rXg

RG Nets Products Overview

Table of Contents:

rXg

RG Nets Introduction

RG Nets manufactures and markets rXg, a family of affordable ***policy*** based revenue eXtraction gateways designed specifically for operators of for profit subscriber based Internet access networks. Introducing policy based services is all about presenting and provisioning subscriber options such as: premium services, managed content, intrusion protection, access controls, payment methods and subscriber self-management while protecting the operator from abusers and excessive users.

rXg enhances network revenue potential and greatly reduces the cost and complexity of service delivery, providing operators with policy enablers such as: captive portals, unified threat management, billing and accounting, content management, packet priority, uplink aggregation, AAA enforcement, SQL subscriber database, core network services, web cache, event triggers, multifaceted advertising insertion, network monitoring and more functions and capabilities required for complete cognizance, control and communications over the subscriber experience -- into a singular gateway.

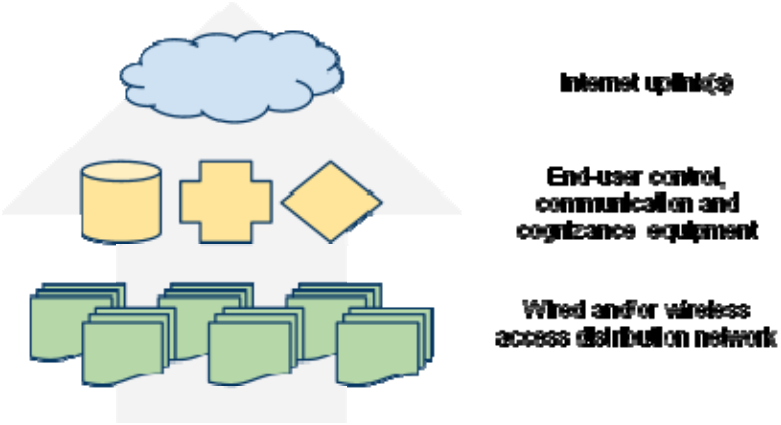
A revenue generating network (RGN) is an interconnection mechanism that is deployed specifically for the purpose of generating revenue for the network operator. A typical person will encounter and use several RGNs in the course of any given day. A decade ago, the landline voice POTS network and broadcast television networks would be the two most commonly accessed RGNs by the average person. Today, cellular telephone networks and Internet access networks are the dominant forms of RGNs. The focus of RG Networks is controlling IP-data RGNs.

Many forms of IP-data RGNs may be found today. The regional telephone LEC and local cable television companies will likely offer one or more IP-data possibilities for end-users that reside in the region. DSL and cable modem networks are two examples of such offerings. The infrastructure that is needed to deploy DSL and cable service limit them to the domain of entities that have large financial war chests to fund the roll out of capital equipment for wireline distribution.

The rapid advances and proliferation of wireless technology have dramatically changed the balance of power in the world of IP-data RGNs. Fixed wireless broadband equipment enables operators to deploy DSL and cable modem equivalent service for region specific end-users without massive investments in wireline distribution infrastructure. Furthermore, the ubiquity of Wi-Fi in portable devices has created an entirely new market for wireless RGNs that provide service in locations frequented by transient end-users.

All IP-data based RGNs are composed of three main elements:

- The WAN uplinks that the operator leases to obtain bulk wholesale Internet access
- The distribution network that enables the operator to deliver physical connectivity to end-users
- The equipment that the operator uses to control, communicate with and gain cognizance over the end-user population



At RG Nets, Inc., we have over four man decades of experience with the largest, most complex and highest traffic IP-data RGNs in the world. In our experience, the most profitable RGNs are driven by the business model. An operator that has a solid understanding of the broad spectrum of revenue generation possibilities is far more likely to deploy a highly profitable RGN. To meet the needs of a business model driven RGN, the provisioning infrastructure must provide complete control, broad spectrum communication and deep cognizance over the end-user population.

Policy Based Service Gateway

Operators are faced with significant new demands on their networks. In general broadband consumption is exploding, this coupled with advanced access enlightment provided by 3G and LTE is leading to a growth of rich media applications and services. The broadband delivery market is becoming more competitive, and over-the-top services and content, third party applications, and new, bandwidth hungry, smart devices can represent a potential threat to network performance, customer control, and revenue streams. With the granular control and personalization enabled by RG Nets, service providers can make better resource, service, and business decisions at an ever-accelerating pace. RG Nets service gateway solutions help operators reduce churn, attract and keep new subscribers, and garner more revenue while managing their operational expenses.

rXg

With RG Nets solutions, service providers can take advantage of dynamic service management, including targeted, personalized services and content for each subscriber; customer profile management, including multi-service quotas with limitless options for prepaid and postpaid service allowances; and policy management, real time policy-based quality of service (QoS) control using network control points, enabling policy-controlled video and voice services with admission-control capabilities. In broadband distribution networks policies are combined to create per user services designed to optimize the network resources while provisioning customers with their unique experience, and ensuring fairlness and security across the network.

Because of its unique features, rXg can be used to solve the industry's most difficult challenges:

- Data congestion management and tiering
- Usage caps, bill shock prevention, in network roaming
- Fair use and multi-service quota management
- 3G mobile data offload (mobile core protection)
- Interactive user quality of experience and loyalty building
- Location and Identity-based air force, ads, and content
- Advanced services development

rXg Policy Based Solutions

Policy based service gateways integrate enforcement rules to service plans that define individual or group user experience. These policy-based offerings allow subscribers to select use plans that meet their specific needs and budget. Policy base service delivery is based on:

- Identifiifing the suscriber anywhere on the network

  Identities are based on a unique subscriber identity that follows the customer anywhere on the operator's network

- Connecting the subscriber through a policy profile

  Policy profiles are presented to the subscriber at provisioning in the form or subscriber selectable plans

- Applying enforcement rules throughout subscriber sessions

  Enforcement rules define the subscriber experience

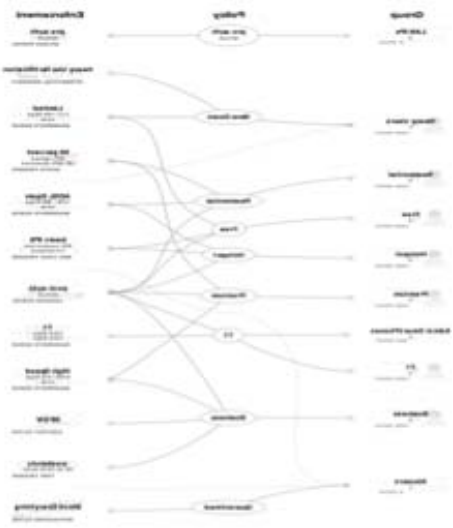
- Policy enforcement Triggers

Automatically change a policy based on events, thresholds, or device behavior

Enforcement Rules

Combining enforcement rules to shape a subscriber or groups of subscribers experience is the foundation for policy based services.

- Subscriber data quotas
- Precise bandwidth profiles
- Protocol priority assignment
- Subscriber priority assignment
- Content filters
- Location based portals
- Web experience manipulation
- Forced browser redirects
- Web caching
- Rule violation detection
- Event triggers



Enforcement Enablers

Offering and provisioning policy based services can be expensive and complex. Policies operators take features from disparate diciplines and devices to create, deliver and manage services.

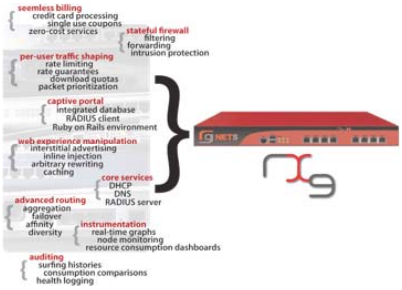
- Web server
- AAA server
- Database server
- DPI switch
- Payment gateway
- Traffic shaping appliance
- Uplink aggregator
- Core network servers and routers
- Storage networks
- Network monitoring system

rXg Service Enforcement Features and Benefits

rXg is the most comprehensive and integrated service gateway in the market! rXg's list of features and benefits is exhaustive, combining policy enabling features and functions that requiring multiple disparate devices.

rXg Rack Collapse

rXg tightly integrates policy enabling features and functions into a single service gateway reducing complexity, CAPEX and OPEX while increasing the financial and service delivery potential of the network.



rXg's Integrated Policy Enablers

rXg not only provides policy enablers in one architecture, but application integration removes interface and latence issues as packets pass through the gateway for policy management.

Forced web-browser redirection with captive portal web application

Redirect selected end-user web requests to a local captive portal web application that features an integrated database for local credential storage. Simple and effective management of end-user credentials via a local SQL database with an AJAX web application GUI.

With rXg operators also have the choice of exercising external database connectivity for credential challenge and response (e.g., via RADIUS, LDAP, WISPr, etc.). Integrate with other AAA mechanisms to reduce credential management overhead.

rXg's extensible framework is built using Ruby on Rails, eRuby and XML allowing operators to quickly and easily extend the portal web application to do anything imaginable through cutting edge Web 2.0 tools with an active open source community and ample availability of skilled developers.

Zero operator intervention end-user self-provisioning billing system

Bill end-users for tiered levels of access and premium services either recurring or one time via a several methodologies, including:

- Credit card processing engine supporting over forty payment gateways. Fully integrated into the captive portal web application is rXg's internal end-user database enabling zero operator intervention end-user self-provisioning.

- Single and multiple use coupon code generator and management. Easy implementation and operation of alternative direct and reseller revenue models (e.g., pre-paid, micro-payment, bulk payment, etc.).
- Zero cost service support. Specific support that simplifies management of networks designed with zero direct revenue generation (e.g., session intercession by MAC address, authorization via shared password, etc.)
- OSS Integration for passing subscriber session metrics for traditional billing or interface with third party OSS solutions.

Role-based AAA policy enforcement engine

Fully automated enforcement of per-user policies with a broad spectrum of target identification and policy template options including:

- Identify and assign roles to end-users through nearly any mechanism imaginable, including but not limited to credential capture via portal, IP address, subnet, VLAN, MAC address, etc.
- Identify and group applications by server IP address, source port(s), destination port(s) and DPI signature.
- One-click assignment of policy templates to end-user roles, application groups and authenticated databases of end-users. Fully automated enforcement of per-user policy over a dynamic end-user population.

Per-user traffic shaping

Specifically designed for zero operator intervention end-user provisioning of premium services including:

- Real-time restriction of bandwidth utilization on a per-user basis to operator specified rate limits. Zero operator intervention provisioning of rate limits for end-users based on a broad spectrum of criteria, including but not limited to payments applied at the captive portal, RADIUS vendor specific attributes and pre-defined lists of MAC addresses.
- Guarantee an operator specified minimum bandwidth to certain end-users on a per-user basis. Enables operator to up-sell end-users premium service packages such as VoIP enablement with zero operator intervention provisioning.
- Enforce usage quotas over the end-user base over an operator specified time scale. Enables operator to control consumption of bandwidth over long-range time scales (e.g., 5 GB per month) while allowing higher instantaneous speeds. Automated zero intervention provisioning of quota additions purchased via captive portal.
- Hard packet prioritization guarantees that packets from operator specified end-users are forwarded before any others. rXg enables several levels of

operator configurable priority. Enables operators to sell premium offerings for prioritized access for business customers, end-users with servers and other scenarios.

Web experience manipulation

Complete control over the end-user world wide web experience with specific support for advertising and premium service revenue generation mechanisms such as:

- Periodically redirect web requests to specially designed interstitial advertising templates delivered via the captive portal mechanism.
- Arbitrarily rewrite any or all web pages that end-users experience. Inject advertising, insert banners, and communicate operator service messages inline with the end-user web experience.
- Simplified integration of pre and post authentication captive portal advertising with integrated payload rotation services.
- Content filtering based on URL pattern matching with automatic synchronization with publicly available block-lists.

Advanced client-side link control and routing

Reduce monthly recurring costs and increase network reliability through several unique features including:

- Aggregate several uplinks to achieve the equivalent throughput of a single large link. Leverage multiple cost effective DSL and cable modem uplinks to acquire large volumes of bandwidth at a low monthly recurring cost.
- Automatically failover between uplinks. Detect uplink status and manages pools of uplinks. Optionally designate certain uplinks as backup-only to support shadow leased line, satellite or WWAN backup scenarios.
- Relate uplink pools to groups of end-users. Enable operators to offer premium services based on routing policy such as business and VPN customers access to high performance leased lines while sending residential customers and bulk traffic to low cost DSLs and cable modem.
- Simultaneously utilize a diverse array of uplink carriers. Enables operators to work with as many carriers as desired without cross carrier configuration. Avoid complex, problematic and costly peering arrangements and special routing protocols. All carrier diversity is handled inside the gateway from the customer side of the Telco demarc.

Fully integrated unified threat management system

Specific features and bias for expanding operator revenue generation opportunities such as:

- Stateful firewall to dynamically alter packet filtering of based end-user group, IP address or MAC address. Designate filtering targets by DNS names, IP address and/or TCP ports. Full integration with billing engine enables operators to use filtering policy as an enabler of premium service offerings.
- rXg's behavioral intrusion detection subsystem to quickly identify abusive end-users. Also can be used to detect malicious hosts attacking the rXg from the WAN.
- DPI engine that enables signature matching. Compatible with industry standard rule formats that are widely available for detecting viruses, worms, malware, DoS attacks and other common problems.
- Behavioral and signature based malicious identification are integrated with the policy enforcement engine, enabling the operator to isolate and temporarily or permanently penalize, quarantine or black-hole abusive end-users.
- All systems are also fully integrated with all available end-user communication vectors including but not limited to captive portal, interstitial redirection and message injection via payload rewriting.
- IPsec VPN concatenation with integrated CA
- Originate and terminate site-to-site IPsec VPNs to ease management of large-scale networks.
- Concatenate host-to-site IPsec VPNs from the WAN to enable secure remote access to privately addressed LANs.
- Concatenate host-to-site IPsec VPNs from the LAN that enable operators to offer secure connectivity as a premium service.
- Fully integrated CA can issue certificates when certain billing plans are purchased enabling zero operator intervention provisioning of premium secure connectivity to end-users.

Core networking services

Fully featured core network services enable operators to reduce operational and maintenance costs and potentially even be used to generate additional revenue. Subsystems include:

- rXg integrates a completely configurable DHCP server. Full integration with end-user management to enable simplified option passing to end-user devices and fixed assignment of addresses.
- rXg integrates a full DNS server with full primary and secondary zone control using Dynamic DNS clients to ease remote access and operational

- rXg contains a commercial grade RADIUS server with full integration into the internal database. Enables operators to use the captive portal web application as a centralized billing and end-user management system with third-party authentication mechanisms.
- Bulk email subsystem with fully customizable templates that can easily broadcast direct marketing materials to part or all of the end-user population.

Full spectrum graphical instrumentation package

- Monitor every aspect of the system and network performance and health in real-time. Web-based AJAX-enabled graphical user interface enables remote access via any web browser while offering desktop usability. Some of the many features include:
- Visualization package enables graphing of all instruments. Operator specified time scales and graphic sizes. Supports multiple parallel output formats. Real-time graph updates via AJAX in the web-based administrative console.
- Monitor the status of network nodes. Poll nodes for status and collect uptime data. Report failures to operators in real-time or monitors.
- rXg is a customizable system and network resource consumption dashboards. Operators have complete information about entire subsystems in a single glance. Real-time updates via AJAX make the dashboards ideal for presentation on NOC displays.

Comprehensive and persistently stored auditing package

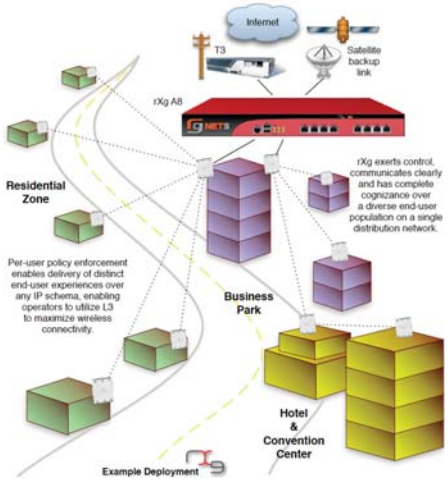
- rXg enables operators to capture the complete surfing history of every end-user. Generate reports on what domains are accessed by end-user login, MAC address, IP address groups and much more. Have complete cognizance over the surfing habits of your end-user population. Target advertising based on surfing profiles. Sell end-user surfing data to aggregators.
- Report on instantaneous transfer rates as well as download quota consumption. Persistent storage of data allows operator to see trends over the long term. Enables operator to understand the end-user population and create offerings to maximize profitability.
- Understand the health of the network and the gateway. Track utilization and resource consumption trends over days, weeks, months and even years. Enables operators to plan, budget and forecast for expansion and optimize usage of deployed assets

rXg In the Network

rXg is all encompassing and requires no additional plugins or options. rXg is designed to be the only device betweeen the uplink and service delivery infrastructure.

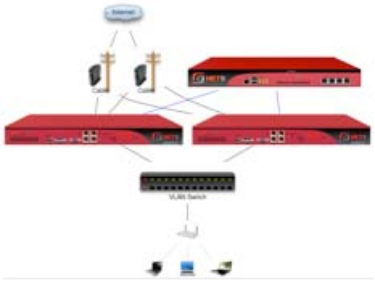
Single Gateway Networks

rXg provides all the functionality for creating, provisioning and maintaining policy based services in RGNs



Multiple Gateway Networks

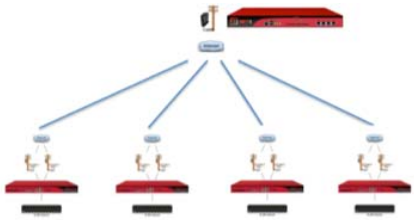
For high availability, load balancing and centralized monitoring and control many operators with critical or large hot zones choose an rXg Cluster.



rXg

Distributed Networks

Operators with multiple sites place policy enforcement at the edge. Central subscriber controls, monitoring and gateway management is provided through a centralized Cluster Controller.



rXg Configurations

RG Nets provides turnkey solutions for every size network.

A4 mk ii

- 50 – 250 Simultaneous users
- 25 – 100 Mbps Sustained / Peak

S4 mk ii

- –500 – 1000 SUL
- –100 – 250 Mbps Sustained / Peak

Q5 mk ii

- 1000 – 2500 SUL
- 5 – 1.5 Gbps Sustained / Peak

Larger deployments cluster multiple rXgs.

Customers in Multiple RGN Market Segments

Free Public Access

Wireless@SG

Country-wide free Public WiFi

rXg

Commercial Public Access

Atlanta International Airport

Guest Access and Public Safety

Distributed Commercial Access

CenturyLink

HotSpots and Hotzones

- Vail Colorado
- Monroe Louisiana
- Gig Harbor Washington
- Columbia Missouri
- Lacrosse Wisconsin
- Kalispell Montana
- Dothan Alabama
- Northeast Michigan
- San Marcos Texas
- Arkansas
- Loraine County Ohio

Resort and Hotels

- Higate Hotels
- Sutton Hotels
- Nobel Investments

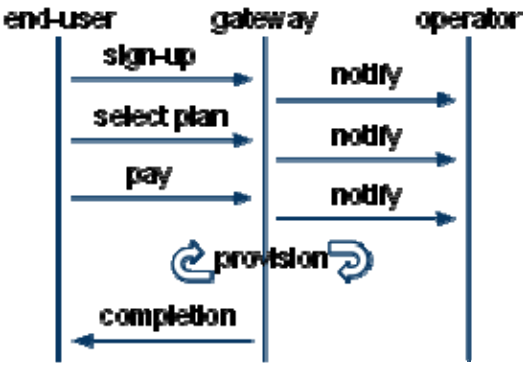
rXg

- Caribe Hotels
- Holiday Ins
- Harrahs
- Raddison
- Tagaytay Resorts

Summary

By collapsing the rack of network equipment that is usually needed to provision a RGN, the rXg enables operators to deploy advanced services without the overhead associated with manual provisioning. Of course, the cap-ex and op-ex are also reduced while network reliability and simplicity is dramatically increased.

By combining all of features needed to operate an RGN into a single device, the rXg is also able to implement zero operator intervention provisioning, a unique alternative to manual provisioning that completely changes the RGN business model. Operators define a set of usage plans along with the policies that are provisioned and link these to costs and a billing engine. End-users use a captive portal to select a usage plan and pay for the desired access. Once payment has cleared, the rXg automatically provisions the policy defined by the end-user. During the course of normal RGN operation where end-users are signing up and selecting services, the RGN operator is a passive recipient of notifications. For many RG Nets, Inc. customers, once the rXg is installed and configured, they can sit back and simply watch as the money flows into their bank accounts.



Using a captive portal for basic service selection (e.g., the amount of online time that the end-user desires to purchase) is fairly common in hotspot environments. The rXg expands on this notion to include all known facets of provisioning. Any policy that the rXg can enforce may be automatically provisioned with zero operator intervention, including but not limited to traffic rate limits, usage quotas, guaranteed committed information rates, content filtering, DPI filters, intrusion protection, firewall, VPN and even physical uplink association.

rXg enabling policy based networks