



# Telit Modules Linux USB Drivers

## Software User Guide

1VV0301371 Rev. 14 – 2022-03-02

## APPLICABILITY TABLE

PRODUCTS	AVAILABLE SINCE KERNEL VERSION
DE910 SERIES	3.4
FD980 SERIES	5.14
FN980 SERIES	5.5
FN990 SERIES	5.16
GE910 SERIES	4.4
HE910 SERIES	4.4
LE866 SERIES	2.6.39
LE910 SERIES	3.18
LE910CxSERIES	4.11
LE910C1-EUX SERIES	5.8
LE910D1 SERIES	2.6.39
LE910R1 SERIES	5.17
LE910S1 SERIES	5.13
LE910 V2 SERIES	3.12
LM940 SERIES	4.10
LM960 SERIES	4.10
LN920 SERIES	5.15
LN940 SERIES	4.20
ME910C1 SERIES	4.15
MEx10G1 SERIES	5.5
ML865C1 SERIES	4.15
ML865G1 SERIES	5.5
UE866 SERIES	4.4
UE910 SERIES	4.4
UL865 SERIES	4.4



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# 1. INTRODUCTION

## 1.1. Scope

This document describes which Linux kernel drivers should be used for the Telit modules listed in the applicability table and how Linux devices can be used for typical use cases.

## 1.2. Audience

This document is intended for Telit customers, especially system integrators, who are about to implement the Telit modules listed in the applicability table in a Linux environment .

## 1.3. Contact Information, Support

For general contact, technical support services, technical questions and report of documentation errors contact Telit Technical Support at:

- [TS-EMEA@telit.com](mailto:TS-EMEA@telit.com)
- [TS-AMERICAS@telit.com](mailto:TS-AMERICAS@telit.com)
- [TS-APAC@telit.com](mailto:TS-APAC@telit.com)
- [TS-SRD@telit.com](mailto:TS-SRD@telit.com)
- [TS-ONEEDGE@telit.com](mailto:TS-ONEEDGE@telit.com)

Alternatively, use:

<https://www.telit.com/contact-us/>

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

<https://www.telit.com>

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates the user feedback on our information.

## 1.4. Symbol Conventions



**Danger:** This information **MUST** be followed or catastrophic equipment failure or personal injury may occur.



**Warning:** Alerts the user on important steps about the module integration.



**Note/Tip:** Provides advice and suggestions that may be useful when integrating the module.



**Electro-static Discharge:** Notifies the user to take proper grounding precautions before handling the product.

*Table 1: Symbol Conventions*

All dates are in ISO 8601 format, that is YYYY-MM-DD.

## 1.5. Related Documents

- Telit QMI SDK and TQCM User Guide, 1VW0301643
- uxfp Software User Guide, 1VW0301613
- AT Commands Reference Guide of Telit modules listed in the applicability table

## 2. OPERATING SYSTEM SETUP

### 2.1. Summary

The Telit modules listed in the Applicability Table expose different kinds of devices according to the Product ID (PID) in use. The table below lists the association between the device type and the kernel driver used:

Device type	Kernel module
Serial port following the CDC-ACM standard	cdc_acm
Serial port (reduced ACM)	option
Network adapter following the CDC-ECM standard	cdc_ether
Network adapter following the CDC-NCM standard	cdc_ncm
Network adapter following Microsoft RNDIS specification	rndis_host
Mobile broadband adapter following CDC-MBIM standard	cdc_mbim
Rmnet mobile broadband adapter	qmi_wwan
Android Debug Bridge (ADB)	N/A (managed at the userspace level)
Audio device	snd-usb-audio

Table 2: device types and related kernel modules

In order to use a specific device type, the related module should be included in the kernel build.



Some kernel modules can be found starting with a specific kernel version (e.g. cdc\_mbim is available from 3.8). If the driver is not supported by the kernel version in use, consider upgrading the kernel or backporting the needed patches.

### 2.2. USB Compositions

#### 2.2.1. PIDs and Related Compositions

The following table lists the currently supported USB compositions in Linux according to the PID:

PID	Composition
0x0021	6 CDC-ACM devices
0x0022	3 CDC-ACM devices
0x0023	6 CDC-ACM devices + 1 CDC-ECM network adapter
0x0032	6 CDC-ACM devices + 1 MBIM adapter
0x0035	6 CDC-ACM devices
0x0036	6 CDC-ACM devices + 1 CDC-NCM network adapter
0x0100	4 CDC-ACM devices + 1 CDC-NCM network adapter
0x1003	3 reduced ACM devices
0x1004	4 reduced ACM devices
0x1005	4 reduced ACM devices
0x1006	3 reduced ACM devices
0x1010	4 reduced ACM devices
0x1012	3 reduced ACM devices
0x1031	3 reduced ACM devices + 1 rmnet adapter
0x1033	3 reduced ACM devices + 1 ECM network adapter
0x1040	5 reduced ACM devices + 1 rmnet adapter + 1 ADB
0x1041	5 reduced ACM devices + 1 MBIM adapter + 1 ADB
0x1042	5 reduced ACM devices + 1 RNDIS network adapter + 1 ADB
0x1043	5 reduced ACM devices + 1 ECM network adapter + 1 ADB
0x1045	5 reduced ACM devices + 1 RNDIS network adapter + 1 ADB + 1 audio device
0x1050	5 reduced ACM devices + 1 rmnet adapter + 1 ADB
0x1051	5 reduced ACM devices + 1 MBIM adapter + 1 ADB
0x1052	5 reduced ACM devices + 1 RNDIS network adapter + 1 ADB
0x1053	5 reduced ACM devices + 1 ECM network adapter + 1 ADB
0x1055	5 reduced ACM devices + 1 ADB
0x1056	Configuration #1: Mass storage device Configuration #2: 5 reduced ACM devices + 1 RNDIS network adapter + 1 ADB
0x1060	5 reduced ACM devices + 1 rmnet adapter + 1 ADB
0x1061	5 reduced ACM devices + 1 MBIM adapter + 1 ADB
0x1062	5 reduced ACM devices + 1 RNDIS network adapter + 1 ADB
0x1063	5 reduced ACM devices + 1 ECM network adapter + 1 ADB
0x1070	5 reduced ACM devices + 1 rmnet adapter + 1 ADB



PID	Composition
0x1071	5 reduced ACM devices + 1 MBIM adapter + 1 ADB
0x1072	5 reduced ACM devices + 1 RNDIS network adapter + 1 ADB
0x1073	5 reduced ACM devices + 1 ECM network adapter + 1 ADB
0x1100	2 reduced ACM devices + 1 rmnet adapter + 1 QDSS device (not supported)
0x1101	3 reduced ACM devices + 1 rmnet adapter
0x1102	3 reduced ACM devices + 1 ECM network adapter
0x110a	3 reduced ACM devices. The composition presents also 1 rmnet adapter, but it can't be used for data calls, just for controlling the device
0x110b	3 reduced ACM devices + 1 ECM network adapter
0x1200	5 reduced ACM devices + 1 rmnet adapter + 1 ADB
0x1201	5 reduced ACM devices + 1 rmnet adapter + 1 ADB
0x1203	5 reduced ACM devices + 1 RNDIS network adapter + 1 ADB
0x1204	5 reduced ACM devices + 1 MBIM adapter + 1 ADB
0x1206	5 reduced ACM devices + 1 ECM network adapter + 1 ADB
0x1207	2 reduced ACM devices
0x1208	3 reduced ACM devices + 1 ADB
0x1211	1 reduced ACM device + 1 ECM network adapter + 1 ADB
0x1212	1 reduced ACM device + 1 ADB
0x1213	1 reduced ACM device + 1 ECM network adapter
0x1214	2 reduced ACM devices + 1 ECM network adapter + 1 ADB
0x1230	5 reduced ACM devices + 1 rmnet adapter + 1 ADB + 1 audio device
0x1231	5 reduced ACM devices + 1 RNDIS network adapter + 1 ADB + 1 audio device
0x1260	5 reduced ACM devices + 1 rmnet adapter + 1 ADB
0x1261	5 reduced ACM devices + 1 rmnet adapter + 1 ADB
0x1900	4 reduced ACM devices + 1 rmnet adapter
0x1901	4 reduced ACM devices + 1 MBIM adapter
0x2300	Config. 1: 3 CDC-ACM devices + 1 RNDIS network adapter Config. 2: 3 CDC-ACM devices + 1 ECM network adapter
0x7010	3 reduced ACM devices + 1 RNDIS network adapter
0x7011	3 reduced ACM devices + 1 ECM network adapter
0x701a	3 reduced ACM devices + 1 RNDIS network adapter

PID	Composition
0x701b	3 reduced ACM devices + 1 ECM network adapter

Table 3: PIDs and related compositions

For additional details on the composition, please refer to the software user guide of the module in use.

The command:

```
$ lsusb
```

can be used for listing the USB devices connected to the host.



Refer to the modem user guide to understand how to change the USB composition and to identify the scope of the exposed devices.

### 2.2.2. Multi-configuration compositions

Some compositions show multiple configurations (e.g. 0x1056): by default the first configuration is used by the system.

To change the configuration, the desired value should be written to file:

```
/sys/bus/usb/devices/<device path>/bConfigurationValue
```

e.g.

```
# echo <configuration value> > /sys/bus/usb/devices/<device path>/bConfigurationValue
```

Tool `usb_modeswitch` can also be used to change the configuration, e.g.:

```
# usb_modeswitch -v 0x1bc7 -p <pid> -u <configuration value>
```

### 2.2.3. Kernel Module Option

When using a supported composition requiring the option kernel module and the serial ports are not available in `/dev`, it is possible that support for that composition has been added in a more recent kernel version than the one in use.

The solution is to upgrade the kernel version or backport the needed patches among the ones listed in [chapter 5](#).

It is possible to add runtime support for the composition in use. With root privileges, type the following commands:

```
# modprobe option  
# echo 1bc7 <PID> > /sys/bus/usb-serial/drivers/option1/new_id
```

where <PID> is the PID of the composition to be supported.



If a network adapter is also available in the composition, make sure it is properly recognized by the kernel before adding runtime support for serial ports.

If the ADB device is available in the composition, adding runtime support for serial ports prevents the ADB device from working properly, since it is bound to a serial port.

For the most up-to-date list of Telit PIDs supported as an option, refer to the [source code in mainline](#), looking for all the device entries with TELIT\_VENDOR\_ID Vendor ID (VID).



If support for a composition missing in [paragraph 2.2.1](#) is needed, contact customer support with the request.

#### 2.2.4. Kernel Module qmi\_wwan

When using a supported composition requiring the qmi\_wwan kernel module and no modem related network interface is available in the list provided by the command:

```
$ ip link show
```

it is possible that support for that composition has been added in a newer kernel version than the one in use.

The solution is to upgrade the kernel version or backport the needed patches among the ones listed in [chapter 5](#).



If the kernel in use has commit [cdc-wdm: fix "out-of-sync" due to missing notifications](#), it should be reverted as done in commit [USB: Revert "cdc-wdm: fix "out-of-sync" due to missing notifications"](#)

For the most up-to-date list of Telit PIDs supported as an option, refer to the [source code in mainline](#), looking for all the entries of the device with Vendor ID (VID) 0x1bc7.



If support for a composition missing in [paragraph 2.2.1](#) is needed, contact customer support with the request.

### 2.2.4.1. qmi\_wwan and QMAP

Since kernel version 4.12, qmi\_wwan supports Qualcomm Multiplexing and Aggregation Protocol (QMAP).

QMAP is needed for multiple concurrent PDNs management and to get the most from high-cat modems in terms of throughput.

Kernel side QMAP management is done through qmi\_wwan sysfs files: check [kernel documentation](#) for further details.

QMAP enablement requires also a special modem configuration executed at the userspace level: the procedure to follow depends on the used tools.

Please check relevant qmi\_wwan QMAP-related fixes in [paragraph 6.2](#) to get a stable version.

---

When QMAP is not set, the rx URB size in qmi\_wwan should be greater than 2048 bytes.

This setting can be configured at runtime, changing the MTU of the network interface to an allowed value > 2048 (should not be a multiple of the endpoint max packetsize) before setting-up the data connection, e.g.



```
ip link set <network interface name> mtu 2500
```

For a permanent setting, the following line:

```
dev->rx_urb_size = 2048;
```

should be added to qmi\_wwan.c function qmi\_wwan\_bind before returning in the successful case.

---

## 3. USING THE MODEM

### 3.1. Using the Serial Ports

According to the driver in use, the following devices are created for serial ports:

Device type	Kernel module
/dev/ttyACMx	cdc_acm
/dev/ttyUSBx	option

Table 4: device names and related kernel modules

These are Linux character devices and support most of the features implemented by the tty layer: for example a terminal emulator like minicom can be used to send AT commands.

When writing code for using these devices, please refer to the programming language API related to character devices. As an example, C applications can use the exported functions in the system header files `fcntl.h` and `unistd.h`. Please refer to the related man page for further details.



When sending AT commands, it is mandatory to have the DTR asserted to get the response.

#### 3.1.1. Data Connection through Serial Ports

To create dial-up connections through serial ports the software `pppd` can be used. Please refer to [pppd official website](#) for further details and updated source code.

### 3.2. Using the Network Adapter

If a network adapter or mobile broadband device is available and the related kernel module is loaded, a network interface is created by the operating system.

Standard Linux commands (e.g. `ip`, `ifconfig`) can be used to manage the network interface: please refer to the man page of the command for further details.

#### 3.2.1. Data Connection through the Network Interface

For establishing a data connection through the network interface refer to the instructions in the table below

according to the kernel module in use:

Kernel module	Procedure
qmi_wwan	The <a href="#">libqmi project</a> can be used: refer to the project documentation for further details. Telit provides also a proprietary QMI SDK, refer to document 1VV0301643,
cdc_mbim	The <a href="#">libmbim project</a> can be used: refer to the project documentation for further details.
cdc_ether	AT commands should be used: refer to modem documentation for further details.
cdc_ncm	AT commands should be used: refer to modem documentation for further details.
rndis_host	AT commands should be used: refer to modem documentation for further details.

Table 5: kernel module in use for the network device and related data connection procedure

### 3.3. Using the Modem with ModemManager and NetworkManager

[ModemManager](#) is a DBus-activated daemon which controls mobile broadband (2G/3G/4G) devices and connections.

ModemManager provides a unified high level API for communicating with mobile broadband modems, regardless of the protocol used to communicate with the actual device (AT commands, MBIM, QMI).

For managing non AT-based modems, ModemManager uses external libraries: freedesktop.org libqmi for QMI-based modems, libmbim for MBIM-based modems.

ModemManager can be used with freedesktop.org NetworkManager for easier network connections management.

[NetworkManager](#) is the standard Linux network configuration tool suite. It supports a wide range of networking setups, from desktop to server and mobile, integrating well with popular desktop environments and server configuration management tools.

NetworkManager provides a complete D-Bus API used to access the NetworkManager daemon. This interface can be used to query network status and the details of network interfaces such as current IP addresses or DHCP options. The API can also be used for managing the connections (creation, activation, deactivation...).

NetworkManager uses freedesktop.org ModemManager to support mobile broadband device.

## 4. FLASHING DEVICES

### 4.1. Overview

The modems listed in the following table support firmware updates through special flashing devices that may require binding to a kernel module:

Product	VID:PID	Kernel module	Device name
FD980, FN980, FN990, LE910C1-EUX, LN920	0x1bc7:0x9010	option	/dev/ttyUSBx
GE/HE/UE910, UE866, UL865	0x058b:0x0041	usb-serial-simple	/dev/ttyUSBx
LE910Cx, LM940, LM960	0x18d1:0xd00d	Managed at the userspace level	n/a
LE910 V2	0x8087:0x0716	usb-serial-simple	/dev/ttyUSBx
LE866, LE910D1	0x216F:0x0051	cdc_acm	/dev/ttyACMx
LE910S1	0x1bc7:0x9200	option	/dev/ttyUSBx
LE910R1	0x1bc7:0x9201	option	/dev/ttyUSBx

Table 6: flashing devices

The Flashing devices available in GE/HE/UE910, UE866, UL865, LE910 V2, LE940B6 and LE866 appear for a few seconds when the modem is turned on: if the flashing application is not running, the flashing device disconnects and the modem proceeds in normal operative mode.



Check chapter 5 for flashing device support in kernel versions.

### 4.2. Flashing Device 0x18d1:0xd00d

The Flashing device 0x18d1:0xd00d is managed at the userspace level by Telit firmware update application uxfp. Refer to document 1VW0301613 for further details.

Legacy Telit firmware update application lxfp requires binding the device to the option driver.

This can be permanently done by adding the following line:

```
{ USB_DEVICE(0x18d1, 0xd00d) }
```



to the struct `usb_device_id option_ids` in the kernel source `drivers/usb/serial/option.c`

For testing purposes the procedure described in paragraph [2.2.2](#) can be used:

```
$ modprobe option
$ echo 18d1 d00d > /sys/bus/usb-serial/drivers/option1/new_id
```

### 4.3. Flashing Device 0x058b:0x0041

Even though the flashing device 0x058b:0x0041 presents itself as an ACM device, it should be driven by the kernel driver `usb-serial-simple`. Support for this device is available since kernel version 4.4.

Previous kernel versions require commits [USB: cdc\\_acm: Ignore Infineon Flash Loader utility](#) and [USB: serial: Another Infineon flash loader USB ID](#).

### 4.4. Flashing Device 0x8087:0x0716

Support for flashing device 0x8087:0x0716 is available since kernel version 3.12 with driver `usb-serial-simple`.

Previous kernel versions require commit [USB: serial: move the "simple" drivers into usb-serial-simple.c](#).



## 5. TELIT KERNEL COMMITS

Below a list of kernel commits related to the compositions available for the modems listed in the applicability table: consider backporting if the required PID is not available in the used kernel version.

Summary	VID:PID	Commit	Availability
<a href="#">USB: option driver: adding support for Telit CC864-SINGLE, CC864-DUAL and DE910-DUAL modems</a>	0x1bc7:0x1005 0x1bc7:0x1006 0x1bc7:0x1010	<a href="#">7204cf584836c24b4b06e4ad4a8e6bb8ea84908e</a>	v3.4-rc1
<a href="#">usb: option driver, add support for Telit UE910v2</a>	0x1bc7:0x1012	<a href="#">d6de486bc22255779bd54b0fceb4c240962bf146</a>	v3.15-rc2
<a href="#">USB: option: add support for Telit LE920</a>	0x1bc7:0x1200	<a href="#">03eb466f276ceef9dcf023dc5474db02af68aad9</a>	v3.8-rc7
<a href="#">NET: qmi_wwan: add Telit LE920 support</a>	0x1bc7:0x1200	<a href="#">3d6d7ab5881b1d4431529410b949ba2e946f3b0f</a>	v3.8-rc7
<a href="#">net: qmi_wwan: add Telit LE920 newer firmware support</a>	0x1bc7:0x1201	<a href="#">905468fa4d54c3e572ed3045cd47cce37780716e</a>	v3.13-rc1
<a href="#">usb: option: add support for Telit LE910</a>	0x1bc7:0x1201	<a href="#">2d0eb862dd477c3c4f32b201254ca0b40e6f465c</a>	v3.18-rc3
<a href="#">USB: cdc_acm: Ignore Infineon Flash Loader utility</a>	0x058b:0x0041	<a href="#">f33a7f72e5fc033daccbb8d4753d7c5c41a4d67b</a>	v4.4-rc5
<a href="#">USB: serial: Another Infineon flash loader USB ID</a>	0x058b:0x0041	<a href="#">a0e80fbd56b4573de997c9a088a33abbc1121400</a>	v4.4-rc5
<a href="#">USB: serial: option: Adding support for Telit LE922</a>	0x1bc7:0x1042 0x1bc7:0x1043	<a href="#">ff4e2494dc17b173468e1713fdf6237fd8578bc7</a>	v4.5-rc2
<a href="#">USB: serial: option: add support for Telit LE922 PID 0x1045</a>	0x1bc7:0x1045	<a href="#">5deef5551c77e488922cc4bf4bc76df63be650d0</a>	v4.5-rc7
<a href="#">net: usb: cdc_ncm: adding Telit LE910 V2 mobile broadband card</a>	0x1bc7:0x0036	<a href="#">79f4223257bfef52b0a26d0d7ad4019e764be6ce</a>	v4.6-rc2
<a href="#">USB: serial: option: add support for Telit LE910 PID 0x1206</a>	0x1bc7:0x1206	<a href="#">3c0415fa08548e3bc63ef741762664497ab187ed</a>	v4.8-rc1

Summary	VID:PID	Commit	Availability
<a href="#">USB: serial: option: add support for Telit LE920A4</a>	0x1bc7:0x1207 0x1bc7:0x1208 0x1bc7:0x1211 0x1bc7:0x1212 0x1bc7:0x1213 0x1bc7:0x1214	<a href="#">01d7956b58e644ea0d2e8d9340c5727a8fc39d70</a>	v4.8-rc3
<a href="#">NET: usb: qmi_wwan: add support for Telit LE922A PID 0x1040</a>	0x1bc7:0x1040	<a href="#">9bd813da24cd49d749911d7fdc0e9ae9a673d746</a>	v4.9-rc8
<a href="#">NET: usb: cdc_mbim: add quirk for supporting Telit LE922A</a>	0x1bc7:0x1041	<a href="#">7b8076ce8a00d553ae9d3b7eb5f0cc3e63cb16f1</a>	v4.9
<a href="#">USB: serial: option: add support for Telit LE922A PIDs 0x1040, 0x1041</a>	0x1bc7:0x1040 0x1bc7:0x1041	<a href="#">5b09eff0c379002527ad72ea5ea38f25da8a8650</a>	v4.10-rc1
<a href="#">drivers: net: usb: qmi_wwan: add QMI QUIRK SET_DT R for Telit PID 0x1201</a>	0x1bc7:0x1201	<a href="#">14cf4a771b3098e431d2677e3533bdd962e478d8</a>	v4.11-rc7
<a href="#">net: usb: qmi_wwan: add Telit ME910 support</a>	0x1bc7:0x1100	<a href="#">4c54dc0277d0d55a9248c43aebd31858f926a056</a>	v4.12-rc1
<a href="#">usb: serial: option: add Telit ME910 support</a>	0x1bc7:0x1100	<a href="#">40dd46048c155b8f0683f468c950a1c107f77a7c</a>	v4.12-rc1
<a href="#">net: usb: qmi_wwan: add Telit ME910 PID 0x1101 support</a>	0x1bc7:0x1101	<a href="#">c647c0d62c82eb3ddf78a0d8b3d58819d9f552aa</a>	v4.15-rc4
<a href="#">USB: serial: option: add support for Telit ME910 PID 0x1101</a>	0x1bc7:0x1101	<a href="#">08933099e6404f588f81c2050bfec7313e06eeaf</a>	v4.15-rc6
<a href="#">net: usb: cdc_mbim: add flag FLAG_SEND_ZLP</a>	0x1bc7:0x1041	<a href="#">9f7c728332e8966084242fcd951aa46583bc308c</a>	v4.17
<a href="#">USB: serial: option: add Telit LN940 series</a>	0x1bc7:0x1900 0x1bc7:0x1901	<a href="#">28a86092b1753b802ef7e3de8a4c4a69a9c1bb03</a>	v4.20
<a href="#">qmi_wwan: Added support for Telit LN940 series</a>	0x1bc7:0x1900	<a href="#">1986af16e8ed355822600c24b3d2f0be46b573df</a>	v4.20
<a href="#">usb: cdc-acm: send ZLP for Telit 3G Intel based modems</a>	0x1bc7:0x0021 0x1bc7:0x0023	<a href="#">34aabf918717dd14e05051896aaecd3b16b53d95</a>	v5.0-rc2

Summary	VID:PID	Commit	Availability
<a href="#">USB: serial: option: add Telit ME910 ECM composition</a>	0x1bc7:0x1102	<a href="#">6431866b6707d27151be381252d6eef13025cfce</a>	v5.1-rc1
<a href="#">net: usb: qmi_wwan: add Telit 0x1260 and 0x1261 compositions</a>	0x1bc7:0x1260 0x1bc7:0x1261	<a href="#">b4e467c82f8c12af78b6f6fa5730cb7dea7af1b4</a>	v5.2-rc2
<a href="#">USB: serial: option: add Telit 0x1260 and 0x1261 compositions</a>	0x1bc7:0x1260 0x1bc7:0x1261	<a href="#">f3dfd4072c3ee6e287f501a18b5718b185d6a940</a>	v5.2-rc5
<a href="#">USB: serial: option: add Telit FN980 compositions</a>	0x1bc7:0x1050 0x1bc7:0x1051 0x1bc7:0x1052 0x1bc7:0x1053	<a href="#">5eb3f4b87a0e7e949c976f32f296176a06d1a93b</a>	v5.4-rc3
<a href="#">net: usb: qmi_wwan: add Telit 0x1050 composition</a>	0x1bc7:0x1050	<a href="#">e0ae2c578d3909e60e9448207f5d83f785f1129f</a>	v5.4-rc4
<a href="#">USB: serial: option: add Telit ME910G1 0x110a composition</a>	0x1bc7:0x110a	<a href="#">0d3010fa442429f8780976758719af05592ff19f</a>	v5.5-rc6
<a href="#">USB: serial: option: add ZLP support for 0x1bc7/0x9010</a>	0x1bc7:0x9010	<a href="#">2438c3a19dec5e98905fd3ffcc2f24716aceda6b</a>	v5.5-rc6
<a href="#">USB: serial: option: add ME910G1 ECM composition 0x110b</a>	0x1bc7:0x110b	<a href="#">8e852a7953be2a6ee371449f7257fe15ace6a1fc</a>	v5.6-rc7
<a href="#">net: usb: qmi_wwan: add Telit LE910C1-EUX composition</a>	0x1bc7:0x1031	<a href="#">591612aa578cd7148b7b9d74869ef40118978389</a>	v5.7
<a href="#">USB: serial: option: add Telit LE910C1-EUX compositions</a>	0x1bc7:0x1031 0x1bc7:0x1033	<a href="#">399ad9477c523f721f8e51d4f824bdf7267f120c</a>	v5.8-rc1
<a href="#">USB: serial: option: add LE910Cx compositions 0x1203, 0x1230, 0x1231</a>	0x1bc7:0x1203 0x1bc7:0x1230 0x1bc7:0x1231	<a href="#">489979b4aab490b6b917c11dc02d81b4b742784a</a>	v5.10-rc3
<a href="#">net: usb: qmi_wwan: add Telit LE910Cx 0x1230 composition</a>	0x1bc7:0x1230	<a href="#">5fd8477ed8ca77e64b93d44a6dae4aa70c191396</a>	v5.10-rc3
<a href="#">USB: serial: option: add Telit FN980 composition 0x1055</a>	0x1bc7:0x1055	<a href="#">db0362eeb22992502764e825c79b922d7467e0eb</a>	v5.10-rc3
<a href="#">usb: serial: option: add Telit LE910-S1 compositions 0x7010, 0x7011</a>	0x1bc7:0x7010 0x1bc7:0x7011	<a href="#">e467714f822b5d167a7fb03d34af91b5b6af1827</a>	v5.13-rc4

Summary	VID:PID	Commit	Availability
<a href="#">usb: serial: option: add Telit FD980 composition 0x1056</a>	0x1bc7:0x1056	<a href="#">5648c073c33d33a0a19d0cb1194a4eb88efe2b71</a>	v5.14-rc5
<a href="#">net: usb: cdc_mbim: avoid altsetting toggling for Telit LN920</a>	0x1bc7:0x1061	<a href="#">aabbdc67f3485b5db27ab4eba01e5fbf1ffea62c</a>	v5.15-rc1
<a href="#">net: usb: qmi_wwan: add Telit 0x1060 composition</a>	0x1bc7:0x1060	<a href="#">8d17a33b076d24aa4861f336a125c888fb918605</a>	v5.15-rc1
<a href="#">USB: serial: option: add Telit LN920 compositions</a>	0x1bc7:0x1060 0x1bc7:0x1061 0x1bc7:0x1062 0x1bc7:0x1063	<a href="#">7bb057134d609b9c038a00b6876cf0d37d0118ce</a>	v5.15-rc3
<a href="#">USB: serial: option: add Telit LE910Cx composition 0x1204</a>	0x1bc7:0x1204	<a href="#">f5a8a07edafed8bede17a95ef8940fe3a57a77d5</a>	v5.15-rc6
<a href="#">USB: serial: option: add Telit LE910S1 0x9200 composition</a>	0x1bc7:0x9200	<a href="#">e353f3e88720300c3d72f49a4bea54f42db1fa5e</a>	v5.16-rc3
<a href="#">USB: serial: option: add Telit FN990 compositions</a>	0x1bc7:0x1070 0x1bc7:0x1071 0x1bc7:0x1072 0x1bc7:0x1073	<a href="#">2b503c8598d1b232e7fc7526bce9326d92331541</a>	v5.16-rc6
<a href="#">net: usb: qmi_wwan: add Telit 0x1070 composition</a>	0x1bc7:0x1070	<a href="#">94f2a444f28a649926c410eb9a38afb13a83ebe0</a>	v5.16-rc6
<a href="#">net: usb: cdc_mbim: avoid altsetting toggling for Telit FN990</a>	0x1bc7:0x1071	<a href="#">21e8a96377e6b6debae42164605bf9dcbe5720c5</a>	v5.17-rc5
<a href="#">USB: serial: option: add Telit LE910R1 compositions</a>	0x1bc7:0x701a 0x1bc7:0x701b 0x1bc7:0x9201	<a href="#">cfc4442c642d568014474b6718ccf65dc7ca6099</a>	v5.17-rc6

Table 7: kernel commits related to Telit modules

## 6. ADDITIONAL KERNEL COMMITS

### 6.1. Raw-Ip Support and Important Fixes for qmi\_wwan

Below is a list of commits for adding Raw-Ip support to qmi\_wwan and addressing important issues.

Summary	Commit	Availability
<a href="#">net: qmi_wwan: MDM9x30 specific power management</a>	<a href="#">93725149794d3d418cf1eddcac60c7b536c5faa1</a>	v4.5-rc1
<a href="#">usbnet: allow mini-drivers to consume L2 headers</a>	<a href="#">81e0ce79f2919dbd5f025894d29aa806af8695c7</a>	v4.5-rc1
<a href="#">net: qmi_wwan: support "raw IP" mode</a>	<a href="#">32f7adf633b9f99ad5089901bc7ebff57704aaa9</a>	v4.5-rc1
<a href="#">net: qmi_wwan: should hold RTNL while changing netdev type</a>	<a href="#">6c730080e663b1d629f8aa89348291fbc46cd9</a>	v4.5-rc1
<a href="#">net: qmi_wwan: ignore bogus CDC Union descriptors</a>	<a href="#">34a55d5e858e81a20d33fd9490149d6a1058be0c</a>	v4.5-rc1
<a href="#">qmi_wwan: Add missing skb_reset_mac_header-call</a>	<a href="#">0de0add10e587effa880c741c9413c874f16be91</a>	v4.14
<a href="#">usbnet: fix alignment for frames with no ethernet header</a>	<a href="#">a4abd7a80adbb4a9547f7dfc7812566b60ec505c</a>	v4.15-rc3
<a href="#">qmi_wwan: set FLAG_SEND_ZLP to avoid network initiated disconnect</a>	<a href="#">245d21190aec547c0de64f70c0e6de871c185a24</a>	v4.16-rc1
<a href="#">qmi_wwan: Fix out-of-bounds read</a>	<a href="#">904d88d743b0c94092c5117955eab695df8109e8</a>	v5.2-rc7

Table 8: qmi\_wwan relevant kernel commits

### 6.2. QMAP Support in qmi\_wwan

Below is a list of commits for adding QMAP support to qmi\_wwan.

Summary	Commit	Availability
<a href="#">net: usb: qmi_wwan: add qmap mux protocol support</a>	<a href="#">c6adf77953bcec0ad63d7782479452464e50f7a3</a>	v4.12-rc1
<a href="#">qmi_wwan: fix NULL deref on disconnect</a>	<a href="#">bbae08e592706dc32e5c7c97827b13c1c178668b</a>	v4.13-rc5
<a href="#">qmi_wwan: Fix qmap header retrieval in qmimux_rx_fixup</a>	<a href="#">d667044f49513d55fcfefe4fa8f8d96091782901</a>	v4.20
<a href="#">qmi_wwan: add MTU default to qmap network interface</a>	<a href="#">f87118d5760f00af7228033fbe783c7f380d2866</a>	v5.0-rc3
<a href="#">qmi_wwan: add support for QMAP padding in the RX path</a>	<a href="#">61356088ace1866a847a727d4d40da7bf00b67fc</a>	v5.2-rc6

Summary	Commit	Availability
<a href="#">qmi_wwan: add network device usage statistics for qmimux devices</a>	<a href="#">44f82312fe9113bab6642f4d0eab6b1b7902b6e1</a>	v5.2-rc6
<a href="#">qmi_wwan: avoid RCU stalls on device disconnect when in QMAP mode</a>	<a href="#">a8fdde1cb830e560208af42b6c10750137f53eb3</a>	v5.2-rc6
<a href="#">qmi_wwan: extend permitted QMAP mux_id value range</a>	<a href="#">36815b416fa48766ac5a98e4b2dc3ebc5887222e</a>	v5.2-rc6
<a href="#">qmi_wwan: Increase headroom for QMAP SKBs</a>	<a href="#">2e4233870557ac12387f885756b70fc181cb3806</a>	v5.12
<a href="#">net: usb: qmi_wwan: add qmap id sysfs file for qmimux interfaces</a>	<a href="#">e594ad980ec26fb7351d02c84abaa77ecdb4e522</a>	v5.12-rc1-dontuse
<a href="#">net: usb: qmi_wwan: allow qmimux add/del with master up</a>	<a href="#">6c59cff38e66584ae3ac6c2f0cbd8d039c710ba7</a>	v5.12-rc3

Table 9: qmi\_wwan QMAP relevant kernel commits

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The system integrator is responsible for the functioning of the final product. Therefore, the external components of the module, as well as any project or installation issue, have to be handled with care. Any interference may cause the risk of disturbing the GSM network or external devices or having an impact on the security system. Should there be any doubt, please refer to the technical documentation and the regulations in force. Every module has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed carefully in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the body (20 cm). In case this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

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[https://ec.europa.eu/growth/sectors/electrical-engineering\\_en](https://ec.europa.eu/growth/sectors/electrical-engineering_en)

## 8. GLOSSARY

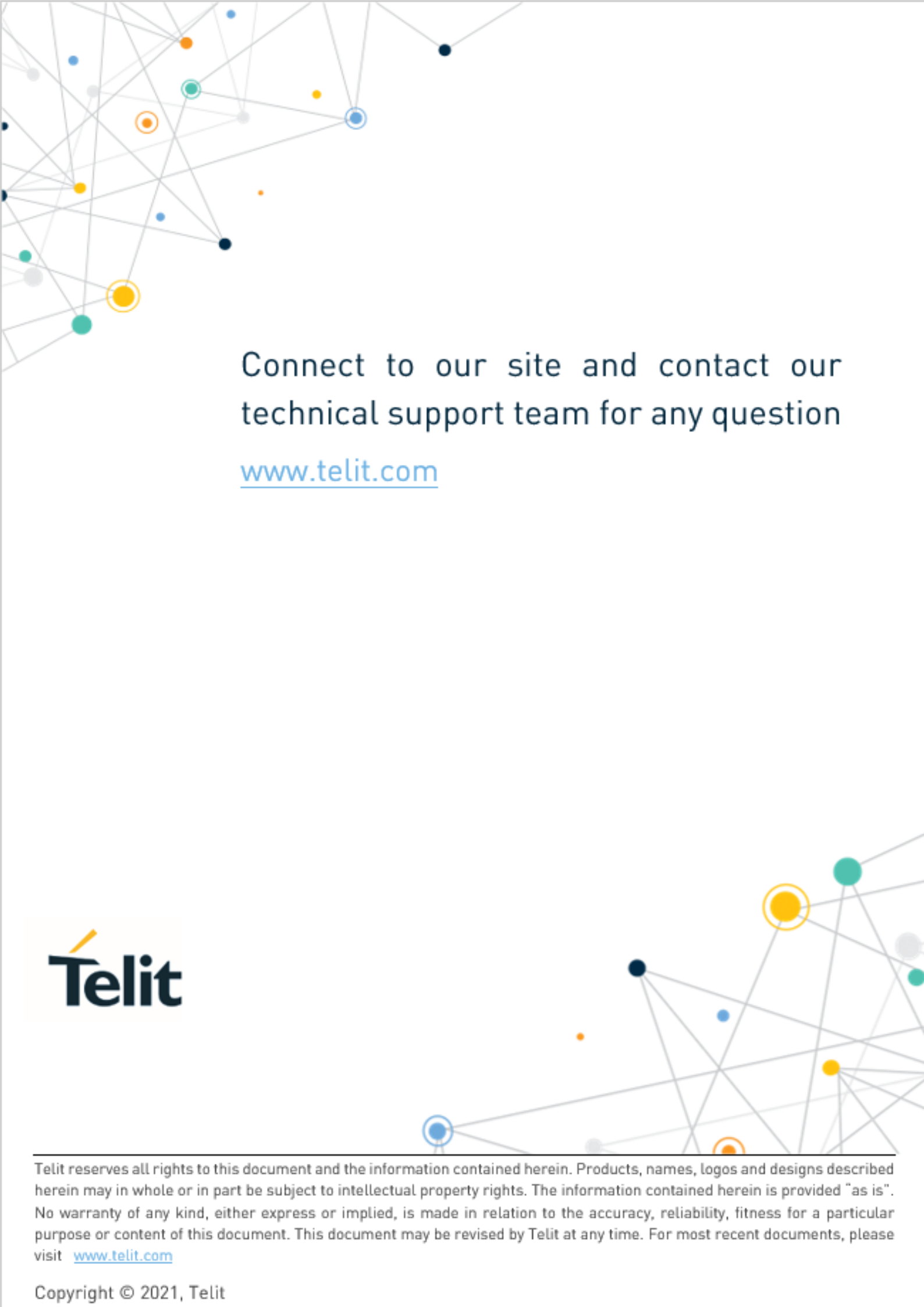
ACM	Abstract Control Model
ADB	Android Debug Bridge
CDC	Communications Class Device
ECM	Ethernet Control Model
MBIM	Mobile Broadband Interface Model
NCM	Network Control Model
PPP	Point to Point Protocol
QMAP	Qualcomm Multiplexing and Aggregation Protocol
USB	Universal Serial Bus

## 9. DOCUMENT HISTORY

Revision	Date	Changes
14	2022-03-02	<p>Added LE910R1 in applicability table</p> <p>Added LE910R1 compositions 0x701A, 0x701B</p> <p>Added LE910R1 composition 0x9201 and related entry in Table 6</p>
13	2021-12-13	<p>Added LE910C1 composition 0x1204</p> <p>Added LE910S1 composition 0x9200 and related entry in Table 6</p> <p>Added FN990 compositions 0x1070, 0x1071, 0x1072, 0x1073</p>
12	2021-09-24	<p>Added LN920 in applicability table and related kernel commits</p>
11	2021-08-09	<p>Added FD980 composition 0x1056</p> <p>Added FD980 in applicability table</p> <p>Added paragraph "Multi-configuration compositions"</p>
10	2021-06-14	<p>Changed document template and reworded some paragraphs</p> <p>Fixed FN980 kernel version availability in applicability table</p> <p>Added LE910S1 to applicability table</p> <p>Added LE910S1 0x7010 and 0x7011 composition description and related kernel commits</p> <p>Added QMAP paragraph and related kernel commits</p> <p>Modified flashing device information for 0x18d1:0xd00d and 0x8087:0x0801 (removed)</p> <p>Changed kernel commit references from github to git.kernel.org</p>
9	2020-11-09	<p>Added LE910Cx compositions 0x1203, 0x1230, 0x1231 and FN980 composition 0x1055</p> <p>Removed references to deprecated ModemManager and NetworkManager documents</p> <p>Removed references to deprecated lxfp</p>
8	2020-09-01	<p>Added LE910C1-EUX support and updated kernel patches list</p> <p>Added LM960 0x1040 qmi_wwan rx urb size note</p>
7	2020-03-27	<p>Changed ME910G1 to MEx10G1 in applicability table</p> <p>Added ML865C1 and ML865G1 to applicability table</p> <p>Updated kernel patches list for composition 0x110b</p>
6	2020-01-13	<p>Added ME910G1 0x110a composition</p> <p>Added FN980 0x9010 flashing device composition</p> <p>Updated kernel patches list</p> <p>Updated applicability table</p>

5	2019-10-21	Added FN980 in applicability table and related kernel commits
4	2019-05-24	Removed automotive modules from applicability table Added LN940 and UE866 in applicability table Added LM940 kernel commit for fixing big data packets issue Added ME910 composition 0x1102, LECx910 compositions 0x1260 and 0x1261 Updated kernel patches list
3	2018-05-07	Added LE866 flashing device details Added kernel commit for PID 0x0036 Added LE910D1 in applicability table
2	2018-02-13	Added LM960 in applicability table Added ME910 composition 0x1101 Added "Additional Kernel Commits" chapter Added "Minimum Kernel Version" in applicability table
1	2017-11-24	Added LE920A4 and LE910C1 composition 0x1201 Added LM940 in applicability table Added reference to commit cdc-wdm: fix "out-of-sync" due to missing notifications
0	2017-04-28	First issue

From Mod.0818 rev.4

A network diagram consisting of various colored nodes (blue, orange, yellow, green, black, grey) connected by thin grey lines, forming a complex web. The nodes are scattered across the page, with a higher density in the top-left and bottom-right corners.

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