

### Atollic development tools for STM32



#### Professional development, code analysis and test automation tools

The embedded systems development tool for the next decade!

#### TrueSTUDIO



Measure test quality with dynamic execution flow analysis!

#### TrueANALYZER



Ensure coding standards compliance with professional code inspection!

TrueINSPECTOR



Get superior software quality with embedded test automation!

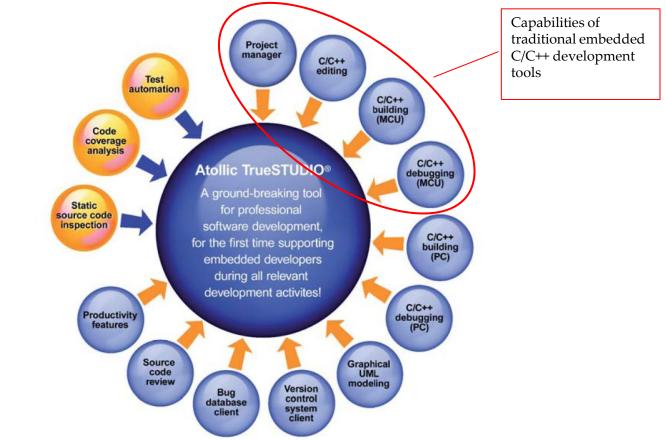
TrueVERIFIER



#### All products integrate together in the same IDE!



# Finally an embedded tool that addresses the problems of today!



Atollic tools cover a much wider set of developer problems than just edit/compile/debug!



### STM32 target support

#### Device families:

- STM32 High density devices
- STM32 Medium density devices
- STM32 Low density devices
- STM32 Connectivity line devices
- STM32 Low density Value Line devices
- STM32 Medium density Value Line devices
- STM32 XL density devices
- STM32 High density Value Line devices
- STM32 Ultralow power devices
- STM32 F-2 High-performance devices
- STM32F4xx devices
- STM32W RF devices

Embedded System

#### EVB boards:

- STM3210E-EVAL
- STM3210E-EVAL\_XL
- STM3210B-EVAL
- STM3210C-EVAL
- STM32100B-EVAL
- STM32100E-EVAL
- STM32L152-EVAL
- STM322xG-EVAL
- STM324xG-EVAL
- STM32F4-DISCOVERY
- STM32W\_MB851
- STM32VL\_Discovery
- STM32L\_Discovery
- IAR\_STM32F103ZE
- KEIL\_MCBSTM32

#### JTAG probes:

- STLINK (no SWV)
- STLINK/V2 (SWV)
- JLINK (SWV)
- gdbserver compatible ones



#### **Atollic TrueSTUDIO**<sup>®</sup>



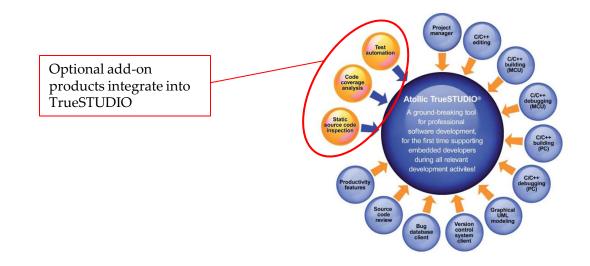
### **Atollic TrueSTUDIO**<sup>®</sup>

- Eclipse IDE with GNU C/C++ compiler & debugger
  - A high-end IDE for professional developers
  - Based on the GNU C/C++ compiler & debugger
- Much more than just an embedded C/C++ product
  - Includes ARM compiler & debugger (for embedded development)
  - Includes x86/PC compiler & debugger (for Windows PC development)
  - Parallel compilation and multiprocessor debug
  - System analysis and real-time tracing with SWV
  - Includes UML editors for graphical modeling
  - Includes version control system GUI client
  - Includes bug database GUI client
  - Includes code review & code review meeting support



### **Atollic TrueSTUDIO®**

- High-end add-on products (optional)
  - TrueINSPECTOR<sup>®</sup>: Static source code inspection (MISRA<sup>®</sup>-C:2004) and code metrics measurements
  - TrueANALYZER<sup>®</sup>: Measure test quality in target (aircraft-grade code-coverage analysis)
  - TrueVERIFIER<sup>™</sup>: Embedded systems test automation in targets





#### **Editing features**

"Embedded passion"



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#### **Editors**

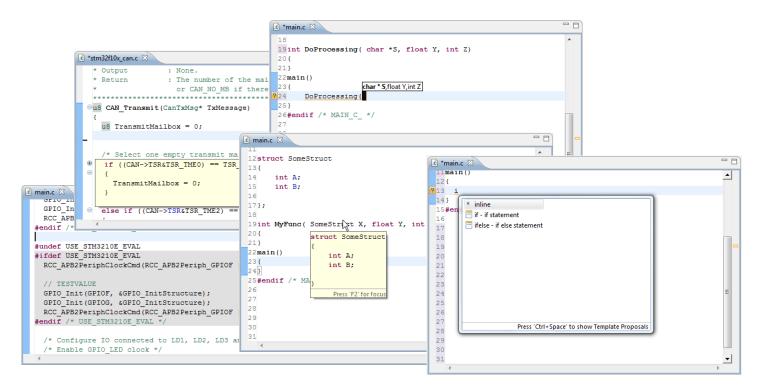
* ( * 1 * * * *	<pre>32f10x_canc 13 Output : None. Return : The number of the mailbox that is used for transmission</pre>		<ul> <li>♥ ■ □</li> <li>♥ ■ □</li> <li>♥ Outline X</li> <li>↓<sup>q</sup><sub>z</sub> ■ □</li> <li>♥ include/makefile.init</li> <li>● RM</li> <li>♥ include sources.mk</li> </ul>
S cortexm3_macros. S .globl _BASEPRICONFI .globl _GetBASEPRI .globl _REV_HalfWord .globl _REV_Word	<pre>/* Select one empty transmit mailbox */ if ((CAN-&gt;TSR&amp;TSR_TME0) == TSR_TME0) {     TransmitMailbox = 0; } else if ((CAN-&gt;TSR&amp;TSR_TME2) == TSR_TME2)     makefile X</pre>	<ul> <li>MRS_PSP</li> <li>MRS_MSP</li> <li>MRS_MSP</li> <li>MRS_MSP</li> <li>SETPRIMASK</li> <li>RESETPRIMASK</li> <li>SETFAULTMASK</li> <li>RESETFAULTMASK</li> <li>RESETFAULTMASK</li> <li>RESETPRICONFIG</li> <li>GE4BASEPRI</li> <li>REV_HalfWord</li> </ul>	<ul> <li>include subdir.mk</li> <li>include stm32FWilb/src/su</li> <li>include objects.mk</li> <li>include objects.mk</li> <li>t<sup>o</sup> ifneq (\$(MAKECMDGOALS),cl</li> <li>t<sup>o</sup> ifneq (\$(strip \$(C_DEPS))</li> <li>include \$(C_DEPS)</li> <li>all</li> </ul>
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	gecho 'rinished bullding: \$g'		P P

- C/C++ editor
- Assembler editor
- Makefile editor
- Outline views



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### Advanced editing (1/3)



- Real-time pre-processor evaluation with colour visualisation
- Symbol type assistance & parameter hints
- Content assist, code completion & code templates
- Smart editing with configurable coding style
- Macro expansion browser (singlestep macro expansion forward/backward)



### Advanced editing (2/3)

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<pre>#include "stm32f10x_lib.h" #include "platform config.h"</pre>			ssibility		Add Block Com	ment	Ctrl+Shif	+/	C/C++ Editor	C/C++ Source	
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- Open include files & "go-to definition" with hypertext-links
- Bookmark & to-do lists (with automatic task detection keywords)
- Configurable keyboard bindings (Emacs, MS-VisualStudio, Eclipse, etc)
- Advanced refactoring (history, record & playback)



### Advanced editing (3/3)

Name	Description	Edit Tem	piate								
III C/C++		Name:	class								
catch	catch block	Description	class declaration								
class	class declaration										
comment	default multiline comme	Pattern:	class \${name} {		The cursor position af						
📑 do	do while statement		<pre>public:</pre>	cursor		demo.c 🛛					
📄 else	else block		\${Cursor}	date dollar							
😑 elseif	else if block					⊖static void state machine task(void)					
📑 for	for loop		private:	enclosing_method							
📑 for	for loop with temporary		};	enclosing_method_arguments		Bool is reset;					
🚍 if	if statement			enclosing_project							
📑 ifelse	if else statement			file		<pre>printf( "Task is running\n");</pre>					
📑 main	main method			line_selection							
namespace	namespace declaration			return_type		Name: printf					
📄 new	create new object			time		Prototype: int printf (const char *format,)					
📑 stderr	print to standard error			todo		Description:					
📑 stdout	print to standard output		*	user		printf accepts a series of arguments, applies to each a format specifier fr					
switch	switch case statement			word_selection		data to stdout, without a terminating NUL character. The behavior of pr arguments for the format, printf returns when it reaches the end of the t					
🚍 try	try catch block		Insert Variable	year		arguments than the format requires, excess arguments are ignored.					
😑 using	using a namespace					arguments than the format requires, excess arguments are ignored.					
						fprintf is like printf, except that output is directed to the stream fd rather					
		?									
III		$\odot$				sprintf is like printf, except that output is directed to the buffer str, and a					
Preview						undefined if more output is generated than the buffer can hold.					
witch (\${key}) {			-			convint is like covint event that output is limited to at most size butes					
case \${value}:			🗈 *demo.c 🛛								
\${cursor}						state fct = STATE FCT FUNCTION2;					
break;			// Clear	rr Zoom state if on and	a kev is presse	new state fct = TRUE;					
default:			1.5	~~~~		, new_state_ict = ikoE;					
break;			{ I The	word 'Clearrr' is not correctly spelled		۰ III ا					
			4 quick	fixes available:							
			a a C	hange to 'Clearer'							
				nore 'Clearrr' during the current sess	ion r active get	descr					
				isable spell checking							
		*									
		P		dd 'Clearrr' to dictionary		-					
				Press 'F2' f	or focus						

- C runtime library manual as editor tooltips
- Drag & drop of pre-defined code templates
- User defined templates with dynamically expanded variables
- Spell checker in C/C++ comments



### C/C++ symbol indexer

a Open Element	Search
Choose an element (? = any character, * = any string):	
RCC* Files included by 'mai	in.c(/IOToggle/src)' - in workspace
Visible element types:	Containing text:
	10x_lib.h 🔹 🔲 Case sensitive
🔽 🖸 Enumeration 🖉 🕕 Union 🛛 🖉 🖉 Eurotion 🔗 🗨 Va	n32f10x_map.h (* = any string, ? = any character, \ = escape for literals: * ? \) Regular expression
# Macros	stm32f10x_conf.h
Matching elements:	File name patterns:
RCC_HSICmd(enum {stm32f10x_type.h:2505})	*.c
RCC_HSICMd(enum {stm32f10x_type.n:2303})     RCC IROHandler()	ITStatus Patterns are separated by a comma (* = any string, ? = any character)
RCC_ICOnfig(unsigned char, enum {stm32f10x_type,h:2505})	RESET
RCC_LSEConfig(unsigned char)	Ca Search
RCC LSICmd(enum {stm32f10x type.h:2505})	
RCC MCOConfig(unsigned char)	S File Search S C/C++ Search s
RCC PCLK1Config(unsigned long int)     Callers of RCC_Configuration() - /IOToggle/src/main	Search string (* = any string, ? = any character):
RCC_PCLK2Config(unsigned long int)     A      RCC_Configuration()	
<ul> <li>RCC_PLLCmd(enum {stm32f10x_type.h:2505})</li> <li>main()</li> </ul>	RCC* Case sensitive
<ul> <li>RCC_PLLConfig(unsigned long int, unsigned long in</li> <li>Reset_Handler()</li> </ul>	Cearch For Limit To
<ul> <li>RCC_RTCCLKCmd(enum {stm32f10x_type.h:2505})</li> </ul>	Class / Struct Function Variable Declarations Definitions Search Cancel
RCC RTCCLKConfinitut & Search	Union Method Field
Qualified name and locatio 'Init' - 1 219 matches in workspace (*.c)	Enumeration Enumerator Namespace
● (global) RCC_PCLK2Co 🔺 😂 IOToggle	V Typedef Macro Any Element
A 🗁 STC	
▲ C main.c (29 matches)	Scope
⇒ 24: GPIO_InitTypeDef GPIO_InitStructure;	Workspace      Selected resources      Enclosing projects
⇒ 62: GPIO_InitStructure.GPIO_Pin = GPIO_Pin_All;	
⇒ 63: GPIO InitStructure.GPIO_Mode = GPIO_Mode_AIN; ⇒ 64: GPIO Init(GPIOA, &GPIO InitStructure);	O Working set:
⇒ 64: GPIO_Init(GPIOA, & GPIO_InitStructure); ⇒ 65: GPIO_Init(GPIOB, & GPIO_InitStructure);	
⑦ OK Cancel	(?) Customize Search Cancel
	Search Cancel

- C/C++ indexer and symbol database (multi-file)
- #include dependency, Class browser, Symbol browser, Call hierarchy etc
- Advanced text- & "find-in-files" search with regular expressions
- C/C++ search with grammar filtering and "search-as-you-type"



### **Productivity features**

	💭 Shell 🔀					🖉 🚮   🛤 🍸 🗖 🗖	
	Wicked Shell 2.0.4 - Cmd.exe						
	J:\TrueSTUDIO_STM32\	ide\workspace\IOTo	ggle\src>copy *.	* j:\		*	
E <sup>0</sup> Compare main.c Current and Local Revision							
C Compare		📄 Batch Files 🛛					\mid 🖗 🗱 🔛 🗖 🗖
Translation Unit		Batch File		Parameters			Testleaded
• main		c:\users\ASW-MU-Adr	A	192.0.0.1 JKPG	echo Batch Test script S		
	<	c:\users\ASW-MU-Adr	min\Desktop\OldPC		echo		TestLog.txt
					echo.  date  find "current" echo.  time  find "current"		
					echo. >> TestLog.txt		
C Compare Viewer							*
Local: main.c	Local history: main.c 10 apr 2009 18.41	•					•
<pre>#endif /* USE_STM3210E_EVAL */</pre>	RCC_APB2PeriphClockCmd(H		alculator 🛛	DEG RAD GRAD H	EX DEC BIN Store Recall Cle	ear LastResult C AC <	: << ▽ □ □
#undef USE STM3210E EVAL	<pre>#endif /* USE_SIM3210E_EV#</pre>	AL */				12 * 3	+ ( asin ( e^ ? 🔥
#ifdef USE_STM3210E_EVAL	/* Configure IO connecte						
RCC_APB2PeriphClockCmd(RCC_APB2Periph_GPIC	/* Enable GPIO_LED cloc}						
// TESTVALUE	RCC_APB2PeriphClockCmd(F	RCC_APB2Periph					<b>)</b>
GPIO_Init(GPIOF, &GPIO_InitStructure);	GPIO_InitStructure.GPIO_			1/n ^2 sqrt	7 8 9		
GPIO_Init(GPIOG, &GPIO_InitStructure); RCC APB2PeriphClockCmd(RCC APB2Periph GPIC	GPIO_InitStructure.GPIO GPIO InitStructure.GPIO			e^   log   10^	4 5 6		
#endif /* USE STM3210E EVAL */	GPIO_INItStructure.GPIO_ GPIO_INIt(GPIO_LED, &GPI	IO InitStructu			1 2 3		
	History 8			OR AND XOR	0 . +/-		-
/* Configure IO connected to LD1, LD2, LD3	while (1)	sin	cos tan a	asin acos atan	A B C		
	Revision Time	sinh	cosh tanh		D E F		
	■ 2009-04-17	22.09					
		21.16				-	
	•		III				

- Graphical file compare
- Compare files with each other or with older versions of itself
- Execute MS/DOS commands and batch files
- Programmer's calculator with HEX/DEC/BIN conversions



#### **Build system**

"Embedded passion"



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#### Project manager

C Project	t of selected type			C Project	
				Select debug configuration	Project Explorer 🛛 🗖 🗖
Project name:	C Project Select Configurations			Debug type	2 4 €
Use defau	Select platforms and configurations y Project type: Executable	C Project  TrueSTUDIO® Build Select hardware and build	-	JTAG SEGGER J-Link     Simulator     This selection will setup an debug configuration tar	<ul> <li>▲ ♀ IOToggle</li> <li>→ ♀ Binaries</li> <li>→ ⋒ Includes</li> <li>↓ ► Debug</li> </ul>
Execu	Toolchains: Atollic ARM Tools Configurations:	Target Evaluation board:	STM3210E-EVAL	with default ip:port settings. Custom settings could be set under Debug Configu	ati → Src → ③ cortexm3_macro.s
🔵 Ti 👝 Make	♥ ॐ Debug ♥ ॐ Release	Microcontroller family: Microcontroller: Floating point: Code location:	All STM32F103ZE Software implementation FLASH		<ul> <li>Imain.c</li> <li>Imain.c</li></ul>
Show proje		Instruction set ARM Thumb Endianess Big endian			<ul> <li>HSEStartUpStatus</li> <li>Delay(vu32)</li> <li>NVIC_Configuration(v</li> <li>RCC_Configuration(vc</li> <li>Delay(vu32)</li> </ul>
0	Use "Advanced settings" button to ec Additional configurations can be add	Optimization Remove unused cod Remove unused dat			main(void)     NVIC Configuration(v
	Use "Manage configurations" button		e type information (RTTI)		
	? <u>B</u> ack	?	< Back Next >	Einish Cancel	→ h stm32f10x_it.h .

- Target specific "New C/C++ project" wizard
- Auto-generates targets specific example projects
- Auto-configures build tools and debugger
- Project explorer



### **Build system**

- GNU command line tools
  - C/C++ compiler, assembler, linker, debugger, etc
  - C/C++ runtime and math libraries for C and C++
  - Atollic start-up code initializations before "main()" starts
- Build system
  - Managed mode (GUI for project configuration)
  - Unmanaged mode (makefile for project configuration)
  - Supports parallel compilation (shorter build times)



# **Compiler quality**

- Almost all commercial compilers on the market are good today
  - Normally +/- 5% in difference in code size
  - But results differ from source code file to source code file
  - Not possible to say that compiler "X" is best in all cases
- We use the GNU tools
  - Increasingly becoming a de-facto standard
  - Academic compiler research mostly use GNU for implementation tests
  - Developed and maintained by many companies, including ARM
  - Used in EmbeddedLinux, Android, QNX and WindRiver platforms
  - Also used in PC-Linux for x86 (desktops and servers)
  - Probably the most well tested compiler in the world (perhaps except Microsoft VisualStudio for C#)
- Testing
  - Tested and maintained by many companies, including ARM
  - Atollic runs ~85.000 test cases on every compiler release



#### Debugger

"Embedded passion"



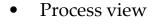
a

# Debugger

📬 • 📾 📓 🕸 • O • Q • 🙋 😂 🛷 • 🌛 🖄 •	\$] • \$ <b>\$</b> \$ <b>\$</b> • \$ •				🖽 🕸 Debug					
Debug 🛙 🗖	04- Variables 🕄 🗣 Breakpoi	ints 🛋 Modules	- 0	IIII Registers 13	🔹 SFR Registers 👘 👘	~ =				
<sup>1</sup> (a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c		🐑 🐽 🖂 🔄 🚱 💕	* % *	Name	Value					
C Debugger.exe [C/C++ Application]	Name	Value	*	Main Main						
MinGW gdb Debugger (2009-09-29 15.09) (Suspended)	pServerContext	<value optimized="" out=""></value>	100	lite eax	0					
Thread [1] (Suspended)	arget_device			iiii ecx	0					
1 main() C:\Users\ASW-AJ-Admin\Desktop\eclipse-SDK-3.5M6-v C:\Users\ASW-AJ-Admin\Desktop\ProductRuntimes\Product runtime :	dbg_interface	0x00000000		ini edx	0 2147340288					
C:\Users\ASW-AJ-Admin\Desktop\ProductNuntimes\Product_runtime_ C:\Users\ASW-AJ-Admin\Desktop\eclipse-SDK-3.5M6-win\runtime-stm	CoreReg	{}		1210 esp	0:0022#50					
C. (ases a gravitation (besit objections, approximation on the sol	CoreReg_u			Illi ebp	0x00221156					
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	Flash_trase_Fi	ag m		4		•				
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- Advanced debugger GUI
- Full execution control functions
- Complex code & data breakpoints
- Colour coded syntax in source code view
- CPU register view
- SFR register view

Embedded Systen



- Breakpoint view
- Variable watch & Expressions views
- Memory view
- Disassembly view
- Breakpoint actions (play MP3, etc)

# **Debugger configurations**

Image: Second	Create, manage, and run co	nfigurations	Ś
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		Арріұ	Revert

- Atollic-proprietary debug configuration & debug launch mechanism
- Simplified & adapted for embedded developers
- Supports multiple debug configurations in the same project
- Ready-made debug configurations for all supported EVB \* JTAG combinations
- Supports many JTAG probes (Segger J-LINK, ST-LINK etc)
- Support for generic 3<sup>rd</sup> party gdbservers as well (Abatron, Ronetix, etc)
- Auto-start and auto-stop of debug servers

Embedded Svste

• Integrated configuration GUI for debug servers

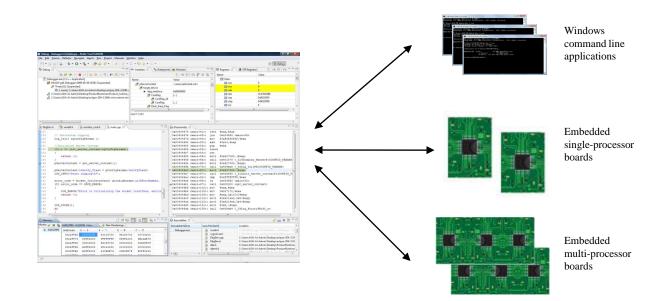
# Debugger commands & scripts

Debug Configurations Create, manage, and run co	nfigurations
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- ~700 debugger commands can be entered manually in the debugger Console view
- Advanced debugger tasks can be automated using debugger scripts
  - Scripts execute debugger commands, interact with application data, etc
  - Scripts supports iterations and conditional execution
- Debugger scripts are :
  - Started manually from the debugger Console view
  - Started automatically on a breakpoint hit ("breakpoint event handler")
- Breakpoint event handlers can automatically resume application being debugged



### Multiprocessor debug



- Support for simultaneous debug (using the same GUI) of any number of CPU's, in any combination, of the following types:
  - Windows command line applications (PC \*.exe files)
  - Single-processor boards (ARM \*.elf files)
  - Multi-processor boards (ARM \*.elf files)

Embedded Systen

- Allows debugging across system boundaries (i.e. debug both sides of two communicating devices from within the same debugger)
- A single mouse-click swaps context and the debugger display a different application/CPU

# **Real-time tracing**

#### with Serial Wire Viewer (SWV)

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- Real-time data view with data trace
- Real-time trace logs & timeline charts for different event types
- Tooltips for detailed event analysis in timeline charts
- Console for ITM printf() redirection

Embedded Syste

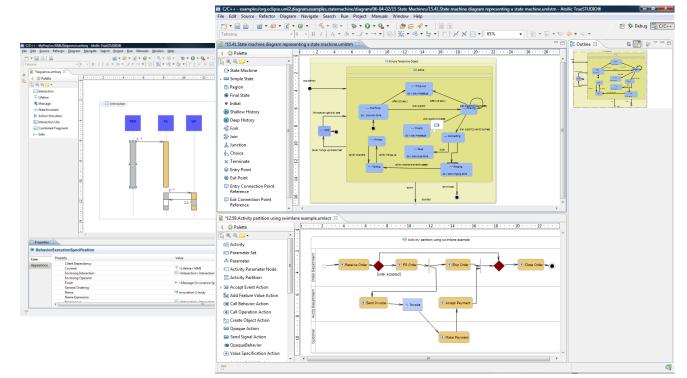
#### **UML** Graphical modeling of software

"Embedded passion"



8

### UML modeling (1/2)



- Atollic TrueSTUDIO® supports model driven design & architecture.
- Integrated UML diagram editors enable software developers to:
  - Capture requirements and use cases
  - Model structural design and dynamic behavior
  - Visualize and document the software architecture

**Fenway** Embedded Systems

### UML modeling (2/2)

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TThe following UML diagram editors are included:

- Activity diagram editor
- Class diagram editor
- Component diagram editor
- Composite structures diagram editor
- Deployment diagram editor
- Sequence diagram editor
- State machine diagram editor
- Use case diagram editor





#### Team collaboration and complexity management tools

Version control system GUI client Bug database GUI client Code review & code review meetings

"Embedded passion"



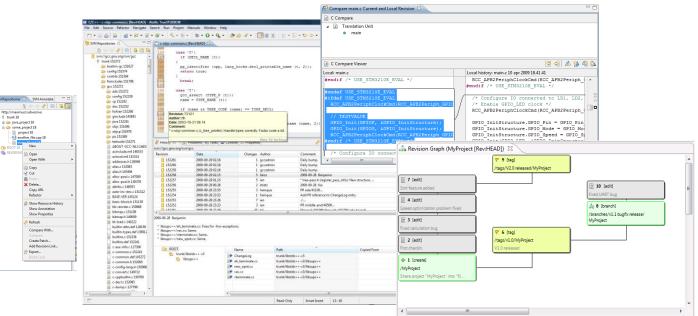
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- Fully integrated GUI client
  - Supports local mode & servers (Bugzilla, Trac, Mantis)
  - Task queries, task search, task lists, task editor, task scheduling
  - Improves team work capabilities & developer productivity
  - Issue management and work/task scheduling + task time calculation
  - Context management & attach screenshots to issues



#### Version control system client



#### Fully integrated GUI client for SVN & CVS

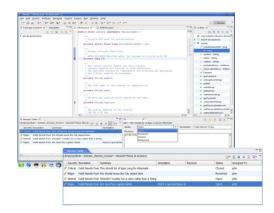
- Check-in/out and Branch/merge (including a merge-conflict editor)
- Repository & history browser
- File revision annotations, file difference viewer and revision graph viewer
- Full traceability of all lines, in all files, throughout complete project history
  - Who did what, when and why?
  - What did the code look like at time or version X?
  - Who added code line X, when and why?



### Code review & review meetings

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#### 1. Individual phase

Developers add code review comments to source code lines in the TrueSTUDIO editor

#### 2. Team phase

All code review comments are discussed in a code review meeting

(or two developers discuss each other's comments in a peer review)

#### 3. Rework phase

Developers fix review comments that have been assigned to him/her

#### Source code review process (for better quality!)





#### DEMO

#### Improve your software development with Atollic TrueSTUDIO<sup>®</sup>!

#### www.atollic.com

"Embedded passion"





#### **Contact Us**

# atollic

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HW&SW development products

#### atollic ab

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