Modem Manager Documentation

Technikon

December 29, 2016

Contents

Installation

Note: This program is portable and does not need installation. However, if you want offline documentation and/or localization files, you should install and use the program from the folder with all corresponding files. Also, you may need to install Sierra Wireless USB driver, which is packed inside the installation.

1. Choose preferred installation language. This language will only be used for the installation: you can switch interface languages inside the program later. Note that if your OS does not have preferred language installed, you will not be able to choose this language.

   Currently (release 0.8), only english and russian languages are supported both in Modem Manager and in its documentation. Although, translation can be made quickly and effortlessly from the technical point of view.

2. Accept license agreement.

   Currently (release 0.8), we are working on license agreement, so there's just copyright notice. This means you agree that the rights to the software are owned by us. Later, when license agreement will be officially added, you'll need to agree to it to continue using the program.

3. Choose folder where Modem Manager will be installed. Modem Manager installs some additional files like localization and help files.

> Warning: Note that if your OS does not allow write access to the folder where Modem Manager will be installed, the program will not create log files when in use. Also, it may not create some other files, so please make sure that your user does have correct rights.
> In Windows 10 Program Files folder access is denied to regular user by default, so you'd have to start the program with Administrator rights.
> This should be fixed in later versions of the program, where log files will be stored in Documents (or temporary) folder.

4. Choose which files to install. You have 3 options:

   (a) Full installation. All files will be installed, including documentation, localization and drivers.

   (b) Compact (minimal) installation. Only core files will be installed: the executable itself and the copyright notice (license agreement).

   (c) Custom installation. You can choose which files to install. This option will be selected automatically if you check/uncheck items manually.

5. Choose program shortcut to be created in the Start Menu folder. If you don't want it to be created, you can check "Don't create a Start Menu folder".

6. Check "Install Sierra Wireless USB drivers" checkbox to install USB driver. The driver is needed to communicate with modem over miniUSB cable. If you already have it installed, you can uncheck it. Uncheck "Create a desktop icon" if you don't want it to be created.

Note: "Install Sierra Wireless USB drivers" checkbox will only appear if you have selected it in installed files selection list before.
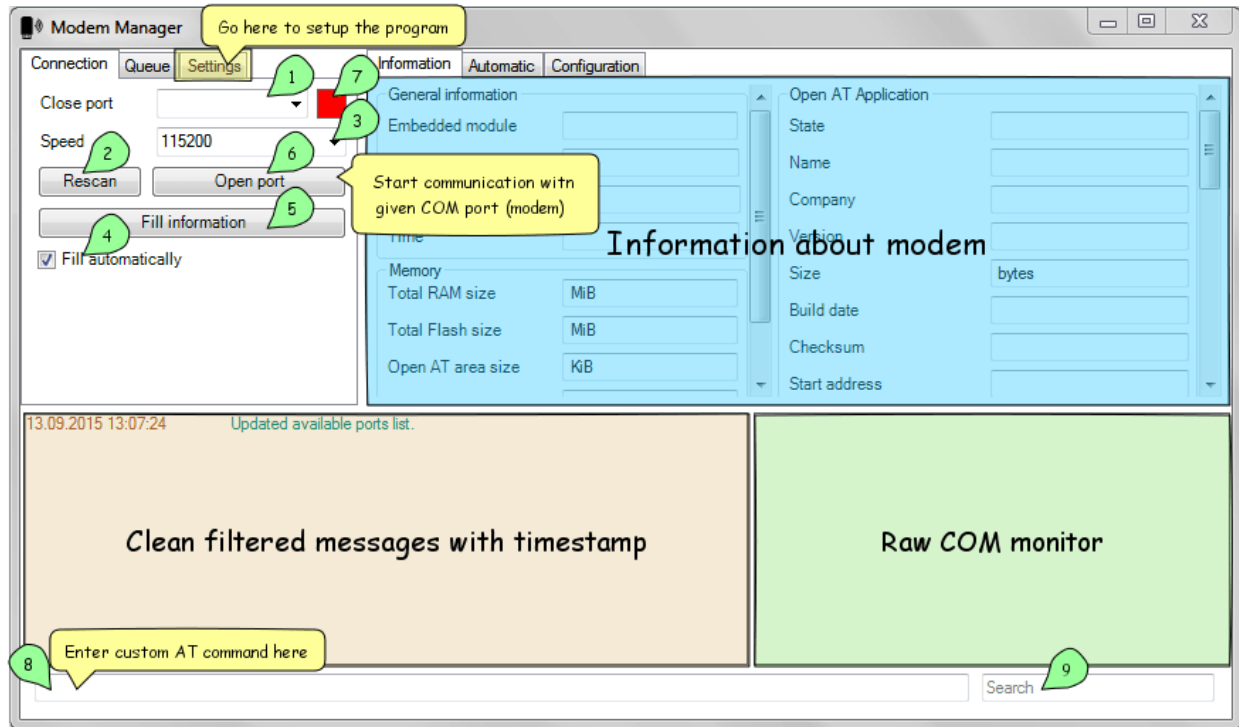
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7. Make sure that everything suits your needs and click Install button to begin the installation.

8. Finally uncheck "Launch Technikon Modem Manager" if you don't want it to launch right away and finish the installation.

User guide

Contents

2.1 Starting communication

When you first open the program, you will see the main window.

At start, all ports available within OS should be updated and filled in ports list 1. You can manually refresh them after inserting new devices by clicking "Rescan" 2 button.

After choosing needed port, select (or input manually) serial port speed (baud rate) for given device 3. Check or uncheck "Fill automatically" 4 checkbox: if it is checked, all information about modem will be filled automatically after you have connected to modem. You can also fill information manually using "Fill information" 5 button. The same result could be achieved by using F5 key (refresh information, see Keyboard shortcuts).

Click "Open port" 6 button to start communication. If port has been successfully opened, status indicator 7 will turn green. This status indicator could be 3 different colors: red for closed, green for opened, blue for "downloading mode".

There's console view at the bottom of the window. Left view is for pretty status messages and filtered AT-command results, where right view is raw COM (serial) monitor which displays all that flows through COM connection.
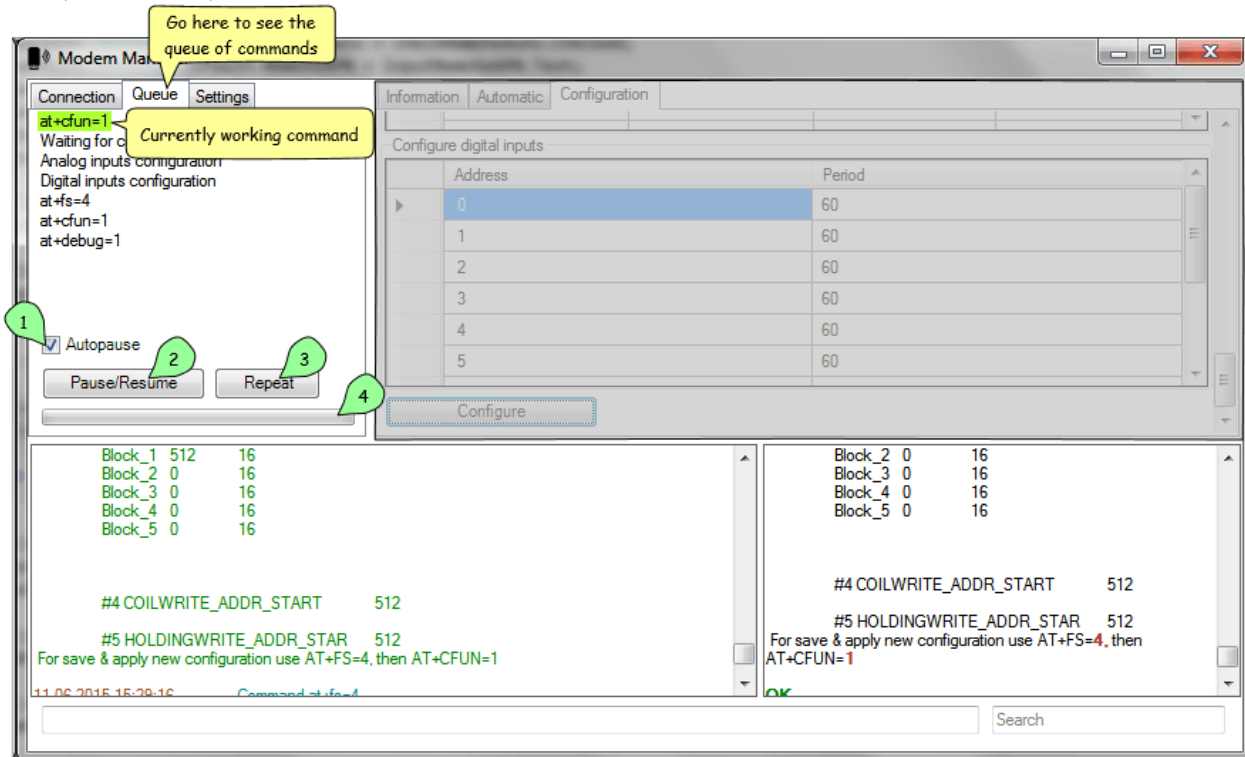
Text field 8 at the bottom allows to send AT commands explicitly into modem and text field "Search" 9 allows to search through both console windows.
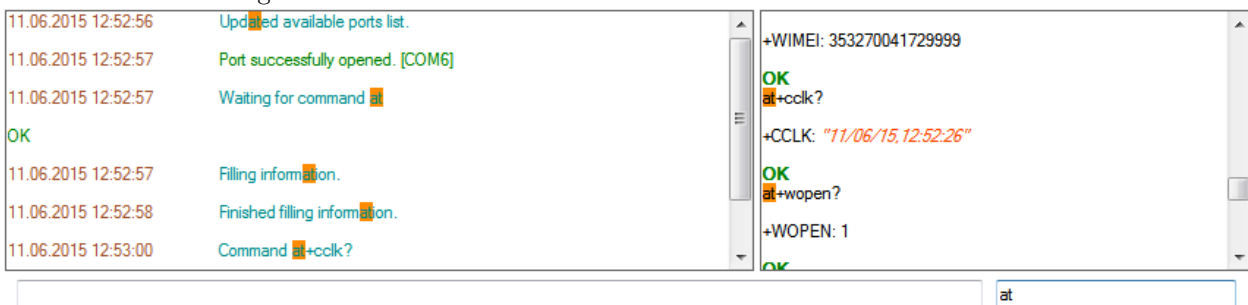
Note: Search does not work incrementally: it just highlights all found matches so you can see them distinctly.

2.2 Using queue

Whether you are using console input or automatized button which processes number of tasks, these tasks will be added into the queue of commands which you can see, pause and resume. Also you can repeat last sent (unsuccessful) command.


Note: If you have "Autofocus queue" enabled in settings, this tab will be automatically opened when automatized sequence of commands is triggered (see ModemManager settings).

Here you can see list of commands that appeared after starting modem application configuration (see Application configuration). Currently working command is highlighted by green color if it is AT-command and by blue color if it is a process which uses progressbar below (XModem uploading, analog/digital inputs configuration).

Checkbox "Autopause" 1 makes sure that if an error occurs when command is executed, whole queue would be paused and you will be notified of that. In most cases, this checkbox should be enabled.

Button "Pause/Resume" 2 allows to manually pause/resume queue. If the queue is paused, you can still input new AT commands which will be immediately executed in second (parallel) queue which is always working in non-pausing mode for this case specially.

Button "Repeat" 3 allows to repeat last (failed) AT-command if the queue is currently paused. This command is executed in second queue, so this is just an automation around typing the same command again and again.

Progressbar 4 is needed for indicating progress of long events (such as downloading firmware or configuring lots of ports).

2.3 ModemManager settings

For more comfortable look and feel you may wish to setup it for your demands. To do so, go to "Settings" 1 tab. If you wish to skip settings chapter, go to Preparation section.
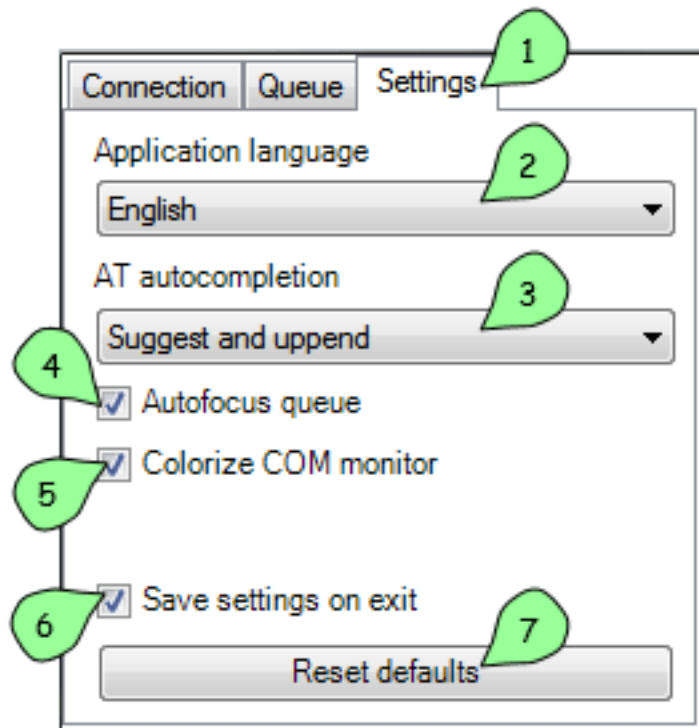
In listbox "Application language" 2 you can choose whole application language between two languages (currently): english and russian. This localizes not only user interface, but also various status messages in console view.

In listbox "AT autocompletion" 3 you can select autocompletion type for manual AT-command input from 4 different types:
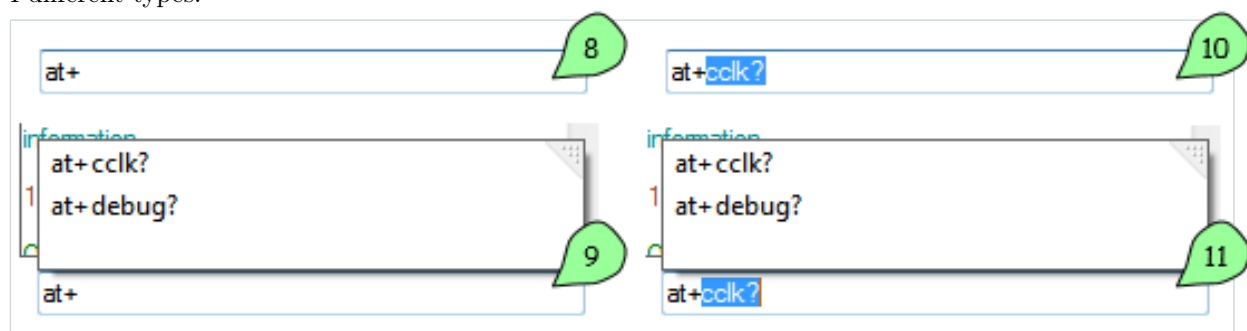
8 - None

9 - Suggest

10 - Append

11 - Suggest and append

Note: Autocompletion uses history of used AT-commands. There's no predefined list of commands.

Checkbox "Autofocus queue" 4 does exactly what it promises to do: it focuses "Queue" tab (see Using queue) when automatized queue of commands is started, so that you can see whole queue coming and going.

"Colorize COM monitor" 5 checkbox improves look and feel of raw COM monitor at the bottom right side of application. It actually colorized input based on some rules, like orange for "quoted text".

Checkbox "Save settings on exit" 6 is needed for saving settings and state of the application between sessions. If you want to start from current setup all the time, just uncheck this checkbox and if you change any settings, they will not remain after restart.

> Warning: The program will not save "Save settings on exit" option if it is unchecked. To explicitely save it you should use Ctrl + S shortcut to manually save current settings (see Keyboard shortcuts).

And finally, button "Reset defaults" 7 resets all configurations to its default values without possibility to return :)

2.4 Preparation

Before using modem, you need to prepare it for work. If you obtained clean modem just from shop without our application and configuration, you need to write initial operational (OS) firmware and bootloader for it. To do this, click "Prepare empty modem" button at the lower left of the "Connection" tab. This should perform initial preparation on modem, so that you could use it properly.

> Warning: You should run application from the installed folder with "Firmware" component installed, so that OS Firmware and Bootloader files (Firmware.dwl and Bootloader.dwl) is present within "Firmware" folder in the same directory where the application is located.

This step totally rewrites OS firmware and resets default modem configuration. To reconfigure modem for your needs, do the following on the "Automatic" tab:
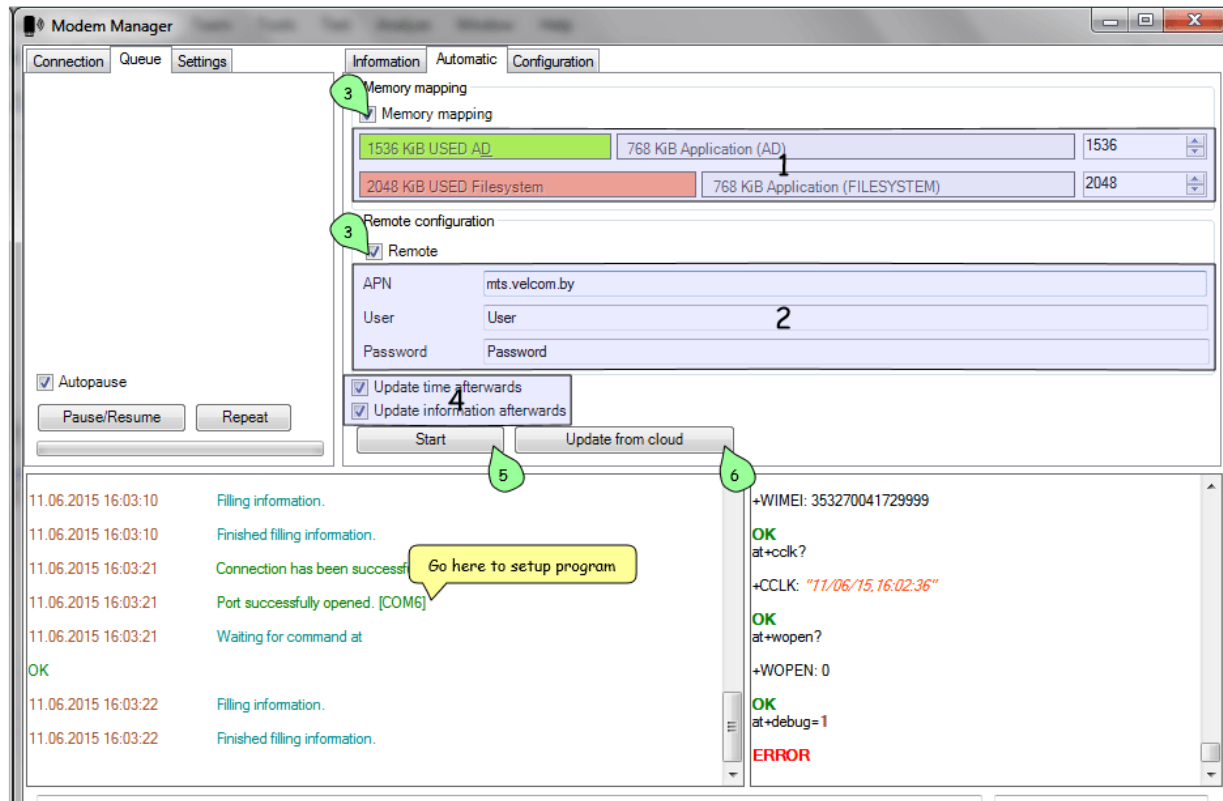
1 Remap Application & Filesystem disk space (if you need it).

2 Configure external (internet) APN for your simcard.

3 Make sure needed checkboxes is checked.

4 Check these if you want to update in-modem time and then refill information from modem.

5 Finally click the "Start" button to get started. Then the queue (see Using queue) will be filled with needed commands and modem will proceed to setup.

If you want to update firmware (or to download it the first time), click the "Update from cloud" 6 button. The process of updating application from the cloud is tricky though, because you will probably run into errors and will need debug skills to proceed. If you encounter any errors, please proceed to Troubleshooting area before contacting us.

2.5 Application configuration

Configuring application only works if you have our application inside your modem (which is obvious).

Information | Automatic | **Configuration**

| Fill configuration from modem | Fill configuration from file | Save XML configuration |

| Modem hard reset (default configuration) | Disable all |

| Write full configuration |

GPRS VPN configuration

	Primary SIM card			Secondary SIM card	
APN	my.apnvelcom.by ⌄	🟩	APN	one.more.apn.by ⌄	🟩
User	i.user	🟩	User	my.bro.user	🟩
Password	my.pass	🟩	Password	bro.pass	🟩
			☐ Enabled		🟩

| Write configuration |

IEC104 configuration

ASDU Address	88	🟩
t0	0	🟩
t1	15	🟩
t2	10	🟩
t3	70	🟩
Maximum K	12	🟩
Maximum W	8	🟩

| Write configuration |

Serial configuration

Baud rate	9600 ⌄	🟩
Data bits	8 ⌄	🟩
Stop bits	1 ⌄	🟩
Parity type	none ⌄	🟩
☐ RTS ☐ CTS		🟩 🟩

| Write configuration |

Power management

Power mode	none ⌄		🟩
Power UP interval (minutes)	5		🟩
Power time table start (hours, minutes)	18	00 🟩	🟩
Power time table interval (minutes)	5		🟩
Power connection allowed (minutes)	1		🟩

| Write configuration |

PLC

			PLC timers		
PLC type	FX PLC	⌄			

Dimensions

Maximum stations	1		Scan timer	200	
Bit registers number	10		Send to UART period	100	
Word registers number	10		Modbus timeout	100	
Inputs number	0				

External hardware watchdog timer

Address	217	
Period	600	
☑ Enabled		

FX PLC

Read buffer size	29	
MCM read address	512	
MCM write address	512	
MCD read address	200	
MCD write address	200	

[Write configuration]

Modbus

Read buffer size	28	
Coil read start address	512	

Holding read address and size

	Device address		Start address		Size	
Block 1	1		512		16	
Block 2	1		0		16	
Block 3	1		0		16	
Block 4	1		0		16	
Block 5	1		0		16	

Configure analog inputs

	Address	Upper limit	Lower limit	Period
▶	0	1	0	60
	1	1	0	60
	2	1	0	60
	3	1	0	60
	4	1	0	60
	5	1	0	60

Write configuration

Configure digital inputs

	Address	Period
▶	0	60
	1	60
	2	60
	3	60
	4	60
	5	60

Write configuration

1 button fills information from modem.

2 button fills information from XML config file. You can get such file with predefined settings and just load whole configuration from it.

3 button saves current on-screen configuration into XML file for future use.

4 button resets default configuration which is defined by the version of application you are using.

5 button toggles all blocks for configuration. You can toggle single block by clicking on it while holding CTRL key.

6 button configures all on-screen configuration into modem.

2.5.1 Reference manual

GPRS VPN Configuration	
Primary SIM card	
APN	Setup Access Point Name for primary SIM card
User	Setup APN User for primary SIM card
Password	Setup APN Password for primary SIM card
Secondary SIM card	
APN	Setup Access Point Name for secondary SIM card
User	Setup APN User for secondary SIM card
Password	Setup APN Password for secondary SIM card
Enable	Check Box, allows secondary SIM card usage

IEC104 configuration	
ASDU Address	Application Service Data Unit address. Denotes separate segments and their addresses inside a device
t0	Reserved
t1	Time to wait for acknowledge ("ACK") to a transmitted APDU. If this time expires, the master assumes data has been lost and attempts to retransmit. The default settings is 15 s.
t2	Time to wait before sending a supervisory APDU ACK. Increasing this setting can reduce bandwidth required for acknowledging. The default settings is 10 ms.
t3	Idle time before sending TEST APDU. This is used by a 104 device to detect device connectivity. The default settings is 20 s.
Maximum K	Maximum unacknowledged transmitted APDUs. The master does not send more APDUs if the maximum number of ADPUs have been transmitted and have not been acknowledged. The default settings is 12.
Maximum W	Maximum unacknowledged received APDUs. This setting works in conjunction with T2 to limit how often the master acknowledges APDUs. Increasing this setting can reduce bandwidth required for acknowledging. The default settings is 8.

Serial Configuration	
Baud Rate	Setup Port Speed
Data Bits	Dropdown menu, sets Serial Frame Data Length
Stop Bits	Dropdown menu, sets Serial Frame Stop Bits
Parity Type	Dropdown menu, sets Serial Frame Parity Type
RTS	Check Box, sets usage of RTS serial flow control signal
CTS	Check Box, sets usage of CTS serial flow control signal

Power management	
Power mode	Dropdown menu, sets power management mode - none - no power management used. - sleep - simple power management algorithm: power up - measure - transfer data if possible - power down - timetable - complex power management algorithm: calculate time table of data transfer permitted periods, independent power-ups with measure cycle, data transferring only at allowed intervals
Power up interval (minutes)	Used in sleep and timetable modes, sets power up intervals.
Power time table start (hours, minutes)	Used in timetable mode, sets start time of calculated timetable, input in two fields if 24h format.
Power time table interval (minutes)	Used in timetable mode, sets interval between data transfer allowed windows.
Power connection allowed (minutes)	Used in timetable mode, sets length of data transfer allowed windows.

PLC	
PLC Type	Drop menu, sets data source device type - SetPoint - connected 4..20 mA analog sensor. - Alpha PLC - connected with alpha-series PLC module. - FX PLC - connected with FX2 of FX3 series PLC module - modbus - connected with connected to modbus network as master Choosing options opens appropriate configuration sections below.
PLC timers	
Scan timer	Sets Data Polling period, in 0.1s units
Send to UART period	Sets delay Between Serial Data Requests, in 0.02s units
Dimensions	
Maxnum stations	Sets number of PLC devices in network. 1 for FX PLC, 1 or 2 for Alpha PLC. Ignored in SetPoint and Modbus modes.
Bit Registers number	Set number of Bits, read from single FX PLC or every Alpha PLC Ignored in SetPoint and Modbus modes.
Word Registers number	Set number of WORD registers, read from FX PLC or every Alpha PLC Ignored in SetPoint and Modbus modes.
External hardware watchdog timer	
Address	Setup address of special watchdog counter PLC register. Will be set as 0 every Period. Ignored in SetPoint mode.
Period	Setup External Hardware Watchdog reset period. Set's in second units.
Enabled	Check Box, setups usage of External Hardware Watchdog mechanism.

FX PLC	
Read Buffer Size	Setup quantity of data units, read per request. Default value is 28
MCM read address	M-registers (BIT) block start read address. Number stored in Bit Registers number option
MCM write address	M-registers (BIT) block start write address. Number stored in Bit Registers number option
MCD read address	D-registers (WORD) block start read address. Number stored in Word Registers number option
MCD write address	D-registers (WORD) block start write address. Number stored in Word Registers number option

Modbus	
Read buffer size	Configure quantity of data units per request. Deprecated.
Coil Read Start Address	Configure start address for COIL registers in modbus device #1. Quantity pf COILS is stored in Bit Registers number option
Holding Read Address and Size	
Block 1 .. 5	Rows describes parameters for 5 modbus requests for periodic polling of HOLDING registers.
Device Address	Setups modbus network device address.
Start Address	Setups Start HOLDING register in data block.
Size	Setups Holding registers quantity. If 0 - this request will be ignored.

Configure Analog Inputs	
Address	Analog (WORD) register index number.
Upper limit	Event generation control value. If current and previous register values difference will be more than this limit, event will be generated. Using for detecting unexpected fast changes of register value. Default value is 1.
Lower limit	Event generation control value. If current and previous register values difference will be less, than this limit, even if Time event occurs, event will not be generated. Using for noise reduction. Default value is 0.
Period	Event generation control value. Time out from last generated event. If it expires, new event will be generated. Default value is 60 seconds.

Configure Digital Inputs	
Address	Bit (BIT) register index number.
Period	Event generation control value. Time out from last generated event. If it expires, new event will be generated.

2.6 Troubleshooting

2.6.1 Error occurs when trying updating from cloud

If error occurred before at+wdss=1,1 command is executed, it most likely happened because you have no SIM card installed. Please, check that you have SIM card installed and that your modem have reliable internet connection (correct APN is set).

Also, make sure that your modem is patched (see Preparation). You should click "Prepare empty modem" at least once per each new modem.

2.6.2 Program stopped working and port has disappeared

This is presumably Sierra Wireless USB driver problem. You will most likely need to reboot your PC to be able to see port again.
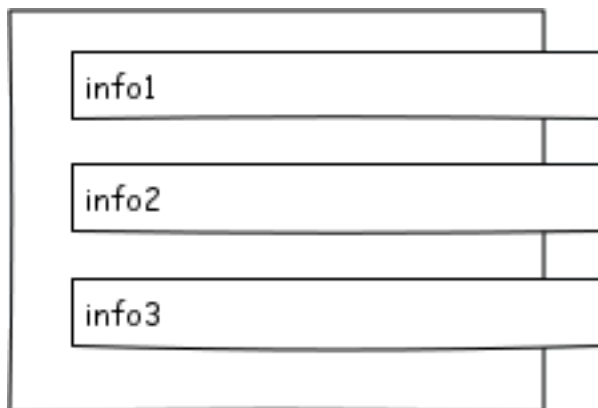
If this error happened when you already set up configuration in the "Configuration" tab, you can simply save whole configuration into XML file, restart application and load this configuration from XML file.
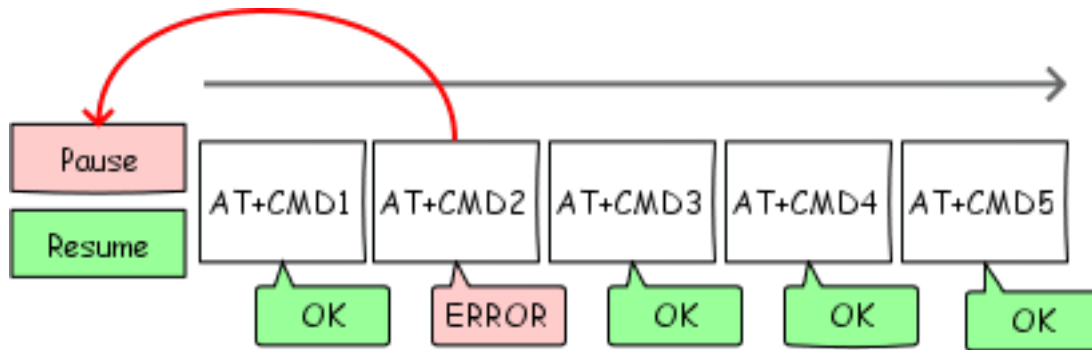
Features

3.1 Functionality

- Stable response from modem
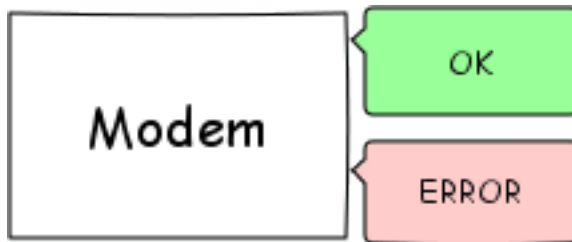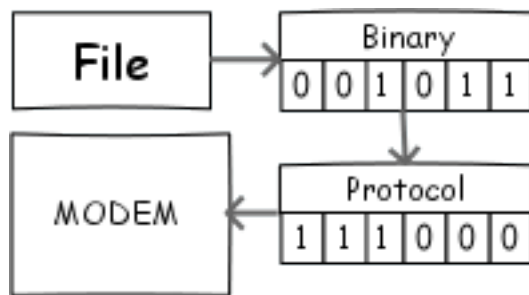

- Query all information about embedded module

  - General information
  - Memory sizes
  - Firmware information
- Queue of commands

Pause
Resume
AT+CMD1 AT+CMD2 AT+CMD3 AT+CMD4 AT+CMD5
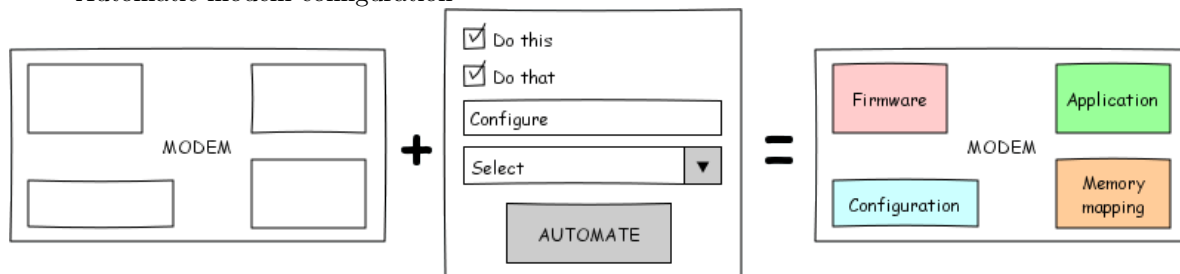OK ERROR OK OK OK

- All commands added to one queue executed in the background thread
- User can pause and resume commands, added to the queue
- Queue can be automatically stopped when an error occur (if configured)
- There is a list of current commands in the queue. Currently running command is highlighted
- When started automatic modem configuration, queue tab can be automatically selected (if not disabled)

• Uploading firmware, using XModem protocol

File
Binary
0 0 1 0 1 1
MODEM
Protocol
1 1 1 0 0 0

• Automatic modem configuration

MODEM

☑ Do this
☑ Do that
Configure
Select ▼
AUTOMATE

=

Firmware   Application
MODEM
Configuration   Memory mapping

- Erase application
- Write bootloader and firmware
- Remap memory
  * Choose both AD and FS sizes, then let automatic mapper do the work for you
  * Minimal size of AD aread is 256 KiB (for safety)
  * Visual view of mapped areas
- Write application
- Prepare modem for remote firmware writing

– Sync time

3.2 Usability

- Command autocompletion and suggestion based on input history
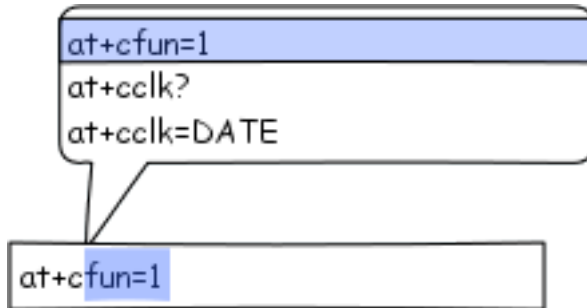
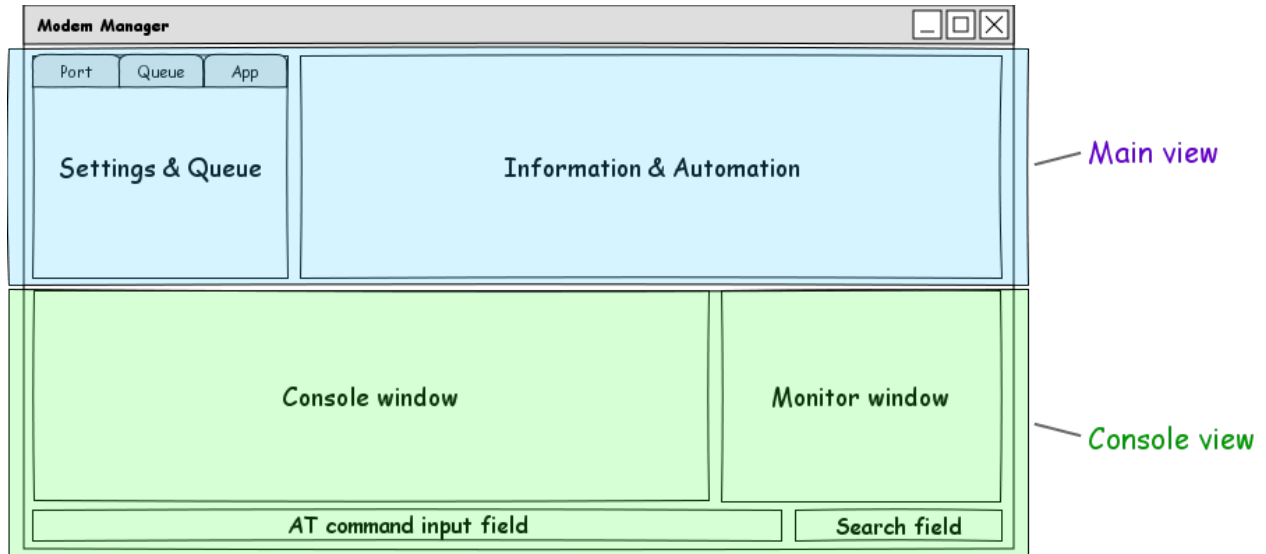- Localization of every UI element as well as status messages

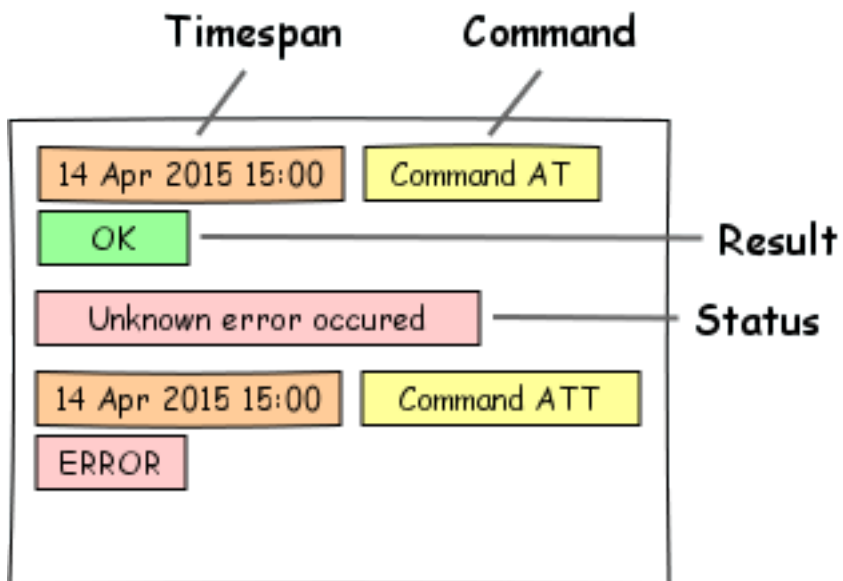- Remember all configured settings per sessions

3.3 Visuals

- Clean and filtered Console window

  – Command timespan
  – Colorful statuses in console
- Raw serial Monitor window

```
at
OK
+WIND: 7
+WIND: 0
at+cclk
ERROR
```

– Keep all history until another port is used

- Search through both console windows

```
at
OK
+WIND: 7
+WIND: 0
at+cclk
ERROR
```

```
at
```

- Colorful and noticeable status boxes

Port is opened   **Port is closed**   **Download mode (WDWL)**

Port: COM7   [ ]   **Port:** COM7   [ ]   **Port:** COM7   [ ]

[Open port]   [Close port]   [Close port]

- Flexible layout - windows are totally resizeable to any screen resolution, in-form splits are totally movable whenever you want. Also, you can show/hide information/console view (F11/F12)
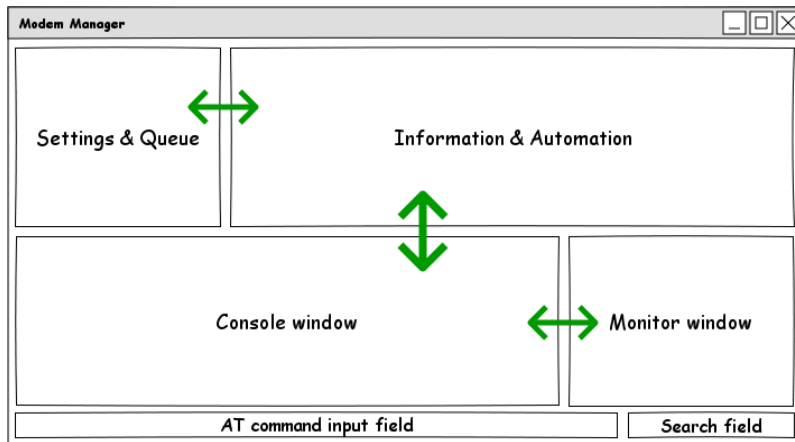
- Progressbar shows file uploading
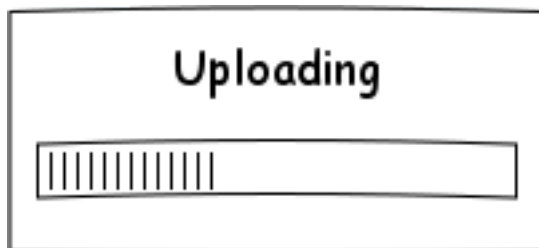
3.4 Keyboard shortcuts

Global:

F1 - PDF documentation will be opened if present, otherwise the website will be shown

Ctrl + F1 - Show Machine ID: needed for license check (full version unlock)

F5 - Update (fill) modem information

F6 - Update (fill) modem configuration

F9 - Store current modem in XML database of installed modems

F11 - Hide / show Console view

F12 - Hide / show Main view

Ctrl + L - Clear console

Ctrl + S - Save all settings, includes current APN configuration

Ctrl + M - RAW console mode (full screen COM monitor), could be used with Detach mode (right click -> Detach)

Ctrl + Space - Pause/Resume queue

Command input field:

Return - Send command

Ctrl + Z - Send data in download mode (substitute character at the end)

Window focus:

Ctrl + I - Focus AT command input field

Ctrl + F - Focus search field

Alt + 1 - switch to 1st Connection tab

Alt + 2 - switch to 2nd Queue tab
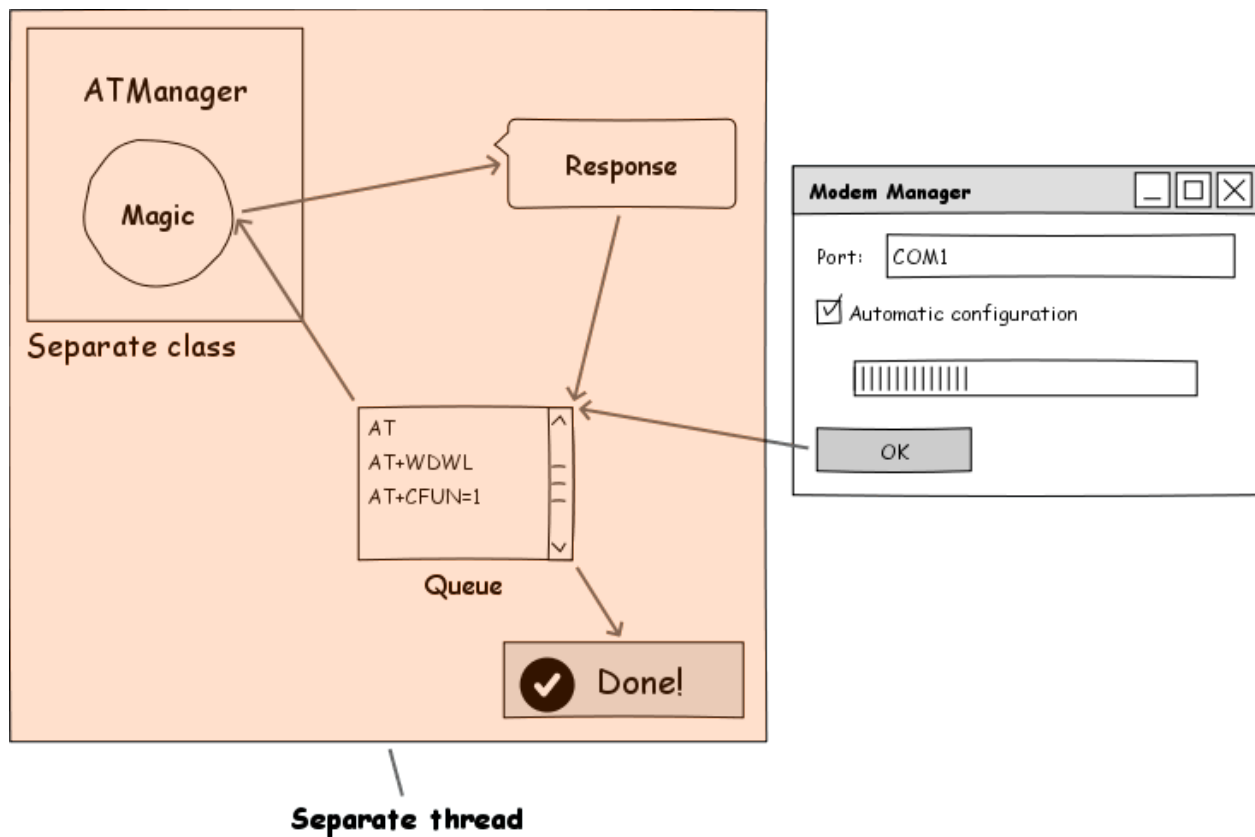
Alt + 3 - switch to 3rd Settings tab

Alt + 4 - switch to 4th Information tab

Alt + 5 - switch to 5th Automatic tab

Alt + 6 - switch to 6th Configuration tab

Note: For switching tabs you can use Ctrl as well.

3.5 Development

- Clean code base and architecture
- Minimal dependencies
- Threading: all the work done in the background thread, UI does not freeze
- Separate classes do separate work
- Constructive comments for most code blocks

- Code enclosed in #regions for clarity

- search