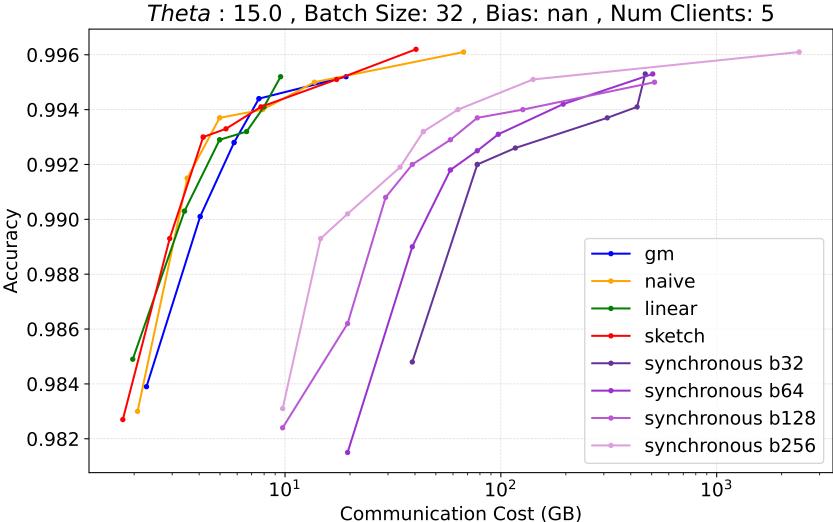
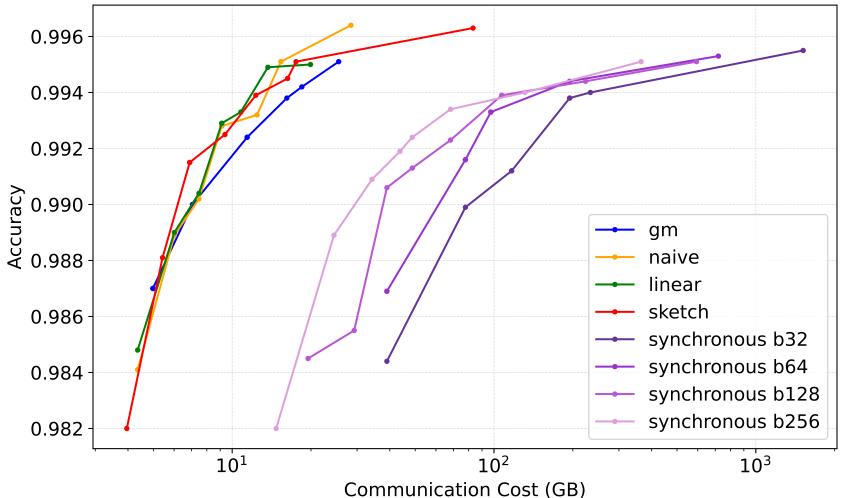
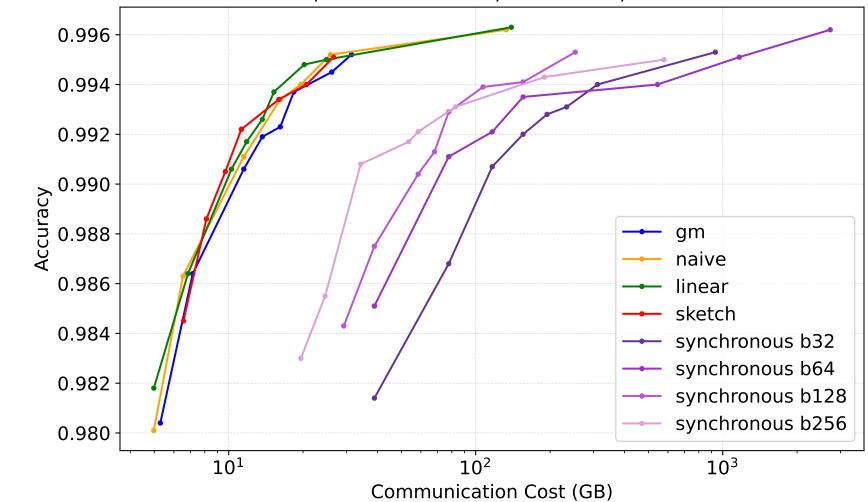
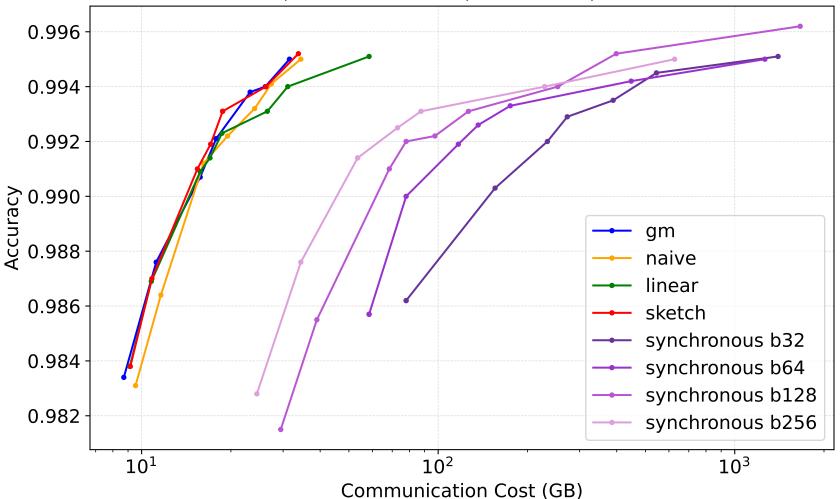
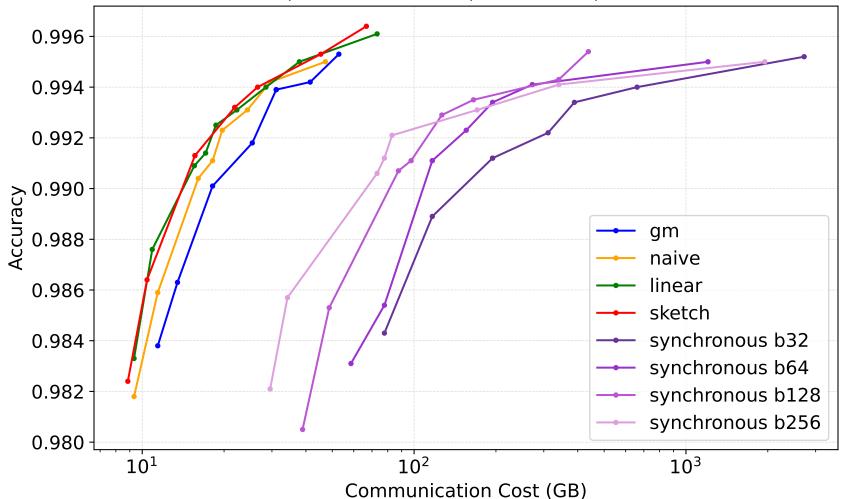
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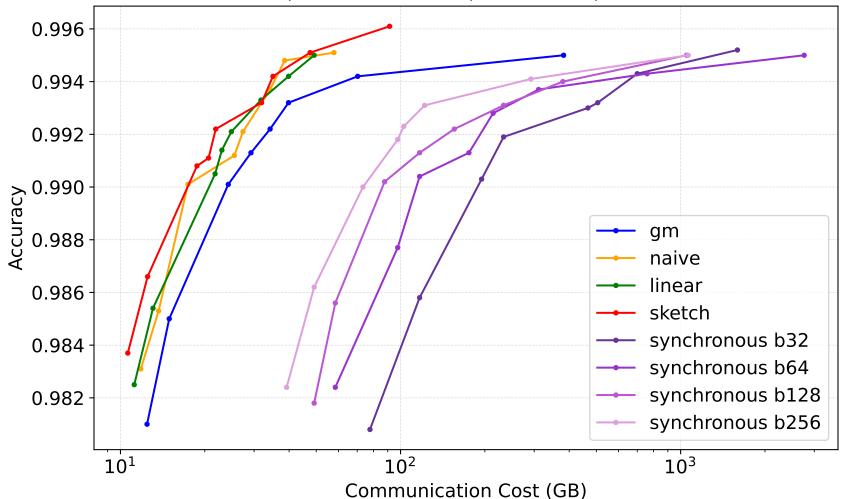


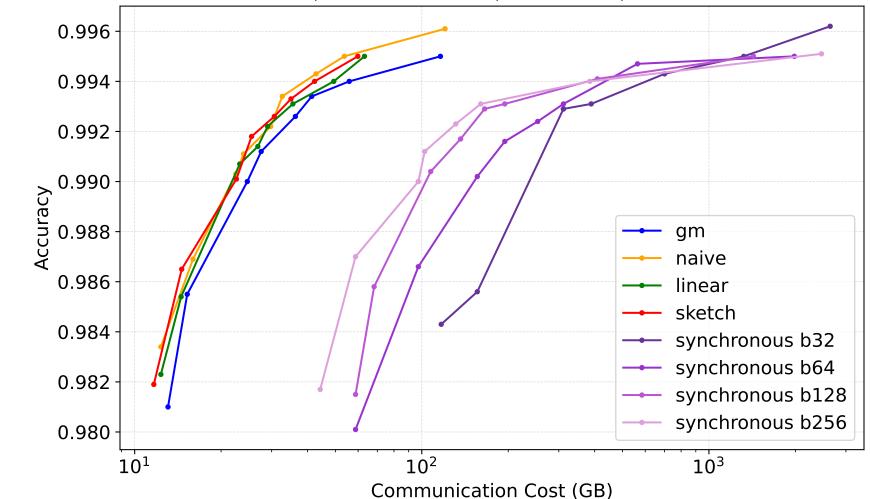




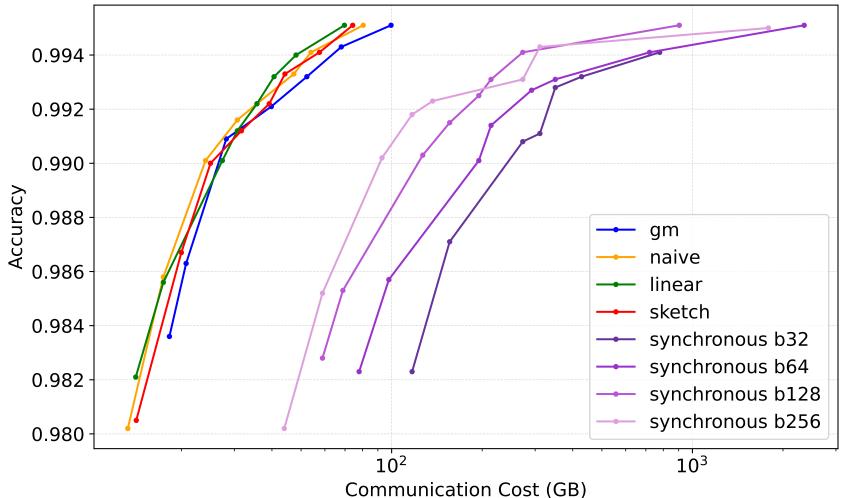


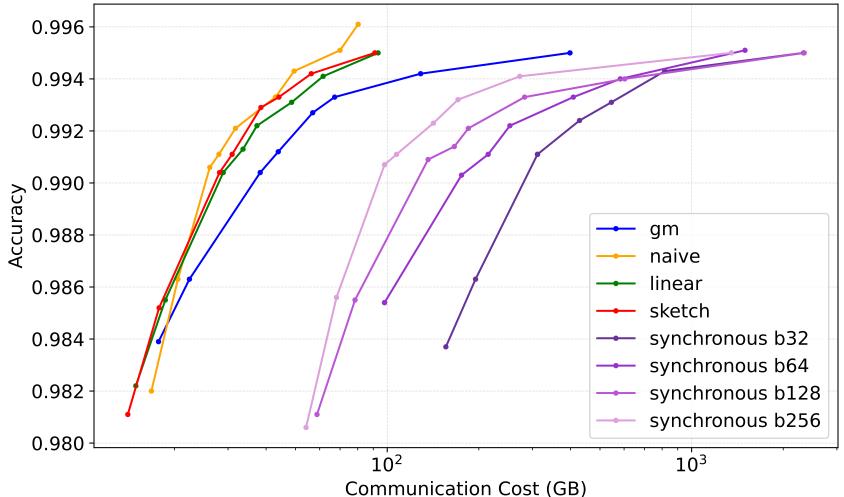


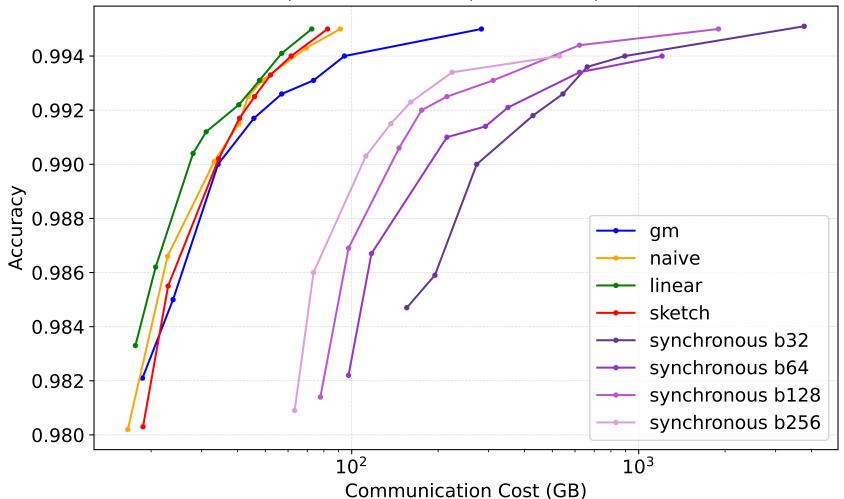




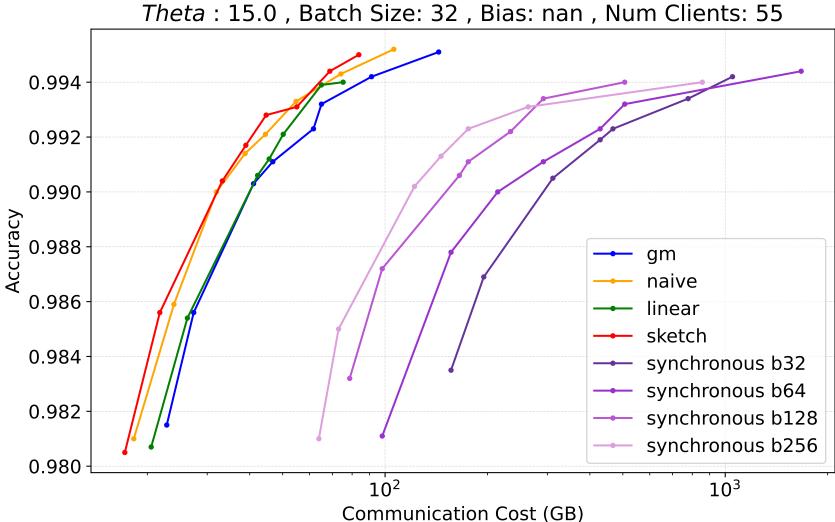
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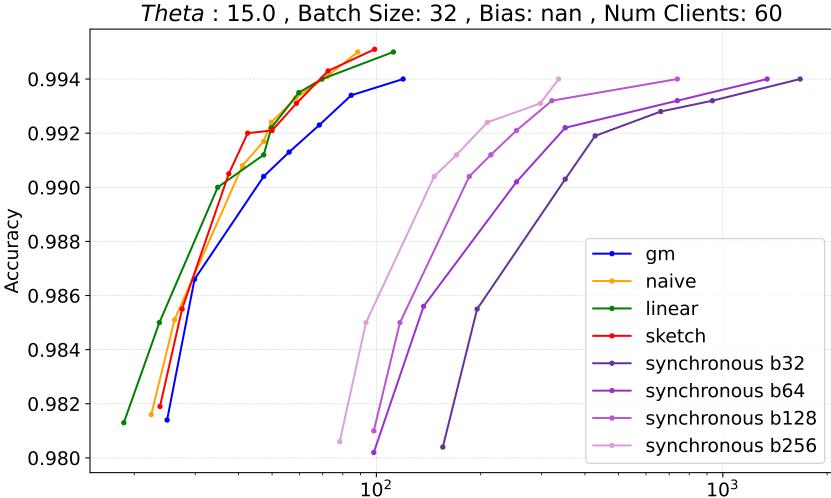




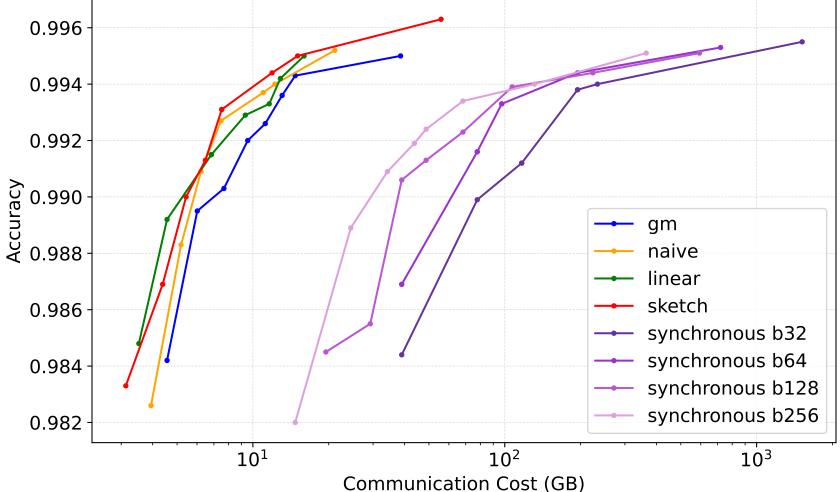
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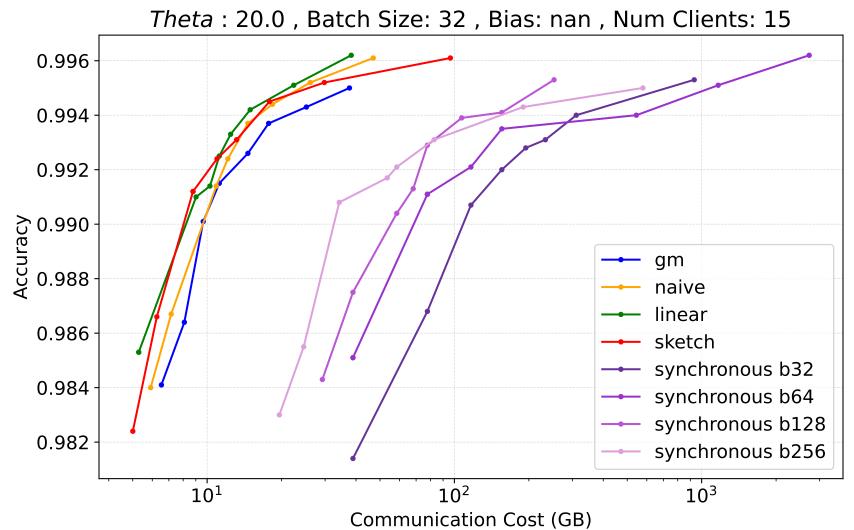


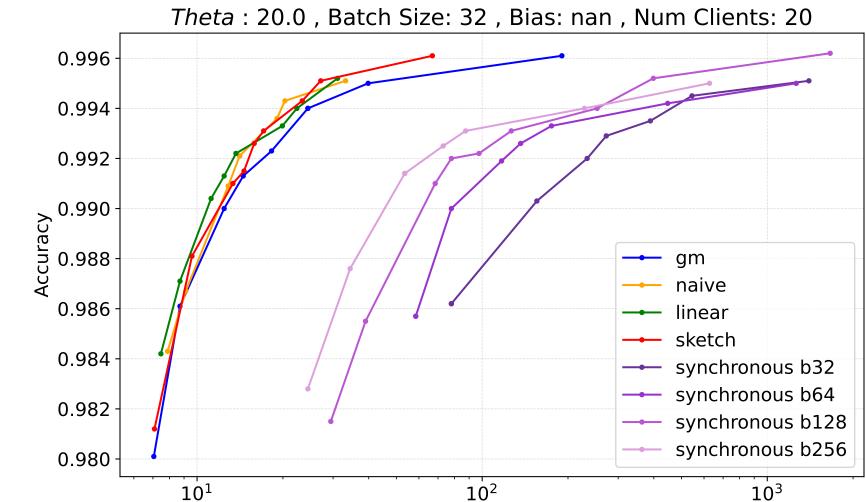
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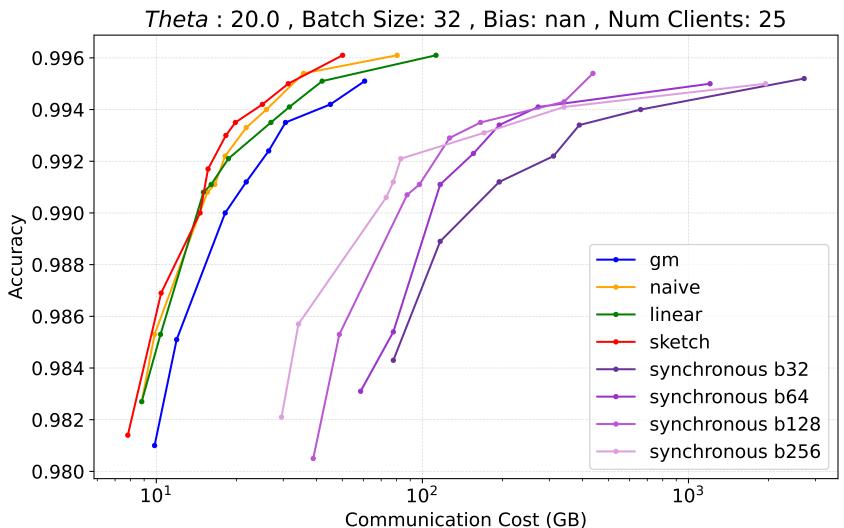
Communication Cost (GB)

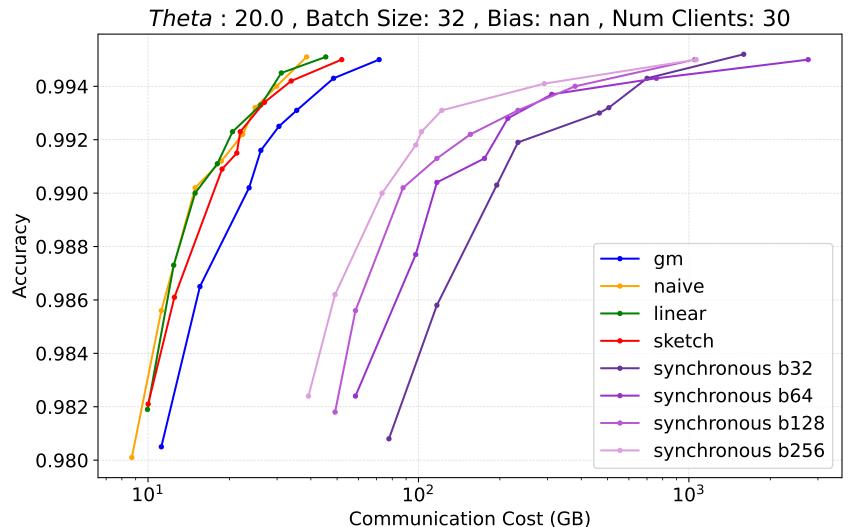


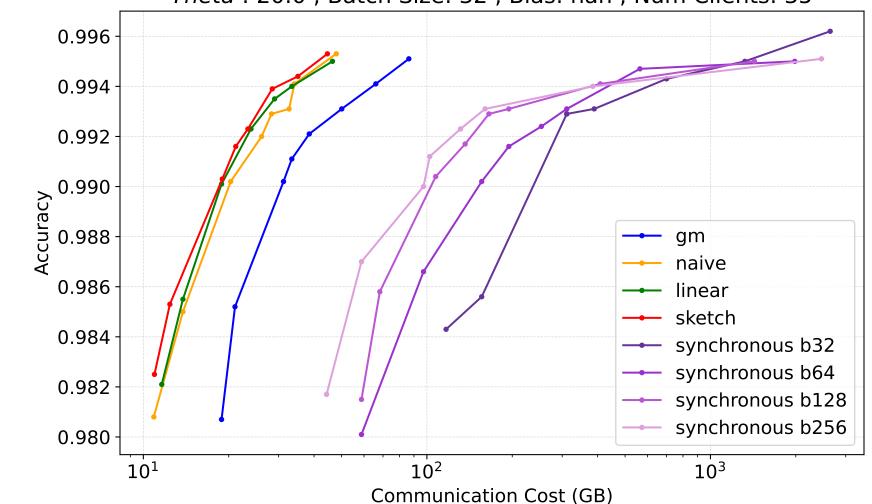


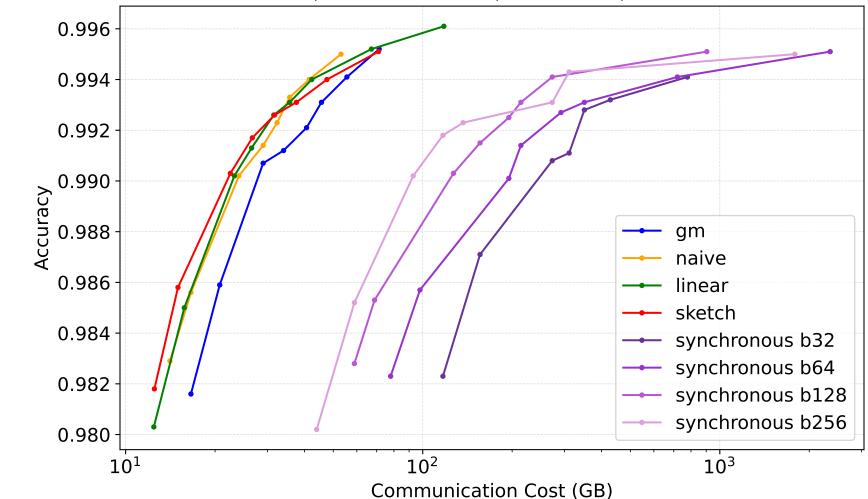


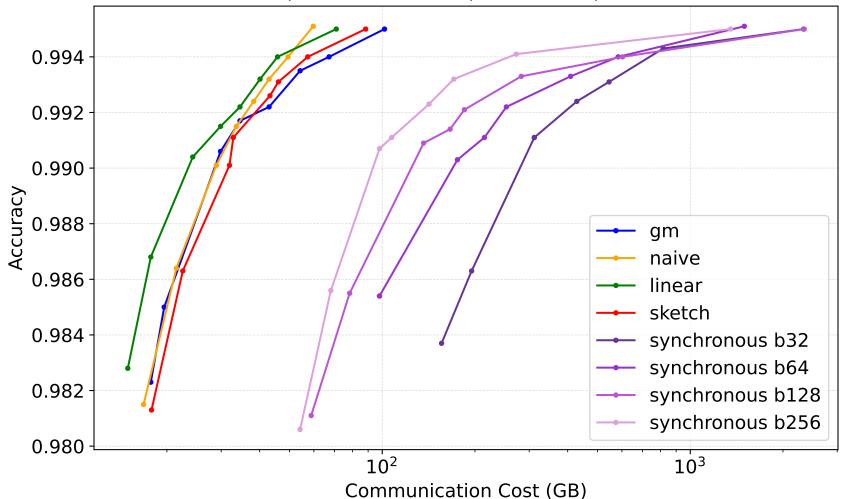
Communication Cost (GB)

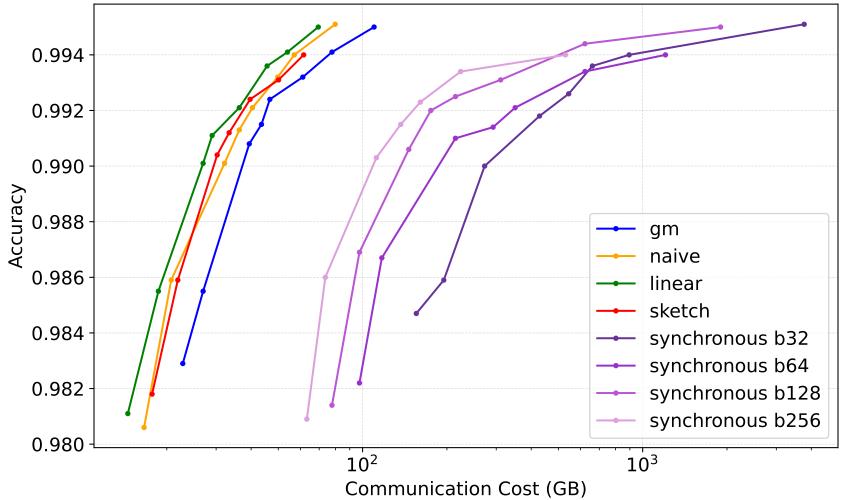


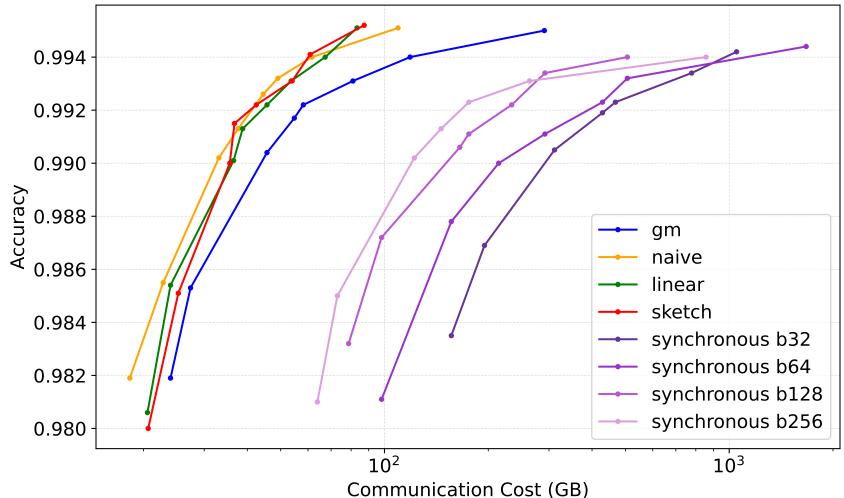


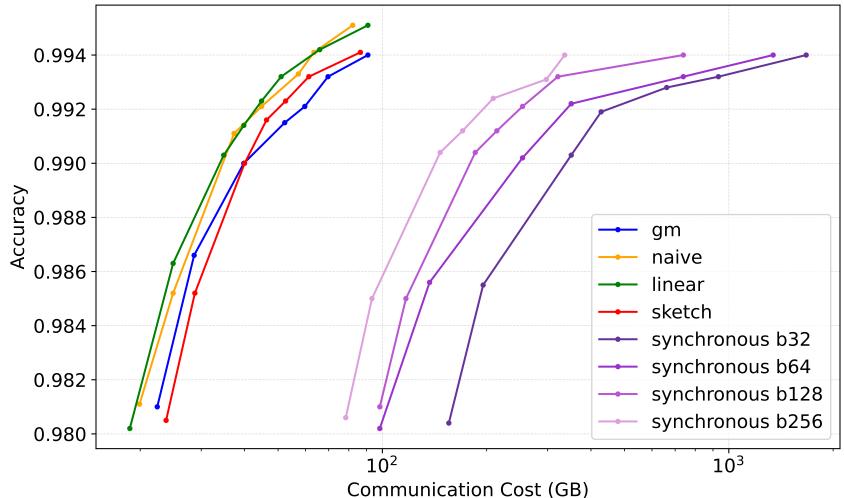




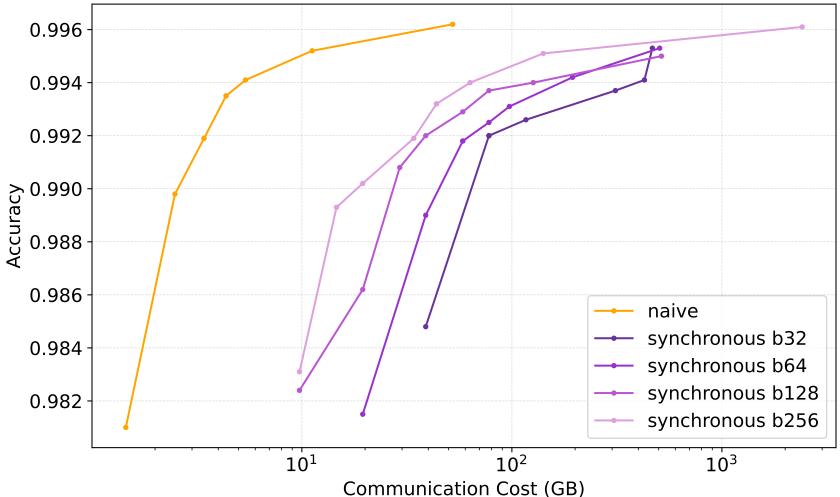


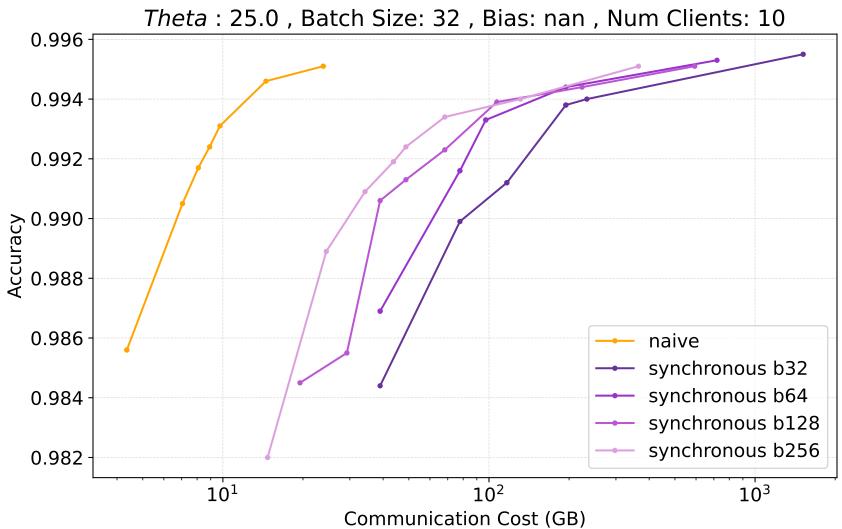


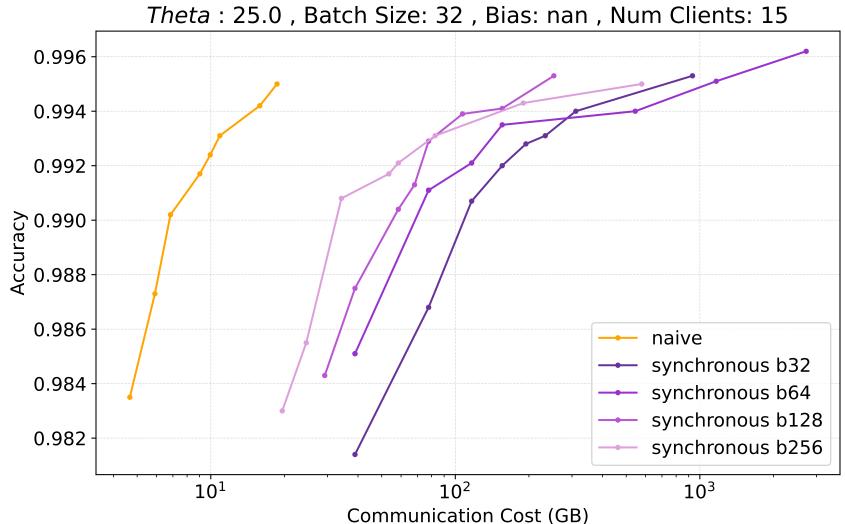


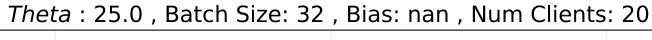


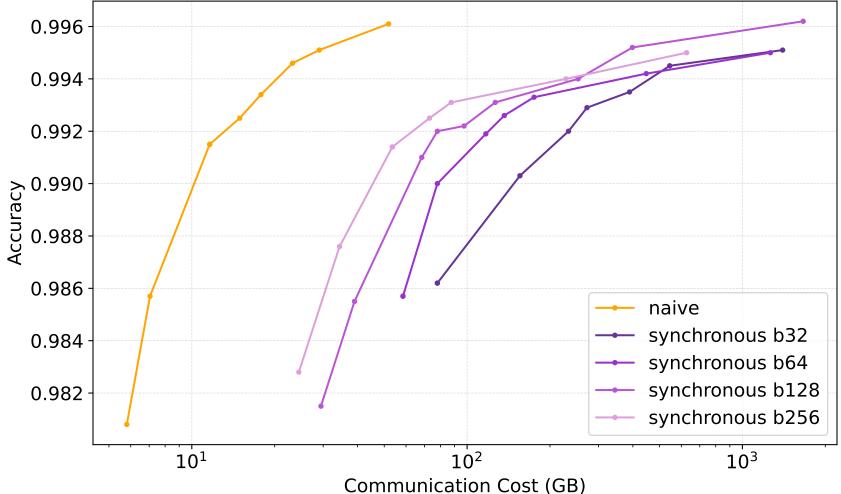
synchronous





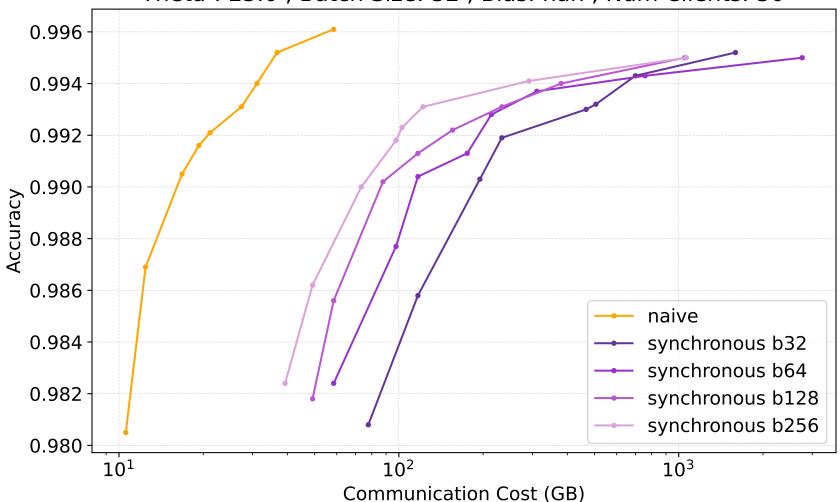


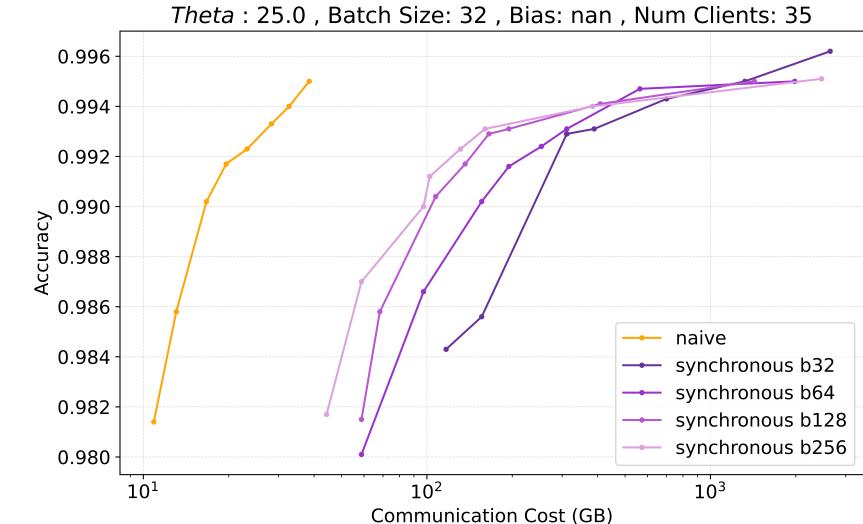


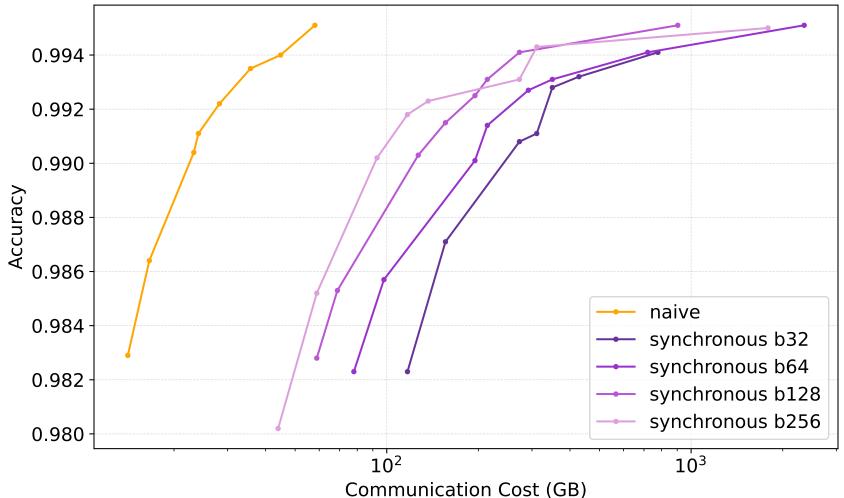


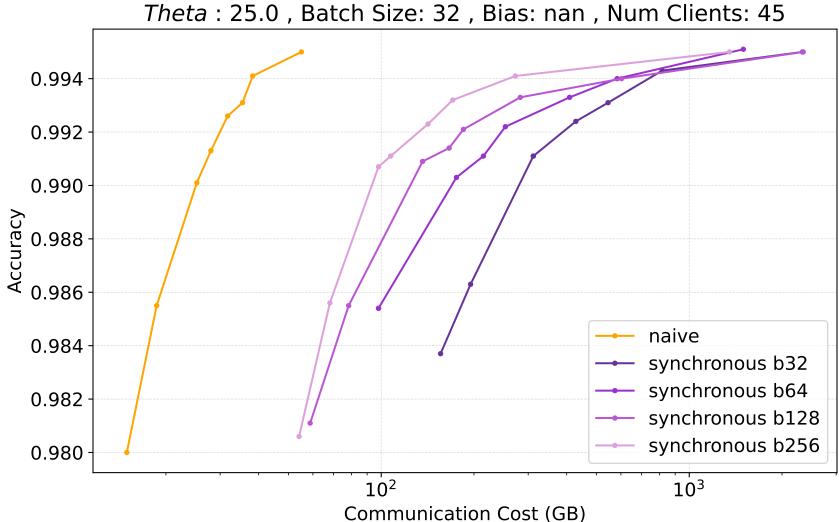
synchronous Theta: 25.0, Batch Size: 32, Bias: nan, Num Clients: 25 0.996 0.994 0.992 0.990 Accuracy 0.988 0.986 naive 0.984 synchronous b32 synchronous b64 0.982synchronous b128 synchronous b256 0.980 10<sup>3</sup>  $10^{1}$  $10^2$ 

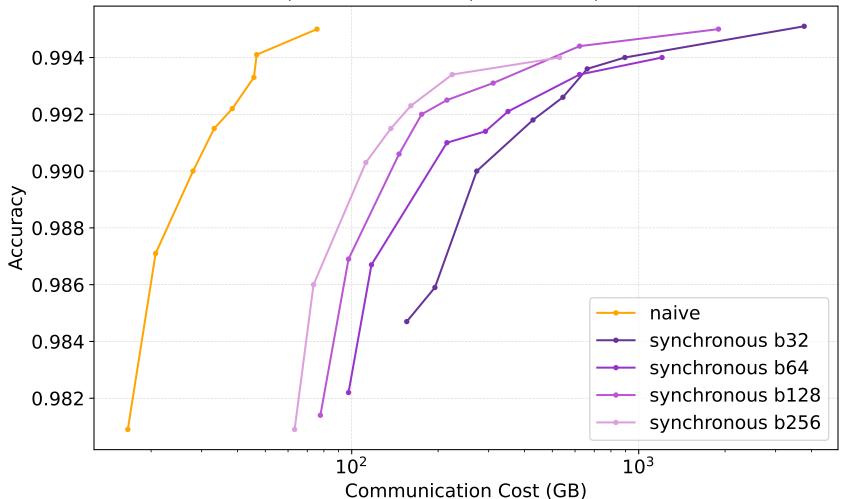
Communication Cost (GB)

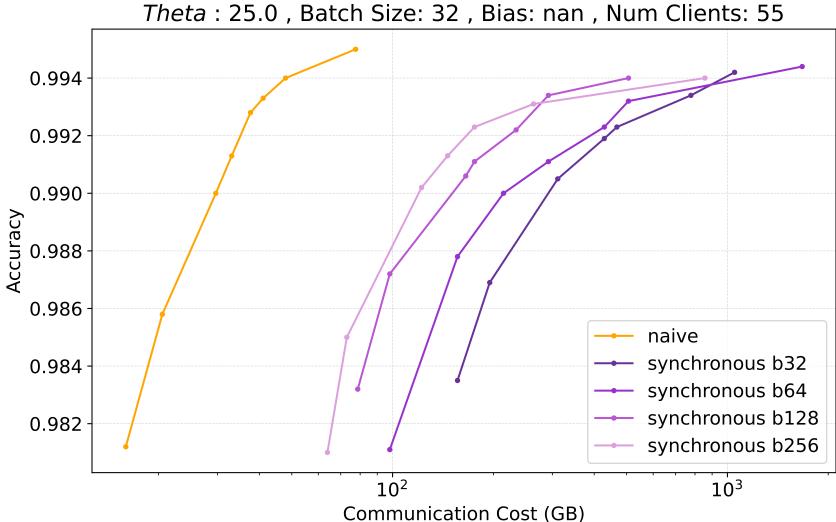


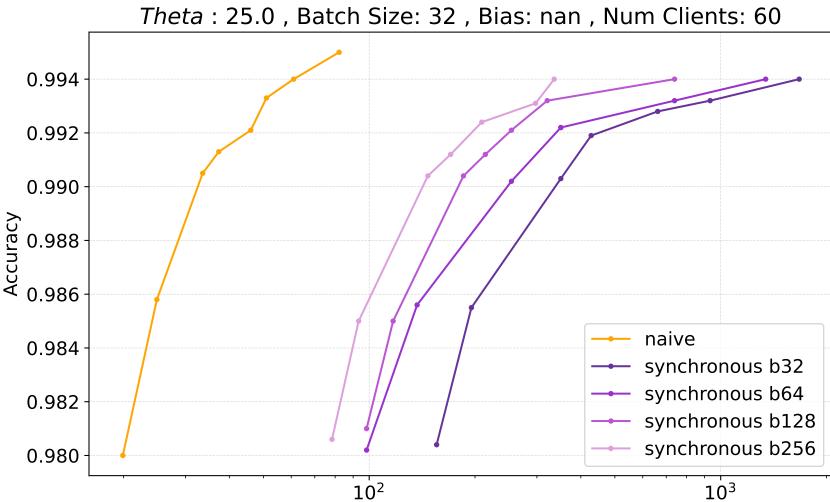




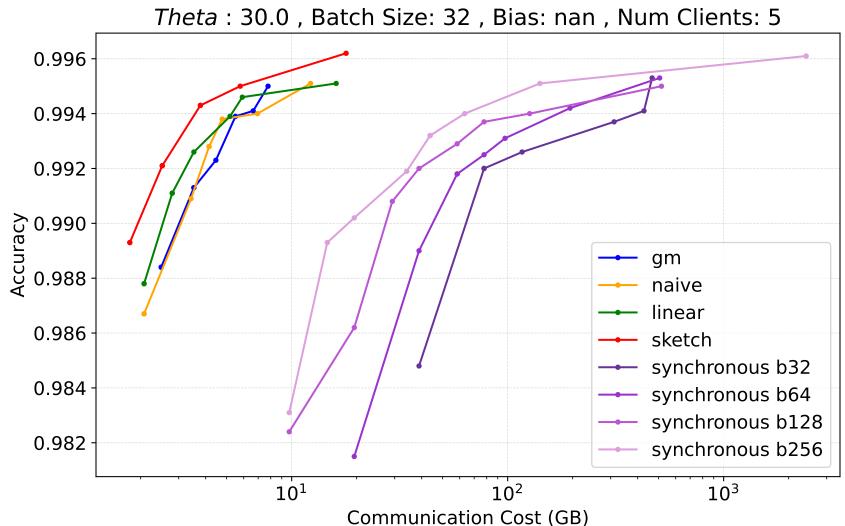


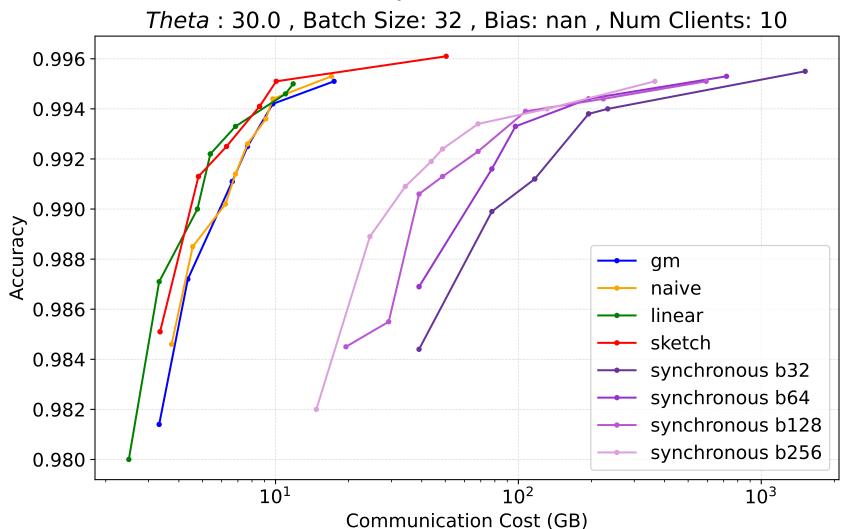


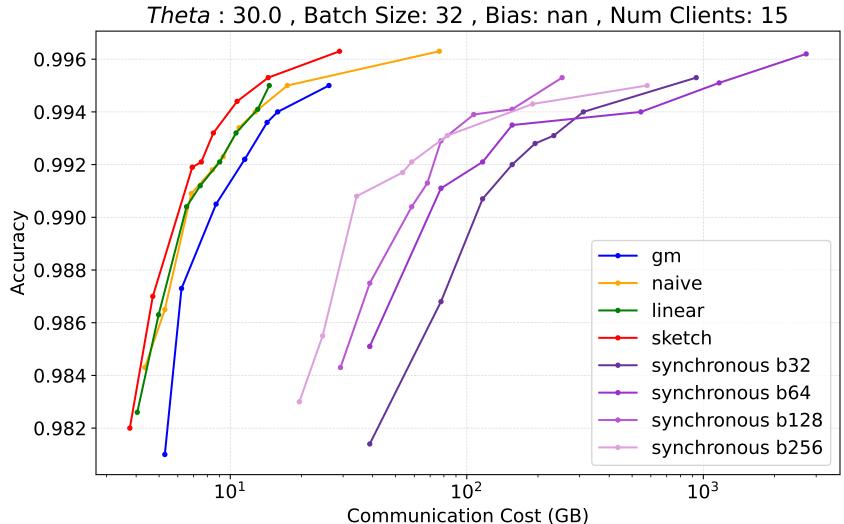




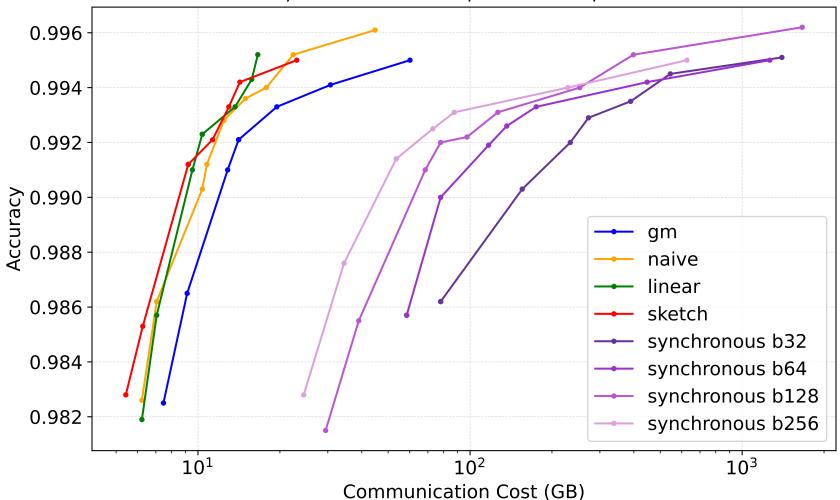
Communication Cost (GB)

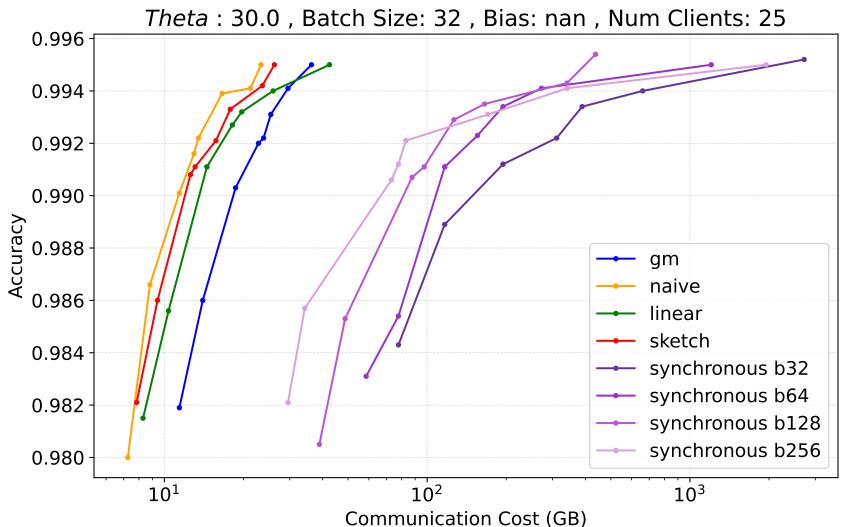




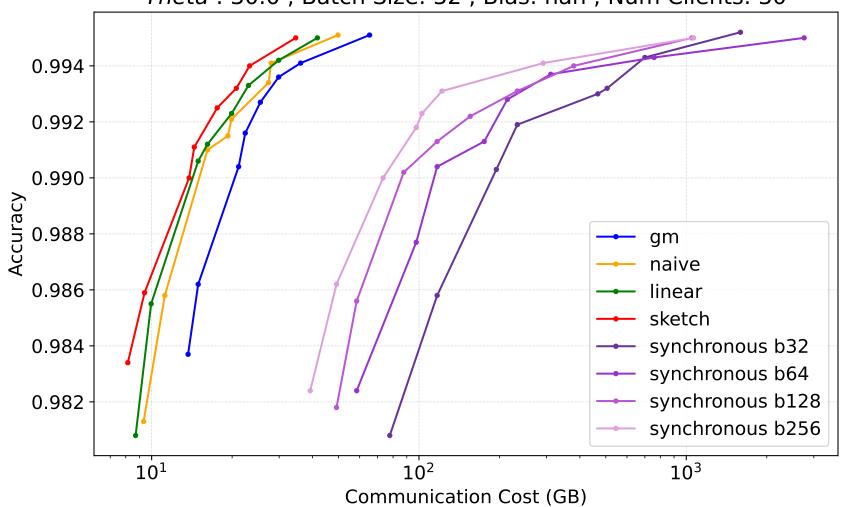


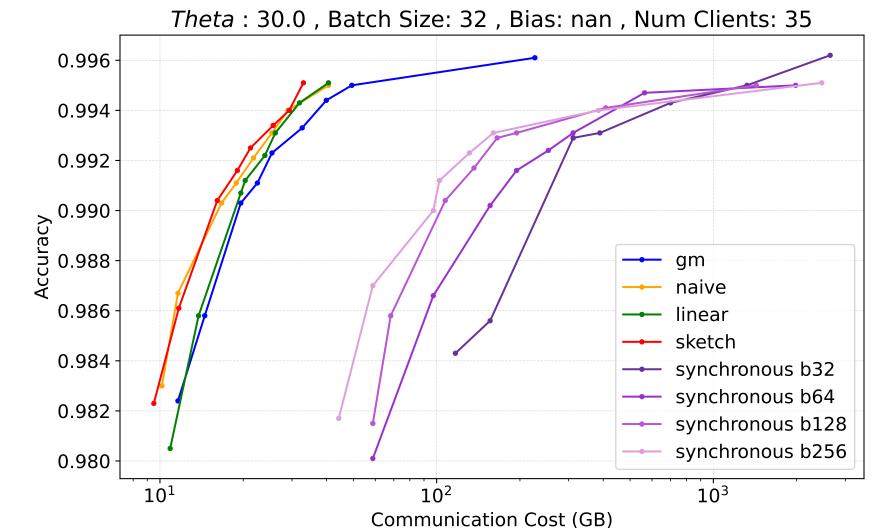
Theta: 30.0, Batch Size: 32, Bias: nan, Num Clients: 20



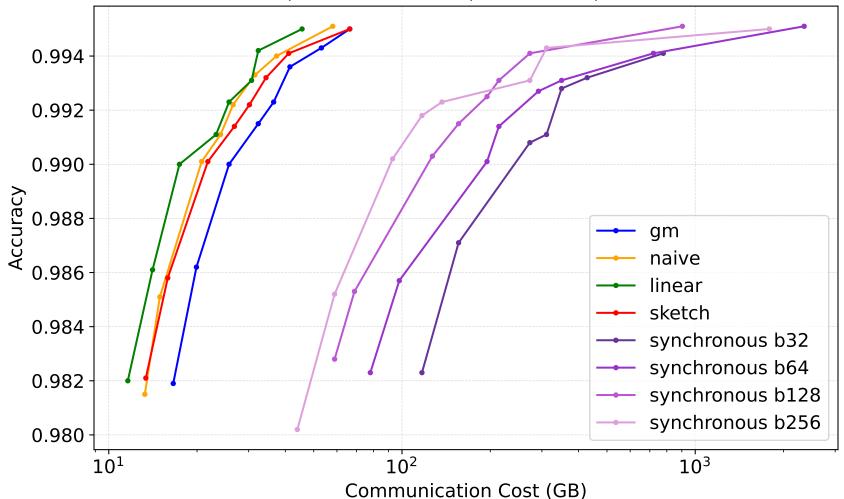


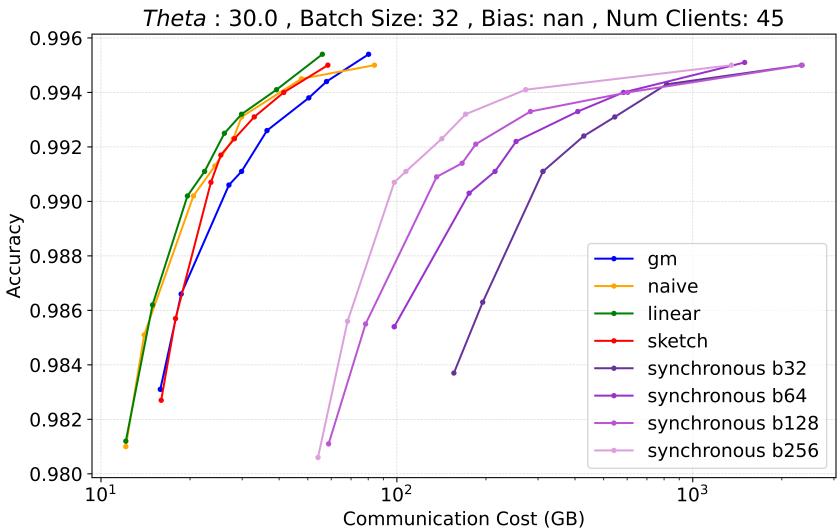


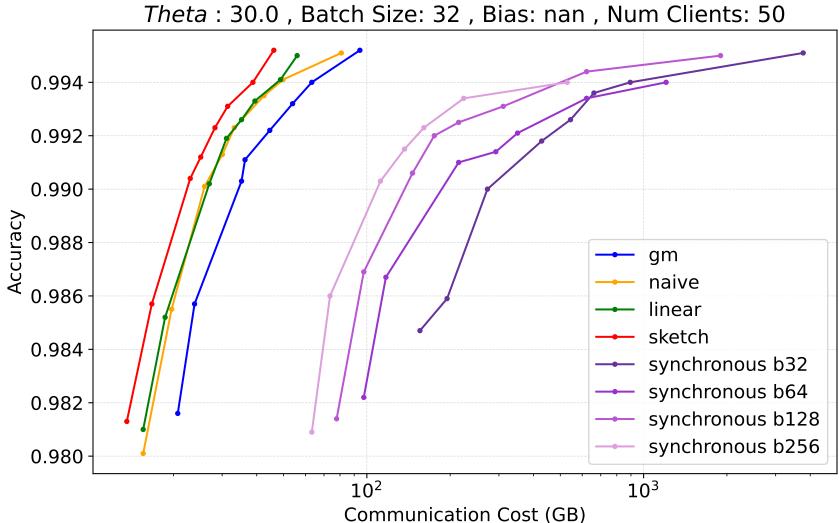




Theta: 30.0, Batch Size: 32, Bias: nan, Num Clients: 40

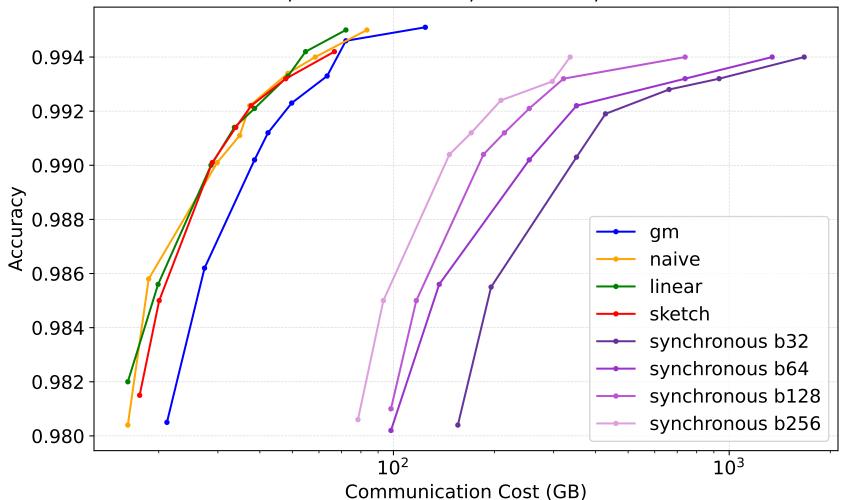


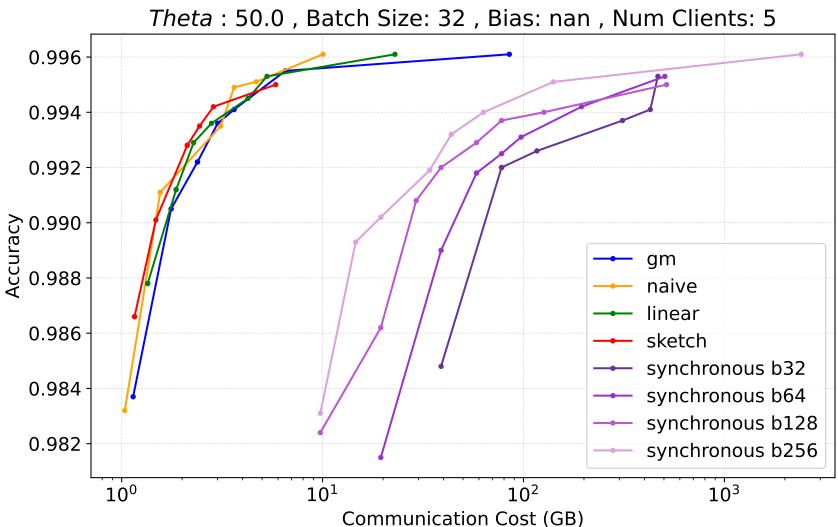


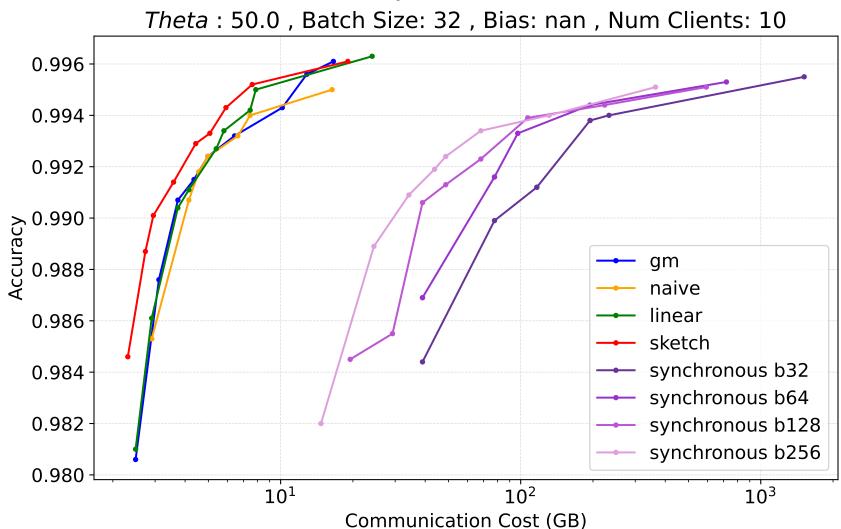


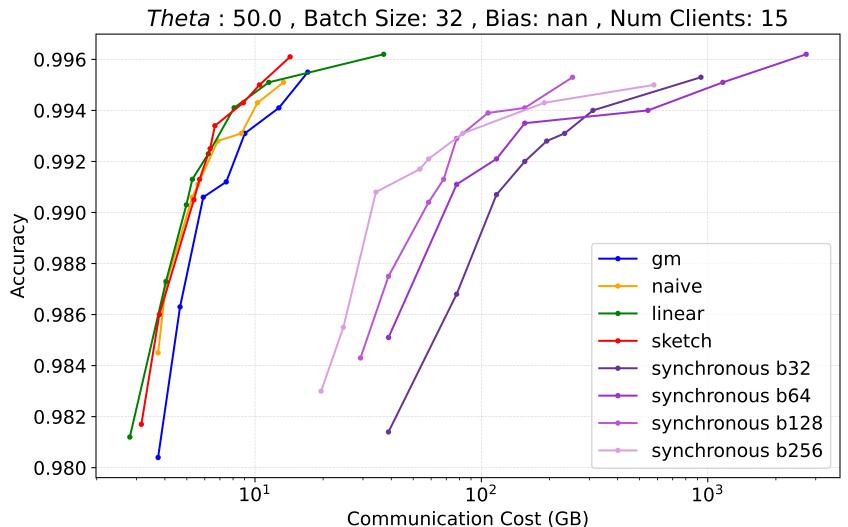
synchronous Theta: 30.0, Batch Size: 32, Bias: nan, Num Clients: 55 0.996 0.994 0.992 0.990 Accuracy 0.988gm naive 0.986 linear sketch 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>3</sup> 10<sup>2</sup> Communication Cost (GB)

Theta: 30.0, Batch Size: 32, Bias: nan, Num Clients: 60

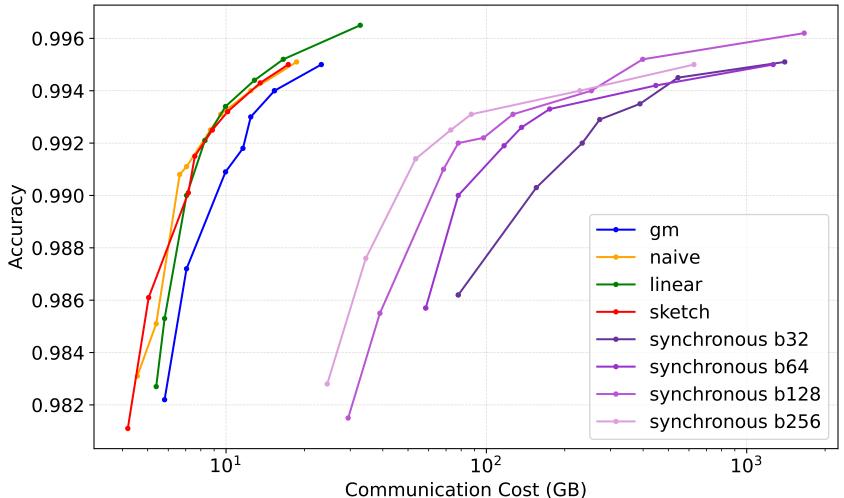


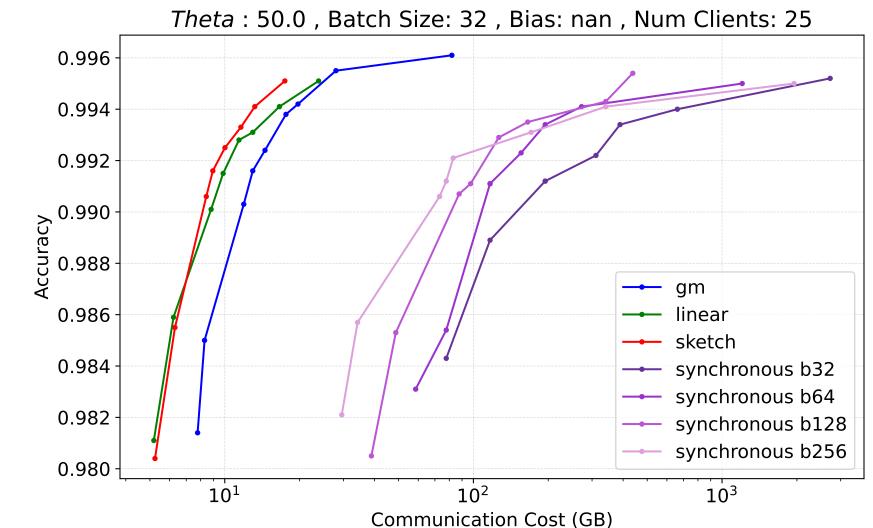






Theta: 50.0, Batch Size: 32, Bias: nan, Num Clients: 20

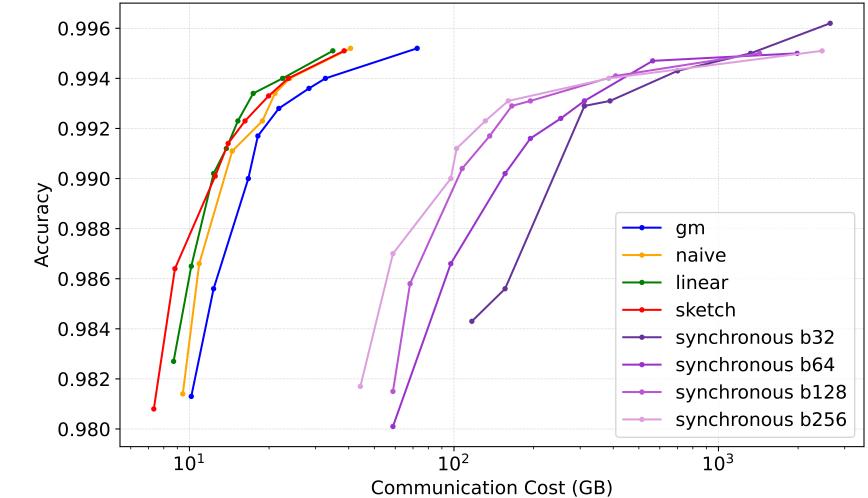


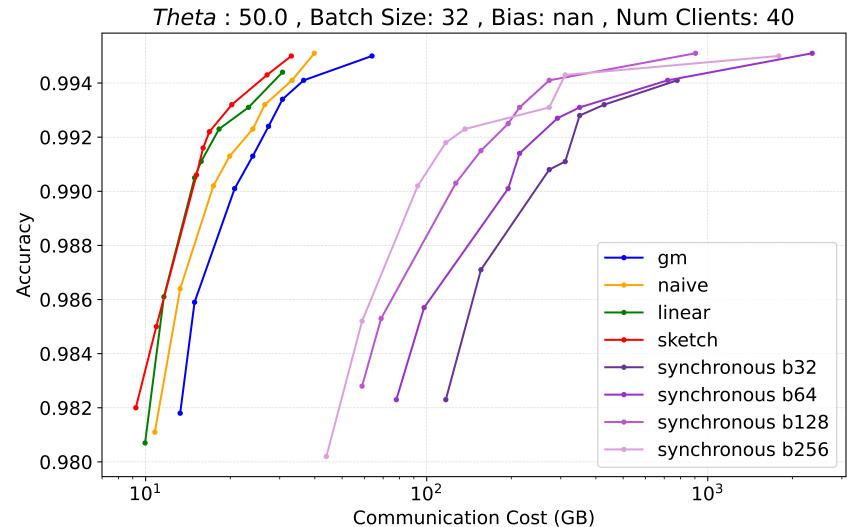


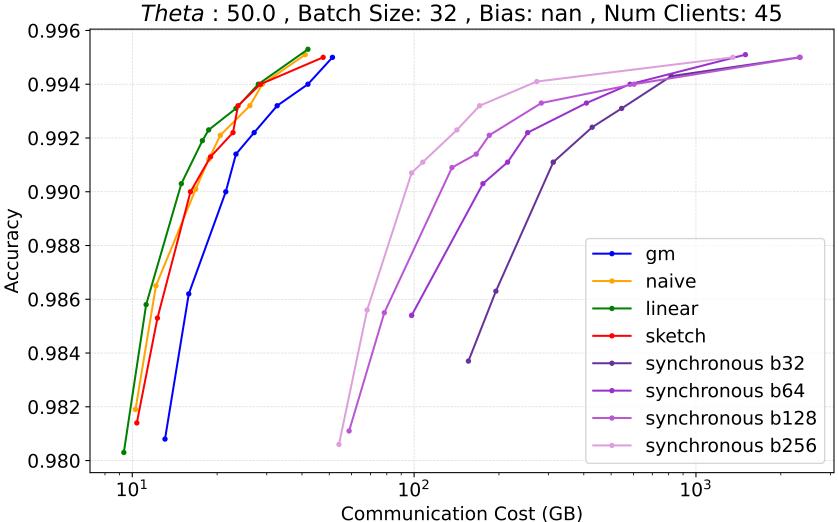
synchronous Theta: 50.0, Batch Size: 32, Bias: nan, Num Clients: 30 0.996 0.994 0.992 0.990 Accuracy 0.988 gm naive 0.986 linear sketch 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980  $10^{2}$ 10<sup>3</sup>  $10^{1}$ 

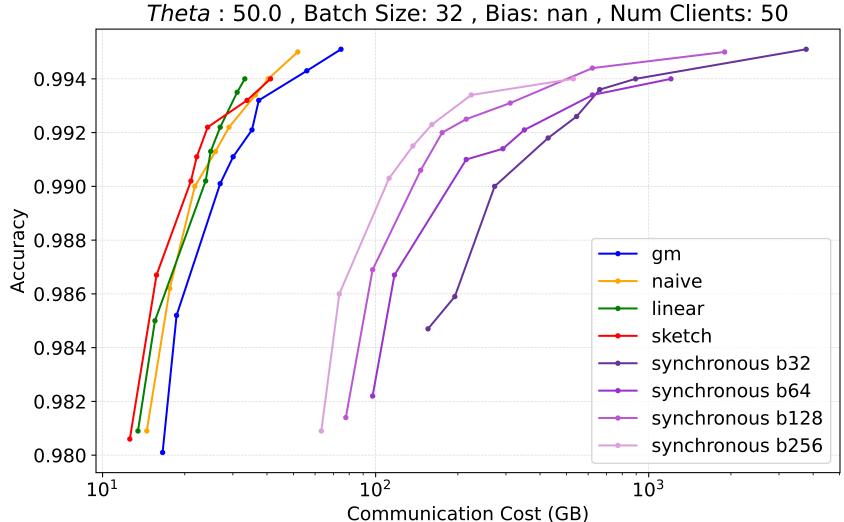
Communication Cost (GB)

Theta: 50.0, Batch Size: 32, Bias: nan, Num Clients: 35

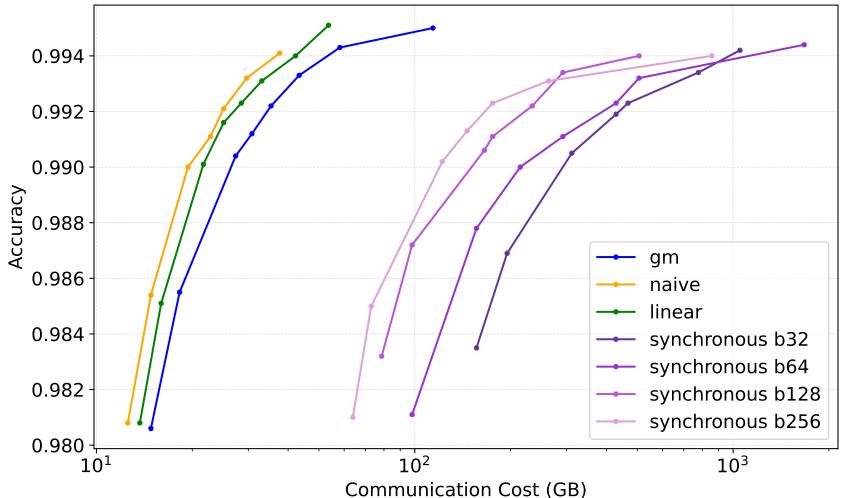




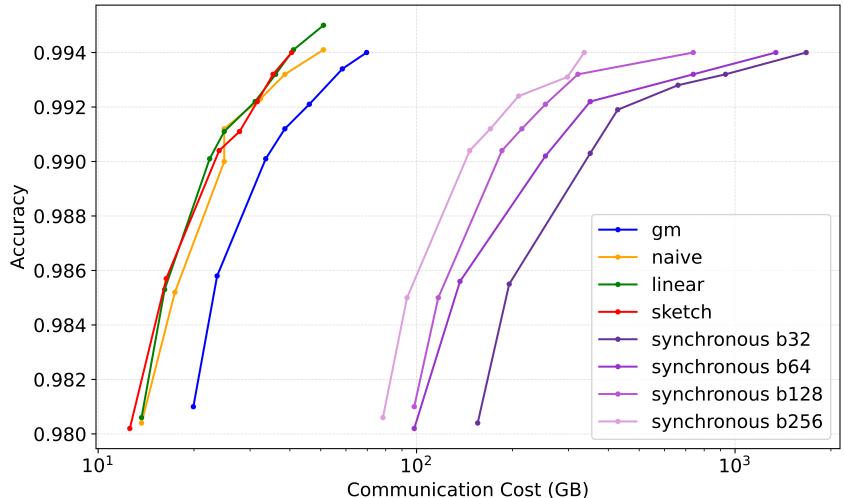


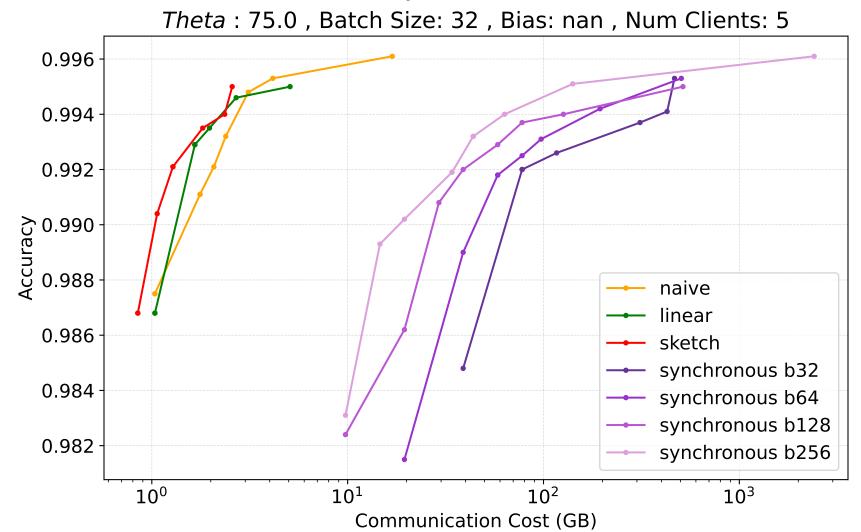


Theta: 50.0, Batch Size: 32, Bias: nan, Num Clients: 55

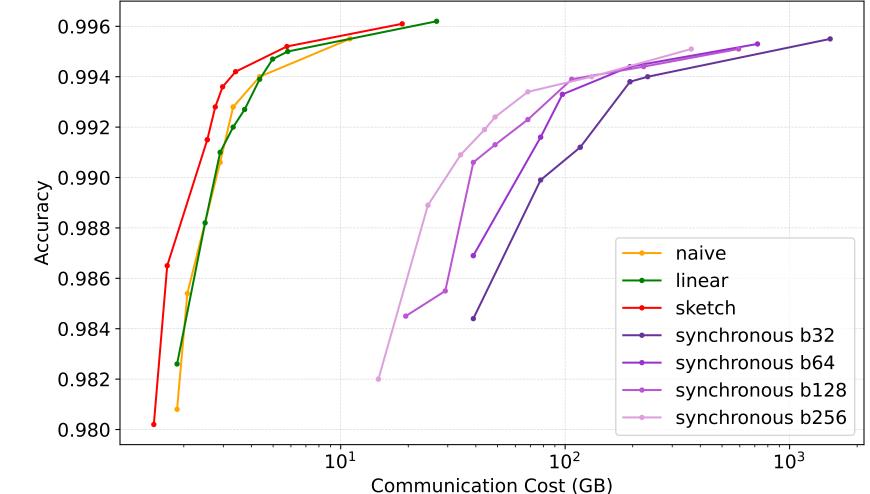


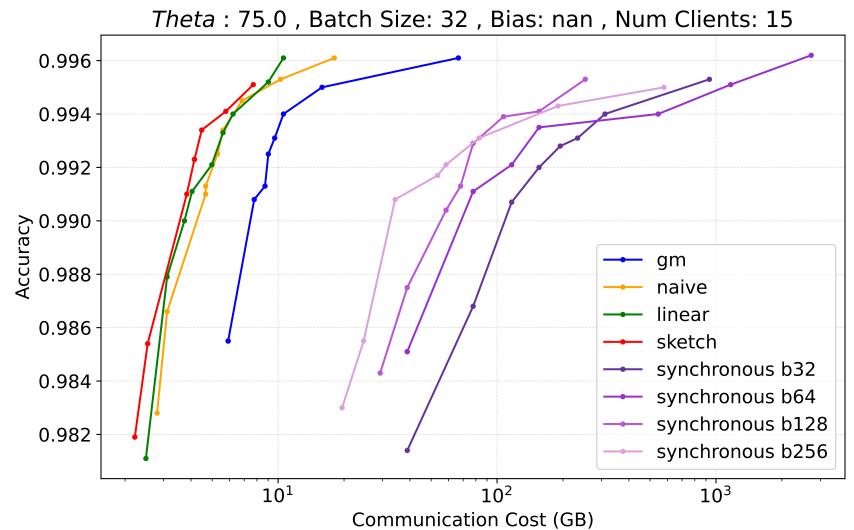
Theta: 50.0, Batch Size: 32, Bias: nan, Num Clients: 60



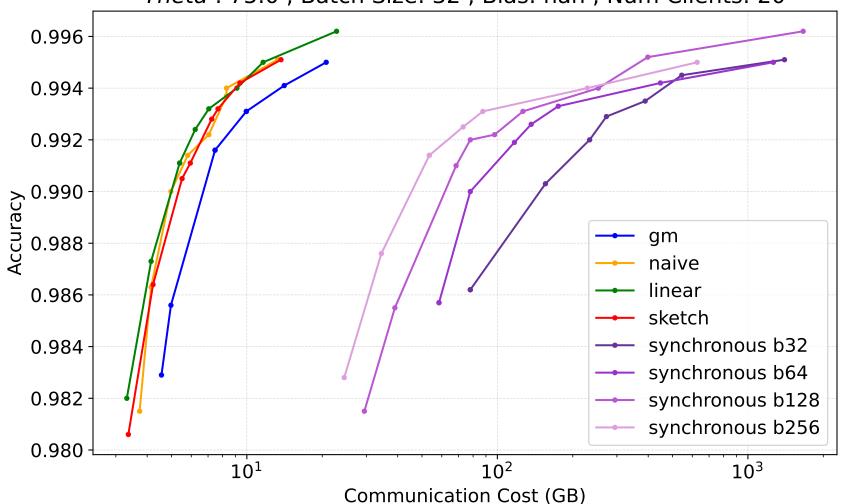


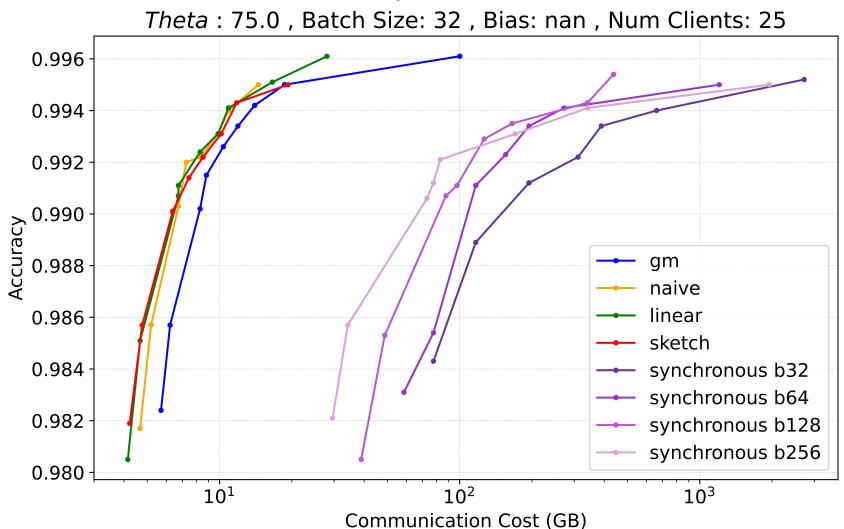
Theta: 75.0, Batch Size: 32, Bias: nan, Num Clients: 10

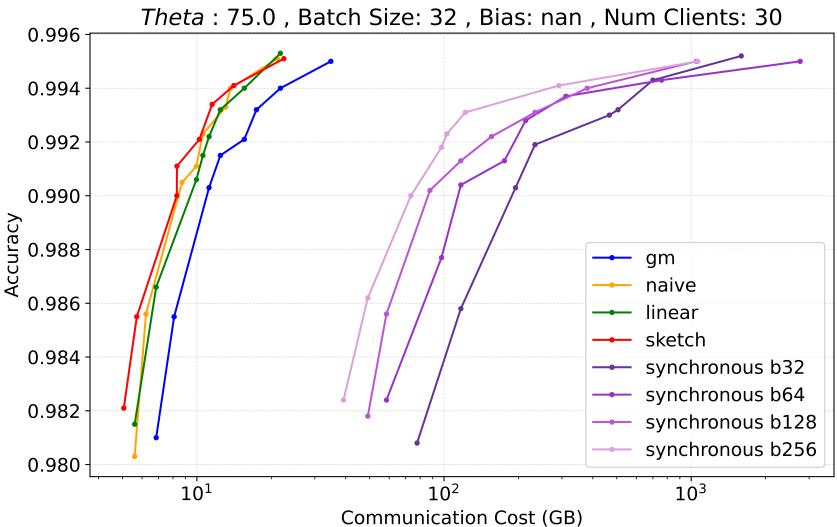


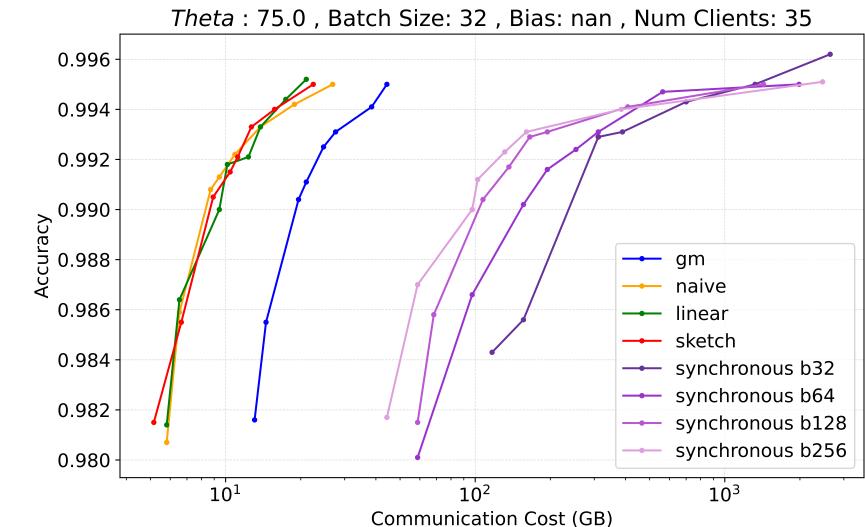


Theta: 75.0, Batch Size: 32, Bias: nan, Num Clients: 20

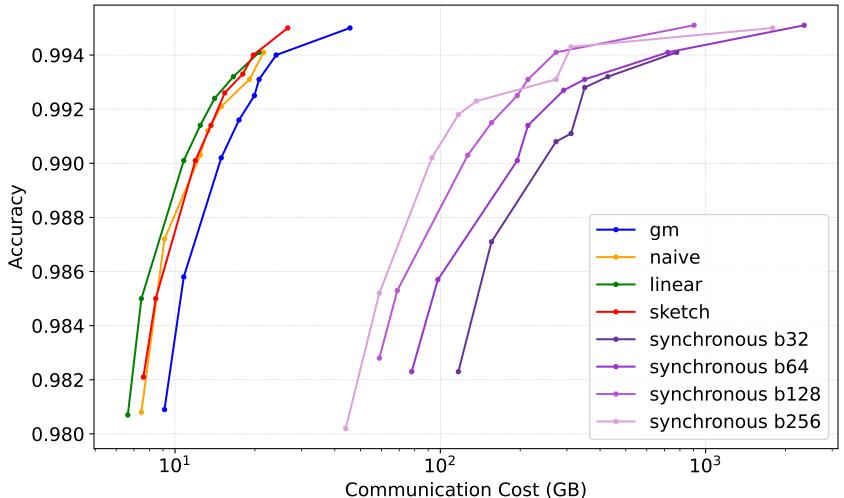


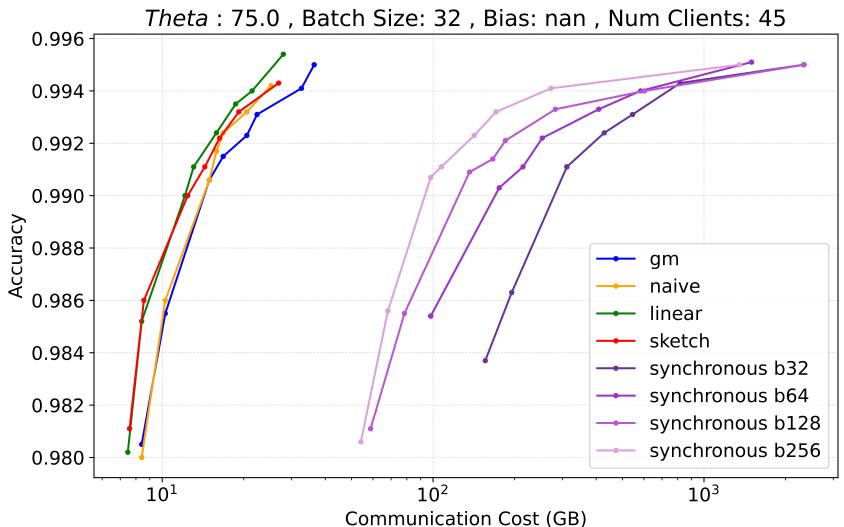


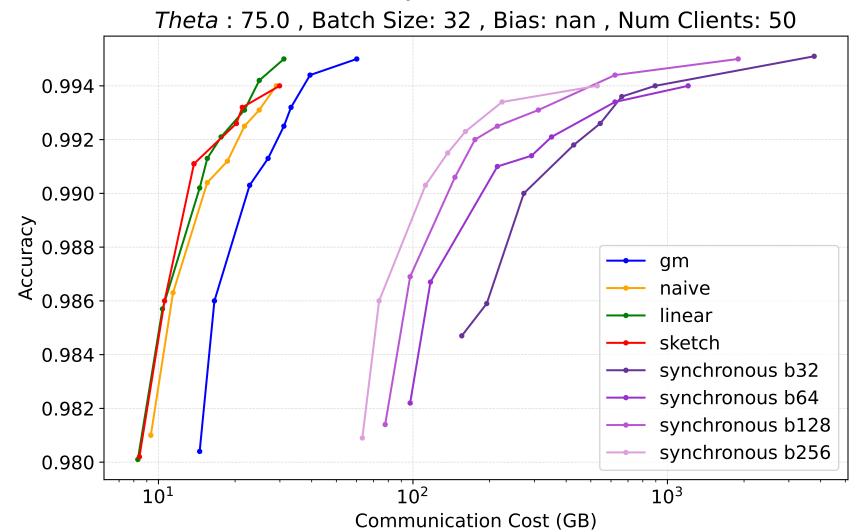


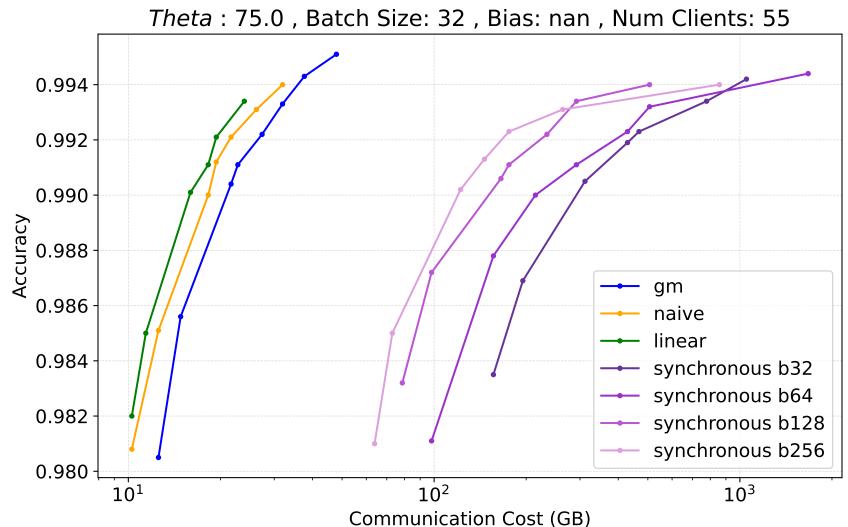


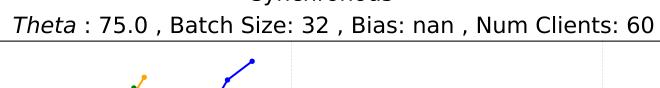
Theta: 75.0, Batch Size: 32, Bias: nan, Num Clients: 40

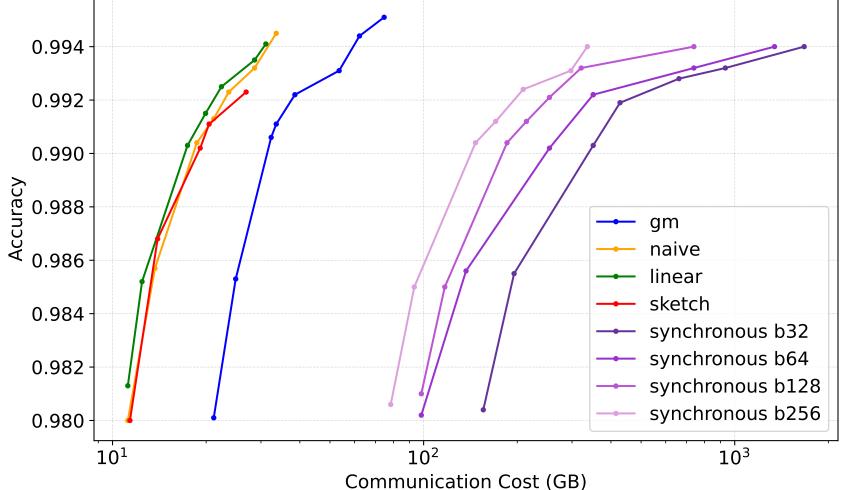


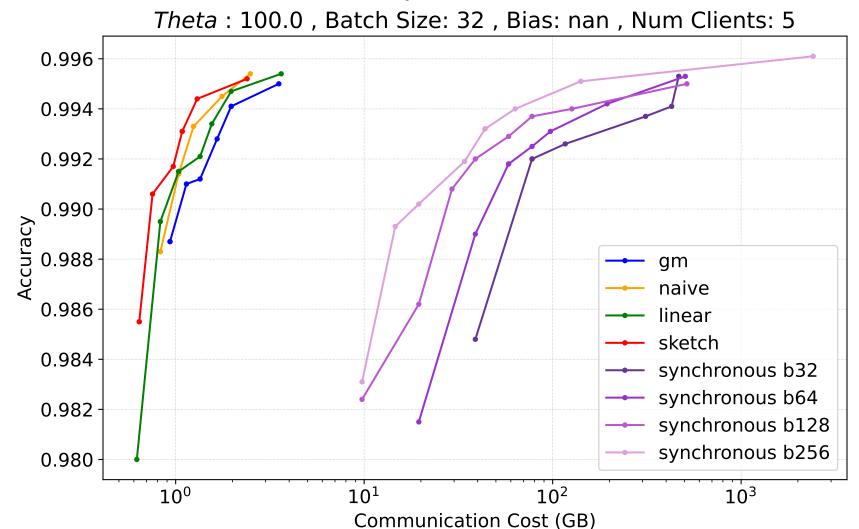


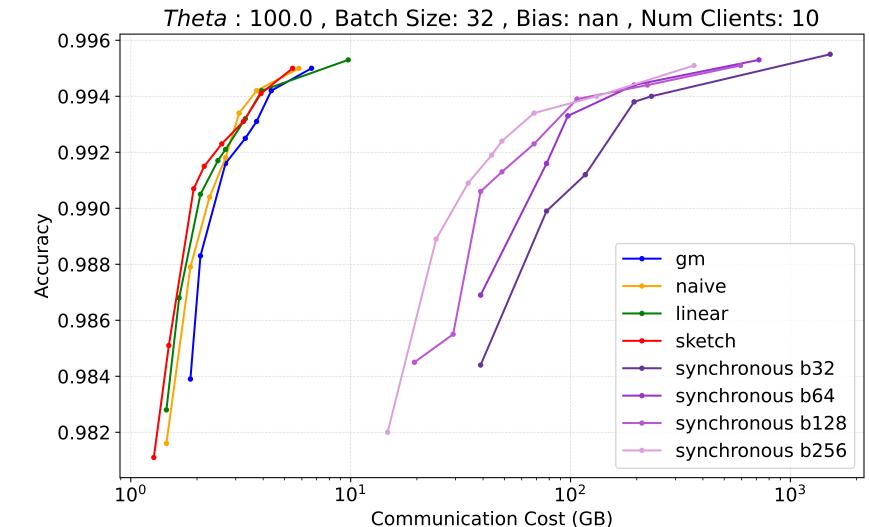


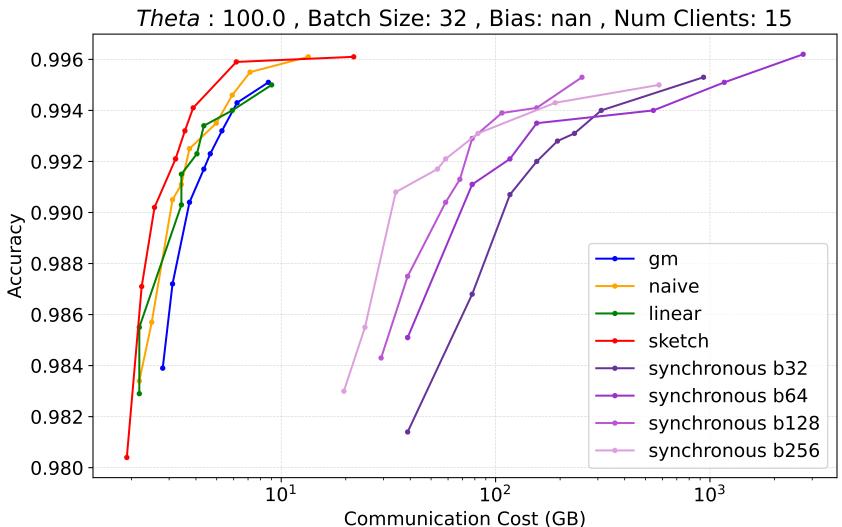


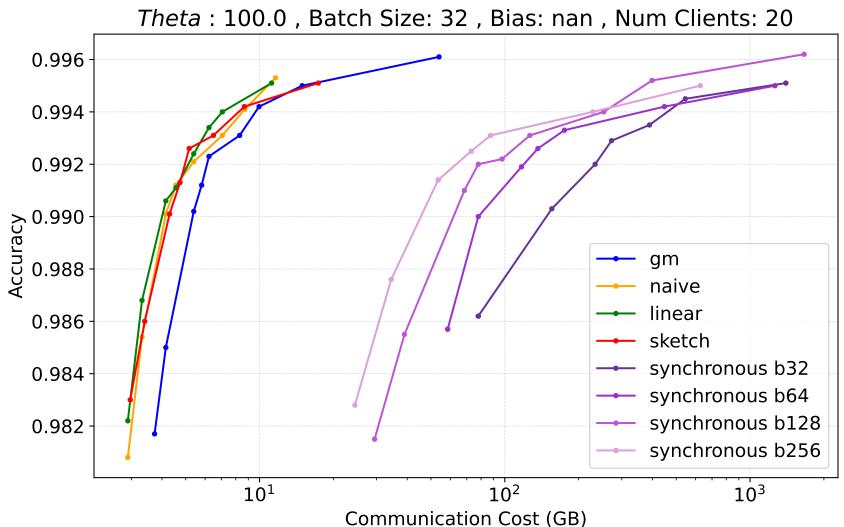


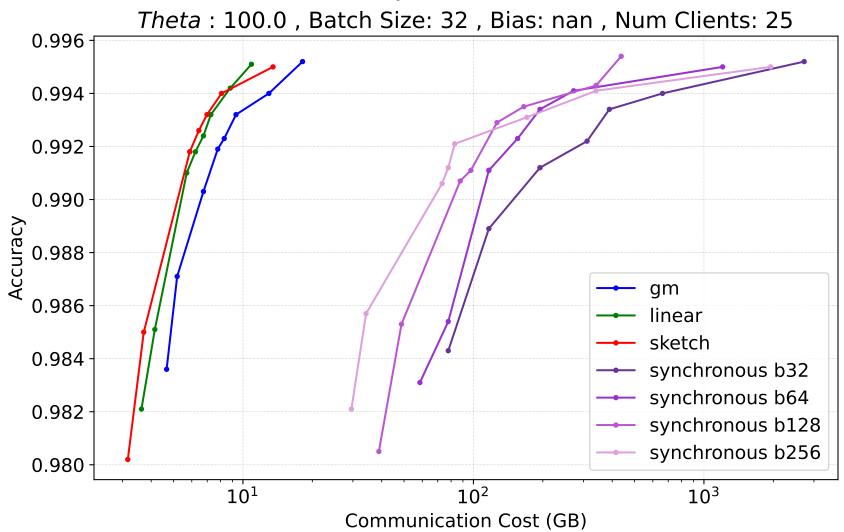




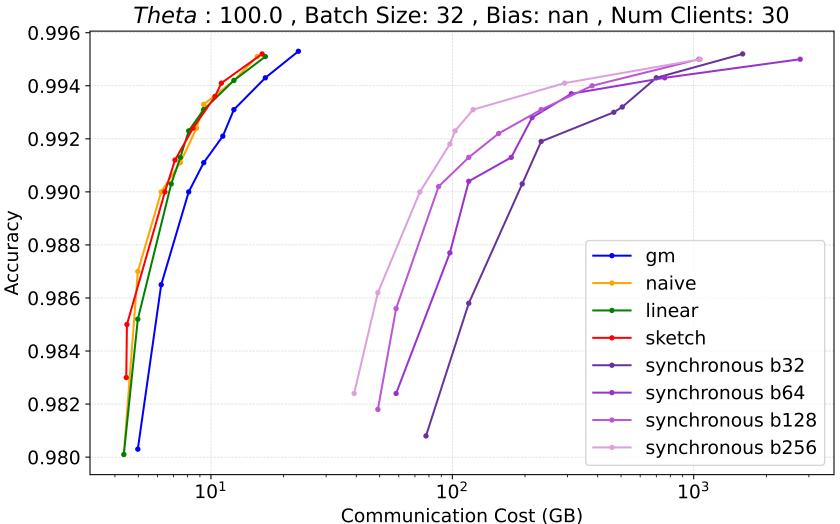


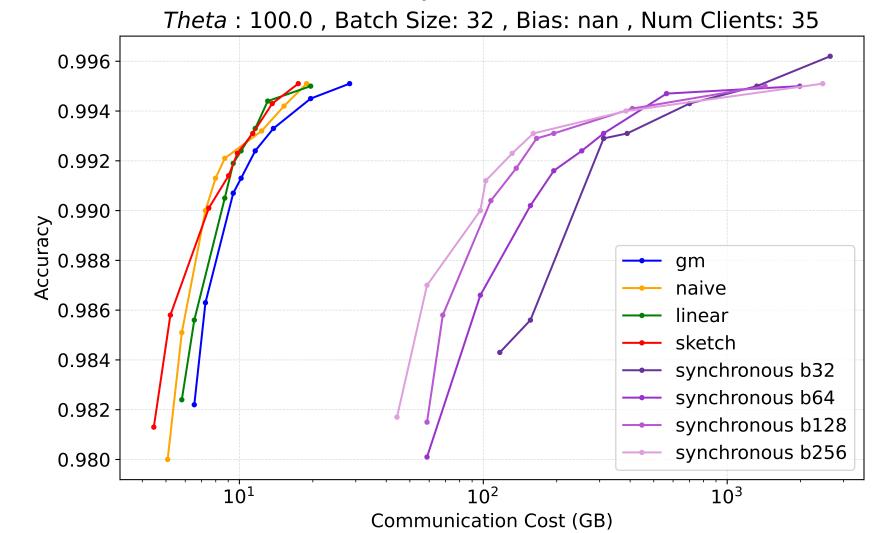


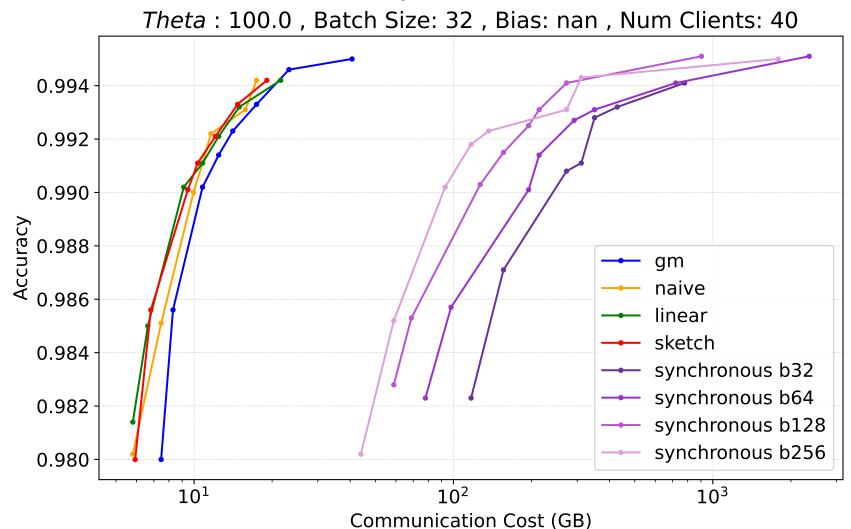


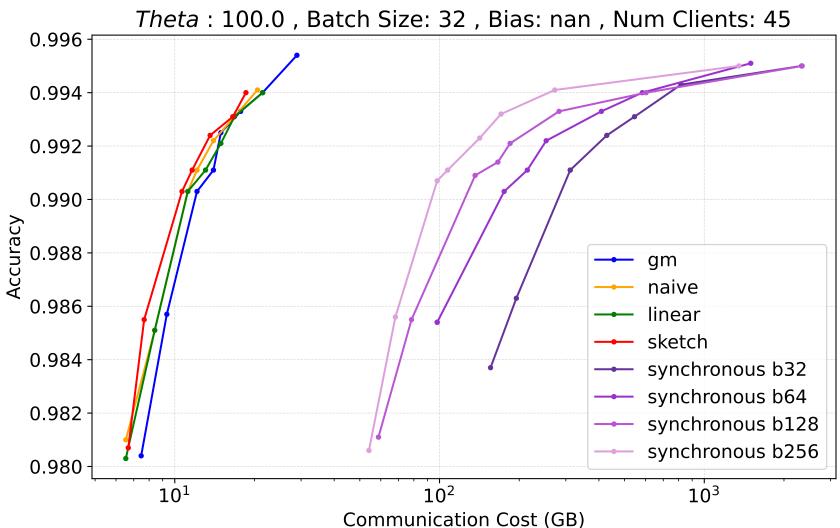


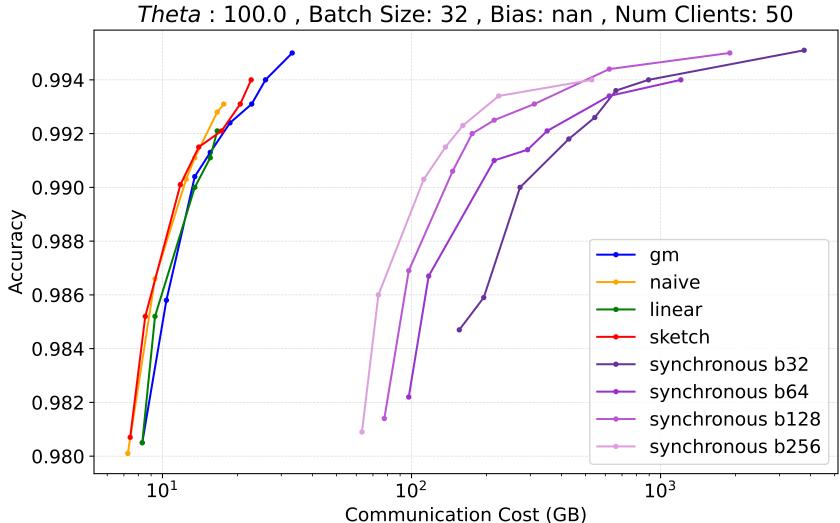
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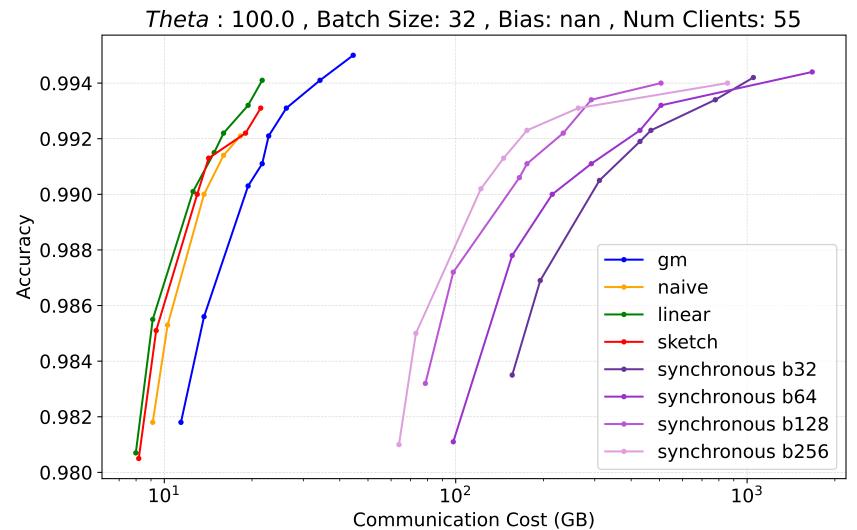


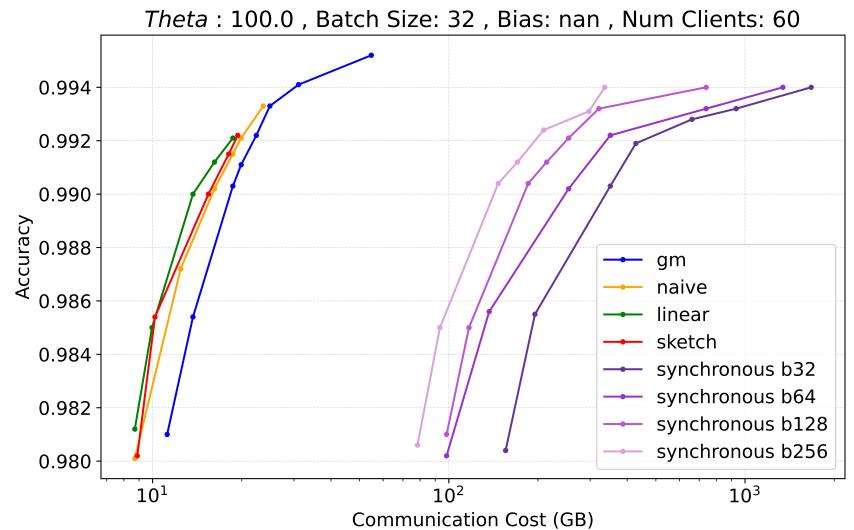


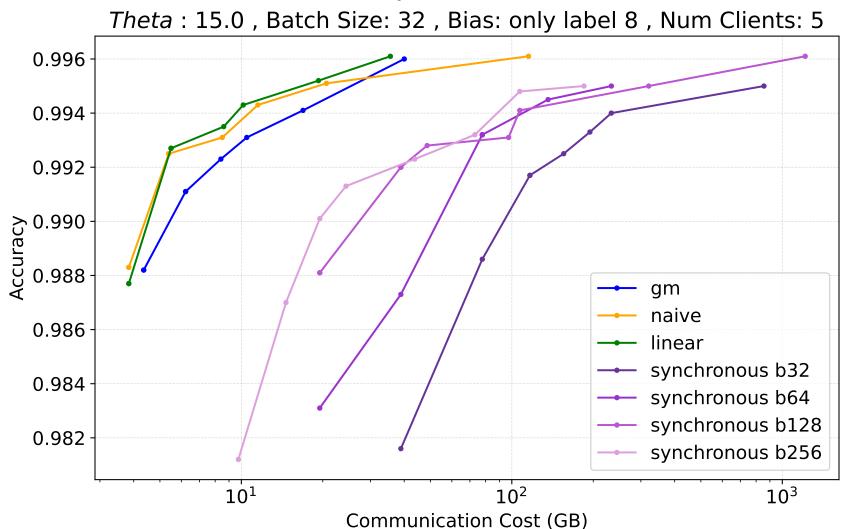


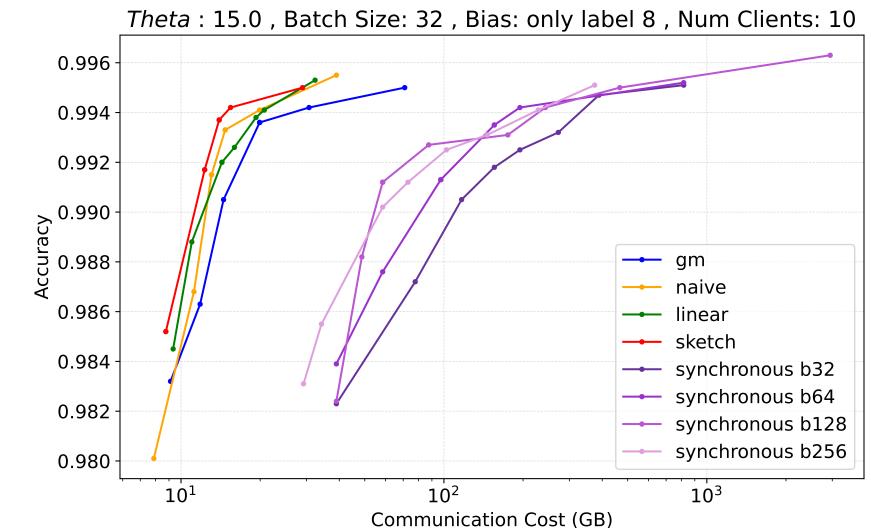


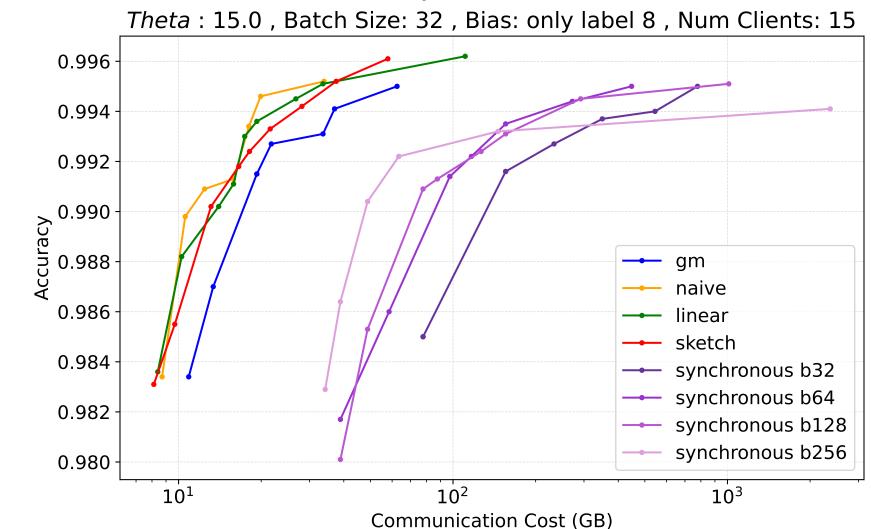


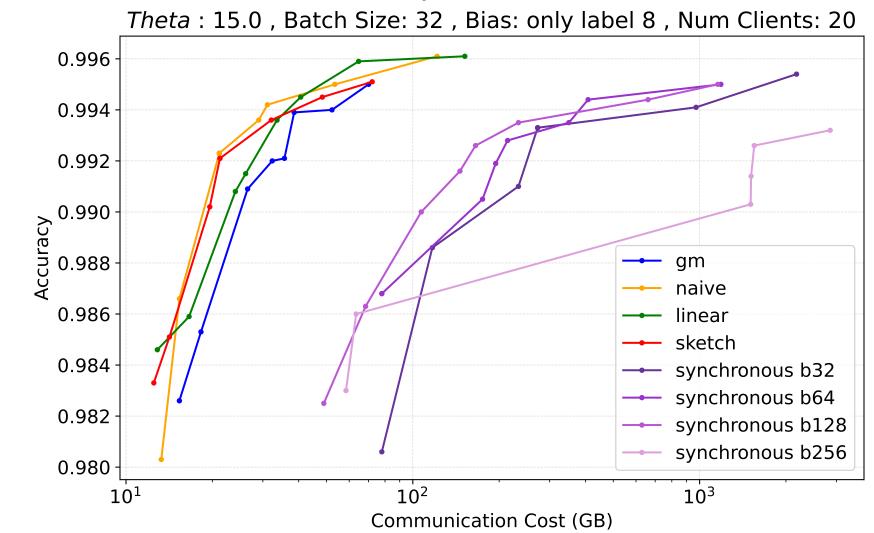


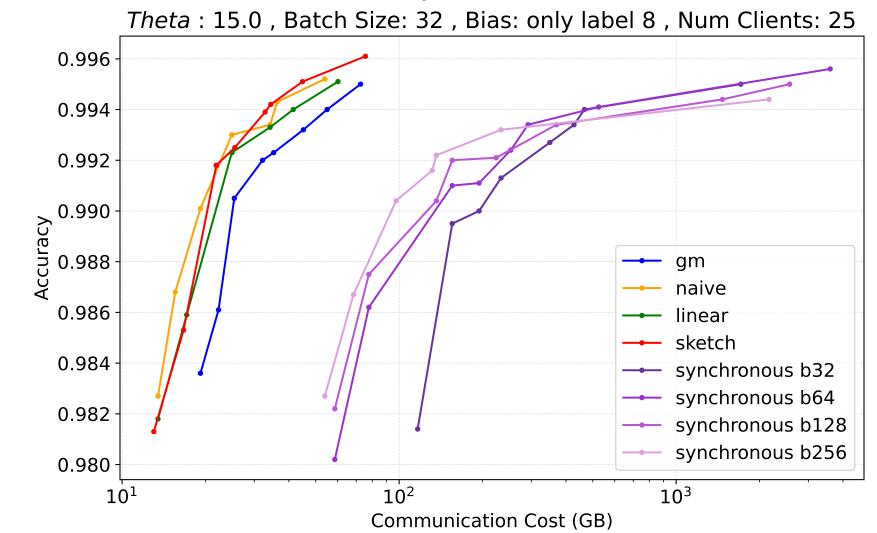


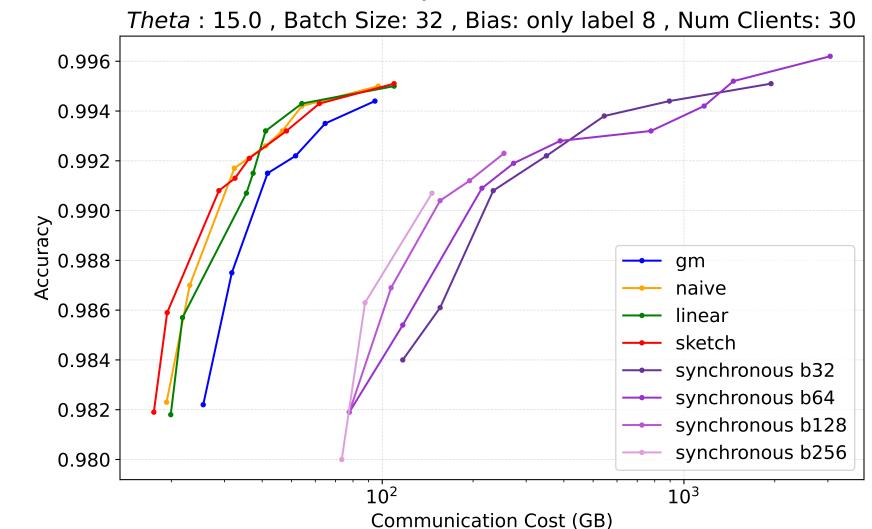


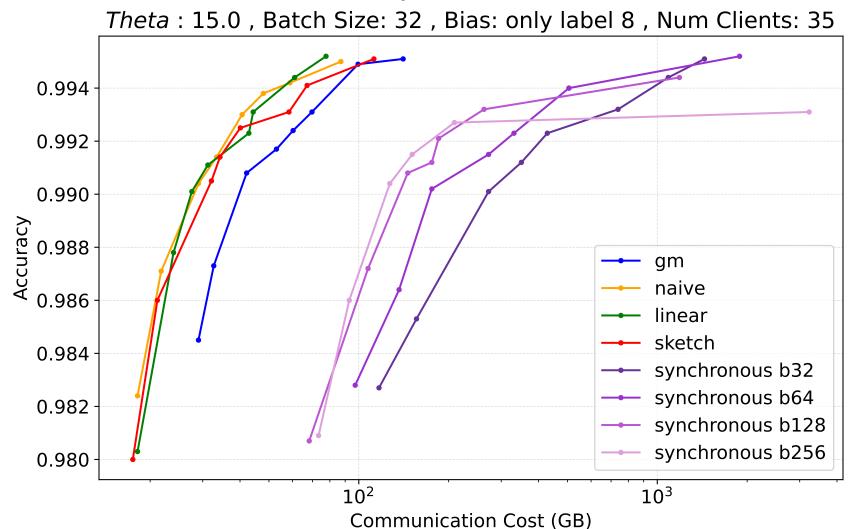


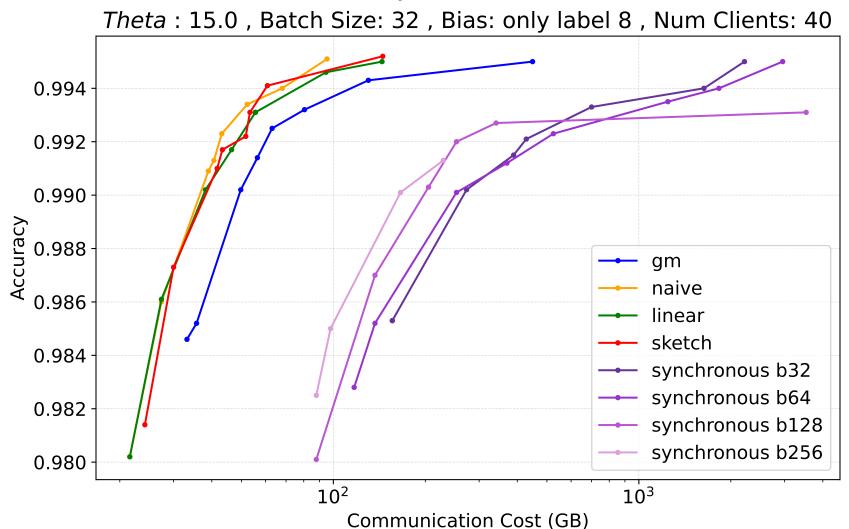


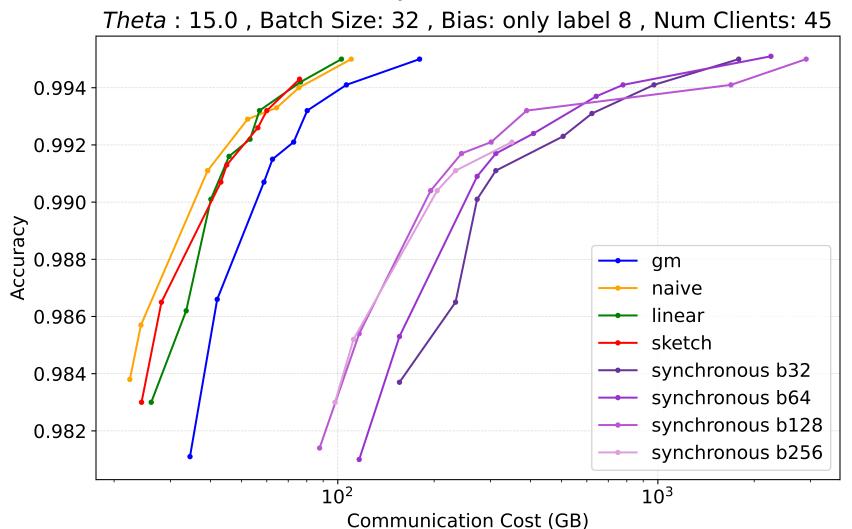


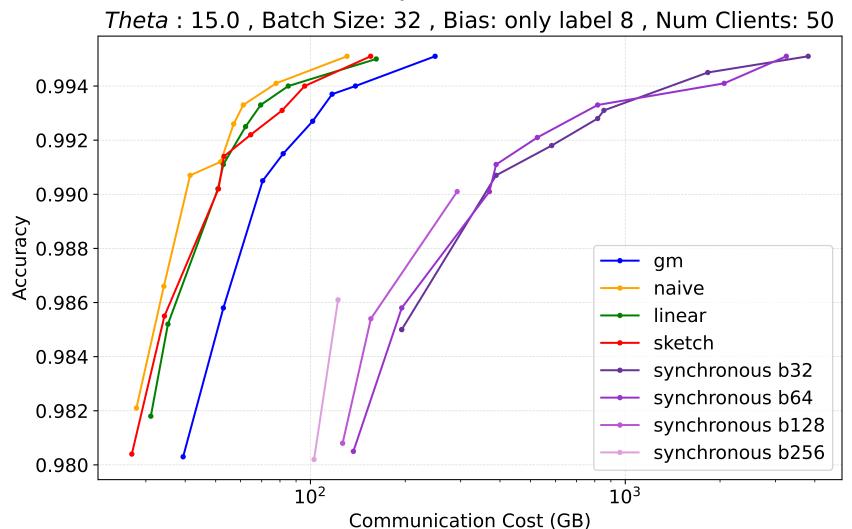






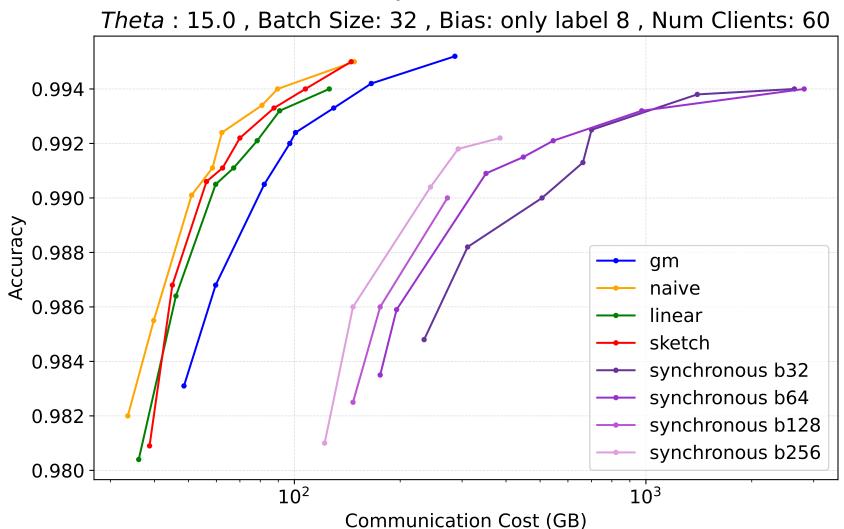


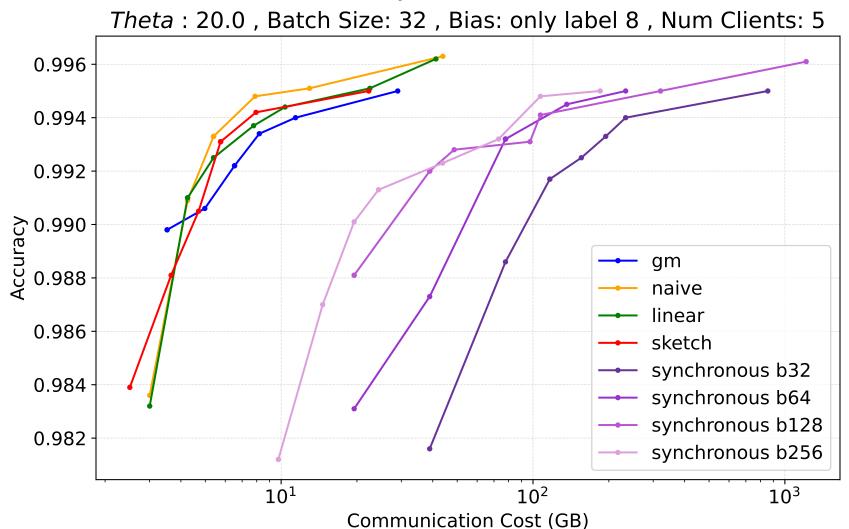


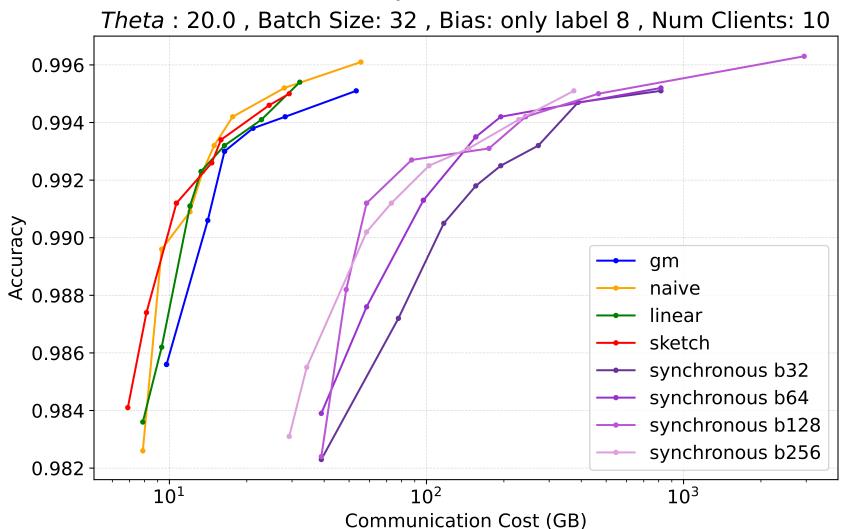


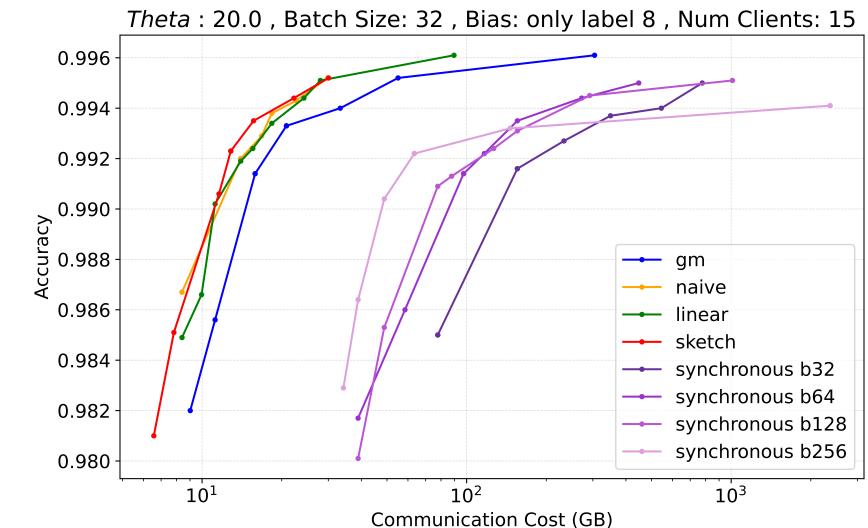
synchronous Theta: 15.0, Batch Size: 32, Bias: only label 8, Num Clients: 55 0.996 0.994 0.992 0.990 Accuracy 0.988 gm naive 0.986 linear sketch 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup>

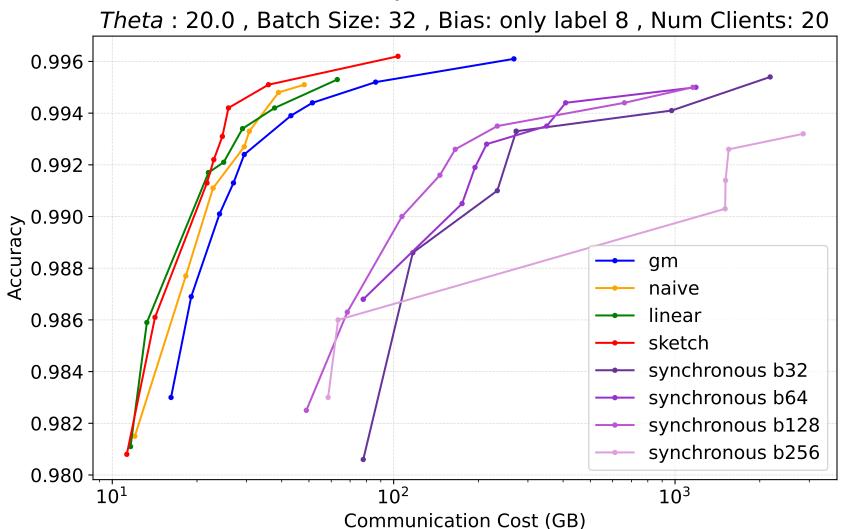
Communication Cost (GB)

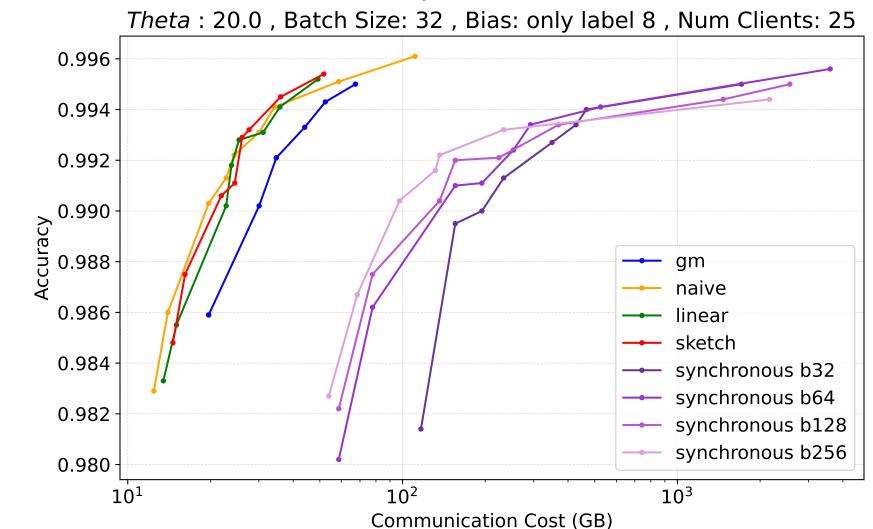


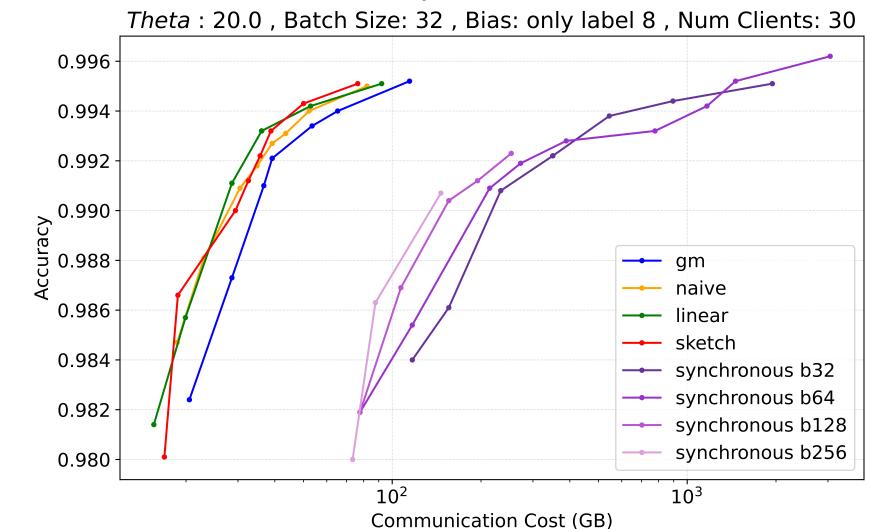


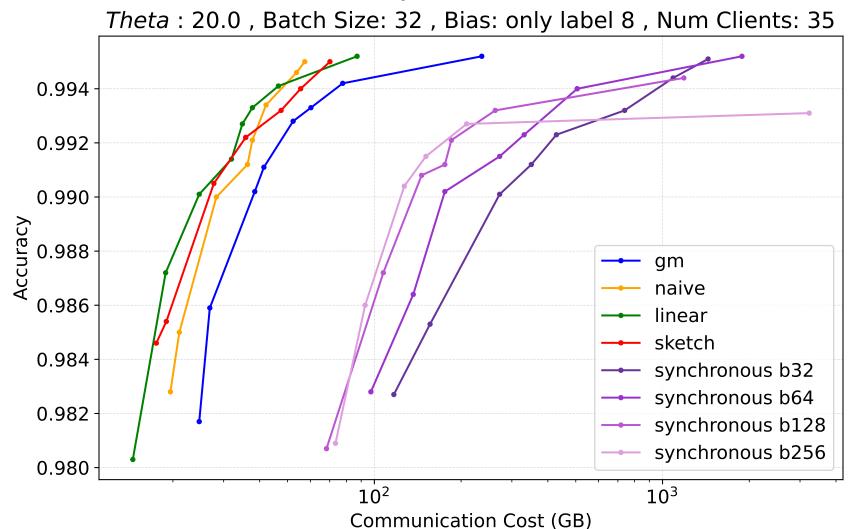






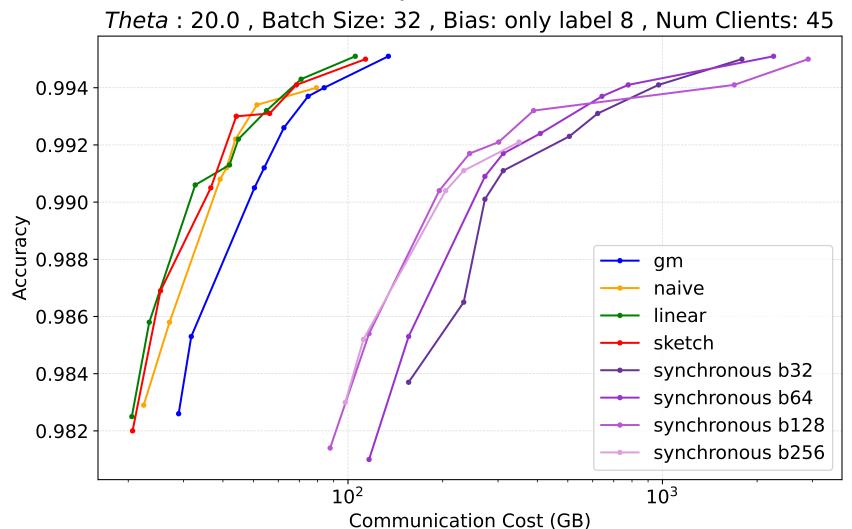


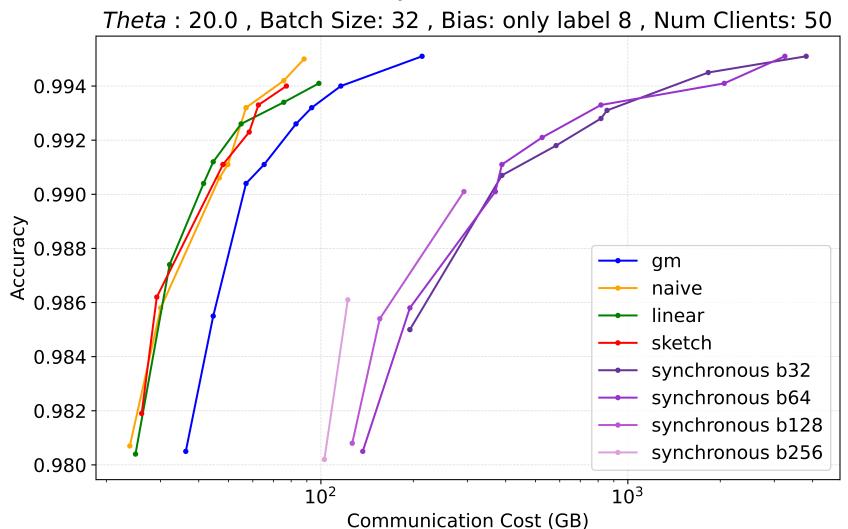




synchronous Theta: 20.0, Batch Size: 32, Bias: only label 8, Num Clients: 40 0.996 0.994 0.992 0.990 Accuracy 0.988 gm naive 0.986 linear sketch 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup>

Communication Cost (GB)

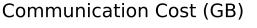




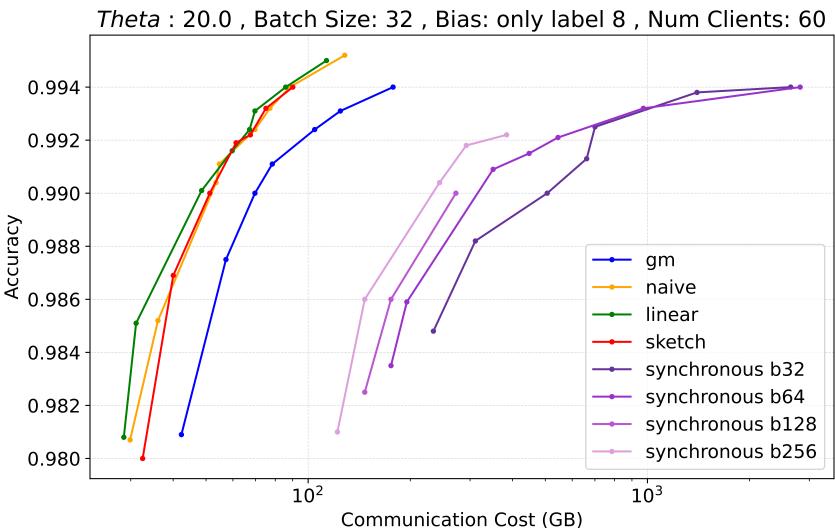
synchronous Theta: 20.0, Batch Size: 32, Bias: only label 8, Num Clients: 55 0.996 0.994 0.992 0.990 Accuracy 0.988 gm naive 0.986 linear sketch 0.984 synchronous b32 synchronous b64 0.982 synchronous b128

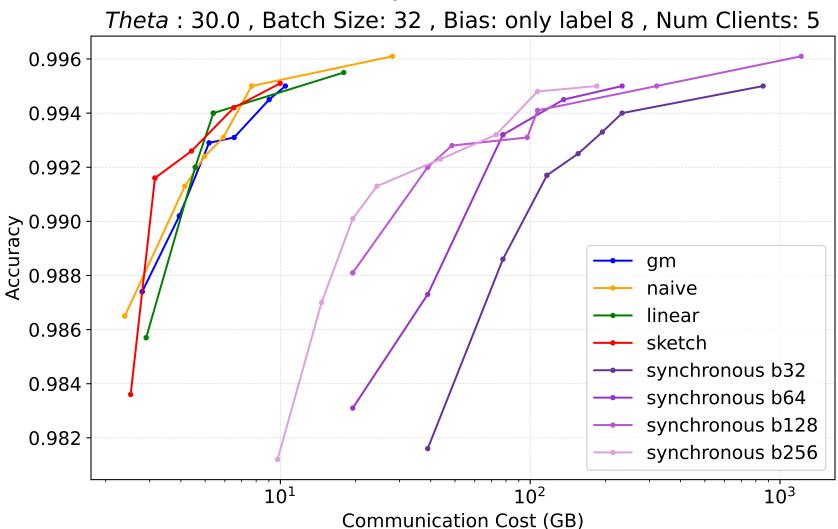
10<sup>2</sup>

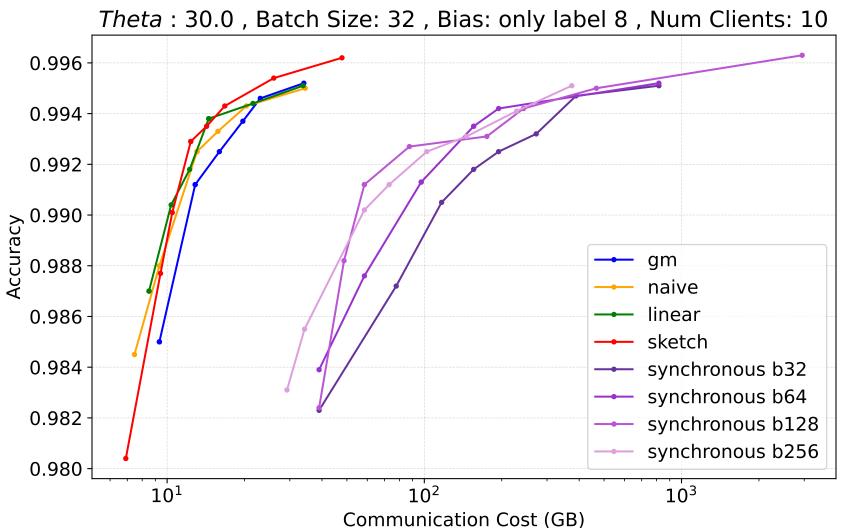
0.980

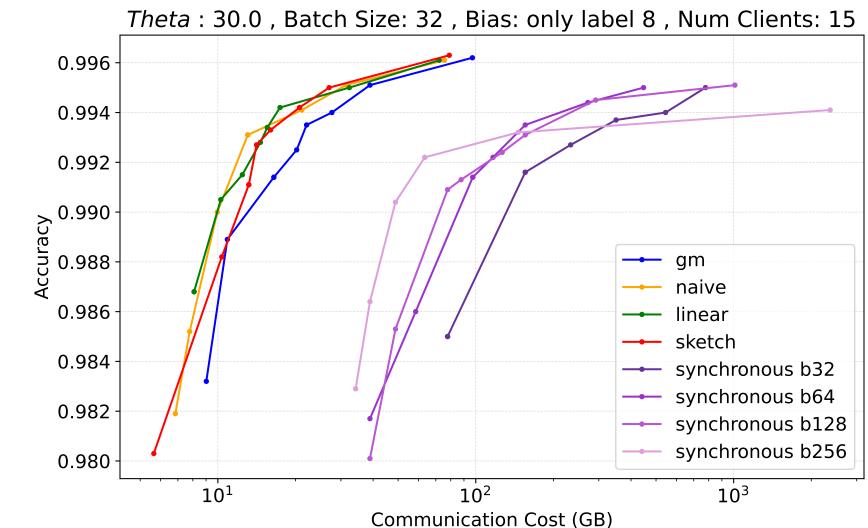


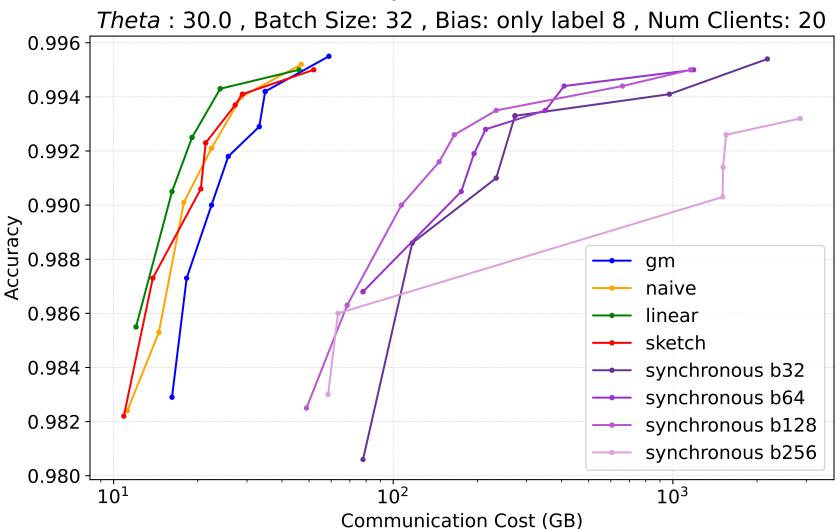
10<sup>3</sup>

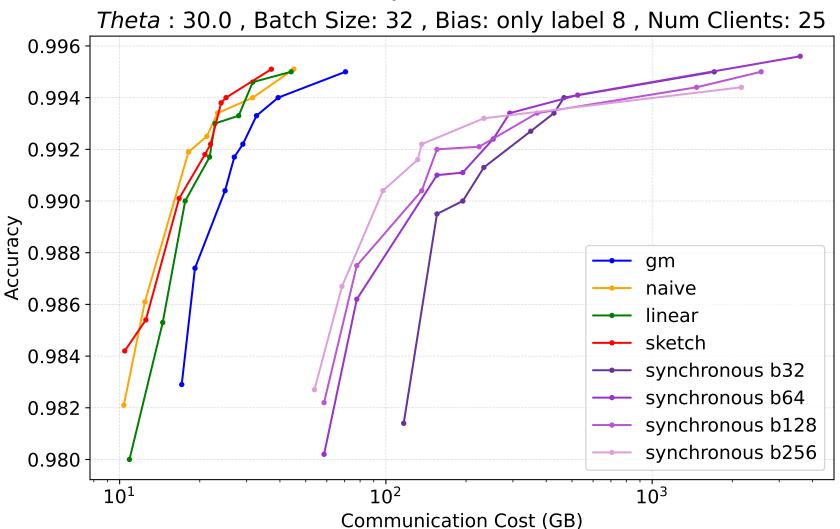


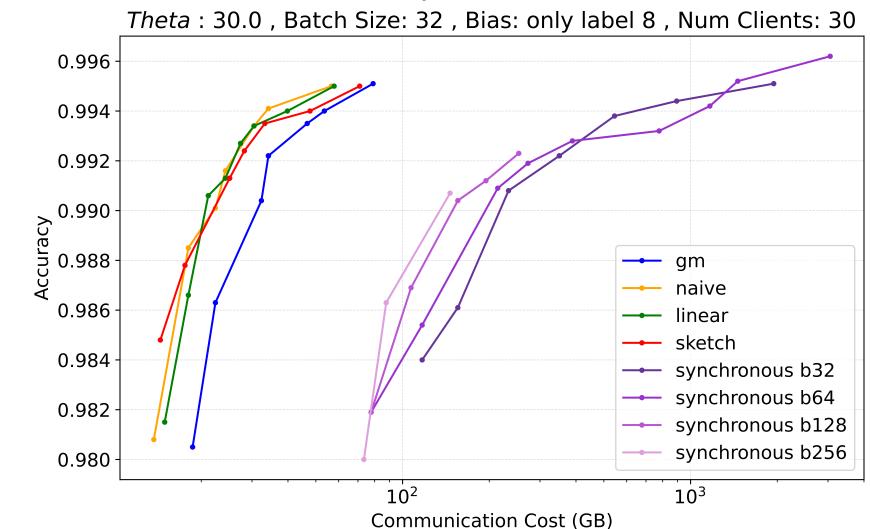


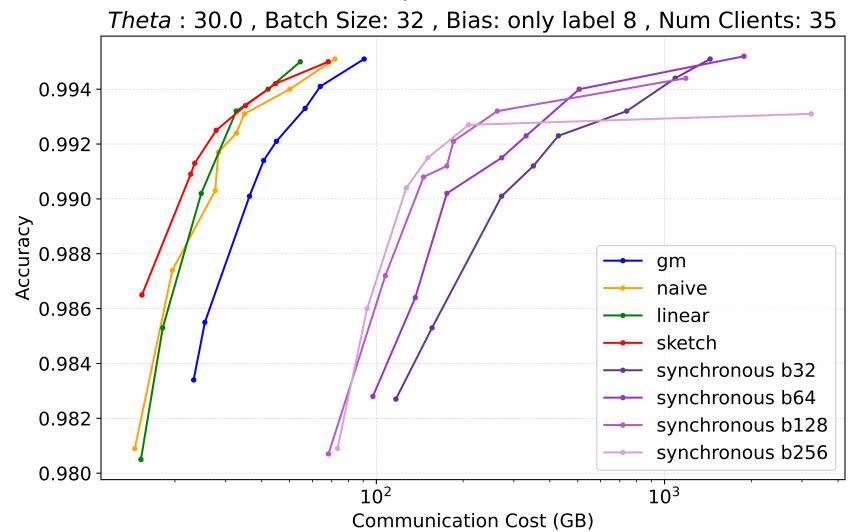


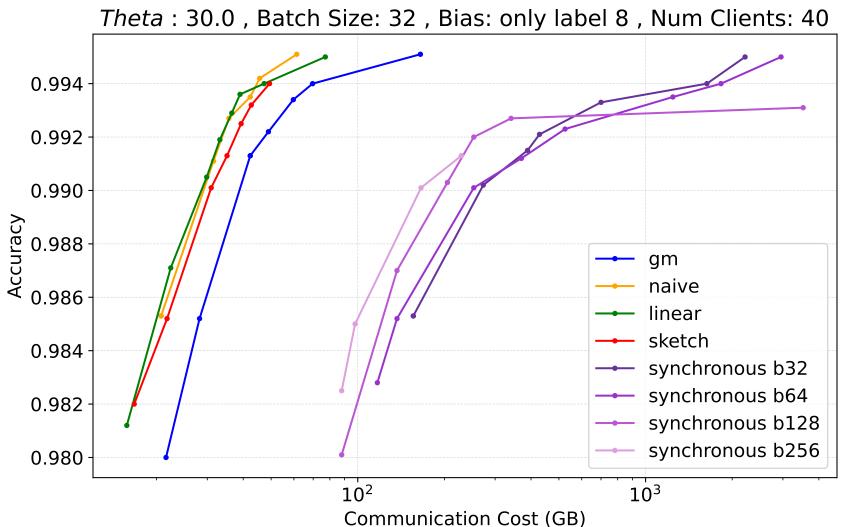


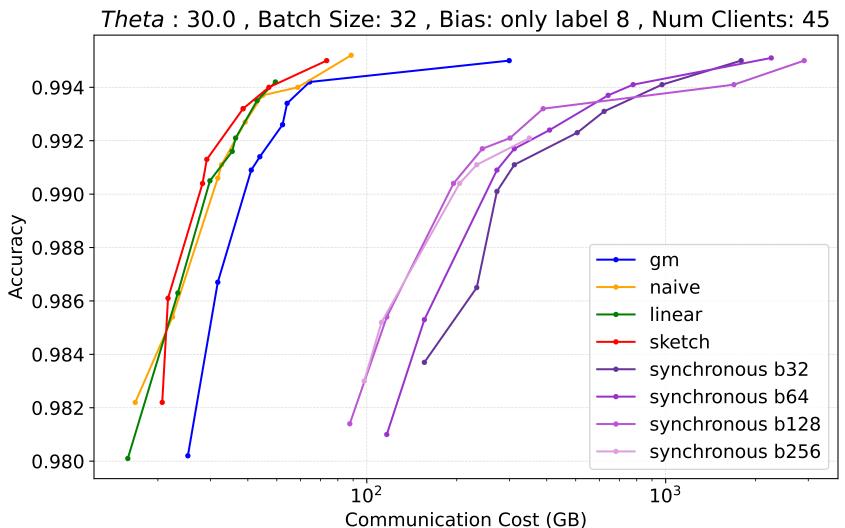


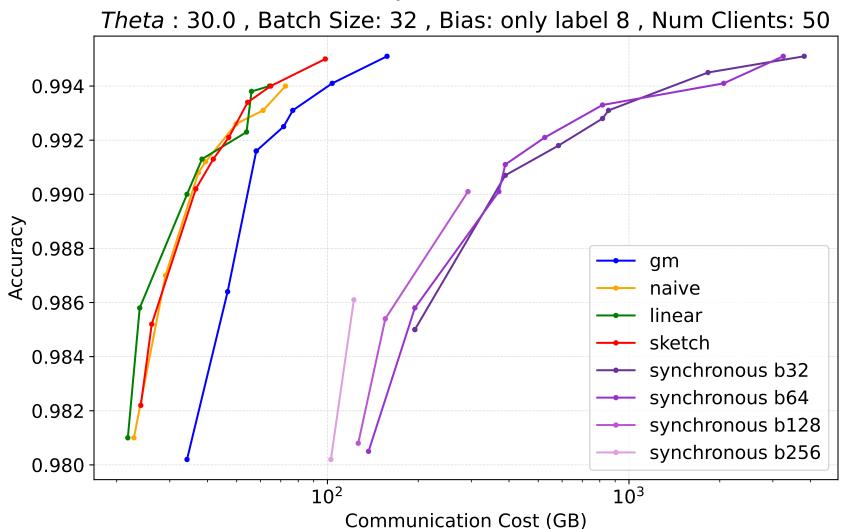






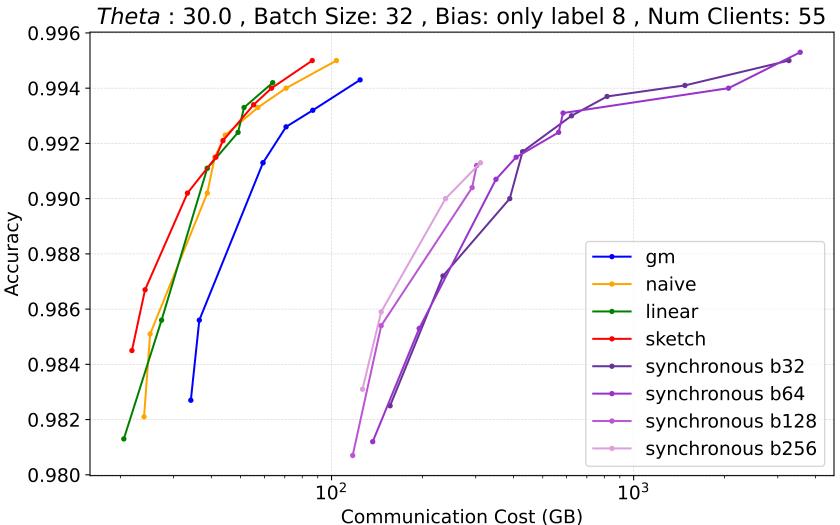


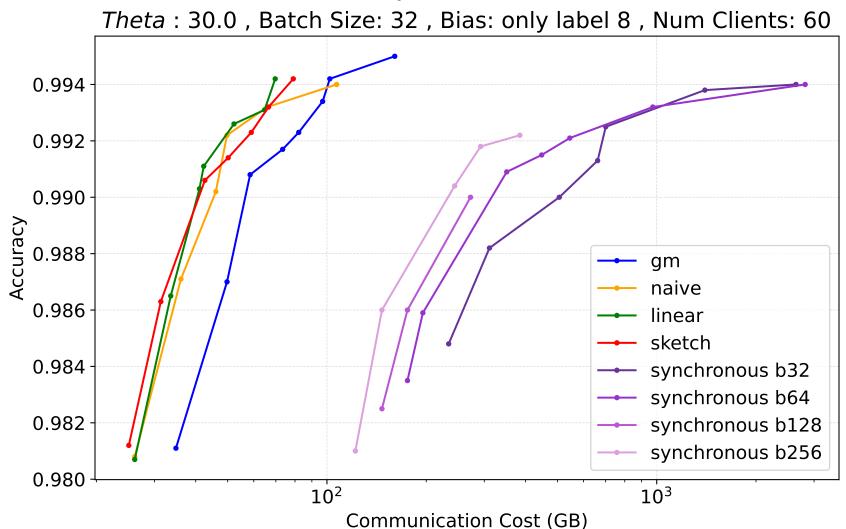


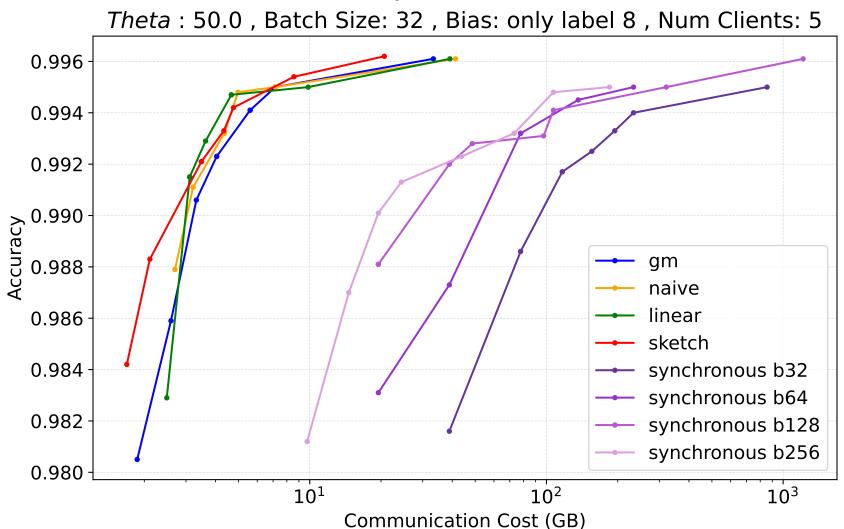


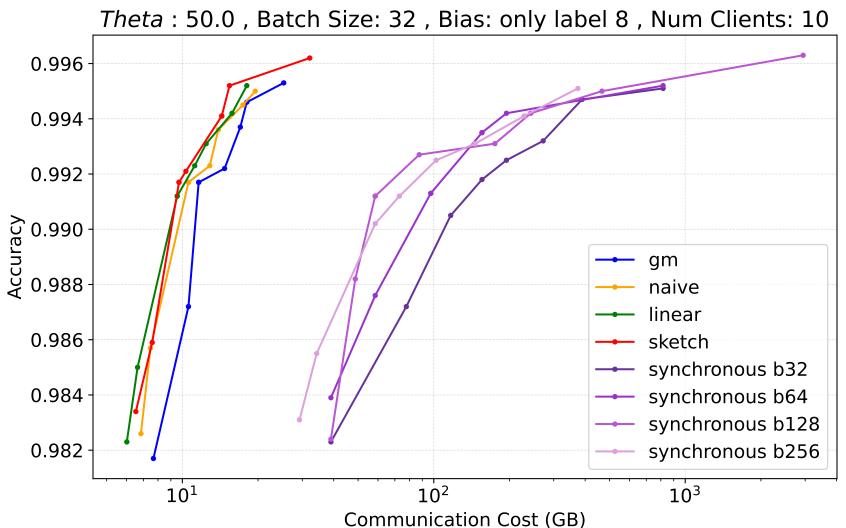
synchronous

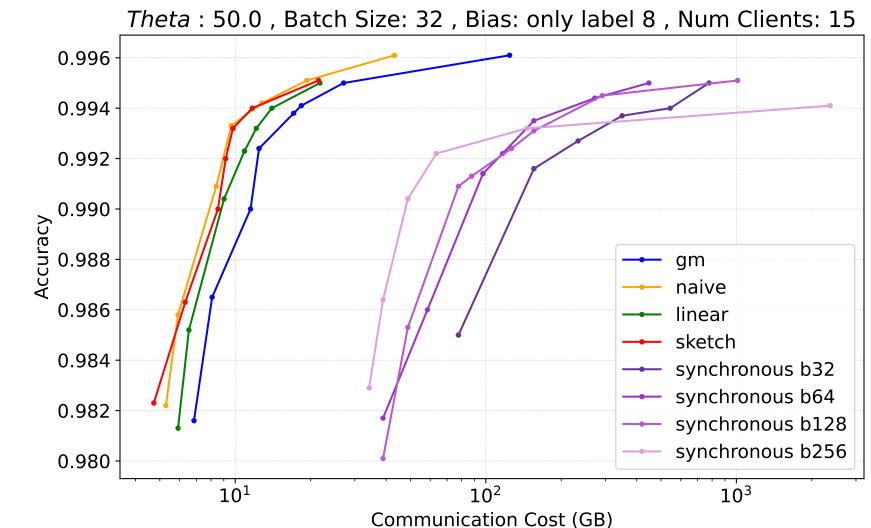
Theta: 30.0, Batch Size: 32, Bias: on

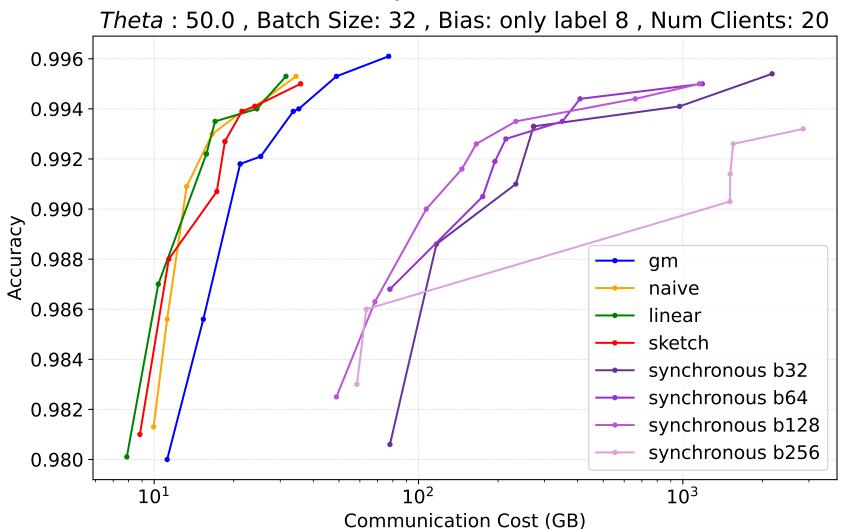


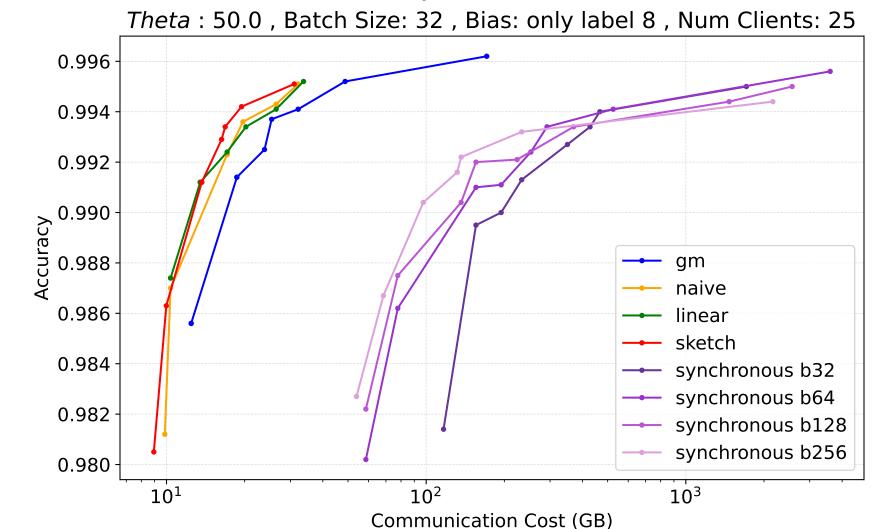


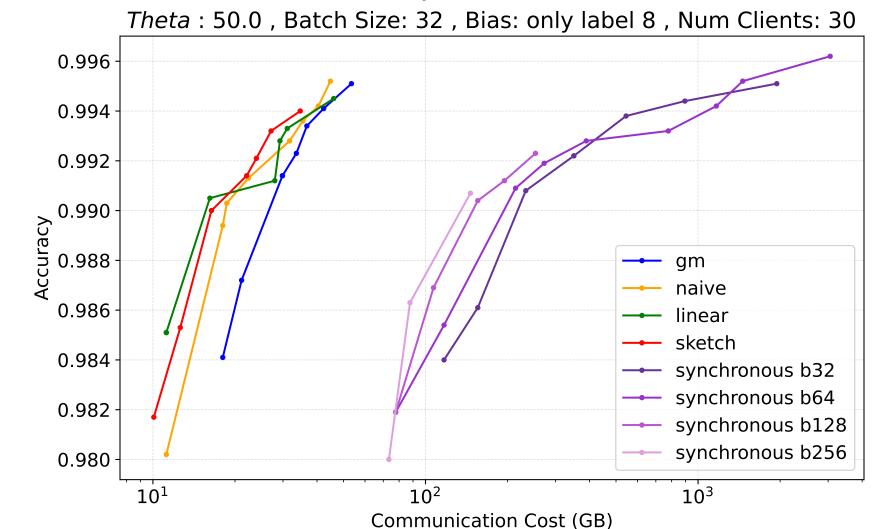


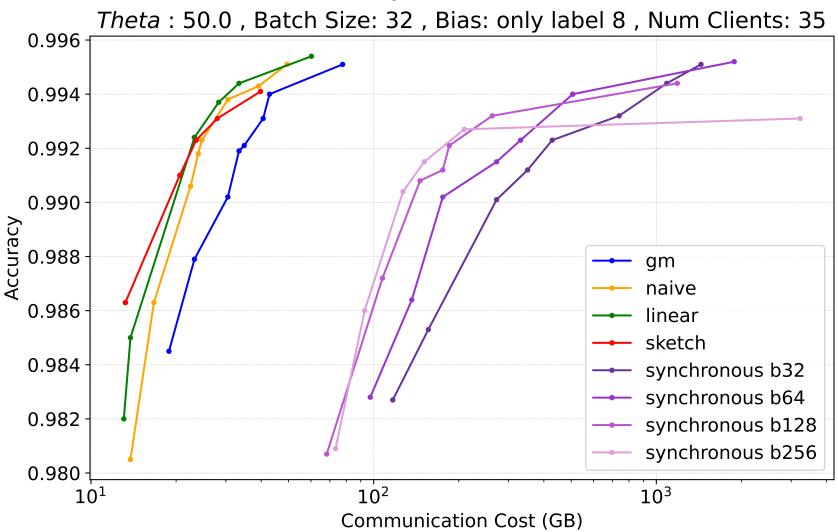


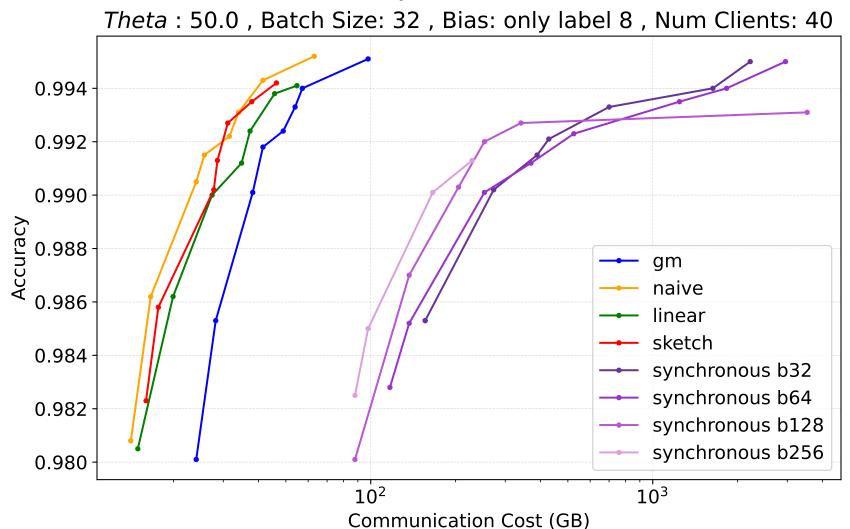


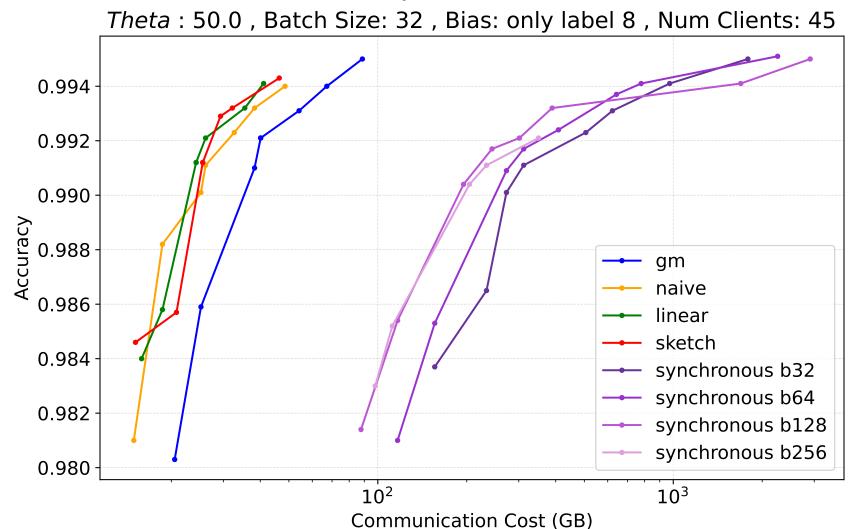


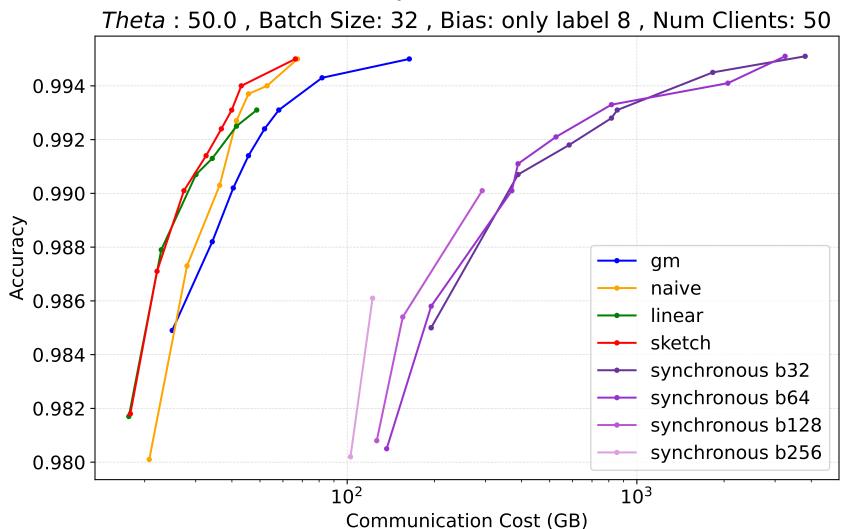


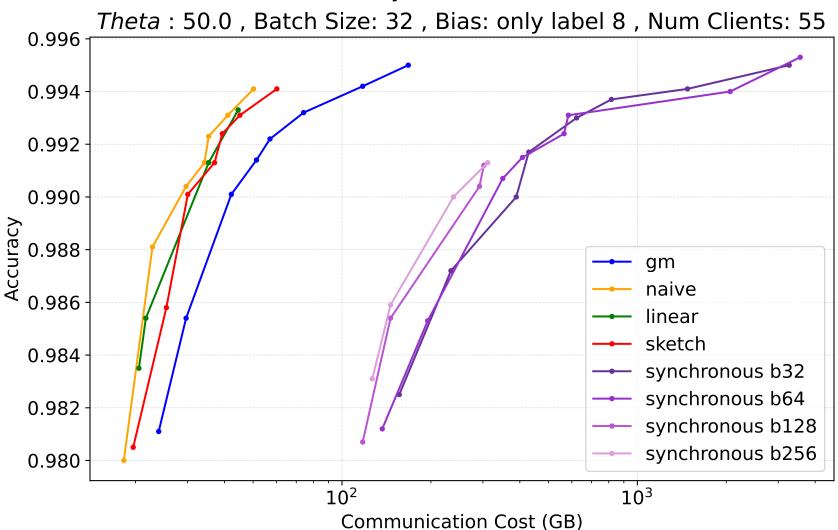


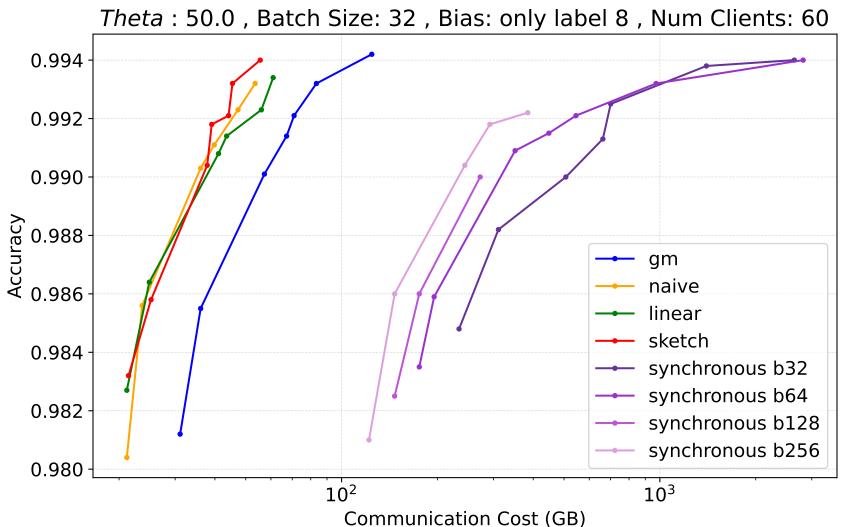


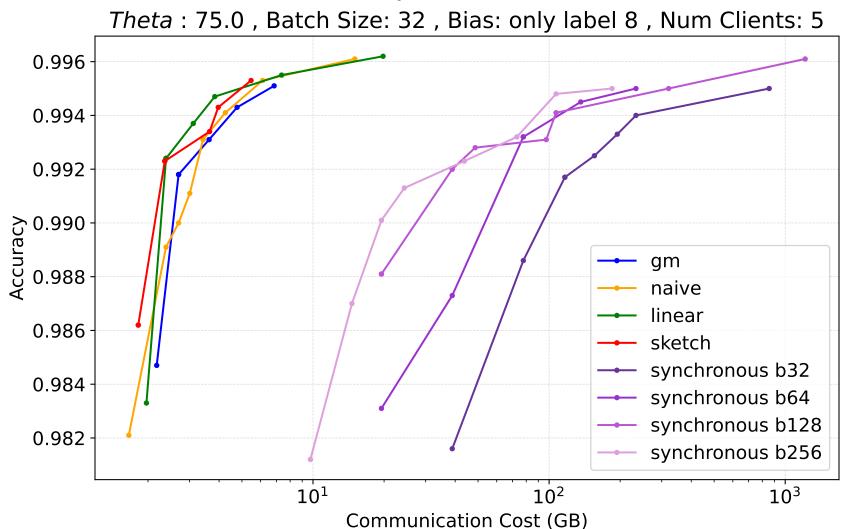


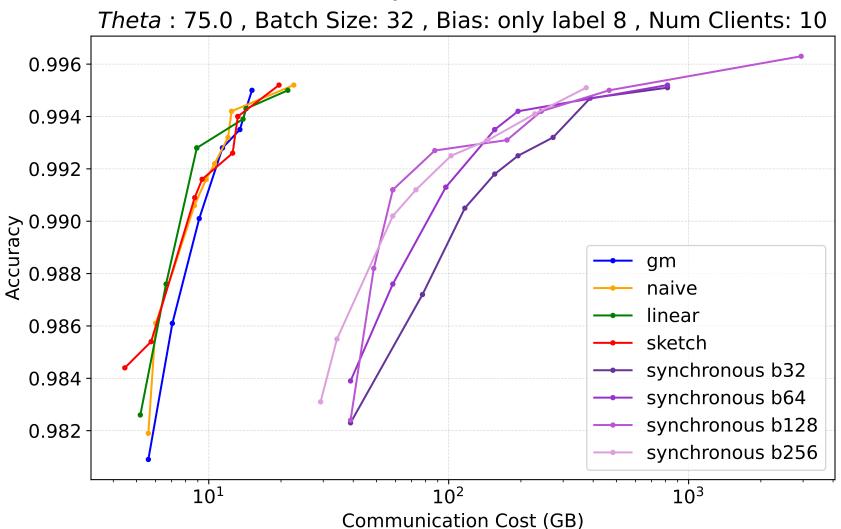


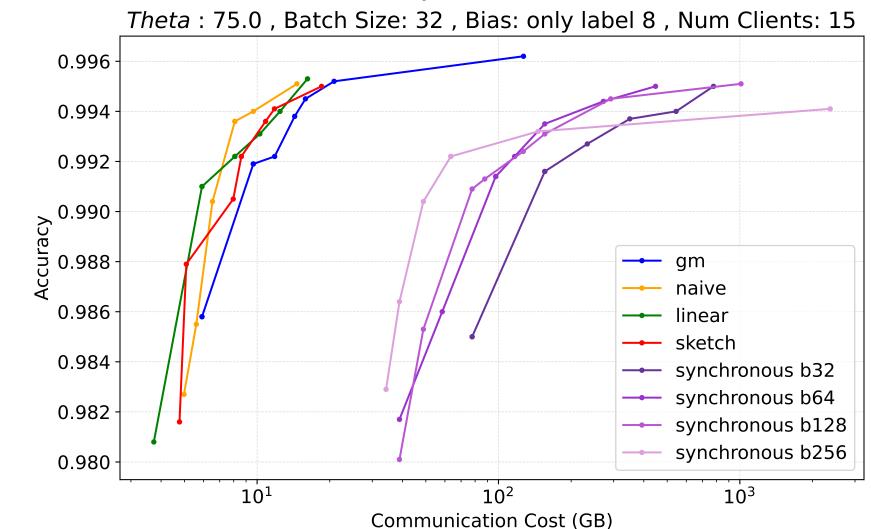


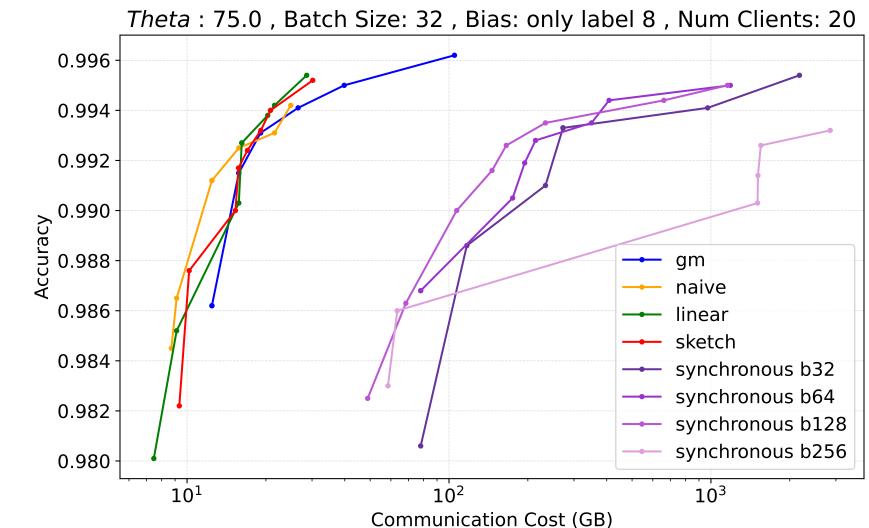


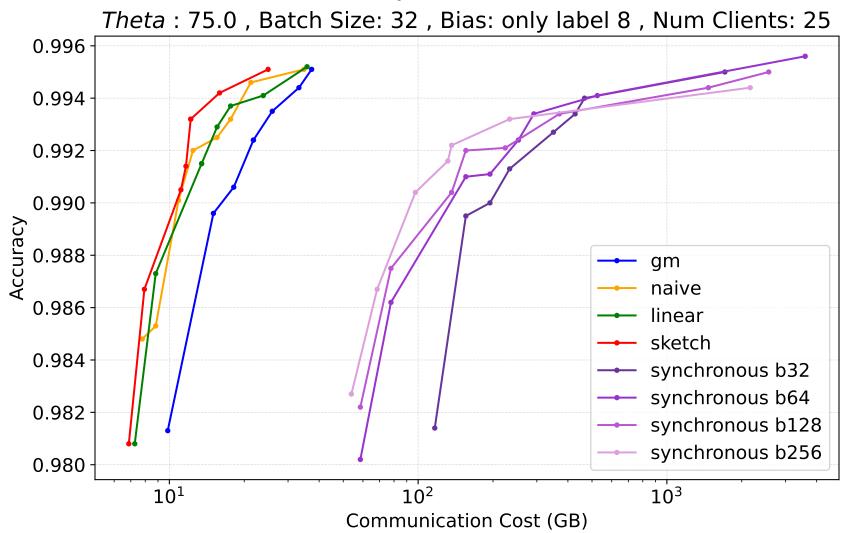


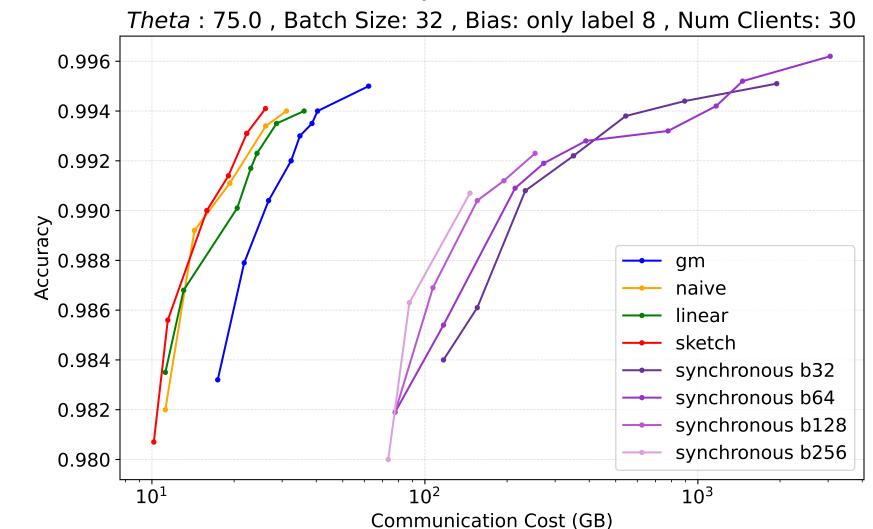


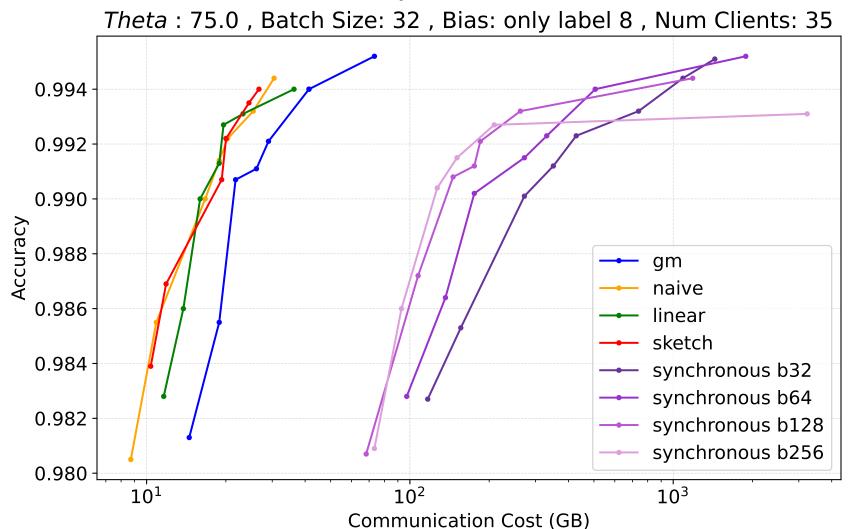


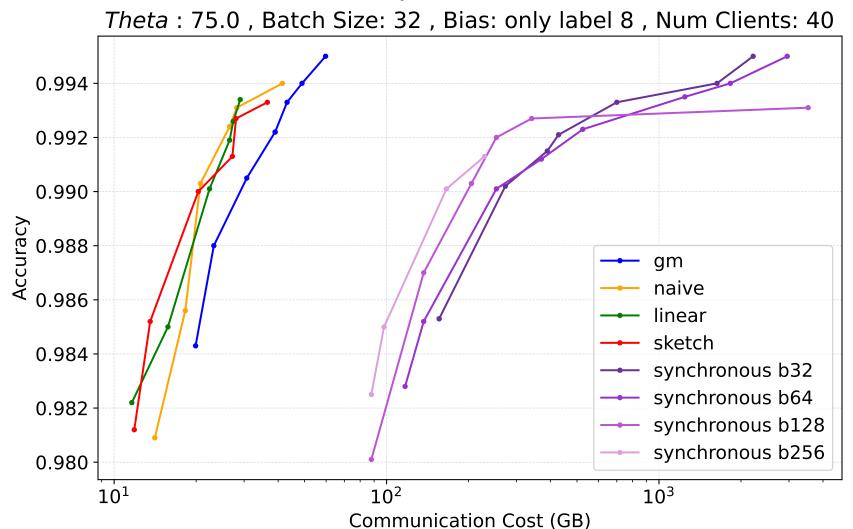


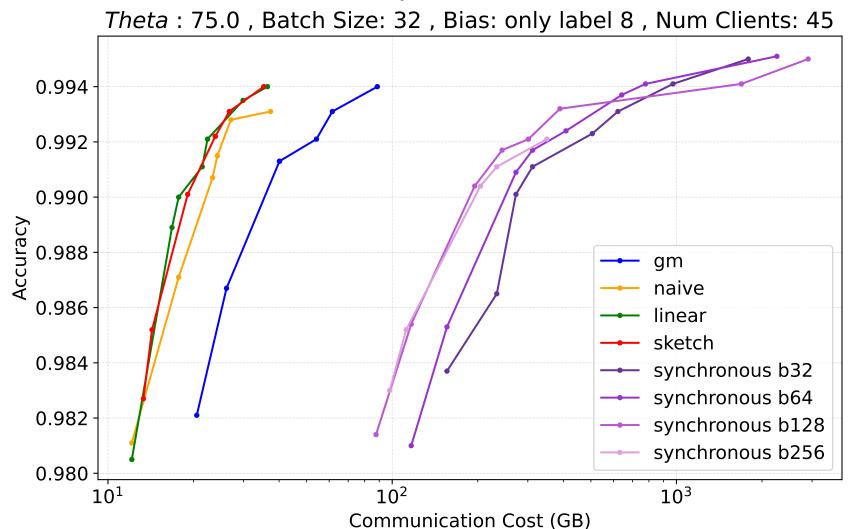


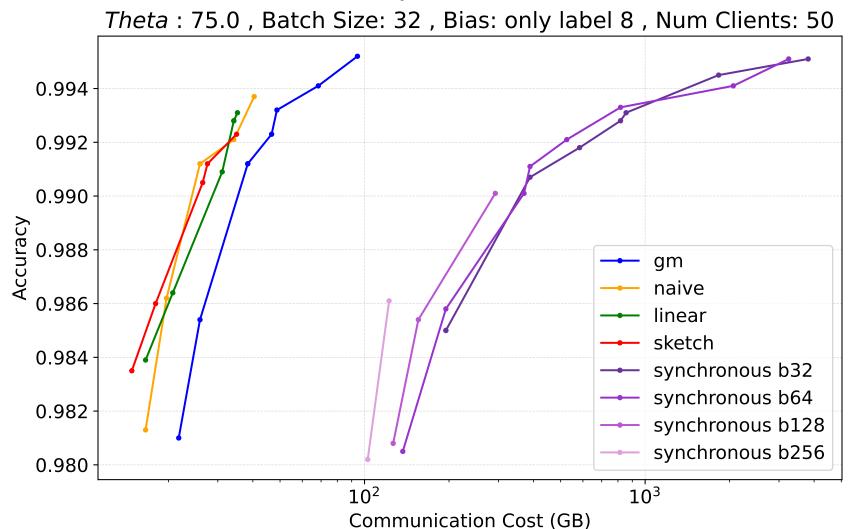












synchronous Theta: 75.0, Batch Size: 32, Bias: only label 8, Num Clients: 55 0.996 0.994 0.992 0.990 Accuracy 0.988 gm naive 0.986 linear sketch 0.984 synchronous b32 synchronous b64 0.982 synchronous b128

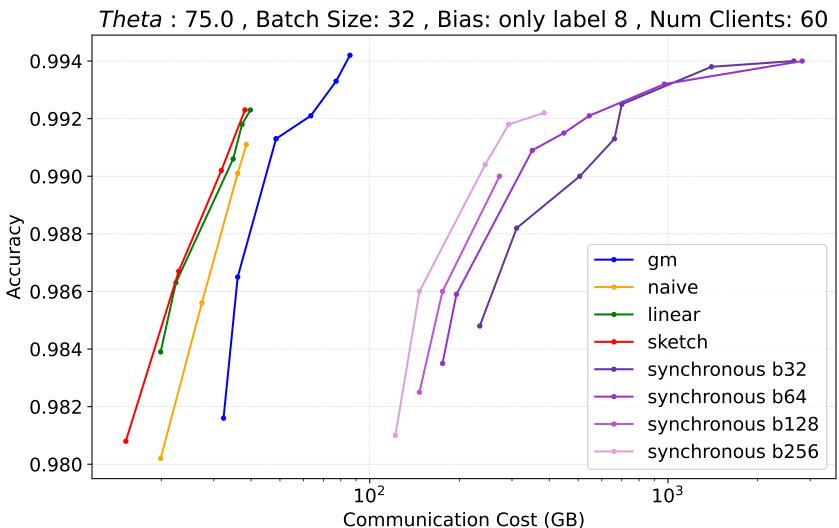
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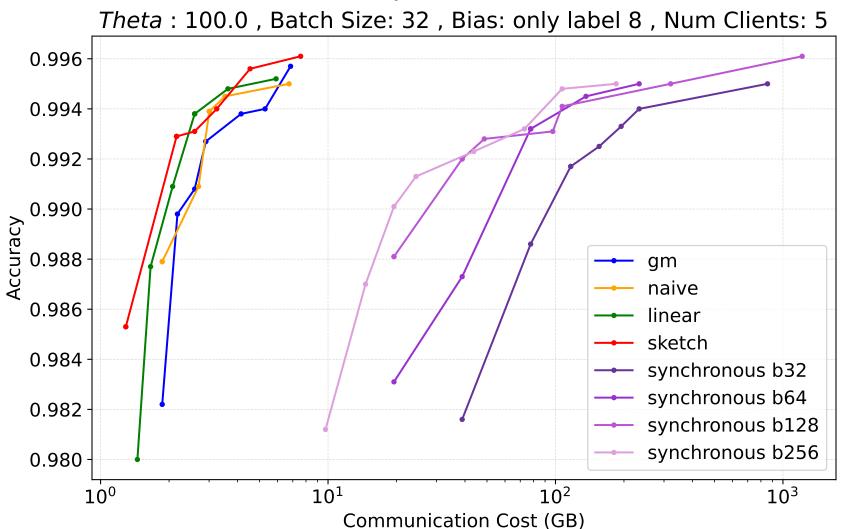
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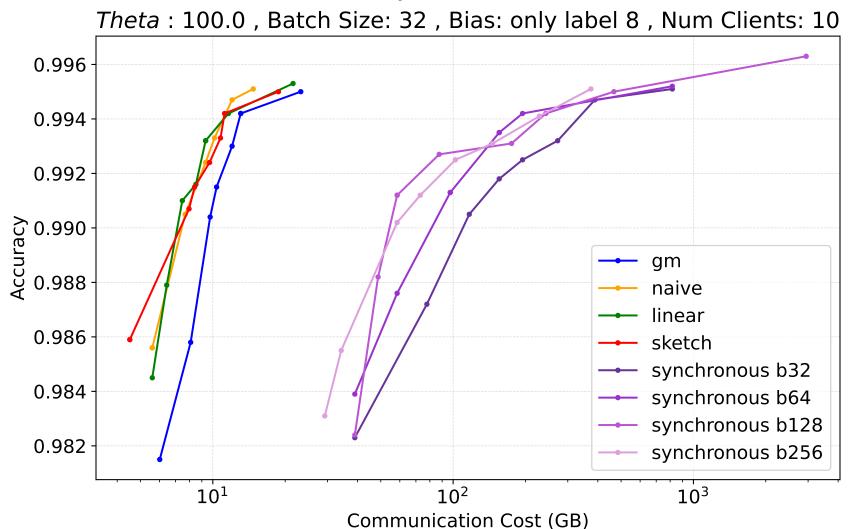
Communication Cost (GB)

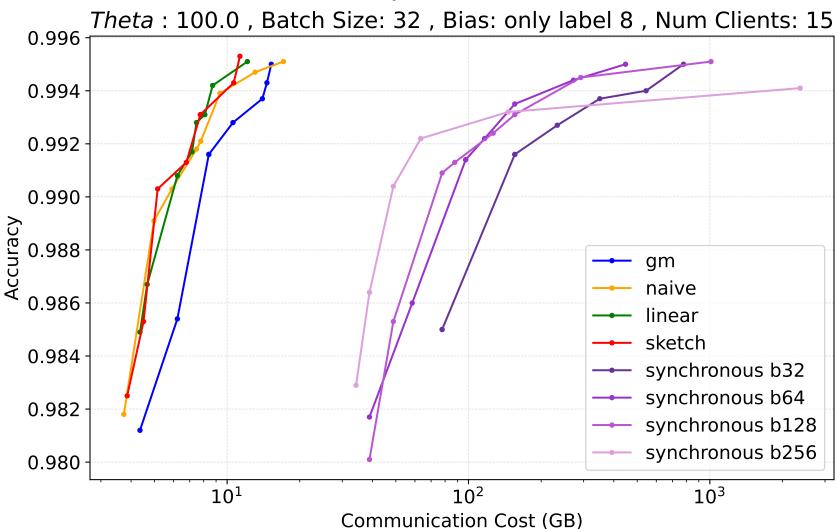
synchronous b256

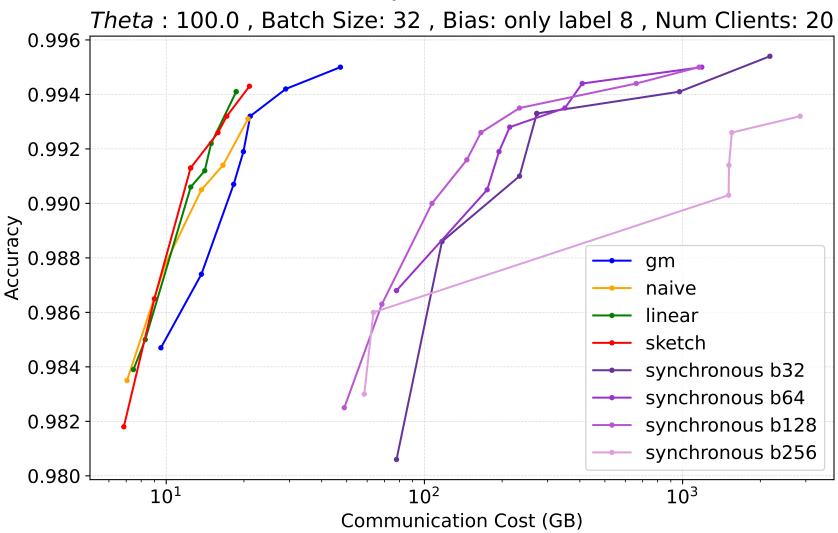
10<sup>3</sup>

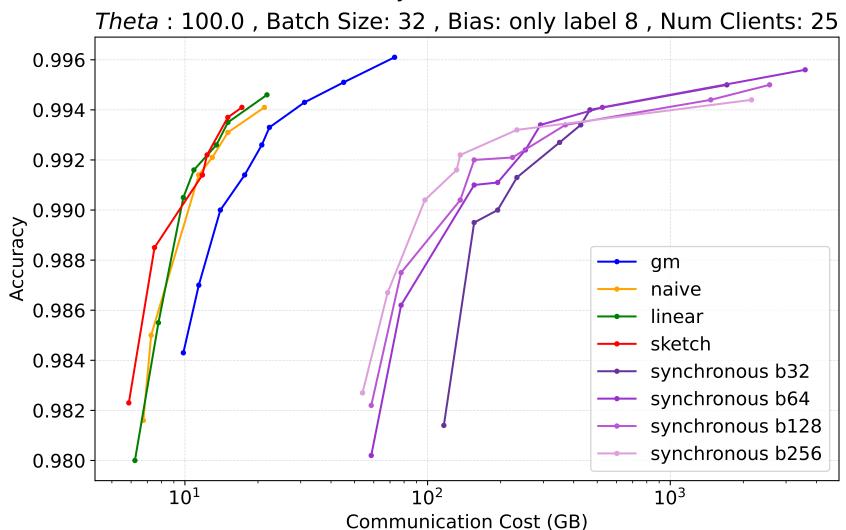


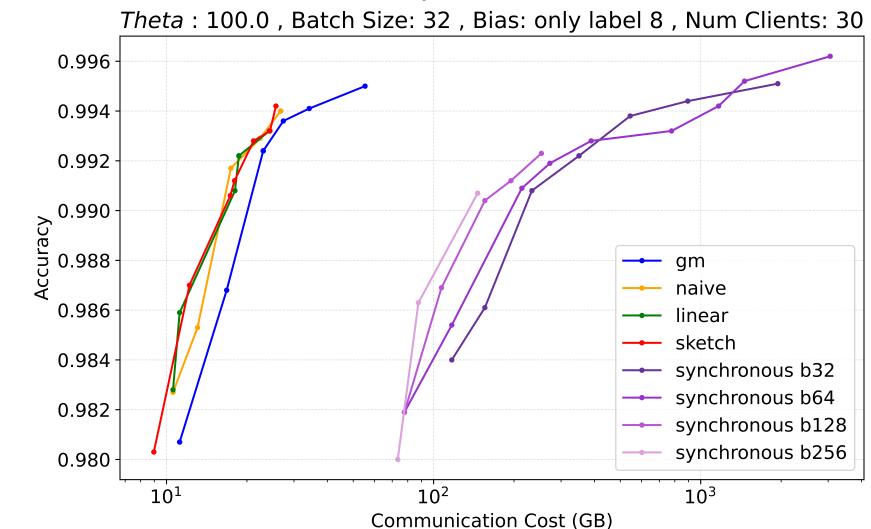


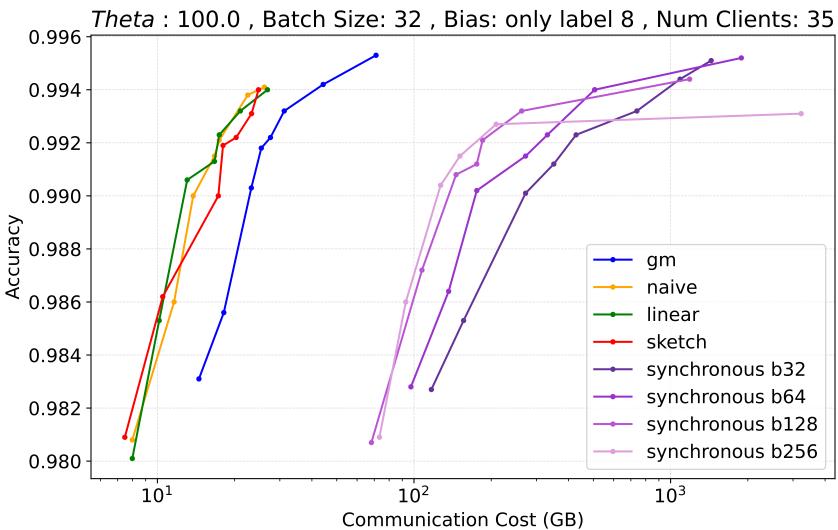


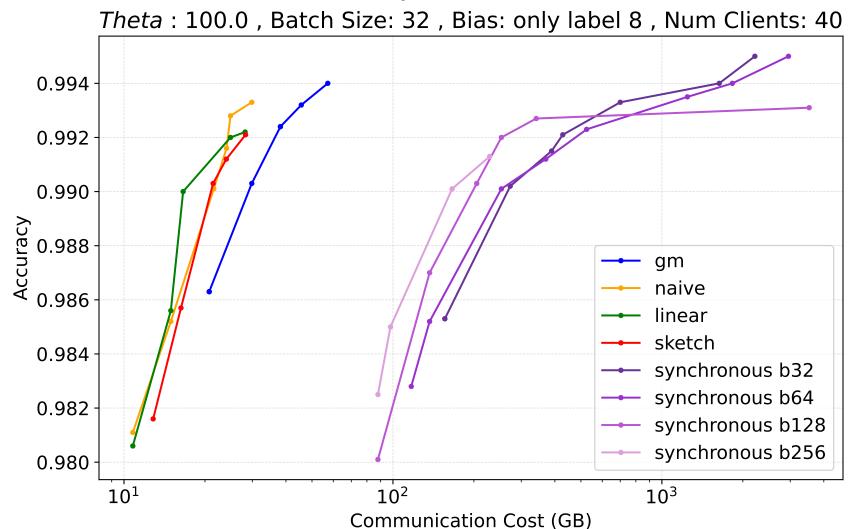


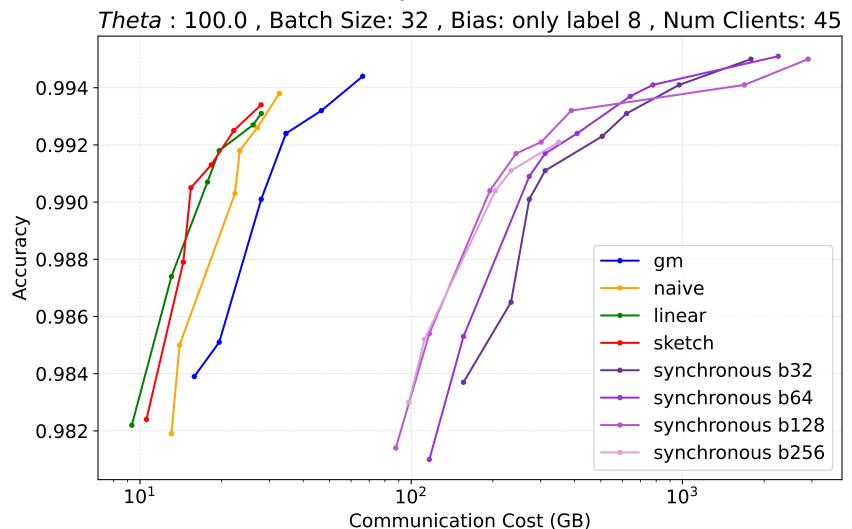


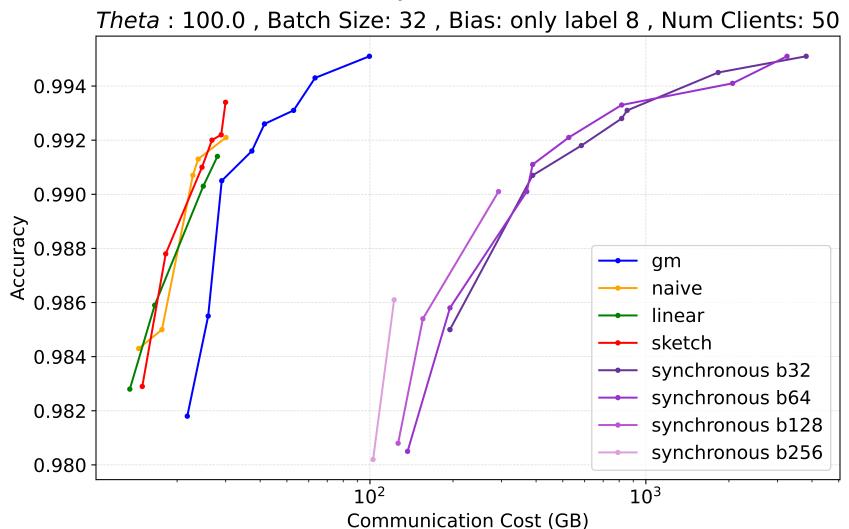




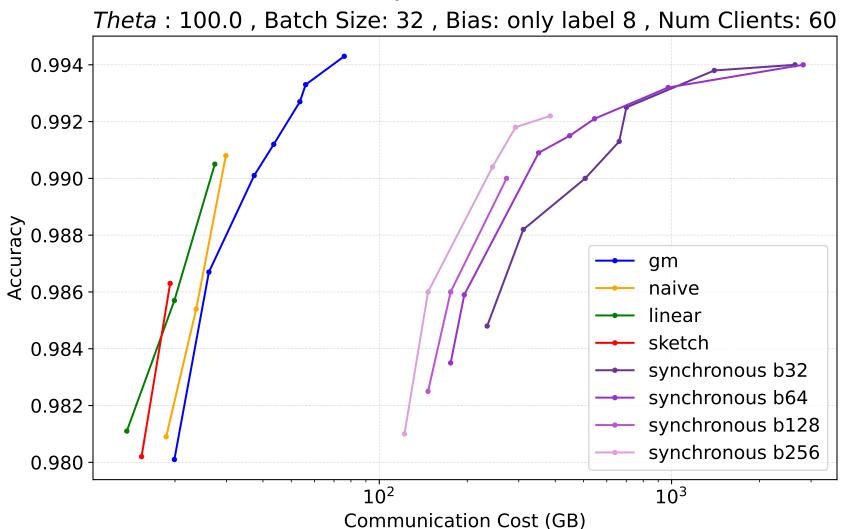


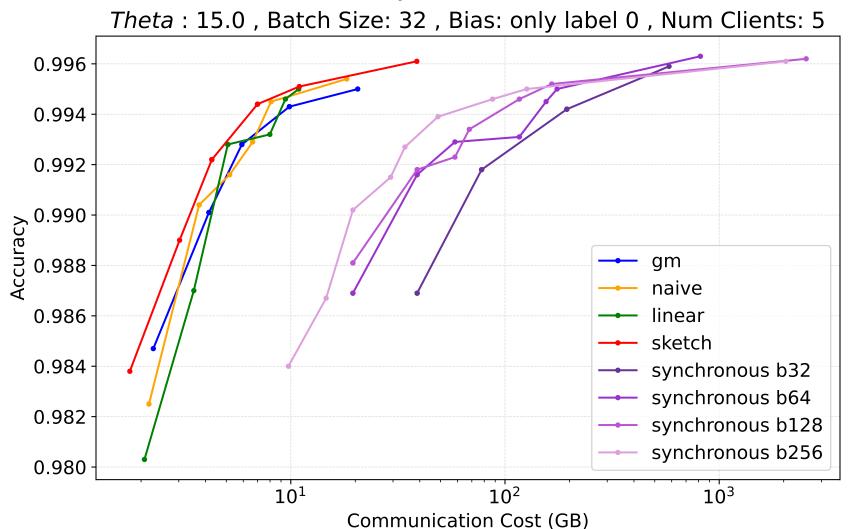


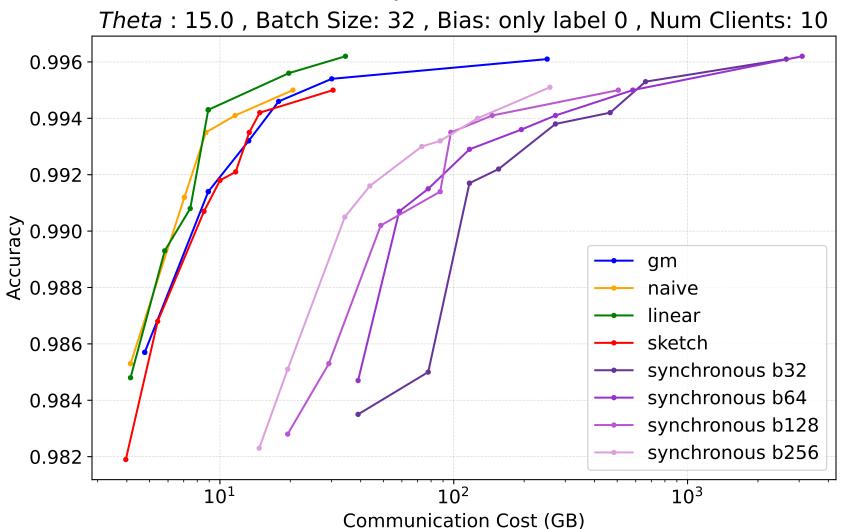


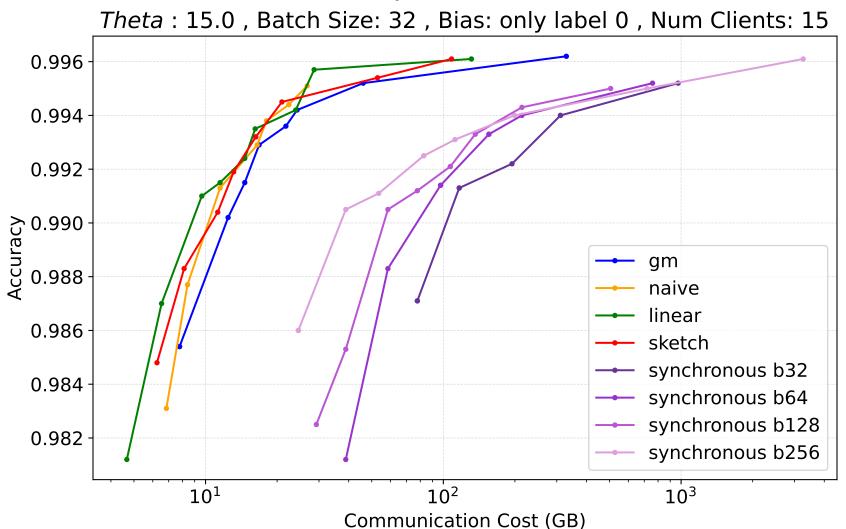


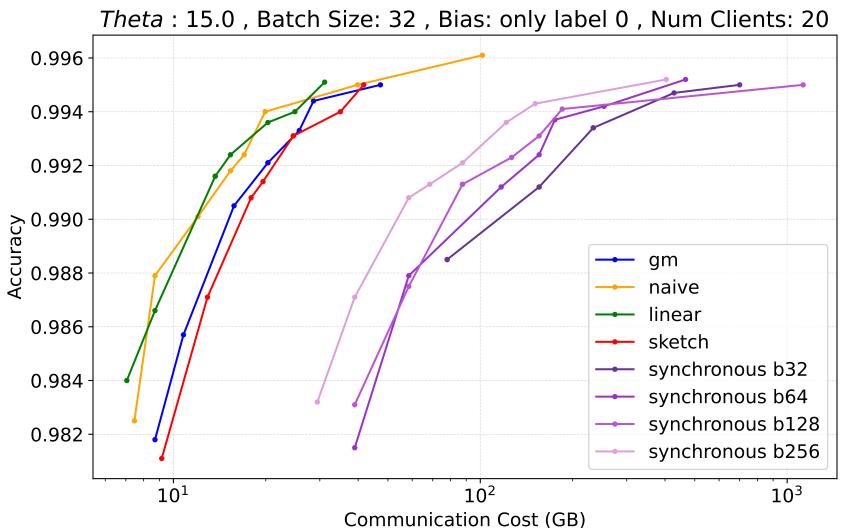
synchronous Theta: 100.0, Batch Size: 32, Bias: only label 8, Num Clients: 55 0.996 0.994 0.992 0.990 Accuracy 0.988 gm naive 0.986 linear sketch 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup> Communication Cost (GB)

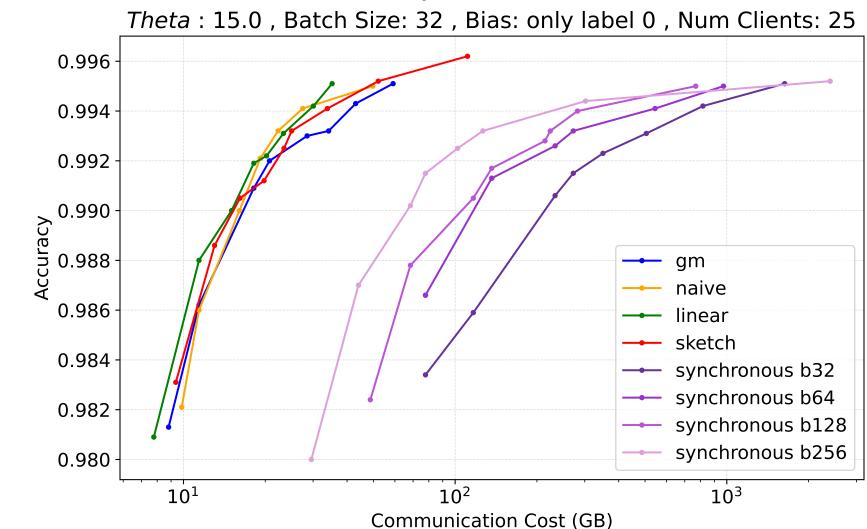


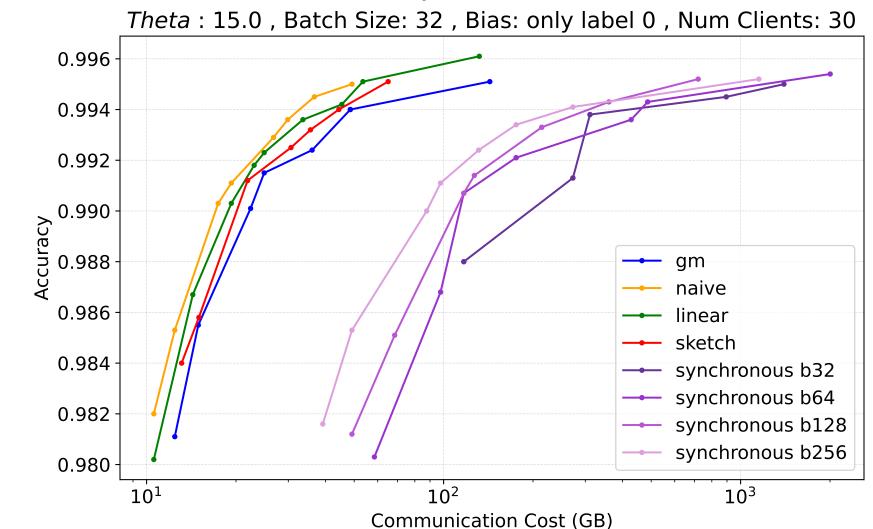


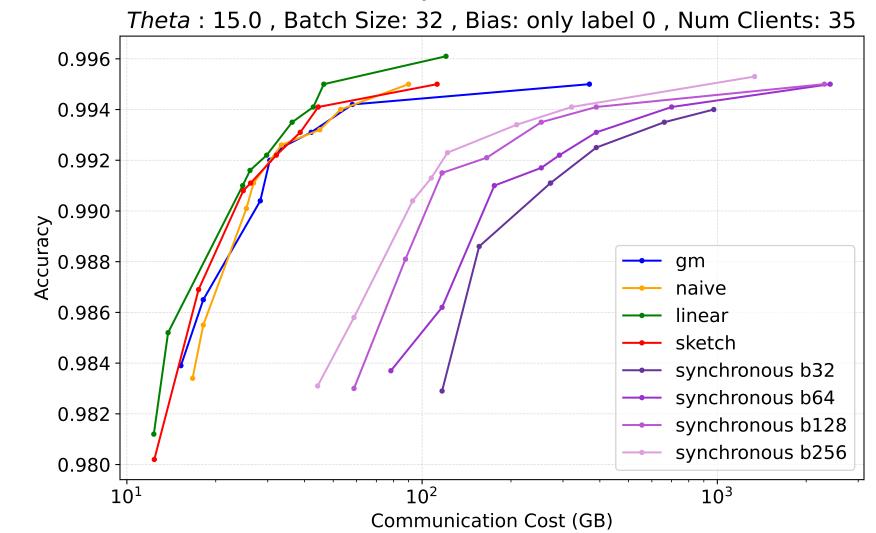


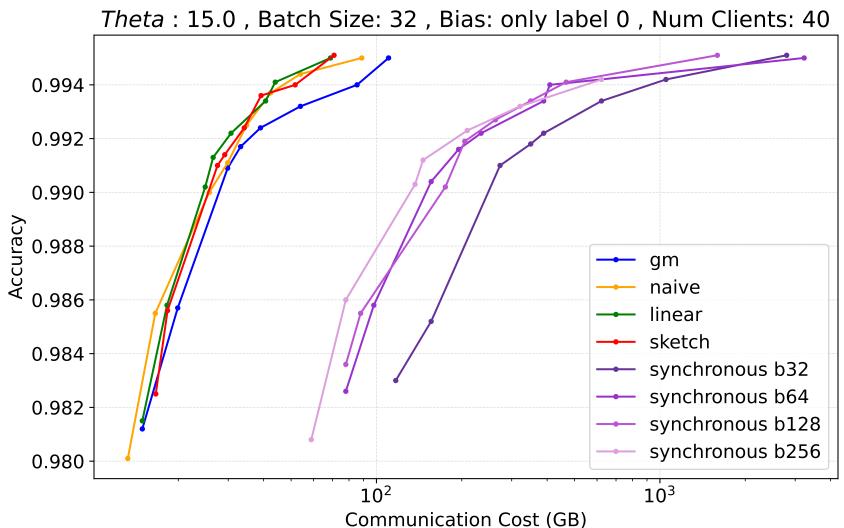


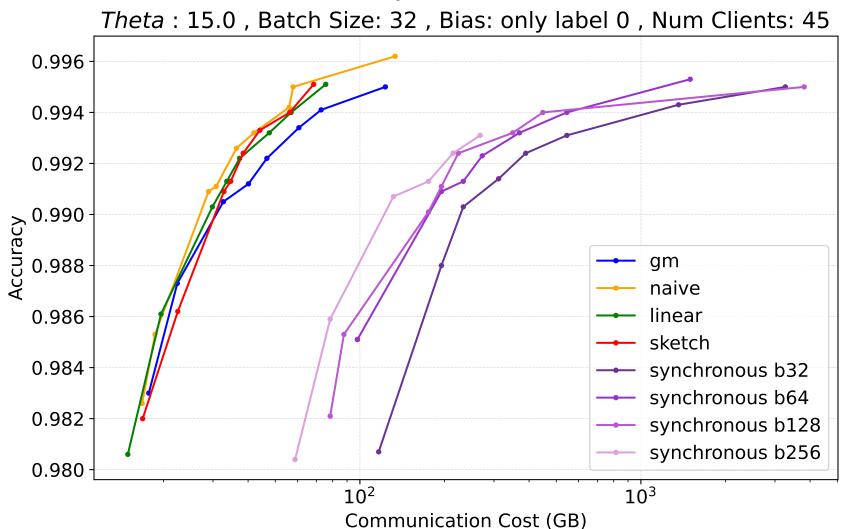








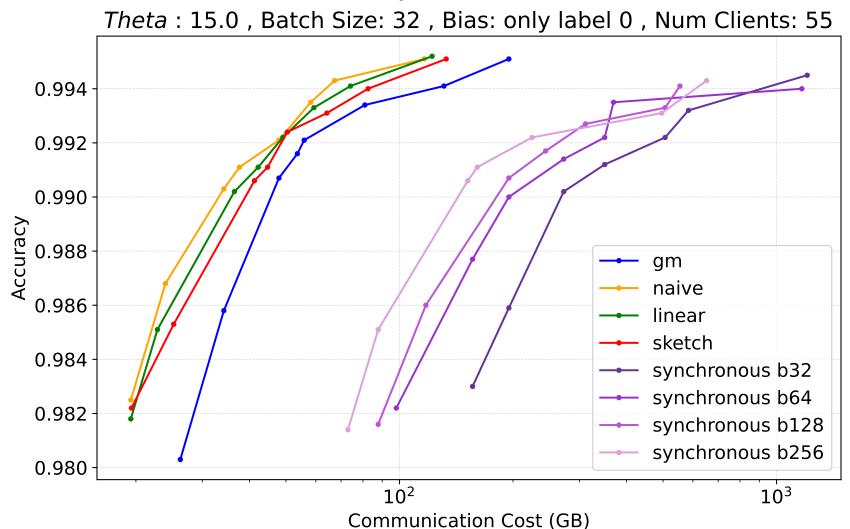


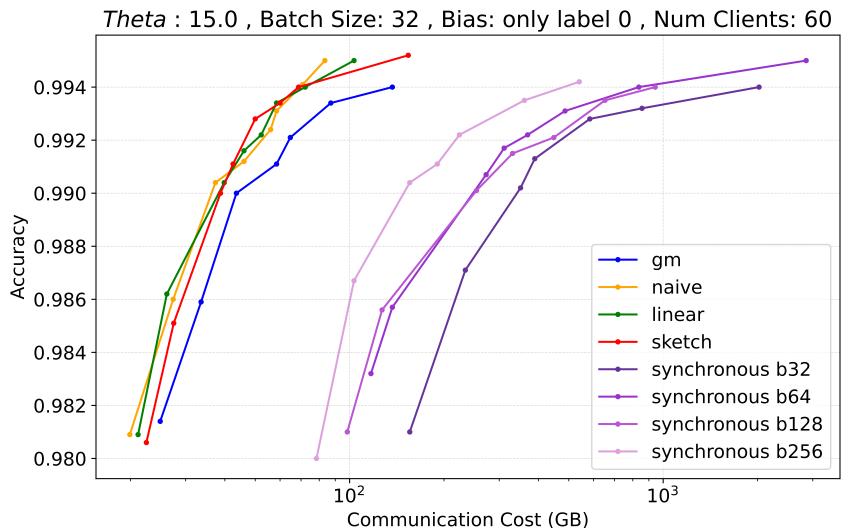


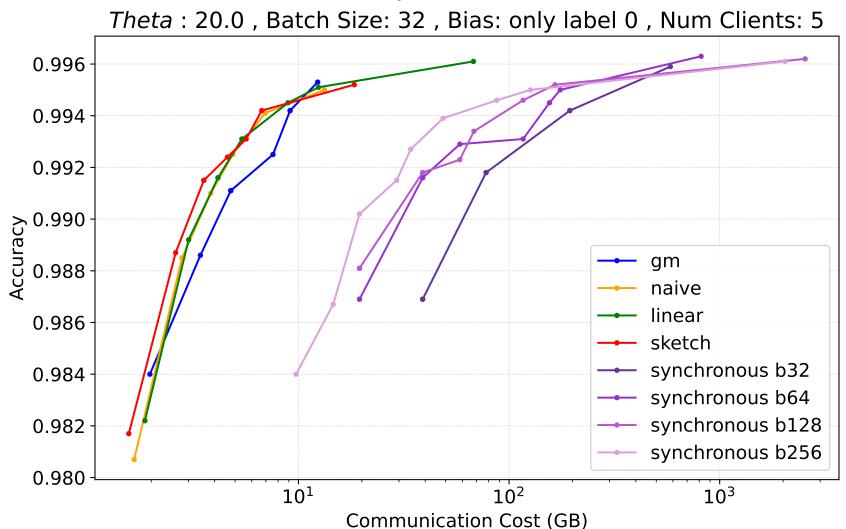
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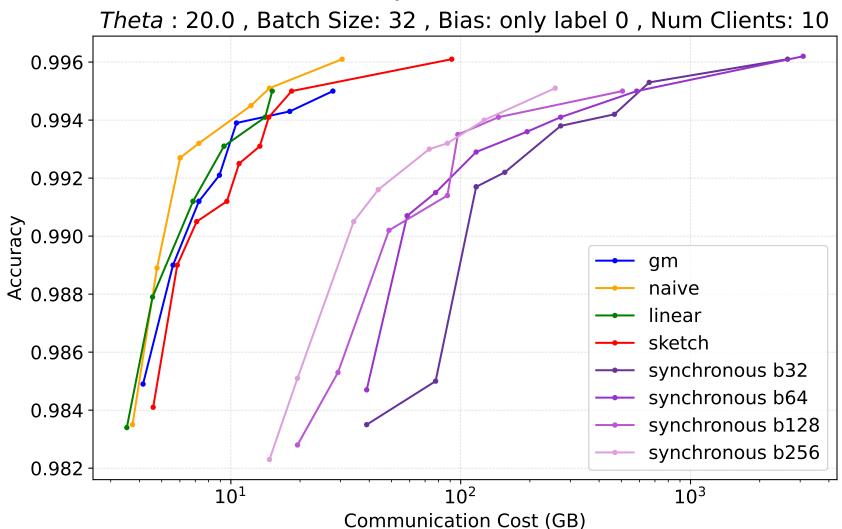
Communication Cost (GB)

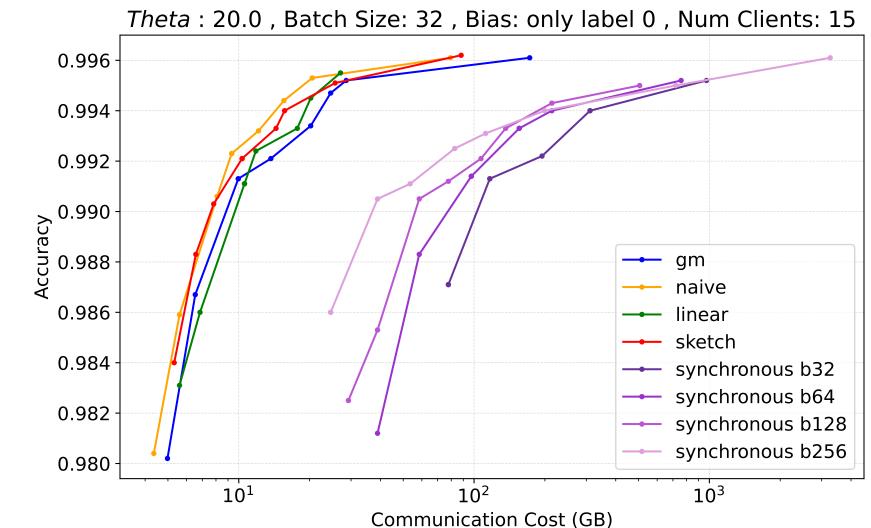
 $10^3$ 

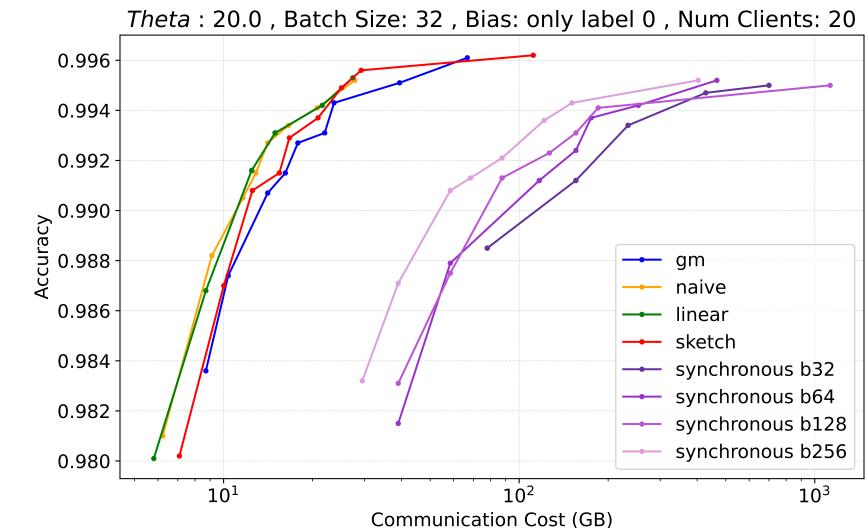


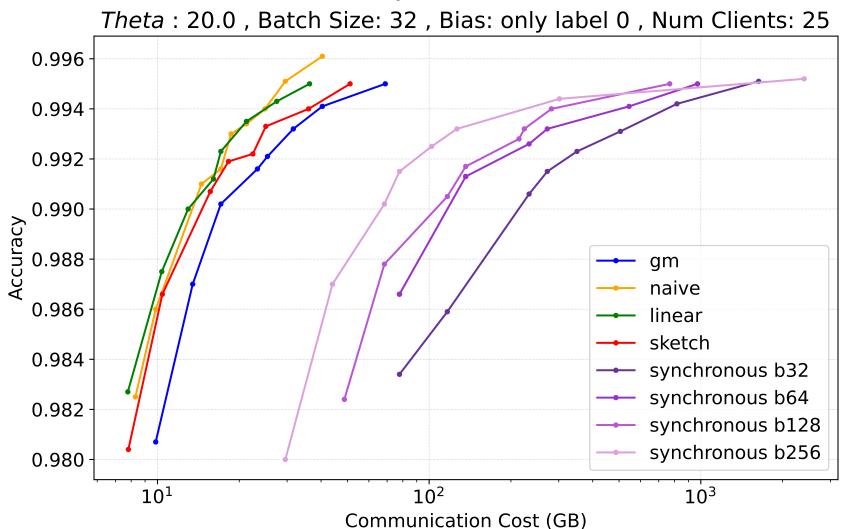


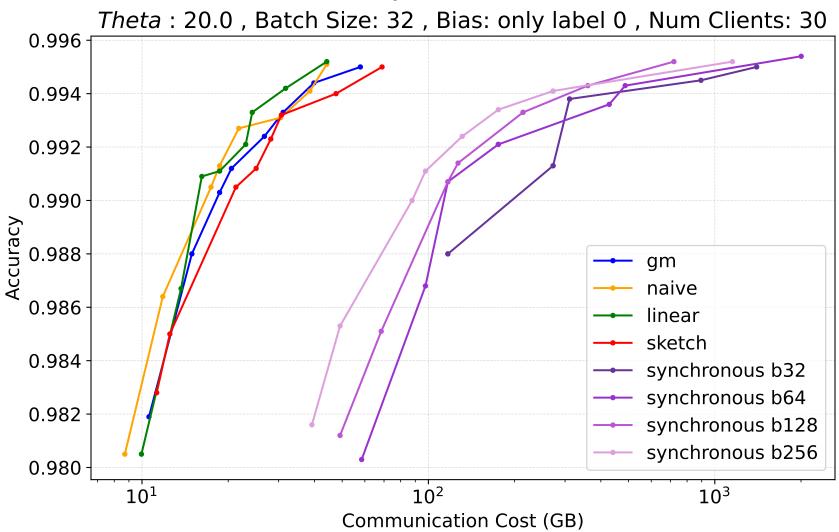


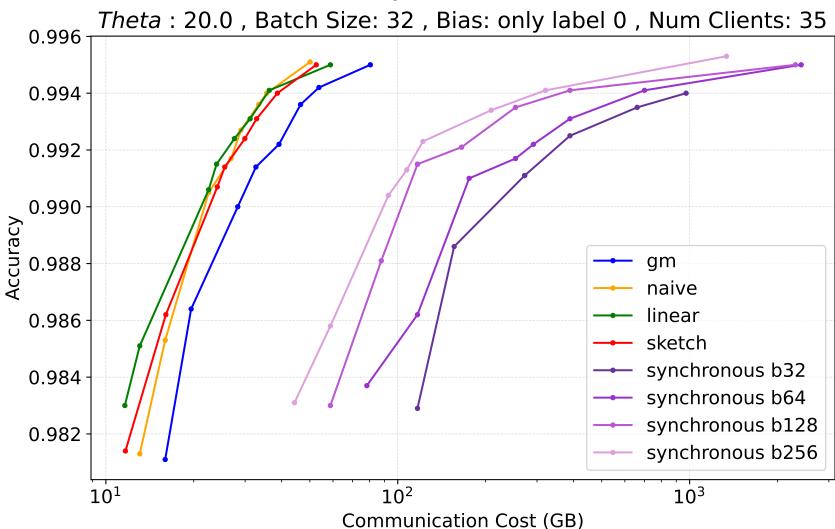


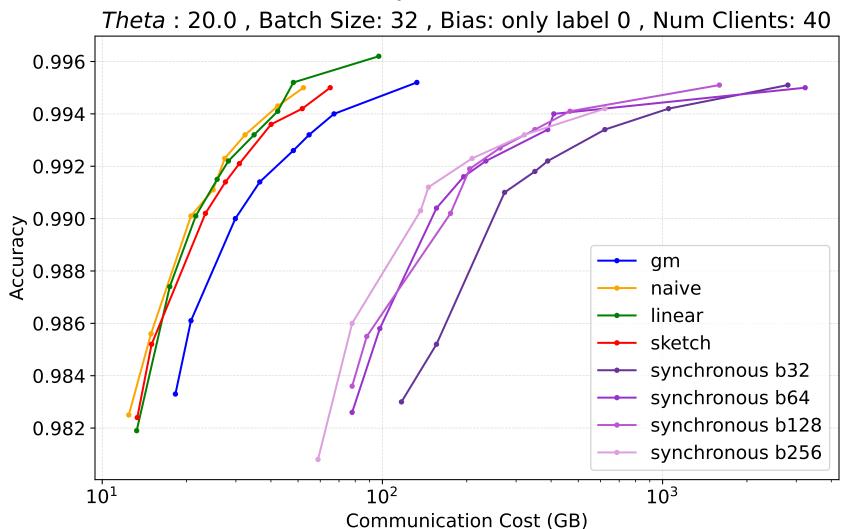












synchronous Theta: 20.0, Batch Size: 32, Bias: only label 0, Num Clients: 45 0.996 0.994 0.992 0.990 Accuracy 0.988 gm naive 0.986 linear sketch 0.984 synchronous b32 synchronous b64 0.982 synchronous b128

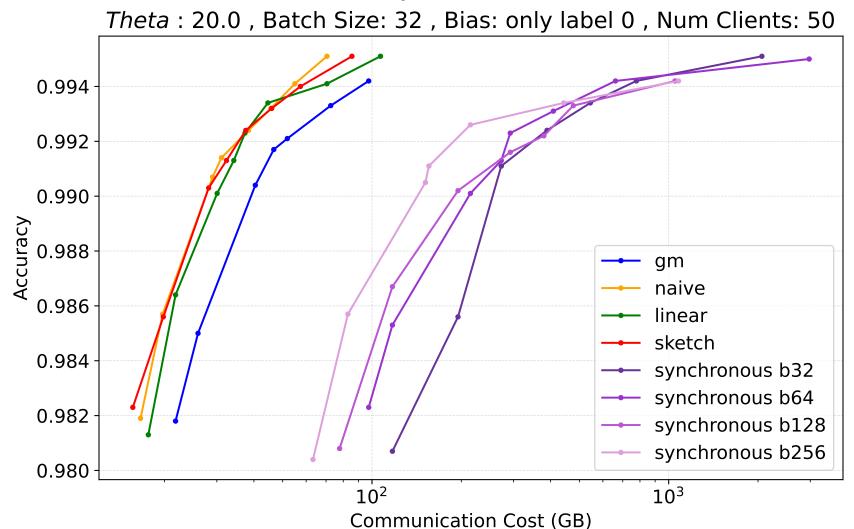
Communication Cost (GB)

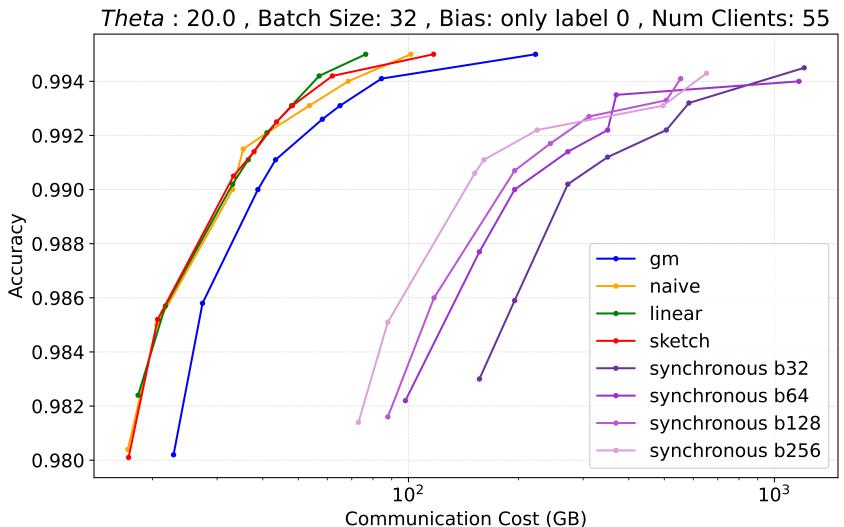
10<sup>2</sup>

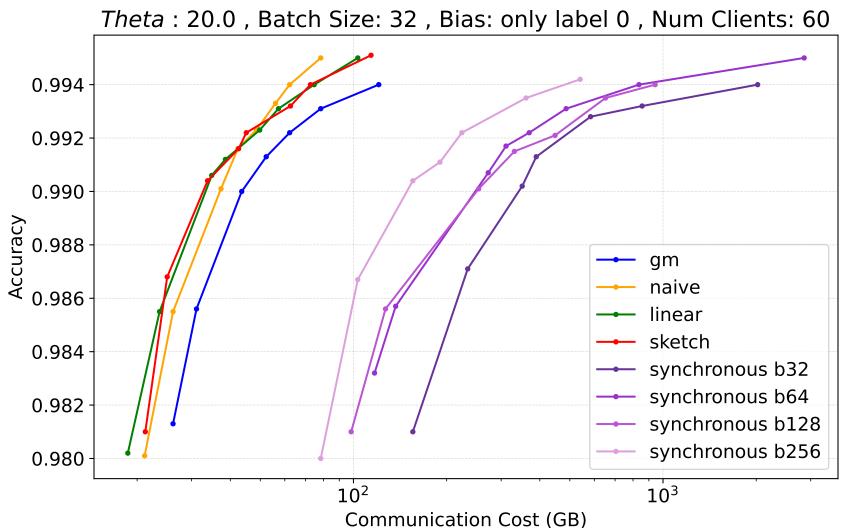
0.980

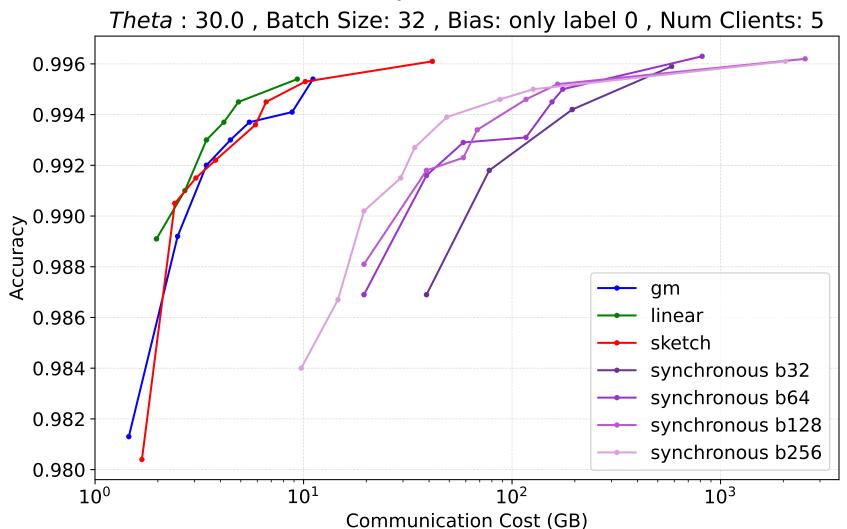
synchronous b256

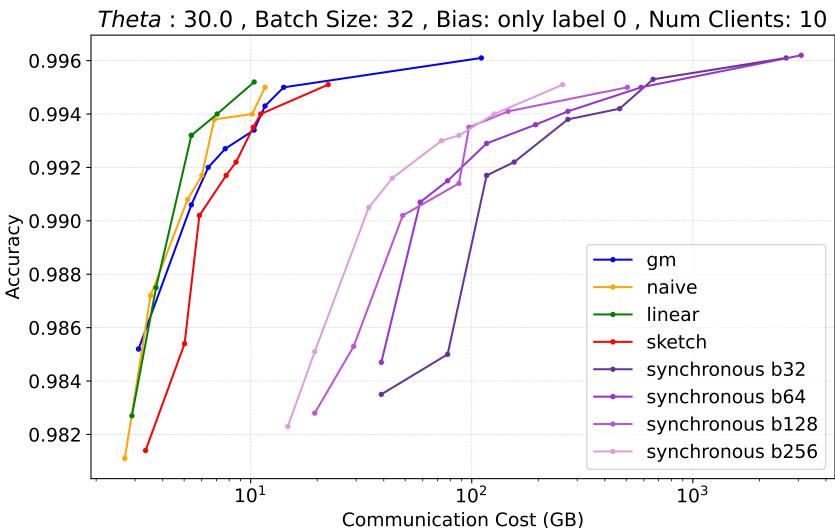
10<sup>3</sup>

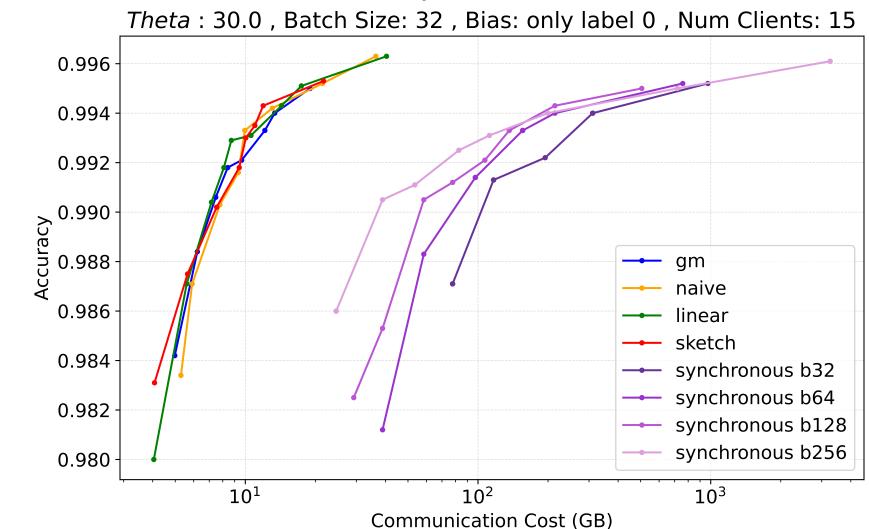


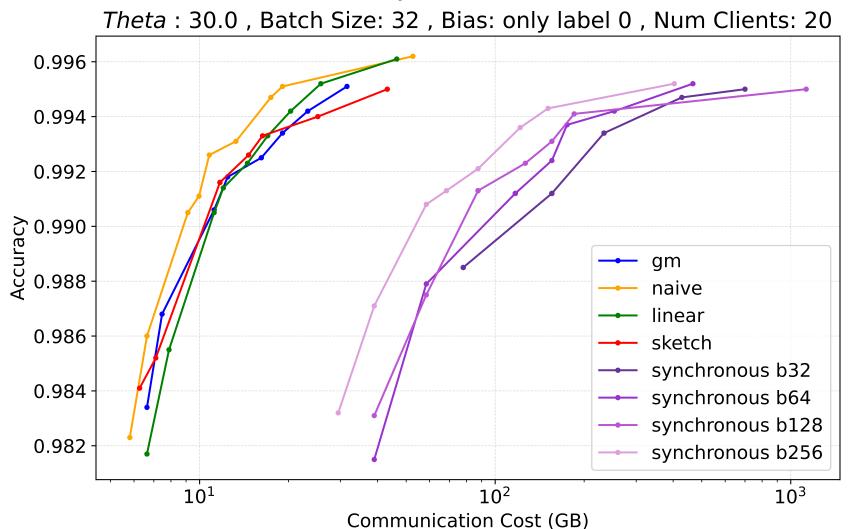


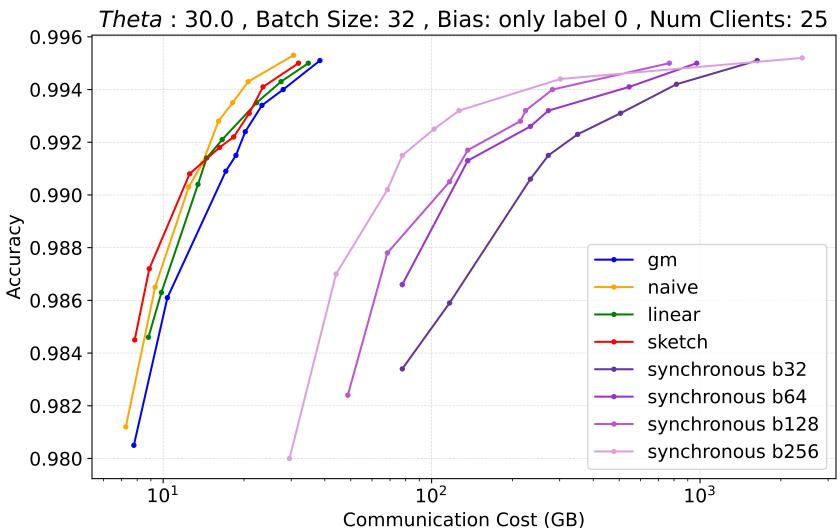


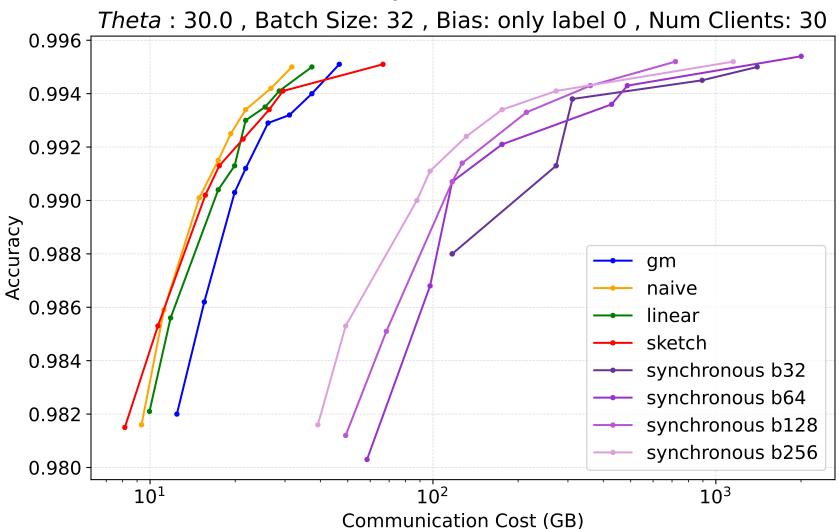


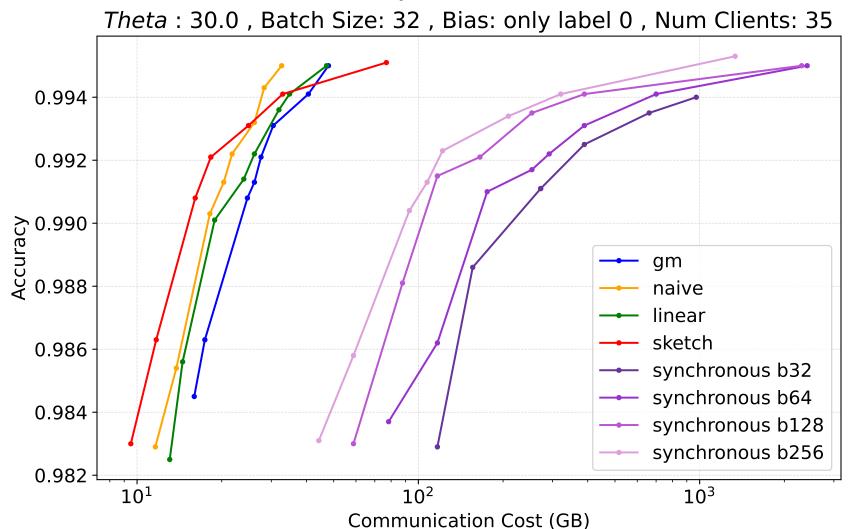


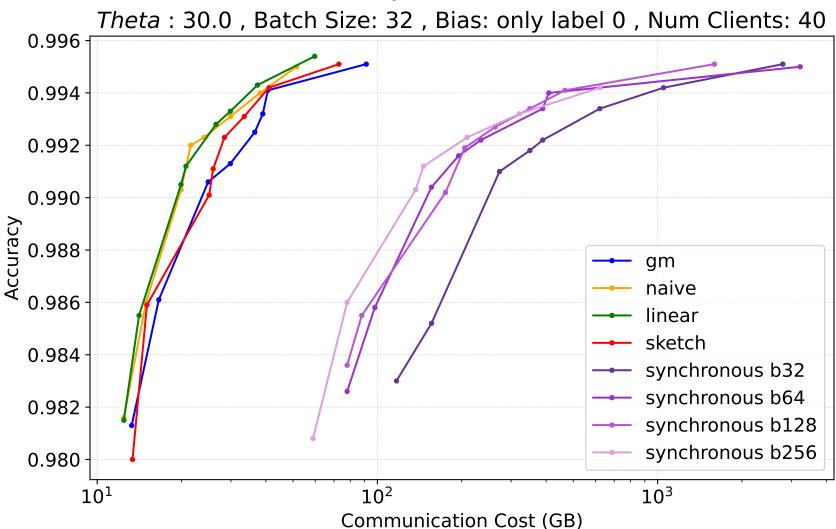


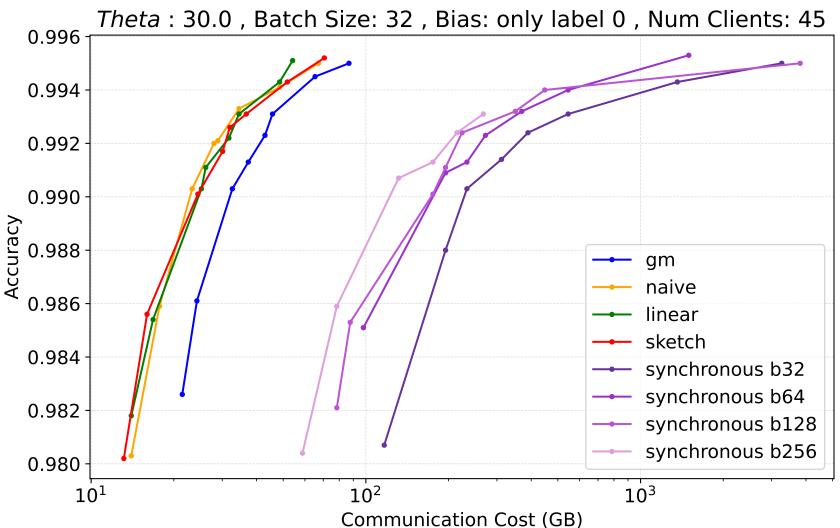


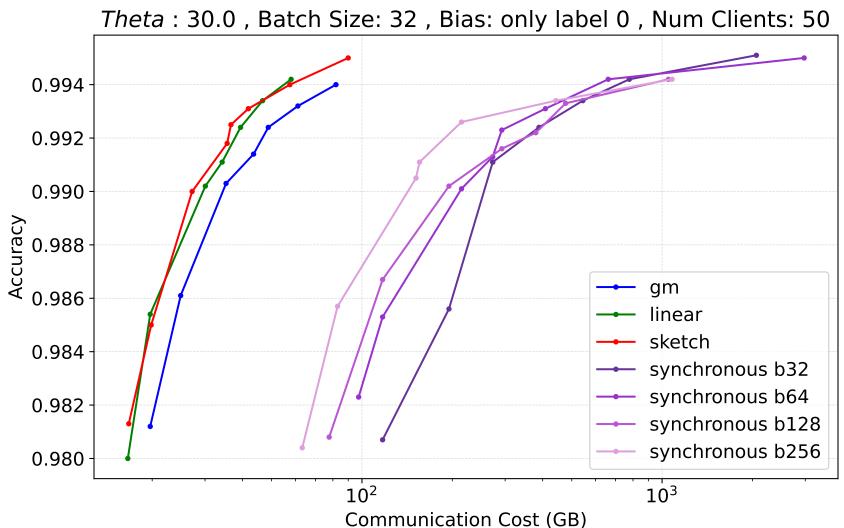


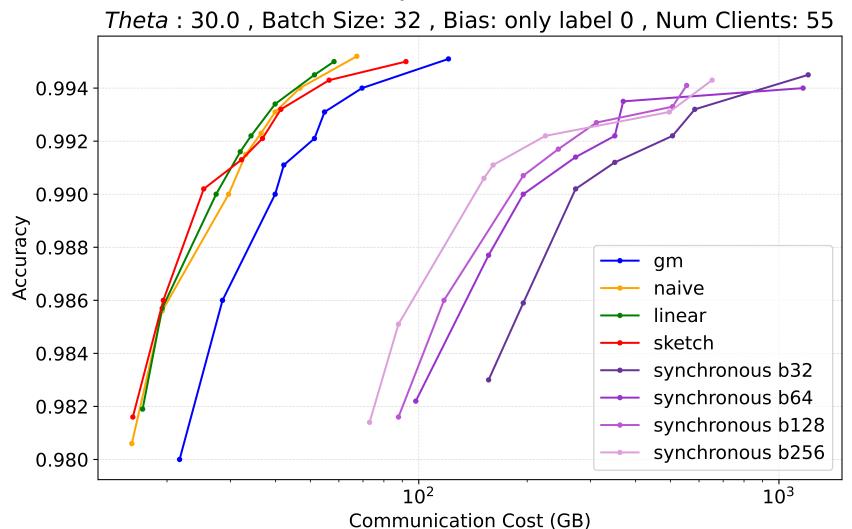






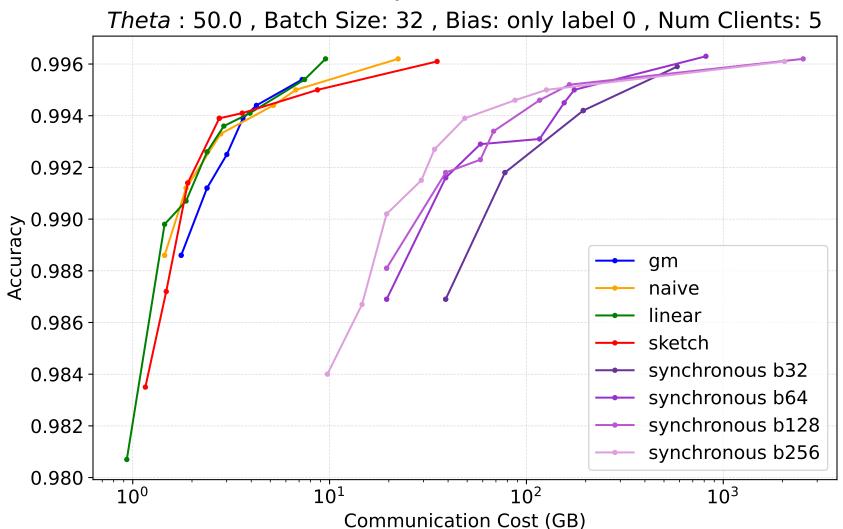


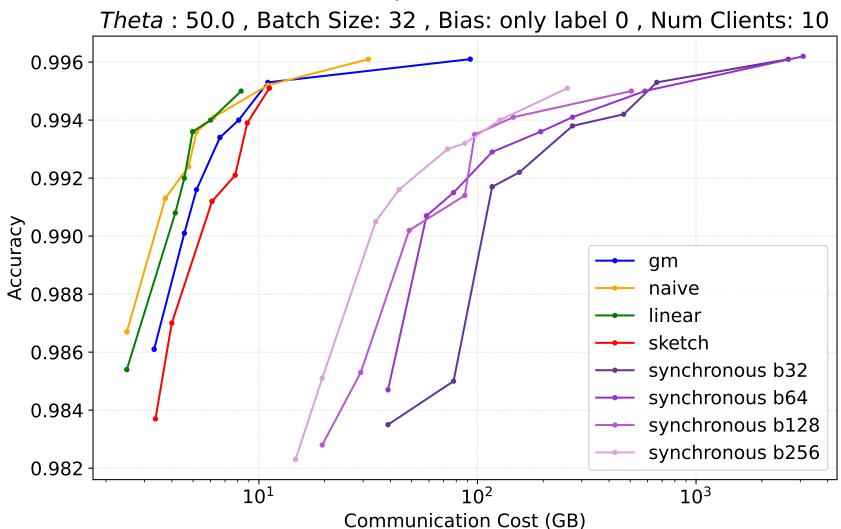


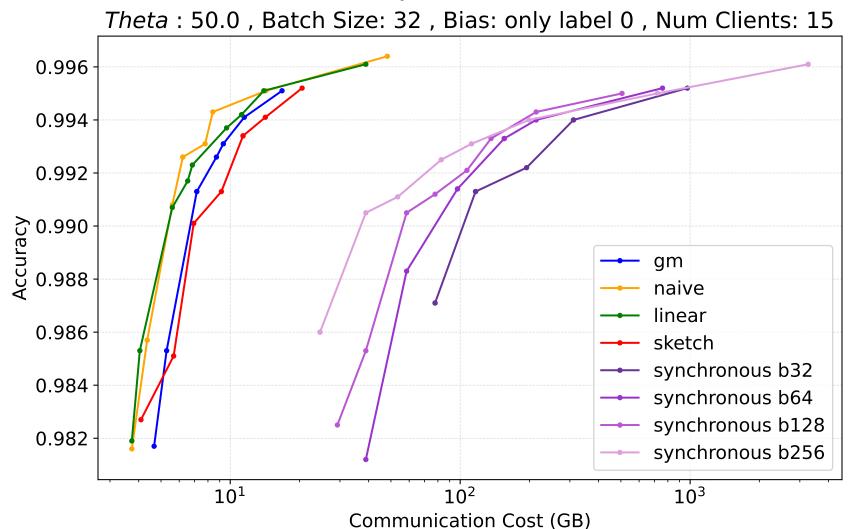


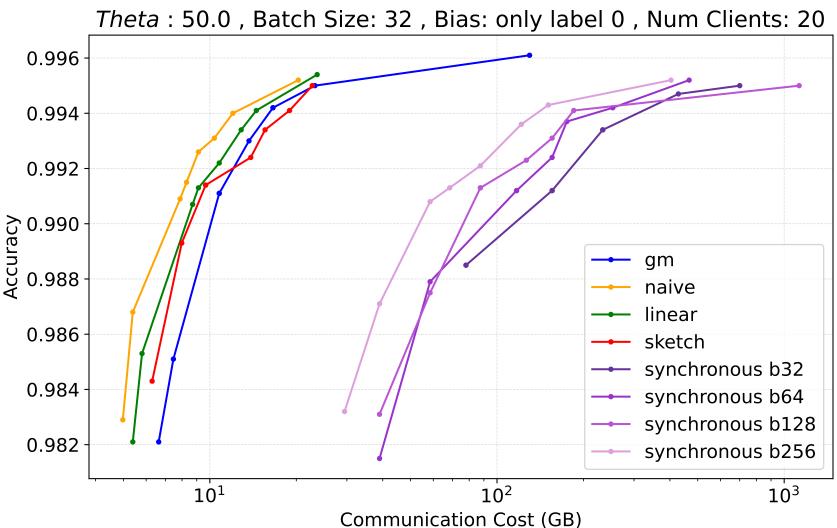
synchronous Theta: 30.0, Batch Size: 32, Bias: only label 0, Num Clients: 60 0.996 0.994 0.992 0.990 Accuracy 0.988 gm 0.986 linear sketch 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980  $10^2$ 10<sup>3</sup>

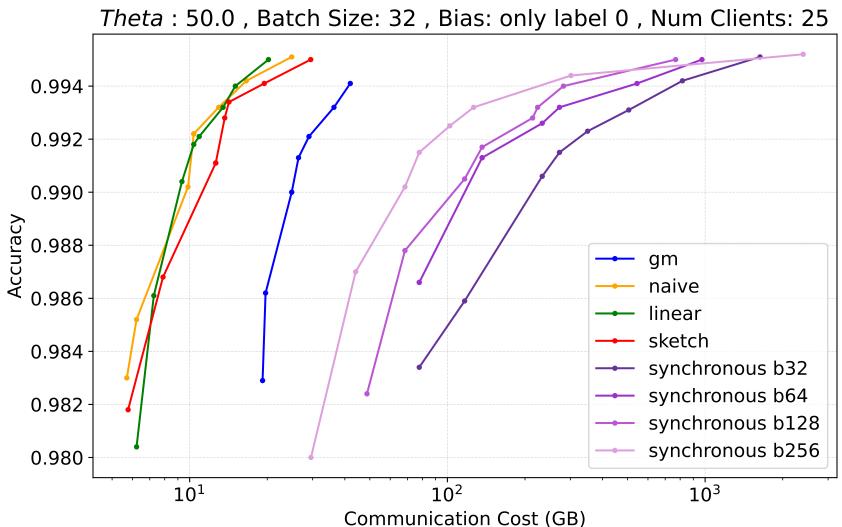
Communication Cost (GB)

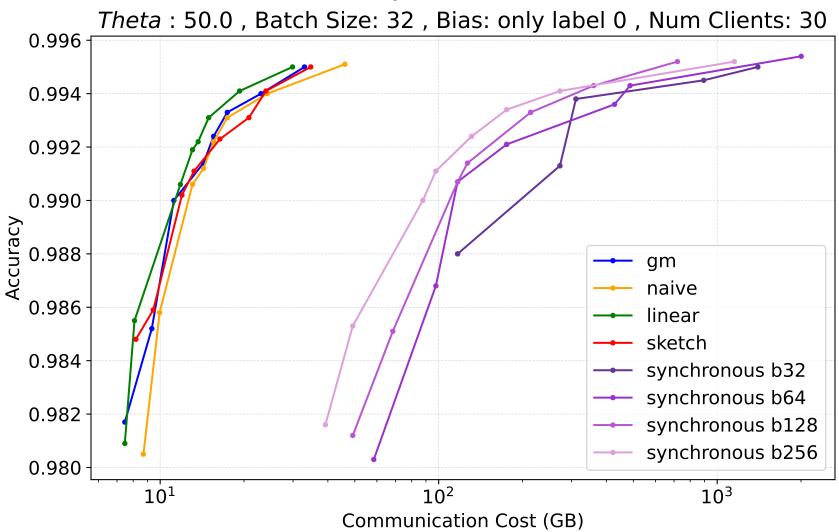


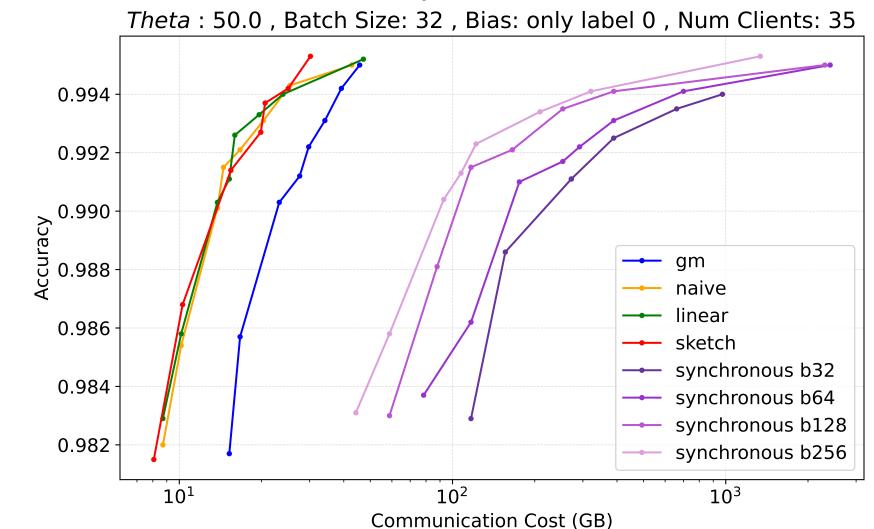


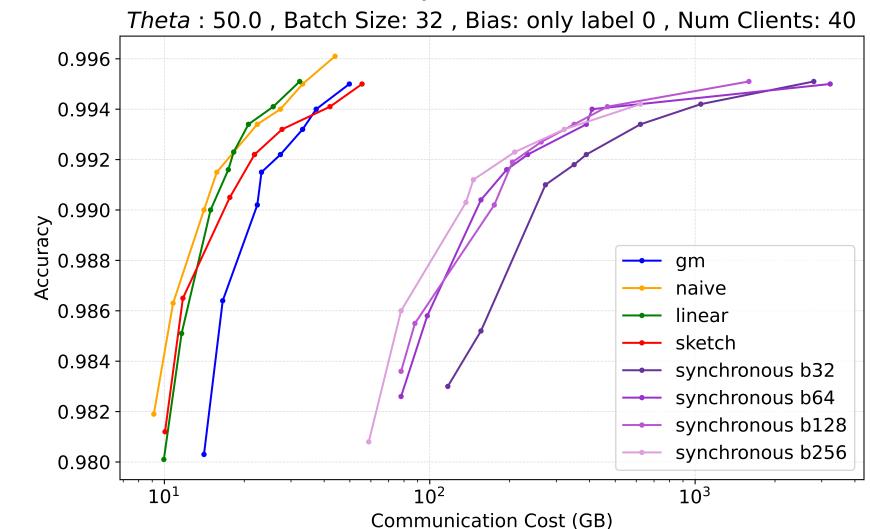


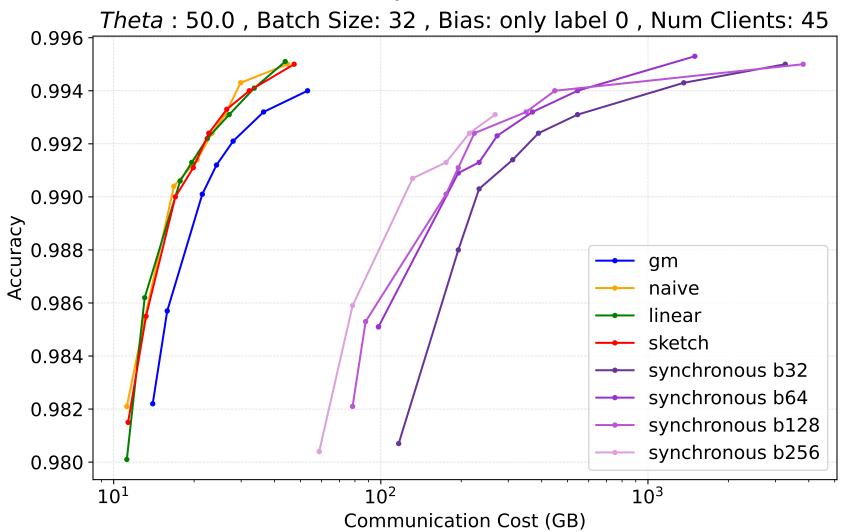


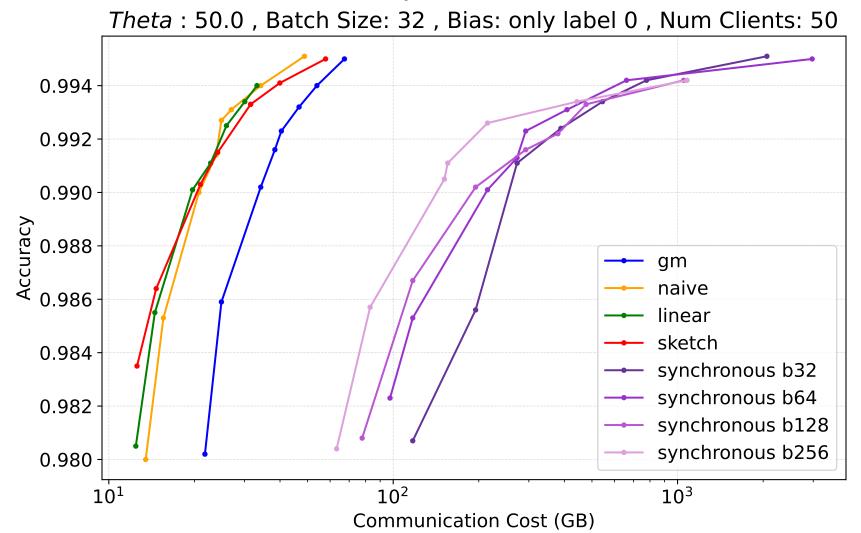


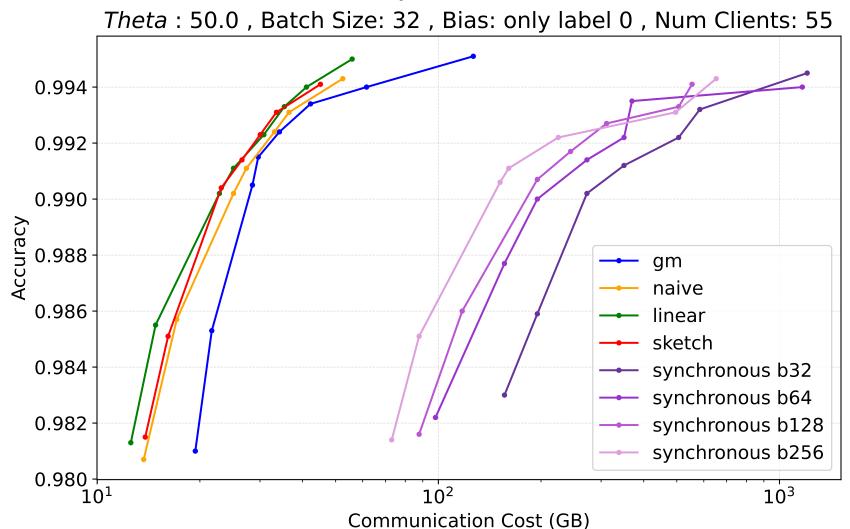


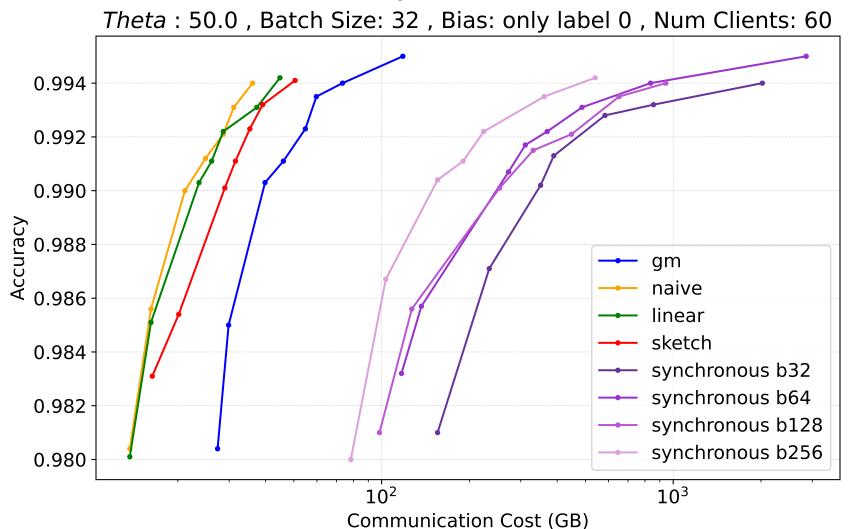


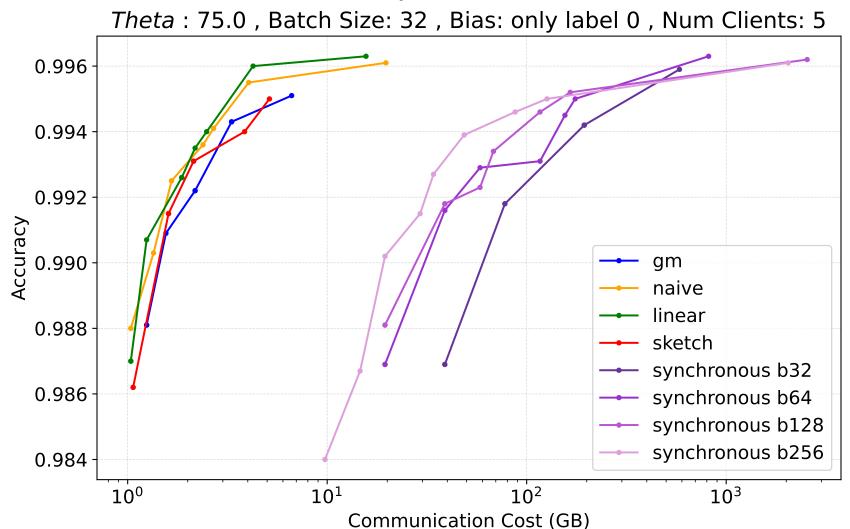


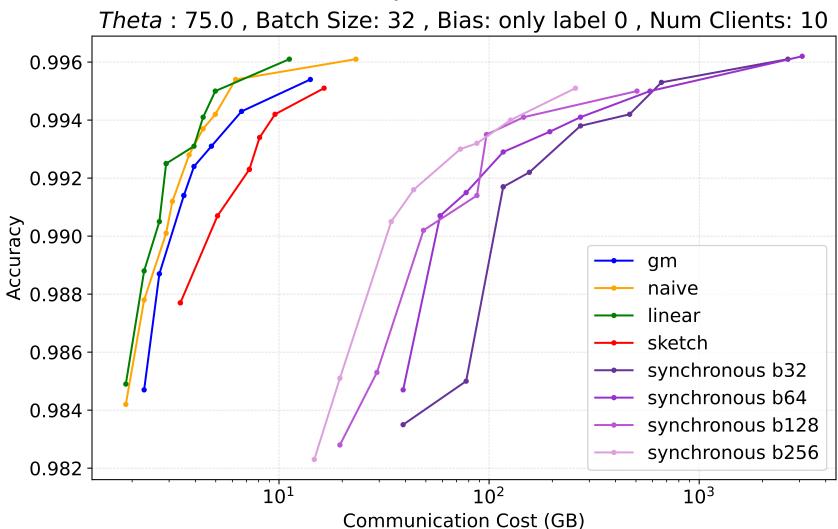


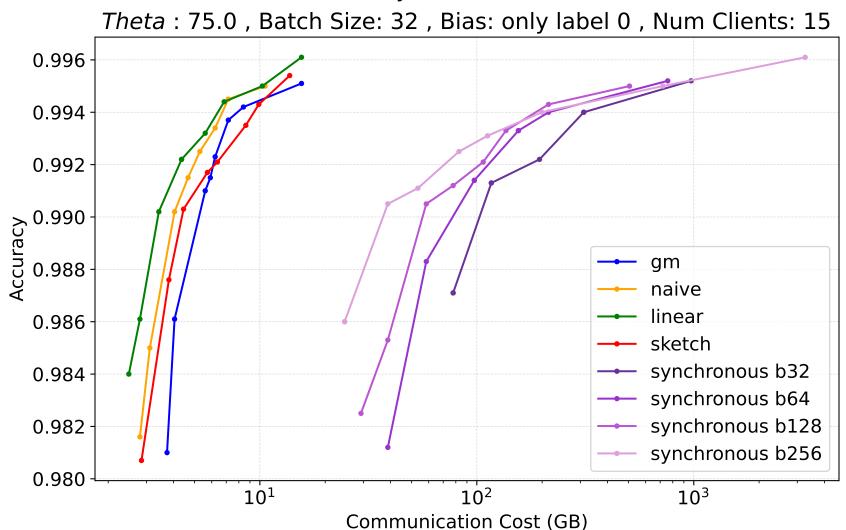


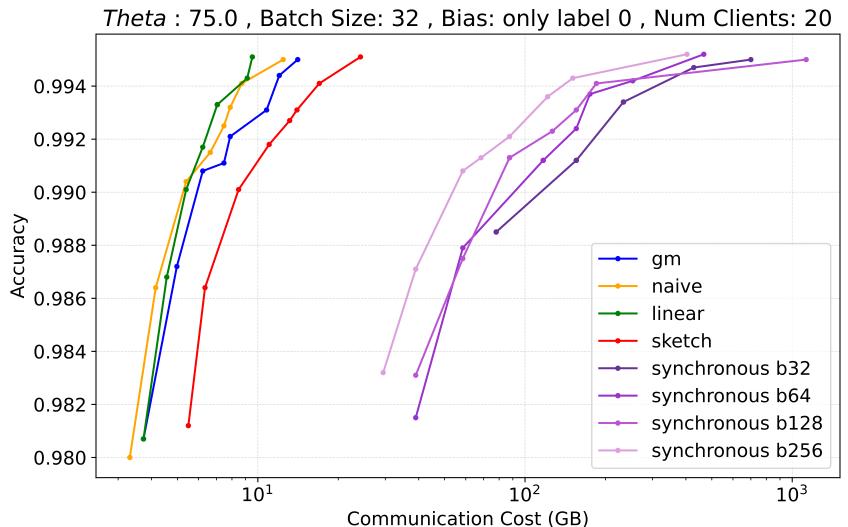


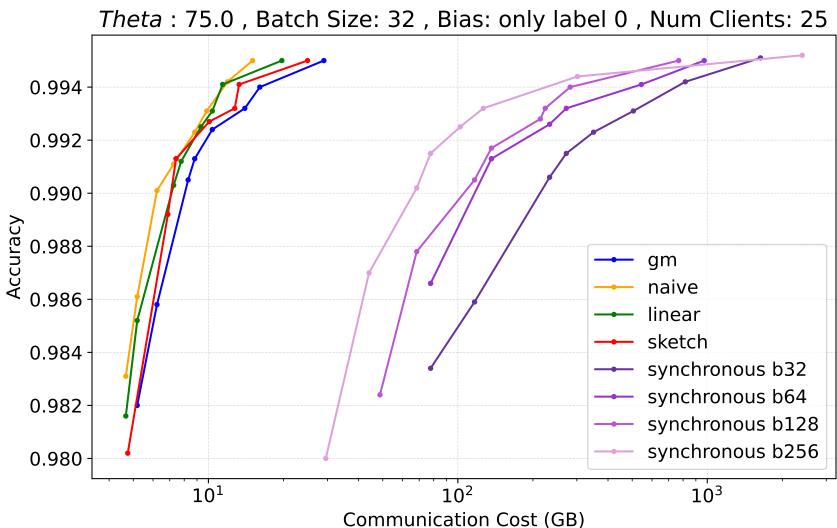


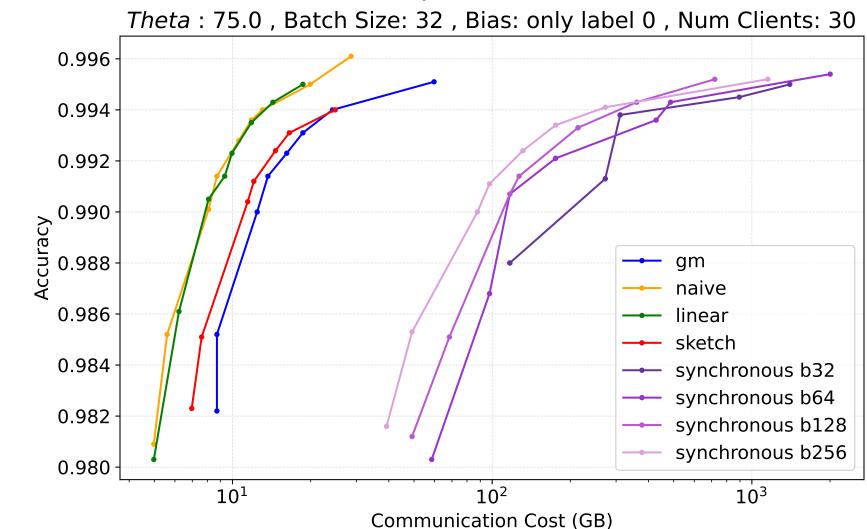


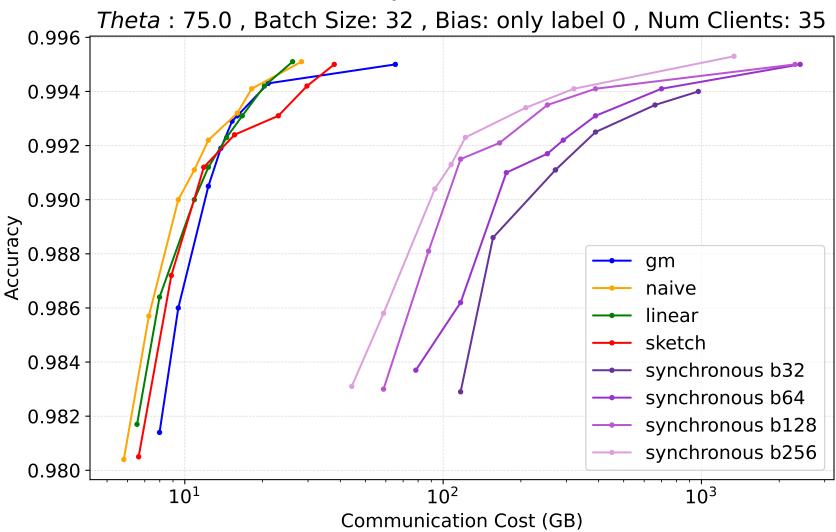


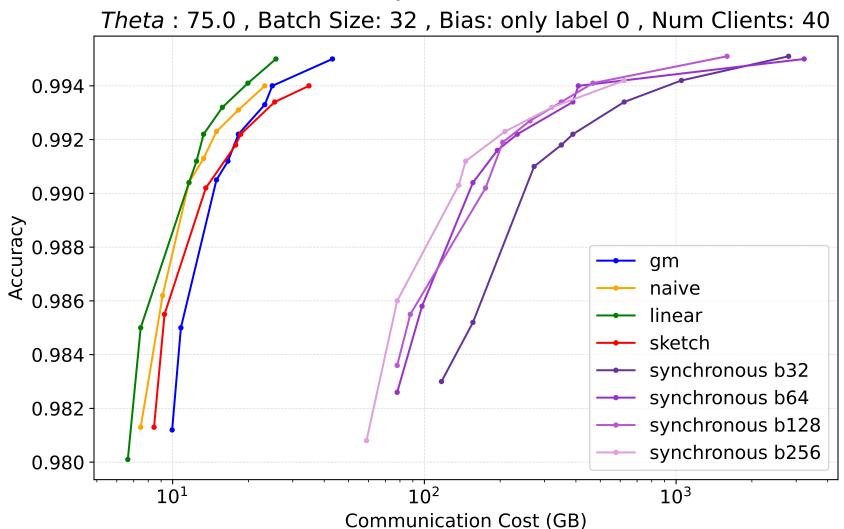


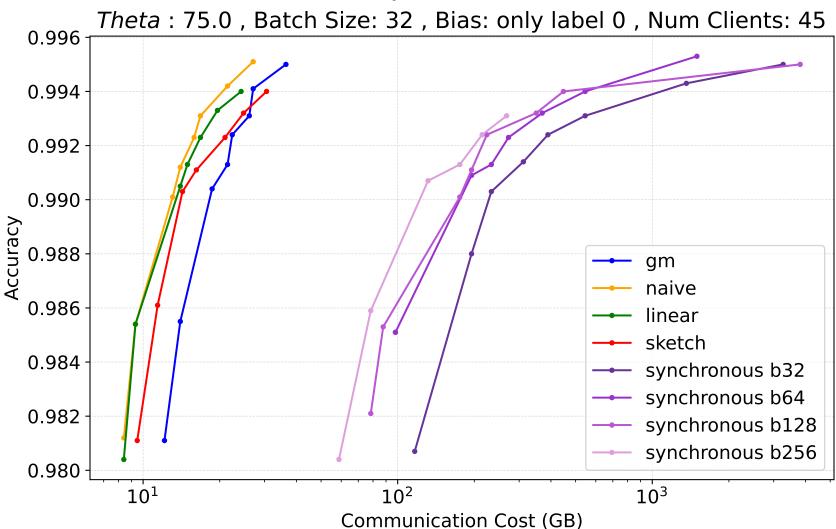


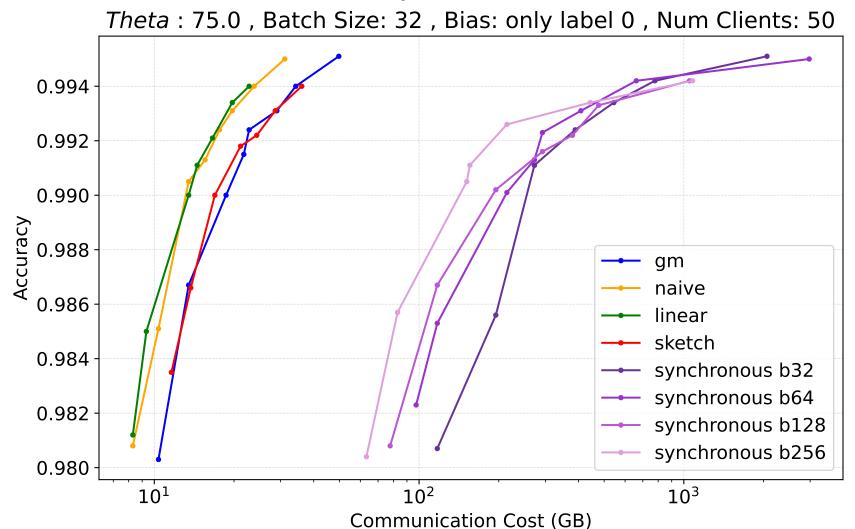


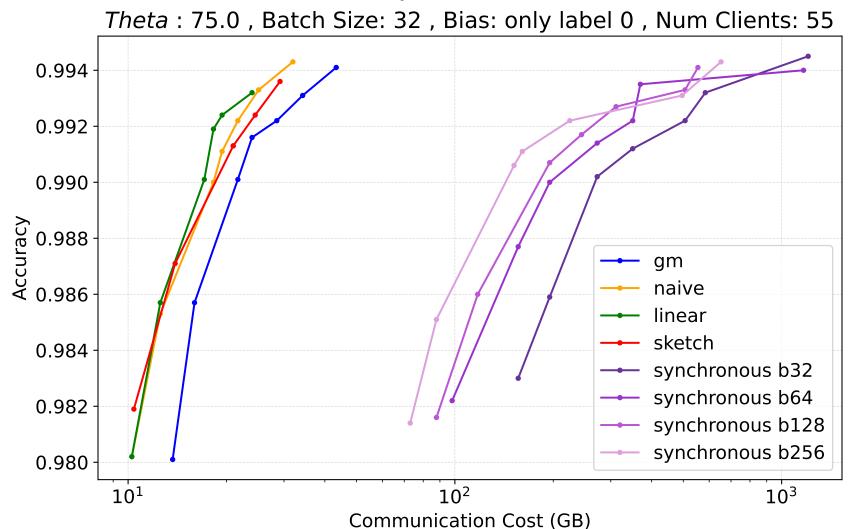


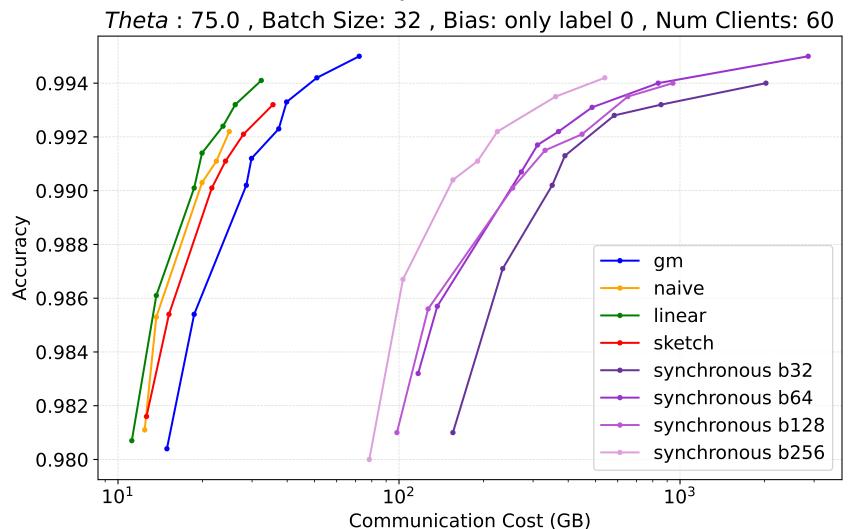


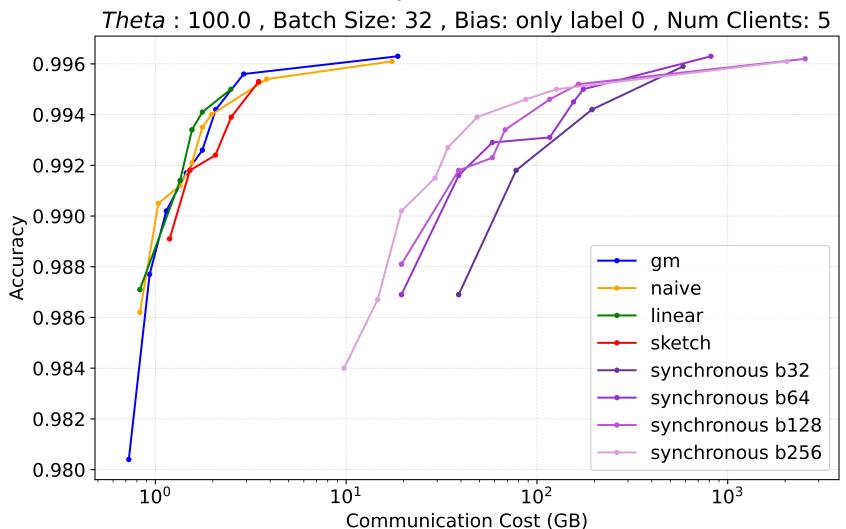


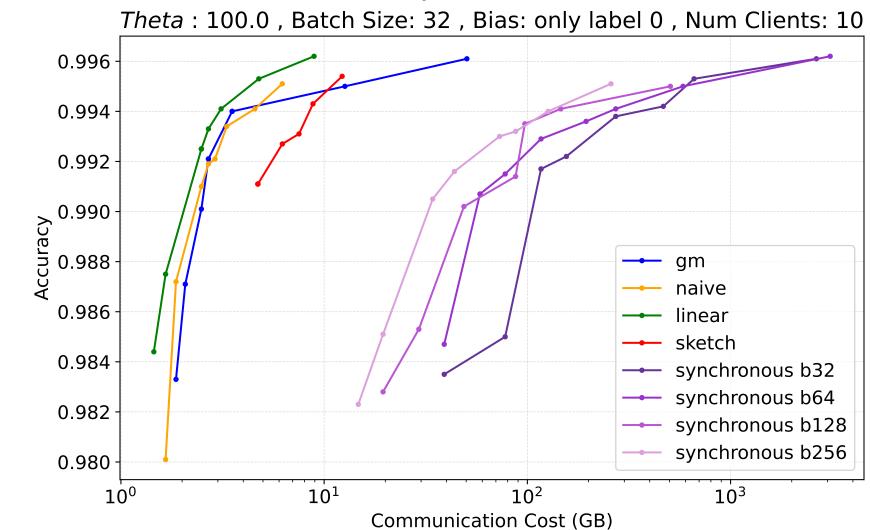


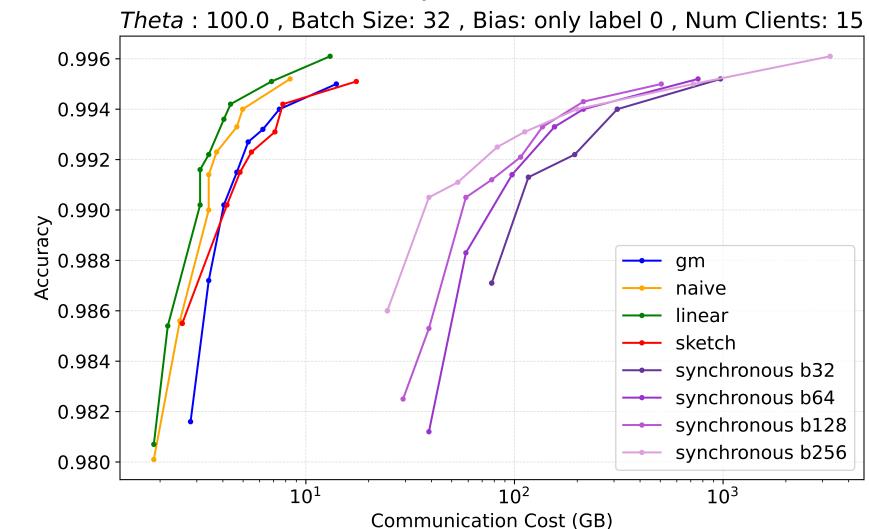


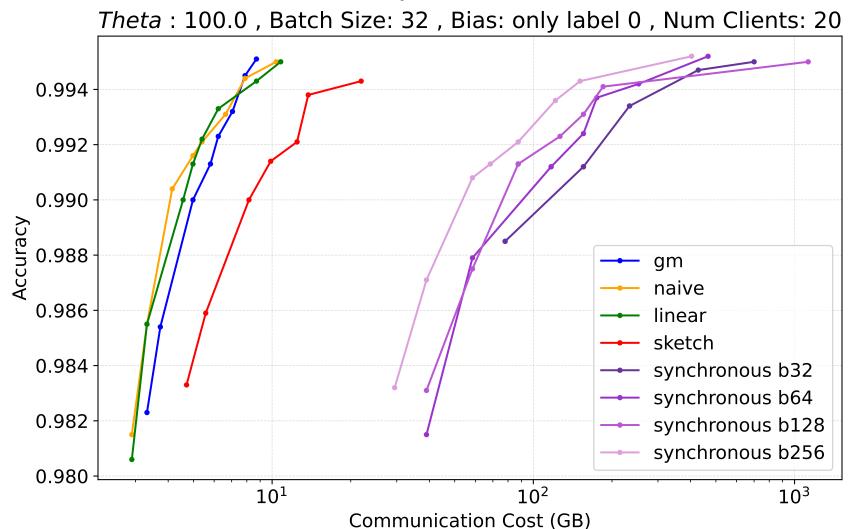


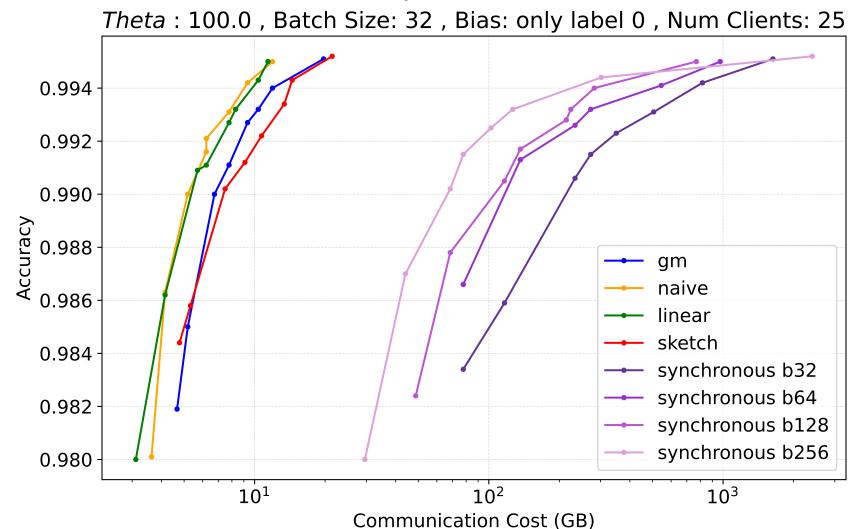


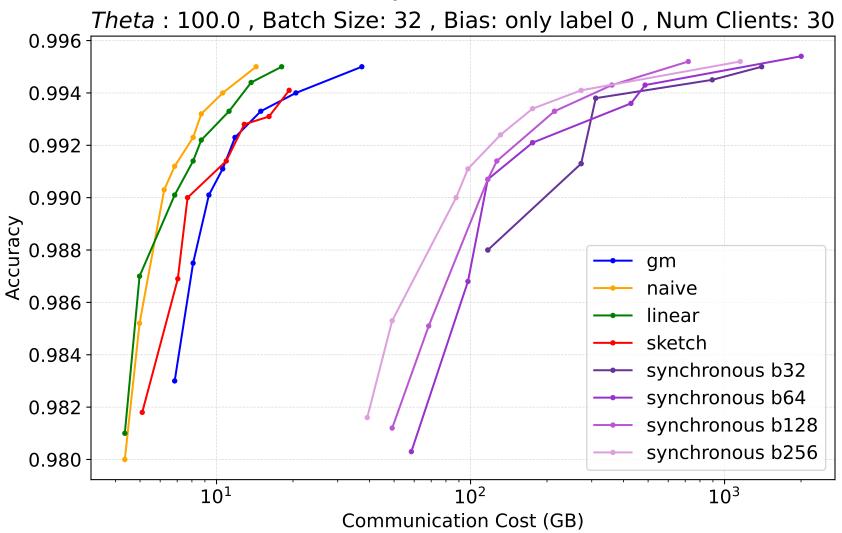


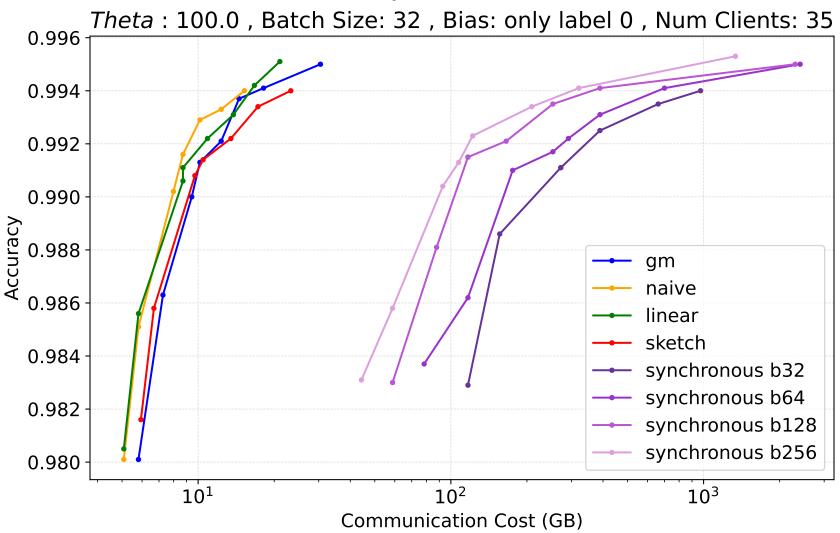


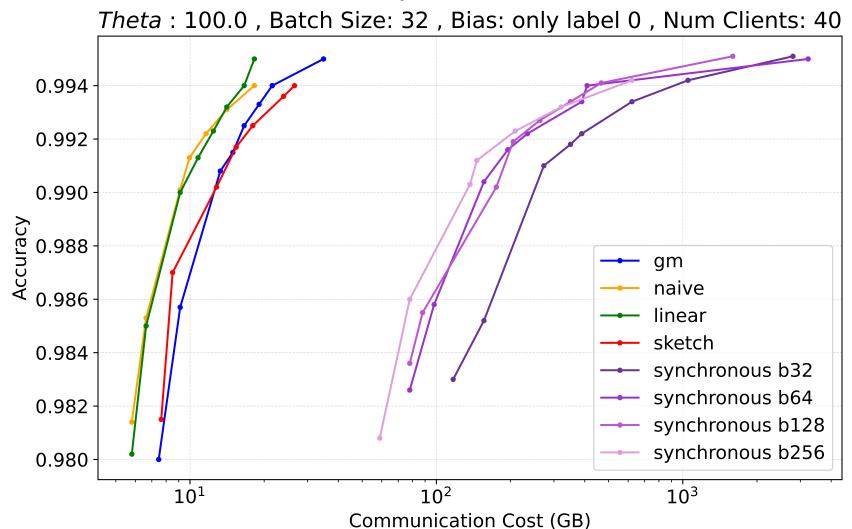


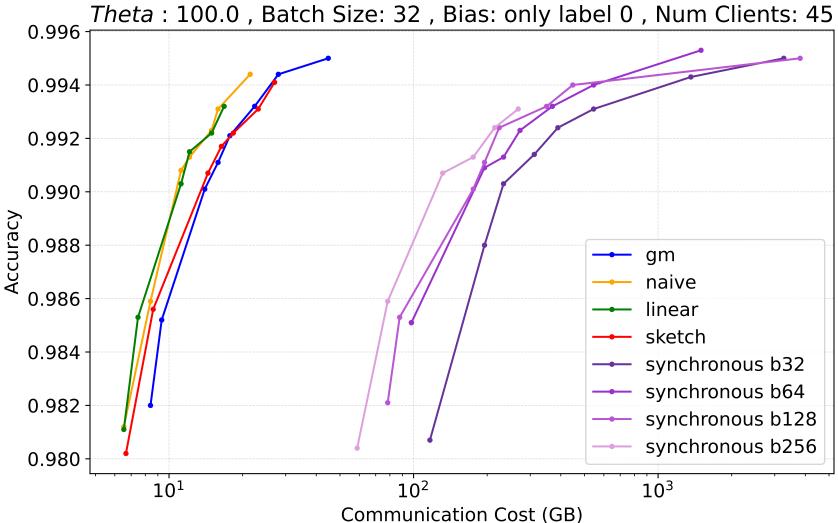


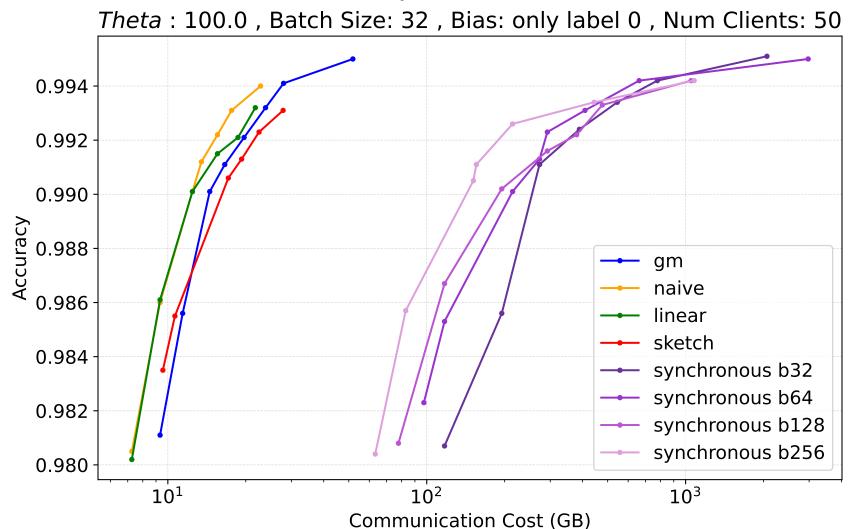


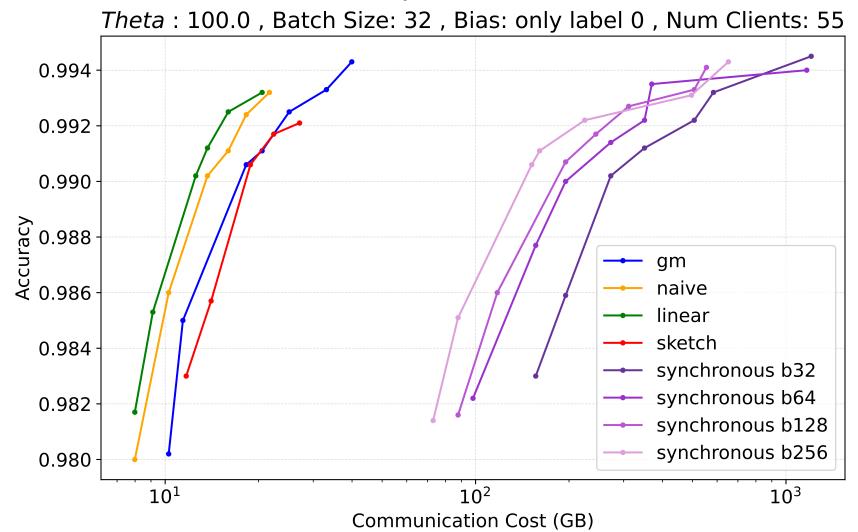


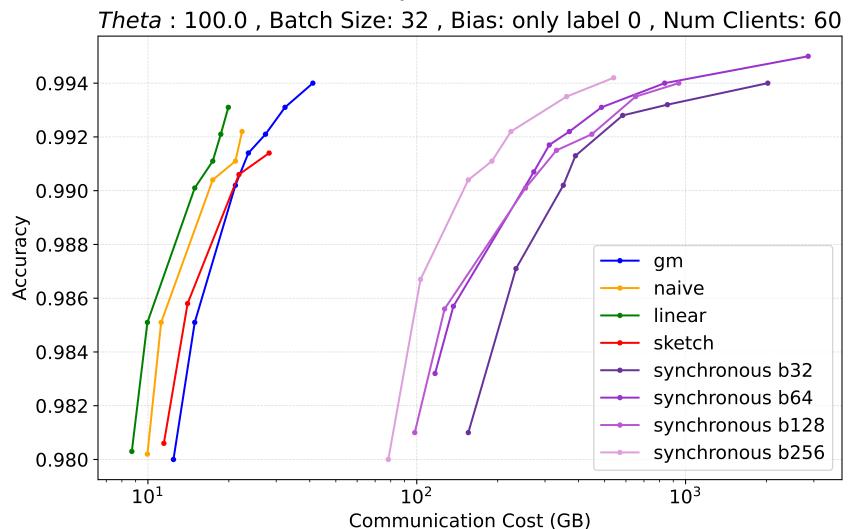




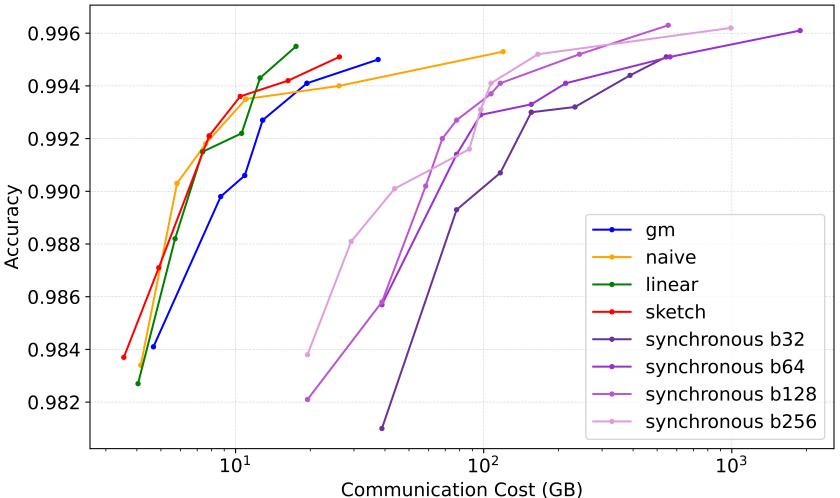


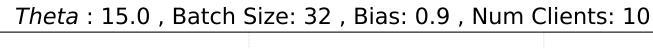


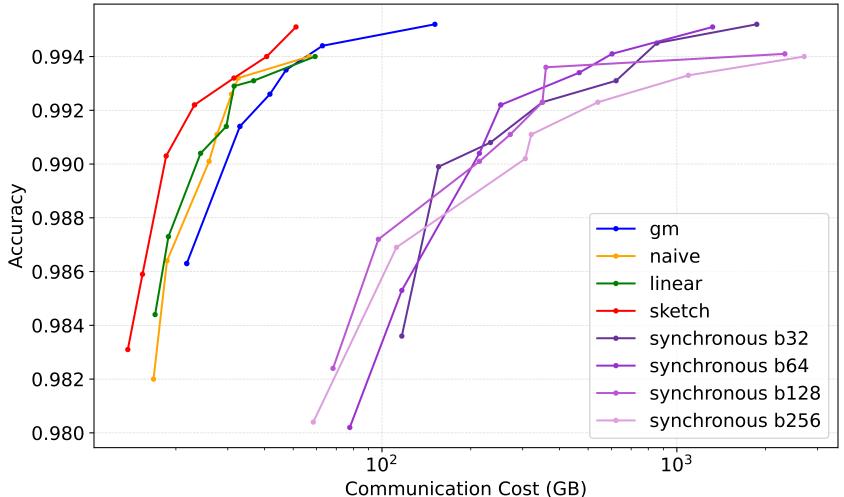


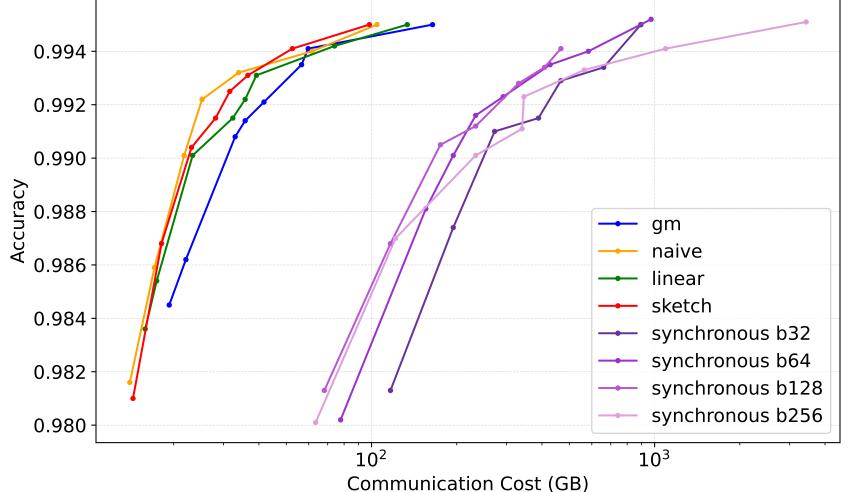


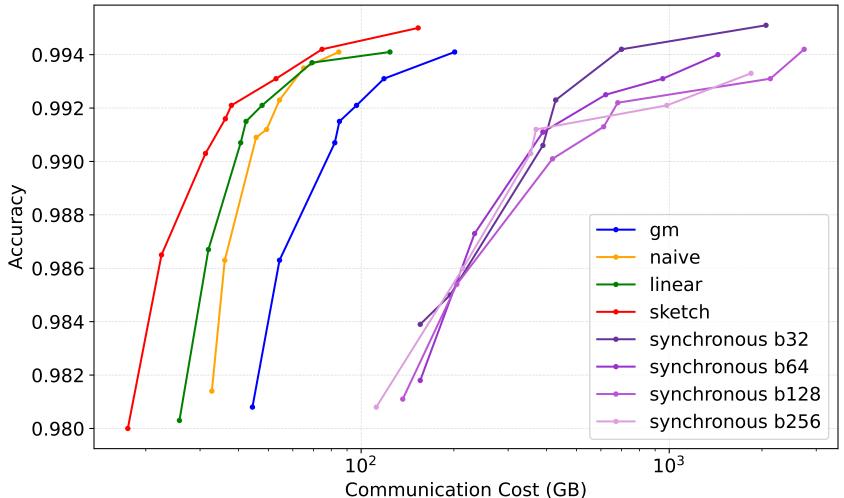
synchronous



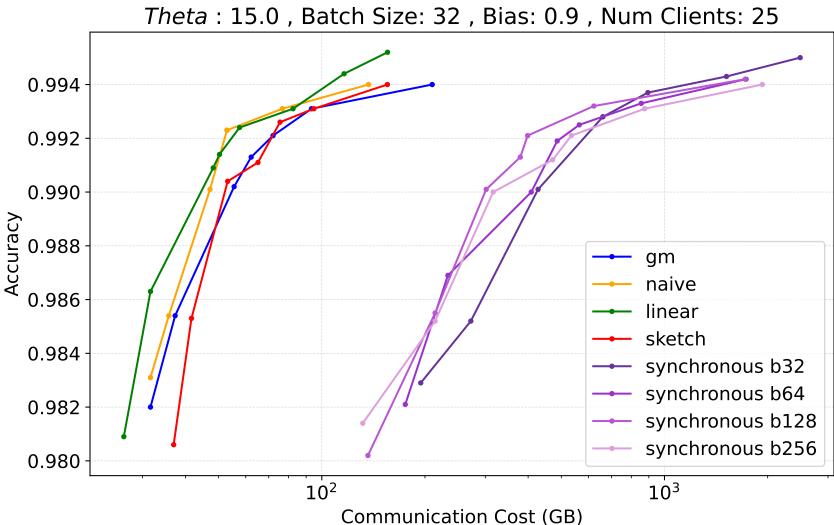


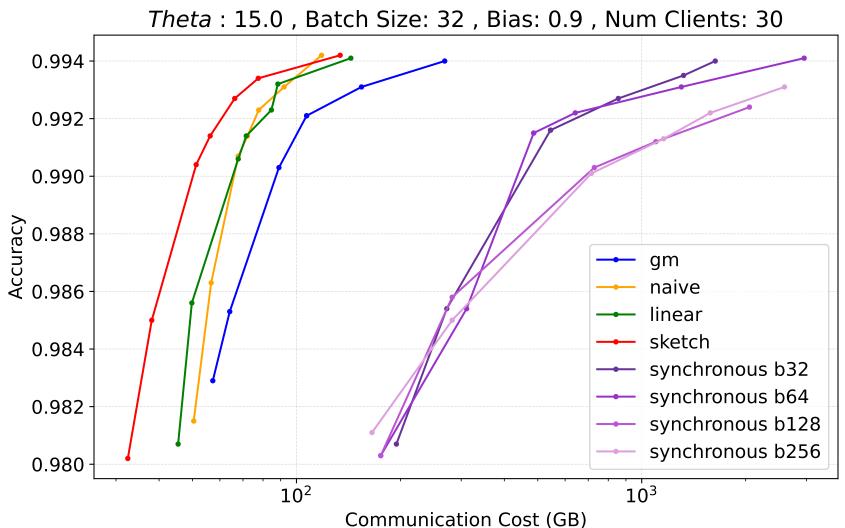


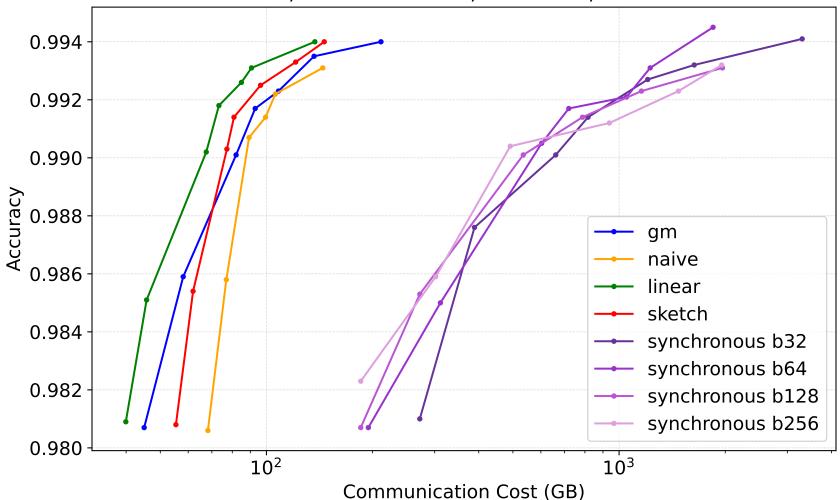


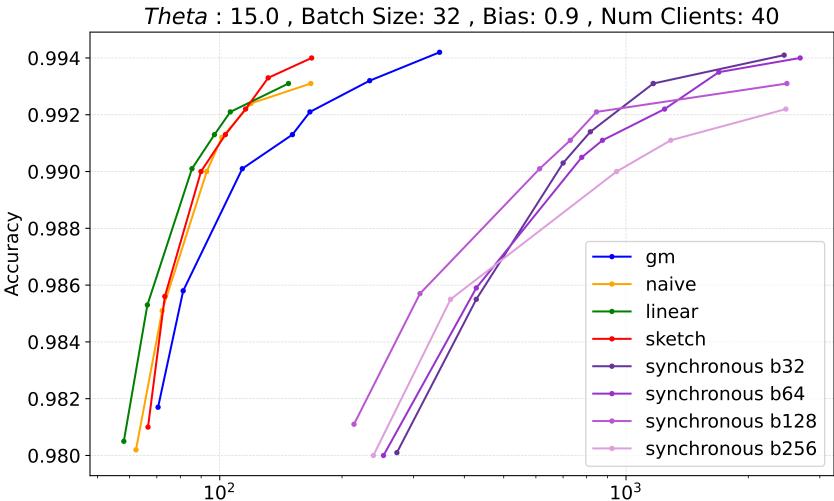


synchronous

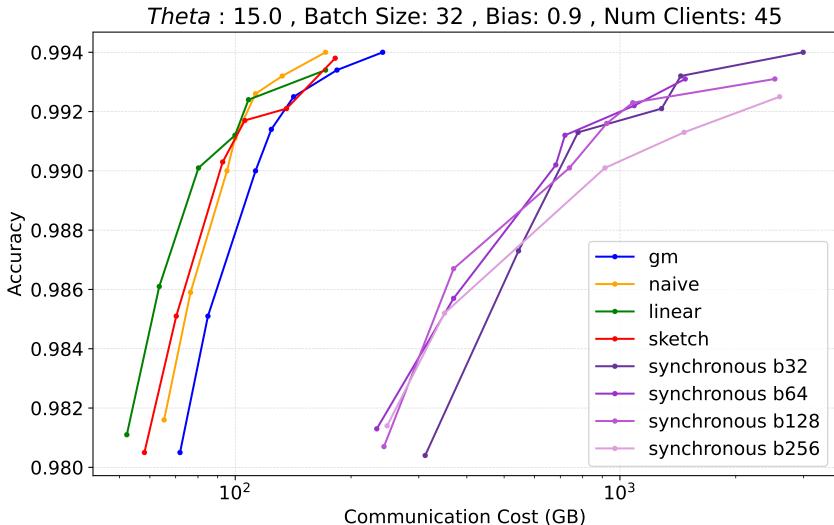


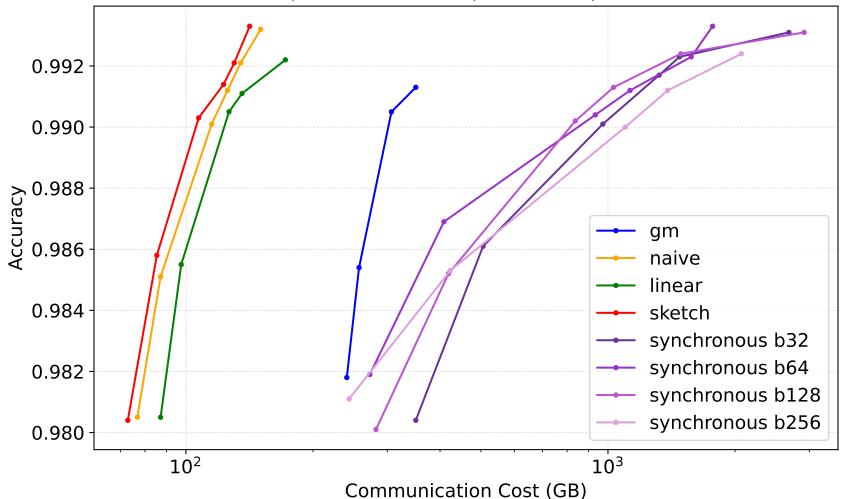


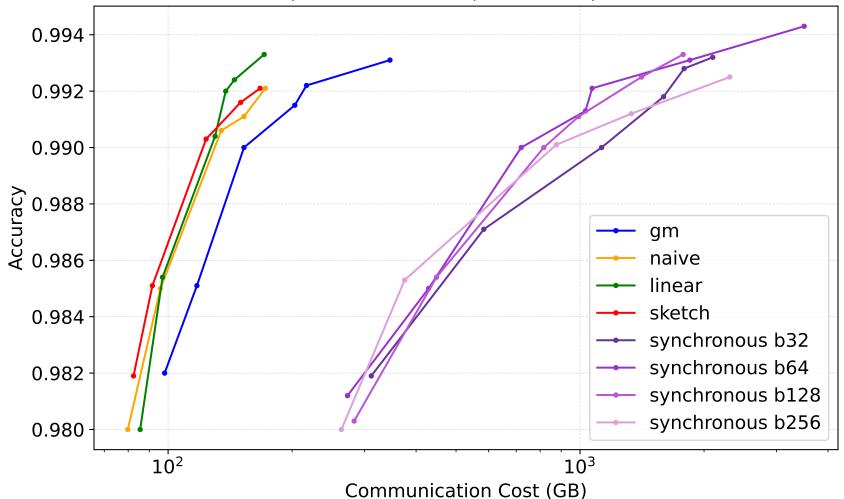


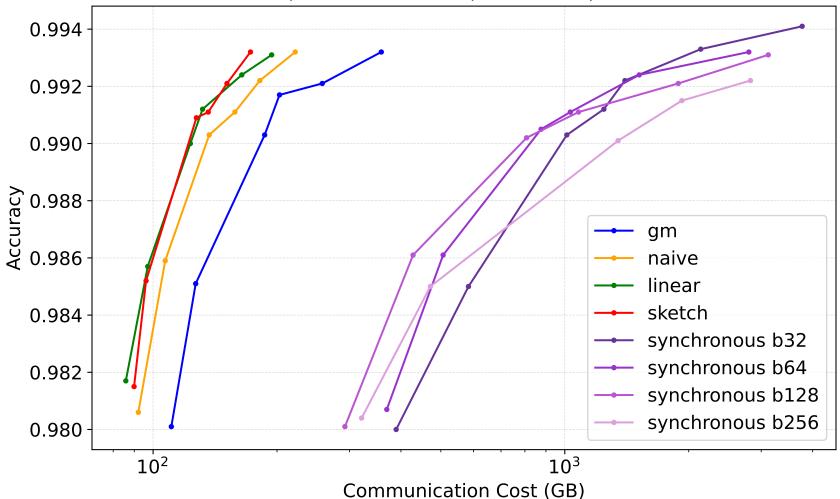


Communication Cost (GB)



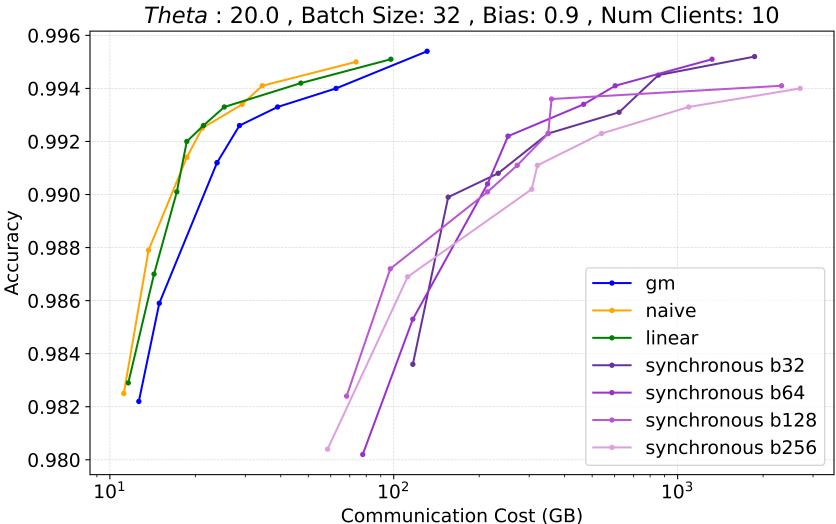


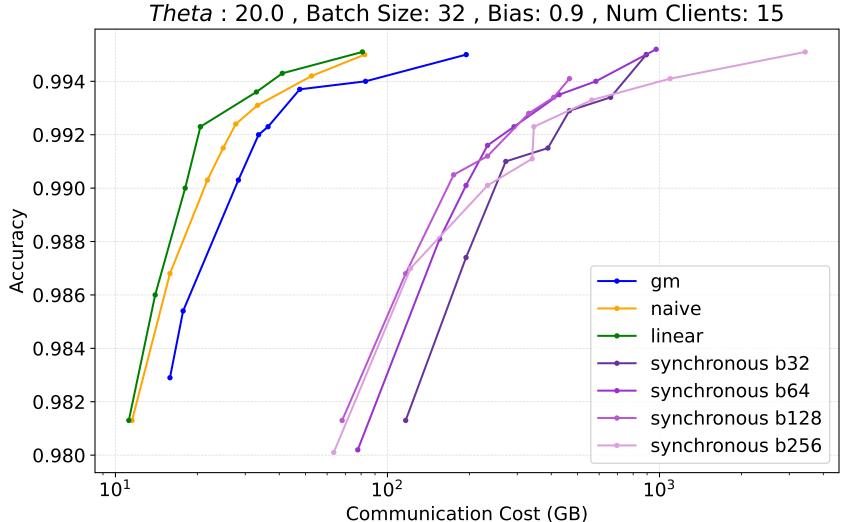


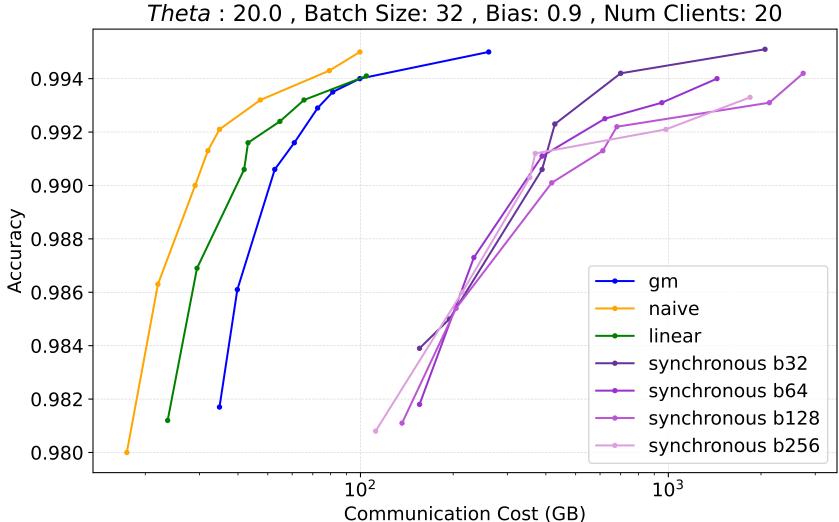


synchronous

Theta: 20.0, Batch Size: 32, Bias: 0.9, Num Clients: 5 0.996 0.994 0.992 Accuracy 886.0 886.0 gm naive 0.986 linear synchronous b32 0.984synchronous b64 synchronous b128 0.982 synchronous b256 10<sup>2</sup> 10<sup>3</sup> 101 Communication Cost (GB)

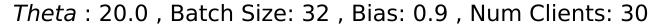


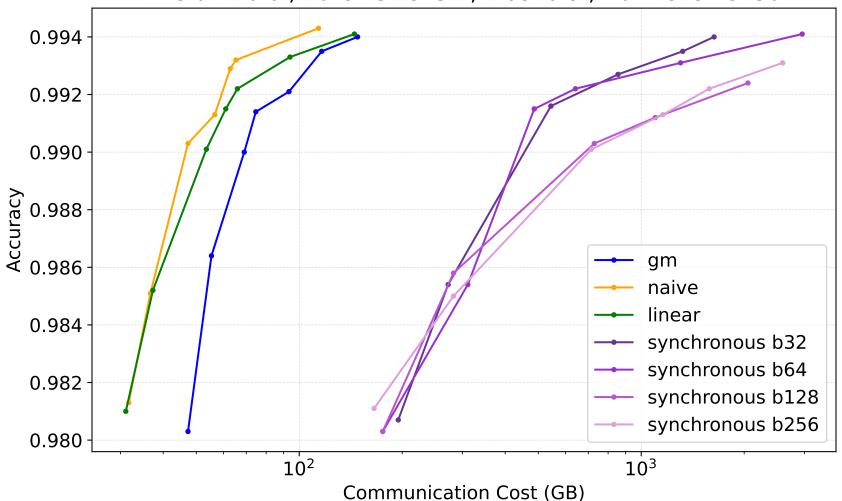




synchronous

Theta: 20.0, Batch Size: 32, Bias: 0.9, Num Clients: 25 0.994 0.992 0.990 Accuracy 0.988 gm 0.986 naive linear 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup> Communication Cost (GB)

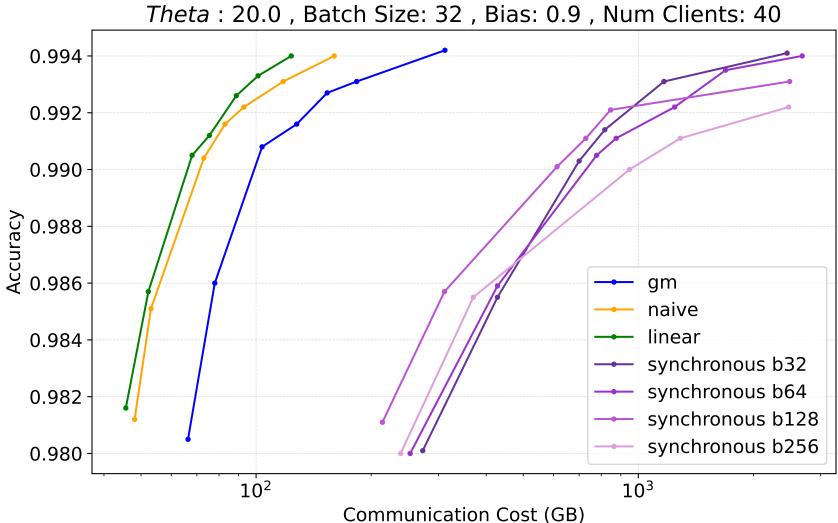


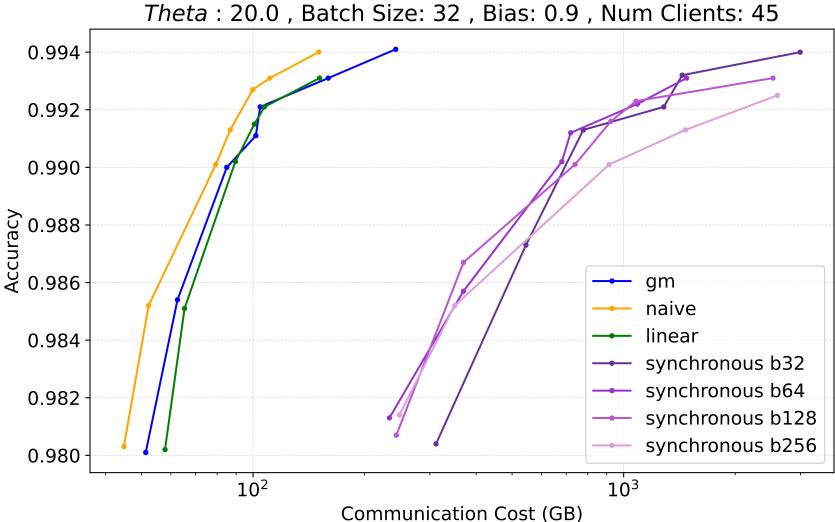


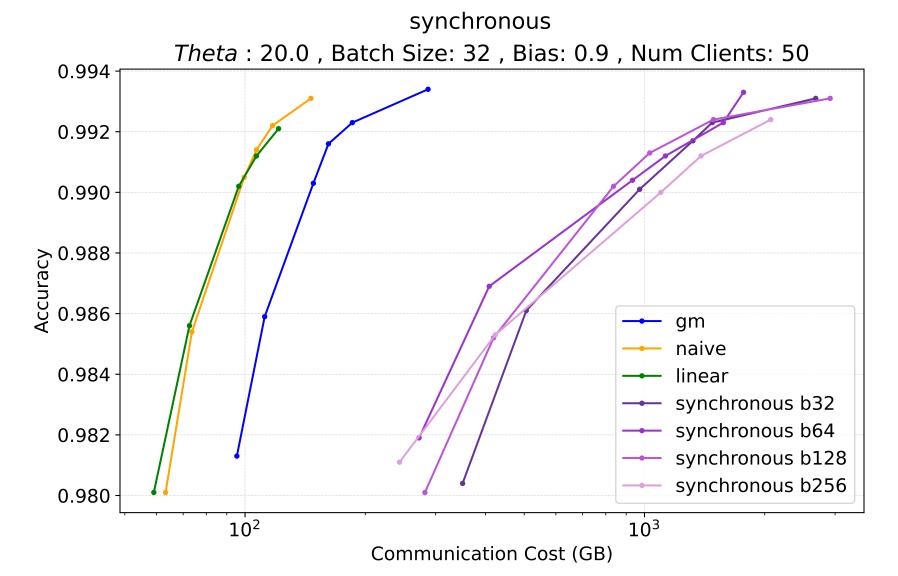
synchronous

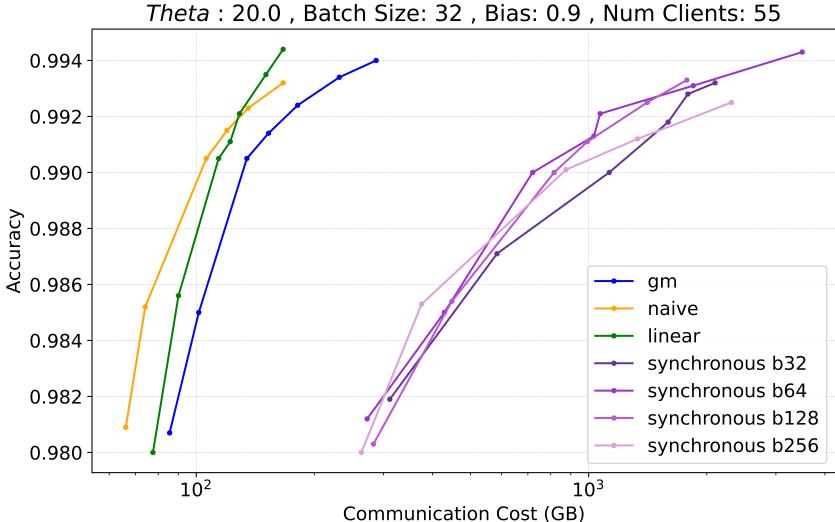
Theta: 20.0, Batch Size: 32, Bias: 0.9, Num Clients: 35 0.994 0.992 0.990 Accuracy 886.0 gm naive linear 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup>

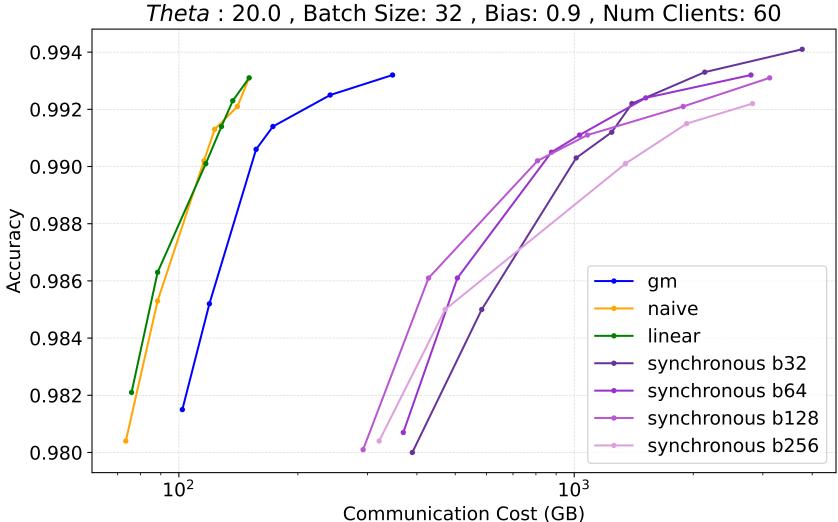
Communication Cost (GB)



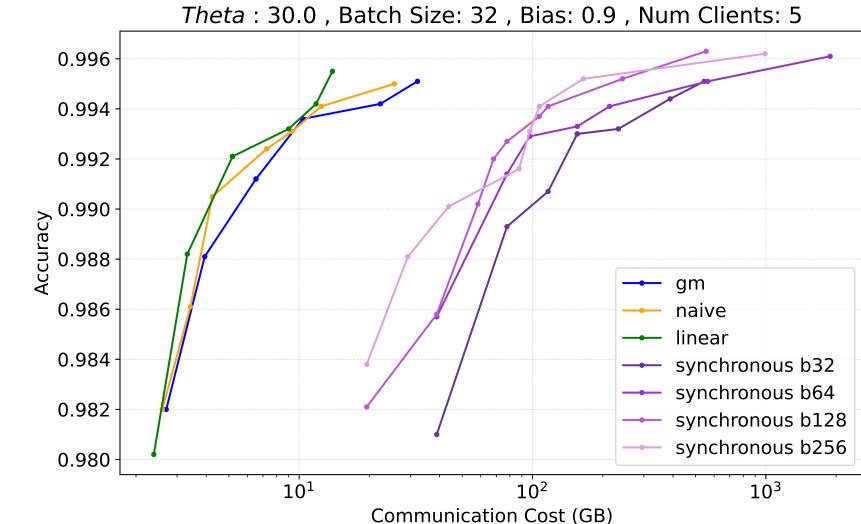




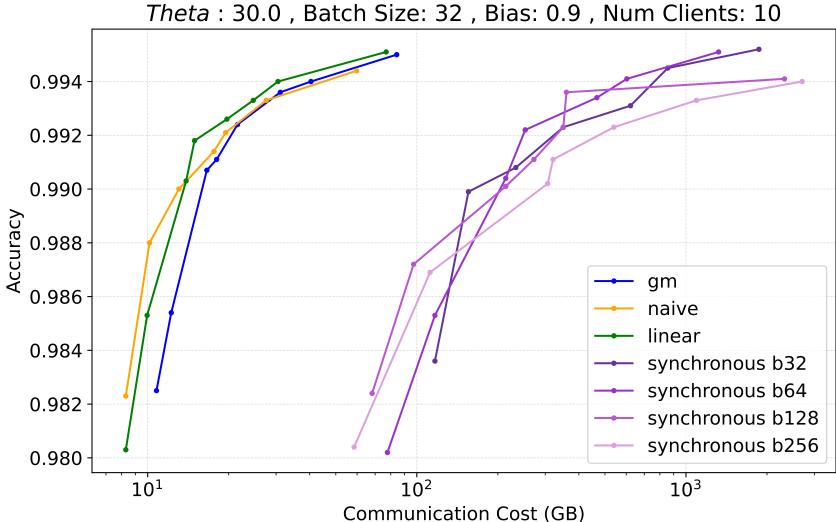




synchronous

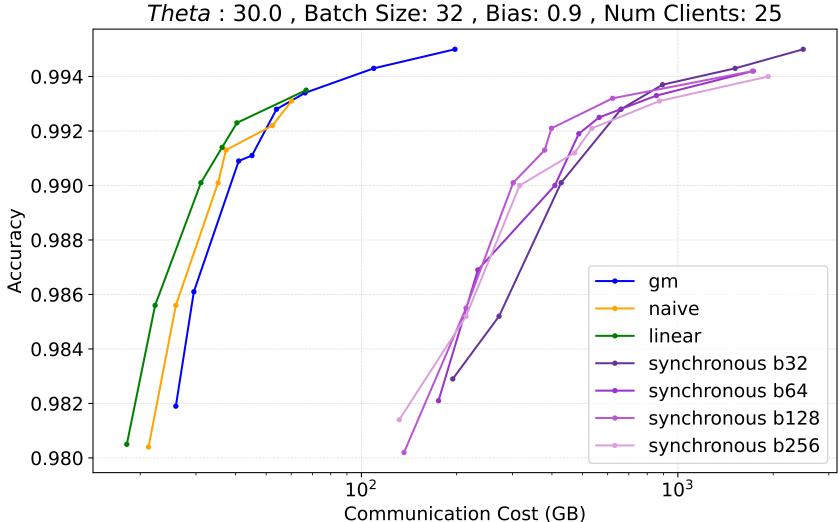


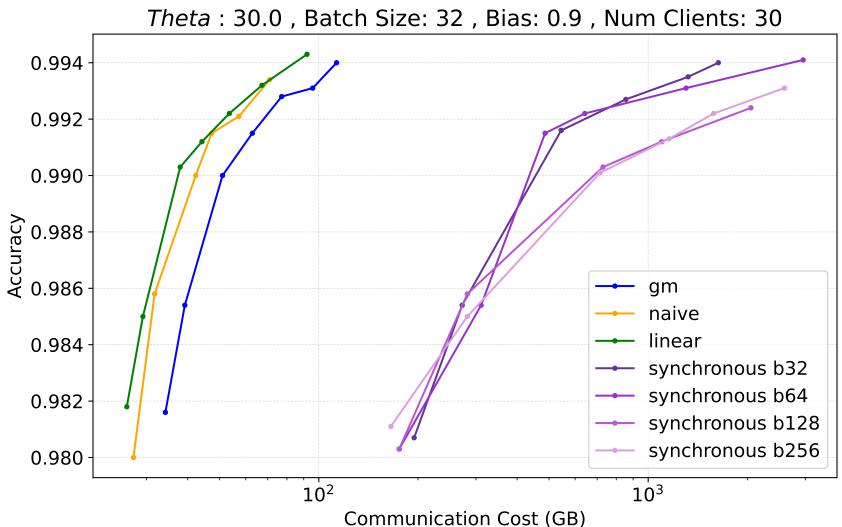
synchronous



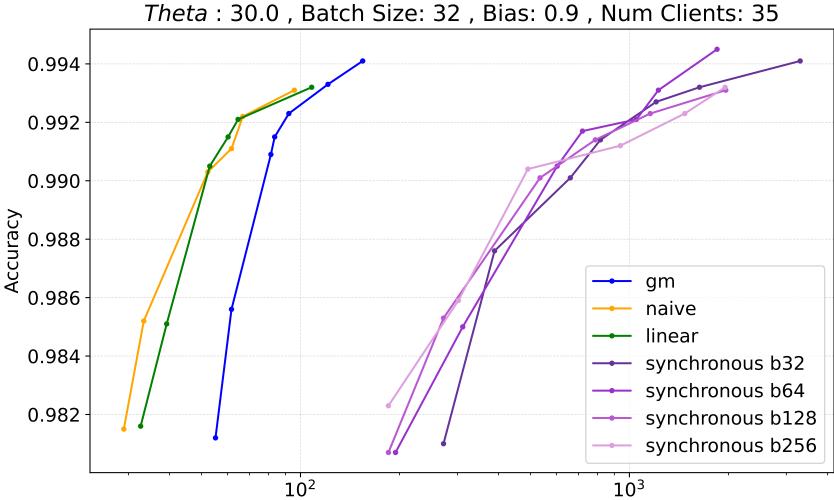
synchronous Theta: 30.0, Batch Size: 32, Bias: 0.9, Num Clients: 15 0.9960.9940.992 0.990 Accuracy 0.988 gm 0.986 naive linear 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup>  $10^1$ Communication Cost (GB)

Theta: 30.0, Batch Size: 32, Bias: 0.9, Num Clients: 20 0.994 0.9920.990 Accuracy 0.988gm 0.986 naive linear 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 102 10<sup>3</sup>



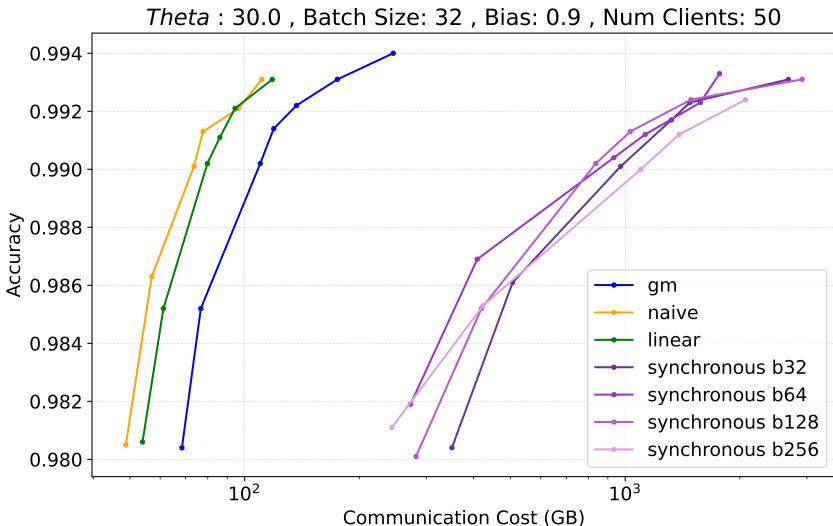


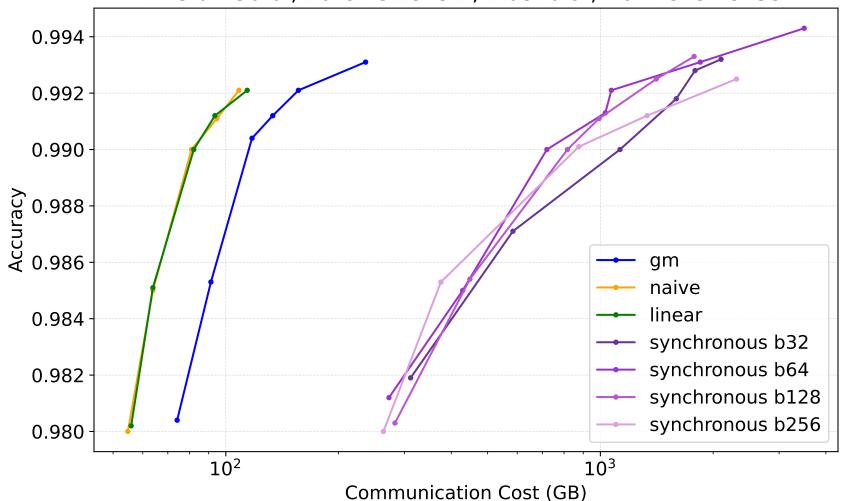
synchronous



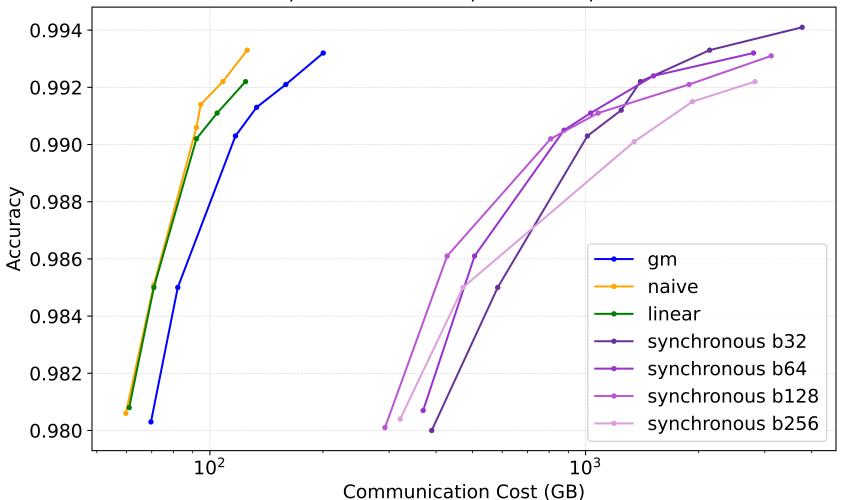
Theta: 30.0, Batch Size: 32, Bias: 0.9, Num Clients: 40 0.994 0.992 0.990 Accuracy 986.0 gm naive linear 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup>

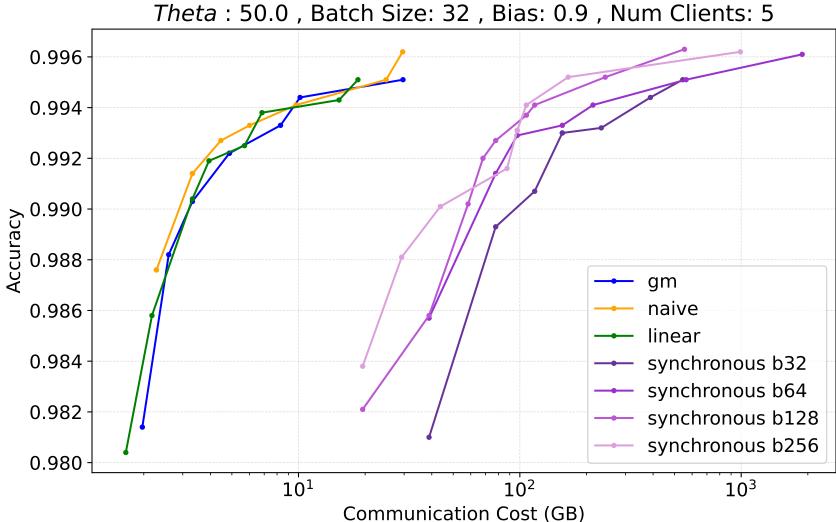
Theta: 30.0, Batch Size: 32, Bias: 0.9, Num Clients: 45 0.994 0.992 0.990 Accuracy 986.0 gm naive linear 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup>



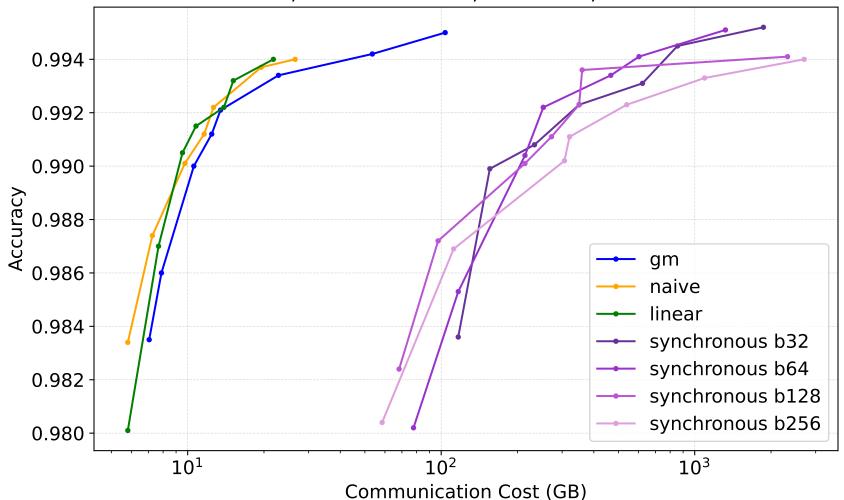


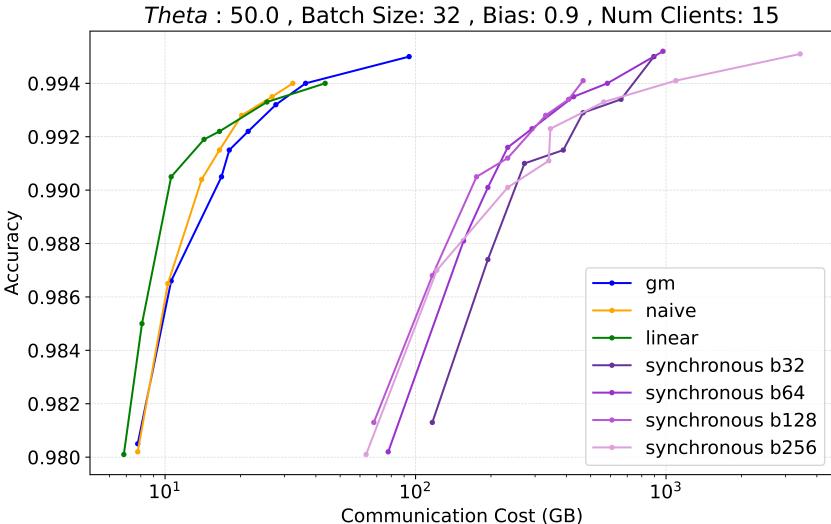




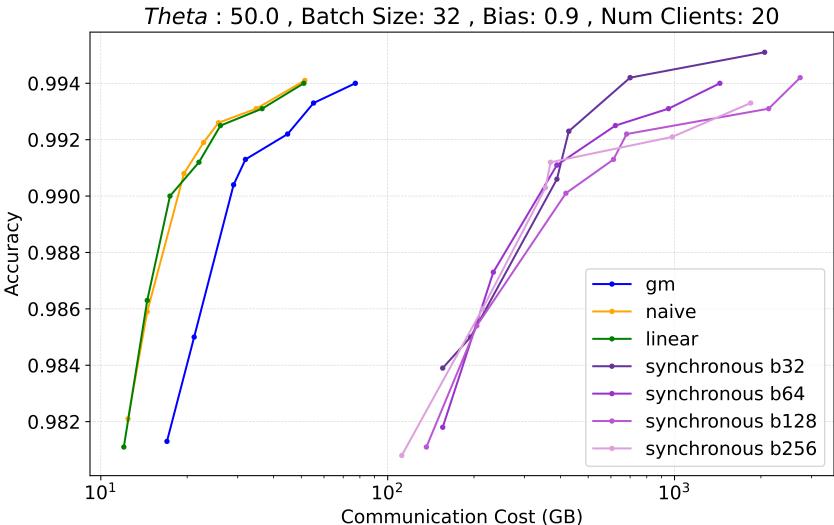


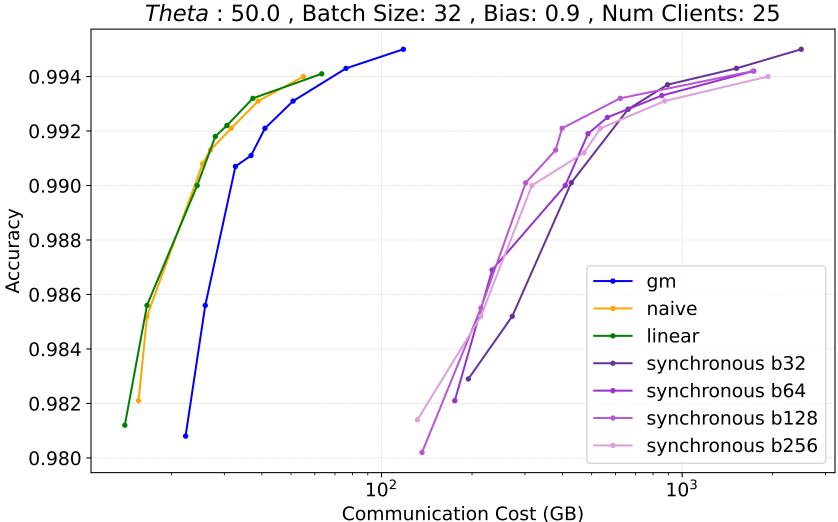
synchronous





synchronous



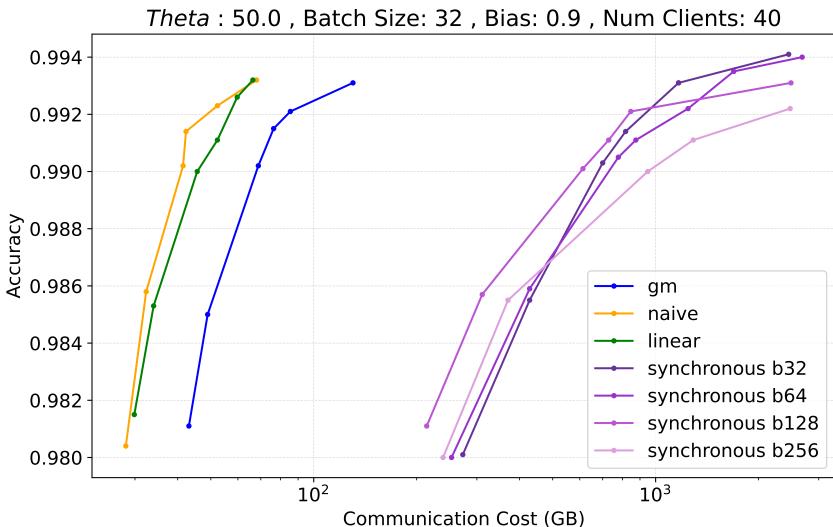


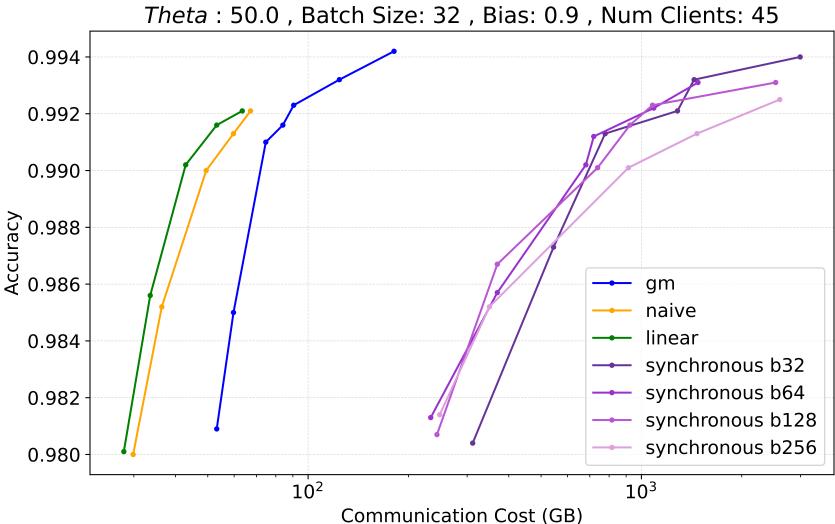
synchronous

Theta: 50.0, Batch Size: 32, Bias: 0.9, Num Clients: 30 0.994 0.9920.990 Accuracy 0.988 gm 0.986 naive linear 0.984synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup> Communication Cost (GB)

synchronous

Theta: 50.0, Batch Size: 32, Bias: 0.9, Num Clients: 35 0.994 0.992 0.990 Accuracy 886.0 986.0 0.988 gm naive linear 0.984synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup>

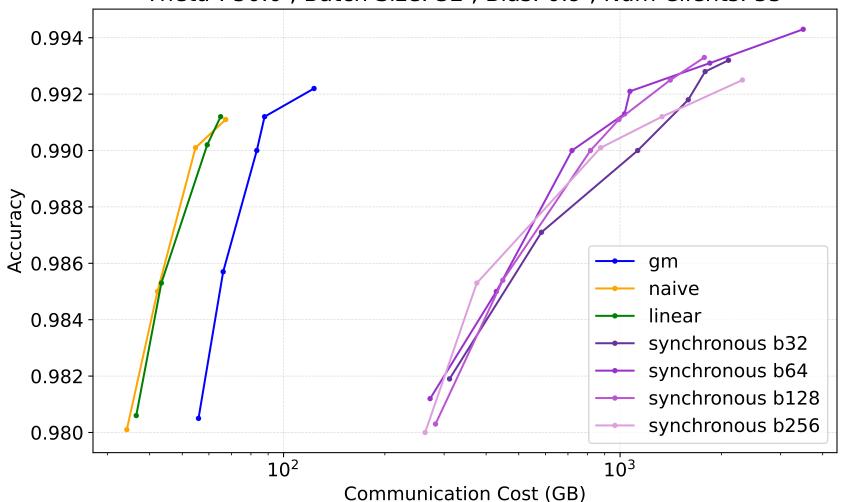


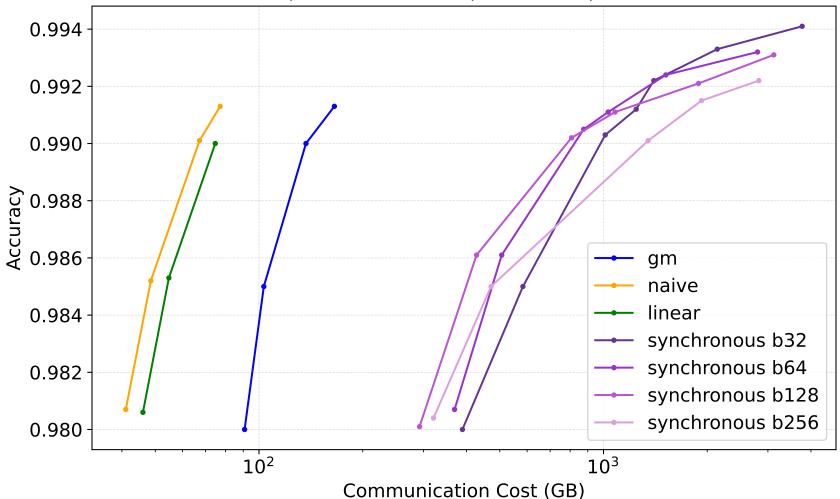


synchronous

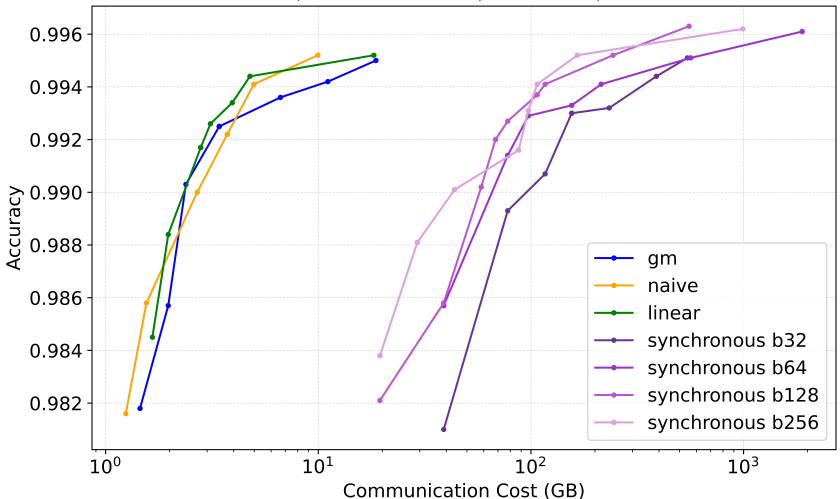
Theta: 50.0, Batch Size: 32, Bias: 0.9, Num Clients: 50 0.992 0.990 Accuracy 986.0 986.0 gm naive 0.984 linear synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 102 10<sup>3</sup>

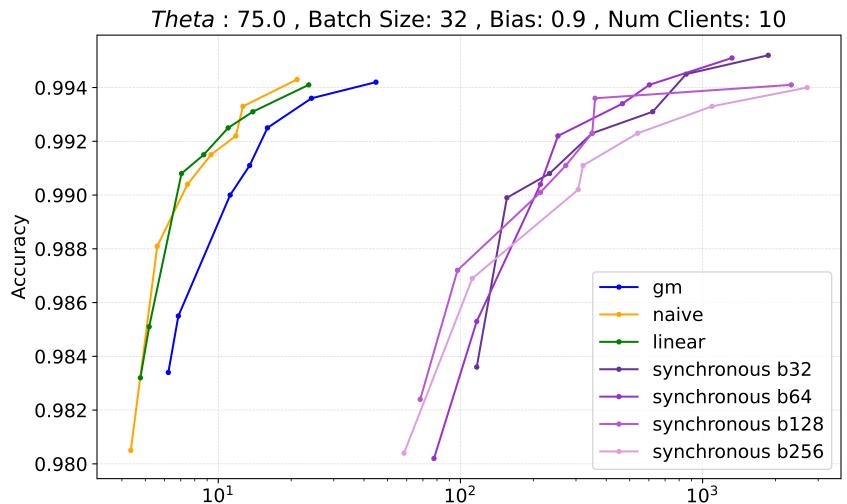


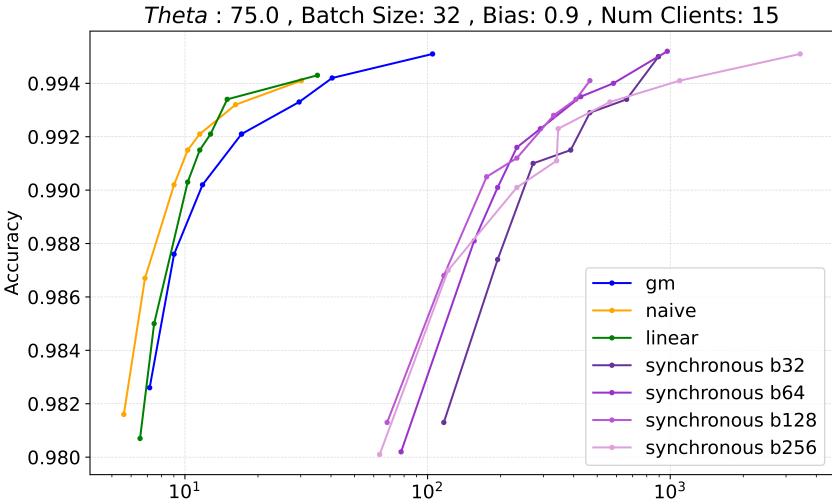


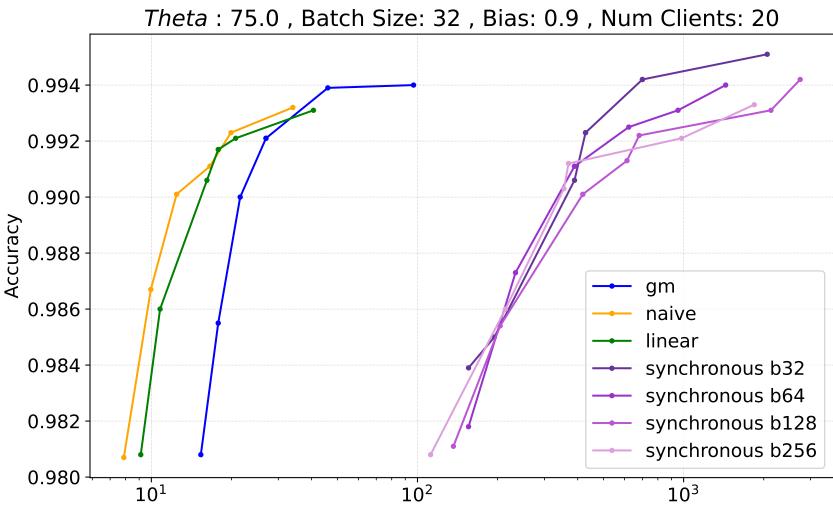


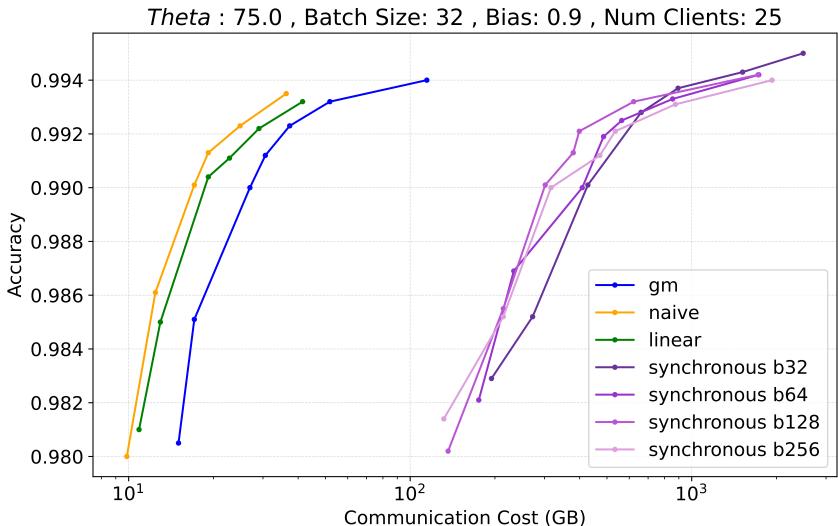
synchronous

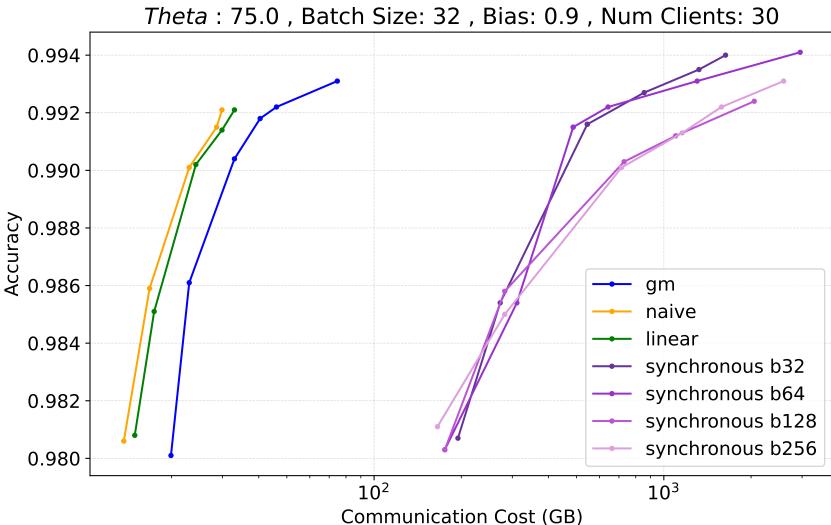


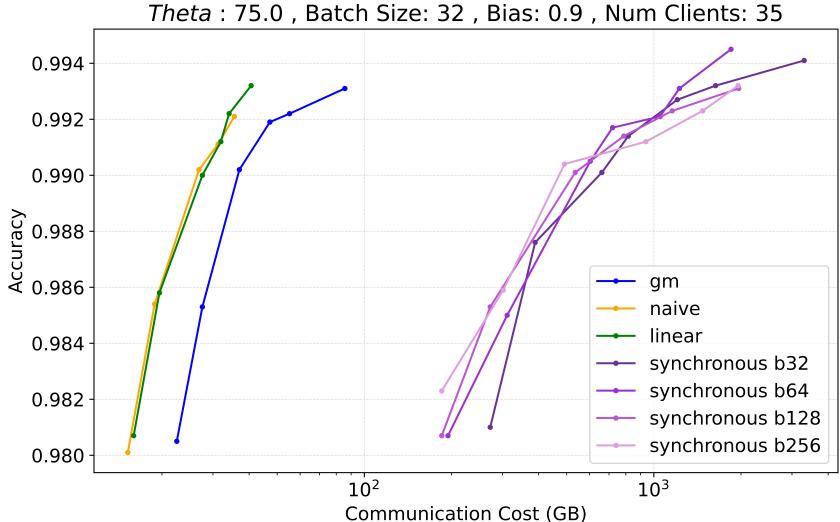


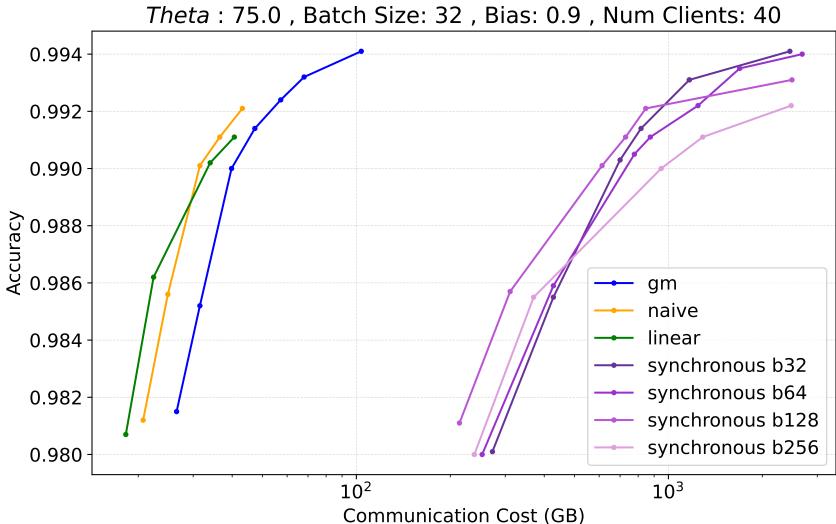


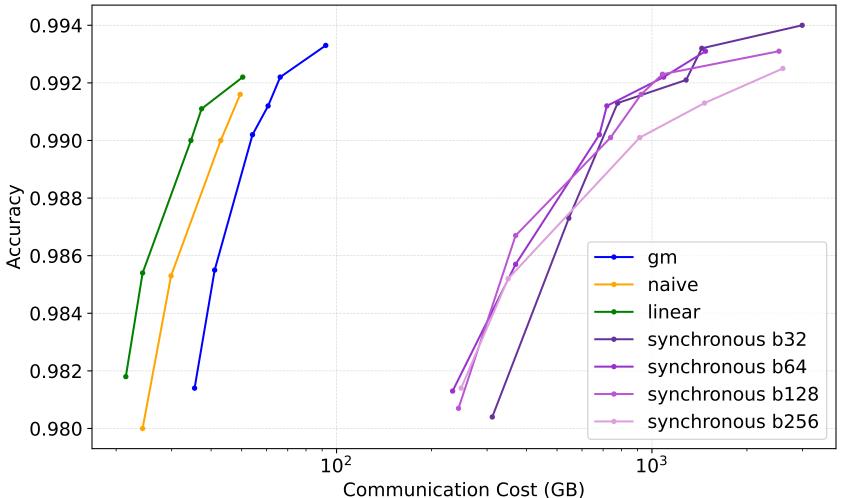


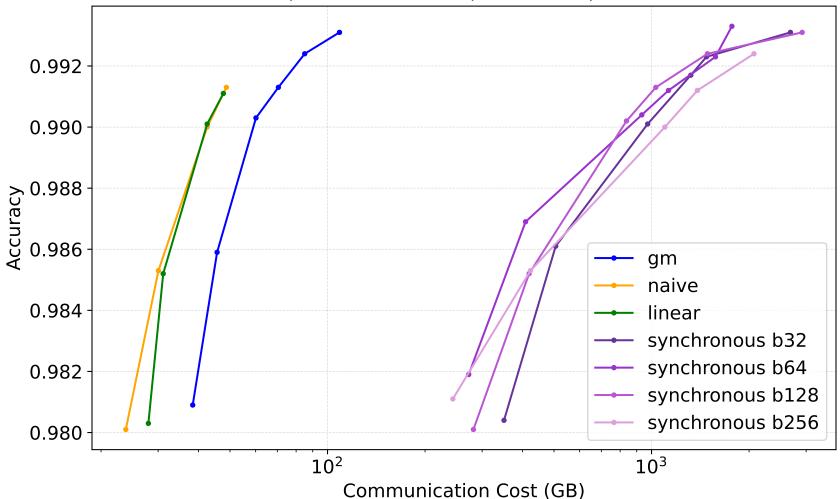


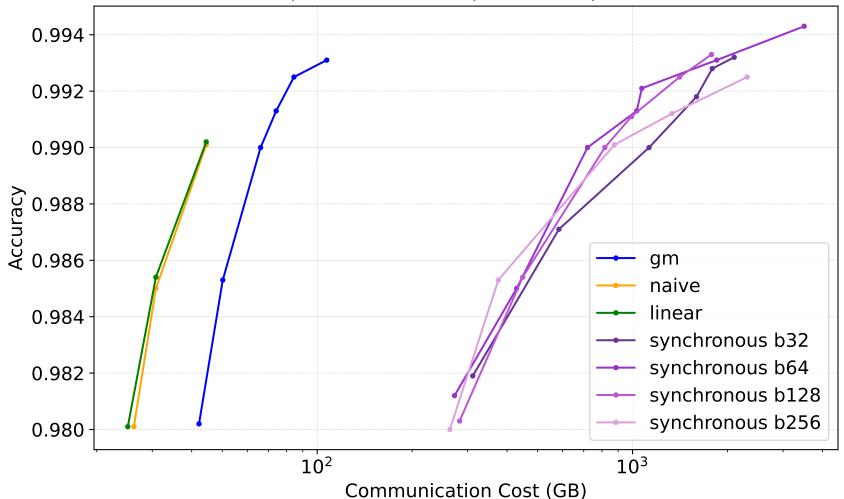


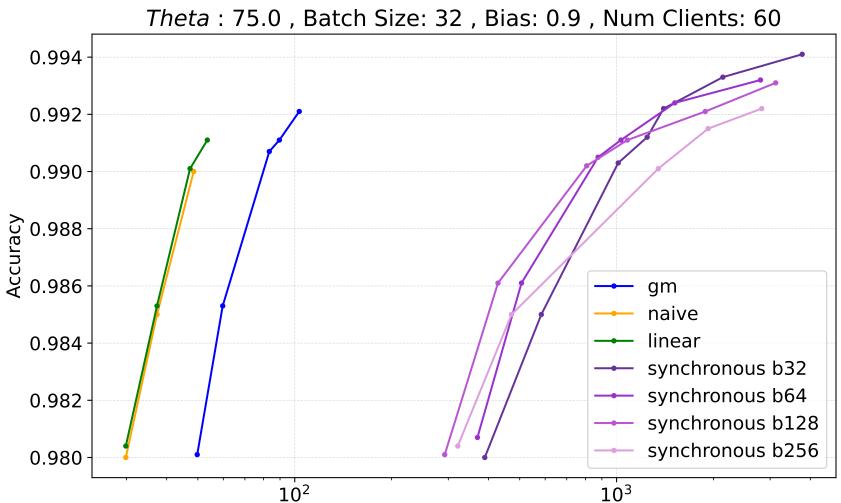






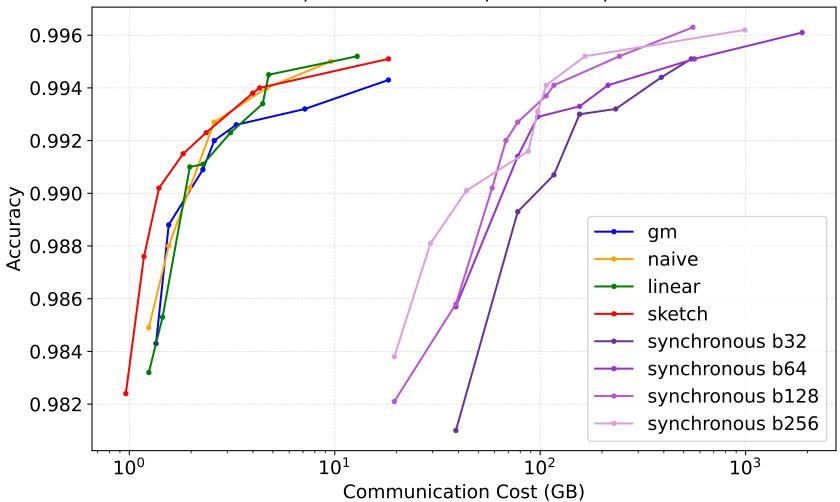


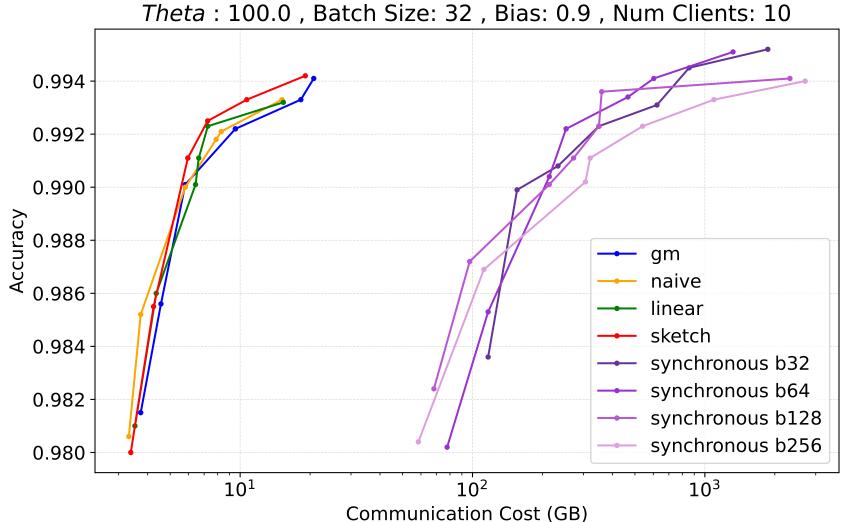


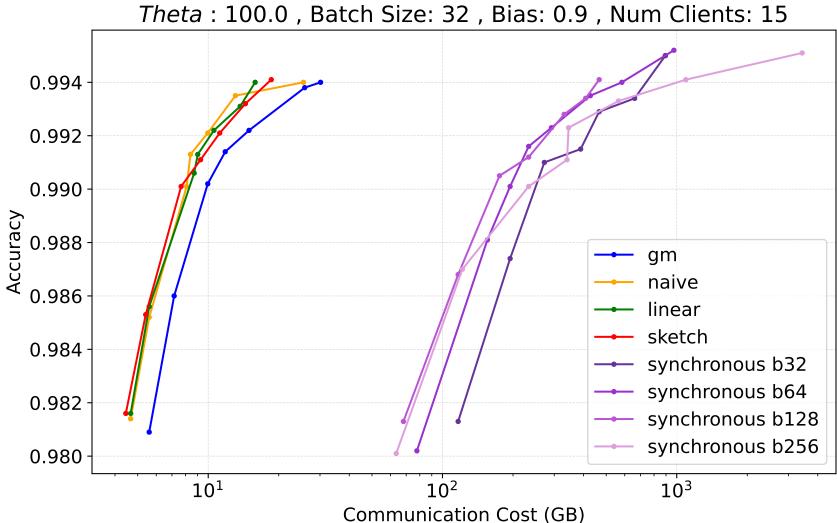


synchronous

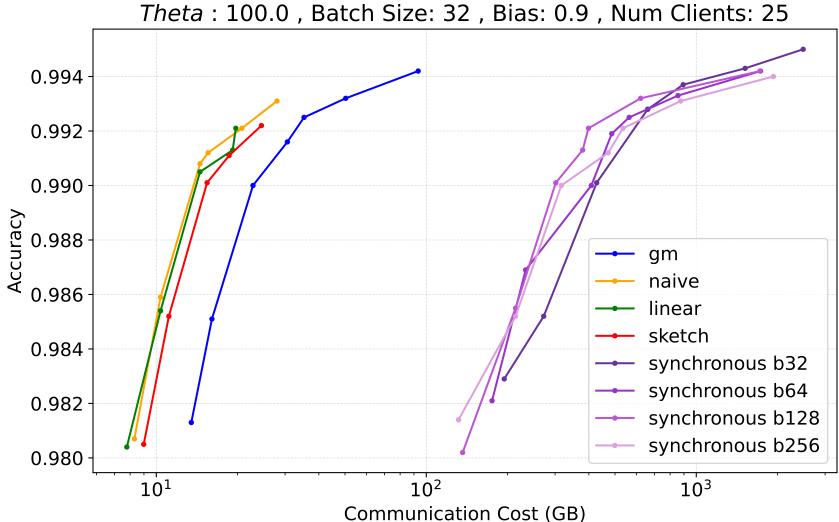


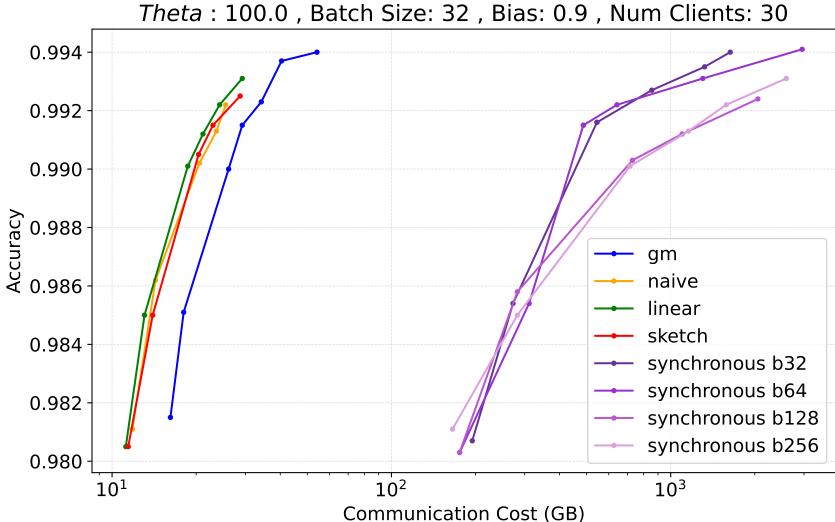


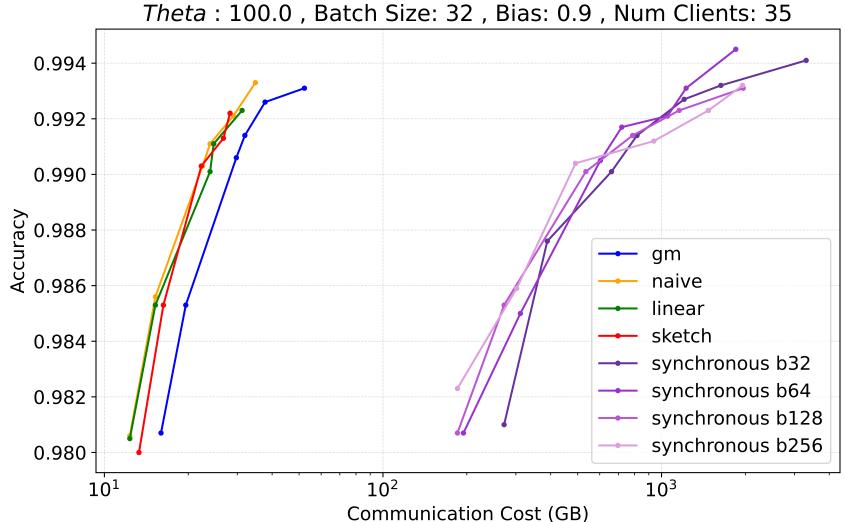


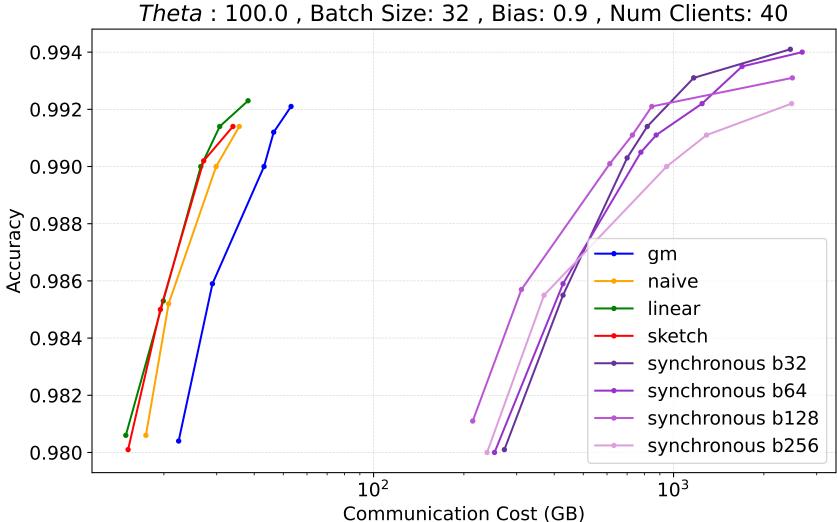


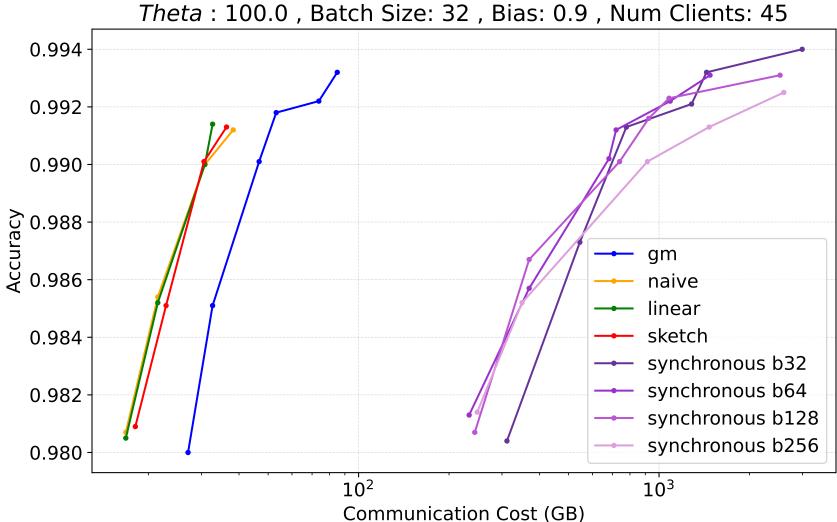
Theta: 100.0, Batch Size: 32, Bias: 0.9, Num Clients: 20 0.994 0.9920.990 Accuracy 0.988 gm naive 0.986 linear sketch 0.984synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980  $10^{1}$ 10<sup>2</sup> 10<sup>3</sup> Communication Cost (GB)

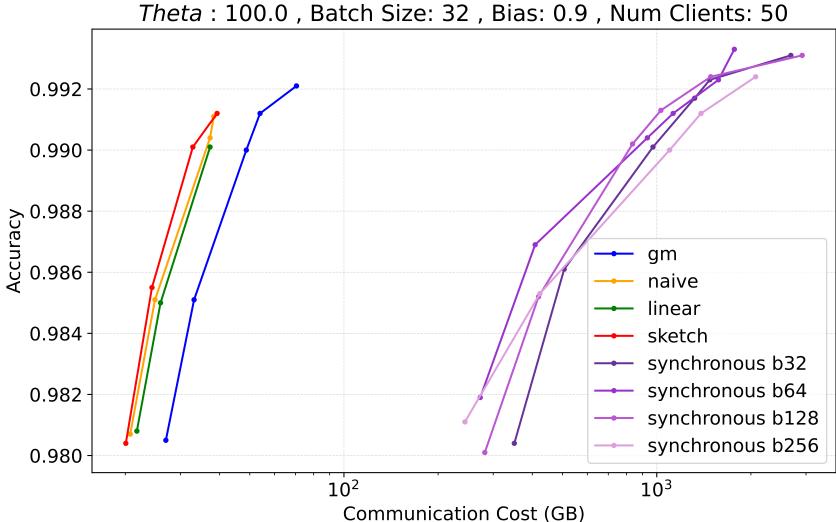


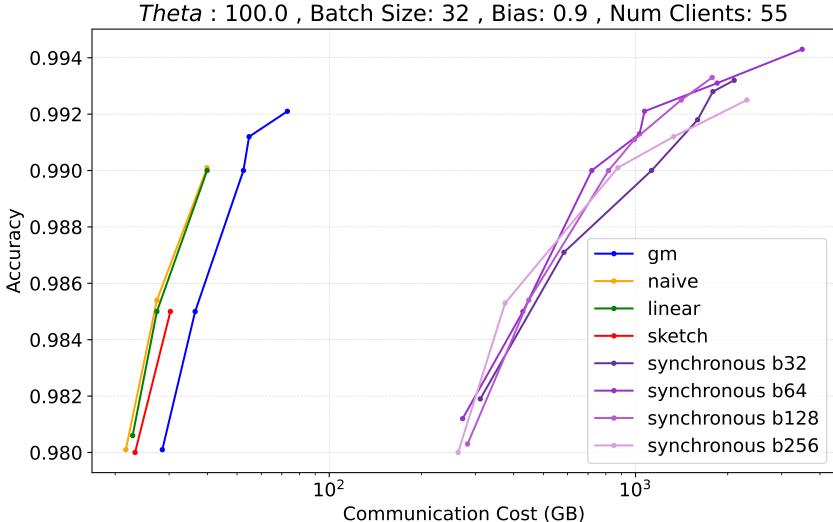












Theta: 100.0, Batch Size: 32, Bias: 0.9, Num Clients: 60 0.994 0.992 0.990 Accuracy - 886.0 gm naive linear sketch 0.984 synchronous b32 synchronous b64 0.982 synchronous b128 synchronous b256 0.980 10<sup>2</sup> 10<sup>3</sup>

Communication Cost (GB)