Programming Languages

Java Basics

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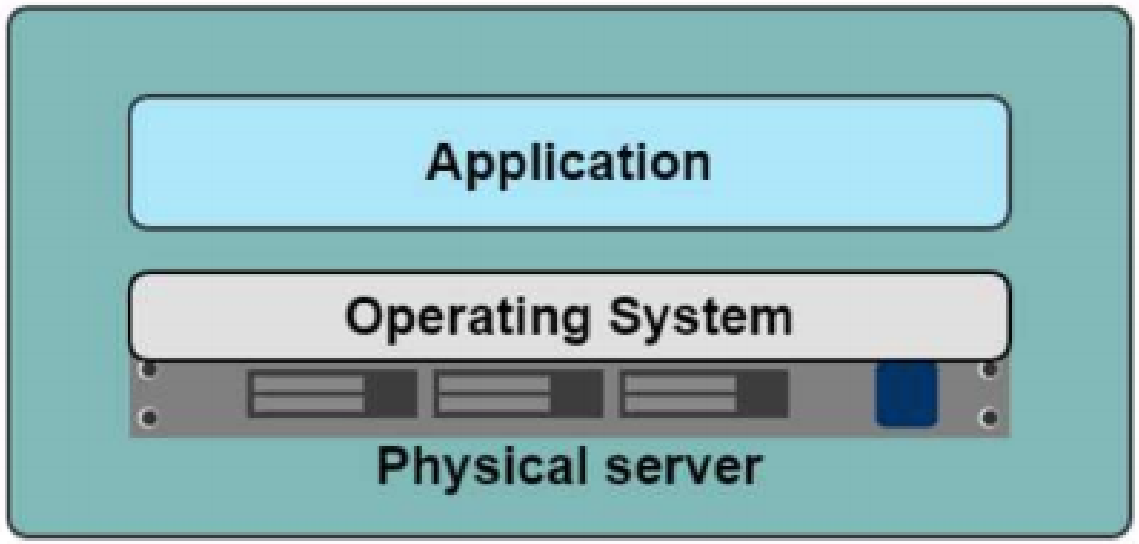
What is a computer?



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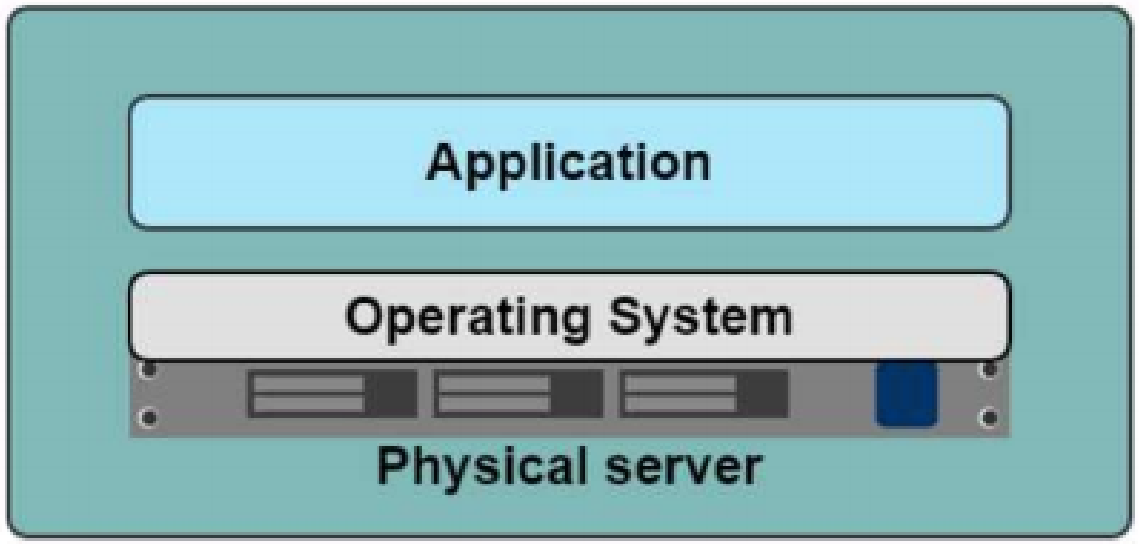
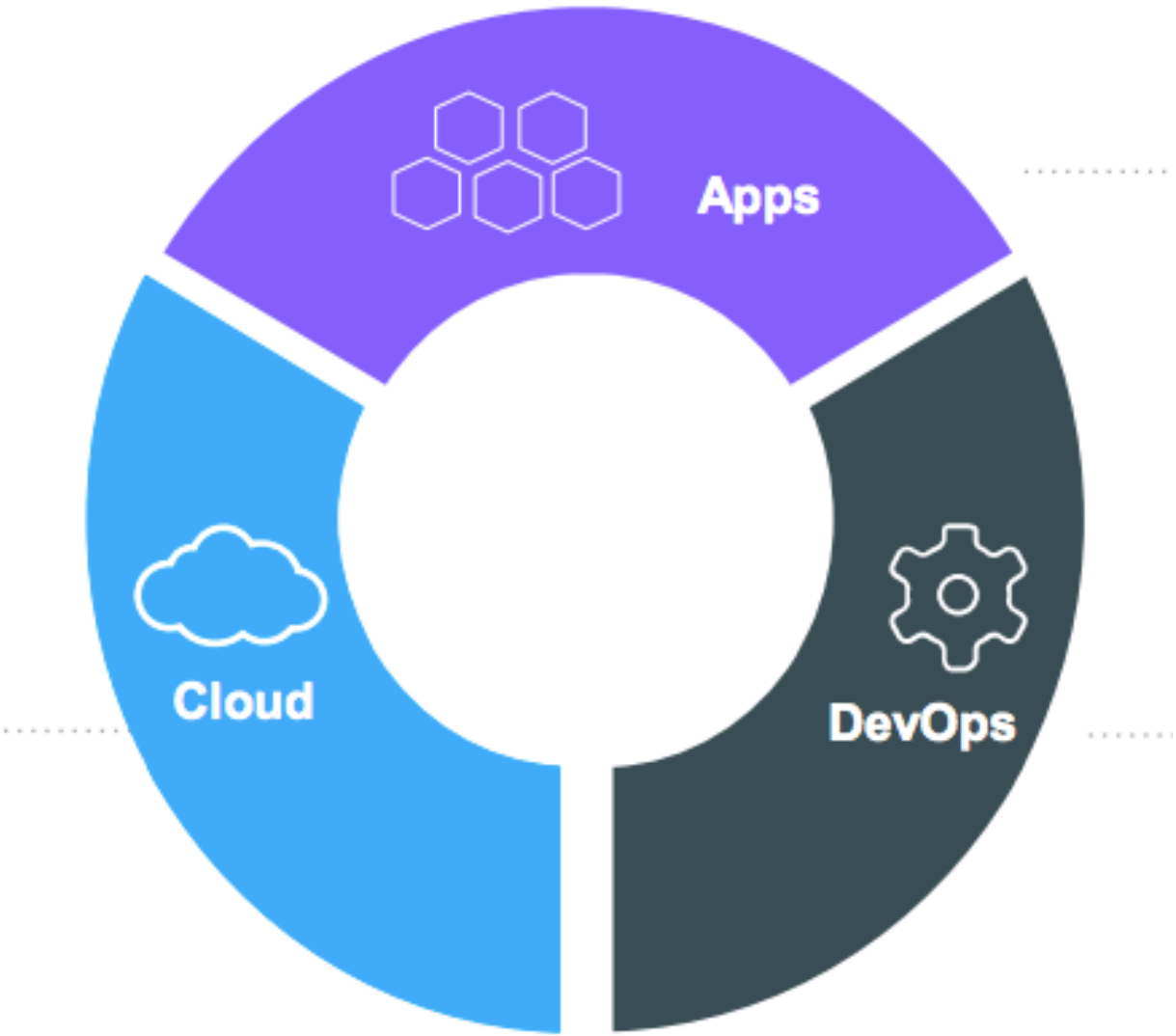


- Slow deployment times
- Huge costs
- Wasted resources
- Difficult to scale
- Difficult to migrate

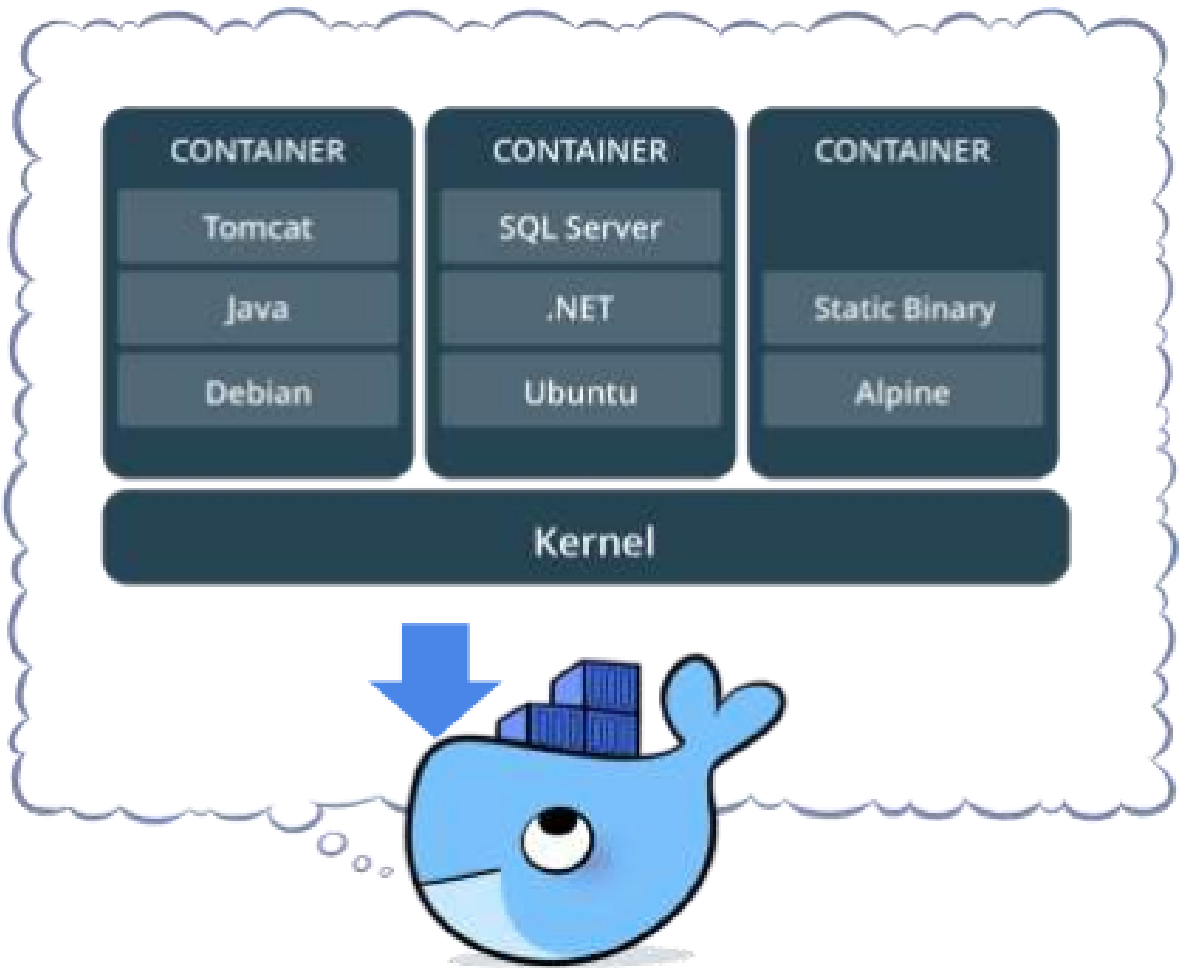
IT Landscape is Changing



IT Landscape is Changing

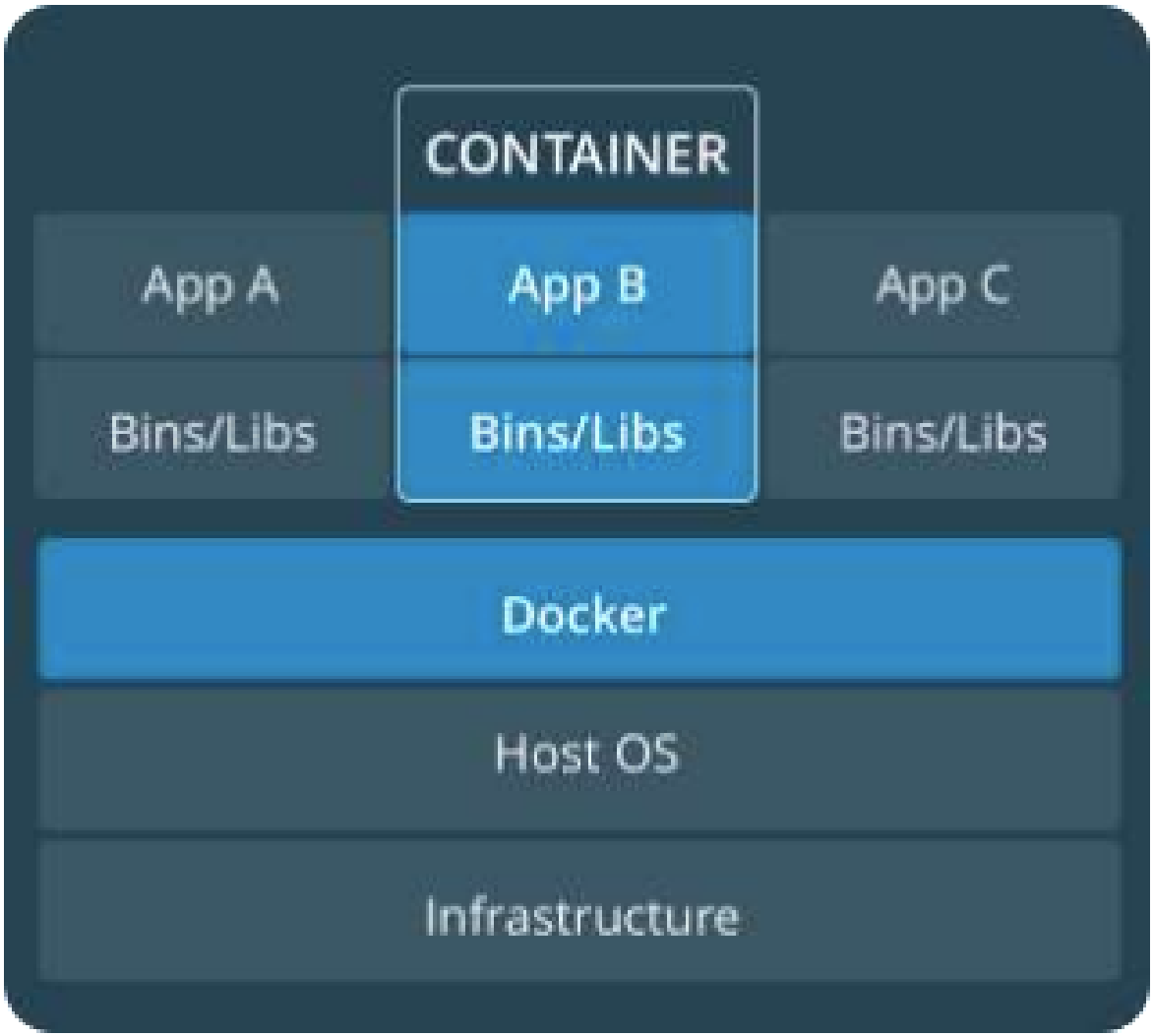
- Migrate workloads to cloud
- Portability across environments
- Want to avoid cloud vendor lock-in

Container-based Approach



Container-based Approach

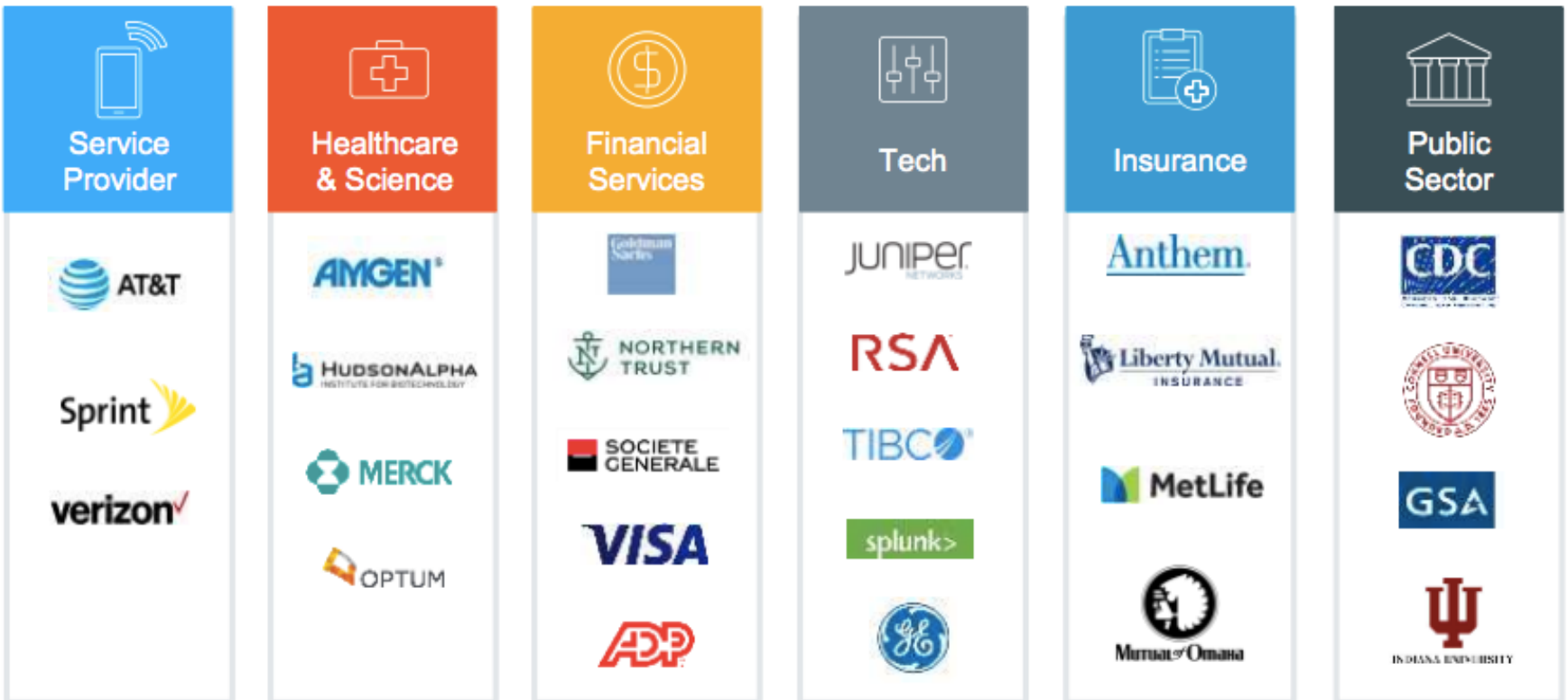
Containers are an app level construct



Docker

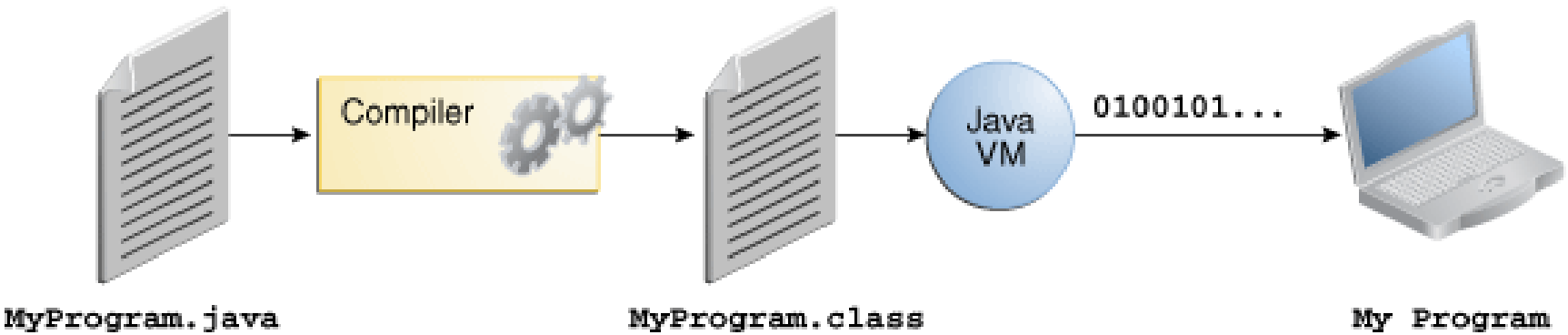

Loved vs. Dreaded
Want
59,164 responses
Docker
76.93%
23.07%
Kubernetes
74.75%
25.25%
Terraform
69.22%
30.78%
Homebrew
68.30%
31.70%
Pulumi
64.43%
35.57%
npm
62.85%
37.15%
Yarn
61.90%
38.10%
Ansible
57.87%
42.13%
Unreal Engine
56.65%
43.35%
Unity 3D
56.13%
43.87%
Flow
44.37%
55.63%
Puppet
36.59%
63.41%
Chef
31.52%
68.48%
0
20
40
60
80
100
Loved
Dreaded

Docker



https://www.docker.com/blog/key-insights-from-stack-overflows-2022-developer-survey/

Java program development process



Simple first Java Program: “Hello World”

```
/** This is the first program people write in a new language,
 the "Hello World!".  In Java, this file must be named
 Welcome.java, with the first part of the name, Welcome, being
 the same as the name of the class. The filename itself
 (not the class name) must always end in .java to indicate
 to the operating system that it's a java source file.
*/
public class Welcome {
  public static void main ( String args[] ) {
      System.out.println ( "Hello World!" );
  }
 }
```

Comments

Comments in Java can be one of three styles:

- **Single line:** starts at // anywhere on a line, ends at the end of that line
- **Multi-line:** starts with character sequence /* anywhere, ends with character sequence */ anywhere after that can span multiple lines
- **javadoc:** starts with character sequence /** anywhere, ends with character sequence */ anywhere, after that uses javadoc utility to create HTML documentation from code

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  - JVM starts executing here!
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- Braces { } are used to collect statements into a "block"
- Statements in Java end with semicolons.

Printing

- println: New line after printing
- print: No new line
- printf: Can specify format

Escape Sequences

- Escape sequences, or escape characters, begin with a slash and are immediately followed by another character.
- This two-character sequence, inside " " allows you to control your output (\n, \t, \b) or output characters you wouldn't otherwise be able to (\\, \") inside a string.

Escape Sequences

Seq	Meaning	Example Code
\n	New line	System.out.println("Hi\nThere");
\t	Horizontal tab	System.out.println("What's\tup?");
\b	Backspace	System.out.println("Hi\b Hey");
\\	Backslash	System.out.println("Back\\Slash");
\"	Double quote	System.out.println("Dbl\"Quote");

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  `count = 0;`
- Must give a value to the variable before using it in the `main` method.

Java Identifiers

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- Java classes, methods, variables: words we chose or make up when writing a program
  System, println, main, args

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Identifier

a letter followed by zero or more letters (including $ and _) and digits

Identifier Rules

- Identifiers must start with a letter, a currency character ($), or a connecting character such as the underscore (_).
- Identifiers cannot start with a number.
- After the first character, identifiers can contain any combination of letters, currency characters, connecting characters, or numbers.
- There is no limit to the number of characters an identifier can contain.
- You can't use a Java keyword as an identifier.
- Identifiers in Java are case-sensitive; foo and FOO are two different identifiers.

Data Types

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- How the computer interprets the string of bits depends on the context.
- In Java, we must make the context explicit by specifying the type of the data.

Data Types

- Java has two categories of data:
  primitive data (e.g., number, character)
  object data (programmer created types)
- There are 8 primitive data types: `byte`, `short`, `int`, `long`, `float`, `double`, `char`, `boolean`
- Primitive data are only single values; they have no special capabilities.

Primitive Data Types

- integers: byte, short, int, long
- floating point: float, double
- characters: char
- booleans: boolean

Common Primitive Data Types

Type	Description	Example of Literals
`int`	integers (whole numbers)	42, 60634, -8
`double`	real numbers	0.039, -10.2
`char`	single characters	'a', 'B', '&', '6'
`boolean`	logical values	true, false

Range of Values

Type	Storage	Range of Values
`int`	32 bits	-2,147,483,648 to 2,147,483,647
`double`	64 bits	$\pm 10^{-45}$ to $\pm 10^{38}$
`char`	16 bits = 2 bytes	0 to 2^{16} or \u0000 to \uFFFF
`boolean`	1 bit	NA

Constants

- Constants hold the same value during their existence.
- Can use a keyword final before the type and name of the variable:
  - always contains the same value.
- final int MAX_BUDGET = 1000

Scanner

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  Scanner *name* = new Scanner (System.in); to read from the terminal, or
  Scanner *name* = new Scanner (File filename); to read from the file, where
  File *filename* = new File ("input.txt");
  and *name* is the name you choose for your instance of the Scanner

Scanner Methods

- next() : get the next word (token) as a String
- nextLine() : get a line of input as a String
- nextInt() : get an integer
- nextDouble() : get a double value
- nextFloat() : get a float value

Java API Packages

- The Java API (Application Programming Interface) contains many separate packages that can be used to make writing complex programs easier.
- Each package focuses on a specific set of tasks and provides pre-written methods :
  java.lang - Fundamentals (Object, String, etc)
  java.util - Utilities (Scanner , Random, etc)

String class

- `String str = ‘‘abc’’;` is equivalent to:
  `String str = new String(‘‘abc’’);`
- The + operator joins two strings together.

`String` class

- `String str = ‘‘abc’’;` is equivalent to:
  `String str = new String(‘‘abc’’);`
- The $+$ operator joins two strings together.
- `String` class is a part of the `java.lang` package.
- The classes of `java.lang` package are automatically available for use, no need to import.

String methods

charAt()

charAt() function returns the character located at the specified index.

```
String str = "studytonight";
System.out.println(str.charAt(2));
```

```
Output : u
```

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```

```
Output : u
```

length()

length() function returns the number of characters in a String.

```
String str = "Count me";
System.out.println(str.length());
```

```
Output : 8
```

String methods

replace()

replace() method replaces occurances of character with a specified new character.

```
String str = "Change me";
System.out.println(str.replace('m','M'));
```

```
Output : Change Me
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String str1 = new String(‘‘This is really fun!!’’);
String str2 = str1.replace( ’i’, ’u’ );
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String str1 = new String(‘‘This is really fun!!’’);
String str2 = str1.replace( ’i’, ’u’ );
```

str2 returns ‘‘Thus us really fun’’

String methods

substring()

substring() method returns a part of the string. **substring()** method has two forms,

```
public String substring(int begin);

public String substring(int begin, int end);
```

The first argument represents the starting point of the subtring. If the substring() method is called with only one argument, the subtring returned, will contain characters from specified starting point to the end of original string.

But, if the call to substring() method has two arguments, the second argument specify the end point of substring.

```
String str = "0123456789";
System.out.println(str.substring(4));
```

```
Output : 456789
```

```
System.out.println(str.substring(4,7));
```

```
Output : 456
```

`String` methods

- `equals()`: This method returns true if the String are equal; false otherwise.

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String str1 = new String(‘‘This is really fun!!’’);
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```

- `value` returns `value = true`

Control Structures

- Java programs are built from only these seven control structures:
  - *three selection* (if, if/else, switch)
  - *three repetition* (while, do/while, for)
- You implement computer algorithms by stringing sequences of these seven control structures together.

Logical Operators

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- These logical operators are based on the concept of Boolean logic or Boolean algebra.

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- These logical operators are based on the concept of Boolean logic or Boolean algebra.
- These are the three logical operators in Java:
  1. && (logical AND)
  2. || (logical OR)
  3. ! (logical NOT, or negation)

Logical **and** Truth Table

expr1	expr2	expr1 && expr2
false	false	false
false	true	false
true	false	false
true	true	true

Logical **or** Truth Table

expr1	expr2	expr1 || expr2
false	false	false
false	true	true
true	false	true
true	true	true

Logical **not** Truth Table

expr1	!expr1
false	true
true	false