Performance evaluation of a CRAN system

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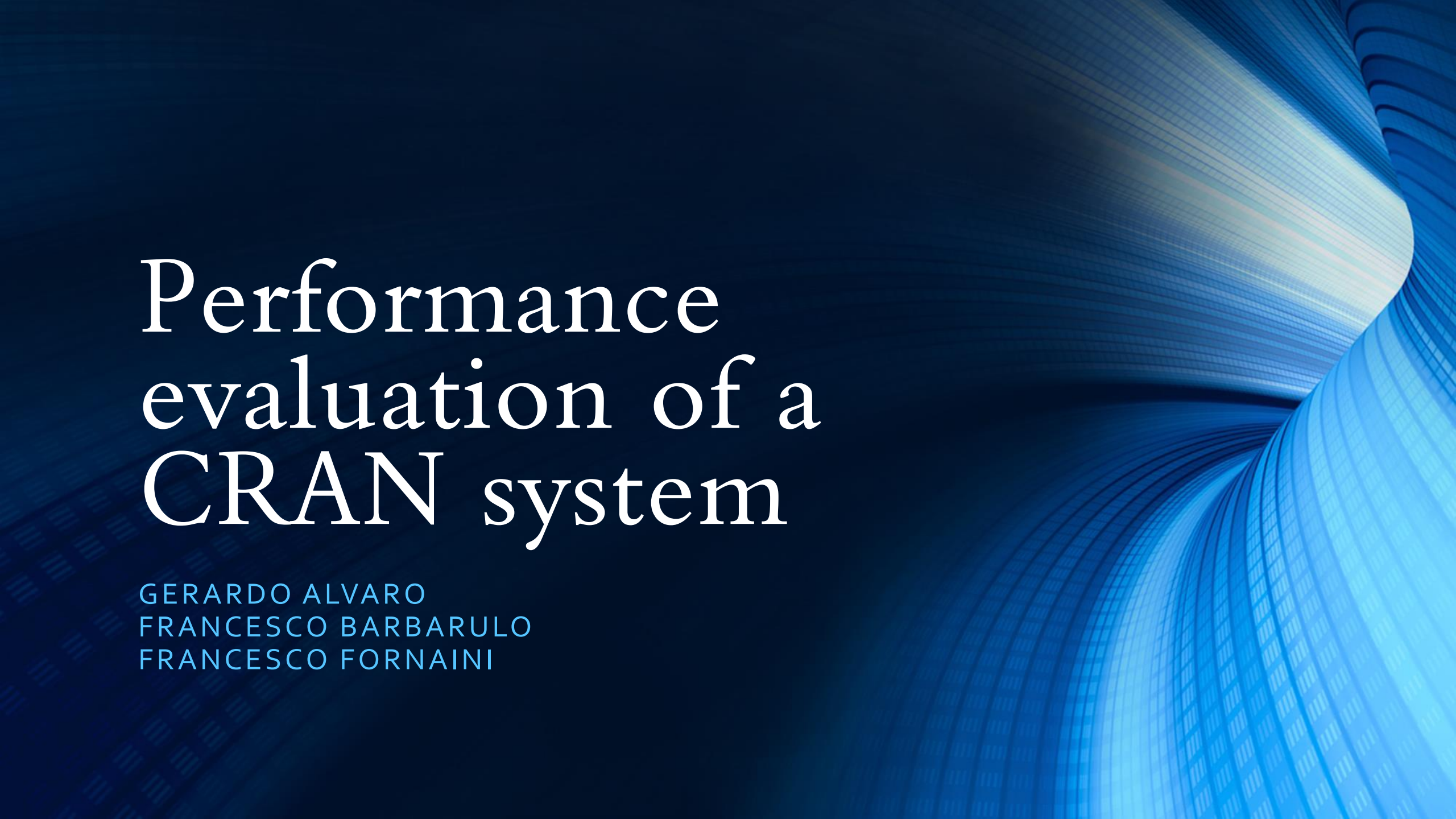
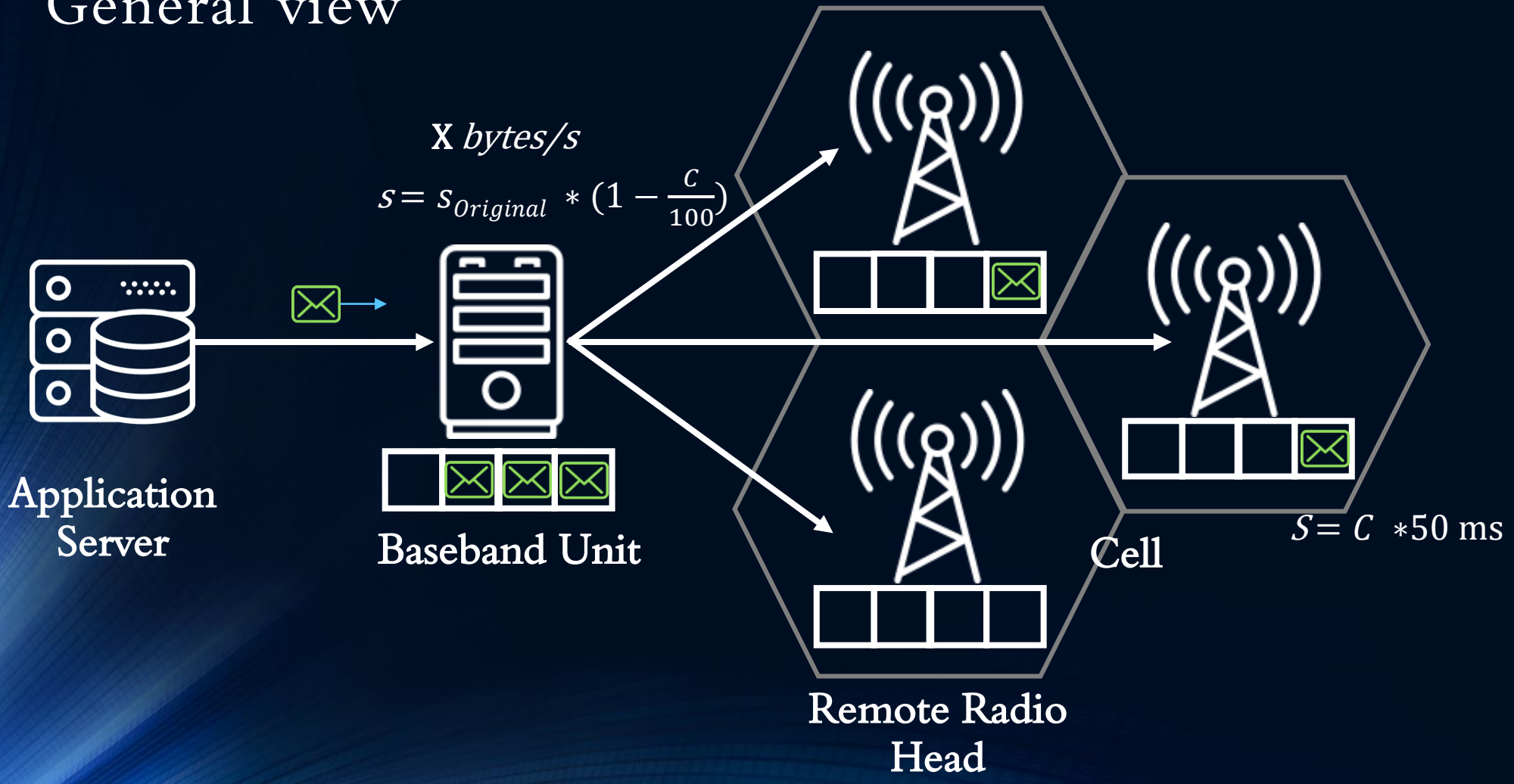
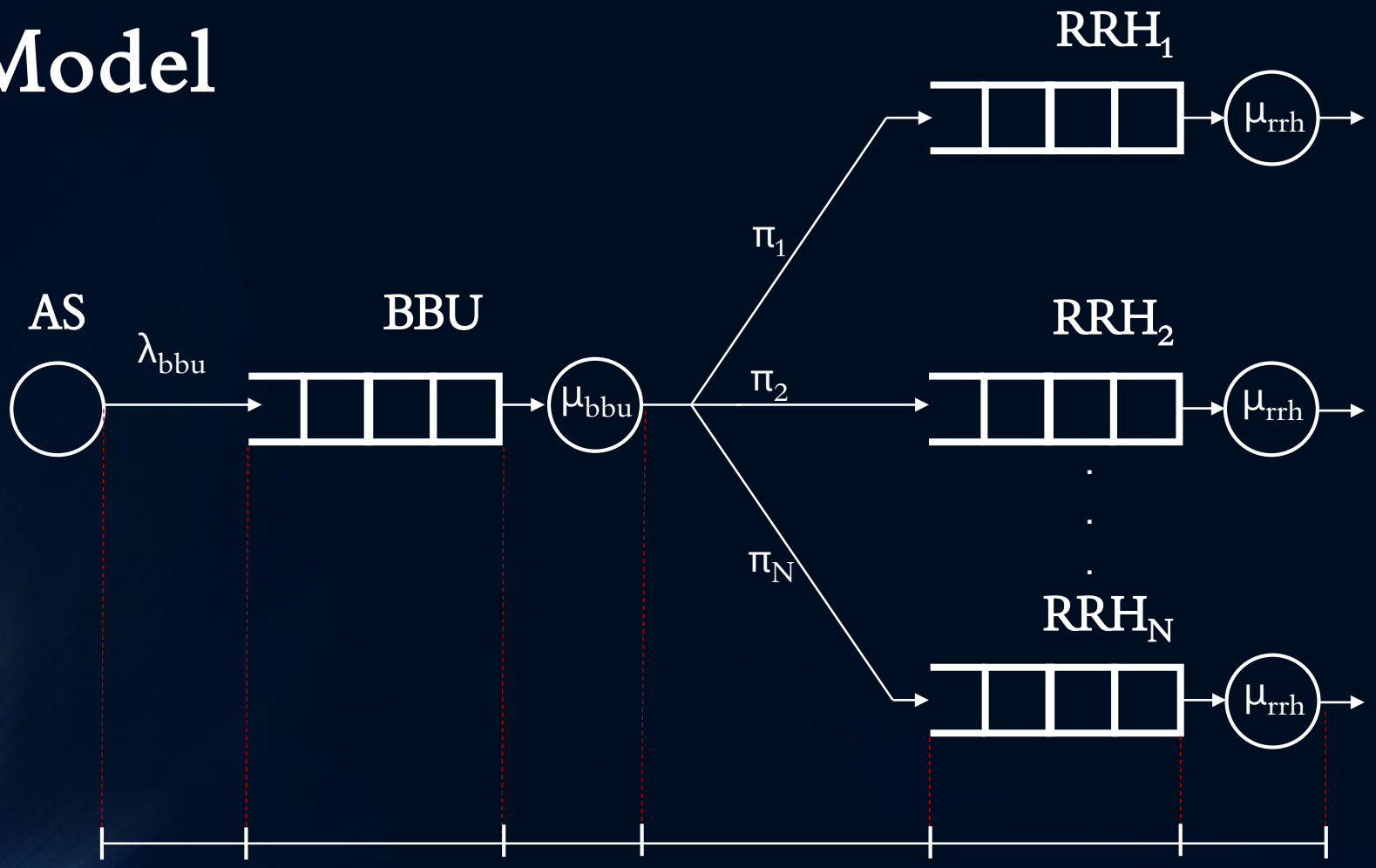


Description of the system

General view



Model



$$\textit{Negligible} + T_{waiting\_bbu} + T_{transmission} + \textit{Negligible} + T_{waiting\_rrh} + T_{decompression} = T_{Delay}$$

$$\frac{s}{X} \qquad C * 50\ ms$$

Stability Conditions:

Case A

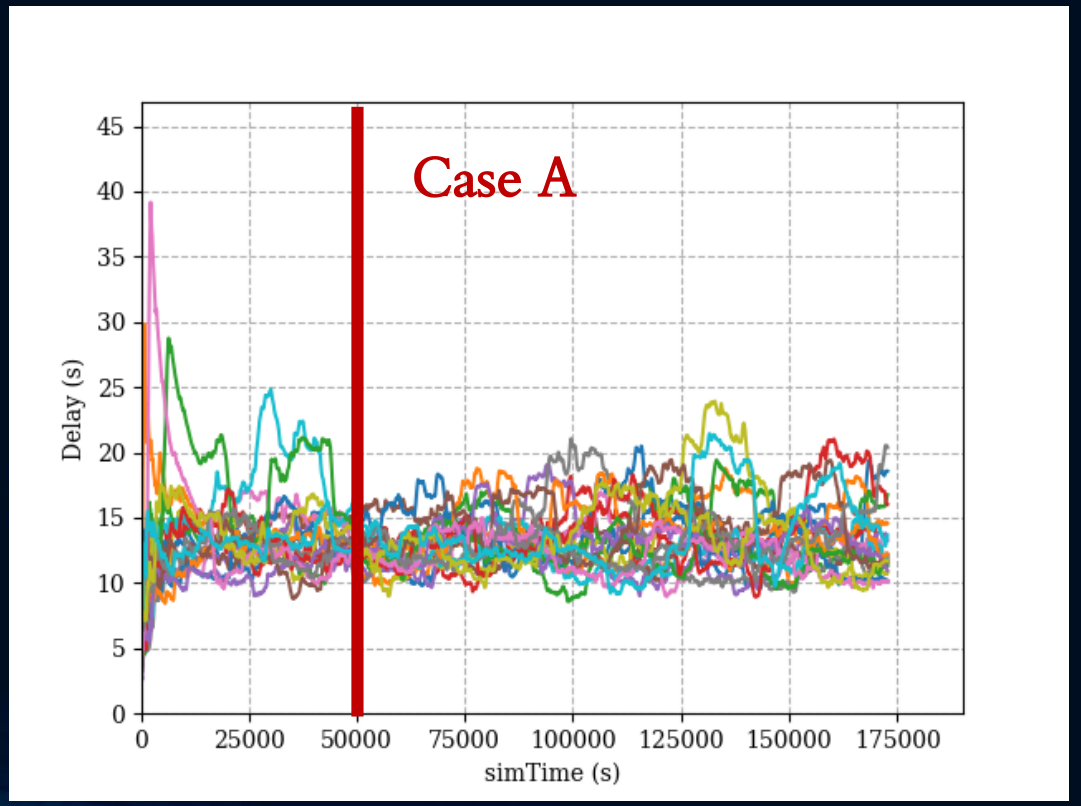
$$\rho_{bbu} = \frac{\lambda_{bbu}}{\mu_{bbu}} = \frac{s}{t \cdot X} < 1$$

Case B

$$\begin{cases} \rho_{bbu} = \dfrac{s}{t \cdot X} < 1 \\ \rho_{rrh} = \dfrac{C \cdot K}{t \cdot N} < 1 \end{cases}$$

The simulator has been verified through Valgrind and known-results simulations.

For the warm-up study:

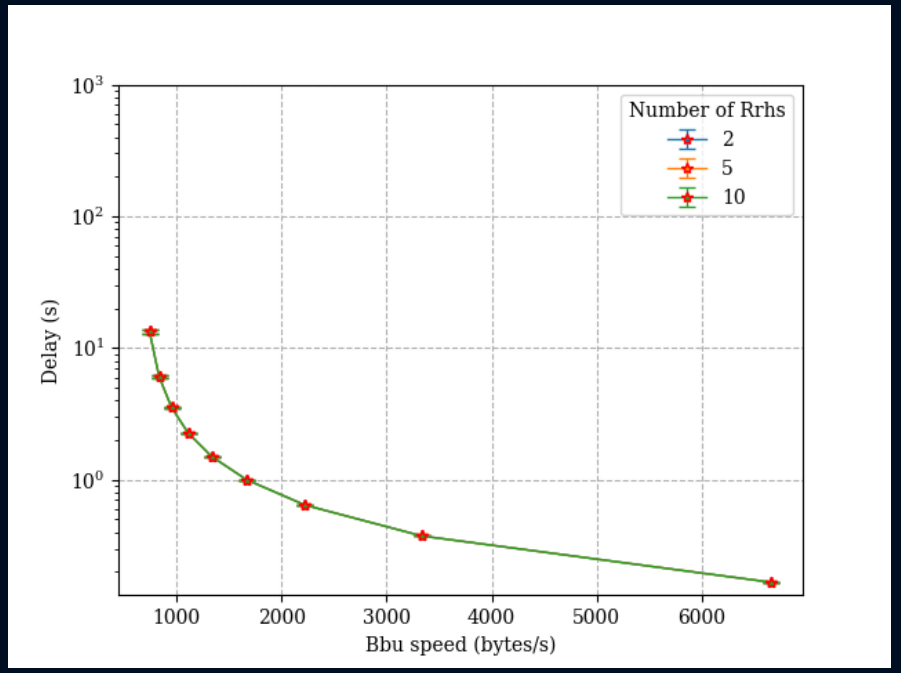


Case A

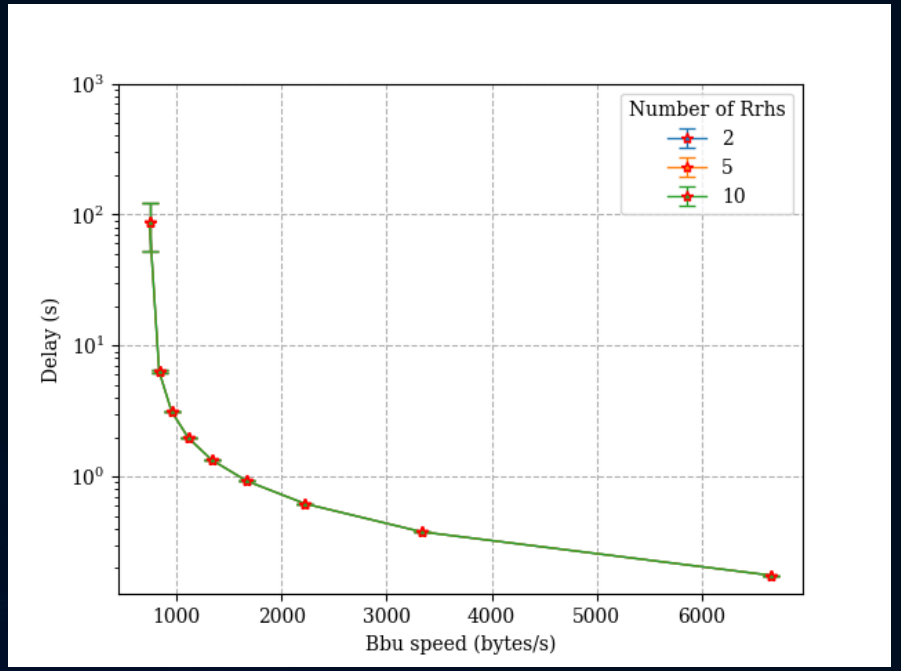
Factors:

- **N** : number of RRH, with values of 2, 5 and 10.
- **X** : transmission speed of the BBU, with values chosen accordingly with ρ_{bbu}

Exponential

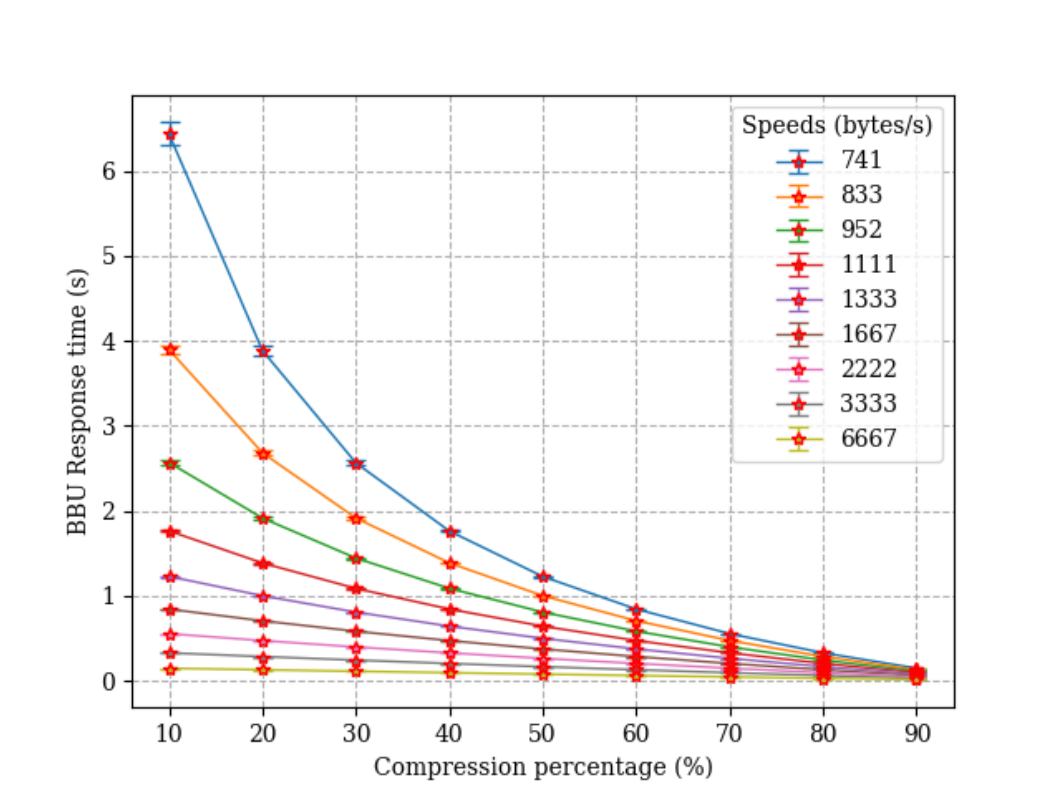


Lognormal

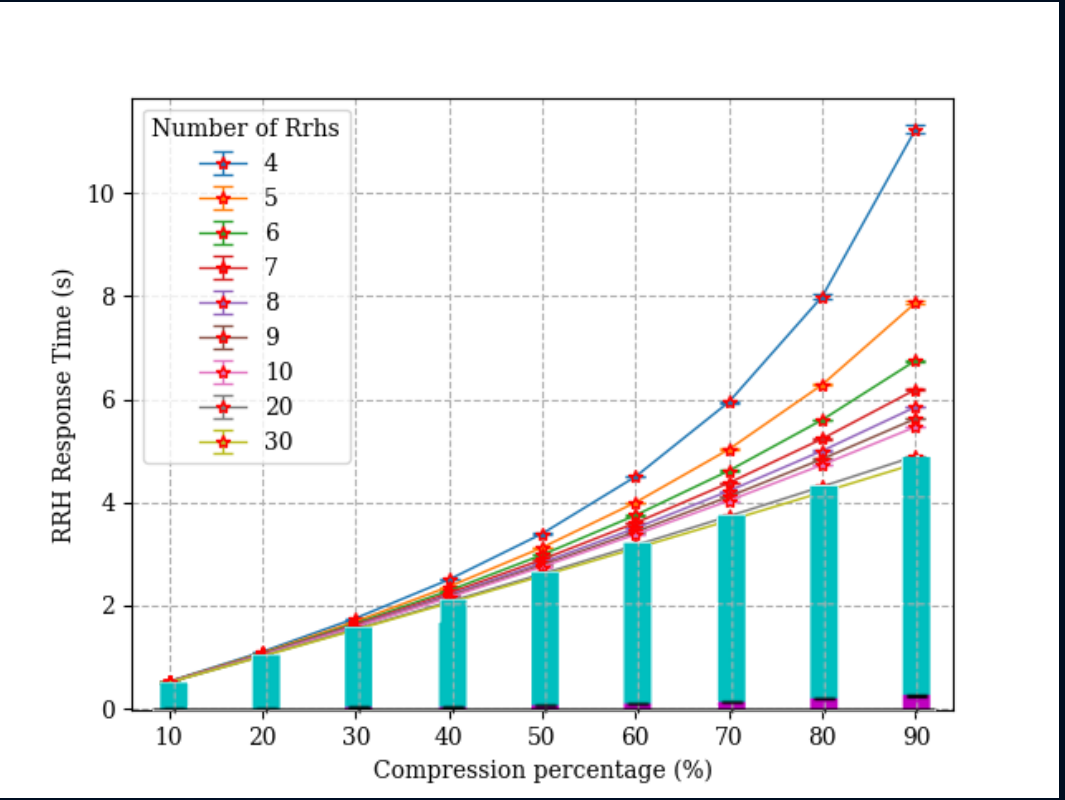


Case B - Exponential

By Burke's theorem: $E[R] = E[R]_{bbu} + E[R]_{rrh}$



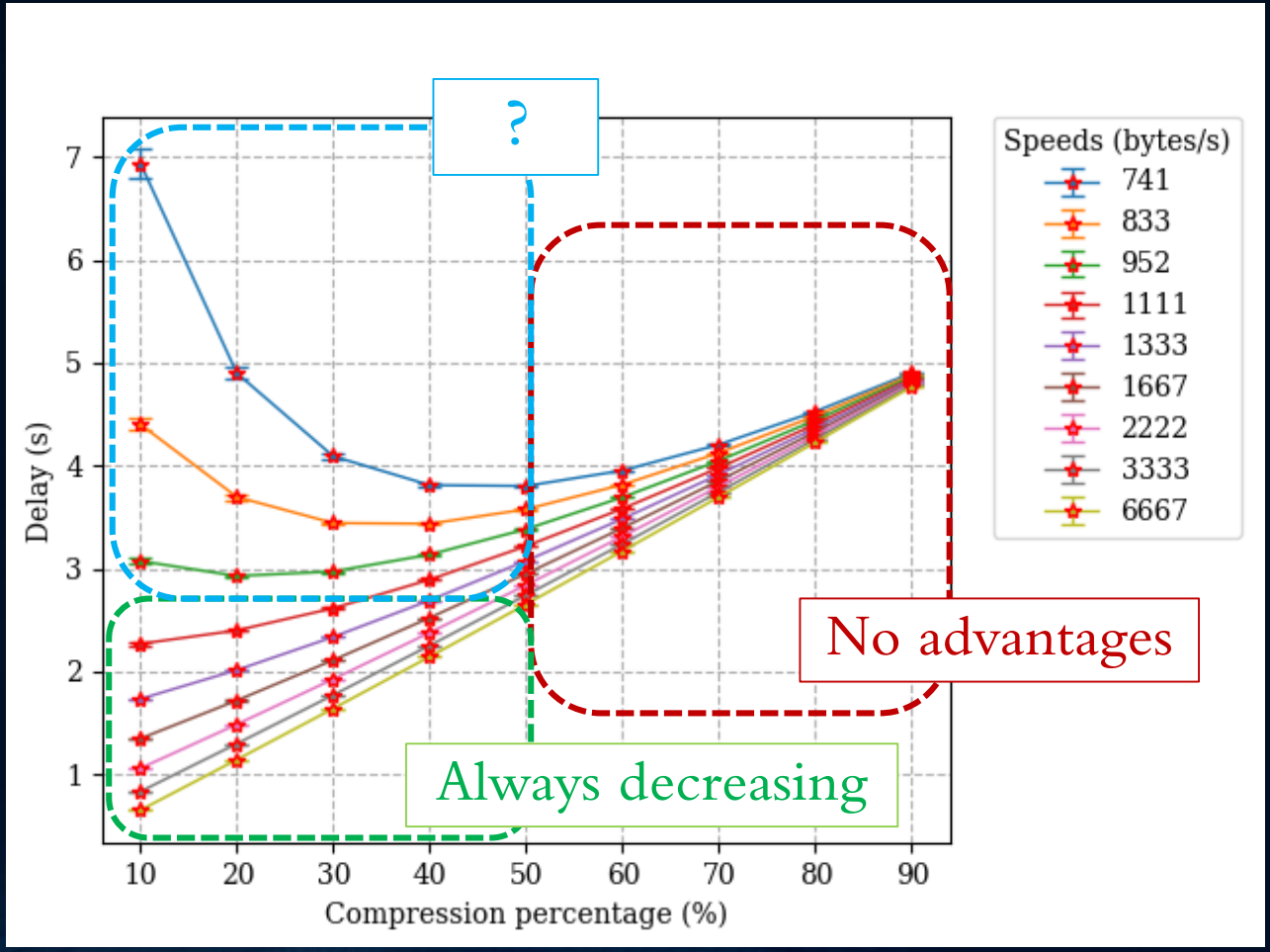
$E[R]_{bbu}$



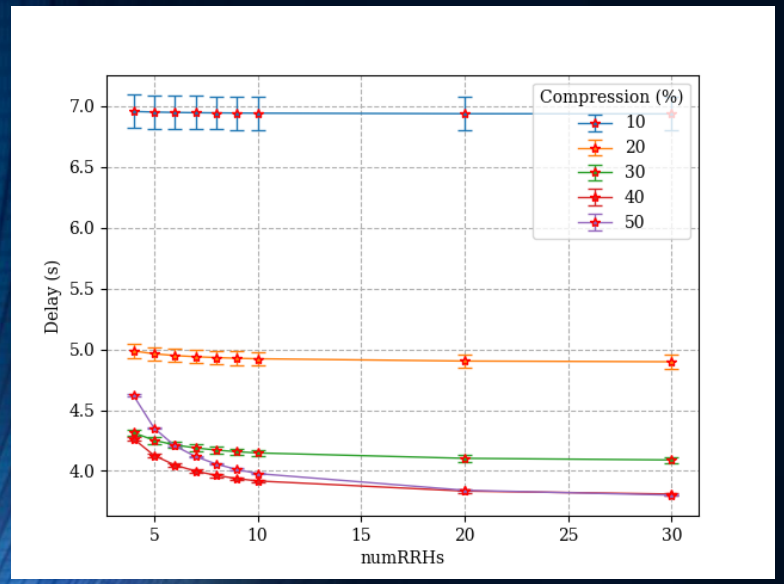
$E[R]_{rrh}$ ratio with 30 RRH

Case B - Exponential

Best scenario (N = 30)



Case B - Exponential



741 bytes/s

40%

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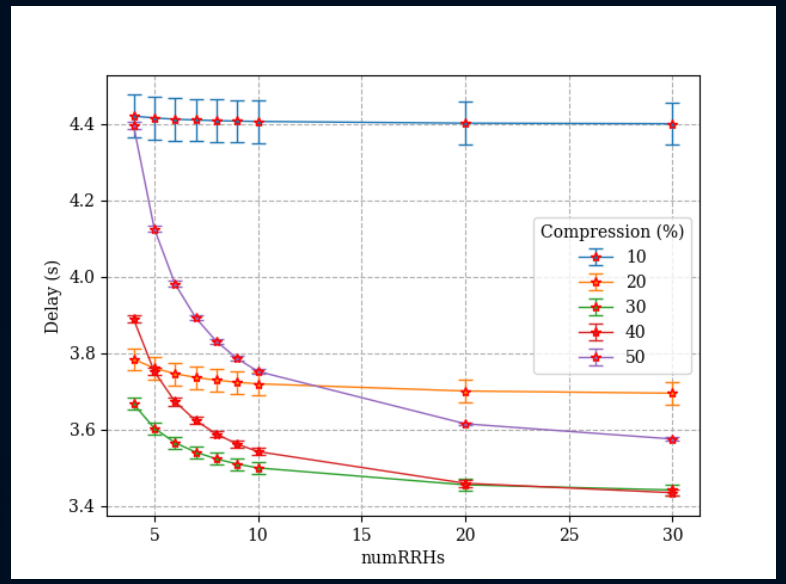

833 bytes/s

30%

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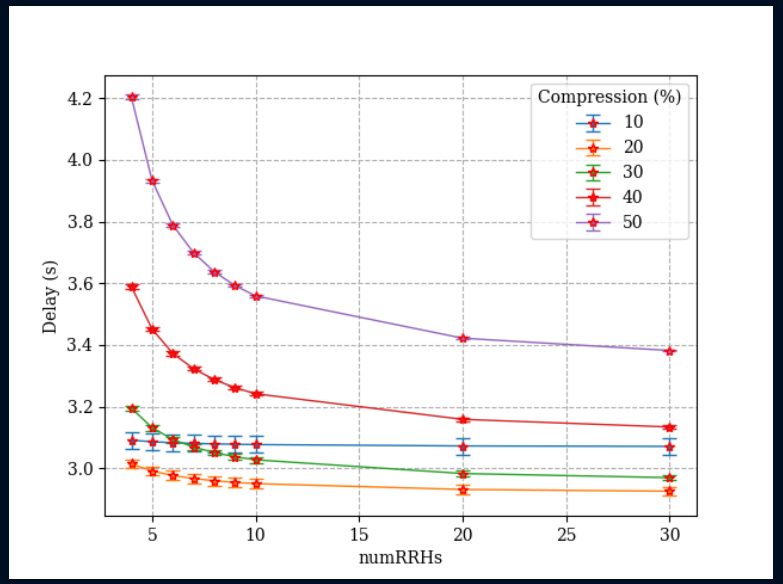
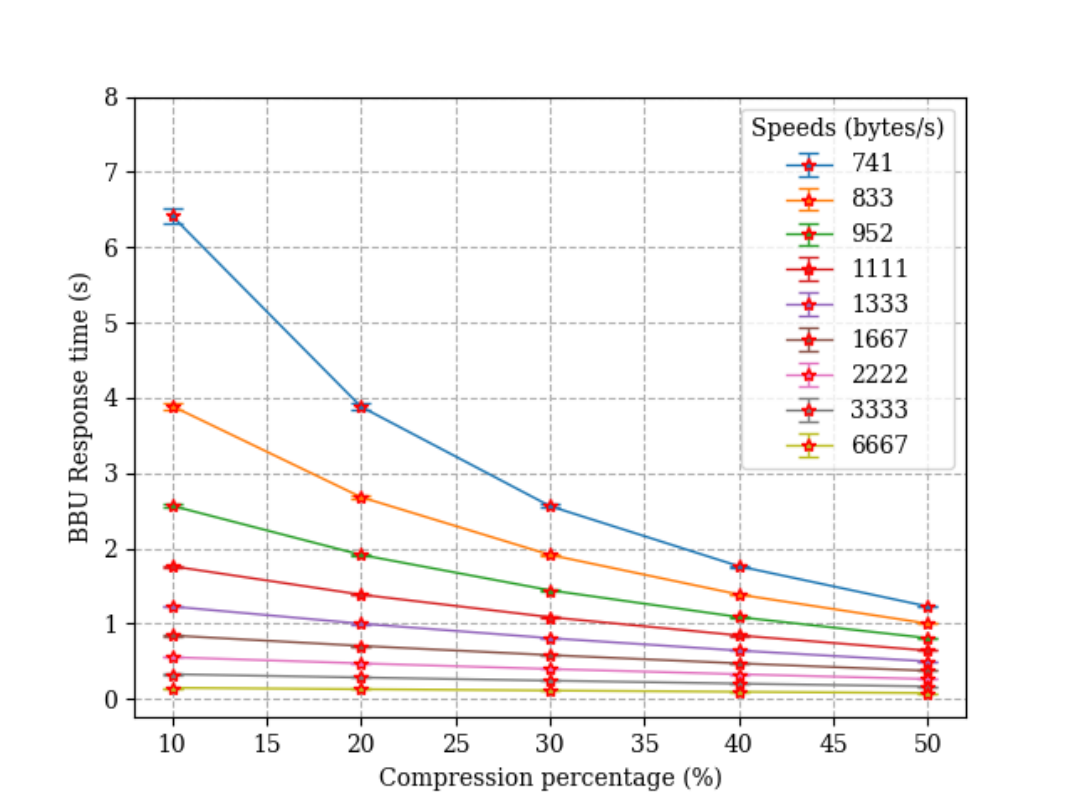


952 bytes/s

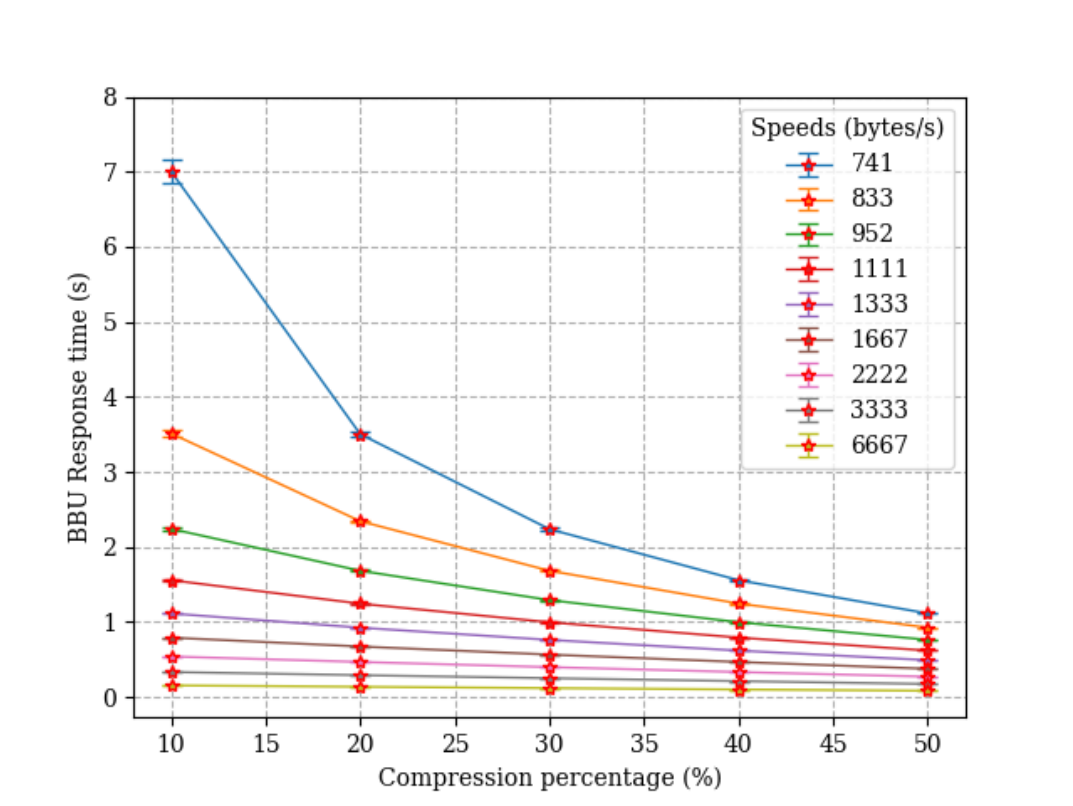
20%

Case B - Lognormal

Exponential:

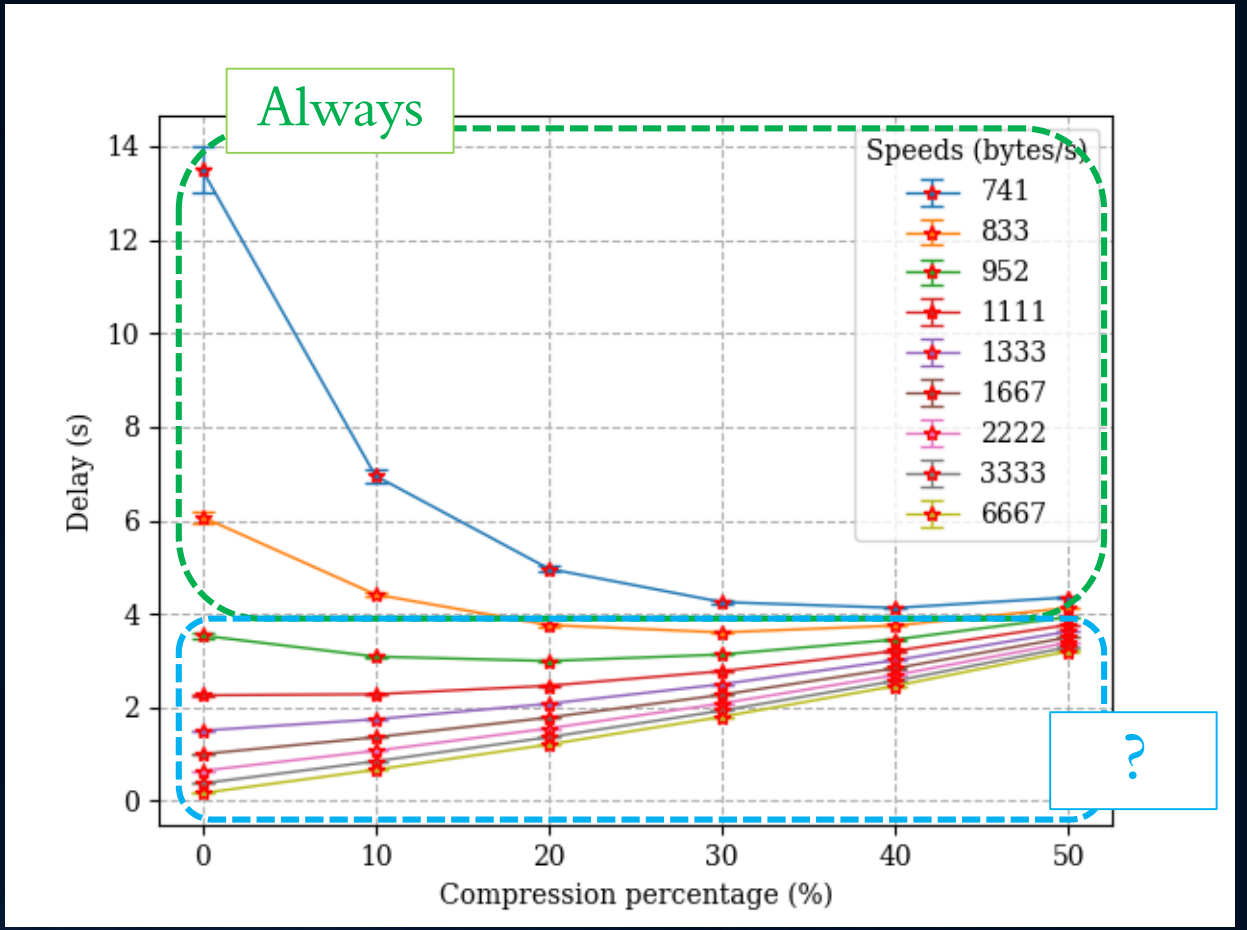


Lognormal:

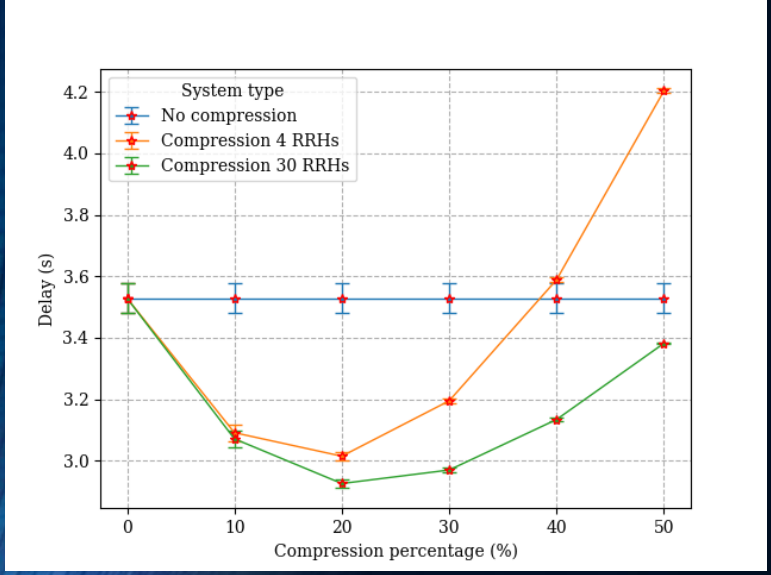


Comparison

Worst scenario (N = 4)

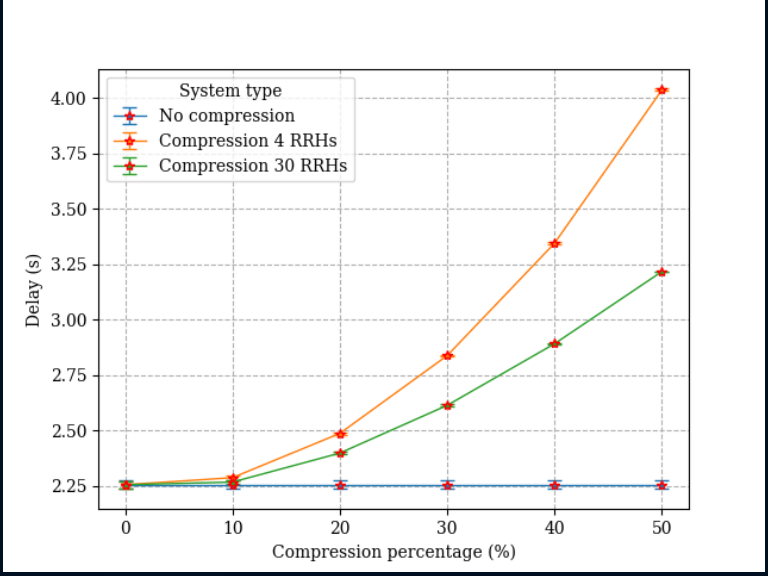


Comparison



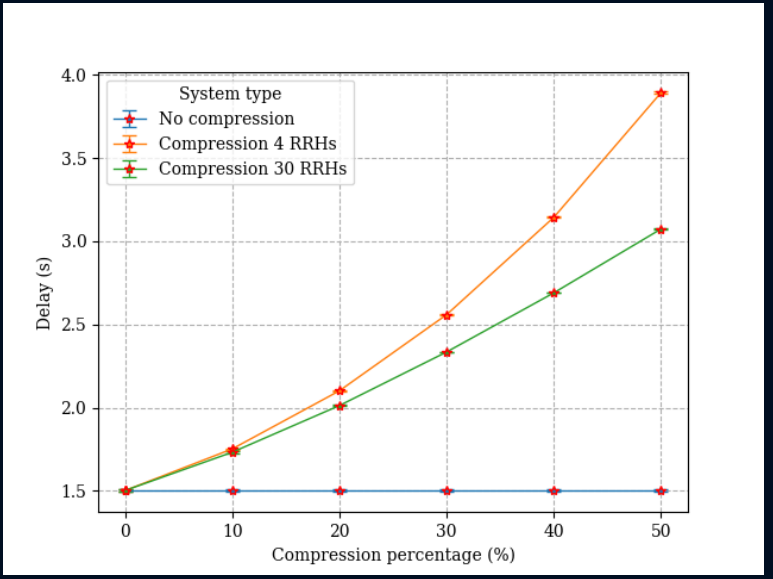
952 bytes/s

Yes



1111 bytes/s

?



1333 bytes/s

No

Conclusions

- Without compression → The system perfoms better increasing X
- With compression → High X: low compression regardless N
- With compression → Low X: ideal compression value taking into account N

When compression is convenient?

The benefits can be appreciated only at slow BBU transmission speeds