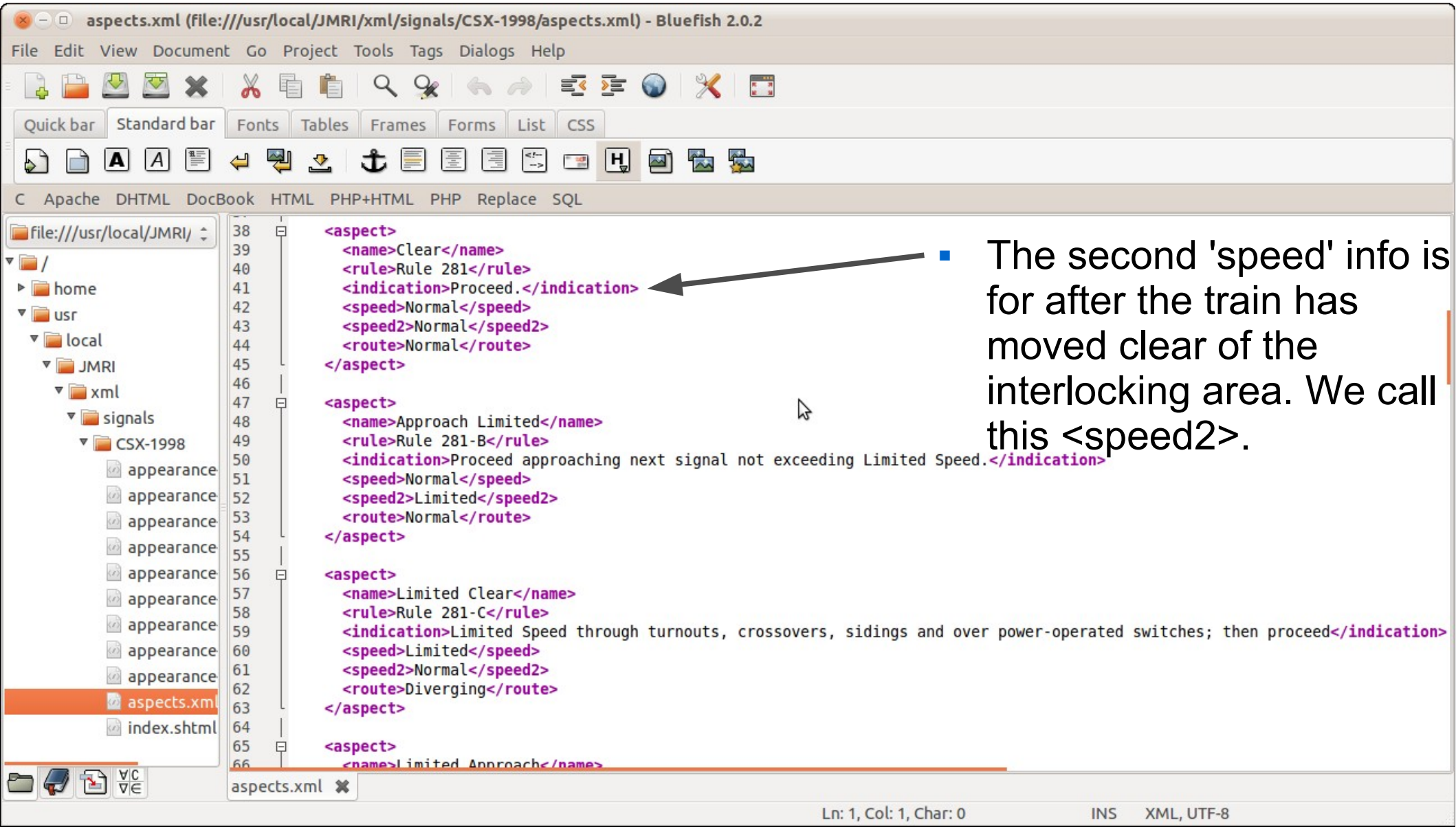
aspects.xml



- <indication> is what the train must do at, and after it passes this signal mast.
- There are two different speeds associated with a signal mast. The first is the speed while any part of the train is in the interlocking area. We call this entry <speed>.

Building a new signal set

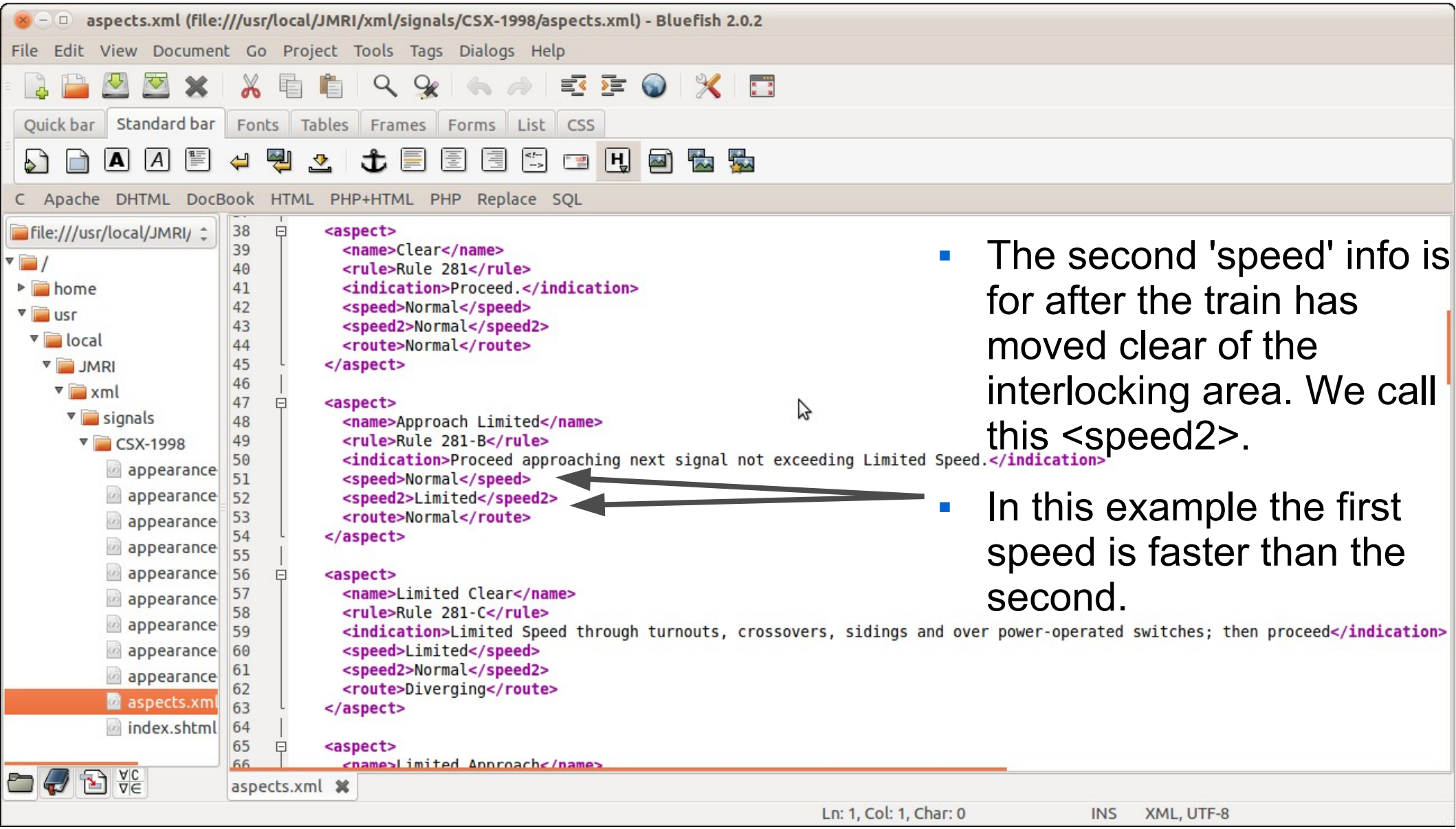
aspects.xml



- The second 'speed' info is for after the train has moved clear of the interlocking area. We call this <speed2>.

Building a new signal set

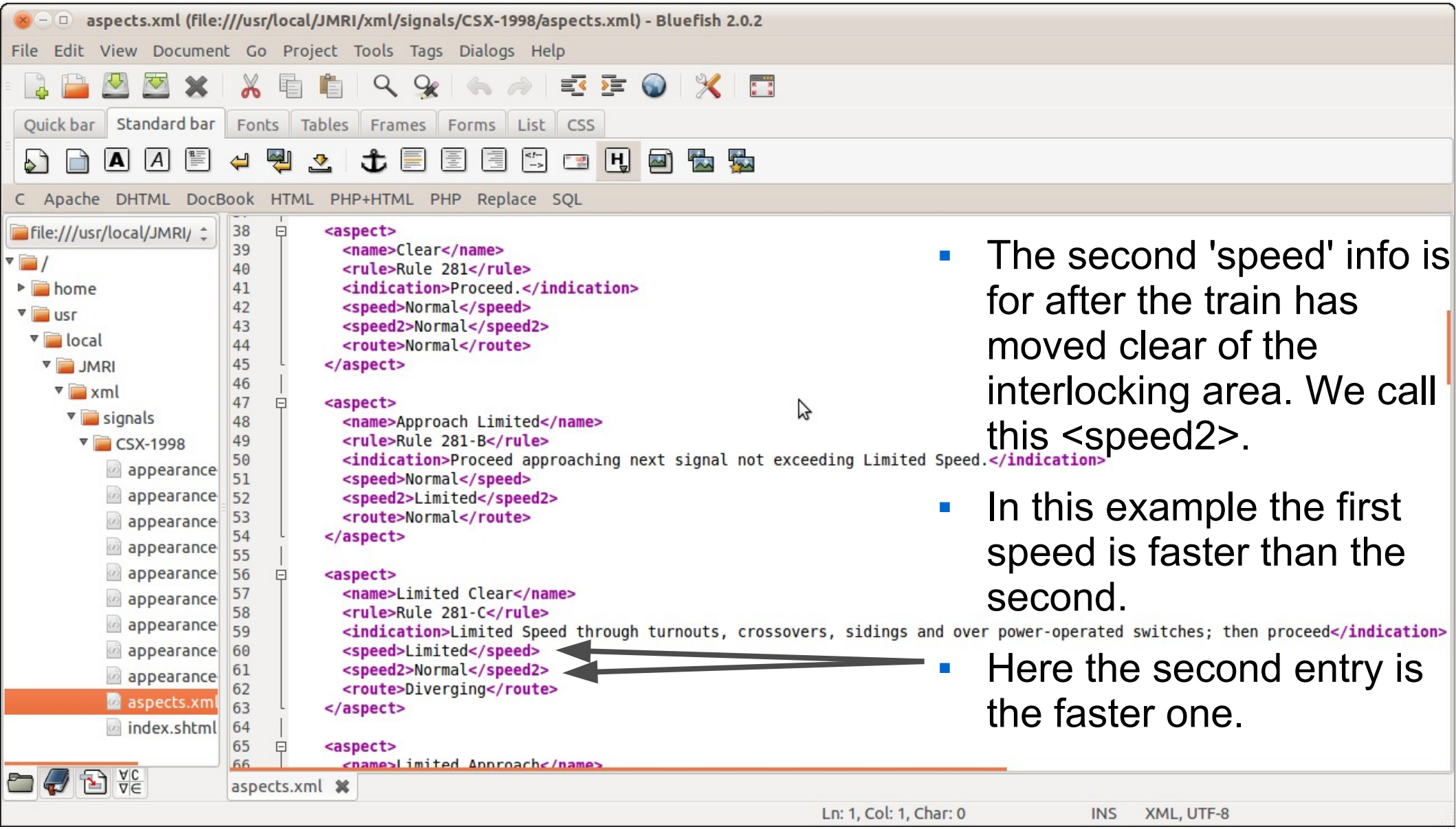
aspects.xml



- The second 'speed' info is for after the train has moved clear of the interlocking area. We call this <speed2>.
- In this example the first speed is faster than the second.

Building a new signal set

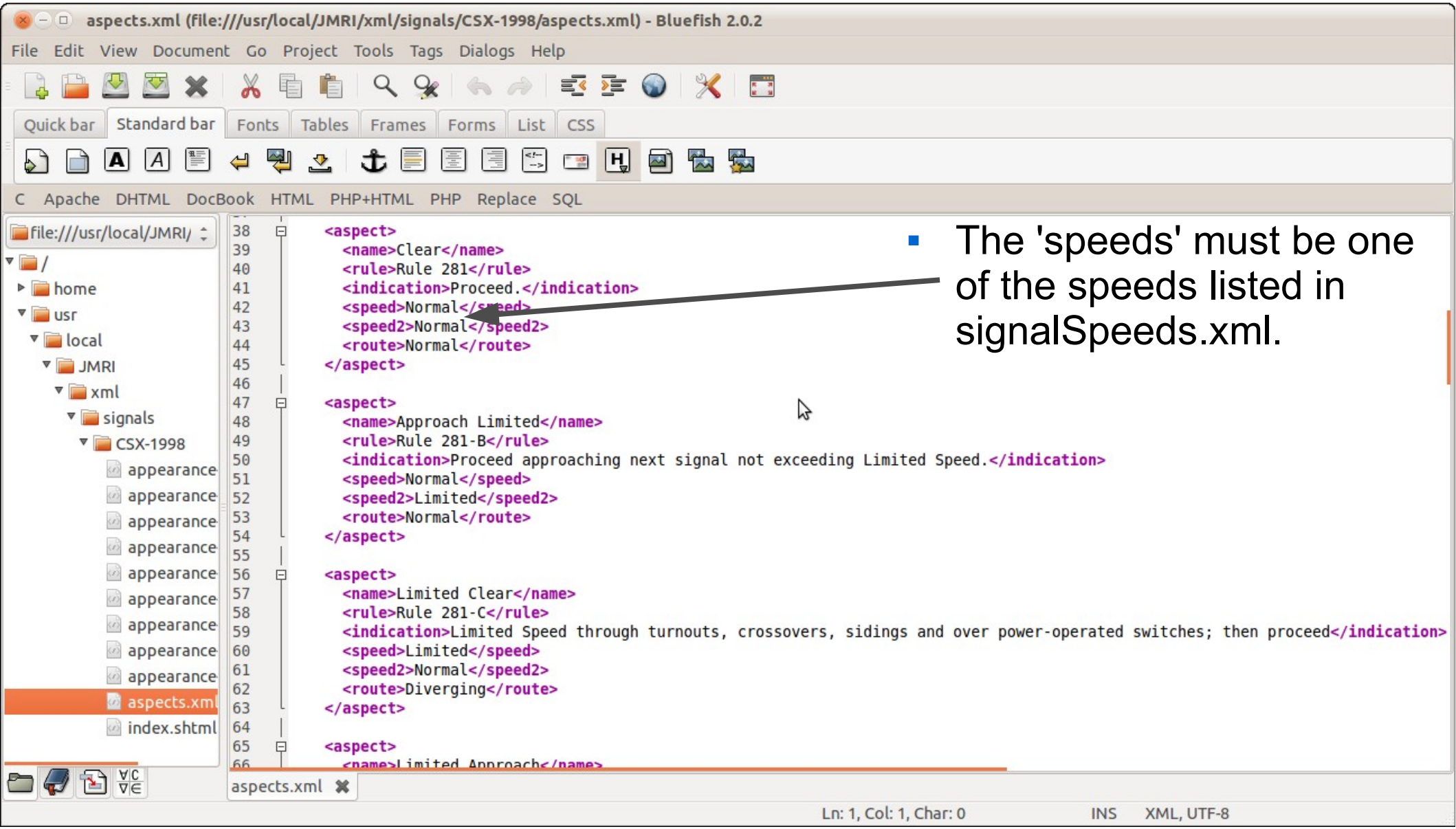
aspects.xml



- The second 'speed' info is for after the train has moved clear of the interlocking area. We call this <speed2>.
- In this example the first speed is faster than the second.
- Here the second entry is the faster one.

Building a new signal set

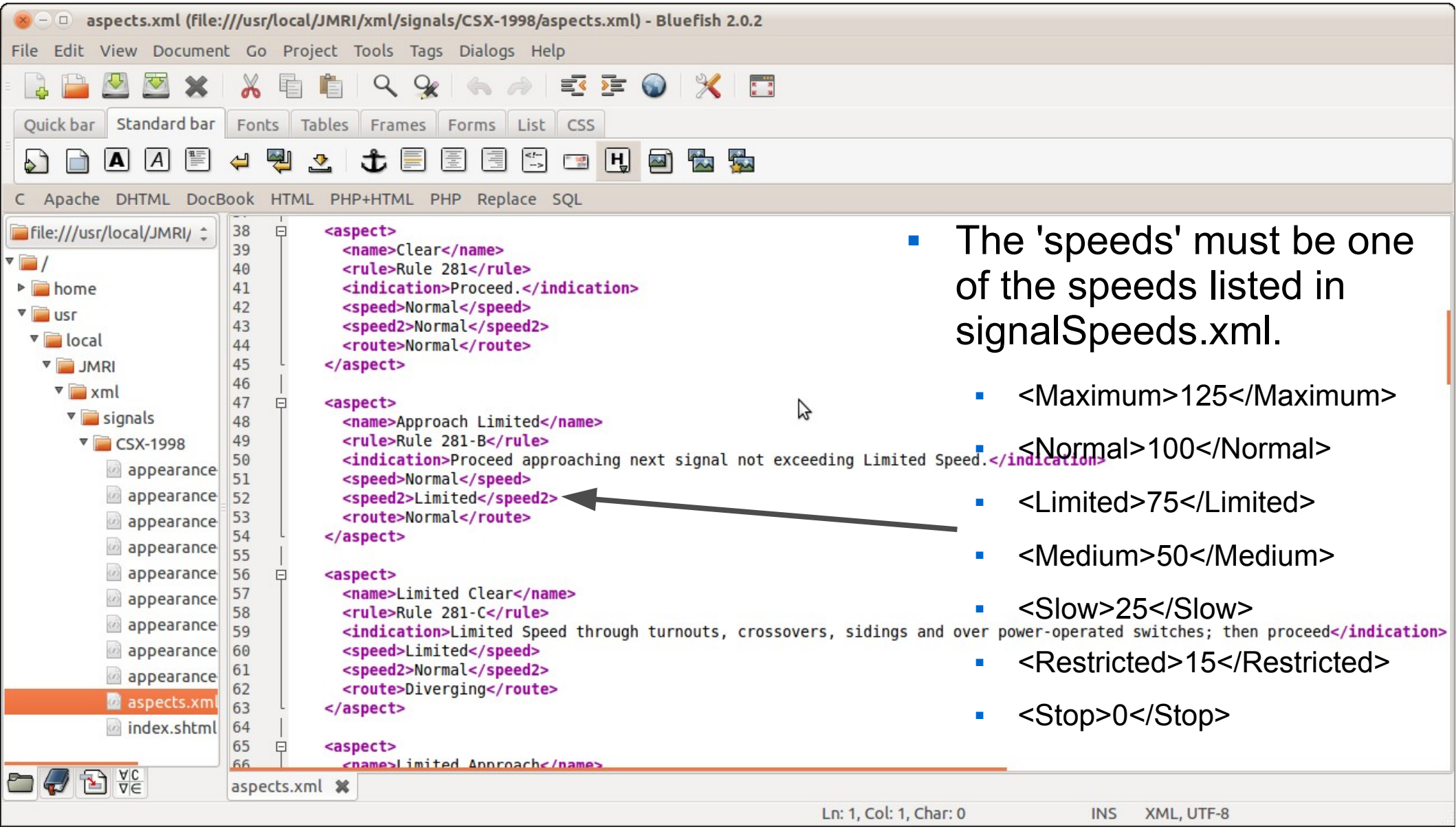
aspects.xml



- The 'speeds' must be one of the speeds listed in signalSpeeds.xml.

Building a new signal set

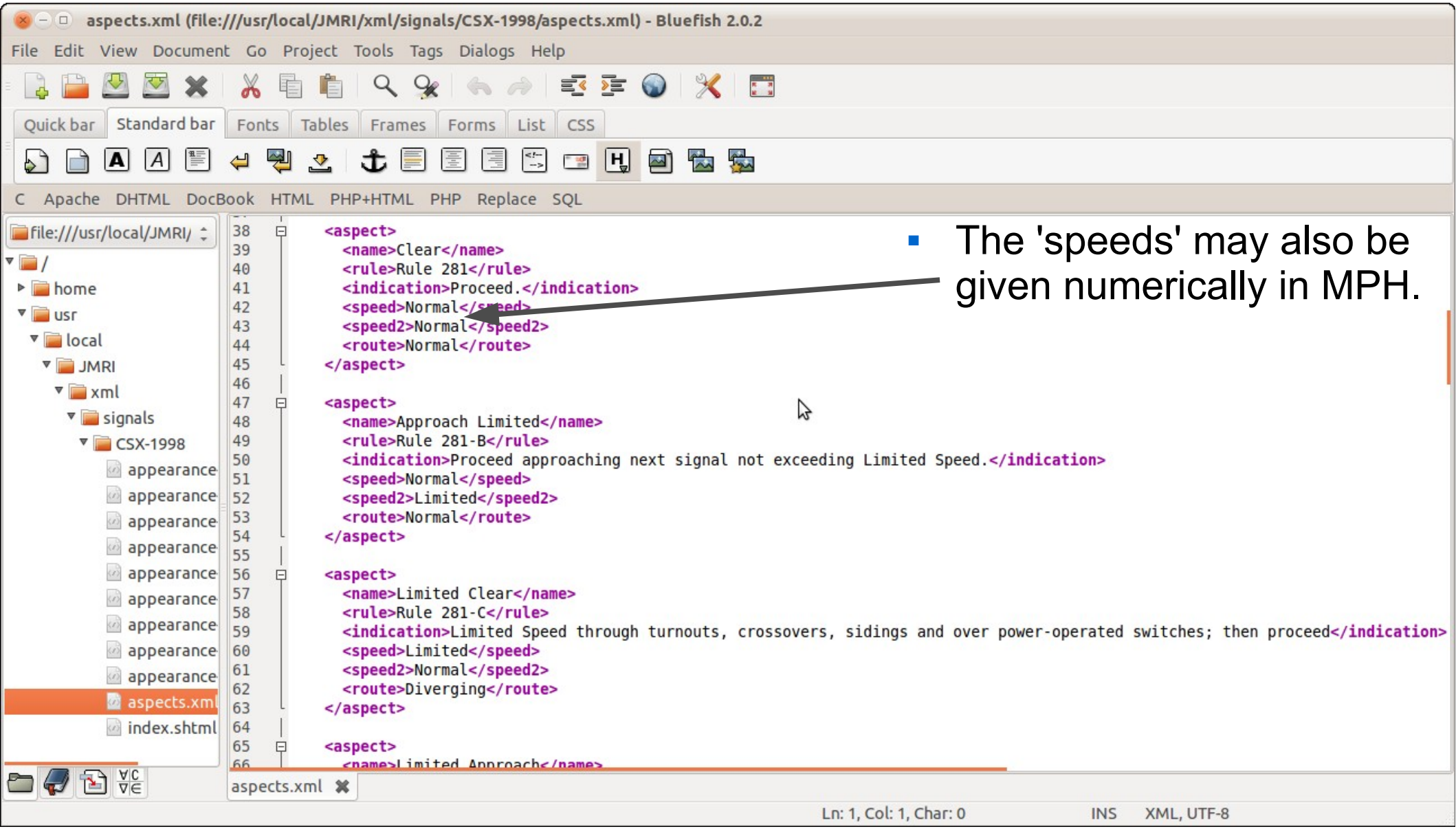
aspects.xml



- The 'speeds' must be one of the speeds listed in signalSpeeds.xml.
  - <Maximum>125</Maximum>
  - <Normal>100</Normal>
  - <Limited>75</Limited>
  - <Medium>50</Medium>
  - <Slow>25</Slow>
  - <Restricted>15</Restricted>
  - <Stop>0</Stop>

Building a new signal set

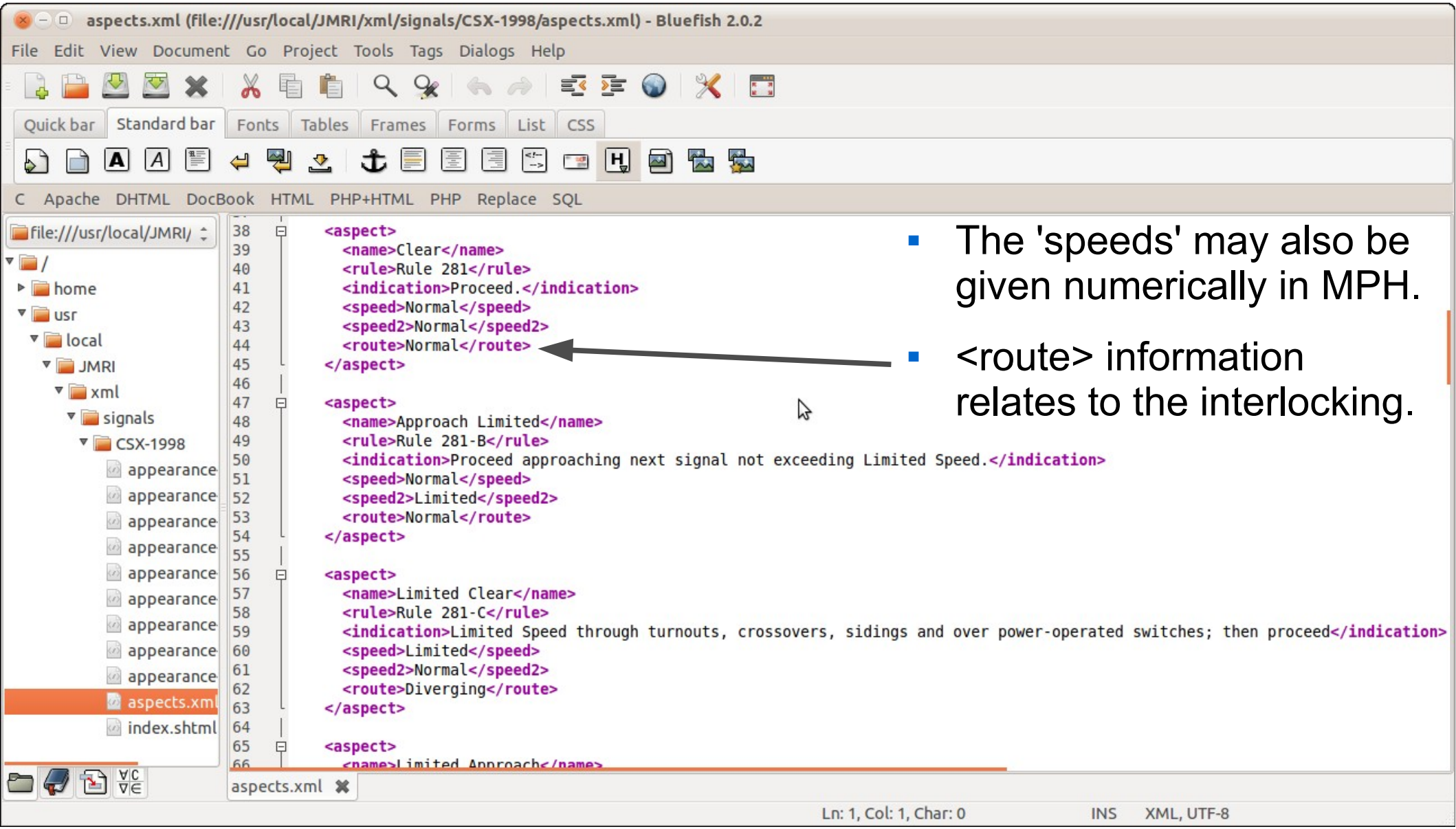
aspects.xml



- The 'speeds' may also be given numerically in MPH.

Building a new signal set

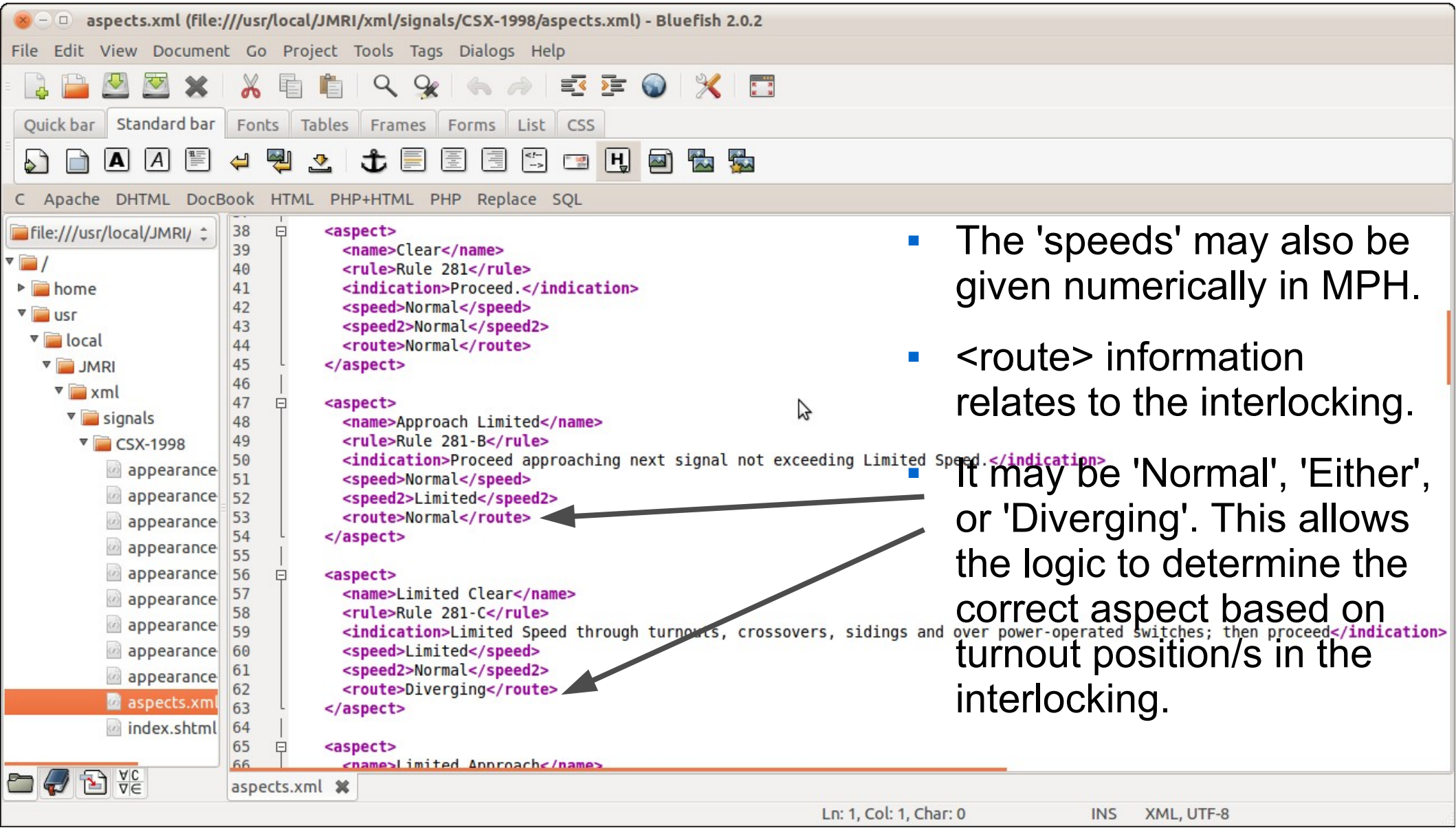
aspects.xml



- The 'speeds' may also be given numerically in MPH.
- <route> information relates to the interlocking.

Building a new signal set

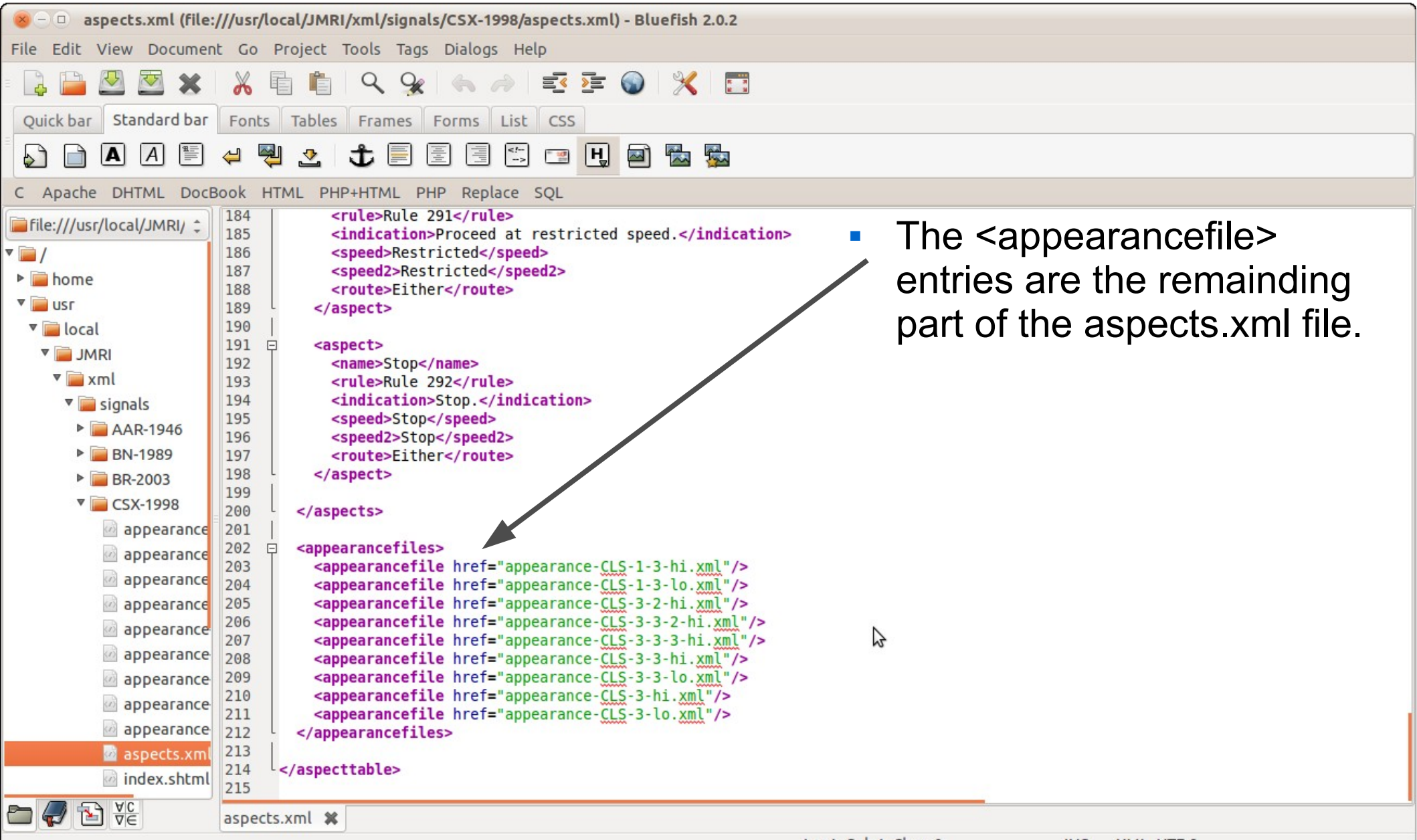
aspects.xml



- The 'speeds' may also be given numerically in MPH.
- <route> information relates to the interlocking.
- It may be 'Normal', 'Either', or 'Diverging'. This allows the logic to determine the correct aspect based on turnout position/s in the interlocking.

Building a new signal set

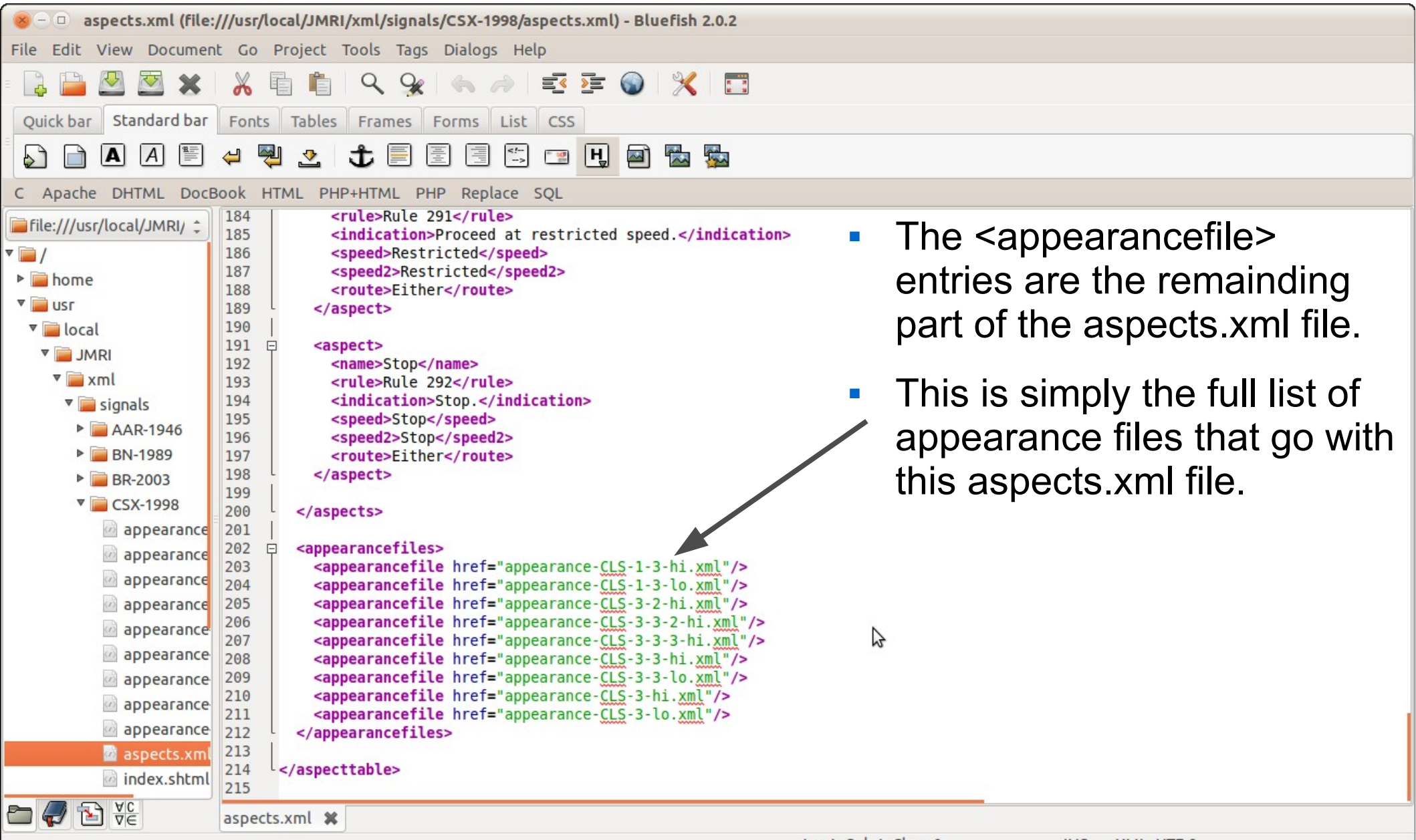
aspects.xml



- The <appearancefile> entries are the remainding part of the aspects.xml file.

Building a new signal set

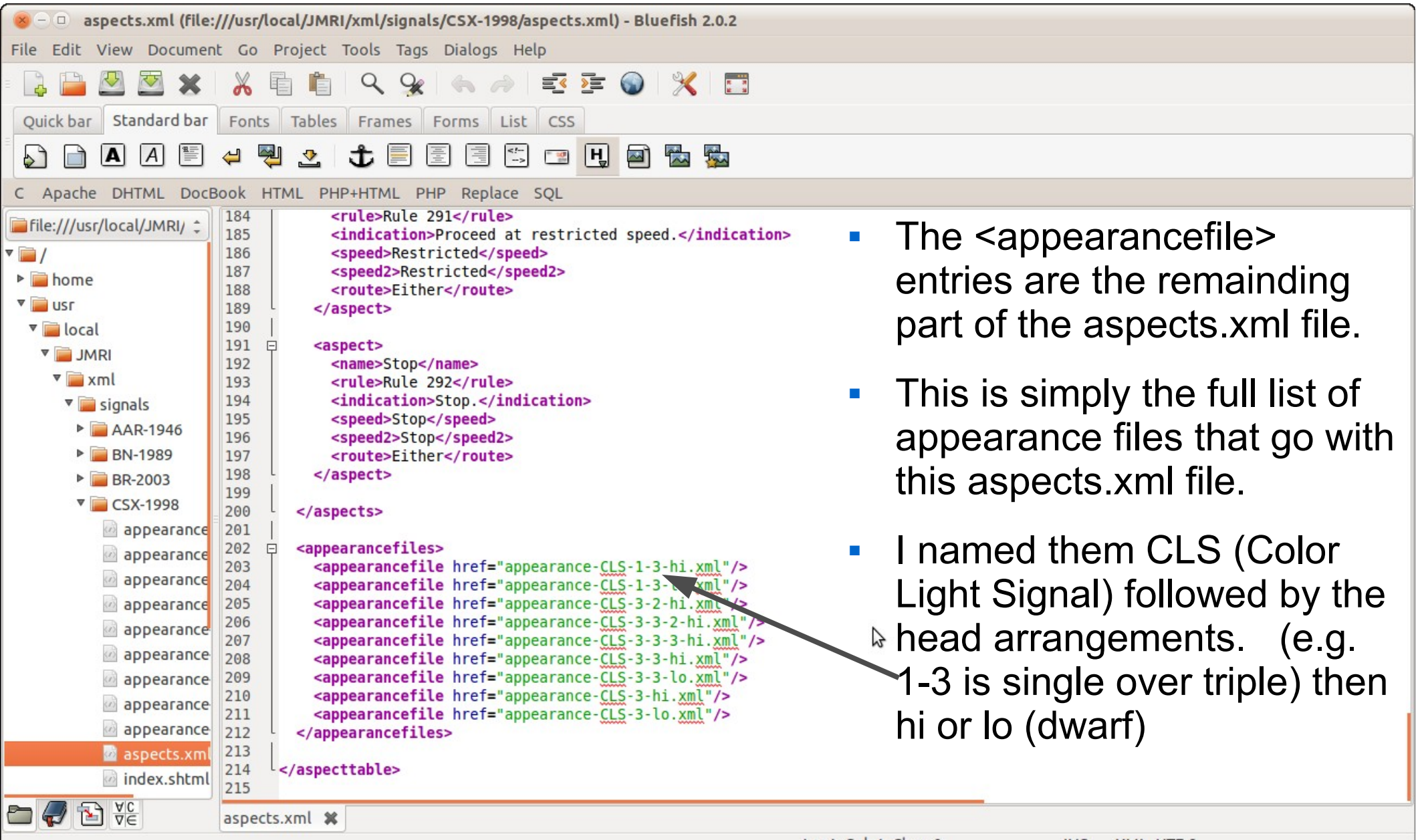
aspects.xml



- The <appearancefile> entries are the remainding part of the aspects.xml file.
- This is simply the full list of appearance files that go with this aspects.xml file.

Building a new signal set

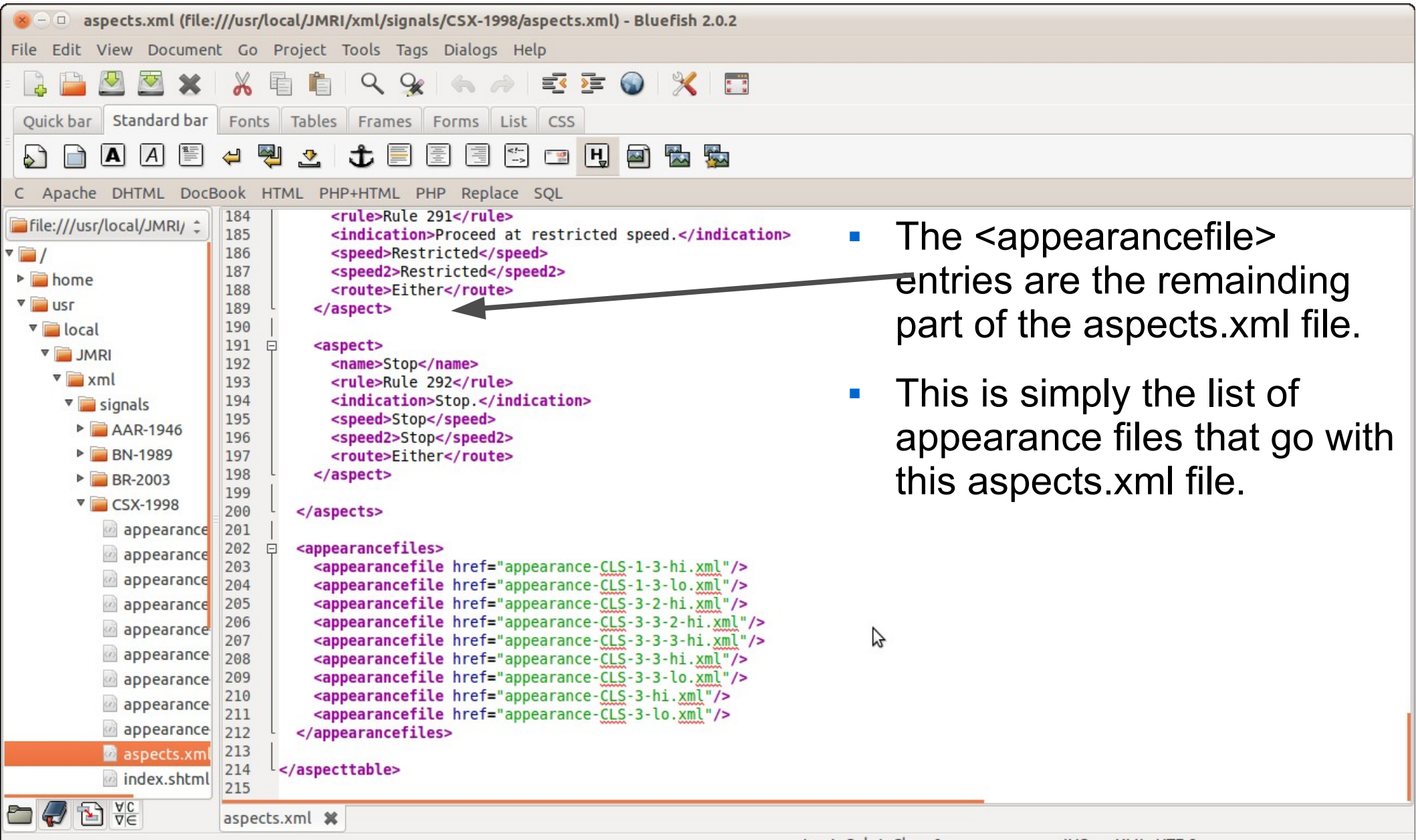
aspects.xml



- The <appearancefile> entries are the remainding part of the aspects.xml file.
- This is simply the full list of appearance files that go with this aspects.xml file.
- I named them CLS (Color Light Signal) followed by the head arrangements. (e.g. 1-3 is single over triple) then hi or lo (dwarf)

Building a new signal set

aspects.xml

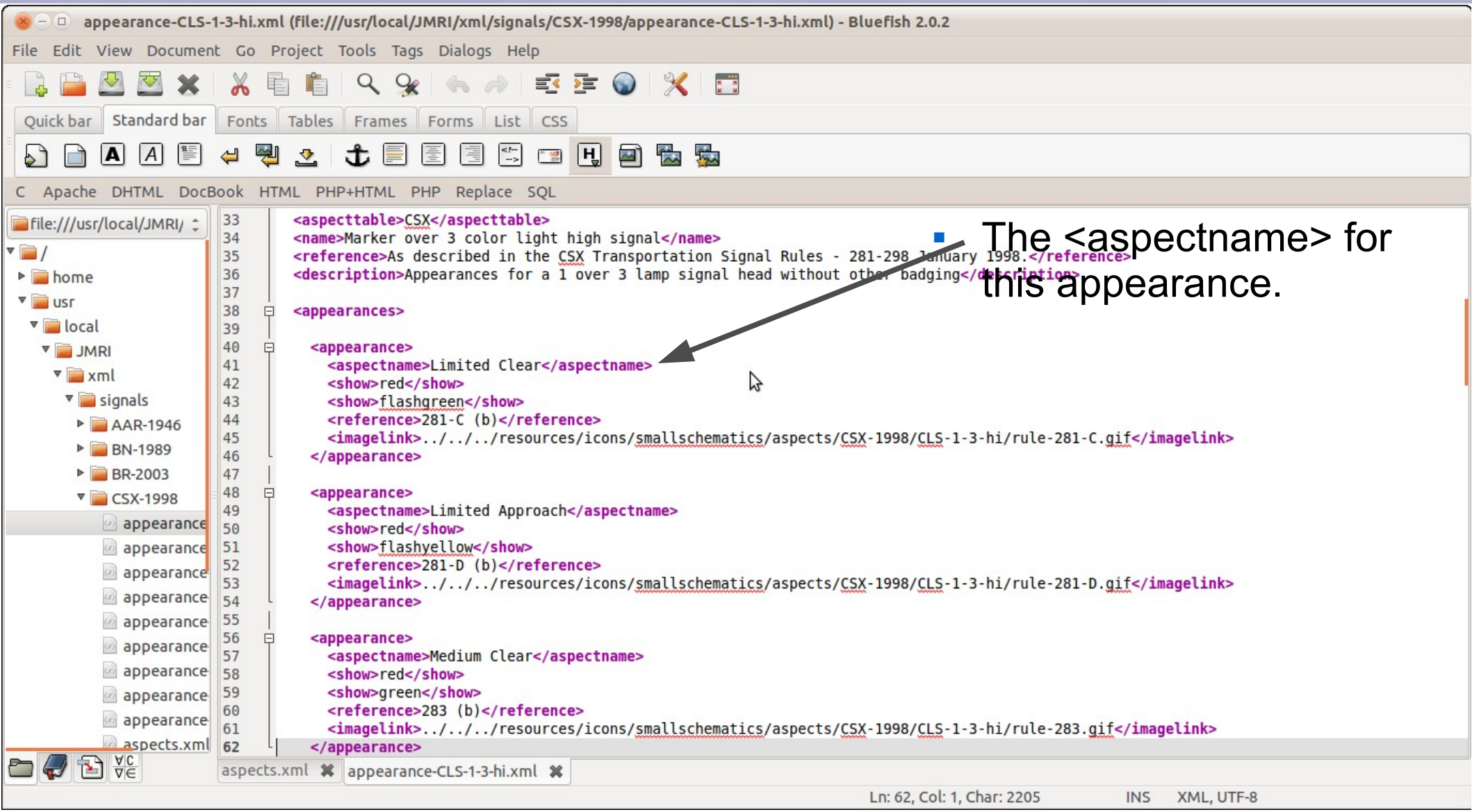


- The <appearancefile> entries are the remainding part of the aspects.xml file.
- This is simply the list of appearance files that go with this aspects.xml file.

- appearance.xml
- For each kind of signal on the layout (one searchlight, two searchlight, dwarf, semaphore, etc), you need to create an appearance file.

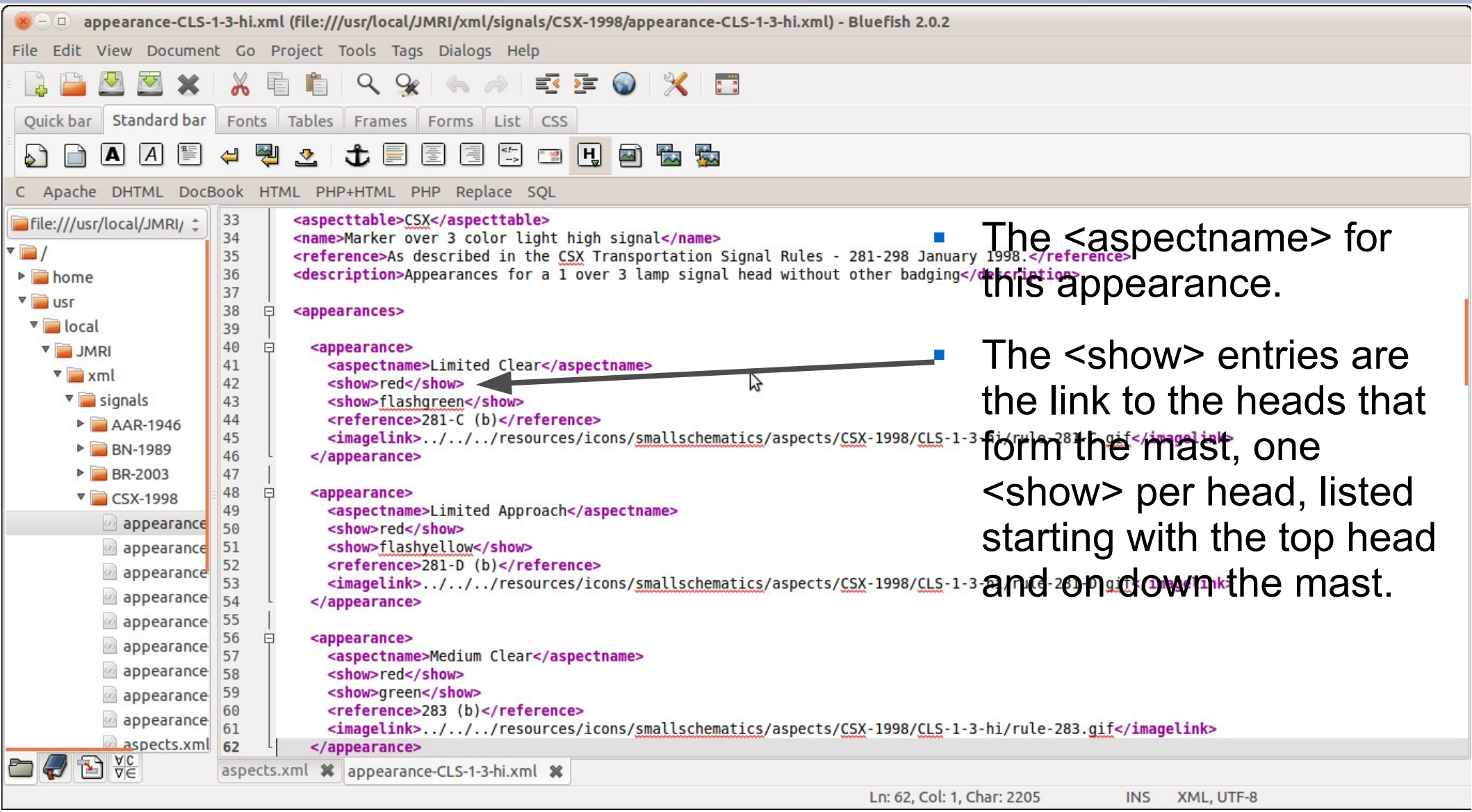
Building a new signal set

appearance.xml



Building a new signal set

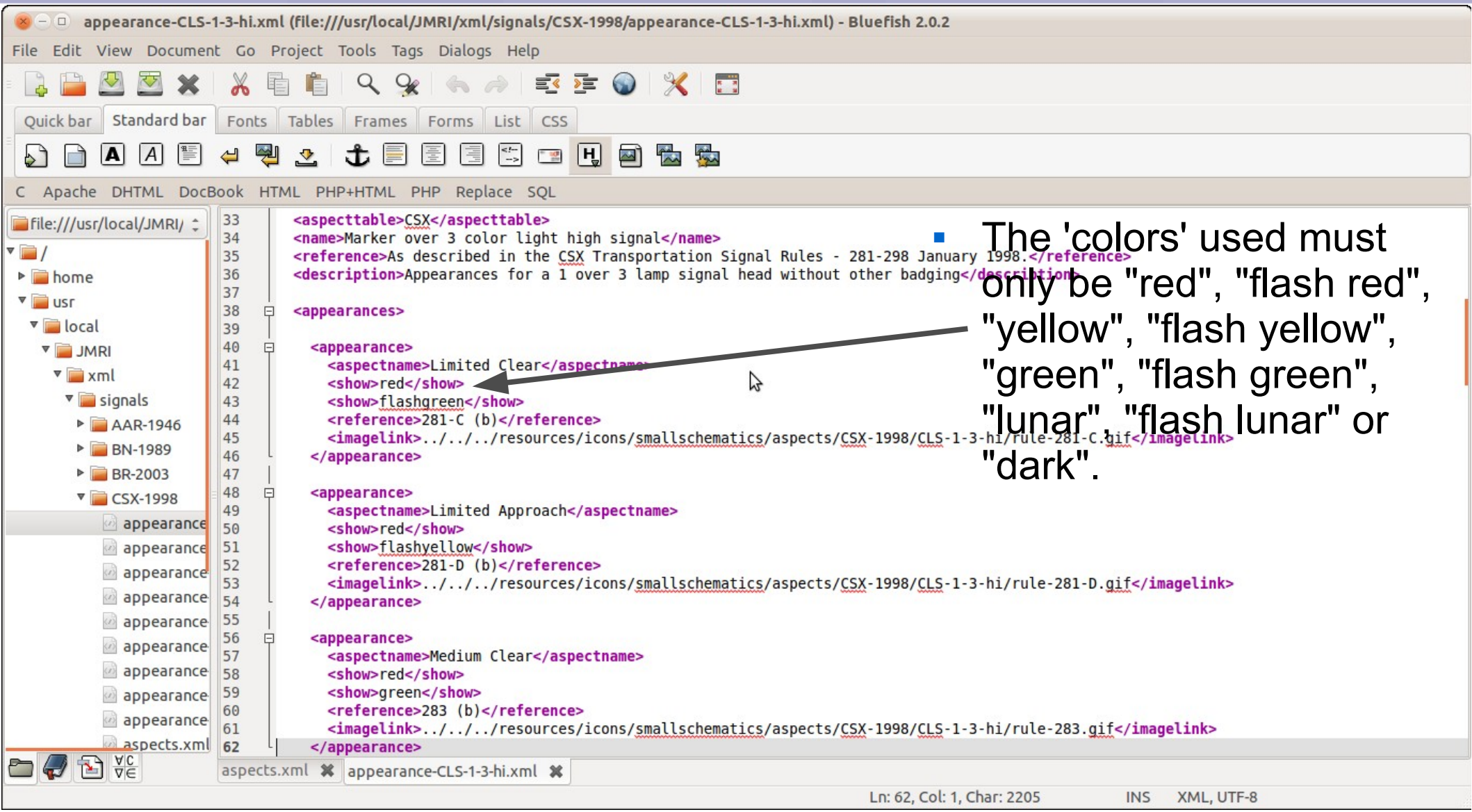
appearance.xml



- The <aspectname> for this appearance.
- The <show> entries are the link to the heads that form the mast, one <show> per head, listed starting with the top head and on down the mast.

Building a new signal set

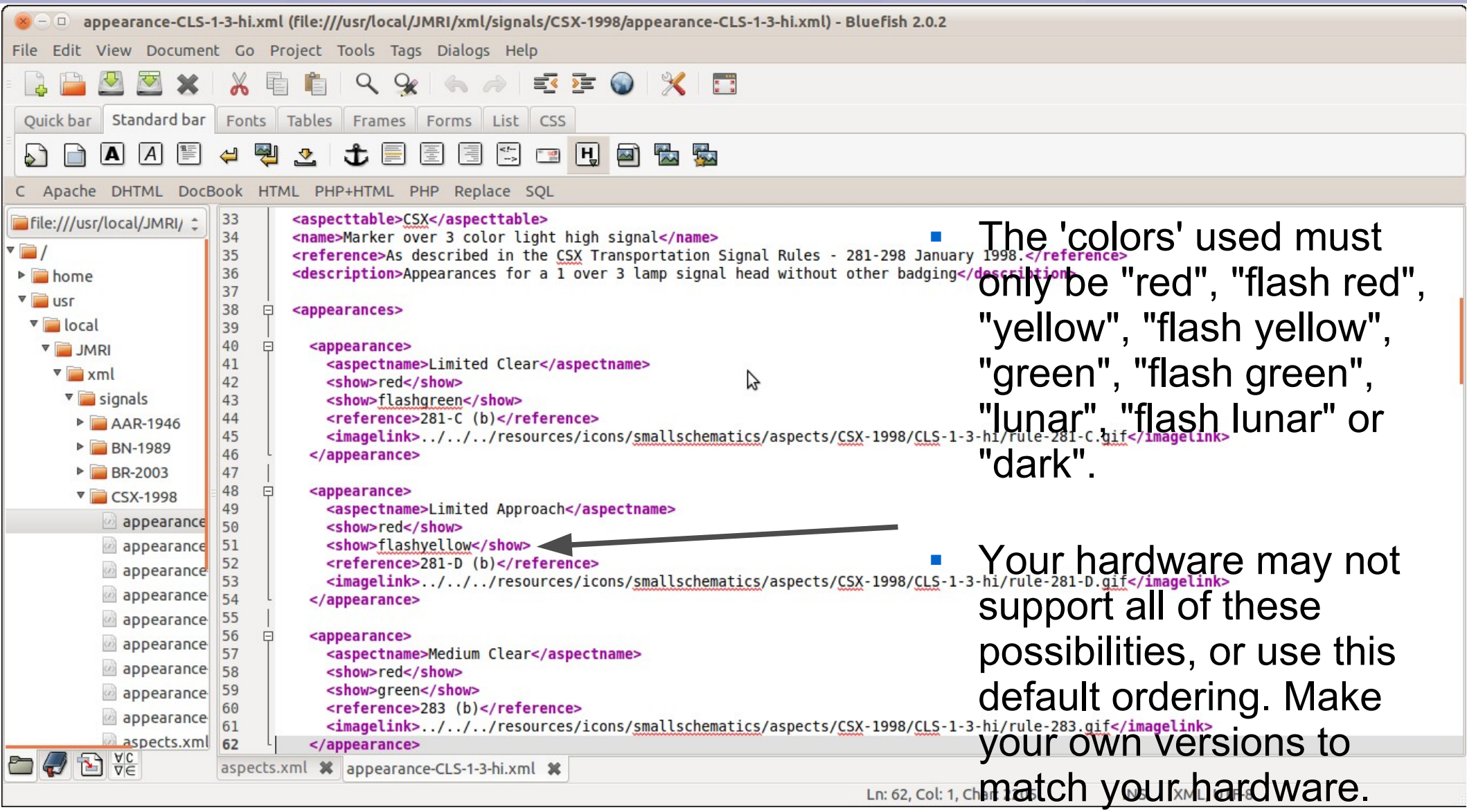
appearance.xml



The 'colors' used must only be "red", "flash red", "yellow", "flash yellow", "green", "flash green", "lunar", "flash lunar" or "dark".

Building a new signal set

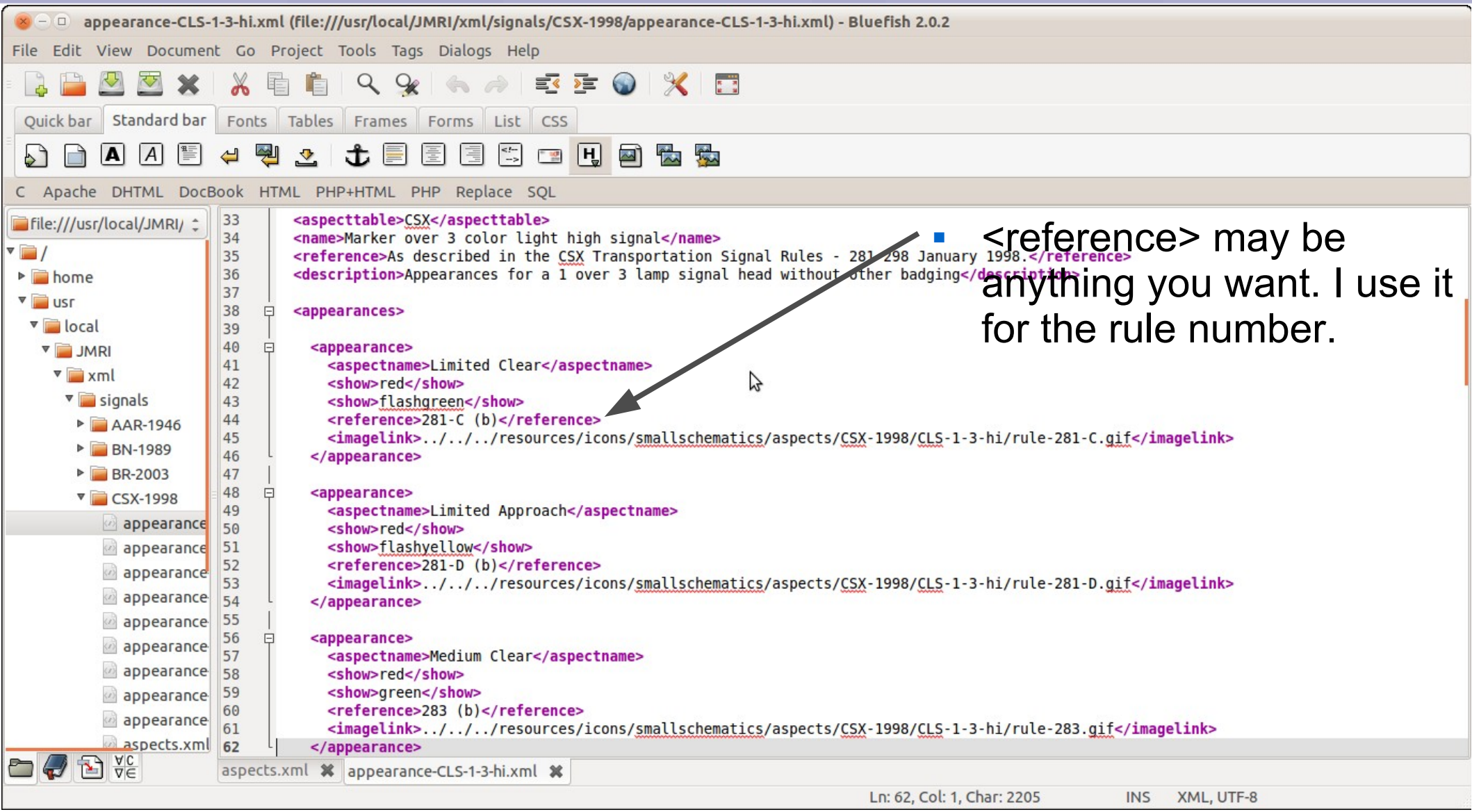
appearance.xml



- The 'colors' used must only be "red", "flash red", "yellow", "flash yellow", "green", "flash green", "lunar", "flash lunar" or "dark".
- Your hardware may not support all of these possibilities, or use this default ordering. Make your own versions to match your hardware.

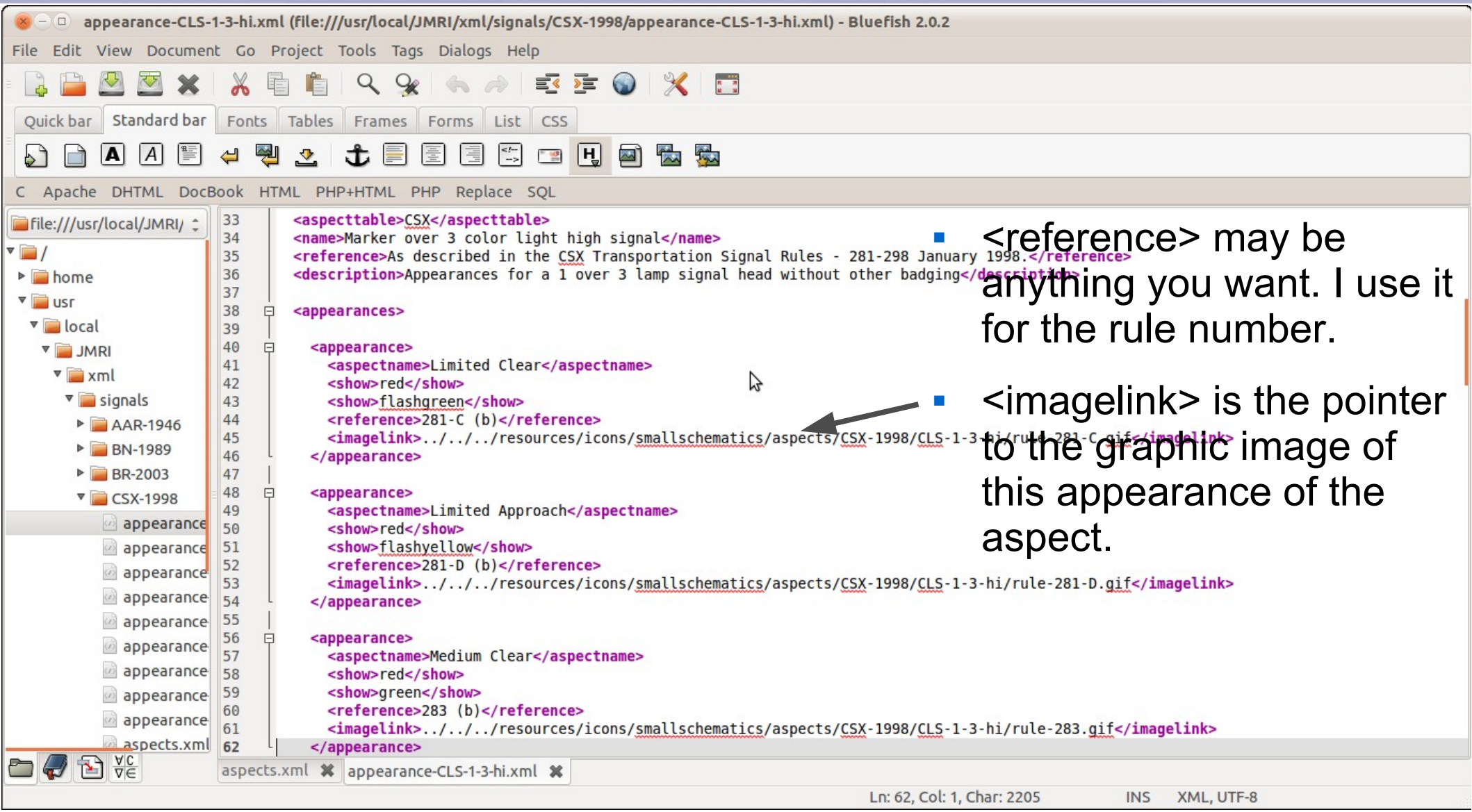
Building a new signal set

appearance.xml



Building a new signal set

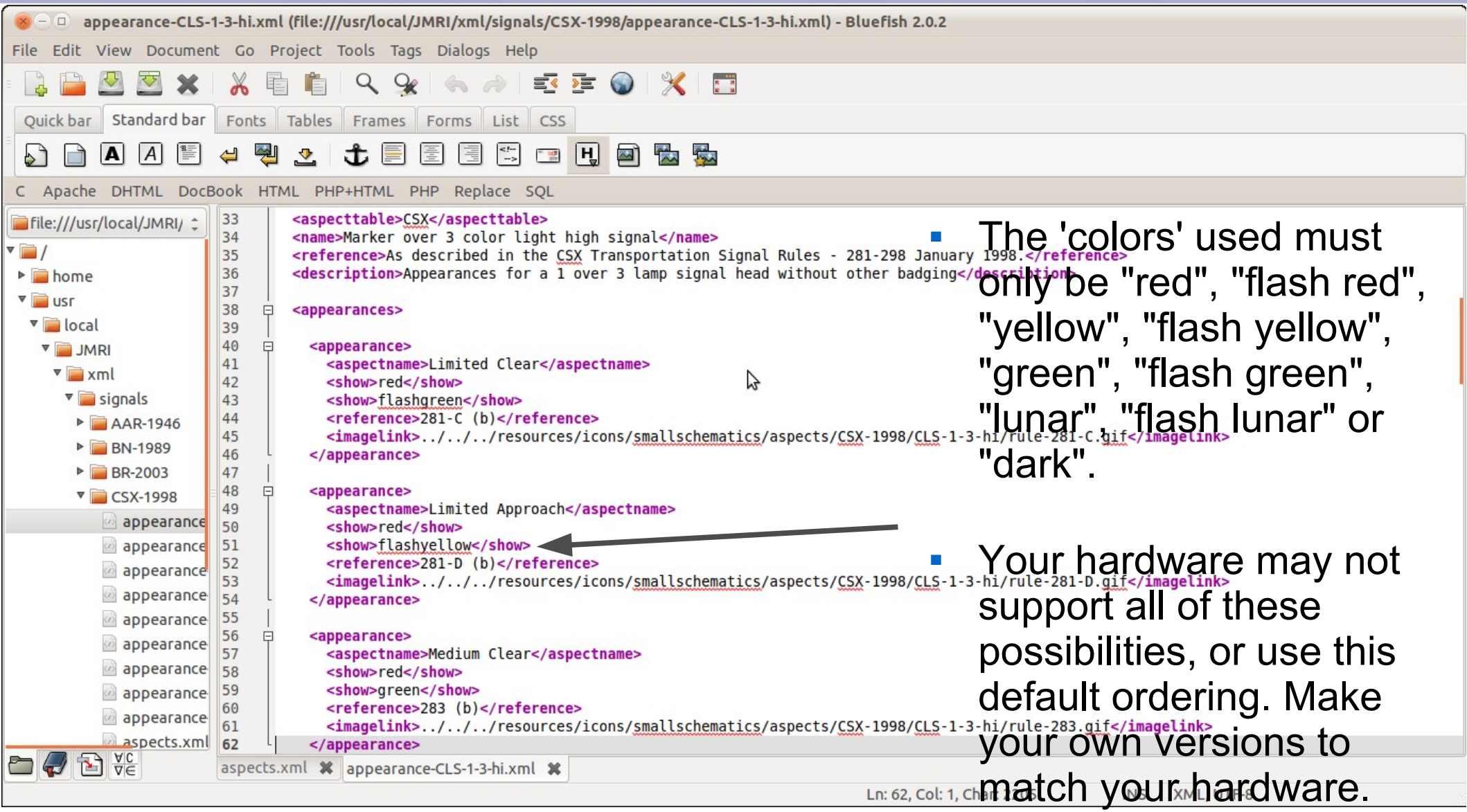
appearance.xml



- <reference> may be anything you want. I use it for the rule number.
- <imagelink> is the pointer to the graphic image of this appearance of the aspect.

Building a new signal set

appearance.xml

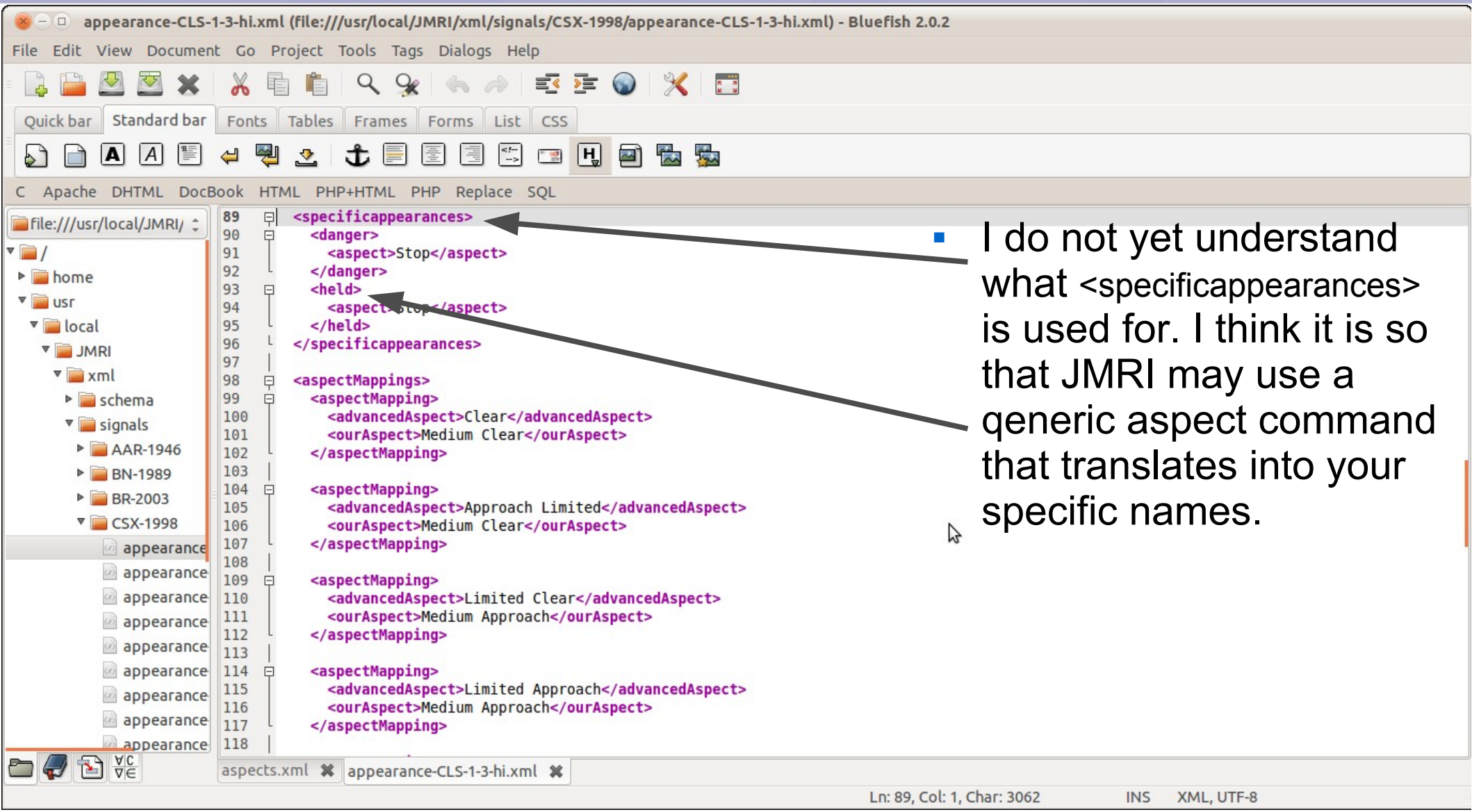


- The 'colors' used must only be "red", "flash red", "yellow", "flash yellow", "green", "flash green", "lunar", "flash lunar" or "dark".
- Your hardware may not support all of these possibilities, or use this default ordering. Make your own versions to match your hardware.

- # appearance.xml
- The appearance.xml file also includes the mapping for each appearance. This is the real key to no longer needing to create Logix entries for each signal. This mapping contains the rules for what aspect/s preceed any mast. For example a 'Stop' aspect is always preceeded by an 'Approach' aspect of some type. Depending on the type of mast it might be 'Approach', 'Medium Approach', 'Slow Approach', etc. Normally the mast style will determine which options are available in each set.
- I found that this step is the most difficult part of creating a new signal set. You must think through exactly how and where each mast type is used. Fortunately once this is completed, then implementing it on the layout is easily done.
- The power of JMRI and open source means that your work may be shared by many others to help them signal their railroads.

Building a new signal set

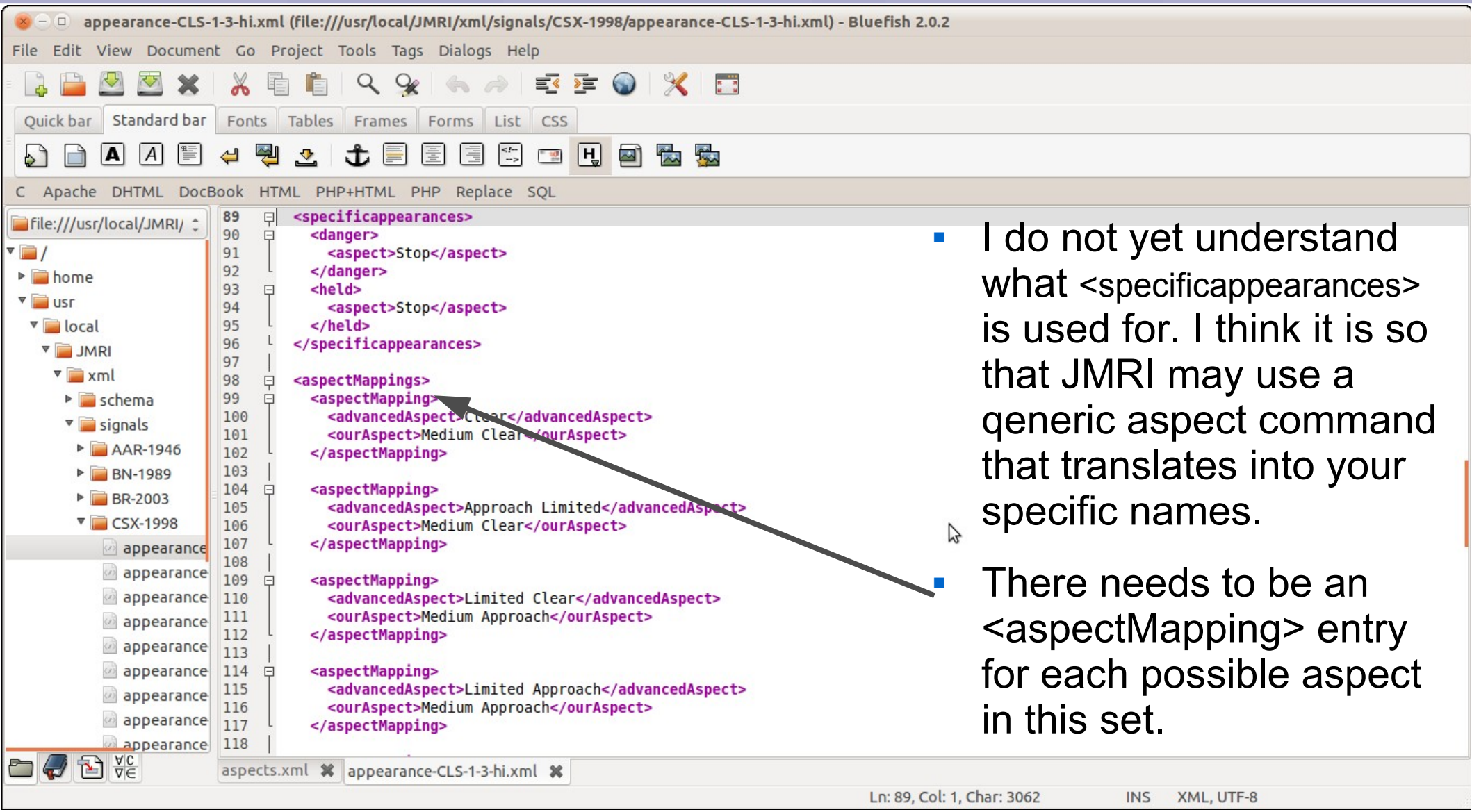
appearance.xml



I do not yet understand what <specificappearances> is used for. I think it is so that JMRI may use a generic aspect command that translates into your specific names.

Building a new signal set

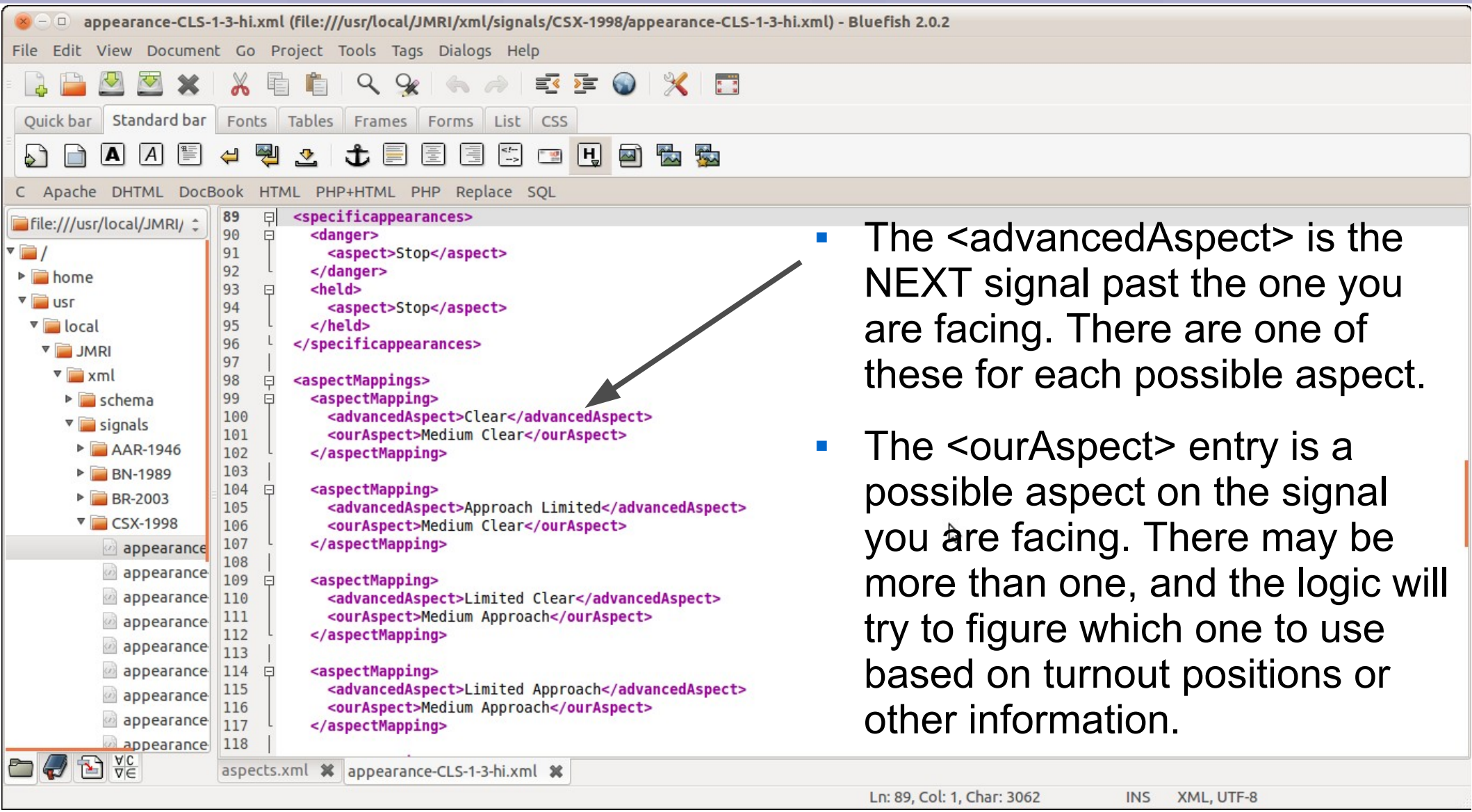
appearance.xml



- I do not yet understand what <specificappearances> is used for. I think it is so that JMRI may use a generic aspect command that translates into your specific names.
- There needs to be an <aspectMapping> entry for each possible aspect in this set.

Building a new signal set

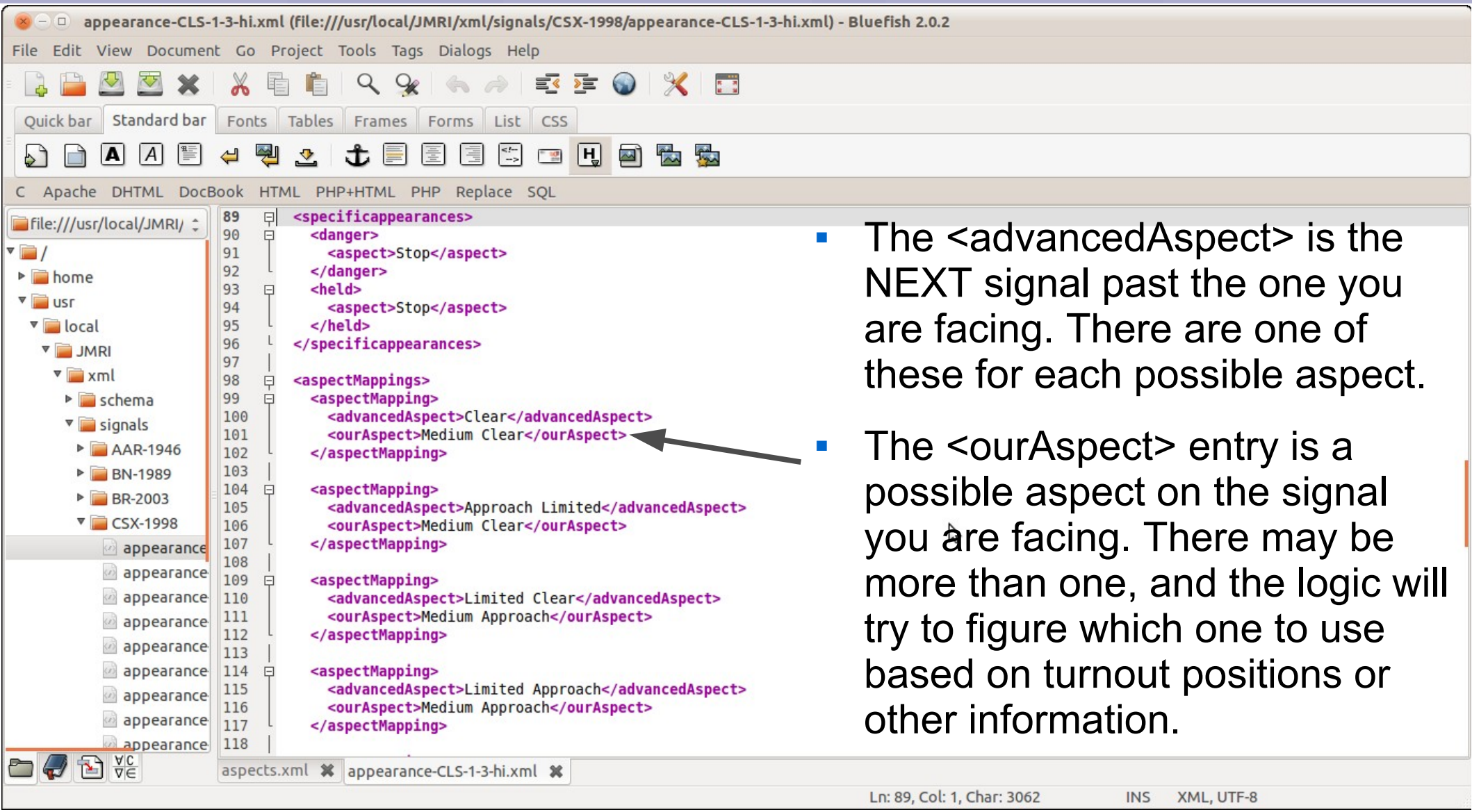
appearance.xml



- The <advancedAspect> is the NEXT signal past the one you are facing. There are one of these for each possible aspect.
- The <ourAspect> entry is a possible aspect on the signal you are facing. There may be more than one, and the logic will try to figure which one to use based on turnout positions or other information.

Building a new signal set

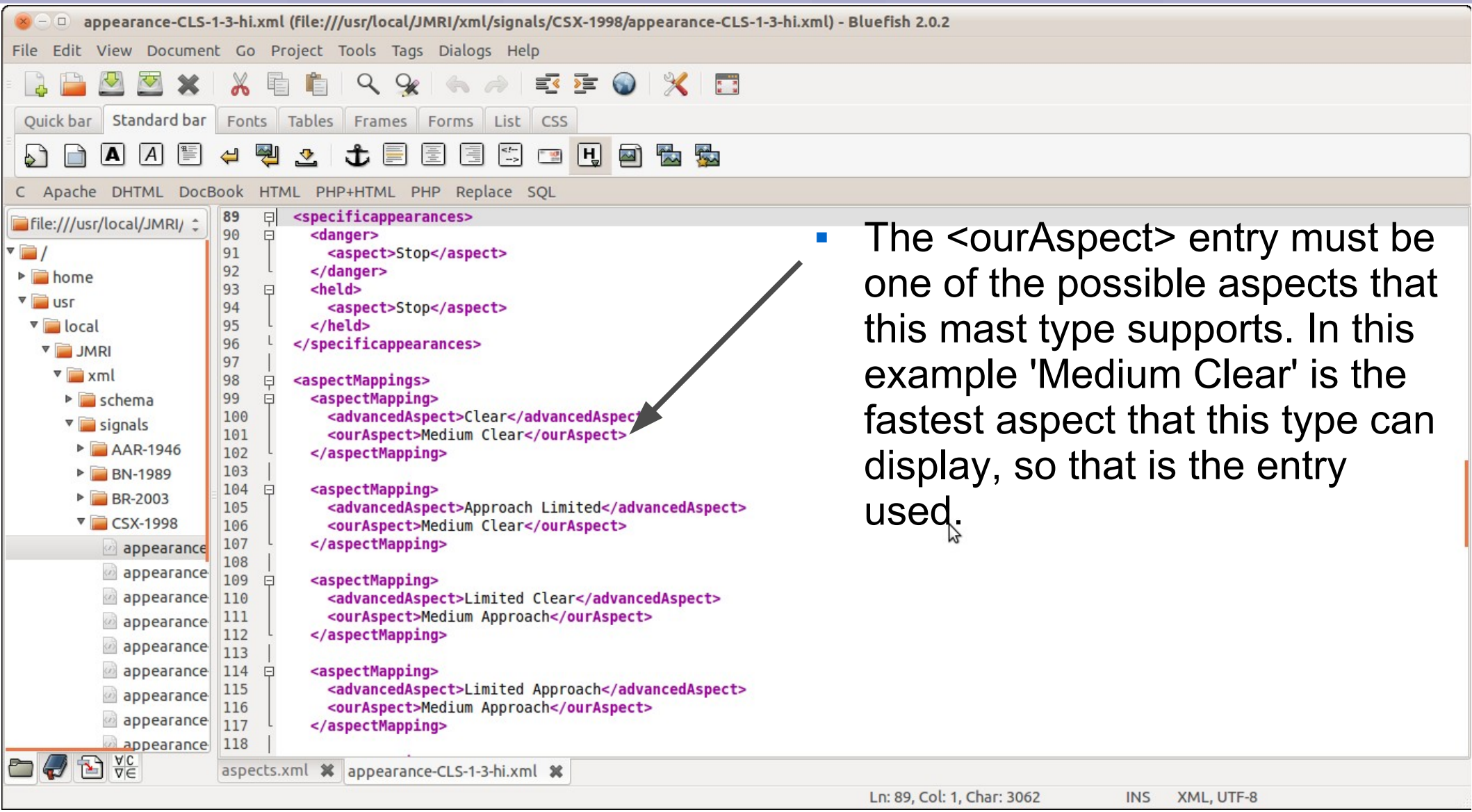
appearance.xml



- The <advancedAspect> is the NEXT signal past the one you are facing. There are one of these for each possible aspect.
- The <ourAspect> entry is a possible aspect on the signal you are facing. There may be more than one, and the logic will try to figure which one to use based on turnout positions or other information.

Building a new signal set

appearance.xml



- The <ourAspect> entry must be one of the possible aspects that this mast type supports. In this example 'Medium Clear' is the fastest aspect that this type can display, so that is the entry used.

Questions?

Be sure to check out www.rr-cirkits.com
for signaling hardware.