



CyberRACE: A Framework for Cyber Range Automation to Support Cybersecurity Education

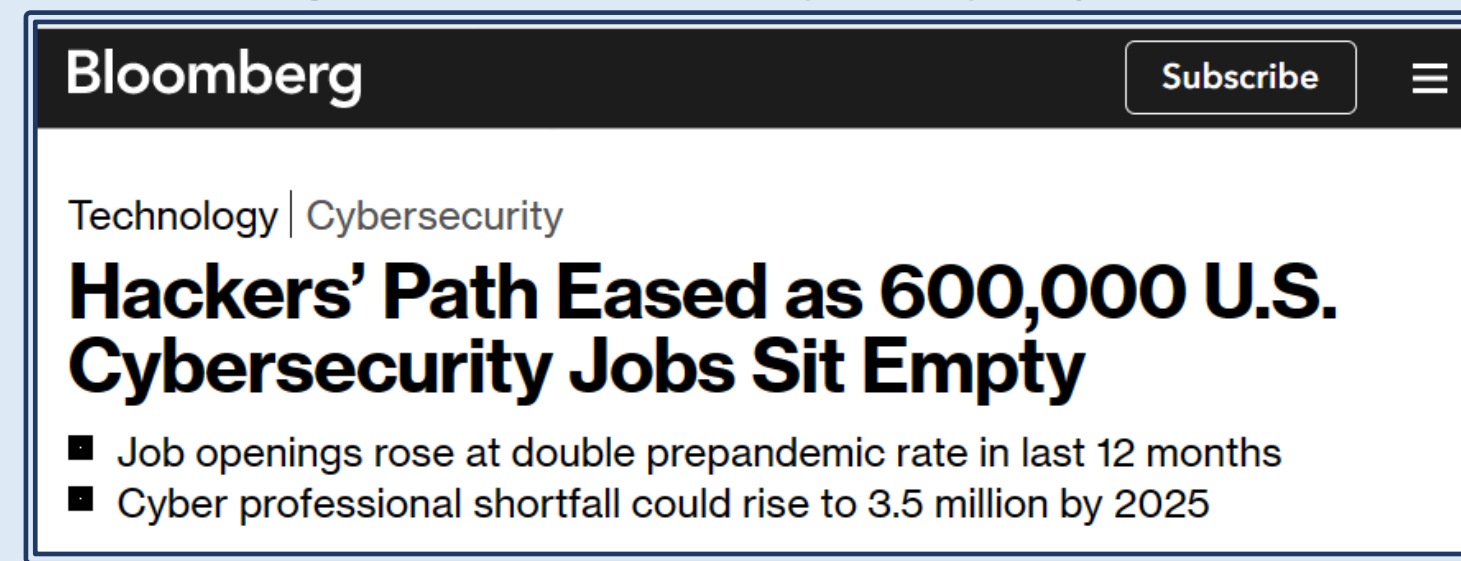


Ekzhin Ear and Shouhuai Xu

Department of Computer Science, University of Colorado Colorado Springs (<https://xu-lab.org>)

I. Research Motivation

- ❖ Pressing requirement for cyber workforce development: *2022 Bloomberg headline on cyber professional shortfall.*¹



- ❖ Cyber range is an emerging and effective technology for training cybersecurity professionals.
- ❖ A cyber range mimics a real-world cyber environment.
 - Analogy: US Army's National Training Center (NTC): *A mock town in the NTC range can simulate Iraqi town.*²



- ❖ State-of-the-art: Commercial cyber ranges – very expensive; fiscally unsustainable; not extendable

II. Research Problem Statement

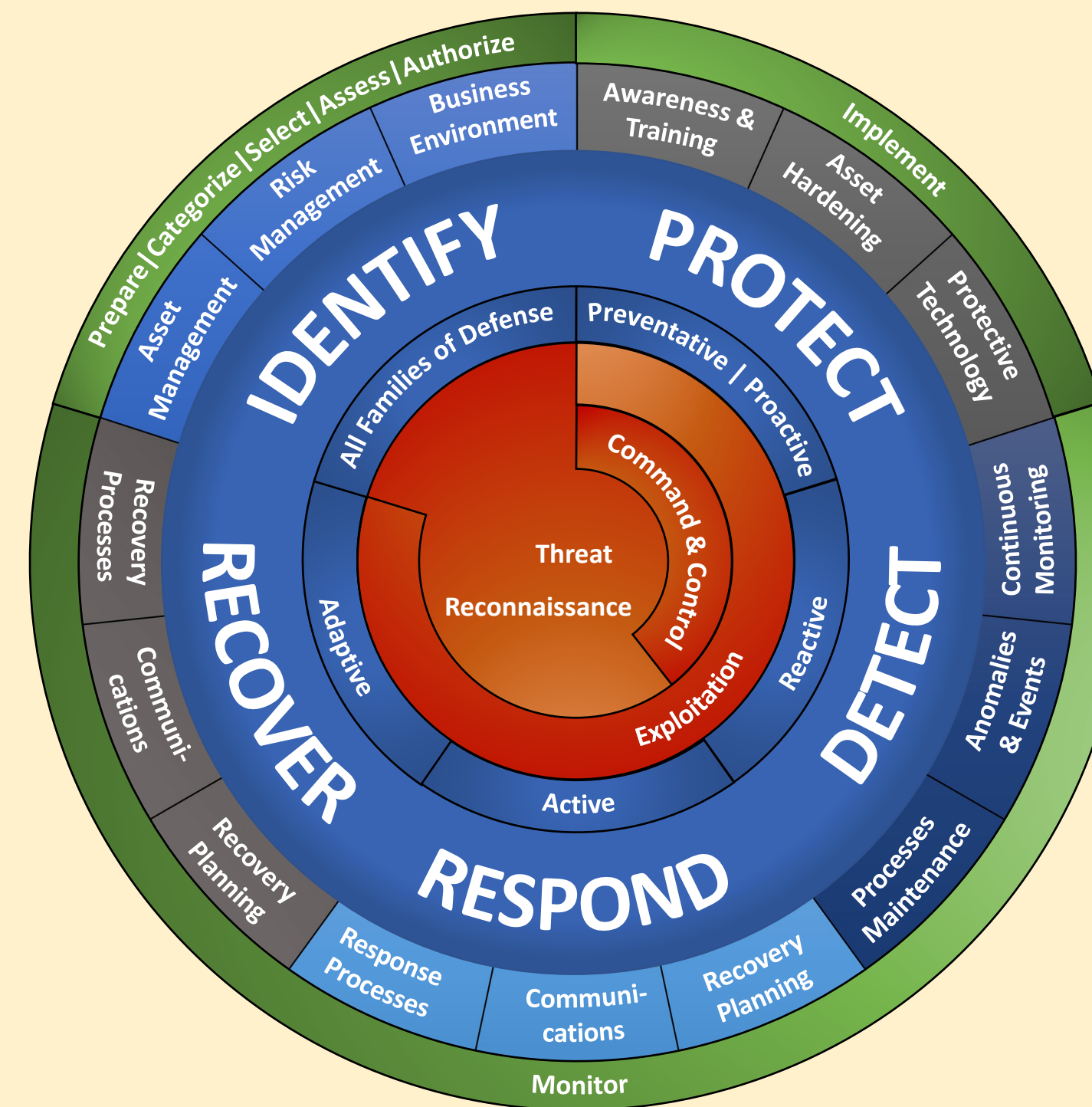
How to build *quality* and *affordable* cyber ranges for higher education and workforce development purposes

III. Approach

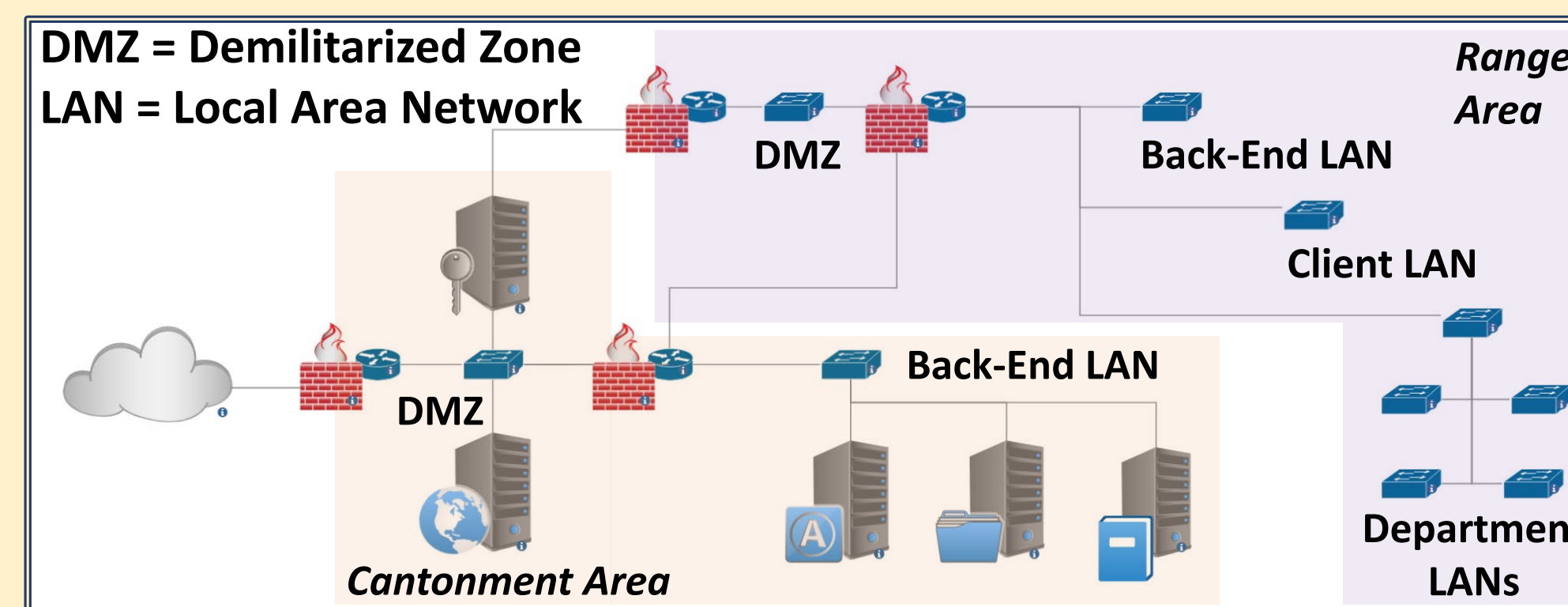
- ❖ Establish an innovative framework to characterize and map cyber range requirements with specifications
- ❖ Implement the framework as an automated software tool

IV. Results

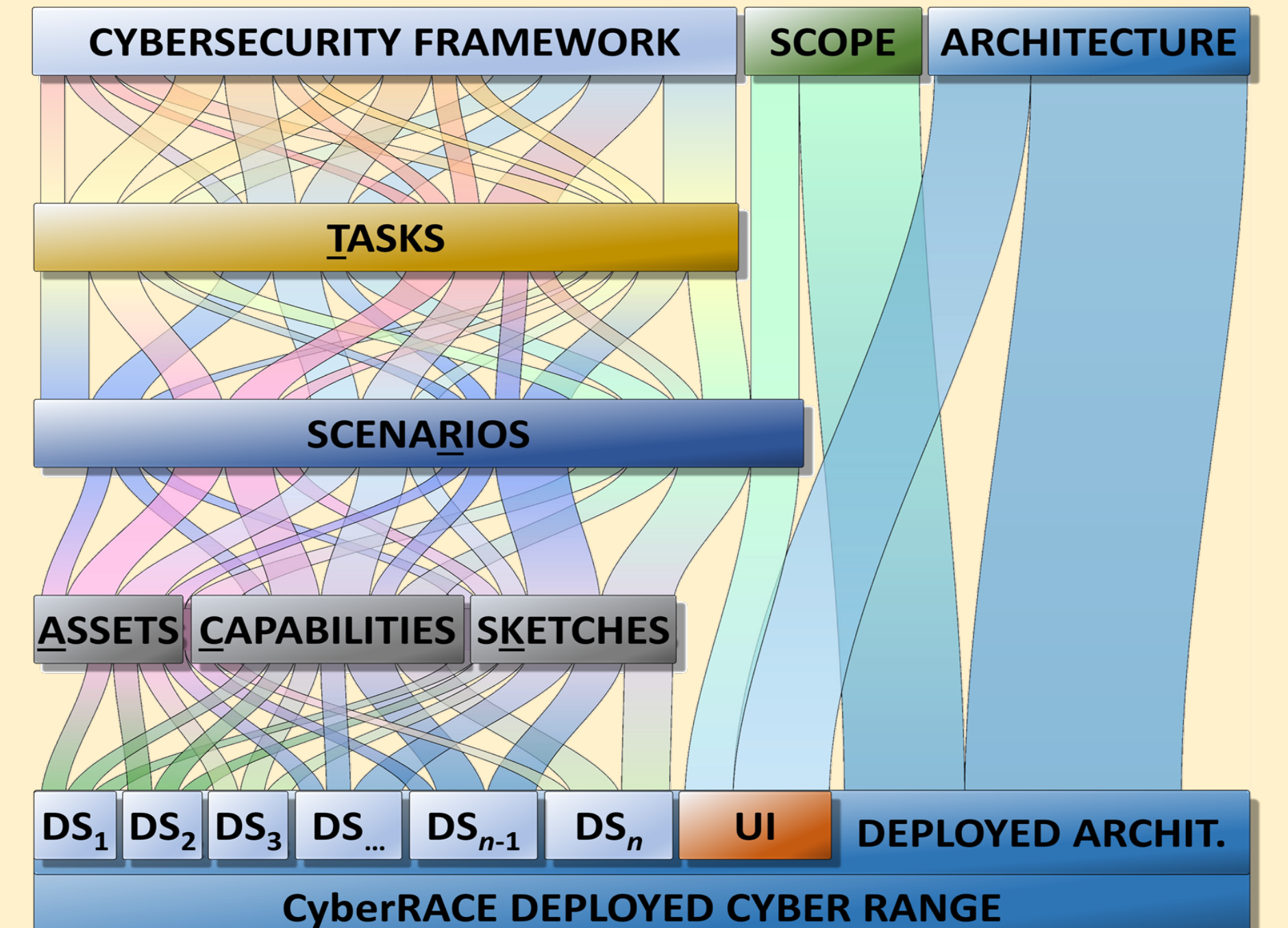
- 1. Unified industrial requirements according to existing cybersecurity frameworks



2. Designed CyberRACE architecture



3. Finished the conceptual mapping of requirements



DS = Deployed Scenarios | UI = User Interface | Archit. = Architecture



Example of cyber range deployed by NATO³

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V. Future Work & Broader Impacts

- ❖ Revolutionize cybersecurity education at UCCS & CU Denver (debuting in Fall 2023)
- ❖ Provide operational and research capabilities
- ❖ Facilitate large scale experiments and cybersecurity decision-making
- ❖ Support Colorado and the Nation's cybersecurity workforce development
- ❖ Enable Colorado as a national leader in cybersecurity



CyberRACE will elevate UCCS' Cybersecurity Missions.⁴

References:

1. Screenshot taken of <https://www.bloomberg.com/news/articles/2022-03-30/hackers-path-is-eased-as-600-000-cybersecurity-jobs-sit-empty>
2. Photo retrieved from https://military-history.fandom.com/wiki/Fort_Irwin_National_Training_Center
3. Photo by Arno Mikkor, retrieved from <https://www.flickr.com/photos/133800821@N02/albums/72157690295698290>
4. Photo retrieved from <https://cyber-center.org/>

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