STEINWURF

Rely: The Next Generation FEC

The most flexible, dynamic, scalable, and efficient FEC software solution to propel your networks and device performance into the future

About Steinwurf and Rely

Steinwurf is the creator of Rely, the next generation FEC solution that maximises data transfer efficiency, whilst providing optimal latency, bandwidth, and reliability performance.

By utilizing the power of the patented Random Linear Network Coding (RLNC) technology, Rely has redefined the trade-off paradigm between latency, reliability, and the cost of delivering this performance, allowing clients to improve QoS, whilst driving down operational costs, bandwidth usage and carbon footprints.

Good for service providers, good for customers and good for the planet, Rely is designed to deliver industry leading reliability and ultra-low latency communications over dynamic, mobile, and wireless networks.

About this Report

This report demonstrates how Steinwurf's Rely outperforms legacy FECs in terms of latency, reliability, and repair costs and why performance and sustainability conscious SD-WAN providers and their customers would benefit from implementing Rely today.

The industry benchmarking tests include both performance data comparisons between Rely and the commonly used legacy FEC solutions based on Reed Solomon, which demonstrate that:

- Rely can produce much higher reliability for lower operating cost while operating at the same repair rate (and level of repair cost) of legacy FEC solutions.

- Rely is at least 30X – and as much as 60X – more effective than legacy FECs in recovering packet losses when paying the same repair cost.

- Rely can provide 10x or greater latency improvements over legacy FEC solutions without sacrificing reliability or increasing repair costs.

Not all FECs are Created Equal

The power of Rely is rooted in Steinwurf's patented RLNC technology, which makes it more flexible and significantly more powerful than any legacy FEC code. The RLNC technology has been actively developed across over 12 universities and research institutes, including MIT and Caltech.

Rely allows enterprises to fully optimise all key parameters and deliver best-in-industry applications that are good, fast, and cheap, unlike legacy FECs - such as Reed Solomon codes developed in the 1950s – which always require a trade-off between 1 or 2 of the key parameters below.

A positive externality of the increased efficiency of using Steinwurf's FEC is improved utilization of networks and network devices, meaning you can serve more customers, faster, using less bandwidth and with less load on equipment, translating to a greener and cheaper solution.

FEC KPIs:

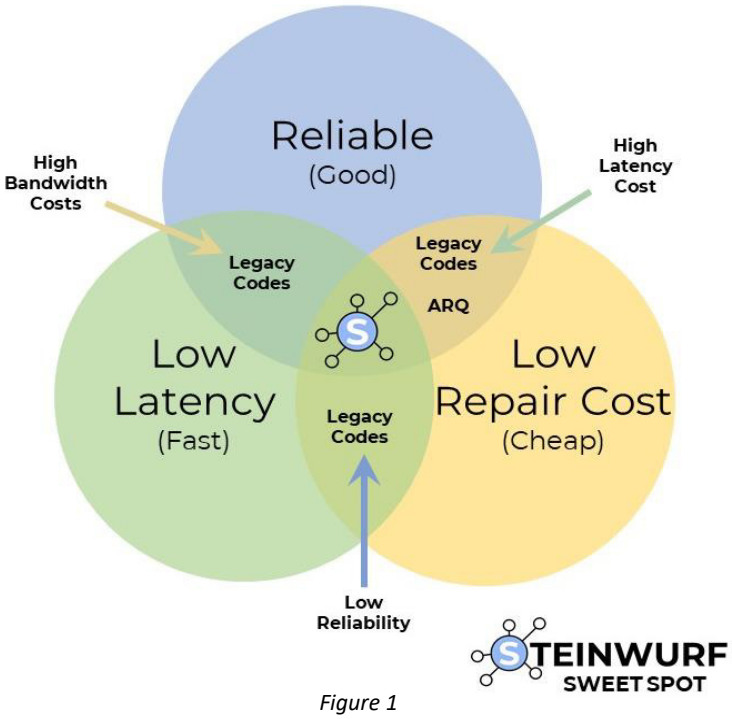

Figure 1

- **Latency**: the end-to-end delay added by the error correction mechanism.
- **Reliability**: the ability to seamlessly recover lost packets and minimize the probability of unrecovered packet loss and the resulting impairments. Good reliability leaves a network with little to no residual packet loss.
- **Repair Cost**: the amount of extra overhead/bandwidth consumed for the error correction mechanism to be able to recover and repair for lost packets.

Industry Benchmarks

To better understand Rely's performance gain versus legacy FEC solutions, we have run comparative analyses against performance data disclosed by a leading SD-WAN solution provider.

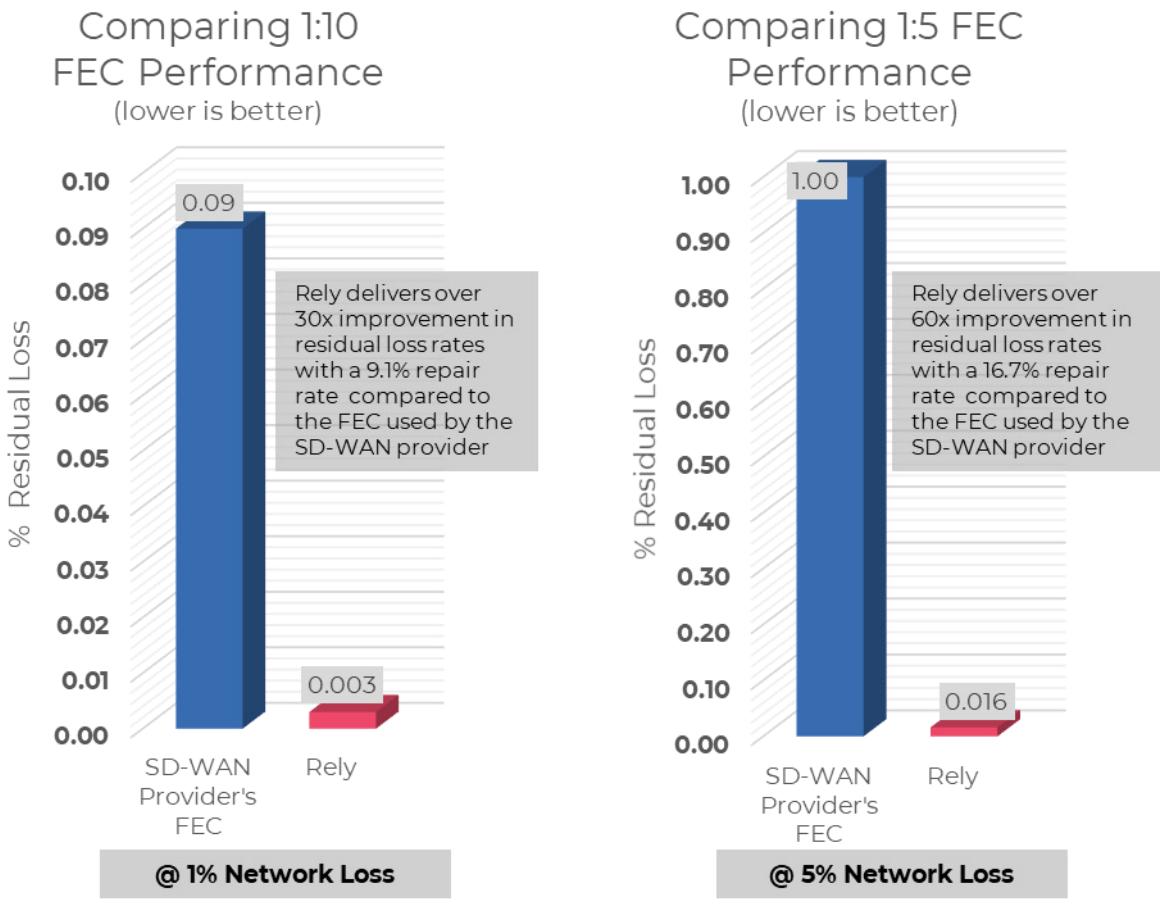

Figure 2

Figure 2 uses the above linked performance data to compare the performance of Rely to this leading SD-WAN provider's FEC when both use identical repair rates.

The analysis clearly demonstrates that **Rely is much more effective in recovering packet losses** than the solution used by the leading SD-WAN provider.

Since the SD-WAN provider's FEC performance very closely approximates Reed Solomon FEC performance, the rest of this analysis compares Rely to Reed Solomon performance.

So the next section uses a 1:10 FEC ratio to demonstrate the superior performance achievable if an SD-WAN provider implements Rely instead of legacy FEC codes. The simulations use a traffic generator that uniformly generates a packet every millisecond with random losses simulated at each level of network loss (the background amount of packet loss the network is susceptible to) computed.

Rely provides superior reliability for any given cost of repair:

This simulation compares performance of Rely and Reed Solomon when both are using identical 9.09% repair rates to plot mean residual loss (the average packet loss remaining after attempts to repair have been performed).

Lower residual loss rates indicate higher reliability performance.

The variance at each data point is shown by the vertical bars.

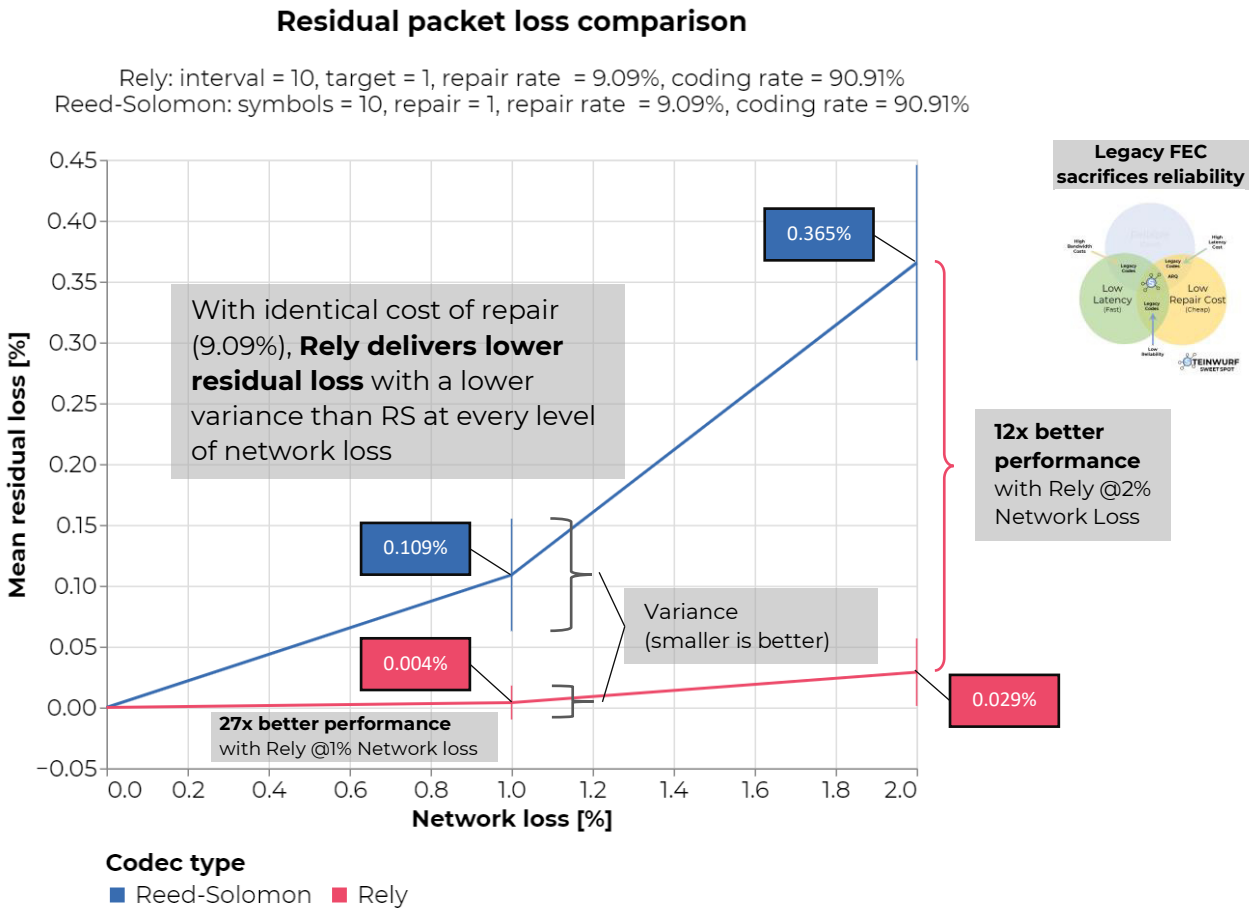

Figure 3

Figure 3 shows that **Rely can provide a serious upgrade in reliability** performance while **keeping repair costs under control**.

This translates to **a better QoE with Rely** at the same cost, and less need for SD-WAN providers to overprovision. With much narrower variance in reliability using Rely, SD-WAN providers can effectively provide tighter performance guarantees using Rely by **ensuring far more consistent performance.**

Rely provides better reliability at much lower repair rates and therefore lower operating cost

This simulation shows the mean residual loss rates when Rely is using a lower rate of repair compared to Reed Solomon. The parameters have of the legacy FEC have been tweaked to try to equalise the reliability of each code and determine

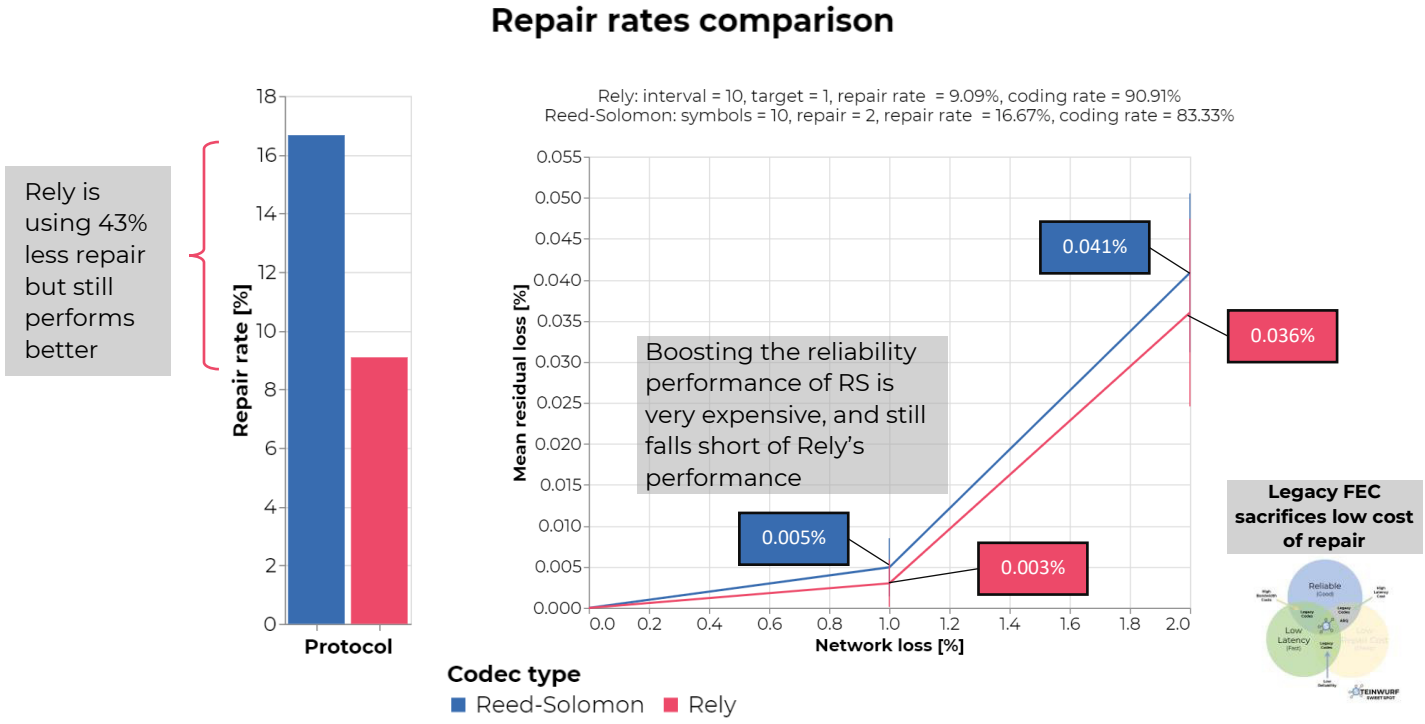

Figure 4

Figure 4 shows **Rely is far less costly to operate to achieve a given reliability target**

Even where legacy FEC codes such as Reed Solomon are given 83% more repair as in this example, Rely still performs better and these repair cost savings at scale can translate directly into operational cost savings from lower bandwidth use, more efficiency, less over provisioning required, more energy savings and freeing up capacity to serve more customers or increase the QoE for any given budget.

Rely does not need to Sacrifice Latency for Reliability

The final simulations look at a key metric that is an absolute necessity for achieving real-time application performance for SD-WAN users. To match the ultra-high reliability of Rely and level the playing field for the Legacy FEC, the block size for Reed Solomon is increased to 50 (whereas previously the block size used was 10). The repair rate used for each code is 9.09% with Rely generating 1 repair packet every 10 packets, and Red Solomon generating 5 repair packets for every block of 50 packets. Two million simulations are performed for each FEC at each network loss rate to come to a conclusion. Figure 5 shows mean latency performance, and figure 6 shows the latency distribution tallying each simulation.

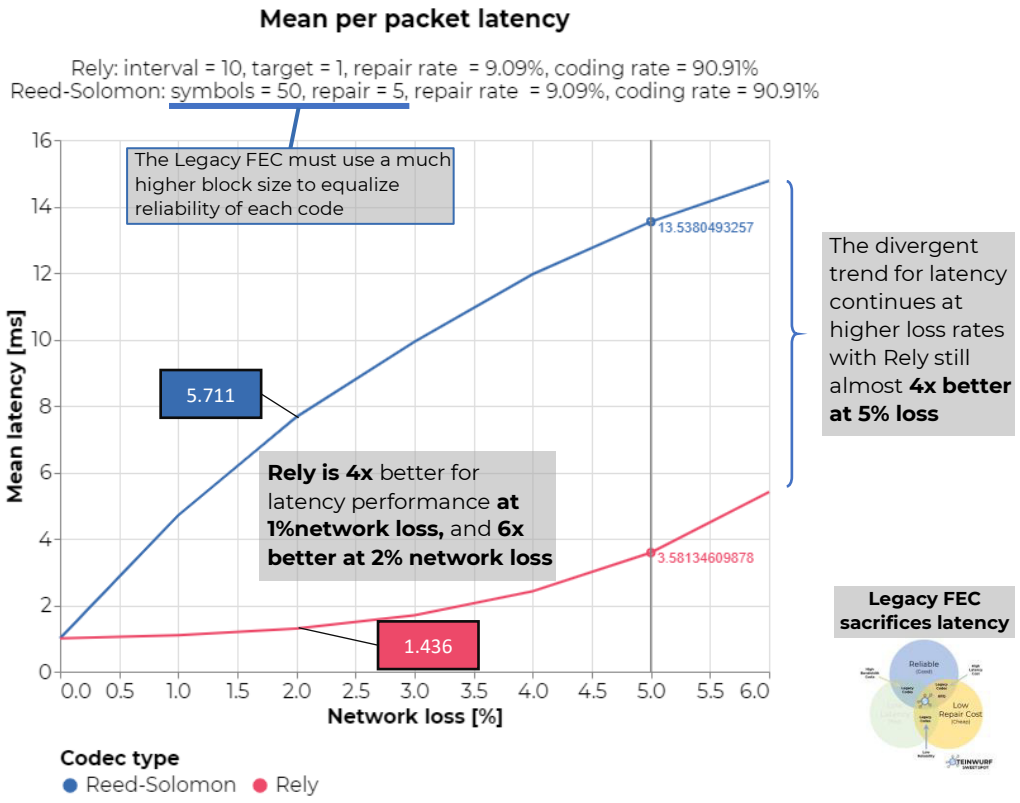

Figure 5

Figures 5 and 6 show that **Rely is the only FEC choice for low latency applications**. When **using Rely, SD-WAN providers can provide performance guarantees** within a certain latency window, e.g., in this case, that all packets will arrive within the 28ms mark.

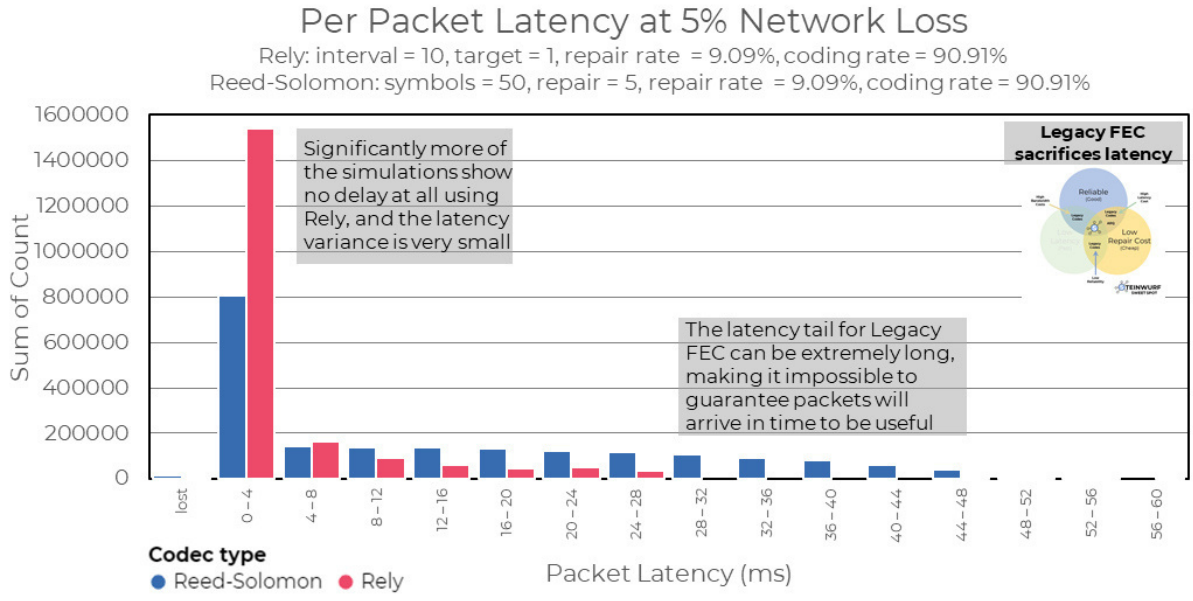

Figure 6

Modern customers using video/audio conferencing services, VoIP, accessing financial trading data, collaborating remotely or using any other application requiring ultra-low latency for a great QoE will look to their SD-WAN providers to make sure they have incorporated the latest technology and have best performing system. **Steinwurf's FEC solutions are a core component** for SD-WAN providers who want to deliver on this performance promise.

Read More about Steinwurf

23/04/2021

Reduce Operating Costs When Protecting Audio Streams with Rely FEC

RLNC based FEC codes from Steinwurf can help level up performance while using less overhead and translating to lower operating costs for better quality of experience and a more reliable service.

Read More

19/03/2021

Steinwurf's next-gen FECs aren't a choice for SD-WAN, they're an imperative

SD-WAN companies need to simultaneously minimize latency and maximize reliability – as a consequence, continued use of ARQ or traditional block ECC / FEC solutions won't deliver the performance required.

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27/02/2021

Overcoming packet loss – the bane of online gamers

The only viable option is to have a system that can operate flawlessly even in the presence of packet loss, and mask it from the user such that they don't experience any drop outs, lag, delay, lost inputs and connection instability. Steinwurf's next generation FEC is a must have component for a seamless gaming experience.

Read More

Get in touch to try Steinwurf's Next Generation FEC codes in your SD-WAN solution for free!

Whether you need a kernel implementation or can deploy our code in the user space, we have high performance solutions you can test and integrate.

Reach out today for expert guidance and details on our free evaluation and flexible pricing to suit your business model.

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