

# With Thanks

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# How to build research network systems in your spare time

Ratul Mahajan



# This talk

## Goal:

- Articulate a research method for building network systems

## Non-goal:

- Building consensus

# Common concerns for research network systems

Do we need another paper on ...?

Is this problem important?

Does this solution work?

What is new here?

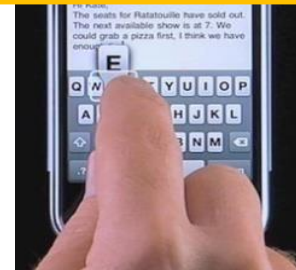
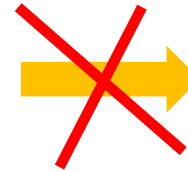
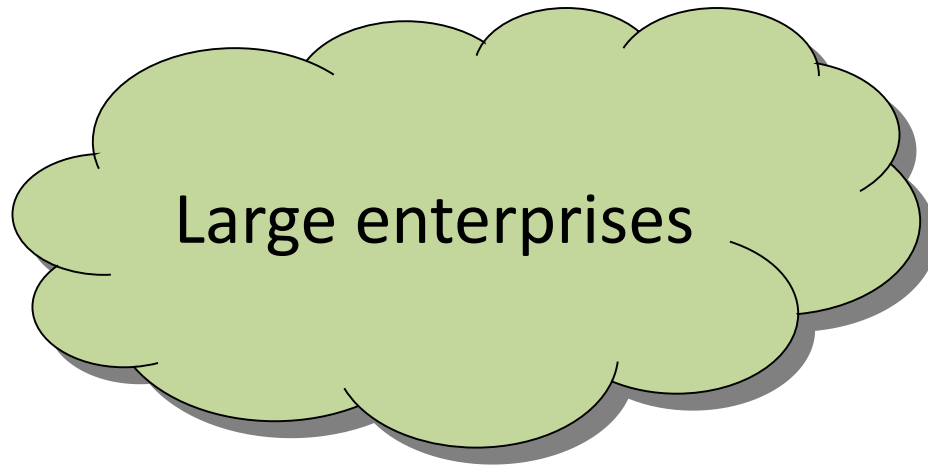
Why not solve the problem this other (simpler) way?

**Do these represent flaws in the  
research process or communication?**

# A method for building research network systems

0. Pick the domain carefully
1. Know the problem well before you build
2. Debate several solution ideas
  - Have a core idea to what you build
3. When building, start small and then embellish
4. Make it real

# Picking a domain



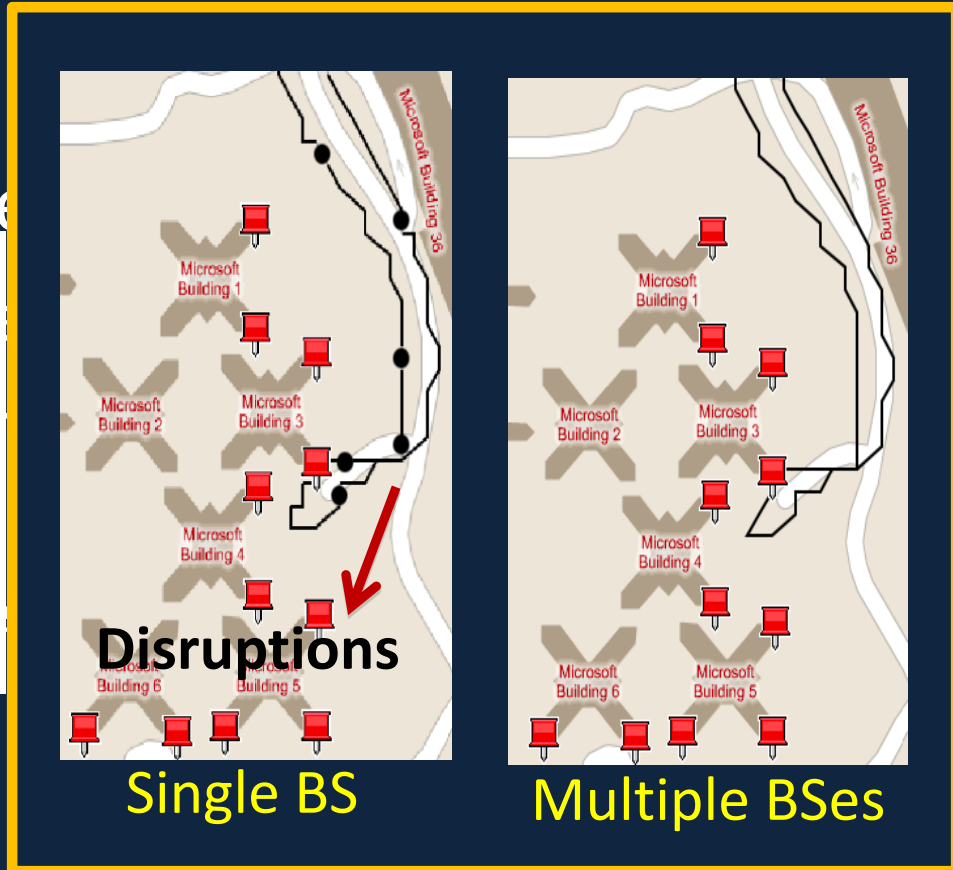
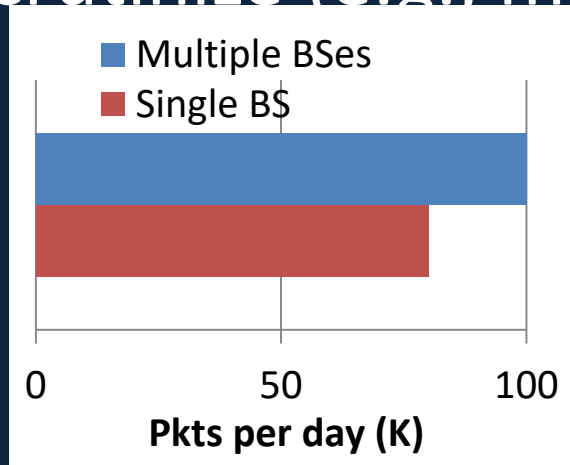
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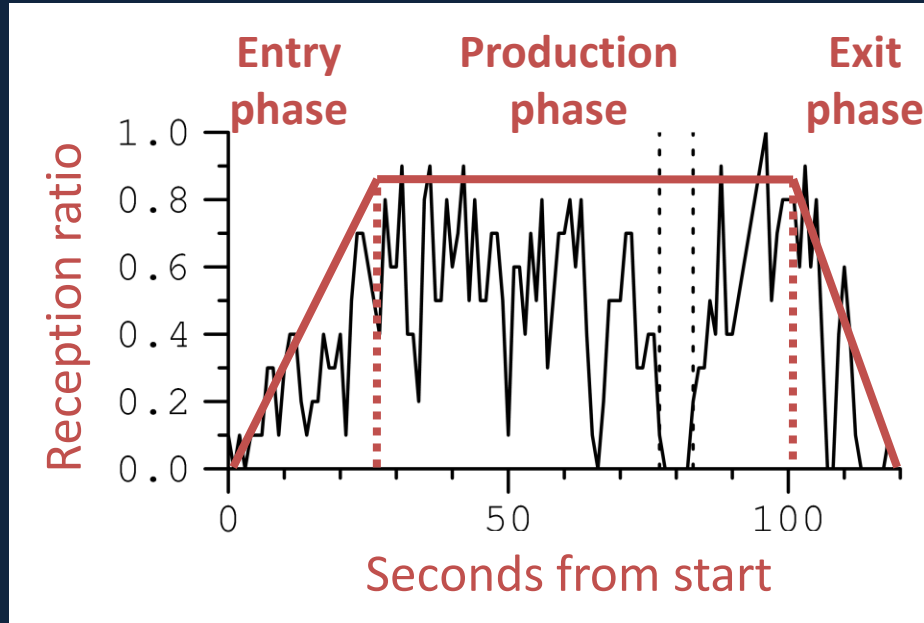
# 1. Knowing the problem

Papers alone are rarely a good source

Scrutinize (e.g., me



# Some scrutiny how-to's



Client-BS connectivity pattern in a realistic setting did not match observations in controlled environments

# Output of well-done scrutiny

## Primary:

- Identification of real issues and non-issues
- An estimate of the benefit before you commit fully
- Detailed insight
  - E.g., domain characteristics that you can leverage

## Secondary:

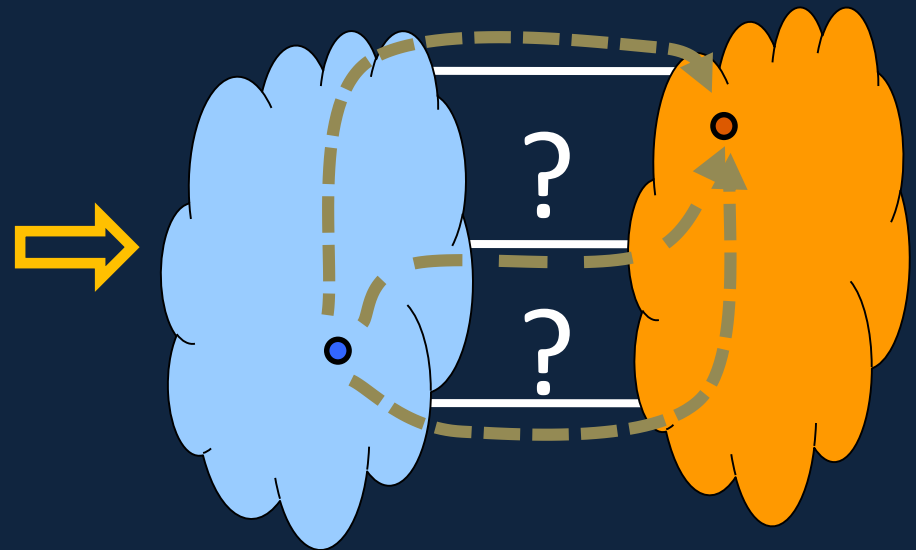
- Sets up evaluation for later
- Risk reduction in publishing

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# Fishing for solution ideas

Filter your problem to its crux



# Idea triage

## Set up an idea racetrack

- Compare relative strengths
- Focus on the essence
- Give others' ideas a fair shake
  - “Not invented here” is not a disqualifying criterion



Helps to have an “adversary”

Answer new measurement questions that arise

# Output of the triage exercise

## A promising solution idea (or two)

- Core of the system that you are about to build
- Simple to express

## Clarity on the design space

- Reframing of the problem
- Classification of your own terms

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# Building the system

## Start small

- Quickly check if the idea works at all
- Consider using controlled experimental platforms first
- Hardcode certain factors

## Then embellish as needed to make it work

## If it does not work as expected:

- Figure out why
- Return to idea generation with the newfound knowledge

# Evaluating your system

Does it work?

- How does it compare to the state of art?

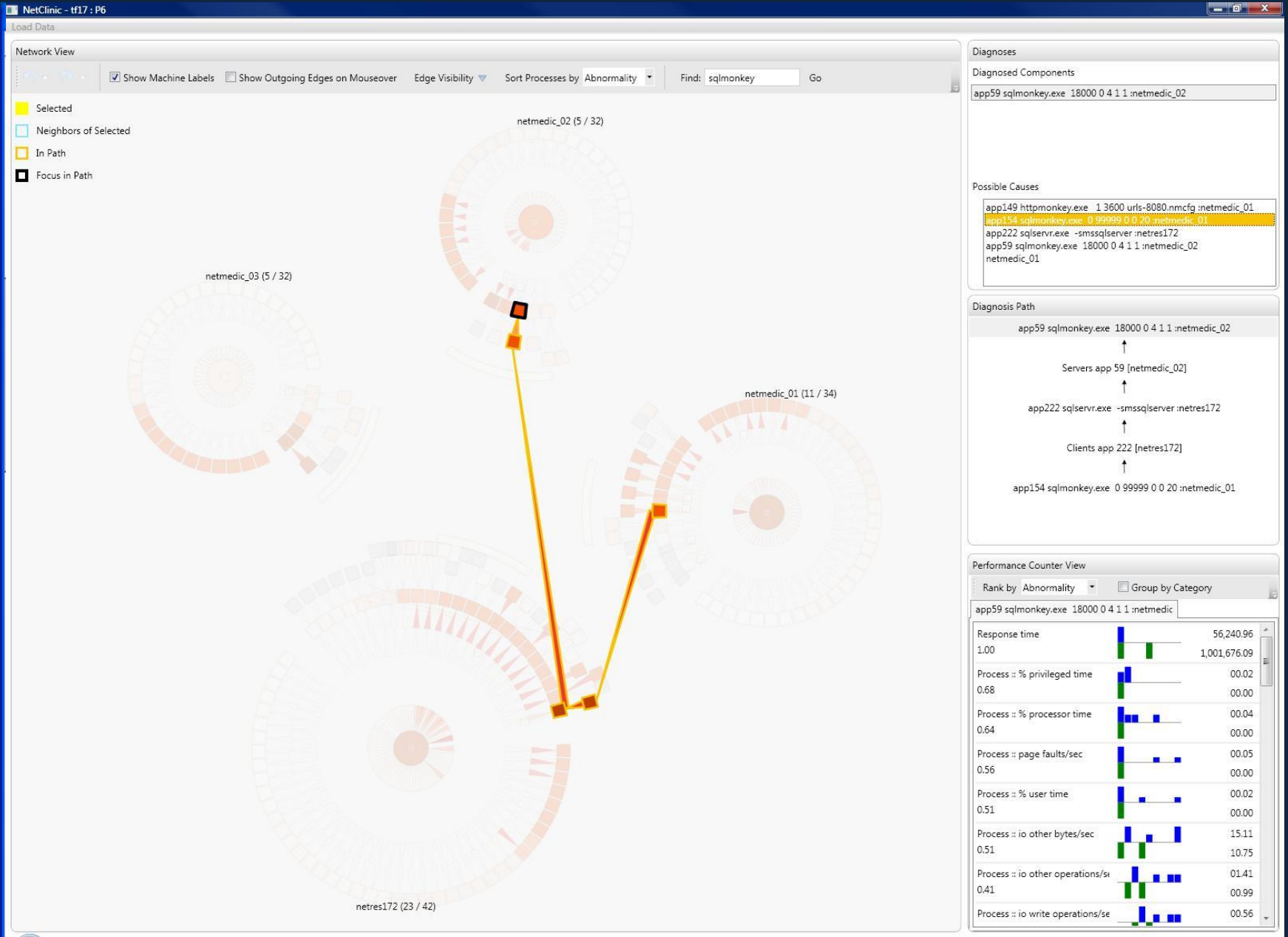
Why/when does it work?

- Do its assumptions hold in practice?

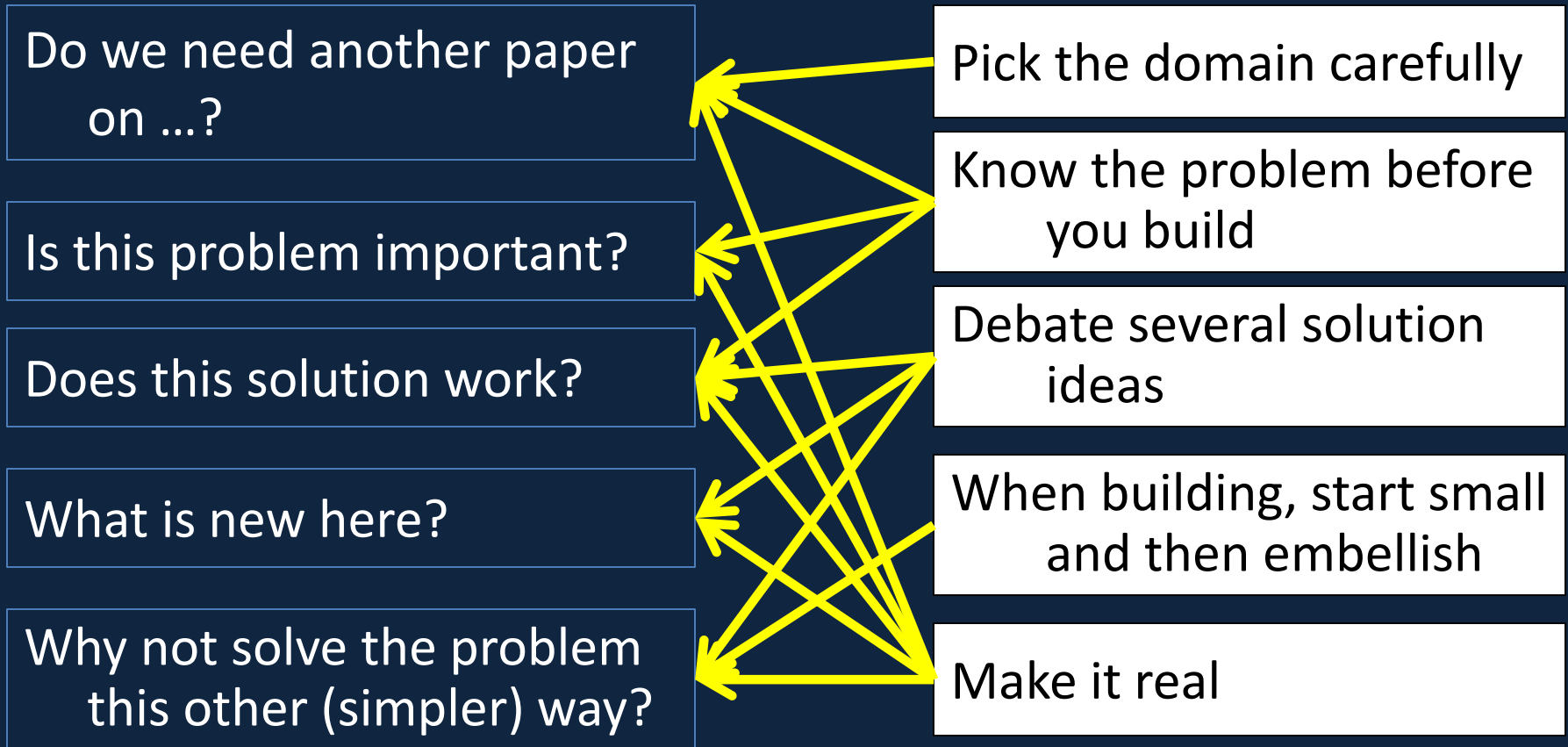
What are the benefits (or costs) of its complexity (or simplifications)?

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# How does this method help address those common concerns?



# Summary

Good research processes help avoid common mistakes and improve efficiency

- As a community, we should openly share what works well and what doesn't

One process:

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