

APEX STANDARDS

Domain-specific GPT Product Matrix and Strategic Use Case Scenarios

Apex Standards introduces a new series of domain-specific GPT models providing direct insights into strategic goals and execution details. This white paper describes the model's domain knowledge, professional communities, and how they work with other Apex Standards analytical tools, guiding innovators to make well-informed decisions. **The following pages illustrate real-world examples of how these models achieve strategic aspirations.**

Core Analysis and Foundational Insights

1. Thoroughly investigate topic queries such as "remote sensing" within 3GPP TDoc and beyond, utilizing intelligent GPT analysis for precision-driven reporting.
2. Cross-reference concepts such as "Zero Trust" in various standards, e.g., IETF, IEEE, 3GPP, and Open-RAN, and compare their feature statuses and alignments.
3. Mitigate human errors and procrastination, achieve consistent performance, understanding diverse domains to reduce oversights, and harnessing the power of context-aware synonyms.

Interoperability Standardization: Horizontal Synergy and Vertical Integration

4. Revolutionize the traditional standardization approach with GPT-powered automation, ranging from scrutinizing competitors' contributions to comparing, and defending fresh ideas.
5. Unearth the links among vertical sectors and cross-industry guidelines, encapsulating directives from IEEE, IoT, Operational Technology, 5G-ACIA, and 5GAA Automotives.
6. Decode industry benchmarks set by NGMN, GSMA, ATIS' Next G Alliance, and 5G Americas, tracking the evolution from industrial applications to tangible tech solutions.

Technical Audits, Patent Investigations, and Market Dynamics

7. Assess a company's position and uncover potential strategic agenda through diverse standardization endeavors, while cross-checking their technical expertise with the firm's patent portfolio.
8. Evaluate patent validity using GPT-search against PL (Patent Literature) and NPL (Non-PL) databases, guiding in-depth claim and feature-level mapping, and refining licensing negotiations.
9. Review how products relate to patents to determine Freedom to Operate (FTO) or Evidence of Use (EoU), connecting product descriptions, terminologies, and specs with patent claim terms.

Controllable Innovation and Explainable Investment Acumen

10. Maximize Standard Essential Patent (SEP) Return on investment (ROI) using 3GPP TS as an example, covering idea creation, patent filing, jurisdiction selection, essentiality validation, licensor status, and accelerated development for emerging SEPs.
11. Elevate the speed and quality of scientific publications.
12. Cultivate a forward-thinking mindset, discerning high-ROI research opportunities, harnessing early market advantages, grounding instincts in data, iterating hypotheses, recovering from failed attempts, and perpetually pursuing clarity amidst ambiguity.

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Apex Standards Proprietary GPT Model Code	ASG-00	ASG-05	ASG-06	ASG-10	ASG-11	ASG-20	ASG-21	ASG-22
Domain	paper-GPT	claim-validity-GPT	patent-drawing-GPT	3gpp-tdoc-GPT	etsi-ts-tr-GPT	ieee-802-dcn-GPT	ieee-802-std-GPT	wifi-6-GPT
Professional Community	University Professors, Research Institutes, Emerging Technology Trackers, Prior Non-Patent Art Searchers	Inventors, Prior Patent Art Searchers, Product Infringing and Standard Essentiality Investigators	Inventors and Investigators Seeking Illustrative Analysis for Patent Drawing Text Descriptions	3GPP Delegates, Telecom R&D, IPR-Patent Attorneys, Prior Non-Patent Art Searchers	ETSI Standard Searchers SEP Essentiality and Non-Essentiality Investigators	IEEE 802 Delegates, WLAN R&D, IPR-Patent Attorneys, Prior Non-Patent Art Searchers	IEEE 802.x Standard Searchers SEP Essentiality and Non-Essentiality Investigators	IEEE 802.11ax (Wi-Fi 6) Standard Searchers SEP Essentiality and Non-Essentiality Investigators
Training Data	Worldwide Academic Papers and Scientific Publications, Including Conference Papers and Journals	USPTO Patent Claims EPO Patent Claims Litigation Legal Grounds 35 U.S.C. §102/103 OA US Inter Partes Review US Post Grant Review EPO Opposition Proc.	USPTO Drawing Description Texts for Graphical Illustrations, Diagrammatic Views, Flowcharts, and Diagrams in the Descriptive Portions	3GPP TSG/WG TDoc Company Contributions 3GPP Email Reflectors TDoc Proposals Chairman Notes Change Requests Feature Lead Reports	ETSI TS Publications ETSI TR Publications Technical Section Clauses	IEEE 802.x Working Group Procedural Documents, Company Contributions	IEEE 802.x Standards, Amendments, Corrigenda, and Technical Section Clauses	IEEE 802.11ax (Wi-Fi 6/6E) Technical Section Clauses; IEEE 802.11ax Amendments: (1) WLAN (2) License-exempt (3) Wake-up Radio (4) Positioning (5) V2X
Year Span	1980 - present	1980 - present	1980 - present	1999 - present	1999 - present	2002 - present	2010 - present	2020 - present
Model Parameter	66 billion	66 billion	66 billion	66 billion	30 billion	30 billion	20 billion	20 billion
Max # CL Tokens	8191 tokens	8191 tokens	8191 tokens	8191 tokens	4095 tokens	4095 tokens	4095 tokens	4095 tokens

ASG-30	ASG-35	ASG-40	ASG-45	ASG-50	ASG-55	ASG-60	ASG-62	ASG-65
itu-t-GPT	ietf-rtt-GPT	open-ran-GPT	gsma-GPT	ngmn-GPT	atis-gpt	cybersec-GPT	qi-wireless-GPT	semicon-GPT
Researchers Cross-Checking ITU's Telecom and ICT (Information Communication Technology) Standards	Researchers Cross-Checking IETF and IRTF's RFC Drafts, Documents, Protocols, and IAB (Internet Architecture Board) Documents	Open-RAN Standard Searchers SEP Essentiality and Non-Essentiality Investigators	Researchers Cross-Checking GSMA Documents	Researchers Cross-Checking NGMN Alliance (Next Generation Mobile Networks) Documents	Researchers Cross-Checking U.S.-Driven 5G & 6G Initiatives, Industrial Applications and Economic Analysis	Researchers Cross-Checking Telecommunication Security and Cybersecurity Standards	Researchers Cross-Checking Wireless Charging Standards for Personal Devices	Researchers Cross-Checking Semiconductor Standards
ITU-T Standards and Recommendations	IETF/IRTF RFC (Request for Comment), Datatracker, Drafts, Mail Archive, and IAB Minutes	Open-RAN Alliance (O-RAN) Specifications	GSMA Specifications, Configurations, Guidelines, Whitepapers	NGMN Recommendations and Whitepapers	ATIS, 5G Americas, and Next G Alliance Market Research Reports, 6G Roadmaps and Whitepapers	IEC, IEEE Security, Cybersecurity and Cryptography Protocols and Standards	Qi (Chee) and Qi2 Wireless Charging Technical Specifications Defined by WPC (Wireless Power Consortium)	JEDEC, SEMI, and IEEE Semiconductor Standards
1990 - present	1969 - present	2018 - present	1998 - present	2008 - present	2001 - present	2000 - present	2011 - present	2000 - present
30 billion	66 billion	30 billion	20 billion	20 billion	20 billion	20 billion	20 billion	20 billion
4095 tokens	8191 tokens	4095 tokens	4095 tokens	4095 tokens	4095 tokens	4095 tokens	4095 tokens	4095 tokens

ASG-70	ASG-71	ASG-75	ASG-76	ASG-77	ASG-78	ASG-79	ASG-80	ASG-85
jvet-jctvc-mpeg-GPT	codec-GPT	iot-GPT	op-tech-GPT	automotive-GPT	uas-uav-GPT	medical-device-GPT	robotics-GPT	banking-GPT
JVET Delegates, MPEG Researchers, Codec R&D, IPR-Patent Attorneys, Prior Non-Patent Art Searchers	Audio-Video Codec Standard Searchers, SEP Essentiality and Non-Essentiality Investigators	Researchers Cross-Checking IoT (Internet of Things) Standards	Researchers Cross-Checking OT (Operational Technology) Hardware, Software and Security Standards	Researchers Cross-Checking 5G-AA (5G Automotive Association), COVESA (Connected Vehicle Systems Alliance prev. GENIVI), and AUTOSAR (Automotive Open System Architecture) Standards	Researchers Cross-Checking UAS (Uncrewed Aerial Systems) and UAV (Uncrewed Aerial Vehicles) Standards	Researchers Cross-Checking Medical Device Data Privacy, Security and Communication Standards	Researchers Cross-Checking Standards and Guidelines for the Design, Safety, Performance and Interoperability of Robotic and Automation Systems	Researchers Cross-Checking Electronic Transaction and Banking Standards
JVET (Joint Video Experts Team), JCT-VC Joint Collaborative Team on Video Coding, and ISO/IEC MPEG (Moving Picture Experts Group) Meeting Documents	ITU-T H.266 (VVC) ISO-IEC 23090-3; ITU-T H.265 (HEVC) ISO-IEC 23008-2; ITU-T H.264 (AVC) ISO-IEC 14496-10; AOM (AV1, VP9) Technical Clauses	IEC, IEEE IoT and ETSI M2M (Machine-to-Machine) Standards	5G-ACIA Whitepapers and Recommendations, IEEE, IEC Industry 4.0, Industrial Automation, Industrial IoT, Process Control Standards	5G-AA, COVESA, and AUTOSAR Recommendations, Publications and Whitepapers Covering Vehicle Communications, APIs, OEM Platforms, Vehicle Signal Ontologies, and Cellular V2X Standards	FAA Remote ID, IEEE, IEC, ASME, ASTM, IEEE, 3GPP Related UAS and UAV Related Standards	ASTM, IEC, IEEE Related Medical Device Standards	IEEE, IEC, RIA (Robotic Industries Association), JIS (Japanese Industrial Standards), DIN (German Institute for Standardization) Specifications	IEEE, IEC, RIA (Robotic Industries Association), JIS (Japanese Industrial Standards), DIN (German Institute for Standardization) Specifications
2010 - present	2018 - present	2010 - present	2010 - present	2003 - present	2010 - present	2010 - present	2002 - present	2018 - present
30 billion	30 billion	20 billion	20 billion	20 billion	20 billion	20 billion	20 billion	20 billion
4095 tokens	4095 tokens	4095 tokens	4095 tokens	4095 tokens	4095 tokens	4095 tokens	4095 tokens	4095 tokens

Apex Standards Domain-specific GPT Product Matrix. Abbreviations. **3GPP:** The 3rd Gen. Partnership Project. **ATIS:** Alliance for Telecom. Industry Solutions. **ETSI:** European Telecommunications Standards Inst. **TS:** Technical Specification. **TR:** Technical Report. **CR:** Change Request. **ASTM:** American Society for Testing & Materials. **ASME:** American Society of Mechanical Engineers. **IEC:** Intl. Electrotechnical Commission. **IEEE SA:** Inst. of Electrical & Electronics Engineers Standards Assoc. **ISO:** Intl. Org. for Standardization. **IETF:** Internet Engineering Task Force. **USPTO:** U.S. Patent and Trademark Office. **EPO:** European Patent Office. **OA:** Office Action. **RAN:** Radio Access Network. **SEP:** Standard Essential Patent. **CL Tokens:** GPT measures Context Length in tokens for a single process, with a limit on tokens for input and output combined. 1 token = ¾ words. For example, 3gpp-tdoc-GPT can process 6143 words; if a query used 2000 words, an answer with up to 4143 words may be returned.

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Perspective 2

The latest agreements regarding "remote sensing" and the comparison of company positions are as follows:

- Agreement on SL-PRS sequence design pattern:**
 - TOYOTA Info Technology Center proposed confirming the working assumption that allowed SL-PRS bandwidth values are pre-configured on a per resource pool basis.
 - Previous RAN1 meetings made relevant agreements on SL-PRS sequence design pattern.
 - In-Band Emission (IBE) interference was mentioned by multiple companies during the RAN1 meeting. [Ref 3: R1-2304411]
- Proposal on beam peak EIS reference sensitivity:**
 - Qualcomm proposed considering and further discussing beam peak EIS reference sensitivity for G50 receiver.
 - ZTE mentioned discussing options related to beam peak EIS reference sensitivity. [Ref 17: R4-2310315]
- Proposal on expanded and improved NR positioning:**
 - Intel Corporation proposed a revised WID on expanded and improved NR positioning.
 - The proposal was referenced as RP-230328 and discussed in RAN 99. [Ref 13: R1-2304967]
- Agreement on UE position estimation:**
 - Huawei and Hisilicon mentioned a globally unique identifier for a specific Ranging SL Positioning application, which can be mapped to a V2X service type or a ProSe identifier.
 - The estimate of the UE position relative to other network elements or UEs was also discussed. [Ref 18: S2-2306776]
- Integration of 3GPP sensing and non-3GPP sensor data:**
 - Huawei and Hisilicon expressed the need to integrate 3GPP sensing results from the network with data provided by non-3GPP sensors from the application layer domain.
 - Efficient sensing, aggregation of requests and notifications, and the use of historical sensing results were also highlighted. [Ref 11: S6-231836]

Differences in company positions:

- Companies like MediaTek Inc., CATT, Huawei, Hisilicon, Qualcomm Incorporated, Xiaomi, Intel Corporation, vivo expressed uncertainty about the usefulness of downlink positioning for remote UEs. [Ref 16: R2-2305850]
- NW-based sensing was mentioned as free of dependency on RAN PHY study by Huawei and Hisilicon, while UE-involved sensing was to be determined by RAN Working Groups. [Ref 19: S2-2306807]

Apex Standards 3gpp-tdoc-GPT (ASG-10) seamlessly extracts insights from the 3GPP TDoc database, offering structured understanding into the latest agreements in "remote sensing" and company viewpoints. Toyota InfoTech highlighted a pre-configured bandwidth proposal, echoing previous RAN1 conclusions, with In-Band Emission interference as a focal point, Qualcomm and ZTE address EIS sensitivity for G50 receivers: Intel's position regarding NR Positioning was marked by its proposal referenced as RP-230328; Huawei and Hisilicon introduced a distinctive identifier for Ranging SL Positioning, emphasizing UE's relational positioning; Concerning Data Integration: Huawei further emphasized melding 3GPP sensing with external sensor data, prioritizing efficient sensing and data utilization. Company differences are also highlighted - notably, companies like MediaTek expressed concerns on downlink positioning efficacy for distant UEs. ASG-10 enables deep dives into these complex scenarios and facilitates precise comparisons of diverse company views. Such capability translates to precision-driven reporting, crystallizing clarity and depth in the conveyed information.

Core Analysis and Foundational Insights

1. Thoroughly investigate topic queries such as "remote sensing" within 3GPP TDoc and beyond, utilizing intelligent GPT analysis for precision-driven reporting.

The integration of Apex Standards tdoc-GPT (ASG-10) and the 3GPP TDoc Analysis Platform (ASS-11) represents a major advance in analytical capabilities. With the dynamic nature of standardization, an eagle-eyed landscape view becomes paramount. ASS-11's intuitive visualization serves as a linchpin, deciphering intricate data into understandable, actionable insights. With visual representation, users can effortlessly navigate expansive data seas, expediting strategic decisions.

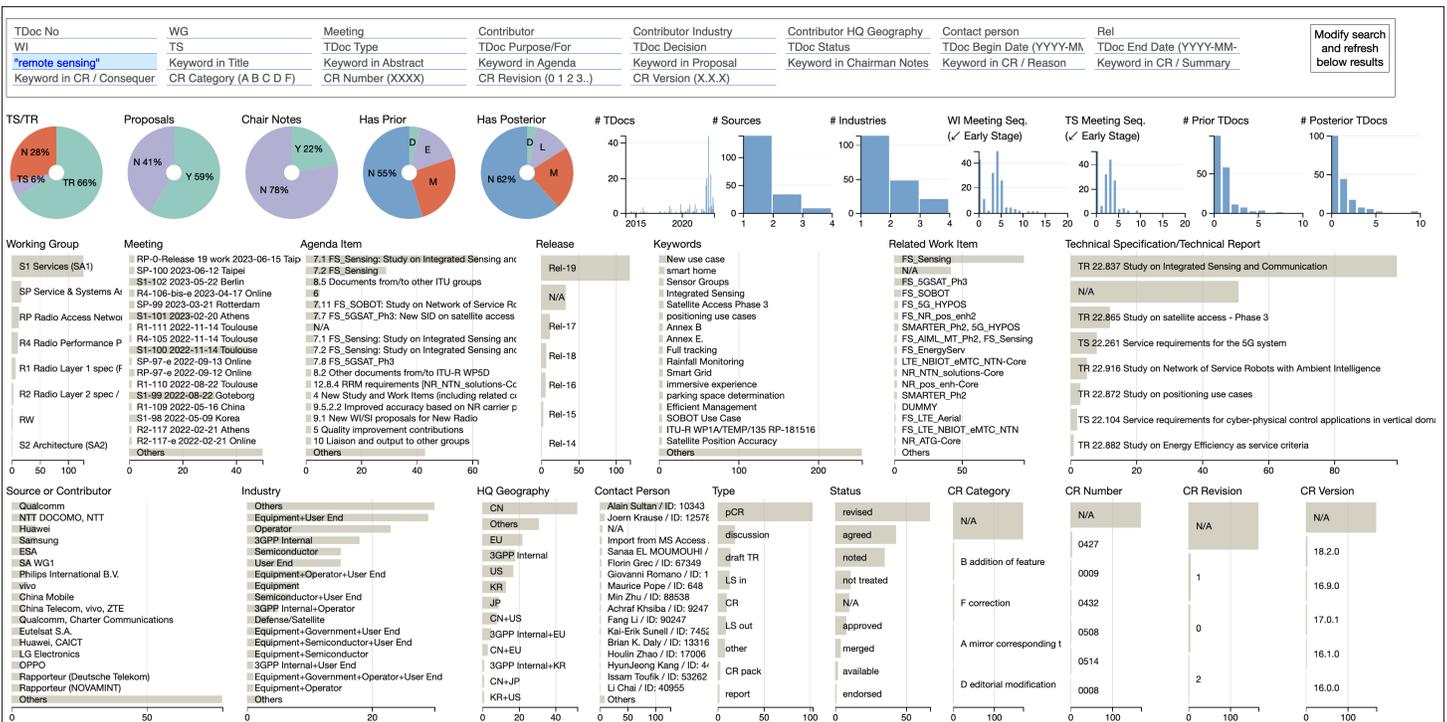
The system's strength is not just in its broad overview. Its ability to finely dissect information allows experts to iteratively customize their analysis based on evolving interests, such as contributors, timeframes, and beyond. This multi-dimensional perspective amplifies profound understanding throughout the research journey.

At its core, ASS-11 synergizes seamlessly with ASG-10's sophisticated textual analysis, forging a formidable duo in the realm of data interpretation. When navigating intricate scenarios or delving into subtle nuances, the AI-powered GPT engine stands out, brilliantly unveiling layered narrative intricacies. This meticulous approach, firmly anchored in textual dynamics, not only amplifies the depth of understanding but also strengthens the interwoven fabric of various concepts. Additionally, the robustness of this comprehension is deeply anchored in exhaustive

data assessments. Such scrutiny ensures that every piece of information, no matter how trivial, is taken into account, upholding the highest standards of due diligence. This unparalleled prowess, combined with the consistent efficiency, is a testament to the remarkable capabilities that ASG-10 affords.

Foundational analysis supported, investigating intricate topics like "remote sensing" becomes less data wading and more coherent narrative derivation. ASS-11's overview combined with ASG-10's AI-precision crafts a formidable industry toolkit.

ASS-11 and ASG-10 empower users to experience a symphony of insights, where each data point harmoniously converges into a clear, comprehensive picture of the evolving standardization landscape.



Apex Standards' 3GPP TDoc Analysis Platform (ASS-11) allows users to seamlessly retrieve and systematize TDocs that mention "remote sensing". The platform boasts an intuitive dashboard that highlights key participants and working groups discussing this theme. Notably, SA1, RAN4, and RAN1 emerge as the predominant working groups, indicated on the top left of the dashboard. Similarly, on the bottom left, Qualcomm, Huawei, Samsung, and the European Space Agency are identified as primary contributors. The dashboard's upper right quadrant presents relevant terms such as "smart home", "integrated sensing", and "satellite access", as well as work items like "FS_Sensing" and "FS_SGSAT_Ph3". It also includes references to specifications like TR 22.837, TR 22.865, and TS 22.261. The ASS-11 further refines the search experience with advanced filtering options, considering factors like TDoc status, contributor, date range, sub-topics, and more. This intricate platform perspective affords users a deep understanding of the ongoing global standardization landscape related to their topic of interest.

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Core Analysis and Foundational Insights

2. Cross-reference concepts such as "Zero Trust" in various standards, e.g., IETF, IEEE, 3GPP, and Open-RAN, and compare their feature statuses and alignments.

In an increasingly interconnected world, the depth and breadth of knowledge required to navigate complex topics like "Zero Trust" is vast. This is where tools like those offered by Apex Standards come into play, serving as invaluable resources for those striving to understand, implement, and perfect the principles of a concept that is foundational to modern digital infrastructure.

As integral as each tool might be in its own right, their collective power is exponentially greater. By enabling cross-referencing of "Zero Trust" along diverse standards like IETF, IEEE, 3GPP, and Open-RAN, these tools empower users to garner a holistic understanding. Such a capability is not merely an asset; it's a transformative feature, turning disparate pieces of information into a cohesive, multidimensional insight.

To grasp the significance of this, consider the task of a researcher. Approaching "Zero Trust" from a singular lens might offer in-depth knowledge but will invariably leave blind spots. These blind spots could be the difference between a groundbreaking discovery and an overlooked vulnerability. With the ability to seamlessly transition between standards, cross-referencing concerns, and solutions, researchers can attain a more complete picture, facilitating more effective and innovative solutions.

Policy makers, entrusted with the monumental task of creating regulations and guidelines, stand to benefit immensely as well. A policy derived from a singular viewpoint risks being myopic and potentially inadequate in addressing the multifaceted challenges of the digital realm. However, when policy makers have access to a toolset that provides viewpoints from varied domains, they can craft regulations that are both comprehensive and adaptive. Such policies are not just reactive but proactive, foreseeing potential challenges and addressing them before they escalate.

Apex Standards' suite of tools, with its intricate cross-referencing capabilities, represents more than just a compendium of knowledge. It's a testament to

the collaborative spirit of the digital age. Each standard is a culmination of expertise from countless professionals. By facilitating the juxtaposition of these standards, Apex Standards is fostering a collaborative approach to understanding and problem-solving. This collaborative spirit is essential in an age where challenges are complex, and solutions require interdisciplinary cooperation.

Furthermore, the meticulous referencing within each standard acts as a roadmap to deeper knowledge. For those willing to dive into the depths of a topic, these references are akin to guiding stars, leading the way to more specialized resources and insights. This not only ensures thorough research but also cultivates a culture of continual learning and exploration.

In essence, the tools offered by Apex Standards exemplify the evolution of knowledge acquisition and dissemination in the digital age. They underscore the importance of holistic understanding, collaborative problem-solving, and continual exploration. The ability to cross-reference "Zero Trust" across varied standards is not just a feature; it's a revolution in how we approach, understand, and solve the challenges of our interconnected world. For researchers, policymakers, and every professional in between, this capability is both a gift and a tool, opening doors to unprecedented insights and solutions.

1. Issue 1: Missing parameters in the RRCReconfiguration message
 - Reference: [Ref 1: C1-233019], [Ref 4: C4-232033], [Ref 5: R3-232570], [Ref 16: S5-233834], [Ref 10: S4-230755]
 - The parameters transmissionOfSessionStartStop and ran-VisibleParameters are missing in the RRCReconfiguration message.
 - This issue was identified after a review of the attached CR S5-232115 to TS 28.405.
 - It needs to be corrected to ensure proper functionality in the RAN2 specifications.

Agreements regarding "zero trust":

1. Agreement 1: Remote UE reporting UE-UE link failure to gNB
 - Reference: [Ref 19: R2-2305282]
 - It was agreed in the RAN2 121bis-e meeting that remote UE can report UE-UE link failure to gNB.
 - However, there are still remaining open issues related to how the remote UE detects the UE-UE link failure.
 - This agreement provides a basis for further discussions and improvements in the RAN2 specifications.
2. Agreement 2: RAN1 agreements for Rel-18 NR RedCap
 - Reference: [Ref 18: R1-2305960]
 - This agreement lists the RAN1 agreements made for the Rel-18 WI on Enhanced support of reduced capability NR devices.
 - The agreement is documented in the RAN1 contribution and provides important information for the development of the WI code NR_redcap_enh-Core.

Apex Standards 3gpp-tdoc-GPT (ASG-10): The topic of "Zero Trust" as addressed within 3GPP is cross-referenced with TDoc IDs associated with each sub-topic for clarity and

Issues:

1. The zero trust architecture (ZTA) demands a high level of security controls and monitoring which some organizations might find challenging to implement. This includes the principle of least privilege, continuous monitoring and logging, and data confidentiality and protection [Ref 15: ORAN-WG11-SharedORU-Security-Analysis-TR.0-R003-v02.00.docx].
2. The architecture calls for micro-perimeters for each asset. This might be time-consuming and resource-intensive [Ref 7: ORAN-WG11-SharedORU-Security-Analysis-TR.0-R003-v02.00.docx].
3. The zero trust model involves a significant shift from traditional security models. It might introduce complexities due to the need for detailed logging and management of security incidents [Ref 3: O-RAN.WG11.Security-Log-Management-TR.0-R003-v01.00.docx].

Agreements:

1. The zero trust model can help improve the security of shared O-RU assets by establishing micro-perimeters for each asset, and not implicitly granting trust to assets or users [Ref 7: ORAN-WG11-SharedORU-Security-Analysis-TR.0-R003-v02.00.docx].
2. The NIST SP 800-207 guidelines define the necessary components of a zero trust architecture, and there is agreement that these guidelines provide a robust framework for implementing zero trust [Ref 15: ORAN-WG11-SharedORU-Security-Analysis-TR.0-R003-v02.00.docx].
3. The ZTA model can help secure the attack surface of the Shared O-RU, including functions, interfaces, and information, which each have assets that should be protected [Ref 17: ORAN-WG11-SharedORU-Security-Analysis-TR.0-R003-v02.00.docx].

Apex Standards open-ran-GPT (ASG-40) provides a comprehensive exploration of "Zero Trust" in Open RAN, with a focus on software and virtualization requirements.

The issues and agreements regarding "zero trust" are largely centered on trust relationships and their establishment in the given context.

The issues raised include the question of why there is a need for the STA to be involved and why it can't trust the infrastructure [Ref 6: 11-06-1606-00-000r-october-ad-hoc-meeting-notes.doc]. There are concerns about the absence of authentication and a lack of a fundamental security in the proposed system, as the STA needs a reason to trust the key [Ref 18: 11-22-0165-00-000h-tghm-minutes-interim-meeting-january-2022.docx]. There are also questions about the trust model and the need to clearly identify assumptions on trust relationships. The guarantee of a trust relationship cannot be assured since the authentication process of RO and R1 key holders has not been specified [Ref 3: 11-06-1575-01-000r-tgr-teleconference-minutes-oct-nov-2006.doc].

The agreements, on the other hand, emphasize the need to establish a trust model that everyone can agree on [Ref 4: 11-06-1575-02-000r-tgr-teleconference-minutes-oct-nov-2006.doc]. Some mechanisms can be used without prior agreements, but there is a need to agree on terms if necessary [Ref 8: 11-22-0164-01-00bi-january-2022-interim-minutes.docx]. It is also agreed that assumptions on trust relationships should be clearly identified, and what can and cannot be done should be understood [Ref 2: 11-06-1575-01-000r-tgr-teleconference-minutes-oct-nov-2006.doc].

Apex Standards ieee-802-dcn-GPT (ASG-21) discusses "Zero Trust" within IEEE 802 Working Groups' local area network environments, encompassing Wi-Fi scenarios and IoT trust challenges.

The concept of "zero trust" revolves around the idea that no user or system should be automatically trusted, irrespective of whether they are internal or external to an organization. Trust needs to be continually validated and authenticated to ensure the security of the system [Ref 16: rfc7556.txt]. This negates the assumption of trust often associated with peers, as suggested in [Ref 4: rfc8496.txt].

However, there are issues associated with this model. For instance, it could be challenging to avoid a third-party trust anchor, despite the recommendations to do so [Ref 3: rfc8061.txt]. Furthermore, the trust relationship needs to be validated, and the mechanisms for this can be complex [Ref 16: rfc7556.txt].

On the other hand, the zero trust model can provide a unified trust point, as depicted in Figure 10 Unifying Trust Point (Unifying Domain) Model 3.3.2. This could mean that relying parties only need to use the trust anchor of their PKI domain, simplifying the process [Ref 7: rfc5217.txt].

The zero trust model requires careful consideration of trust list considerations [Ref 14: rfc5217.txt]. It also necessitates the development of specific conventions and terminology [Ref 17: rfc8498.txt]. This can be seen as both an agreement to the necessity of the model and an issue in its complexity and implementation.

Apex Standards ietf-gpt (ASG-35) delves into the intricacies of "Zero Trust" within the realm of cybersecurity and internet architectures as addressed in IETF RFCs and Drafts.

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Core Analysis and Foundational Insights

3. Mitigate human errors and procrastination, achieve consistent performance, understanding diverse domains to reduce oversights, and harnessing the power of context-aware synonyms.

GPT can enhance core analysis in the following fundamental ways:

Mitigating human errors: Human errors are a common problem in any professional setting. They can be caused by fatigue, boredom, or lack of attention to detail. GPT can help to mitigate human errors by providing consistent performance and by offering insights and information that can help to prevent mistakes.

Reducing procrastination: Procrastination is a common problem that affects

professional performance. GPT reduces procrastination by providing instant insights and information that can help professionals to make decisions more quickly.

Preventing oversights: Oversights are often caused by a lack of understanding of the different perspectives involved in a project. GPT can help to prevent oversights by providing access to a vast knowledge base and by suggesting context-aware synonyms that can help to ensure clarity of communication.

Stimulating incremental innovation: GPT can help to stimulate incremental innovation by suggesting new ideas that build on existing ones. This can help to foster an environment where progress is consistently made.

Enhancing communication: GPT's ability to clarify adds another layer of precision to communication. This ensures clarity and professionalism in one's career.

<p>- Proposed new solutions for BS energy saving:</p> <ol style="list-style-type: none">1. Dynamic cell activation technique: This solution involves dynamically activating and deactivating cells based on the traffic load and user demand. By only activating cells when needed, energy consumption can be significantly reduced. This solution can be compared with static cell activation techniques that keep all cells active at all times. [Ref 15: R2-2305337]2. Sleep mode optimization: This solution involves optimizing the sleep mode parameters, such as the sleep duration and periodicity, to minimize energy consumption while maintaining the required quality of service. This solution can be compared with fixed sleep mode parameters that may not be optimized for the network conditions. [Ref 4: R4-2307703]3. Energy-efficient beamforming: This solution involves optimizing the beamforming algorithms to minimize the energy consumption while maintaining the desired signal quality. This can be achieved by dynamically adjusting the beamforming weights and directions based on the channel conditions and user requirements. This solution can be compared with conventional beamforming techniques that may not prioritize energy efficiency. [Ref 10: R2-2305025]
<p>- Comparison of new solutions with old ones:</p> <ol style="list-style-type: none">1. The dynamic cell activation technique can be compared with static cell activation techniques in terms of energy savings achieved and impact on network performance. The dynamic technique may provide more efficient energy usage by activating cells only when necessary, while the static technique keeps all cells active at all times, leading to higher energy consumption.2. The sleep mode optimization solution can be compared with fixed sleep mode parameters in terms of energy savings and impact on user experience. The optimized sleep mode parameters may result in lower energy consumption without compromising the quality of service, while fixed parameters may not be tailored to the specific network conditions.3. The energy-efficient beamforming solution can be compared with conventional beamforming techniques in terms of energy savings and signal quality. The energy-efficient technique may achieve similar or better signal quality while consuming less energy, compared to traditional beamforming techniques.
<p>- Practical use cases for BS energy saving techniques:</p> <ol style="list-style-type: none">1. Urban areas with high population density: Optimizing energy consumption in BSs can help reduce operational costs and improve sustainability in densely populated areas where energy demands are high.2. Rural or remote areas with limited power infrastructure: Investigating the use of renewable energy sources and energy harvesting technologies can enable the deployment of BSs in regions with limited access to the power grid, ensuring reliable and sustainable network coverage.3. Mobile network operators aiming to reduce their carbon footprint: Implementing energy-saving techniques in BSs can contribute to the overall environmental sustainability goals of mobile network operators by reducing greenhouse gas emissions and energy consumption.
<p>- Technical details to consider in the research areas and proposed solutions:</p> <ol style="list-style-type: none">1. Performance metrics to evaluate the effectiveness of energy-saving techniques, such as energy efficiency, network capacity, and user experience.2. System-level simulations or field trials to validate the proposed solutions and compare them with existing techniques in real-world scenarios.3. Consideration of different deployment scenarios, such as urban, suburban, and rural areas, to assess the scalability and adaptability of the proposed solutions.4. Standardization efforts to ensure interoperability and compatibility of energy-saving techniques across different vendors and network deployments.

Starting Point GPT assistance can spark innovative ideas and provide valuable starting points. For example, 3gpp-tdoc-GPT (ASG-10) can be used to effectively prepare for upcoming 3GPP meetings. RAN Working Groups (WGs) are tasked with identifying new physical domains ripe for enhancement and standardization. Every quarterly WG meeting is an opportunity to introduce and discuss these technical advancements. For example, RAN WGs are recently exploring areas concerning energy-saving techniques in Radio Access Network Base Stations. This is because 5G could consume up to 1,000 times as much energy as today's networks, in order to match its promise of delivering up to 1,000 times as much data. Energy efficiency is becoming a hot topic at 5G deployment conferences, as concerns over this issue grow. By presenting novel solutions alongside established methods, we can streamline the thought process. This not only alleviates the pressure on standardization delegates and back-office researchers, but it also automates the ideation phase, minimizes inertia and procrastination, and fosters proactive engagement.

<p>To propose new Machine Learning Optimization methods to improve energy efficient beamforming, we can consider the following:</p> <ol style="list-style-type: none">1. Reinforcement Learning-based Optimization: Implement a reinforcement learning algorithm that learns the optimal beamforming weights and directions through trial and error. The algorithm can use rewards or penalties based on energy consumption and signal quality to guide the learning process. This approach allows the system to continually adapt and optimize the beamforming parameters based on the current channel conditions and user requirements.2. Genetic Algorithm-based Optimization: Use a genetic algorithm to search for the optimal beamforming weights and directions. The algorithm can generate a population of candidate solutions and iteratively evolve them through selection, crossover, and mutation operations. The fitness function can be defined based on both energy consumption and signal quality, allowing the algorithm to find a balance between the two objectives.3. Convolutional Neural Network-based Optimization: Train a convolutional neural network (CNN) to predict the optimal beamforming weights and directions based on the input channel conditions and user requirements. The CNN can be trained using a large dataset of labeled examples, where the inputs are the channel conditions and user requirements, and the outputs are the optimal beamforming parameters. This approach allows for fast and efficient optimization without the need for iterative search algorithms.
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Step-by-Step Innovation With GPT, researchers have the capability to delve into topics and uncover more opportunities for standardization, while also suggesting improved solutions. For instance, if someone seeks enhancements regarding energy-efficient beamforming, they might use a prompt such as "Please suggest new Machine Learning Optimization methods for energy-efficient beamforming." This builds upon a prior GPT recommendation that suggests "Optimizing beamforming algorithms to conserve energy while ensuring optimal signal quality. This is realized by dynamically tweaking beamforming weights and directions based on channel conditions and user needs, contrasting traditional techniques that might not focus on energy efficiency." Given this foundation, researchers can further explore AI/ML-centric areas, such as "Reinforcement Learning-based Optimization, Genetic Algorithm-based Optimization, and Convolutional Neural Network-based Optimization" to attain the desired energy-saving objectives.

<p>Potential inefficiencies that may inadvertently consume energy in the reinforcement learning-based optimization method for beamforming include:</p> <ol style="list-style-type: none">1. Inadequate reward or penalty design: If the rewards or penalties based on energy consumption and signal quality are not properly designed, the reinforcement learning algorithm may not converge to an optimal solution efficiently. This can result in unnecessary energy consumption as the system continuously explores suboptimal beamforming parameters.2. Inaccurate channel condition estimation: The algorithm relies on accurate channel condition information to optimize the beamforming parameters. If the channel conditions are not estimated correctly, the algorithm may make incorrect decisions that lead to inefficient energy consumption.3. Insufficient exploration-exploitation balance: Reinforcement learning algorithms require a balance between exploration (trying out different beamforming parameters) and exploitation (using the best-known parameters). If the algorithm leans too much towards exploration, it may consume excessive energy in the process of trial and error.

Balanced View and Blindspot Awareness When proposing a method to address an existing problem, it's crucial to recognize that new issues can arise. To ensure that R&D resources are optimally used, it's vital to adopt a balanced perspective and to foresee potential challenges from the outset. Take, for instance, the method titled "Reinforcement Learning-based Optimization (RLBO)." This method involves implementing a reinforcement learning algorithm that adjusts beamforming weights and directions based on trial and error. It utilizes rewards or penalties derived from energy consumption and signal quality to steer the learning. This strategy enables the system to consistently tweak the beamforming parameters according to the prevailing channel conditions and user demands. However, one should ask: What potential inefficiencies might unintentionally increase energy consumption within this method? A few considerations include: Inadequate design of rewards or penalties; Erroneous estimations of channel conditions; An imbalance between exploration and exploitation. These factors can undermine the effectiveness of the otherwise promising "Reinforcement Learning-based Optimization" method.

APEX STANDARDS

Domain-specific GPT Product Matrix and Strategic Use Case Scenarios

Company viewpoints regarding "virtual reality" and application scenarios:

InterDigital Communications:

- Emphasizes the use of 3D capture and reconstruction for real-time generation of realistic 3D representations, enabling more immersive communication between people. [Ref 16: S4-230935]
- Highlights the convergence between real and virtual realities through the use of point clouds, which provide a more realistic rendering and a natural mixed reality (MR) experience. Users wearing headsets or smartphones can view content inside a 3D VR scene or an AR MR application. [Ref 17: S4-230935]
- Presents a use case of free navigation, where users can watch a sports match or concert from the perspective of multiple cameras. This use case is suitable for both 2D devices with UI controls and VR headsets for a more immersive experience. [Ref 12: S4-230935]
- Envisions the engagement of viewers through the insertion of point cloud models in VR environments, making programs funnier and more memorable. [Ref 13: S4-230935]
- Suggests the potential of virtual reality for capturing events and allowing viewers to freely navigate and change their viewpoints. [Ref 15: S4-230935]

vivo:

- Highlights the concept of a virtual human, which can be a digital assistant driven by an AI model. Mobile metaverse services offer opportunities for socialization and entertainment, combining the user experience of the virtual and real worlds. [Ref 7: S1-231585], [Ref 9: S1-231163]
- Mentions the use of motion capture devices, vibrating backpacks, haptic gloves, and VR glasses for driving virtual humans in a meta-universe space. These devices are 5G UEs that collaborate with each other to complete user actions and provide real-time feedback. [Ref 18: S1-231163]
- Focuses on the importance of motion-to-photon latency, which should be kept below 20ms to ensure a seamless experience for players using VR glasses and other haptic devices. [Ref 19: S1-231585], [Ref 20: S1-231163]

Samsung, Huawei, and CATT:

- Mention the participation and passive observation of virtual reality events, such as basketball, as potential application scenarios. [Ref 14: S1-231623], [Ref 8: S1-231767]
- Highlight the presentation of AR content, including feature-length movies, on virtual screens. [Ref 14: S1-231623], [Ref 8: S1-231767]

Overall, the differences in company viewpoints lie in their emphasis on specific use cases and technical details. InterDigital Communications focuses on the use of 3D capture and reconstruction, point clouds, and free navigation scenarios. Vivo emphasizes the concept of virtual humans, mobile metaverse services, and the use of motion capture devices. Samsung, Huawei, and CATT mention participatory and passive observation of virtual reality events and the presentation of AR content on virtual screens.

Standardization delegates can utilize Apex Standards 3gpp-tdoc-GPT (ASG-10) for the latest insights on virtual reality and related mobile metaverse services.

Interoperability Standardization: Horizontal Synergy and Vertical Integration

4. Revolutionize the traditional standardization approach with GPT-powered automation, ranging from scrutinizing competitors' contributions to comparing, and defending fresh ideas.

Standardization, traditionally, has been a meticulous process. Historically, it entailed sifting through enormous volumes of data, scrutinizing the contributions of competitors, and laboriously weighing different ideas against each other. Such methods, although thorough, were tedious and prone to human errors. They easily overlooked innovative concepts or missed pivotal opportunities due to the sheer volume of information and the manual nature of the comparisons.

Enter the Apex Standards GPT tool. This novel tool has significantly transformed the way we approach standardization. Leveraging the capabilities of GPT and AI technologies, it can autonomously analyze the contributions of competitors. This allows for swift and efficient comparisons with new proposals. But its benefits aren't merely limited to automated comparisons. A unique aspect of the tool is its ability to robustly advocate for fresh and innovative concepts. It ensures that groundbreaking ideas are not simply pushed to the sidelines.

Furthermore, the Apex Standards GPT tool places a renewed emphasis on creativity and innovation. It isn't just a tool for those who want to follow established norms and standards. Instead, it's tailor-made for tech enthusiasts and professionals who

REDEFINING STANDARDIZATION IGNITING SYNERGY UNLEASHING IMAGINATION FOR OUR CURIOUS INQUISITORS

are constantly seeking new solutions to existing problems. The AI doesn't just lead users down well-trodden paths; it encourages exploration into the unknown. By delivering valuable insights, making pertinent comparisons, and offering thoughtful recommendations, the tool inspires users to venture beyond traditional boundaries and think outside the box.

While efficiency is a prominent feature of the Apex Standards GPT tool, its true value lies in its ability to cultivate creativity and forward-thinking. This isn't just another tech tool designed solely for optimization. Its purpose goes deeper. The tool beckons its users to explore areas not previously charted, to look beyond the conventional, and to dream big. By doing so, it stimulates a kind of thinking that isn't confined by boundaries.

At its core, the Apex Standards GPT tool has evolved into more than just a technical assistant. It has become a vibrant platform that aims to spark collaboration and synergy among its users. It endeavors to reshape our very perception of what standardization can be, making it a dynamic, creative process rather than a static, rule-bound one. The tool is also a beacon for innovators, researchers, and tech aficionados worldwide,

championing their innate curiosity and pioneering spirit.

Apex Standards GPT tool is redefining standardization. By blending automation with inspiration, it's not just simplifying the process but also making it a breeding ground for creativity and innovation. The tool stands as a testament to the limitless potential that emerges when technology and human imagination converge.

New and possibly emerging application scenarios for the next level of standardization, which are not yet mentioned in the references, could include:

1. **Virtual Tourism:** Users can explore and experience different tourist destinations through virtual reality. They can view the point cloud representations of real-world locations and navigate through them as if they were physically there. This would provide a more immersive and realistic travel experience.
2. **Remote Real Estate Viewing:** Real estate agents can use point clouds and mixed reality applications to showcase properties to potential buyers remotely. Users can wear headsets or use smartphones to view realistic 3D representations of properties and virtually walk through them. This would save time and resources for both buyers and sellers.
3. **Virtual Design and Prototyping:** Architects, engineers, and designers can use point clouds and mixed reality to visualize and iterate on their designs. They can create virtual 3D models of buildings, products, or prototypes and view them in a mixed reality environment. This would allow for better collaboration, faster design iterations, and more accurate visualization.
4. **Virtual Training and Simulation:** Point clouds and mixed reality can be used for training purposes in various industries. For example, medical students can practice surgeries in a virtual operating room, pilots can simulate flight scenarios, and firefighters can train for emergency situations. This would provide a safe and realistic training environment.
5. **Virtual Museums and Exhibitions:** Point cloud technology can be used to create virtual museums and exhibitions, allowing users to explore historical artifacts and artworks in a virtual environment. Users can view high-resolution 3D representations of the objects and interact with them through mixed reality applications. This would make cultural heritage more accessible to a wider audience.

GPT's tools herald groundbreaking applications, pushing the boundaries of next-gen standardization. They introduce innovative scenarios such as Virtual Tourism, offering users vivid travel adventures. Remote Real Estate Viewing simplifies property showcases, while Virtual Design and Prototyping empower seamless collaborations. Training evolves with ultra-realistic virtual simulations, ensuring expertise across various fields. Moreover, Virtual Museums make cultural treasures easily accessible, broadening horizons for all. These new use case scenarios, previously unmentioned in TDoc documents, underscore GPT's vast transformative reach to discover new ideas.

APEX STANDARDS

Domain-specific GPT Product Matrix and Strategic Use Case Scenarios

Whitepaper
GPT Product Matrix
Scenario 5

The Advanced Driver Assistance Systems (ADAS) incorporate various automation systems to control the vehicle functions such as adaptive cruise control, automatic parking, and lane assist, using IoT sensors and OT. These systems operate on different levels of automation, with Levels 4 and 5 representing high to full automation, respectively. A number of related issues can be considered in this context:

- 1. Distributed Automation System:** The automation systems in vehicles operate on a distributed basis, using local automation functions to control different systems like the motor speed [Ref 5]. These systems are interconnected through wireless communication, enabling them to exchange information [Ref 13].
- 2. Device Density and Communication:** The density of devices and sensors can be high in these systems, requiring robust communication networks for efficient operation [Ref 11].
- 3. Infrastructure and Mobility:** The systems might require infrastructure components and should be able to handle the mobility of devices, including their speed and range of movement [Ref 17].

10 File Source 5G-ACIA_Performance_Testing_of_5G_Systems_for_Industrial_Automatin_single-pages.pdf:

Paragraph: Physical link Logical link Output module Input module PLC M Source: 5G-ACIA White Paper Performance Testing of 5G Systems for Industrial Automation 9 The physical system is controlled by the distributed automa- tion system, which uses local automation functions to con- trol the physical system, e. g. to set the motor speed.

Keywords: Physical link Logical link Output module Input module PLC M Source: 5G-ACIA White Paper Performance Testing of 5G

11 File Source 5G for low latency industrial networks by Qualcomm.pdf:

Paragraph: Density is the number of endpoint devices within the service area. Especially where sensors are used, densities may be very high relative to today s wide-area cellular networks. Robotic Motion Control Example One of the most demanding use-case categories for any networking system is robotic motion control.

Keywords: Density is the number of endpoint devices within the service area.

12 File Source 5G-ACIA_Performance_Testing_of_5G_Systems_for_Industrial_Automatin_single-pages.pdf:

Paragraph: Infrastructure components might be present, and the wireless modules are able to com- municate with multiple devices. A given wireless industrial automation system will always comprise the three systems depicted in Figure 3: physical production system, distributed automation system and wire- less communication system. However, in reality, these systems are distributed and the re- lationship between them will be more complex, i. e. as shown in Figure 4.

Keywords: Infrastructure components might be present, and the wireless modules are able to com- municate with multiple devices.

Apex Standards op-tech-GPT (ASG-76) reveals 5G-ACIA (5G for Connected Industries and Automation) focuses on Advanced Driver Assistance Systems (ADAS), which use IoT and OT for automation functions like adaptive cruise control. These systems need distributed automation, robust communication networks due to device density, and flexible infrastructure for device mobility.

Interoperability Standardization: Horizontal Synergy and Vertical Integration

5. Unearth the links among vertical sectors and cross-industry guidelines, encapsulating directives from IEEE, IoT, Operational Technology, 5G-ACIA, and 5GAA Automotives.

The automotive sector is undergoing a rapid transformation, driven by the advancement of technology. This transformation is characterized by the increasing connectivity and intelligence of vehicles, which is blurring the lines between automotive, telecommunications, and digital technologies.

To ensure that this transformation is coordinated and efficient, it is essential to cross-check vertical sectors with cross-industry guidelines. This is because the technology that enables the transformation no longer exists in silos. For example, Vehicle-to-Everything (V2X) communication, which is a cornerstone of modern transport, relies on vehicles communicating with various elements, from other vehicles to pedestrians and networks. Ensuring that these interactions are harmonized, efficient, and safe requires stringent standards, which can only be achieved when industry guidelines are diligently cross-referenced.

Two of the key technologies driving the transformation of the automotive sector are Operational Technology (OT) and the Internet of Things (IoT). OT refers to the use of sensors, software, and other technologies to monitor and control physical systems. IoT refers

to the network of physical devices that are embedded with sensors and software that enable them to collect and exchange data.

OT and IoT are playing a pivotal role in the development of advanced driver assistance systems (ADAS), which integrate systems like adaptive cruise control and lane assist. They are also laying the groundwork for autonomous vehicles, which are vehicles that can drive themselves without human intervention.

Aside from OT and IoT, several standard-setting organizations play key roles, including 3GPP, IEEE, 5G-ACIA, and 5GAA. 3GPP establishes standards for long-range mobile communications, while IEEE focuses on standards for electronics and IT, especially when vehicles communicate over shorter distances. On the other hand, 5G-ACIA is dedicated to integrating connected industries with automation, while 5GAA champions the development and implementation of 5G specifically for the automotive industry. They work together to develop the standards and technologies that will enable the safe and efficient operation of connected and autonomous vehicles.

The transformation of the automotive sector is a complex and challenging undertaking. However, by using APEX Standards GPT tools to cross-check vertical sectors with cross-industry guidelines, OT and IoT technologies, and other emerging technologies, it is possible to streamline these manual standardization processes, which can altogether create a safe, efficient, and interconnected transport ecosystem for the future.

From 5G-ACIA & 5GAA Verticals through OT & IoT Applications to 3GPP & IEEE Standardization Charting Autonomous Roads Ahead

The issues related to Advanced Driver Assistance Systems (ADAS) and levels of automation revolve around technology, efficiency, safety, and standardization.

One of the primary issues is the development of a standardized interface for different types of sensors, particularly camera sensors, used in automated driving functions [Ref 15: AUTOSAR_RS_AutomatedDrivingInterfaces.pdf]. This standardization is essential for achieving efficient communication between sensors and data fusion units, which are pivotal to the functioning of automated driving systems [Ref 14: AUTOSAR_RS_AutomatedDrivingInterfaces.pdf].

The increasing use of 5G-V2X (Vehicle-to-Everything) technology is expected to enhance efficient and safe driving. However, its mass rollout and successfully integrating it with vehicle connectivity for advanced automated driving and safety use cases is a challenge that is projected to be overcome by 2025 [Ref 9: 5GAA].

Another issue is the anticipation of additional automated driving functionalities from 2026. The specifics of these functionalities and how they will fit into existing systems and standards is an area of concern [Ref 3: 5GAA].

The safety of ADAS is a constant concern. While they are designed to increase safety by providing a second set of eyes on the road, there are concerns about their reliability and effectiveness in all situations. The sensors must be able to detect lane departures, road signs, speed limits, other vehicles, pedestrians, and other objects accurately and in real-time to prevent accidents [Ref 10: COVESA - Feb242014 Industry standards tune up tomorrow's vehicles - Embedded Computing Design.pdf].

Apex Standards automotive-GPT (ASG-77) can be used to compare the focuses of different automotive standardization alliances. These alliances all address the challenges of Advanced Driver Assistance Systems (ADAS) and vehicle automation, which involve technology, efficiency, safety, and standardization. The 5G Automotive Association (5GAA), based in Germany, focuses on the development and deployment of 5G-V2X (Vehicle-to-Everything) technology. This technology could improve the efficiency and safety of driving by allowing vehicles to communicate with each other and with infrastructure. AUTOSAR (AUTomotive Open System Architecture), another German-led organization, focuses on the standardization of interfaces for different sensors used in automated driving functionalities. This standardization is essential for ensuring that the sensors can communicate effectively with each other and with the vehicle's computer system. The Connected Vehicle Systems Alliance (COVESA), based in California, focuses on the safety of ADAS. They work to ensure that sensors can reliably detect and respond to objects on the road, such as lane markers, road signs, and pedestrians. These organizations are working together to shape the future of vehicle communication software platforms.

APEX STANDARDS

Domain-specific GPT Product Matrix and Strategic Use Case Scenarios

Whitepaper
GPT Product Matrix
Scenario 6

NGMN discusses several key topics regarding quantum attacks. These include:

1. The potential for attackers to tap the fronthaul link in 5G networks, especially when the O-RU and O-DU are not located on the same physical site. This could lead to threats not only about sniffing but also about changing or inserting traffic [Ref 12: 200316-NGMN-LS-on-Security-consideration-of-Low-Layer-Split-in-O-RAN.pdf].
2. The storage of sensitive security assets at the edge of networks could present a vulnerability. If these assets are compromised, attackers could maliciously reuse them to gain connectivity or carry out spoofing, eavesdropping, or data manipulation attacks [Ref 14: 161028-NGMN-5G_Security_MEC_ConsistentUEExp_v1.3_final.pdf].
3. The design of the entire telecommunication security by 3GPP has taken a static approach, with the best effort in designing the behaviour and analysing potential key attack issues as a design defence principle. However, the actual deployment of networks and the defence mechanism can differ, creating potential vulnerabilities [Ref 9: 210726-NGMN-Sustainable-Trust-V1.0.pdf].
4. Variety in industry use cases and configurations of TDD in public macro networks can introduce additional challenges in the co-existence of TDD networks with differing frame structures, potentially making them more vulnerable to quantum attacks [Ref 11: 220117-5G-TDD-UpLink-White-Paper-v1.0.pdf].

Apex Standards ngmn-GPT (ASG-50) offers a lucid understanding of the activities related to NGMN - in this example - its approach towards quantum attacks and their inherent vulnerabilities. The tool methodically details NGMN's influences, additionally, in relation to other standards like 3GPP. It structurally breaks down its answer into: (1) Identification of potential attack vectors; (2) Evaluation of the likelihood and potential impact of each vector; (3) Crafting of appropriate mitigation strategies. This clarity is a boon for researchers. Whether they're well-versed with NGMN's initiatives or are exploring them anew, the well-organized information ensures swift and easy comprehension of the topic.

Interoperability Standardization: Horizontal Synergy and Vertical Integration

6. Decode industry benchmarks set by entities such as NGMN, GSMA, Next G Alliance, and 5G Americas, identifying key applications and tracking the evolution from industrial aspirations to tangible tech solutions.

The development of 6G wireless technology is underway, with various global organizations taking the lead. Each has its unique regional focus and expertise, emphasizing the importance of a coordinated approach to build a cohesive global 6G framework.

The Next Generation Mobile Networks Alliance (NGMN) is leading the way in Europe. The NGMN is a non-profit organization that brings together mobile operators, vendors, and research institutions to define and shape the future of mobile networks. The NGMN has a strong track record of collaborating with other organizations, such as the 3GPP, IEEE, and GSM Association, and its work has had a significant impact on the development of mobile standards.

The NGMN's vision for mobile broadband is based on system characteristics, future network recommendations, and detailed requirements. The NGMN believes that 6G should be a global standard that meets the needs of all stakeholders, and it is working to ensure that 6G development is coordinated across different regions.

The GSM Association (GSMA) is another key player in the European 6G landscape. The GSMA is a trade association that represents the interests of mobile operators worldwide. The GSMA is focused on promoting scale and interoperability in new mobile technologies, and it is working to ensure that 6G is interoperable with existing 5G networks.

Cross-Check Roadmaps Connect Global Visions 6G

The GSMA is also working with governments and institutions to create an environment that is conducive to the growth and adoption of 6G. The GSMA believes that 6G has the potential to transform the way we live and work, and it is committed to making sure that this technology is accessible to everyone.

In the United States, 5G Americas and the Next G Alliance are pioneering 6G technological advancements. 5G Americas is a non-profit organization that represents the interests of the mobile ecosystem in the Americas. 5G Americas is focused on the growth and advancement of 5G and future technologies across the Americas.

The Next G Alliance is a public-private partnership that is developing a 6G roadmap for the United States. The Next G Alliance is bringing together industry leaders, government officials, and academic experts to ensure that 6G meets the needs of the US economy and society.

The Alliance for Telecommunications Industry Solutions (ATIS) is also playing a role in the US 6G landscape. ATIS is a non-profit organization that brings together stakeholders from across the telecommunications industry to develop standards and best practices. ATIS is working to ensure that 6G standards are interoperable and meet the needs of all stakeholders.

For the worldwide success of 6G, it's imperative that innovators, policymakers, and industry leaders synchronize their efforts across continents. This alignment not only ensures consistent and compatible solutions but also minimizes duplicative efforts and addresses market needs. By adopting a unified approach with Apex Standards GPT tools, we can pave the way for a 6G framework that's globally advantageous and commercially robust.

Perspective 1

Improvements in quantum computer gate fidelity may reduce the number of logical qubits needed to run Grover's algorithm, potentially making symmetric key encryption more susceptible to quantum attack, especially when combined with poor entropy. Before increasing key length for AES to boost quantum security, the source of entropy on a device should be given serious consideration [Ref 3: ATIS]. To secure against quantum threats, much of today's public-key cryptography infrastructure will need to be replaced with post-quantum cryptography [Ref 14: ATIS]. The ATIS Quantum-Safe Communication and Information Initiative is addressing concerns that quantum computing will compromise current encryption algorithms [Ref 20: ATIS]. Ensuring that cryptographic secret key generation comes from a good entropy source is crucial; without it, merely increasing the symmetric key length to 256 bits will not offer more protection against the power of a QC [Ref 10: index.html]. Potential solutions include Quantum Random Number generation, which offers a robust source of entropy, and Quantum Key Distribution (QKD) for secure key material distribution [Ref 17: Next G Alliance Report].

Perspective 2

The resilience of symmetric key encryption to quantum attacks may be compromised by poor entropy, especially as the fidelity of quantum computer gates improves. Therefore, before increasing key length for AES encryption, attention should be given to the entropy source on a device. The emergence of quantum computing also necessitates a shift to post-quantum cryptography to replace much of the current public-key cryptography infrastructure [Ref 3: ATIS], [Ref 14: ATIS], [Ref 5: ATIS]. Quantum computers running Grover's algorithm are capable of weakening symmetric cryptographic algorithms, with greater implications for public-key cryptography [Ref 1: Next G Alliance Report]. Moving forward, ATIS is working with academia and industry to develop quantum-safe communication and information solutions [Ref 20: index.html]. Apart from increasing key length, effective cryptographic secret key generation must also ensure good entropy source, without which, the symmetric key length increase to 256 bits would offer no extra protection against a QC [Ref 10: ATIS]. Quantum Random Number generation and Quantum Key Distribution (QKD) are two applications that offer robust entropy source and secure key material distribution between endpoints, respectively [Ref 17: Next G Alliance Report]. For public-key cryptography, quantum computers can use Shor's algorithm to break the RSA and ECC, necessitating the development of alternative algorithms for key exchange, asymmetric encryption, and digital signatures [Ref 7: Next G Alliance Report].

Apex Standards atis-GPT (ASG-55) equips researchers with multi-angle views on a select topic - in this example - quantum attacks, demystifying their complexities and offering strategies to address vulnerabilities. The primary perspective underscores potential threats posed by advancements in quantum computer gate fidelity to symmetric key encryption. Influenced by Grover's algorithm and poor entropy, these threats underscore the significance of evaluating entropy sources before extending AES encryption key lengths. ATIS propounds a transition to post-quantum cryptography to counter these threats. Emphasizing this, their Quantum-Safe Communication and Information Initiative seeks to counter quantum-induced threats to current encryption standards. ATIS accentuates the necessity of sourcing cryptographic keys from reliable entropy, suggesting that increasing key length alone isn't a quantum-proof solution. Among the remedies, Quantum Random Number generation is touted for its entropy benefits, while Quantum Key Distribution (QKD) is heralded for secure key transfer, a sentiment echoed by the Next G Alliance Report. The secondary perspective re-emphasizes the vulnerabilities intrinsic to symmetric key encryption when faced with insufficient entropy and quantum advancements. ATIS's synergy with academia and industry emphasizes the development of quantum-resistant tools. Alongside emphasizing key lengths, reliable entropy's importance for key generation is stressed. The Next G Alliance spotlights the dangers of quantum computers utilizing Shor's algorithm on traditional public-key cryptography, calling for innovative cryptographic methodologies.

APEX STANDARDS

Domain-specific GPT Product Matrix and Strategic Use Case Scenarios

Scenarios related to "DCSF is added as the consumer and Nnrf_NFManagement service to support DCSF registration. Nnrf_NFDDiscovery service is extended to support DCSF discovery" in relation to UAS:

1. UAS registration with DCSF (DCSF as the consumer):
 - UAS registers itself with the DCSF using the Nnrf_NFManagement service.
 - The DCSF sends the necessary registration information to the Nnrf_NFManagement service to complete the registration process.
 - The registration includes details such as the UAS's capabilities, supported services, and network information.
 - This allows the DCSF to manage and track the UAS's presence in the network.
2. UAS discovery by DCSF (DCSF as the consumer):
 - The DCSF utilizes the extended Nnrf_NFDDiscovery service to discover UASs in the network.
 - The Nnrf_NFDDiscovery service includes additional functionalities to support UAS discovery.
 - The DCSF can query the Nnrf_NFDDiscovery service to retrieve information about UASs available in the network.
 - This enables the DCSF to identify and communicate with UASs for various purposes, such as service provisioning or network management.
3. Practical use case: UAS traffic management:
 - The DCSF acts as a central control point for managing UAS traffic in the network.
 - By registering and discovering UASs through the Nnrf_NFManagement and Nnrf_NFDDiscovery services, the DCSF can effectively monitor and control UAS activities.
 - The DCSF can allocate appropriate network resources, prioritize UAS traffic, and enforce policies and regulations specific to UAS operations.
 - This ensures efficient and safe UAS integration into the network, reducing the risk of interference and optimizing network performance.

Apex Standards 3gpp-tdoc-GPT (ASG-10) can also be used to distill technical details for clarity. For instance, in June 2023, Nokia contributed TDoc C1-233884, explaining the process by which UASs register and get located within the DCSF network, as shown above. ASG-10 breaks the technical details down succinctly: in plain English, it reads "UASs enroll with DCSF via the Nnrf_NFManagement service, sharing crucial details like their capabilities. Furthermore, DCSF uses the enhanced Nnrf_NFDDiscovery service to identify UASs. Armed with these tools, DCSF can efficiently engage with and oversee UASs on the network. This centralized management ensures UAS traffic flows seamlessly and securely, preventing potential system disturbances."

Technical Audits, Patent Investigations, and Market Dynamics

7. Assess a company's position and uncover potential strategic agenda through diverse standardization endeavors, while cross-checking their technical expertise with the firm's patent portfolio.

The telecommunications and technology industry is constantly evolving, presenting organizations with new challenges and opportunities. To stay ahead of the curve, organizations need to have a deep understanding of the latest technologies, standards, and market dynamics.

Apex Standards GPT is a suite of tools that help organizations with technical audits, patent investigations, and market analysis.

Technical Audits

Technical audits are essential for ensuring that proposed technologies meet or exceed industry standards. Apex Standards GPT provides robust tools that can help organizations conduct technical audits quickly, and identify potential risks and vulnerabilities, and ensure that their proposed technologies are sound.

Patent Investigations

Patent investigations are crucial for organizations operating within the telecommunications and technology sectors. Gaining a comprehensive understanding of their patent portfolio enables these organizations to meticulously assess potential intellectual property risks. With this clarity, they can make well-informed, strategic decisions regarding their contributions to standardization. Apex Standards GPT offers advanced tools specifically designed to simplify and enhance the patent investigation process, so organizations can more efficiently identify and address potential conflicts within their patent holdings, thereby preemptively safeguarding

Clearer Decisions Where Standardization and Patents Shape the Strategic Agenda

against potentially expensive and time-consuming litigation.

Market Analysis

Market analysis is essential for understanding the competitive landscape and identifying emerging opportunities. Apex Standards GPT provides tools that can help organizations conduct market analysis, identify trends, and track competitors, therefore enabling organizations to make informed decisions about their product development, marketing, and sales strategies.

Strategic Scenarios

The Apex Standards GPT tools can be used to support a variety of strategic scenarios. For example, organizations can use these tools to:

Mitigate risk: By cross-checking proposed technologies against their patent portfolio, organizations can identify potential risks and vulnerabilities. This information can be used to develop strategies to mitigate these risks, such as obtaining licensing or entering into partnerships.

Position themselves in the market: By understanding market dynamics, organizations can identify gaps in the market and tailor their offerings to meet specific needs. This can help organizations to gain a competitive advantage.

Form strategic collaborations: By identifying organizations that hold key patents, organizations can explore opportunities for strategic collaborations. This can help organizations to amplify their market impact.

Apex Standards GPT tools offer a 360-degree view of the telecommunications landscape. They can help organizations to ensure technical robustness, safeguard intellectual property, and gain strategic market insights. By using these tools, organizations can position themselves as leaders in the industry's future.

The features that can be found similar between US Patent 9137677 ('677), as owned by Nokia, and C1-233884, as contributed by the same company, are:

1. Both contexts involve telecommunications systems and focus on service or traffic management within these systems.
2. The DCSF in C1-233884 and the QoS monitoring method in US Patent 9137677 ('677) both involve monitoring and managing network resources. The DCSF uses the Nnrf_NFManagement and Nnrf_NFDDiscovery services to register, discover, and control UAS activities, while the QoS monitoring method in ('677) monitors the call blocking rate and data throughput and adapts traffic handling capacity based on these monitoring results.
3. Both contexts involve the allocation and prioritization of network resources. In C1-233884, the DCSF can allocate appropriate network resources and prioritize UAS traffic. In ('677), the monitoring method reallocates capacity between different traffic classes upon detecting a negative monitoring result to ensure sufficient and appropriate future traffic handling capacity.
4. Both contexts involve processes or methodologies for managing and optimizing network performance and handling capacity in a telecommunication system.
5. The forecasting functionality in ('677) is similar to the DCSF's role in managing UAS traffic in C1-233884. Both involve predicting and planning for future network conditions and resource needs.

Nokia is a telecommunications company that owns many patents. In June 2023, Nokia contributed a TDoc to a standards body. The TDoc describes a new way to manage traffic in telecommunications systems. Apex Standards calim-validity-GPT (ASG-05) can be used to identify similar patents owned by Nokia. When ASG-05 is used to analyze the TDoc, it finds that it is similar to a patent owned by Nokia. This patent describes a way to monitor the quality of service (QoS) in telecommunications systems. The similarities between the TDoc and the patent suggest that Nokia may have a hidden agenda. If the TDoc becomes a standard, Nokia could gain a better position to license its QoS monitoring technology. This could give Nokia a significant advantage over its competitors. The story illustrates how ASG-05 can be used to uncover hidden agendas. By identifying similarities between TDocs and patents, ASG-05 can help to reveal the strategic goals of companies that are involved in standardization.

APEX STANDARDS

Domain-specific GPT Product Matrix and Strategic Use Case Scenarios

Whitepaper
GPT Product Matrix
Scenario 8

The following patents appear to be similar to the claim in question:

1. [Patent 9781413, Claim 22 based on 35 USC 102(a) – Prior Art]: This patent teaches or discloses a method of encoding multi-layer video data, including the following steps:
 - Determining a set of layers for the multi-layer video data, where the set of layers corresponds to at least one independently decodable bitstream of the multi-layer video data and includes two or more layers.
 - Generating a syntax element specifying a maximum layer identification (ID) value for any NAL units associated with a first set of layers.
 - Generating a one-bit layerID included flag for a first layer with a layer ID value less than the maximum layer ID value, signaling whether the first layer is included in the first set of layers.
 - Outputting an encoded bitstream comprising the multi-layer video data.

This claim is similar to the query claim as both involve the processing of multi-layer video data and the inclusion of indicators or parameters to guide the encoding or decoding process. Differences lie in the specifics of the syntax elements used and the precise handling of layers.

2. [Patent 9712871, Claim 1 based on 35 USC 103(a) – Non-Obviousness]: This patent teaches or discloses a method of decoding multi-layer video data, including the following steps:
 - Decoding a bitstream that comprises an encoded representation of the multi-layer video data and obtaining syntax elements that indicate a plurality of different partitioning schemes.
 - Determining whether a multi-layer video decoder is capable of decoding the output layer set, which is formed by the union of disjoint partitions specified by each partitioning scheme.
 - Based on the multi-layer video decoder being capable of decoding the bitstream, decoding the bitstream.

This claim is similar to the query claim as both involve the decoding of multi-layer video data and the use of partitioning schemes or modes to handle layers. The query claim focuses on identifying all layers as output layers, while this claim concerns the ability of the decoder to handle the output layer set.

Apex Standards claim-validity-GPT (ASG-05) can be used to identify potential prior arts (Patent Literature), compare similar feature terms, provide technical explanations, and suggest legal grounds under 35 U.S.C. 102/103 or EPC Article 52-56. This helps stakeholders investigate and gain a clear understanding of the patent invalidity evaluation.

Technical Audits, Patent Investigations, and Market Dynamics

8. Evaluate patent validity using GPT-search against PL (Patent Literature) and NPL (Non-PL) databases, guiding in-depth claim and feature-level mapping, and refining licensing negotiations.

Patent validity checks are important for many reasons, including:

Protecting IP and asserting rights. A valid patent gives a company the legal strength to safeguard its technology from competitor imitation.

Defending rights in litigation. If a company is pursuing legal action against another, alleging product infringing its patent, it's key to demonstrate the patent is robust against known prior arts or state of the arts. By doing so, the company ensures the court's attention remains squarely on the subject matter of infringement.

Securing strategic IP acquisitions. When acquiring a patent portfolio, it is important to ensure that the patents are valid. A validity search can help to identify any potential weaknesses in the portfolio, which can affect the price that is paid for it.

Scrutinize
Claims
Optimize
Portfolios
Accelerate
Returns

Performing risk assessments. Conducting a validity search is essential for risk assessments. It reveals potential vulnerabilities in a patent, like the chance it might be invalidated. Armed with this knowledge, one can make strategic decisions on licensing, selling, or even discontinuing its renewal fees.

Monetizing patents. A valid patent can be monetized through licensing or sale, and a validity search helps pinpoint its value and monetization strategies.

How Apex Standards Can Help

Apex Standards offers a variety of tools that can help IPR professionals to achieve the goals of patent validity checks accurately and efficiently. These tools use artificial intelligence to identify relevant prior art and to assess the validity of patents.

With Apex Standards' ability to efficiently check patent validity against both patent and non-patent literature, R&D inventors and IPR professionals can unlock the potential of their ideas, turning innovation into sustainable rewards. Imagine not just defending your ideas, but thriving and reaching new heights in earnings. The future shines brighter with the right tools in hand.

Based on the context provided, the following JVET or JCTVC documents and features may be similar to the feature described in the claim:

1. In the document [Ref 16: JVT-D094.doc], AVC H.264 bitstream format is introduced which is defined for the transport layers based on bitstreams such as ITU-T H.320 or ISO IEC 13818-1. This format may also include OLS and VPS, where OLS may contain different layers of coded pictures and the VPS may include an identification code specifying output layers for each OLS.
2. The document [Ref 10: VPS_C_ERICSSON_2.zip] talks about a single VPS bitstream with two dependent layers. The layers are encoded with different inputs and inter-layer prediction is enabled for layer 1. This shows the use of multiple layers in VPS and their interdependence, similar to the claim.
3. In [Ref 20: JVT-W051.zip], the concept of sub-pic_layer_flag is discussed. It indicates that the scalable layer with a specified layer identifier consists of sub-pictures, each subset of coded slices of an access unit. This appears to be similar to the claim as it also involves layers and coded slices in an access unit.

Apex Standards jvet-jctvc-mpeg-GPT (ASG-70) can be used to compare a claim element to contributions in the JVET, JCT-VC, and MPEG meetings. It then highlights and explains technical similarities between them.

1. The paper published on "IEEE Transactions on Communications / Vol 59 / Issue 11 / Page: 3059 – 3071" has a similar feature with the CLAIM. The paper focuses on the process of determining layers to be decoded and decoding them in a successive manner. This technique is somewhat similar to the CLAIM's process of receiving a bitstream comprising an OLS and a VPS where all layers in each OLS are output layers [Ref 5].

- Both the CLAIM and the paper deal with the decoding process of layers.

- The layers in the CLAIM are specified by an OLS mode identification code (ols_mode_idc), while in the paper, a group of layers is identified each time for decoding.

- The process in the paper where the decoded layers are subtracted from the received signal and the same procedure is repeated for the remaining layers could be seen as analogous to the CLAIM's ols_mode_idc specifying that all layers in each OLS are output layers.

References

5 Published on IEEE Transactions on Communications: Volume: 59 / Issue: 3059 / Page: 3059-3071; Involved Companies or Institutions: Columbia University / Princeton University; published on 2011-09-01

Title: Interference Channel with Constrained Partial Group Decoding

Abstract: We propose novel coding and decoding methods for a fully connected K-user Gaussian interference channel. Each transmitter encodes its information into multiple layers and transmits the superposition of those layers. Each receiver employs a constrained partial group decoder (CPGD) that decodes its designated message along with a part of the interference. In particular, each receiver performs a twofold task by first identifying which interferers it should decode and then determining which layers of them should be decoded. Determining the layers to be decoded and decoding them are carried out in a successive manner, where in each step a group of layers with a constraint on its group size is identified and jointly decoded while the remaining layers are treated as Gaussian noise. The decoded layers are then subtracted from the received signal and the same procedure is repeated for the remaining layers. We provide a distributed algorithm, tailored to the nature of the interference channels, that determines the transmission rate at each transmitter based on some optimality measure and also finds the order of the layers to be successively decoded at each receiver. We also consider practical design of a system that employs the quadrature amplitude modulations (QAM) and rateless codes. Numerical results are provided on the achievable sum-rate under the ideal case of Gaussian signaling with random codes as well as on the system throughput under practical modulations and channel codes. The results show that the proposed multi-layer coding scheme with CPGD offers significant performance gain over the traditional un-layered transmission with single-user decoding.

Apex Standards paper-GPT (ASG-00) can take a text snippet, in this case, a patent's claim element, and compare it to worldwide scientific publications, with descriptions regarding how they are technically alike.

APEX STANDARDS

Domain-specific GPT Product Matrix and Strategic Use Case Scenarios

Whitepaper
GPT Product Matrix
Scenario 9

Based on the PRODUCT DESCRIPTION and CLAIM ELEMENTS, the following potential patent infringements and technical mappings can be identified:

1. Potential Patent Infringement: [Patent 9319200, Claim 18]

- Product description term: "C-V2X PC5 Mode 4 direct communications: independent of cellular network & enabling (U)SIM-less operation"
- Patent feature term: "The processor unit, in conjunction with the transceiver, configured to cause the communications controller to allocate a set of subframes to a group of UEs for a direct mobile communication (DMC) link."
- Reasoning: The product's use of C-V2X PC5 Mode 4 for direct communication, independent of the cellular network and enabling (U)SIM-less operation, can be seen as an implementation of the patent's feature of the processor unit causing the communications controller to allocate a set of subframes for a direct mobile communication link.

2. Potential Patent Infringement: [Patent 10873941, Claim 17]

- Product description term: "MIMO technology meets demands for data rate and link reliability in modem wireless communication systems"
- Patent feature term: "The programming including instructions to encode a traffic flow using a rate-less code to obtain rate-less-encoded packets and transmit a first subset of the rate-less-encoded packets to a receive point over a licensed band of a unified air interface operating in accordance with a common cellular RAT."
- Reasoning: The product's use of MIMO technology to meet demands for data rate and link reliability in modem wireless communication systems could be seen as similar to the patent's feature of encoding a traffic flow using a rate-less code to obtain rate-less-encoded packets and transmit them over a licensed band of a unified air interface.

3. Potential Patent Infringement: [Patent 10420065, Claim 1]

- Product description term: "Embedded multi-constellation GNSS receiver available for applications requiring a fast and accurate positioning in any environment."
- Patent feature term: "Determine, based on whether communications of the apparatus are delay tolerant, to request extended idle mode discontinuous reception (DRX) encode a radio resource control (RRC) message for transmission to a network responsive to determining to request extended idle mode DRX."
- Reasoning: The product's feature of having an embedded multi-constellation GNSS receiver for applications requiring fast and accurate positioning could be considered an inventive step over the patent's feature of determining communications tolerance to delay and requesting extended idle mode DRX for encoding an RRC message.

18 US Patent 10420065: Claim Element 1. Filed by Intel IP Corporation on 2016-03-21 and published on 2019-09-17
User equipment and methods for adapting system parameters based on extended paging cycles

Paragraph: An apparatus for a user equipment (UE), the apparatus comprising: memory; and processing circuitry to: determine, based on whether communications of the apparatus are delay tolerant, to request extended idle mode discontinuous reception (DRX); encode a radio resource control (RRC) message for transmission to a network responsive to determining to request extended idle mode DRX, the RRC message including extended idle mode DRX parameters information element to indicate usage of extended mode DRX, the message including an extended idle mode DRX length; and monitor cells of the network according to a periodicity Higher_priority_search, the periodicity being based on the extended idle mode DRX length when the extended idle mode DRX length is larger than 60*N layers, where N layers is a total number of configured higher priority Evolved Universal Terrestrial Radio Access (E-UTRA), UTRA Frequency Division Duplex (FDD), UTRA Time Division Duplex (TDD), Code-Division Multiple Access (CDMA2000 1A-) and High Rate Packet Data (HRPD) carrier frequencies and is additionally increased by one if one or more groups of Global System for Mobile Communications (GSM) frequencies is configured as a higher priority.
Keywords: apparatus for a user equipment

Apex Standards claim-validity-GPT (ASG-05) can be used to compare a product's technical descriptions to existing patents. The tool clearly establishes the mapping between the product's function terms and the claim element features, and provides detailed reasoning so that researchers can evaluate the results with clarity. ASG-05 not only maps the product's attributes to patent features, but it also justifies each mapping in depth. For example, the tool can be used to compare a product designed for rigorous automotive conditions with attributes such as MIMO technology and an embedded GNSS receiver to existing patents. ASG-05 will identify any potential patent infringements and provide detailed reasoning for the mappings, which will help researchers to understand why the product is potentially infringing. These comprehensive insights assist researchers in discerning potential infringement nuances and are instrumental in obtaining Freedom to Operate (FTO) clearances. FTO clearances help to minimize legal issues by ensuring that a product does not infringe any existing patents. On the flip side, patent holders can also leverage ASG-05. When they come across a competitor's product that might seem relevant, they can use this tool to discern connections between their patent and the rival product. This approach equips them to accurately gauge the potency of the Evidence of Use (EoU), ensuring they make informed decisions before investing in significant litigation pursuits against competitors.

Technical Audits, Patent Investigations, and Market Dynamics

9. Review how products relate to patents to determine Freedom to Operate (FTO) or Evidence of Use (EoU), connecting product descriptions, terminologies, and specs with patent claim terms.

Given the complexities of the patent landscape and the high stakes involved in infringement cases, it's essential to leverage all available tools for a thorough analysis. Apex Standards' suite of advanced GPT-AI tools offers unparalleled advantages in this realm, ensuring that businesses can confidently navigate the patent landscape, be it for establishing their Freedom to Operate or for building strong Evidence of Use cases. Specifically, we enable:

1. Accurate and Swift Patent Identification:

Our tool can expedite the search process within vast databases like USPTO, EPO, WIPO, etc. Instead of relying solely on manual keyword guessing and searches, AI can process natural language, recognize patterns, and draw connections between related patents, ensuring that no potentially infringed patents are overlooked.

2. Deep Understanding of Patent Claims:

Reading and understanding patent claims can be a daunting task given the complexity of legal language. AI can quickly interpret the language, cross-reference it with cross-domain contexts, and extract core elements that are protected. This ensures a comprehensive and error-free understanding.

3. Comparison and Mapping:

Once the patent claims are understood, AI can systematically compare them to product descriptions, terminologies, and specifications. Using advanced GPT models, the tool can identify matches between patent claims and product features, even if the language used is not identical. This is especially valuable when products have intricate specifications, as human-experience-based or manual analysis may overlook subtle similarities.

4. Freedom to Operate (FTO) Analysis:

AI can significantly streamline FTO searches by identifying potential areas of concern early on. This allows companies to make necessary changes to their products or processes before infringing on any patents, avoiding legal disputes, and launching new products with greater confidence.

5. Evidence of Use (EoU) Chart Preparation:

By connecting product descriptions with patent claim terms, AI can assist in creating comprehensive EoU charts. Such charts are pivotal in showcasing potential or existing product infringements, forming the backbone of any legal action or out-licensing negotiations.

6. Recognizing Different Categories of Infringement:

With the multiple ways in which patent infringement can occur (direct, indirect, induced, contributory, etc.), our GPT models are trained to recognize signs of each infringement type, ensuring a multi-faceted approach to patent analysis.

7. Doctrine of Equivalence (DoE) Analysis:

While a product might not literally infringe on a patent, it may still be deemed infringing under the Doctrine of Equivalence. AI can assess both literal and equivalent infringement, ensuring a more exhaustive analysis.

8. Reverse Engineering and Product Testing:

When combined with appropriate domain knowledge, AI can be a valuable tool for decoding the logic of product designs and implementations, tracing back the logic, and suggesting steps for reverse engineering products to evaluate possible patent infringements. This ensures that no potential infringement is overlooked.

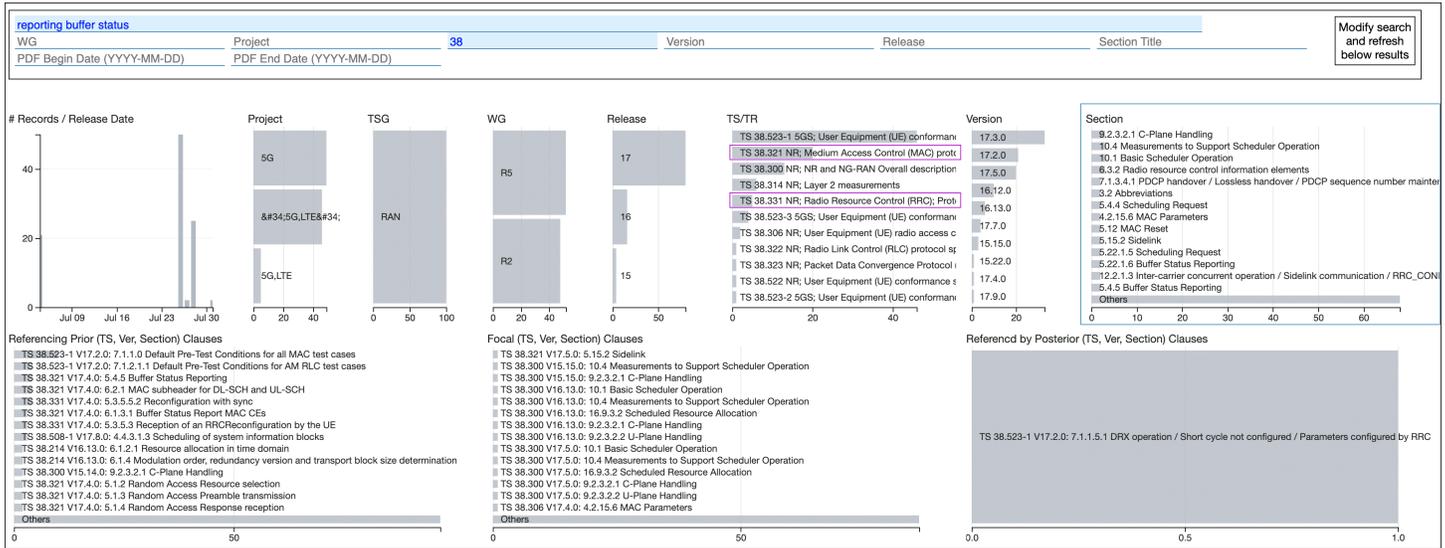
9. Cost-Effective and Time-Saving:

Engaging in manual patent searches and infringement analysis is time-consuming and costly. AI, on the other hand, offers a faster, more accurate, and cost-effective solution, making it a critical tool for companies, legal professionals, and innovators.

Evidence Made Evident with AI's Enhanced EoU and FTO Charting Preval

APEX STANDARDS

Domain-specific GPT Product Matrix and Strategic Use Case Scenarios



Apex Standards TS Section Essentiality Analysis Platform (ASS-12) provides SEP professionals with a comprehensive overview to drill down on section clause relevance and referencing/referenced-by relationships among TS.

Controllable Innovation and Explainable Investment Acumen

10. Maximize Standard Essential Patent (SEP) Return on investment (ROI) using 3GPP TS as an example, covering idea creation, patent filing, jurisdiction selection, essentiality validation, licensor status, and accelerated development for emerging SEPs.

Patent portfolio development is a strategic process that organizations use to protect their inventions, capitalize on market opportunities, and maintain a competitive edge. It involves making many decisions, such as which patents to file, whether to declare them as SEPs, and how to validate them.

Jurisdiction Selection in Patent Filing:

When filing a patent, a legal professional should consider the invention's nature, applicability, and potential market. They also need to factor in costs, such as filing fees, maintenance costs, and attorney charges. International patent families are sought after when the invention has the potential to be used globally. Regional filings can be a cost-effective option, and provisional applications can be a good way to perfect the invention before filing a non-provisional application.

Your Roadmap to Patent Portfolio Mastery

Standard Essential Patents (SEPs):

SEPs are important in industries where standards are needed for interoperability requirements. Before a SEP declaration, several aspects are scrutinized:

Technical Alignment (ensure the patent is technically integral to the standard); **Context-specific Synonyms** (connecting similar concepts described differently across domains); **Market Dynamics** (tracking features across versions and releases); **Strategic Impetus** (eclectic mix of SEPs and non-SEPs diversify a patent portfolio, providing multiple revenue streams and strategic benefits); **Informing Competition** (cross-licensing opportunities); **Showing Potential** (a robust SEP portfolio enhances M&A appeal).

SEPs come tethered with obligations, especially around the Fair, Reasonable, and Non-Discriminatory (FRAND) licensing. It's imperative to evaluate and balance these factors.

Developing a portfolio is akin to assembling a strategic puzzle. Merging insight, foresight, market intelligence, and legal expertise is essential, positioning it as a cornerstone of an organization's innovation trajectory.

Technical Clauses with Similar Features:

1. Spec 38.321, Version 16.8.0, Section 5.22.1.6 Buffer Status Reporting:
- This clause discusses the reporting of buffer status for different data transmission scenarios.
2. Spec 38.214, Version 15.16.0, Section 5.2.2.1 Channel quality indicator (CQI):
- This clause discusses the determination of the channel quality indicator based on the modulation scheme and transport block size.

Similarities with the Patent Claim:

- Both the patent claim and the technical clauses involve data processing and transmission in a communication system.
- Both mention the use of different data types or classes.
- Both discuss the mapping or encapsulation of data onto a specific channel or bearer.
- Both mention the alignment of data frames or blocks to a specific size or format.
- Both involve considerations of network and user equipment support for data transmission.
- Both mention the use of padding or filler bits to align data frames.

Technical Explanations:

- In the patent claim, the method involves processing circuit switched domain (CS-domain) service data, which includes adaptive multi-rate (AMR) speech service with different substreams. The method encapsulates these substreams into one speech frame and maps it onto a radio bearer, which is then mapped to a radio high-speed packet data access channel. The speech frame comprises a frame type, payload, and padding.
- In the technical clauses, the Buffer Status Reporting clause discusses the reporting of buffer status for data available for transmission, taking into consideration the number of bits in the UL grant. The Channel quality indicator (CQI) clause discusses the determination of the CQI index based on the combination of modulation scheme and transport block size.

Context-Specific Synonyms:

- CS-domain service data: buffer status
- AMR speech service: modulation scheme
- Substreams A, B, and C: different classes of data
- Speech frame: data frame
- Network and user equipment support: UL grant
- Radio bearer: CSI reference resource
- Radio high-speed packet data access channel: PDSCH

Apex Standards etsi-ts-tr-GPT (ASG-11) provides critical intelligence to guide SEP portfolio development. It discerns technical relevance, be it in draft claims for a forthcoming patent application or in an existing patent undergoing evaluation against a TS. Moreover, ASG-11 offers feature-level mapping crucial for claim charting in SEP validation. Such in-depth mapping bolsters the patent's worth, especially when validated as a true SEP.

Controllable Innovation and Explainable Investment Acumen

11. Elevate the speed and quality of scientific publications.

In today's rapidly evolving scientific domain, it's imperative to stay abreast of the latest advancements, particularly when competitors possess greater resources for innovation. AI emerges as a significant asset in this scenario, not just for balancing the competitive landscape in knowledge and innovation, but also for introducing foundational principles: Controllable Innovation and Explainable Investment.

Controllable Innovation:

This pertains to effectively guiding and managing the innovation journey. Given the mounting complexity of scientific exploration, controlling the direction of innovation is essential. AI tools furnish researchers with insights for potential scenarios, ensuring that research is consistent with intended objectives. This conservation of resources facilitates a sharper, quicker, and more accurate research outcome.

Explainable Investment:

Within R&D, it translates to comprehending the allocation of resources, including time, money, and personnel. AI, through its data-centric methodology, provides clear rationales for investment decisions. When the reasoning behind R&D resource allocation becomes transparent, stakeholders are more inclined to endorse and financially back these ventures, fostering a robust and steady research environment.

Revolutionizing Scientific Publications with AI:

Automating hypothesis generation: AI can scan large amounts of historical data to identify patterns and trends, which can help researchers generate new hypotheses.

Identifying gaps: AI can help researchers identify areas where there is limited research or where there are unanswered questions. This can help researchers focus their research on areas that are most likely to be productive.

Providing predictive analysis: AI can detect trends in research. This can help researchers identify emerging areas of research and avoid wasting time and resources on outdated topics.

Where Curiosity
Meets Creativity
Assisted by AI
Critical Thinking
Publish
Proudly

Giving historical insights: AI can help researchers learn from the past by providing insights into previous research, decisions, and methods. This can help researchers avoid making the same mistakes and improve their research outcomes.

Critical thinking skills for the modern scholar

AI-guided critical thinking skills are proving essential for researchers, including:

Identify logical fallacies: Logical fallacies are errors in reasoning. By identifying logical fallacies with AI, researchers can avoid making flawed arguments.

Question assumptions: Assumptions are beliefs that we take for granted. By questioning assumptions, researchers can be more open-minded and objective in their thinking.

Consider multiple perspectives: There are often multiple perspectives on a single issue. By considering multiple perspectives, researchers can get a more complete understanding of the issue.

Be open to new information: Researchers should be willing to change their minds when presented with new information.

Analyze evidence carefully: Researchers can test the evidence with AI, before drawing conclusions.

Iterative feedback loops: AI facilitates continuous feedback loops in scientific research. This allows researchers to promptly gain insights on their sudden inspirations, maintaining their innovative momentum. Such feedback ensures the enhancement of their studies, adherence to the intended direction, and the recovery from failed attempts.

The future of AI in scientific research

AI has the potential to revolutionize scientific research. By automating hypothesis generation, identifying gaps, providing predictive analysis, giving historical insights, and creating iterative feedback loops, AI can help researchers do their work more quickly, efficiently, and effectively.

Knowledge is a key competitive advantage. By using AI, researchers can stay up-to-date with the latest advancements, gain clarity, identify new areas of research, and improve their research outcomes.

Based on the provided context, the key unsolved problems and hot topics in the field of sensing for autonomous cars can be summarized as:

- Efficiency and reliability of sensors:** As per [Ref 7], autonomous vehicles and Advanced Driver Assistance Systems (ADAS) are heavily dependent on sensors. However, these systems have an inherent inability to detect all potential dangerous driving situations. Therefore, the development of more reliable and efficient sensors remains a key unsolved problem.
- Power consumption of sensor devices:** From [Ref 14], it is clear that traditional sensor devices used in smart parking systems are power-hungry and battery-operated. Therefore, a key challenge lies in developing power-efficient or self-powered sensor devices.
- Routing problem for taxis:** As highlighted in [Ref 16], self-driving cars represent a rapidly growing domain with many open problems. One such problem is the routing problem for taxis, which is a widely-known Pickup and Delivery problem (PDP) in mathematical terms.

Potential solutions for these problems might include:

- Enhancement of sensor technology:** Significant improvements in sensor technology could help increase the efficiency and reliability of autonomous vehicles and ADAS. This could involve the development of novel software configuration technologies as suggested by [Ref 9].
- Development of self-powered sensor devices:** Transitioning to self-powered sensor devices, particularly those equipped with supercapacitors (battery-less), could be an effective solution to the power consumption problem as highlighted in [Ref 14].
- Use of advanced mathematical models:** The routing problem for taxis could potentially be solved using advanced mathematical models or algorithms, although the context does not provide specific solutions for this problem.

7 Published on Lecture Notes in Computer Science: Volume: 2019 / Issue: 67 / Page: 67-77; Involved Companies or Institutions: Arizona State University; published on 2019-08-26

Title: Estimating the Driver Status Using Long Short Term Memory

Abstract: Driver distraction is one of the leading causes of fatal car accidents. Driver distraction is any task that diverts the driver attention from the primary task of driving and increases the driver's cognitive load. Detecting potentially dangerous driving situations or automating some repetitive tasks, using Advanced Driver Assistance Systems (ADAS), and using autonomous vehicles to reduce human errors while driving are two suggested solutions to diminish driver distraction. These solutions have some advantages, but they suffer from their inherent inability to detect all potentially dangerous driving situations. Besides, autonomous vehicles and ADAS depend on sensors. As a result, their accuracy diminishes significantly in adverse conditions. Analyzing driver behavior using machine learning methods and estimating the distraction level of drivers can be used to detect potentially hazardous situations and warn the drivers. We conducted an experiment in eight different driving scenarios and collected a large dataset from driving data and driver related data. We chose Long Short Term Memory (LSTM) as our machine learning method. We built and trained a stacked LSTM network to estimate the driver status using a sequence of driving data vectors. Each driving data vector has 10 driving related features. We can accurately estimate the driver status with no external devices and only using cars Can-Bus data.

Paragraph: Detecting potentially dangerous driving situations or automating some repetitive tasks, using Advanced Driver Assistance Systems (ADAS), and using autonomous vehicles to reduce human errors while driving are two suggested solutions to diminish driver distraction. These solutions have some advantages, but they suffer from their inherent inability to detect all potentially dangerous driving situations. Besides, autonomous vehicles and ADAS depend on sensors.

Keywords: potentially dangerous driving situations or automating some repetitive tasks

Apex Standards paper-GPT (ASG-00) fundamentally shapes a researcher's exploration journey. As a starting point, they'd dive deep into literature reviews, as evinced by [Ref 7] that outlines the pivotal role of sensors in autonomous vehicles and Advanced Driver Assistance Systems (ADAS). However, this very literature also highlights a challenge—the sensors' inability to fully detect dangerous driving scenarios, thereby underlining the need for heightened efficiency and reliability. Taking another example, the researcher would discover, as mentioned in [Ref 16], that the autonomous vehicle domain is riddled with myriad challenges, notably the mathematical conundrum of the Pickup and Delivery problem (PDP) relating to the taxi routing problem. Solutions like the innovative software configuration technologies proposed in [Ref 9] or the supercapacitor-equipped sensors could act as a beacon of hope. Such detailed exploration, guided by ASG-00, reveals existing problems and unearths potential solutions, leading the way for future work, publications, patents, or products.

APEX STANDARDS

Domain-specific GPT Product Matrix and Strategic Use Case Scenarios

Whitepaper
GPT Product Matrix
Scenario 12

Embark on a journey liberated from 'what-ifs', where innovation is not hindered by uncertainty.

With Apex Standards, every creative spark encounters immediate, insightful feedback, catapulting your ideas to unparalleled heights.

Controllable Innovation and Explainable Investment Acumen

Cultivate a forward-thinking mindset, discerning high-ROI research opportunities, harnessing early market advantages, grounding instincts in data, iterating hypotheses, recovering from failed attempts, and perpetually pursuing clarity amidst ambiguity.

Modern AI has profoundly reshaped the way we approach problems, discern solutions, and envision the future. AI, if properly used, holds the potential to enhance various fundamental tasks, catalyzing innovation, scientific publications, patent protection, productization, and ultimately, commercial success. The ways AI can be pivotal in this journey, include:

1. Cultivating a Forward-Thinking Mindset: Albert Einstein remarked, "Imagination is more important than knowledge." In the context of AI, this underscores the importance of looking beyond state of the art research to visualize what might be possible. AI can extrapolate trends and offer foresights, guiding researchers and entrepreneurs towards emerging frontiers.

2. Discerning High-ROI Research Opportunities: Einstein's assertion that "Information is not knowledge. The only source of knowledge is experience" emphasizes the difference between mere data collection and actionable insights. AI can sift through vast prior work, spot trends, and reason about areas that hold the potential for breakthroughs. It not only provides raw information but, through human-AI interaction and iterative feedback loops, can turn that data into knowledge, pinpointing high-ROI opportunities.

3. Harnessing Early Market Advantages: With AI's ability to simulate scenarios, businesses can strategically position themselves to capitalize on early market trends, by identifying gaps in the market, analysing competition dynamics, and enabling rapid prototyping, thus affording an edge in highly competitive environments.

4. Grounding Instincts in References: While instincts play a crucial role in decision-making, grounding these hunches in relevant literature and prior work ensures they are well-directed. AI analytics can transform subjective inklings into data-backed strategies, ensuring that decisions, whether in research or business, are both innovative, grounded and informed.

5. Iterating Hypotheses: One of the hallmarks of great scientific endeavor is the willingness to adapt and evolve. As Einstein insightfully pointed out, "The best scientists are open to the possibility that they may be wrong, and they are willing to change their minds in the face of new evidence." AI can expedite this iterative process. Through researcher feedback and iterative learning, AI refines their thinking and therefore, their outputs, enabling innovators to tweak their hypotheses and approaches based on collaborative brainstorming.

6. Recovering from Failed Attempts: Innovation demands both persistence and resilience. While challenges are expected, AI aids innovators in adapting to changes and recovering from hurdles. These challenges, faced by resilient innovators, often transform into stepping stones leading to greater success. Moreover, when there's a setback, AI's cutting-edge capabilities come in handy. It can quickly sift through researcher queries against a broad spectrum of scientific literature, patents, technical standards and company contributions. This allows it to identify why certain experiments or strategies fail. Such insights clarify mistakes and guide toward improved strategies and solutions.

7. Pursuing Clarity Amidst Ambiguity: The journey of research and innovation often treads paths riddled with ambiguity. Taking a cue from Einstein's belief in the power of experience as a wellspring of knowledge, AI steps in as a beacon of clarity, providing clear guidance where human judgment might waver.

Human intuition, curiosity, and creativity underpin every scientific and commercial achievement. By melding AI's capabilities with wisdom from visionaries like Einstein, and bolstered by the Apex Standards GPT tools, we stand side by side with our clients, supporting them towards groundbreaking technical and commercial successes.

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