Scanners

COMP 102

Victoria University of Wellington

Doing more with data in a file:

What if each line of the file has multiple values?

How do we get individual values out of the Strings?

fruit.txt

```
4447 quince  11.45
4430 pineapple 6.82
4041 red-plum 5.99
4416 D'Anjou-pear  5.44
4011 Banana     2.99
```

Use a Scanner

Scanners

- Scanner: a class in Java that allows a program to read values out of a String (or any other source of characters…)

"There are 25 boxes; and 16.3 kg (average) per box."

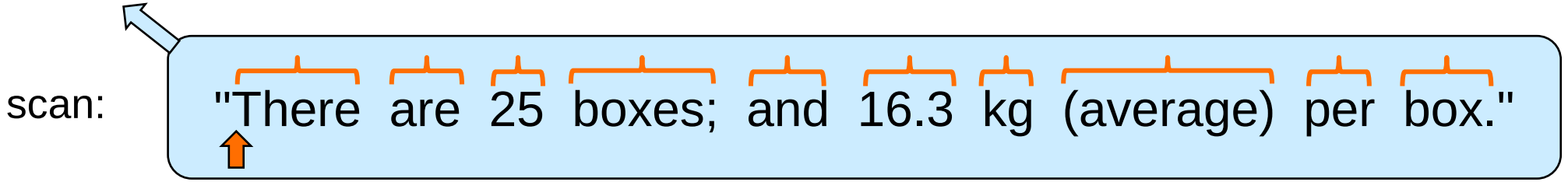
To get a Scanner:

- Create a new Scanner object, passing it the source:

```
Scanner scan = new Scanner("There are 25 boxes; and 16.3 kg (average) per box.");
Scanner sc = new Scanner(UI.askString("Enter some text"));
String line = ….
Scanner lineSc = new Scanner(line);
```

Scanners

- A Scanner breaks up the source string into a sequence of tokens, separated by spaces or tabs.



- Token: a word, a number, or … any sequence of non-space characters.

- A Scanner provides the tokens, one at a time, using the .next…() methods:

  scan.next() ⇒ next token as a string

  scan.nextInt() ⇒ next token as an int (error if next token is not an integer)

  scan.nextDouble() ⇒ next token as a double (error if next token is not a number)

- Each call to .next…() moves the "cursor" to the end of the token.

Reading Tokens from a Scanner

- If you know how many tokens in the Scanner, you can just pull them out:

```
Scanner scan = new Scanner ("4447 quince 11.45");
String PLU = scan.next();
String product = scan.next();
String price = scan.next();

Scanner scan = new Scanner ("This string has (exactly) 10 tokens:  a-b-c-d & 9.0  #10");
for (int i = 0; i <10; i++){
    String tok = scan.next();
    UI.println("Token " + i + " : "  +  tok);
}
```

- Tokens are Strings (whether they look like words, numbers, other…)
- Can only take them out in order

Reading from a Scanner

- If you know the number of tokens and their types, can extract as different types.
  - Eg, if the string has an integer, a word, and a double:

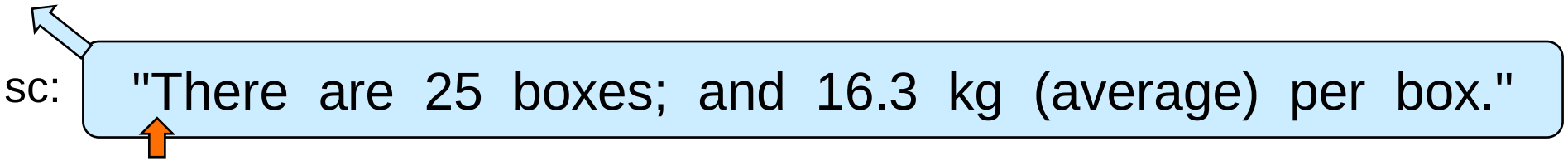
```
Scanner scan = new Scanner ("4447 quince 11.45");
int PLU = scan.nextInt();
String product = scan.next();
double price = scan.nextDouble();

Scanner scan = new Scanner ("4430 pineapple 6.82");
double PLU = scan.nextDouble();
double product = scan.nextDouble();
int price = scan.nextInt();
```

- Safe to read a number as a String, or an integer as a double.
- Not safe to read a non-number as a number, or a double as an int

Reading from a Scanner

- If the number of tokens in a scanner is unknown,
  How can you tell when to stop?

```
Scanner sc = new Scanner (UI.askString("Enter a line of text"));
```



- Scanner lets you ask if there is another token using the .hasNext() method:

  sc.hasNext() ⇒ true or false: is there another token in the scanner?

- Can use a while loop with a Scanner:

```
while (sc.hasNext()){
    String word = sc.next();
    ....
}
```

Reading from a Scanner

- If the types of the tokens in a Scanner can vary,
  How can you tell what type they are?

- Scanner lets you "peek" at the next token using the .hasNext…() methods:

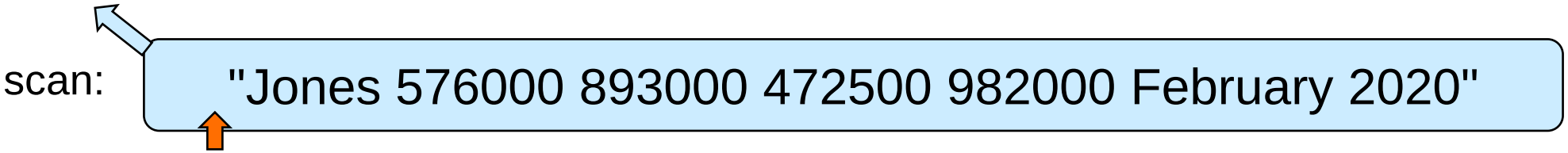
  scan.hasNextInt() ⇒ true or false: is there another token AND is it an integer?

  scan.hasNextDouble() ⇒ true or false: is there another token AND is it a number?

```
Scanner sc = new Scanner (UI.askString("Enter some tokens"));
int total = 0;
while (sc.hasNext()){
    if (sc.hasNextInt()){   // if the next token is an integer, read it and add to total
        int num = sc.nextInt();
        total = total + num;
    }
    else {                  // if next token is not an integer, read it and throw it away
        sc.next();
    }
}
```

Reading from a Scanner

- More unknown values:




```
Scanner scan = new Scanner (line);
String salesperson = scan.next();
double total = 0;
while (scan.hasNextDouble()){
        total = total + scan.nextDouble();
}
String month = scan.next();
int year = scan.nextInt();
```

Scanner "next" methods

Method	What it does	Returns
next()	Read and return next token	String
nextInt() nextDouble()	Read the next token. Return it as a number, if it is a number. Throws an exception if it is not a number.	int double
nextBoolean()	Read the next token. Return true if it is "true"; return false if it is "false". Throws an exception if it is anything else.	boolean
hasNext()	Returns true if there is another token	boolean
hasNextInt() hasNextDouble() hasNextBoolean()	Returns true if there is another token AND the next token is an int / double / Boolean	boolean
nextLine()	Read characters up to the next end-of-line and return them as a string. Reads and throws away the end-of-line character. If the first character is an end-of-line, then it returns an empty string ("").	String
Go to Javadocs, there are many methods		