Red Room Discussion Channel

Bernhard Hartmann, Pavol Malo

Projektübersicht

(1) Definition of Use Case and Requirements

(2) Design and Architecture

(3) Development Environment Setup

(4) Setting up QUIC-Connection

(5) Message System with QUIC

(6) Compiling Experiments (Windows)

(7) Implementation of Database

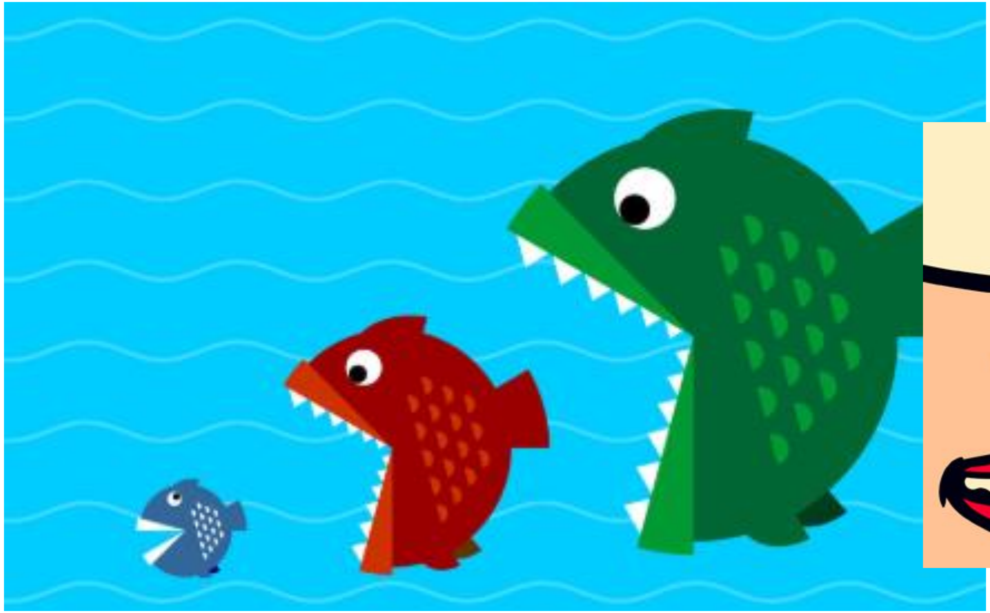
(8) Multi-Connection Server Implementation

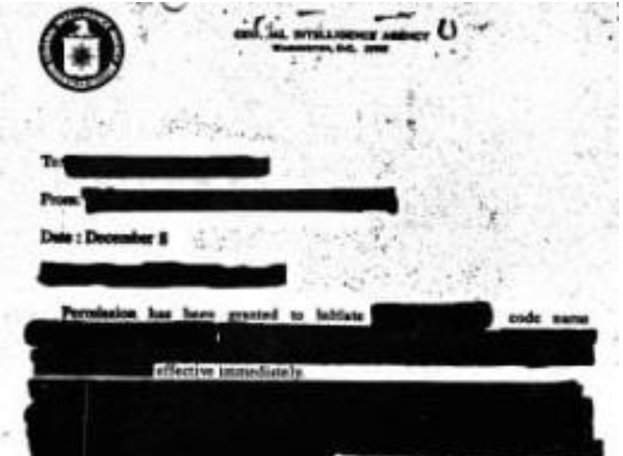
(9) Multi-Threading Client App

(10) GUI and Database Adjustments

Use Case: GeldGeldGeld AG

Mergers & Acquisitions





[illegible] INTELLIGENCE AGENCY
[illegible]

To: [redacted]

From: [redacted]

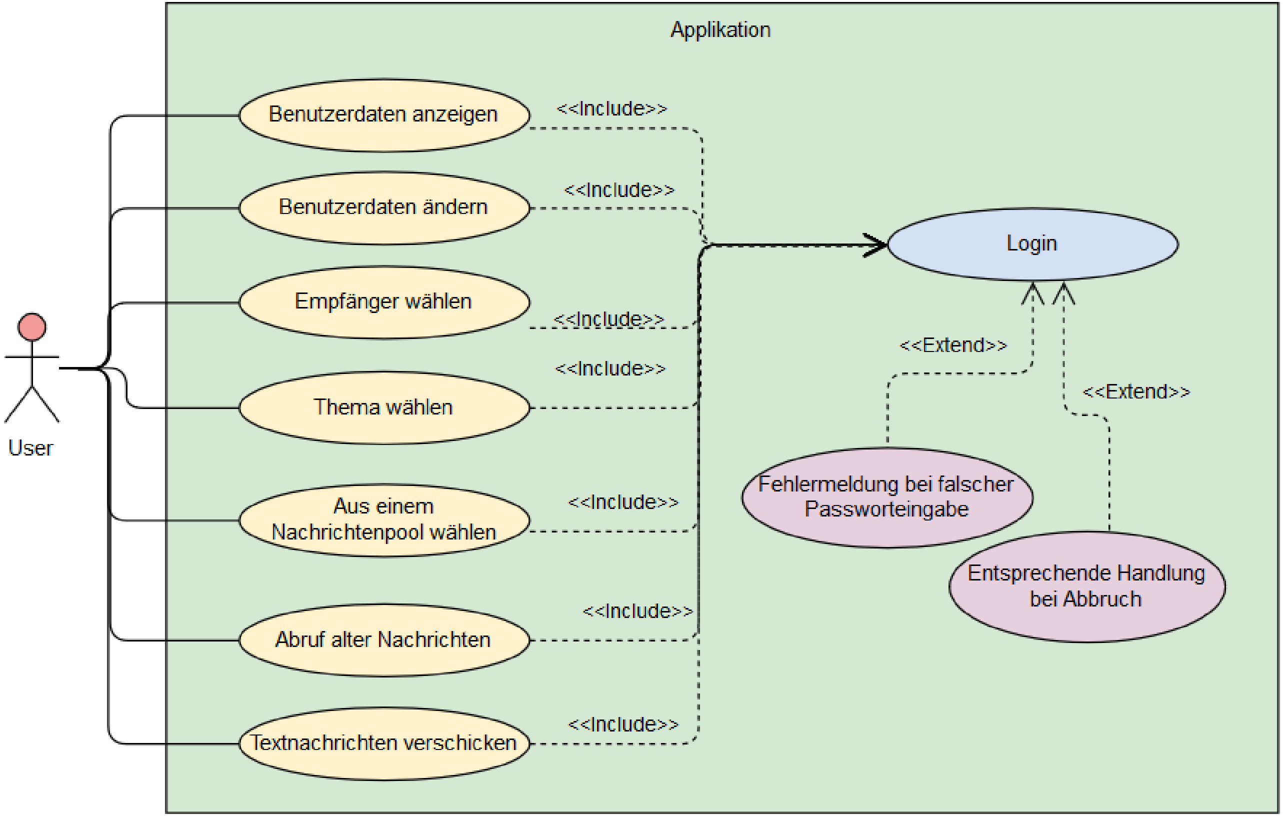
Date : December 8

[redacted]

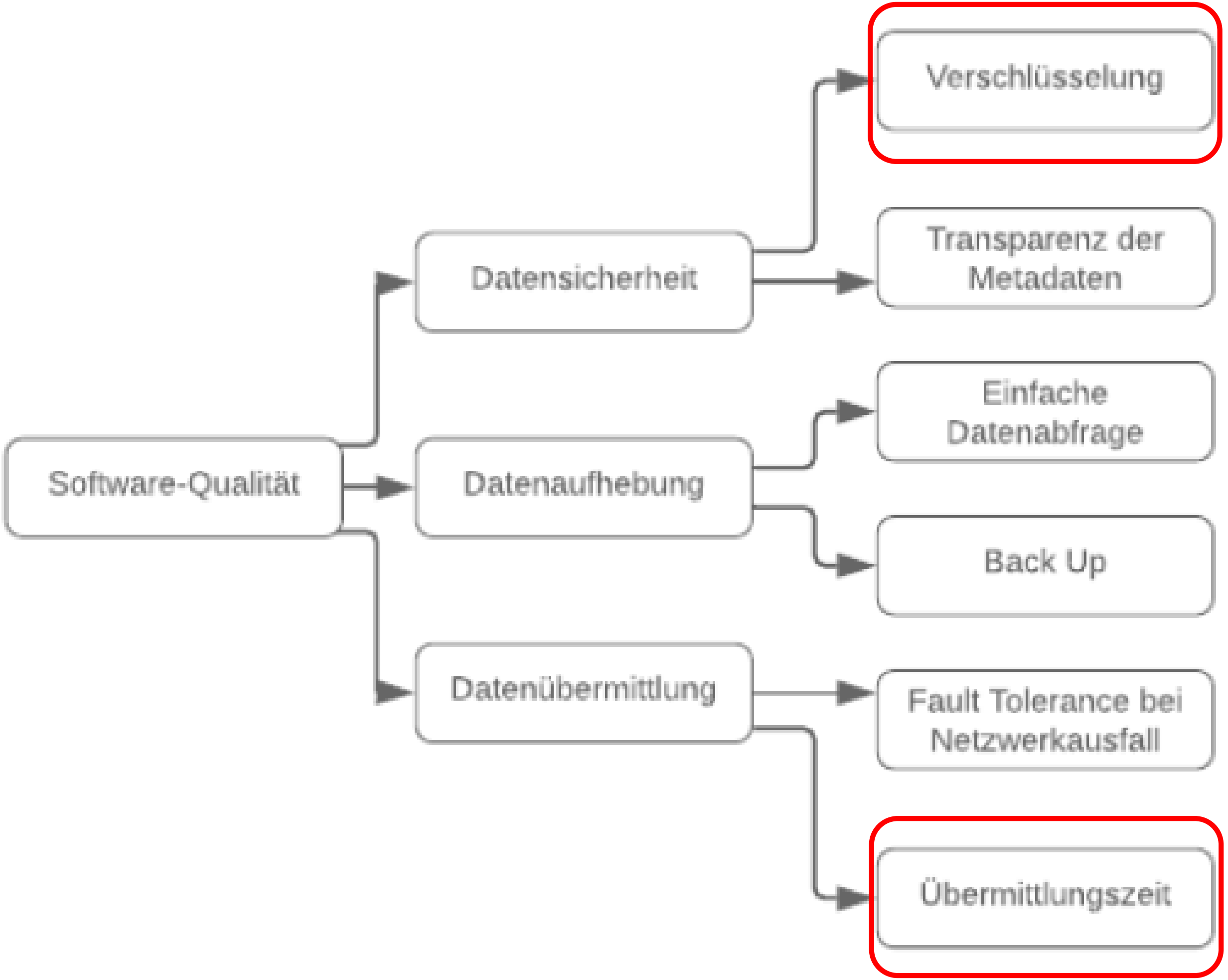
Permission has been granted to initiate [redacted] code name [redacted] effective immediately [redacted]

Der geheime Firmenwert

Use case(s)


Applikation
User
Benutzerdaten anzeigen
Benutzerdaten ändern
Empfänger wählen
Thema wählen
Aus einem Nachrichtenpool wählen
Abruf alter Nachrichten
Textnachrichten verschicken
<<Include>>
<<Include>>
<<Include>>
<<Include>>
<<Include>>
<<Include>>
<<Include>>
Login
<<Extend>>
<<Extend>>
Fehlermeldung bei falscher Passworteingabe
Entsprechende Handlung bei Abbruch

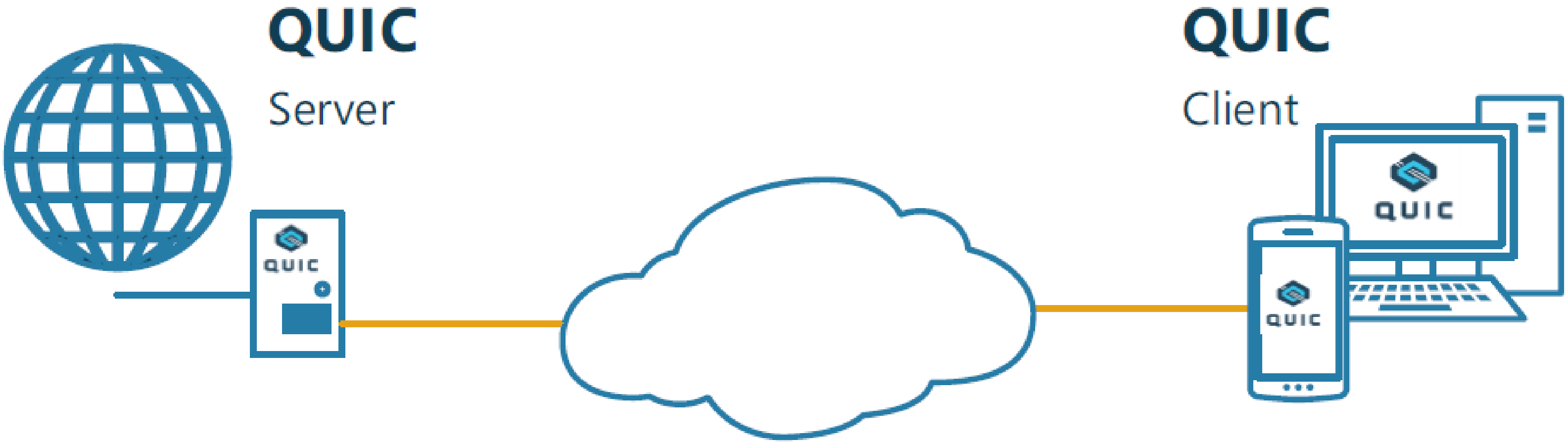
Quality Tree



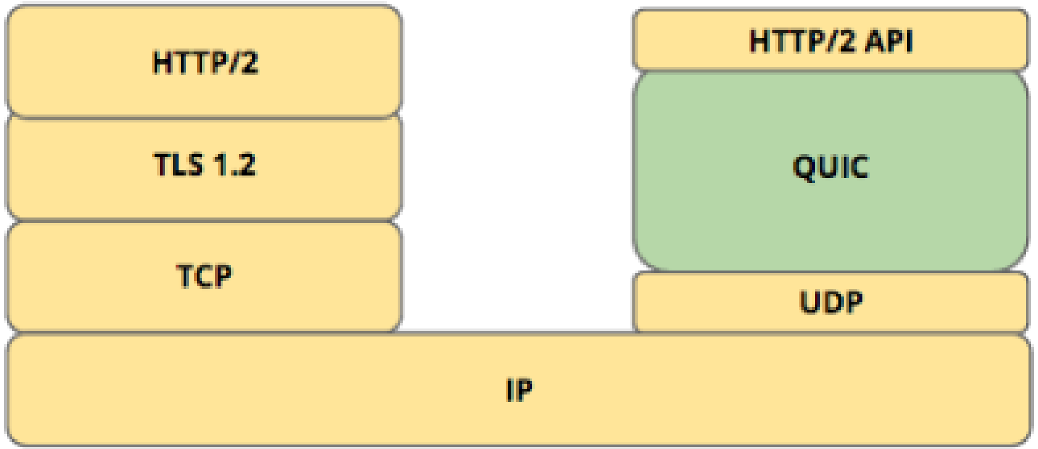
Design and Architecture:

Fachlicher Kontext

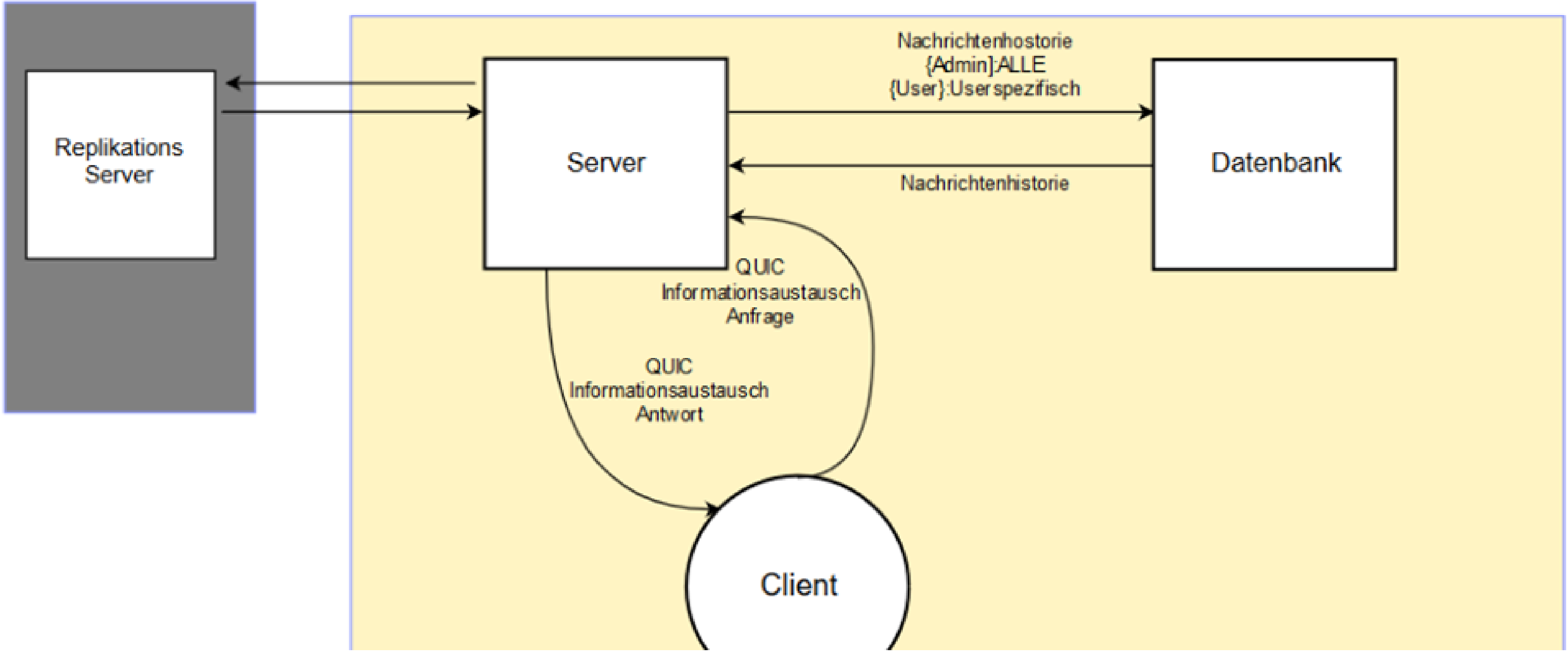
Blackboxsicht



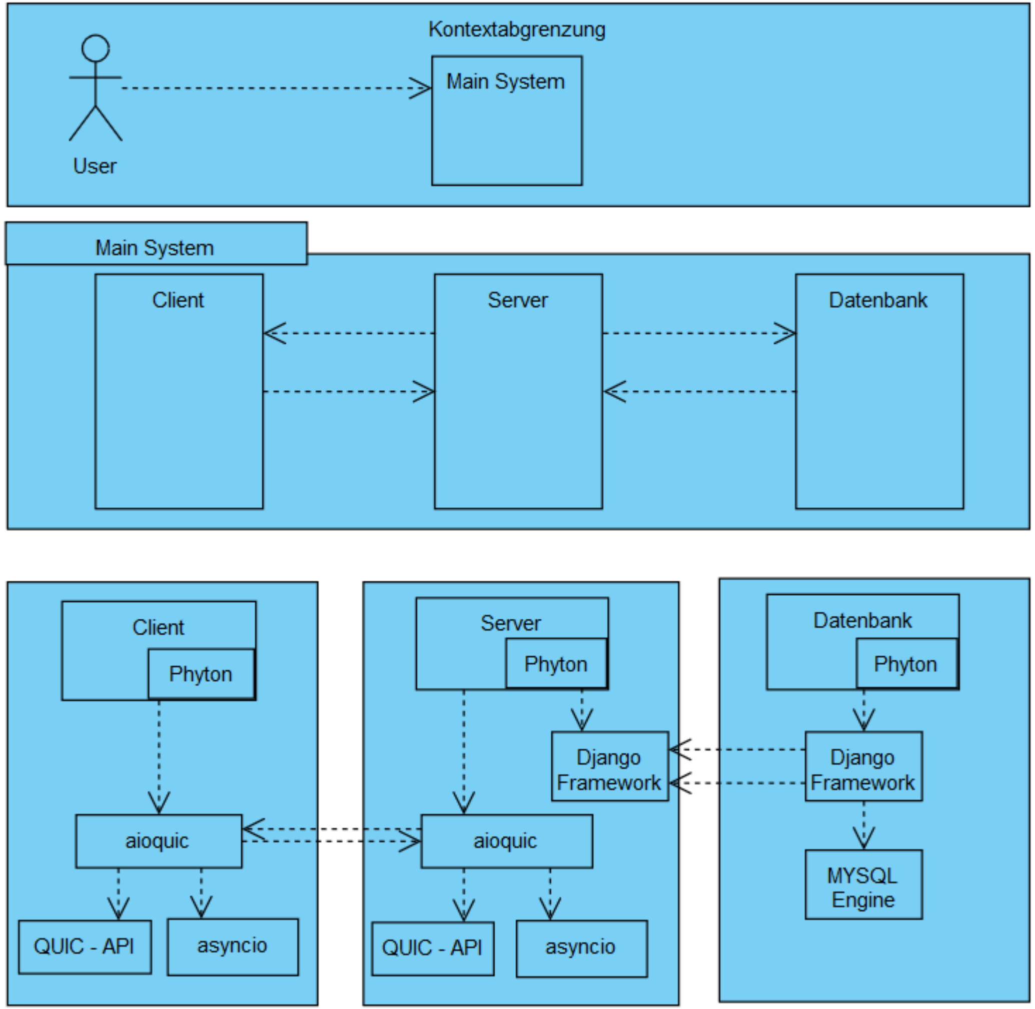
Lösungsstrategie



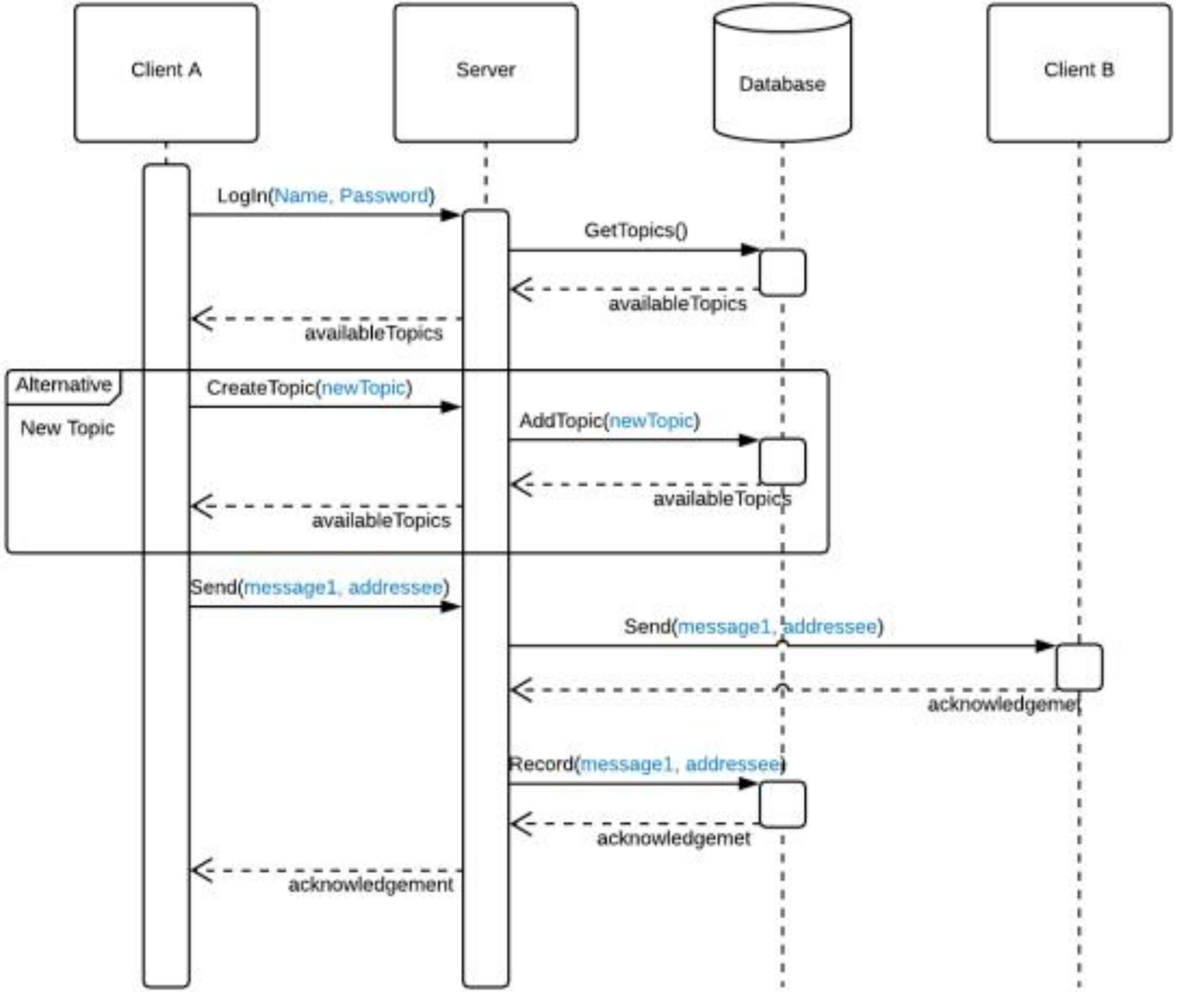
Kontextabgrenzung

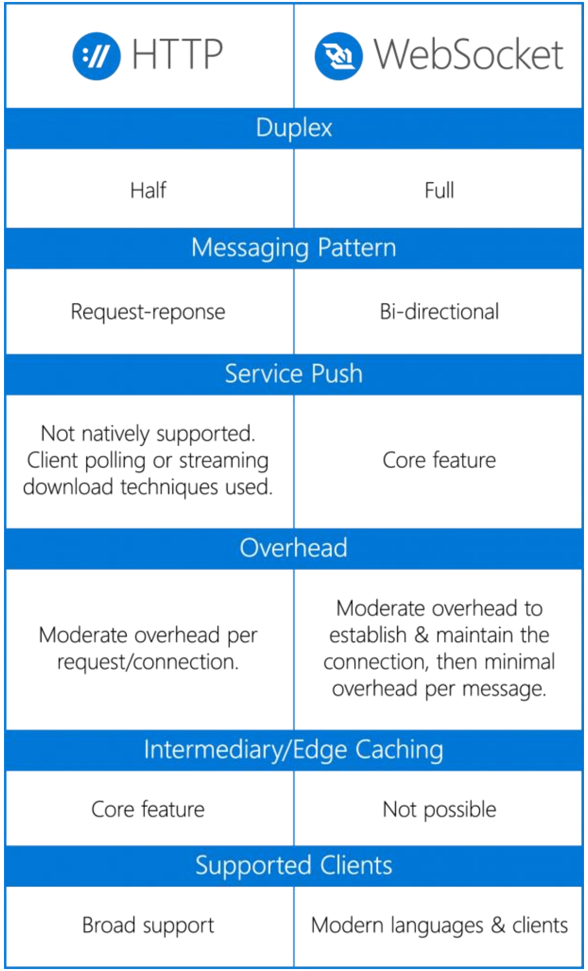


Bausteinsicht



Laufzeitsicht

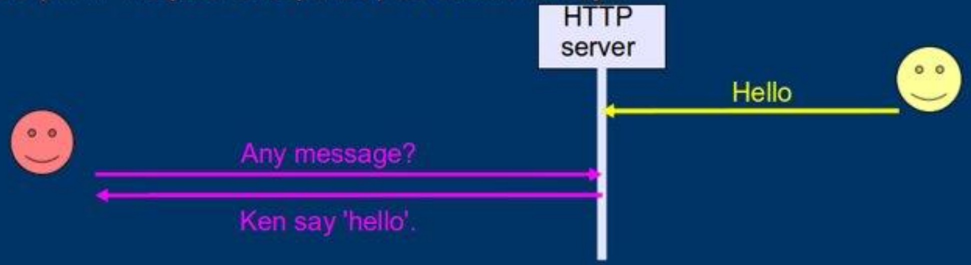




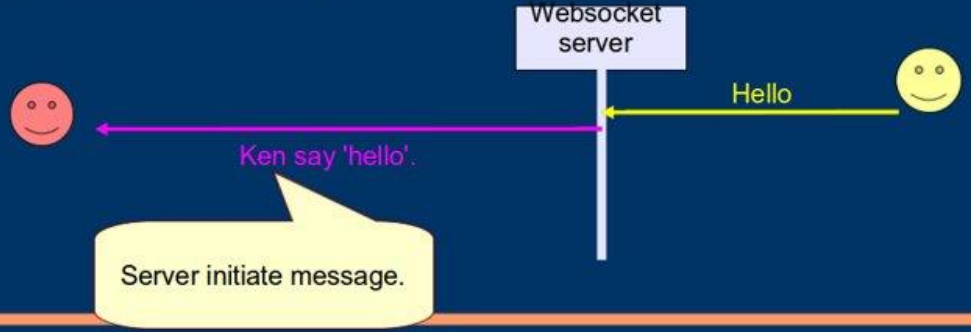
HTTP	WebSocket
Duplex	
Half	Full
Messaging Pattern	
Request-reponse	Bi-directional
Service Push	
Not natively supported. Client polling or streaming download techniques used.	Core feature
Overhead	
Moderate overhead per request/connection.	Moderate overhead to establish & maintain the connection, then minimal overhead per message.
Intermediary/Edge Caching	
Core feature	Not possible
Supported Clients	
Broad support	Modern languages & clients

Before & After websocket

Before (HTTP : request & response) too traditional way...



After (Websocket : bidirectional)



Server initiate message.

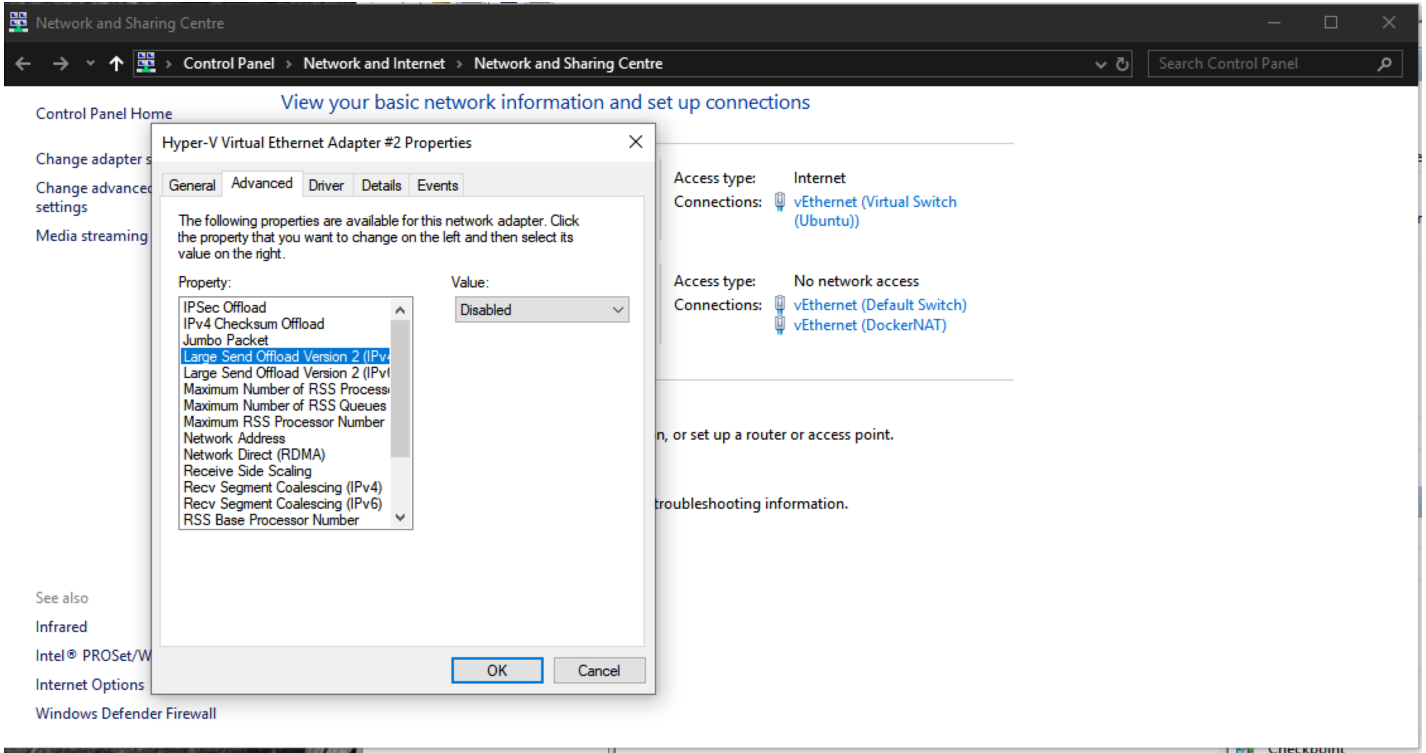
Development Environment Setup

Windows incompatibility

```
C:\Users\admin>pip install aioquic
Collecting aioquic
…
ERROR: Command errored out with exit status 1: 'c:\users\admin\appdata\local\programs\python\python38\python.exe' -u
-c 'import sys, setuptools, tokenize; sys.argv[0] = '"'"'C:\\Users\\admin\\AppData\\Local\\Temp\\pip-install-
zyvsrlfr\\aioquic\\setup.py'"'"'; __file__='"'"'C:\\Users\\admin\\AppData\\Local\\Temp\\pip-install-
zyvsrlfr\\aioquic\\setup.py'"'"';f=getattr(tokenize, '"'"'open'"'"',
open)(__file__);code=f.read().replace('"'"'\r\n'"'"', '"'"'\n'"'"');f.close();exec(compile(code, __file__,
'"'"'exec'"'"'))' install --record 'C:\Users\admin\AppData\Local\Temp\pip-record-iq__239n\install-record.txt' --
single-version-externally-managed --compile Check the logs for full command output.
```

Development Environment Setup

Virtual machine – network setup issue



Network and Sharing Centre

Control Panel › Network and Internet › Network and Sharing Centre

Search Control Panel

Control Panel Home

Change adapter s

Change advanced settings

Media streaming

See also

Infrared

Intel® PROSet/W

Internet Options

Windows Defender Firewall

View your basic network information and set up connections

Access type: Internet
Connections: vEthernet (Virtual Switch (Ubuntu))

Access type: No network access
Connections: vEthernet (Default Switch)
vEthernet (DockerNAT)

n, or set up a router or access point.

troubleshooting information.

Hyper-V Virtual Ethernet Adapter #2 Properties

General | Advanced | Driver | Details | Events

The following properties are available for this network adapter. Click the property that you want to change on the left and then select its value on the right.

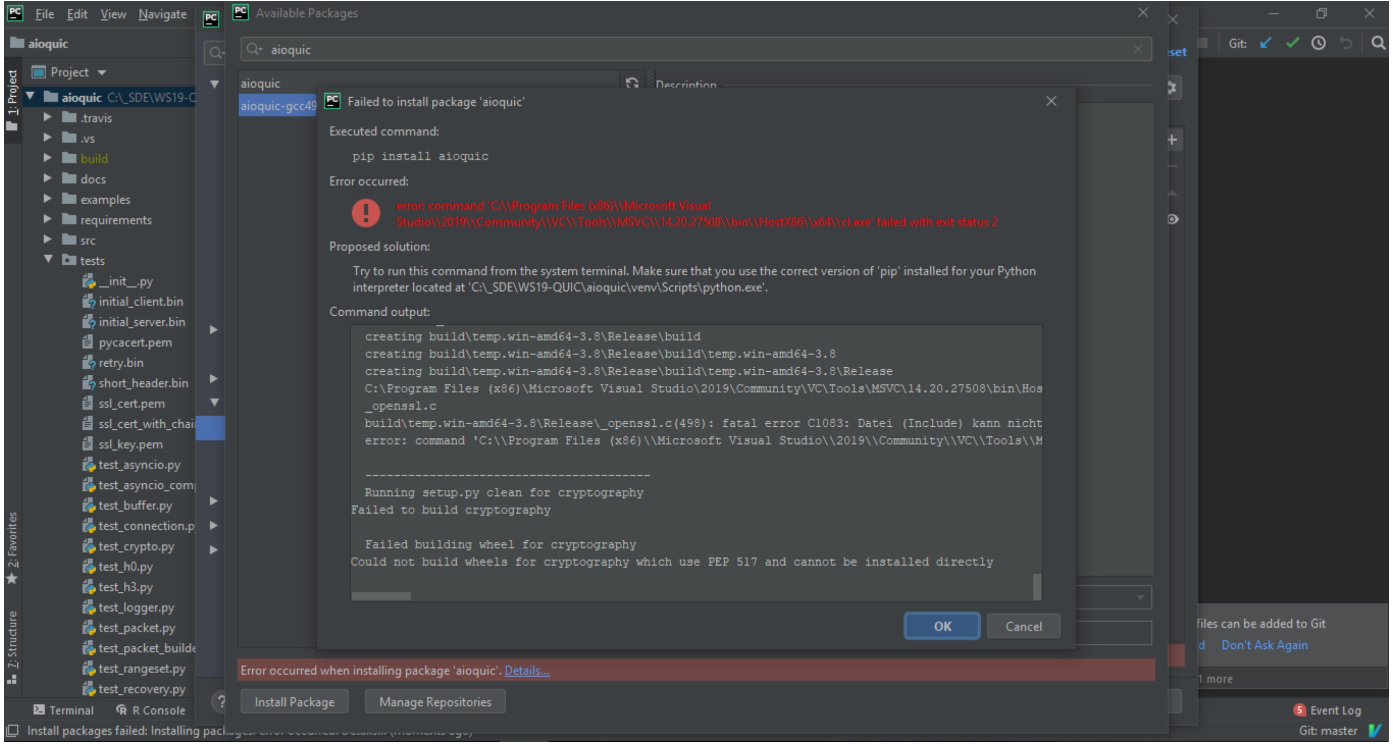
Property:
- IPSec Offload
- IPv4 Checksum Offload
- Jumbo Packet
- Large Send Offload Version 2 (IPv4
- Large Send Offload Version 2 (IPv(
- Maximum Number of RSS Process
- Maximum Number of RSS Queues
- Maximum RSS Processor Number
- Network Address
- Network Direct (RDMA)
- Receive Side Scaling
- Recv Segment Coalescing (IPv4)
- Recv Segment Coalescing (IPv6)
- RSS Base Processor Number

Value: Disabled

OK | Cancel

Development Environment Setup

Python incompatibility



Failed to install package 'aioquic'

Executed command:

```
pip install aioquic
```

Error occurred:

error: command 'C:\\Program Files (x86)\\Microsoft Visual Studio\\2019\\Community\\VC\\Tools\\MSVC\\14.20.27508\\bin\\HostX86\\x64\\cl.exe' failed with exit status 2

Proposed solution:

Try to run this command from the system terminal. Make sure that you use the correct version of 'pip' installed for your Python interpreter located at 'C:_SDE\WS19-QUIC\aioquic\venv\Scripts\python.exe'.

Command output:

```
  creating build\temp.win-amd64-3.8\Release\build
  creating build\temp.win-amd64-3.8\Release\build\temp.win-amd64-3.8
  creating build\temp.win-amd64-3.8\Release\build\temp.win-amd64-3.8\Release
  C:\Program Files (x86)\Microsoft Visual Studio\2019\Community\VC\Tools\MSVC\14.20.27508\bin\Hos
  _openssl.c
  build\temp.win-amd64-3.8\Release\_openssl.c(498): fatal error C1083: Datei (Include) kann nicht
  error: command 'C:\\Program Files (x86)\\Microsoft Visual Studio\\2019\\Community\\VC\\Tools\\M

  ----------------------------------------
  Running setup.py clean for cryptography
Failed to build cryptography

  Failed building wheel for cryptography
Could not build wheels for cryptography which use PEP 517 and cannot be installed directly
```

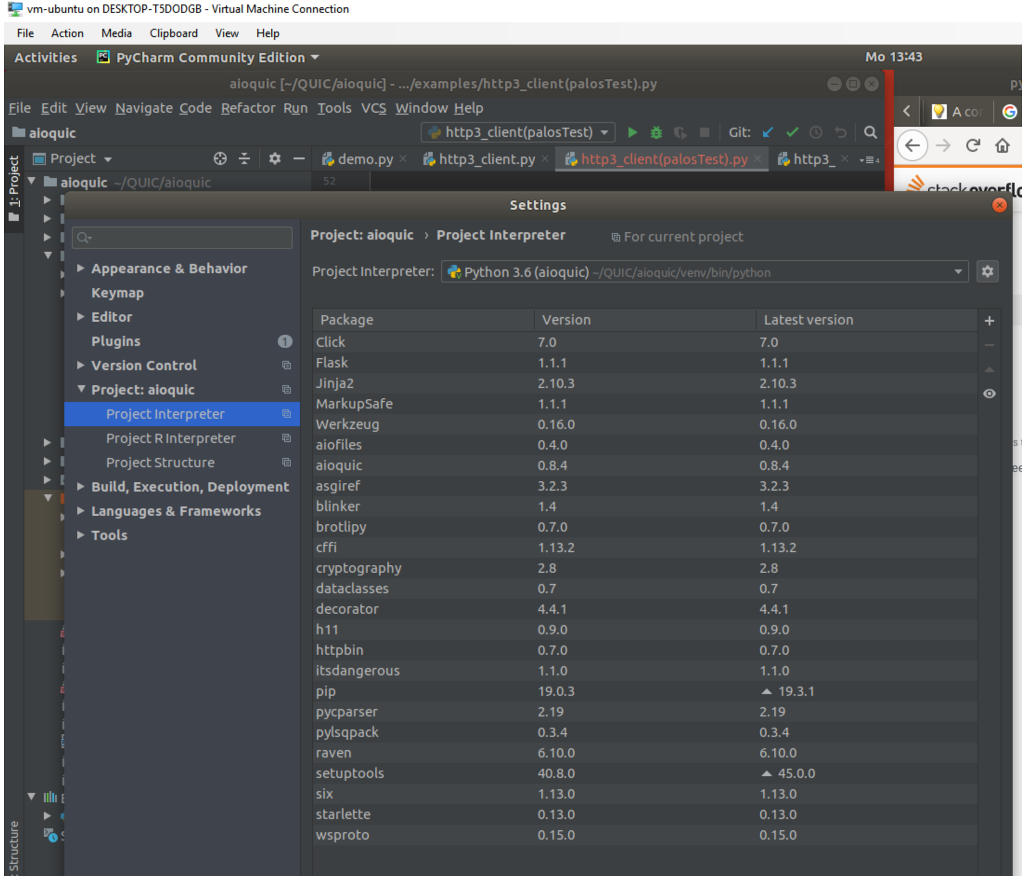
Error occurred when installing package 'aioquic'. Details...

Files can be added to Git

Install packages failed: Installing pack

Development Environment Setup

Python incompatibility

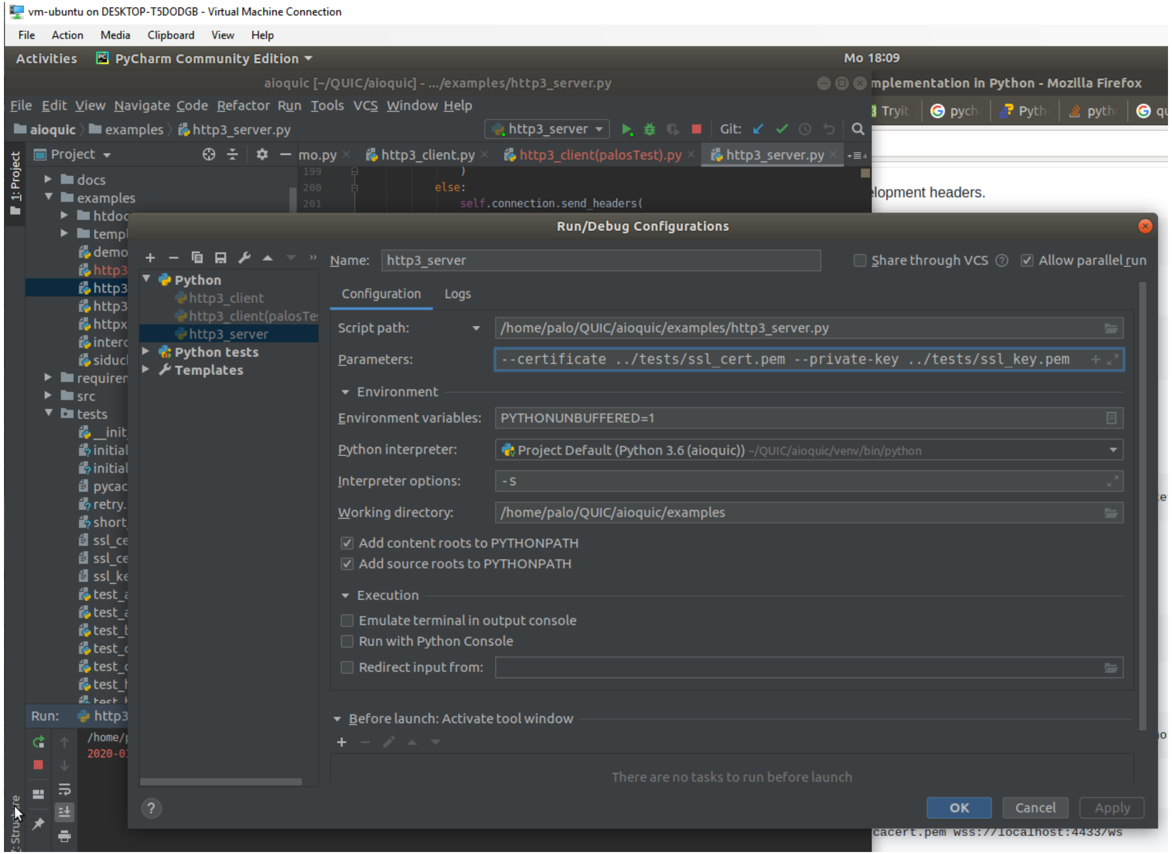

vm-ubuntu on DESKTOP-T5DODGB - Virtual Machine Connection
File Action Media Clipboard View Help
Activities
PyCharm Community Edition
Mo 13:43
aioquic [~/QUIC/aioquic] - .../examples/http3_client(palosTest).py
File Edit View Navigate Code Refactor Run Tools VCS Window Help
aioquic
http3_client(palosTest)
Git:
Project
demo.py
http3_client.py
http3_client(palosTest).py
http3_
aioquic ~/QUIC/aioquic
1: Project
Structure
Settings
Appearance & Behavior
Keymap
Editor
Plugins
Version Control
Project: aioquic
Project Interpreter
Project R Interpreter
Project Structure
Build, Execution, Deployment
Languages & Frameworks
Tools
Project: aioquic › Project Interpreter
For current project

Project Interpreter: Python 3.6 (aioquic) ~/QUIC/aioquic/venv/bin/python

Package	Version	Latest version
Click	7.0	7.0
Flask	1.1.1	1.1.1
Jinja2	2.10.3	2.10.3
MarkupSafe	1.1.1	1.1.1
Werkzeug	0.16.0	0.16.0
aiofiles	0.4.0	0.4.0
aioquic	0.8.4	0.8.4
asgiref	3.2.3	3.2.3
blinker	1.4	1.4
brotlipy	0.7.0	0.7.0
cffi	1.13.2	1.13.2
cryptography	2.8	2.8
dataclasses	0.7	0.7
decorator	4.4.1	4.4.1
h11	0.9.0	0.9.0
httpbin	0.7.0	0.7.0
itsdangerous	1.1.0	1.1.0
pip	19.0.3	▲ 19.3.1
pycparser	2.19	2.19
pylsqpack	0.3.4	0.3.4
raven	6.10.0	6.10.0
setuptools	40.8.0	▲ 45.0.0
six	1.13.0	1.13.0
starlette	0.13.0	0.13.0
wsproto	0.15.0	0.15.0

Development Environment Setup

PyCharm runtime setup



vm-ubuntu on DESKTOP-T5DODGB - Virtual Machine Connection
File Action Media Clipboard View Help
Activities
PyCharm Community Edition
Mo 18:09
aioquic [~/QUIC/aioquic] - .../examples/http3_server.py
File Edit View Navigate Code Refactor Run Tools VCS Window Help
aioquic examples http3_server.py
http3_server
Git:
Project
mo.py
http3_client.py
http3_client(palosTest).py
http3_server.py
docs
examples
src
tests
Run:
Run/Debug Configurations
Python
http3_client
http3_client(palosTest)
http3_server
Python tests
Templates
Configuration
Logs
OK
Cancel
Apply

Name: http3_server

☐ Share through VCS ☑ Allow parallel run

Script path: /home/palo/QUIC/aioquic/examples/http3_server.py

Parameters: --certificate ../tests/ssl_cert.pem --private-key ../tests/ssl_key.pem

Environment

Environment variables: PYTHONUNBUFFERED=1

Python interpreter: Project Default (Python 3.6 (aioquic)) ~/QUIC/aioquic/venv/bin/python

Interpreter options: -S

Working directory: /home/palo/QUIC/aioquic/examples

☑ Add content roots to PYTHONPATH

☑ Add source roots to PYTHONPATH

Execution

☐ Emulate terminal in output console

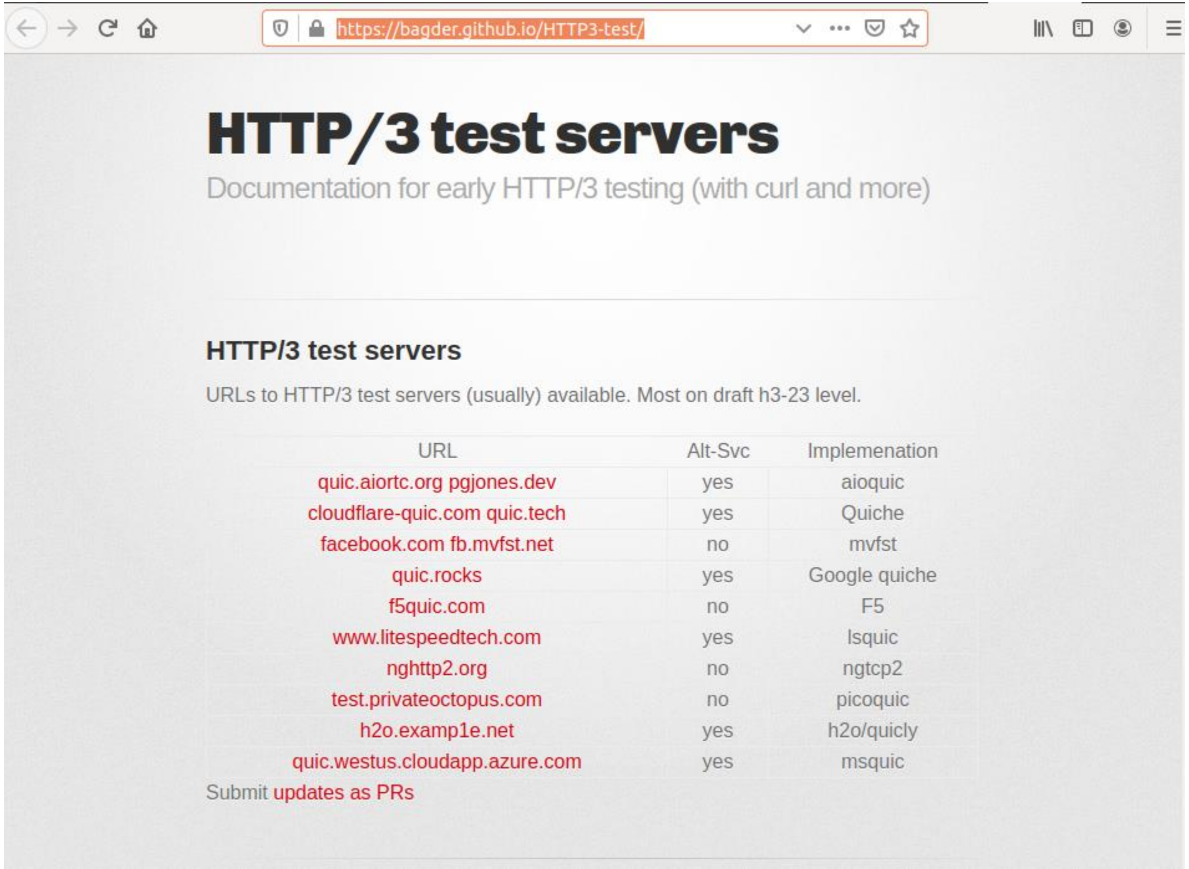
☐ Run with Python Console

☐ Redirect input from:

Before launch: Activate tool window

There are no tasks to run before launch

QUIC Connection (HTTP3)



HTTP/3 test servers

Documentation for early HTTP/3 testing (with curl and more)

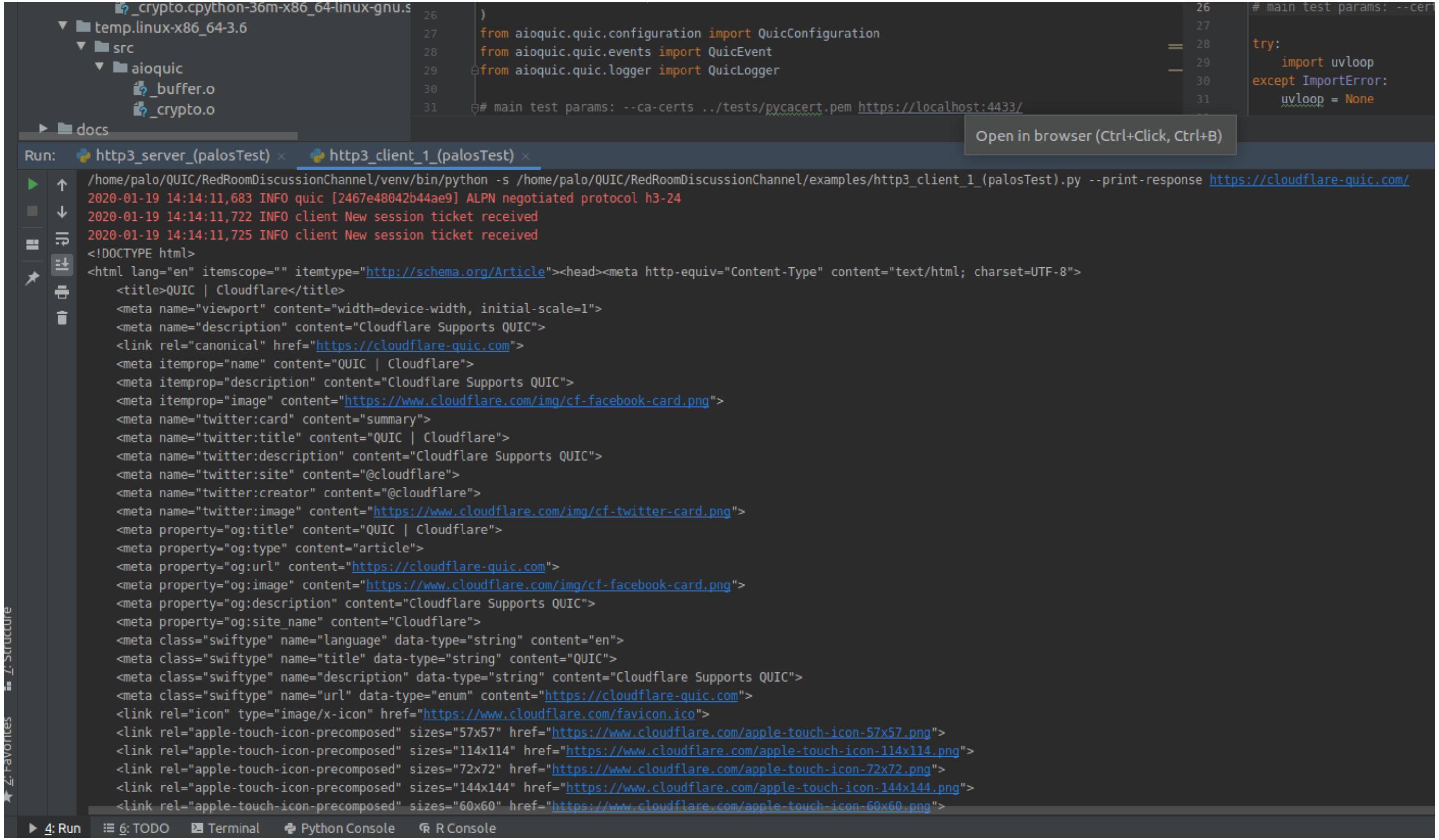
HTTP/3 test servers

URLs to HTTP/3 test servers (usually) available. Most on draft h3-23 level.

URL	Alt-Svc	Implemenation
quic.aiortc.org pgjones.dev	yes	aioquic
cloudflare-quic.com quic.tech	yes	Quiche
facebook.com fb.mvfst.net	no	mvfst
quic.rocks	yes	Google quiche
f5quic.com	no	F5
www.litespeedtech.com	yes	lsquic
nghttp2.org	no	ngtcp2
test.privateoctopus.com	no	picoquic
h2o.examp1e.net	yes	h2o/quicly
quic.westus.cloudapp.azure.com	yes	msquic

Submit updates as PRs

QUIC Connection (HTTP3)



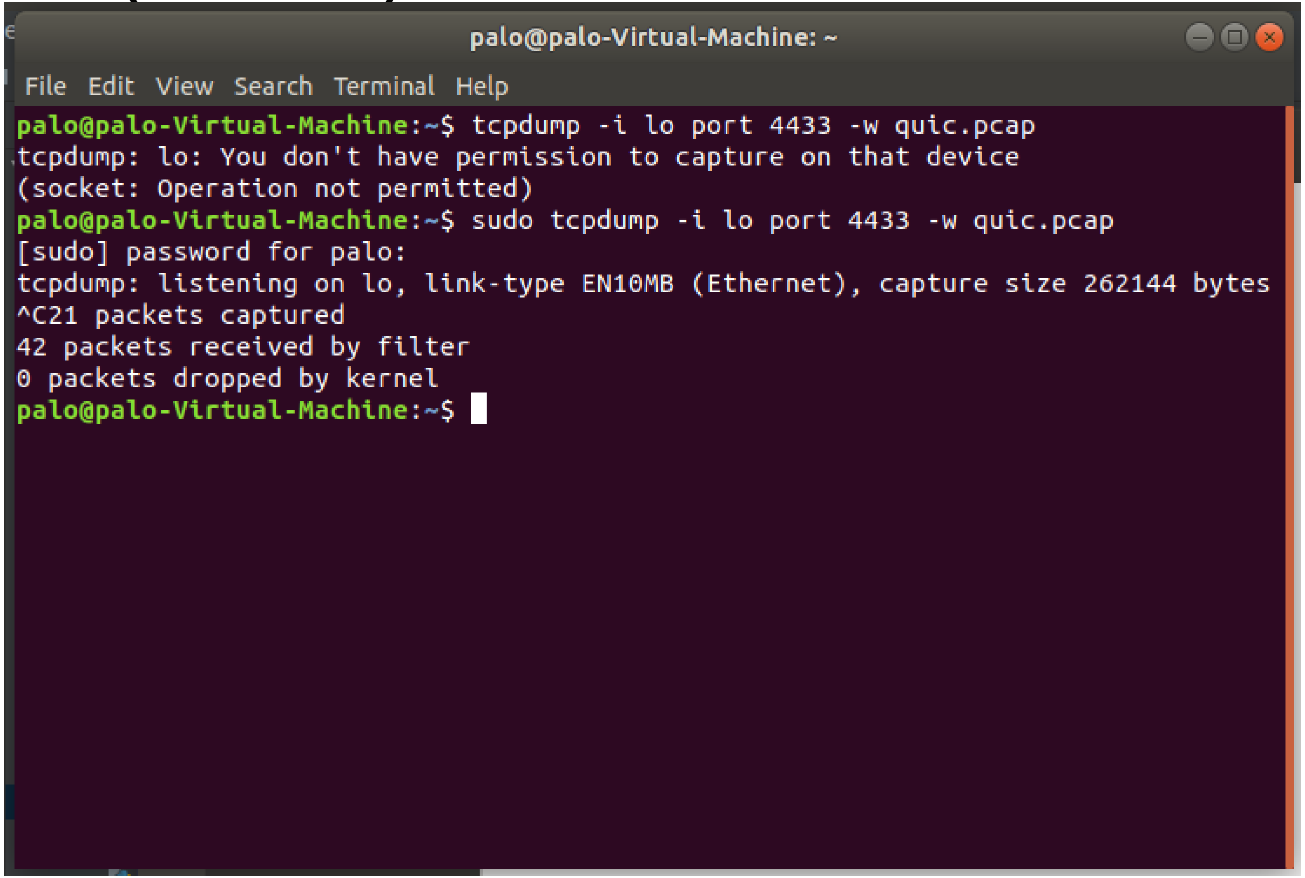
```
)
from aioquic.quic.configuration import QuicConfiguration
from aioquic.quic.events import QuicEvent
from aioquic.quic.logger import QuicLogger

# main test params: --ca-certs ../tests/pycacert.pem https://localhost:4433/
```

```
# main test params: --cer

try:
    import uvloop
except ImportError:
    uvloop = None
```

```
/home/palo/QUIC/RedRoomDiscussionChannel/venv/bin/python -s /home/palo/QUIC/RedRoomDiscussionChannel/examples/http3_client_1_(palosTest).py --print-response https://cloudflare-quic.com/
2020-01-19 14:14:11,683 INFO quic [2467e48042b44ae9] ALPN negotiated protocol h3-24
2020-01-19 14:14:11,722 INFO client New session ticket received
2020-01-19 14:14:11,725 INFO client New session ticket received
<!DOCTYPE html>
<html lang="en" itemscope="" itemtype="http://schema.org/Article"><head><meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
    <title>QUIC | Cloudflare</title>
    <meta name="viewport" content="width=device-width, initial-scale=1">
    <meta name="description" content="Cloudflare Supports QUIC">
    <link rel="canonical" href="https://cloudflare-quic.com">
    <meta itemprop="name" content="QUIC | Cloudflare">
    <meta itemprop="description" content="Cloudflare Supports QUIC">
    <meta itemprop="image" content="https://www.cloudflare.com/img/cf-facebook-card.png">
    <meta name="twitter:card" content="summary">
    <meta name="twitter:title" content="QUIC | Cloudflare">
    <meta name="twitter:description" content="Cloudflare Supports QUIC">
    <meta name="twitter:site" content="@cloudflare">
    <meta name="twitter:creator" content="@cloudflare">
    <meta name="twitter:image" content="https://www.cloudflare.com/img/cf-twitter-card.png">
    <meta property="og:title" content="QUIC | Cloudflare">
    <meta property="og:type" content="article">
    <meta property="og:url" content="https://cloudflare-quic.com">
    <meta property="og:image" content="https://www.cloudflare.com/img/cf-facebook-card.png">
    <meta property="og:description" content="Cloudflare Supports QUIC">
    <meta property="og:site_name" content="Cloudflare">
    <meta class="swiftype" name="language" data-type="string" content="en">
    <meta class="swiftype" name="title" data-type="string" content="QUIC">
    <meta class="swiftype" name="description" data-type="string" content="Cloudflare Supports QUIC">
    <meta class="swiftype" name="url" data-type="enum" content="https://cloudflare-quic.com">
    <link rel="icon" type="image/x-icon" href="https://www.cloudflare.com/favicon.ico">
    <link rel="apple-touch-icon-precomposed" sizes="57x57" href="https://www.cloudflare.com/apple-touch-icon-57x57.png">
    <link rel="apple-touch-icon-precomposed" sizes="114x114" href="https://www.cloudflare.com/apple-touch-icon-114x114.png">
    <link rel="apple-touch-icon-precomposed" sizes="72x72" href="https://www.cloudflare.com/apple-touch-icon-72x72.png">
    <link rel="apple-touch-icon-precomposed" sizes="144x144" href="https://www.cloudflare.com/apple-touch-icon-144x144.png">
    <link rel="apple-touch-icon-precomposed" sizes="60x60" href="https://www.cloudflare.com/apple-touch-icon-60x60.png">
```

QUIC Connection (HTTP3)

Verification (tcpdump)

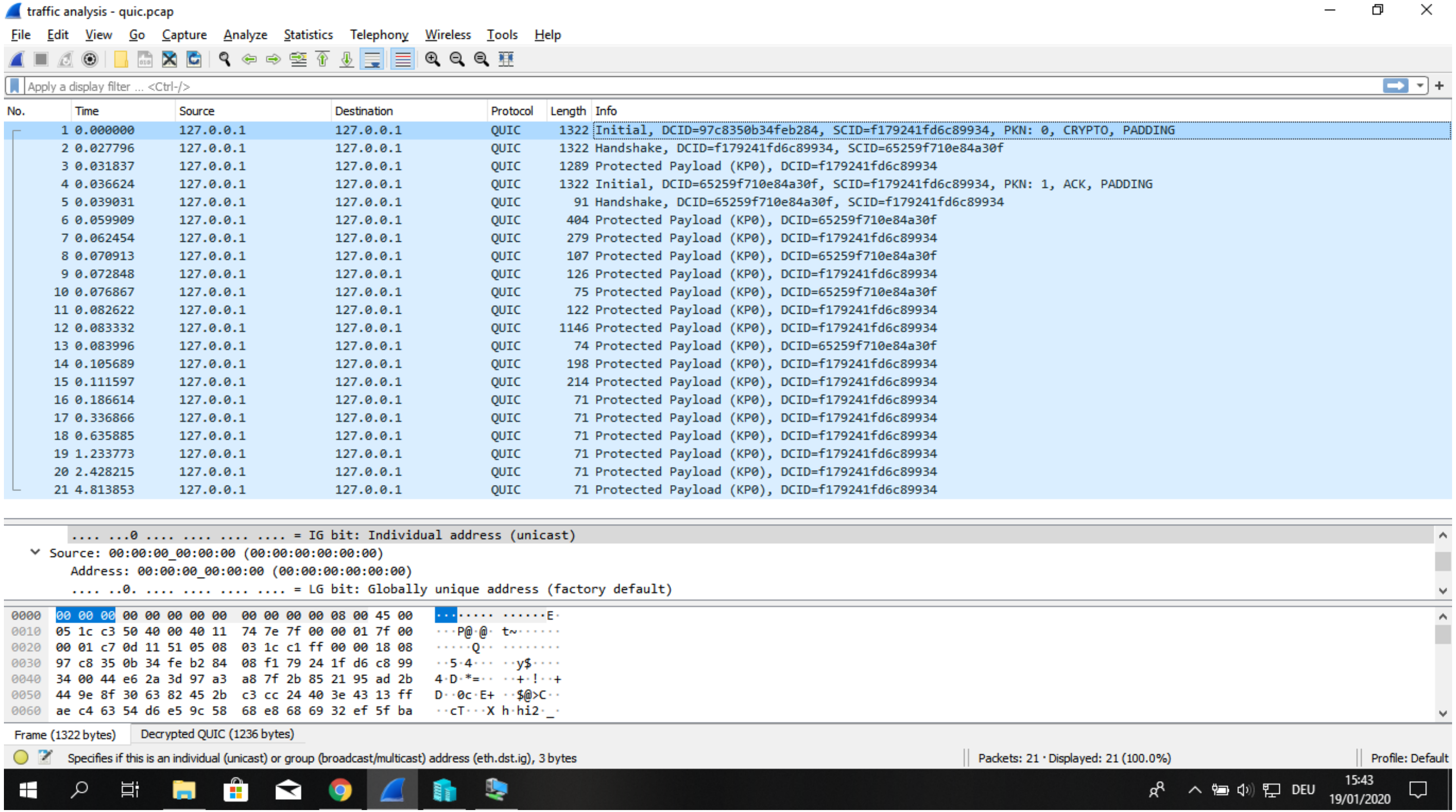


palo@palo-Virtual-Machine: ~
File Edit View Search Terminal Help

```
palo@palo-Virtual-Machine:~$ tcpdump -i lo port 4433 -w quic.pcap
tcpdump: lo: You don't have permission to capture on that device
(socket: Operation not permitted)
palo@palo-Virtual-Machine:~$ sudo tcpdump -i lo port 4433 -w quic.pcap
[sudo] password for palo:
tcpdump: listening on lo, link-type EN10MB (Ethernet), capture size 262144 bytes
^C21 packets captured
42 packets received by filter
0 packets dropped by kernel
palo@palo-Virtual-Machine:~$
```

QUIC Connection (HTTP3)

Verification (WireShark)



No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	127.0.0.1	127.0.0.1	QUIC	1322	Initial, DCID=97c8350b34feb284, SCID=f179241fd6c89934, PKN: 0, CRYPTO, PADDING
2	0.027796	127.0.0.1	127.0.0.1	QUIC	1322	Handshake, DCID=f179241fd6c89934, SCID=65259f710e84a30f
3	0.031837	127.0.0.1	127.0.0.1	QUIC	1289	Protected Payload (KP0), DCID=f179241fd6c89934
4	0.036624	127.0.0.1	127.0.0.1	QUIC	1322	Initial, DCID=65259f710e84a30f, SCID=f179241fd6c89934, PKN: 1, ACK, PADDING
5	0.039031	127.0.0.1	127.0.0.1	QUIC	91	Handshake, DCID=65259f710e84a30f, SCID=f179241fd6c89934
6	0.059909	127.0.0.1	127.0.0.1	QUIC	404	Protected Payload (KP0), DCID=65259f710e84a30f
7	0.062454	127.0.0.1	127.0.0.1	QUIC	279	Protected Payload (KP0), DCID=f179241fd6c89934
8	0.070913	127.0.0.1	127.0.0.1	QUIC	107	Protected Payload (KP0), DCID=65259f710e84a30f
9	0.072848	127.0.0.1	127.0.0.1	QUIC	126	Protected Payload (KP0), DCID=f179241fd6c89934
10	0.076867	127.0.0.1	127.0.0.1	QUIC	75	Protected Payload (KP0), DCID=65259f710e84a30f
11	0.082622	127.0.0.1	127.0.0.1	QUIC	122	Protected Payload (KP0), DCID=f179241fd6c89934
12	0.083332	127.0.0.1	127.0.0.1	QUIC	1146	Protected Payload (KP0), DCID=f179241fd6c89934
13	0.083996	127.0.0.1	127.0.0.1	QUIC	74	Protected Payload (KP0), DCID=65259f710e84a30f
14	0.105689	127.0.0.1	127.0.0.1	QUIC	198	Protected Payload (KP0), DCID=f179241fd6c89934
15	0.111597	127.0.0.1	127.0.0.1	QUIC	214	Protected Payload (KP0), DCID=f179241fd6c89934
16	0.186614	127.0.0.1	127.0.0.1	QUIC	71	Protected Payload (KP0), DCID=f179241fd6c89934
17	0.336866	127.0.0.1	127.0.0.1	QUIC	71	Protected Payload (KP0), DCID=f179241fd6c89934
18	0.635885	127.0.0.1	127.0.0.1	QUIC	71	Protected Payload (KP0), DCID=f179241fd6c89934
19	1.233773	127.0.0.1	127.0.0.1	QUIC	71	Protected Payload (KP0), DCID=f179241fd6c89934
20	2.428215	127.0.0.1	127.0.0.1	QUIC	71	Protected Payload (KP0), DCID=f179241fd6c89934
21	4.813853	127.0.0.1	127.0.0.1	QUIC	71	Protected Payload (KP0), DCID=f179241fd6c89934

```
    .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Source: 00:00:00_00:00:00 (00:00:00:00:00:00)
    Address: 00:00:00_00:00:00 (00:00:00:00:00:00)
    .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
```

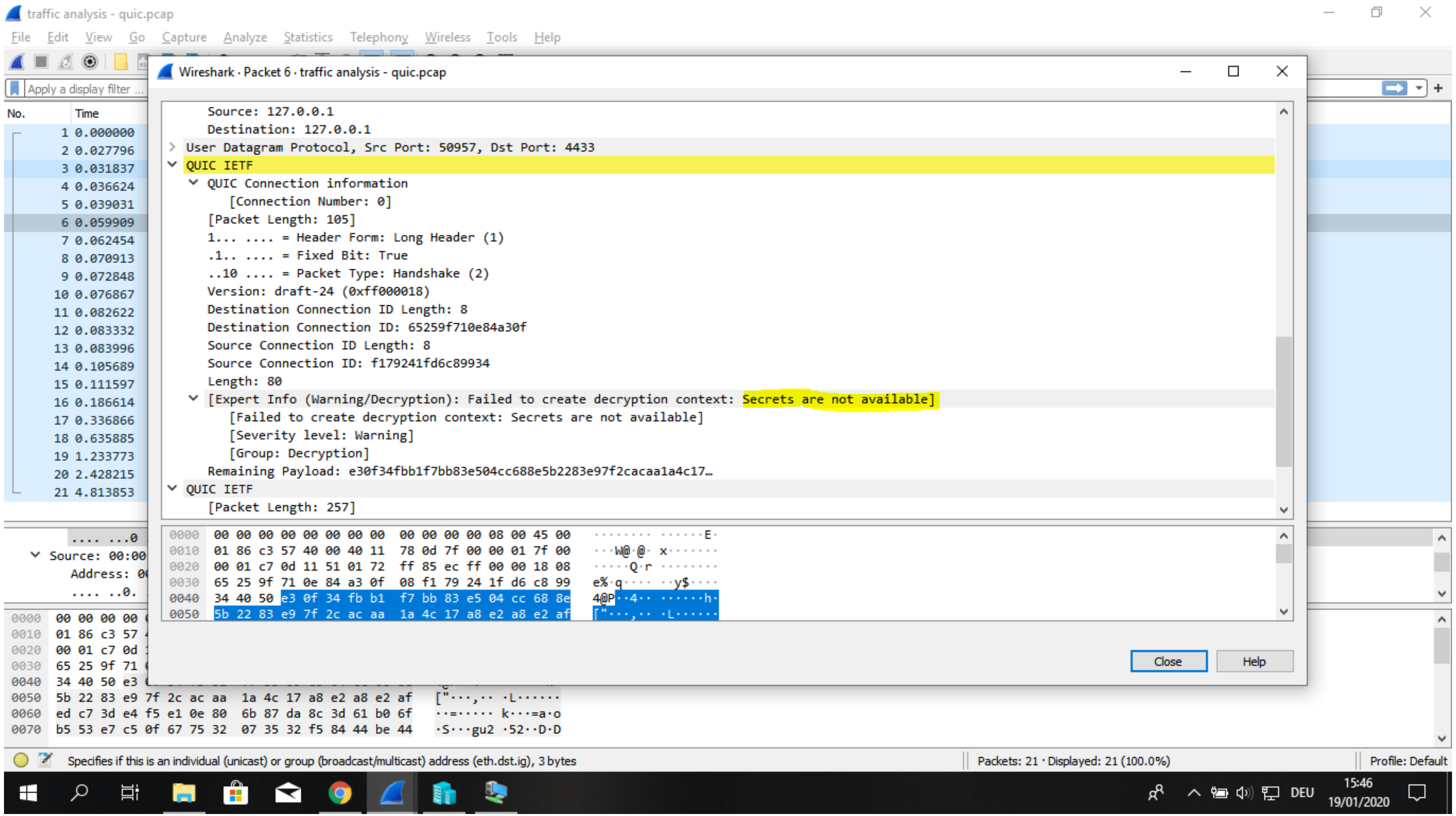
```
0000  00 00 00 00 00 00 00 00  00 00 00 00 08 00 45 00   ········ ······E·
0010  05 1c c3 50 40 00 40 11  74 7e 7f 00 00 01 7f 00   ···P@·@· t~······
0020  00 01 c7 0d 11 51 05 08  03 1c c1 ff 00 00 18 08   ·····Q·· ········
0030  97 c8 35 0b 34 fe b2 84  08 f1 79 24 1f d6 c8 99   ··5·4··· ··y$····
0040  34 00 44 e6 2a 3d 97 a3  a8 7f 2b 85 21 95 ad 2b   4·D·*=·· ··+·!··+
0050  44 9e 8f 30 63 82 45 2b  c3 cc 24 40 3e 43 13 ff   D··0c·E+ ··$@>C··
0060  ae c4 63 54 d6 e5 9c 58  68 e8 68 69 32 ef 5f ba   ··cT···X h·hi2·_·
```

Frame (1322 bytes) | Decrypted QUIC (1236 bytes)

Specifies if this is an individual (unicast) or group (broadcast/multicast) address (eth.dst.ig), 3 bytes | Packets: 21 · Displayed: 21 (100.0%) | Profile: Default

QUIC Connection (HTTP3)

Verification (WireShark)


traffic analysis - quic.pcap
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ...
Wireshark · Packet 6 · traffic analysis - quic.pcap
Close
Help
DEU
15:46
19/01/2020

```
No.   Time
 1 0.000000
 2 0.027796
 3 0.031837
 4 0.036624
 5 0.039031
 6 0.059909
 7 0.062454
 8 0.070913
 9 0.072848
10 0.076867
11 0.082622
12 0.083332
13 0.083996
14 0.105689
15 0.111597
16 0.186614
17 0.336866
18 0.635885
19 1.233773
20 2.428215
21 4.813853
```

```
    Source: 127.0.0.1
    Destination: 127.0.0.1
> User Datagram Protocol, Src Port: 50957, Dst Port: 4433
v QUIC IETF
  v QUIC Connection information
      [Connection Number: 0]
    [Packet Length: 105]
    1... .... = Header Form: Long Header (1)
    .1.. .... = Fixed Bit: True
    ..10 .... = Packet Type: Handshake (2)
    Version: draft-24 (0xff000018)
    Destination Connection ID Length: 8
    Destination Connection ID: 65259f710e84a30f
    Source Connection ID Length: 8
    Source Connection ID: f179241fd6c89934
    Length: 80
  v [Expert Info (Warning/Decryption): Failed to create decryption context: Secrets are not available]
      [Failed to create decryption context: Secrets are not available]
      [Severity level: Warning]
      [Group: Decryption]
    Remaining Payload: e30f34fbb1f7bb83e504cc688e5b2283e97f2cacaa1a4c17…
v QUIC IETF
    [Packet Length: 257]
```

```
0000  00 00 00 00 00 00 00 00  00 00 00 00 08 00 45 00   ········ ······E·
0010  01 86 c3 57 40 00 40 11  78 0d 7f 00 00 01 7f 00   ···W@·@· x·······
0020  00 01 c7 0d 11 51 01 72  ff 85 ec ff 00 00 18 08   ·····Q·r ········
0030  65 25 9f 71 0e 84 a3 0f  08 f1 79 24 1f d6 c8 99   e%·q···· ··y$····
0040  34 40 50 e3 0f 34 fb b1  f7 bb 83 e5 04 cc 68 8e   4@P··4·· ······h·
0050  5b 22 83 e9 7f 2c ac aa  1a 4c 17 a8 e2 a8 e2 af   ["···,·· ·L······
```

```
    .... ...0
  v Source: 00:00
      Address: 0(
      .... ..0.
```

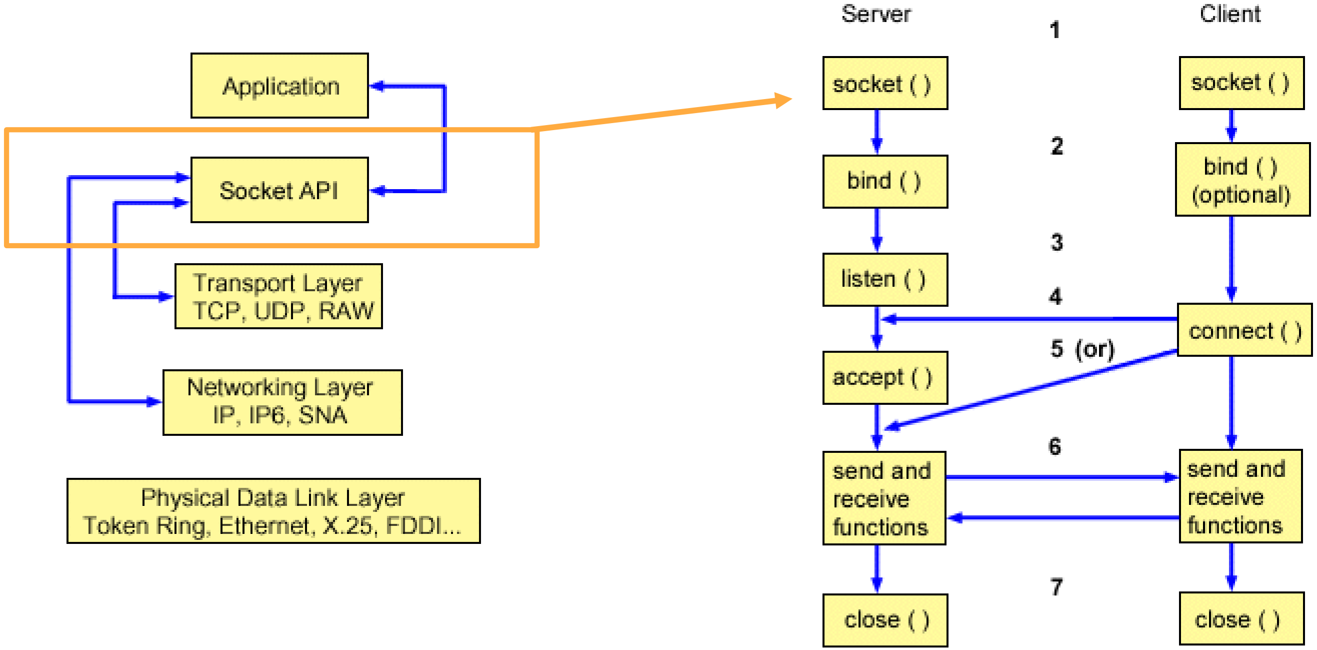
```
0000  00 00 00 00
0010  01 86 c3 57
0020  00 01 c7 0d
0030  65 25 9f 71
0040  34 40 50 e3
0050  5b 22 83 e9 7f 2c ac aa  1a 4c 17 a8 e2 a8 e2 af   ["···,·· ·L······
0060  ed c7 3d e4 f5 e1 0e 80  6b 87 da 8c 3d 61 b0 6f   ··=····· k···=a·o
0070  b5 53 e7 c5 0f 67 75 32  07 35 32 f5 84 44 be 44   ·S···gu2 ·52··D·D
```

Specifies if this is an individual (unicast) or group (broadcast/multicast) address (eth.dst.ig), 3 bytes

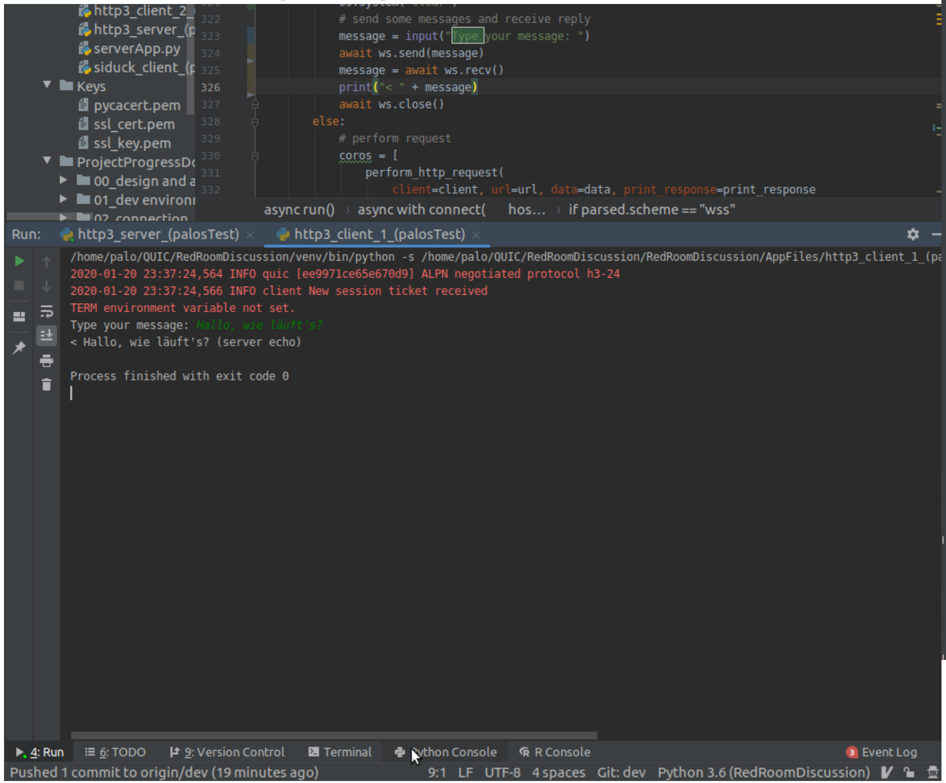
Packets: 21 · Displayed: 21 (100.0%)

Profile: Default

Messaging: Sockets API

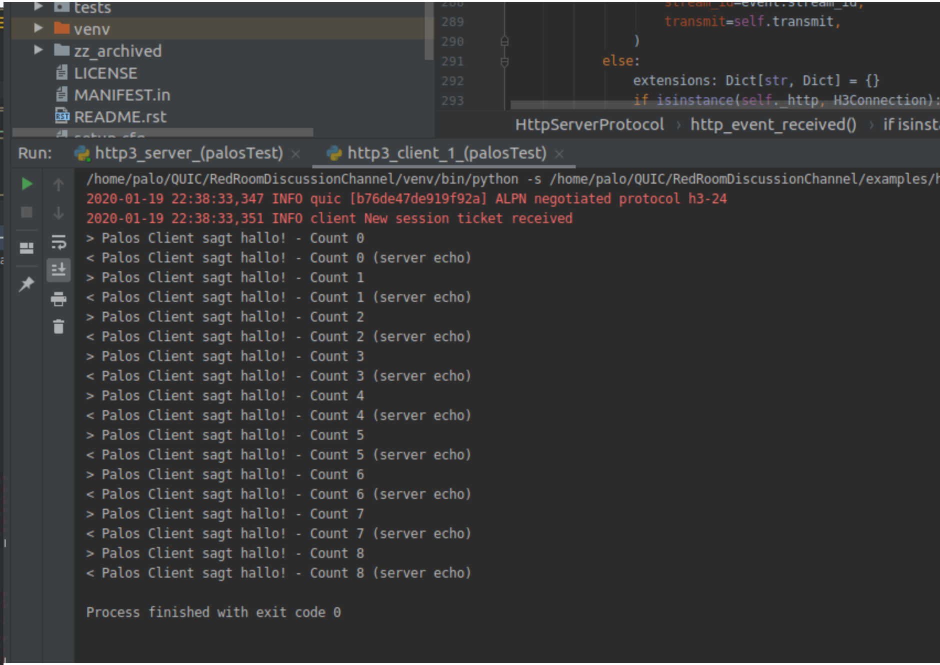


Messaging: Sockets API



```
            # send some messages and receive reply
            message = input("Type your message: ")
            await ws.send(message)
            message = await ws.recv()
            print("< " + message)
            await ws.close()
        else:
            # perform request
            coros = [
                perform_http_request(
                    client=client, url=url, data=data, print_response=print_response
```

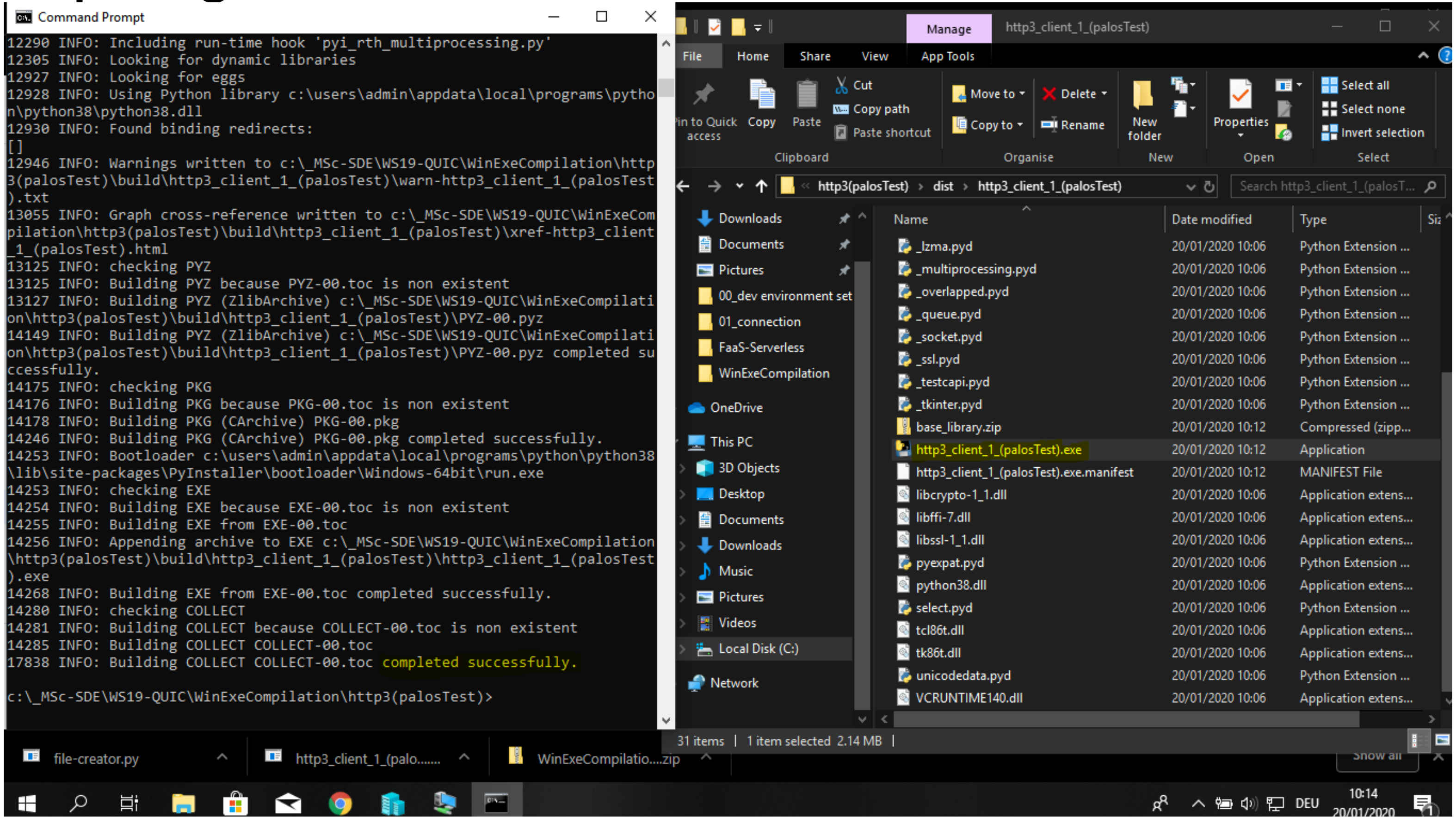
```
/home/palo/QUIC/RedRoomDiscussion/venv/bin/python -s /home/palo/QUIC/RedRoomDiscussion/RedRoomDiscussion/AppFiles/http3_client_1_(pa
2020-01-20 23:37:24,564 INFO quic [ee9971ce65e670d9] ALPN negotiated protocol h3-24
2020-01-20 23:37:24,566 INFO client New session ticket received
TERM environment variable not set.
Type your message: Hallo, wie läuft's?
< Hallo, wie läuft's? (server echo)

Process finished with exit code 0
```



```
                    transmit=self.transmit,
                )
            else:
                extensions: Dict[str, Dict] = {}
                if isinstance(self._http, H3Connection):
```

```
/home/palo/QUIC/RedRoomDiscussionChannel/venv/bin/python -s /home/palo/QUIC/RedRoomDiscussionChannel/examples/h
2020-01-19 22:38:33,347 INFO quic [b76de47de919f92a] ALPN negotiated protocol h3-24
2020-01-19 22:38:33,351 INFO client New session ticket received
> Palos Client sagt hallo! - Count 0
< Palos Client sagt hallo! - Count 0 (server echo)
> Palos Client sagt hallo! - Count 1
< Palos Client sagt hallo! - Count 1 (server echo)
> Palos Client sagt hallo! - Count 2
< Palos Client sagt hallo! - Count 2 (server echo)
> Palos Client sagt hallo! - Count 3
< Palos Client sagt hallo! - Count 3 (server echo)
> Palos Client sagt hallo! - Count 4
< Palos Client sagt hallo! - Count 4 (server echo)
> Palos Client sagt hallo! - Count 5
< Palos Client sagt hallo! - Count 5 (server echo)
> Palos Client sagt hallo! - Count 6
< Palos Client sagt hallo! - Count 6 (server echo)
> Palos Client sagt hallo! - Count 7
< Palos Client sagt hallo! - Count 7 (server echo)
> Palos Client sagt hallo! - Count 8
< Palos Client sagt hallo! - Count 8 (server echo)

Process finished with exit code 0
```

Compiling Windows EXE

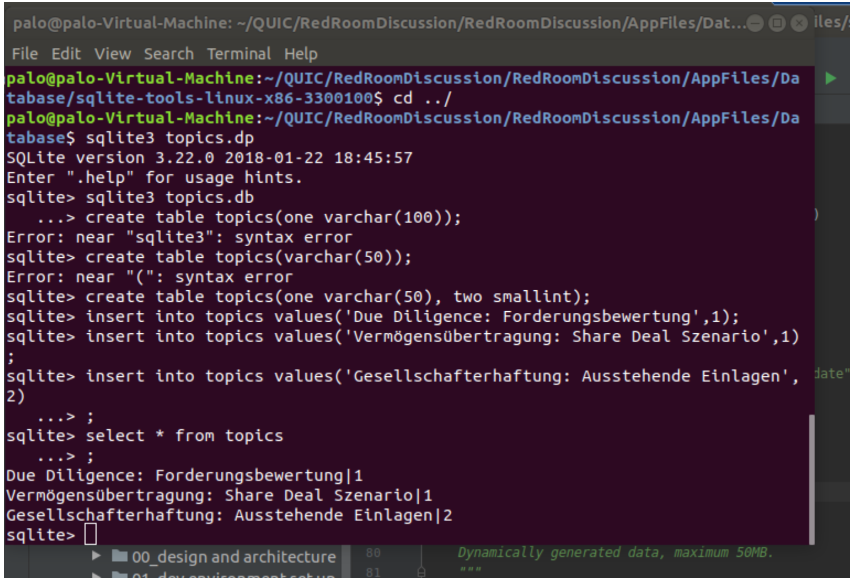


```
12290 INFO: Including run-time hook 'pyi_rth_multiprocessing.py'
12305 INFO: Looking for dynamic libraries
12927 INFO: Looking for eggs
12928 INFO: Using Python library c:\users\admin\appdata\local\programs\pytho
n\python38\python38.dll
12930 INFO: Found binding redirects:
[]
12946 INFO: Warnings written to c:\_MSc-SDE\WS19-QUIC\WinExeCompilation\http
3(palosTest)\build\http3_client_1_(palosTest)\warn-http3_client_1_(palosTest
).txt
13055 INFO: Graph cross-reference written to c:\_MSc-SDE\WS19-QUIC\WinExeCom
pilation\http3(palosTest)\build\http3_client_1_(palosTest)\xref-http3_client
_1_(palosTest).html
13125 INFO: checking PYZ
13125 INFO: Building PYZ because PYZ-00.toc is non existent
13127 INFO: Building PYZ (ZlibArchive) c:\_MSc-SDE\WS19-QUIC\WinExeCompilati
on\http3(palosTest)\build\http3_client_1_(palosTest)\PYZ-00.pyz
14149 INFO: Building PYZ (ZlibArchive) c:\_MSc-SDE\WS19-QUIC\WinExeCompilati
on\http3(palosTest)\build\http3_client_1_(palosTest)\PYZ-00.pyz completed su
ccessfully.
14175 INFO: checking PKG
14176 INFO: Building PKG because PKG-00.toc is non existent
14178 INFO: Building PKG (CArchive) PKG-00.pkg
14246 INFO: Building PKG (CArchive) PKG-00.pkg completed successfully.
14253 INFO: Bootloader c:\users\admin\appdata\local\programs\python\python38
\lib\site-packages\PyInstaller\bootloader\Windows-64bit\run.exe
14253 INFO: checking EXE
14254 INFO: Building EXE because EXE-00.toc is non existent
14255 INFO: Building EXE from EXE-00.toc
14256 INFO: Appending archive to EXE c:\_MSc-SDE\WS19-QUIC\WinExeCompilation
\http3(palosTest)\build\http3_client_1_(palosTest)\http3_client_1_(palosTest
).exe
14268 INFO: Building EXE from EXE-00.toc completed successfully.
14280 INFO: checking COLLECT
14281 INFO: Building COLLECT because COLLECT-00.toc is non existent
14285 INFO: Building COLLECT COLLECT-00.toc
17838 INFO: Building COLLECT COLLECT-00.toc completed successfully.

c:\_MSc-SDE\WS19-QUIC\WinExeCompilation\http3(palosTest)>
```

Name	Date modified	Type	Siz
_lzma.pyd	20/01/2020 10:06	Python Extension ...	
_multiprocessing.pyd	20/01/2020 10:06	Python Extension ...	
_overlapped.pyd	20/01/2020 10:06	Python Extension ...	
_queue.pyd	20/01/2020 10:06	Python Extension ...	
_socket.pyd	20/01/2020 10:06	Python Extension ...	
_ssl.pyd	20/01/2020 10:06	Python Extension ...	
_testcapi.pyd	20/01/2020 10:06	Python Extension ...	
_tkinter.pyd	20/01/2020 10:06	Python Extension ...	
base_library.zip	20/01/2020 10:12	Compressed (zipp...	
http3_client_1_(palosTest).exe	20/01/2020 10:12	Application	
http3_client_1_(palosTest).exe.manifest	20/01/2020 10:12	MANIFEST File	
libcrypto-1_1.dll	20/01/2020 10:06	Application extens...	
libffi-7.dll	20/01/2020 10:06	Application extens...	
libssl-1_1.dll	20/01/2020 10:06	Application extens...	
pyexpat.pyd	20/01/2020 10:06	Python Extension ...	
python38.dll	20/01/2020 10:06	Application extens...	
select.pyd	20/01/2020 10:06	Python Extension ...	
tcl86t.dll	20/01/2020 10:06	Application extens...	
tk86t.dll	20/01/2020 10:06	Application extens...	
unicodedata.pyd	20/01/2020 10:06	Python Extension ...	
VCRUNTIME140.dll	20/01/2020 10:06	Application extens...	

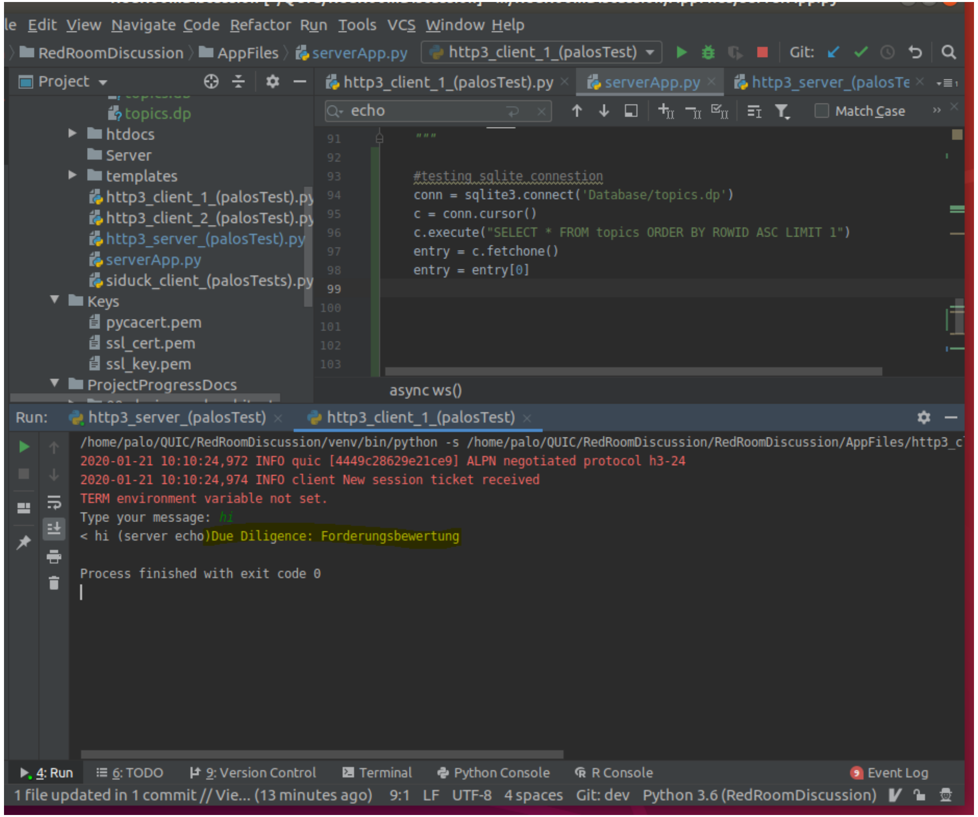
31 items | 1 item selected 2.14 MB |

First Database Implementation


palo@palo-Virtual-Machine: ~/QUIC/RedRoomDiscussion/RedRoomDiscussion/AppFiles/Dat...
File Edit View Search Terminal Help

```
palo@palo-Virtual-Machine:~/QUIC/RedRoomDiscussion/RedRoomDiscussion/AppFiles/Da
tabase/sqlite-tools-linux-x86-3300100$ cd ../
palo@palo-Virtual-Machine:~/QUIC/RedRoomDiscussion/RedRoomDiscussion/AppFiles/Da
tabase$ sqlite3 topics.dp
SQLite version 3.22.0 2018-01-22 18:45:57
Enter ".help" for usage hints.
sqlite> sqlite3 topics.db
   ...> create table topics(one varchar(100));
Error: near "sqlite3": syntax error
sqlite> create table topics(varchar(50));
Error: near "(": syntax error
sqlite> create table topics(one varchar(50), two smallint);
sqlite> insert into topics values('Due Diligence: Forderungsbewertung',1);
sqlite> insert into topics values('Vermögensübertragung: Share Deal Szenario',1)
;
sqlite> insert into topics values('Gesellschafterhaftung: Ausstehende Einlagen',
2)
   ...> ;
sqlite> select * from topics
   ...> ;
Due Diligence: Forderungsbewertung|1
Vermögensübertragung: Share Deal Szenario|1
Gesellschafterhaftung: Ausstehende Einlagen|2
sqlite> 
```

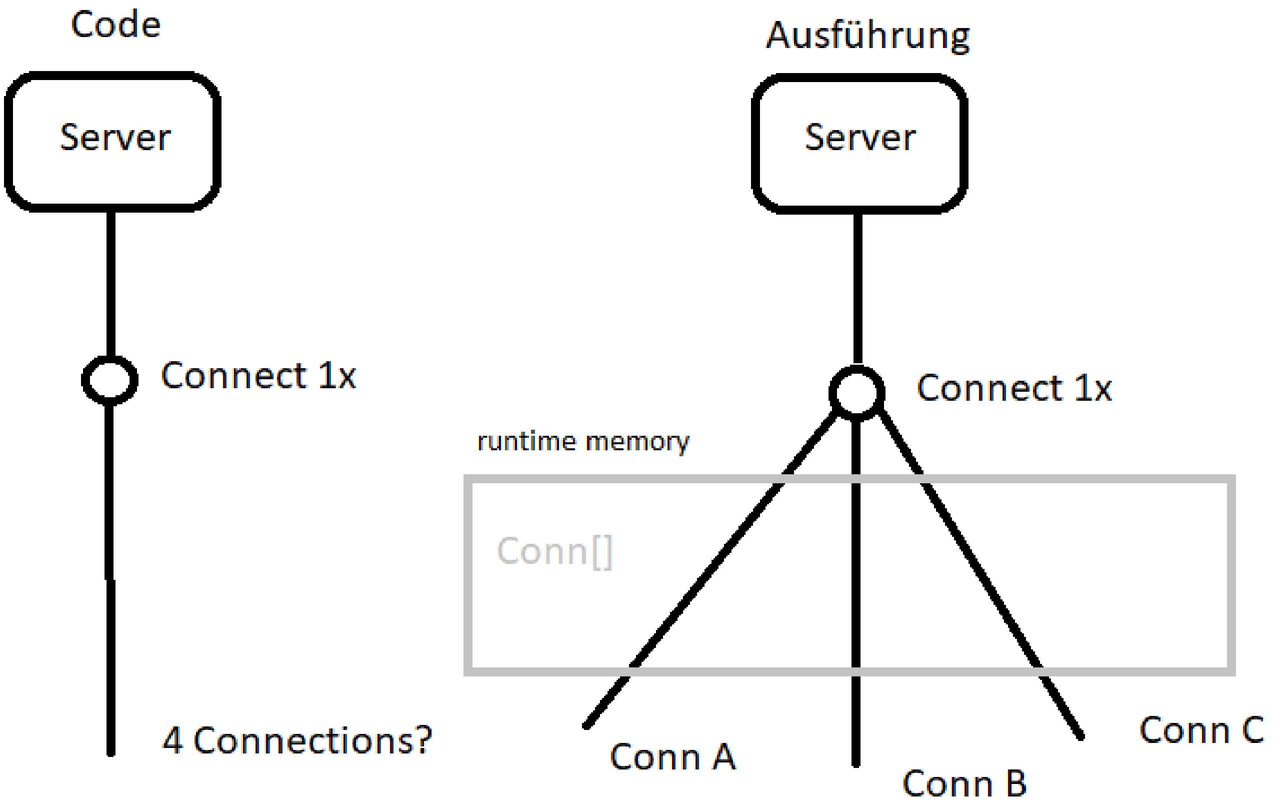
00_design and architecture
Dynamically generated data, maximum 50MB.


le Edit View Navigate Code Refactor Run Tools VCS Window Help
RedRoomDiscussion
AppFiles
serverApp.py
http3_client_1_(palosTest)
Git:
Project
http3_client_1_(palosTest).py
serverApp.py
http3_server_(palosTe
echo
Match Case
topics.dp
htdocs
Server
templates
http3_client_1_(palosTest).py
http3_client_2_(palosTest).py
http3_server_(palosTest).py
serverApp.py
siduck_client_(palosTests).py
Keys
pycacert.pem
ssl_cert.pem
ssl_key.pem
ProjectProgressDocs
async ws()
Run:
http3_server_(palosTest)
http3_client_1_(palosTest)
4: Run
6: TODO
9: Version Control
Terminal
Python Console
R Console
Event Log
1 file updated in 1 commit // Vie... (13 minutes ago)
9:1
LF
UTF-8
4 spaces
Git: dev
Python 3.6 (RedRoomDiscussion)

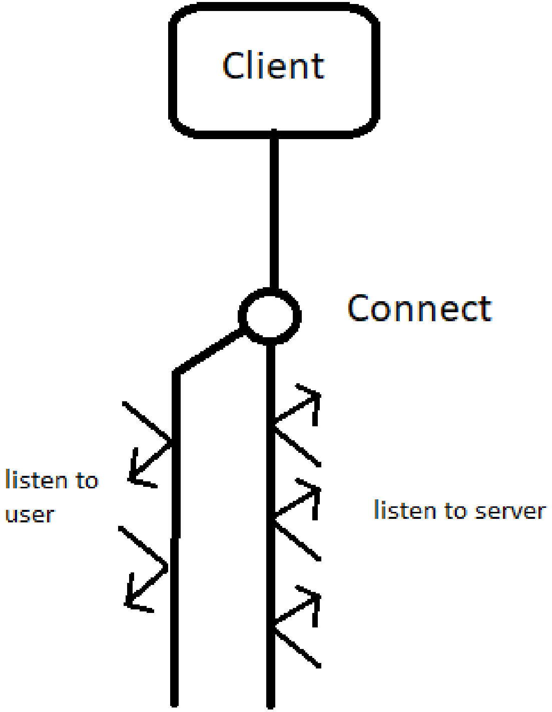
```python
    """

    #testing sqlite connestion
    conn = sqlite3.connect('Database/topics.dp')
    c = conn.cursor()
    c.execute("SELECT * FROM topics ORDER BY ROWID ASC LIMIT 1")
    entry = c.fetchone()
    entry = entry[0]
```

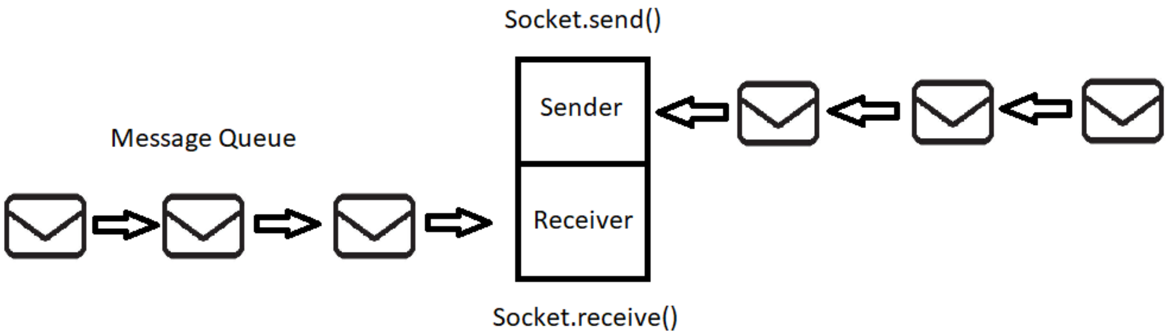
```
/home/palo/QUIC/RedRoomDiscussion/venv/bin/python -s /home/palo/QUIC/RedRoomDiscussion/RedRoomDiscussion/AppFiles/http3_c
2020-01-21 10:10:24,972 INFO quic [4449c28629e21ce9] ALPN negotiated protocol h3-24
2020-01-21 10:10:24,974 INFO client New session ticket received
TERM environment variable not set.
Type your message: hi
< hi (server echo)Due Diligence: Forderungsbewertung

Process finished with exit code 0
```

Multi-Connection Server

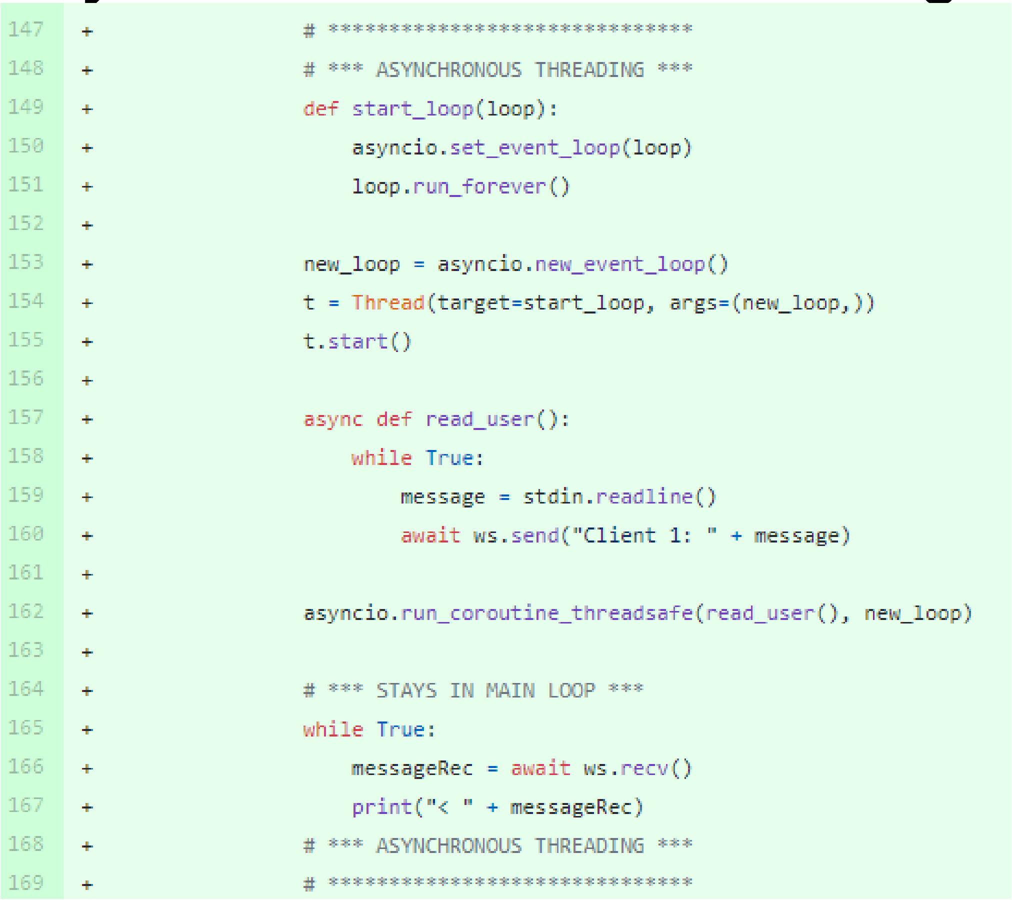


Asynchronous Multithreading Client





Asynchronous Multithreading in Python 3.6



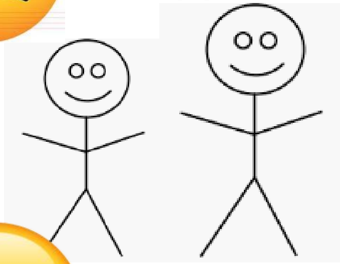
```
+       # *******************************
+       # *** ASYNCHRONOUS THREADING ***
+       def start_loop(loop):
+           asyncio.set_event_loop(loop)
+           loop.run_forever()
+
+       new_loop = asyncio.new_event_loop()
+       t = Thread(target=start_loop, args=(new_loop,))
+       t.start()
+
+       async def read_user():
+           while True:
+               message = stdin.readline()
+               await ws.send("Client 1: " + message)
+
+       asyncio.run_coroutine_threadsafe(read_user(), new_loop)
+
+       # *** STAYS IN MAIN LOOP ***
+       while True:
+           messageRec = await ws.recv()
+           print("< " + messageRec)
+       # *** ASYNCHRONOUS THREADING ***
+       # *******************************
```

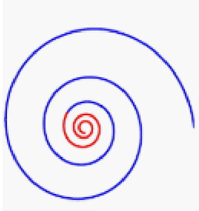
Realisierte Risiken

) Inkompatibilität -> Komponententest

aioquic < - > django

) Knappes Budget -> Spiral Development Model

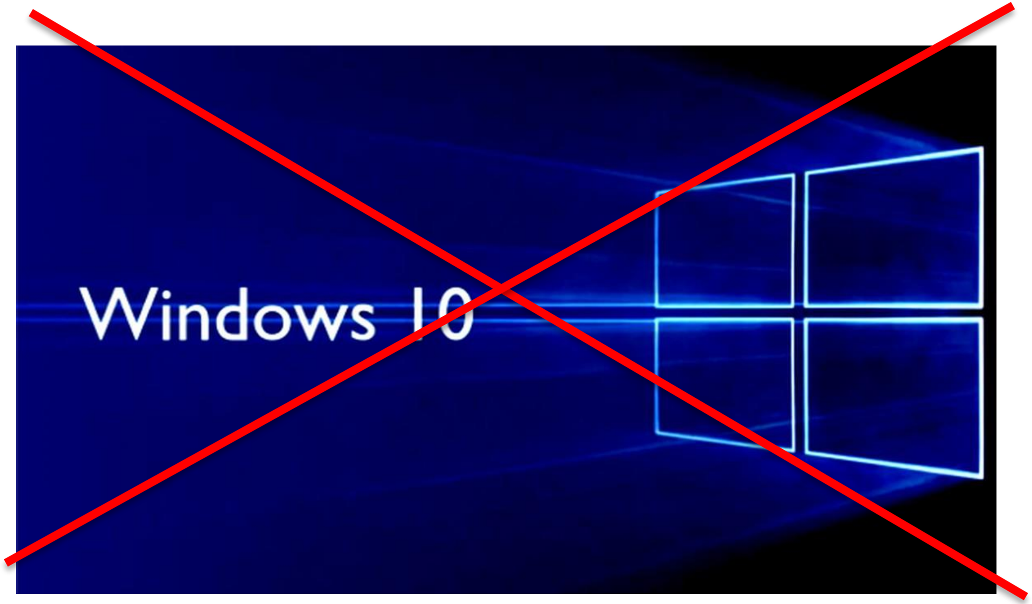


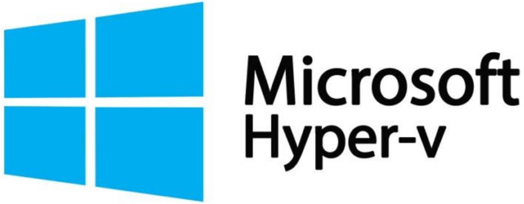


Technologiewechsel -> flexibler Projektablauf

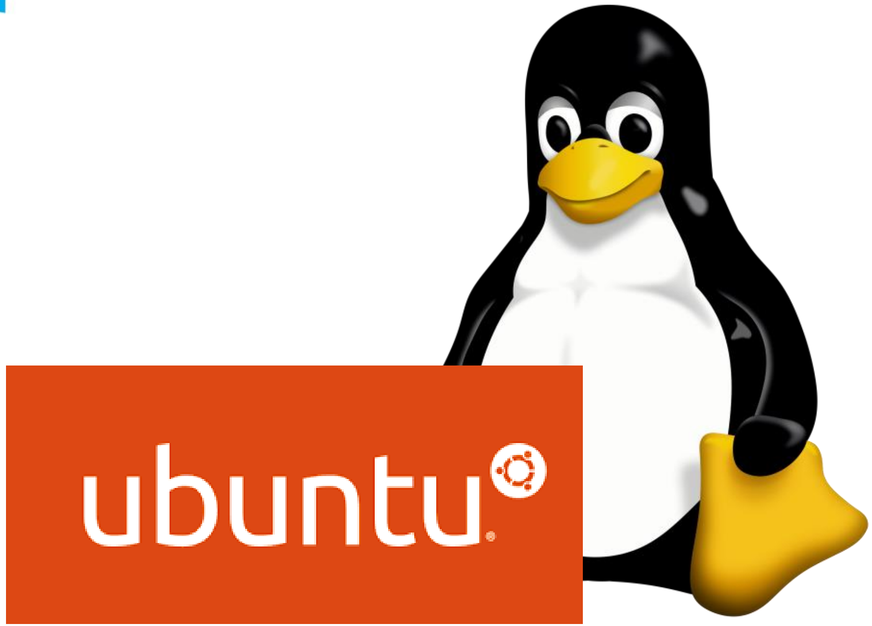
Weitere Erkenntnisse

Environment setup




Microsoft
Hyper-v

ORACLE
VirtualBox


ubuntu

python

python
TM
Package
Index

PC
PyCharm

Temporäre Lösung

SQLite

- Bedienung über SQL-Befehle
- Schnelles Setup
- Keine laufende Datenbankserveranwendung nötig
- Datenbankdatei lässt sich einfach sichern, austauschen und weitergeben

Live DEMO

Danke für Ihre Aufmerksamkeit!