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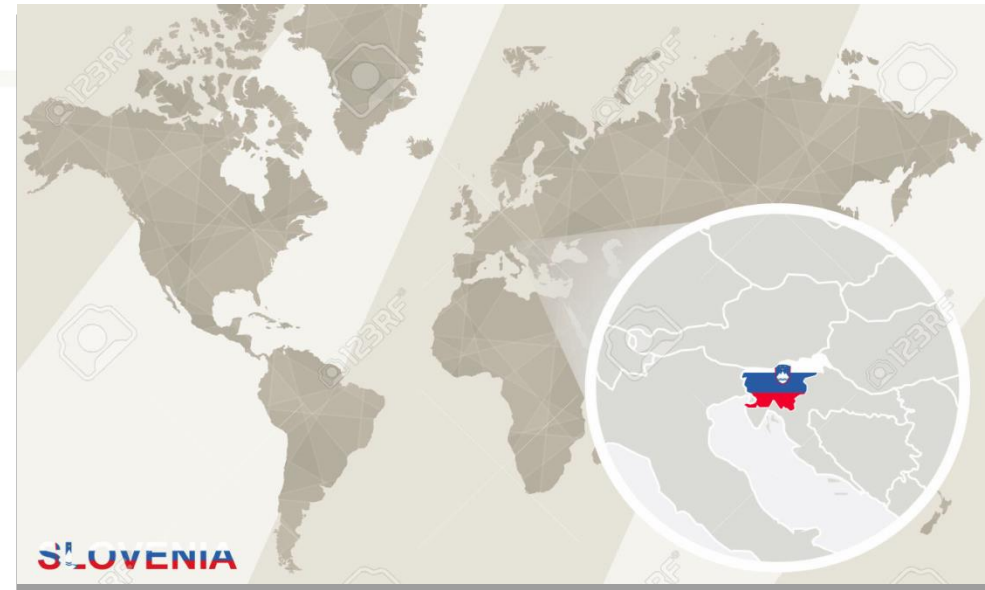
# Testing different genomic selection scenarios in a small cattle population by simulation

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# Introduction

- Small cattle populations
- Genomic selection not fully integrated
- Sustainable strategy to catch up with other populations?



# Aims

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- 1) Develop the simulator
- 2) Sire selection scenarios
- 3) Sire use strategies

# The simulator

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- Cattle population under selection
- Overlapping generation
- User-defined parameters
  - % selected, years in use, dosage, selection criterion ...
- Progeny and genomic testing (10K reference)
- Python wrapper around AlphaSim (Faux et al., 2012) and blupf90 (Miszta et al., 2002)

# Sire selection scenarios

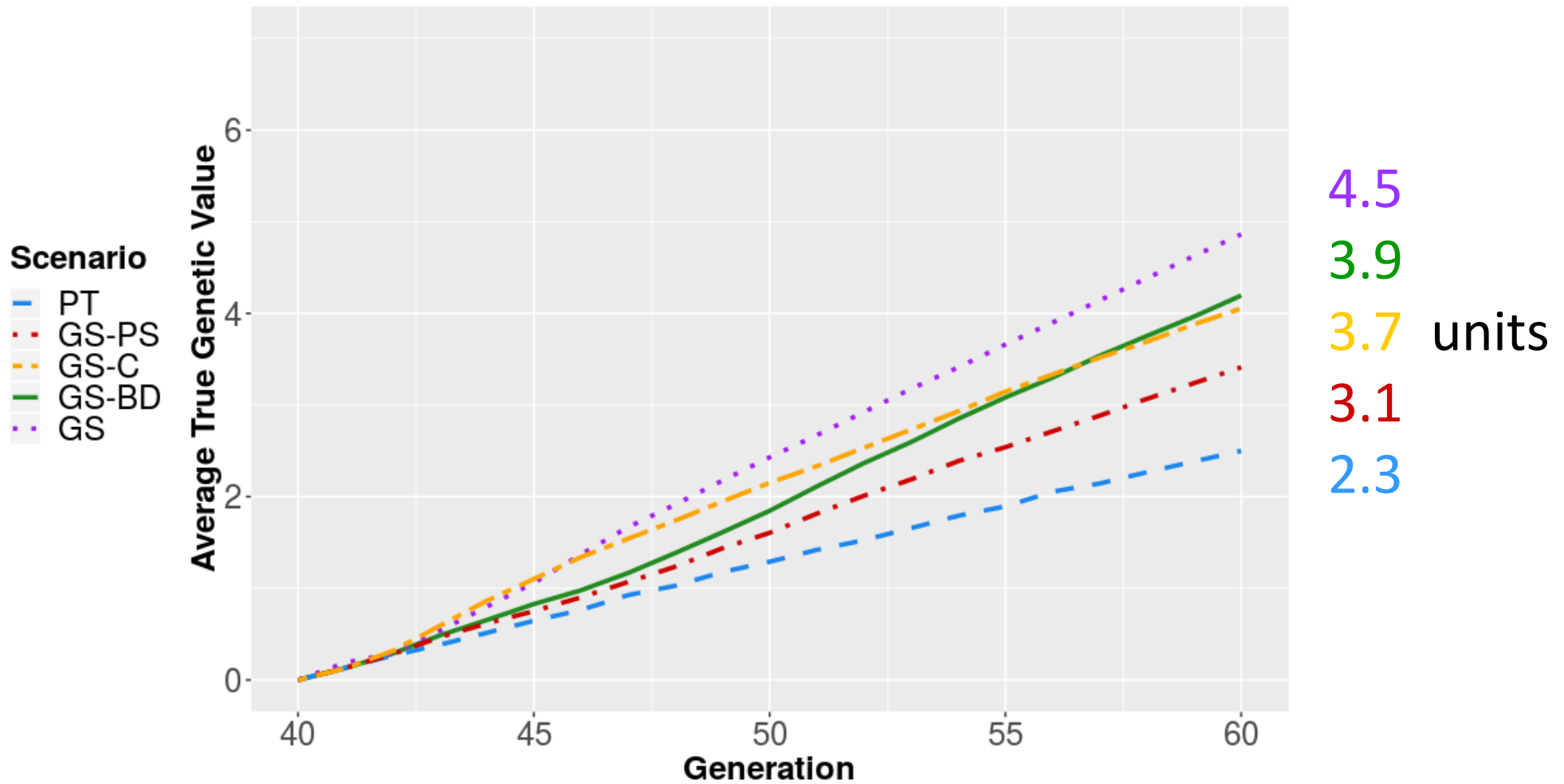
	SIRES OF SIRES	SIRES OF DAMS
PT		
GS-PS		
GS-C		
GS-BD		
GS		

Progeny testing  
- pre-selection on parent average

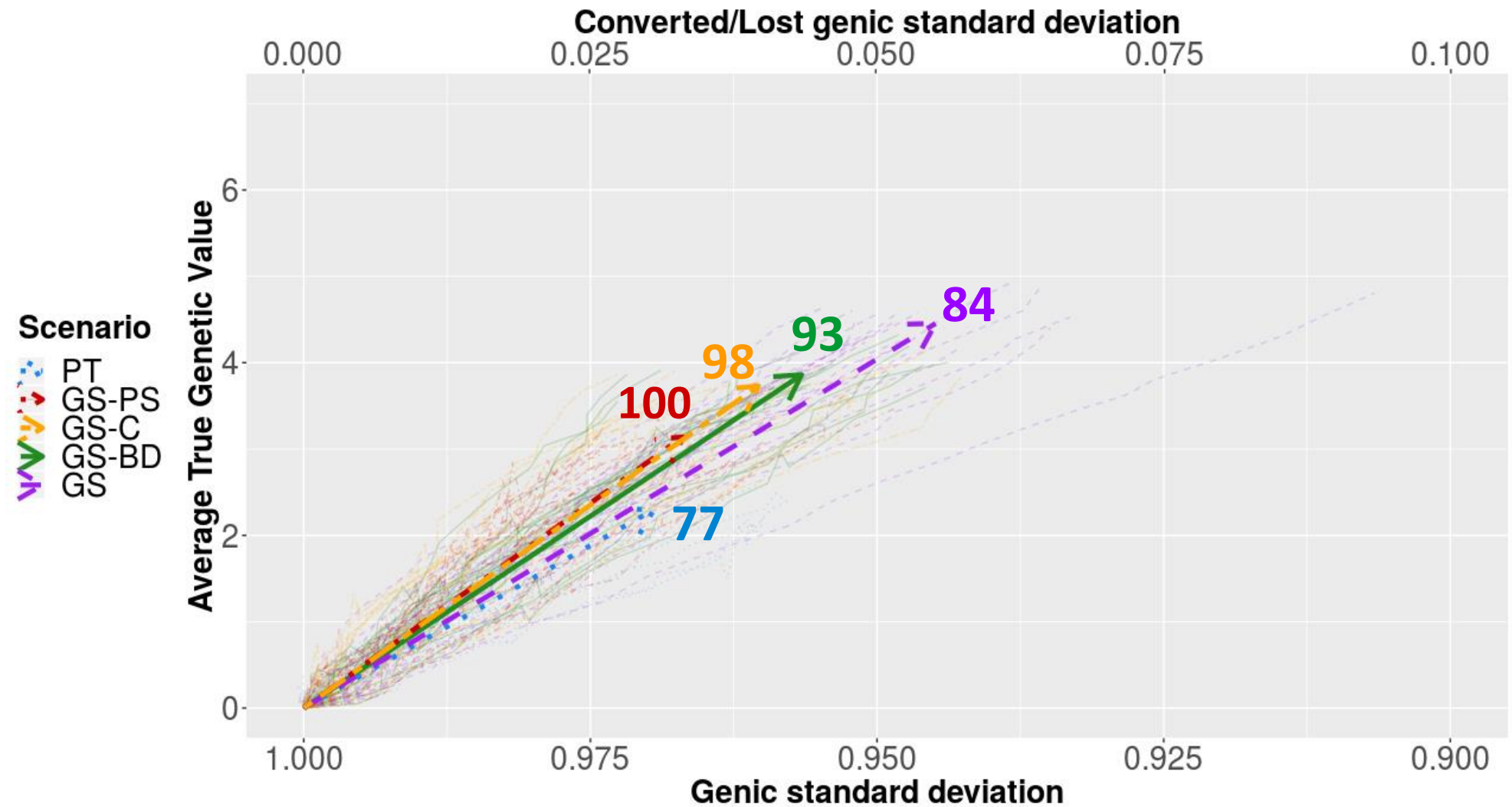
Progeny testing  
- pre-selection on gEBV

Genomic testing

# Genetic gain



# Selection efficiency



# Effective population size

	Genomic (via locus heterozygosity)			
	Pedigree	Neutral	Selection	QTN
PT	270	178	175	172
GS-PS	372	165	162	159
GS-C	330	134	132	129
GS-BD	267	122	121	119
GS	213	93	92	90



# Sire use strategy

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5 bulls / 5 years

PS  
GS-PS  
GS-C  
GS-BD  
GS

1 bull / 5 years

PS  
GS-PS  
GS-C  
GS-BD  
GS

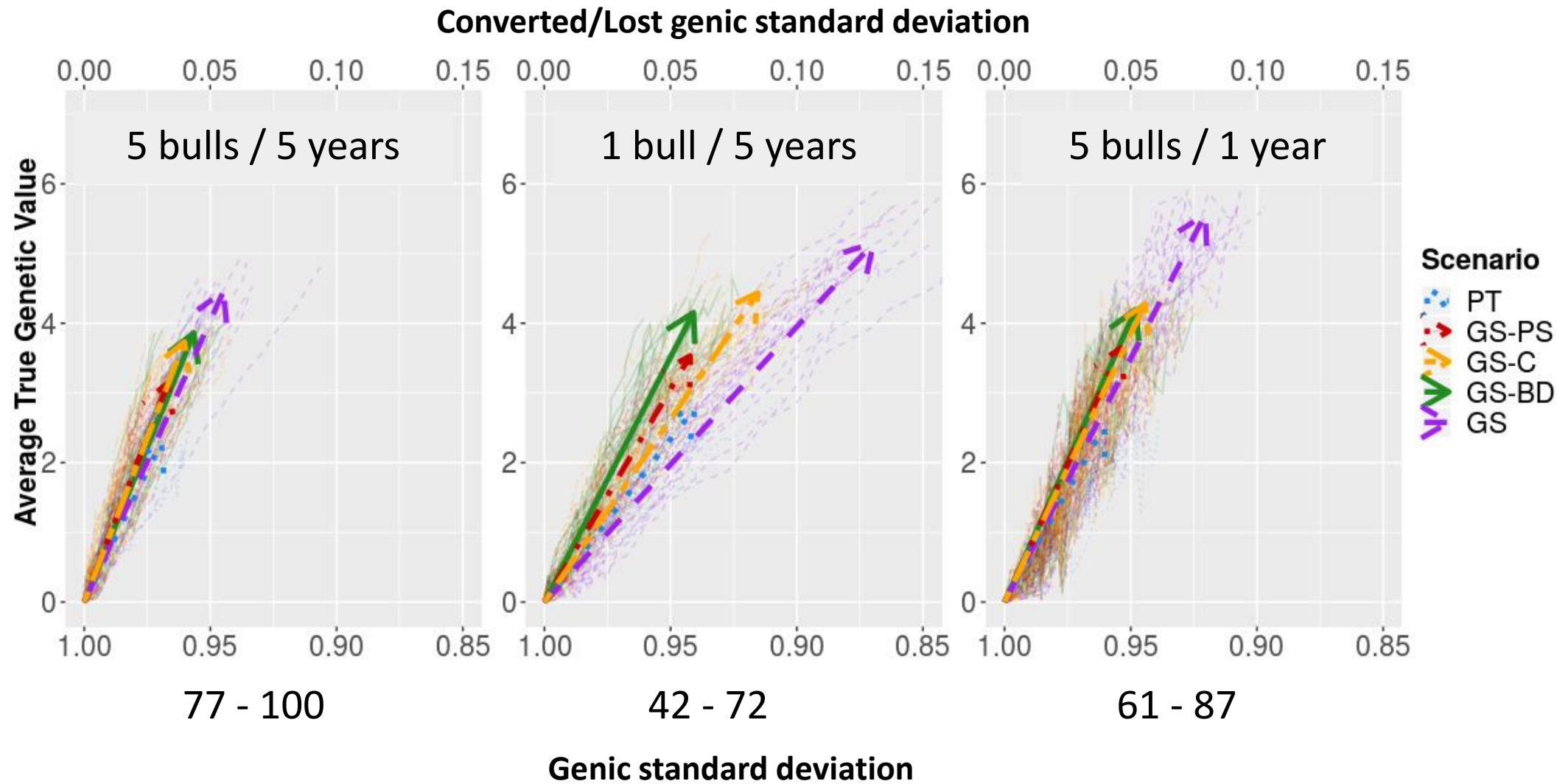
5 bulls / 1 year

PS  
GS-PS  
GS-C  
GS-BD  
GS

## Genetic gain of the tested scenarios in the last generation.

	5 bulls / 5 years	1 bull / 5 years	5 bulls / 1 year
PT	100%	121%	110%
GS-PS	136%	153%	159%
GS-C	162%	193%	186%
GS-BD	168%	181%	182%
GS	<b>194%</b>	<b>224%</b>	<b>242%</b>

# Efficiency of the tested scenarios in the last generation.



Effective population size (genomic) of the tested scenarios in the last generation.

	5 bulls / 5 years	1 bull / 5 years	5 bulls / 1 year
PT	175	98	186
GS-PS	162	101	149
GS-C	131	65	126
GS-BD	120	96	113
GS	91	38	73

# Conclusions

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- Developed a realistic cattle breeding simulator
- Sire selection scenarios
  - Genetic gain increases with genomics and reduced interval
  - Hybrid scenarios the most efficient
  - Use of genomics and increased intensity reduce  $N_e$
- Sire use strategies
  - Very high intensity obviously not recommended
  - Rapid turn-over of bulls increases gain and only slightly decreases efficiency and  $N_e$

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