Project Pitch: Eco-Resilient Networks Smart Deployment for the Future

Muhammad Hamza Shahab

Syed Haider Abbas Naqvi

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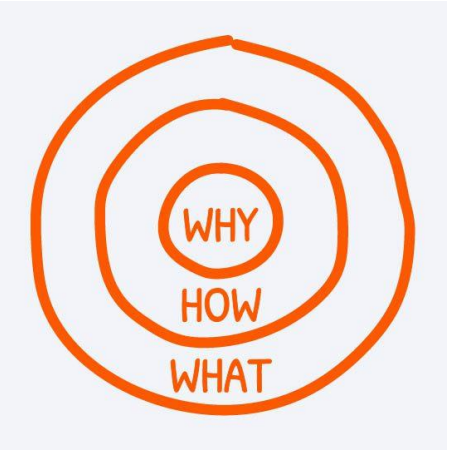
Researching and Engineering Community Centred Software

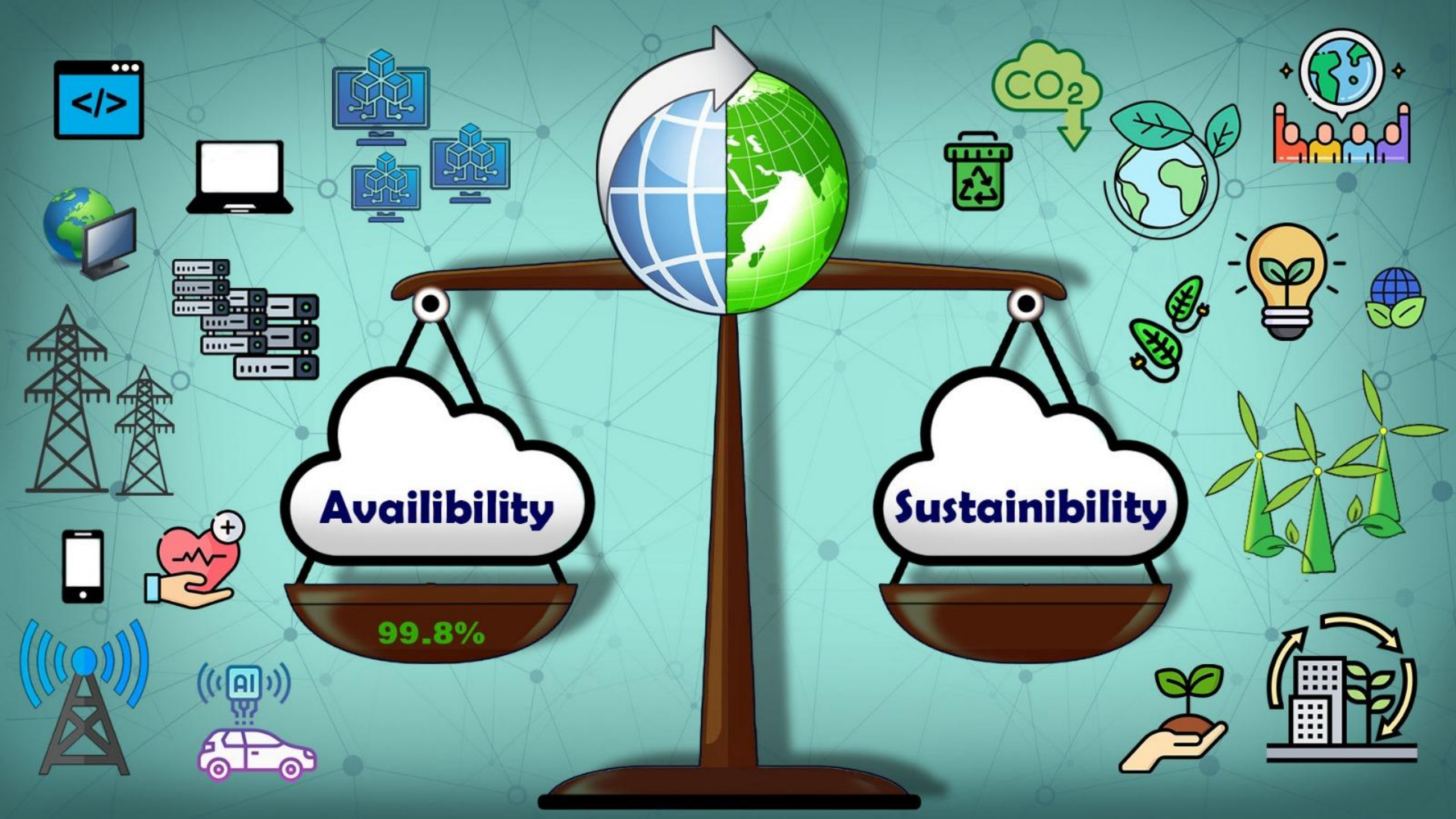
University of Regina

Go far, together.

Why? The Need for Sustainable and Available Networks (Plan-Do)

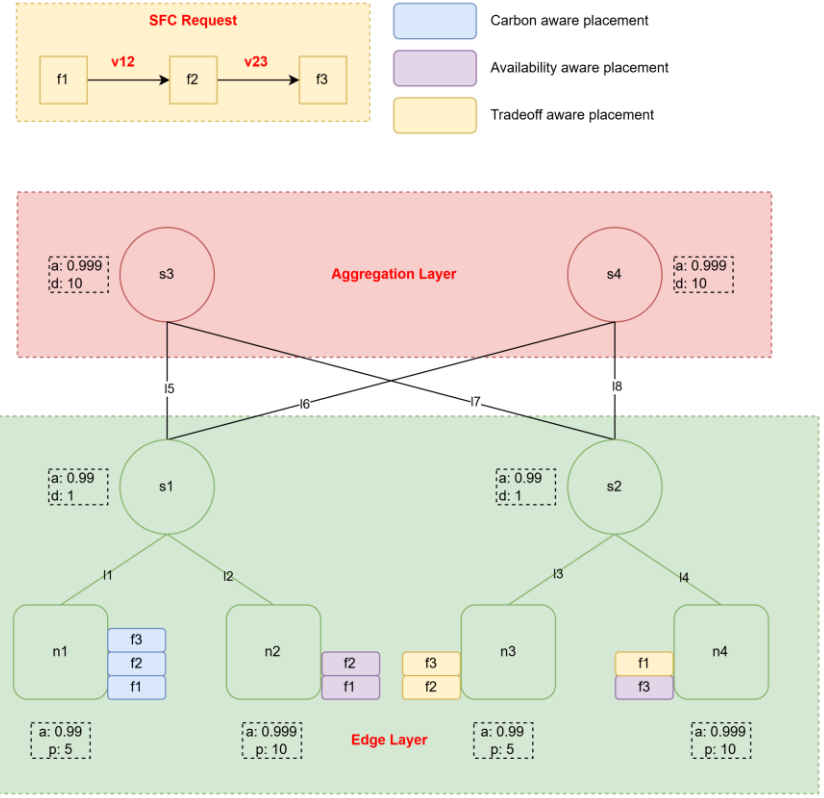
- **Problem:** Exploding growth in network services creates a dilemma:
  - High availability is crucial for modern applications (6G, IoT, and edge computing)
  - Sustainability (energy efficiency, low carbon footprint) is increasingly vital.
  - Current solutions often prioritize one over the other, creating an imbalance.
- **Our Belief (The "Why"):** We believe networks MUST be both highly available AND environmentally sustainable.
- **Why it matters:** Addresses rising energy costs, environmental responsibility, and the need for seamless service delivery, aligning with UN SDGs 7, 11, 12, and 13.
- **Our Goal (PDSA-Plan):** To develop a system that optimizes networks for both maximum availability and minimal carbon footprint.
- **Our Intent (PDSA-Do):** We intend to achieve this by developing and testing novel algorithms within a robust simulation environment, using real-world data to guide our efforts.




Availibility
99.8%
Sustainibility
CO2
AI

How? Optimizing Networks Allocation and Placement (Study-Act)

- **Our Approach:** Develop and evaluate novel algorithms to optimize networks in edge-cloud environments.
- **Key Strategies:**
  - Network placement policies considering both availability and carbon footprint.
  - Metaheuristic algorithms for intelligent network placement and redundancy.
  - Robust simulation using real-world data (Google Cluster Traces).
- **Study:**
  - Analyze the collected data to evaluate performance
  - Compare results against baseline algorithms.
  - Identify strengths/weaknesses of each algorithm and policy.
- **Act:**
  - Refine algorithms and policies based on analysis.
  - Document findings and prepare a research paper.



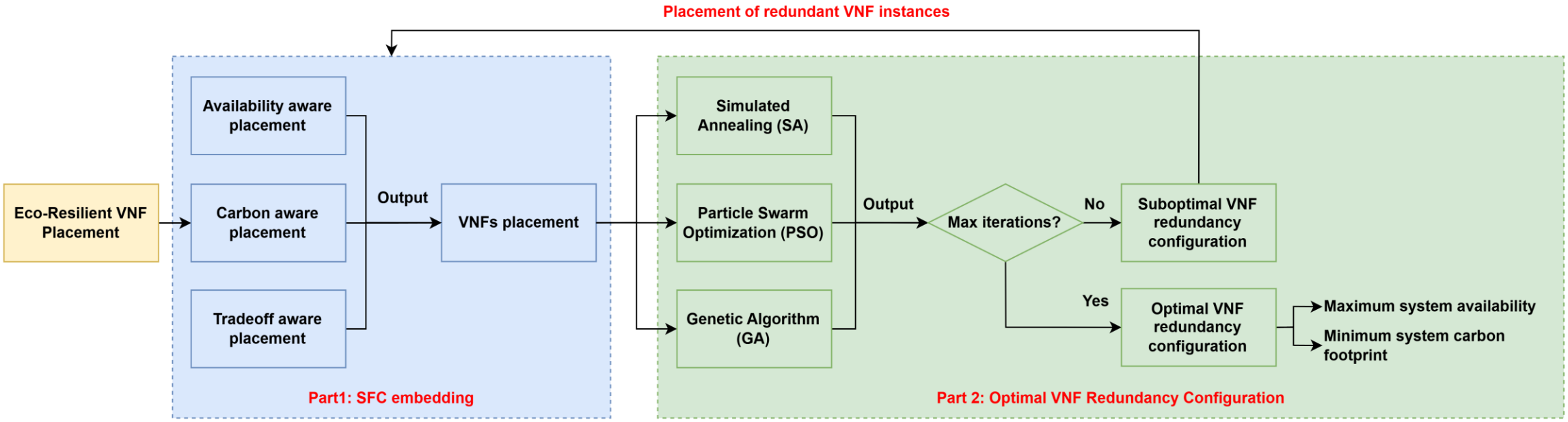
Tools and Technologies: Enabling Our Study and Action

- **Programming Languages:**
  - Python (with libraries like NetworkX, NumPy, Pandas)
- **Optimization Libraries:**
  - Explore libraries for implementing metaheuristic algorithms (e.g., DEAP for Genetic Algorithms in Python).
- **Data Visualization:**
  - Utilize libraries like Matplotlib, Seaborn, or Plotly to create clear and informative visualizations.
- **Machine Learning (Future):**
  - Explore ML (reinforcement learning) for dynamic adaptation (TensorFlow, PyTorch).
- **Cloud/Edge Platforms (Future):**
  - To move beyond simulation, consider AWS, Azure, Google Cloud

What? Delivering Sustainable and Available Networks (Create/Iterate)

- **Vision:** A future where seamless connectivity and environmental stewardship go hand-in-hand.
- **Project Deliverables:**
  - **Optimized Algorithms:** For networks allocation and placement, demonstrably balancing availability and sustainability.
  - **Simulation Framework:** A robust tool for evaluating network performance in edge-cloud environments.
  - **Empirical Evidence:** Quantitative results on availability, carbon footprint reduction, latency, and execution time.
  - **Research Contribution:** A paper advancing the field of network function virtualization and sustainable computing.
- **Iteration:**
  - We acknowledge that this is an iterative process.
  - We will use the feedback and data gathered to continuously refine our algorithms, policies, and simulation environment.

What? Delivering Sustainable and Available Networks (Create/Iterate)



Open Questions and Seeking Feedback

- ***Your Input Matters: Shaping the Future of this Project***
- **Current Idea:** A system that intelligently places and manages network functions, optimizing for both availability and sustainability, using advanced algorithms to make dynamic decisions.
- **Areas for Feedback:**
  - **Impact:** Which aspects are likely to have the most significant impact (research-wise and practically)?
  - **Technology Choices:** Are there other technologies or tools you would recommend?
  - **Alternative Approaches:** Can you suggest any different approaches?
  - **Expansion:** How might this project be expanded beyond the course?

Thank You - Let's Build Sustainable Networks!

- **Contact:**
  - **Email:** msx044@uregina.ca
  - **LinkedIn:** https://www.linkedin.com/in/hamzashahab1610/
  - **GitHub:** https://github.com/hamzashahab1610