Drafting an emerging picture

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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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Instructions:

Using your researched information fill out the flowing comparing the current state of the art with what you think new (software) innovations could bring to the community

Covering the orientations	
Compare the left-hand column of the document "Technology configuration inventory" table with the right-hand column of the document "Community characteristics & orientation" table. What do you notice about the match (or mismatch) between your dominant community orientations and the current configuration of tools?	
How well does the technology inventory cover the orientations? What themes emerged from both the community orientations and the technology configuration from your colleagues' notes	The technology inventory covers the *operational* aspects of the dominant community orientations reasonably well. The tools are geared towards ensuring network uptime, managing configurations, troubleshooting issues, and providing access to performance data. However, the theme that emerges is a reactive approach to network management: responding to issues as they arise and maintaining the status quo. The *proactive* optimization for sustainability is largely missing.
☒ Are you almost there? ☒ Are there big gaps?	No, despite its foundational importance, it's still in the development phase. There are some potential gaps like industry engagement, deployment consideration, and open-source strategy.
What is the range of skills? If their interests and/or skills are diverse, could it cause conflict or distraction?	The range of skills within the SaskTel network engineering and architecture teams is broad, spanning from junior engineers to senior architects, with varying levels of expertise in specific networking domains, virtualization, and optimization techniques. This diversity *would* cause minor challenges in adopting a new tool, particularly if it requires specialized knowledge. However, it's unlikely to cause major conflict or distraction if the tool is well-designed, well-documented, and its benefits are clearly communicated. Providing training and support will be crucial.
Achieving integration	
Look at all the pieces of your configuration	

What level of integration and interoperability has been achieved?	SaskTel, like most large telecommunications providers, has a *moderate to high* level of integration between their existing network management systems. They use APIs and standardized protocols to allow different tools to communicate and share data. However, there are still some silos and manual processes, particularly when it comes to integrating newer technologies (like SDN and NFV) with legacy infrastructure.
Where are there big gaps	• **Integration with Sustainability Metrics:** The biggest gap is the lack of integration between operational tools and sustainability metrics. There's likely no direct link between network performance data and energy consumption data, making it difficult to optimize for both. • **Integration with Optimization Tools:** Existing tools don't have built-in capabilities for advanced optimization, such as the metaheuristic algorithms we are developing. The project will need to demonstrate how its outputs can be integrated into existing workflows, either through manual interpretation or potentially through APIs.
Balancing the polarities (Current state)	
How is the configuration balanced with respect to each polarity?	
Synchronous >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> The current tools support synchronous activities (real-time monitoring, alerting).	<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< **Asynchronous** The current tools support asynchronous (reporting, documentation) activities. The balance is tilted slightly towards **asynchronous**, as much of the network management is based on analyzing historical data and responding to alerts.
Participation >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> There is less focus on facilitating direct interaction and collaboration among engineers (though that certainly happens).	<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< **Reification** The current balance is heavily tilted towards **Reification**. The focus is on managing and maintaining the *network itself* (the "thing"), rather than on facilitating direct interaction and collaboration among engineers (though that certainly happens). Network management is inherently about controlling and optimizing a complex system.
Group >> The current tools support group work. Network monitoring dashboards are often viewed collectively. The balance is tilted towards **Group**, as network management is a team effort.	<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< **Individual** The current tools also support individual work. Configuration changes are often made by individual engineers.
How well does this balance fit your community?	The current balance generally fits the community's needs, as their primary responsibility is to ensure network availability and performance. However, there's an opportunity to shift the balance slightly by incorporating sustainability

	considerations, which could lead to more proactive and holistic network management.

Solution seeking

In the new configuration, do you want your choice of tools to affect the polarities of your community in ways that differ from the current configuration? Which way?

Synchronous >>	<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< **Asynchronous**
Real-time monitoring dashboards, network telemetry data streams, and integration with SDN controllers for dynamic adaptation.	Enhanced simulation capabilities, more sophisticated data analysis tools, and potentially asynchronous collaboration platforms for distributed teams. The primary focus remains on planning and optimization, which are inherently asynchronous activities.
Participation >>	<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< **Reification**
Workshops, collaborative design sessions with industry partners, open-source platforms for community engagement, and feedback mechanisms.	Improved documentation, code repositories, user interfaces for the simulation framework, and potentially APIs for external system integration. The focus here should be on increasing reification.
Group >>	<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< **Individual**
Collaborative coding platforms, project management tools, communication platforms (Slack, Microsoft Teams), shared document repositories.	Specialized analysis tools, individual development environments. The focus here should be on supporting the *existing* balance, ensuring both group collaboration and individual contributions are well-supported.

MVP notes

Reduce the scope to a very focused real-world application, such as optimizing video streaming over 5G networks, and make it more influential and manageable.

MVP:

- Begin with a simplified version-basic simulation, main optimization algorithms, and minimum network integration, such as CloudSim.
- Implement embedding policies (e.g., availability-aware, carbon-aware and tradeoff-aware policies tailored to video streaming).
- Implement redundancy optimization algorithms (e.g., Simulated Annealing, Particle Swarm Optimization and Genetic Algorithm).
- Focus on demonstrating the ability to place VNFs (e.g., video transcoder, packet gateway) and calculate availability and energy consumption metrics for a single video stream.
- Further refine the solution using the PDSA cycle of feedback, testing, and adaptation.

- **Open Source:** Make the simulation framework (or a core part of it) open source on GitHub to encourage collaboration and wider adoption.

- **Industry Feedback:** Actively seek feedback from telecom companies and network operators (e.g., SaskTel, if possible) on the relevance and practicality of the project. This could involve informal discussions, presentations, or even short surveys.
- **Deployment Planning:** Document the steps that would be required to integrate the solution into a real-world network environment. This demonstrates the project's potential and scalability. This could include:
    - Identifying potential integration points with existing network management systems.
    - Outlining the data requirements for real-time operation.
    - Describing the necessary monitoring and control mechanisms.