SMC
The State Machine Compiler (40 ')

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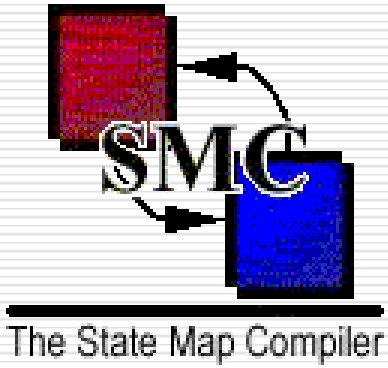

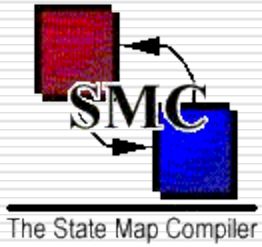

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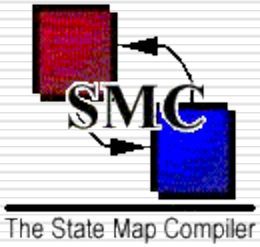
- Introduction
- Basic concepts
- Advanced concepts
- More features
- A case study : a Telephone
- Conclusion

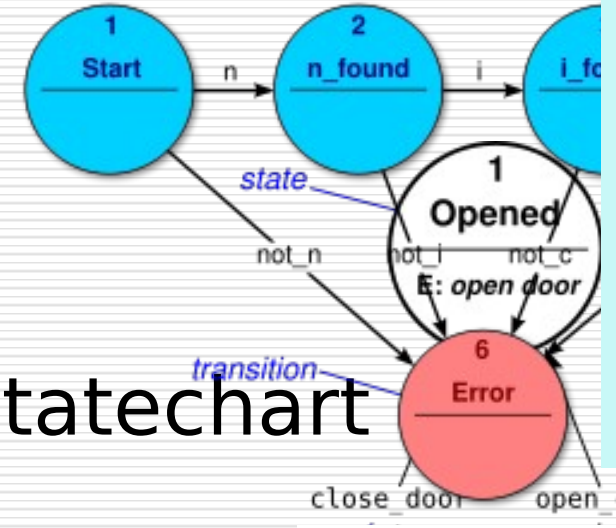


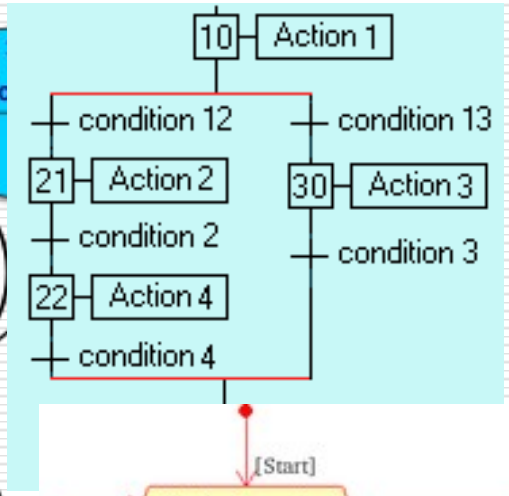
FSM are everywhere

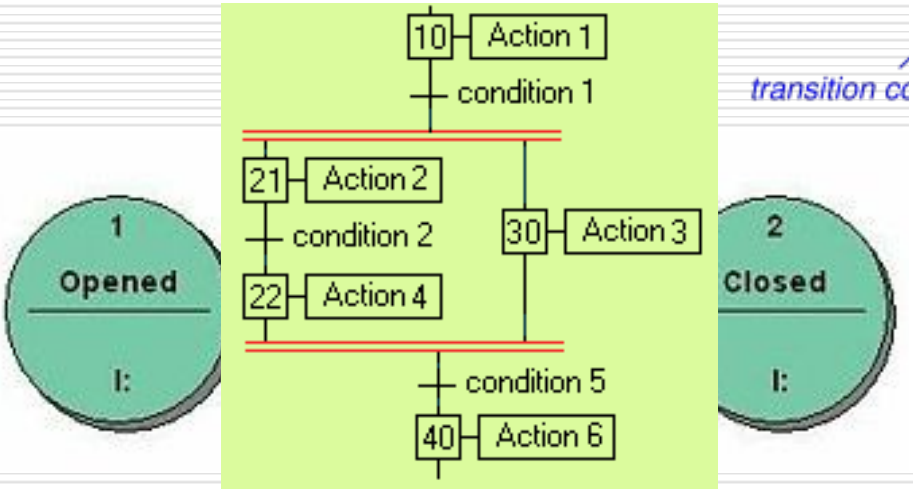
- FSM : Finite State Machine
- Not a new technology
- Strong theorical base
- Reactive systems / Transformational systems
- Event driven
- Applications :
  - Telephones, automobiles, communication networks, avionic systems, man-machine interface

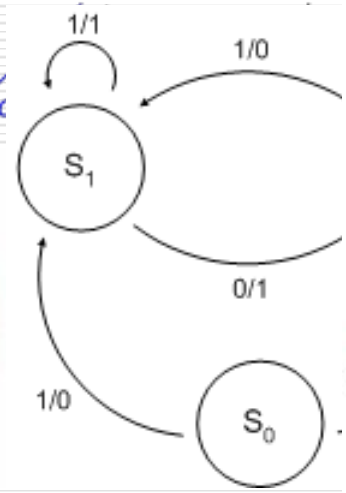
FSM graphical view

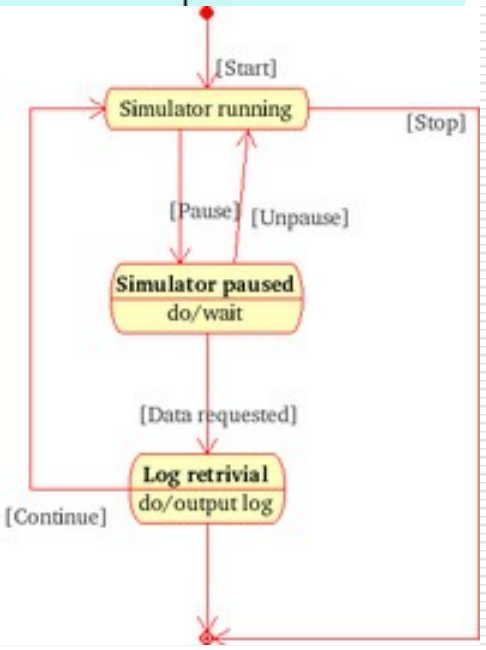
- Moore
- Mealy
- Grafcet
- UML = Harel statechart





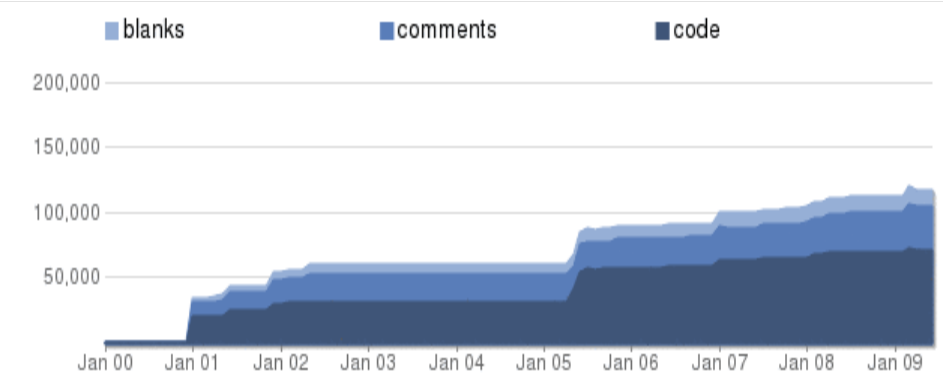




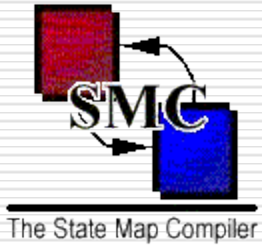


A SourceForge project

- Some facts :
  - registered in 2000
  - ~500 downloads / month
  - ~100 bugs (closed)
  - written in Java
  - mature codebase
  - well documented
  - 3 developers
  - Licence MPL



- See : http://www.ohloh.net/projects/7339?p=SMC



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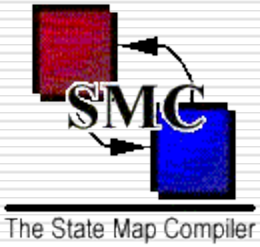
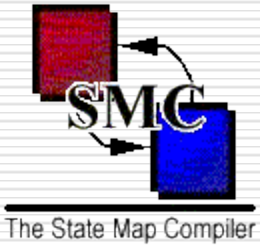


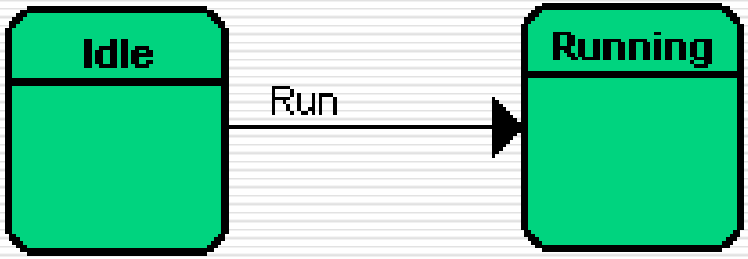
A Compiler

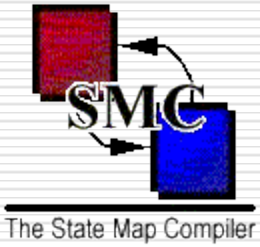
- A input source .sm (yacc-like syntax)
- A output source (readable) in your language
- Currently 14 target languages :
  - C, C++, C#, Groovy, Java, Lua, Objective-C, Perl, PHP, Python, Ruby, Scala, Tcl and VB.net
- An Object Oriented design :
  - your class has a member which is the FSM generated class
- A small RunTime Library
- Parser & Lexer of SMC are written with SMC
- The root of SMC is ATN (Augmented Transition Network)
- Robert C. Martin (uncle bob) is the author of the initial SMC implementation



A Simple Transition

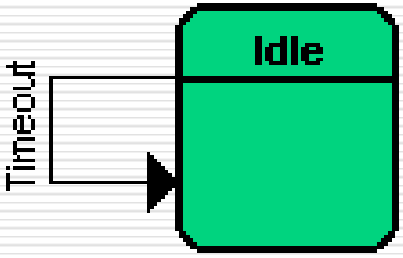
```
// State
Idle {
    // Trans          Next State    Actions
    Run               Running       {}
}
```

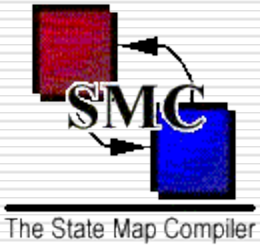




A Reflexive Transition

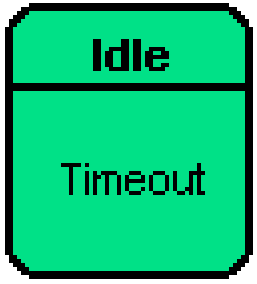
```
// State
Idle {
    // Trans          Next State   Actions
    Timeout           Idle         {}
}
```





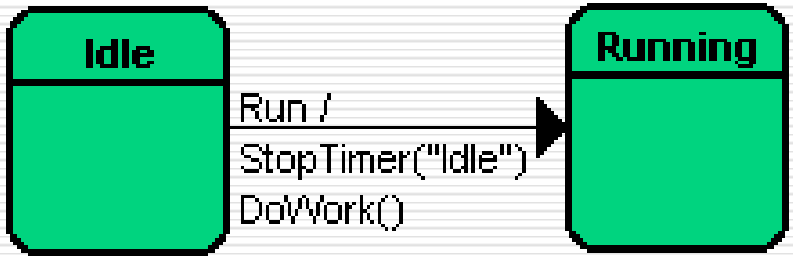
A Internal Event

```
// State
Idle {
    // Trans          Next State   Actions
    Timeout           nil          {}
}
```



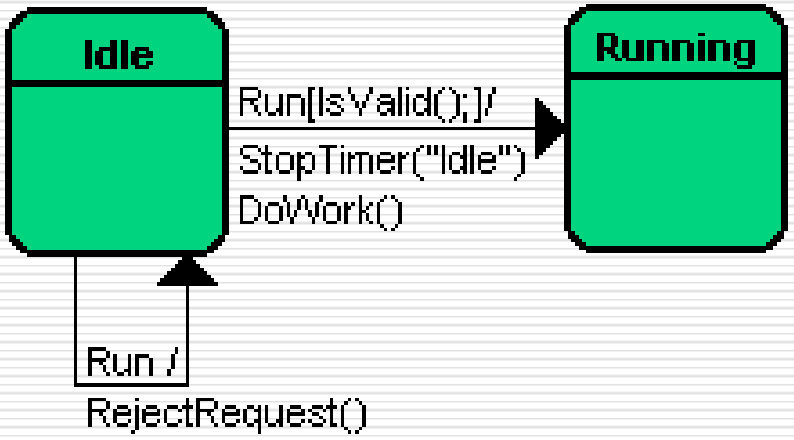
A Transition with Actions

```
// State
Idle
{
    // Trans
    Run
        // Next State
        Running
                // Actions
                {
                    StopTimer("Idle");
                    DoWork();
                }
}
```



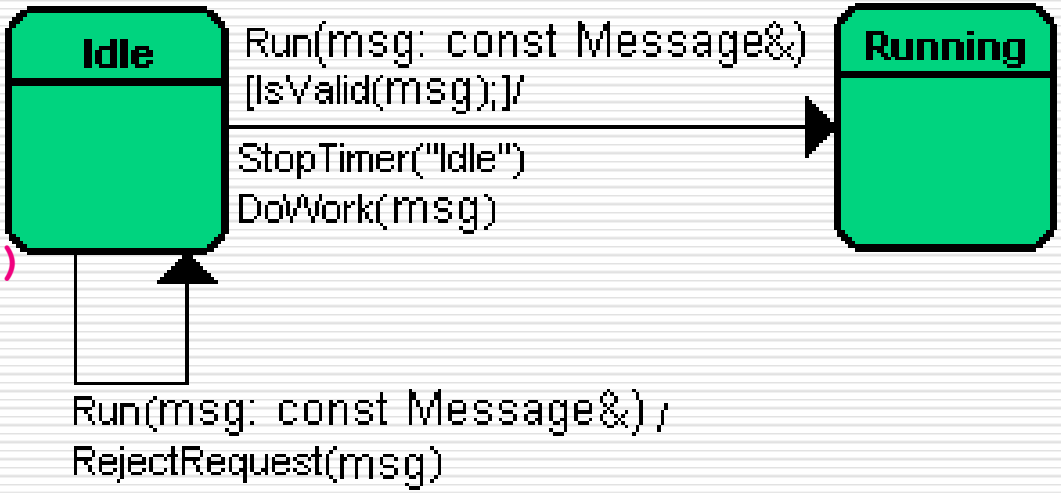
Transition Guards

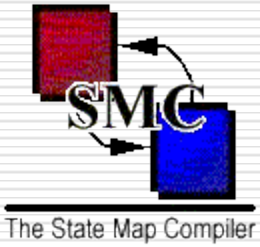
```
// State
Idle
{
    // Trans
    Run
    // Guard condition
    [ctxt.isValid()]
        // Next State
        Running
                // Actions
                {
                    StopTimer("Idle");
                    DoWork();
                }

    Run         Idle    { RejectRequest(); }
}
```



Transition Arguments

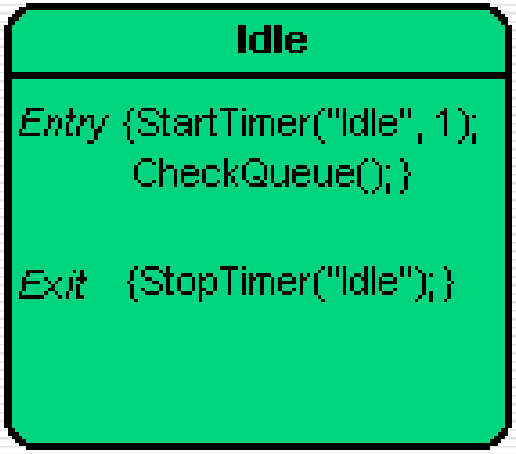
```
// State
Idle
{
    // Transition
    Run(msg: const Message&)
    // Guard condition
    [msg.isValid()]
        // Next State
        Running
        // Actions
        {
            StopTimer("Idle");
            DoWork(msg);
        }
    Run(msg: const Message&)
        // Next State Actions
        Idle            { RejectRequest(msg); }
}
```

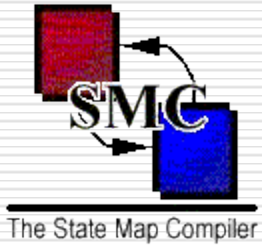




Entry and Exit Actions

```
// State
Idle
Entry  { StartTimer("Idle", 1); CheckQueue(); }
Exit   { StopTimer("Idle"); }
{
    // Transitions

}
```





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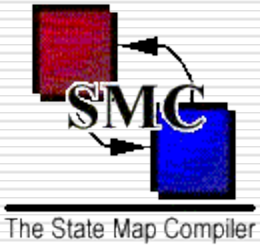
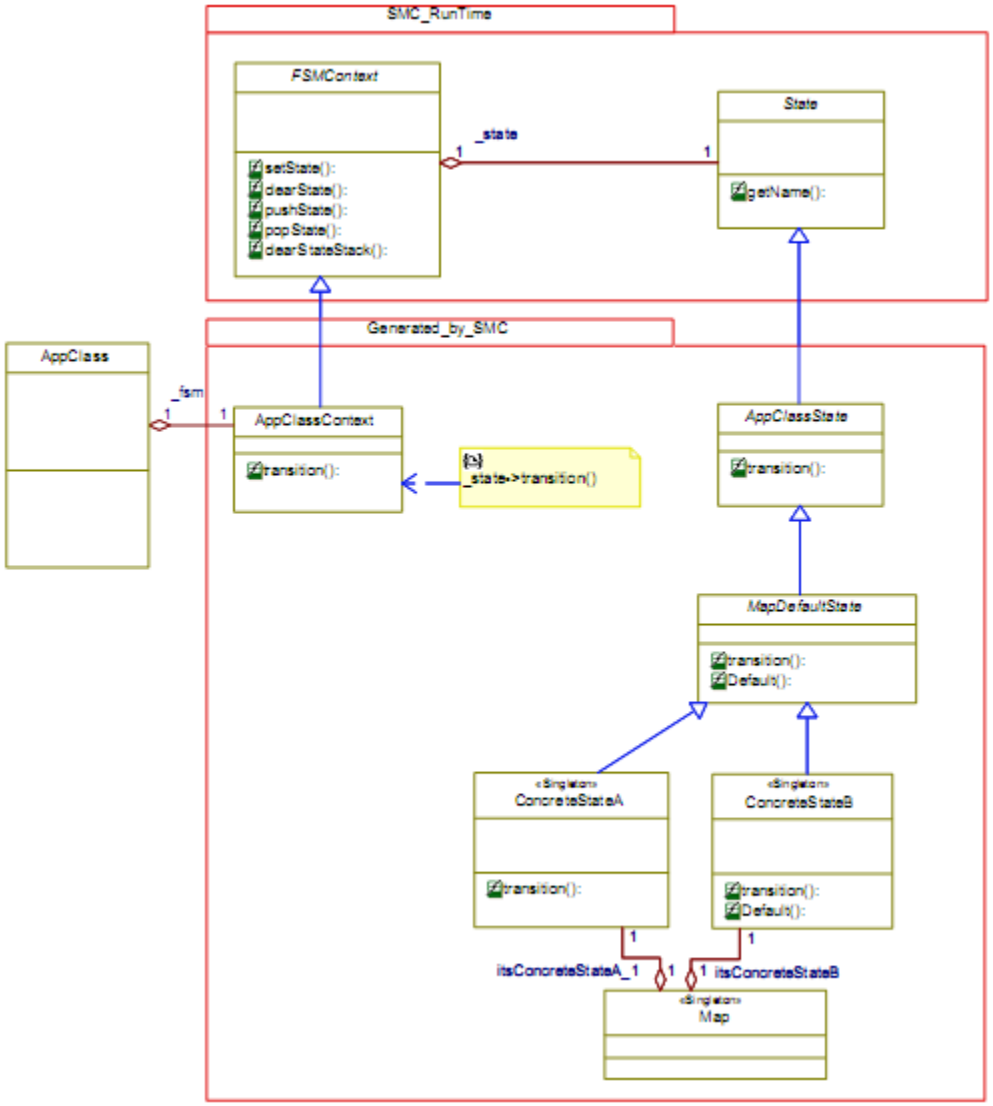
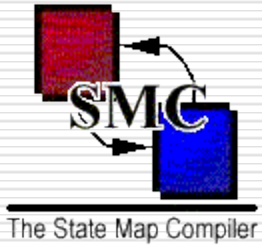


Advanced Features

- Map : state container
  - only one level (multiple with UML)
- Push/Pop
  - with stack context
  - see UML History
- Default state
  - factorisation of common behavior in a map
- No concurrency (ie //)

The Design Pattern





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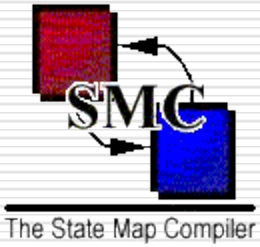
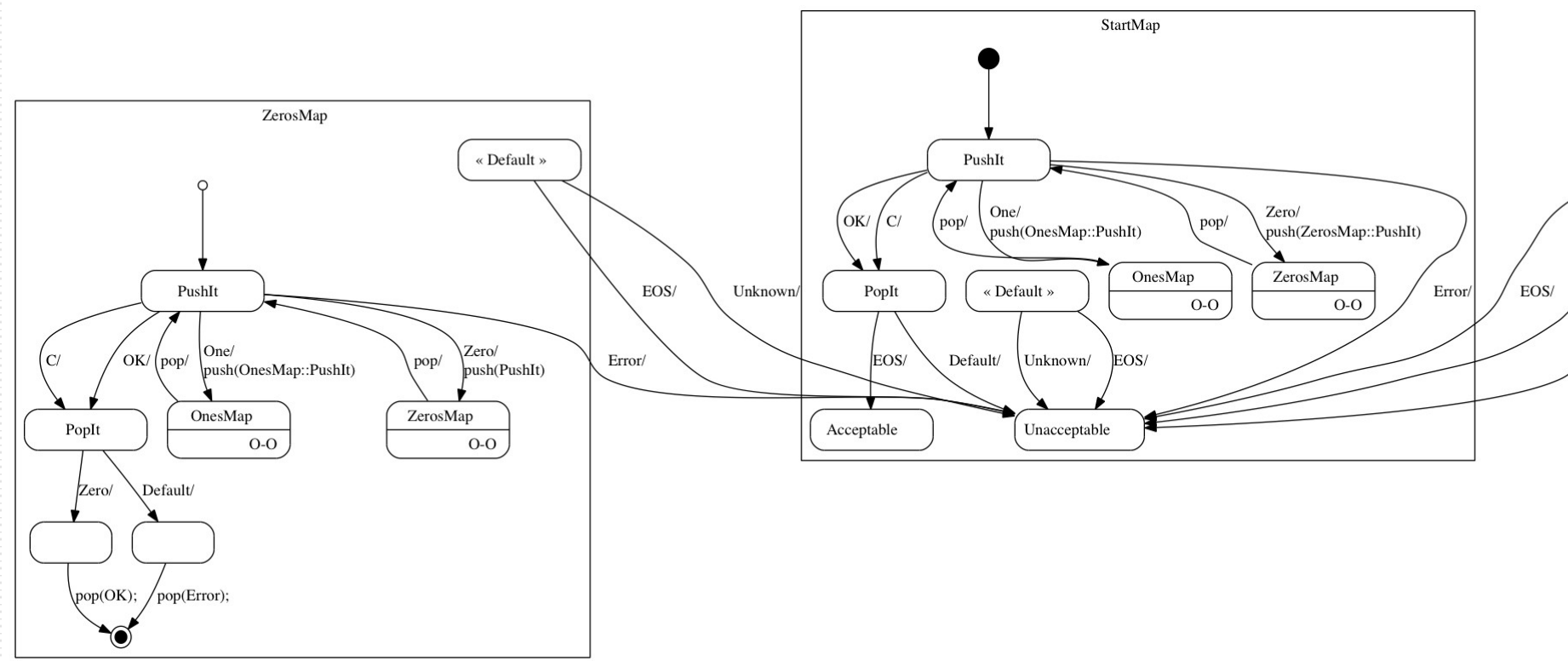
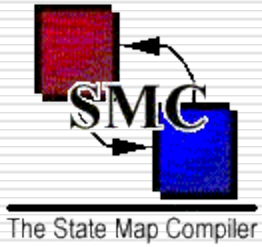


More features

- Event management is yours
- Graphviz output generation
- HTML table generation
- Dynamic trace
- Namespace support
- Reflection/Introspection (for MMI)

Graphviz output





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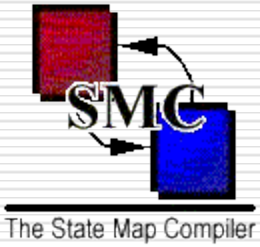
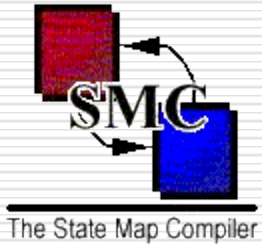


A Telephone

- Go to the WEB
- Play with the demo (Applet Java)

@ http://smc.sourceforge.net/SmcDemo.htm



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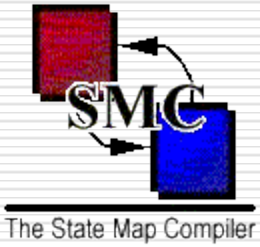
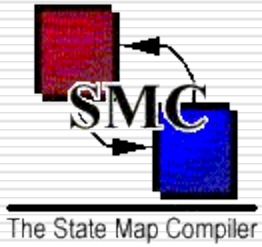


all contributions welcomed

- Eclipse plugin
- Debian packaging
- Pluggable language support
- New target language
- Regression test
- ...



Bibliography / Webography

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