# Agent Based Modelling and Simulation
# Session 01

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April 2, 2014

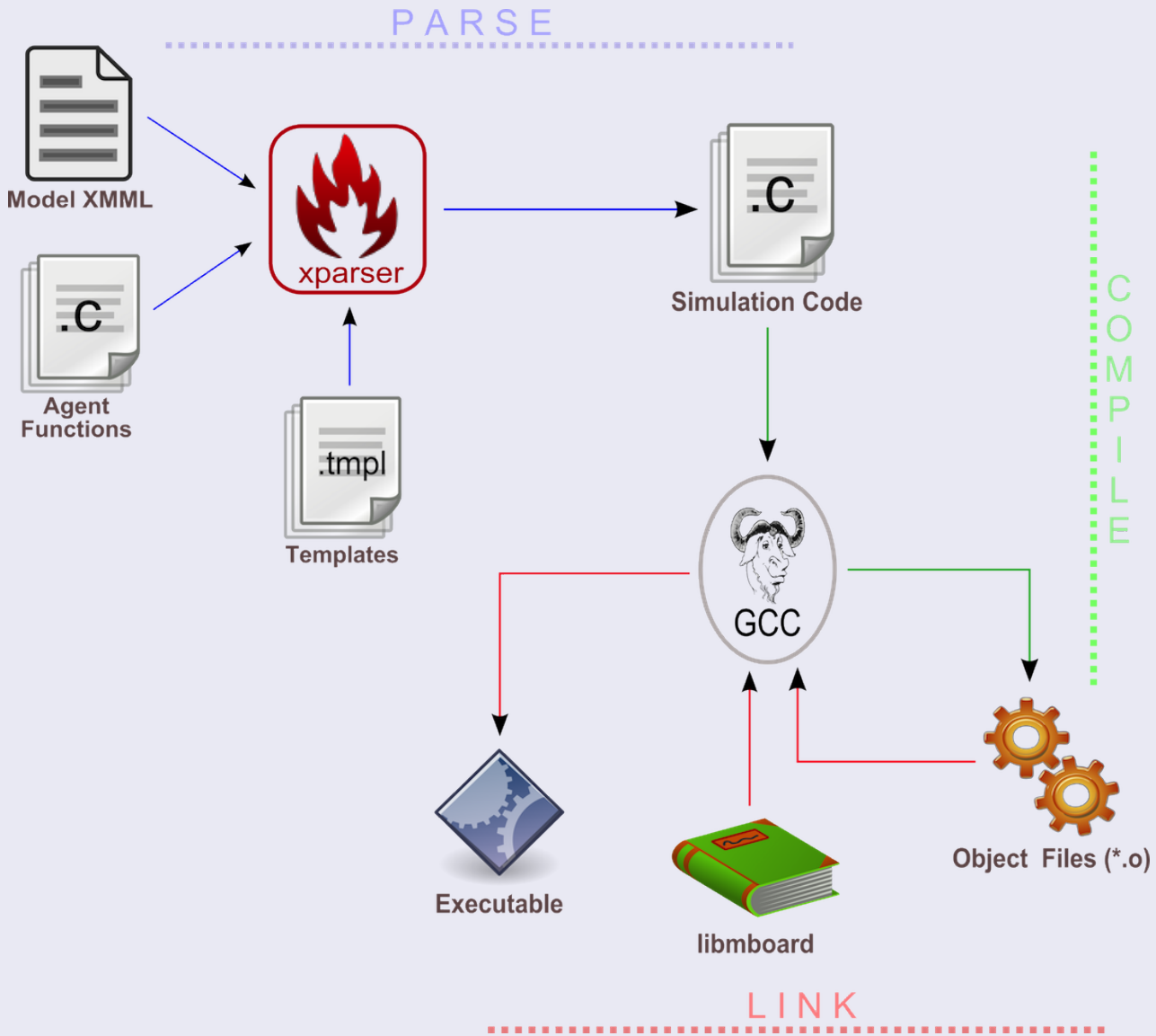
# Outline

# FLAME - ABMS Development Framework

## FLAME: What and Why?

- **F**lexible **LA**rge-scale **A**gent **M**odelling **S**ystem
- "FLAME is a generic agent-based modelling system which can be used to development applications in many areas. It generates a complete agent-based application which can be compiled and built on the majority of computing systems ranging from laptops to HPC super computers."
- `http://www.flame.ac.uk/`

## FLAME Framework Overview



# FLAME - Components

## Required Software Components

- GCC Compiler
- XParser: Model Description (XML)
- LIBMBOARD: Agent communication and behavior implementations (C Functions)

## Optional Software Components

- Dotty - Graph Visualizer for State Transitions
- XMME - Xagents Machine Markup Editor, the model description component
- PopGUI, ExpGUI - Initialization and Experiment Setup
- VisGUI - Data Visualizer

# Installation Steps

## What are the platform specific steps?

- Linux: xparser, libmboard
- MAC: xcode, xparser, libmboard
- Windows: MinGW, xparser, libmboard

# Installing MinGW the GCC Compiler

## What does MinGW serve for?

- Basic GNU C Compiler, the GCC
- Basic linux/unix like terminal MSYS

# MinGW Installation Steps

## installing ...

1. `http://www.mingw.org/`
2. Download the MinGW installer
3. The installer will be used for further installation of GCC related libraries and programs.
4. Install to default directory C:\MinGW
5. Run the installer and select following modules:
6. Basic Setup: "mingw32-base", "msys-base". You just need to select the "bin" options.
7. MSYS:" msys-gcc". You just need to select the binary "bin" option.
8. Click apply changes option of the installer
9. Find "Advanced Settings" on your "System" and click on "Environment Variables" option. You need to update, edit, the PATH variable. It is one of your Windows environment variable. Do not replace or remove it!
10. Append following to the end of PATH variable: ";C:\MinGW\bin;C:\MinGW\msys\1.0\bin"

# Xparser Installation Steps

## What is Xparser?

Xparser is the program that parses a model file and produces source code for a simulation program.

## Steps:

1. `http://ccpforge.cse.rl.ac.uk/gf/project/xagents/frs/`
2. Download Xparser from the link above.
3. Unzip the package.
4. (optional) Save it under a folder, i.e., "C:\FLAME"
5. On the command line change to the xparser directory: "cd C:\FLAME\xparser"
6. To create the xparser executable, run: "make".

# Libmboard Installation Steps

## What is Libmboard?

Libmboard is the communication library used by simulation programs. It can be compiled or a compiled (binary) version is available for Windows.

## Steps:

1. `http://ccpforge.cse.rl.ac.uk/gf/download/frsrelease/107/224/libmboard-0.2.1-WinBinaries.zip`
2. Download the Windows binary version from the link above.
3. Unzip the package.
4. (optional) Save it under a folder, i.e., "C:\FLAME"
5. Rename the folder from "libmboard-0.2.1" to just "libmboard"

# Installing / Configuring Limboard under Linux or MAC

## Libmboard installation for non-Windows platforms

1. `http://ccpforge.cse.rl.ac.uk/gf/project/xagents/frs/`
2. Download the software from the link above.
3. Unarchive the package.
4. At the folder create libmboard directory: "mkdir libmbdir"
5. To configure, i.e., for a serial version and without cunits: "./configure –prefix=/Users/bulent/iceace/libmbdir –disable-parallel –disable-tests"
6. To compile: "make"
7. To install: "make install"

# Tutorial Models

## Obtaining Example FLAME Models

1. `http://www.flame.ac.uk/docs/tutorials.html`
2. Download the models from the link above.
3. Unarchive the package and save it under, i.e., "C:\FLAME".

# XMML: Model Specification via XML

## The XMML

- XML
- Xagent and environment specifications.
- Walking though sample models ...

## How to edit XML or C files?

Any code developing editor even a plan text editor such as "Notepad" would be sufficient. However, an editor with code highlight and some features that ease programming experience is advised. "Sublime Text 2" is one from many other equally good options. Sublime Text 2:

- `http://www.sublimetext.com/2`

# Steps for Compiling and Running a Model

## A sample process:

1. Creating or locating a model: "cd C:\FLAME\tutorial_models \model_01
2. Compiling the model description: "C:\FLAME\xparser\xparser.exe model_01.xml"
3. Compiling the function implementations: "make LIBMBOARD_DIR=C:\FLAME\libmboard"
4. Running the compiled model: "main 10 0.xml -f 1"

# Graphiz Tool: Visualizing State Transition Graph

## Steps:

1. The site: `http://www.graphviz.org/Download_windows.php`
2. Pick the "msi" version: `http://www.graphviz.org/pub/graphviz/stable/windows/graphviz-2.34.msi`
3. Use the installed "GVEdit.exe" program to inspect graph *.dot" generated by the xparser.

# Inspecting Simulation Outputs

## Where are the simulation outputs?

- Snapshot of agent memory variables and environmental variables.
- Iterations: "0.xml, 1.xml, ..."

# Manual for XMML and FLAME Model Implementation and Execution

## How to progress forward?

Check the online manual. It does contain everything you need to design, implement and run your project:

- `http://www.flame.ac.uk/docs/user_manual.html`