



Packet Generation of SIP Traffic using GANs

Technical and Practical Aspects: Meeting n°2



Outline

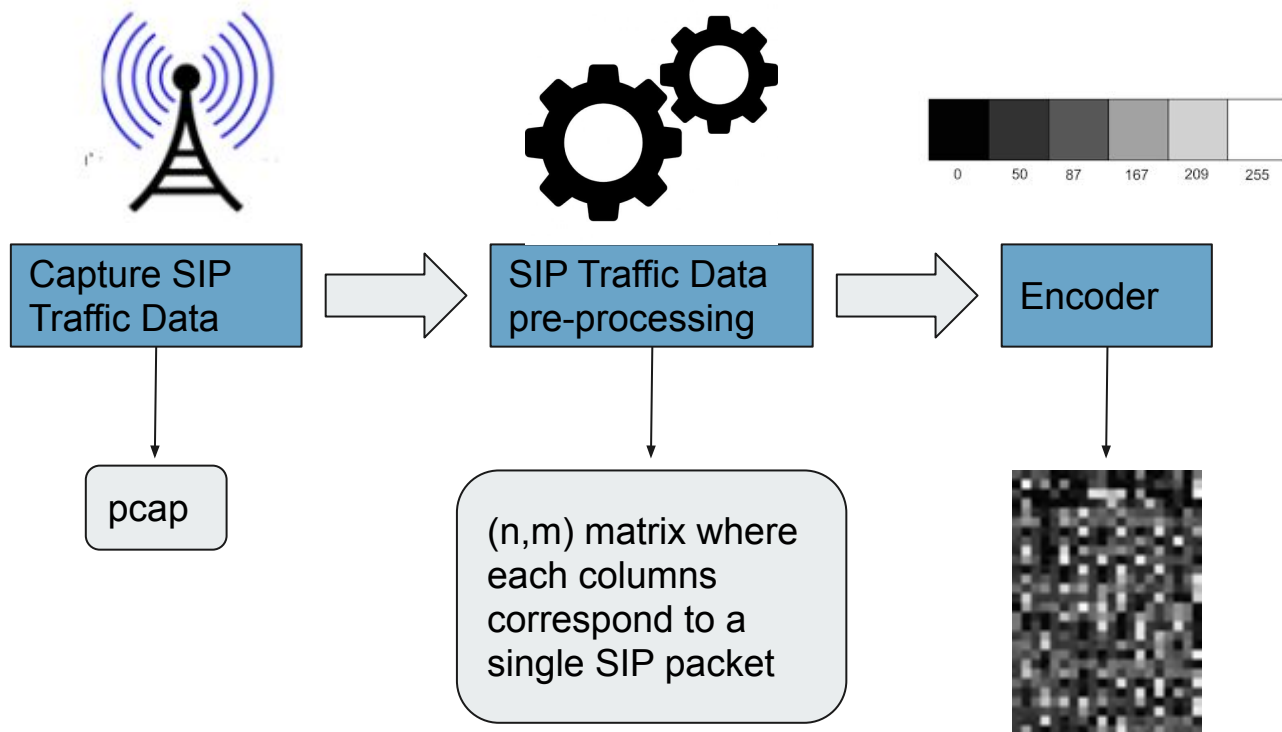
- Introduction
 - Summary of the last week
 - Status of the implementation
- Last Achievements
 - SIP-GAN
 - Generator
 - Decoder
 - Preliminaries Results
- Next Step: Evaluation
- Q&A

For full list of references visit: <https://bit.ly/3jad5He>

(Amar Meddahi 2021)

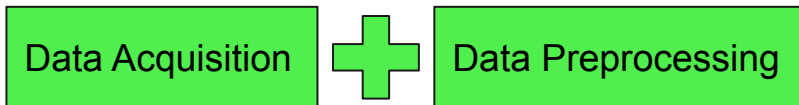
Introduction

Summary of the last presentation

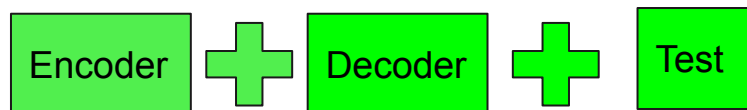


Status of the implementation

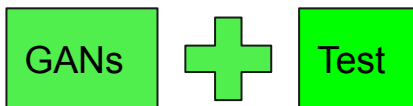
Step 1



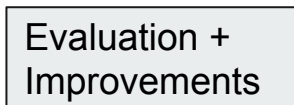
Step 2



Step 3



Step 4

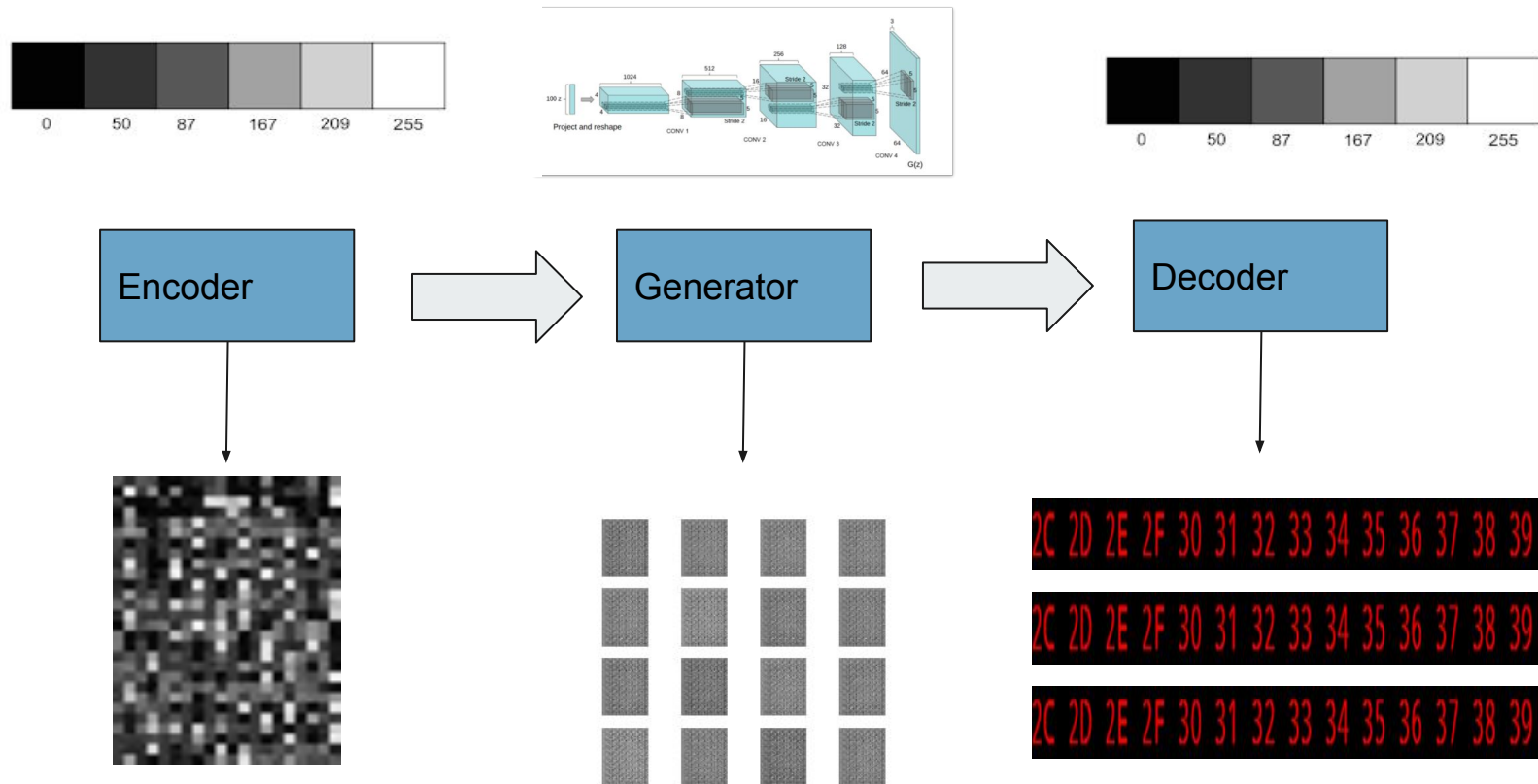


Last achievements

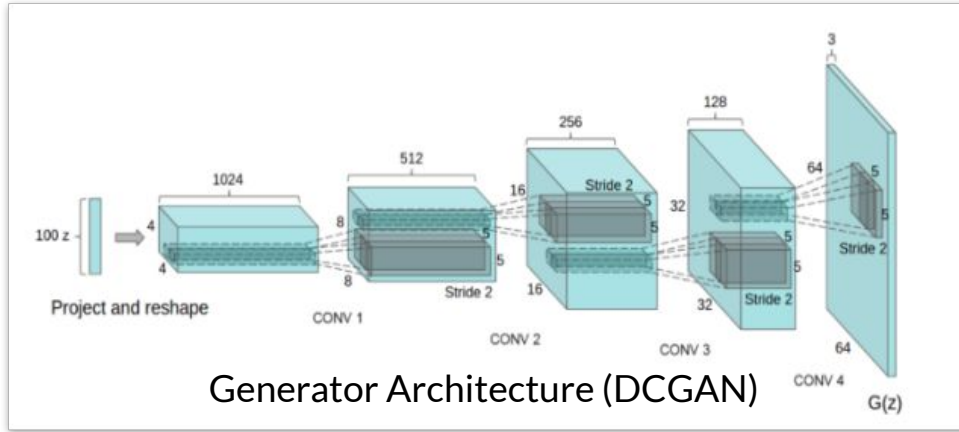
For full list of references visit: <https://bit.ly/3jad5He>

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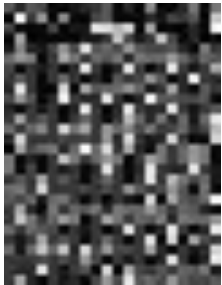
SIP-GAN: Overview



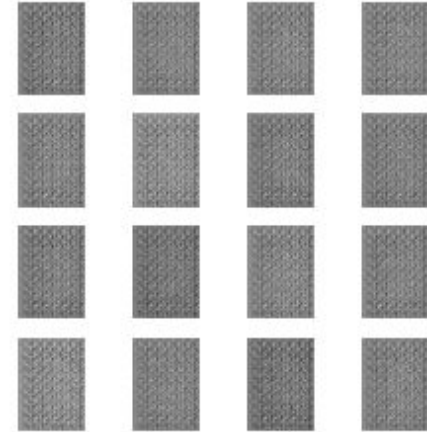
Generator



FAKE PACKET

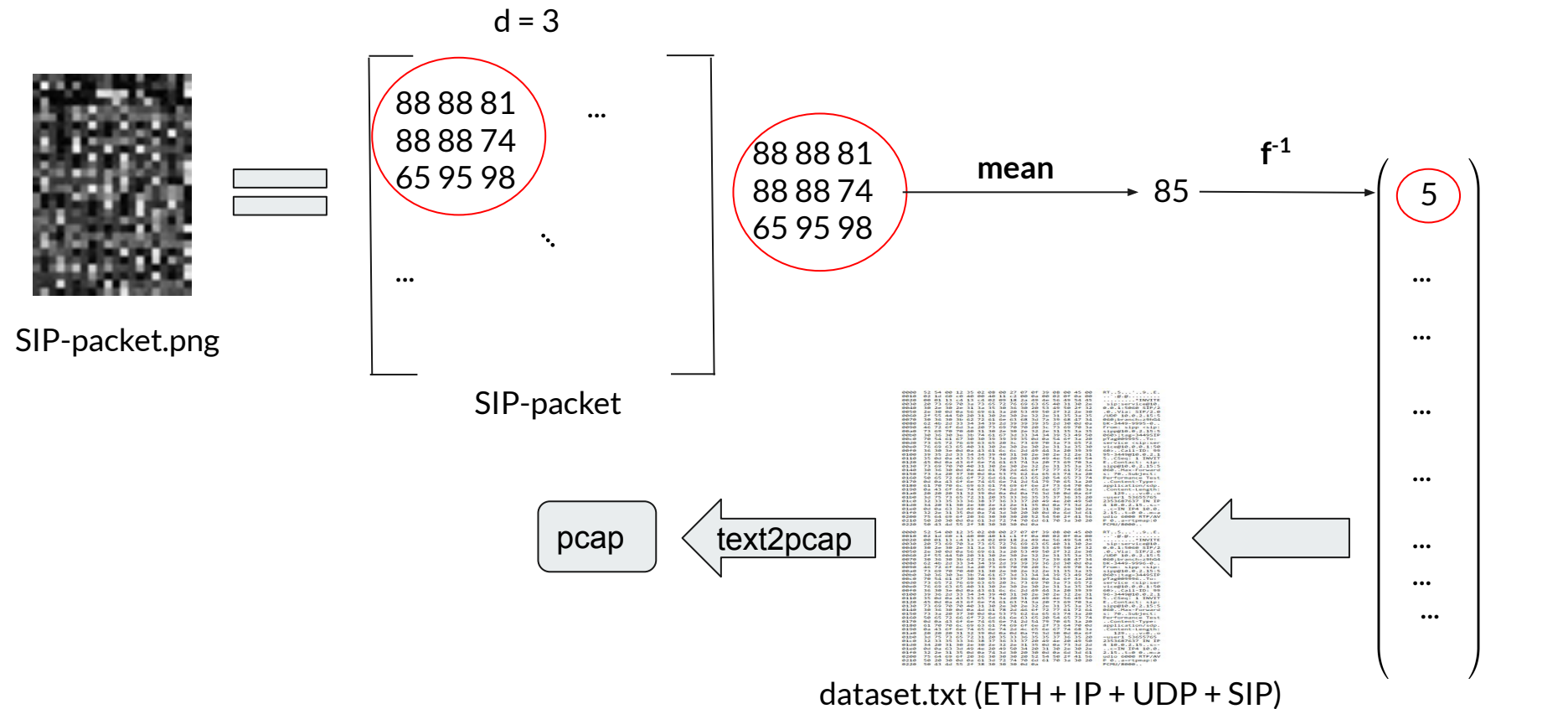


REAL PACKET



Results of the generator on 50 EPOCHS

Decoder



CPU/GPU/Dataset

Evaluation Conditions:

- TensorFlow **GPU + CUDA**
- Dataset = 10000 SIP Packets
- EPOCHS = 50
- Batch Size = 32



AMD Ryzen™ 9 5950X



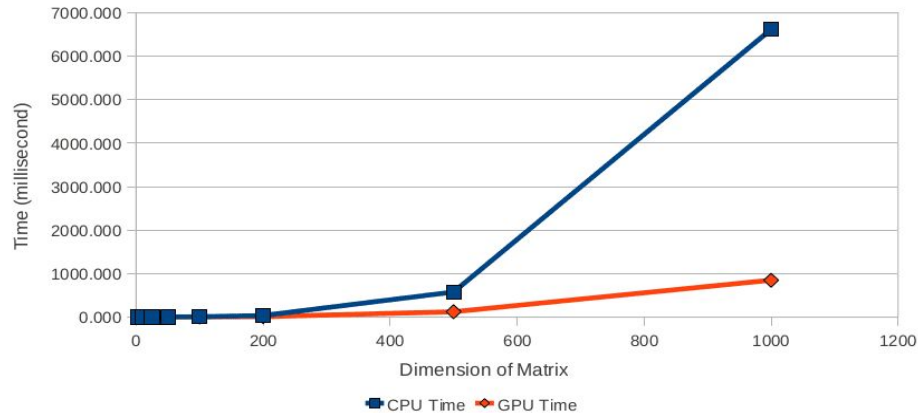
Carte graphique NVIDIA® GeForce RTX™ 3090



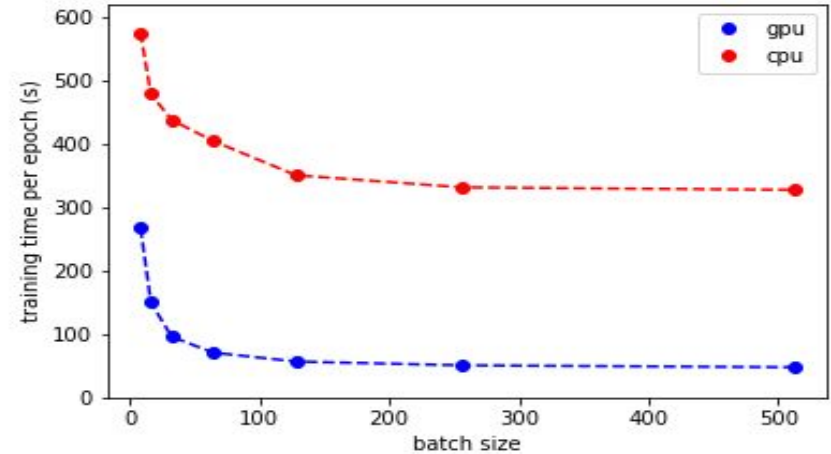
64 Go de mémoire DDR4 XMP bicanale à 3 466 MHz ;

CPU vs. GPU
Comparison of computational times

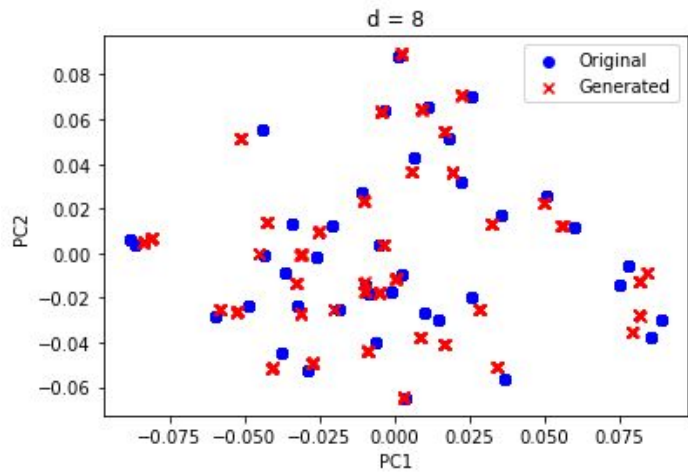
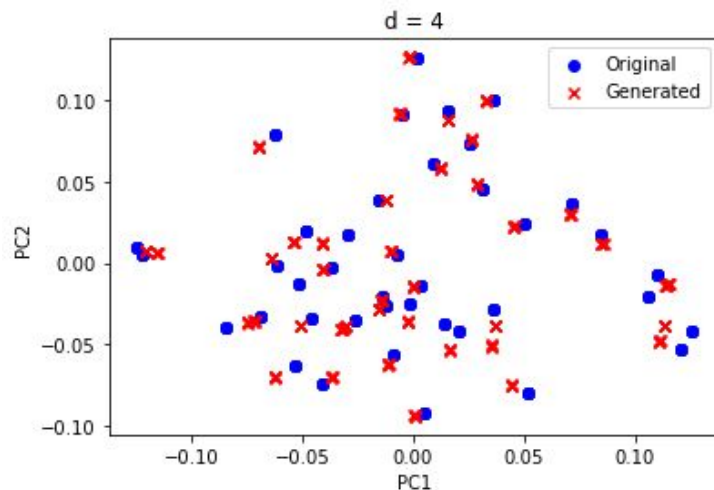
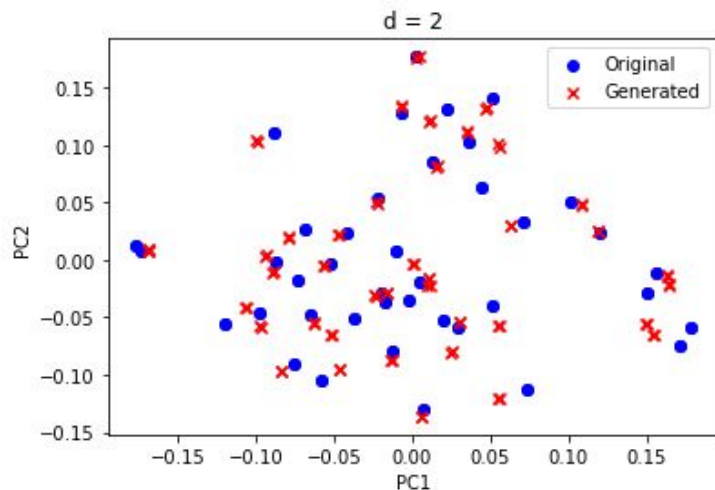
[5]



[6]



Preliminaries Results (PCA)



training time:

- d = 8: 1929 sec (32,15 min)

Preliminaries Results (Packet Analysis)

Real SIP INVITE

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	10.0.2.15	10.0.0.1	SIP/SDP	546	Request: INVITE sip:service@10.0.0.1:5060

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	NorskDat_07:0f:5c	RealtekU_13:26:06	0x0a00	560	Ethernet II
2	0.000001	PcsCompu_08:0f:5c	RealtekU_13:26:06	0x0a00	560	Ethernet II
3	0.000002	PcsCompu_08:0f:5c	RealtekU_13:26:06	0x0a00	560	Ethernet II
4	0.000003	PcsCompu_07:0f:5c	RealtekU_13:25:06	0x0a00	560	Ethernet II
5	0.000004	PcsCompu_07:0f:5c	RealtekU_13:25:05	0x0a00	560	Ethernet II
6	0.000005	PcsCompu_07:0f:5d	52:53:00:13:26:06	0x0a00	560	Ethernet II
7	0.000006	NorskDat_08:0f:5c	RealtekU_13:25:05	0x0a00	560	Ethernet II
8	0.000007	PcsCompu_08:0f:5c	RealtekU_13:36:06	0x0a00	560	Ethernet II
9	0.000008	PcsCompu_07:0f:5d	52:53:00:13:26:06	0x0a00	560	Ethernet II
10	0.000009	PcsCompu_07:0f:5c	RealtekU_13:26:06	0x0a00	560	Ethernet II

d = 2

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	NorskDat_06:0f:39	RealtekU_12:35:03	0x0900	560	Ethernet II
2	0.000001	10.0.2.15	10.0.0.1	UDP	560	5060 → 5060 Len=258
3	0.000002	10.0.2.15	10.0.0.2	UDP	560	5060 → 5044 Len=258
4	0.000003	10.0.2.15	10.0.0.1	UDP	560	5060 → 5060 Len=258
5	0.000004	10.0.2.15	10.0.0.1	UDP	560	5060 → 5060 Len=258
6	0.000005	10.0.2.15	10.0.0.1	UDP	560	5060 → 5060 Len=258
7	0.000006	10.0.2.15	10.0.0.1	UDP	560	5060 → 5044 Len=258
8	0.000007	10.0.2.15	10.0.0.1	UDP	560	5060 → 5044 Len=258
9	0.000008	10.0.2.15	10.0.0.1	UDP	560	5060 → 5044 Len=258
10	0.000009	10.0.2.15	10.0.0.1	UDP	560	5060 → 5044 Len=258

d = 4

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	10.0.2.15	10.0.0.1	IPv4	560	Fragmented IP protocol
2	0.000001	10.0.2.15	10.0.0.1	IPv4	560	Fragmented IP protocol
3	0.000002	10.0.2.15	10.0.0.1	IPv4	560	Fragmented IP protocol
4	0.000003	10.0.2.15	10.0.0.1	IPv4	560	Fragmented IP protocol
5	0.000004	10.0.2.15	10.0.0.1	IPv4	560	Fragmented IP protocol
6	0.000005	10.0.2.15	10.0.0.1	IPv4	560	Fragmented IP protocol
7	0.000006	10.0.2.15	10.0.0.1	IPv4	560	Fragmented IP protocol
8	0.000007	10.0.2.15	10.0.0.1	IPv4	560	Fragmented IP protocol
9	0.000008	10.0.2.15	10.0.0.1	IPv4	560	Fragmented IP protocol
10	0.000009	10.0.2.15	10.0.0.1	IPv4	560	Fragmented IP protocol

d = 8

Preliminaries Results (Packet Analysis)

```
RT..5... '...9..E...
...@..@.. C.....
...!INVITE
sip:service@10.
0.0.1:50 60 SIP/2
.0..Via: SIP/2.0
/UDP 10. 0.2.15:5
060;bran ch=z9hG4
bK-7091- 1-0..Fro
m: sipp <sip:sip
p@10.0.2 .15:5060
>;tag=70 91SIPpTa
g001..To : servic
e <sip:service@1
0.0.0.1: 5060>..C
all-ID: 1-7091@1
0.0.2.15 ..CSeq:
1 INVITE ..Contac
t: sip:sipp@10.0
.2.15:50 60..Max-
Forwards : 70..Su
bject: Performance
ce Test ..Content
-Type: application/
sdp..Content-
Length: 129...
..v=0..o= user1 53
655765 2 35368763
7 IN IP4 10.0.2.
15..s=-..c=IN IP
4 10.0.2 .15..t=0
0..m=audio 6000
RTP/AVP 0..a=rt
pmap:0 P CMU/8000
```

Real SIP INVITE

```
RT..%... &...\..D..
...y@..@..V.....
...+INVISD
sip:service@1 /
0/ /1;50 60 eH`/3
.0..fia: TYP/2.0
?UEP A0> @>2.0DIF
070;brbn Th>j9hG4
c[-3580- F,12,@..
Grom; si pp <sip:
sipp@20. 0.2.16:5
7 >-saf L3580RI@
pS`g0092 #0..To*
servicef Mrjp:rerr
vjce@1 . 0.0.1+50
&0>..Cal 1.ID; ;2
4!.3580@ 00.0/1/0
E..CSeq: 0 9NF9U
E..3onsP bs; bip:
ripp@10. .2.14;5
060..M` -Uorward
s: 70..C ubkfTt9
Pereormance Tdst
..Content-Type:
applicat ion/cdp.
..Condfns -Lengt9
"29...v=..o
=useq1 5 4F55G65-
3362787& 38.J>-IP
5 20.0.1 /!5...=-
..T>9N I P4 20/0.
2.14..s- 0.0..n=a
uTY_.'00 0 RSP/AV
P 0..a>b upnQ`+
P2MU/H00 0.....
```

d = 2

```
RT..5... &..9..E...
...@..@..&.....
...()INVH4
sip:service@10.
0.0.1:50 50 SHP/2
.0..VYQ9 SIP/2.0
/UD@ 10. 0.2-15:5
0&0+brqn ch=z9hF#
bK-3580- 9394-0..
From: si pp <sip:
si`@20. 0.2.15:5
0%0?;tag =3580CIP
pCag0048 1:..To:
service <rip:rerr
vicd@10. 0.0.1:50
60>..Ca\ 1.H49 65
66-34( 0 10-0.2.1
5..2Ceq: 1 HNVIU
E..Sonta St: sip*
sipp@10. 0/1.15:E
060..Max -Forwbrd
s: 70..S ubject:
Pebforma nce Test
..Contfm t-Type:
ap`kicbt ion/scp.
..Consent ,Length:
39...v=0..o
-useq1 5 #&$5&6$-
2242%7&% "6 I? IP
4 10.0.1 .A4..s<,
..c<I>0I P401 .0.
2.15..t. 0 0..m-a
udio 500 0 RTP/AV
P 0..a=r tpmmap:0
PCMU/800 0.....
```

d = 4

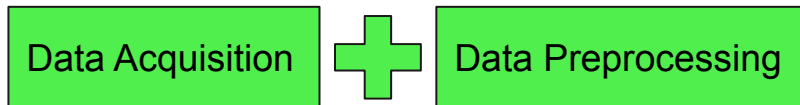
```
RT..5... '...9..E...
...0..@..&.....
...*INVITE
sip:service@10.
0/0.1:50 60 SIP/2
.0..Via: SIP/2.0
/UDP 10. 0/2.15:5
060;bqan ch=z9hG4
bL-3590. 854D-0..
Fron: si pp <sip:
sipp@10> 0.2/05:5
06 =;tag <3580SIP
pTbg0167 78..To:
sesvjce <sip:ser
vice@10. 0.0.1:50
6 >..Cal 1.ID: 6*
%3-359 0 00-0-2.1
5..CSeq: 1 IMVIT
E..Conta ct: sip;
ripp@10. 0.2.25:%
060..Max -Forward
s: 70..S ubject:
Performa nce Test
..Content .Type:
applicat ion/sdp.
..Content -MengthJ
029...v=0..o
=useq1 5 3655765-
23536876 37 IN IP
4 10.0.2 /25..s=-
..c=J0 I P4 10.0.
2.15..t= 0.0..m=b
udio 600 0 RUP/QV
P 0..a=r tlap:0
PCNU/800 0.....
```

d = 8

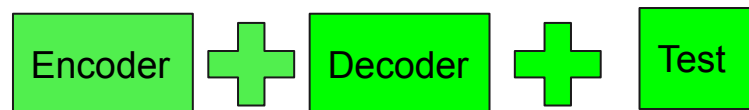
Next Step

Next Step: Evaluation

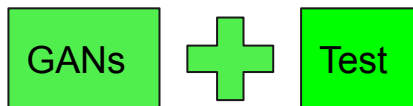
Step 1



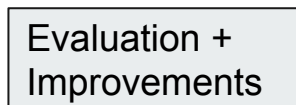
Step 2



Step 3



Step 4



mapping function? multi-mapping?

new evaluation metrics

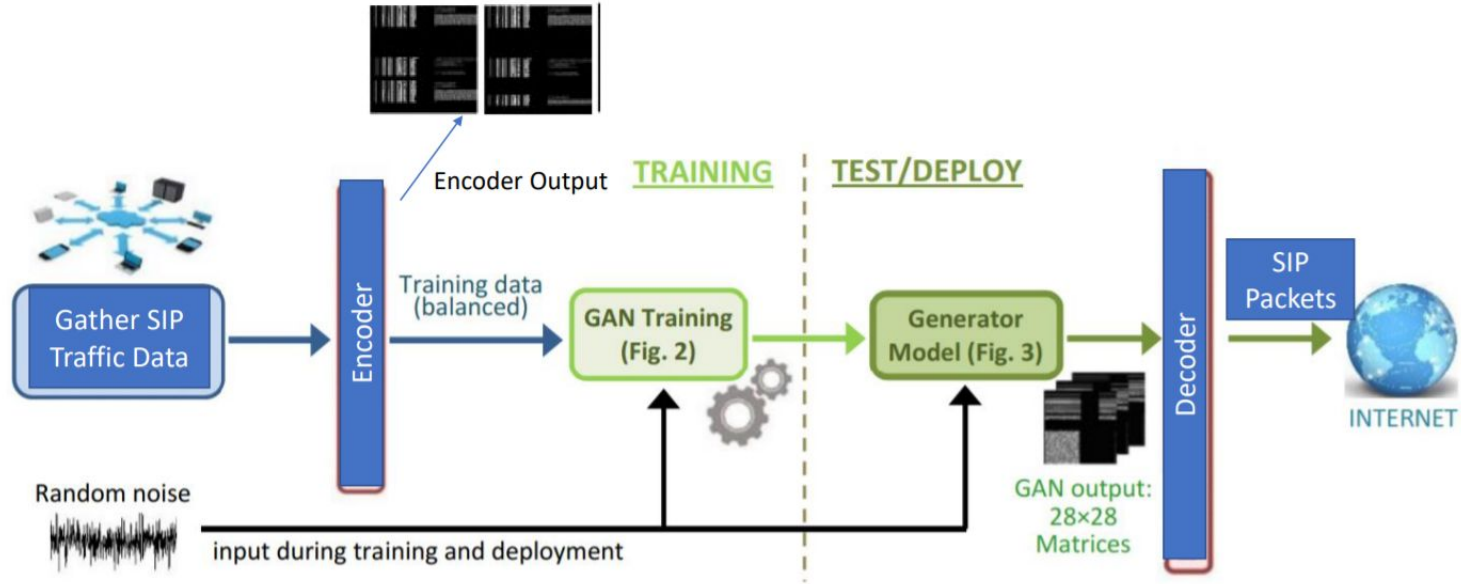
dataset?

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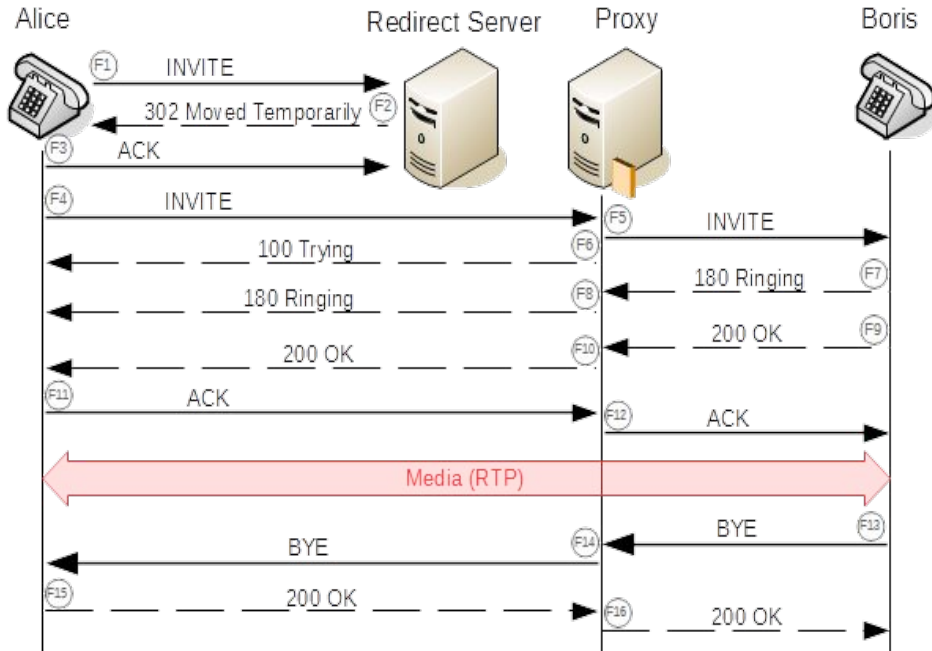
Q&A

Appendix 1: SIP-GAN



SIP-GAN VS SIPp PacketGen™

Appendix 2: SIP Protocol



Establishment of a session

