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gramola

a graph modeling language

2013 Spring PLT	Team 4

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Outline

Introduction: Why and How Gramola

Language Highlights

Project Management

Gramola Translator Architecture

Runtime Environment

Test Plan

Demo

Conclusions

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Why Gramola?

- Graph Theory
  - An important subject of modern science
  - Applied in numerous domains: social networks
- Many languages support Graph, but they
  - are not developer-friendly: Longer learning curve
  - focus on limited functionalities like graph DB or draw
- Developers need the power of

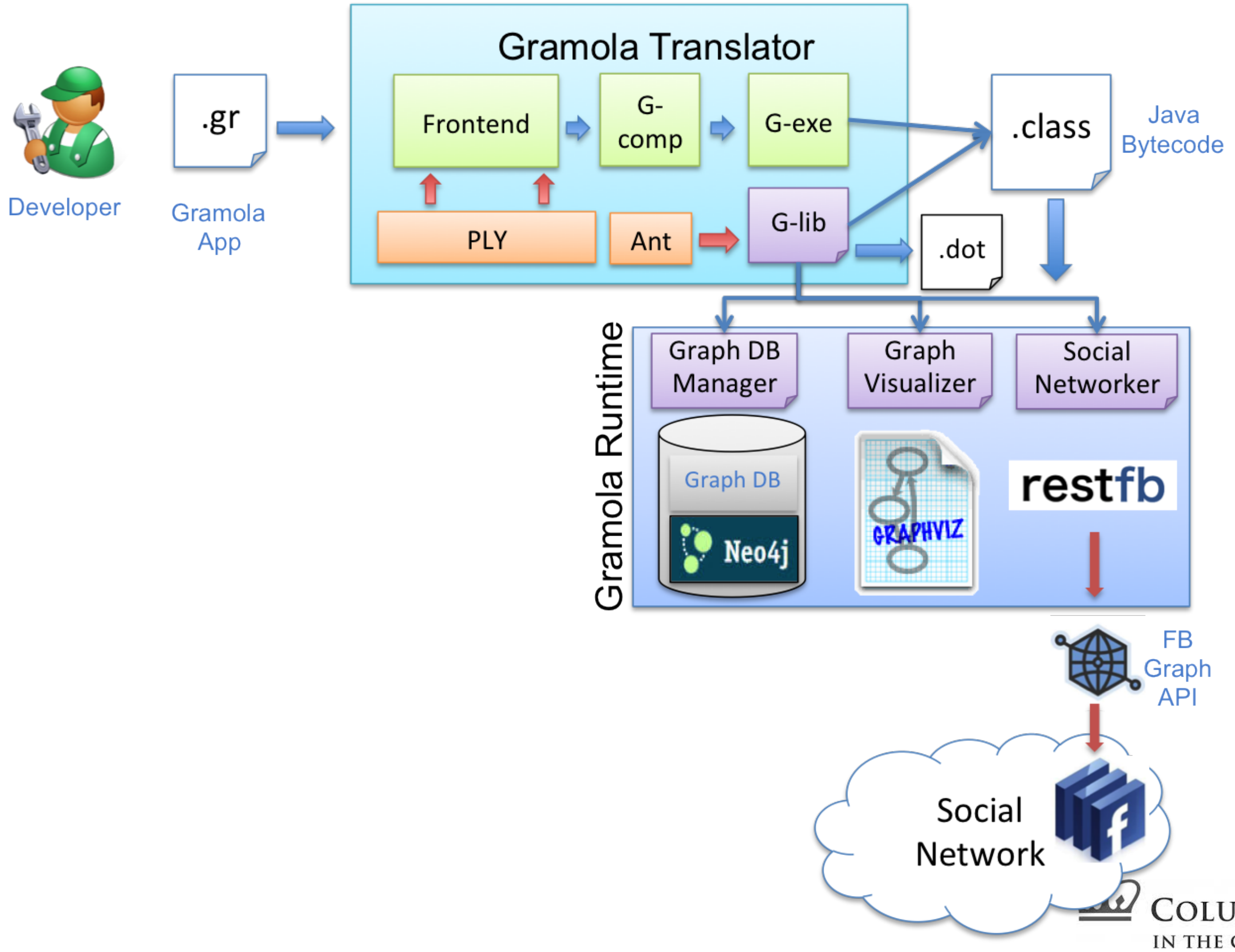
Graph-Native

Intuitive

Easy

Extensible

Gramola Module Overview



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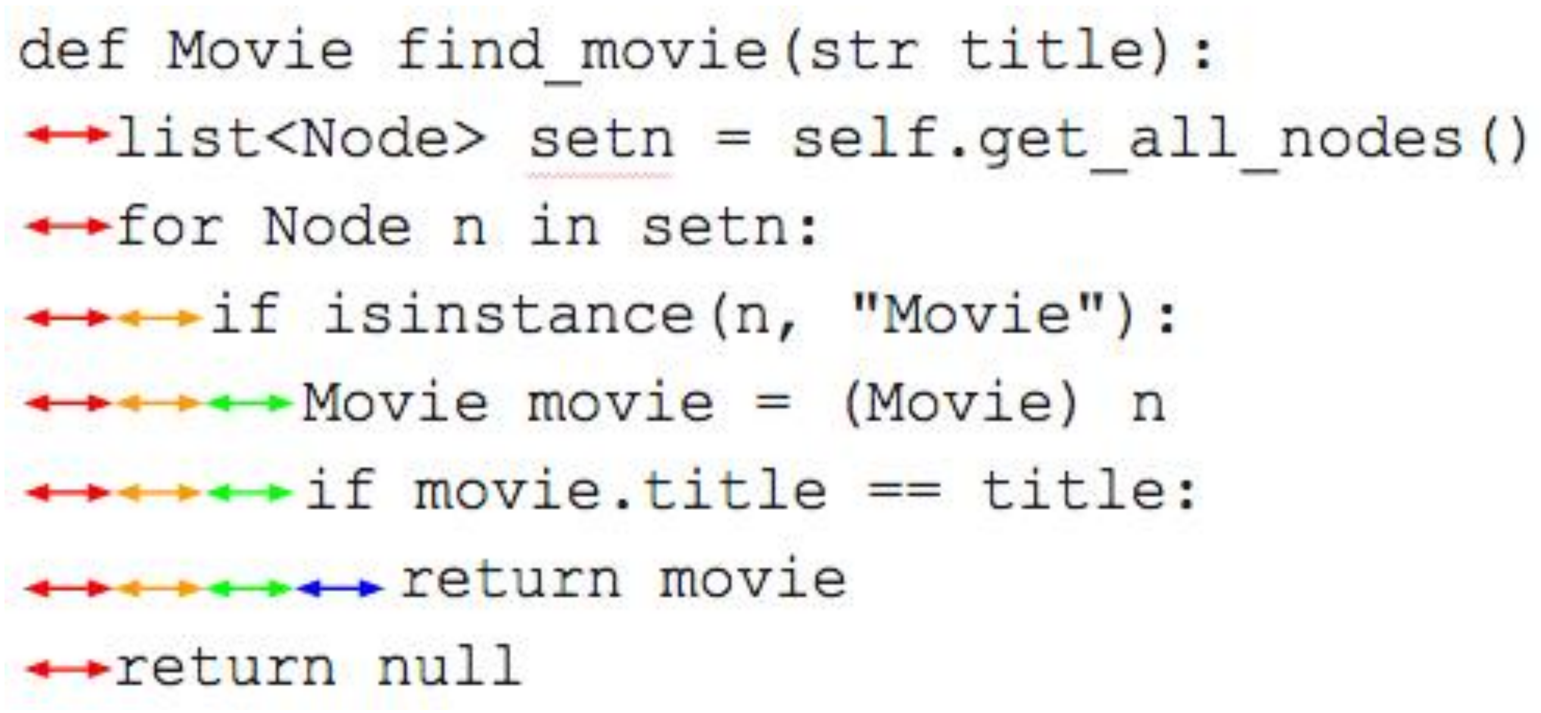
Language Highlights

Indentation-based blocks, logical lines



```
def Movie find_movie(str title):
	list<Node> setn = self.get_all_nodes()
	for Node n in setn:
		if isinstance(n, "Movie"):
			Movie movie = (Movie) n
			if movie.title == title:
				return movie
	return null
```

Language Highlights

Many "general-purpose" features

```
def void main():
  for object j in [2, 3]:
      int i = (int) j
      if i <= 3 and i > 2:
           print "i is less than 3"
      elif i + 1 <= 3:
           print "i + 1 less than 3"
```

Language Highlights

Classes, inheritance, namespaces

```
class Actor(Node):
  str name
  def Actor __init__(dict<str,str> dd,
                         str actorname):
      Node(dd)
      self.name = actorname
```

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Language Highlights

Built-ins

```
str token1 = "login_token"
Graph fb1 = get_fb(token1)
draw(fb1, "name", "type")
dump(fb1, "PLT")
```

Project Management

- Weekly Scheduled Meetings
- Google Drive
  - Document management
- Googlegroups
  - Announcement
  - Meeting Agenda
  - Coordinating remote work
- GitHub
  - Gramola version control

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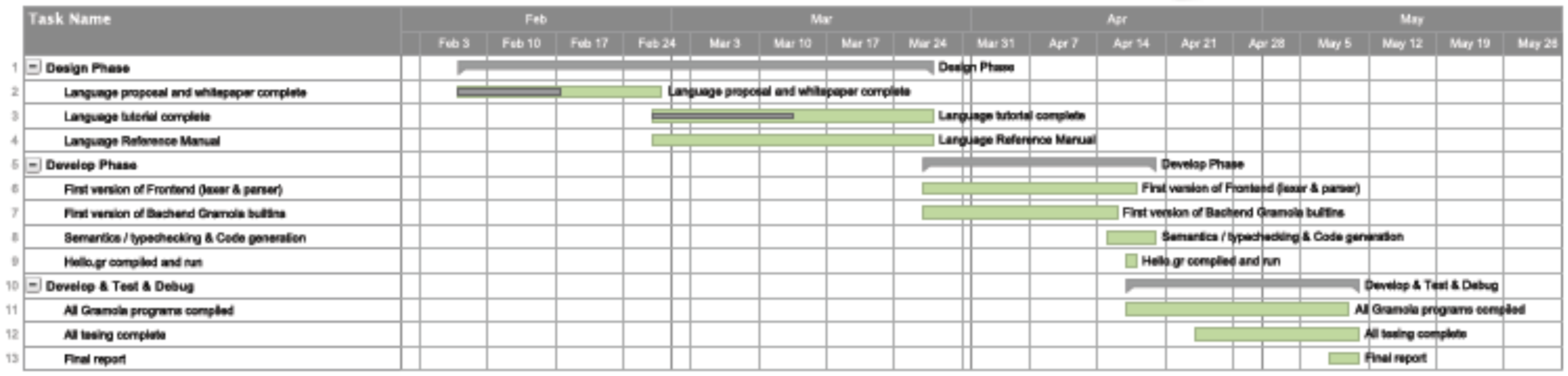
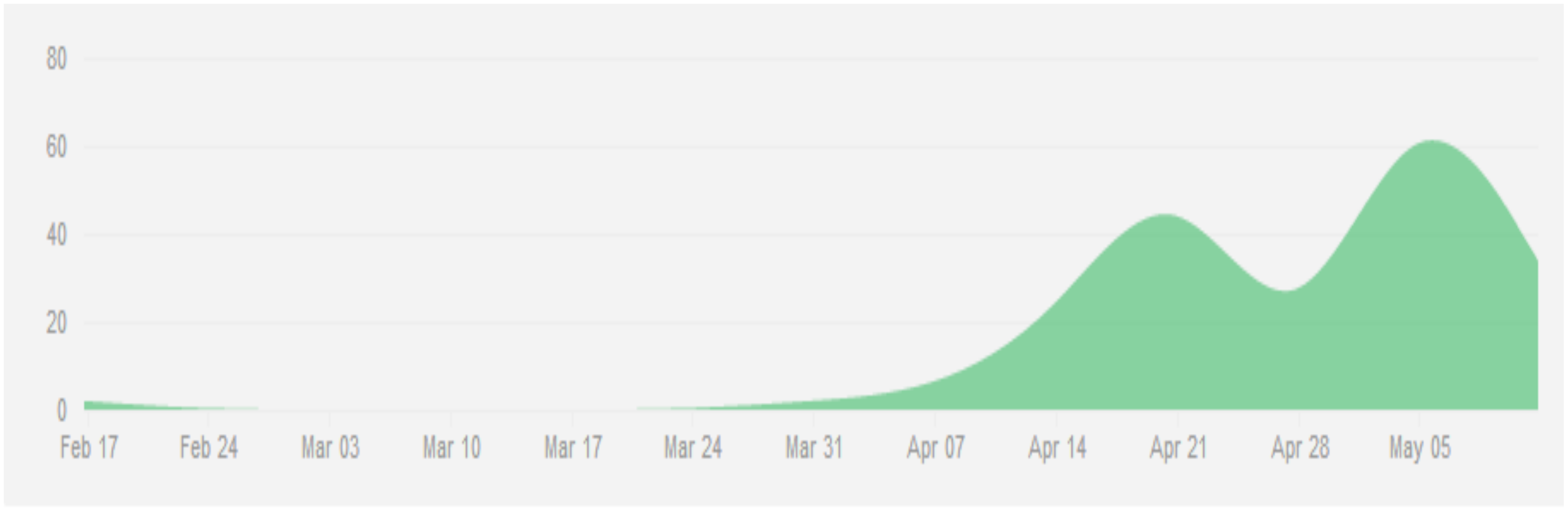
Project Management

- Iterative and incremental project planning
- Project timeline
    - Gantt Chart



Project Management

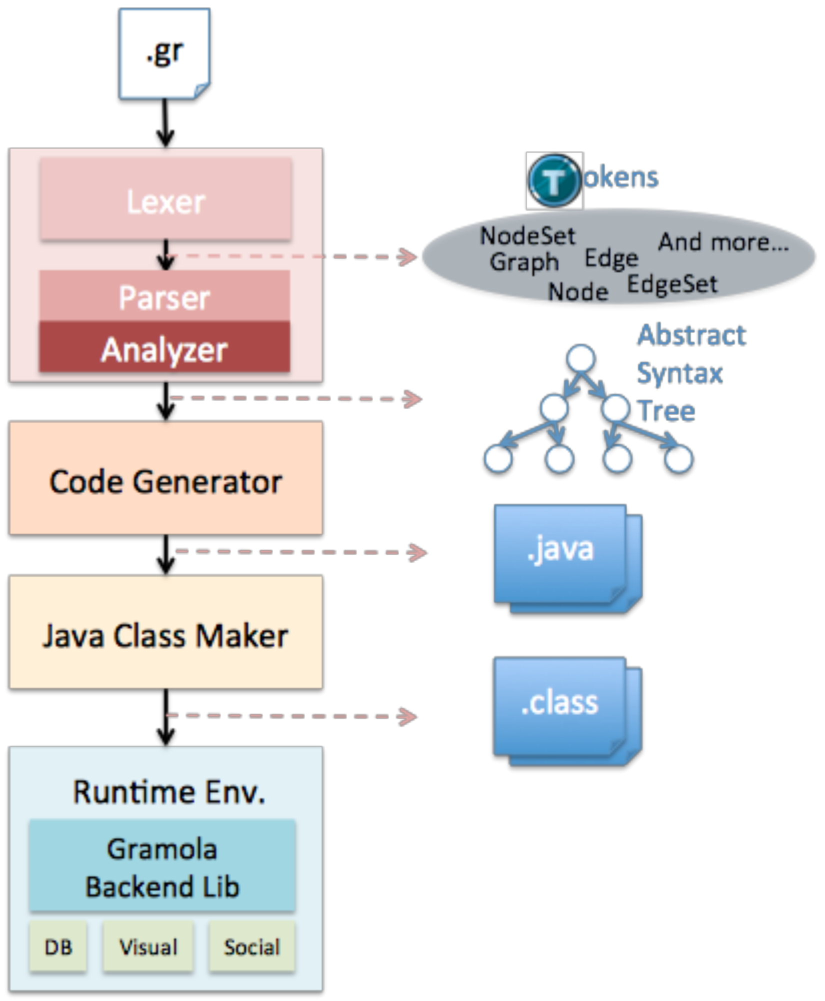
- GitHub commits by days



Development Environment

- Frontend: PLY/Python
- Backend: Java
- Version Control: Git with Github hosting
- **gcompile**

Gramola Translator



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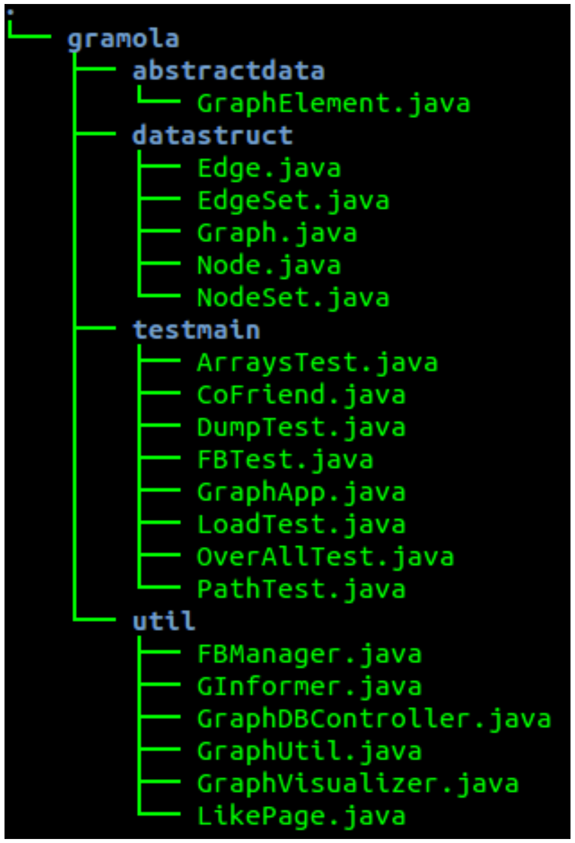
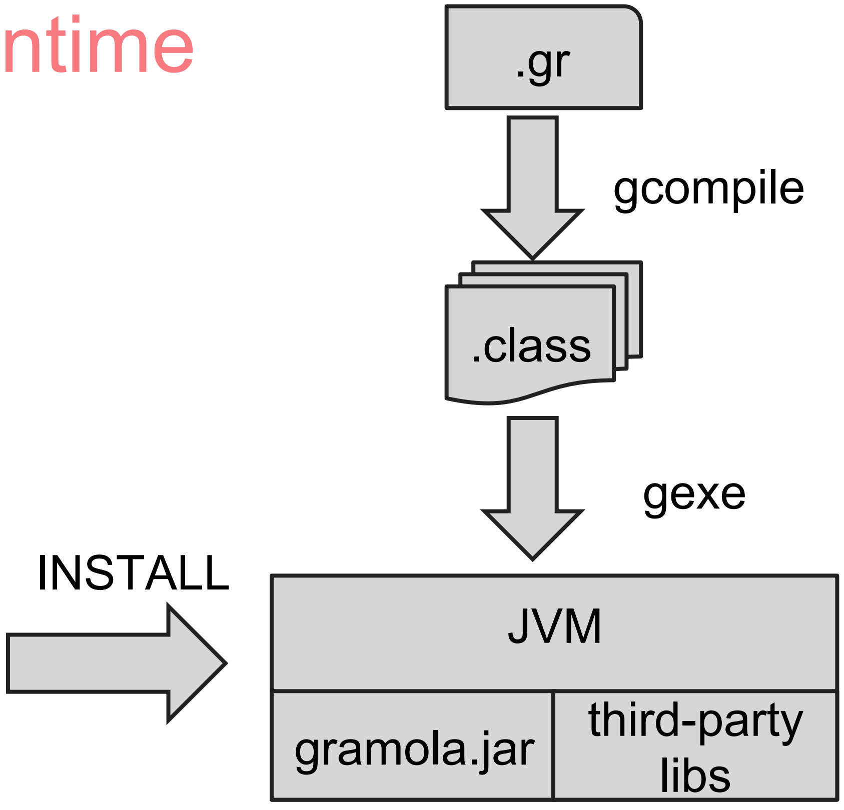
Runtime Environment

- Java-powered runtime



```
.
└── gramola
    ├── abstractdata
    │   └── GraphElement.java
    ├── datastruct
    │   ├── Edge.java
    │   ├── EdgeSet.java
    │   ├── Graph.java
    │   ├── Node.java
    │   └── NodeSet.java
    ├── testmain
    │   ├── ArraysTest.java
    │   ├── CoFriend.java
    │   ├── DumpTest.java
    │   ├── FBTest.java
    │   ├── GraphApp.java
    │   ├── LoadTest.java
    │   ├── OverAllTest.java
    │   └── PathTest.java
    └── util
        ├── FBManager.java
        ├── GInformer.java
        ├── GraphDBController.java
        ├── GraphUtil.java
        ├── GraphVisualizer.java
        └── LikePage.java
```



Runtime Environment

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Runtime Environment

- Scripts
  - INSTALL: one-click configuration of the runtime environment. For internal use and first-time user installation
  - gcompile: compile .gr ->.java -> .class
    - ./gcompile hello.gr Hello
  - gexe: invoke JVM to link compiled user program (.class), the gramola library (gramola.jar) and other supporting libraries
    - ./gexe Hello

Runtime Environment

- The Gramola library
  - Built-in data structures for graphs, e.g. Graph, Node, Edge, etc
  - Implementations of syntax sugars, e.g. initialize dictionaries with arbitrary number of key-value pairs
  - Converters/Drivers to connect to third-party libraries for advanced features, e.g. graph persistence, graph visualization

Test Plan

Pylint

check your Python code before running it

FindBugs

because it's easy

- Fuzz testing: Lexer
- End-to-end automated testing: To localize bugs to a specific compiler phase.
- About 900 LOC of syntactically and semantically valid Gramola programs to test every keyword, operator, built-in, data type, data structure, programming construct through every phase of the compiler.
- Less focus on error-handling.

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Test Results

Phase	Passed	Failed
Lexical Analysis	35	0
Syntax & Semantic Analysis	31	4
Code Generation	31	4
Compilation	30	5
Execution	30	5

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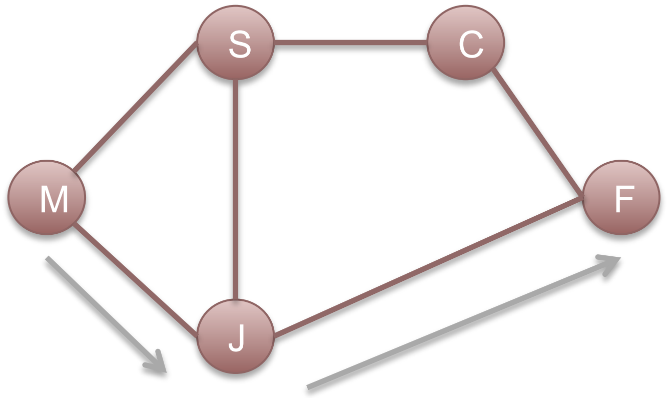
Demo

1. IMDB
   a. Inheritance
   b. Loop
   c. Control Flow
2. Common Friends on Facebook
   a. User-defined class
   b. get_fb: Real-time data retrieval from Facebook
   c. dump: Graph data storage in Graph DB
   d. draw: Graph object=>dot => Graph visualization
3. More time?
   a. get_shortest_path: Shortest path finding
   b. Actually we have about 10+ Gramola apps!!



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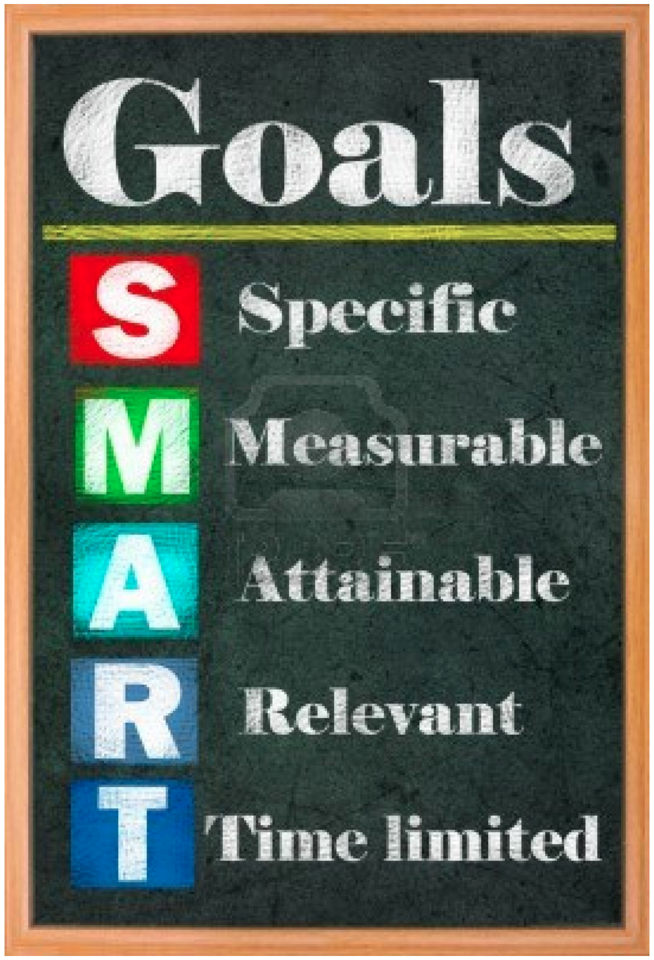
Conclusions

- We're proud of...
  - Gramola graph-native features (e.g., connection to FB), extensibility (class inheritance)
- What worked well...
  - gcompile
  - git version control
- Lessons we learnt
  - Start testing immediately after feature implemented!
  - We should plan for suitable scoping at the beginning!

We Can Do Better!



Measurable Progress

Relevant Workload

Specific Features

Attainable Target

Yes, time is never enough

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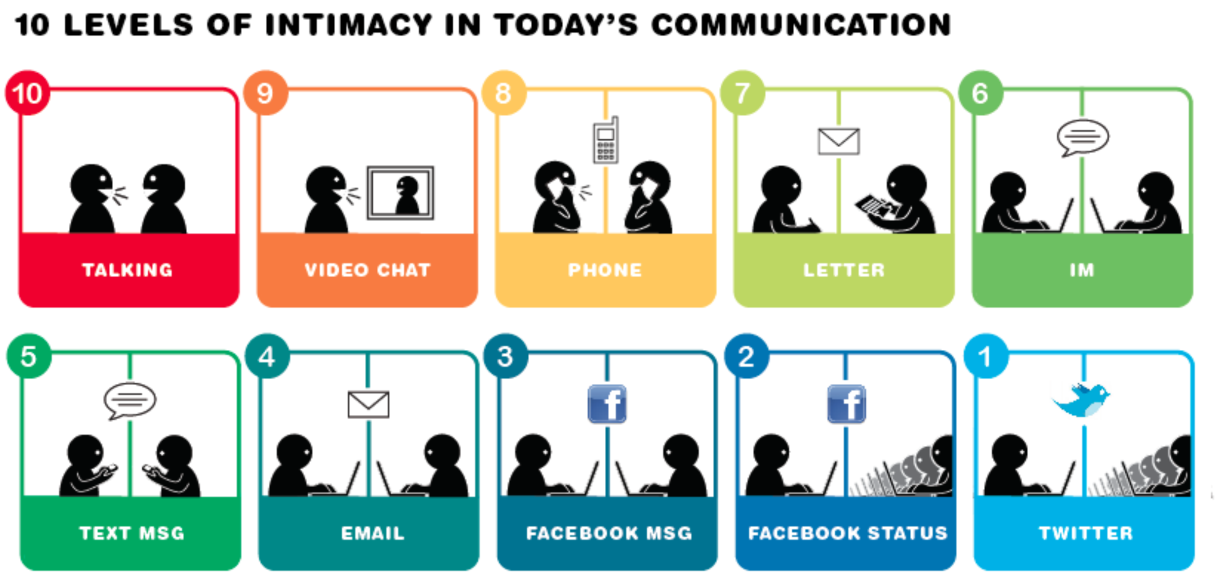
Work Together



```
while work_in_same_place(team4):
    productivity[team4] += 1
```

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Thanks!

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RCA logo redux taken from http://kayleighmahon.wordpress.com/2012/09/

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