Business case

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Community & UN SDG(s): **SaskTel network engineers and architects**

UN SDG(s):

- SDG#7: Affordable and clean energy
- SDG#11: Sustainable cities and communities
- SDG#12: Responsible consumption and production
- SDG#13: Climate action

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Proposed Project	Eco-Resilient Networks: Smart Deployment for the Future
Date Produced	February 8th, 2025
Background	The rapid growth of network services, driven by trends like 5G/6G, IoT, and edge computing, is placing increasing demands on network infrastructure. Telecommunications providers like SaskTel must ensure high availability and low latency for these services while also addressing growing concerns about energy consumption and environmental sustainability. Traditional approaches to network design often prioritize either availability *or* sustainability, leading to trade-offs and inefficiencies. There's a critical need for new methods that can *jointly* optimize for both, ensuring reliable service delivery while minimizing the environmental impact. This project addresses this need by developing and evaluating novel algorithms for virtual networks allocation and embedding in edge-cloud environments.
Business Need/ Opportunity	SaskTel, as the leading telecommunications provider in Saskatchewan, needs to continuously improve the availability, performance, and sustainability of its network infrastructure to meet the evolving needs of its customers and fulfill its commitment to corporate social responsibility. Specifically, there's a need to: • **Enhance Network Availability:** Minimize service downtime and ensure reliable connectivity, even in the face of node or link failures. This is crucial for supporting critical applications and services, particularly in rural areas. • **Reduce Environmental Impact:** Decrease the energy consumption and carbon footprint of their network operations, contributing to provincial and national sustainability goals. • **Optimize Resource Utilization:** Improve the efficiency of resource allocation (CPU, memory, bandwidth) in edge and cloud environments, reducing operational costs and maximizing the utilization of existing infrastructure. • **Prepare for the Future:** Future proof the network, preparing it for 6G and beyond. This project provides an opportunity for SaskTel to proactively address these needs by exploring and potentially adopting innovative solutions for SFC management that can deliver both high availability and improved sustainability. It also offers an opportunity to enhance their reputation as a technology leader and a responsible corporate citizen.
Options	• **Option 1: Implement the Proposed Project.** Develop and evaluate a simulation framework with new algorithms that jointly optimize for availability and sustainability in network deployment. • **Option 2: Invest in Existing Commercial Solutions.** Purchase and implement commercially available network optimization tools. • **Option 3: Focus solely on availability improvements**

- **Option 4: Focus solely on carbon footprint reduction**

Cost-Benefit Analysis

Option 1: Implement the Proposed Project

- *Costs:*
  - Time and effort required for research and development.
  - Computational resources needed for simulations.
  - Potential future costs associated with integrating the solution into a real-world environment.
- *Benefits:*
  - **Improved Network Availability:** Reduced downtime and more reliable service for SaskTel customers, particularly in rural areas. This benefits businesses, residents, and essential services.
  - **Reduced Carbon Footprint:** Lower energy consumption and CO2 emissions, contributing to environmental sustainability and potentially reducing operational costs for SaskTel.
  - **Optimized Resource Utilization:** More efficient use of network resources, potentially delaying or reducing the need for costly infrastructure upgrades.
  - **Advancement of Knowledge:** Contribution to the field of network function virtualization and sustainable computing, benefiting the broader research community.
  - **Enhanced Reputation:** Positions SaskTel as a leader in adopting innovative and sustainable network solutions.

Option 2: Invest in Existing Commercial Solutions

- *Costs:*
  - Potentially high licensing fees for commercial software.
  - Integration costs with existing systems.
  - Training costs for staff.
  - Risk of vendor lock-in.
  - Maintenance costs of the algorithms.
- *Benefits:*
  - Potentially faster implementation compared to developing a custom solution.
  - Access to vendor support and maintenance.
  - Potentially proven solutions with established track records.
  - **Needs further research:** We need to identify specific commercial solutions and assess their capabilities in terms of availability and sustainability optimization. Do they *jointly* optimize, or focus on one or the other?

Option 3: Focus solely on availability improvements

- *Costs:*
  - Potentially higher energy consumption and carbon footprint.
  - Missed opportunity to improve resource utilization and operational efficiency.
  - Potential damage to reputation if seen as lagging in sustainability efforts.
- *Benefits:*
  - Reduced downtime and more reliable service for SaskTel customers, particularly in rural areas. This benefits businesses, residents, and essential services.

Option 4: Focus solely on carbon footprint reductions

- *Costs:*
  - Risk of increased service downtime or performance degradation as network demands grow.
- *Benefits:*
  - Lower energy consumption and CO2 emissions, contributing to environmental sustainability and potentially reducing operational costs for SaskTel.

Recommendation

Based on the preliminary cost-benefit analysis, **Option 1: Implement the Proposed Project** is the recommended option. While it requires upfront effort in research and development, it offers the potential for significant long-term benefits in terms of both network availability and sustainability. It directly addresses the identified business needs and aligns with SaskTel's commitment to innovation and corporate social responsibility. **Option 2 (commercial solutions)** could be considered as a fallback or complementary approach, but further research is needed to determine if existing solutions adequately address the joint optimization of availability and sustainability. **Options 3** and **4** are not as holistically beneficial as **Option 1**.