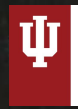
Black Holes, High Throughput Computing, and User Experience Design - Creating a Science Gateway for the Event Horizon Telescope

Rob Quick
July 11, 2023
High Throughput Week
University of Wisconsin - Madison



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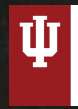
- The Science and Discovery we will Enable
- How the EHT Gateway Project Came Together
- User Experience Focus
- Project Structure and Goals
- The Event Horizon and Beyond



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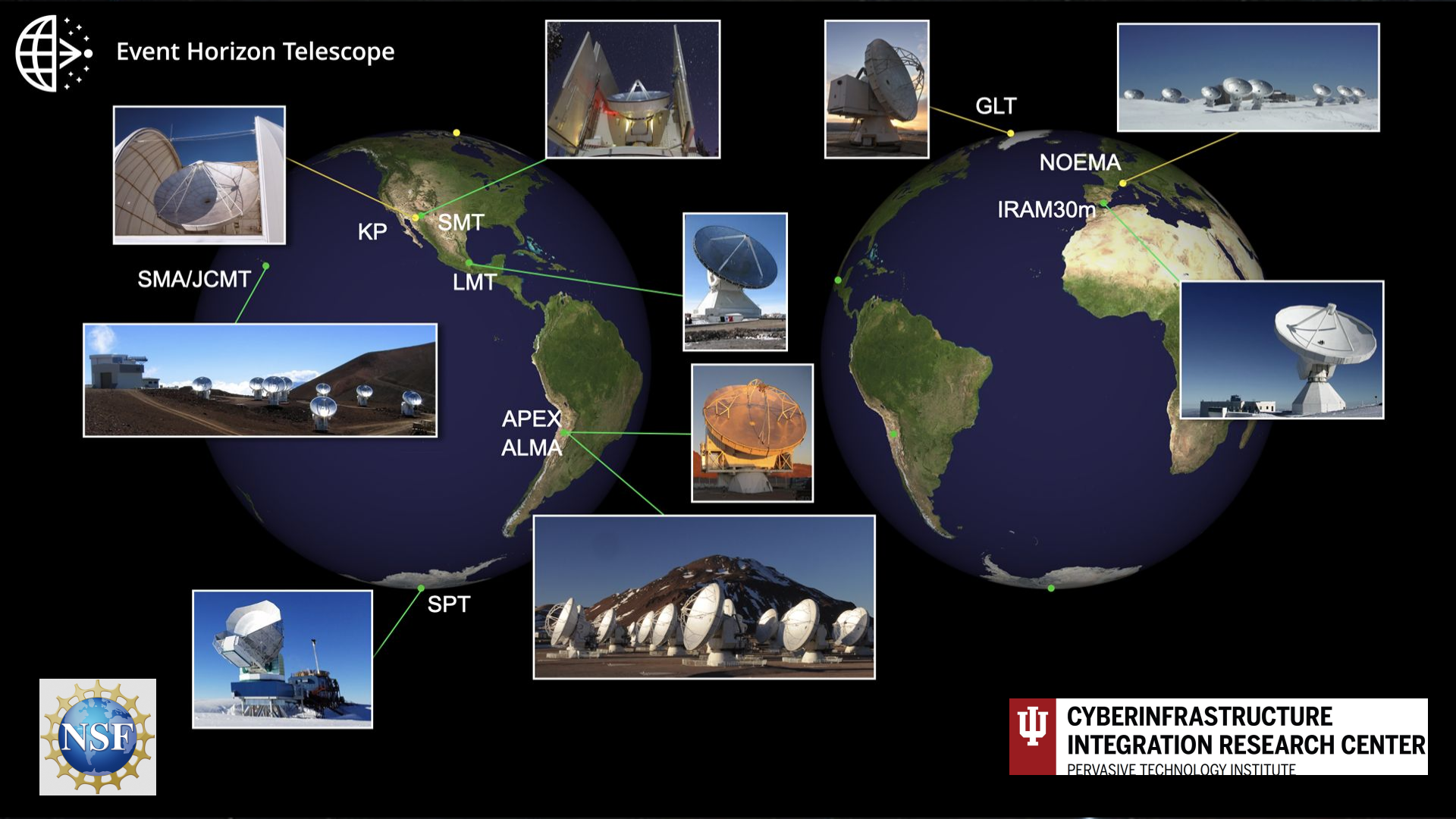
Event Horizon Telescope
KP
SMT
LMT
SMA/JCMT
APEX
ALMA
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NOEMA
IRAM30m
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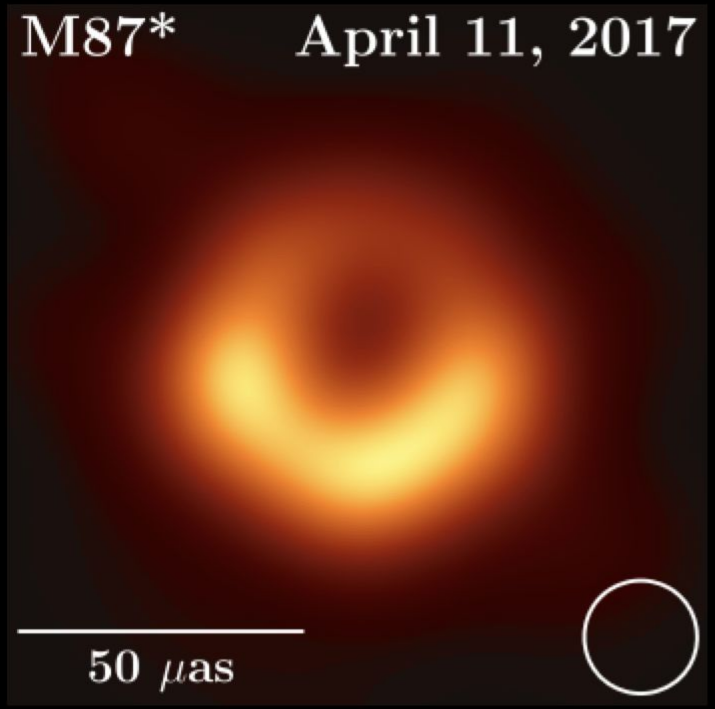

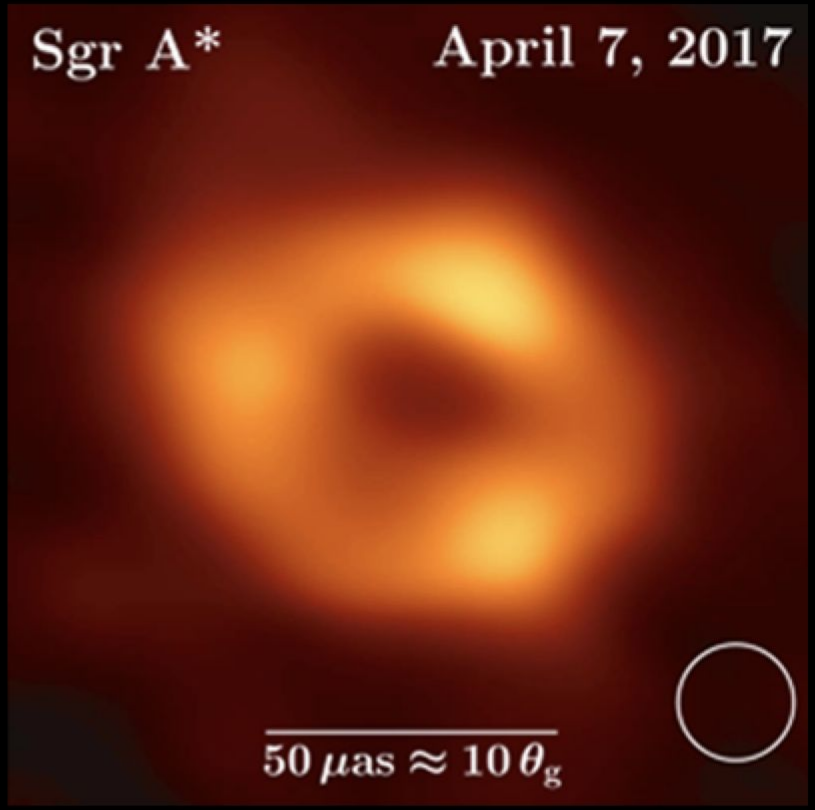

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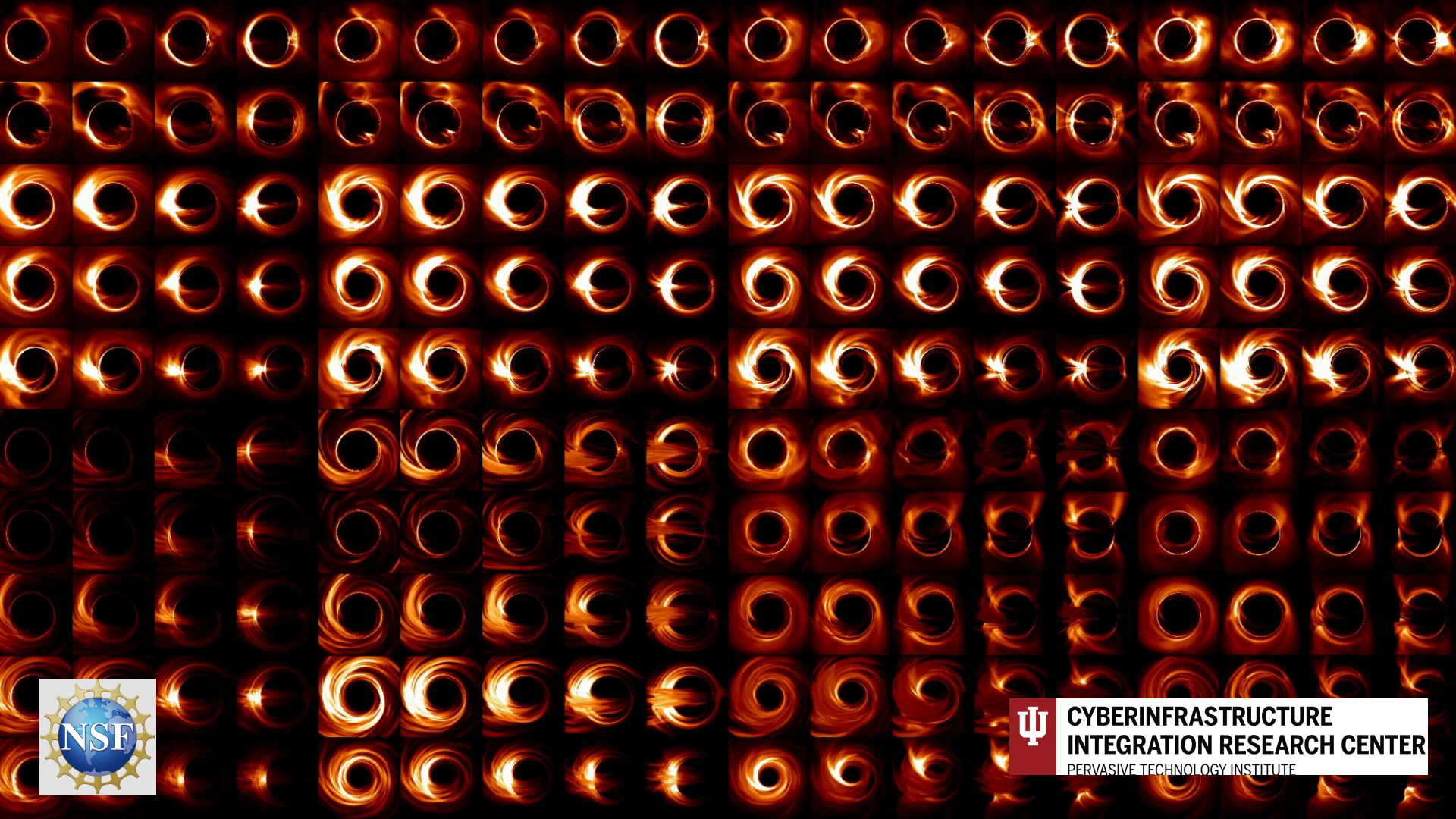

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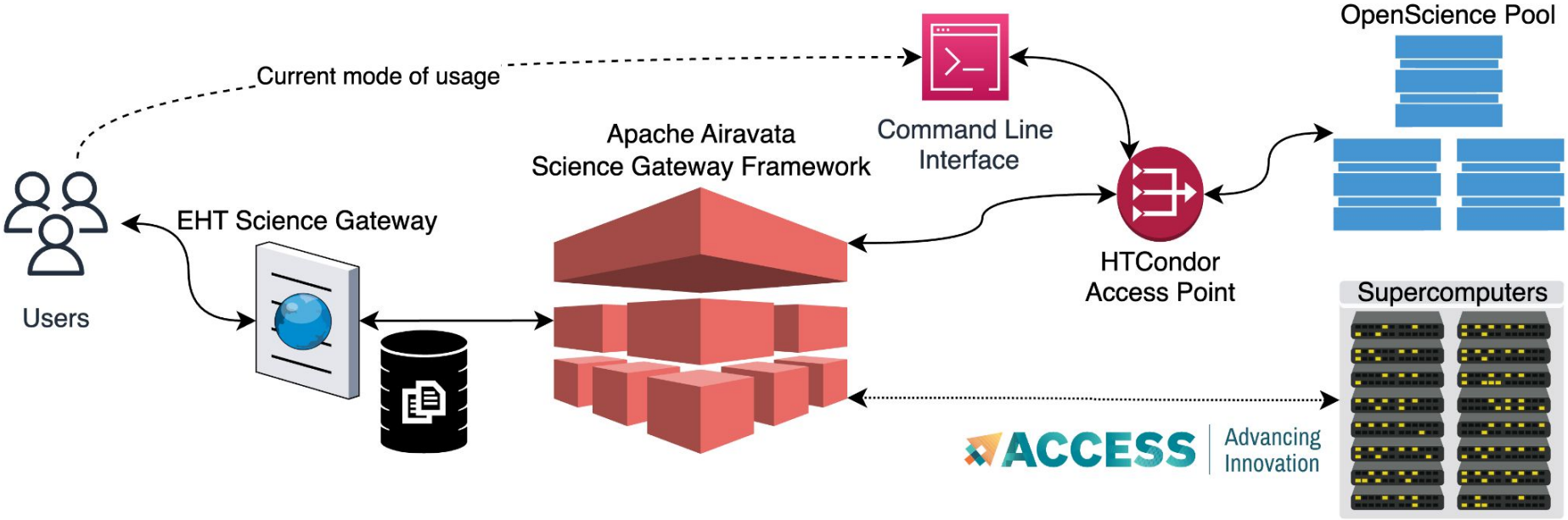
How we got here…

- Presented work with University of Nebraska (RNAMake) at OSG AHM 2022
- Was contacted soon afterward by NSF
  - Identified EHT as a target
- Worked with EHT team to create a demonstration project
  - Non-functional version can be seen at (https://eht.scigap.org/)
    - Not functional due transitioning OSG Access Point
  - Presented the demo at EHT Webinar and Science Gateways 2022
- After several interactions we agreed to submit a one year EAGER project (EArly-concept Grants for Exploratory Research)
- Submitted March - Award Notification May
- Project start July 1



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What we will do…

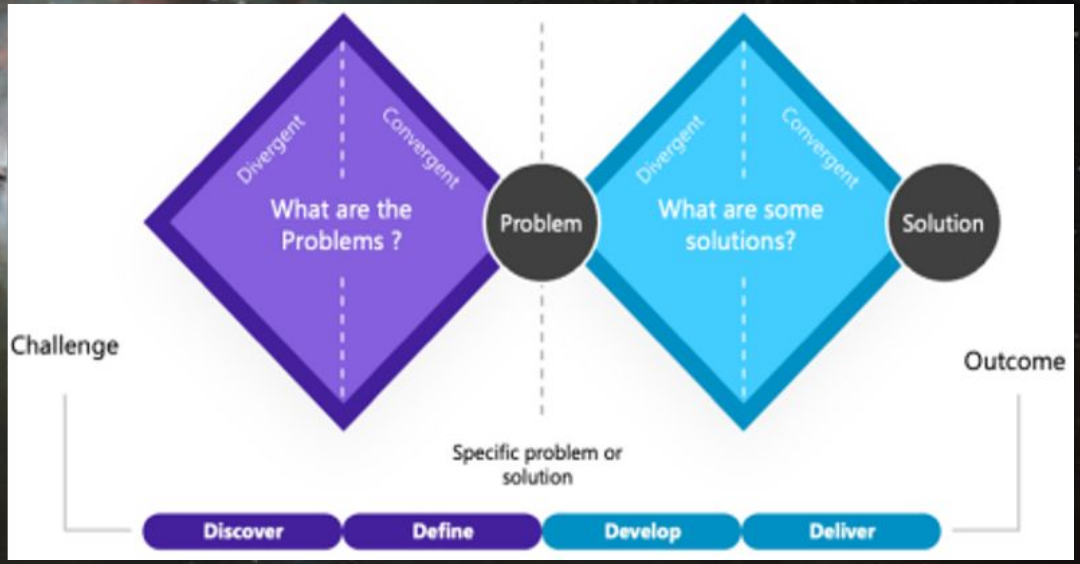
The goal of this exploratory work is to demonstrate the effectiveness of combining human-computer interaction design methodologies with science gateway technologies to better enable the EHT's analysis of large astronomical data sets.

Objectives:

- Provide the EHT project with a highly functional, UX-centric gateway that allows application integration for three existing workflows that leverage OSPool resources.
- Address the technical hurdles to allow the full utilization of HTC resources from a science gateway environment within the Apache Airavata framework.
- Provide strategically targeted outreach to astronomy researchers and the CI community to amplify the work done during the project.

User Experience (UX) Focus

- A **UX-centric approach** is leveraged within the **Double Diamond design process** to ensure user-centered solutions that address the challenges in the problem space while promoting iterative exploration, ideation, evaluation, and refinement.



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Specifically….

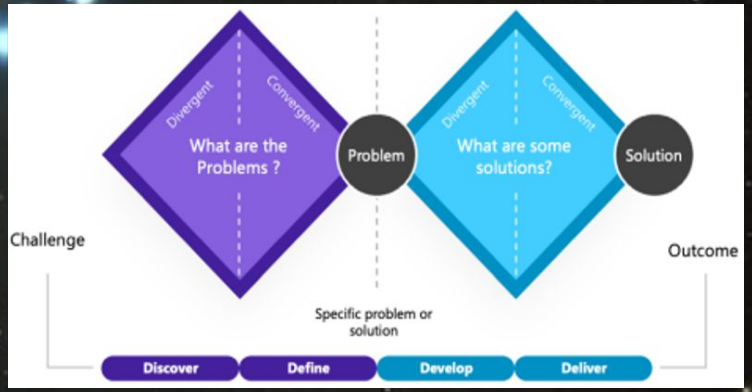
The Double Diamond Design Process emphasizes the iterative nature of divergent and convergent thinking throughout both the *problem-solving* and *solution* phases.

Problem-Solving Phase:

- Apply divergent and convergent thinking to address questions about current workflows and pain points of three identified EHT applications on the OSG platform.

Solution Phase:

- Generate and refine design solutions based on insights gained during the problem-solving phase.



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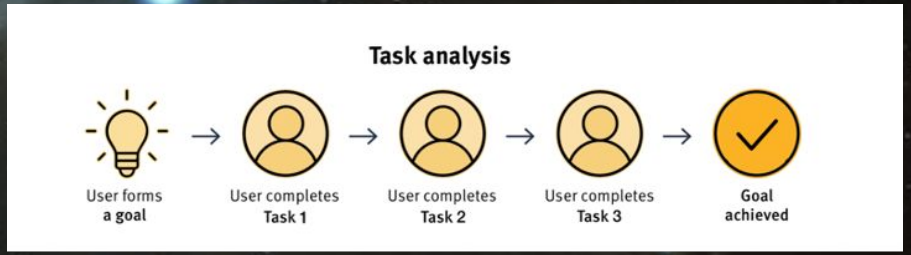
Cognitive Task Analysis & User Interviews

Systematic understanding of how EHT users complete tasks to achieve their goals.

- Observe and interview users & experts
- Analyze tasks for details (quantity, sequence, hierarchy, complexity)
- Identify patterns, dependencies, and areas of improvement in EHT workflows.
- Utilize the user interviews as we bring the design solutions to life



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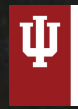
What does that mean…

- We will integrate three identified EHT tools within the Apache Airavata environment to lower the barrier for black hole researchers
- Provide a roadmap for HTC usage for future gateways
- Introduce these concepts in the astronomy community and beyond



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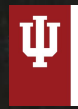
Our timeline of deliverables…

- July 2023 - Begin Design Phase - Throughput Computing 2023
- September 2023 - Completion of Initial Design Phase—UX Cognitive Task Analysis and User Requirements Report (*ipole, SYMBA*)
- October 2023 - Science Gateways Conference
- December 2023 - Begin Implementation Phase—Initial Release of Gateway (*ipole, SYMBA*)
- December 2023 - Tutorial at EHT Virtual Winter Collaboration Meeting
- March 2024 - Completion of Design Phase—*ehtim* User Requirements Report and UX Review of Initial Release - Usability Report
- April 2024 - Webinar for EHT's software and data compatibility working group
- June 2024 - Complete Implementation Phase—Final Gateway Release (*ehtim*)
- June 2024 - Tutorial in EHT In-Person Summer Collaboration Meeting
- July 2024 - PEARC Conference



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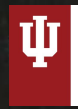
What's Next

- The UX Design will reveal usability issues with the EHT Software, Airavata, and the OSPool
- Are there other EHT adjacent projects that can benefit from the EHT gateway environment
- What other existing projects could benefit from Science Gateway access to the OSPool
- Can the OSPool be as accessible as other ACCESS resources from Science Gateways
- Create many 'skins' for OSG APs



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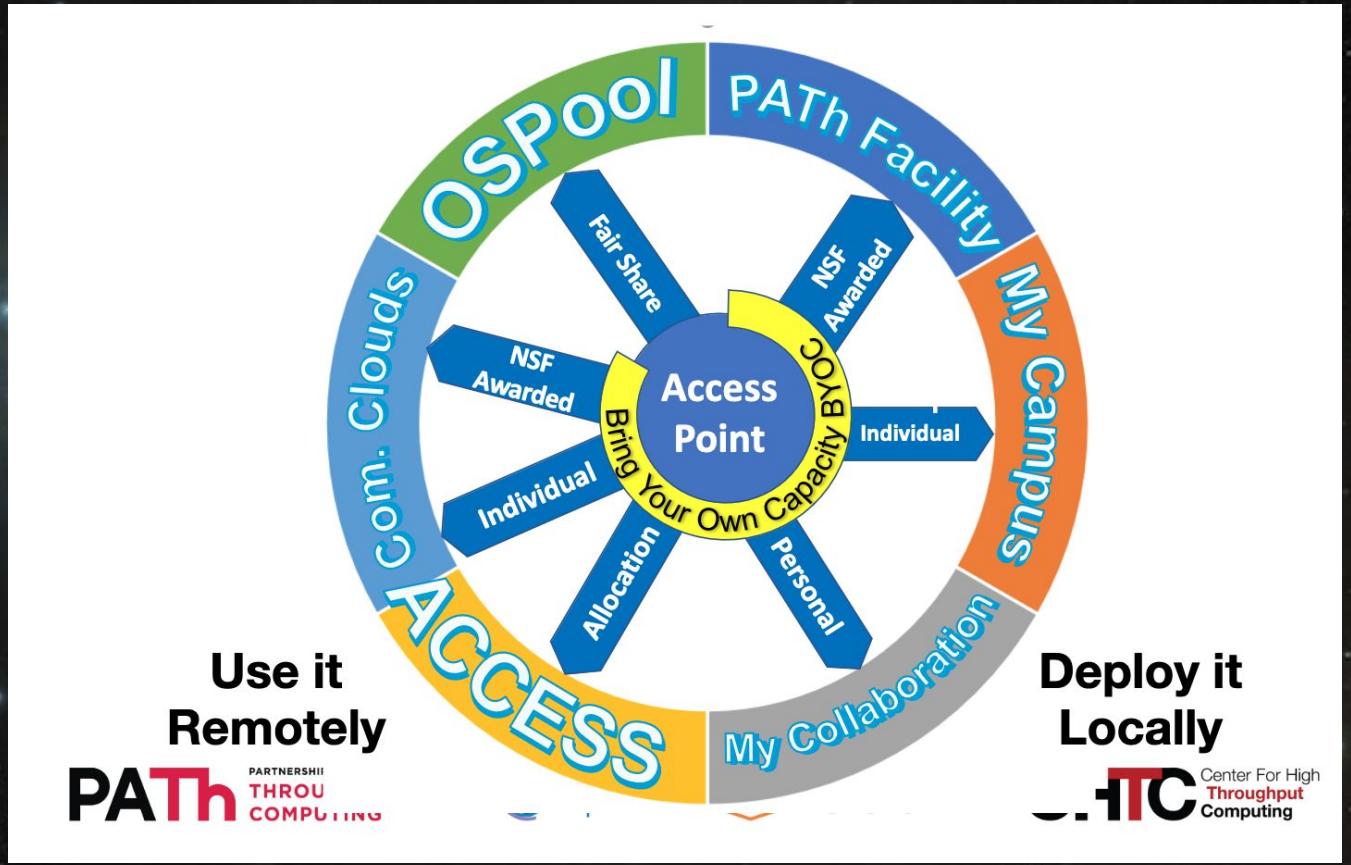

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Who we are…

- Rob Quick - PI
- Chi-kwan Chan - Co-PI and Domain Expert
- Isuru Ranawaka - Developer
- Esen Gokpinar-Shelton - UX Designer
- Eroma Abeysinghe - Project Management and Operational Advising
- Post-doc at University of Arizona
- Suresh Marru - Science Gateway Advice and Support

- NSF Award 2324672