



Embedded software solutions ST, Partners and open source

STM32 and STM8

A full portfolio and several models

- Extensive software ecosystem around the STM32 and STM8
- You will find your solution, fitting your requirements in terms of price, license and support

ST-designed software

- Built in-house, making the most of the STM32 and STM8
- Source code or binaries
- Supported by ST

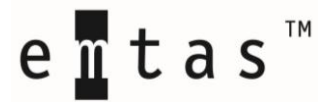
Open source

- Proposed by community or partners
- Source code, from BSD or GPL licenses to commercial products
- Supported by open source community or partners

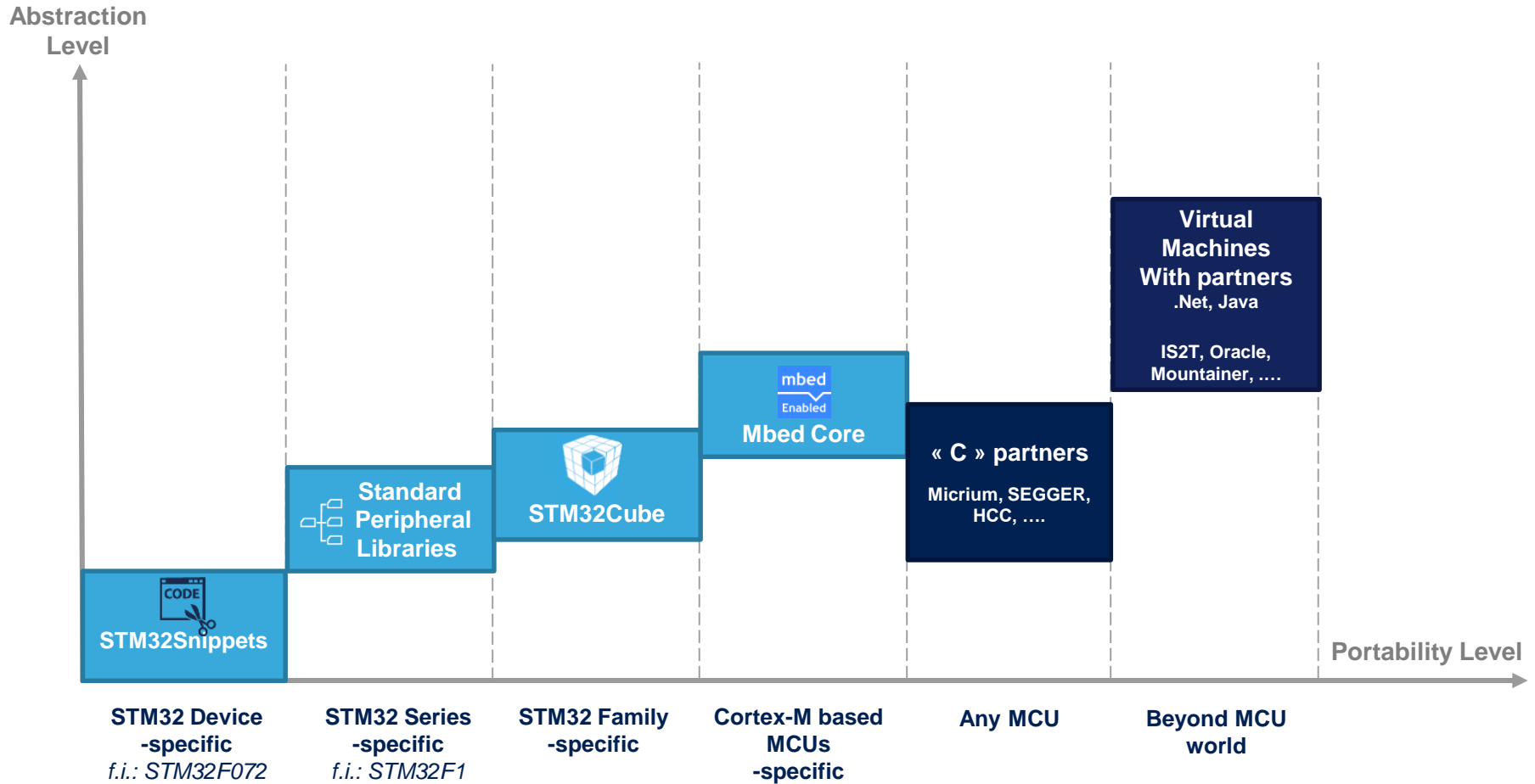
Partners

- Generic solutions proposed by many companies, portable to/from other platforms
- Source code or binaries
- Supported by partners

A large community of partners... and growing !

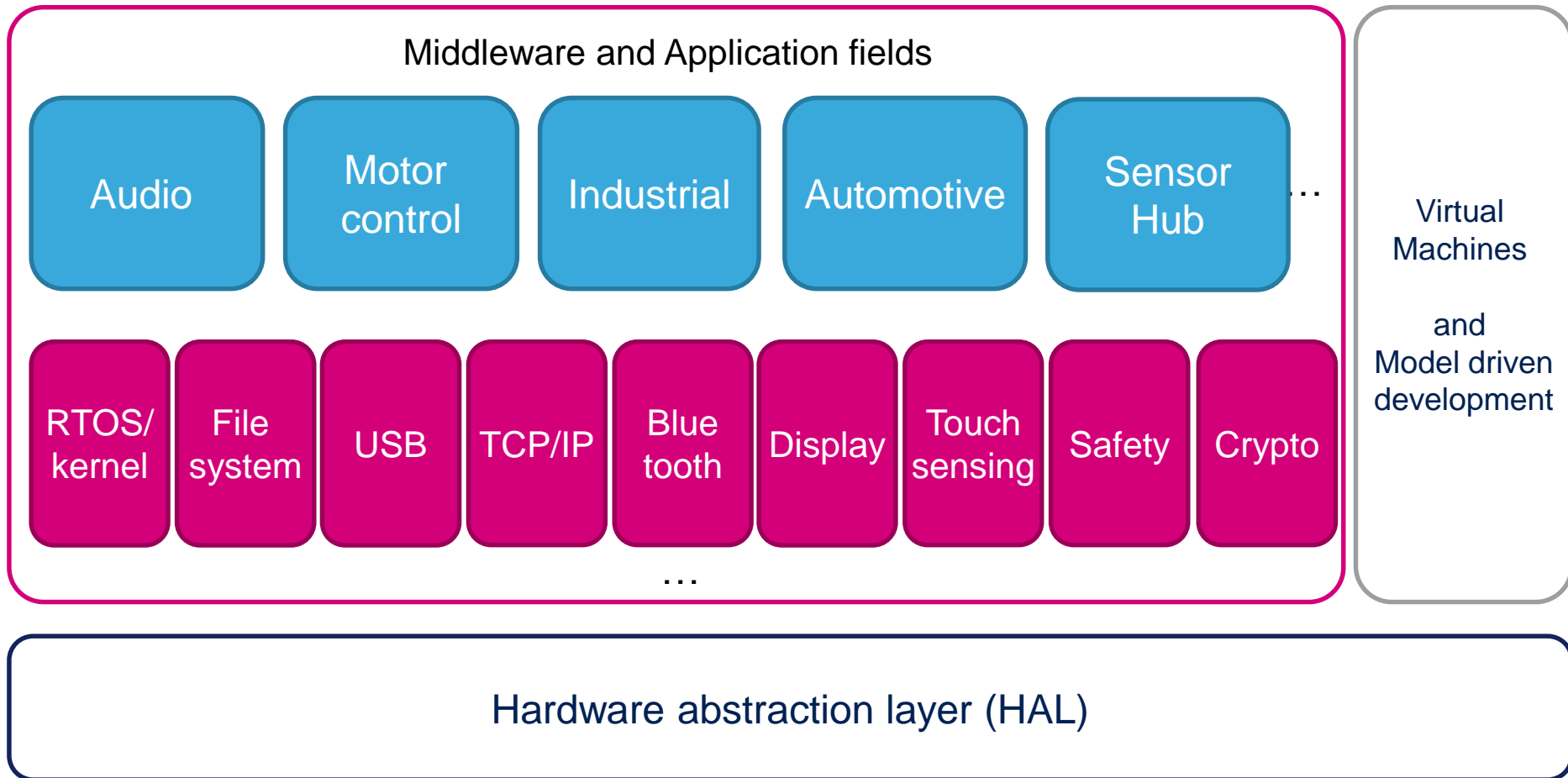


STM32 Embedded Software Offer Overview



Solutions at all levels

5



Select the area of interest for more details



Hardware abstraction layer (HAL)

Hardware abstraction layer

This layer is the first one to interact with the MCU hardware

- **Consistent programming interface**
 - When microcontrollers have different hardware implementations
- **Full microcontroller coverage**
 - All peripherals are handled



STM32 – Hardware abstraction layer

Provider	Solution name	Model	Cost	Availability								
				F0	F1	F2	F3		F4	F7	L0	L1
							F30x	F37x				
ST	STM32Snippets	Source	Free	Y	N	N	N		N	N	Y	N
ST	Standard peripheral library	Source	Free	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>	N	N	<u>Y</u>
ST	STM32Cube - HAL Hardware Abstraction Layer	Open Source	Free (BSD)	Y	Q1 15	Y	Y		Y	Q2 15	Y	Y



STM8 – Hardware dependent layer

Provider	Solution name	Model	Cost	Availability			
				S	A	L	
						L10x	L15x
ST	Standard peripheral library	Source	Free	<u>Y</u>	<u>Y</u>	<u>Y</u>	<u>Y</u>



Middleware (USB, Ethernet, ...)

Middleware and Application fields

Middleware stacks fill the gap between hardware and your application. ST and ST's partners bring the required solutions.

ST also propose some application software bricks, to speed up customers development.

- **All standard middleware covered**

- RTOS/kernel
- File system
- USB
- TCP/IP
- Bluetooth
- Safety and Security
- Industrial protocols
- Audio
- ...

Middleware – RTOS/kernel

This is the root component to share time between several tasks on a single core. It ensures task switch within a known and limited duration.

- **A multitude of solutions for the STM32 and STM8 available now**
 - New contributions are being added regularly



STM32 – RTOS / kernel (1/2)

Provider	Solution name	Model	Cost	Availability							
				F0	F1	F2	F3	F4	F7	L0	L1
AVIX-RT	AVIX	Binaries	License	N	Y	Y	Y	Y	Y	N	Y
Chibios	ChibiOS/RT	Open source (GPL3) or Source	Free or License	Y	Y	Y	Y	Y	Y	Y	Y
CMX	CMX-RTX	Source	License	N	Y	Y	Y	Y	Y	N	Y
CMX	CMX-Tiny	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
eCosCentric	eCosPro	Source ¹	License	N	Y	Y	Y	Y	Y	N	Y
eForce	µC3/Compact	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
Emcraft	uCLinux	Open Source (GPL) ²	Free ²	N	N	Y	N	Y	Y	N	N
EUROS	EUROSPlus	Binaries	License	N	Y	Y	Y	Y	Y	N	Y
Express Logic	ThreadX	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
FreeRTOS	FreeRTOS	Open source (modified GPL)	Free	Y	Y	Y	Y	Y	Y	Y	Y
Green Hills	µ-velOSity	Source	License	N	Y	Y	Y	Y	Y	N	Y
HCC	eTaskSync	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
Keil/ARM	MDK-ARM	Source	License	Y	Y	Y	Y	Y	Y	Y	Y



1/ eCos is an open source kernel, a subset of eCosPro. eCosPro comes with TCP/IP stack, FAT, jFFS2, RAM and ROM FS
 2/ uCLinux is open source, but this company proposes some ports on STM32. It requires some additional boards that they sell.
 uCLinux can be much more than just a Kernel



STM32 – RTOS / kernel (2/2)

Provider	Solution name	Model	Cost	Availability							
				F0	F1	F2	F3	F4	F7	L0	L1
Mentor	Nucleus Kernel	Source	License	N	Y	Y	Y	Y	Y	N	Y
Micrium	μC-OS	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
Micro Digital	SMX	Source	License	N	Y	Y	Y	Y	Y	N	Y
Quadros	RTXC Rtos	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
Rowebots	Unison	Source ¹	License	N	Y	Y	Y	Y	Y	N	Y
SEGGER	embOS	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
ST	STM32Cube - FreeRTOS	Open source (modified GPL)	Free	Y	Q1 15	Y	Y	Y	Q2 15	Y	Y
High Integrity Systems	OpenRTOS²	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
High Integrity Systems	SafeRTOS³	Source	License	Y	Y	Y	Y	Y	N ⁴	N ⁴	Y



STM8 – RTOS/kernel

Provider	Solution name	Model	Cost	Availability		
				S	A	L
AtomThreads	AtomThreads RTOS	Open source (BSD)	Free	Y	N ¹	N ¹
Chibios	ChibiOS/RT	Open source (GPL3) or Source	Free or License ²	Y	N ¹	Y
CMX	CMX-Tiny+	Source	License	Y	N ¹	N ¹
SEGGER	embOS	Source	License	Y	Y	Y

A file system is the way in which files are named and how they are placed logically for storage and retrieval. Several standards exist, such as FAT and JFFS2

- **Some safety solutions**

- Ensuring data is not corrupted in any way (power supply removal, ...)

- **Some NAND memory access solutions**

- With error correction and wear-leveling



STM32 – File system (1/2)

Provider	Solution name	Model	Cost	Availability								
				F0	F1	F2	F3	F4	F7	L0	L1	
ChaN	FatFS	Open source (BSD)	Free	Y ³	Y ³	Y ³	Y ³	Y ³	Y ³	Y ³	Y ³	Y ³
CMX	CMX-FFS	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cypherbridge	uFile	Source	License	N	N	Y	N	Y	Y	N	N	N
EmCraft	JFFS2, YaFFS, FAT, NFS, etc..	Open source (GPL)	Free	N	N	Y	N	Y	Y	N	N	N
eCosCentric	eCosPro-YAFFS, MMFS, JFFS2	Source	License ¹	N	Y	Y	Y	Y	Y	N	Y	Y
eForce	uC3-FileSystem	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
Express Logic	FileX	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
EUROS	FMS	Binaries	License	N	Y	Y	Y	Y	Y	N	Y	Y
FreeRTOS	FreeRTOS+FAT SL	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
HCC	FAT File Sys, Thin, SafeFAT, FTL, NAND,NOR, eMMC...	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
Green Hills	u-veLOsity File System	Source	License	N	Y	Y	Y	Y	Y	N	Y	Y



1/ Free for non commercial usage.
 2/ Available on customer request. Please contact supplier.
 3/ FatFS ported on STM32 available on demos



STM32 – File system (2/2)

Provider	Solution name	Model	Cost	Availability							
				F0	F1	F2	F3	F4	F7	L0	L1
Keil/ARM	MDK-ARM Flash	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
Mentor Embedded	Nucleus Storage	Source	License	N	Y	Y	Y	Y	Y	N	Y
Micrium	µC/FS	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
Micro Digital	smxFS	Source	License	N	Y	Y	Y	Y	Y	N	Y
Quadros	RTXCfatfile	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
Rowebots	Unison FAT File System	Source	License	N	Y	Y	Y	Y	Y	N	Y
SEGGER	emFile	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
ST	STM32Cube - FatFS	Open source (BSD)	Free	Y	Q1 15	Y	Y	Y	Q2 15	Y	Y



STM8 – File system

Provider	Solution name	Model	Cost	Availability		
				S	A	L
ChaN	Petit FatFS	Open source (BSD)	Free	N ¹	N ¹	Y ²
HCC	FAT THIN	Source	License	Y	Y	Y
SEGGER	emFile	Source	License	Y	Y	Y



Universal Serial Bus requires a dedicated software stack. This serial bus is organized in a star topology with host and device roles, host organizing the traffic. Several device classes are specified, in order to ease communication in different application cases.

- **ST provides a complete offer for STM32**

Often seen acronyms

OTG	On-The-Go: An OTG peripheral can switch host and device role on the fly
HUB	Defines what protocols to implement to build a hub application
MS	Mass storage: Protocols to interact with storage block devices (for files)
HID	Human interface device: Protocols for peripherals interacting with human body (mouse, keyboard, etc.)
CDC	Communication device class: Protocols for serial communications, different sub-classes define details, for instance ACM for a standard COM port, or ECM for modems
Printer	Defines what protocols to implement to build a printer application
Audio	Defines what protocols to implement to build an audio application (microphone, headset, etc.)
DFU	Device firmware upgrade: Protocols to implement firmware upgrade ability



STM32 – USB solutions (1/2)

Provider	Solution name	Model	Cost	Availability								
				F0	F1	F2	F3	F4	F7	L0	L1	
Chibios	ChibiOS/HAL	Open source (GPL3) or Source	Free or License ²	Y	Y	Y	Y	Y	Y	Y	Y	Y
CMX	CMX-USB Device, Host	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
eCosCentric	eCosPro-Host, Device	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
EUROS	USB Host & Device	Binaries	License	N	Y	Y	Y	Y	Y	Y	N	Y
EmCraft	Linux USB Host	Open source (GPL)	Free	N	N	Y	N	Y	N	N	N	N
Express Logic	USBX	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
HCC	HCC-USB Host, Device	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
Keil/ARM	MDK-ARM USB	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mentor Embedded	Nucleus USB	Source	License	N	Y	Y	Y	Y	Y	Y	N	Y
Micrium	µC/USB	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
Micro Digital	smxUSB	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quadros	RTXCusb	Source	License	N ¹	Y	Y	Y	Y	N ¹	N ¹	N ¹	N ¹
Rowebots	Unison USB System	Source	License	N	Y	Y	Y	Y	Y	Y	N	Y





STM32 – USB solutions (2/2)

Provider	Solution name	Model	Cost	Availability								
				F0	F1		F2	F3	F4	F7	L0	L1
					Othe rs	F105 F107						
SEGGER	emUSB Device , emUSB Host	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
ST	USB FS device library	Source	Free	<u>Y</u>	<u>Y</u>	N	N	<u>Y</u>	N	N	N	<u>Y</u>
ST	USB FS&HS Host&Device lib	Source	Free	N	N	<u>Y</u>	<u>Y</u>	N	<u>Y</u>	N	N	N
ST	STM32Cube – USB Host&Device	Source	Free	Y ²	Q1/15		Y	Y ²	Y	Q2 15	Y ²	Y ²
Thesycon	Embedded USB Device	Source	License	N ¹	N ¹		Y	N ¹	Y	N ¹	N ¹	N ¹



STM32 – USB solutions details (1/2)

Provider	Solution name	Details
Chibios	<u>ChibiOS/HAL</u>	Device: HID, MS, CDC
CMX	CMX-USB <u>Device</u> , <u>Host</u>	Device: HID, MS, CDC (ACM, ECM, RNDIS), Audio, Midi, MTP, PHDC Host: HID, MS, CDC (ACM, ECM, RNDIS, OBEX), Audio, Midi, Printer, HUB
eCosCentric	<u>eCosPro-Host</u> , <u>Device</u>	Device: MS, CDC (ACM, ECM, EEM, RNDIS) Host: MS, CDC (ACM, ECM, EEM, RNDIS), Hub
EUROS	<u>USB Host & Device Stack</u>	Device: HID, MS, CDC (ACM, ECM) Host: HID, MS, CDC (ACM, ECM), HUB
Express Logic	<u>USBX</u>	Device: HID, MS, CDC (ACM, ECM, RNDIS), Still Image, PTP, PictBridge Host: HID, MS, CDC (ACM, ECM), Audio, Printer, HUB
EmCraft	<u>Linux USB Host</u>	Host: HID, MS, CDC (ACM, ECM), HUB
HCC	<u>HCC-USB</u>	Device: HID, MS, CDC (ACM, ECM, EEM, RNDIS), Audio, Video, MIDI, PTP, MTP, PictBridge, DFU, PHDC Host: HID, MS, CDC (ACM, ECM, EEM, NCM, OBEX, FTDI), Audio, Video, PTP, MTP, iPod, HUB
Keil/ARM	<u>MDK-ARM USB</u>	Device: HID, MS, CDC (ACM), Audio Host: HID, MS
Mentor Embedded	<u>Nucleus USB</u>	Device: HID, MS, CDC (ACM, ECM) Host: HID, MS, CDC (ACM, ECM), HUB
Micrium	<u>µC/USB</u>	Device: HID, MS, CDC (ACM), Audio, PHDC (Medical) Host: HID, MS, CDC (ACM), Audio, Printer, PHDC (Medical)
Micro Digital	<u>smxUSB</u>	Device: HID, MS, CDC (ACM, RNDIS, ECM), Audio, Video, Midi, PTP, MTP, DFU Host: HID, MS, CDC (ACM, ECM), Audio, Video, Printer, HUB
Quadros	<u>RTXCusb</u>	Device: MS, CDC (ACM, ECM, RNDIS) Host: HID, MS, CDC (ACM), HUB



STM32 – USB solutions details (2/2)

Provider	Solution name	Details
Rowebots	Unison USB System	Device: MS, CDC (ACM) Host: MS, CDC (ACM), HUB, others on demand (inc . PHDC)
SEGGER	emUSB Device , emUSB Host	Device: HID, MS, CDC (ACM), RNDIS, Printer, MTP Host: HID, MS, CDC (ACM), HUB
ST	USB FS device library	Device: HID, MS, CDC (ACM), Audio, DFU, PHDC (with below Continua package)
ST	USB FS&HS Host&Device	Device: HID, MS, CDC (ACM), Audio, DFU Host: HID, MS
ST	STM32Cube – USB Host&Device	Device: HID, MS, CDC (ACM), Audio, DFU Host: HID, MS, CDC (ACM), Audio, MTP
Thesycon	Embedded USB Device	Device: HID, MS, CDC (ACM, ECM, NCM)



Middleware – TCP/IP (1/2)

TCP and IP were developed by a US Department of Defense research project to connect a number of different networks designed by different vendors into a network of networks (the Internet).

It was initially successful because it delivered a few basic services that everyone needs (file transfer, electronic mail, remote logon) across a very large number of client and server systems, and is now widely deployed.



Middleware – TCP/IP (2/2)

Often seen acronyms

ARP	Address resolution protocol: Provides physical address from IP address
IP	Internet protocol: Primary protocol in Internet Protocol Suite. 2 flavors: IPv4 and IPv6. IPv4 will disappear as it only supports up to 2^{32} addresses, not enough for future needs, while IPv6 supports 2^{128}
6LoWPAN	IPv6 over low power wireless personal area networks: Provides IPv6 connectivity to low rate wireless networks
IPSec	Internet protocol security: Secured version of IP, using cryptography
TCP	Transmission control protocol: Provides reliable, ordered delivery of a stream of bytes
UDP	User datagram protocol: Provides unreliable service. Datagrams may arrive in any order, duplicated, or may be missing. Used for time-sensitive applications, when data drop is better than delay
DHCP	Dynamic host configuration protocol: Provides means to allocate IP address dynamically
DNS	Domain name system: Translates domain names meaningful to humans into numerical IP ones
FTP	File transfer protocol: Provides means to copy files from one host to another
TFTP	Trivial file transfer protocol: Similar to FTP, but based on UDP, and simpler (for example, no directory)
SMTP	Simple mail transfer protocol: Used to send e-mail to a server
POP	Post office protocol: Used to retrieve e-mail from a server
HTTP	Hypertext transfer protocol: Used by web browsers
SSL/TLS	Transport layer security: Secured container for application protocols using cryptography. Example: HTTPS means HTTP over SSL, FTPS, etc.. IPSec applies cryptography at a lower level than SSL/TLS, making it more universal. However SSL is widely used.
Wi-Fi	Wi-Fi is an implementation of the IEEE 802.11 radio communication specification. It is usually used with a TCP/IP stack, so all TCP/IP bricks can be reused on Wi-Fi, adapting the lowest firmware layer.



STM32 – TCP/IP solutions (1/3)

Provider	Solution name	Model	Cost	Availability			
				F107	F2	F4	F7
CMX	CMX-TCP/IP , CMX-MicroNet , CMX-Inet-Plus	Source	License	Y	Y	Y	Y
Cypherbridge	uSSH	Source	License	N	Y	Y	Y
EUROS	TCP/IP stack	Binaries	License	N	Y	Y	Y
Express Logic	NetX and NetX Duo IPv4/IPv6	Source	License	Y	Y	Y	Y
eCosCentric	SecureSockets , SecureShell eCosPro stacks	Source	License	Y	Y	Y	Y
eForce	uNet3	Source	License	Y	Y	Y	Y
EmCraft	Linux TCP/IP stack	Open source (GPL)	Free	N	Y	Y	Y
GreenHills	μ-velOSity TCP/IP v4/v6	Source	License	Y	Y	Y	Y
HCC	MISRA HCC-TCP/IP v4/v6	Source	License	Y	Y	Y	Y
Interniche	NicheStack	Source	License	Y	Y	Y	Y
Interniche	embTCP v4/v6	Binaries	License	N	Y	Y	Y
Keil/ARM	MDK-ARM TCPNET	Source	License	Y	Y	Y	Y
SICS	LwIP	Open source (BSD)	Free	<u>Y</u> ²	<u>Y</u> ²	<u>Y</u> ²	Y ³



1/ Available on customer request. Please contact supplier
 2/ A port to STM32 was implemented by ST
 3/ A port to STM32 was implemented by ST, as part of STM32Cube



STM32 – TCP/IP solutions (2/3)

Provider	Solution name	Model	Cost	Availability			
				F107	F2	F4	F7
Mentor Embedded	Nucleus Network	Source	License	Y	Y	Y	Y
Micrium	µC/TCP-IP	Source	License	Y	Y	Y	Y
Micro Digital	smxNS and smxNS6 (Dual IPv6/v4)	Source	License	Y	Y	Y	Y
Oryx Emb.	CycloneTCP	Open source (GPL2) or source	Free or license	Y	Y	Y	Y
Quadros	RTXC Quadnet	Source	License	Y	Y	Y	Y
Rowebots	Unison TCP-IP/v4-v6	Source	License	Y	Y	Y	Y
SEGGGER	embOS/IP	Source	License	Y	Y	Y	Y
ST	STM32Cube - LwIP	Open source (BSD)	Free	Q1/15	Y	Y	Q2/15



STM32 – TCP/IP solutions (3/3)

Provider	Solution name	Model	Cost	Availability			
				F107	F2	F4	F7
CypherBridge	uSSL/TLS	Source	License	N	Y	Y	Y
HCC	Verifiable SSL/TLS	Source	License	Y	Y	Y	Y
Oryx Emb.	CycloneSSL	Open source (GPL2) or Source	Free or license	Y	Y	Y	Y
PolarSSL	PolarSSL	Open source (GPL2) or Source	Free or license	Y ¹	Y ¹	Y ¹	Y ²
ST	STM32Cube - PolarSSL	Open source (GPL2) or Source	Free or license	Q1 15	Y	Y	Q2 15
wolfSSL	CyaSSL	Open source (GPL2) or Source	Free or license	N	Y	Y	Y
SEGGER	emSSL	Source	License	Y	Y	Y	Y

STM32 – TCP/IP solutions details (1/2)

Provider	Solution name	Details
CMX	<u>CMX-TCP/IP</u>	PPP, PPPoE, ARP, IGMP, ICMP, IPv4, UDP, TCP, DHCP(cs), DNS, FTP(cs), IMAP4, NAT, POP3(c), SMTP, SNMP, SNTP, Telnet(s), SSL/TLS, SSH, TFTP(cs), HTTP(s)
CMX	<u>CMX-MicroNet</u>	PPP, ARP, IGMP, ICMP, IPv4, UDP, TCP, DHCP(c), DNS, FTP(cs), POP3(c), SMTP, SNMP, SNTP, Telnet(s), SSL/TLS, TFTP (c), HTTP(s)
CMX	<u>CMX-Inet-Plus</u>	SLIP, PPP, PPPoE, ARP, IGMP, ICMP, IPv4, IPv6, IPSec/IKE, UDP, TCP, DNS, DHCP(cs), FTP(cs), NAT, POP3(c), SMTP, SNMP, SNTP, Telnet(s), SSL/TLS, TFTP, HTTP(s), RTP/RTCP, SSH
Cypherbridge	<u>uSSH</u>	SSH
EUROS	<u>TCP/IP stack</u>	PPP, PPPoE, ARP, IGMP, ICMP, IPv4, IPv6, IPSec/IKE, UDP, TCP, DNS, DHCP(cs), FTP(cs), NAT, POP3(c), SMTP, SNMP, SNTP, Telnet(s), SSL/TLS, TFTP, HTTP(cs)
Express Logic	<u>NetX and NetX Duo IPv4/IPv6</u>	PPP, ARP, IGMP, ICMP, IPv4, IPv6, IPSec/IKE, UDP, TCP, DNS, DHCP(c), FTP(cs), NAT, POP3(c), SMTP, SNMP, SNTP, Telnet(s), TFTP, HTTP(s)
eCosCentric	<u>SecureSockets</u>	SSH2
eCosCentric	<u>SecureShell</u>	SSL/TLS
eCosCentric	<u>eCosPro stacks</u>	PPP, ARP, ICMP, UDP, TCP, IPv4, IPv6, DHCP, BOOTP, SMTP, TFTP, FTP(c+s), HTTP, SNMP, NTP, mDNS, Bonjour
eForce	<u>µNet3</u>	PPP, ARP, IGMP, ICMP, IPv4, IPv6, UDP, TCP, DNS, DHCP(c), FTP(s), HTTP(cs), TFTP, SNMP, SNTP, Telnet(s), POP3(c), SMTP, SSL/TLS
EmCraft	<u>Linux TCP/IP stack</u>	PPP, DNS, NAT, SSH (cs), DHCP (cs), SNMP (cs), Telnet (cs), FTP (cs), HTTP (cs)
HCC	<u>MISRA HCC-TCP/IP v4/v6</u>	ARP, ICMP, IPv4, IPv6, UDP, TCP, DNS, DHCP(c), FTP(s), SMTP, TFTP(s), HTTP(s)
Green Hills	<u>µ-veLOsity TCP/IP v4/v6</u>	ARP, ICMP, IGMP, IPv4, IPv6, IPv4/6, UDP, TCP, DNS, DHCP(c),
Interniche	<u>NicheStack</u>	SLIP, PPP, PPPoE, ARP, IGMP, ICMP, IPv4, IPv6, IPSec/IKE, UDP, TCP, DNS, DHCP(cs), FTP(cs), NAT, POP3(c), SMTP, SNMP, SNTP, Telnet(s), SSL/TLS, TFTP, HTTP(s), RTP/RTCP, SSH
Interniche	<u>embTCP v4/v6</u>	ARP, TCP/IP v4, IPv4/v6 HTTP, FTP Telnet ICMP, UDP, TCP. DNS, DHCP

STM32 – TCP/IP solutions details (1/2)

Provider	Solution name	Details
Keil/ARM	MDK-ARM TCPNET	SLIP, PPP, ARP, IPv4, ICMP, UDP, TCP, DNS, DHCP(c), FTP(s), SMTP, SNMP, Telnet(s), TFTP(s), HTTP(s)
SICS	LwIP	PPP, ARP, ICMP, IPv4, UDP, TCP, DHCP(c)
Mentor Embedded	Nucleus Kernel	PPP, PPPoE, ARP, IGMP, ICMP, IPv4, IPv6, IPSec/IKE, UDP, TCP, DHCP(c), FTP(cs), NAT, SNMP, SMTP, Telnet(cs), SSL/TLS, TFTP (cs), HTTP(cs)
Micrium	μC/TCP-IP (and μC/SSL)	ARP, ICMP, IPv4, UDP, TCP, DNS, DHCP(c), FTP(cs), SMTP, POP3(c), SNMP, Telnet(s), SSL/TLS, TFTP, HTTP(s)
Micro Digital	smxNS and smxNS6 (Dual IPv6/v4)	SLIP, PPP, PPPoE, ARP, IGMP, ICMP, IPv4, IPv6, IPv4/6, UDP, TCP, DNS, mDNS, DHCP(cs), FTP(cs), NAT, POP3(c), SMTP, SNMP, SNMP, Telnet(s), SSL/TLS, TFTP, HTTP(cs), RTP/RTCP, SSH
Oryx Emb.	CycloneTCP	ARP, IPv4, ICMP, IGMP, IPv6, ICMPv6, MLD, NDP, SLAAC, UDP, TCP, DNS, DHCP(c), DHCPv6(c), SMTP(c), FTP(cs), HTTP(s)
Quadros	RTXC Quadnet	PPP, PPPoE, ARP, IGMP, ICMP, IPv4, IPv6, IPSec/IKE, UDP, TCP, DNS, DHCP(cs), FTP(cs), NAT, POP3(c), SMTP, SNMP, SNMP, Telnet(s), SSL/TLS, TFTP, HTTP(cs), UPnP, Prioritized Packets Handling
Rowebots	Unison TCP-IP/v4-v6	PPP, ARP, ICMP, IGMP, IPv4, IPv6, IPv4/6, 6LoWPan, IPSec, UDP, TCP, DNS, DHCP(cs), SMTP(c), SNMP, Telnet(s), TFTP(cs), HTTP(cs), NAT
SEGGER	embOS/IP	PPP, PPPoE, ARP, ICMP, IGMP, IPv4, UDP, TCP, DNS, DHCP(cs), FTP(cs), SMTP(c), SNMP(c), Telnet(s), TFTP(cs), HTTP(s)
SICS	Contiki/uIP6	IPv6, 6LoWPAN
ST	STM32Cube - LwIP	PPP, ARP, ICMP, IPv4, UDP, TCP, DHCP(c)

Bluetooth is a wireless communication technology for exchanging data over short distances, typically used in the mobile world between phones and accessories.

- **Solutions with STM32 + Bluetooth transceiver**

- Several solutions are available, using STM32 with ST's [STA2500D](#), [STLC2690](#), [BlueNRG](#), or other components

Often seen acronyms

Bluetooth Low Energy	(Also called Bluetooth Smart) very interesting for application running out of battery (coin cell type) as power consumption is very low, with a lower data rate and connection time
Classic Bluetooth	Original Bluetooth before Bluetooth Low Energy appearance. Still required for Audio application.
Dual mode devices	Devices able to handle Classic Bluetooth, and Bluetooth Low Energy. Also called Bluetooth Smart ready
HCI	Host/controller interface: Standardized communication between controller and radio chips
SPP	Serial port profile: Profile that emulates serial line over Bluetooth
A2DP	Advanced audio distribution profile: Profile to stream high quality audio
HSP	Headset profile: Profile to implement a basic headset application
HDP	Health device profile: Profile designed to facilitate transmission and reception of medical data
HFP	Hands-free profile: Typical profile used in cars for hands-free phone usage



STM32 – Bluetooth solutions

Provider	Solution name	Model	Cost	Availability									
				F0	F1	F105 F107	F2	F3	F4	F7	L0	L1	
Alpwise	iAnywhere Blue SDK 3.x	Binaries or Sources	License + royalties	N ²	Y	Y	Y	N ²	Y	Y	N ²	Y	
Alpwise	iAnywhere Blue SDK 4.x	Binaries or Sources	License + royalties	N ²	N ²	Y	Y	N ²	Y	Y	N ²	N ²	
Alpwise	ALPW-BLESDK	Binaries or Sources	License + royalties	Y	Y	Y	Y	Y	Y	Y	Y	Y	
A&W	PhoneLink	Binaries or Sources	License and/or royalties	N	N	Y	Y	N	Y	Y	N	N	
Clarinox	ClarinoxBlue	Binaries or Sources	License and/or royalties	On demand									
SEARAN	dotStack	Binaries or Sources	License and/or royalties	Y	Y	Y	Y	Y	Y	N ¹	N ¹	Y	
ST	BlueNRG software	Binaries and Sources	Free	N ³	N ³	N ³	N ³	N ³	Y ³	N ³	Y ³	N ³	
ST	Nordic nRF51	Binaries and Sources	Free	N ³	N ³	N ³	N ³	N ³	N ³	N ³	Y ³	N ³	



1/ Available on customer request. Please contact supplier
 2/ Available on specific conditions. Please contact supplier
 3/ Available on STM32Cube so porting is very easy

STM32 – Bluetooth solutions details

Provider	Solution name	Details
Alpwise	iAnywhere Blue SDK 3,x	BT2.1 + EDR, BT3.0, BT3.0 + HS Supported profiles: AD2P, AVRCP, HFP, HSP, HID, OBEX, FTP, OPP, SPP and more
Alpwise	iAnywhere Blue SDK 4.x	BT4.0 BLE Dual Mode Supported profiles: AD2P, AVRCP, HFP, HSP, HID, OBEX, FTP, OPP, SPP and more
Alpwise	iAnywhere	BT4.0 BLE Single Mode Supported profiles: GAP, GATT, Proximity, Find Me, Heart Rate, Health Thermometer, Alert Notification, Time and more
A&W	PhoneLink	BT2.1+EDR, BT4.0 Supported Profiles : HFP, HSP, PBAP, A2DP, AVRCP, HID, OBEX, FTP, OPP, SPP, PAN, MAP and more
Jungo	BTware	BT2.1+EDR, BT3.0 Supported profiles: A2DP, AVRCP, HFP, HSP, HDP HID, FTP, SPP, iPod, and more
Clarinox	ClarinoxBlue	BT4.0 + EDR + LE Supported profiles: A2DP, AVCTP, AVDTP, AVRCP, DI, DUN, FTP, GAVDP, GAP, HFP, HSP, HCI, IOP, L2CAP, MAP, OBEX, OPP, PAN, PBAP, RFCOMM, SDAP, SDP, SPP, GAP, ATT, GATT
SEARAN	dotStack	BT2.1+EDR, BT4.0, BT4.1 Supported profiles: SPP, HID, PAN, MAP, FTP, HSP, HFP, A2DP, AVRCP, PBAP, iAP, GATT, apps on iOS and Android
ST	BlueNRG software	BT4.0, BT4.1 All profiles supported
ST	Nordic nRF51	BT4.0, BT4.1 All profiles supported



ST's MCUs can drive displays through serial or parallel interfaces.

- **Getting the most from hardware and software**

- ST has built a close relationship with partners providing software solutions based on our microcontrollers. Customers can make the most of their hardware.

Often seen acronyms

Anti aliasing	Technique to minimize distortion artifacts known as aliasing when presenting a high-resolution image at a lower resolution. Aliased images show some stair effects on curves. Anti-aliasing removes this by modifying edge pixel colors.
Alpha blending	Alpha blending is the process of combining a translucent foreground color with a background color, thereby producing a new blended color.
GUI	Graphical user interface
bpp	Bits per pixel (also known as color depth: Number of bits used to represent the color of a single pixel in an image. 1 bpp corresponds to monochrome images.
Palette	Technique to lower image memory size by storing the set of colors used in a table and using this table for each pixel
JPEG	Commonly used method of lossy compression for digital image. The degree of compression can be adjusted, allowing a trade-off between storage size and image quality. JPEG typically achieves 10:1 compression with little perceptible loss in image quality.
RGB	Color model in which red, green and blue are merged to reproduce a broad array of colors.
Widgets	Element of a graphical user interface that can be changed by the user (such as text box, radio button)



STM32 – Display solutions (1/2)

Provider	Solution name	Model	Cost	Availability							
				F0	F1	F2	F3	F4	F7	L0	L1
Altia	Altia Design and Deep screen	Source	License	Y	Y	Y	Y	<u>Y</u>	Y	N ¹	Y
Crank	Storyboard	Binaries	License	N	N ¹	N ¹	Y	Y	Y	N	N ¹
Draupner	TouchGFX	Source	License	N	N	N	N	Y	Y	N	N
eCosCentric	eCosPro-C/PEG, PEG+	Source	License	N ¹	Y	Y	Y	Y	N ¹	N ¹	N ¹
EUROS	eGUI	Binaries	License	N ¹	Y	Y	Y	Y	Y	N ¹	Y
Express Logic	GUIX	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
IS2T	MicroUI as part of MicroEJ	Binaries	Lic. + Roy.	Y	Y	Y	N	Y	Y	Y	Y
Korulab	Koru	Binaries	License	N	N	N	N	Y	Y	N	N
ST	Embedded GUI library	Source	Free	N	Y	Y	Y	Y	N	N	Y
ST	STemWin¹	Binaries	Free	N	Y	Y	Y	Y	Y	N	Y
ST	STM32Cube - STemWin	Binaries	Free	N	Q1 15	Y	Y	Y	Q2 15	N	Y
ST	ST Java UI	Binaries	Free	Y	Y	Y	N	Y	Y	Y	Y



1/ Available on customer request. Please contact supplier



STM32 – Display solutions (2/2)

Provider	Solution name	Model	Cost	Availability							
				F0	F1	F2	F3	F4	F7	L0	L1
Mentor Embedded	Inflexion UI	Binaries	License	N	N	Y	N	Y	Y	N	N
Micrium	µC/GUI	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
Micro Digital	C/PEG, PEG+, PEG Pro	Source	License	N ¹	Y	Y	Y	Y	Y	N ¹	N ¹
Rowebots	Remedy GraphXgen	Source	License	N	Y	Y	Y	Y	Y	N	N ¹
SEGGER	emWin	Source	License	Y	Y	Y	Y	Y	Y	Y	Y



Middleware – Touch sensing

Capacitive touch sensing is an electrical cost-efficient technology, replacing conventional mechanical switches to detect user actions, to build modern GUI look and feel.

- **NRE/royalty-free C source code**

- Complete solution for touch keys, linear and rotary touch sensors, with acquisition, post processing and API layers, debounce filtering and calibration functions

Often seen acronyms

Surface capacitance	The capacitance of a single ended electrode is modified when the finger gets close to it.
Projected capacitance	The capacitance between two sensing electrodes is modified when the finger gets close to them.
RC acquisition	Resistor-capacitor acquisition for surface capacitance only. It consists in measuring the charge and discharge time duration of a RC cell made of the electrode capacitance and a load resistor.
CT acquisition	Charge transfer acquisition for surface capacitance only. It consists in measuring the duration for charging the electrode capacitance and transferring part of the accumulated charge into a sampling capacitor. The CT acquisition is more robust than the RC one.



STM32 – Touch-sensing solutions

Provider	Solution name	Acquisition	Model	Cost	Availability							
					F0	F1	F2	F3	F4	F7	L0	L1
ST	STM32 Touch Sensing Library	CT	Source	Free	<u>Y</u>	N	N	<u>Y</u>	N	N	N	<u>Y</u>
ST	<u>STM32Cube – Touch Sensing</u>	CT	Source	Free	Y	N	N	Y	N	N	Y	Y



STM8 – Touch-sensing solutions

Provider	Solution name	Acquisition	Model	Cost	Availability		
					S	A	L
ST	STM8 Touch Lib	RC + CT	Source	Free	<u>Y</u> ¹	<u>Y</u> ¹	<u>Y</u> ¹



Safety targets protection of people and equipment from danger and harm, through a set of counter-measures ensuring some defined targets

- **Ready for certification offers on STM32**
 - Through partners or directly from ST

Often seen acronyms

ClassB	The IEC60730 safety standard defines the test and diagnostic methods that ensure the safe operation of embedded control hardware and software for household appliances. The IEC60730 standard category Class B prevents unsafe operation of the controlled equipment.
SIL	Safety Integrity Level (SIL) is defined by the industry standard IEC 61508 as a relative level of risk-reduction provided by a safety function, or to specify a target level of risk reduction.
ASIL	ASIL is a risk classification scheme defined by the ISO 26262 - Functional Safety for Road Vehicles standard. This is an adaptation of the Safety Integrity Level used in IEC 61508 for the automotive industry.



STM32 – Safety solutions

Provider	Solution name	Model	Cost	Availability							
				F0	F1	F2	F3	F4	F7	L0	L1
ST	Class B guidelines	Source ¹	Free	Y	Y	Y	Y	Y	N ²	N ²	Y
ST	STM32 Safety Manuals	Document	Free	Y	Y	Y	Y	Y	N	N	Y
Yogitech	fRSTL_STM32	Source	License	Y	Y	Y	Y	Y	N	N	Y



STM8 – Safety solutions

Provider	Solution name	Model	Cost	Availability		
				S	A	L
ST	Class B guidelines	Source	Free	Y	Y	Y



Cryptology means help user to ensure security of data or authentication. This is a key element to ensure IoT applications for instance.

- **Many supported algorithms**

- Through partners (some with certifications) or directly from ST

Often seen acronyms

Symmetric ciphering	Ciphering method that ensures the reuse of a unique key, both for encryption and decryption. Example: AES, DES, 3DES, ARC4, ...
Asymmetric ciphering	Ciphering method based on pair of key, a private and a public one. This also brings some kind of authentication: only the owner of private key can decrypt content that was encrypted with a public one. And people able to decrypt with public key can be sure it was encrypted by owner of private key. Example: ECDSA, RSA, ...
Hashing	Method to calculate a value, unique versus a given data content. This allows ensuring a content was not modified for instance. Example: MD5, SHA, ...



STM32 – Crypto

Provider	Solution name	Model	Cost	Availability								
				F0	F1	F2	F3	F4	F7	L0	L1	
HCC	Verifiable Encryption manager AES, 3DES, DSS, EDH, MD5, RSA, SHA1, SHA256	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
SEGGER	emSecure signatures	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
SEGGER	emLib AES and emLib DES	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
SEGGER	emFile encryption	Source	License	Y	Y	Y	Y	Y	Y	Y	Y	Y
ST	STM32 Cryptographic library ^{1, 2} AES, DES, 3DES, ARC4, MD5, SHA1, SHA2, RSA sig, ECC Key gen, ECDSA, ...	Binaries	Free	Y	Y	Y	Y	Y	Y	Y	Y	Y
wolfSSL	wolfCrypt ¹ , part of wolfSSL MD2, MD4, MD5, SHA-1, SHA-256, SHA-384, SHA-512, BLAKE2b, RIPEMD-160, Poly1305 AES (CBC, CTR, GCM, CCM), Camellia, DES, 3DES, ARC4, RABBIT, HC-128, ChaCha20 RSA, DSS (DSA), DH, EDH, NTRU ECDH-ECDSA, ECDHE-ECDSA, ECDH-RSA, ECDHE-RSA	Open source (GPL2) or Source	Free or license	N	N	Y	N	Y	Y	Y	Y	Y



1/ Can take benefit from hardware acceleration when available.
2/ Subject to trade regulation. See web site.



- **A complete solution for all audio aspects**

- All audio aspects can be covered by solutions from ST or partners or STM32

- **Optimized for ST products**

- Unlike open-source non-optimized solutions, ST works with partners to propose optimized algorithms for ST platforms

Often seen acronyms

Codec	A codec is a program capable of encoding and decoding a digital data stream. The encoded stream can be compressed or not, with a lossy (MP3, WMA, ...) or lossless (FLAC, ALAC, ...) mechanism.
PCM	Pulse-code modulation: Digital representation of an analog signal, in which the magnitude of the analogue signal is sampled regularly, each sample being quantized to the nearest value within a range of digital steps.
AAC, MP3, WMA	Music codecs with patents. Royalties need to be paid to patent owners.
Speex	Open source, no royalties speech codec
G711	Simple codec with no royalties often used in telephony
G726	ADPCM (adaptive differential pulse code modulation): Simple compression of PCM data

Provider	Solution name	Model	Cost	Availability								
				F0	F1	F105 F107	F2	F3	F4	F7	L0	L1
ST	ADPCM Vocoder , Speex Vocoder	Source	Free	N	Y	N ¹	N ¹	N ¹	N ¹	N	N	N ¹
ST	G711, G726, G726A Vocoders	Source	Free	N	N ¹	N ¹	Y ³	N ¹	Y ³	N	N	N ¹
ST	Audio Engine MP3 Decoder With Channel Mixer, Equalizer and Loud	Binaries	Free	N	N ¹	Y	Y	N ¹	Y	N ¹	N	N ¹
ST	Audio Engine MP3 Codec With Channel Mixer, Equalizer and Loud	Binaries	Free	N	N ¹	Y	Y	N ¹	Y	N ¹	N	N ¹
ST	Audio Engine WMA Decoder With Channel Mixer, Equalizer and Loud	Binaries	Free	N	N ¹	Y	Y	N ¹	Y	N ¹	N	N ¹
ST	Audio Engine AAC Decoder AAC-LC, HE-AAC+ v1, HE-AAC+ v2	Binaries	Free	N	N ¹	Y ³	Y ³	N ¹	Y ³	N ¹	N	N ¹
ST	Audio Engine AC3 Decoder	Binaries	Free	N	N	N	N	N	N ²	N ¹	N	N
ST	Audio Engine Post Processing Smart volume control, Equalizer, Sample rate converters, Stereo widening	Binaries	Free	N	N	N	N	N ¹	Y	N ¹	N	N
ST	Apple iAP Streaming Library (iPod/iPhone/iPad) ²	Source	Free	N	N	Y	Y	Y	Y	N ¹	N	Y
ST	USB audio class and stream synchro. (feedback pipe, external PLL, ...)	Binaries	Free	Y	N	Y	Y	N ¹	Y	Y	Y	N
ST	Source Rate Converter ³	Binaries	Free	N	Y	Y	Y	N ¹	Y	Y	N	N ¹

Provider	Solution name	Model	Cost	Availability								
				F0	F1	F105 F107	F2	F3	F4	F7	L0	L1
DSPConcept	Audio Weaver Algorithms	Binaries	License	N	N	N	N	N	Y	N ¹	N	N
Craftwork	Remote Speakers (DLNA Media Renderer)	Binaries	License	N	N	N	N ¹	N	Y	N ¹	N	N
Sensory	Voice recognition ²	Binaries	License	N	N	N	N	N	Y	N ¹	N	N
Vestec	Voice recognition ²	Binaries	License	N	N	N	N	N	Y	N ¹	N	N



Focus - STM32 audio post-processing (1/2)

Modules Names	Quality	Measured MHz	Flash Memory	Static RAM	Dynamic RAM	Remarks
SRC441	Standard	13.7 MHz	3204 Bytes	232 Bytes	3228 Bytes	Sampling Rate Conversion from 44.1 to 48 kHz
	High Quality	20.4 MHz	3894 Bytes	360 Bytes	3676 Bytes	
SRC236	Standard	8->16: 4.4 MHz 48->96: 25.3 MHz 16->48: 12.5 MHz 8->48: 12.3 MHz 32->48: 12.7 MHz 24->16: 6.2 MHz	1740 Bytes	972 Bytes	3364 Bytes	Sampling Rate Conversion supporting ratios 2, 3, 6, 1/2, 1/3, 1/6, 3/2 and 2/3.
	High Quality	8->16: 7.1 MHz 48->96: 40.7 MHz 16->48: 20.4 MHz 8->48: 20.2 MHz 32->48: 20.5 MHz 24->16: 10.2 MHz	2238 Bytes	1932 Bytes	4804 Bytes	
Omnisurround – Stereo Widening	Enhanced Mono to Stereo	6.4 MHz	3660 Bytes	1992 Bytes	384 Bytes	Signal is sampled at 48 kHz
	SW 2.0 to 2.0	13.2 MHz				
	Closely Spaced Speakers	4.0 MHz				
Omnisurround – 7.1 Virtualizer	5.1 or 7.1 -> 2.0	25.6 MHz	4764 Bytes	3028 Bytes	1152 Bytes	Signal is sampled at 48 kHz

Figures of merit on STM32F4 target



Focus - STM32 audio post-processing (2/2)

Modules Names	Quality	Measured MHz	Flash Memory	Static RAM	Dynamic RAM	Remarks
Gfx Equalizer (GrEq)	10-bands	14 MHz	4390 Bytes	552 Bytes	3840 Bytes	Graphical Equalizer. Signal is sampled at 48 kHz, 10 parallel bands with 6 available presets Can run inplace (Input buf = Output buf)
Biquad Filters	10 Biquads	14.1 MHz	570 Bytes	600 Bytes	4 Bytes	Generic Biquads filter (used for Transducer Equalizer for instance) Signal is sampled at 48 kHz Can run inplace (Input buf = Output buf)
Bass Manager (BAM)	with Limiter	17.1 MHz	9266 Bytes	2236 Bytes	5760 Bytes	BAss Manager. Up to +/- 24 dB, between 60 and 300Hz Can run inplace (Input buf = Output buf)
	without Limiter	12.7 MHz				
Smart Volume Control (SVC)	Standard	6.2 MHz	6160 Bytes	2648 Bytes	4800 Bytes	Smart Volume Control (includes DRC) Signal is sampled at 48 kHz Can run inplace (Input buf = Output buf)
	High Quality	10.9 MHz				
Gain Manager (GAM)	Standard	Stereo: 2.6 MHz	1472 Bytes	120 Bytes	1 Bytes	Gain Manager Signal is sampled at 48 kHz Can run inplace (Input buf = Output buf)
		8 channels: 8.6 MHz				
Panning	L/R Panning F/R Balancing	8.4 MHz	5654 Bytes	6872 Bytes	7680 Bytes	Signal is sampled at 48 kHz 2.0 input, 4.0 output Contains Front and Rear Left/Right Panning, Front/Rear balancing. Sweet Spot Mode for one user.
	Sweet Spot Mode 1	4.2 MHz				
	Sweet Spot Mode 2 (Ambi)	4.7 MHz	7956 Bytes	6968 Bytes	7680 Bytes	

Figures of merit on STM32F4 target



Application field – Industrial

Industrial market needs are very fragmented in terms of communication protocols. Many different protocols are available for different target applications in lighting, automation, metering and others.

- **Benefit from ST's extensive partner network**

- With ST's extensive partner network, our customers can easily find their required industrial protocol solution

Stack	Meaning
EtherCAT, Profinet, Ethernet/IP, Powerlink ...	Industrial Ethernet protocols for factory automation. Ethernet field buses are the latest trend in this application domain.
Profibus PA	Standard for field bus communication in automation technology (PA – process automation). Originally designed for EIA-485 but also available for fiber optics. Profibus is an open standard.
CANopen	Based on CAN physical layer, most popular protocol in industrial automation, medical devices, light electric vehicles and more
J1939	Standard used for communication and diagnostics with vehicle components (e.g. agricultural machines).
DeviceNet	Based on CAN physical layer. The common industrial protocol (CIP) is an industrial protocol for industrial automation applications. CIP is used in Ethernet/IP and DeviceNet.
Modbus	Originally designed for EIA-485. Modbus TCP is its Ethernet variant.
OPC-UA server	OPC defines communication of real-time process data over Ethernet between industrial equipment from different manufacturers (process instrumentation). All SCADA/HMI products support OPC-UA.
IO-Link	IO-Link is used for the lowest field level communication. It offers an additional and integrated digital data channel down to the smallest sensor and actuator in factory automation.



STM32 – Industrial solutions (1/5)

Provider	Solution name	Application	Model	Cost	Availability							
					F0	F1	F2	F3	F4	F7	L0	L1
Andrea Informatique	DLMS / COSEM	Metering	Binaries	License	N ¹	Y	Y	N ¹	Y	N ¹	N ¹	Y
eCosCentric	eCosPro-CAN	Factory Automation	Sources	License	N	Y	Y	Y	Y	Y	N	N
eCosCentric	CANopen	Factory Automation	Sources	License	N	Y	Y	Y	Y	Y	N	N
eCosCentric	eCosPro-ModbusTCP	Factory Automation	Sources	License	N	N	Y	Y	Y	Y	N	N
emtas	CANopen	Automation, medical	Source	License	Y	Y	Y	N	Y	N ¹	N	N
emtas	J1939	Commercial vehicles	Source	License	Y	Y	Y	N	Y	N ¹	N	N
emtas	EnergyBus	Commercial vehicles	Source	License	Y	Y	Y	N	Y	N ¹	N	N
emtas	EtherCAT²	Automation, medical	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
HMS	IXXAT® CANopen	Automation, medical	Source	License	N	Y	Y	Y	Y	Y	N	N
HMS	IXXAT® DeviceNet	Factory Automation	Source	License	N	Y	Y	Y	Y	Y	N	N
HMS	IXXAT® SAE J1939	Transportation	Source	License	N	Y	Y	Y	Y	Y	N	N



1/ Please contact supplier.
2/ Requires external HW



STM32 – Industrial solutions (2/5)

Provider	Solution name	Application	Model	Cost	Availability							
					F0	F1	F2	F3	F4	F7	L0	L1
HMS	<u>IXXAT® ModbusTCP</u>	Factory automation	Source	License	N	Y	Y	N	Y	Y	N	N
HMS	<u>EtherNet/IP³</u>	Factory automation	Source	License	N	Y ¹	Y	N	Y	Y	N	N
HMS	<u>IXXAT® Powerlink</u>	Automation	Source	License	N	Y ¹	Y	N	Y	Y	N	N
HMS	<u>EtherCAT Master³</u>	Motion, Measurement	Source	License	N	Y ¹	Y	N	Y	Y	N	N
HMS	<u>IXXAT® IEEE1588</u>	Factory automation	Source	License	N	Y ¹	Y	N	Y	Y	N	N
HMS	<u>IXXAT® Safety over EtherCAT</u>	Automation	Source	License	N	Y ¹	Y	N	Y	Y	N	N
HMS	<u>IXXAT® CIP Safety (EtherNet/IP, sercos)</u>	Automation	Source	License	N	Y ¹	Y	N	Y	Y	N	N
MESCO	<u>IO-Link</u>	Factory automation	Binaries	Lic. + Royal.	N	Y	N	Y ²	Y	Y ²	N	N

1/ Also possible with external HW to support real-time features

2/ Please contact supplier

3/ Requires external HW



STM32 – Industrial solutions (3/5)

Provider	Solution name	Application	Model	Cost	Availability							
					F0	F1	F2	F3	F4	F7	L0	L1
MESCO	<u>HART Master/Slave</u>	Process automation	Source	Lic. + Royal.	N ²	Y	Y	N ²	N ²	N ²	N ²	N ²
MESCO	<u>Modbus</u>	Factory automation	Source	Lic. + Royal.	N ²	Y	N	N ²	N ²	N ²	N ²	N ²
MicroControl	<u>DeviceNet</u>	Factory automation	Binaries	Lic. + Royal.	N ²	Y	Y	N ²	N ²	N ²	N ²	N ²
MicroControl	<u>EtherCAT¹</u>	Factory automation	Binaries	Lic. + Royal.	N ²	N ²	Y	N ²	N ²	N ²	N ²	N ²
MicroControl	<u>CANopen</u>	Factory automation	Binaries	Lic. + Royal.	N ²	Y	Y	N ²	N ²	N ²	N ²	N ²
Micrium	<u>µC/Modbus</u>	Factory automation	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
Port	<u>CANopen</u>	Factory automation	Source	License	Y	Y	Y	Y	Y	N ²	Y ²	N
Port	<u>EtherCAT¹</u>	Factory automation	Source	License	Y ²	Y	Y	Y	Y	N ²	Y ²	N



STM32 – Industrial solutions (4/5)

Provider	Solution name	Application	Model	Cost	Availability							
					F0	F1	F2	F3	F4	F7	L0	L1
Port	<u>PROFINET</u>	Factory automation	Source	License	N	N	Y	Y	N	N ²	Y ²	N
Port	<u>EtherNet/IP³</u>	Factory automation	Source	License	N	Y	Y	Y	Y	N ²	Y ²	N
Port	<u>POWERLINK</u>	Factory automation	Source	License	N	Y	Y	Y	Y	N ²	Y ²	N
PTPd	<u>PTPd</u>	Factory automation	Open source (BSD) ¹	Free	N	Y ¹	N	N	N	N	N	N
SEGGER	<u>emModbus</u>	Factory automation	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
ST	DALI ⁴	Lightning	Source	Free	N	Y	N	N	N	N	N	Y
ST	<u>DMX</u>	Lighting/home & building automation	Source ⁴	Free	N	Y	N ²	N ²	N ²	N ²	N ²	N ²
TAPKO	<u>KAlstack</u> <u>KNX</u>	Building automation	Binaries	License + royalties	Y	Y	Y	Y	Y	Y	Y	Y



1/ PTPd ported on STM32 by ST
 2/ Please contact supplier.
 3/ Can be ported
 4/ Provided on demand to sales office



STM32 – Industrial solutions (5/5)

Provider	Solution name	Application	Model	Cost	Availability							
					F0	F1	F2	F3	F4	F7	L0	L1
TMG	<u>IO-Link Device</u>	Factory automation	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
TMG	<u>IO-Link Master</u>	Factory automation	Source	License	N	Y	Y	Y	Y	Y	N	N
TMG	<u>Profibus DP and PA</u>	Factory automation	Source	License	Y	Y	Y	Y	Y	Y	Y	Y
TMG	<u>Profinet</u>	Factory automation	Source	License + royalties	N	N	Y	N	Y	Y	N	N
TMG	<u>Ethernet/IP</u>	Factory automation	Source	License + royalties	N	N	Y	N	Y	Y	N	N
Weinzierl	<u>KNX</u>	Home and Building automation	Source	License	Y	Y	N ¹	N ¹	N ¹	N	N ¹	Y



STM8 – Industrial solutions

Provider	Solution name	Application	Model	Cost	Availability		
					S	A	L
MESCO	IO-Link	Factory automation	Binaries	License	Y	N ¹	Y
SEgger	emModbus	Factory automation	Source	License	Y	Y	Y
ST	DALI	Lighting	Source	Free	Y	N ²	N ²
TMG	IO-Link	Factory automation	Source	License	Y	Y	Y
TAPKO	KAstack KNX	Building automation	Binaries	License + royalties	N	N	Y



Application field – Motor control

- **Control your 3-phase motor with top performance**

- Use of FOC algorithm allowing high energy efficiency and reduced noise emission
- Outstanding dynamic performance and speed range
- STM32 PMSM FOC SDK V4.0 breakthrough:
 - new documentation set including technical training slides and examples for easy and quick accessibility.
 - new motor control library architecture and API for easy and quick accessibility
 - new sensorless motor control algorithm based on the HFI method

- **Easy for designers**

- Full firmware customization through PC tool: ST motor control workbench

Often seen acronyms

BLDC	Brushless DC: permanent magnet motor with trapezoidal shaped B-EMF, FOC applicable
PMSM	Permanent magnet synchronous motor: with sinusoidal shaped B-EMF, FOC applicable
ACIM	AC induction motor: type of motor, FOC applicable
FOC	Field-oriented control: Mathematical technique used to achieve decoupled control of the flux and torque in a 3-phase motor.
HFI, MTPA	High Frequency Injection: algorithm for very low speed and fast acceleration (air con, fridge) and increased efficiency for low- or zero-speed, full torque applications (washing machines, factory automation) <ul style="list-style-type: none">• “Maximum Torque Per Ampere” (MTPA): optimizes the motor torque for each load and increases the efficiency,• “Feed Forward”: improves the current control at high speed.

Provider	Solution name	Model	Cost	Availability							
				F0	F1	F2	F3	F4	F7	L0	L1
ST	Bipolar stepper motors driving	Sources	Free	N ¹	Y	N ¹	N ¹	N ¹	N ¹	N ¹	N ¹
ST	STM32 FOC PMSM SDK Software development kit including: <ul style="list-style-type: none"> • Motor control library (sensors, algorithms...), Single or Dual control • Motor control application (implementation of library, high-level MC commands) • HFI • ST Motor Control Workbench software tool • Demo projects and utilities 	Several models <ul style="list-style-type: none"> • Binaries² • Source (without FOC control loop)³ • Source (with FOC control loop)⁴ 	Free	Y	Y	Y	Y	Y	N ¹	N	N
ST	STM32 ACIM SDK Software development kit focusing on ACIM motors with indirect FOC method.	Source ⁴	Free	N	Y	N ¹	N ¹	N ¹	N ¹	N	N

1/ Can be ported

2/ Motor Control Library is provided in binary form

2/ Available on demand by contacting nearest ST sales office

3/ Available under NDA on demand by contacting nearest ST sales office



STM8 – Motor control

Provider	Solution name	Model	Cost	Availability			
				S	A	L	T
ST	STM8S and STM8A BLDC and ACIM motor control firmware library <ul style="list-style-type: none">• Scalar control of induction motor control• Scalar control (six-step) of permanent magnet brush-less motors (BLDC and PMSM)	Source	Free	Y	Y	N	N
ST	STM8S motor control firmware library builder GUI	Binaries	Free	Y	Y	N	N



Application field – Automotive

- **More than hardware**

- In addition to microcontrollers dedicated to automotive equipment, ST proposes a set of firmware solutions

Often seen acronyms	
J1939	Vehicle standard used for communication and diagnostics with vehicle components (e.g. agricultural machines).
J2602	USA variant of LIN
LIN	Local interconnect network: The LIN bus is a small and slow network system that is used as a cheap sub-network of a CAN bus to integrate intelligent sensor devices or actuators in today's cars. The LIN specification is enforced by the LIN-consortium, with the first exploited version being 1.1, released in 1999. Since then, the specification has evolved to version 2.1 to meet current networking needs. Bit rates vary within the range of 1 to 20 Kbit/s.
CAN	Controller-area network (CAN or CAN-bus): This is a standard vehicle bus designed to allow microcontrollers and devices to communicate with each other within a vehicle without a host computer. Possible bit rates from 125 Kbit/s up to 1 Mbit/s.
ASIL	ASIL is a risk classification scheme defined by the ISO 26262 - Functional Safety for Road Vehicles standard. This is an adaptation of the Safety Integrity Level used in IEC 61508 for the automotive industry.



STM32 – Automotive solutions

- Warning: STM32 device is not qualified for automotive, but there are however some existing software solutions.

Provider	Solution name	Model	Cost	Availability	
				F1	Others
ArcCore	ArcticCore Autosar stack	Open Source or source	Free or License	Y	N ¹
MicroControl	SAE J1939	Source	License	Y	Y ²
IHR	LIN 2.1 Driver	Source	License	N ¹	Y ³
Vector	CANbedded	Source	License	Y	N ¹
Vector	CANbedded J1939	Source	License	Y	N ¹



STM8 – Automotive solutions

Provider	Solution name	Model	Cost	Availability		
				S	A	L
ST	J2602 Driver	Source	Free ¹	N ²	Y	N
ST	LIN 2.1 Driver	Source	Free ¹	N ²	Y	Y
ST	FMEDA Snapshot Safety Manual Safety Analysis report	Documents	Free	N	Q2 15	N
Vector	CANbedded	Source	License	N ²	Y	N
Vector	CANbedded LIN	Source	License	N ²	Y	N
Vector	CANbedded J1939	Source	License	N ²	Y	N



- **Sensor hub solution for Android & Windows 8 mobile devices**
 - Sensor hub framework including 9-axis sensor fusion, gesture recognition, context awareness and pedestrian dead reckoning on STM32
- **Power efficient implementations**
 - Optimized algorithms with smart scheduling allowing power efficient sensor data acquisition, data batching and motion processing on STM32

Definitions

Motion sensors	Components able to sense various motions including accelerations (accelerometers = A), rotations (gyroscopes = G) and earth magnetic field (magnetometers = M).
Sensor hub	Microcontroller collecting and processing the motion sensors raw data (data fusion) for an upstream device (usually a mobile application processor).
9-axis sensor fusion	Processing that “fuse” the raw data collected from the AGM sensors in order to compute the device orientation. Fusing each other sensor data allow to increase the orientation accuracy and to correct each sensor inherent noise, drift or sensitivity to external environment. Sensor data calibration is included as well in the fusion process.
Gestures recognition	Processing that allows the sensor hub to sense various gestures like shaking, taping, flipping, twisting, ...
Context awareness	Processing that allows the sensor hub to detect the system user’s activity like device facing up, device facing down, user standing, user walking, user running, ...
PDR	Pedestrian dead reckoning allowing the sensor hub to determine the system user’s trajectory based one the sensors data only (no GPS, no WIFI, ...). The trajectory will be represented in 2D or 3D (if pressure sensor is used) environment.



STM32 – Sensor Hub solutions

Provider	Solution name	Model	Cost	Availability					
				F0	F1	F2	F3	F4	L1
ST ¹	CyWee - 9-axis sensor fusion – Windows 8	Binaries	Free	N	Y	N	N	N	Y
ST ¹	CyWee - 9-axis sensor fusion – Android 4.4	Binaries	Free	N	N	N	Y	Y	N ²
ST ¹	CyWee - Gesture recognition (flip, shake, tap, twist, pick-up, hang-up, tilt)	Binaries	Free	N	N	N	Y	Y	N ²
ST ¹	CyWee - Activity monitoring (device facing up, or facing down, significant motion detection, user standing, walking or running)	Binaries	Free	N	N	N	Y	Y	N ²
ST ¹	CyWee - Indoor navigation (pedometer, heading, pedestrian dead reckoning)	Binaries	Free	N	N	N	Y	Y	N ²
ST ¹	Hillcrest- 9-axis sensor fusion – Windows 8	Binaries	Free	N	N	N	N	Y	N ²

Virtual Machines and Model driven development

Some new environments modify traditional firmware development. These environments can be based on high-level object-oriented languages, coming with their own specific development environments, or enable a model-driven development



Java



- **Easier migration**

- ST and its partners support customers as they migrate to these new environments

Environment	Meaning
Java	Java object-oriented language and Eclipse development environment.
.NET	C# object-oriented language and Microsoft Visual Studio development environment. This is Microsoft .NET Micro Framework for microcontrollers.
Matlab/Simulink	Brands from MathWorks company, for software enabling model-driven approach



STM32 – Virtual Machines and Model driven development

Provider	Solution name	Model	Cost	Availability							
				F0	F1	F2	F3	F4	F7	L0	L1
IS2T	MicroEJ Java	License	Tool purchase + Royalties	Y	Y	Y	N	Y	Y	Y	Y
ST (with IS2T)	STM32Java	License	Tool purchase	Y	Y	Y	N	Y	Y	Y	Y
ST	STM32 Peripheral blocks for Matlab/Simulink	License	Free	Y	Y	Y	Y	Y	Y	Y	Y
Mountaineer	Microsoft .NET Micro Framework	Open source (Apache 2.0)	Free	N	Y	Y	N	Y	Y	N	N

Releasing your creativity



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