VŠB TECHNICKÁ UNIVERZITA OSTRAVA | FAKULTA ELEKTROTECHNIKY A INFORMATIKY

Web Application Development

XPATH and JSON

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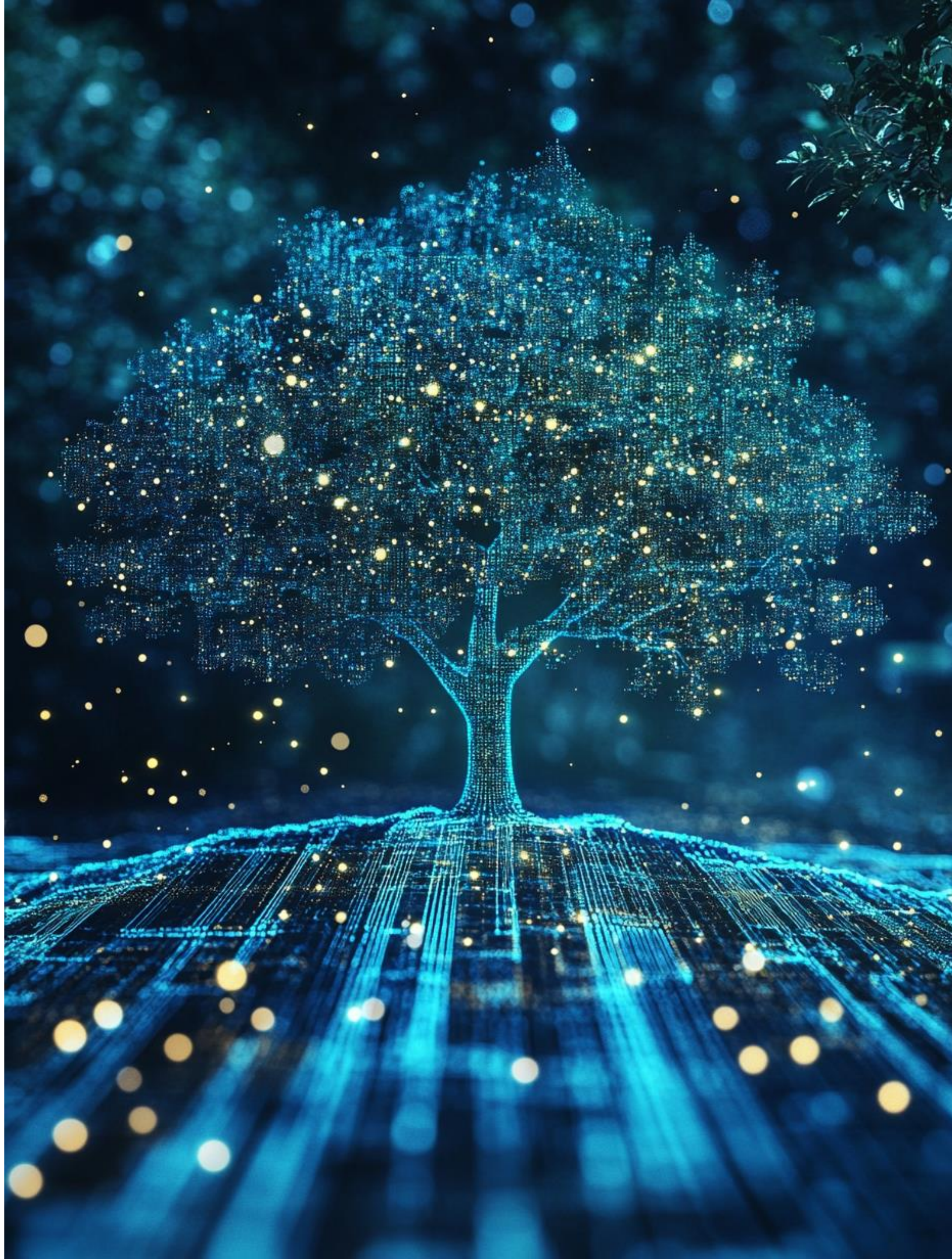


XPath

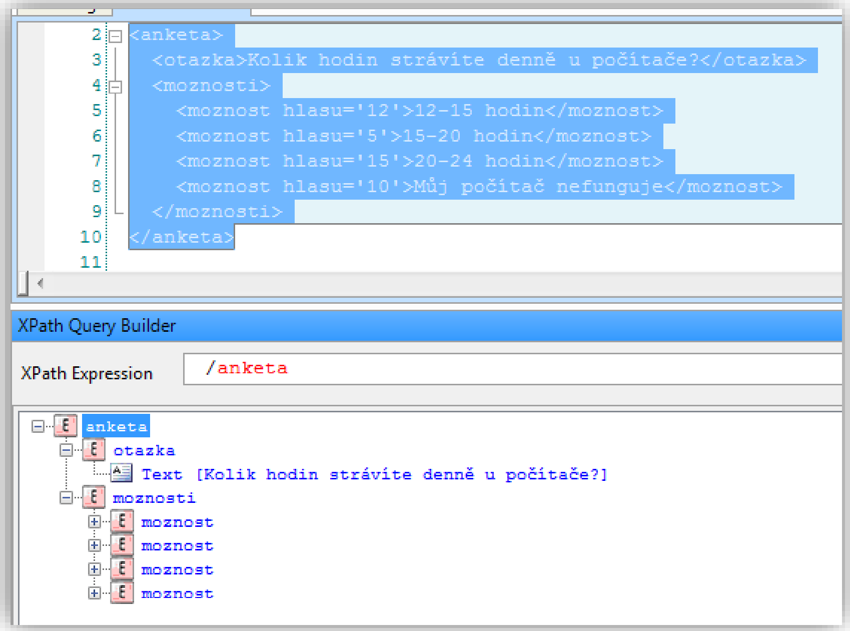
- Path Expression is the main construct for specifying queries
- Analogous to the path definition in the OS file system
- Sequence of steps separated by "/" or "//"
- Joining multiple sequences with an OR bond using "|"
- Each step consists of
    - axis identifier (axes)
    - node test (required)
    - predicate
- The path is evaluated from left to right, relative to the current node

```
axisname::nodetest[predicate]
```

XPath

Zdroj: http://interval.cz/clanky/zaklady-jazyka-xpath/

```
<anketa>
  <otazka>Kolik hodin strávíte denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

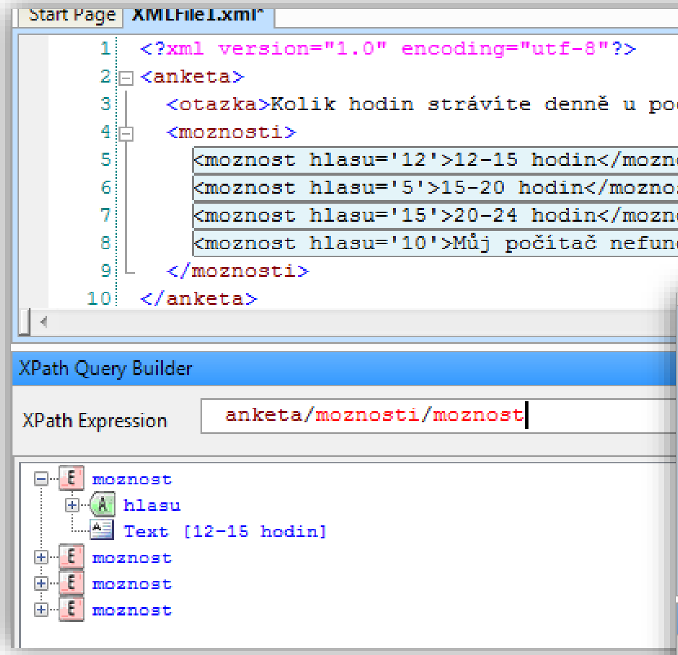


```
<anketa>
  <otazka>Kolik hodin strávíte denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Query Builder

XPath Expression /anketa

```
anketa
  otazka
    Text [Kolik hodin strávíte denně u počítače?]
  moznosti
    moznost
    moznost
    moznost
    moznost
```

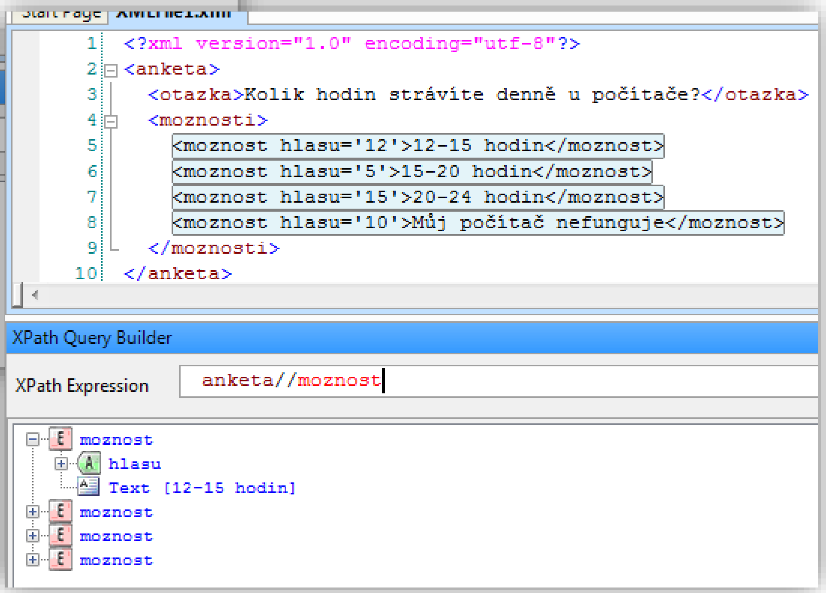


```
<?xml version="1.0" encoding="utf-8"?>
<anketa>
  <otazka>Kolik hodin strávíte denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Query Builder

XPath Expression anketa/moznosti/moznost

```
moznost
  hlasu
  Text [12-15 hodin]
moznost
moznost
moznost
```



```
<?xml version="1.0" encoding="utf-8"?>
<anketa>
  <otazka>Kolik hodin strávíte denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Query Builder

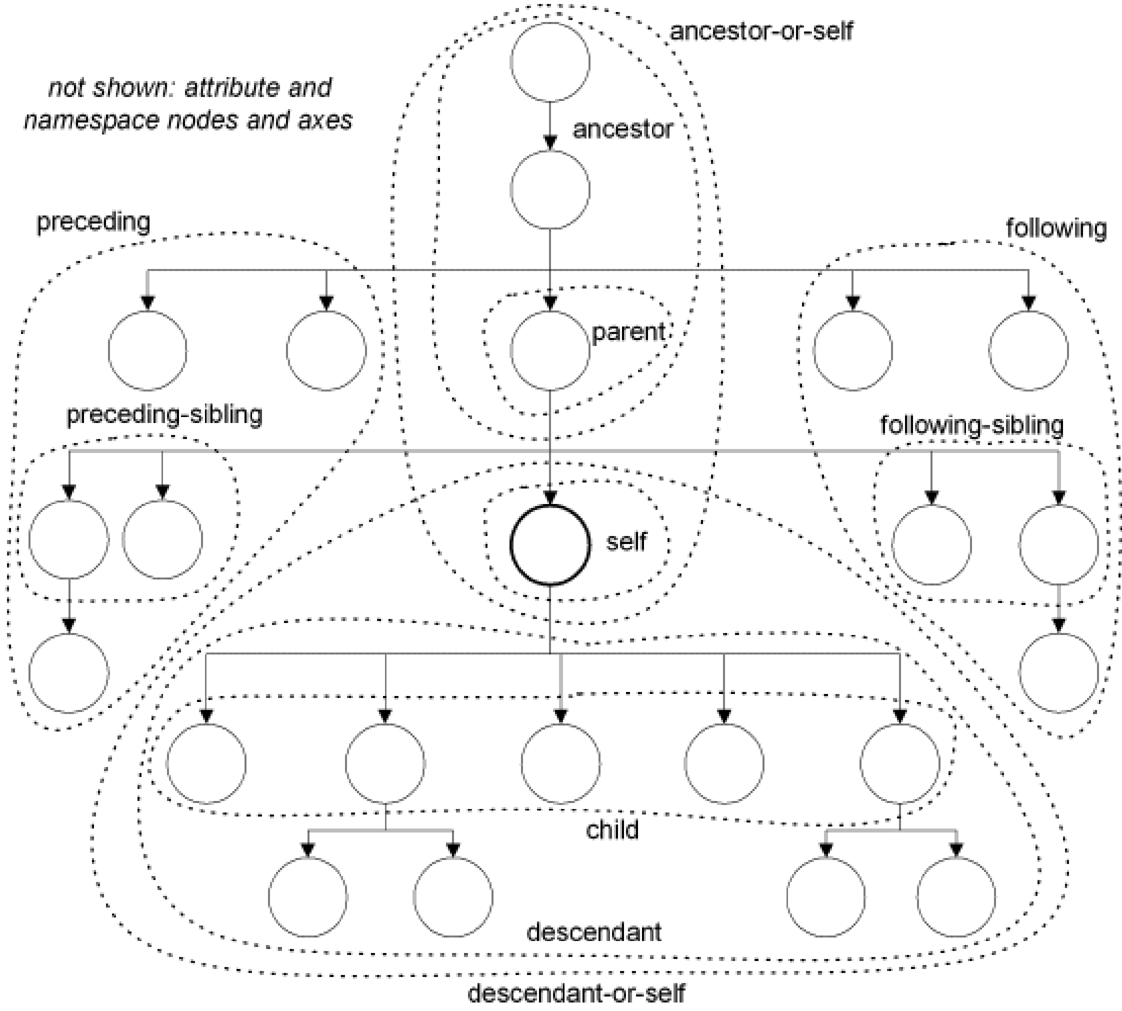
XPath Expression anketa//moznost

```
moznost
  hlasu
  Text [12-15 hodin]
moznost
moznost
moznost
```

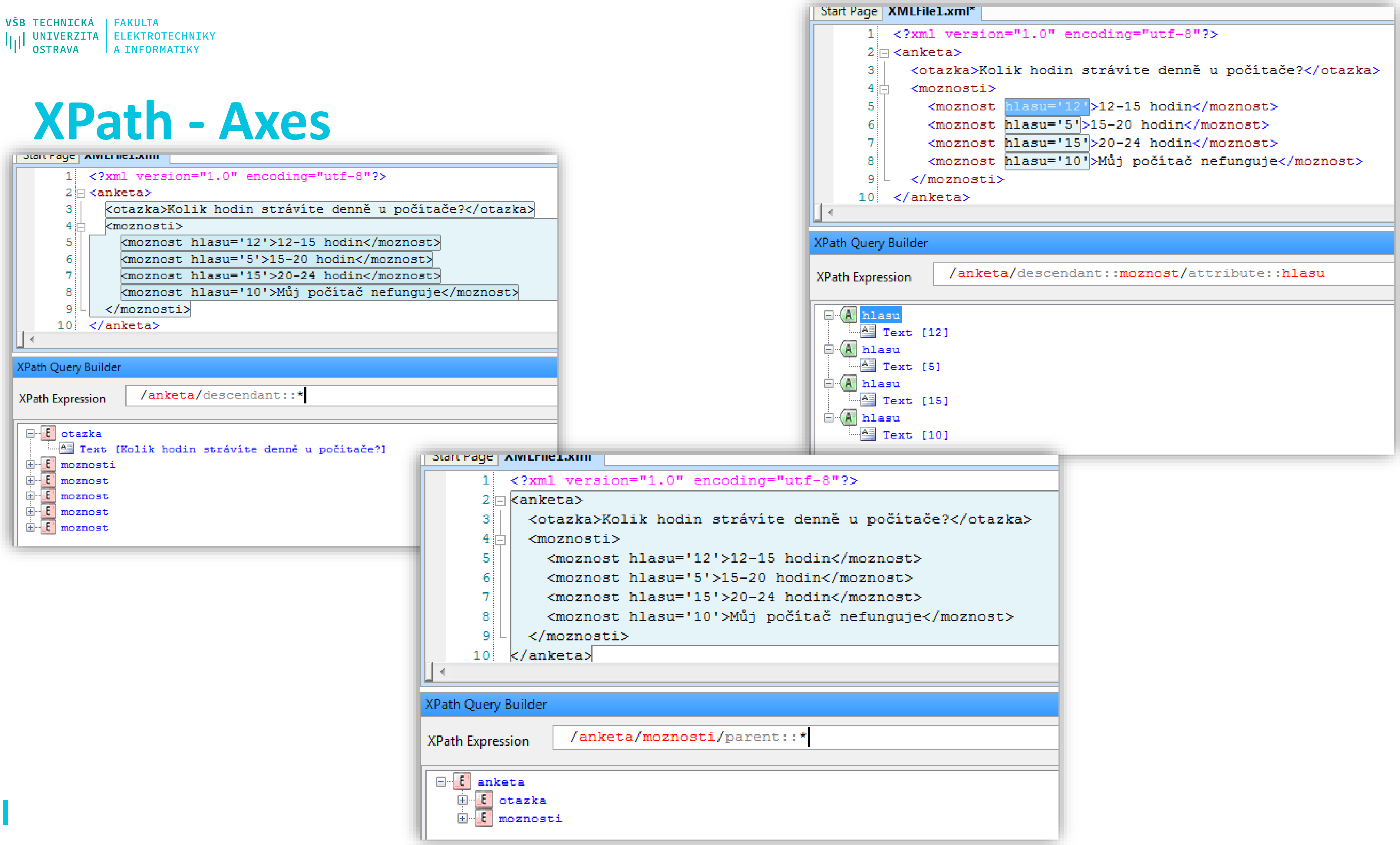
Zdroj: http://www.georgehernandez.com

XPath - Axes

- Specifies the direction of the XML tree search
- The set of relevant nodes entering the testing is determined by the axis specification,
  if it is not specified, then child::
- The *ancestor, descendant, following, preceding*, and *self* axes do not overlap and together they contain all document nodes



XPath - Axes



```xml
<?xml version="1.0" encoding="utf-8"?>
<anketa>
  <otazka>Kolik hodin strávíte denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Expression: `/anketa/descendant::*`

```
⊟ E otazka
    Text [Kolik hodin strávíte denně u počítače?]
⊞ E moznosti
⊞ E moznost
⊞ E moznost
⊞ E moznost
⊞ E moznost
```

XPath Expression: `/anketa/descendant::moznost/attribute::hlasu`

```
⊟ A hlasu
    Text [12]
⊟ A hlasu
    Text [5]
⊟ A hlasu
    Text [15]
⊟ A hlasu
    Text [10]
```

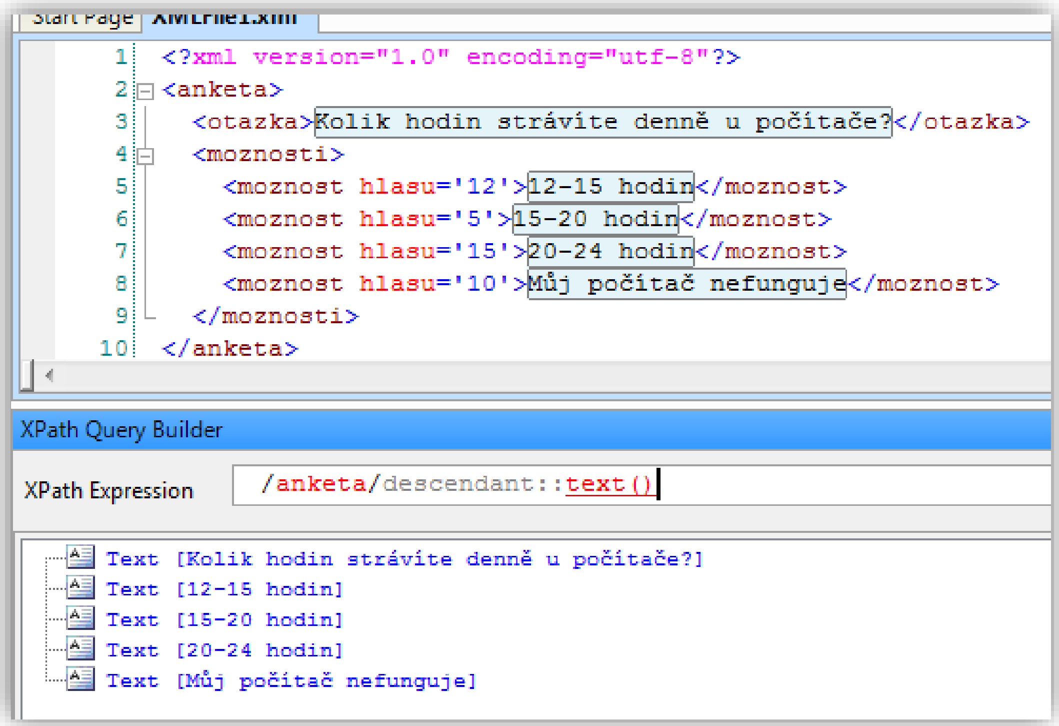
XPath Expression: `/anketa/moznosti/parent::*`

```
⊟ E anketa
  ⊞ E otazka
  ⊞ E moznosti
```

XPath – node test

Node specifications

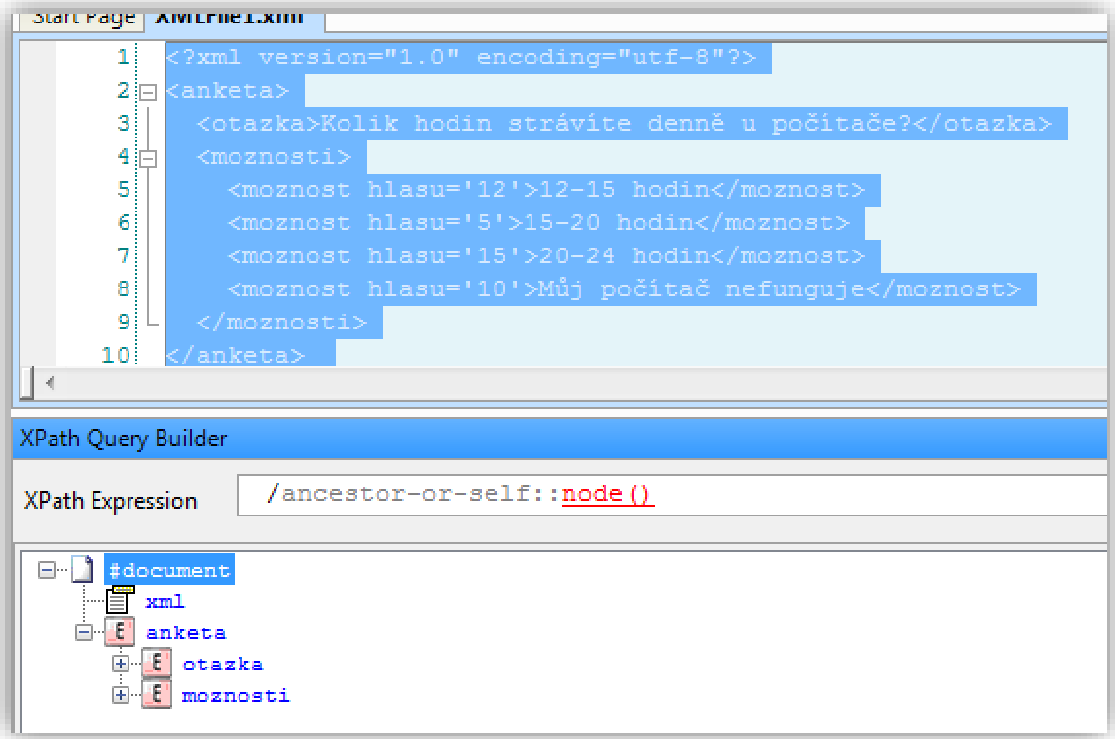
- name (including the use of a namespace prefix)
- typem (text(), node(), comment(), processing-instruction())



```
<?xml version="1.0" encoding="utf-8"?>
<anketa>
  <otazka>Kolik hodin strávíte denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Expression: `/anketa/descendant::text()`

```
Text [Kolik hodin strávíte denně u počítače?]
Text [12-15 hodin]
Text [15-20 hodin]
Text [20-24 hodin]
Text [Můj počítač nefunguje]
```



```
<?xml version="1.0" encoding="utf-8"?>
<anketa>
  <otazka>Kolik hodin strávíte denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Expression: `/ancestor-or-self::node()`

```
#document
  xml
  anketa
    otazka
    moznosti
```

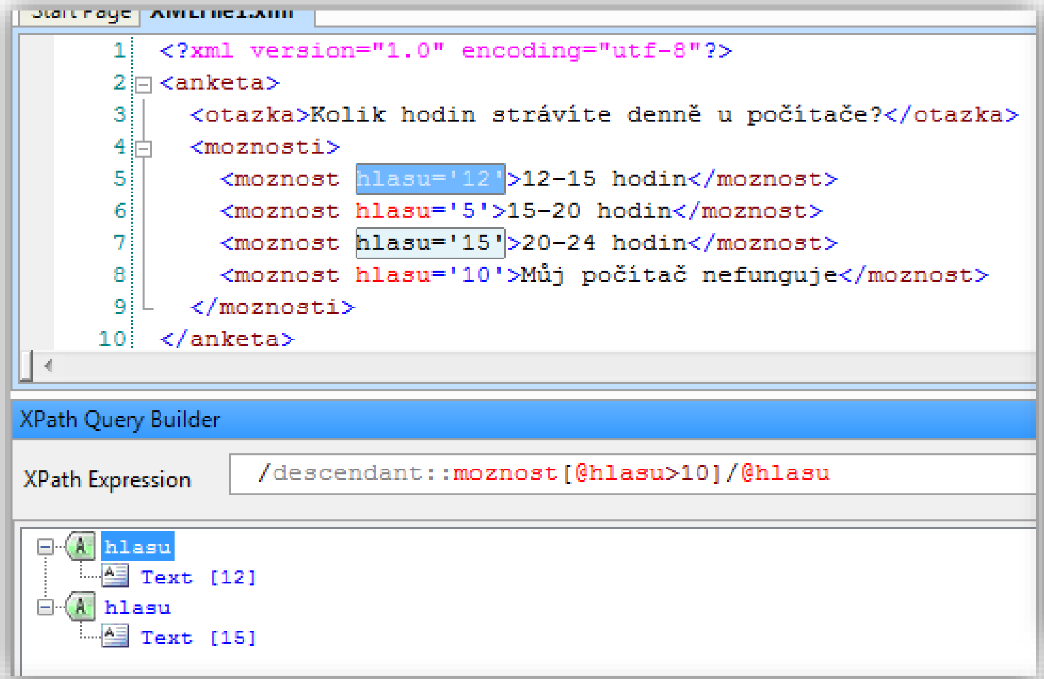
XPath – predicate

Can be used

- The characters "*", ".", ".."
- Mathematical, relational and logical operators)
- The "@" shortcut character for the attribute axis:
- Functions (approx. 100 functions) (last(), position(), string(), concat(), etc.)

Conditions can be constructed with respect to all elements in relation to the element (i.e. axes, node and attribute tests)

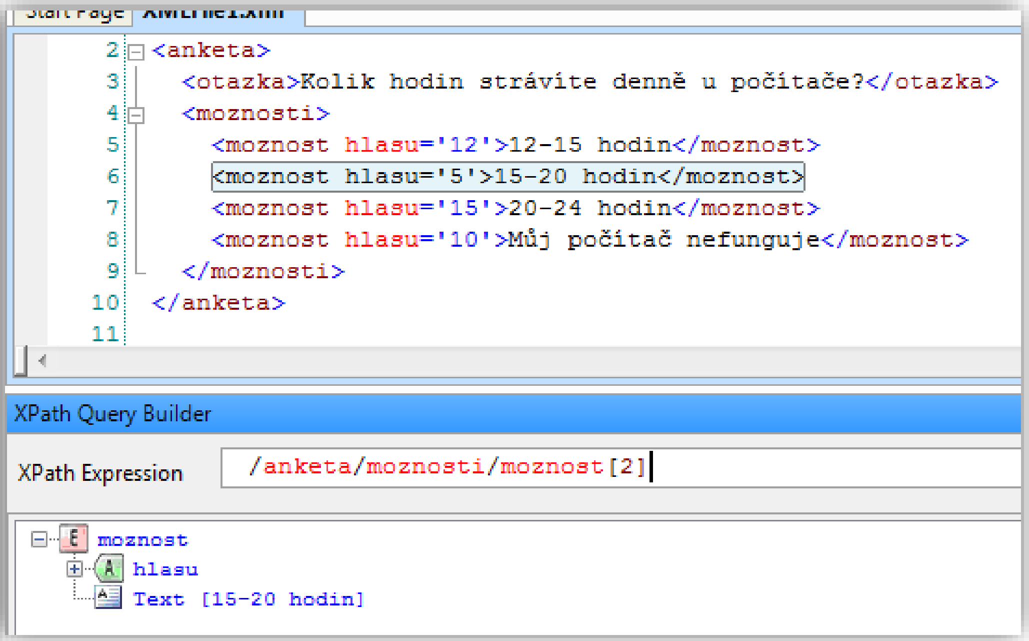
XPath



```
<?xml version="1.0" encoding="utf-8"?>
<anketa>
  <otazka>Kolik hodin strávite denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Expression `/descendant::moznost[@hlasu>10]/@hlasu`

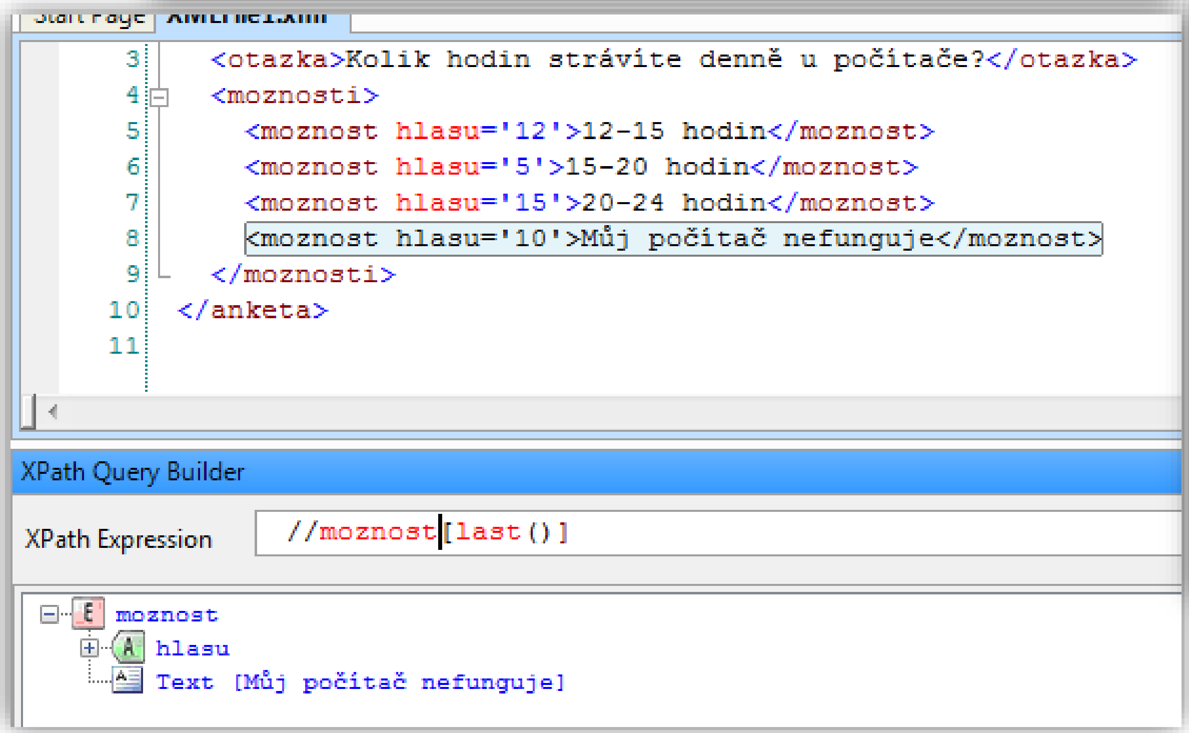
```
hlasu
  Text [12]
hlasu
  Text [15]
```



```
<anketa>
  <otazka>Kolik hodin strávite denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Expression `/anketa/moznosti/moznost[2]`

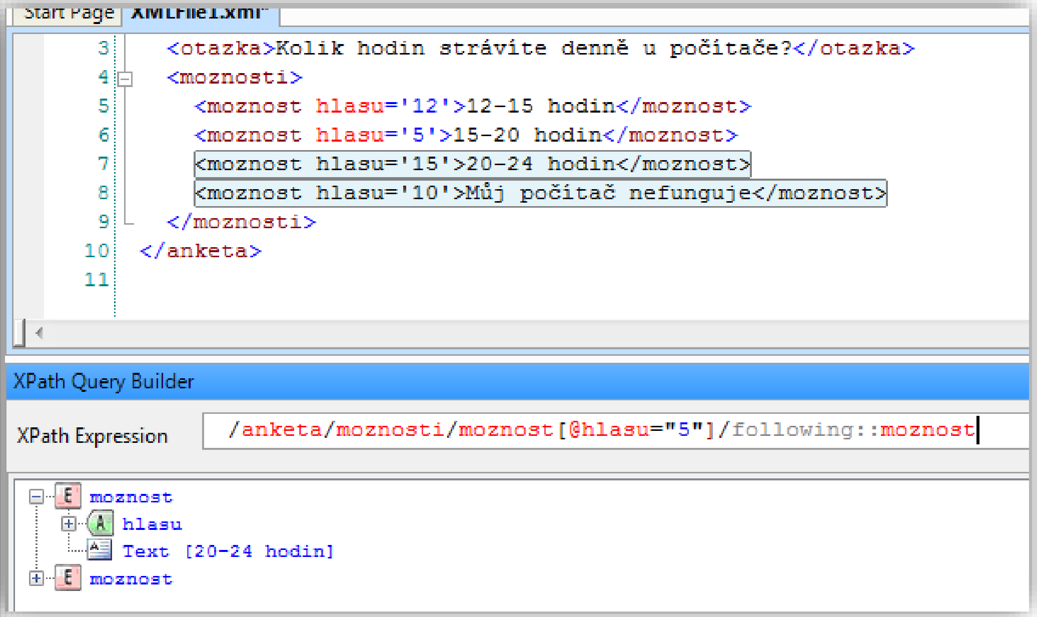
```
moznost
  hlasu
  Text [15-20 hodin]
```



```
  <otazka>Kolik hodin strávite denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Expression `//moznost[last()]`

```
moznost
  hlasu
  Text [Můj počítač nefunguje]
```

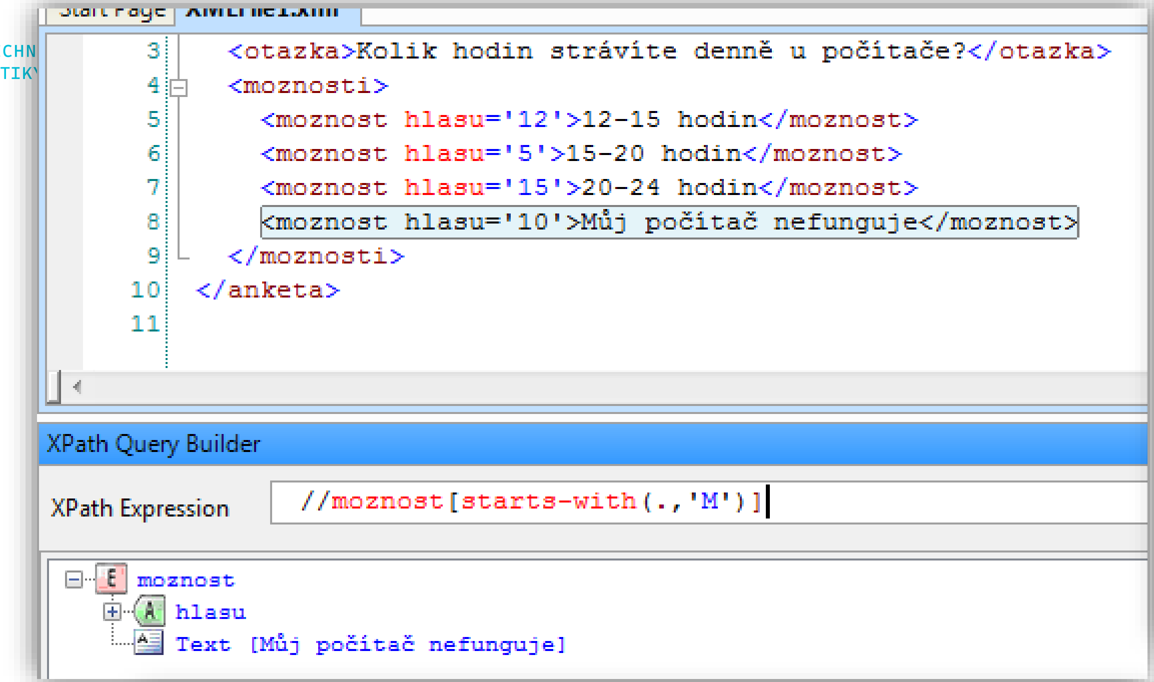


```
  <otazka>Kolik hodin strávite denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Expression `/anketa/moznosti/moznost[@hlasu="5"]/following::moznost`

```
moznost
  hlasu
  Text [20-24 hodin]
moznost
```

XPath

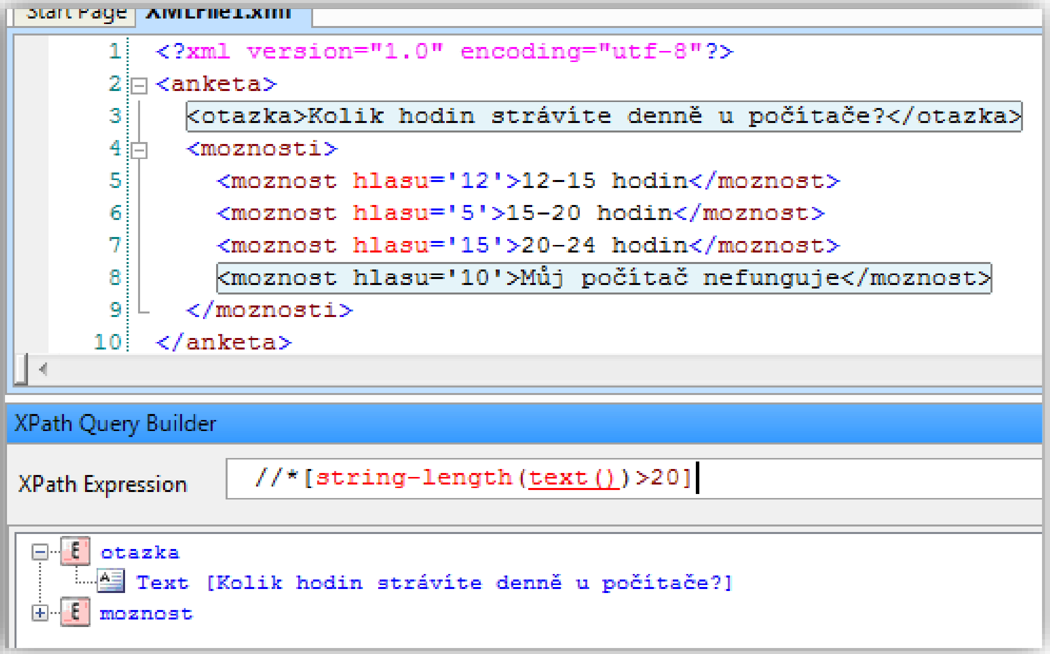


```
  <otazka>Kolik hodin strávite denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Query Builder

XPath Expression `//moznost[starts-with(.,'M')]`

```
moznost
  hlasu
  Text [Můj počítač nefunguje]
```

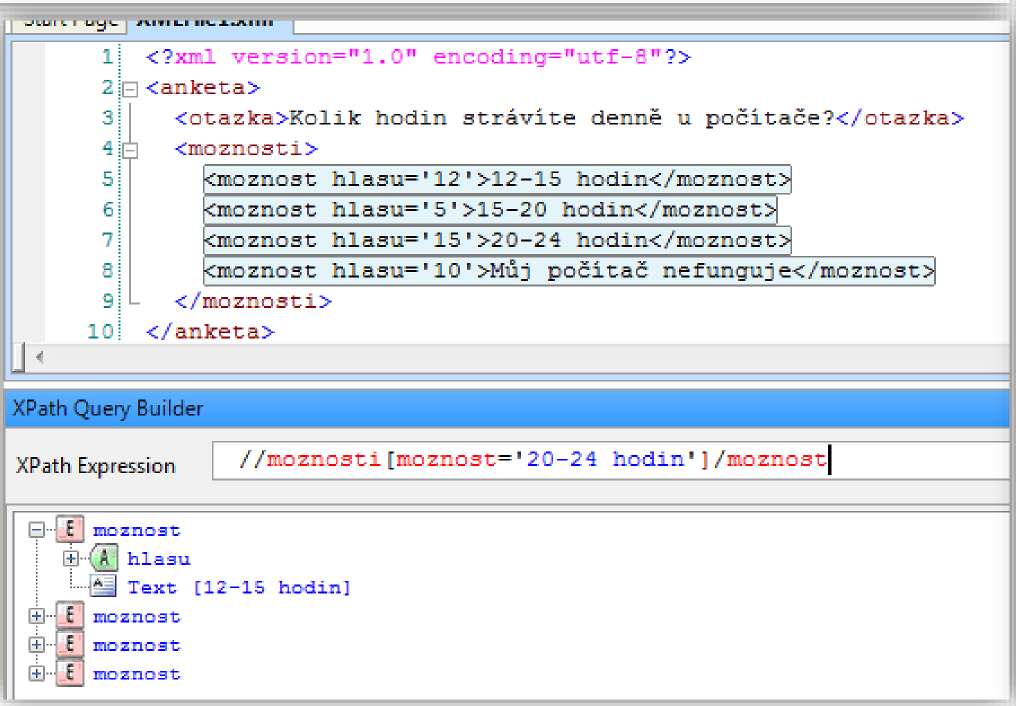


```
<?xml version="1.0" encoding="utf-8"?>
<anketa>
  <otazka>Kolik hodin strávite denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Query Builder

XPath Expression `//*[string-length(text())>20]`

```
otazka
  Text [Kolik hodin strávite denně u počítače?]
moznost
```

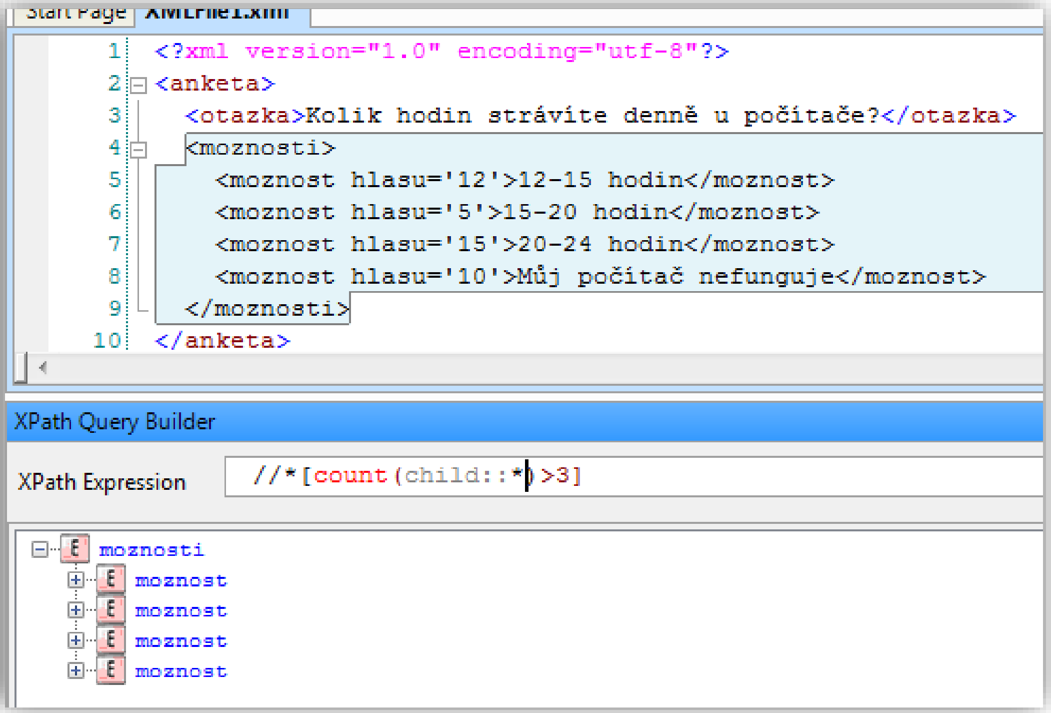


```
<?xml version="1.0" encoding="utf-8"?>
<anketa>
  <otazka>Kolik hodin strávite denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Query Builder

XPath Expression `//moznosti[moznost='20-24 hodin']/moznost`

```
moznost
  hlasu
  Text [12-15 hodin]
moznost
moznost
moznost
```



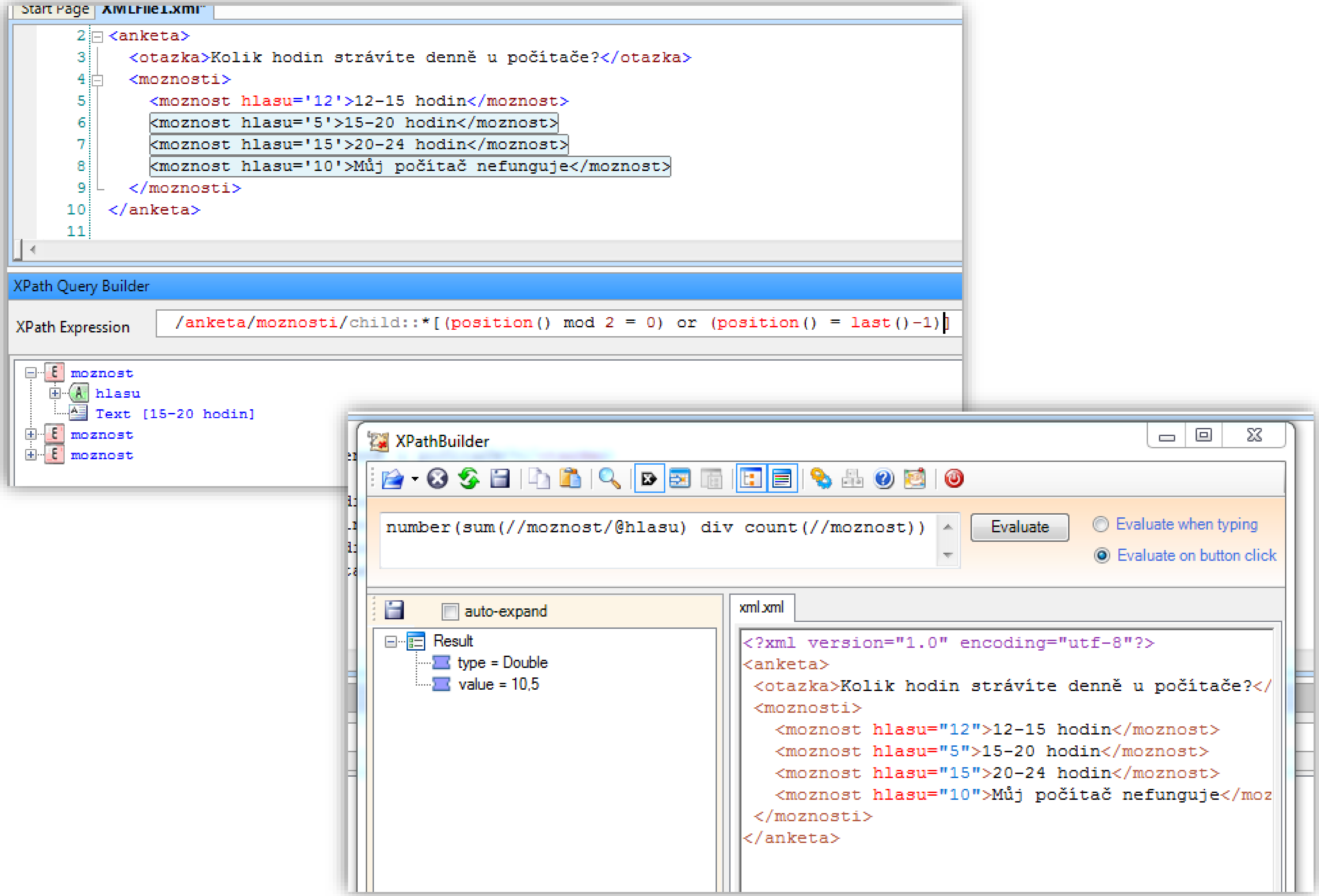
```
<?xml version="1.0" encoding="utf-8"?>
<anketa>
  <otazka>Kolik hodin strávite denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Query Builder

XPath Expression `//*[count(child::*)>3]`

```
moznosti
  moznost
  moznost
  moznost
  moznost
```

XPath



```
<anketa>
  <otazka>Kolik hodin strávite denně u počítače?</otazka>
  <moznosti>
    <moznost hlasu='12'>12-15 hodin</moznost>
    <moznost hlasu='5'>15-20 hodin</moznost>
    <moznost hlasu='15'>20-24 hodin</moznost>
    <moznost hlasu='10'>Můj počítač nefunguje</moznost>
  </moznosti>
</anketa>
```

XPath Expression

```
/anketa/moznosti/child::*[(position() mod 2 = 0) or (position() = last()-1)]
```

```
moznost
  hlasu
  Text [15-20 hodin]
moznost
moznost
```

```
number(sum(//moznost/@hlasu) div count(//moznost))
```

Evaluate

○ Evaluate when typing

● Evaluate on button click

☐ auto-expand

```
Result
  type = Double
  value = 10,5
```

```
<?xml version="1.0" encoding="utf-8"?>
<anketa>
 <otazka>Kolik hodin strávite denně u počítače?</
 <moznosti>
   <moznost hlasu="12">12-15 hodin</moznost>
   <moznost hlasu="5">15-20 hodin</moznost>
   <moznost hlasu="15">20-24 hodin</moznost>
   <moznost hlasu="10">Můj počítač nefunguje</moz
 </moznosti>
</anketa>
```

XPATH and JavaScript

- Using the evaluate method on an object with a DOM
- It can also work with namespaces through the so-called Namespace Resolvers (specific object as a parameter of the evaluation method)
- https://developer.mozilla.org/en-US/docs/Web/XPath/Introduction_to_using_XPath_in_JavaScript

```
var xhttp = new XMLHttpRequest();
xhttp.onreadystatechange = function() {
    if (this.readyState == 4 && this.status == 200) {
        showResult(xhttp.responseXML);
    }
};
xhttp.open("GET", "books.xml", true);
xhttp.send();

function showResult(xml) {
    var txt = "";
    path = "/bookstore/book/title"
    if (xml.evaluate) {
        var nodes = xml.evaluate(path, xml, null, XPathResult.ANY_TYPE, null);
        var result = nodes.iterateNext();
        while (result) {
            txt += result.childNodes[0].nodeValue + "<br>";
            result = nodes.iterateNext();
        }
     }
    document.getElementById("demo").innerHTML = txt;
}
```

JSON

- JavaScript Object Notation
  - A collection of name/value pairs
  - List of values
  - Data types – JSONString, JSONNumber, JSONBoolean, JSONNull, etc.
- Suitable for the exchange and transmission of short structured data
- JSON Schema can also be used for validation (https://json-schema.org)
- Attention to date and time – string according to ISO 8601, conversion to Date object

```
const date-json = "2024-11-10T14:30:00Z“;

const date = new Date(date-json);
console.log(datum);
```

JSON.parse() vs. JSON.stringify()

http://jsonlint.com/

JSON

```
{
  "@context": "http://schema.org",
  "@type": "ItemList",
  "name": "Seznam produktů",
  "itemListElement": [
    {
      "@type": "Product",
      "name": "Kvalitní boty",
      "description": "Elegantní boty pro každou příležitost.",
      "offers": {
        "@type": "Offer",
        "price": "49.99",
        "priceCurrency": "USD",
        "availability": "http://schema.org/InStock"
      }
    },
    {
      "@type": "Product",
      "name": "Moderní tričko",
      "description": "Stylové tričko s moderním designem.",
      "offers": {
        "@type": "Offer",
        "price": "29.99",
        "priceCurrency": "USD",
        "availability": "http://schema.org/OutOfStock"
      }
    ],
  "datePublished": "2023-10-29T15:30:00"
}
```

JSON a JavaScript

```
function loadJSON()
{
   var data_file = "http://www.tutorialspoint.com/json/data.json";
   var http_request = new XMLHttpRequest();

   http_request.onreadystatechange  = function(){
      if (http_request.readyState == 4  )
      {
        // Javascript function JSON.parse to parse JSON data
        var jsonObj = JSON.parse(http_request.responseText);

        // jsonObj variable now contains the data structure and can
        // be accessed as jsonObj.name and jsonObj.country.
        document.getElementById("Name").innerHTML =  jsonObj.name;
        document.getElementById("Country").innerHTML = jsonObj.country;
      }
   }
   http_request.open("GET", data_file, true);
   http_request.send();
}
```

```
// URL k JSON souboru na serveru
var url = 'https://example.com/products.json';

// Načteme JSON data z externího souboru
fetch(url)
  .then(response => response.json())
  .then(products => {

   products.forEach(product => {
      console.log('Název produktu: ' + product.name);
      console.log('Cena produktu: ' + product.price);
      console.log('--------------------------');
    });
  })
  .catch(error => {
    console.error('Chyba při načítání dat: ' + error);
  });
```

JSON a JavaScript

```
const user =
{
  firstname: "Jan",
  lastname: "Novák",
  age: 30,
  active: true};

const jsonString = JSON.stringify(user);

console.log(jsonString);
```