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Agentic AI and opportunities for telcos

White paper

Just as the release of ChatGPT 3.5 in late 2022 engendered a spike in interest around AI, we are seeing a second wave of interest in the concept of agentic AI. In this white paper, we look at agentic AI and what it offers telcos. We lay out the benefits that it can bring generally and then focus on specific examples of agentic AI use cases for customer care, service provisioning, and network planning and optimization. We look at some of the pitfalls of AI and agentic AI that need to be overcome, as well as its general business benefits, offering insights into how agentic AI might best be deployed by telco operators to harness its power while maintaining critical guardrails and security across their operations.

Contents

Introduction

Generative AI, especially large language models (LLMs), has brought more focused interest on AI with several companies and even governments around the world giving special attention and investments to capitalize on its benefits. Many organizations have a role called Chief AI Officer or Chief Data Officer mandated to drive AI strategy, governance and deployments. More recently agentic AI has taken center stage bringing advanced AI capabilities that are spearheading further AI and automation investments.

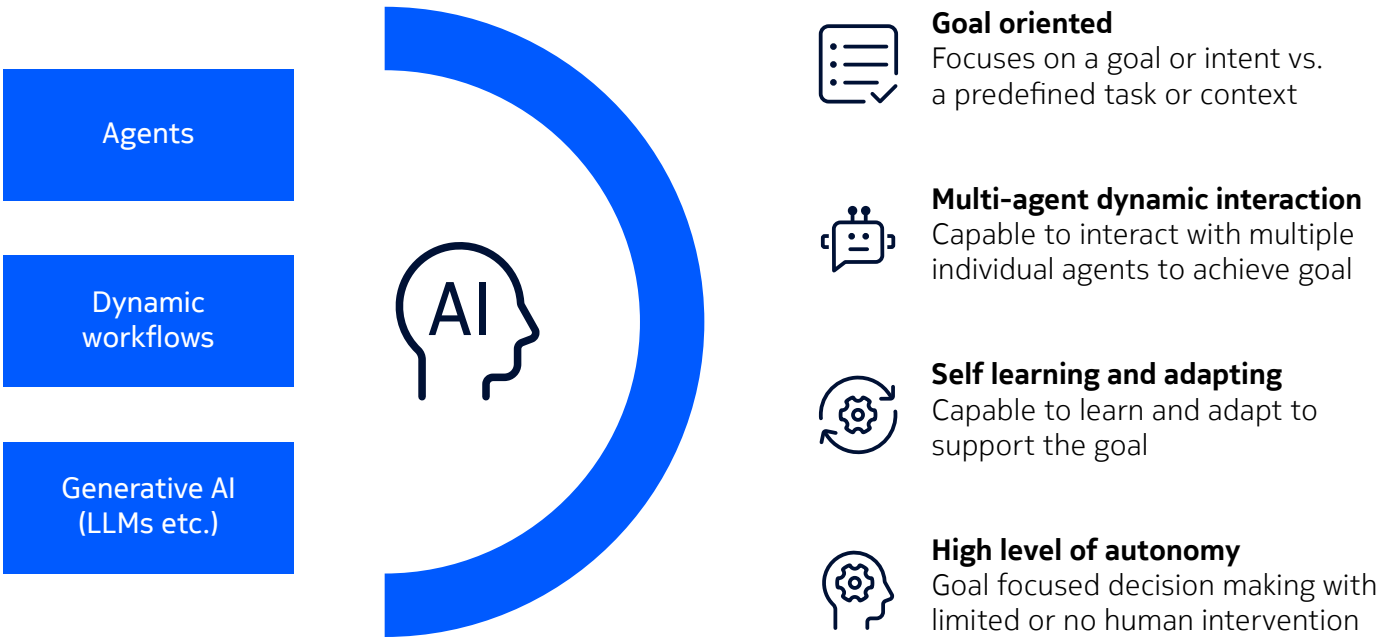
This paper will address the benefits of agentic AI for telcos in driving overall efficiency and further accelerate automation.

But what is agentic AI?

Agentic AI is an evolving AI paradigm that enables AI to adapt and take autonomous decisions based on specified goals with limited or no human intervention.

Agentic AI as shown in figure 1 combines the power of generative AI (LLMs etc.), workflow automation, and advanced reasoning methods to provide capabilities with a high degree of autonomy including goal or intent focus execution of tasks, dynamic workflow orchestration, including several AI agents/systems/tools and self-learning, and adaptability to support achieving specified goal.

Figure 1. Agentic AI: A paradigm shift toward autonomy



Difference between AI agents and agentic AI

The difference between AI agents and agentic AI is subtle, and the need for differentiation will not be needed as the technology matures. For sake of understanding in the current context, we have tried to bring some clarity on what AI agents and Agentic AI means.

AI agents are systems that can automate and execute simple as well as complex tasks on behalf of the user while agentic AI autonomously operates based on specified goals with limited or no human intervention. Table 1 shows the main differences between AI agents and agentic AI.

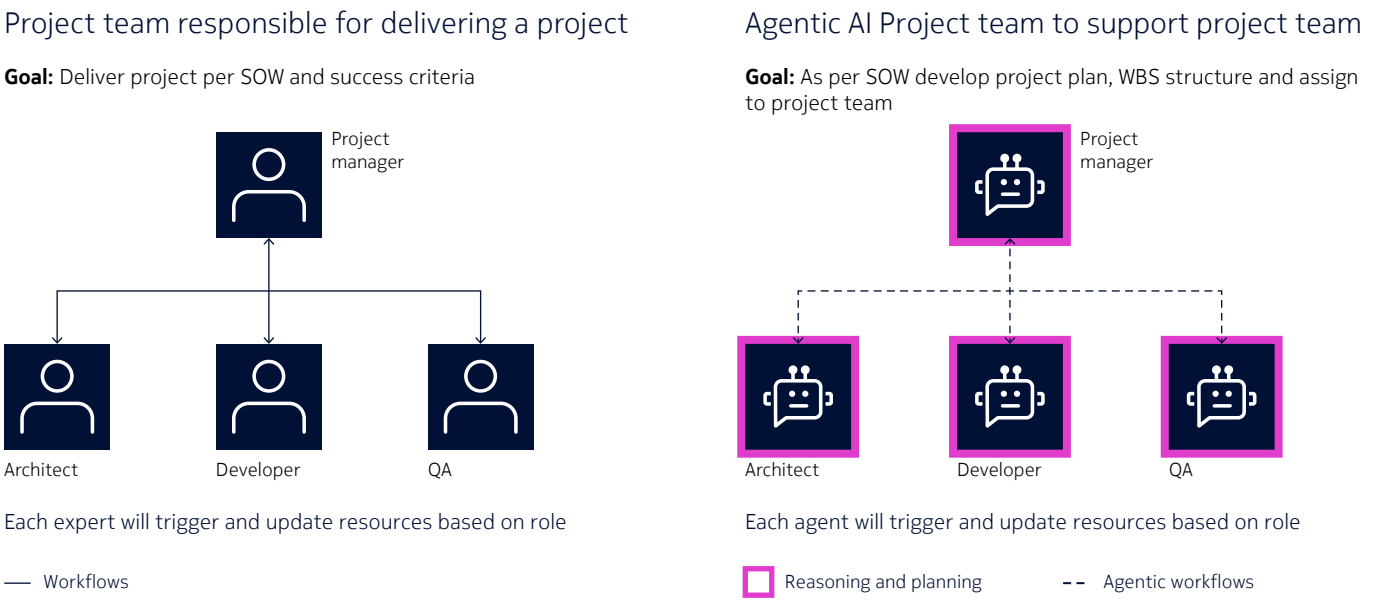
Table 1. Difference between AI agents and agentic AI

AI agent	Agentic AI
Focus on specified tasks	Focus on a specified goal
Orchestrates resources limited to its tasks	Orchestrates resources and agents to achieve goal
Limited autonomy	High level of autonomy

Components in agentic AI

To understand the various components of agentic AI, let's look at an example, in figure 2, of how a virtual agentic-AI team (right) might support a human project team (left).

Figure 2. Project team enabled by an agentic AI Project team



As we can see, the goals and success criteria for the project team are set out in the statement of work (SOW). Members of the team have defined roles that constitutes how work will flow between them. The project team are further enabled by various systems such as an ERP. Similar SOW-based goals and the work breakdown structure (WBS) extend to the Project agentic-AI team. A non-exhaustive list of components needed by the agentic-AI team to ensure success of the sub-goals would include:

- Reasoning and planning methods that enable autonomy through self-learning and adaptability
- Agentic workflows that enable dynamic workflows between agents and tools/systems
- Generative AI (LLMs etc.) to enable agent interactions and generation.

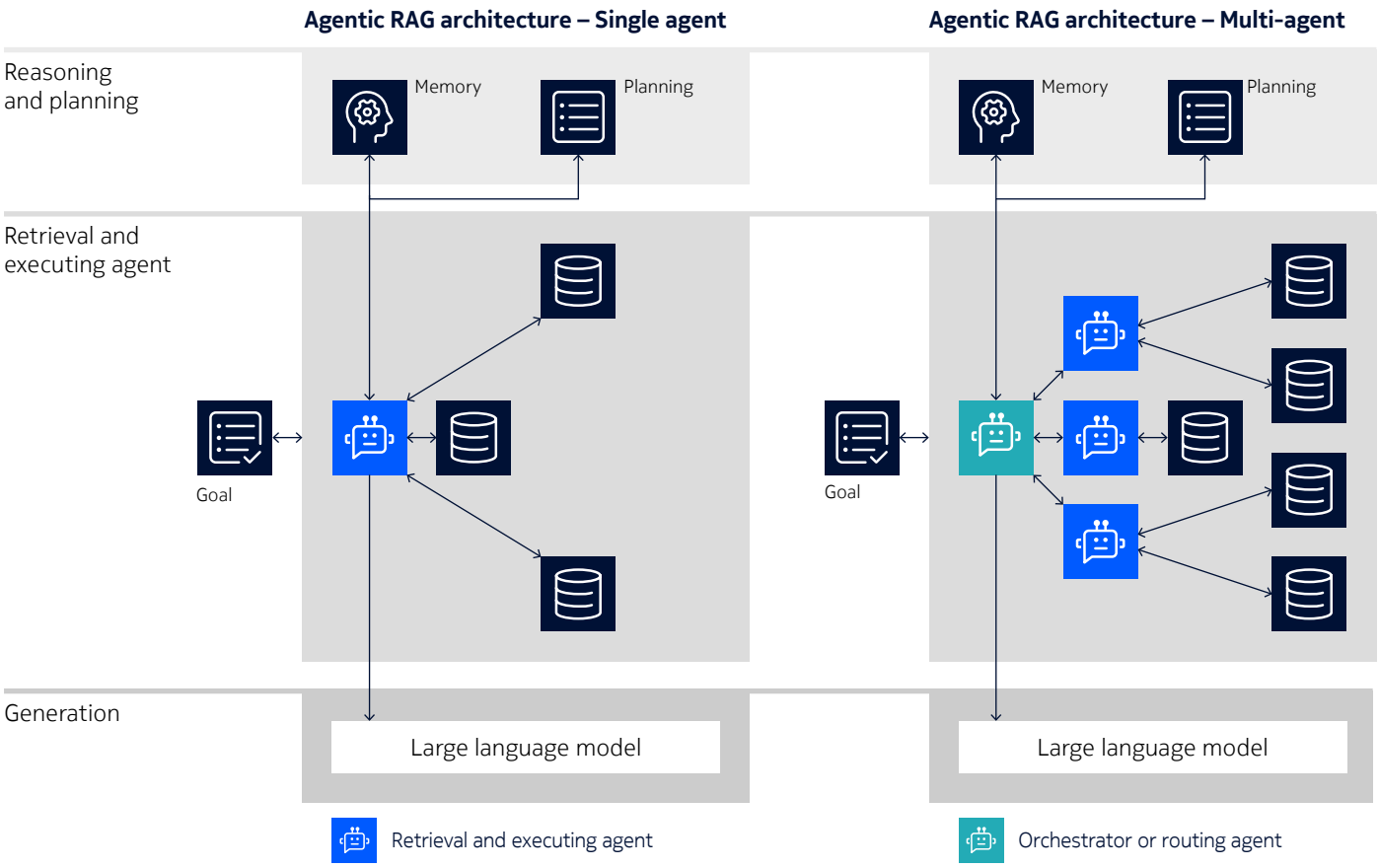
Reasoning and planning

There are several reasoning and planning methods that are used in AI. The most common are [1]:

- ReACT (reason and act): An LLM prompting methodology where the agent reasons first, acts on the result, and then observes the result, which is fed back into the model's context before repeating the cycle until the task is complete
- RAISE: This method builds on ReACT but employs a dual memory system for short-term memory (scratchpad) and long-term observations and relevant examples, which gives it an ability to retain context for longer conversations and more continuity
- Reflexion: In this method, the AI agent observation stage includes both numeric and verbalized feedback from an Evaluator model, which improves the efficiency of the Self-Reflection model and better performance.

Figure 3 shows a different agentic retrieval-augmented generation (RAG) architecture where the reasoning and planning methods can be used to support, challenge and augment the agent to execute the goals given to it.

Figure 3. Agentic RAG architecture [2]



Agentic workflow

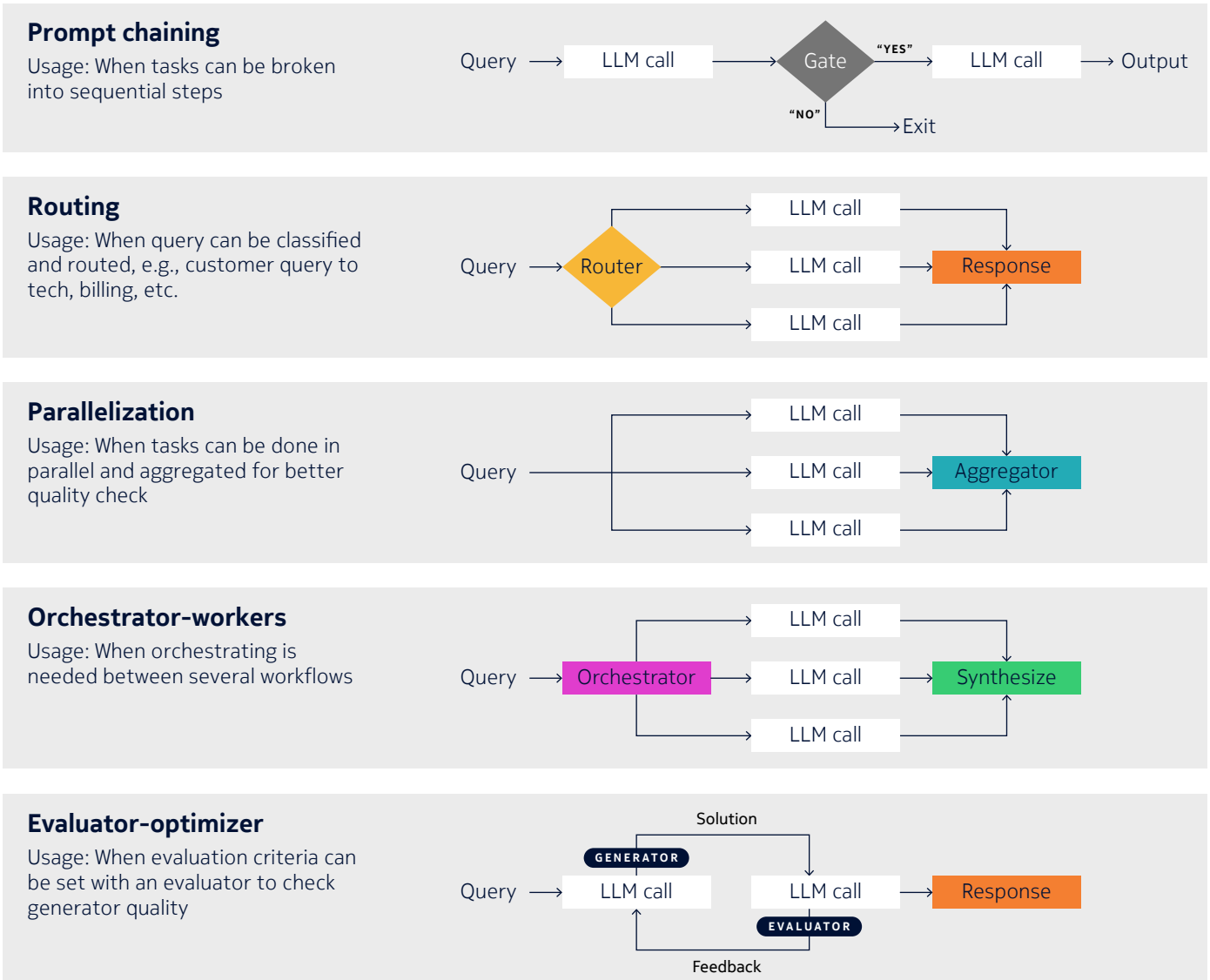
Agentic workflows are a key component of interactions/workflow within agents and with systems and tools. Agentic workflows enable dynamic adaptability of workflow based on specified goals.

Figure 4 shows a non-exhaustive list of agentic workflow types and the reason to use them. In addition to existing standards and APIs, several protocols are being developed to enable agent-based communication. Some of these include:

- MCP – Model context protocol (Anthropic)
- A2A – Agent to agent protocol (Google)
- ACP – Agent communication protocol (IBM).

Many of these are poised to work alongside APIs, further integrating agents and existing systems and allowing seamless AI to AI and AI to tools/systems communications. It's also worth noting that these protocols are not necessarily in competition with each other and are complementary.

Figure 4. Types of agentic workflows [3]



Generative AI (e.g., LLMs)

Generative AI, especially LLMs, are a well-known branch of AI, especially since Open AI launched ChatGPT in 2022. LLMs are trained on large volumes of data to perform numerous tasks such as classification, summarization, prediction, translation and content generation.

What does it mean for telcos

Before we look at agentic AI opportunities for telcos, let's look at what generative AI brought for telco operations [4]. The benefits of generative AI include:

- Faster access to information without having to source from multiple places
- Synthesis of complex information to provide meaningful insights
- Contextual communication and guided action based on those insights.

Agentic AI opportunities for telcos

Agentic AI adds additional capabilities with benefits such as:

- Intent-based autonomy between functions
- Dynamic orchestration of workflows between functions
- Autonomous collaboration and interactions between functions.

Figure 5. Agentic AI benefits classification for telcos

Dynamic orchestration
across functions

Autonomous collaboration
between functions

Intent-based autonomy
of functions

These capabilities and benefits can transform several areas in telcos such as:

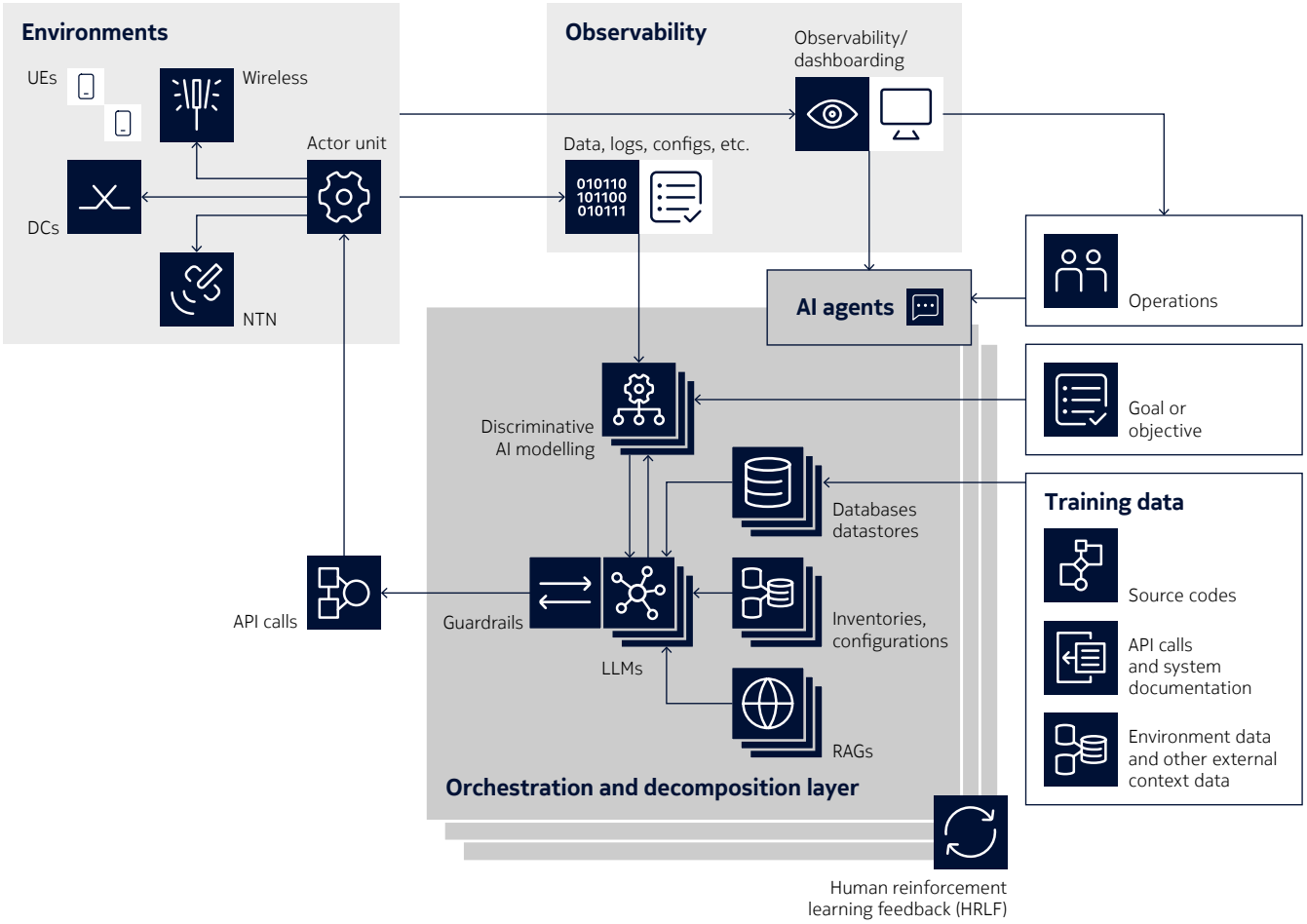
1. **Customer care operations**—accelerate shift left and increase autonomous resolutions through collaboration with BSS and OSS functions
2. **Service provisioning**—accelerate the shift towards zero-touch intent-based provisioning
3. **Network optimization**—improve network performance through autonomous collaboration and dynamic orchestration of network resources
4. **Network design**—Speed up the network design process cycle through autonomous multi-function collaboration
5. **Service assurance**—Improve service assurance through autonomous collaboration and dynamic orchestration of services and network resources.

Agentic AI for networks has the ability to:

- Understand the network as an environment (e.g., via APIs to access data streams and log files)
- Plan a sequence of actions toward a goal (e.g., provisioning a subscriber, parameter tuning, or clearing an alarm)
- Act autonomously using tools (e.g., APIs, orchestration platforms)
- Adapt or adjust based on feedback (e.g., network observability).

Figure 6 shows how an AI agent may be used to orchestrate, manage, and optimize a network with a continuous feedback loop and needed human supervision and guardrails.

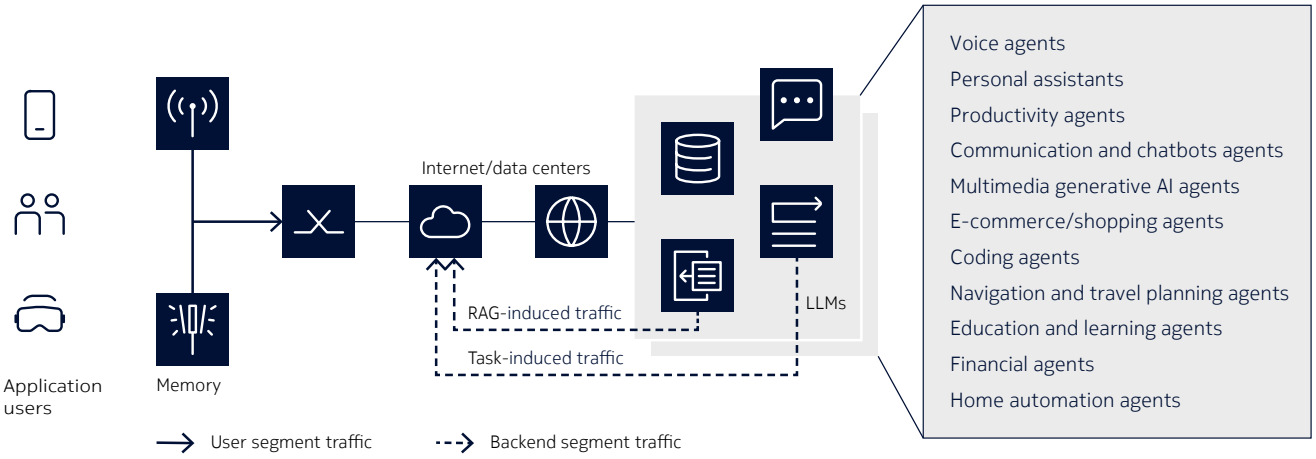
Figure 6. Agentic AI for networks



As AI continues to grow, networks must act as an access medium for agentic AI traffic along with the incumbent AI traffic, which is expected to grow by 24% CAGR by 2033 [5]. This agentic AI traffic is likely to come from:

- Users who interact with AI agents based on a use case (e.g., voice agent, personal assistants, and chatbots)
- Backend, which is either retrieval-induced (e.g., due to RAG, backend reaches, or deep searches), or task-induced, which depends on the choice of the AI agent.

Figure 7. Networks for agentic AI



Agentic AI is evolving rapidly with growing interests in AI agents for other applications (e.g., AR/VR, decentralized finance, and more).

Agentic AI for customer care operations

Customer care operations have always seen the highest number of automation and AI use case deployments. With the high volume of repetitive tasks and direct impact on customers, the use cases focus on driving cost efficiencies and improving response times and the customer experience. The use cases have continuously evolved to address complex queries as well as provide a holistic view to customer support.

Most of the deployed use cases, however, face limitations such as:

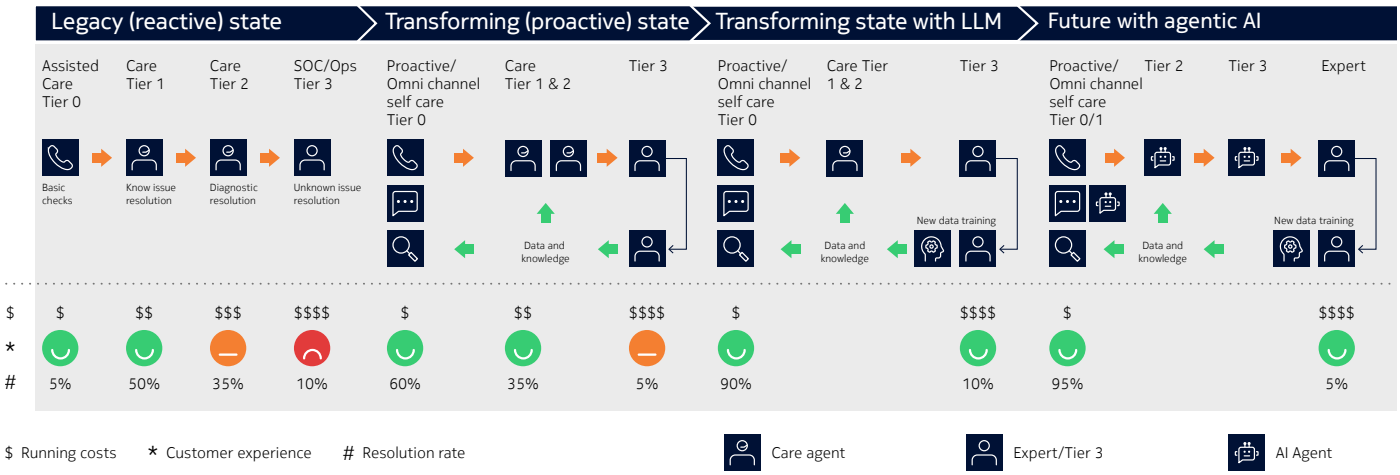
- Multi-tier network issues resulting in customer complaints
- Personalizing responses to customer behavior and requirements
- Maintaining context and continuity.

As a result, the customer care operations have taken a hybrid approach where repetitive tasks are managed by automation and/or AI applications while complex queries and issues are handed over to human agents.

Future with agentic AI

Customer care operations have traditionally been organized in a tiered structure (Tier 0–4) to ensure better and more experienced resources only handle the more complex issues. This results in complex issues taking a longer time to resolve as trouble tickets move through multiple tiers, which can result in a poor customer experience and higher handling costs.

Figure 8. Customer care operations transformation with agentic AI



To reduce the cost of handling customer issues, telcos have tried to enrich the information available at Tier 0 (self-help and FAQs) following the shift-left philosophy. The self-service omni-channel experience is transformational, with a sizeable portion of tickets solved through self-service and proactive care. The reduced number of issues that are forwarded to human agents can also be supported by AI-enabled workflow assistants to help with troubleshooting. Extremely complex issues are referred to a knowledge steward.

Generative AI accelerates this shift left by also improving customer self-service interactions, for example, with chat bots using natural language. Generative AI makes interactions more fluid and continuous, thus providing a more consistent and natural experience between different channels.

Future agentic AI efforts will further transform Tier 2 support replacing technical personnel and knowledge stewards with AI agents for minimal human intervention. Based on customer issues, customer care AI agents can pull information from multiple resources, such as ongoing network issues, and analyze the current network state and perform root cause analysis. Using this information, customer care AI agents can raise trouble tickets, provide regular and resolution updates to the end customer, and collaborate with other AI agents to resolve the ticket.

Care AI agents can also continuously gather information to proactively inform customers about preventive actions, outages and respective resolutions as well as recommend personalized tariff plans with the help of a marketing AI agent.

Benefits and challenges of agentic AI

Agentic AI can offer transformative benefits to customer operations by providing 24/7 customer support with minimal to zero human intervention. The AI agents can scale faster hence the wait time will not increase exponentially even if telcos see a high acquisition phase. The AI agents can adapt to customer sentiments, history and tailor personal responses thus improving customer experience and loyalty. With integrated feedback loops, the agentic system can continuously learn and improve across all channels.

The benefits, however, come with a set of challenges. The high cost of development, integration and maintenance can be prohibitive, especially for smaller organizations. The AI agents may generate incorrect responses or take inappropriate actions, potentially damaging customer trust. Data privacy concerns also loom large, as agentic AI often requires access to sensitive personal information, increasing the risk of

breaches and regulatory non-compliance. However, through responsible and ethical AI practices—such as transparent decision-making, rigorous testing, human oversight, and strict data governance—organizations can mitigate these risks and harness the full potential of agentic AI while maintaining customer trust and regulatory compliance.

Agentic AI for service provisioning

Service provisioning is a complex process that involves orchestrating multiple systems and network resources for a seamless delivery of ordered services. To ensure a smooth ordering and provisioning process, telcos follow a software development lifecycle (SDLC) methodology for service introduction. A well-designed SDLC facilitates the automation and orchestration of multiple systems needed to provision the necessary resources for business or consumer service delivery.

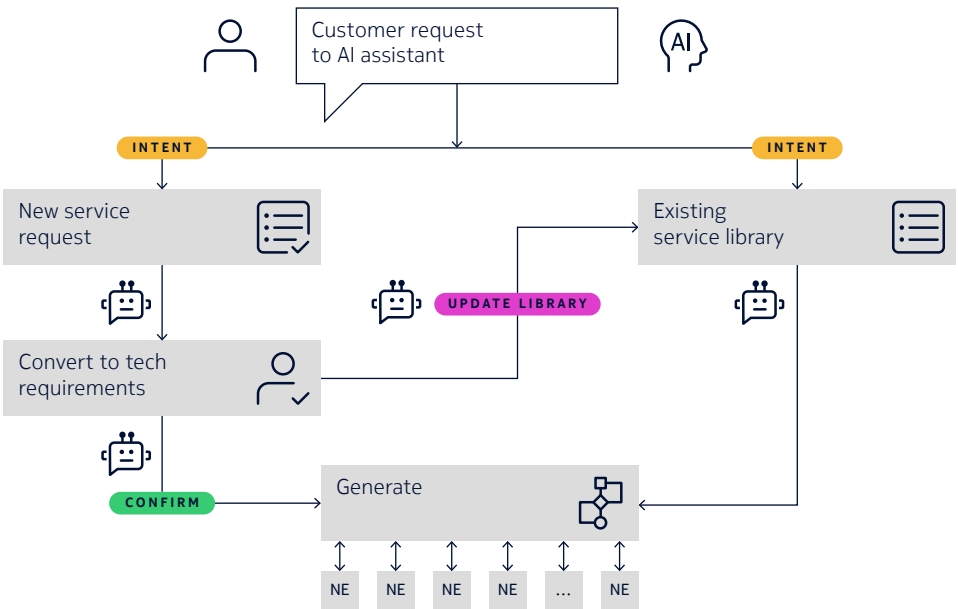
Due to its direct correlation to customer experience and the ability to get the services order processed in a timely manner, telcos have constantly invested in automating these processes.

Future service provisioning with agentic AI

Key agentic-AI capabilities such as intent-based autonomy, dynamic (agentic) workflows, and autonomous collaboration, mean that service provisioning with agentic AI will be a homogenous, near-real-time autonomous operation. Agentic AI can be embedded as follows (see figure 9):

- **Intent discovery**—an LLM-enabled assistant is used to understand customer requirements through prompt-engineered natural language conversations
- **Existing services**—agents orchestrate systems and resources using pre-established intents to provision the service
- **New services**—agents convert customer requirements to technical specifications, with a validation by an expert, then dynamically orchestrate and provision resources, finally updating the existing service ordering catalogue with the new service.

Figure 9. Service provisioning with agentic AI



Benefits and challenges with agentic AI

There are several benefits of introducing agentic AI to service provisioning that include:

- Launching new services with shorter time to market
- Flexibly meeting customer needs dynamically, allowing customers to curate their requirements and then provisioning customized services for them
- Making progress on the path to zero-touch intent-based provisioning.

Agentic AI relies on human training and reasoning, thus it can delay or deviate due to conflicting training goals of agents. For service provisioning, proper guardrails and care such as human supervision will ensure success.

Agentic AI for network planning and optimization

Network planning and optimization (NPO) aims to ensure the best possible service and network experience for subscribers. To achieve this objective, NPO focuses on the following ends:

- Maximizing spectral efficiency
- Optimizing capacity, coverage and quality
- Ensuring efficient use of network resources.

NPO has a direct impact on the customer experience, which can help telcos prevent churn and protect revenues, as well as grow new revenue generating opportunities.

The future of NPO with agentic AI

Agentic AI can achieve NPO objectives through the autonomous management of complex NPO workflows with minimal human intervention. Figure 10 shows Bell Labs Consulting's proposed agentic-AI framework for NPO (this framework builds on the 3GPP 37.817 functional framework (Study on enhancement for Data Collection for NR and EN-DC (Release 17), 2022)).

Figure 10. Agentic-AI framework for NPO

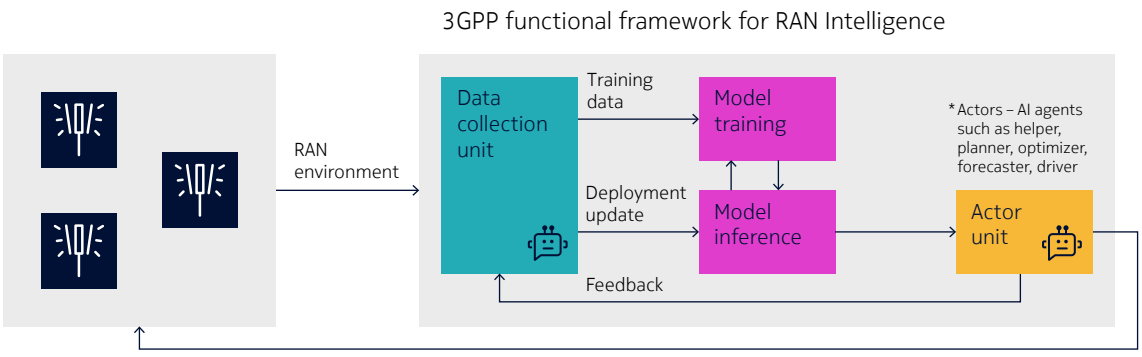


Table 2 shows various AI agents that can be implemented in the network to drive the NPO function and its various objectives.

Table 2. AI agents for NPO

Agent	Description
Collector	Gathers network data (fault, configuration and performance management), user data (geo-synthesis and mean downtime), and other external data sources (such as weather, crowdsource, neighborhood prices, and imagery) and structures them in a learnable format
Planner	Makes decisions about new site builds, new frequency adds, and massive MIMO enabling
Optimizer	Parameter tuning, antenna tilt tuning, antenna re-azimuthing, feature enablement (or disablement) to achieve target service KPIs, improve spectral efficiency, and eliminate interference
Forecaster	Predicts traffic growth, mobility patterns, and hotspot deployments in the network over a time horizon
Helper	Interfaces with humans (e.g., NPO engineers) to explain root cause analysis and troubleshooting decisions made, and adjusts based on feedback
Driver	Drives the creation of new business (e.g., FWA), new service offerings, and reduces churn

Benefits and challenges of agentic AI

Agentic AI has several benefits for NPO. As stated earlier, it has direct impact on the customer experience of network services. Agentic AI can help:

- Reduce churn and improve overall customer experience
- Ensure efficient use of network and spectral resources
- Improve time to market and operational efficiency.

Agentic AI relies on human training and reasoning and can have unwanted outcomes. This may not be suitable for NPO where network performance is at the center of objectives. This means proper guardrails with human supervision of agents should be considered to reduce or eliminate these unwanted outcomes.

Business benefits

Methodology

To calculate the benefits of agentic AI, we looked at a study done by Bell Labs Consulting at the end of 2023 on generative AI and its benefits [4]. We also looked at delta or additional benefits agentic AI brings to telcos, which include:

- Intent-based autonomy between functions
- Dynamic orchestration of workflow between functions
- Autonomous collaboration and interactions between functions.

We then studied the impact of these additional benefits on the functions, on top of the benefits from generative AI.

Customer care operations

Customer care will see more autonomous resolutions of calls and tickets enabled by goal-oriented dynamic orchestration across BSS and OSS functions. A capability that today is mostly done with the help of a customer care expert (Tier 2) by contacting and collaborating with network/service operations (Tier 3) experts. Expert review provides needed guardrails to ensure quality resolutions and ensure further training of models/agents on a regular basis.

Network and service design

Network design collects and processes data from both external and internal sources (e.g., macro data, vendor data, business growth, etc.) to come up with logical and optimal service designs. Generative AI will augment this process through easy synthesis of data and providing meaningful insights. Agentic AI will bring additional capabilities by orchestrating data sources and generating logical/optimal designs based on specified goals. Human supervision is needed to review designs and further optimize goals for the agent.

Network performance and optimization

Network performance and optimization collects and processes data to ensure optimal network performance. Generative AI will augment this process through easy synthesis of data and providing meaningful insights. Agentic AI will add capabilities by dynamically orchestrating and optimizing network resources as well as forecasting future resource needs. Human observation and supervision will be needed to ensure compliance and prevent unplanned events.

Service provisioning

Service provisioning will move from a generative-AI-augmented SDLC for introducing services to homogeneous near-real-time intent-driven autonomous provisioning using agentic-AI capabilities such as intent-based autonomy, dynamic orchestration, and autonomous collaboration. Human supervision will be needed to ensure that the provisioning of new services follows the business strategy and focus areas.

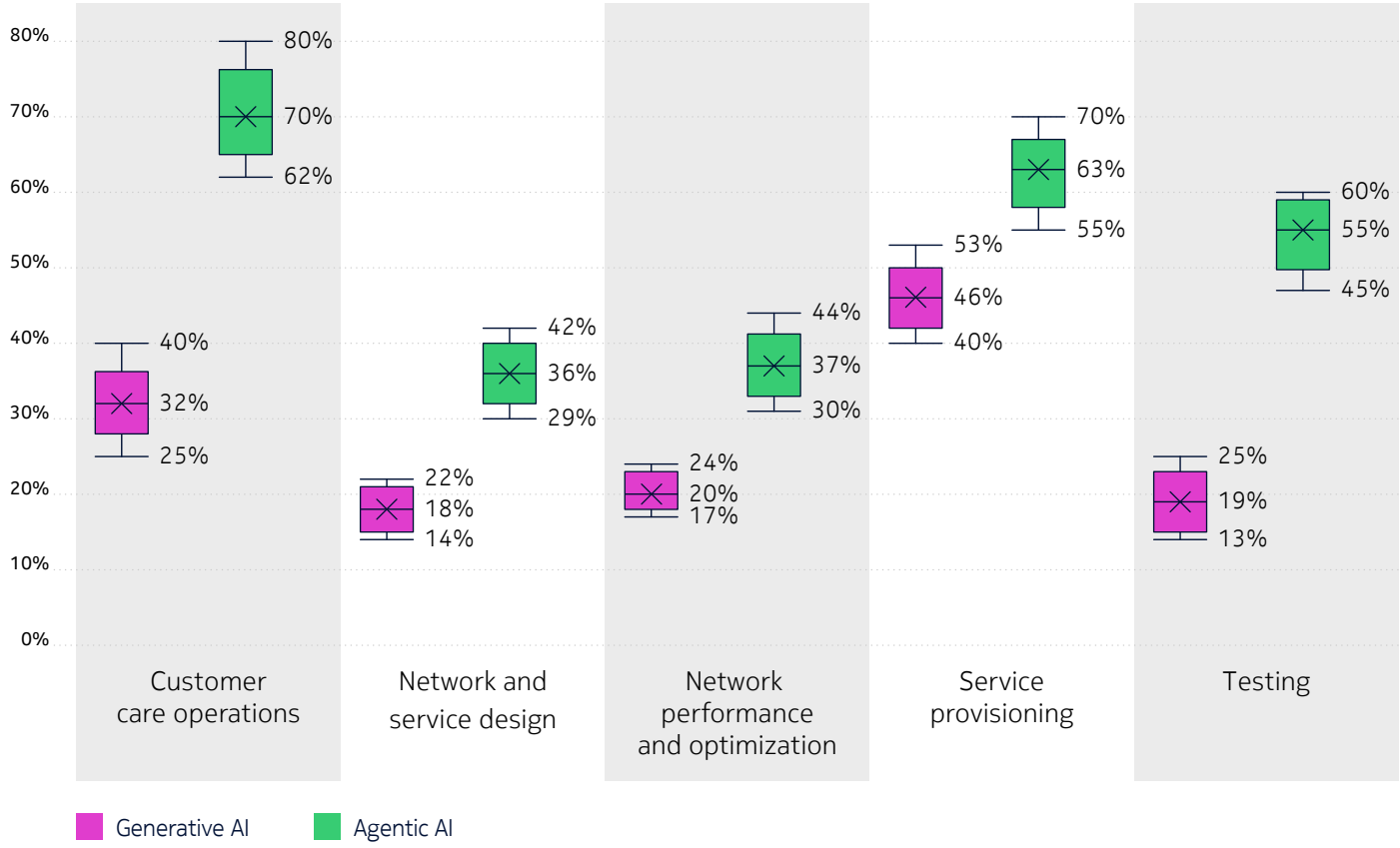
Testing

Testing with generative AI will be augmented to create test description and test codes. Agentic AI will enable further autonomy using test-plan-based goal-oriented test cases and code generation and execution. Human supervision will be needed to review test case codes and execution results for further optimization.

Benefit analysis summary

As described in the methodology section, the benefits of each function were calculated considering benefits from generative AI and the additional capability agentic AI was bringing on top. Figure 11 shows the expected productivity benefits of agentic AI for telcos in select functions on top of benefits generative AI brings.

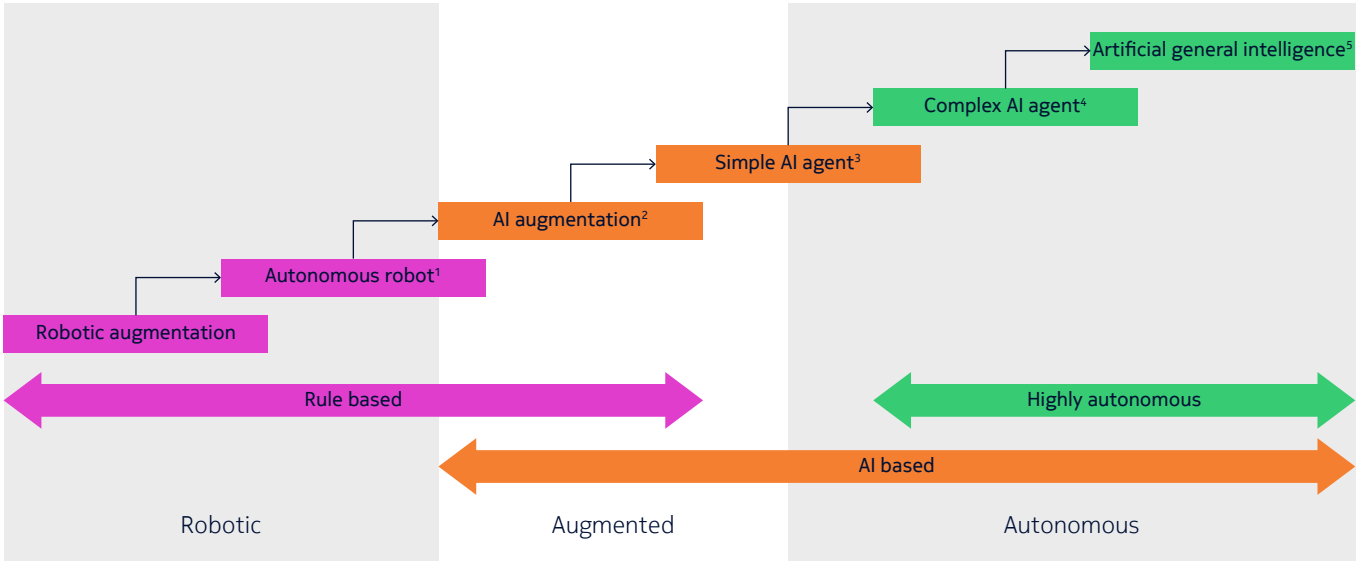
Figure 11. Productivity increase per function



Agentic scale and level of augmentation

As telcos move through their AI and autonomous journey, there will be a state where there is more autonomous decision-making by AI with limited or no human supervision. This means a journey from humans being an integral part of the process to having supervisory control and, finally, to a fully autonomous operation with limited or no-control needed. Figure 12 represents this journey across three maturity stages.

Figure 12. Agentic scale and level of augmentation



[1] Rule based robot acting autonomously
[2] AI supports humans e.g., by providing proposals for action
[3] AI takes autonomous decisions and action for simple situations (e.g., restarting a service) and provides augmented support for complex
[4] AI takes autonomous decisions and action for complex situations (e.g., reconfiguration of an NE)
[5] AI replaces human – takes decisions with no human supervision

Robotic

The robotic stage is rule-based automation where simple and complex processes are augmented with RPA (robotic process automation). The decision making at this stage is fairly simple with a rule or checklist based decision-making process enabling execution of activities by RPA. Human experts drive most of the operations and allow mundane or repeatable tasks/activities to be done by rule-based RPA.

Augmented

In the augmented stage, telcos have introduced AI into operations allowing further augmentation, improved and informed decision making for experts to execute their tasks efficiently—e.g., predicting anomalies and augmenting human expert decision-making processes with probable solutions. At this stage human experts are the decision makers and AI is improvising and augmenting the decision-making process.

Autonomous

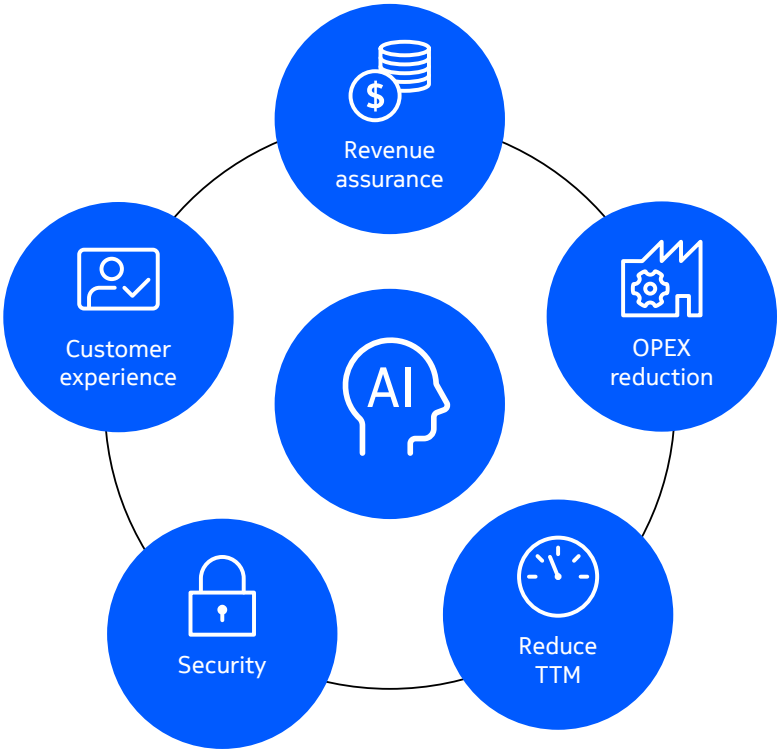
The autonomous stage is where AI can handle more complex decision making and also execute complex tasks with limited or no-human supervision. For example, this would include AI systems analyzing complex parameters and re-configuring based on scenario and situation, either with human approval or autonomously. While this is a journey which will take many years, the change and psychological considerations on experts involved will play a key role in a telco's ability to successfully navigate this journey. It's important that both human factors and AI guardrails are considered during this transformation.

Conclusions

Just as generative AI began to generate tremendous attention in late 2022 (Open AI launches ChatGPT), there is currently a lot of hype around agentic AI. It does show promise and, as it matures, it is likely to live up to its hype and expectations.

Agentic AI is here for a long run, and we see several benefit areas for telcos as show in figure 13. Telcos that have already invested in LLMs are likely to start investing and progressing towards agentic-AI capabilities. Agentic AI will be a key enabler for telcos to further accelerate their autonomous networks journey.

Figure 13. Benefit areas for telco



While holding promise, agentic AI has limitations like any technology. They include:

- **Complexity and integration challenges**—integration of AI systems with legacy infrastructure and diverse data sources can be a significant hurdle if not properly considered
- **Black box problem**—understanding the decisions made by agentic AI can be challenging and is crucial for trust, thus proper consideration should be given to transparency when developing and deploying use cases.

While investing in agentic AI is a strategic and long-term decision, proper analysis should be done to assess the maturity of existing digital ecosystems and the need for security and guardrails, including making decisions on which agentic AI use cases can have full autonomy, require human supervision, or need full human control.

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Abbreviations

A2A	Agent-to-agent protocol
ACP	Agent communication protocol
AI	Artificial intelligence
API	Application programming interface
AR	Augmented reality
BSS	Business support systems
CAGR	Compounded annual growth rate
ERP	Enterprise resource planning
FWA	Fixed wireless access
HRLF	Human reinforced learning feedback
KPI	Key performance indicator
LLM	Large language model
MCP	Model context protocol
MDT	Mean down time
MIMO	Multiple input multiple output
NE	Network element
NPO	Network performance and optimization
OSS	Operational support systems
RAISE	ReACT + AI + scratchpad + examples
RAG	Retrieval augmented generated
ReACT	Reason and act
RPA	Robotic process automation
SDLC	Software development lifecycle
SOW	Statement of work
TTM	Time to market
VR	Virtual reality
WBS	Work breakdown structure
XR	Extended reality

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At Bell Labs Consulting, we empower our clients to harness future technologies for enduring business success. By integrating our expertise across Business & Services Strategy, Network & Cloud Infrastructure, and Operations & Transformation, we craft solutions rooted in empirical evidence, ready for immediate application. We are engaging with leading global clients to inspire and drive the industry’s transformation through the accelerated adoption of future technologies. Bell Labs Consulting builds actionable, client-specific, leading-edge solutions. We leverage our deep industry knowledge, our broad experience, and analytical tools to identify strategic opportunities, support decision-making, optimize deployments and operations, and support our clients to succeed in their business and digital transformation. Bell Labs Consulting is part of Nokia Bell Labs, the world-renowned research arm of Nokia, having invented many of the foundational technologies that underpin information and communications networks and the corresponding digital ecosystems. This research has produced ten Nobel Prizes, five Turing Awards, and numerous other awards. To contact Bell Labs Consulting go to https://www.bell-labs.com/about/contact/

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