Embedded software solutions

STM32, STM8

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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

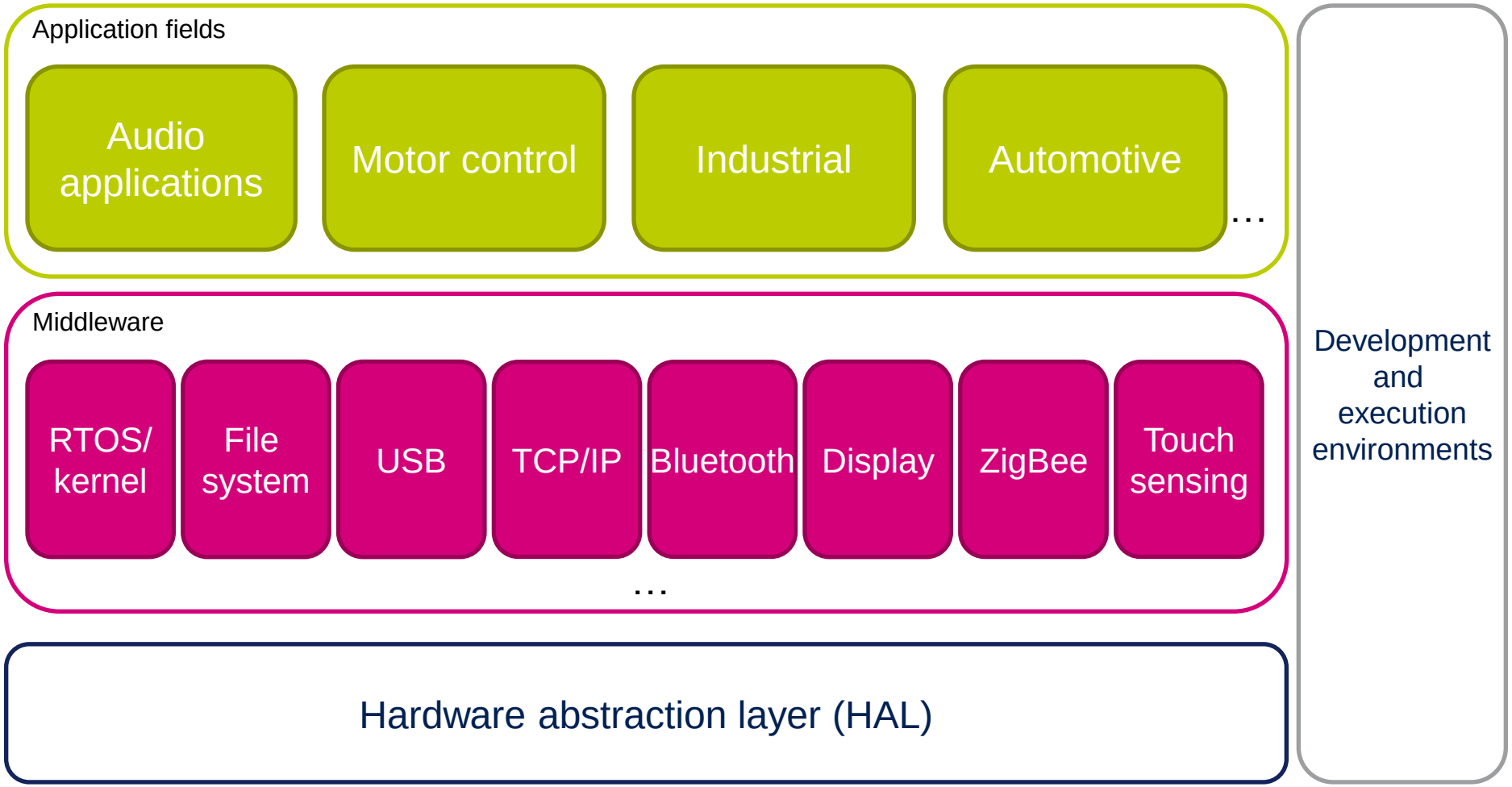
- Proposed by community or partners
- Source code, from BSD or GPL licenses to commercial products
- Supported by open source community or partners

Partners

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

A large community of partners

Solutions at all levels



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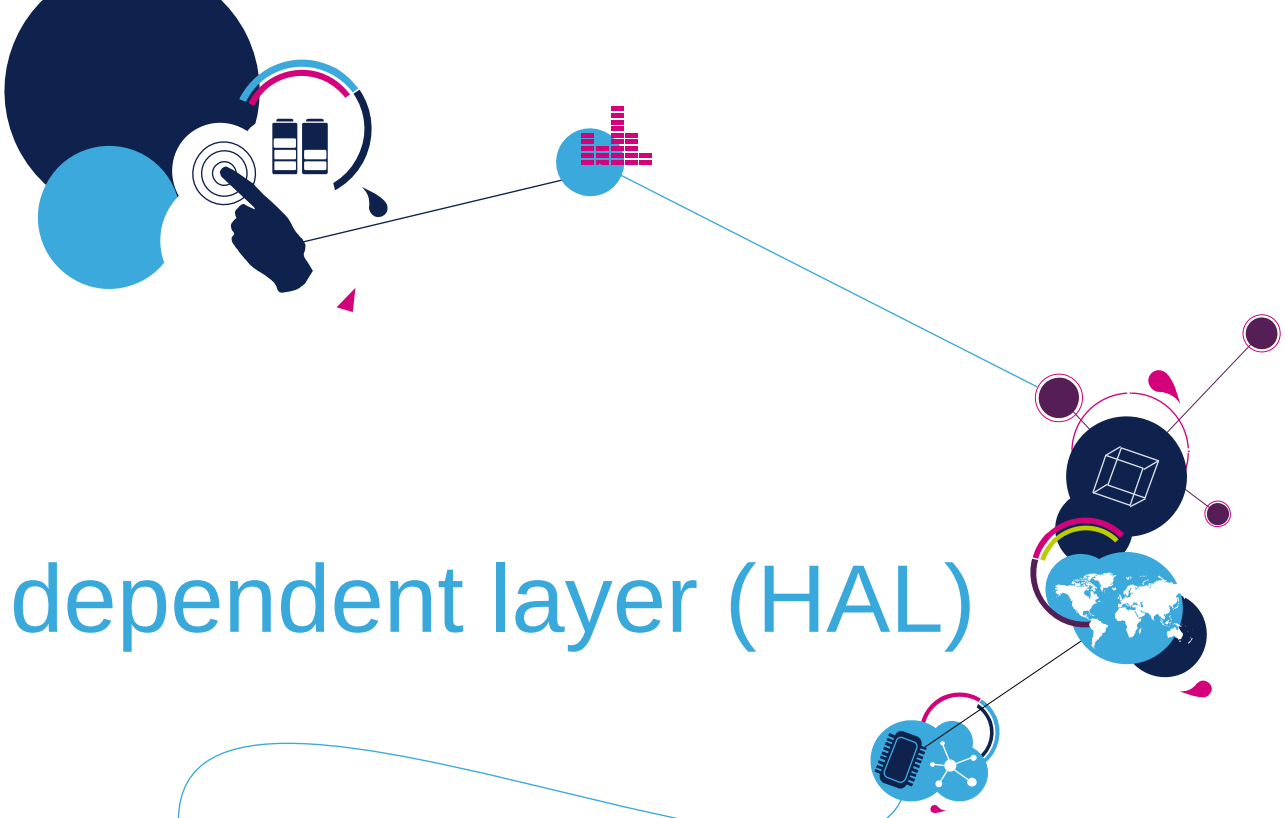

Hardware dependent layer (HAL)

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Hardware dependent 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 dependent layer

Provider	Solution name	Model	Cost	Availability							
				F0	F1	F2	F3		F4	L1	W
							F30x	F37x			
ST	Standard peripheral library and CMSIS DSP library[4]	Source	Free	Y	Y	Y	Y	Y	Y	Y	Y
ST	Class B guidelines	Source[1]	Free	Y	Y	Y	Y		N[2]	Y	N
ST	Crypto library[3] AES, DES, 3DES, ARC4, MD5, SHA1, SHA2, RSA sig, ECC Key gen, ECDSA, ...	Binaries	Free	N[2]	Y	Y	N[2]		Y	Y	N[2]

1/ Application note can be downloaded from ST web site. Software can be obtained on demand with NDA. Contact your local sales office.
2/ Can be ported.
3/ Subject to trade regulation, please contact our sales office.
4/ DSP library for Cortex-M4 cores only.

STM8 – Hardware dependent layer

Provider	Solution name	Model	Cost	Availability				
				S	A	L		T
						L10x	L15x	
ST	Standard peripheral library	Source	Free	Y	Y	Y	Y	Y
ST	Class B guidelines	Source	Free	Y	Y	Y		N[1]

1/ Can be ported.

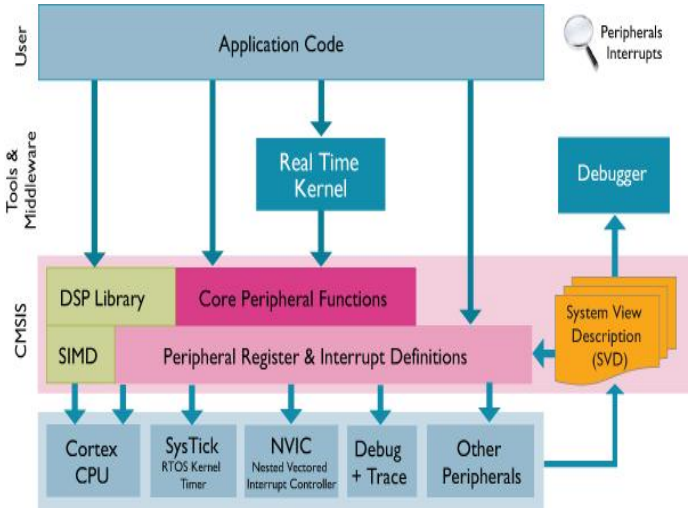
Focus – ST standard peripheral library

Hardware abstraction layer fully covering the STM32 or STM8

- **Compliant with standards**
  - ANSI-C source code
  - Misra and ST coding rules
  - ARM-CMSIS compliant for STM32
- **A real help for developers**
  - Comes with a multitude of examples demonstrating usage

Focus – CMSIS DSP library

- **ARM CMSIS DSP library**
  - Complete set of DSP algorithms, with examples
    - Math
    - Vectors
    - Statistics
    - Filters (FIR, IIR, …)
    - Interpolation
    - Matrix
    - Transform (FFT, …)
  - Optimized for Cortex-M4 core, on integer and floating-point values



Middleware (USB, Ethernet, …)

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Middleware

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

- **All standard middleware covered**
  - RTOS/kernel
  - File system
  - USB
  - TCP/IP
  - Bluetooth
  - ZigBee
  - …

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	L1	W
AVIX-RT	AVIX	Binaries	License	N	Y	Y	Y	Y	Y	N
CMX	CMX-RTX	Source	License	N	Y	Y	Y	Y	Y	N
CMX	CMX-Tiny	Source	License	Y	Y	Y	Y	Y	Y	N
Chibios	ChibiOS/RT	Open source (GPL3) or Source	Free or License	Y	Y	Y	Y	Y	Y	N
eCosCentric	eCosPro	Source[1]	License	N	Y	Y	Y	Y	Y	N
eForce	µC3	Source	License	Y	Y	Y	Y	Y	Y	N
Emcraft Systems	uCLinux	Open Source (GPL)[2]	Free[2]	N	N	Y	Y	Y	N	N
EUROS	EUROSPlus	Binaries	License	N	Y	Y	Y	Y	Y	N
Express Logic	ThreadX	Source	License	Y	Y	Y	Y	Y	Y	N
FreeRTOS	FreeRTOS	Open source (modified GPL)	Free	Y	Y	Y	Y	Y	Y	N
Green Hills	µ-velOSity	Source	License	Y	Y	Y	Y	Y	Y	N
Keil/ARM	MDK-ARM	Source	License	Y	Y	Y	Y	Y	Y	N

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	L1	W
Mentor	Nucleus Kernel	Source	License	N	Y	Y	Y	Y	Y	N
Micrium	µC-OS	Source	License	Y	Y	Y	Y	Y	Y	N
Micro Digital	SMX	Source	License	N	Y	Y	Y	Y	Y	N
Quadros	RTXC Rtos	Source	License	Y	Y	Y	Y	Y	Y	N
Rowebots	Unison	Source[1]	License	N	Y	Y	Y	Y	Y	N
SEGGER	embOS	Source	License	Y	Y	Y	Y	Y	Y	Y
SICS	Contiki	Open source (BSD)	Free	N	N	N	N	N	N	Y
High Integrity Systems	OpenRTOS[2]	Source	License	Y	Y	Y	Y	Y	Y	N
High Integrity Systems	SafeRTOS[3]	Source	License	N[4]	Y	Y	N[4]	Y	Y	N

1/ An Open Source version with less features is also available.
2/ OpenRTOS is FreeRTOS with commercial support
3/ SafeRTOS is OpenRTOS with Safety features and certificates
4/ Available on customer request. Please contact supplier

STM8 – RTOS/kernel

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

1/ Could be very easily ported
2/ Contact supplier

Middleware – File system

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	L1	W
ChaN	FatFS	Open source (BSD)	Free	Y[3]	Y[3]	Y[3]	Y[3]	Y[3]	Y[3]	N
CMX	CMX-FFS	Source	License	Y	Y	Y	Y	Y	Y	N
eCosCentric	eCC-YAFFS (Nand), MMFS, JFFS2	Source	License[1]	N	Y	Y	Y	Y	Y	N
Express Logic	FileX	Source	License	Y	Y	Y	Y	Y	Y	N
EUROS	FMS	Binaries	License	N	Y	Y	Y	Y	Y	N
HCC	HCC-FFS	Source	License	Y	Y	Y	Y	Y	Y	N
Green Hills	µ-velOSity File System	Source	License	Y	Y	Y	Y	Y	Y	N
Keil/ARM	MDK-ARM Flash	Source	License	Y	Y	Y	Y	Y	Y	N
Mentor Embedded	Nucleus Storage	Source	License	N	Y	Y	Y	Y	Y	N
Micrium	µC/FS	Source	License	Y	Y	Y	Y	Y	Y	N
Micro Digital	smxFS	Source	License	N	Y	Y	Y	Y	Y	N

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	L1	W
Quadros	RTXCfatfile	Source	License	Y	Y	Y	Y	Y	N[1]	N
Rowebots	Unison FAT File System	Source	License	N	Y	Y	Y	Y	Y	N
SEGGER	emFile	Source	License	Y	Y	Y	Y	Y	Y	Y
SICS	Contiki/Coffee FS	Open source (BSD)	Free	N	N	N	N	N	N	Y

1/ Available on customer request. Please contact supplier.

STM8 – File system

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

1/ Could be very easily ported.
2/ Petit FatFS ported on STM8 available on demos

Middleware – USB

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				
				F1	F2	F3	F4	L1
CMX	CMX-USB Device, Host	Source	License	Y	Y	Y	Y	Y
EUROS	USB Host & Device	Binaries	License	Y	Y	Y	Y	Y
Express Logic	USBX	Source	License	Y	Y	Y	Y	Y
HCC	HCC-USB	Source	License	Y	Y	Y	Y	Y
Jungo	USBware	Source	License + royalties	On demand				
Keil/ARM	MDK-ARM USB	Source	License	Y	Y	Y	Y	Y
Mentor Embedded	Nucleus USB	Source	License	Y	Y	Y	Y	Y
Micrium	µC/USB	Source	License	Y	Y	Y	Y	Y
Micro Digital	smxUSB	Source	License	Y	Y	Y	Y	Y
Quadros	RTXCusb	Source	License	Y	Y	Y	Y	N[1]
Rowebots	Unison USB System	Source	License	Y	Y	Y	Y	Y
SEGGER	emUSB	Source	License	Y	Y	Y	Y	Y

1/ Available on customer request. Please contact supplier

STM32 – USB solutions (2/2)

Provider	Solution name	Model	Cost	Availability					
				F1		F2	F3	F4	L1
				Others	F105 F107				
ST	USB FS device library	Source	Free	Y	N	N	Y	N	Y
ST	USB FS&HS Host&Device lib	Source	Free	N	Y	Y	N	Y	N
ST	Continua USB certified stack[2]	Source	Free	N[3]		N[3]	N[3]	N[3]	Y[2]
Thesycon	Embedded USB Device	Source	License	N[1]		Y	N[1]	Y	N[1]

1/ Available on customer request. Please contact supplier
2/ Available to Continua members only. Refer to your local ST sales office.
3/ Can be ported

STM32 – USB solutions details (1/2)

Provider	Solution name	Details
CMX	CMX-USB Device, Host	Device: HID, MS, CDC (ACM, ECM, RNDIS), Audio, Midi, MTP, PHDC Host: HID, MS, CDC (ACM, ECM, RNDIS, OBEX), Audio, Midi, Printer, HUB
EUROS	USB Host & Device Stack	Device: HID, MS, CDC (ACM, ECM) Host: HID, MS, CDC (ACM, ECM), HUB
Express Logic	USBX	Device: HID, MS, CDC (ACM, ECM, RNDIS), Still Image, PTP, PictBridge Host: HID, MS, CDC (ACM, ECM), Audio, Printer, HUB, Prolific
HCC	HCC-USB	Device: HID, MS, CDC (ACM, ECM, RNDIS), Printer, Audio, Midi, MTP, Still Image Host: HID, MS, CDC (ACM, ECM, RNDIS), Audio, Midi, Printer, HUB
Jungo	USBWare	Device: HID, MS, CDC (ACM, ECM, RNDIS, WMC, OBEX), Audio, Video, SICD, PTP, MTP, PictBridge, CCID, DFU Host: HID, MS, CDC (ACM, ECM, EEM, NCM), Audio, Video, PTP, MTP, ICCD, iPod, HUB
Keil/ARM	MDK-ARM USB	Device: HID, MS, CDC (ACM), Audio Host: HID, MS
Mentor Embedded	Nucleus USB	Device: HID, MS, CDC (ACM, ECM) Host: HID, MS, CDC (ACM, ECM), HUB
Micrium	µC/USB	Device: HID, MS, CDC (ACM), Audio, PHDC (Medical) Host: HID, MS, CDC (ACM), Audio, Printer, PHDC (Medical)
Micro Digital	smxUSB	Device: HID, MS, CDC (ACM, RNDIS, Single Interface and mult. ports), Audio, Video, Midi, PTP, MTP, DFU Host: HID, MS, CDC (ACM), Audio, Printer, HUB
Quadros	RTXCusb	Device: MS, CDC (ACM, ECM, RNDIS) Host: HID, MS, CDC (ACM), HUB
Rowebots	Unison USB System	Device: MS, CDC (ACM) Host: MS, CDC (ACM), HUB, others on demand (inc . PHDC)
SEGGER	emUSB	Device: HID, MS, CDC (ACM), Printer Host: HID, MS, CDC (ACM), Printer

STM32 – USB solutions details (2/2)

Provider	Solution name	Details
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	Continua USB certified stack	USB PHDC Class (Personal Health Device Class), 11073-20601 = Base Framework. Agents: 1073-10417 = Glucose, 11073-10408 = Thermometer Other Agents can be implemented on demand
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 (1/2)

Provider	Solution name	Model	Cost	Availability			
				F107	F2	F4	W
CMX	CMX-TCP/IP, CMX-MicroNet, CMX-INet	Source	License	Y	Y	Y	N
EUROS	TCP/IP stack	Binaries	License	Y	Y	Y	Y
Express Logic	NetX and NetX Duo IPv4/IPv6	Source	License	Y	Y	Y	N
eCosCentric	SecureSockets, SecureShell	Source	License	Y	Y	Y	N
eForce	µNet3	Source	License	Y	Y	Y	N
GreenHills	µ-velOSity TCP/IP v4/v6	Source	License	Y	Y	N[1]	N
HCC	MISRA HCC-TCP/IP v4/v6	Source	License	Y	Y	Y	N
Interniche	NicheLite	Source	Free	Y	Y	Y	N
Interniche	NicheStack	Source	License	Y	Y	Y	N
Interniche	embTCP v4/v6	Binaries	License	N	Y	Y	N
Keil/ARM	MDK-ARM TCPNET	Source	License	Y	Y	Y	N
SICS	LwIP	Open source (BSD)	Free	Y[2]	Y[2]	Y[2]	N
Mentor Embedded	Nucleus Network	Source	License	Y	Y	Y	N

1/ Available on customer request. Please contact supplier
2/ A port to STM32 was implemented by ST

STM32 – TCP/IP solutions (2/2)

Provider	Solution name	Model	Cost	Availability			
				F107	F2	F4	W
Micrium	µC/TCP-IP	Source	License	Y	Y	Y	N
Micro Digital	smxNS and smxNS6 (Dual IPv6/v4)	Source	License	Y	Y	Y	N
Oryx Emb.	CycloneTCP	Open source (GPL2) or source	Free or license	Y	Y	Y	N
Quadros	RTXC Quadnet	Source	License	Y	Y	Y	N
Rowebots	Unison TCP-IP/v4-v6	Source	License	Y	Y	Y	N
SEGGER	embOS/IP	Source	License	Y	Y	N[1]	N
SICS	Contiki/uIP6	Open source (BSD)	Free	N	N	N[1]	Y

Provider	Solution name	Model	Cost	Availability			
				F107	F2	F4	W
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[2]	Y[2]	Y[2]	N
yaSSL	CyaSSL	Open source (GPL2) or Source	Free or license	N	Y	Y	N

1/ Available on customer request. Please contact supplier
2/ A port to STM32 was implemented by ST

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

Provider	Solution name	Details
CMX	CMX-TCP/IP	PPP, PPPoE, ARP, IGMP, ICMP, IPv4, UDP, TCP, DHCP(cs), DNS, FTP(cs), IMAP4, NAT, POP3(c), SMTP , SNMP, SNTP, Telnet(s), SSL/TLS, TFTP(c), HTTP(s)
CMX	CMX-MicroNet	PPP, ARP, IGMP, ICMP, IPv4, UDP, TCP, DHCP(c), DNS, FTP(cs), POP3(c), SMTP, SNMP, SNTP, Telnet(s), SSL/TLS, TFTP, HTTP(s)
EUROS	TCP/IP stack	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	NetX and NetX Duo IPv4/IPv6	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	SecureSockets	SSH2
eCosCentric	SecureShell	SSL/TLS
eForce	µNet3	PPP, ARP, IGMP, ICMP, IPv4, IPv6, UDP, TCP, DNS, DHCP(c), FTP(s), SSL/TLS
HCC	MISRA HCC-TCP/IP v4/v6	ARP, ICMP, IPv4, IPv6, UDP, TCP, DNS, DHCP(c), FTP(s), SMTP, TFTP(s), HTTP(s)
Green Hills	µ-velOSity TCP/IP v4/v6	ARP, ICMP, IGMP, IPv4, IPv6, IPv4/6, UDP, TCP, DNS, DHCP(c),
Interniche	NicheLite	ARP, ICMP, IPv4, UDP, TCP, DNS, DHCP(c), FTP(s), Telnet(s), TFTP
Interniche	NicheStack	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	embTCP v4/v6	ARP, TCP/IP v4, IPv4/v6 HTTP, FTP Telnet ICMP, UDP, TCP. DNS, DHCP
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, SNTP, Telnet(cs), SSL/TLS, TFTP (cs), HTTP(cs)

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

Provider	Solution name	Details
Micrium	µC/TCP-IP (and µC/SSL)	ARP, ICMP, IPv4, UDP, TCP, DNS, DHCP(c), FTP(cs), SMTP, POP3(c), SNTP, 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, SNTP, 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, SNTP, 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(c), FTP(cs), SMTP(c), Telnet(s), TFTP(cs), HTTP(s)
SICS	Contiki/uIP6	IPv6, 6LoWPAN

Middleware – Bluetooth

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 or ST-Ericsson's STLC2690 or other components

Often seen acronyms	
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. Implements more features than HSP, such as voice dialing or last number redial

STM32 – Bluetooth solutions

Provider	Solution name	Model	Cost	Availability					
				F0	F1	F105/107	F2	F4	L1
Alpwise	iAnywhere Blue SDK 3.x	Binaries or Sources	License + royalties	N[2]	Y	Y	Y	Y	Y
Alpwise	iAnywhere Blue SDK 4.x	Binaries or Sources	License + royalties	N	N	N	Y	Y	N
Alpwise	ALPW-BLESDK	Binaries or Sources	License + royalties	Y	Y	Y	Y	Y	Y
A&W	CAMagic PhoneLink	Binaries or Sources	License and/or royalties	On demand					
Jungo	BTware	Sources	License+ royalties	On demand					
Clarinox	ClarinoxBlue	Binaries or Sources	License and/or royalties	On demand					
SEARAN	dotStack	Binraies or Sources	License and/or royalties	Y	Y	Y	Y	Y	Y

1/ Available on customer request. Please contact supplier
2/ Available on specific conditions. Please contact supplier

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	CAMagic 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	BT2.1+EDR Supported profiles: HCI, L2CAP, RFCOMM, SDP, SDAP, GAP, SPP, AVRCP, A2DP, ADVTP, GAVDP, HFP, HSP, IOP, MAP, PBAP
SEARAN	dotStack	BT2.1+EDR, BT4.0 Supported profiles: SPP, HID, FTP, HSP, HFP, A2DP, AVRCP, PBAP, iAP, GATT, demo apps on iOS and Android

Middleware – ZigBee

With short messages, ZigBee offers green wireless standards to connect a wide range of devices so they work together intelligently and help you control your world.

- **Full coverage of STM32W built-in Radio**
  - STM32W family embeds an IEEE 802.15.4 2.4 GHz compliant radio supporting ZigBee and proprietary protocols

Often seen acronyms	
ZigBee RF4CE	Wireless protocol stack for low data rate, low power optimized for consumer electronics. Applications include remote control, mice, keyboards, 3D goggles.
ZigBee PRO	Wireless protocol stack for low data rate, low-power applications using mesh routing. Supports home automation, building automation and smart energy 1.x applications.
ZigBee IP	Wireless protocol based on IPv6/6LowPan targeting next generation smart energy/smart grid applications.
ZRC	Remote control application profile supported by ZigBee RF4CE for consumer electronics.
ZID	ZigBee human interface device application profile supported by ZigBee RF4CE for mice, keyboards, etc.
ZHA	Home automation application profile supported by ZigBee PRO protocol stack.
ZSE	ZigBee smart energy application profile supported by ZigBee PRO and ZigBee IP protocol stacks.

STM32 – ZigBee solutions

Provider	Solution name	Model	Cost	Availability
				W
ST	Simple MAC firmware	Binaries	Free	Y
ST	ZigBee RF4CE	Binaries	Free	Y
ST (with Sensinode)	ZigBee IP stack	Binaries	Free	Q2/13

Middleware – Display

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

Provider	Solution name	Model	Cost	Availability					
				F0	F1	F2	F3	F4	L1
Altia	Altia Design	Source	License	N[1]	N[1]	Y	N[1]	Y	N[1]
EUROS	eGUI	Binaries	License	N[1]	Y	Y	Y	Y	Y
Express Logic	PEGX	Source	License	Y	Y	Y	Y	Y	N[1]
ST	Embedded GUI library	Source	Free	N	Y	Y	Y	Y	Y
ST	STemWin[1]	Binaries	Free	Y	Y	Y	Y	Y	Y
Mentor Embedded	Inflexion UI	Binaries	License	N	N	Y	N	Y	N
Micrium	µC/GUI	Source	License	Y	Y	Y	Y	Y	Y
Micro Digital	C/PEG, PEG+, PEG Pro	Source	License	N[1]	Y	Y	Y	Y	N[1]
Quadros	C/PEG, PEG+, PEG Pro	Source	License	N[1]	Y	Y	Y	Y	N[1]
Rowebots	Remedy GraphXgen	Source	License	N	Y	Y	Y	Y	N[1]
SEGGER	emWin	Source	License	Y	Y	Y	Y	Y	Y

1/ Available on customer request. Please contact supplier

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.
ProxSense™ acquisition	Charge transfer acquisition for projected capacitance. This acquisition offers enhanced features such as integrated sampling capacitor, automatic electrode tuning, electrode parasitic capacitance compensation, … The ProxSense acquisition is more robust than the CT one.

STM32 – Touch-sensing solutions

Provider	Solution name	Acquisition	Model	Cost	Availability					
					F0	F1	F2	F3	F4	L1
ST	STM32 Touch Sensing Library	CT	Source	Free	Y	N	N	Y	N	Y

STM8 – Touch-sensing solutions

Provider	Solution name	Acquisition	Model	Cost	Availability			
					S	A	L	T
ST	STM8 Touch Lib	RC + CT	Source	Free	Y[1]	N[2]	Y[1]	N
ST	STM8TL5xxx Touch Lib	ProxSense™	Source	Free	N	N	N	Y

1/ RC for STM8S, RC and CT for STM8L
2/ Available on customer request.

Application fields (audio, motor,…)

life.augmented

Application field – Audio

- **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.
Vorbis	Open source, no royalties music codec
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

STM32 – Audio solutions

Provider	Solution name	Model	Cost	Availability						
				F0	F1	F105 /107	F2	F3	F4	L1
ST	ADPCM Vocoder, Speex Vocoder	Source	Free	N	Y	N[1]	N[1]	N[1]	N[1]	N[1]
ST	G711, G726, G726A Vocoders	Source	Free	N	N[1]	N[1]	Y[4]	N[1]	Y[3]	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]
ST	Audio Engine MP3 Codec With Channel Mixer, Equalizer and Loud	Binaries	Free	N	N[1]	Y	Y	N[1]	Y	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]
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]
ST	Audio Engine Post Processing Smart Volume Control, Biquad Filters, Source Rate converters, Stereo Widening	Binaries	Free	N	N	N	N	N[1]	Q3/13	N
ST	Apple iAP Library (iPod/iPhone/iPad)[2]	Source	Free	Q3/13	N	Y	Y	Y	Y	Y
ST	USB audio class and stream synchro. (feedback pipe, external PLL, …) [4]	Binaries	Free	N	N	Y	Y	N[1]	Y	N
ST	Source Rate Converter[3]	Binaries	Free	N	Y	Y	Y	N[1]	Y	N[1]
DSPConcept	Audio Weaver	Binaries	License	N	N	N	N	N	Y	N
Craftwork	Remote Speakers (DLNA Media Renderer)	Binaries	License	N	N	N	N[1]	N	Y	N

1/ The library will run immediately on these targets, even if not ported officially.
2/ Only available by request to local sales for companies being a licensee of Apple MFi (Made for iPod) program.
3/ Available on demand. Ask your local ST Sales office.

Focus – STM32 Audio Engine MP3

- **De facto standards support**
  - Support for popular MP3 and WMA key formats, AAC coming
- **More than just a codec**
  - Comes with must-have add-ons such as
    - Channel mixer utility (for volume and mute control)
    - Standalone 5-band parametric equalizer utility
    - Loudness control utility
  - Part of global “Audio Engine” initiative, gathering many Audio algorithms under a consistent umbrella
- **Beyond open-source standard approach**
  - Optimized for Cortex-M3 and Cortex-M4

Firmware brick	STM32F2 MIPS	STM32F4 MIPS	Flash in bytes		RAM in bytes
			Code	Const	
MP3 decoder	21	10	15508	7108	12344

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. Industrial Ethernet protocols very often support the CANopen device profiles.
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 (1/3)

Provider	Solution name	Application	Model	Cost	Availability			
					F1	F2	F4	L1
Andrea Informatique	DLMS / COSEM	Metering	Binaries	License	Y	Y	Y	Y
Embedded Labs	OPC-UA server	Factory and building automation	Binaries	License + royalties	N	Y	Y	N
Embedded Solutions	Modbus RTU/ASCII	Factory automation	Binaries	License + royalties	Y	Y	Y	N
eCosCentric	eCosPro-CAN	Factory Automation	Sources	License	Y	Y	Y	N
eCosCentric	CANopen	Factory Automation	Sources	License	Y	Y	Y	N
Embex	IO-Link	Factory automation	Binaries	License + royalties	Y	N	N	N
IXXAT	CANopen	Automation, medical	Source	License	Y	Y	Y	N
IXXAT	DeviceNet	Factory Automation	Source	License	Y	Y	Y	N
IXXAT	J1939	Commercial vehicles	Source	License	Y	Y	Y	N
IXXAT	ModbusTCP	Factory automation	Source	License	Y	Y	Y	N
IXXAT	Ethernet/IP[3]	Factory automation	Source	License	N[1]	Y	Y	N
IXXAT	PROFINET[3]	Factory automation	Source	License	N	N[2]	N[2]	N

1/ Please contact supplier.
2/ Possible with external memory usage
3/ Also possible with external HW to support real-time features

STM32 – Industrial solutions (2/3)

Provider	Solution name	Application	Model	Cost	Availability			
					F1	F2	F4	L1
IXXAT	POWERLINK[1]	Factory automation	Source	License	Y	Y	Y	N
IXXAT	EtherCAT[3]	Factory automation	Source	License	Y	Y	Y	Y
IXXAT	Sercos III[3]	Factory automation	Source	License	Y	Y	Y	Y
IXXAT	IEEE1588 PTP	Factory automation	Source	License	Y	Y	Y	N
IXXAT	openSAFETY	Factory automation	Open source	Free	Y	Y	Y	N
MESCO	IO-Link	Factory automation	Binaries	License + royalties	Y	N	N	N
MESCO	Profibus PA	Factory automation	Binaries	License + royalties	Y	N	N	Y
MESCO	HART Master/Slave	Process automation	Source	License + royalties	Y	Y	Y	N
MESCO	Modbus	Factory automation	Source	License + royalties	Y	N	N	N
MicroControl	DeviceNet	Factory automation	Binaries	License + royalties	Y	Y	Y	N
MicroControl	EtherCAT	Factory automation	Binaries	License + royalties	N	Y	Y	N
MicroControl	CANopen	Factory automation	Binaries	License + royalties	Y	Y	Y	N
Micrium	µC/Modbus	Factory automation	Source	License	Y	Y	Y	N
Port	CANopen	Factory automation	Source	License	Y	Y	Y	N

1/ Also possible with external HW to support real-time features
2/ Please contact supplier
3/ Requires external HW

STM32 – Industrial solutions (3/3)

Provider	Solution name	Application	Model	Cost	Availability			
					F1	F2	F4	L1
Port	Modbus RTU/ASCII	Factory automation	Source	License	Y	Y	Y	N
Port	DeviceNet	Factory automation	Source	License	Y	Y	Y	N
Port	EtherCAT[3]	Factory automation	Source	License	Y	Y	Y	N
Port	PROFINET	Factory automation	Source	License	N	Y	Y	N
Port	EtherNet/IP[3]	Factory automation	Source	License	Y	Y	Y	N
Port	ModbusTCP[3]	Factory automation	Source	License	Y	Y	Y	N
Port	POWERLINK[3]	Factory automation	Source	License	Y	Y	Y	N
PTPd	PTPd	Factory automation	Open source (BSD)[1]	Free	Y	N[2]	N[2]	N
ST	DALI	Lightning	Source	Free	Q3/13	Q3/13	Q3/13	Q3/13
ST	DMX[4]	Lighting/home & building automation	Source[4]	Free	Y	N[2]	N[2]	N[2]
TMG	IO-Link	Factory automation	Source	License	Y	Y	Y	Y
TMG	Profibus DP and PA	Factory automation	Source	License	Y	Y	Y	Y
TMG	Profinet	Factory automation	Source	License + royalties	N	Y	Y	N
TMG	Ethernet/IP	Factory automation	Source	License + royalties	N	Y	Y	N

1/ PTPd ported on STM32 by ST
2/ Please contact supplier.
3/ with external MAC or with ESC1100/1200 (EtherCAT)
4/ Code is provided on request. Contact your local ST sales office.

STM8 – Industrial solutions

Provider	Solution name	Application	Model	Cost	Availability			
					S	A	L	T
Embex	IO-Link	Factory automation	Binaries	License + royalties	Y	N[1]	Y	N
MESCO	IO-Link	Factory automation	Binaries	License	Y	N[1]	Y	N
ST	DALI	Lighting	Source	Free	Y	N[2]	Q3/13	N[2]
TMG	IO-Link	Factory automation	Source	License	Y	Y	Y	Y
TAPKO	KNX	Building automation	Binaries	License + royalties	N	N	Y	N

1/ Please contact supplier
2/ Can be easily ported

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
- **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.

STM32 – Motor control

Provider	Solution name	Model	Cost	Availability					
				F0	F1	F2	F3	F4	L1
ST	Bipolar stepper motors driving	Sources	Free	N[1]	Y	N[1]	N[1]	N[1]	N[1]
ST	STM32 FOC PMSM SDK Software development kit including: • Motor control library (sensors, algorithms…), Single or Dual control • Motor control application (implementation of library, high-level MC commands) • Demo projects and utilities	Several models • Binaries[2] • Source (without FOC control loop)[3] • Source (with FOC control loop)[4]	Free	Y	Y	Y	Q3/13	Y	N
ST	ST motor control workbench	Binaries	Free	Y	Y	Y	Q3/13	Y	N
ST	STM32 ACIM SDK Software development kit focusing on ACIM motors with indirect FOC method.	Source[4]	Free	N	Y	N	N	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 • 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.

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	F2	F4	L1
ArcCore	ArcticCore Autosar stack	Open Source or source	Free or License	Y	N[1]	N[1]	N[1]
Vector	CANbedded	Source	License	Y	N[1]	N[1]	N[1]
Vector	CANbedded J1939	Source	License	Y	N[1]	N[1]	N[1]

1/ Please contact supplier

STM8 – Automotive solutions

Provider	Solution name	Model	Cost	Availability			
				S	A	L	T
ST	J2602 Driver	Source	Free[1]	N[2]	Y	N	N
ST	LIN 2.1 Driver	Source	Free[1]	N[2]	Y	Y	N
Vector	CANbedded	Source	License	N[2]	Y	N	N
Vector	CANbedded LIN	Source	License	N[2]	Y	N	N
Vector	CANbedded J1939	Source	License	N[2]	Y	N	N

1/ Available on demand. Ask your local ST Sales office.
2/ Please contact supplier

Development and execution environments

Some new environments modify traditional firmware development. These environments are based on high-level object-oriented languages, coming with their own specific development environments.

Java

Microsoft .net

- **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.

STM32 – Development and execution environments

Provider	Solution name	Model	Cost	Availability		
				F1	F2	F4
ST (with IS2T)	STM32Java	License	License on tool. No royalty on parts	Y[1]	Y	Y
Mountaineer	Microsoft .NET Micro Framework	Open source (Apache 2.0)	Free	Y	Y	Y

1/ Upon request to IS2T.

Thank you

www.st.com