Basic Behaviour

Jolie

Types and Data Manipulation

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Previously on **Jolie**

Basic Datatypes

Jolie supports seven basic data types:

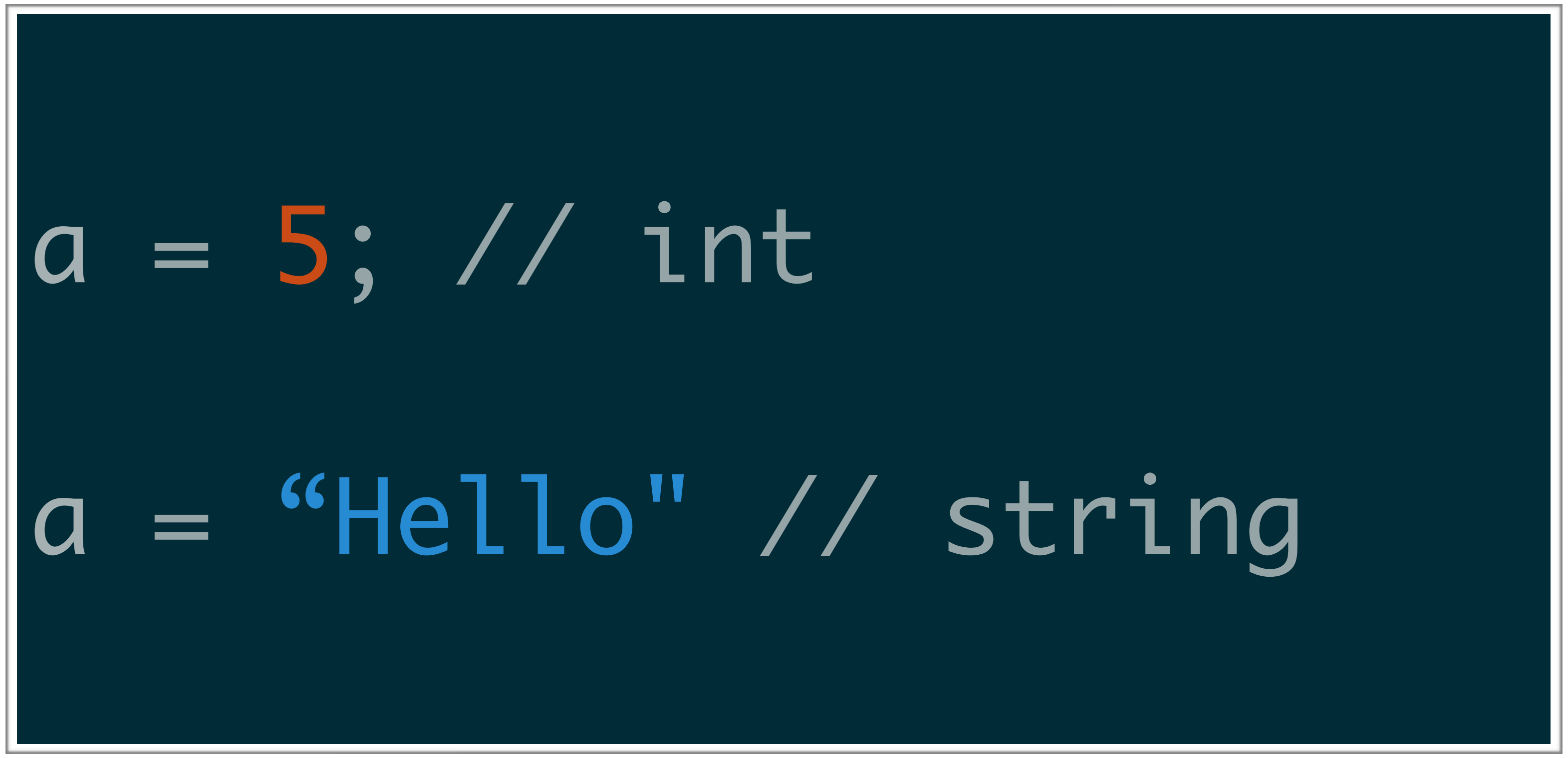
- bool: booleans;
- int: integers;
- long: long integers (with “L” or “l” suffix);
- double: double-precision float (decimal literals);
- string: strings;
- raw: byte arrays;
- void: the empty type.

Jolie also supports the any basic type, a value that can be any basic type.

Data & Types - Part I

Defining variables

Jolie is a **dynamically typed** language



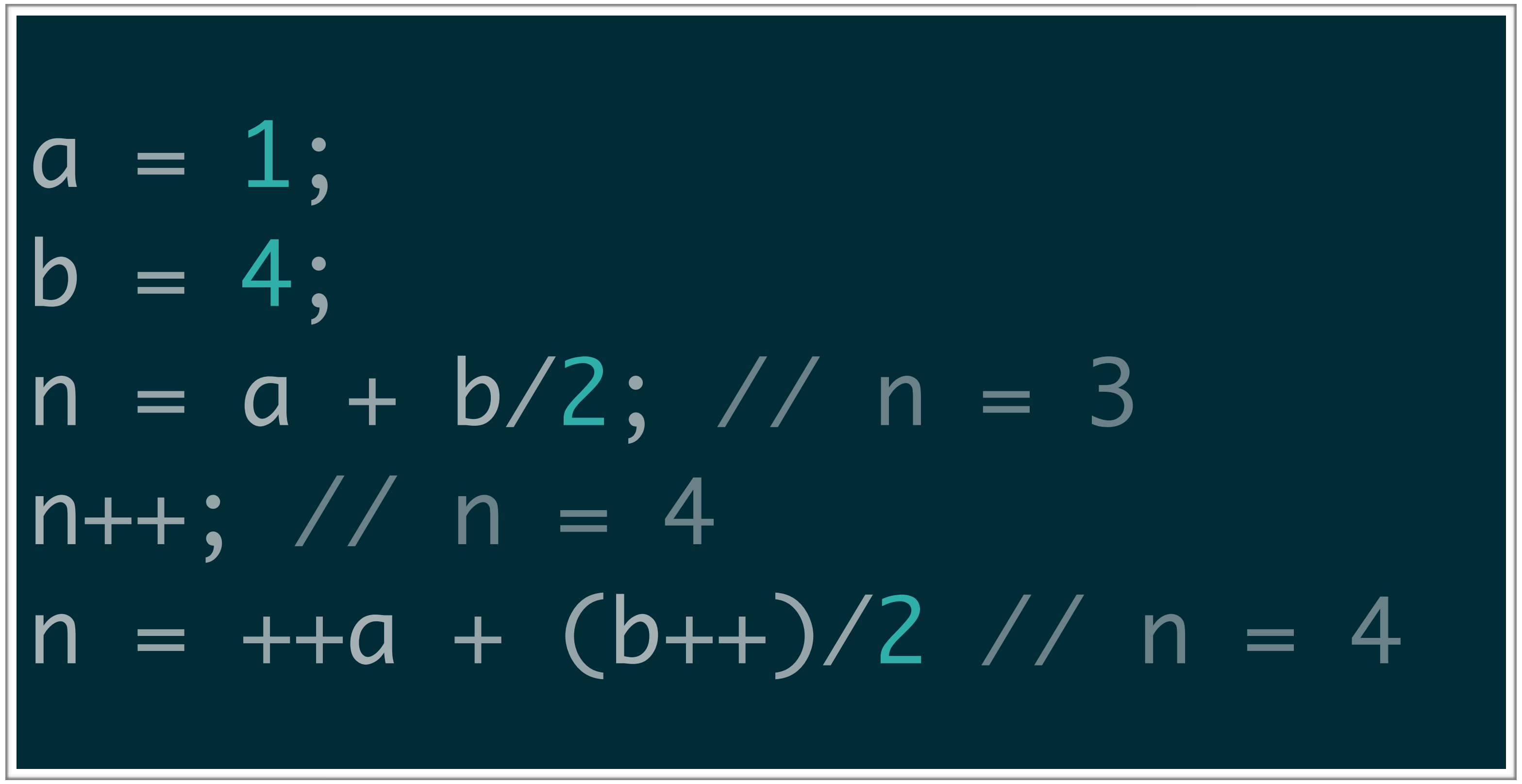
```
a = 5; // int
a = “Hello" // string
```

Jolie applies **file-level scoping** on variables, i.e., their scope extends for the entire file — and *includes*, if present.

Defining variables

Jolie supports basic arithmetic operators:

add	+
subtract	-
multiply	*
divide	/
modulo	%
pre-/post-increment	++
pre-/post-decrement	--



```
a = 1;
b = 4;
n = a + b/2; // n = 3
n++; // n = 4
n = ++a + (b++)/2 // n = 4
```

Casting variables

Variables can be cast to other types by using the corresponding casting functions

`bool()` `int()` `long()`
`double()` `string()`

```
s = "10";
n = 5 + int( s ); // n = 15

d = "1.3";
n = double( d ); // n = 1.3
n = int ( n ) // n = 1
```

Checking variable types

A variable type can be checked at runtime by means of the `instanceof` operator

```
s = "10";
n = s instanceof string; // n = true
n = s instanceof int; // n = false
n = ( s = 10 ) instanceof int; // n = true
```

Strings

Strings can be inserted enclosing them between double quotes. Character escaping works, like in C and Java, using the \ escape character

```
s = "This is a string\n"

s = "This is " + "a string\n"

s = "
JOLIE preserves formatting.
  This line will be indented.
         This line too.
"
```

Checking if variables are defined and undefining them

Once a variable is assigned, it is *defined*.

The operator is_defined(var) checks if a variable is defined

```
a = 1;
is_defined( a ) // returns true
is_defined( b ) // returns false
```

Undefining variables

The operator undef() makes a variable undefined again (it removes its assigned value)

```
a = 1;
is_defined( a ); // returns true
undef( a );
is_defined( a )  // returns false
```

Dynamic Arrays

Arrays in Jolie are dynamic and can be accessed by using the [] operator

```
a[ 0 ] = 0;
a[ 1 ] = 5;
a[ 2 ] = "Hello";
a[ 3 ] = 2.5
```

Dynamic Arrays

in Jolie

every variable is a dynamic array

```
a = 1
```

is interpreted as

```
a[0] = 1
```

Dynamic Arrays

in Jolie

every variable is a dynamic array

```
a.b.c = 1
```

=

```
a[ 0 ].b[ 0 ].c[ 0 ] = 1
```

Dynamic Arrays

```
a.b.c[0] = 1;
a.b.c[1] = 2
```

jolie tree

VS

```
<a>
  <b>
    <c>1</c>
  </b>
  <b>
    <c>2</c>
  </b>
</a>
```

xml

```
{
  "a": {
    "b": [
      { "c": "1" },
      { "c": "2" }
    ]
  }
}
```

json

The array size operator

```
a[ 0 ] = 0;
a[ 1 ] = 1;
a[ 2 ] = 2;
a[ 3 ] = 3;
#a // returns 4
```

The array size operator

```
a.b = 0;
a.b[ 1 ] = 1;
a.b.c = 2;
a = 3;
```

Dare to guess?

#a #a.b #a.b.c

The array size operator

```
a[ 0 ] = 3
|_ b [ 0 ] = 0
|    [ 1 ] = 1
|_ c [ 0 ] = 2
```

The array size operator

```
a[ 0 ] = 3
|_ b [ 0 ] = 0
|    [ 1 ] = 1
|_ c [ 0 ] = 2
```

Did you guess right?

#a=?   #a.b=?   #a.b.c=?

The array size operator

```
a[ 0 ] = 3
|_ b [ 0 ] = 0
|    [ 1 ] = 1
|_ c [ 0 ] = 2
```

Did you guess right?

#a=1 #a.b=? #a.b.c=?

The array size operator

```
a[ 0 ] = 3
|_ b [ 0 ] = 0
|    [ 1 ] = 1
|_ c [ 0 ] = 2
```

Did you guess right?

#a=1   #a.b=2   #a.b.c=?

The array size operator

```
a[ 0 ] = 3
|_ b [ 0 ] = 0
|    [ 1 ] = 1
|_ c [ 0 ] = 2
```

Did you guess right?

`#a=1`   `#a.b=2`   `#a.b.c=1`

Data & Types - Part II

Managing complex data structures - **Deep Copy** Operator

Deep Copy Operator

dst << src

```
birds.dove   = 1;
birds.swan   = 2;

mammals.lion = 2;
mammals.puma = 3;

fish.tuna    = 1;

zoo.fly  << birds;
zoo.walk << mammals;
zoo.swim << fish
```

Managing complex data structures - **Deep Copy** Operator

```
zoo
|_ fly
|    |_ dove
|    |_ swan
|
|_ walk
|     |_ lion
|     |_ puma
|
|_ swim
      |_ tuna
```

```
birds.dove    = 1;
birds.swan    = 2;

mammals.lion = 2;
mammals.puma = 3;

fish.tuna     = 1;

zoo.fly  << birds;
zoo.walk << mammals;
zoo.swim << fish
```

Managing complex data structures - **Deep Copy** Operator

Attention: `d << s` overwrites all the correspondent sub-nodes of **s** rooted in **d**, leaving the other sub-nodes unaffected

```
d.greeting      = "hello";
d.first         = "to the";
d.first.second  = "world";
d.first.third   = "!";

s.first.first   = "to a";
s.first.second  = "brave";
s.first.third   = "new";
s.first.fourth  = "world";

d << s
```

Before

```
d
|_ greeting = "hello"
|_ first = "to the"
   |_ first.second = "world"
   |_ first.third = "!"
```

After

```
d
|_ greeting = "hello"
|_ first
   |_ first = "to a"
   |_ second = "brave"
   |_ third = "new"
   |_ fourth = "world"
```

Managing complex data structures - **Inline Trees**

It is possible to compose trees inline with syntax

```
{
 .node1 = 1,
 .node2 = "2",
 .node3 = var3
}
```

```
zoo.fly << {
  .dove = 1,
  .swan = 2
  };
zoo.walk << {
    .lion = 2,
    .puma = 3
  };
zoo.swim << {
    .tuna = 1
  };
```

Navigating complex data structures - **Dynamic Lookup**

Nested variables can be identified by means of a string expression evaluated at runtime.

Dynamic look-up is obtained as a subpath with **a string within round parenthesis**

```
zoo
|_ fly
|     |_ dove
|     |_ swan
|
|_ walk
|      |_ lion
|      |_ puma
|
|_ swim
       |_ tuna
```

```
zoo.( "fly" ).dove

zoo.( "f" + "l" + "y" ).dove

zoo.( "f" + "l" + "y" ).( "dove" )


fly = "fly"
zoo.( fly ).dove
```

Navigating complex data structures - **‘with’ Operator**

with operator provides a shortcut for repetitive variable paths.

```
with ( zoo ){
  .fly.dove = 1;
  .fly.swan = 2
  .mammals.lion = 2;
  .mammals.puma = 3
  .fish.tuna = 1
  }
```

Navigating complex data structures - ‘**with**’ **Operator**

with operator provides a shortcut for repetitive variable paths.

withs can be nested!

```
with ( zoo ){
  with( .fly ){
    .dove = 1;
    .swan = 2
  };
  with( .mammals ){
    .lion = 2;
    .puma = 3
  };
  with( .fish ){
    .tuna = 1
  }
}
```

Navigating complex data structures - ‘**with**’ **Operator**

with operator provides a shortcut for repetitive variable paths.

```
with ( arr[ #arr ] ) {
   .a = "1";
   .b = "2";
   .c = "3"
}
```

evaluates to

```
arr[ #arr ].a = "1";
arr[ #arr ].b = "2";
arr[ #arr ].c = "3"
```

it means it is evaluated for each **.subpath** inside the **with**

Navigating complex data structures - **‘foreach’ Operator**

```
foreach ( kind : zoo ){
    foreach( species : zoo.( kind ) ){
      println@Console( "zoo." +
        kind + "." + species )()
    }
  }
```

Returns

```
zoo.fly.dove
zoo.fly.swan
zoo.swim.tuna
zoo.walk.lion
zoo.walk.puma
```

The **foreach** operator looks for any child-node inside the given **root. For every child** assigns **its name** to the given variable and executes the internal code block.

Navigating complex data structures - **Aliases**

An **alias** is a pointer to to another variable path. Aliases are created with the -> operator

```
birds   -> zoo.fly;
mammals -> zoo.walk;
fishes  -> zoo.swim
```

Navigating complex data structures - **Aliases**

```
currentKind -> zoo.( kind );
foreach ( kind : zoo ) {
  foreach ( species : currentKind ) {
    println@Console( species )()
  }
}
```

prints

```
dove
swan
tuna
lion
puma
```

Navigating complex data structures - **Aliases**

```
with ( a.b.c ){
.d[ 0 ] = "zero";
.d[ 1 ] = "one";
.d[ 2 ] = "two";
.d[ 3 ] = "three"
};

currElem[ 0 ] -> a.b.c.d[ i ];

for ( i = 0, i < #a.b.c.d, i++ ){
  println@Console( currElem )()
}
```

Prints

```
zero
one
two
three
```