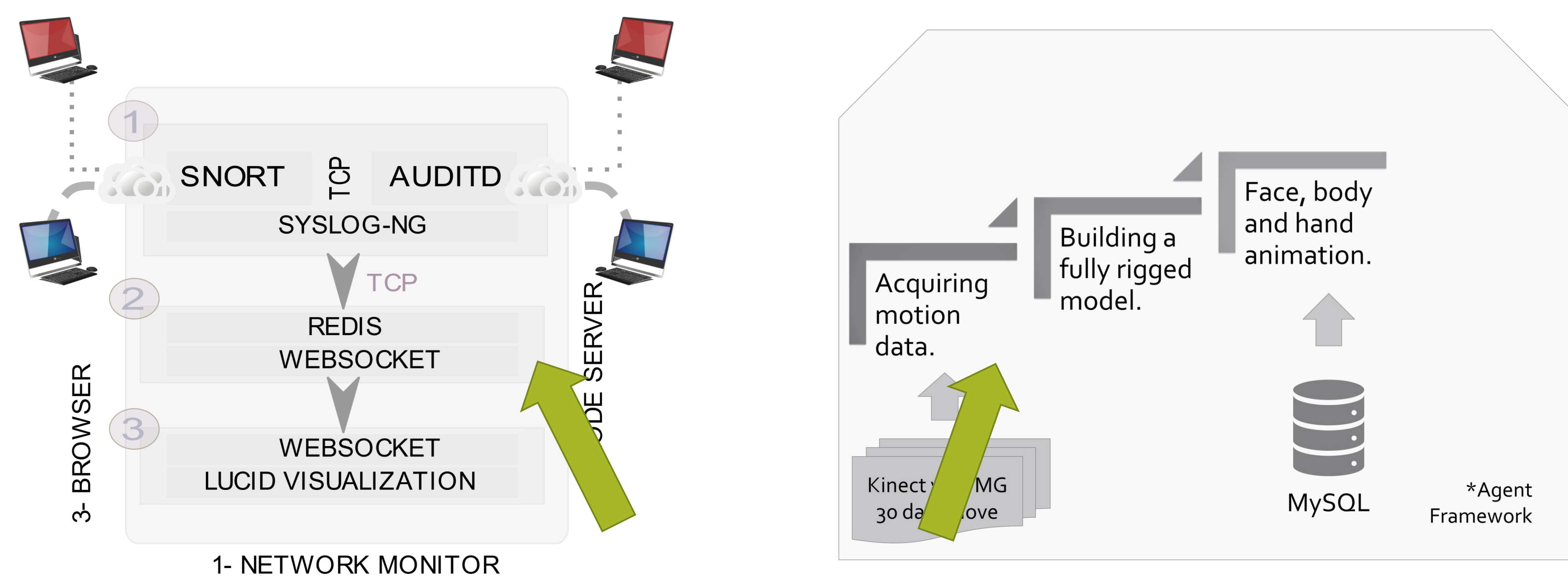


## Introduction

- In a cyber defense competition, teams of students are charged with managing and defending an enterprise network against security attacks from a team of experienced hackers. In the case of the Collegiate Cyber Defense Competition (CCDC), the stated purpose of these exercises is education, the number of student participants engaged in these competitions has been relatively small, especially among underrepresented minorities and women. The reason for this tends toward the niche area of cyber security. For a spectator of a competition, the excitement and educational value do not necessarily transfer. Our hypothesis is that spectators' excitement and learning outcomes are associated with the audience ability to extract, visualize and comprehend the details of the game as they unfold.
- For this project, we developed a visualization and broadcast system targeted to improving a spectator's ability to understand and make sense of cyber defense competitions. The system aims to engage the spectator by presenting information pertinent to understanding the real-time events of the competition as they unfold. It accomplishes this through a combination of techniques, including real-time network security visualization, live video and audio monitoring, animation, computer graphics, user profiling, and commentary. We examine, specifically, how the LUCID system enables the audience to make sense of ongoing activities in a cyber defense competition.

## Methods



## Results



## Conclusion

LUCID aims to engage the spectator by presenting information pertinent to understanding the real-time events of a competition and accomplishes this through the combination of various techniques. These techniques include user profiling, real-time network security visualization, live video and audio monitoring, animation, computer graphics and commentary. This article examined, specifically, how the visualization system enables the audience to make sense of ongoing activities in a cybersecurity competition. We anticipate that the system will ultimately improve the educational value and excitement for the spectator and broaden interest in the field of cybersecurity.