Comprehensive Technical & Executive Whitepaper: PooyTel Converged Charging, Accounting & Network Management Platform

Designed for C-Level Executives, Strategic Decision-Makers, and ICT Regulatory Authorities

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Product Name: PooyTel
Developer: PooyTech Engineering Co. (pooytech.ir)
Product Category: Converged Online Charging System (3GPP OCS / 5G CHF), Enterprise AAA Server, Dynamic Policy & QoS Controller, Telecom Invoicing & Billing, Intelligent Self-Care & Line Diagnostics
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Table of Contents

1. Executive Summary & Strategic Value
2. Platform Overview, Design Philosophy & Core Differentiators
3. Comprehensive Fixed-Mobile Convergence (FMC) Architecture
4. Detailed Functional Modules & System Capabilities
   4.1. Real-Time Cellular Charging Core (3GPP OCS / CHF - 4G/5G)
   4.2. Comprehensive Authentication, Authorization & Accounting Server (Enterprise RADIUS AAA)
   4.3. Enterprise Directory Authentication & Office Network Integration Suite (Enterprise LANSuite & 802.1X SSO)
   4.4. Multi-Dimensional Rating Engine & Comprehensive Discount Strategies
   4.5. Comprehensive Package Catalog, Subscription Lifecycle & Multi-Tier Deductions
   4.6. Integrated Telecom Invoicing, Periodic Billing & Banking Payment Identifier Engine
   4.7. Quality of Service (QoS) Management, Bandwidth Control & Fair Usage Policy (FUP)
   4.8. Real-Time Network Router Control & Dynamic Policy Enforcement (RFC 5176 CoA / PoD)
   4.9. Centralized Subscriber Management, Lifecycle & SIM/Equipment Inventory
   4.10. Advanced IP Address Management & Intelligent CG-NAT Solution (IPAM)

4.11. Regulatory Compliance, Lawful Judicial Inquiries & 5-Tuple CG-NAT Correlation (IPDR Compliance)
4.12. Real-Time Telecom Anti-Fraud Engine
4.13. Intelligent Traffic Classification, National/International Data Separation & High-Speed IP Trie
4.14. Orchestration Engine, Workflow Automation & Network Rule Simulator
4.15. True Multi-Tenancy, Reseller / Agent Portal & Revenue Sharing
4.16. Comprehensive Subscriber Self-Care Portal, Online Line Diagnostics & Guest Captive Portal
4.17. Advanced Web Management Console & NOC Executive Dashboard (Dark Glassmorphism)
4.18. Big Data Streaming Pipeline, Event Stream Processing & Telemetry Monitoring
5. Carrier-Grade High Availability, Clustering & Resilience (Five Nines - 99.999%)
6. Technical Specifications, Standards & Operational Capacity Matrix
7. Competitive Advantages, Strategic Value & Return on Investment (ROI) Analysis
8. Deployment Models, Infrastructure Flexibility & Cloud-Native Readiness
9. About PooyTech Engineering, Service Level Agreements (SLA 24/7/365) & Support Services

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1. Executive Summary & Strategic Value

Rapid digital transformation and the exponential surge in broadband consumption across fixed and mobile domains have introduced critical operational imperatives for Telecommunications Operators, Internet Service Providers (FCP, Servco, WISP), Mobile Virtual Network Operators (MVNO), and large-scale enterprise campus networks. Achieving sustainable profitability and market leadership in this high-velocity landscape requires a unified, intelligent, ultra-resilient charging and accounting platform designed to deliver:

- **Guaranteed Zero Revenue Leakage:** Sub-5 millisecond balance reservation and dynamic quota slicing that strictly eliminates over-consumption, unbilled traffic, and negative balance anomalies.
- **True Fixed-Mobile Convergence (FMC):** Unified management of cellular subscribers (4G/5G), optical fiber networks (FTTH/GPON), fixed wireless access (TD-LTE/Wireless), enterprise campus networks, and public guest Wi-Fi hotspots through a shared wallet, unified database, and centralized rating engine.
- **Agile Time-to-Market:** The power to configure, test, and commercially roll out bundled service packages, dynamic loyalty tiers, and segmented promotional tariffs within minutes—bypassing lengthy core network reconfiguration cycles.

- **Lawful Interception & Regulatory Compliance:** Instant, auditable responses to judicial and cyber-police inquiries via high-precision 5-tuple CG-NAT session correlation and automated regulatory data-separation mechanisms.
- **Aggressive OPEX & TCO Reduction:** Complete workflow automation, automated end-subscriber line self-diagnostics that deflect up to 35% of customer support call center traffic, and total independence from expensive foreign-currency proprietary licenses subject to geopolitical or sanction risks.

PooyTel, engineered by **PooyTech Engineering Co.**, is a carrier-grade, highly scalable software platform purposefully designed to solve these mission-critical challenges. By uniting an ultra-fast compiled processing core, a distributed microsecond in-memory state engine, and an intuitive bilingual web management interface, PooyTel establishes an unshakeable foundation for telecom operational excellence and revenue growth.

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2. Platform Overview, Design Philosophy & Core Differentiators

PooyTel converges eight vital telecom architectural pillars into a single, cohesive ecosystem:

1. **3GPP-Compliant Online Charging System (OCS)** for 3G/4G cellular networks.
2. **5G Converged Charging Function (CHF)** supporting cloud-native service-based architectures (SBI).
3. **Carrier-Grade Enterprise AAA Server** running high-concurrency RADIUS and dynamic authorization.
4. **Enterprise LANSuite & 802.1X SSO** bridging telecommunications infrastructure with corporate directory domains (Active Directory/LDAP).
5. **Dynamic Policy & Quality of Service (QoS) Controller** with seamless Fair Usage Policy (FUP) throttling.
6. **Automated Telecom Invoicing & Periodic Billing Engine** featuring national banking payment algorithms (Mod-11 check digits).
7. **Lawful Interception, Syslog Collector & 5-Tuple IPDR Correlation Engine** for carrier-scale CG-NAT tracking.
8. **Next-Generation Web Consoles** spanning executive NOC dashboards, reseller portals, and subscriber self-care portals.

Strategic Design Principles of PooyTel:

Architectural Pillar	Technical Specification	PooyTel Engineering Approach	Operational Benefit to Organization
True FMC Convergence	Unified fixed, mobile, and enterprise management	Shared wallet, unified subscriber database, and consolidated rating engine	Eliminates siloed software stacks and drastically reduces multi-vendor licensing costs
Ultra-Low Latency	Sub-5ms charging response time	Native compiled in-memory parallel execution pipeline	Guarantees silky-smooth subscriber data experience without packet queuing or jitter
Zero Revenue Leakage	100% financial and quota reconciliation	Distributed transactional locks with dynamic adaptive slice reservations	Completely prevents post-depletion unpaid consumption and unexpected balance deficits
Vendor-Agnostic Core	Universal hardware interoperability	Strict adherence to standard 3GPP, IETF RFC, and IEEE protocols	Freedom from vendor lock-in (fully compatible with Cisco, MikroTik, Huawei, Juniper, Nokia)
Business Ergonomics	Zero-code tariff and package definition	Modern web-based visual package, billing, and policy managers	Accelerates commercial campaign launch from weeks to under 5 minutes without engineering overhead

Five Fundamental Differentiators:

1. **Absolute Convergence (True FMC):** Terminates the sprawl of fragmented, expensive point solutions. Fiber broadband, cellular data, fixed wireless, enterprise LAN, and public Wi-Fi all converge onto a single intelligent brain.

2. **Microsecond In-Memory Execution:** By pairing compiled algorithms with in-memory state management, PooyTel processes high-density transactions with near-zero latency, maintaining wire-speed line performance during peak network bursts.

3. **Definitive Financial Integrity:** Patented distributed locking models ensure that every single byte transmitted is strictly covered by active balance or quota units, driving revenue leakage down to absolute zero.

4. **Hardware Neutrality:** Communicates seamlessly with core routers, broadband access servers (BRAS/BNG), cell towers, packet gateways, and campus switches from Cisco, MikroTik, Huawei, Juniper, Ericsson, ZTE, and Nokia.

5. **No-Code Business Autonomy:** Marketing and financial departments can create, modify, or retire tariff models, promotional bundles, and tiered campaigns directly through intuitive web consoles without requiring software development tickets.

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3. Comprehensive Fixed-Mobile Convergence (FMC) Architecture

The PooyTel architecture is engineered around a four-tier, distributed, and decoupled framework. Standardized edge adapters isolate external network protocols from the high-performance central decision engine:

Architectural Tier	Covered Network Elements	Supported Protocols & Standards	Operational Role in PooyTel Platform
1. Access Layer	• 4G/5G Cellular Core (PGW, SMF, UPF, IMS)• Fixed Broadband BRAS/BNG (MikroTik, Cisco, Huawei)• Campus Wi-Fi & Layer-3 Enterprise Switches	• 3GPP Diameter Gy / Ro• 5G Nchf HTTP/2 REST• RADIUS AAA (UDP 1812/1813)• RFC 5176 CoA/PoD (UDP 3799)• IEEE 802.1X / LDAPS	Ingests subscriber access requests, transmits balance verification queries, streams accounting usage packets, and applies real-time QoS and disconnection signals
2. Edge Gateway Layer	• High-Throughput Diameter Edge Gateway• Dedicated Carrier RADIUS Edge Server• Real-Time Syslog Collector (UDP 5140)	• CCR/CCA state machines & MSCC bundles• PAP, CHAP, MS-CHAPv2, MAB, EAP-SIM• High-rate CG-NAT syslog ingestion	Normalizes heterogeneous network packets, manages ingress priority queues, isolates the core from DDoS bursts, and ensures standards compliance
3. Central Processing Core (PooyTel	• Multi-Dimensional Rating & Pricing Engine• Dynamic Quota Reservation & Balance Locker• Package	• Sub-5ms parallel decision pipeline• Multi-service rating and simultaneous deductions• Automated	Serves as the central business logic and operational brain; executes mathematical rating calculations,

Architectural Tier	Covered Network Elements	Supported Protocols & Standards	Operational Role in PooyTel Platform
Core)	Catalog, Subscriptions & Queues• Policy, QoS & Seamless FUP Controller• Real-Time Telecom Anti-Fraud Engine• Periodic Invoicing & Mod-11 Payment Engine• Workflow Orchestrator & Rule Simulator• Enterprise Directory Sync (Active Directory)	zero-drop speed throttling• Instant pattern-based fraud intervention• Shetab/Shaparak banking ID generation• Connectors to HLR/HSS, PCRF, and SMPP	issues balance reservations, enforces business policies, and coordinates external systems
4. State, Persistence & Big Data Layer	• ACID-Compliant Transactional Data Store• Ultra-Low Latency In-Memory Session Cache• High-Capacity Enterprise Event Streaming Bus• Columnar Big Data Warehouse (CDR / IPDR)	• Fully ACID-compliant relational persistence• Microsecond distributed session state• High-throughput pub/sub event pipeline• 10x compressed columnar CDR storage	Guarantees absolute transactional integrity, provides seamless session failover across cluster nodes, and allows sub-second analytical reporting across billions of CDRs

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4. Detailed Functional Modules & System Capabilities

4.1. Real-Time Cellular Charging Core (3GPP OCS / CHF - 4G/5G)

The PooyTel cellular charging core strictly complies with international telecommunications standards, including **3GPP TS 32.299**, **3GPP TS 32.296**, and **IETF RFC 4006**. It provides native interfaces to 4G Evolved Packet Core (EPC) and 5G Core (5GC) network functions, including PGW, SMF, UPF, and IMS.

Key Cellular Charging Capabilities:

- **Full Session-Based Credit Control Lifecycle:**
  - Real-time processing of `CCR-Initial` (session setup and initial balance reservation), `CCR-Update` (interim usage reporting and quota refresh), and `CCR-Termination` (session tear-down and final balance reconciliation).
  - Native support for `Event-Based Charging` (Direct Debiting and Refund) for instantaneous transactions such as Value-Added Services (VAS), one-time pass purchases, and interactive SMS billing.
- **Multi-Services Credit Control (MSCC):**
  - Simultaneously handles dozens of Rating Groups and Service-IDs within a single Diameter response. For example, international internet data, national intranet traffic, zero-rated educational domains, and VoLTE voice calls can be rated and debited concurrently over a single bearer connection.
- **Intelligent Final-Unit-Indication (FUI):**
  - Automated instruction dispatch to network gateways upon bundle depletion or account expiration:

    1. **TERMINATE:** Immediately terminates the bearer and disconnects the subscriber.

    2. **REDIRECT:** Seamlessly redirects HTTP/HTTPS browsing sessions to a branded captive portal for instant online top-up without dropping network connectivity.

    3. **RESTRICT_ACCESS:** Enforces a restrictive IP filter rule restricting access solely to whitelisted public utility or banking endpoints.
- **Adaptive Dynamic Quota Allocation:**
  - Dynamically sizes allocated quota slices based on the subscriber's real-time consumption velocity. High-speed downloading subscribers receive larger quota slices to prevent signaling overhead, while slow consumers receive smaller slices to eliminate revenue leakage risk.

4.2. Comprehensive Authentication, Authorization & Accounting Server (Enterprise RADIUS AAA)

Engineered for fixed broadband operators (FTTH, VDSL, ADSL, Wireless), TD-LTE providers, and enterprise campuses, PooyTel’s carrier RADIUS server conforms to **RFC 2865**, **RFC 2866**, **RFC 2869**, and **RFC 5176**.

Core AAA Module Highlights:

- **Broad Authentication Protocol Support:**
  - Native execution of **PAP**, **CHAP**, and **MS-CHAPv2** (critical for secure VPNs and Windows domain integration), **MAB (MAC Authentication Bypass)** for passwordless onboarding of IoT devices, security cameras, and POS terminals, as well as **EAP-SIM** mobile offloading.
- **Structured Network Access Server (NAS) Management:**
  - Supports unlimited NAS clients (BRAS, Layer-3 routers, and Wi-Fi access controllers) with independent shared secrets.
  - Hierarchical logical grouping by province, telecom zone, PoP site, or access medium for streamlined bulk configuration and policy propagation.
- **Carrier-Scale Gigawords Accounting:**
  - Fully tracks and aggregates standard 64-bit rollover counters (`Acct-Input-Gigawords` and `Acct-Output-Gigawords`), guaranteeing 100% accurate volumetric recording when subscriber sessions exceed the 4GB 32-bit boundary.
- **Distributed Simultaneous-Use Enforcement:**
  - Real-time concurrency tracking that instantly blocks unauthorized concurrent logins (e.g., single-session residential accounts vs. multi-branch enterprise pools).

4.3. Enterprise Directory Authentication & Office Network Integration Suite (Enterprise LANSuite & 802.1X SSO)

A premier enterprise feature of PooyTel is **Enterprise LANSuite**, tailor-made for enterprise campuses, universities, government ministries, and multi-branch organizations.

Strategic Capabilities of LANSuite:

- **Direct Enterprise Directory Integration (LDAP / Active Directory):**
  - Secure encrypted synchronization with **Microsoft Windows Server Active Directory** and **OpenLDAP** over **LDAPS (SSL Port 636)** and **StartTLS (Port 389)**.
  - Eliminates duplicate account creation: staff authenticate against network switches and Wi-Fi using their existing corporate Active Directory usernames and passwords.
- **Campus & University Network Authentication (IEEE 802.1X SSO):**
  - Secures employee workstations, physical switch ports (Cisco Catalyst, Aruba), and corporate WPA2/WPA3 Enterprise Wi-Fi networks through centralized Single Sign-On.
- **Dynamic Group Mappings:**

- Dynamically maps Active Directory Security Groups to specific bandwidth profiles and monthly quota allocations (e.g., C-Level Executives receive unconstrained 100Mbps links, while contractors or interns receive 10Mbps capped pools).

- **Automated Organizational Unit (OU) Synchronization:**
  - Continuously polls and imports departmental OU hierarchies, providing complete synchronization audit logs and change alerts.

4.4. Multi-Dimensional Rating Engine & Comprehensive Discount Strategies

PooyTel's rating engine empowers marketing and commercial teams to roll out complex, high-performing tariff strategies without touching code.

Four Primary Pricing Paradigms:

1. **FLAT Rate:** Fixed monetary rate per standard unit of consumption (Bytes, Kilobytes, Seconds, or Transactions).

2. **BLOCK Rating:** Charging based on discrete increments (e.g., voice calls rated in 60-second intervals; data rounded up to 1MB blocks).

3. **TIERED / Progressive Rating:** Stepped tariffs that dynamically drop rates as the subscriber surpasses defined monthly volume tiers, encouraging higher usage.

4. **ZERO_RATED:** Zero-cost access for government services, banking portals, utility systems, and national educational platforms.

Comprehensive Rating Dimensions per Transaction:

- **Content & Rating Group Classification:** Differential rating for international transit, national domestic traffic (half-price / 50% discount), and approved domestic messaging applications (one-third price / 67% discount).
- **Time-of-Day Profiles:** Time-based multipliers differentiating peak hours, off-peak daytime, and late-night free or deeply discounted windows.
- **Destination Zone Matching (E.164):** Cost separation for On-Net calls, Off-Net mobile interconnect, national fixed landlines, and international destination tiers with defined profit margins.
- **Roaming Surcharges:** Location-aware national and international roaming markups tied to Visited Public Land Mobile Network (VPLMN) codes.

- **Daily Maximum Charge Cap:** Enables marketing offers with guaranteed maximum daily charges; once the subscriber hits the expenditure ceiling, subsequent traffic for the rest of the calendar day becomes 100% free.

4.5. Comprehensive Package Catalog, Subscription Lifecycle & Multi-Tier Deductions

PooyTel implements a clean, decoupled two-tier architecture separating "Commercial Package Definitions" in the product catalog from "Active Subscriptions" assigned to individual accounts.

Advanced Package Management Capabilities:

- **Extensive Product Diversity:**
  - Volumetric Data Packages (MB / GB)
  - Voice Bundles (Minutes / Seconds)
  - Short Message Service Bundles (SMS count)
  - Converged Hybrid Bundles (Data + Voice + SMS + Bonus Gift Credit)
- **Flexible Financial Settlement Modes:**
  - **WALLET_DEBIT:** Instant balance deduction from the subscriber's prepaid wallet.
  - **POSTPAID_INVOICE:** Charges billed directly to the subscriber's monthly cyclical invoice.
  - **EXTERNAL_SETTLED:** Activations processed via third-party fintech apps, promotional vouchers, or corporate sponsorships.
- **Intelligent Auto-Renewal Engine:**
  - Supports dual renewal triggers: **Volume Depletion** or **Calendar Expiration**.
  - Checks credit thresholds in real time, automatically renews subscriptions, and issues SMS confirmations without interrupting active browsing sessions.
- **Package Queuing Mechanism:**
  - Subscribers can purchase upcoming bundles in advance. Queued packages remain in a `RESERVED` state and automatically promote to `ACTIVE` the instant the current package is exhausted or expires.
- **Prioritized Deduction Ladder:**
  - Strict consumption sequencing: Short-term promotional bundles are consumed first, followed by night-time packs, followed by standard monthly allowances, and finally falling back to pay-as-you-go cash wallet debiting.

4.6. Integrated Telecom Invoicing, Periodic Billing & Banking Payment Identifier Engine

The PooyTel billing engine automates the entire revenue lifecycle for Postpaid and Hybrid subscribers through an autonomous batch billing processor.

Strategic Billing Capabilities:

- **Flexible Billing Cycles:** Supports monthly, bi-monthly, custom calendar ranges, or arbitrary billing intervals with configurable payment deadlines (Due Dates).
- **National Standard Banking Identifiers (Mod-11 Check-Digit Algorithm):**
  - Automatically calculates standard **Bill ID** and **Payment ID** conforming to national banking standards (Shetab, Shaparak). Subscribers can pay invoices through mobile banking apps, ATMs, POS terminals, and online payment gateways.
- **Dynamic Surcharges, VAT & Regulatory Fees:**
  - Fully automated calculation of Value-Added Tax (10% VAT), line maintenance subscriptions, telecommunication development duties, and municipal taxes—fully adjustable via web config without software patching.
- **Carried-Over Balances & Debt Aging:**
  - Aggregates unpaid prior balances, incorporates interim payments, applies credits, and enforces automated late-payment penalty surcharges.
- **Visual HTML/CSS Invoice Template Designer:**
  - Integrated drag-and-drop and CSS editor for corporate invoices, complete with live preview, dynamic variables, and high-resolution PDF generation supporting both Jalali (Solar Hijri) and Gregorian dates.

4.7. Quality of Service (QoS) Management, Bandwidth Control & Fair Usage Policy (FUP)

PooyTel provides network engineers with surgical tools to shape traffic, prioritize latency-sensitive applications, and prevent network congestion.

Multi-Dimensional Bandwidth Shaping:

- Dedicated symmetrical or asymmetrical Receive (Rx) and Transmit (Tx) limits.
- **Burst Limit:** Temporary speed bursts enabling instant web page rendering.
- **Burst Threshold & Burst Time:** Fine-grained burst eligibility windows.
- **Guaranteed Rate (CIR):** Committed minimum bandwidth guarantees for mission-critical enterprise SLAs.
- **Traffic Priority Queuing:** Prioritization levels (1 to 8) applied during peak backhaul congestion.

Seamless Fair Usage Policy (FUP) Without Disconnection:

- Power to offer "Unlimited" commercial bundles with guaranteed quality:
  - When a subscriber breaches the fair consumption ceiling, the system dispatches a real-time signal to the access router, cleanly down-throttling speed to a manageable default (e.g., 256 Kbps) **without tearing down the active connection**.
  - Instant SMS notifications alert the user of FUP entry.
  - Bandwidth automatically restores to full line-speed at the start of the next billing cycle or upon purchasing an add-on top-up bundle.

4.8. Real-Time Network Router Control & Dynamic Policy Enforcement (RFC 5176 CoA / PoD)

By fully implementing the **IETF RFC 5176 (Dynamic Authorization)** standard, PooyTel eliminates the frustrating requirement for users to disconnect and reconnect to apply policy changes:

- **Change of Authorization (CoA):**
  - Instantly upgrades upload/download speeds the moment a subscriber purchases a new booster package.
  - Enforces immediate throttling when FUP consumption thresholds are exceeded.
  - Transitions bandwidth profiles seamlessly upon entering or exiting nighttime discount windows.
- **Packet of Disconnect (PoD / Disconnect-Request):**
  - Forcibly and instantly terminates subscriber sessions upon complete credit depletion, credit limit breach, or immediate fraud mitigation triggered by the anti-fraud module.

4.9. Centralized Subscriber Management, Lifecycle & SIM/Equipment Inventory

The subscriber lifecycle management subsystem maintains a comprehensive, 360-degree digital profile of every subscriber, including contractual data, consumption history, and hardware assets.

Subscriber Management Capabilities:

- **Holistic Account Status States:** Active, Suspended, Financially Blocked, and Terminated.
- **Integrated SIM & Equipment Inventory (SIM/IMSI/IMEI):**
  - Complete repository tracking Mobile Station International Subscriber Directory Numbers (MSISDN), International Mobile Subscriber Identities (IMSI), Integrated Circuit Card IDs (ICCID), and PIN/PUK security codes.
  - Conflict-free SIM allocation ensuring absolute asset uniqueness across the network.
- **Immutable Financial Ledger:**
  - Strict accounting separation of cash balances, promotional bonus credits, and credit ceilings, backed by a tamper-proof audit trail for all top-ups, debits, and adjustments.
- **Shared Corporate & Family Wallets:**
  - Connects multiple employee SIMs or family members to a single master billing wallet, complete with individual monthly usage caps and granular permission boundaries.

4.10. Advanced IP Address Management & Intelligent CG-NAT Solution (IPAM)

Intelligent management of precious IPv4 address pools and CG-NAT infrastructure is a native core capability of PooyTel:

- **Static IP Binding (Framed-IP-Address):** Automatically allocates dedicated static public IPs to corporate clients, VPN gateways, and servers upon authentication.

- **Dynamic Multi-Tier IP Pools:** Segregates public routable, private RFC 1918, local subnet, and CG-NAT address ranges into independently managed pools.
- **Allocation Algorithms:** Supports Sequential and Random allocation algorithms to balance routing table efficiency with cybersecurity obfuscation.
- **Live Pool Utilization Telemetry:** Real-time visibility into pool saturation, active allocations, and remaining addresses, paired with proactive threshold alerts to prevent pool exhaustion.

4.11. Regulatory Compliance, Lawful Judicial Inquiries & 5-Tuple CG-NAT Correlation (IPDR Compliance)

PooyTel provides full, audited compliance with national regulatory mandates, telecommunications regulatory authorities (CRA), and cyber-police (FATA) requirements:

Specialized Regulatory Ingestion & Correlation:

- **High-Rate Syslog CG-NAT Ingestion:**
  - Features a dedicated, non-blocking Syslog Collector listening on UDP Port 5140, streaming NAT translation events directly from edge routers without impacting routing performance.
- **5-Tuple Precision Correlation Engine:**
  - Accurately identifies the offending subscriber based on minimal historical data: **Public IP, Public Source Port, and Transaction Timestamp** (featuring an intelligent temporal jitter tolerance window to compensate for slight router clock drift).
- **Electronic Judicial Case Dossier:**
  - Records court warrant numbers, judicial branch metadata, and automatically appends the complete subscriber profile (National ID, Full Name, Contact Numbers, Registered Physical Address, Switch Port, and Serving Cell Tower ID).
- **Official Government-Formatted Export:**
  - Generates standardized official inquiry response documents complete with official agency letterheads, security verification barcodes, and investigating officer credentials.
- **Tamper-Evident Audit Trail:**
  - Permanently logs all administrative search queries, timestamps, and accessed records to prevent unauthorized surveillance or internal data misuse.

4.12. Real-Time Telecom Anti-Fraud Engine

PooyTel's integrated anti-fraud engine constantly analyzes subscriber behavioral patterns and transaction streams to neutralize revenue loss and network exploitation:

- **Wangiri & High-Cost Premium Rate Fraud:** Detects rapid recurring calls or connections to suspicious international destinations, instantly tearing down active sessions and placing offending lines under administrative lock.
- **SIM Cloning & Impossible Travel Anomaly Detection:** Flags SIMs appearing simultaneously across distant cell towers or exhibiting physical velocity that violates geographic feasibility, instantly invalidating sessions.
- **Rapid Device (IMEI) Flipping:** Triggers security warnings and blocks service when a SIM card is rotated rapidly across multiple IMEI devices within short time intervals.
- **Traffic Spikes & Bandwidth Abuse:** Automatically mitigates unauthorized tethering or bandwidth bypass attempts that exceed normal subscriber baseline profiles via real-time CoA throttling.

4.13. Intelligent Traffic Classification, National/International Data Separation & High-Speed IP Trie

To comply with regulatory mandates requiring differential pricing for domestic intranet versus international internet traffic, PooyTel incorporates a high-performance in-memory search structure:

- **In-Memory IP Prefix Trie:**
  - Indexes hundreds of thousands of IP prefixes directly in high-speed memory. Sub-microsecond prefix lookups execute in pure O(K) time, ensuring zero packet processing bottlenecks even under massive line-rate traffic.
- **Standard Regulatory Tariff Ratios:**
  - International Internet Traffic (1.0x baseline rate)
  - National Information Network (0.5x half-price rate)
  - Approved Domestic Messaging Apps (0.33x one-third rate)
  - Government & Banking Portals (0.0x Zero-Rated)
- **Automated Regulatory Whitelist Sync:**

- Automatically pulls updated IP ranges and certified domain lists from Information Technology Organization (ITO) and Regulatory Authority (CRA) web services, dynamically refreshing the in-memory Trie without system restarts.

- **Interactive IP & ASN Lookup Console:**
  - Built-in diagnostic tool within the web console allowing administrators to test any IP address, view its Autonomous System Number (ASN), and verify its exact tariff multiplier before committing rules.

4.14. Orchestration Engine, Workflow Automation & Network Rule Simulator

The workflow engine coordinates event-driven automations across core network infrastructure and external enterprise platforms:

- **Comprehensive Event-Driven Rule Engine:**
  - Fires actions across a multitude of network events: SIM assignment, subscriber creation, balance shifts, package expiration, peak hour transitions, 80% and 100% quota threshold breaches, and fraud detections.
- **Telecom Core Integration Adapters:**
  - **HLR / HSS / UDM Connectors:** Provision, suspend, and modify subscriber profiles across 2G/3G/4G/5G mobile subscriber registers.
  - **PCRF / PCF Connectors:** Injects dynamic policy and charging control parameters via standard interfaces.
- **Carrier-Scale SMS Gateway (SMPP Protocol):**
  - Connects directly to mobile operator Short Message Service Centers (SMSC) on Port 2775 for high-speed delivery of balance alerts, OTP passwords, and billing invoices.
- **Custom Webhooks with Dynamic Templating:**
  - Dispatches structured HTTP/HTTPS webhooks with encrypted authorization headers to upstream CRM, ERP, and billing systems.
- **Safe Workflow Simulator:**
  - Validates and stress-tests newly crafted business automation rules in a sandboxed simulator before applying them live to the network.
- **Reliable Retry Queues:**
  - Employs exponential backoff queues to guarantee message delivery even during temporary outages of third-party external endpoints.

4.15. True Multi-Tenancy, Reseller / Agent Portal & Revenue Sharing

Designed for wholesale infrastructure providers, multi-province operators, and FCP/Servco franchise networks:

- **Strict Multi-Tenant Isolation:** Complete isolation of database records, subscriber lists, financial ledgers, and operational configurations; each tenant or provincial branch operates exclusively within its authorized domain.
- **Dedicated Reseller Portal:** Self-contained web interface empowering regional agents and dealers to register subscribers, sell bundles, renew subscriptions, and monitor line health without gaining access to master system settings.
- **3-Way Financial Reconciliation:**
  - Automated commission computation, revenue sharing distribution between upstream wholesale operators and downstream resellers, and exportable financial settlement reports.

4.16. Comprehensive Subscriber Self-Care Portal, Online Line Diagnostics & Guest Captive Portal

Empowering subscribers with self-service tools significantly enhances customer satisfaction while eliminating customer support overhead:

Self-Care Portal Capabilities:

- **Passwordless SMS OTP Login:** Fast, secure subscriber access via mobile number verification codes.
- **Transparent Usage Analytics:** Intuitive real-time dashboards displaying remaining wallet balance, domestic vs. international data breakdowns, package expiration timers, and active connection speeds.
- **Real-Time Line Diagnostics & Line Health Score:**
  - Tests the physical and logical link from the subscriber's terminal to the network gateway. Measures ping latency, packet loss percentage, link health score (0–100), and physical optical/radio signal quality.

- **One-Click Remote Port Reset / ONT Reboot:**
  - Allows the subscriber to trigger an automated port reset or modem reboot signal directly from their smartphone if they experience degradation. This single feature deflects up to 35% of Tier-1 helpdesk support calls.
- **Guest Wi-Fi Captive Portal:**
  - Automatically redirects visitors at commercial malls, airports, hotels, and corporate branches to a customizable branded landing page; features SMS OTP onboarding and allocates time- or quota-limited guest internet access.
- **Integrated E-Commerce Package Store:** Allows instant purchasing of data bundles, voice packs, and wallet top-ups via direct integration with online banking payment gateways.

4.17. Advanced Web Management Console & NOC Executive Dashboard (Dark Glassmorphism)

Designed to meet the stringent visual and ergonomic requirements of 24/7 Network Operations Centers (NOC):

- **Telecom Dark Glassmorphism UI:** Sophisticated dark theme optimized for large NOC video walls, minimizing eye strain during round-the-clock monitoring shifts.
- **Full Bilingual & Dual Calendar Support:** Instant, seamless switching between **Persian (RTL with Solar Hijri / Jalali calendar)** and **English (LTR with Gregorian calendar)**.
- **Live Real-Time Telemetry Dashboard:** Live streaming widgets displaying Transactions Per Second (TPS), active online session counts, real-time charging latency histograms, and multi-tier cluster health metrics without manual browser refreshes.
- **Granular Role-Based Access Control (RBAC):** Hierarchical permission levels (`SUPER_ADMIN`, `ADMIN`, `OPERATOR`, `VIEWER`, `RESELLER`) protecting core configuration entities and maintaining comprehensive administrative audit logs.

4.18. Big Data Streaming Pipeline, Event Stream Processing & Telemetry Monitoring

- **High-Throughput Streaming Event Bus:** Real-time ingestion, routing, and publication of billions of charging transactions, AAA accounting packets, and operational alarms.
- **Columnar Big Data Warehouse:** Highly optimized storage for Call Detail Records (CDR) and IP Detail Records (IPDR) featuring up to 10x compression ratios; enables complex analytical multi-dimensional queries across hundreds of millions of historical records in milliseconds.
- **Standard Observability Telemetry:** Exposes comprehensive operational metrics across standard monitoring endpoints for zero-friction integration with enterprise observability suites.

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5. Carrier-Grade High Availability, Clustering & Resilience (Five Nines - 99.999%)

In mission-critical telecom environments, even a few seconds of charging downtime results in catastrophic revenue loss or subscriber blackout. PooyTel incorporates a strictly validated **No Single Point of Failure (No SPOF)** architecture engineered for **99.999% availability**:

Infrastructure Layer	Active Master Node	Synchronous Standby Node	Failover & Resilience Mechanism
Ingress Network & VIP	Hosts floating Virtual IP (VIP) and receives all incoming network traffic	Standby node actively monitors master heartbeat	Instant VIP takeover in under 1 second via VRRP / Keepalived without packet loss
Edge Gateways & Charging	Real-time execution of AAA and Diameter charging requests	Synchronously active and provisioned to handle 100% network load	Symmetric Active-Active load balancing or instant Hot-Standby transition
Financial ACID Persistence	Authoritative write node for all balance transactions and user records	Continuously ingests write stream via synchronous replication	Zero data loss risk (RPO = 0) with automated, instant promotion of standby database
In-Memory Session Cache	Real-time tracking of active online sessions and distributed locks	Replicates session state and quota reservations in real time	Seamless session survival: active subscriber connections remain uninterrupted during hardware failover
Analytical	Buffers and writes	Stores compressed	Zero accounting event

Infrastructure Layer	Active Master Node	Synchronous Standby Node	Failover & Resilience Mechanism
Big Data Store	high-density CDR/IPDR accounting records	replicas with continuous offsite backup	drops with uninterrupted analytical reporting

- **Continuous Data Stream Replication:** Guaranteed real-time replication of financial records and operational states across cluster nodes.
- **Stateful Session Failover:** Active sessions, QoS profiles, and allocated quota locks survive node hardware crashes without severing end-user internet connectivity.
- **Sub-Second Automated Recovery:** Heartbeat monitors detect physical node degradation and automatically redirect network traffic to healthy nodes in under 1,000 milliseconds.

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6. Technical Specifications, Standards & Operational Capacity Matrix

Subsystem	Standard / Specification	PooyTel Supported Status & Operational Capacity
3GPP Cellular Core	3GPP TS 32.299 / TS 32.296	Full real-time online charging over standard Gy and Ro Diameter interfaces
5G Service-Based Core	5G Nchf Interface	Fully cloud-native RESTful HTTP/2 architecture using standard 3GPP JSON schemas
Diameter Protocol	RFC 6733 / RFC 4006	High-throughput Credit-Control (CCR/CCA) handling with multi-service MSCC support
Carrier AAA Core	RFC 2865, RFC 2866, RFC 2869	Sub-millisecond RADIUS engine supporting Gigawords accounting attributes
Enterprise Directory	IEEE 802.1X, LDAPS, StartTLS	Direct SSO synchronization with Microsoft Active Directory and OpenLDAP
Dynamic	RFC 5176 (CoA / PoD)	Dynamic bandwidth upgrades, FUP

Subsystem	Standard / Specification	PooyTel Supported Status & Operational Capacity
Authorization		throttling, and instant disconnection packets
Multi-Vendor BNG	Universal Hardware Neutrality	Certified for Cisco IOS-XE, MikroTik RouterOS, Huawei BRAS, Juniper, Aruba
Rating Models	Flat, Block, Tiered, Zero-Rated	Multi-dimensional rating by volume, duration, destination prefix, and time-of-day
Billing Engine	Standard Mod-11 Banking Algorithm	Automated generation of national Bill IDs and Payment IDs for banking settlement
Traffic Classification	In-Memory IP Prefix Trie	Nanosecond prefix lookups; automated CRA/ITO regulatory whitelist synchronization
Lawful Compliance	5-Tuple IPDR & Syslog Collector	Ingests CG-NAT logs over UDP 5140; sub-second 5-tuple correlation with judicial dossiers
ACID Persistence	Carrier-Grade Relational Storage	Strict transactional guarantees ensuring absolute financial data integrity
In-Memory Cache	Sub-Millisecond State Engine	Ultra-low latency distributed locks and session state preservation
Big Data Warehouse	Columnar CDR Storage	10x compression ratio; sub-second query performance over billions of accounting records
Subscriber Self-Care	Self-Care, Diagnostics & Captive	Line health scoring, subscriber-initiated port resets, SMS OTP login, bundle shop
Operations Console	NOC Responsive Web Portal	Dark Glassmorphism, bilingual (EN/FA), dual calendar, real-time live TPS streaming

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7. Competitive Advantages, Strategic Value & Return on Investment (ROI) Analysis

Investing in the PooyTel platform unlocks tangible financial and operational value for your organization:

Strategic Business Objective	Key Performance Indicator (KPI)	Concrete Impact on Enterprise Operations
Zero Revenue Leakage	100% Financial & Quota Integrity	Completely terminates unauthorized post-depletion traffic; saves billions in unrecoverable debt
Total Cost of Ownership (TCO)	60% to 80% Capital & Operational Savings	Eliminates expensive foreign-currency recurring licenses, immune to geopolitical sanctions, backed by local 24/7 engineering support
Agile Time-to-Market	Under 5 Minutes for New Campaigns	Roll out promotional bundles, seasonal offers, and loyalty campaigns via web UI without core network downtime
Call Center OPEX Reduction	Up to 35% Ticket Deflection	Self-care line health diagnostics and automated remote port resets empower subscribers to resolve issues independently
Regulatory Peace of Mind	Sub-Second Judicial Responses	Instant, audited 5-tuple CG-NAT tracebacks, tamper-evident logs, and certified regulatory reports

Six Key Business Triumphs:

1. **Definitive Zero Revenue Leakage:**
Dynamic quota slicing and distributed transaction locking ensure that not a single byte of data is transferred without being accounted for. Accidental over-usage, uncollected traffic, and negative customer balances are entirely eliminated.

2. **Dramatic TCO Reduction & Currency Independence:**
Replaces astronomically expensive foreign OCS/AAA software stacks that demand recurring licensing fees in foreign currency. Eliminates foreign vendor lock-in and geopolitical sanctions risk while providing direct access to the core engineering development team.

3. **Unprecedented Commercial Agility:**
Marketing managers can conceive, configure, simulate, and launch creative bundles, tiered promotions, and seasonal discount schemes in minutes directly through the web console—completely bypassing weeks of IT development backlogs.

4. **Substantial Helpdesk Deflection via Self-Care:**
Equipping end-users with self-diagnostic tools—such as real-time line health scoring and one-click remote ONT/port reboots—resolves the vast majority of physical line and router freeze issues, directly slashing call center operational expenditure.

5. **Unified Infrastructure Management:**
Replaces fragmented point solutions by managing cellular subscribers, residential fiber broadband, enterprise leased lines, and public Wi-Fi hotspots under a single consolidated administrative pane.

6. **Frictionless Lawful & Regulatory Compliance:**
Lawful interception requests from judicial authorities and cyber-police (FATA) regarding CG-NAT mappings and subscriber identities are fulfilled within seconds through standard, tamper-proof electronic reports.

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8. Deployment Models, Infrastructure Flexibility & Cloud-Native Readiness

PooyTel provides uncompromised flexibility across diverse enterprise deployment topologies:

- **Bare-Metal High-Performance Deployment:** Ideal for tier-1 telecommunications carriers handling massive concurrent throughput; maximizes direct hardware utilization, multi-core CPU scheduling, and hardware network interface cards (NIC).
- **Enterprise Virtualization:** Fully validated and turnkey ready for deployment across enterprise virtualization platforms, including **VMware vSphere / ESXi**, **Proxmox VE**, and **Linux KVM**.
- **Cloud-Native & Containerized Architecture:** Built with microservices-ready containerized architectures (Docker, Kubernetes) for elastic horizontal scaling in response to peak traffic surges within private telecom cloud environments.
- **Air-Gapped On-Premises Data Centers:** Functions with 100% autonomy in isolated, air-gapped private enterprise data centers without requiring external internet connectivity, ensuring sovereign cybersecurity and total subscriber data confidentiality.

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9. About PooyTech Engineering, Service Level Agreements (SLA 24/7/365) & Support Services

PooyTech Engineering Co. brings together elite telecommunications network architects, high-throughput distributed systems engineers, and seasoned ICT industry consultants. Our unwavering commitment to continuous innovation, carrier-grade stability, and collaborative

engineering partnerships guarantees peace of mind when selecting PooyTel as the mission-critical charging and accounting backbone of your organization.

Enterprise Services & Support Ecosystem:

- **Turnkey Deployment & Custom Engineering:** End-to-end platform deployment, customized integration with proprietary network elements, and tailored business workflow implementation.
- **Zero-Downtime Migration:** Seamless migration of active subscriber profiles, remaining package quotas, and historical financial ledgers from legacy billing systems with zero service interruption.
- **Carrier-Grade 24/7/365 SLA Support:** Round-the-clock dedicated technical engineering teams on standby 365 days a year to ensure continuous, uninterrupted network operations.
- **Continuous Updates & Roadmap Evolution:** Regular feature upgrades tracking the latest 3GPP technical releases, IETF RFC standards, and domestic regulatory mandates.
- **Comprehensive Enterprise Training:** Hands-on certified training workshops for network administrators, NOC operators, financial controllers, and commercial sales teams.

🌐 Connect with PooyTech Engineering & Schedule a Live Demo

To learn more about the **PooyTel** platform, discuss specific organizational architectural requirements, receive a complimentary technical and commercial consultation, or schedule an interactive live demonstration, please visit our official portal:

🔗 **https://pooytech.ir**

PooyTech: Pioneering Next-Generation Telecom Software, Converged Charging & Intelligent Network Architecture.