Wifi Presentation

High-Performance RADIUS Server and Converged Prepaid & Postpaid Billing

ISP, VOIP, Wimax, Mobile & Wifi Providers

ARADIAL Technologies

About Aradial Technologies

- Designer and provider of Billing, AAA and Policy control servers for IP services.

- Targets multiple vertical markets, xDSL/FTTH, WiMAX, LTE, Wifi, VOIP, Cable/MSO and 3G mobile, Wifi offload.

- Experienced personnel from top networking and billing companies

- Private, self funded, profitable

ARADIAL
Technologies

Aradial Products

- Aradial AAA/RADIUS
- Aradial Enforcer – AAA with Prepaid Enforcement
  - Spotngo add-on for Payment and top-up vouchers
- Aradial Converged Billing
  - Billing and CRM
  - Prepaid and Postpaid billing
  - Voucher management
  - Self Care
  - PRM – Partner management
  - Wholesale Data and Voice
  - PCRF – Policy Control Engine - module
  - Diameter support for Gx/Gy and Ro/Rf - LTE
- PCRF – including AAA and optional billing
- HSS (including dual protocol Diameter and Radius)
- Aradial SMART-HLR - connector for 3G offload

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Hotspot/Wifi
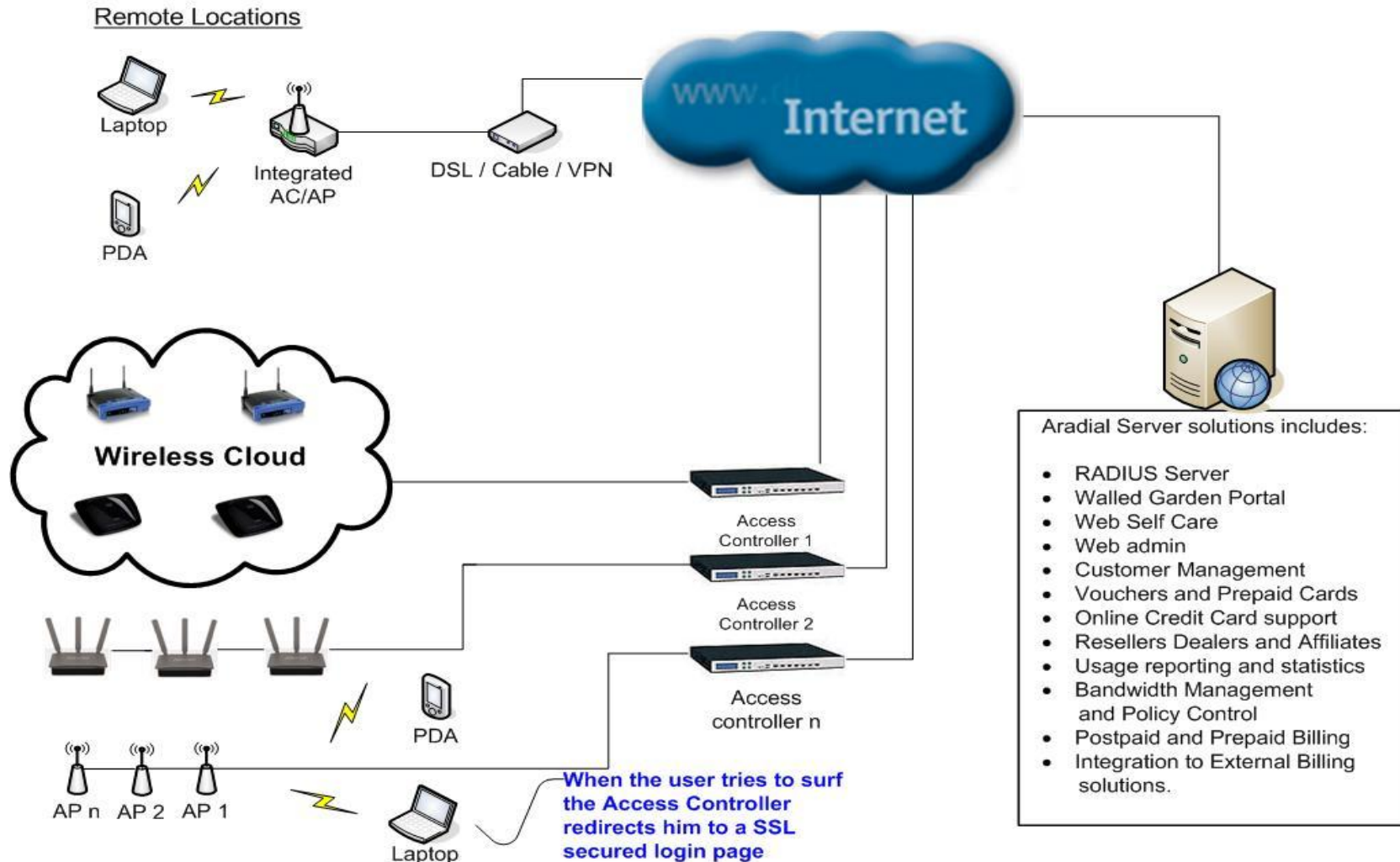# And Case Studies

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Hotspots/WiFi Installed Base

Over 500 hotspots network installed worldwide

- Interstate USA
- Bell Aliant Canada
- Kewiko Mongolia - Ruckus
- STAN Telecom - AF
- O'Fallon Wireless USA
- Telecell - Burkuno Passo
- Easy Kiosk - Australia
- PTK – Aruba networks
- Teledata – MZ

- MTN Rwanda - Balton/Alvarion
- MTN Uganda – Balton/Alvarion
- Dekal Telecom–Jamaica-Altai
- Noble Telecom - Jamaica
- Saudi Telecom - Altai
- Angola Telecom
- Namibia Telecom -Nomadix
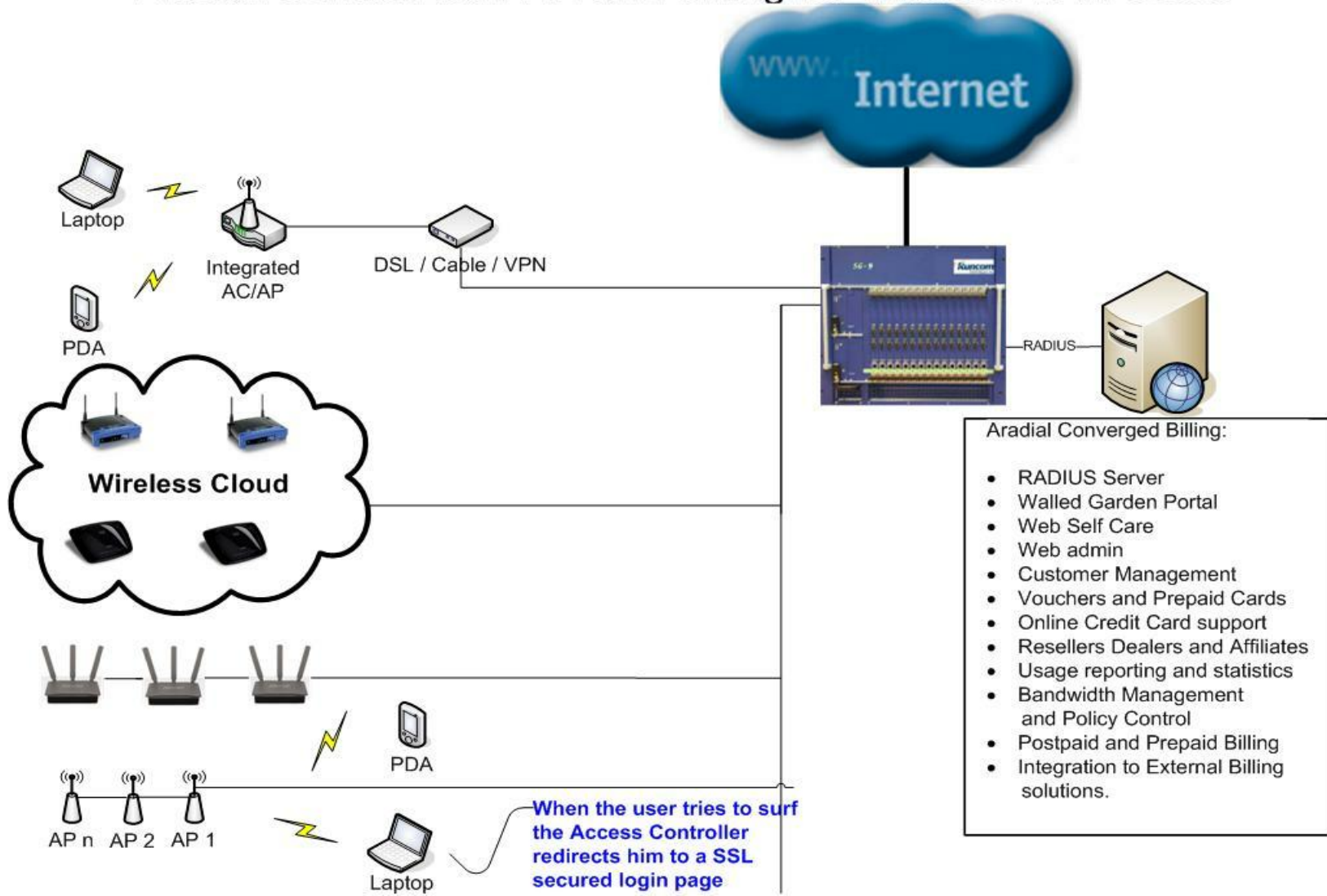- BSNL – India – Nomadix
- Paamul Mx– Motorola + MTK

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Typical Hotspot Deployment

Aradial Centralized AAA and Billing for Wireless LAN Users

Remote Locations

Laptop

Integrated AC/AP

PDA

DSL / Cable / VPN

Internet

Wireless Cloud

Access Controller 1

Access Controller 2

Access controller n

PDA

AP n AP 2 AP 1

Laptop

When the user tries to surf the Access Controller redirects him to a SSL secured login page

Aradial Server solutions includes:

- RADIUS Server
- Walled Garden Portal
- Web Self Care
- Web admin
- Customer Management
- Vouchers and Prepaid Cards
- Online Credit Card support
- Resellers Dealers and Affiliates
- Usage reporting and statistics
- Bandwidth Management and Policy Control
- Postpaid and Prepaid Billing
- Integration to External Billing solutions.

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Centralized deployment

Aradial Centralized AAA and Billing for Wireless LAN Users

Aradial Converged Billing:

- RADIUS Server
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- Web Self Care
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Laptop

Integrated AC/AP

PDA

DSL / Cable / VPN

Internet

RADIUS

Wireless Cloud

AP n   AP 2   AP 1

PDA

Laptop

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Hotspots/WiFi Case Study

- MTN Uganda – Wifi 3G offload

  - Alvarion (WBS/Wavion) base stations

  - Mikrotik

  - ARCB with integration to Mobile Core

  - Hotel deployments and hospitality

- MTN Rwanda – Wifi 3G offload

  - Alvarion (WBS/Wavion) base stations

  - Mikrotik

  - Enforcer integration with Mobile IN

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Hotspots/WiFi Case Study

- Interstate – Wifi

  – Mikrotik

  – Military bases and travel stops in USA

- Kewiko – Wifi in Mongolia

  – Ruckus (Zone Director)

  – Mikrotik

- Seychelles – Wifi all the Island

  – 300 Alvarion (WBS/Wavion) base stations

  – Mikrotik

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Hotspots/WiFi Case Study

- ## Altai – Jamaica Dekal

  - Altai base stations

  - Mikrotik   controllers
  - 250,000 subscribers
  - Aradial Converged Billing - Prepaid

- ## Sea Link Denmark

  - Nomadix and Mikrotik
  - 250,000 subscribers
  - Prepaid cards
  - Spotngo Online Payments
  - Spotngo refill vouchers

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Hotspots/WiFi Case Study

- Colima – Wifi Mexico

  - Alvarion (WBS/Wavion) – big coverage

  - Runcom controller for Wifi and Wimax

  - Wimax is for backhauling

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Technologies

Typical Hotspot Deployment
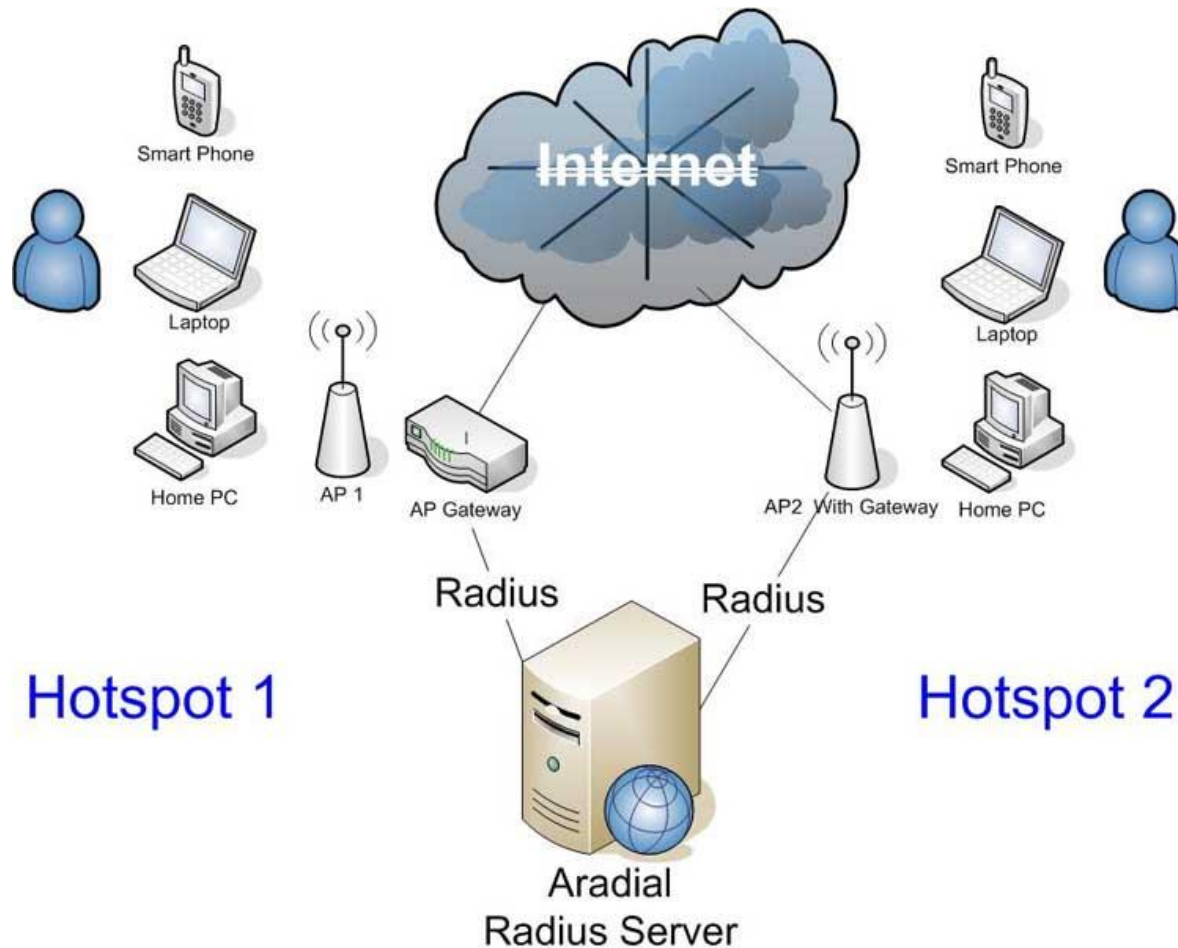
Integration using Aradial Smart-HLR Gateway

Aradial EAP-SIM Mobile Offloading using Aradial SS7 MAP - HLR Gateway

Smart Phone

Laptop

Access controller
Gateway or
AP with RADIUS Client

Radius EAP-SIM

RADIUS Accounting

Aradial
Radius
Server
And
Aradial Converged
Billing

Operator's
Radius
Server

RADIUS

IP based
Interface
API
For EAP-SIM

MAP

Aradial SS7
GW - MAP

Operator's
HLR / VLR

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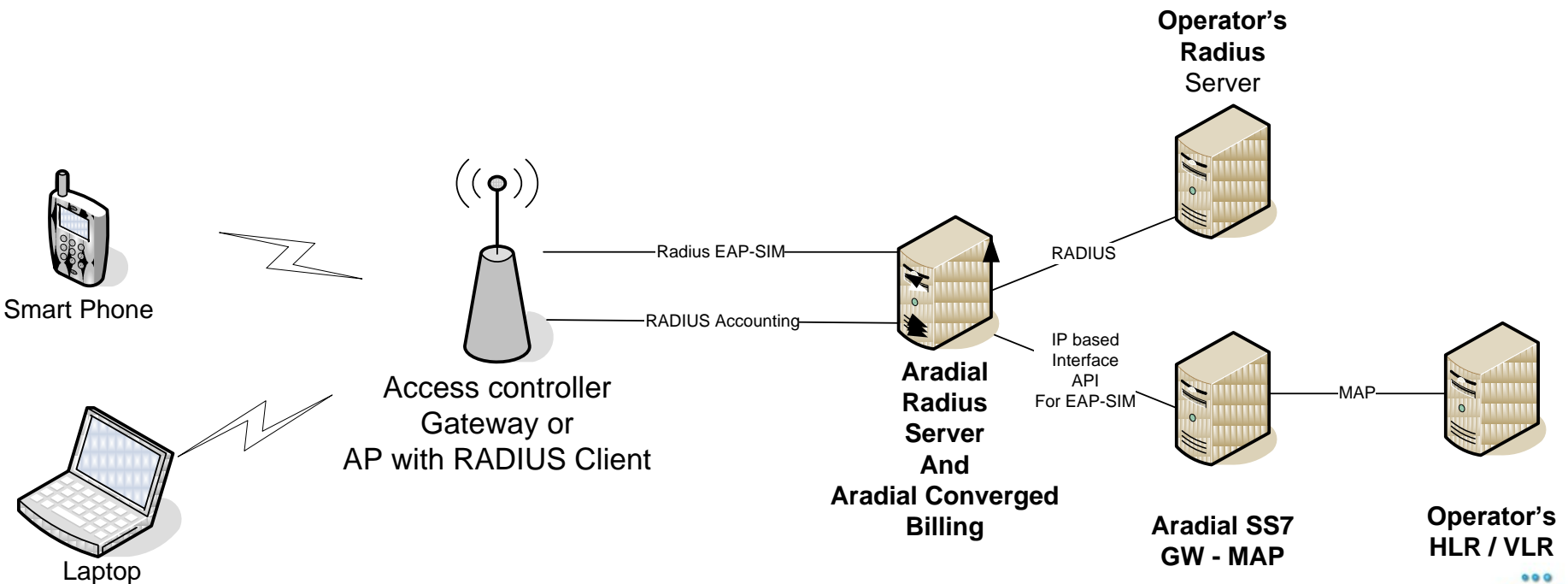
Aradial Supported Wide Area Base stations

- Ruckus
- Alvarion Networks (WBS/Wavion)
- GoNet
- Altai Technologies
- Motorola Solutions WING
- Cisco WLC
- Ubiquity
- Aruba
- Autelan
- Motorola Canopy - Cambium
- Xirrus

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Aradial Supported WiFi Access Controllers

- Ruckus Zone Director
- Mikrotik OS
- Cisco WLC
- Runcom SG1
- Motorola WING
- Aruba Networks
- Nomadix
- HP Curve
- Zyxel, ValuePoint, Planet, Handlink
- 4IPNet
- Griffin, Dlink, NetGear,
- Chillispot based, Linksys - DD-WRT
- PfSense
- Ikarus OS

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ISP/LTE/Wimax/VOIP/Mobile Customers

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ISP / WISP

- Vodafone Ghana – GhanaTel
- Nepal Telecom – xDSL, Dialup and Wimax
- MTN Uganda – Wifi 3G offload
- MTN Rwanda – Wifi 3G offload
- NewRoz Telecom – IRAQ
- Kewiko - Mongolia
- Bezeq Israel PTT – ADSL, Wifi and Wimax
- Smile / Orange Israel
- PMI – Philippe Morris – Enterprise
- Cable & Wireless Atlantic – broadband ISPs
- Sure
- Sahara Net – Saudi Arabia

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ISP / WISP

- Multivision - Djibouti
- BPK – Russia – multiple installations
- Rye Telecom – USA
- Jefferson Telecom – USA
- Bentley Walker – Canada
- Palau Telecom
- GTlink – Mexico
- DHI Telecom Group – USA, multiple locations
- Digicel group – Caribbean
- IOG – Norway
- STAN Telecom

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Mobile GSM/CDMA (3G)

- **nPhase / Verizon Wireless**
  - 16M subscribers for supporting all the smartphones
- Maingate – M2M
  - 700,000 mobile subscribers in Sweden
- Orange Senegal
- STI – Mobile
  - mobile subscribers in Indonesia
  - Installation with FTS
- Telikom – PNG
  - With Telrad and Amdocs
- NSSL – UK
- Applied Satellite Technology– UK
- Globe Wireless – UK – DRP deployment

LTE

- Airspan - LTE and Wifi and Aricent EPC
  - Vanuatu
  - IPI9
  - RLTT
  - Others in the trails
- Telrad - LTE and HSS with Telrad EPC
- Cello Wireless

WiMAX

- Airspan – multiple installations including LTE
- Telrad – multiple installations including LTE
- Runcom – multiple installations
- Wichorus/Tellabs – multiple installations
  - Sprint USA
  - Augere Uganda
- Cisco ASN-GW and Starent
- Huawei and ALU - Telemax - Mongolia
- Motorola PMP / Canopy Wimax
  - Craig Wireless - USA – multiple projects
  - INEA – Poland

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VoIP

- Net4India
  - VoIP provider with 2.5 M subscribers
- GCS - IDT
  - VoIP termination provider in USA
  - 100 million calls per month
- Globe Comm Systems
- Globe Wireless – USA/UK
- NetCiti / Datacom - Indonesia

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Aradial RADIUS /AAA Server

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Aradial AAA Server/ Module

- High performance, fully-featured
- Compliant with RADIUS standards
- EAP support including EAP-SIM/AKA
- Wimax NWG support and LTE extension
- IPv4 and IPv6
- Scalable and High available (Multithreaded, Multi process)
- Geo redundancy
- Provisioning interface exposed to External system
- Diameter AAA and HSS - extra optional module
  - Diameter – Ro/Rf (DCCA), Gx/Gy (PCRF)

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Aradial AAA Server (Cont.)

- 100% web-based interface
- SSL security support
- Scalable Dynamic IP Pools
- Database
  - MS SQL, Oracle, MySQL, LDAP, Active Directory
  - Flat files
- Statistics and reporting modules
- Enforcer add-on module:
  - Prepaid cards management,
  - Bandwidth management
  - Quotas and balance enforcement
  - Disconnect using POD on quota depletion or COA
 - MAC authentication and binding

ARADIAL
Technologies
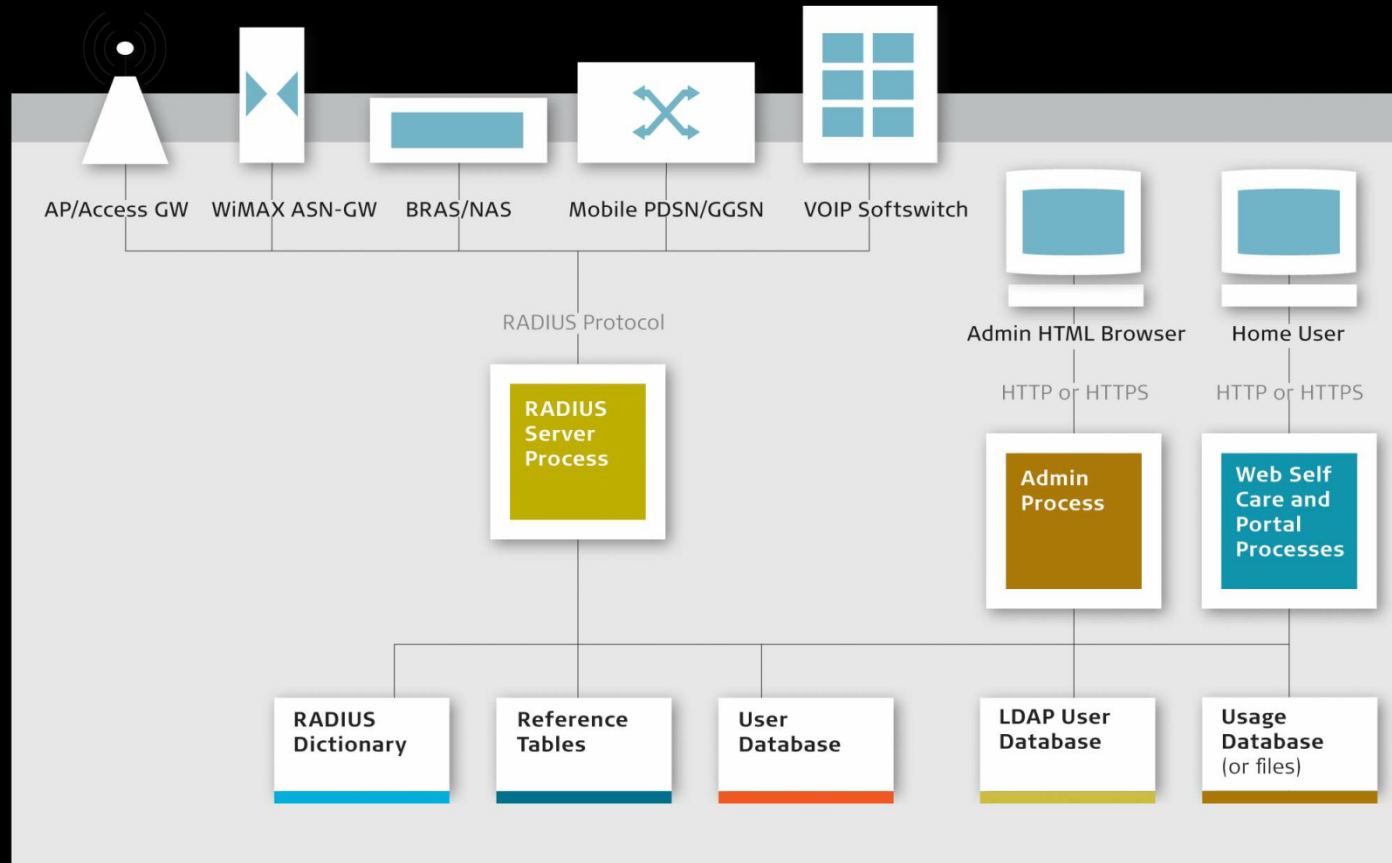
Architecture

Integration with External Billing Systems

- Enhanced provisioning APIs
  - Internal support for traffic, duration metering & QoS
- Export usage to billing systems
- Advanced API for external online charging/billing servers using CORBA
  - Session duration limitation
  - Data transfer limitations – directional limiting supported
  - Bandwidth limit using VSA RADIUS Attributes
  - Quota-based access
  - QoS and subscriber profile
- Integration using stored procedures calling external databases

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Technologies

Typical High-Availability Deployment
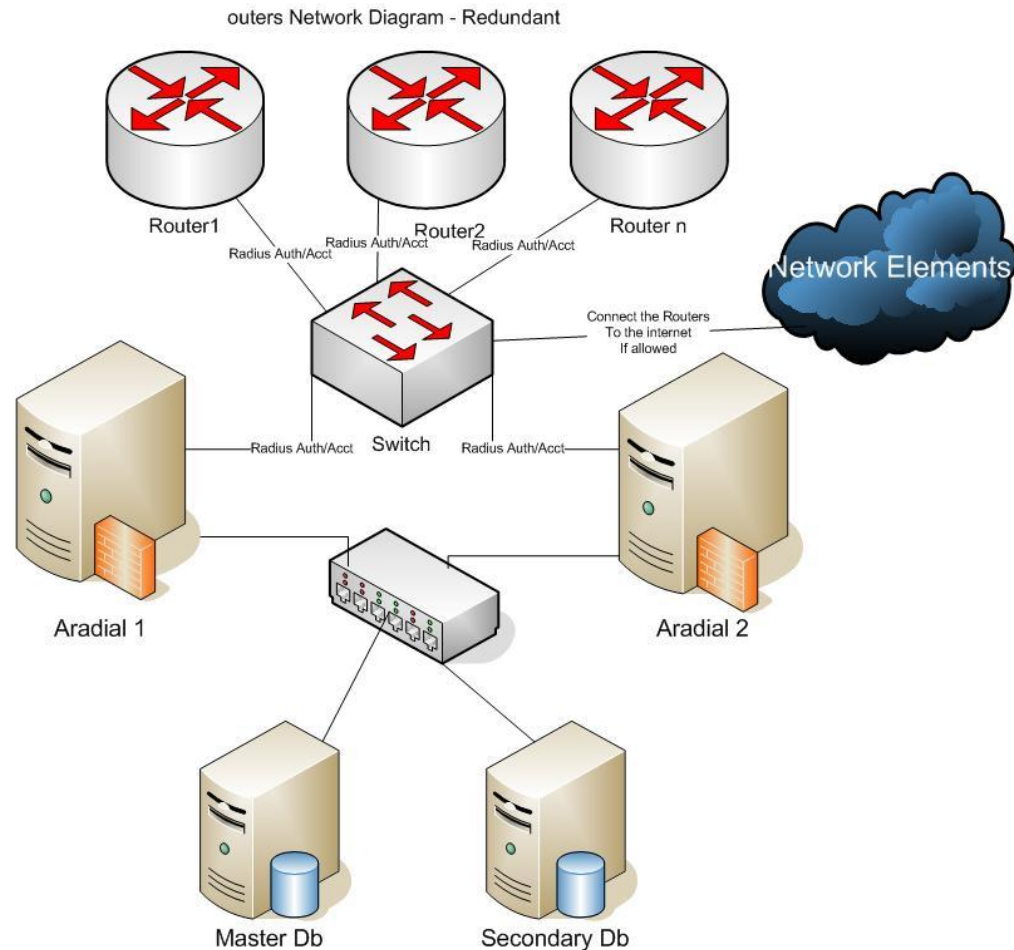
Spotngo Payment Module
Add-on to AAA

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Technologies

Spotngo Enhanced Vouchers and Credit-Card Payment Module

- Plan/tariff management (time, traffic and expiration)
- PIN generation and management using plans
- User signup from the portal using a PIN
- Refilling users with a new PIN (PIN attached to a tariff plan with time, traffic or expiration)
- Refill by credit card
- Creating users with a credit card
- Configurable and customizable payment interface
- View/query payment history
- Secured portal (SSL)
- Secured PIN and plans management (SSL)
- Printing and exporting PINs to CSV files
- Customizable flows

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AAA & Enforcer Advanced Features

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Overview

- Policy algorithms

  – Handling RADIUS messages

- State server

  – What is happening in the network

- Prepaid user monitoring

- User management

- Process monitoring

  – Including SNMP MIBs and traps

- Load simulator to test the network

  – Test any scenario for any equipment

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Policy Algorithm Mechanism

- Customizable handling flow for each RADIUS message type
- Flow made of a chain of RADIUS algorithms
- Core algorithms supplied with the product
  - Authentication and Authorization algorithm
  - Accounting algorithms
  - RADIUS proxy algorithm
- New algorithms can be developed using shared C++ and/or Lua & TCL scripting

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Aradial AAA Features

- PAP and CHAP authentication
- EAP authentication
  - EAP-PEAP, MD5, LEAP
  - EAP-TTLS, TLS
  - EAP-SIM and AKA (need integration with SS7)
- Digest, MS-Chap and MS-ChapV2
- Proxying to other RADIUS servers
  - RFC-based RADIUS proxy
  - iPass & other specialized proxy support
- Tunneling
  - PPTP
  - L2TP
- Policy algorithms

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Unique Functionality

- TCL & Lua scripting for policy algorithms

- Extended billing server provisioning API

- Grouping and subgrouping

- Persistent IP pools (support H/A)

- Bandwidth control per NAS model

- Metering (on external billing databases)

  - Time and data accumulator

  - Service suspension based on traffic per NAS model

- Blocking or changing QoS for groups in time-of-day periods (for example, peak, offpeak configurations)

- POD and COA support

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Unique Functionality (Cont.)

- User management
- User self care
- Hotspots WiFi walled garden portal
  - Customization of the portal per location
- Prepaid cards management
- Bandwidth management
- Quotas and balance enforcement and expiration
- Disconnect using POD on quota depletion
- MAC authentication and binding
- Viewing sessions and summaries
- Exporting usage

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Unique Functionality (Cont.)

- Spotngo payment system
  - Refillable vouchers
  - Credit-card processing
  - PayPal support
  - Customization of Spotngo per location
  - PMS system support – Fidelio/Micros

Integration with External Billing Systems

- Enhanced provisioning APIs
  - Internal support for traffic, duration metering & QOS
- Export usage to billing systems
- Advanced API for external online charging/billing servers using CORBA
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  - Quota-based access
  - QOS and subscriber profile
- Integration using stored procedures calling external databases

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Aradial Converged Billing

ARCB

Aradial Converged Prepaid & Postpaid, Multi IP Services

- Prepaid and postpaid billing subscribers
- Advanced AAA & HSS– RADIUS and Diameter
- PCRF - Policy Control management
- Customer Management and basic CRM
- Voucher Management system
- Advanced Customizable Captive portal
- Multiple services on same platform:
  - Wifi / Hotspots and Wifi 3G/LTE Offloading
  - Wired Broadband – ADSL, FTTH– all ISP services
  - LTE & Wimax
  - Mobile 3G
  - VOIP, Traditional VOICE, SMS, MMS, VAS
  - VSAT, IPTV

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Aradial Converged Prepaid & Postpaid, Multi IP Services

- Customer Management Hierarchy
  - Account – shared balance for users
  - Users under account
  - Resource/ANI/CPE defined per users

- Account and user operation – including Roles
  - View financial transactions, sessions and calls
  - Payment by credit card or PayPal
  - Adjustments to invoices
  - Manual payments – cash, checks, banks
  - Balance transfer between users and accounts

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Aradial Converged Prepaid & Postpaid, Multi IP Services

- Business Partners and Reseller Management
  - Hierarchy
  - Revenue Sharing with Business partners
  - Registering subscribers / account
  - Selling vouchers and prepaid cards
  - Receiving commissions
  - Balance transfer (like Mobile Banking)
- Multiple VISP support as Business entity
  - Hierarchy
  - Special administration for VISP/BE
  - Manage users and vouchers under the VISP account
  - External HTTP interface for VISP billing integration
- Revenue Sharing with Business partners

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Aradial Converged Prepaid & Postpaid, Multi IP Services

- Captive portal (customized per location)
  - Responsive design–support all OS including phones
  - Self registration
  - SMS registration (sending PIN via SMS)
  - Free registration (e.g. limit 30 min per day)
  - Buying online by PayPal / CC
  - Voucher registration and refill / top-up
- Web self care for users and accounts
  - Users and passwords management
  - Accounts - Payments and invoices
  - Purchase new offers and upgrades
  - View usage and sessions
- Trouble ticketing

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Aradial Converged Prepaid & Postpaid, Multi IP Services

- Product catalog
  - Price plans
  - Offers using price plans
    - Price plan
    - Network profile provisioning
  - One-time offers
  - Add on offers

ARADIAL
Technologies

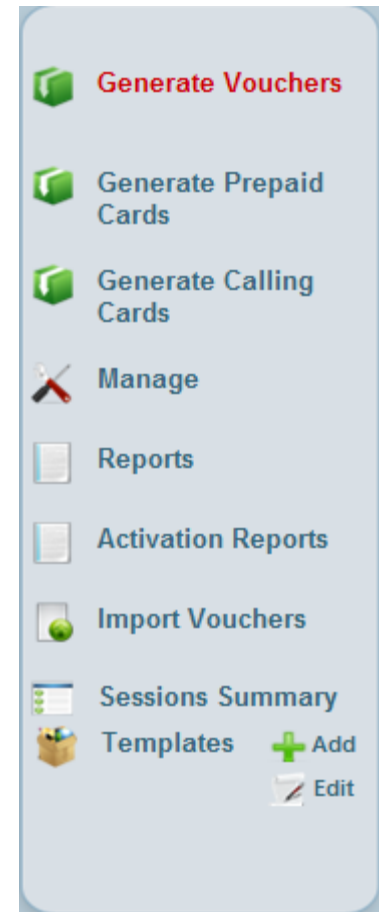# Aradial Converged Prepaid & Postpaid, Multi IP Services

- Flexible charging & rating
  - Periodic Recurring Charges
  - Usage charges
    - Allowances – multiple balances and counters
    - Time of day and day of week and Calendar dates
    - Destination charging – e.g use for VOIP and VOICE Prefix table
  - One-time charges

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Aradial Converged Voucher management

- Voucher management
  - Top-up vouchers
  - Prepaid Cards - Activated on first use
  - Calling Cards
- Creating in Batches
- Generating and managing by Resellers/Business entity (self care for BE)
- Voucher reports including Revenue reports
- Vouchers used in Captive Portal and Self Care
- Advanced Life Cycle including export to files
  - Created
  - Shipped
  - Ready for use
  - In use

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Vouchers

- 3 kind of Vouchers:
- Top-up Vouchers
- Prepaid Cards (Anonymous user)
- Calling Cards (VOIP)

- Reports
- Templates
- Manage vouchers

Generate Vouchers

Generate Prepaid Cards

Generate Calling Cards

Manage

Reports

Activation Reports

Import Vouchers

Sessions Summary

Templates   Add

Edit

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Aradial Converged
Prepaid & Postpaid, Multi IP Services

- Invoicing
  - Periodic automatic invoicing
  - Invoicing sent by email
  - XSL layout – branding
  - Undo billing
  - Discounting
- Accounting reports
  - Invoicing
  - Payment
  - Operator statement, per-account statement
  - Aging payment

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Aradial Converged Prepaid & Postpaid, Multi IP Services

- Automatic payment
  - Error management
- Account Receivables (A/R)
  - Manual, fast payment screen
  - Credit card
  - PayPal
  - Bank Transfer (*)
  - Mobile Payments (*)
- PMS – Micros (Fidelio/Opera support)

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Aradial Converged Prepaid & Postpaid, Multi IP Services

- CDRs processing & error management or rating problems
- Inventory and Resource management
  - DID
  - ANI
  - MAC Address
  - IP Address

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Aradial Policy Control

- PCRF - Policy Control quota management
- Fast definition of Policy rules, actions and step
- Handles various users events
- Advanced dynamic policies for active users
  - Change of QoS parameters in real-time
  - Disconnect
  - Redirect
  - Send balance notifications via email and SMS
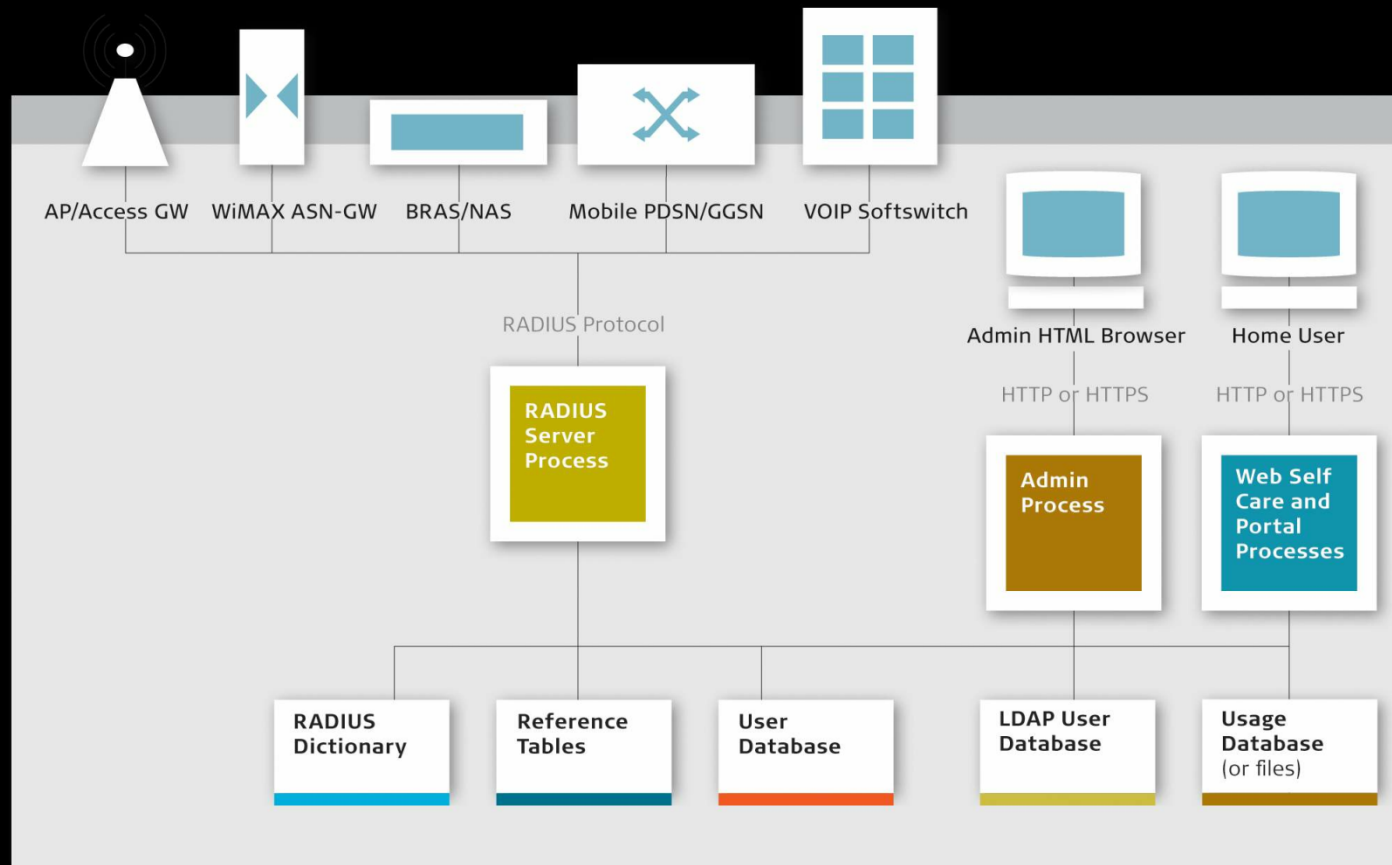
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Wifi / Hotspots Advanced Features

- Bandwidth and QOS per unique NAS
- Volume quota limiting
  - Using RADIUS attributes sent to the NAS
  - Using Interim updates and COA / POD
  - Exact volume charging without Interim accounting, using redirection with Runcom.
- Time bank / allowance
- Expiration
- POD - Packet-of-disconnect for live sessions
  - From the Admin
  - Using API from external system
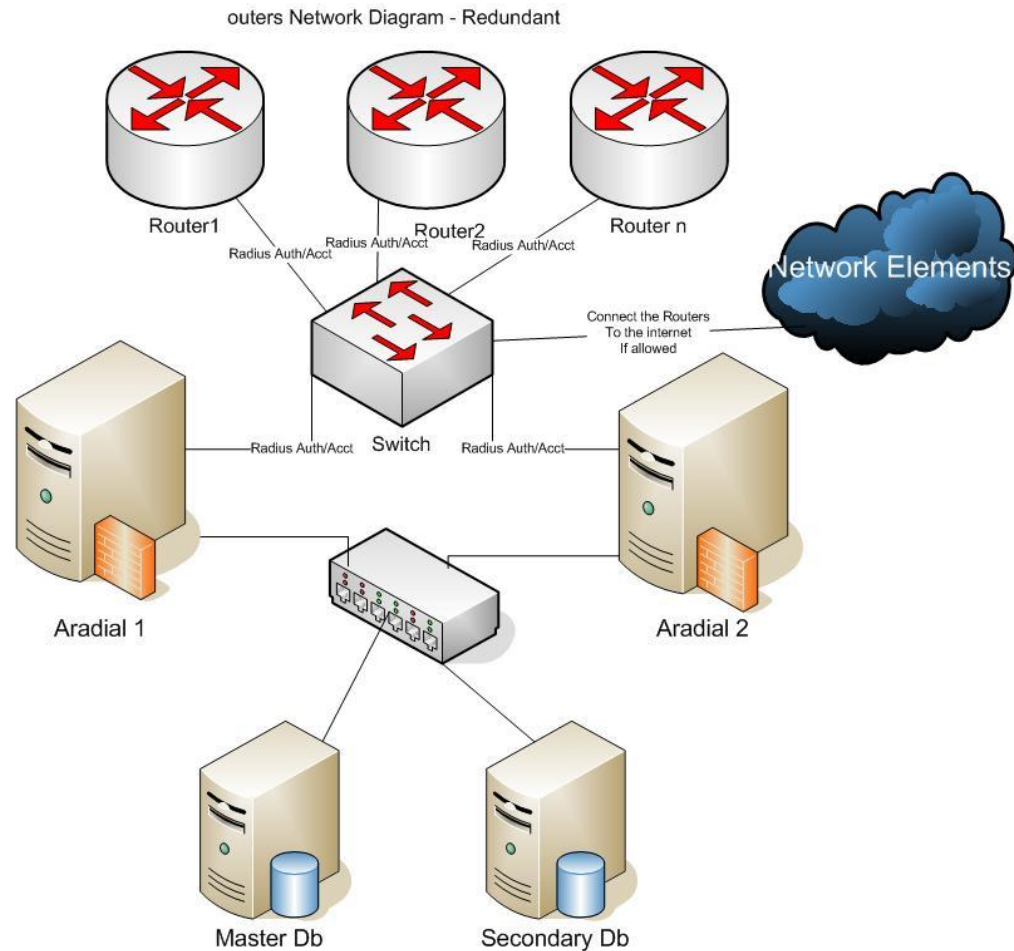- COA – change of Authorization

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Wifi / Hotspots Advanced Features

- Different Portal per location or VLAN

- Different catalog/cart per location

- Doing MAC authentication prior to redirecting to web page.

- SMS and USSD registration flow

- Time Period charging

- Location based charging

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Architecture

Typical High-Availability Deployment

outers Network Diagram - Redundant

Router1

Router2

Router n

Radius Auth/Acct

Radius Auth/Acct

Radius Auth/Acct

Network Elements

Connect the Routers
To the internet
If allowed

Radius Auth/Acct   Switch   Radius Auth/Acct

Aradial 1

Aradial 2

Master Db

Secondary Db

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Aradial LTE

LTE & AAA/Radius and Billing

- LTE Billing and policy control

- Prepaid and postpaid

- Diameter standard for Gx/Gy for PCRF

- Diameter Ro/Rf for charging

- HSS - Diameter

- HSS & AAA supports LTE extension for HSS

- Radius to Diameter converter

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Aradial WiMAX

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WiMAX AAA/Radius and Billing

- WiMAX Forum standard compliant
- AAA supports 16e NWG 1.4 Stage 3 including:
  - Authentication and authorization
  - EAP-TTLS/TLS for authentication adapted to the WiMAX standard
  - Integration with leading ASN gateway partners
  - IP-based and flow-based accounting
  - Hotlining with CoA
  - Wimax Prepaid application
  - 16d support with all known BRAS

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WiMAX AAA/Radius and Billing (Cont.)

- Real-time active session management

- Scalability and real-time AAA functionalities

- Cost-effective solution and fast ROI
  - Billing and ordering:
    - All services, including broadband data, VoIP, voice, IPTV, VoD for WiMAX
    - Allows controlling users balance, time and traffic in real time and with zero leakage

- Advanced user management for subscribers

- Advance creation of prepaid cards

- Self ordering and provisioning redirection to activation portal at zero balance and plans purchase (add on module or ARCB billing)

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WiMAX AAA/Radius and Billing (Cont.)

- Integration with external billing systems and future systems - advanced APIs for external billing integration, for both real-time events and provisioning

- Support of the following base station providers: Airspan, Runcom, Telrad/Alvarion, Cambium/Motorola PMP, Huawei, Alcatel Lucent, Ipaxiom, Soma, Samsung, Redline, Aperto, Expedience

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Aradial VoIP Prepaid

Prepaid VoIP with Aradial

- Aradial VoIP supported services:
  - IVR calling
  - Direct calling using ANI/calling cards
  - Username
  - Peering
  - Termination and origination
- Two charging models:
  - Single session – entire balance is allocated for the user during the session
  - Multisession – the session is split into time quotas for all users that use a single balance

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Prepaid VoIP with Aradial (Cont.)

- Centralized authentication and accounting for all routers or gateways

- High-performance and reliable server

- Scalable to handle millions of users and concurrent sessions on low-end hardware Converged IP services

- SSL secured HTML-based administration

- Dealer/business partner management – dealers can manage their own users

- Extended HTML UI for user database and user groups
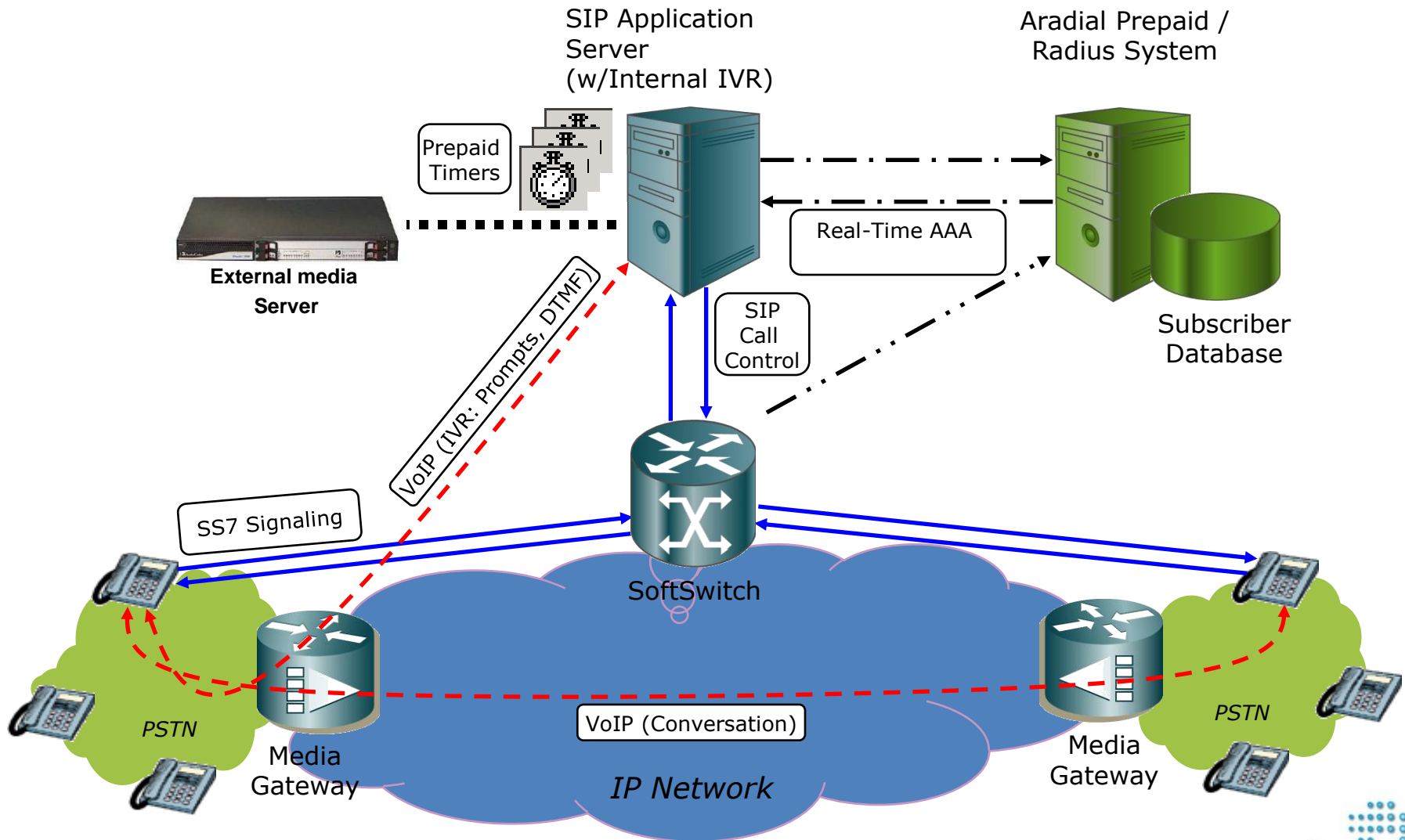
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Prepaid VoIP with Aradial (Cont.)

- Self-care user module
- User and calling-card management, rating, import and export from/to CSV files
- Balance, duration and traffic enforcement
- User concurrence enforcement and view of concurrent calls from the administration tool
- Optional integration with SNMP-based NMS
- Multiple admin types
- Admin activity tracking
- External billing system interface using stored procedures or CORBA
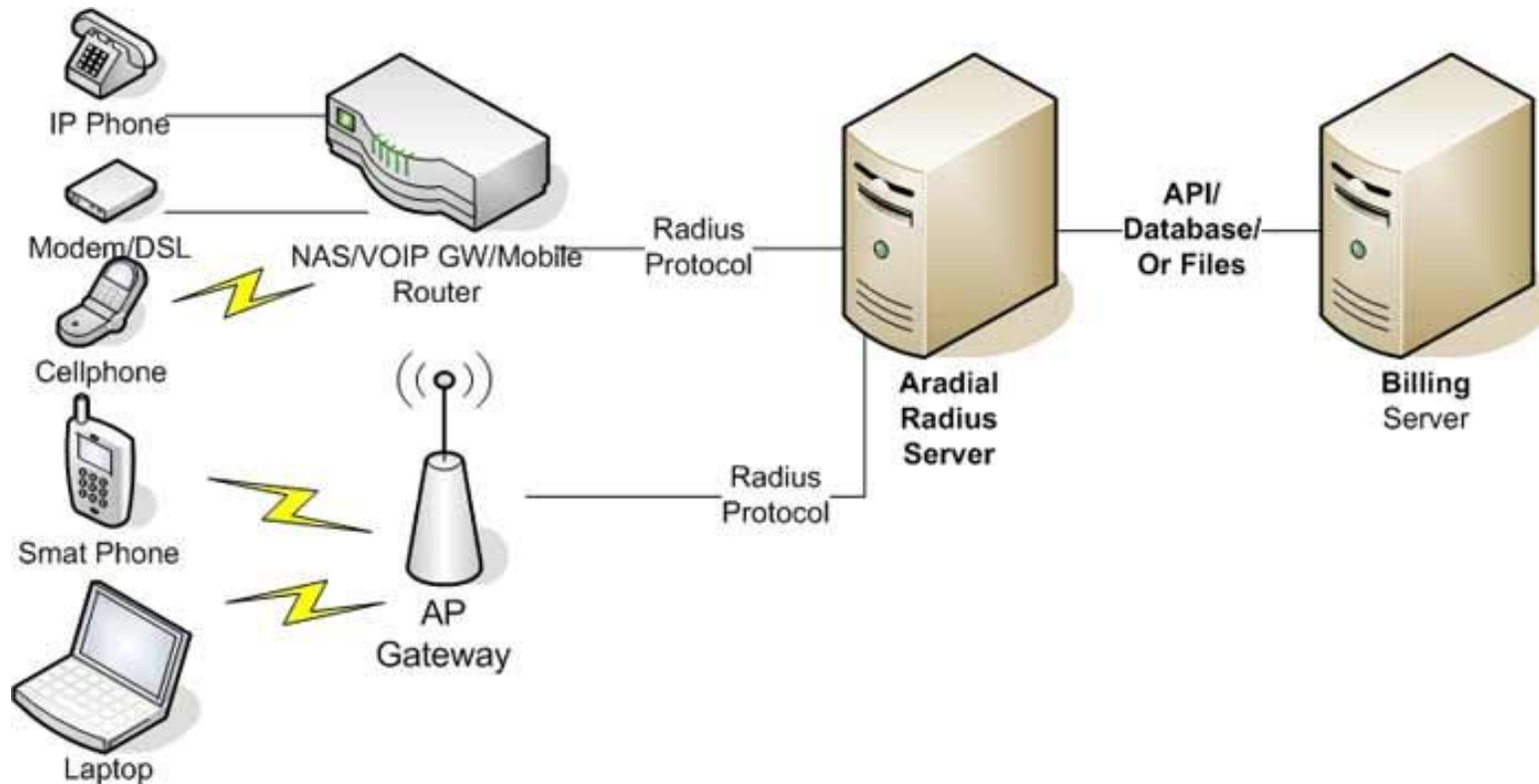
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Prepaid VoIP & Calling Cards

- Calling-card based prepaid billing
- Calling-card generation, import and export
- Username or ANI based (caller ID) prepaid VoIP billing
- Rating according to call destination, time of day, day of week
- Different rounding intervals per tariff or per destination
- Call setup cost
- Replenishing API or voucher refilling with payment module.
- Support of multiple tariffs and destinations rating tables that can be assigned to a calling card
- Session and summary reports per calling card, system, destination and period
- Optional module – termination billing including wholesale credit limit and fraud control

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Architecture

SIP Application Server (w/Internal IVR)

Aradial Prepaid / Radius System

Prepaid Timers

External media Server

Real-Time AAA

Subscriber Database

VoIP (IVR: Prompts, DTMF)

SIP Call Control

SS7 Signaling

SoftSwitch

PSTN

Media Gateway

VoIP (Conversation)

IP Network

PSTN

Media Gateway

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Typical Deployment Example

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Thank You.

www.aradial.com

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