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1 Abstract

The use of IP networks for data, voice and telephony applications has gained ground in recent years as equipment and applications have advanced and enterprises have recognized the tremendous cost and productivity advantages of VoIP (Voice over IP). Regardless of the size of your organization, if you have employees who work from home or from a regional office, you can significantly reduce telecommunications costs and increase productivity by rerouting interoffice traffic over your LAN/WAN. You can also enhance your services and applications by using IP network solutions in such areas as collaborative applications, conferencing, one number calling, unified messaging, call centers, video applications, and network integration with the front office and back office databases and servers.

Fujitsu Coral IP solutions allow you to take advantage of all the above applications with a smooth and cost-effective migration path to the new world of IP-based communications at the pace that matches your business & investment protection. The Coral's proven ability, stability and flexibility combined with its rich set of features and state of the art IP interfaces and devices bring you the Coral ToIP (Telephony over IP) platform. The Coral ToIP platform will enable you to use new sets of features without losing any existing features, to use new interfaces while keeping all the ones you have and to add IP terminals in combination with existing terminals.

2 Coral IP Infrastructure

2.1 UGW

The Universal Gateway (UGW) is an internal VoIP gateway that supports any combination of IP stations and trunks. On the station side the UGW supports the FlexSet IP, FlexIP softphone and any single line type port (IST, T.38 FAX, Modem) when connected to an MGCP capable FXS adapter. On the trunk side (FXO) there is support for QSIG IP-NET and analog trunks (Loop-start type).

A Single gateway card provides support of up to 240 ports over the LAN/WAN regardless of their physical locations. All Coral features are available to stations and trunks connected to the UGW. The UGW supports G.711, G.729 and G723.1 codecs, MGCP signaling protocol and peer-to-peer communications between terminals. The Coral can support multiple UGW gateway cards with basic load sharing and redundancy to enhance system performance and reliability.

2.2 IPG

The Internet Protocol Gateway (IPG) card supports 30 'point to multi-point' interconnection PRI style IP links for the purpose of private networking (voice, T.38 FAX, modem). The IPG will work independent of the Coral software version as long as QSIG is supported.

The IPG interconnects Coral systems over the IP network while supporting all existing Coral QSIG features. The Multi node private networks established by the IPG will allow full connectivity for members with uniform numbering scheme, ANI across the network, centralized voice mail, centralized resource usage and QSIG features transparency. The IPG can be configured to operate with G711 and G729 codecs to meet the bandwidth restrictions.

2.3 FlexSet IP

The Coral FlexSet IP is a member of the Coral FlexSet phone family. The FlexSet IP supports all the Coral FlexSet 280S capabilities (e.g. full duplex speakerphone, soft keys, directory access and call log) and has new features and capabilities such as local recording of ringtones, two way headset port and more. For ease of maintenance, it supports technician configuration via HTTP, SNMP and the ability to download new software via TFTP.

The FlexSet IP is an ideal solution for a Home Office/Branch Office type of application. It includes an internal switch (with VLAN support) allowing the mutual connection of the phone and a data device (e.g. computer) to a single RJ-45 receptacle, and provides priority to the real-time audio streams (*figure 1*). The FlexSet IP draws its power from a power transformer or (when available) from an "in line" standard power facility (802.11af power over LAN).

The FlexSet IP supports standard packetized and 3DES encrypted (for secured communication) voice streams. Codec support includes the G711, G729 and G723.1.



Figure 1

2.4 FlexIP Softphone

The FlexIP softphone (*figure 2*) is a comprehensive software-based application, designed to offer a full range of features and capabilities that combines all the benefits of a standard phone with the convenience and flexibility of an interactive software application.

The FlexIP softphone has the look, feel and functionality of a FlexSet-IP phone, with many additional features that make it ideally suited as the “away from office” office phone. Among the unique features of the FlexIP are; dialing from any application, dial by name, 24 quick access keys (to destination numbers and features), a personal directory (Outlook contacts), extensive contacts list, rules wizard and many more.



Figure 2

2.5 Teleport FXS/FXO Gateways

The Coral Teleport analog adaptor units are FXS and FXO gateways supporting analog trunks and single line network connections (including T.38 FAX and Modem access ports). The FXS gateway supports 2 to 24 IST ports with all Coral IST features like message lamp and hook flash. The FXO gateway supports 2 to 8 analog loop-start trunks. The Coral Teleport FXS includes a single power fail PSTN port.

The gateways are fully compatible with the UGW gateway interface and as such support the MGCP protocol. The Coral Teleport gateways support the G711, G729 and G723.1 codecs (same as the UGW) and operate in a Peer-to-Peer mode whenever connected to other IP ports.

2.6 Coral Sentinel

The Coral Sentinel is a Session Border Control (SBC) unit enabling the connection of remote IP phones that sit behind NAT (Network Address Translation) servers or firewalls to the Coral. NAT service enables a local-area network (LAN) to use one set of IP addresses for internal (private) traffic and a second address or set of addresses (public) when connecting to services on an external network, such as the Internet. A client with a private IP address connects to the WAN through the NAT server that translates the request to the public address. The use of NAT lowers the number of "public" IP addresses that are needed by the organization and by that reduces its communication costs. In VoIP applications NAT devices prevent two-way voice and multimedia communication, because the private IP addresses and ports inserted by the terminal (IP phones) in the voice packet are not routable in public networks. The Coral Sentinel brings the right intelligence to resolve these NAT limitations and allow the Coral IP to operate in an environment that includes NAT devices.

A firewall that does not have support for the MGCP protocol has to expose holes - one for each endpoint. The Coral Sentinel can assist such firewalls by maintaining one defined access point, through which all incoming traffic connects.

The Coral Sentinel enables the connection between external IP phones via the NAT server, and the local IP phones via the UGW card and the LAN.

3 Coral IP Solutions

3.1 Networking

The already robust QSIG networking of the Coral system gets a new twist when using the IP network. Standard Coral networking functions like centralized Voice Mail, ANI, and feature transparency are available while adding the benefit of point to multipoint capability. The elimination of point-to-point type networking and introduction of the multi site capability brings the reliability of a full mesh topology without the expenses of dedicated communication lines (*figure 3*).

Other benefits when using IP networking includes:

- Reduce communication costs by sending voice, data, and fax over IP networks
- Eliminate the expense and inconvenience of maintaining separate infrastructures by creating a single “distance carrier” for voice, data, and fax
- Maximize transmission capacity by using one "pipe" for voice, data and fax
- Enhance network reliability

Traditional Enterprise Network

QSIG over IP Enterprise Network

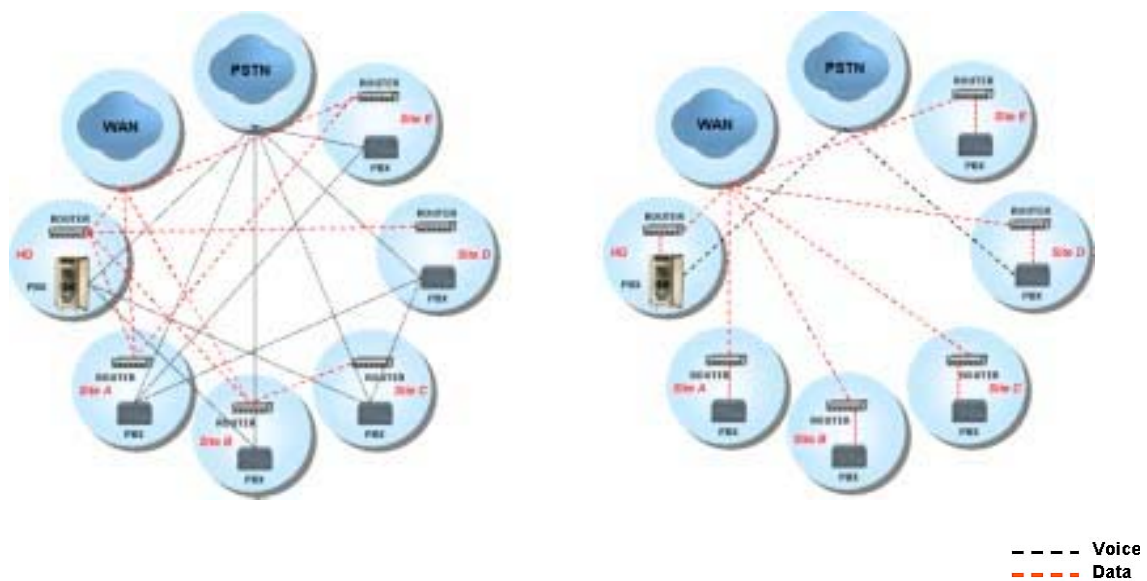


Figure 3

The Coral Networking capabilities do not end with QSIG networking with other Corals. Basic networking can be formed between the Coral and any other PBX or key-system over IP. Basic networking enables users from one system to dial users on the other system using internal numbers. Setting up a basic network can be accomplished using a UGW gateway card in the Coral and a combination of Coral Teleport FXS connected to the foreign system trunks and Coral Teleport FXO connected to the foreign system stations (*figure 4*).

Networking with Foreign systems

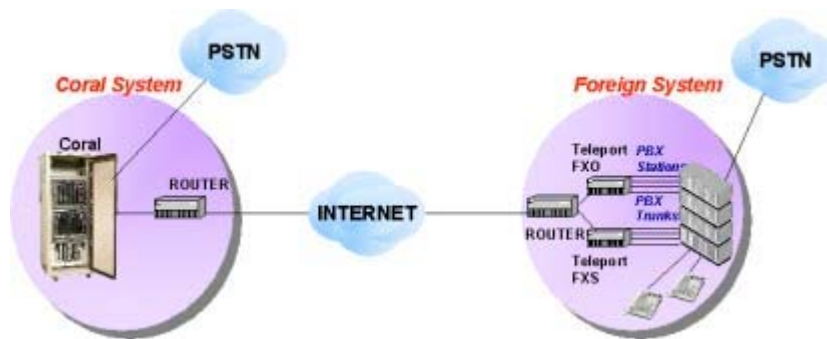


Figure 4

3.2 Home Office/Branch Office

Data transmission lines are relatively inexpensive and can reach any distance at an affordable cost. Broadband Internet access is available everywhere. The Coral's advanced IP telephony solutions take advantage of the ease of moving data across long distances and use it to provide full PBX services to users anywhere on the network. By installing Coral IP terminals at a branch/home office, users benefit from all the capabilities and features available to the users at the headquarters. Users can be reached through DID numbers, initiate conference calls, camp on busy stations, transfer calls, forward calls, see the identity of a calling party, access outside lines while using the headquarters special long distance or VPN tariffs etc. Typical users of this application are users working in a branch office, senior managers, company critical personnel, telecommuters and road warriors.

Home/Branch Office Examples

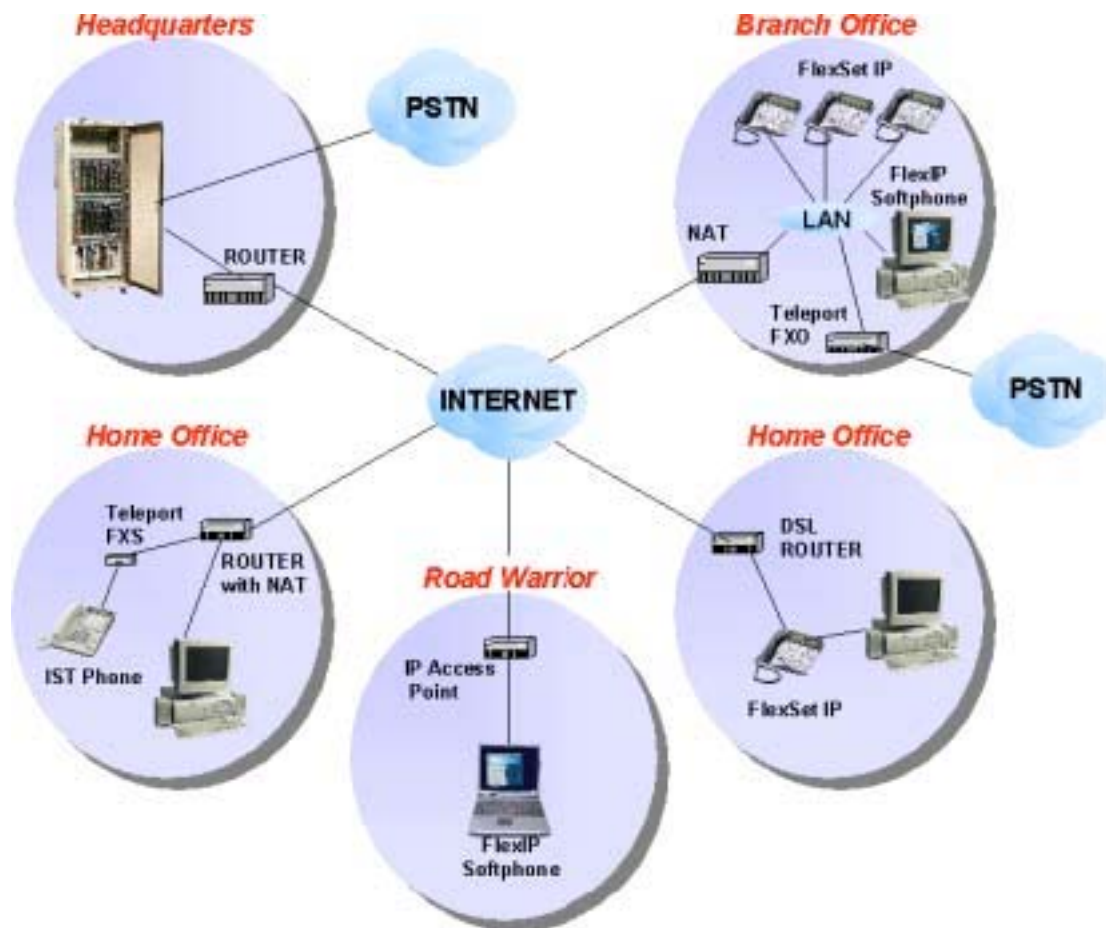


Figure 5

Another use for the home/branch office capability of the Coral IP solutions is the contact center (*figure 6*). The Coral IP enables the contact center to support local presence in different geographical regions while lowering communication costs by using unified infrastructure to move voice, data and fax. Skilled agents are one of the more important factors of a successful call center. The Coral IP enables agents to receive calls without the limitation of physical location. The call can reach the agent at the headquarters, branch or even at home.

Terminals available for use in home/branch offices include the FlexSet IP keyset, FlexIP softphone and any IST phone connected to an FXS gateway.

IP Contact Center

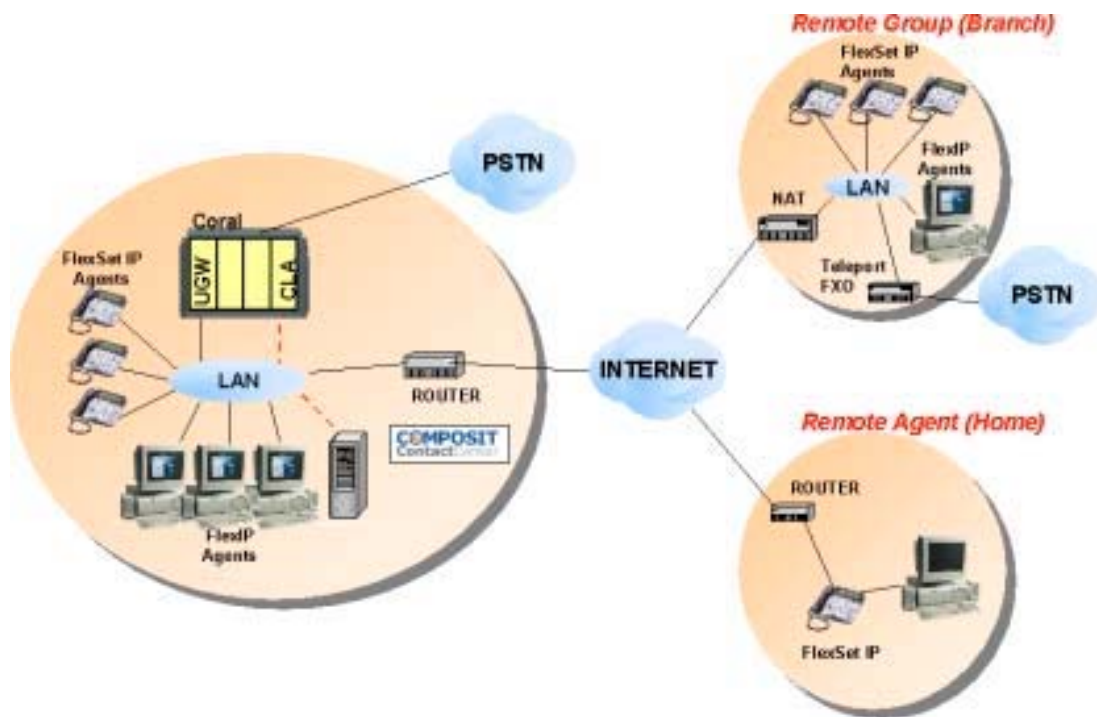


Figure 6

3.3 Secured Communications

Use of public Internet for VoIP communications has a great appeal to many business users. It is almost free and it is very easily accessible. But public Internet has become a very hostile environment. Attacks by hackers and viruses on corporate networks take its toll on productivity and profitability. The use of public Internet for remote VoIP applications without taking the appropriate security measures can compromise the integrity of VoIP communication and possible the data network of an organization. Call interception and tapping, break-ins into corporate networks are just two examples of such threats. All Coral VoIP applications are security minded by design with the right tools for dealing with VoIP vulnerabilities.

Coral Sentinel

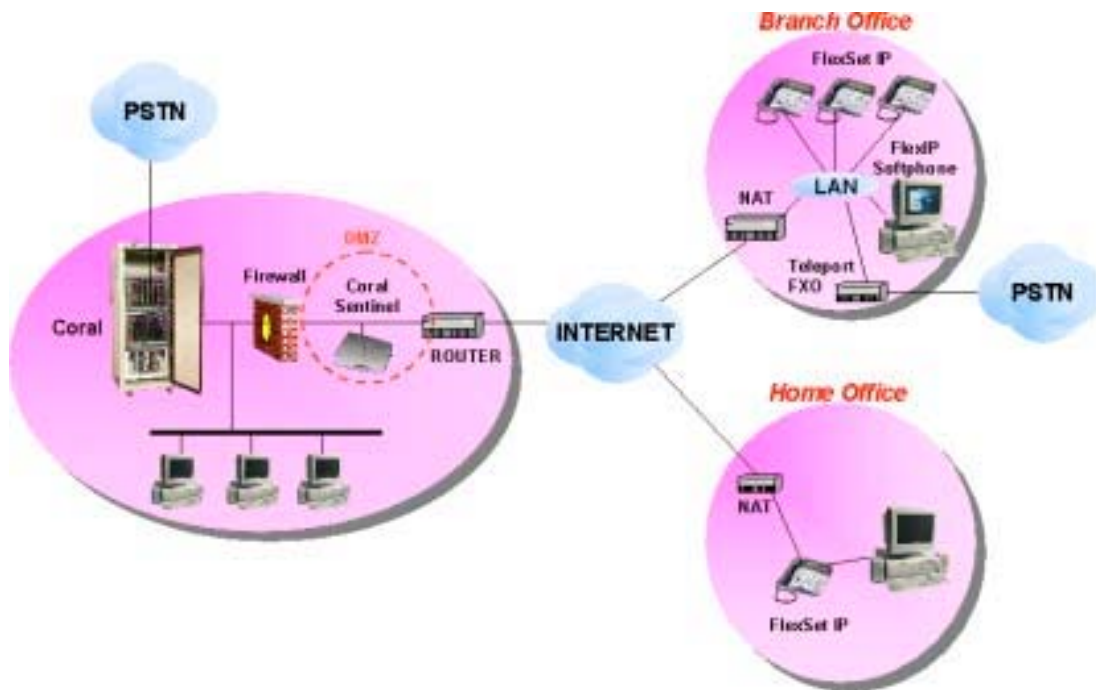


Figure 7

Encryption

Coral FlexSet IP keysets can encrypt RTP media traffic using DES or 3DES from end to end. Coral generates new encryption keys for each voice session.

NAT Traversal

Sentinel signaling proxy support static or dynamic NAT traversal for IP phones and gateways.

Stateful Inspection

The Coral Sentinel provides stateful protocol inspection ensuring, for example, that create-session signaling occurs before RTP media traffic. In addition, the Coral Sentinel is compatible with third party firewall stateful inspection of MGCP protocols, such as that of CheckPoint Firewall-1 NG FP2 and above.

Zone Isolation

The Coral server can be configured as a “voice firewall” by keeping separate VoIP zones. A typical example for zones might be Internet zone (i.e. direct connection using DSL) and corporate LAN zone.

Voice Firewall

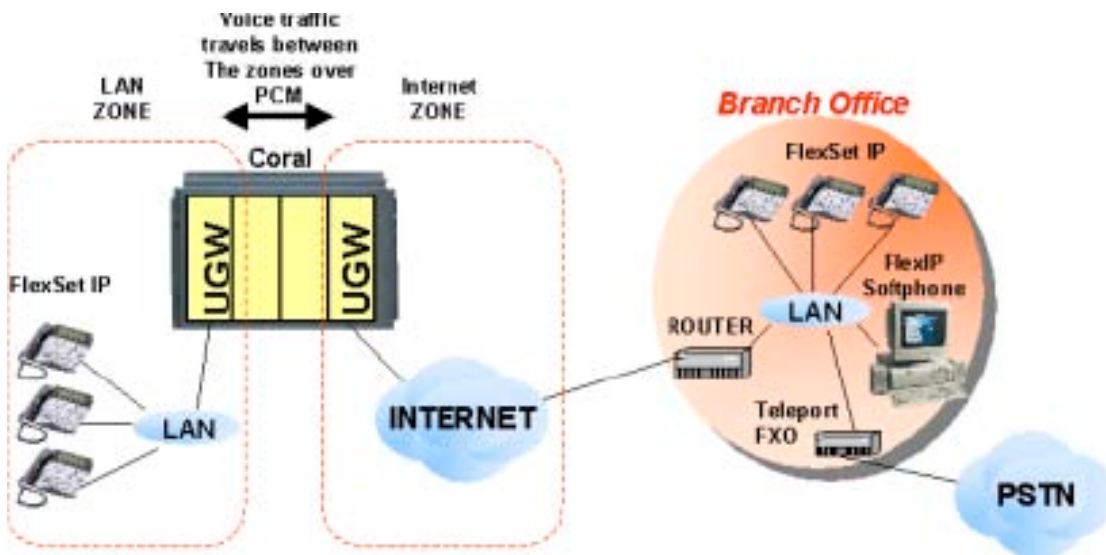


Figure 8

RTP relay

The Coral Sentinel support of RTP relay, blocks direct connection between the firewall and the Coral, and vice versa, hence preventing uncontrolled flooding.