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| МИНОБРНАУКИ РОССИИ | | |
| Федеральное государственное бюджетное образовательное учреждение  высшего образования  **«МИРЭА – Российский технологический университет»**  **РТУ МИРЭА** | | |

Институт Информационных технологий

Кафедра Математического обеспечения и стандартизации информационных технологий

**Отчет по практическим работам №7**

по дисциплине «Технологические основы Интернета вещей»

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| **Выполнил:**  Студент группыИМБО-02-22 | Ким Кирилл Сергеевич |
| **Проверил:** | Синицын Иван Васильевич |

2024 г.

# **Практическая работа №7 – Форматы представления данных**

**Цель работы:**

Целью данной работы является создать правила на языке, похожем на JavaScript. Нам достался Вариант 7. Задания седьмого варианта представлены на Рисунке 1.

**Выполнения практической работы**

1. С компьютера в аудитории или личного устройства подпишитесь на несколько MQTT-топиков стенда согласно вариантам.

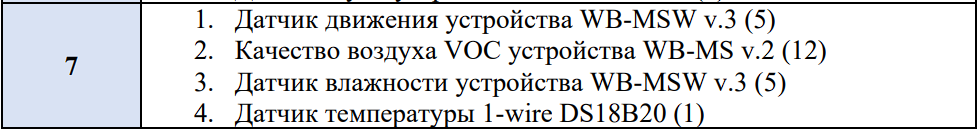


Рисунок 1 — Задания варианта 7

1. На любом языке программирования реализуйте программу (скрипт), которая бы каждые 5 секунд упаковывала последние полученные данные в файлы формата JSON и XML. В одной записи должно быть 6 полей: 4 показаний датчиков, время формирования файла, номер чемодана (последние две цифры IP-адреса).

*Листинг 1 – Запись файла*

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| import paho.mqtt.client as mqtt  import json  from datetime import datetime  import xml.etree.ElementTree as ET  import csv  # Параметры подключения к MQTT-брокеру  HOST = "192.168.2.27" # IP чемодана  PORT = 1883 # Стандартный порт подключения для Mosquitto  KEEPALIVE = 60 # Время ожидания доставки сообщения, если при отправке оно будет прeвышено, брокер будет считаться недоступным  # Словарь с топиками и собираемыми из них параметрами  # pr 7  SUB\_TOPICS = {      '/devices/wb-msw-v3\_21/controls/Current Motion': 'motion',      '/devices/wb-ms\_11/controls/Air Quality (VOC)': 'air',      '/devices/wb-msw-v3\_21/controls/Humidity': 'humidity',      '/devices/wb-m1w2\_14/controls/Externak Sensor 1': 'temperature',  }  # pr 8  # SUB\_TOPICS = {  #     '/devices/wb-msw-v3\_21/controls/Humidity': 'humidity',    #     '/devices/wb-ms\_11/controls/Temperature': 'temperature',    #     '/devices/wb-map12e\_23/controls/Ch 1 P L2': 'power',  # }  JSON\_LIST = []  # Создание словаря для хранения данных JSON  JSON\_DICT = {}  for value in SUB\_TOPICS.values():      JSON\_DICT[value] = 0  *def* on\_connect(*client*, *userdata*, *flags*, *rc*):      """ Функция, вызываемая при подключении к брокеру      Arguments:      client - Экземпляр класса Client, управляющий подключением к брокеру      userdata - Приватные данные пользователя, передаваемые при подключениии      flags - Флаги ответа, возвращаемые брокером      rc - Результат подключения, если 0, всё хорошо, в противном случае идем в документацию      """      print("Connected with result code " + str(*rc*))      # Подключение ко всем заданным выше топикам      for topic in SUB\_TOPICS.keys():  *client*.subscribe(topic)  *def* on\_message(*client*, *userdata*, *msg*):      """ Функция, вызываемая при получении сообщения от брокера по одному из отслеживаемых топиков      Arguments:      client - Экземпляр класса Client, управляющий подключением к брокеру      userdata - Приватные данные пользователя, передаваемые при подключениии      msg - Сообщение, приходящее от брокера, со всей информацией      """      payload = *msg*.payload.decode() # Основное значение, приходящее в сообщение, например, показатель температуры      topic = *msg*.topic # Топик, из которого пришло сообщение, поскольку функция обрабатывает сообщения из всех топиков      param\_name = SUB\_TOPICS[topic]      JSON\_DICT[param\_name] = payload      JSON\_DICT['time'] = str(datetime.now())      JSON\_LIST.append(JSON\_DICT.copy())      print(topic + " " + payload)      # Запись данных в файл      with open('data.json', 'w') as file:          json\_string = json.dumps(JSON\_LIST) # Формирование строки JSON из словаря          file.write(json\_string)        # Запись данных в файл XML      root = ET.Element("data")      for data in JSON\_LIST:          entry = ET.SubElement(root, "entry")          for key, value in data.items():              item = ET.SubElement(entry, key)              item.text = str(value)      tree = ET.ElementTree(root)      tree.write("data.xml", *encoding*="utf-8", *xml\_declaration*=True)          csv\_file = 'data.csv'      keys = JSON\_DICT.keys()      # Check if the file already exists to write headers      write\_header = not os.path.exists(csv\_file)        with open(csv\_file, 'a', *newline*='') as csvfile:          writer = csv.DictWriter(csvfile, *fieldnames*=keys)          if write\_header:              writer.writeheader()          writer.writerow(JSON\_DICT)  *def* main():      # Создание и настройка экземпляра класса Client для подключения в Mosquitto      client = mqtt.Client()      client.on\_connect = on\_connect      client.on\_message = on\_message      client.connect(HOST, PORT, KEEPALIVE)      client.loop\_forever() # Бесконечный внутренний цикл клиента в ожидании сообщений  if \_\_name\_\_ == "\_\_main\_\_":      main() |

1. На любом языке программирования реализуйте программу-парсер, которая бы выводила в консоль данные, полученные из сгенерированных в п.2 файлов.

*Листинг 2 – Программа-парсер*

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| --- |
| import json  from xml.etree.ElementTree import parse as xml\_parse  def print\_elem(\*\*kwargs):      elem\_str = 'Record:'      for key, val in kwargs.items():          elem\_str = f'{elem\_str} {key}={val},'      print(elem\_str)  def main():      n = 5      print(f"First {n} elements of data.xml:\n")      tree = xml\_parse('data.xml')      for elem in tree.getroot().findall('.//record')[:n]:          d = {x.tag: x.text for x in elem}          print\_elem(\*\*d)      print("\nFirst 5 elements of data.json:\n")      json\_str = ''      with open('data.json', 'r') as file:          json\_str = file.read()      data = json.loads(json\_str)      for elem in data[:n]:          print\_elem(\*\*elem)    if \_\_name\_\_ == "\_\_main\_\_":      main() |

*Листинг 3 – Упакованный файл формата XML*

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| <data>  <record>  <motion>63</motion>  <sound>0</sound>  <illuminance>0</illuminance>  <temperature>0</temperature>  <time>2024-10-21 14:05:38.788082</time>  <id>12</id>  </record>  <record>  <motion>90</motion>  <sound>50.97</sound>  <illuminance>548</illuminance>  <temperature>25.85</temperature>  <time>2024-10-21 14:05:44.810854</time>  <id>12</id>  </record>  <record>  <motion>52</motion>  <sound>57.46</sound>  <illuminance>548</illuminance>  <temperature>25.88</temperature>  <time>2024-10-21 14:05:49.850384</time>  <id>12</id>  </record>  <record>  <motion>113</motion>  <sound>51.61</sound>  <illuminance>548</illuminance>  <temperature>25.84</temperature>  <time>2024-10-21 14:05:55.788054</time>  <id>12</id>  </record>  <record>  <motion>104</motion>  <sound>61.35</sound>  <illuminance>546</illuminance>  <temperature>25.88</temperature>  <time>2024-10-21 14:06:00.896623</time>  <id>12</id>  </record>  <record>  <motion>70</motion>  <sound>60.16</sound>  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*Листинг 3 – Упакованный файл формата JSON*

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**Вывод:** осуществили подписку на топики и собрали необходимую информацию