pyneovi Documentation

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CHAPTER 1

Overview

pyneovi is a Python wrapper around the API provided by Intrepid Control Systems for communicating with their NeoVI range of devices.

There are three layers to pyneovi and application code can be written against any of them:

- API wrapper layer. This is a Python wrapper around the API provided by ICS in their DLL/shared object. Code written against this will primarily use the *neovi* module, which contains the function wrappers and associated constants. Additionally, some constants are defined in the *can* module and structures are defined in the *structures* module.
- neoVI device layer. This provides a more Pythonic implementation of the API based around objects representing neoVI devices. Code written against this will primarily use the *neodevice* module.
- ECU layer. This shifts the focus to the devices being interacted with, providing objects representing ECUs on the network. Code written against this will primarily use the neoVI device layer to set up the interface plus the *neodevice* module.

The API wrapper layer and the neoVI device layer may both be used as provided. The ECU layer, however, requires additional information about the ECUs being communicated with. This may be provided by the application code directly, but it will usually be preferable to construct a "vehicle spec" file. This describes the networks provided by the vehicle, the ECUs on those networks, and the signals made available by the ECUs. ECUs and signals may then be identified by their names rather than addresses and conversion of the values read from the ECU will be performed automatically. The *spec* module is used to create a vehicle spec.

CHAPTER 2

Examples

examples

CHAPTER 3

Submodules

3.1 neovi.can module

3.2 neovi.ecu module

3.3 neovi.neodevice module

3.4 neovi.neovi module

3.5 neovi.spec module

This module provides classes and functions to allow a network specification to be created for use with pyneovi. A network specification defines the valid networks for a given model of vehicle, along with the ECUs on those networks and the identifiers and signals made available by the ECUs.

Below is an example of a simple network specification. Only the medium speed CAN bus is defined and only a single ECU is associated with that network. The ECU provides four identifiers, each made up of a single signal.

```
from neovi.spec import *
from neovi.neovi import NETID_MSCAN, BitRate
import json


networks = {NETID_MSCAN: {'bitrate': BitRate.BR_125000}}

hvac_ecu = ECU(NETID_MSCAN, 0x456, 'HVAC')

hvac_identifiers = [
    Identifier('Blower Speed Output',          0x9601, [Signal(units='%', m=100./255.
↪)], READ_WRITE),
```

```
    Identifier('External Ambient Temperature', 0x9628, [Signal(units='Deg C', m=0.
↪25)], READ_WRITE),
    Identifier('Left Solar Radiation Sensor',  0x9734, [Signal(units='W', m=10, max_
↪val=1250)]),
    Identifier('Cabin Temperature',            0x97A5, [Signal(units='Deg C',␣
↪length=16, m=0.01, b=-100, min_val=-50, max_val=100)]),
]


ECUs = {
    'HVAC': {'ecu': hvac_ecu, 'identifiers': hvac_identifiers}
}


output_file = open('vehicle.spec', 'wt')
json.dump({'networks': networks, 'ECUs': ECUs}, output_file, cls=PyNeoViJSONEncoder)
output_file.close()
```

exception neovi.spec.**NonByteBoundarySignalError**

Bases: exceptions.Exception

exception neovi.spec.**ValueTooLargeError**

Bases: exceptions.Exception

exception neovi.spec.**UnsupportedValueTypeError**

Bases: exceptions.Exception

neovi.spec.**prepend_zeroes**(*values*, *final_length*)

class neovi.spec.**Signal**(*self*, *name='value'*, *signal_type=ANALOG*, *value_type=UNSIGNED_INT*, *start=0*, *length=8*, *min=None*, *max=None*, *units=''*, *m=1*, *b=0*, *description=''*)

Represents a signal. An *spec.Identifier* will contain one or more signals.

Parameters

- **name** (*str*) – The name of this signal.
- **signal_type** (*int*) – The type of signal. Currently, only spec.ANALOG is supported.
- **value_type** (*int*) – The type of value returned for the signal. Currently only spec.UNSIGNED_INT is supported.
- **start** (*int*) – The bit within the identifier's aggregate value at which this signal starts.
- **length** (*int*) – The length in bits of this signal.
- **min_val** (*float*) – The minimum value for this signal. This is not enforced and is for reference only. If not specified then b is used as the default value.
- **max_val** (*float*) – The minimum value for this signal. This is not enforced and is for reference only. If not specified then (255. * m) + b is used as the default value.
- **units** (*str*) – The units of the signal once converted.
- **m** (*float*) – The slope for conversion of the signal into engineering units.
- **b** (*float*) – The offset for conversion of the signal into engineering units.
- **description** (*str*) – A human-readable description of the signal.

Raises *NonByteBoundarySignalError* – If length or start are not integer multiples of 8.

decode_signal_bytes(*signal_bytes*)
Converts the individual data bytes into the final value for the signal.

Parameters **signal_bytes** (*list of ints*) – The bytes received from the ECU.

Returns Tuple of final value and the units of the signal.

Raises ***UnsupportedValueTypeError*** – If the signal is of a type that is currently unsupported.

encode_value(*value*)
Converts a value into the individual data bytes required for transmission.

Parameters **value** (*float/int*) – The value for conversion.

Raises

- ***UnsupportedValueTypeError*** – If the signal is of a type that is currently unsupported.
- ***ValueTooLargeError*** – If the value does not fit into the number of bits specified for the signal.

class neovi.spec.**Identifier**(*self*, *name*, *data_id*, *signals = []*, *io_type = READ*)
Represents an identifier (an example of which would be "Blower Speed Output" in a HVAC ECU). The value of an identifier can consist of multiple individual signals but often there is only a single signal associated with an identifier.

Parameters

- **name** (*str*) – The name of the identifier.
- **data_id** (*int*) – The address (internal to the ECU) with which this identifier is associated.
- **signals** (*list of spec.Signal*) – The signals that form this identifier.
- **io_type** (*int*) – Allowed IO for this identifier: `spec.READ`, `spec.WRITE`, `spec.READ_WRITE`.

get_data_id_bytes()

Returns The data_id as individual bytes. Used when constructing a message.

class neovi.spec.**ECU**(*network*, *address*, *short_desc=''*, *long_desc=''*)
Represents an ECU for the purpose of building a network specification. Note that if you need an object that allows you to communicate with the ECU then you're looking for `ecu.ECU`.

Parameters

- **network** (*int*) – The network to transmit on. See NETID_* in `neovi`.
- **address** (*int*) – The address of the ECU.
- **short_desc** (*str*) – A short name for the ECU (e.g. "HVAC").
- **long_desc** (*str*) – A long description for the ECU (e.g. including model number or other information).

get_network()

get_request_id()

get_response_id()

class neovi.spec.**PyNeoViJSONEncoder**(*skipkeys=False, ensure_ascii=True, check_circular=True, allow_nan=True, sort_keys=False, indent=None, separators=None, encoding='utf-8', default=None*)

Bases: `json.encoder.JSONEncoder`

Can be passed to json.dump as the cls parameter to handle the additional object types defined here.

default(*o*)

neovi.spec.**from_json**(*json_object*)

Can be passed to json.load as the object_hook parameter to handle the additional object types defined here.

3.6 neovi.structures module

Classes provided by this module:

- *NeoDevice*
- *icsSpyMessage*
- *spyFilterLong*
- *CAN_SETTINGS*
- *SWCAN_SETTINGS*
- *LIN_SETTINGS*
- *ISO9141_KEYWORD2000__INIT_STEP*
- *ISO9141_KEYWORD2000_SETTINGS*
- *UART_SETTINGS*
- *STextAPISettings*
- *SFireSettings*
- *SVCAN3Settings*

neovi.structures.**array_equal**(*a1, a2*)

neovi.structures.**format_array**(*array*)

neovi.structures.**get_status_bits_set**(*msg*)

class neovi.structures.**NeoDevice**

Bases: `_ctypes.Structure`

DeviceType

Structure/Union member

Handle

Structure/Union member

MaxAllowedClients

Structure/Union member

NumberOfClients

Structure/Union member

SerialNumber

Structure/Union member

class neovi.structures.**icsSpyMessage**

Bases: _ctypes.Structure

AckBytes
Structure/Union member

ArbIDOrHeader
Structure/Union member

ColorID
Structure/Union member

Data
Structure/Union member

DescriptionID
Structure/Union member

MessagePieceID
Structure/Union member

MiscData
Structure/Union member

NetworkID
Structure/Union member

NodeID
Structure/Union member

NumberBytesData
Structure/Union member

NumberBytesHeader
Structure/Union member

Protocol
Structure/Union member

StatusBitField
Structure/Union member

StatusBitField2
Structure/Union member

TimeHardware
Structure/Union member

TimeHardware2
Structure/Union member

TimeStampHardwareID
Structure/Union member

TimeStampSystemID
Structure/Union member

TimeSystem
Structure/Union member

TimeSystem2
Structure/Union member

Value
Structure/Union member

class neovi.structures.**spyFilterLong**
Bases: _ctypes.Structure

ByteDataLSB
Structure/Union member

ByteDataLength
Structure/Union member

ByteDataMSB
Structure/Union member

ByteDataMaskLSB
Structure/Union member

ByteDataMaskMSB
Structure/Union member

ExpectedLength
Structure/Union member

FrameMaster
Structure/Union member

Header
Structure/Union member

HeaderLength
Structure/Union member

HeaderMask
Structure/Union member

MiscData
Structure/Union member

MiscDataMask
Structure/Union member

NetworkID
Structure/Union member

NodeID
Structure/Union member

Status2Mask
Structure/Union member

Status2Value
Structure/Union member

StatusMask
Structure/Union member

StatusValue
Structure/Union member

bStuff2
Structure/Union member

bUseArbIdRangeFilter
Structure/Union member

class neovi.structures.**CAN_SETTINGS**
Bases: _ctypes.Structure

BRP
Structure/Union member

Baudrate
Structure/Union member

Mode
Structure/Union member

NetworkType
Structure/Union member

SetBaudrate
Structure/Union member

TqProp
Structure/Union member

TqSeg1
Structure/Union member

TqSeg2
Structure/Union member

TqSync
Structure/Union member

auto_baud
Structure/Union member

class neovi.structures.**SWCAN_SETTINGS**
Bases: _ctypes.Structure

BRP
Structure/Union member

Baudrate
Structure/Union member

Mode
Structure/Union member

NetworkType
Structure/Union member

SetBaudrate
Structure/Union member

TqProp
Structure/Union member

TqSeg1
Structure/Union member

TqSeg2
Structure/Union member

TqSync
Structure/Union member

auto_baud
Structure/Union member

high_speed_auto_switch
Structure/Union member

class neovi.structures.**LIN_SETTINGS**
Bases: _ctypes.Structure

Baudrate
Structure/Union member

MasterResistor
Structure/Union member

Mode
Structure/Union member

brgh
Structure/Union member

spbrg
Structure/Union member

class neovi.structures.**ISO9141_KEYWORD2000__INIT_STEP**
Bases: _ctypes.Structure

k
Structure/Union member

l
Structure/Union member

time_500us
Structure/Union member

class neovi.structures.**ISO9141_KEYWORD2000_SETTINGS**
Bases: _ctypes.Structure

Baudrate
Structure/Union member

brgh
Structure/Union member

chksum_enabled
Structure/Union member

init_step_count
Structure/Union member

init_steps
Structure/Union member

p2_500us
Structure/Union member

p3_500us
Structure/Union member

p4_500us
Structure/Union member

spbrg
Structure/Union member

class neovi.structures.**UART_SETTINGS**
Bases: _ctypes.Structure

Baudrate
Structure/Union member

bOptions
Structure/Union member

brgh
Structure/Union member

flow_control
Structure/Union member

parity
Structure/Union member

reserved_1
Structure/Union member

spbrg
Structure/Union member

stop_bits
Structure/Union member

class neovi.structures.**STextAPISettings**
Bases: _ctypes.Structure

Reserved0
Structure/Union member

Reserved1
Structure/Union member

Reserved2
Structure/Union member

Reserved3
Structure/Union member

Reserved4
Structure/Union member

can1_options
Structure/Union member

can1_rx_id
Structure/Union member

can1_tx_id
Structure/Union member

can2_options
Structure/Union member

can2_rx_id
Structure/Union member

can2_tx_id
Structure/Union member

can3_options
Structure/Union member

can3_rx_id3
Structure/Union member

can3_tx_id3
Structure/Union member

can4_options
Structure/Union member

can4_rx_id4
Structure/Union member

can4_tx_id4
Structure/Union member

network_enables
Structure/Union member

class neovi.structures.**SFireSettings**
Bases: _ctypes.Structure

ain_sample_period
Structure/Union member

ain_threshold
Structure/Union member

can1
Structure/Union member

can2
Structure/Union member

can3
Structure/Union member

can4
Structure/Union member

cgi_baud
Structure/Union member

cgi_chksum_enable
Structure/Union member

cgi_enable_reserved
Structure/Union member

cgi_rx_ifs_bit_times
Structure/Union member

cgi_tx_ifs_bit_times
Structure/Union member

fast_init_network_enables_1
Structure/Union member

fast_init_network_enables_2
Structure/Union member

iso15765_separation_time_offset
Structure/Union member

iso9141_kwp_enable_reserved
Structure/Union member

iso9141_kwp_settings
Structure/Union member

iso9141_kwp_settings2
Structure/Union member

iso9141_kwp_settings_3
Structure/Union member

iso9141_kwp_settings_4
Structure/Union member

iso_msg_termination
Structure/Union member

iso_msg_termination_2
Structure/Union member

iso_msg_termination_3
Structure/Union member

iso_msg_termination_4
Structure/Union member

iso_parity
Structure/Union member

iso_parity_2
Structure/Union member

iso_parity_3
Structure/Union member

iso_parity_4
Structure/Union member

iso_tester_pullup_enable
Structure/Union member

lin1
Structure/Union member

lin2
Structure/Union member

lin3
Structure/Union member

lin4
Structure/Union member

lsftcan
Structure/Union member

misc_io_analog_enable
Structure/Union member

misc_io_initial_ddr
Structure/Union member

misc_io_initial_latch
Structure/Union member

misc_io_on_report_events
Structure/Union member

misc_io_report_period
Structure/Union member

network_enabled_on_boot
Structure/Union member

network_enables
Structure/Union member

network_enables_2
Structure/Union member

perf_en
Structure/Union member

pwm_man_timeout
Structure/Union member

pwr_man_enable
Structure/Union member

swcan
Structure/Union member

text_api
Structure/Union member

uart
Structure/Union member

uart2
Structure/Union member

class `neovi.structures.`**SVCAN3Settings**
Bases: `_ctypes.Structure`

can1
Structure/Union member

can2
Structure/Union member

iso15765_separation_time_offset
Structure/Union member

misc_io_initial_ddr
Structure/Union member

misc_io_initial_latch
Structure/Union member

misc_io_on_report_events
Structure/Union member

misc_io_report_period
Structure/Union member

network_enabled_on_boot
Structure/Union member

network_enables
Structure/Union member

perf_en
Structure/Union member

class neovi.structures.**APIFirmwareInfo**
Bases: _ctypes.Structure

iAppMajor
Structure/Union member

iAppMinor
Structure/Union member

iBoardRevMajor
Structure/Union member

iBoardRevMinor
Structure/Union member

iBootLoaderVersionMajor
Structure/Union member

iBootLoaderVersionMinor
Structure/Union member

iMainFirmChkSum
Structure/Union member

iMainFirmDateDay
Structure/Union member

iMainFirmDateHour
Structure/Union member

iMainFirmDateMin
Structure/Union member

iMainFirmDateMonth
Structure/Union member

iMainFirmDateSecond
Structure/Union member

iMainFirmDateYear
Structure/Union member

iManufactureDay
Structure/Union member

iManufactureMonth
Structure/Union member

iManufactureYear
Structure/Union member

iType
Structure/Union member

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Contact

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