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Advancing Generative AI Implementation in Telecommunications Networks

EXECUTIVE SUMMARY

Generative Artificial Intelligence (GenAI) is a rapidly evolving technology that will transform the telecommunications industry by enhancing the efficiency, personalization, and security of network operations across domains such as Radio Access Networks (RAN), core networks, devices, and network management. This white paper surveys key use cases of GenAI, including RAN optimization, digital twins, network slicing, and AI-enhanced troubleshooting. While GenAI shows great potential, the telecommunications sector lacks focused studies on its specific applications. This white paper addresses these gaps by analyzing real-world use cases and offering recommendations to facilitate the integration of GenAI technologies into telecom networks, aiming to improve operational efficiency and foster future innovations. It provides actionable recommendations that will drive the telecommunications industry forward while complementing the ongoing efforts by Standards Development Organizations (SDOs).

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FOREWORD

As a leading technology and solutions development organization, the Alliance for Telecommunications Industry Solutions (ATIS) brings together the top global ICT companies to advance the industry's most pressing business priorities. ATIS' nearly 200 member companies are currently working to address the all-Internet Protocol (IP) transition, 5G, NF virtualization, big data analytics, cloud services, device solutions, emergency services, M2M, cyber security, network evolution, quality of service, billing support, operations, and much more. These priorities follow a fast-track development lifecycle — from design and innovation through standards, specifications, requirements, business use cases, software toolkits, open source solutions, and interoperability testing.

ATIS is accredited by the American National Standards Institute (ANSI). The organization is the North American Organizational Partner for the 3rd Generation Partnership Project (3GPP), a founding Partner of the oneM2M global initiative, a member of and major U.S. contributor to the International Telecommunication Union (ITU), as well as a member of the Inter-American Telecommunication Commission (CITEL). For more information, visit www.atis.org.

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1. INTRODUCTION

GenAI is a category of AI systems designed to create various new content, such as text, images, sounds, animations, videos, three-dimensional (3D) models, and computer code. It can leverage a wide range of AI/Machine Learning (ML) techniques, including Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), diffusion models, reinforcement learning, and transformers, among others. A prominent example of GenAI applications is OpenAI's ChatGPT, which is a Large Language Model (LLM) based on the Generative Pre-trained Transformer (GPT).

GenAI development is moving quickly, transforming business operations, service offerings, and productivity across industries, including telecommunications. GenAI has the potential to reinvent the telecommunication industry, enabling customers to use telecommunication services more easily and efficiently. Concurrently, it enables service providers to offer more secure, reliable, and personalized services.

Although much of the focus of this white paper is on wireless networks, it is important to recognize that the applicability of GenAI extends across various types of telecom networks — wireline, fiber, and satellite — in addition to wireless. These networks can benefit from AI-enhanced network automation, real-time data analytics, traffic optimization, and dynamic network configurations. GenAI can also assist in predictive maintenance, customer service chatbots, and adaptive resource allocation, regardless of the specific network type.

Despite various telecom SDOs discussing AI/ML, such as the comprehensive work conducted by the 3rd Generation Partnership Project (3GPP) [1], focused studies on GenAI in telecommunications remain limited. To address this gap, ATIS launched a new AI Network Applications Working Group, which conducted a first-of-its-kind study on GenAI in telecommunications, surveying GenAI use cases across the network. This work aims to assess key use cases for network applications, address critical gaps, and provide recommendations to help advance AI implementation across networks.

The rest of this white paper is organized as follows:

- Sections 2, 3 4, and 5 survey GenAI use cases in telecommunications for RAN, core, device, and management domains, respectively.
- Section 6 examines GenAI use cases that span across domains.
- Section 7 provides a gap analysis on the application of GenAI in telecommunications.
- Section 8 highlights key recommendations for applying GenAI across networks, followed by concluding remarks in Section 9.

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