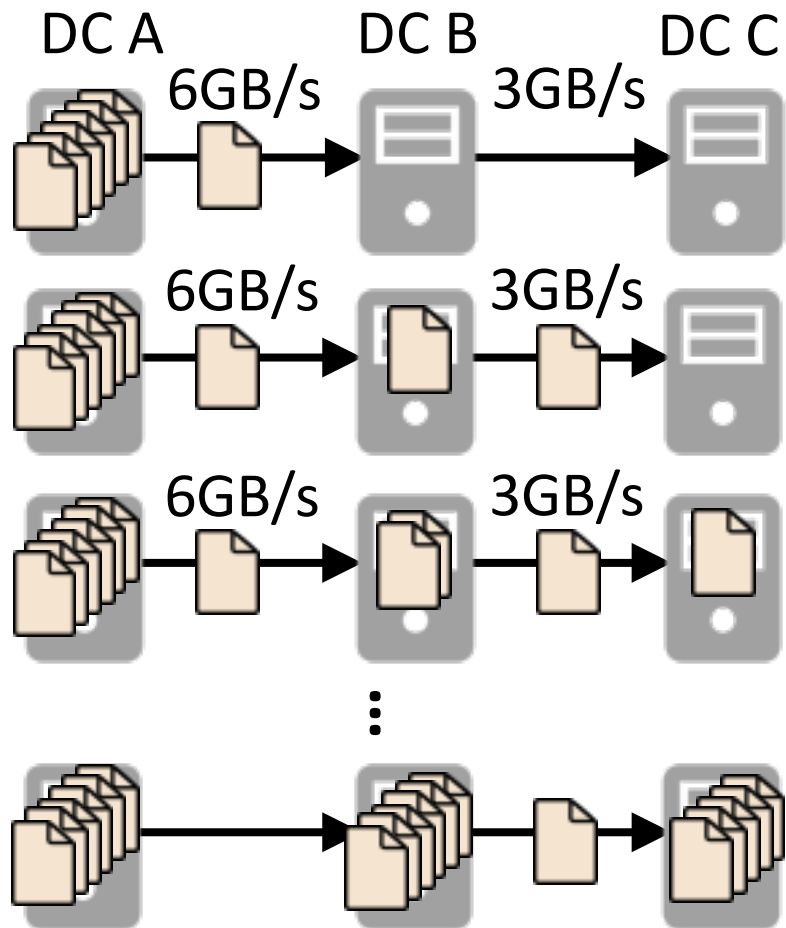


**(a) No overlay: 18 sec**  
 $= \max(36/6, 36/2)$

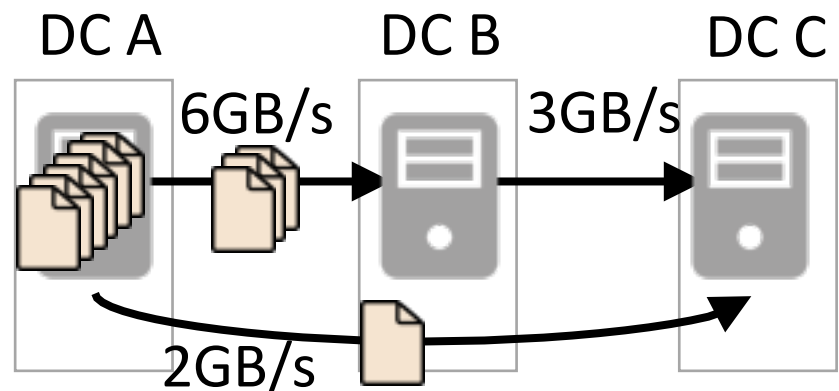
## Setting:

B & C need a file of 36GB from A.  
 The file is split into six 6-GB blocks.

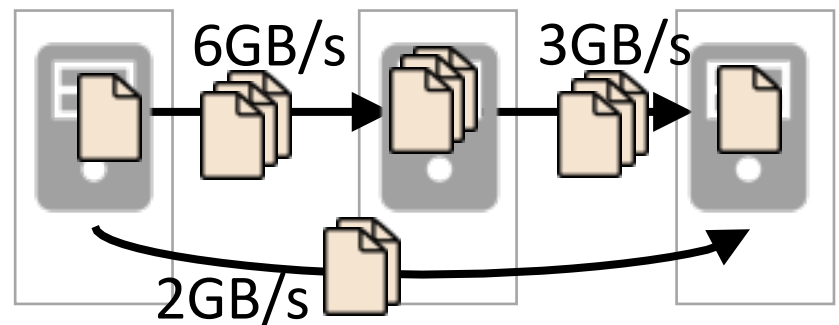
 represents a 6-GB block



**(b) Chain replication: 13 sec**  
 $= 6/6 + 6/3 + 6/3 + 6/3 + 6/3 + 6/3 + 6/3$



3 sec =  $\max(18/6, 6/2)$



6 sec =  $\max(18/6, 18/3, 12/2)$

**(c) Smart overlay: 9 sec**  
 $= 3 + 6$