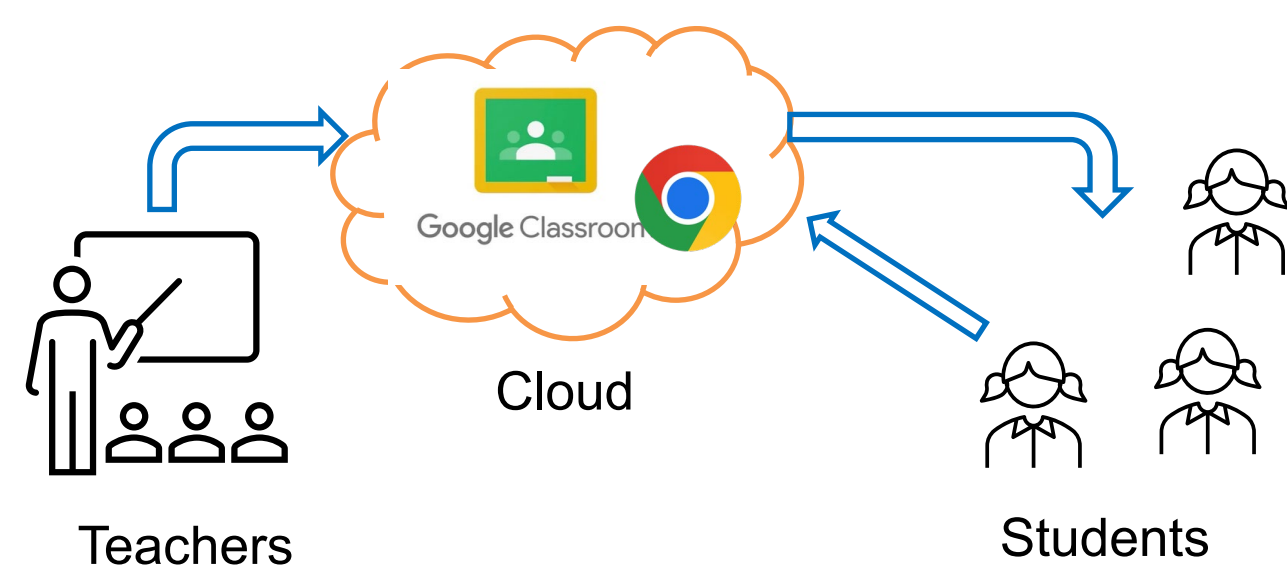




**PIs:** Umakishore Ramachandran, Ashutosh Dhekne, Nisha Botchwey, Shatakshee Dhongde, Mustaque Ahamad, Mostafa Ammar  
**Community Partners:** Victoria Bambo (Booker T Washington High School), Faith Porter (Raising Expectations)

## Introduction

- We use the internet for everything today
- The pandemic increased reliance on being online
  - Classrooms became virtual
  - Remote work became the norm

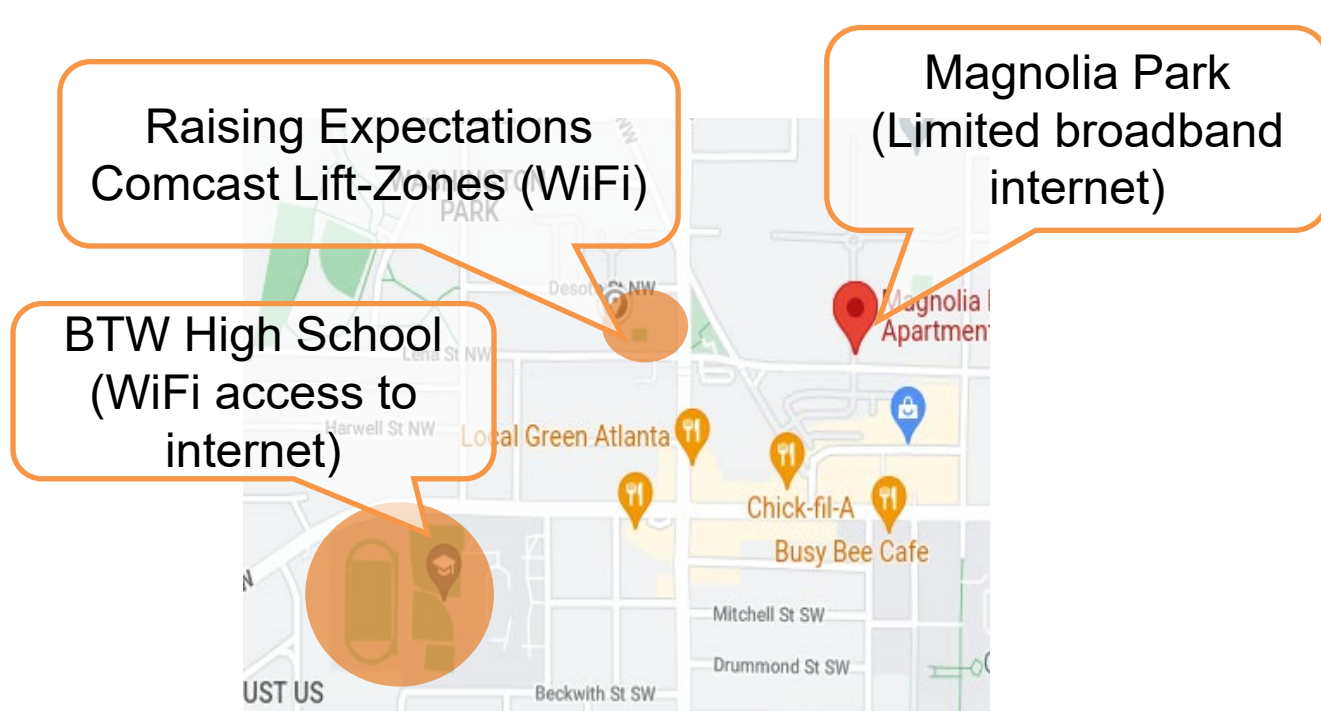


**Fig 1: Role of Internet in Education**

- **Homework Gap:** One-third (35%) of households with children ages 6 to 17 and an annual income below \$30,000 a year do not have a high-speed internet connection at home [1]!

### Homework gap in Atlanta

- The Westside of Atlanta is a low-income neighborhood [2] with average income \$24778

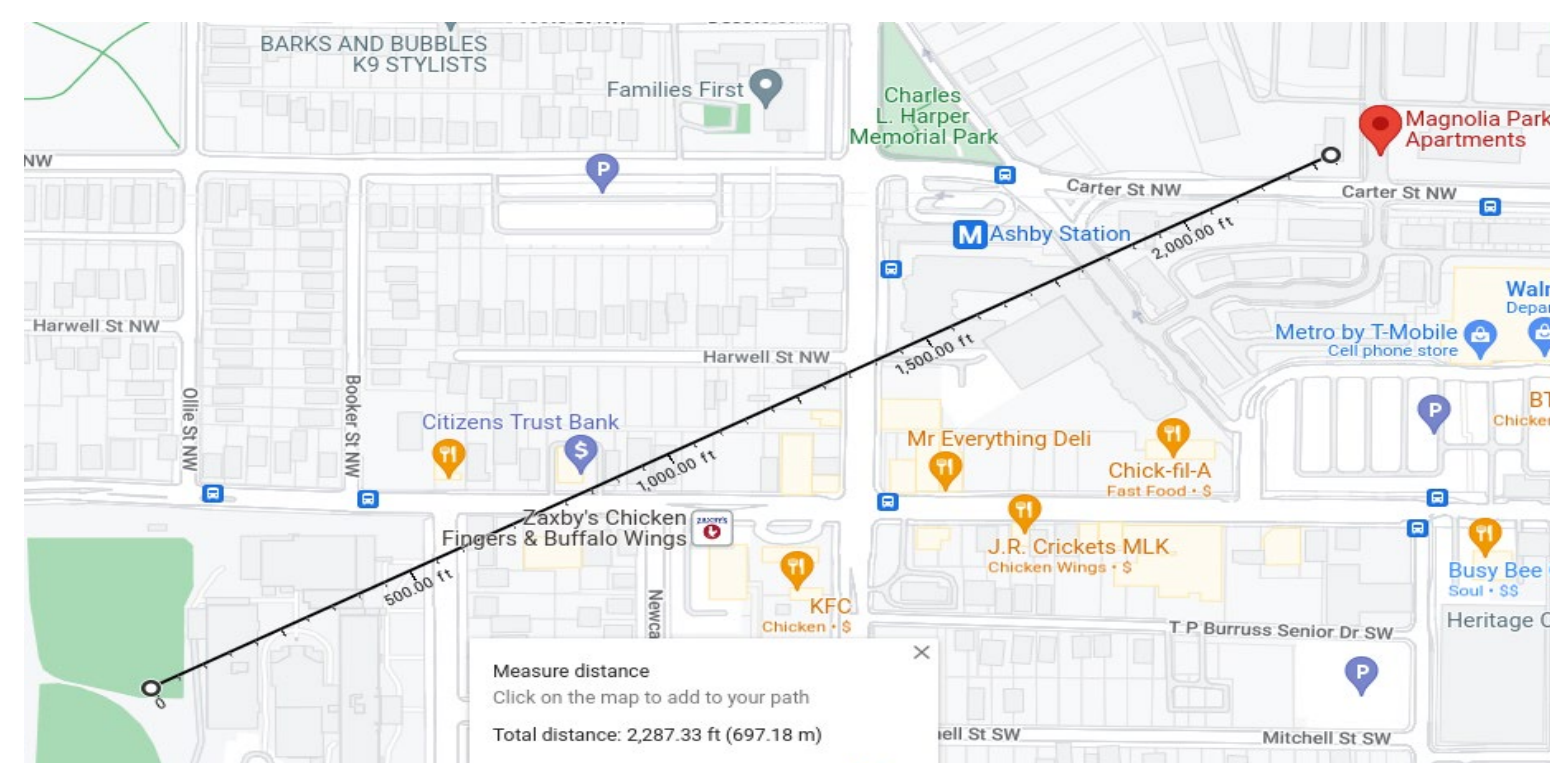


**Fig 2: Internet access for Westside students**

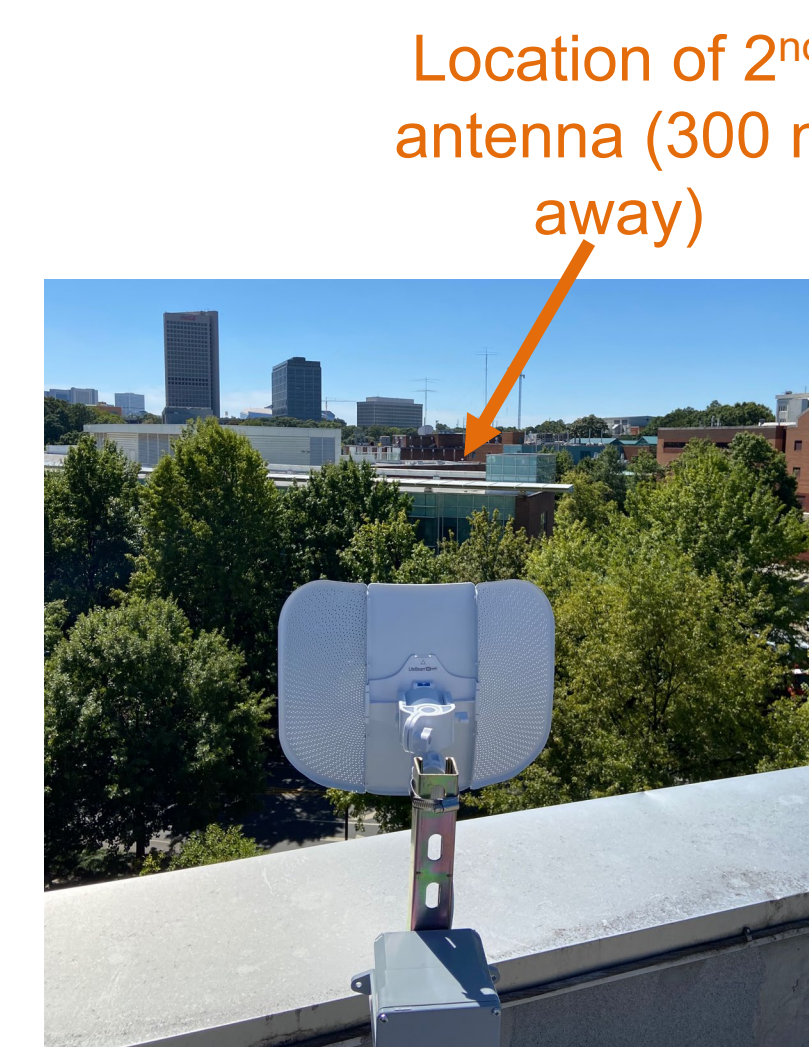
- Discussion with community partners at BTW High and Raising Expectations
  - While school and tutoring hubs have access to broadband internet, many students lack these services in their homes.
  - Their circumstances were made worse by the covid-19 pandemic

## Reducing the homework gap

- Extend the range of school's Internet
  - Many students live in an apartment building < 0.5 mile away from the school
  - Use wireless point-to-point links (fig 3.)
  - Experimental p2p setup at Georgia tech to evaluate performance of low-cost direction antennas (fig 4.)



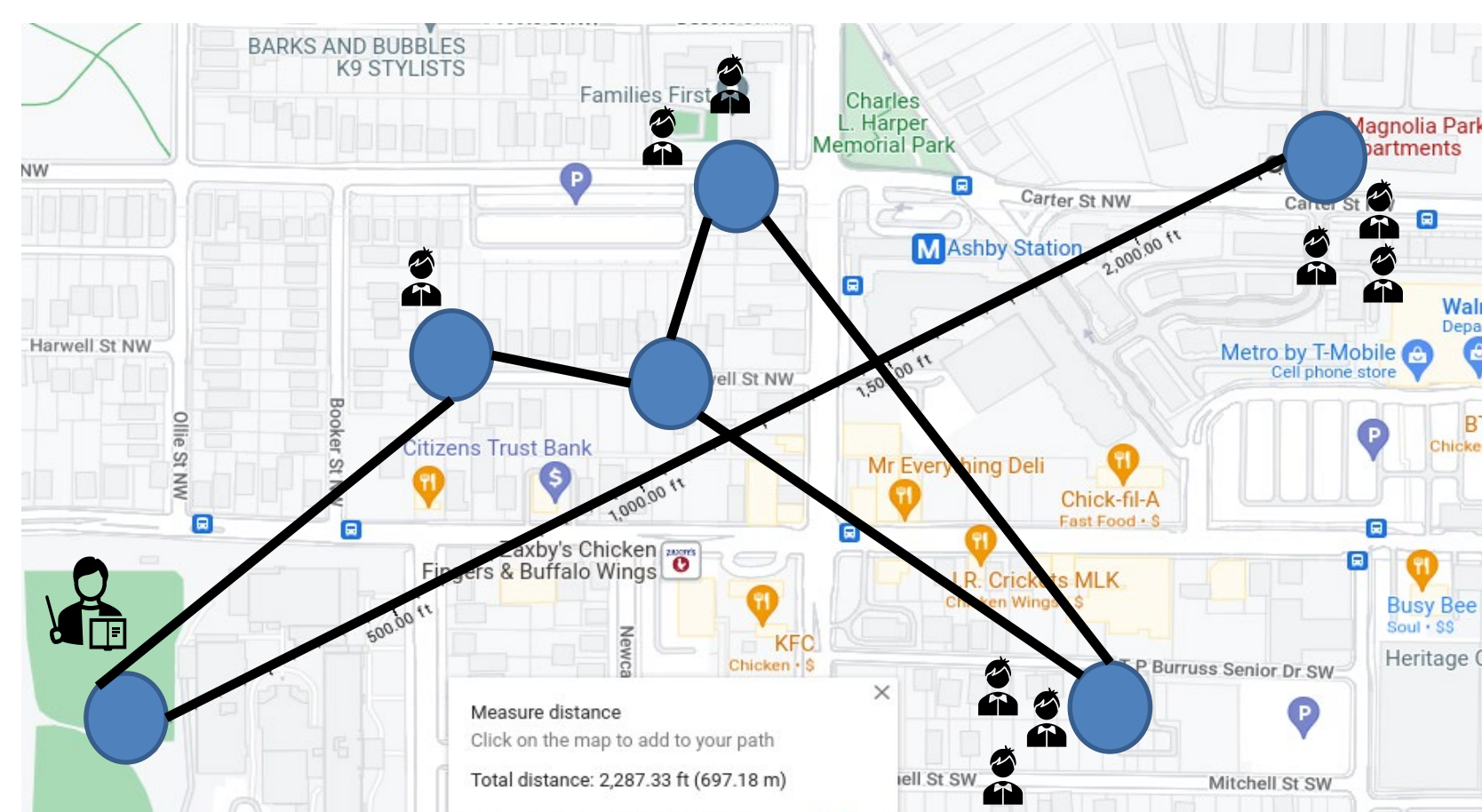
**Fig 3: Locations of BTW High and student homes**



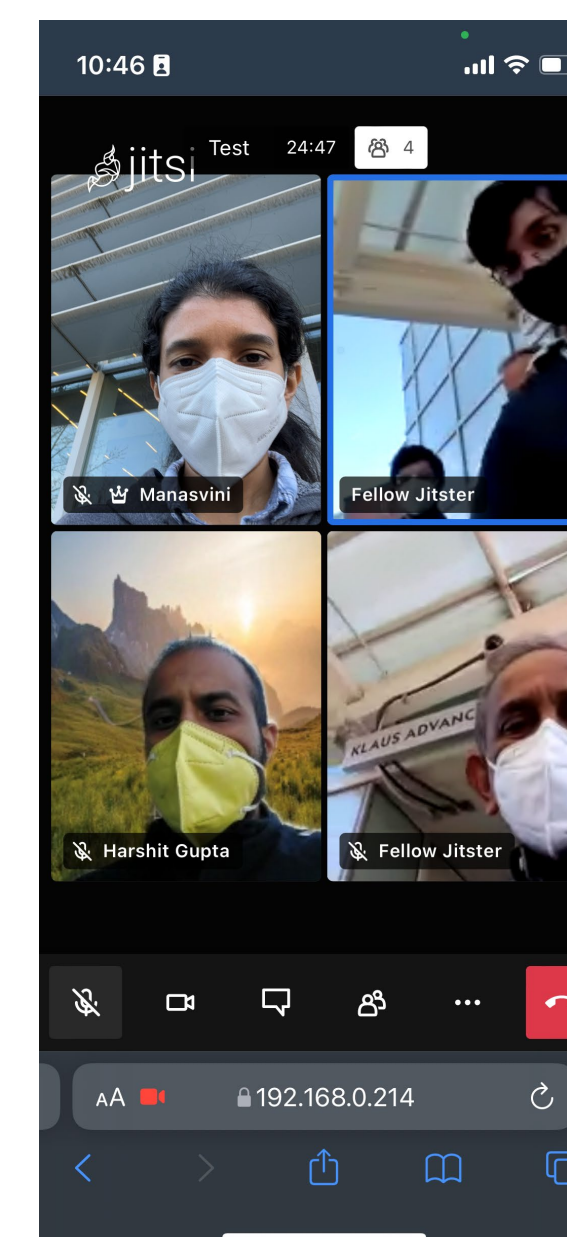
**Fig 4: p2p setup at GaTech**

## Enabling smart services on wireless mesh

- Enable new services that can be locally hosted (without reliance on WA Internet)
  - Video conferencing
  - File servers
  - Educational material can be cached locally



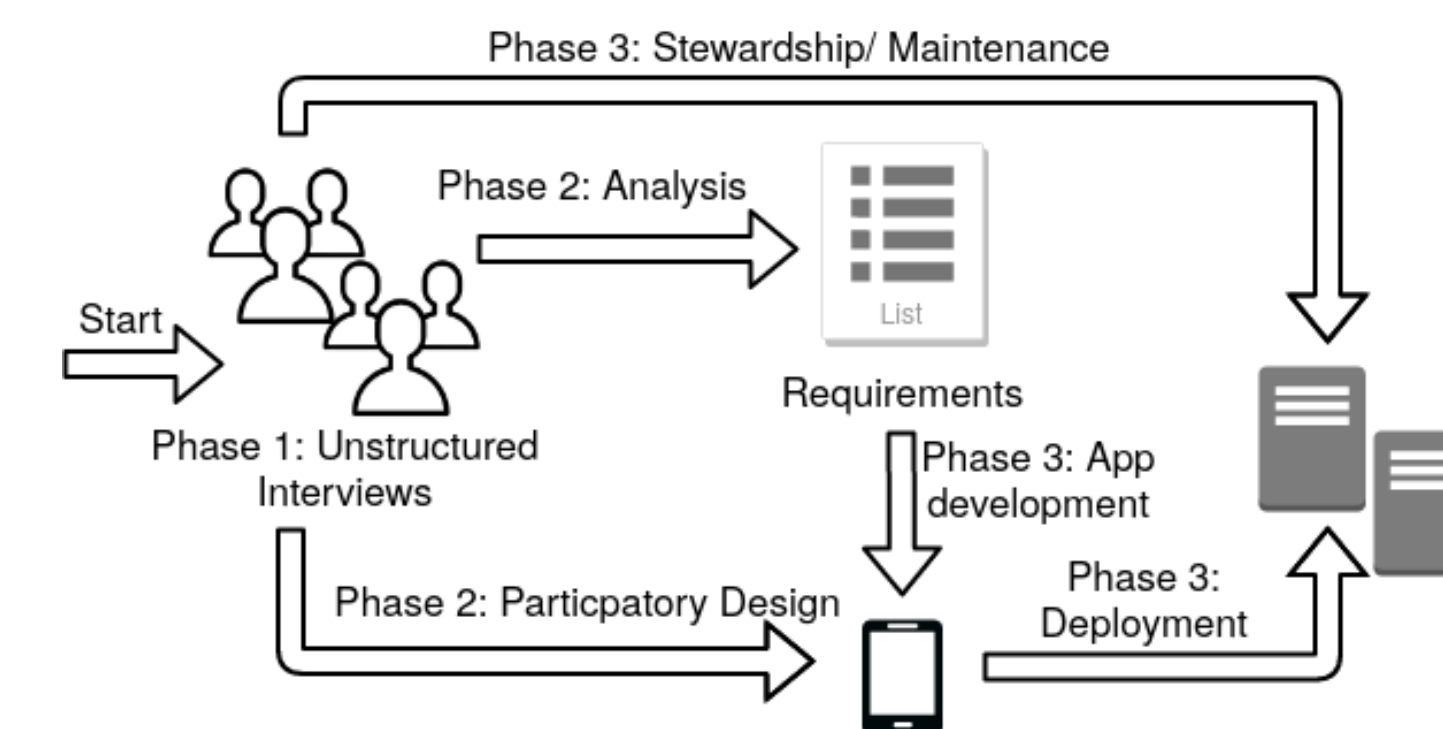
**Fig 5: Envisioned mesh deployment**



**Fig 6: video conference on mesh**

## Future work

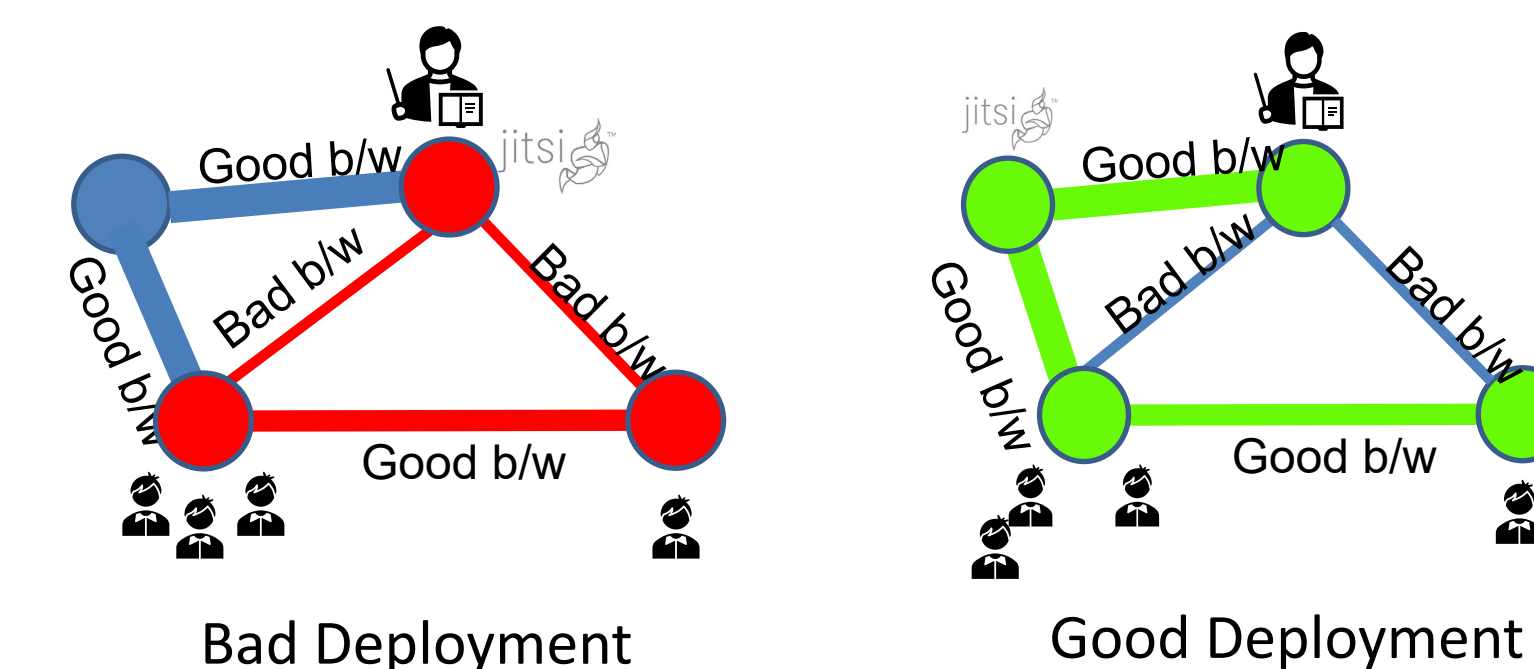
- Identify community-oriented applications
- Internet-independence for applications
- Participatory design



**Fig 7: Participatory design process**

### Challenges to mesh centric application deployment

- Bandwidth is shared and unpredictable for mesh networks
- Therefore, it is important to be bandwidth-aware for application deployment especially for bandwidth hungry applications. E.g., Video Conferencing.



**Fig 8: Need for bandwidth aware deployment on mesh**

## References

- [1] <https://www.pewresearch.org/fact-tank/2021/10/01/what-we-know-about-online-learning-and-the-homework-gap-amid-the-pandemic/>
- [2] <https://www.zipdatamaps.com/30314>