



# Cloudy with a chance of meatballs

Some thoughts

September 2017



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# What is cloud?



## Some answers

- “elastic, agile provisioning”
- “a mechanism for emancipating the users”
- “a tool for removing power from IT”
- “a threat to our jobs”
- “a conspiracy by a bunch of American suppliers to create further monopolistic supply”
- “a boon for science and the economy”
- “inevitable”
- “a threat to science”



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# What is cloud?



## My answer

- Inevitable
- Revolutionary
- A fantastic economic opportunity
- A fantastic tool for (some/most/?) science
  
- An existential threat to some science



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# But first let's take a step back



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# What is the point (of HPC)?



## Some typical answers

- Get better results
- Get faster answers
- “My PVCR told me!”
- It’s sexy
- For our students
- To cement the status of our organisation
- “It’s what we’ve always done”
- ...



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# What is the point?



## Only one answer

- Because it provides value

## Alternative, slightly better answer

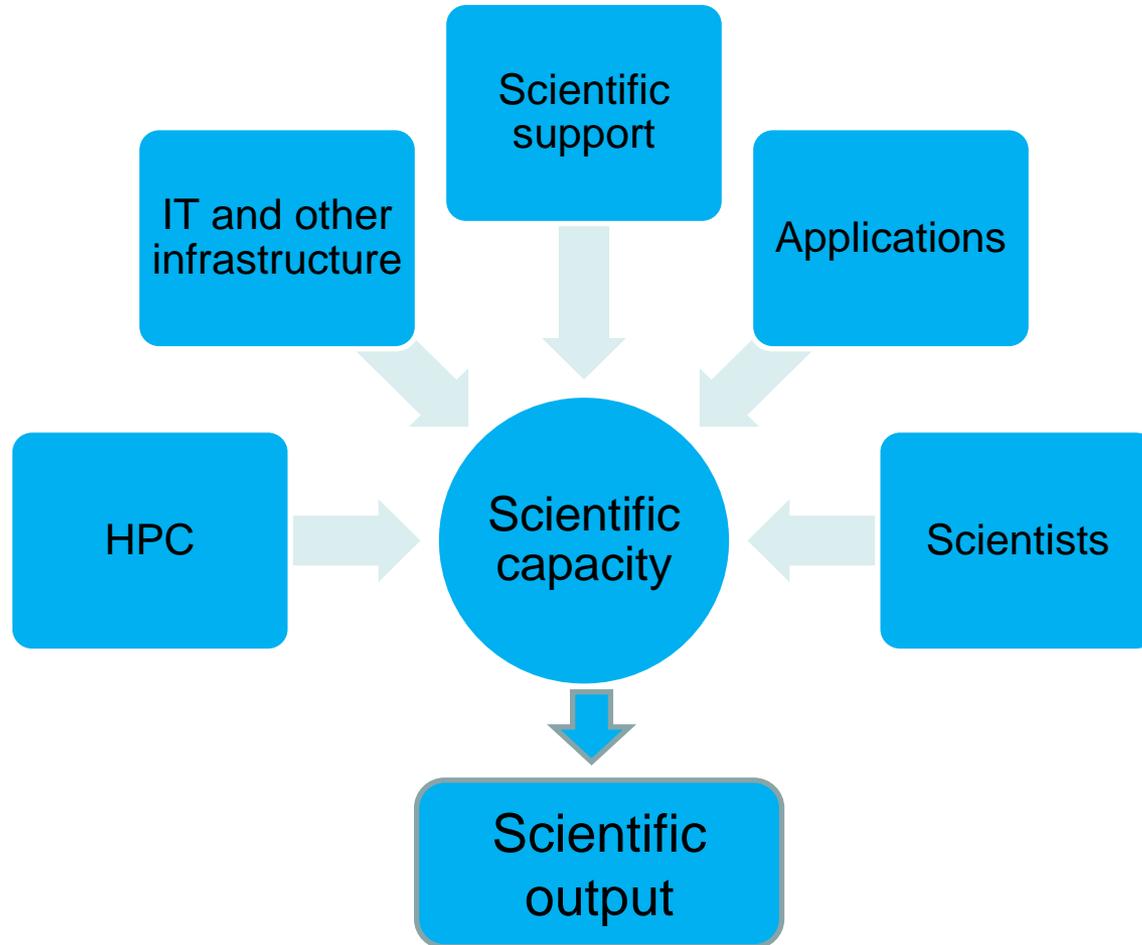
- Because it provides more value than it costs



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# What is value?



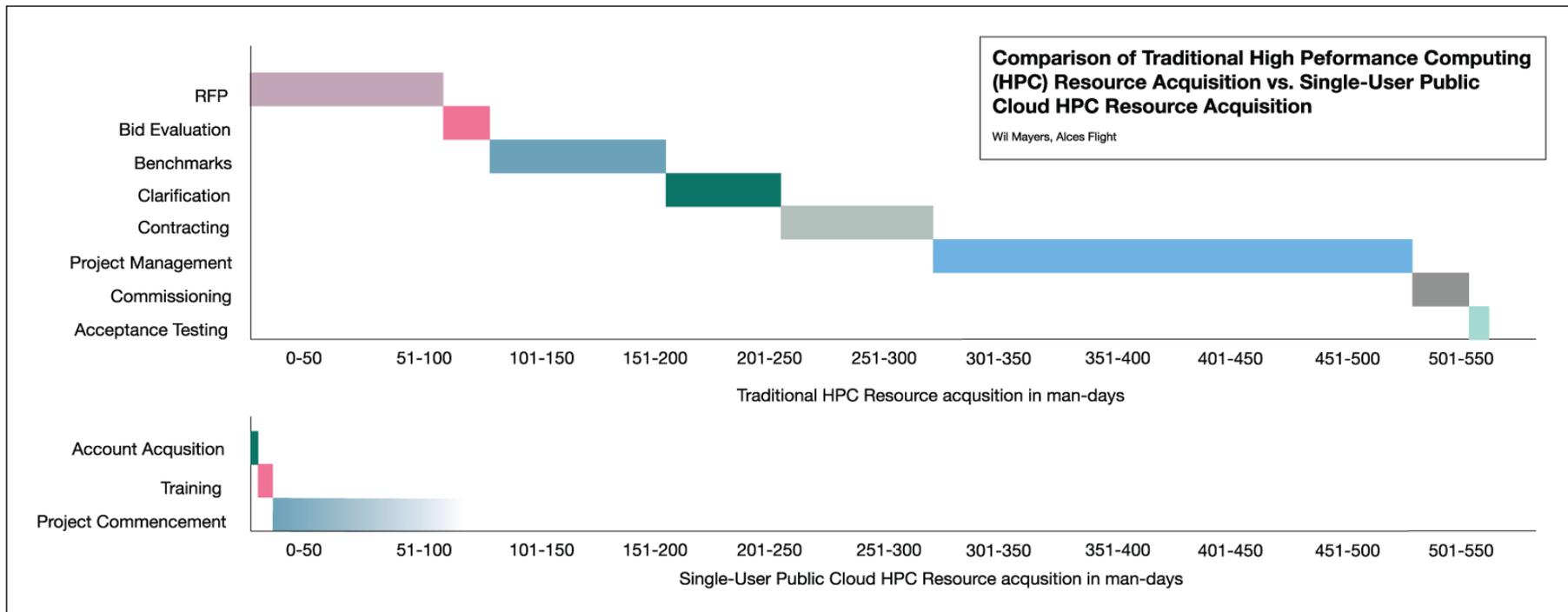
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# The “small” case



It takes a long time to get started ...



# And why it matters



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Source: Aristotle & Brendan Bouffler, AWS

# Working together ...



## Collective action

- By working together we can overcome many of these issues
- Essentially hiding the latency from the users
- However comes with significant “overhead”
- Centralised planning, procurement, operation, allocation, ...
- The correct response in times of market failure (or absence)



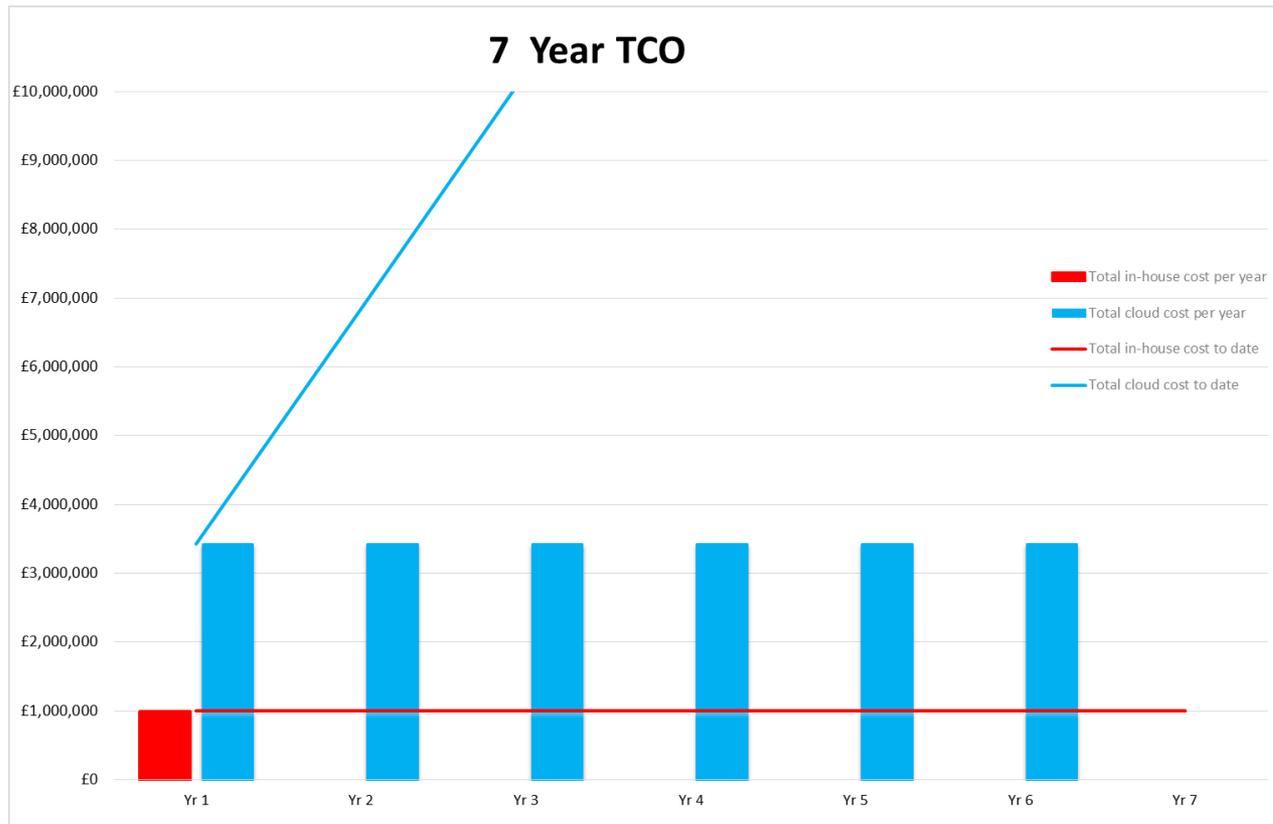
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# But we now have a market ...



Relative costs are not:



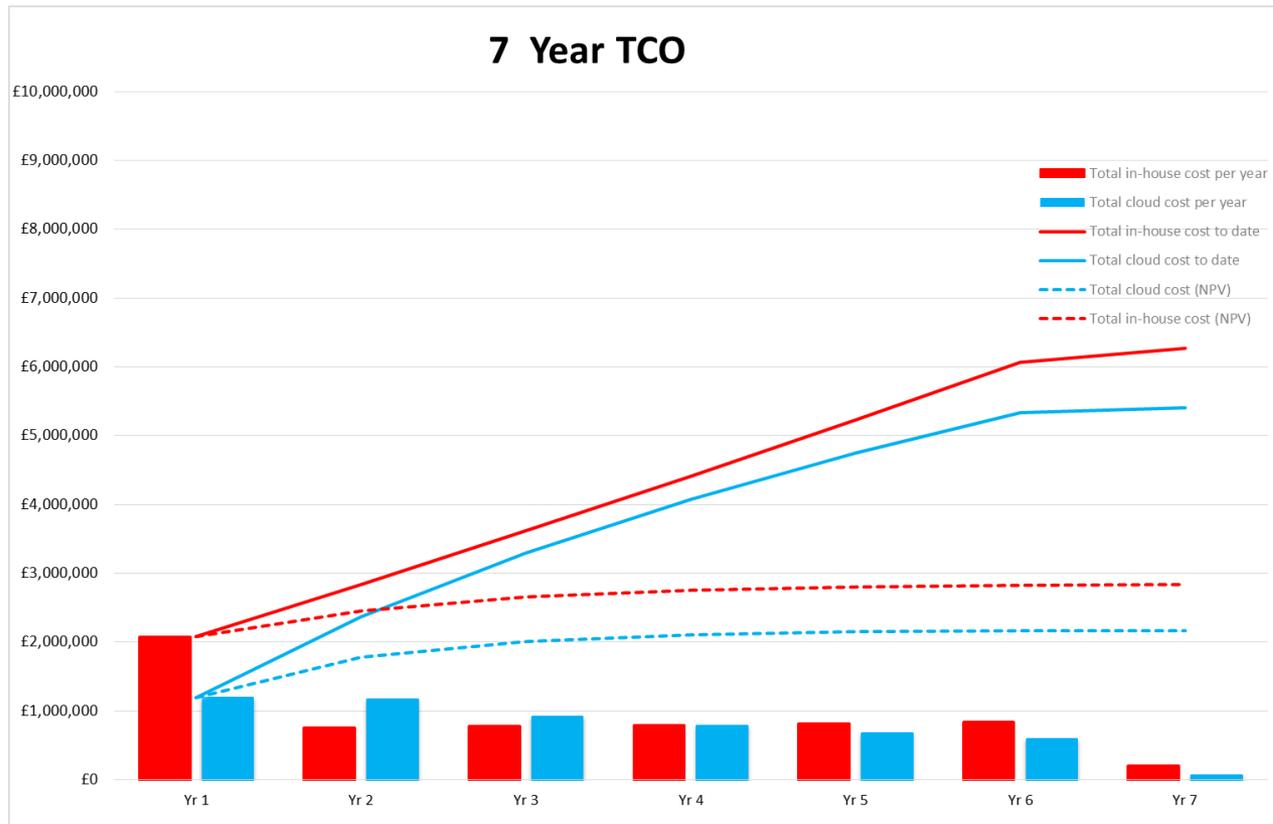
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# But now we have a market ...



But:



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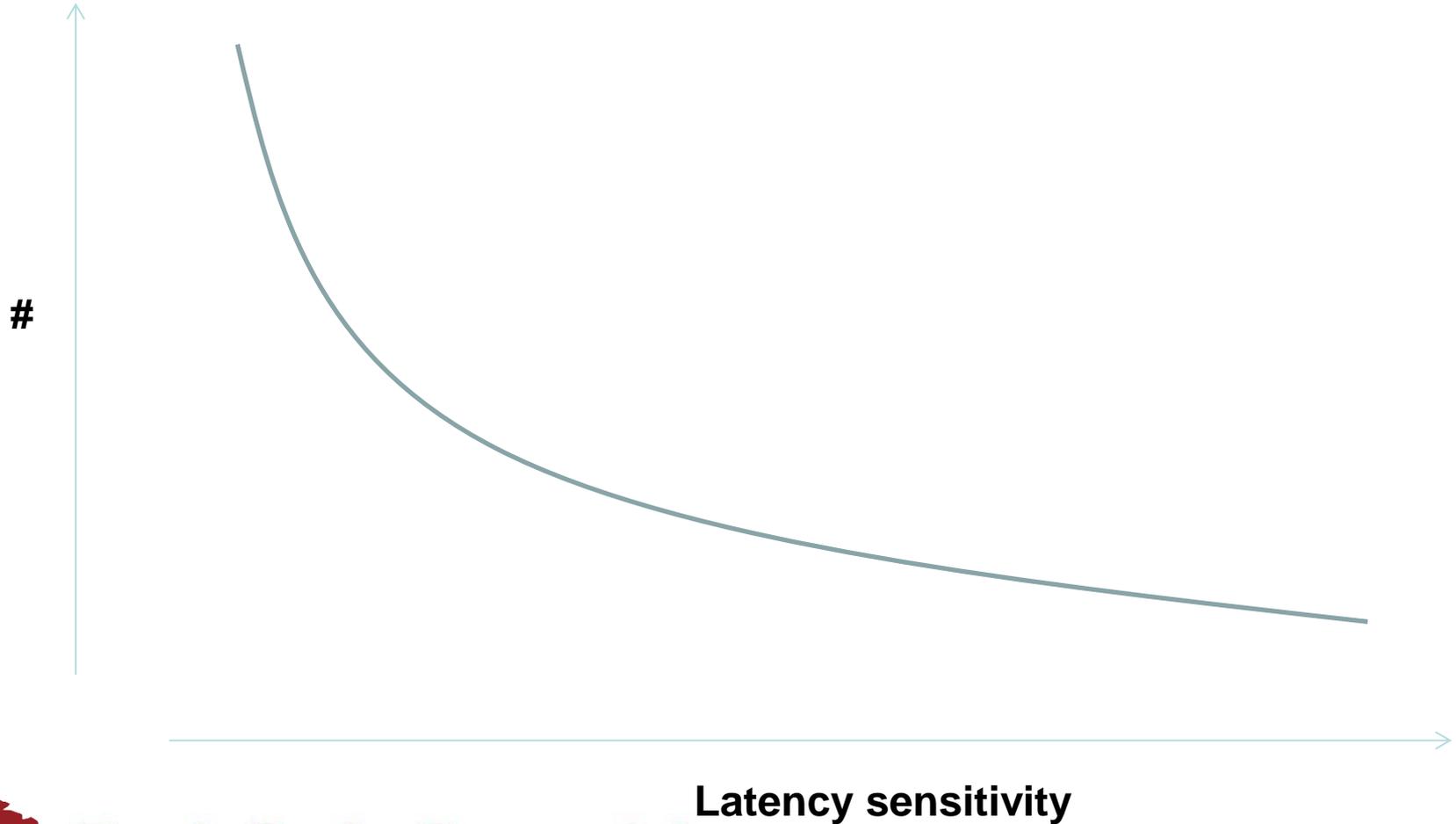
# World peace?

For some



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# A view of applications ...



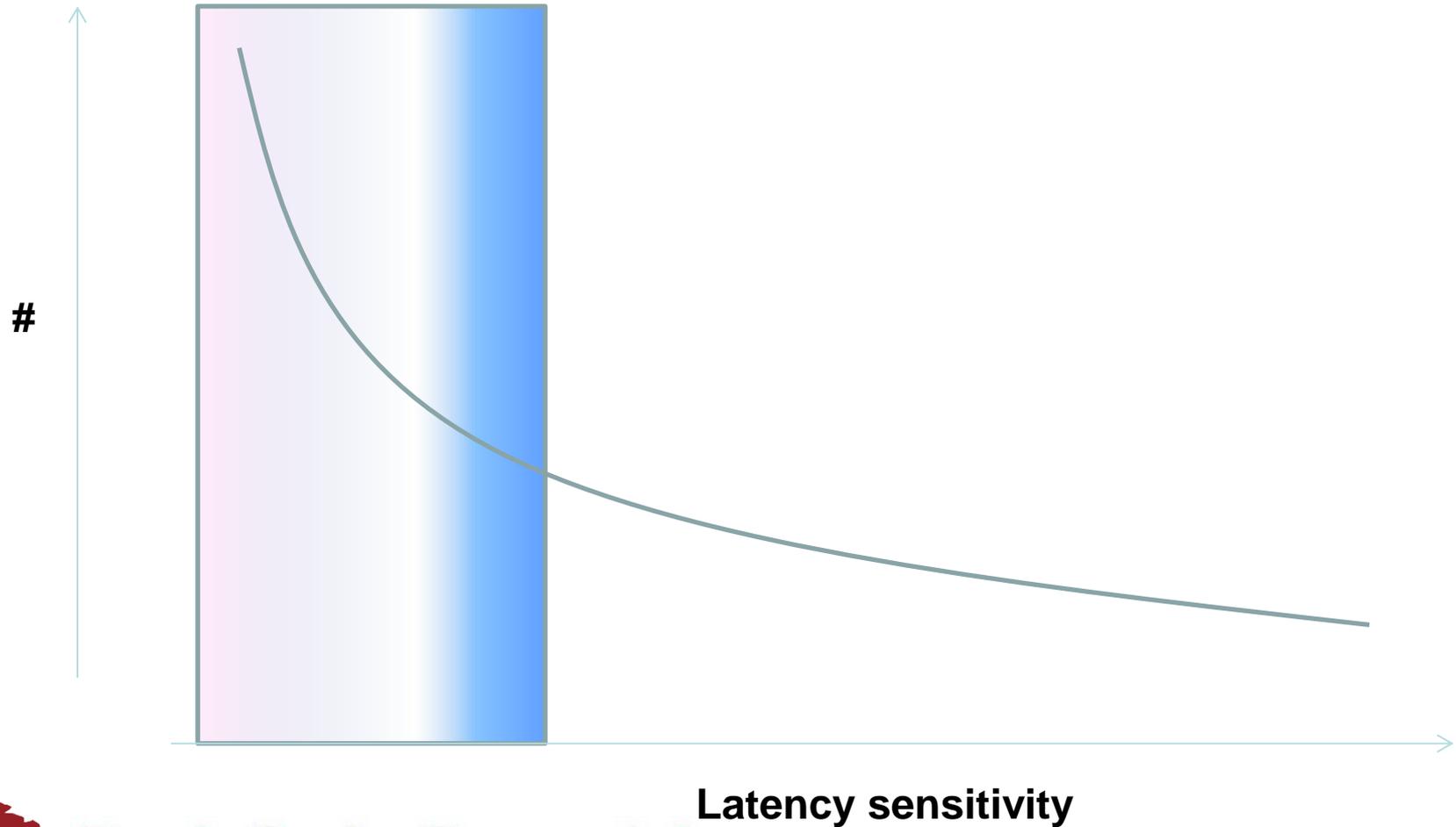
Latency sensitivity



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# The cloud “front”



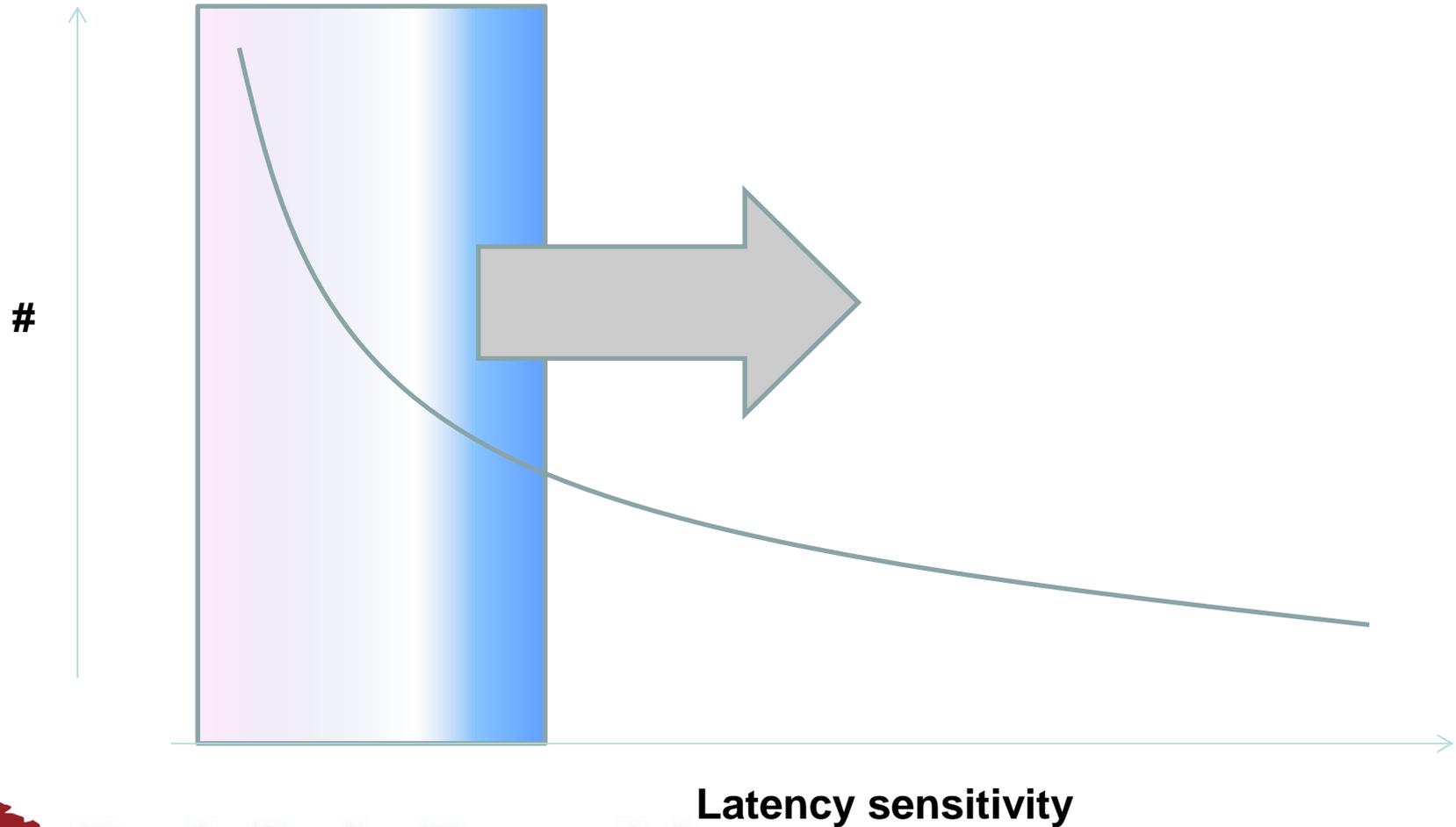
Latency sensitivity



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# Geostrophic wind



Latency sensitivity



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# Why it matters



How much does a supercomputer cost



OEMs build up the system from lots of different components



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# Why it matters



How much does a supercomputer cost



OEMs build up the system from lots of different components



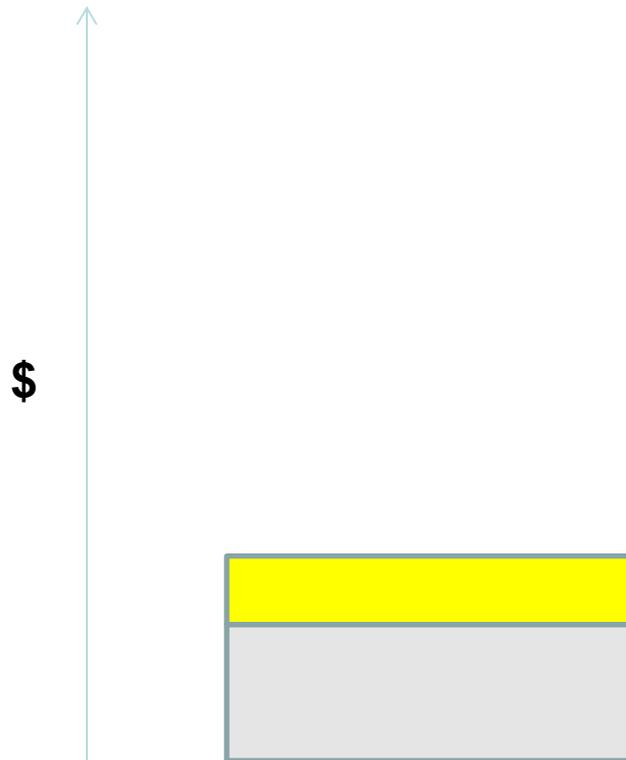
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# Why it matters



## How much does a supercomputer cost



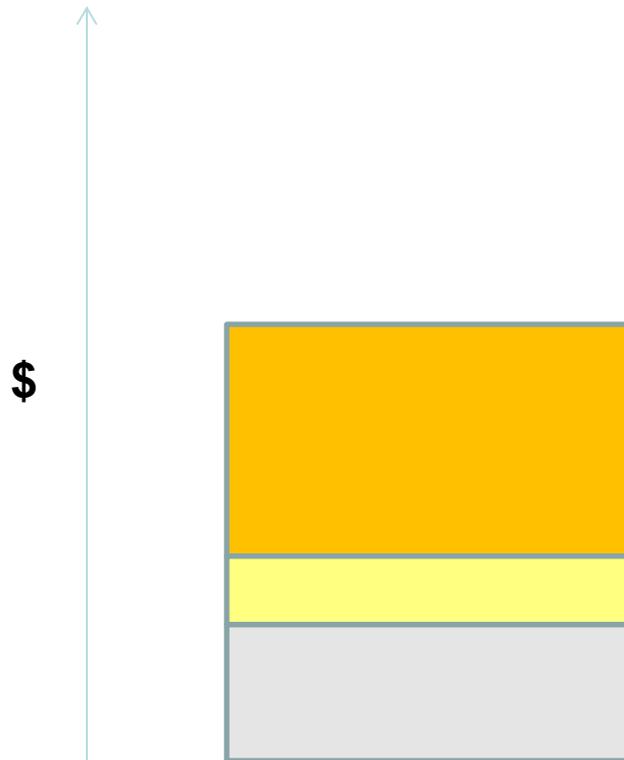
OEMs build up the system from lots of different components



# Why it matters



## How much does a supercomputer cost



OEMs build up the system from lots of different components



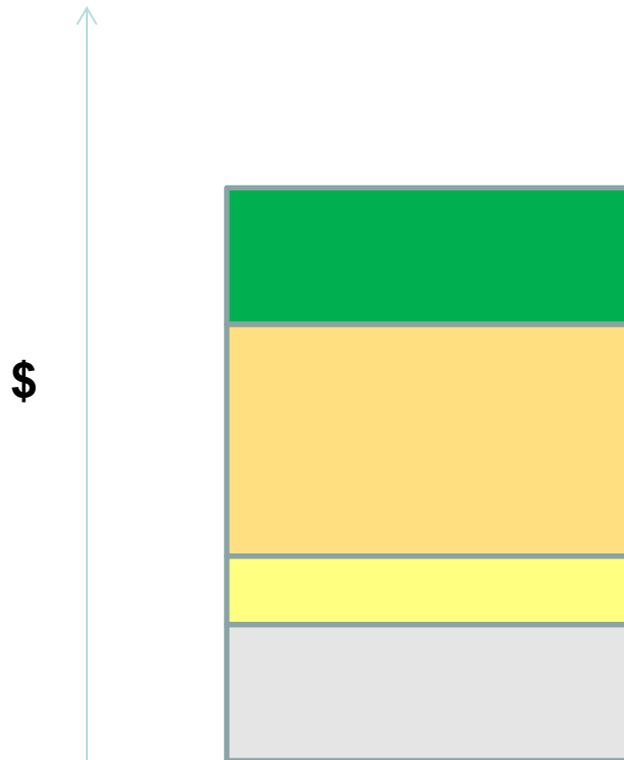
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# Why it matters



How much does a supercomputer cost



OEMs build up the system from lots of different components



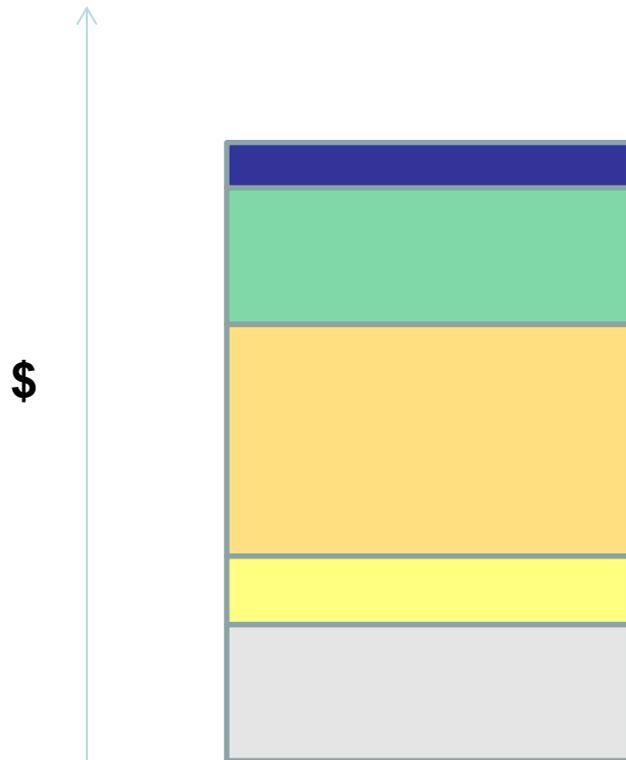
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# Why it matters



How much does a supercomputer cost



OEMs build up the system from lots of different components



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# Why it matters



How much does a supercomputer cost



And then add a mark-up to cover “overheads”



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# OEM's costs



## Gross margin

- Pays for the non-marginal costs
- Buildings, taxes, staff, office functions, ...
- And recovered R&D costs
- Amortised over all products
- For example:
- Cray's gross margin: 30%
- Cray's latest profit figure: 1.6%



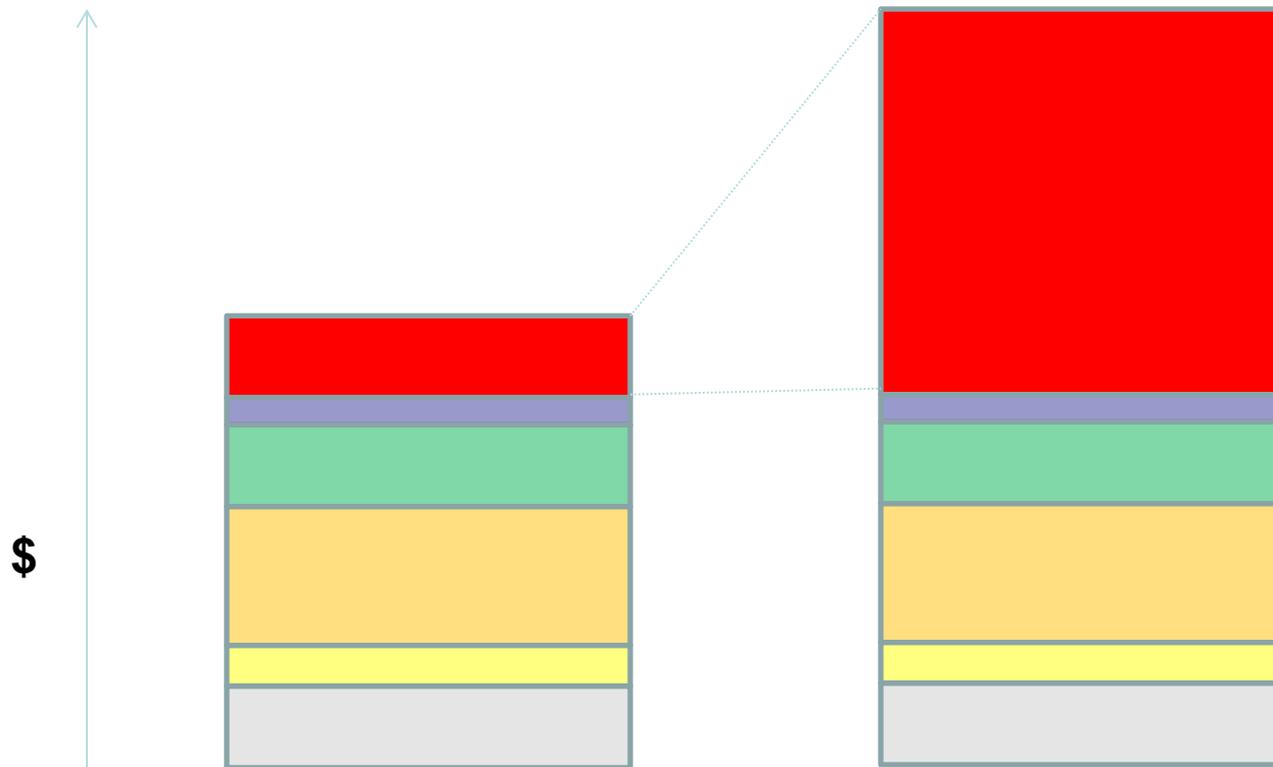
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# Why do I care?



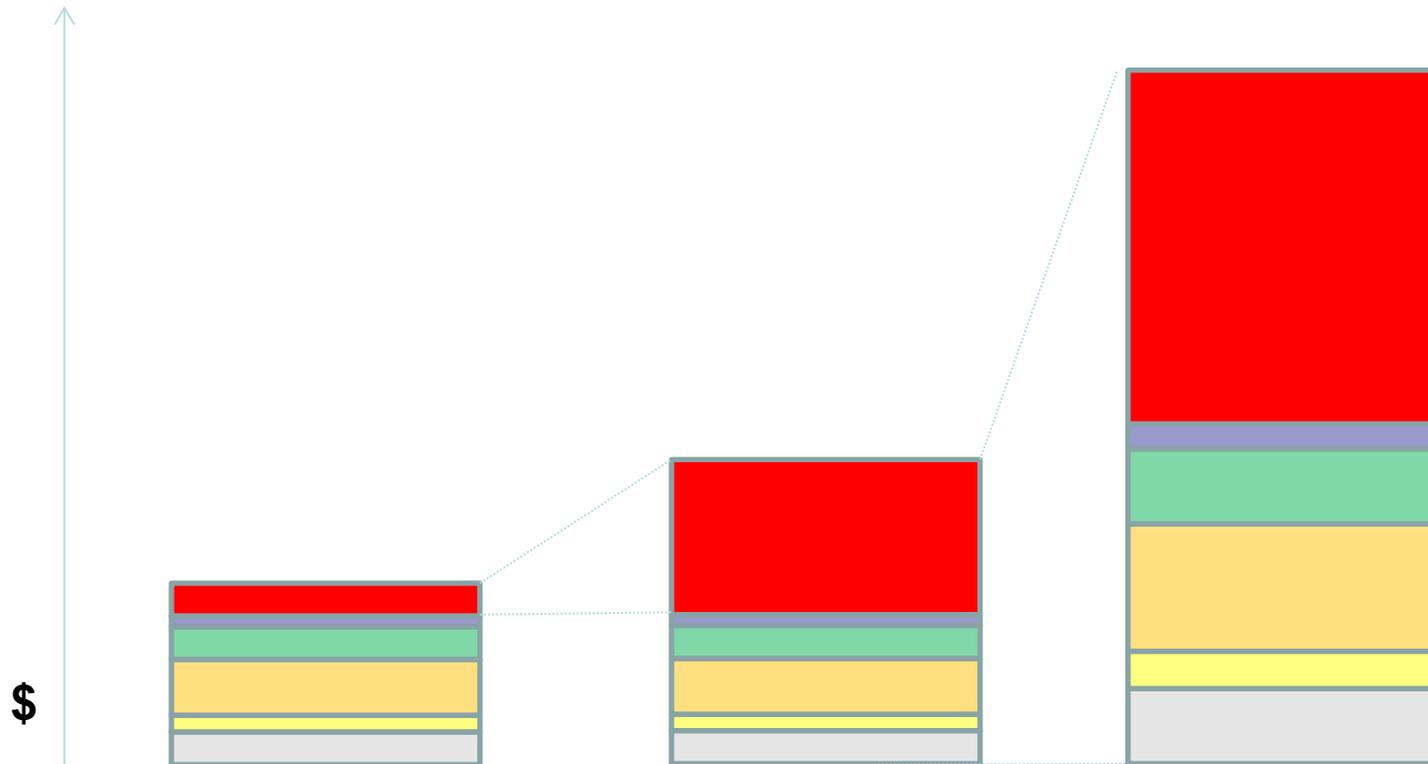
If there are fewer customers to amortise over ...



# Actually it's worse than that



If there are fewer customers to amortise over ...

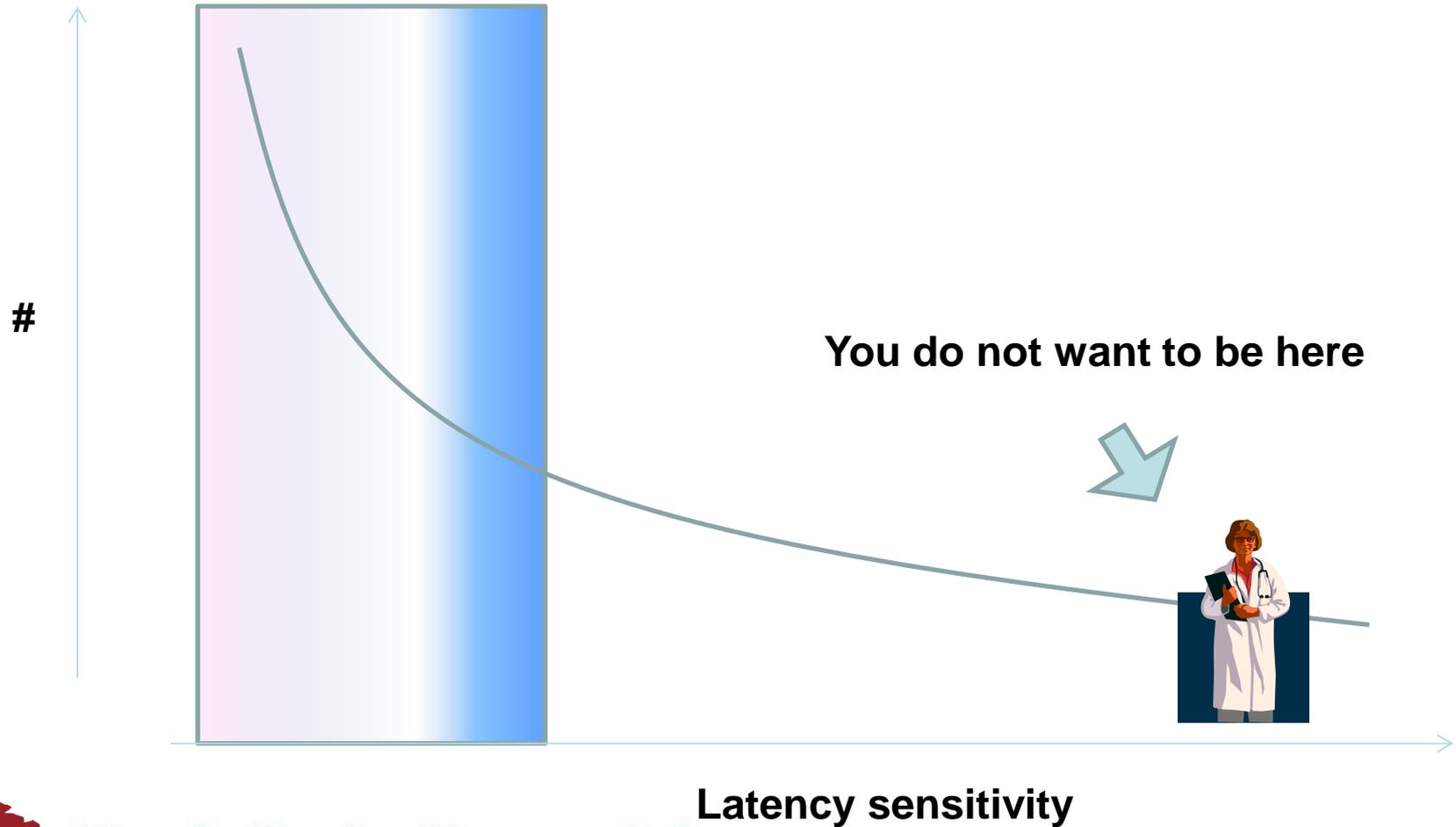


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# The Left Behind



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