

## Your Life After TT!

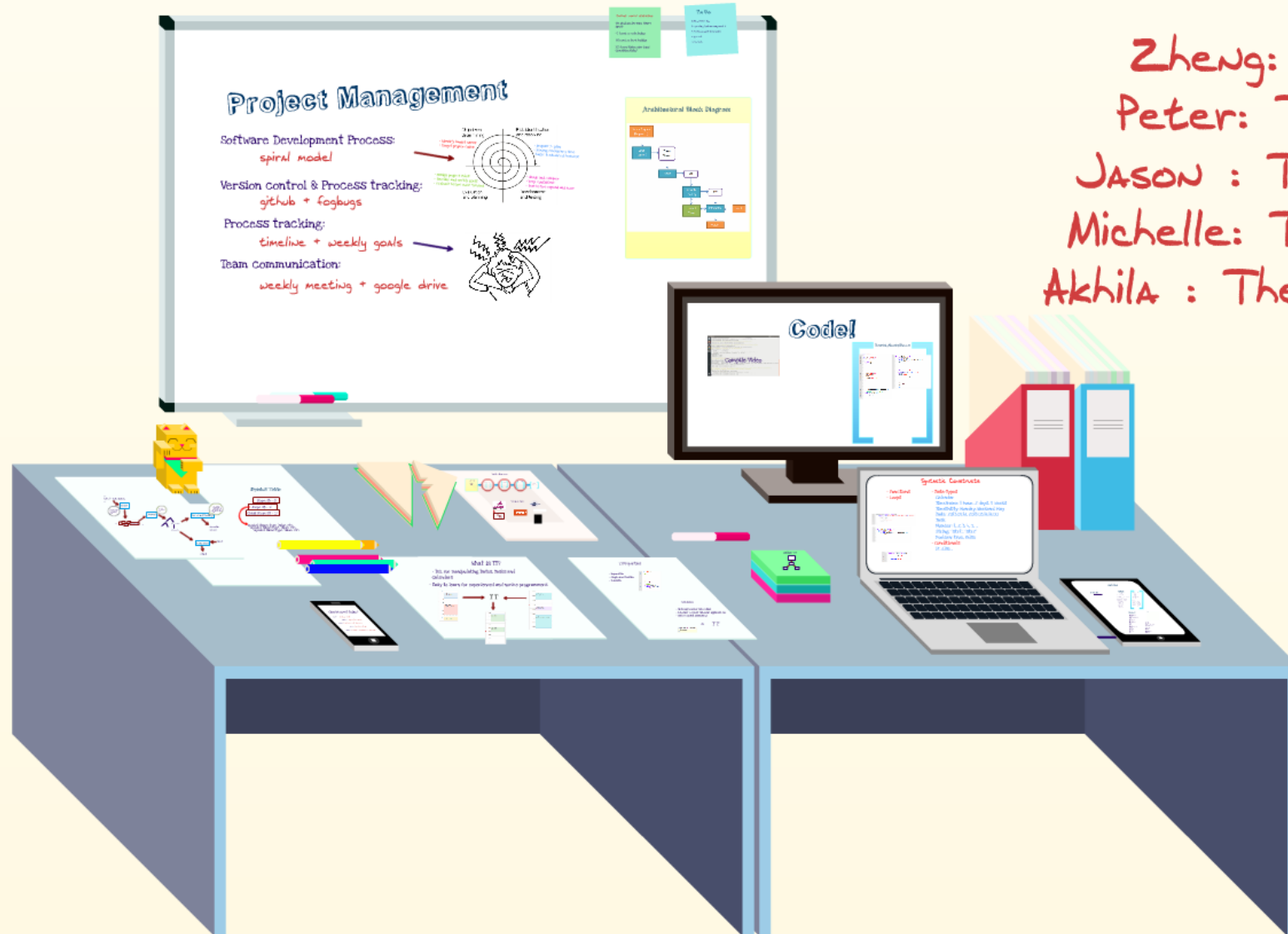


## Time & Task



Zheng: The PM  
Peter: The Guru  
Jason: The Architect  
Michelle: The Tester  
Akshita: The Integrator

# Time & Task



Zheng: The PM  
Peter: The Guru  
Jason : The Architect  
Michelle: The Tester  
Akhila : The Integrator

# Can We meet today?

JaSon: No, I'm at work!

Michelle: Nope, I have classes.

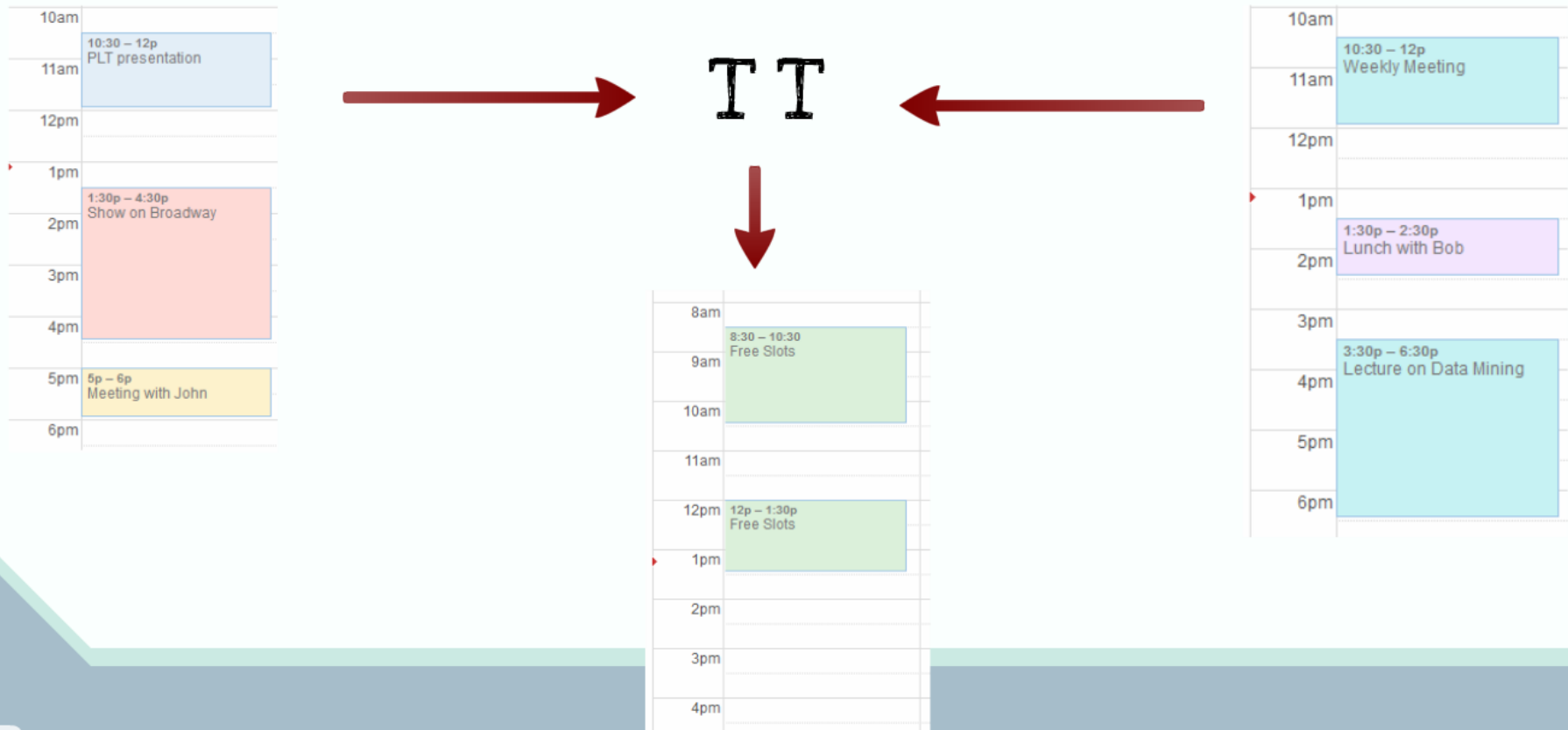
Zheng: I am free in the afternoon.

Peter: I am free all day.

Akhila: No, I am meeting with my research group

# what is IT?

- DSL for manipulating Dates, Tasks and Calendars
- Easy to learn for experienced and novice programmers



# IT Properties

- Imperative
- Simple and Familiar
- Readable

```
1 import "<std>";
2
3 //FAMILIAR
4 main() {
5     //SIMPLE
6     Date a = 2013.05.16;
7     Date b = a + 1 day;
8     //output 2013.05.17
9     print(b);
10
11 //READABLE
12 Calendar myCalendar;
13 every Task t in myCalendar {
14     print(t);
15 }
16 }
```

# Motivation

- Java deprecated Date class
- Relevant context Calendar applications
- Gather useful statistics



vs.



```
java.util.Date d = new java.util.Date();  
int year = d.getYear();
```

```
int java.util.Date.getYear()
```

```
@Deprecated
```

# Collect useful statistics

The windows dev team @MSFT  
Spent :

40 hours on code design

55 hours on dev & testing

100 hours fixing user bugs  
(something fishy)

# To Do

1. fix grammar bug
2. operating Systems assignment :(
3. Meet my project team mates
4. pay rent
5. call mom

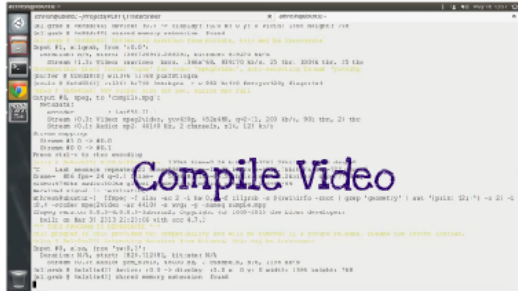


# Tutorial\_MeetingTime.tt

```
1 import "<std>";
2
3 Date start = 2013.05.16;
4 Date end = 2013.05.17;
5
6 main() {
7     Calendar c1;
8     Calendar c2;
9
10    c1.name = "Michelle's Day";
11    c1.start = start;
12    c1.end = end;
13
14    Task t;
15    t.name = "Team Meeting";
16    t.start = 2013.05.16.10;
17    t.end = 2013.05.16.12;
18    addTask(c1, t);
19
20    c2.name = "Jason's Day";
21
22    Task t4;
23    t4.name = "Tennis Lesson";
24    t4.start = 2013.05.16.11;
25    t4.end = 2013.05.16.12;
26    addTask(c2, t4);
27
28    Calendar c3;
29    c3 = getAvailableOneHourMeetingSlots(c1, c2);
30
31    // loop through c3, and print out
32    every Task meeting in c3
33    {
34        print(meeting);
35    }
36 }
```

```
37
38 Boolean conflict(Calendar c, Task t) {
39     Boolean conflicts = false;
40     every Task task in c {
41         if(not (task.end < t.start || t.end < task.start)){
42             conflicts = true;
43         }
44     }
45     return conflicts;
46 }
47
48 Calendar getAvailableOneHourMeetingSlots(Calendar cal1, Calendar cal2) {
49     Calendar c;
50     c.name = "Meeting Calendar";
51     TimeFrame meetingLength = 1 hours;
52
53     every Date d from start to end by 30 minutes {
54         Task t;
55         t.name = "Meeting";
56         t.start = d;
57         t.end = d + meetingLength;
58
59         Boolean con1 = conflict(cal1, t);
60         Boolean con2 = conflict(cal2, t);
61
62         if(not con1 && not con2)
63         {
64             addTask(c, t);
65         }
66     }
67     return c;
68 }
```

# Code!



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```

## Syntactic Con

- Functions
- Loops

- Data-Types
- Calendar
- TimeFrame

# Syntactic Constructs

- Functions
- Loops

```
15 populateTasks( Calendar c, String name) {
16     every Date d from 2013.05.16.12.00 to 2013.05.16.17.00 by 30 minutes {
17         Task t;
18         t.name = name;
19         t.start = d;
20         t.end = d + 30 minutes;
21         addTask(c, t);
22     }
23 }
```

```
3
4 Boolean conflict( Calendar c, Task t) {
5     Boolean conflicts = false;
6     every Task task in c {
7         if (not (task.end < t.start || t.end < task.start)) {
8             conflicts = true;
9             break;
10        }
11    }
12    return conflicts;
13 }
14 }
```

```
15 Boolean isMay(Date d){
16     if (is(d, May))
17         return true;
18     return false;
19 }
```

- Data-Types

Calendar

TimeFrame: 1 hour, 2 days, 3 weeks

TimeEntity: Monday, Weekend, May

Date: 2013.05.16, 2013.05.16.16.00

Task

Number: 1, 2, 3, 4, 5, ...

String: "str1", "str2"

Boolean: true, false

- Conditionals

if...else...

- Functions
- Loops

```
15 populateTasks( Calendar c, String name) {
16     every Date d from 2013.05.16.12.00 to 2013.05.16.17.00 by 30 minutes {
17         Task t;
18         t.name = name;
19         t.start = d;
20         t.end = d + 30 minutes;
21         addTask(c, t);
22     }
23 }
```

```
3
4 Boolean conflict( Calendar c, Task t) {
5     Boolean conflicts = false;
6     every Task task in c{
7         if ( not (task.end < t.start || t.end < task.start)) {
8             conflicts = true;
9             break;
10        }
11    }
12    return conflicts;
13 }
14
```

## - Data-Types

Calendar

TimeFrame: 1 hour, 2 days, 3 weeks

TimeEntity: Monday, Weekend, May

Date: 2013.05.16, 2013.05.16.16.00

Task

Number: 1, 2, 3, 4, 5, ...

String: "str1", "str2"

Boolean: true, false

## - Conditionals

if...else...

```
15 Boolean isMay(Date d) {
16     if (is(d, May))
17         return true;
18     return false;
19 }
```

**Collect useful statistics**

The Microsoft dev team @MSFT spent:

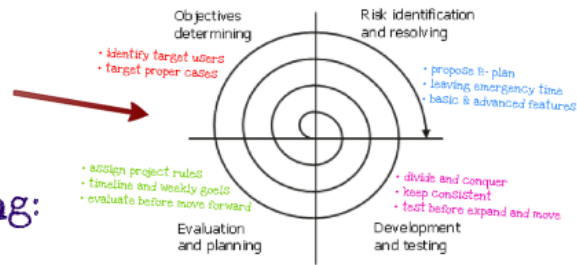
- 40 hours on code design
- 50 hours on dev & testing
- 100 hours fixing other bugs (something fishy!)

**To Do**

1. fix printer bug
2. upgrade software development
3. meet my project team midist
4. pay rent
5. call mom

# Project Management

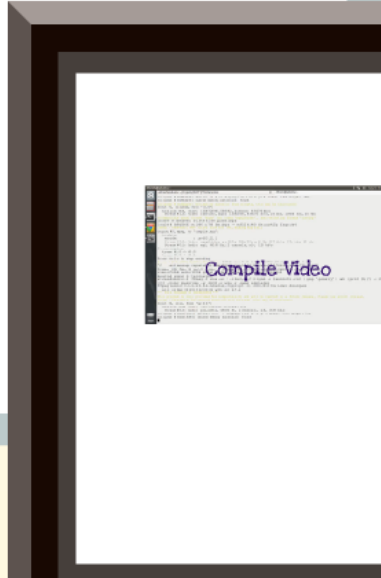
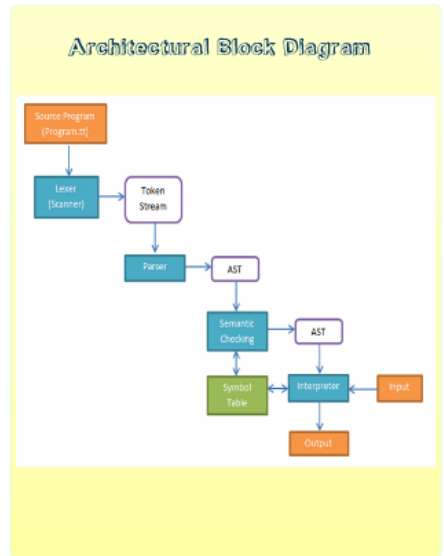
Software Development Process:  
*spiral model*



Version control & Process tracking:  
*github + fogbugs*

Process tracking:  
*timeline + weekly goals*

Team communication:  
*weekly meeting + google drive*





# Project Management

Software Development Process:

*spiral model*

Version control & Process tracking:

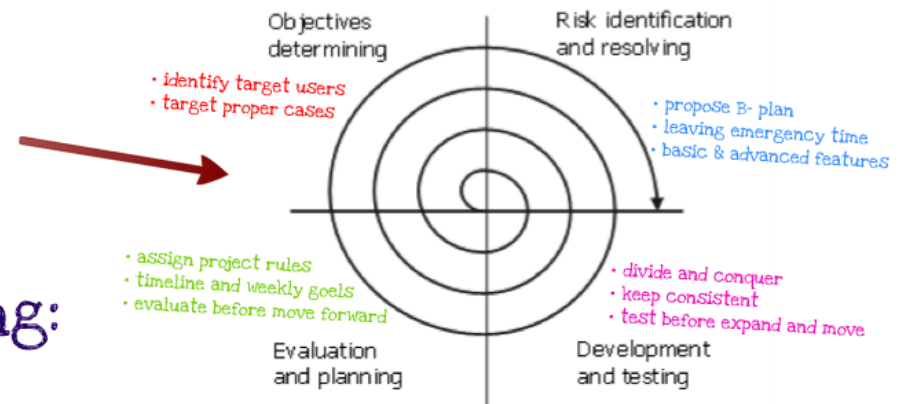
*github + fogbugs*

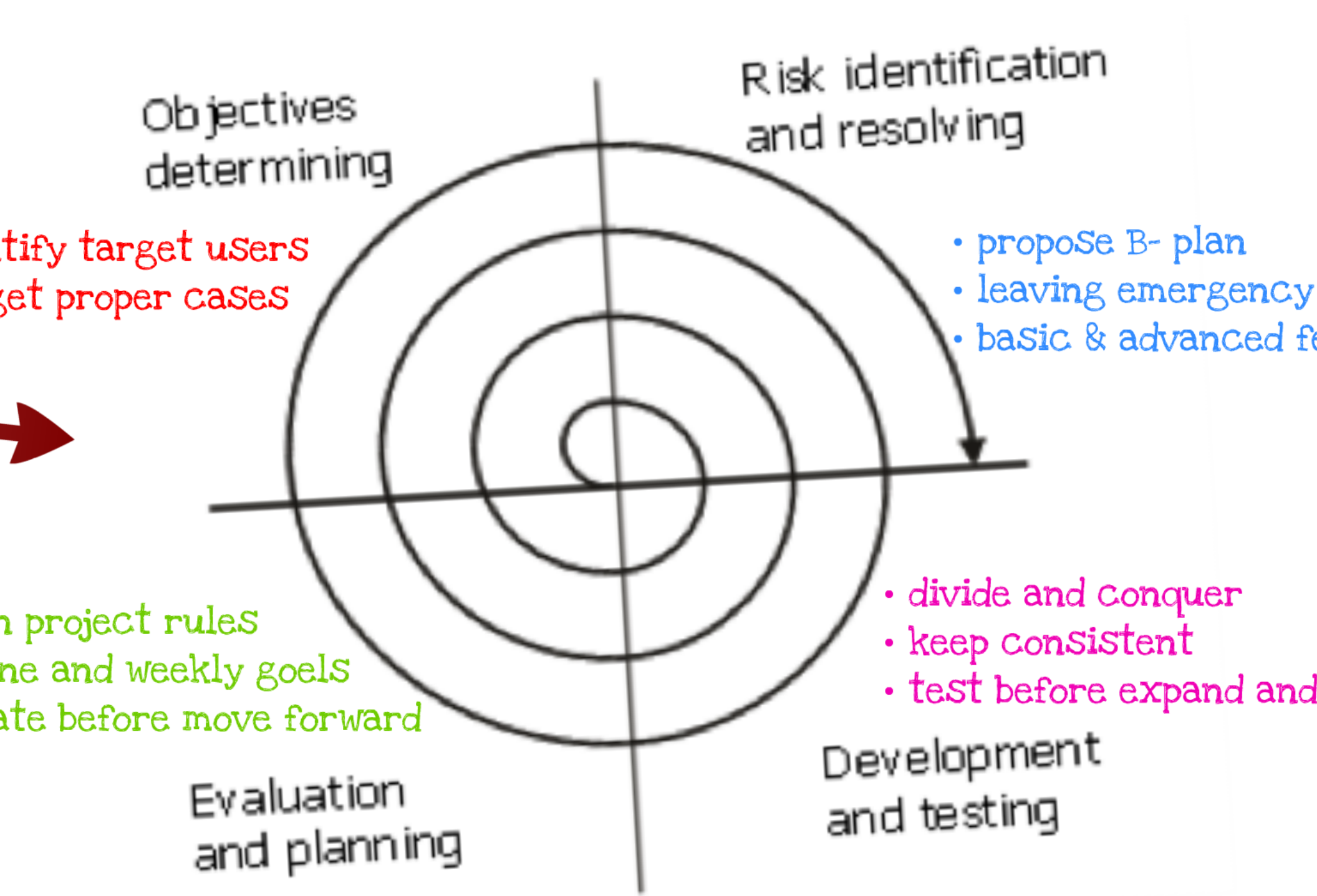
Process tracking:

*timeline + weekly goals*

Team communication:

*weekly meeting + google drive*





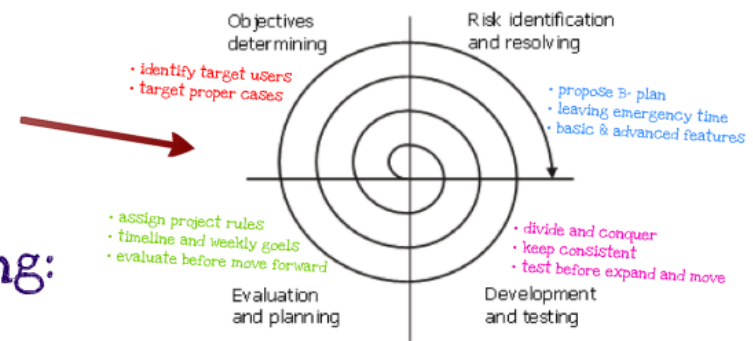
# Project Management

Software Development Process:  
*spiral model*

Version control & Process tracking:  
*github + fogbugs*

Process tracking:  
*timeline + weekly goals*

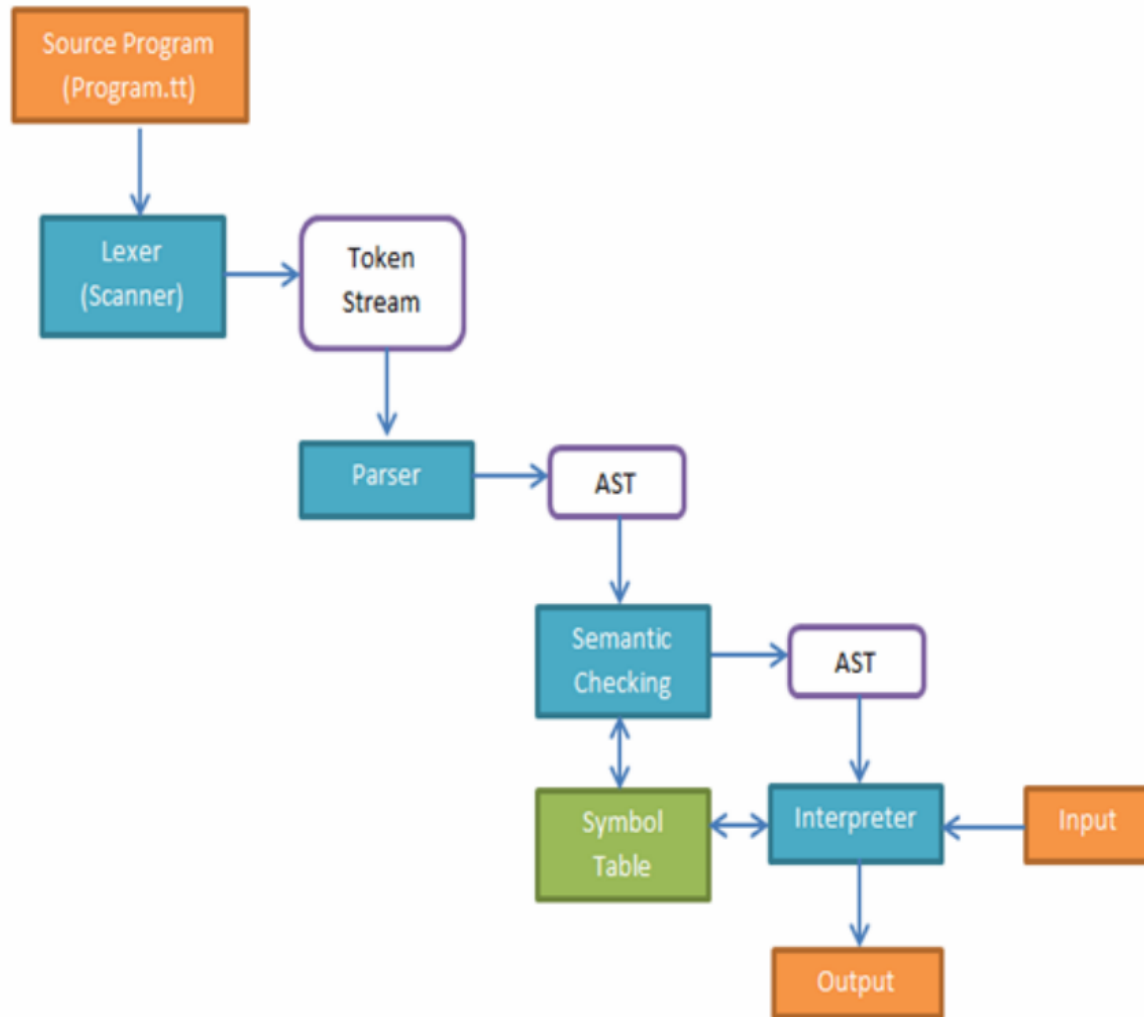
Team communication:  
*weekly meeting + google drive*



Correct use of  
The windows dev tool  
spent :  
40 hours on code de  
55 hours on dev & te  
100 hours fixing use  
(something fishy)

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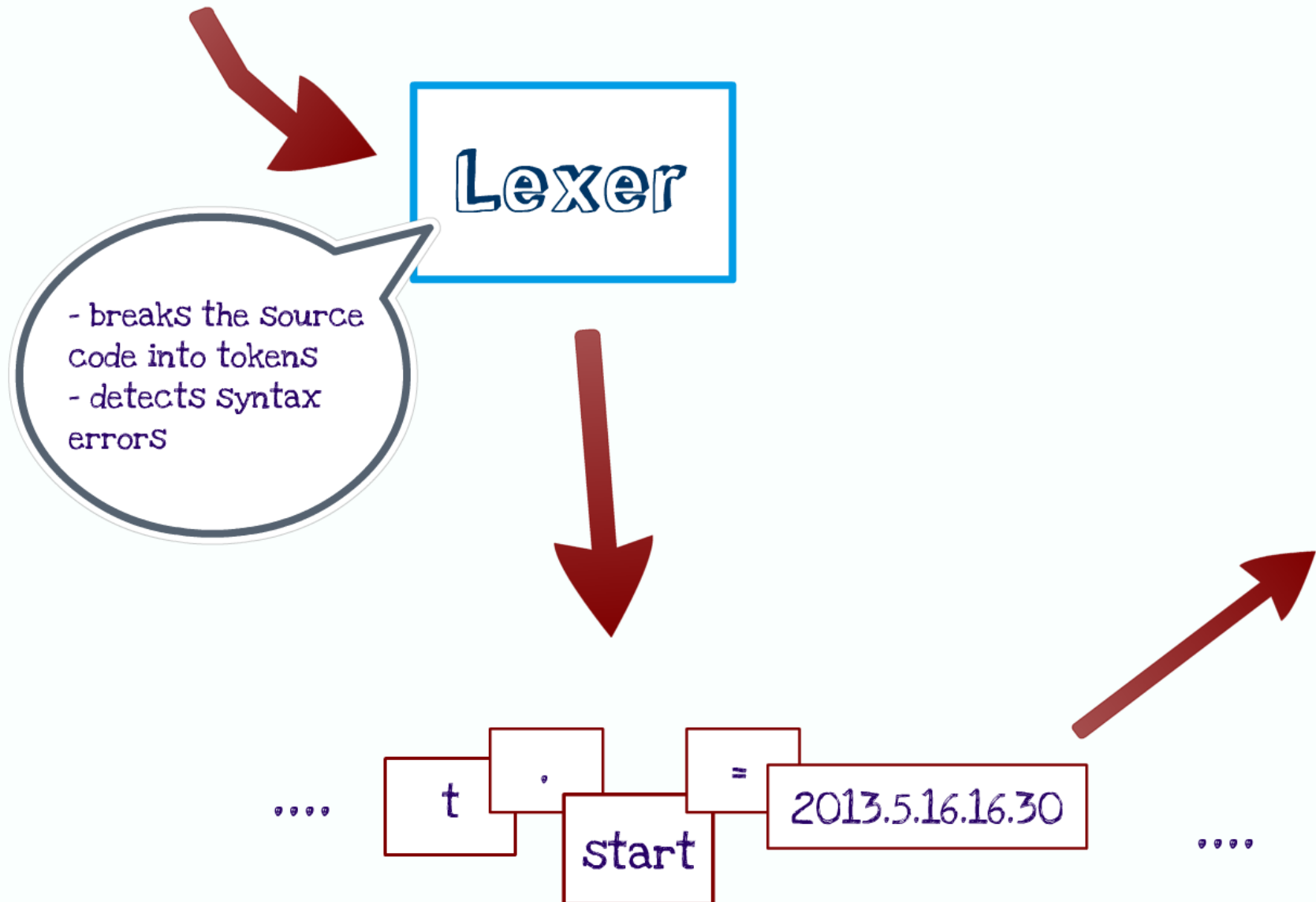
# Architectural Block Diagram



....

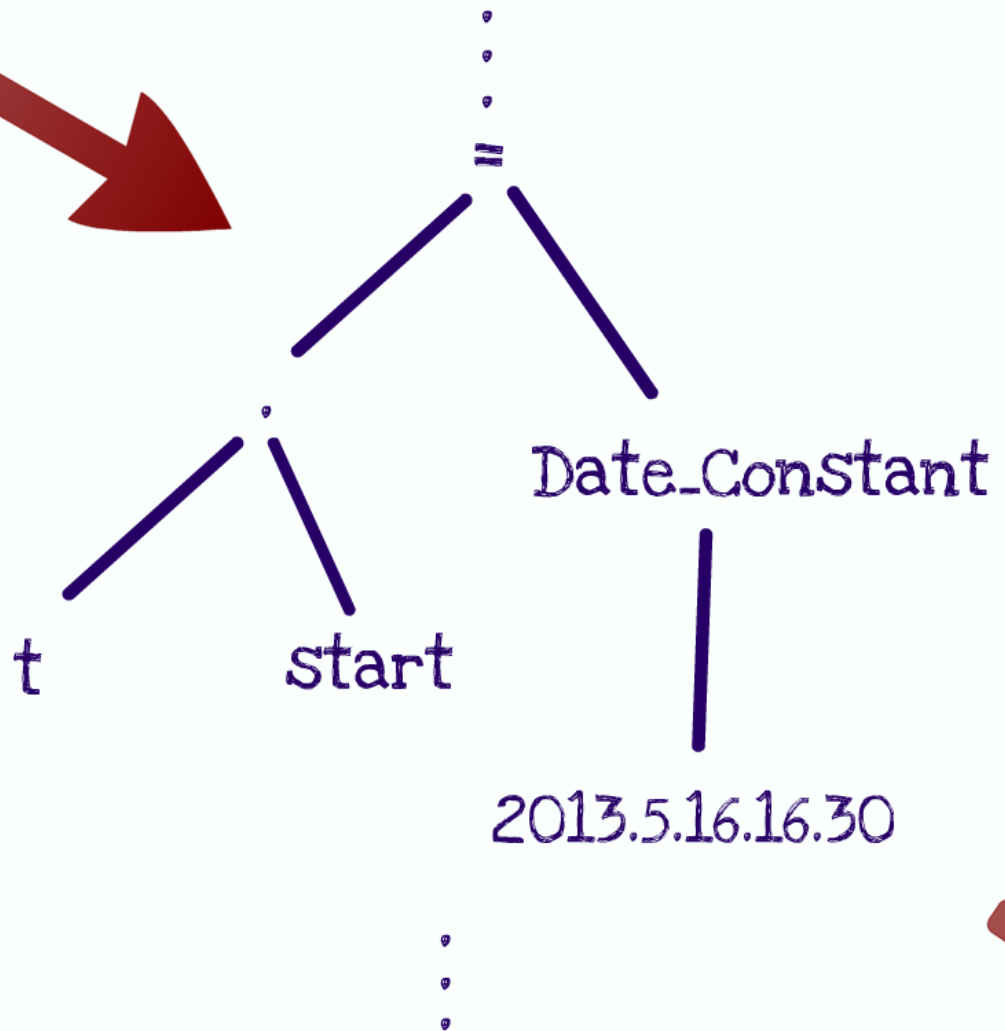
```
t.start = 2013.5.16.16.30;
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....



Parser

- generates an AST
- detects syntax errors



# Semantic Checking

- Type Checking
- analyze functions and variables and put them into Symbol Table

Semantic  
Errors





The diagram illustrates the flow of an interpreter. It features a central box labeled 'Interpreter' with a blue border. A red arrow points from the top-left towards the box. Another red arrow points from the right towards the box, with the word 'Input' written in purple next to it. A third red arrow points downwards from the bottom of the box towards the word 'Output', which is also written in purple. The background is white with a light green footer bar.

Interpreter



Input



Output




# Symbol Table

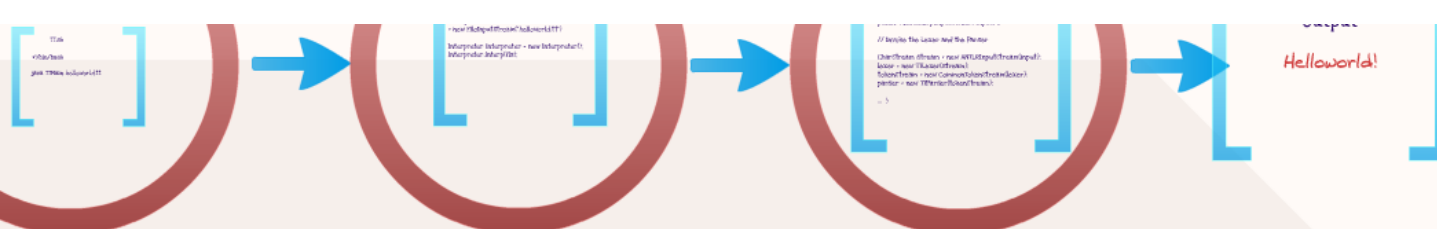
Scope (ID = 2)

Scope (ID = 1)

Global Scope (ID = 0)



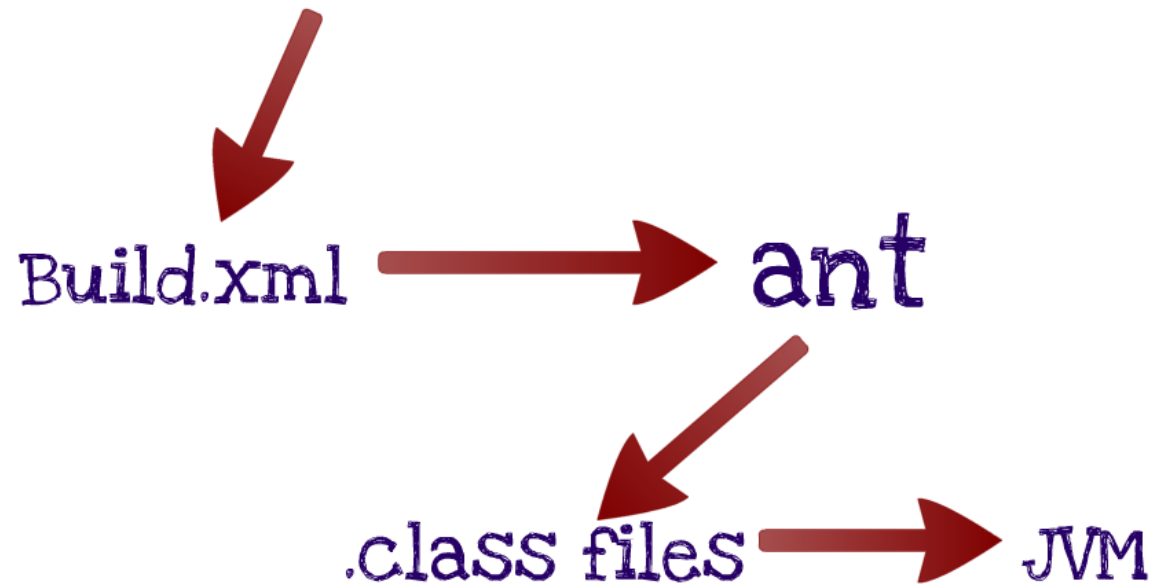
Symbol: Name, Type, Value, etc.  
Symbol: Name, Type, Value, etc.  
Symbol: Name, Type, Value, etc.

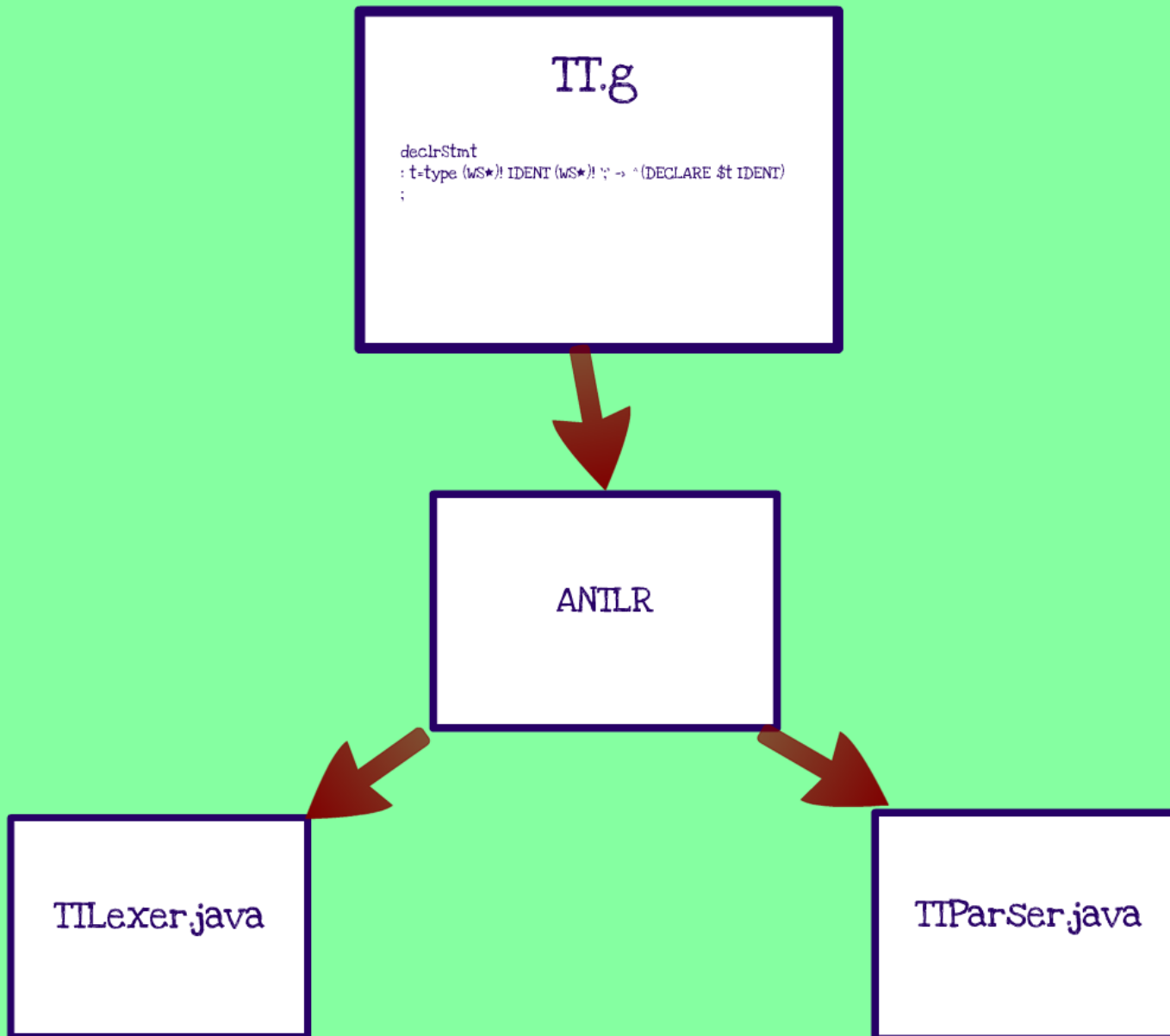


### Development Tools



TIParSer, TILexer, TIMain, Interpreter.java

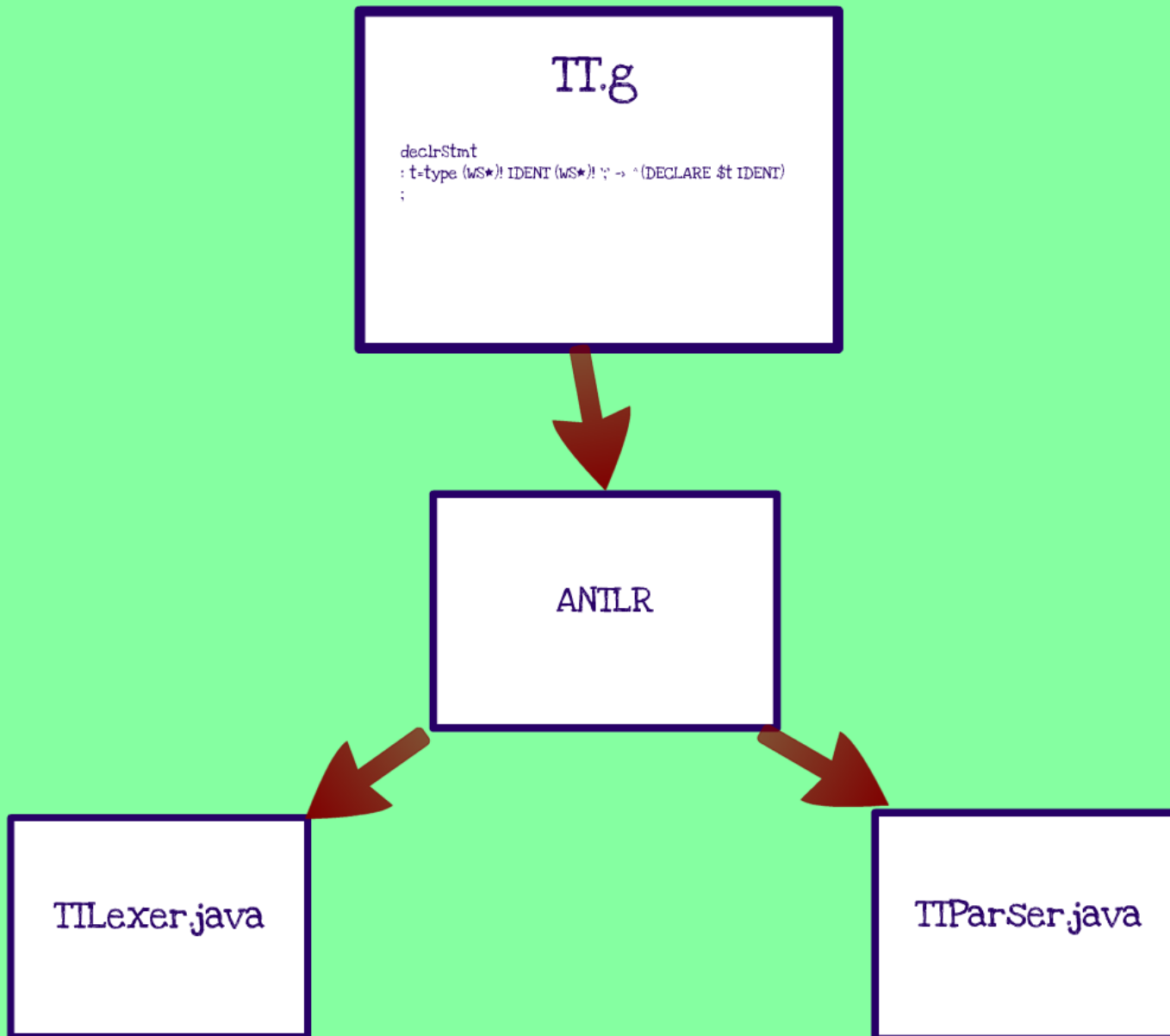




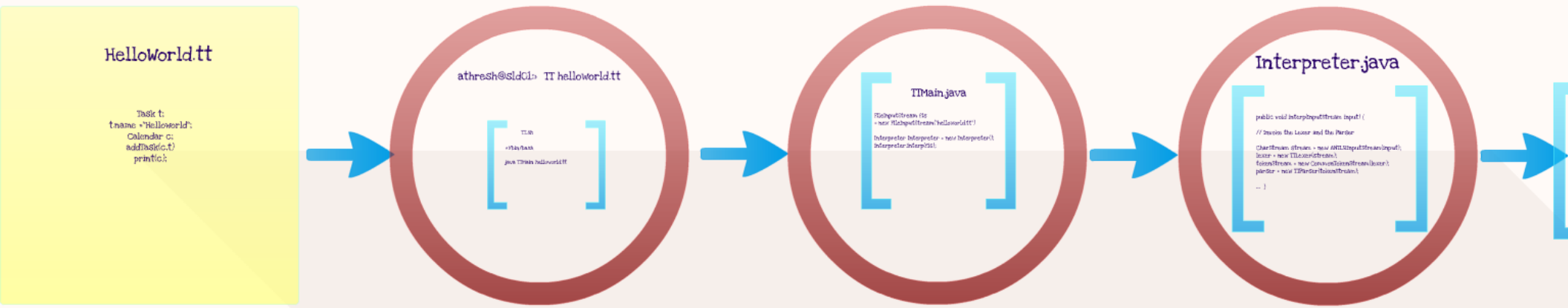
# II.g

declrStmt

: t=type (WS★)! IDENT (WS★)! ";" -> ^ (DECLARE \$t IDENT)  
;



# Run-Time Environment



## Development Tools



# HelloWorld.tt

```
Task t;  
t.name = "Helloworld";  
Calendar c;  
addTask(c,t)  
print(c);
```





```
athresh@sld01:~$ TT helloworld.tt
```

```
TT.sh
```

```
#!/bin/bash
```

```
java TTMain helloworld.tt
```

TT.Sh

```
#!/bin/bash
```

```
java TTMain helloworld.tt
```

A diagram illustrating the execution of a Java program. A large red circle is centered on the slide. Inside this circle, the text 'TMain.java' is displayed in a dark blue, monospaced font. Below the title, two lines of Java code are shown in the same font: 'FileInputStream fis' followed by '= new FileInputStream("helloworld.txt")' on the next line, and 'Interpreter interpreter = new Interpreter();' followed by 'interpreter.interp(fis);' on the next line. The code is enclosed within large, light blue square brackets. A blue arrow points from the left edge of the slide towards the left side of the red circle. Another blue arrow points from the right side of the red circle towards the right edge of the slide.

## TMain.java

```
FileInputStream fis  
= new FileInputStream("helloworld.txt")  
  
Interpreter interpreter = new Interpreter();  
interpreter.interp(fis);
```

# TIMain.java

```
FileInputStream fis  
= new FileInputStream("helloworld.tt")
```

```
Interpreter interpreter = new Interpreter();  
interpreter.interp(fis);
```

# Interpreter.java

```
public void interp(InputStream input) {  
  
    // Invoke the Lexer and the Parser  
  
    CharStream stream = new ANTLRInputStream(input);  
    lexer = new TILexer(stream);  
    tokenStream = new CommonTokenStream(lexer);  
    parser = new TIParser(tokenStream);  
  
    ... }  
}
```



```
public void interp(InputStream input) {  
  
    // Invoke the Lexer and the Parser  
  
    CharStream stream = new ANTLRInputStream(input);  
    lexer = new TILexer(stream);  
    tokenStream = new CommonTokenStream(lexer);  
    parser = new TTParser(tokenStream);  
  
    ... }  
}
```

Output

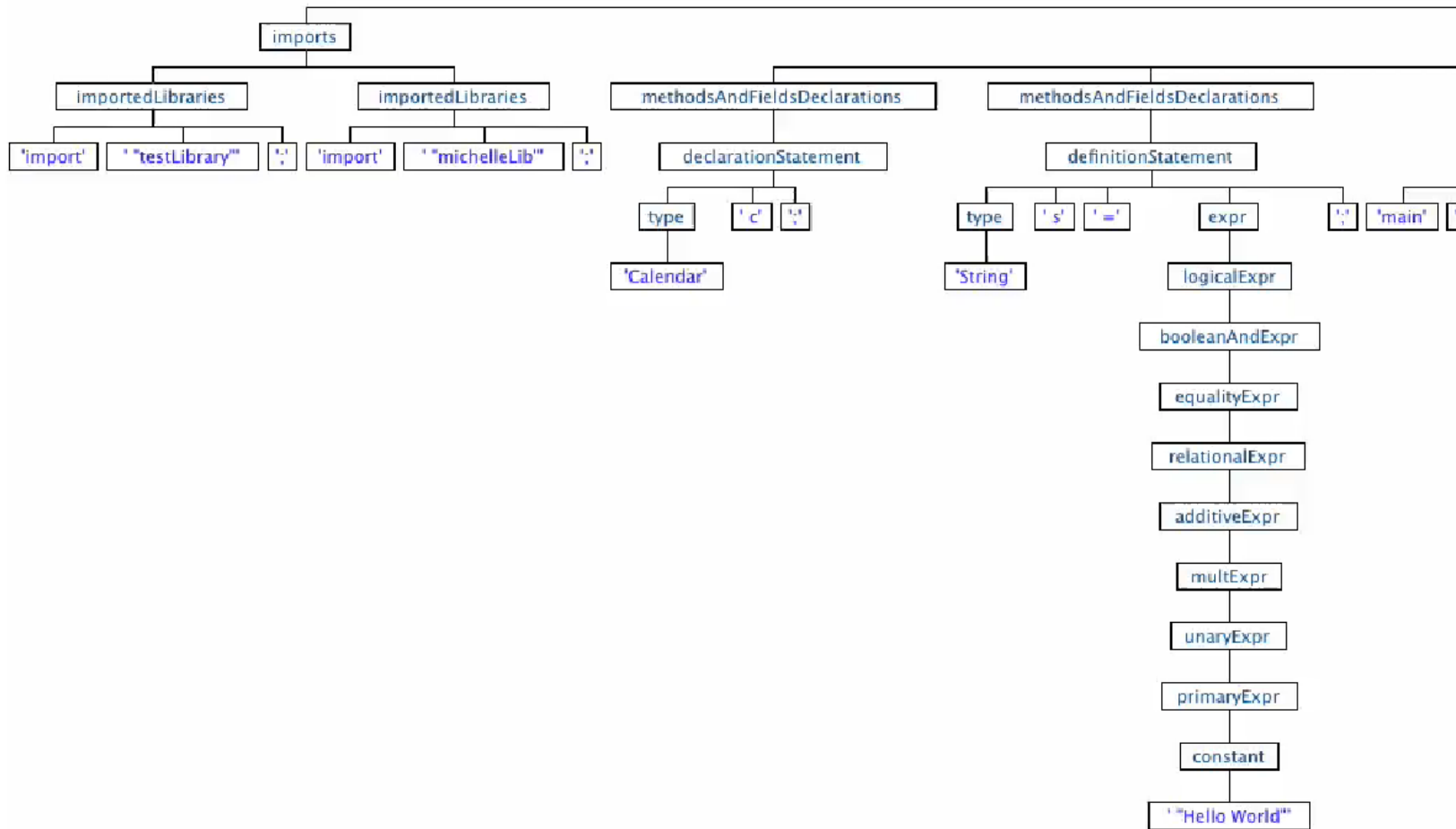
Hello world!







# Parse Tree:



# FogBugz:

<https://plt-tt.fogbugz.com/>

## CASES IN SAMPLE PROJECT

<input type="checkbox"/>			Case	Title	Status
<input type="checkbox"/>			2	String does not accept spaces commenting out the two rul...	Closed (Fixed)
<input type="checkbox"/>			3	IDENT and STRING conflict use fragment if two Lexer rule...	Closed (Fixed)
<input type="checkbox"/>			4	YEAR and NUMBER conflict use fragment keyword	Closed (Fixed)
<input type="checkbox"/>			5	Force bracket use in if and if else statements? Yes, force ...	Closed (Fixed)
<input type="checkbox"/>			6	timeFrame and timeFrameConstant break allowing spaces ...	Closed (Fixed)
<input type="checkbox"/>			7	logical statements should take IDENT ex ( e < 3 ) someo...	Resolved (Fixed)
<input type="checkbox"/>			8	what are all the every loop options Yes, include the last 2 ...	Closed (Fixed)
<input type="checkbox"/>			9	punctuation should be allowed inside of strings try to use ...	Resolved (Fixed)
<input type="checkbox"/>			10	should Read be upper case and print lower case Read sho...	Closed (Fixed)
<input type="checkbox"/>			11	timeFrameDefnStmt should allow assignment with 'until' W...	Closed (Fixed)
<input type="checkbox"/>			12	definition of a variable from another variable? var1 = var2;...	Closed (Fixed)
<input type="checkbox"/>			13	we shouldn't need WS* in between definitions in .g file, it is...	Closed (Fixed)
<input type="checkbox"/>			14	dateConstant does not work I think we can just accept 01-...	Resolved (Fixed)
<input type="checkbox"/>			15	Discontinuity Timeframe or TimeFrame	Resolved (Fixed)
<input type="checkbox"/>			16	Java.util.Calendar vs our Calendar.java We are probably ...	Closed (Fixed)

 Add Case

# JUnit:

```
public void testIfElse()
{
    FileInputStream fileStream = null;
    try {

        fileStream = new
        FileInputStream("src/columbia/pl1/tt/programs/ifelse.tt");
        interpreter.interp(fileStream);

        String[] programOut = outContent.toString().split("\n");
        assertEquals(programOut[0], "YES n is in range");
        assertEquals(programOut[1], "c is less than d");

    } catch (FileNotFoundException e) {
        // TODO Auto-generated catch block
        e.printStackTrace();
    } catch (antlr.RecognitionException e) {
        // TODO Auto-generated catch block
        e.printStackTrace();
    } catch (IOException e) {
        // TODO Auto-generated catch block
        e.printStackTrace();
    } catch (RecognitionException e) {
        // TODO Auto-generated catch block
        e.printStackTrace();
    }
}
```

## Test Programs

- decalaredefine.tt
- ifelse.tt
- Loops.tt
- methods.tt
- operator.tt
- Program1.tt
- standard\_library.tt
- strcmp.tt

## Tutorial Programs

- tutorial\_daysLeft.tt
- tutorial\_HelloWorld.tt
- tutorial\_MeetingTime.tt
- tutorial\_RecurringTask.tt
- tutorial\_ScheduleTasks.tt
- tutorial\_StudyTime.tt

# Time & Task



Zheng: The PM  
Peter: The Guru  
Jason: The Architect  
Michelle: The Tester  
Akhila: The Integrator

# Your Life After TT!

## Conclusions

- Code Early
- Code Often
- Code Together

Questions?



# Conclusions

- Code Early
- Code Often
- Code Together

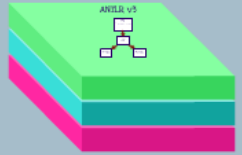
# Questions?





### Syntactic Constructs

- Functions
- Loops
- Data-Types
  - Calendar
  - TimeFrame: 1 hour, 2 days, 3 weeks
  - TimeEntity: Monday, Weekend, May
  - Date: 2013.05.16, 2013.05.16.00
  - Task
  - Number: 1, 2, 3, 4, 5, ...
  - String: 'str1', 'str2'
  - Boolean: true, false
- Conditionals
  - if, else...



### IT Properties

- Imperative
- Single and handler
- Sequential

### MultiPipes

- New abstracted data class
- Reduced context calculator application
- Better visual structure

vs. IT

TIParser, TILexer, ITMain, Interpreter.java

