



DAB ITALIA s.c.p.a.

DAB+ signal distribution over IP using EDI + SRT

Who I am

I have been working for DAB Italia since early 2020 as network assistant.

I am focussing on the development and integration of IP networks for DAB Italia 's national digital radio network.



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Main topics

- What is EDI?
- Distribution of EDI with UNICAST
- Distribution of EDI with Multicast
- What is SRT?
- Distribution of EDI with SRT

What is EDI ?

Edi is an encapsulation and distribution protocol, based on DCP, for distribution of STI-D and ETI compliant data streams over IP networks.

An EDI Packet represents a single STI-D or ETI 24 ms logical frame.

It is designed to distribute STI-D and ETI over varying conditions of IP networks, and ensure the robust delivery over networks affected by congestion, jitter and **limited packet loss**.

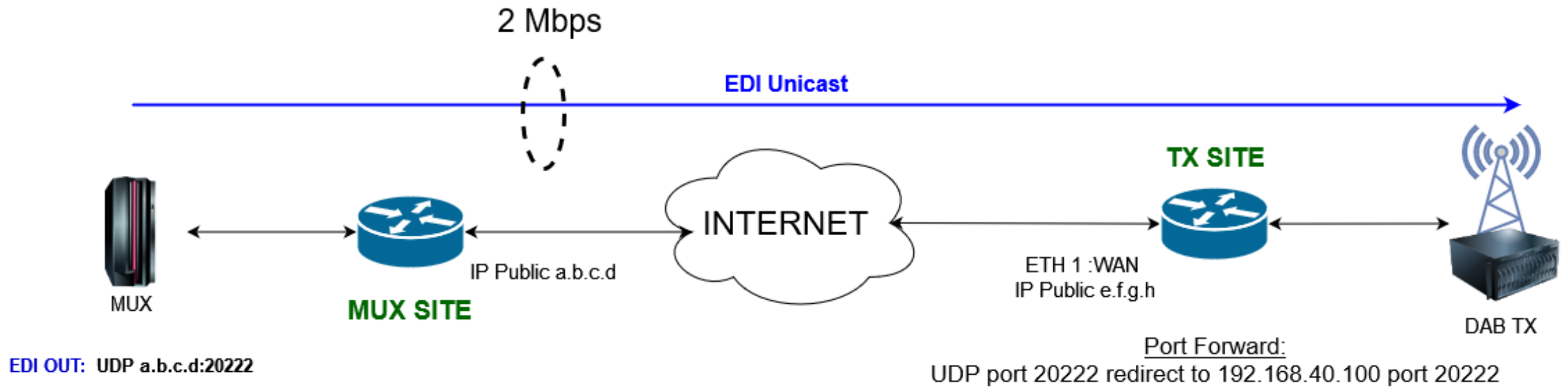
EDI could be distributed over a unicast or multicast stream using UDP/IP or TCP/IP protocols.

An EDI stream is around 2 Mbps.

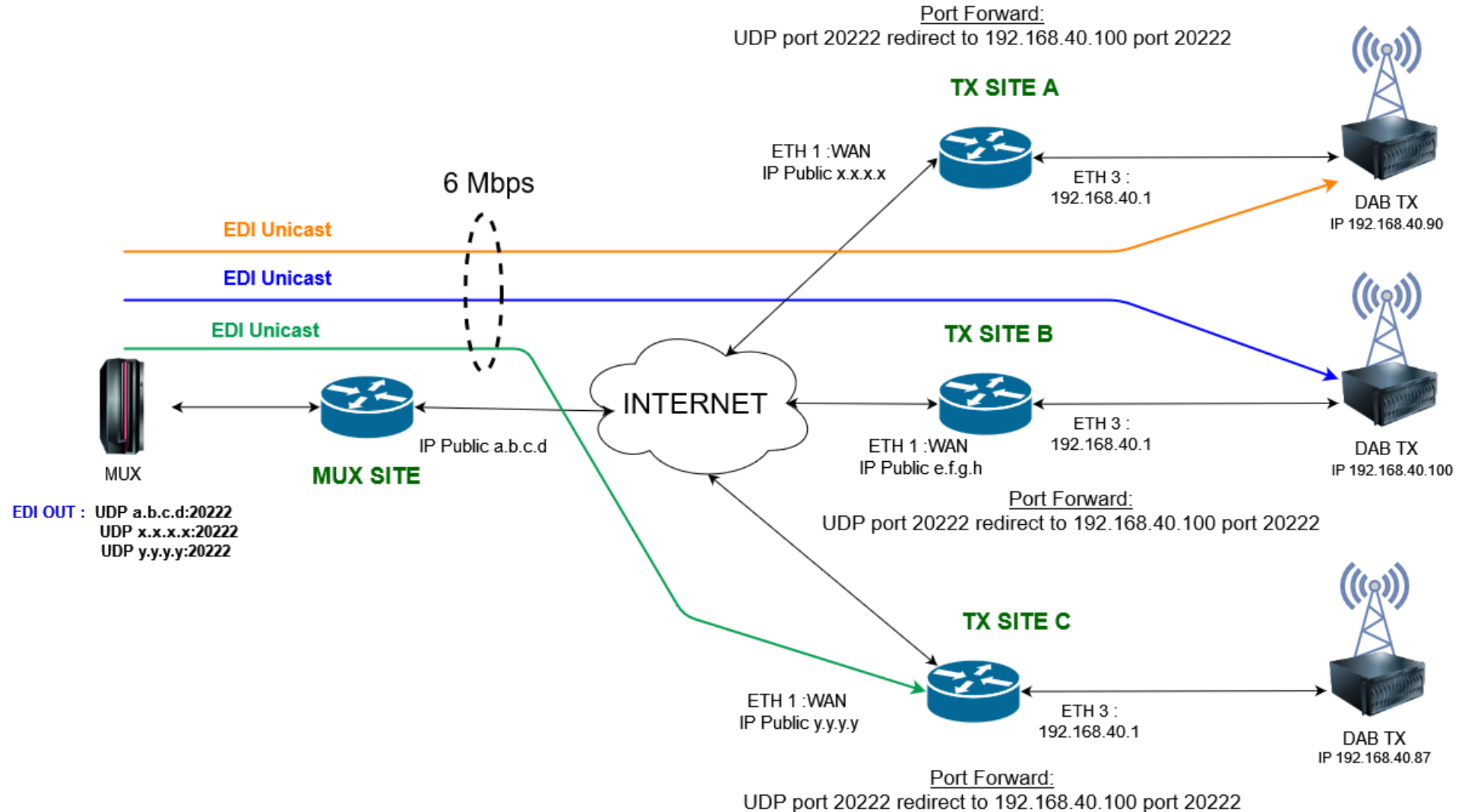
Distribution of EDI with UNICAST

Unicast EDI is a point to point stream. We can distribute this stream through the internet.

Remember to pay attention to the NAT rule.



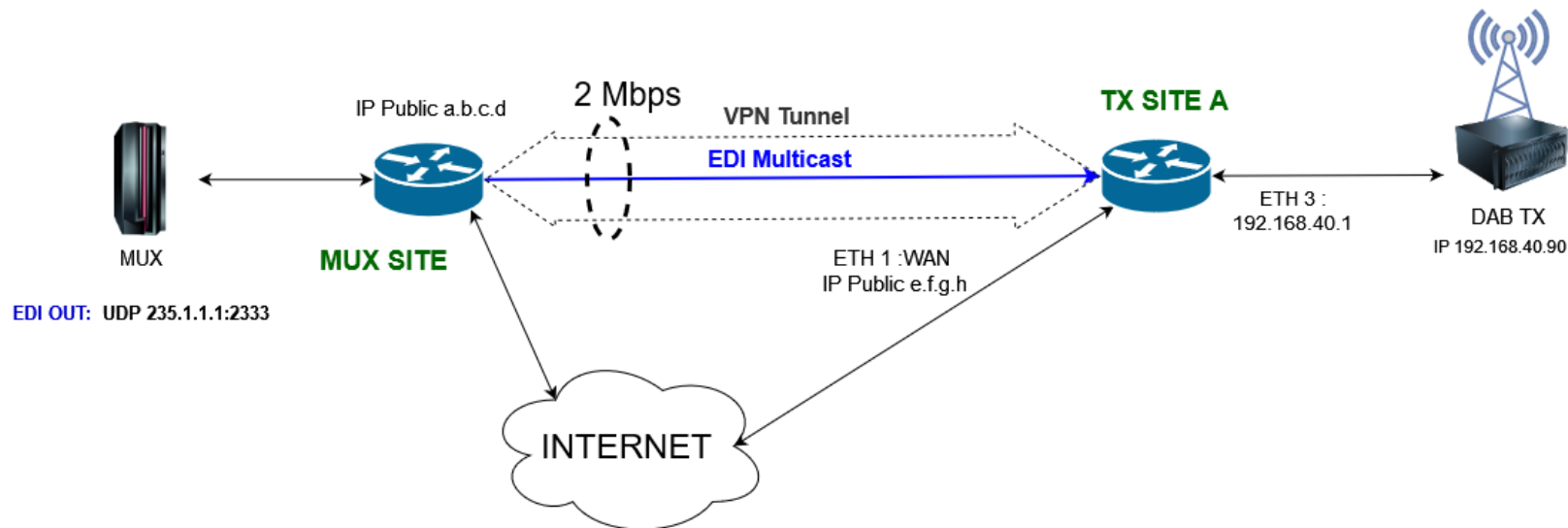
Distribution of EDI with UNICAST



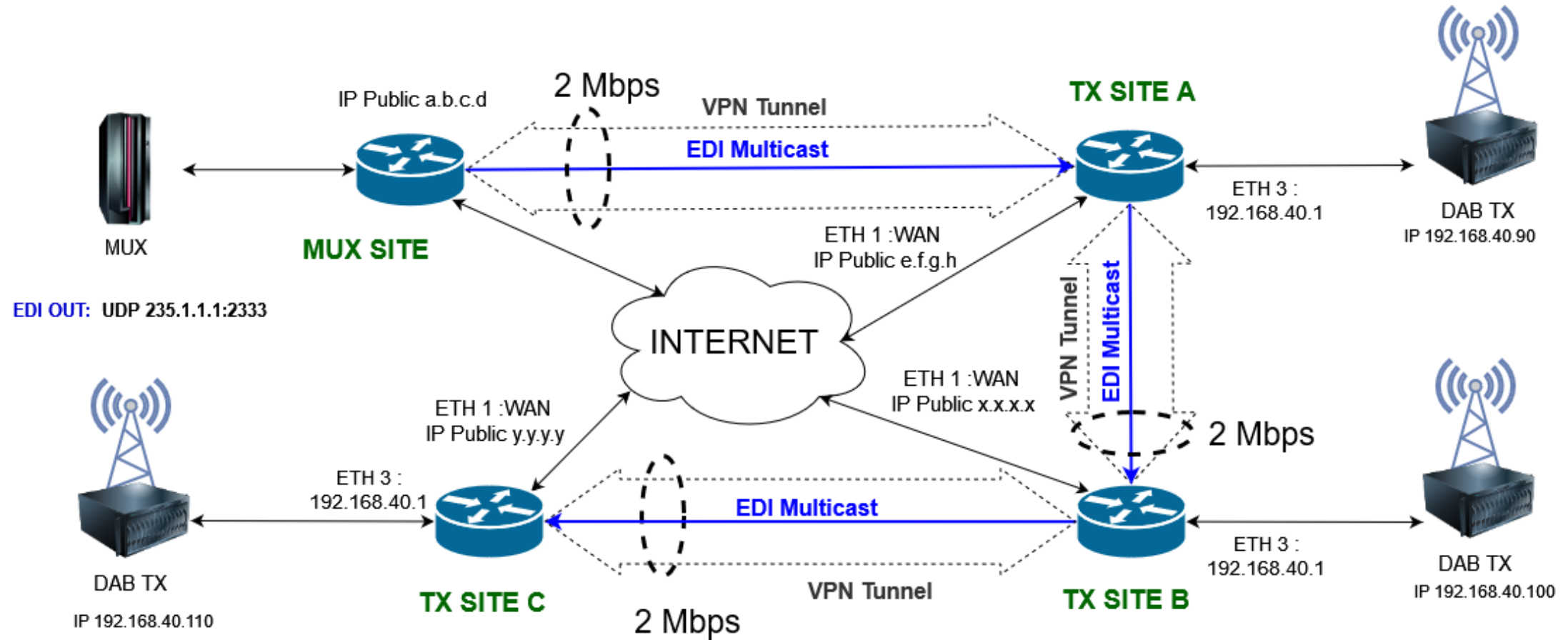
Distribution of EDI with Multicast

The multicast EDI is a point to multipoint stream. We can distribute this stream through the internet using a VPN network and a PIM protocol.

Protocol-Independent Multicast (PIM) is a family of multicast routing protocols for Internet Protocol (IP) networks that provide distribution of multicast data on the Internet networks.



Distribution of EDI with Multicast



What it is SRT ?

Secure Reliable Transport (SRT) is an open-source low-latency live video transport protocol that uses the UDP transport protocol.

SRT is designed to be used on noisy networks.

SRT provides connection and control, reliable transmission similar to TCP using UDP protocol as an underlying transport layer.

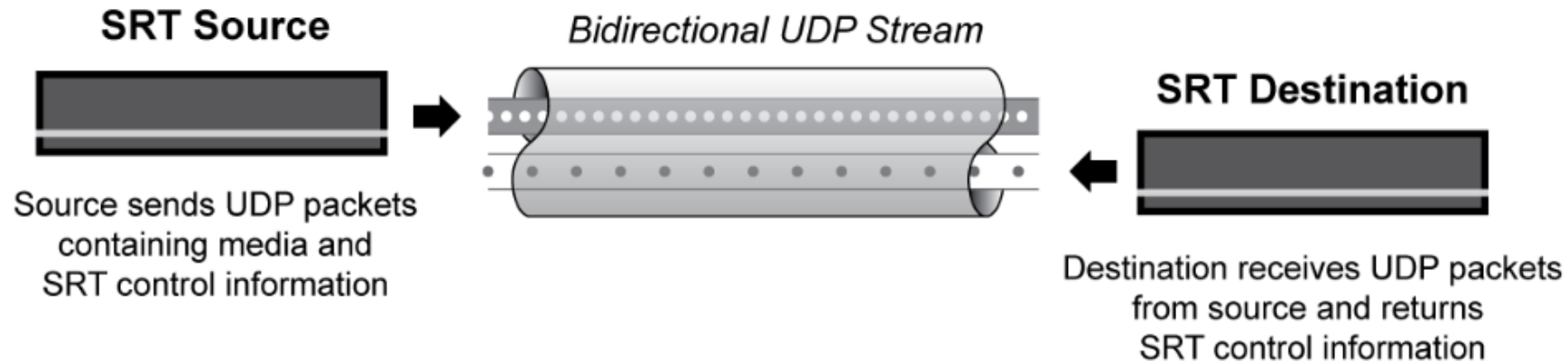
It supports packet recovery while maintaining low latency (default: 120 ms).

SRT also supports encryption using AES.

What it is SRT ?

The SRT stream works on a point to point connection.

This protocol relies on bi-directional UDP traffic to optimize streaming over public networks.

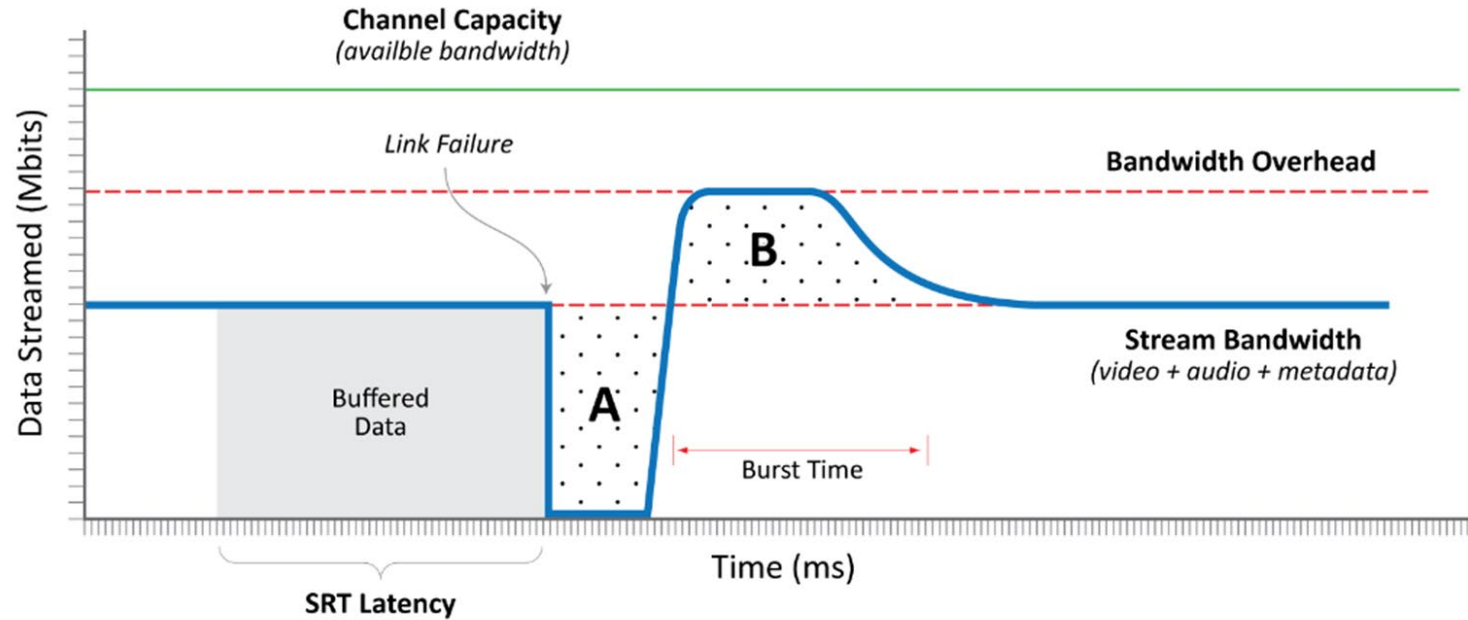


What it is SRT ?

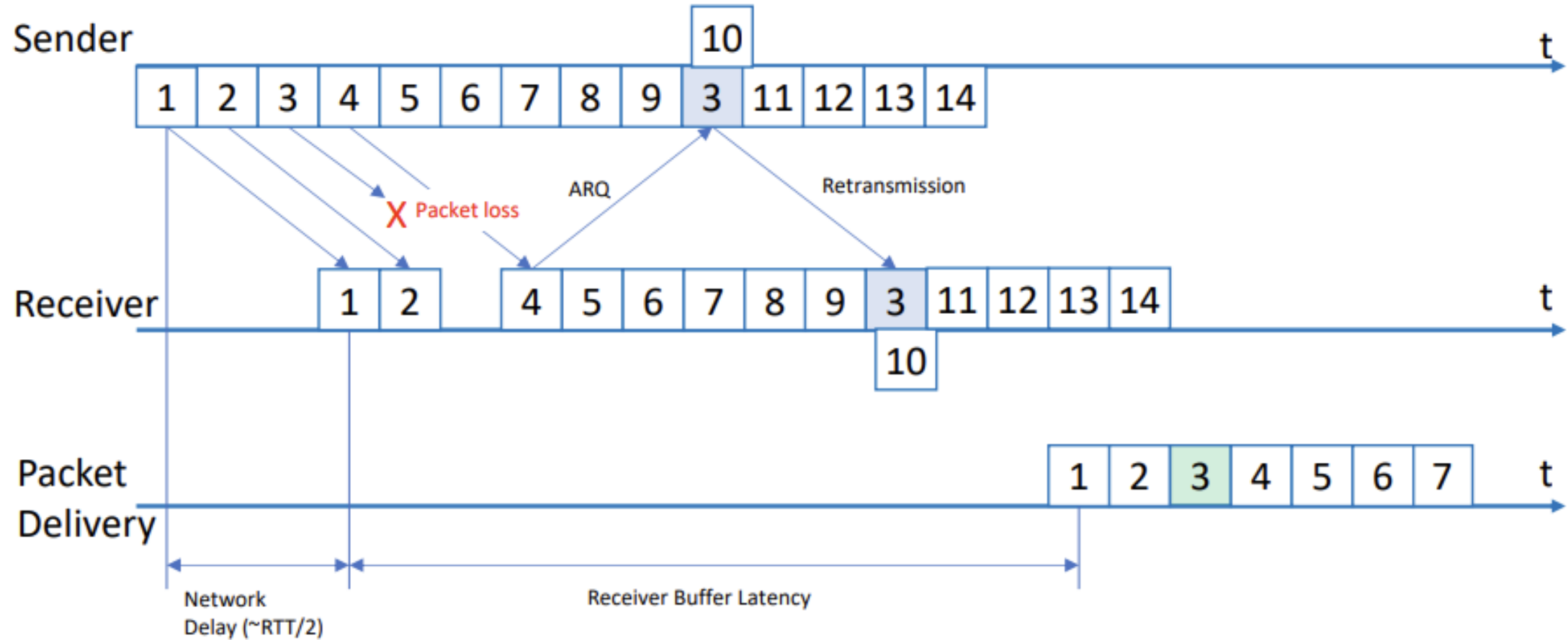
SRT introduces a latency on both RX and TX to increase the reliability of transmission.

SRT deals with data loss in two ways.

1. the stream output is maintained from the received buffer.
2. the source is able to re-send the packets lost during the link failure.



What it is SRT ?



Distribution of EDI with SRT

To encode the EDI stream into SRT stream we use a sample application called **srt-live-transmit** provided to GitHub on official repository.

The **srt-live-transmit** tool is a universal transport tool with the purpose to encode and decode live-data.

At the same time, it is just a sample application to show some of the powerful features of SRT.

The general usage is the following:

```
srt-live-transmit <input-uri> <output-uri> [options]
```

Distribution of EDI with SRT

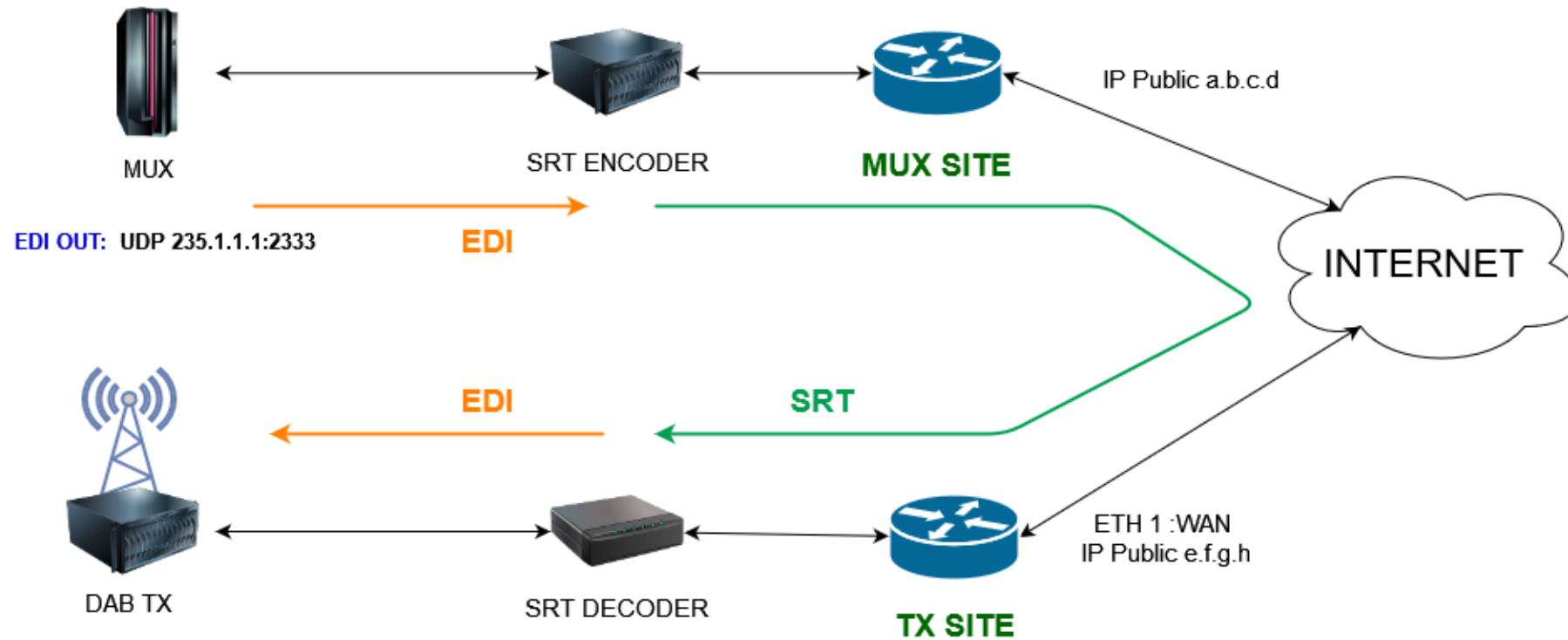
To make our test we are using Raspberries Pi 4B+, set as encoder and as a decoder.

The mux site is located in Milan.

We have installed SRT decoders on four different transmitters sites to test the stability and reliability. The sites are located in Rome, Bolzano, Palermo and on Lake Garda.

Distribution of EDI with SRT

```
srt-live-transmit udp://235.1.1.1:2333 srt://:30100?latency=200 -statsout
```



```
srt-live-transmit srt://a.b.c.d:30100?latency=200 udp://235.1.1.1:2333 -statsout
```

Distribution of EDI with SRT

```
=====  
SRT STATS: sid=882348057  
PACKETS SENT: 0 RECEIVED: 9982  
LOST PKT SENT: 0 RECEIVED: 0  
REXMIT SENT: 0 RECEIVED: 0  
DROP PKT SENT: 0 RECEIVED: 0  
FILTER EXTRA TX: 0 RX: 0  
FILTER RX SUPPL: 0 RX LOSS: 0  
RATE SENDING: 0 RECEIVING: 2.04189  
BELATED RECEIVED: 0 AVG TIME: 1.84467e+16  
REORDER DISTANCE: 26  
WINDOW FLOW: 8192 CONGESTION: 8192 FLIGHT: 0  
LINK RTT: 4.733ms BANDWIDTH: 39.684Mb/s  
BUFFERLEFT: SND: 12288000 RCV: 11985000  
=====  
SRT STATS: sid=882348057  
PACKETS SENT: 0 RECEIVED: 9998  
LOST PKT SENT: 0 RECEIVED: 0  
REXMIT SENT: 0 RECEIVED: 0  
DROP PKT SENT: 0 RECEIVED: 0  
FILTER EXTRA TX: 0 RX: 0  
FILTER RX SUPPL: 0 RX LOSS: 0  
RATE SENDING: 0 RECEIVING: 2.04404  
BELATED RECEIVED: 0 AVG TIME: 1.84467e+16  
REORDER DISTANCE: 26  
WINDOW FLOW: 8192 CONGESTION: 8192 FLIGHT: 0  
LINK RTT: 4.583ms BANDWIDTH: 46.452Mb/s  
BUFFERLEFT: SND: 12288000 RCV: 11970000
```


Distribution of EDI with SRT

```
top - 11:31:23 up 10 days, 2:18, 2 users, load average: 0,24, 0,16, 0,06
Tasks: 186 total, 1 running, 185 sleeping, 0 stopped, 0 zombie
%Cpu(s): 1,3 us, 3,5 sy, 0,0 ni, 94,9 id, 0,0 wa, 0,0 hi, 0,3 si, 0,0 st
MiB Mem : 3838,9 total, 2827,9 free, 249,7 used, 761,3 buff/cache
MiB Swap: 100,0 total, 100,0 free, 0,0 used. 3383,5 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
1102	pi	20	0	65000	8304	3668	S	12,2	0,2	2022:46	srt-live-transm
571	root	20	0	341212	97268	78888	S	6,6	2,5	60:01.67	Xorg
538	root	20	0	61076	34684	18664	S	2,0	0,9	2:45.53	vncserver-x11-c
836	pi	20	0	262108	66864	50940	S	1,3	1,7	15:59.21	lxterminal
41	root	20	0	0	0	0	S	0,3	0,0	0:57.23	kcompactd0
618	root	20	0	20060	12756	12240	S	0,3	0,3	0:04.99	vncagent
826	pi	20	0	623804	60704	46824	S	0,3	1,5	6:48.40	lxpanel
15898	root	20	0	0	0	0	I	0,3	0,0	0:00.09	kworker/1:0-events
15943	pi	20	0	11352	3056	2636	R	0,3	0,1	0:01.88	top
1	root	20	0	33840	8684	6788	S	0,0	0,2	2:12.79	systemd
2	root	20	0	0	0	0	S	0,0	0,0	0:01.87	kthreadd
3	root	0	-20	0	0	0	I	0,0	0,0	0:00.00	rcu_gp
4	root	0	-20	0	0	0	I	0,0	0,0	0:00.00	rcu_par_gp
8	root	0	-20	0	0	0	I	0,0	0,0	0:00.00	mm_percpu_wq
9	root	20	0	0	0	0	S	0,0	0,0	0:00.00	rcu_tasks_rude_
10	root	20	0	0	0	0	S	0,0	0,0	0:00.00	rcu_tasks_trace
11	root	20	0	0	0	0	S	0,0	0,0	10:43.62	ksoftirqd/0
12	root	20	0	0	0	0	I	0,0	0,0	32:51.79	rcu_sched
13	root	rt	0	0	0	0	S	0,0	0,0	0:03.52	migration/0
14	root	20	0	0	0	0	S	0,0	0,0	0:00.00	snubn/0

Conclusions

In conclusion, the SRT protocol increases the reliability of transmission of the EDI stream over the internet.

In addition, to obtain an additional degree of stability, it is good to have a connectivity with a guaranteed bandwidth.

With a few hundred euros it is possible to start to use the SRT protocol
As initial costs there are only the purchase of the SRT encoder/decoder units and then the costs of the connectivity.

After my experience, I recommend using the SRT protocol because it guarantees and adds a level of security on sending data.

Thank You



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Reference LINK

- https://www.etsi.org/deliver/etsi_ts/102600_102699/102693/01.01.02_60/ts_102693v010102p.pdf
- https://en.wikipedia.org/wiki/Secure_Reliable_Transport
- <https://www.wowza.com/blog/srt-the-secure-reliable-transport-protocol-explained>
- <https://www.srtalliance.org/srt-faq/>
- <https://github.com/Haivision/srt/blob/master/docs/apps/srt-live-transmit.md>
- <https://qiita.com/tomoyafujita/items/2e10a9b9d463a36d4a3e>