Eclipse-P

Modular Paging Infrastructure

- **Latest Technology**
- **Optimised for performance**
- **Open interfaces**
- **Industrially rated Public Safety grade**
- **Backward compatible with legacy systems using modern standards**
- **RF IP Linking in narrowband**

RF Technology Group.

RF Technology was first commenced in 1986 with over 6000 Eclipse 2 base stations deploy. It offers Public Safety voice and data infrastructure designed and made in Australia.

RF Technology has incorporated the following companies over the years:-

IP Mobilenet LLC manufacturer of Public Safety narrow band mobile radio infrastructure and terminals. Data solutions from 19.6 to 64 kbps with full CAD interface.

DX Radio Systems LLC North Americas leading paging solutions provider leveraging the Eclipse 1 and Eclipse 2 infrastructure.

Skysweep Technologies OY Manufacturer of HF Data controller and applications and high speed Data radio.

Infrastructure Components

Console/Gateway

gateway features to name a few:-
- SMS
- SMTP (Email)
- P25 ISSI
- SIP/IP PABX
- IP networks
- LTE
- Other terminals/consoles
- All paging interfaces
- CAD
- Database
- Legacy support
- Message success

The Gateway hosts the management application used for configuration and managing services. No separate server. It runs a webserver which is used as the customer interface. No driver issues or application issues moving platforms. An additional licence will enable a fully featured terminal/console functionality.

Paging Base Station.

The Eclipse 2 software designed base station with fully integrated transmitter Receiver (optional) power supply (optional) and Intelligent power amplifiers (25 to 500 watts). Offer a high performance NTIA approved base station

best spurious and sensitivity in the market.

Simulcast Controller (legacy base station controller.)

A slide in module at each site which provides 10 Mhz ref, GPS and timing epoch. Synchronization of timing is coordinated with the Eclipse 2 simulcast algorithm or for third party transmitter option used as a base station controller providing launch delays with paging data.

Latest Technology

RF Technology has applied this latest available technology on all aspects of its solution.

Lets explain how this translates to the various hardware and software aspects of the solution.

Hardware.

The Operating systems used are up to date linux platform stripped of all superfluous components. These run on industrial grade hardware each part of the infrastructure is build for reliability and efficiency. Where needed drivers are optimized for increased performance.

The systems offers multicore high performance output with minimal

operating overhead.

The use of linux offers a licence free stable platform supported for cycles of up to 20 years. It also allows for tight integration and a FIPS-2 compliant offering.

The gateway/console can be offered as virtual server to meet the customer's computer security requirements and leverage approved hardware.

This does away with the issues encountered with windows based solutions and constant upgrades.

The controller deploys a quad core linux processing board (daughter board) embedded in the industrialized carrier board with delay board (option for legacy transmitters) , gps receiver and 10 Mhz reference.

The Eclipse 2 as a software defined radio offering future proof radio capable of FM, P25, DMR POCSAG and FLEX. Its high performance OCXO and timing algorithms make it a perfect simulcast solution. The Power Amplifier (various options 1 watt to 500 watts and form factors) offer intelligent performance and monitoring. The PA controller sports a webserver enabling full monitoring of the 13 critical parameters. A full isolator is built in hardware and software with VSWR monitoring. Up to 8 IOs are available to control external equipment.

Software:-

RF technology architecture utilizes numerous UpToDate technologies to enhance performance and robustness. These are:-

• **Intelligence at the edge.**

 We have been deploying this across every aspect of the infrastructure. What this means is that optimized operations are performed at the edge devices in lieu of a centralized processor.

The Eclipse 2 uses sophisticated algorithms to provide a distributed simulcast solution. A few bits of information is sent out to the network carrying critical timing information. The mesh layout enable each of the corresponding Eclipse 2 to interpret and act on that information to synchronize transmission. All other pieces of infrastructure uses the same algorithm to

interpret this information and set launch delays. A coordinated and distributed architecture.

The timing of this decision and the reduced bandwidth make it the most efficient solution on the market. The Eclipse 2 has its own encoder and decoder which enables arbitration and acknowledgement decisions to be made at each site. For example with only a transmitter module the software will detect that the transmission has not reached the outside port and will alert to a failed message. Other uses of sniffer ports introduce RF issues, cost, delays and impression to name a few.

A dedicated receiver is also available for diagnostics and receipt of message as an outdoor receiving device.

Using linux as its operating core the Eclipse 2 has standard routing and network capabilities allowing internal interfaces between receiver and transmitter at a high speed bus level. This also enables interfaces such as serial to be accommodated directly.

Watch dog times and ?? on all intelligent portions of the Eclipse 2, Controller and Gateway enable systems and subsystems (operating system, transmitter and receiver) to be restarted within micro seconds should external glitches occur.

Utilizing the latest in web sockets technology the Gateway runs as a server. The client interface is through any web browser using a secure Https link. The Gateway can be placed anywhere on the network (or secure cloud) for access by the end user. Multiple Gateways can be deployed to optimize message deliver, offer redundancy or provide regional access for users.

This keeps processing to a minimum and enables any web enabled device to access all the features. It also reduces driver dependencies and is continually evolving as the standards are enhanced.

Hosted behind a FIPS-2 enable host any FIPS-2 client can gain access. The user device can be a customer compliant windows (Linux, android or mac) desktop/device. These leverages open sip audio and control functions now available in web sockets without the need to build specific applications or update drivers as hardware changes. Applications reduce

efficiency and increase network maintenance issues, using web sockets removes these issues.

To reduce bandwidth, decrease delays and improve efficiencies multiple media servers are used. This distributed architecture is part of RF Technologies intelligence at the edge focus.

This allows for the transferring of only relevant information over the network (no graphics, small bits of data) and caching intelligently all other common media . This reduces bandwidth and increases performance.

RF Technology through its subsidiary IP Mobilenet has been deploying and refining this process for the last 20 years. The IP Mobilenet Datalink product has been used by the LA Sheriffs office to provide database information from its CAD to vehicles over a 32 Kbps mobile data to vehicles for over 20 years .

RF Technology has further improved this technology with its Dhango D product (Patent pending). Incorporating a sophisticated database in the gateway and using search and data algorithms user defined data is captured from disparate databases. This is then incorporated into a web layout for user interface.

Numerous permutations are available. This has been deployed in hospitals where a simple webpage will enable users from any device to send paging messages.

For CAD users who want selective information displayed on a customized screen from several databases.

Electricity Utilizes that want to display on off status of equipment or selective monitoring information.

Some systems deploy buffers and data management subsystems to control data flow. This is a significant overhead and performance inhibiter. With algorithms, efficient and intelligent small buffers the data flow is managed to meet output performance. As most user will tell you having a large overflow creates significant management issues both human and computing. By keeping these to a minimum the system retry and resending requirements are minimal.

Software debugging program captures data traces which allows for detailed software analysis. This enables deep dive reviews to ensure performance and

diagnostics of complicated network environments.

The Simulcast Controller as with all modules has the watchdog times built in with overhanging should GPS signal be lost. The alarming and realignment functions can enable timing to be obtained from other time servers on the network. The Simulcast Controller hosts an snmp and syslog server for local capture with ability to hand off to centralized monitoring as required i.e. priority alarms immediate general information can be selectively sent.

Software defined site simulcast offsets enable enhanced simulcast optimization. To manage site characteristics.

Optimization.

With backward compatibility and advances in technology at the forefront of products RF Technology has used standard interfaces at its core.

Using P25 as the bearer RF Technology has imbedded an IP stream for transport of data. This has enable an RF Link to provide posag and simulcast information enabling modern simulcast technology to be deployed at remote sites. The P25 protocol provides FEC and self healing properties making the link robust and public safety grade C4FM (P25) modulation offers excellent data performance and RF propagation properties. The optimized software used to transmit the POCSAG and Simulcast data offers a robust and proven delivery mechanism.

Optimization of the Pocsag protocol over IP (P-Feed) has reduced bandwidth by over 70%. This is the most efficient Pocsag over IP transport mechanism on the market. We are currently working on incorporating IP header compression to further improve payload over the link as currently deployed in IPMN product.

The Eclipse 2 has optimized drivers and implement priority scheduling to ensure efficient and consistent launch delay within the Eclipse 2. The Eclipse 2 supports a direct IP connection for delivery of the POCSAG reducing delay bandwidth and external equipment.

One of the major benefits of this intelligence at the edge is the ability to capture the data in raw form (without transcoding or other equipment processing) for pure diagnostics.

Open Interfaces.

The most important aspects of bringing any system into the modern age is compliance with modern interfaces. This has been RF Technology's focus.

Predominately this has centered around IP, WebSocket's, P25 and LTE. These offer a migration to, and participation in future networks. We currently support full ISSI interface enabling direct network interface to P25 networks.

We can map a talk group to a paging pocsag group enabling a simultaneous page and P25 short data message to be sent out (along with SMS , email and HF message). All other providers use a radio as a gateway offering limited functionality and reduced performance

We currently support all the relevant protocols required for paging .Some are listed here:-

Backward compatibility & Interoperability

The simulcast controller has a hardware fixed delay and Pocsag encoder circuit which can be enabled. This will take a link from the Gateway or a third party console through the Gateway and act as a Base Station Controller for any third party transmitter provides TTL and PTT (Pocsag data and key up).

Full support is provided for analogue support used for voice paging and legacy voting solutions.

The Gateway can also interface to a third party console and integrate several disparate systems together. Some of the main features offered by the Gateway are:-

1. Maintenance of independent system while sharing other infrastructure site resources.

2. Selective group or site transmission

3. Priority settings and paging interleaving to enable shared resources

4. All console functionality eg P25 messaging, email, sms, message success, zone and group selectivity

5. Multiple paging protocols including voice

6. Multiple consoles using distributed access with control functionality

7. Data Analytics. Both performance and utilization of transmitted information which is captured and data mined.

8. Fip-2 compliant solution

9. Telephony

10. Regional deployment with and without hard IP connectivity

This technology has been successfully deployed interfacing to STI transmitters, Zetron legacy Model 66 controllers, JPS legacy audio controllers,

RF Linking

Leveraging the technology successfully deployed by its subsidiaries and developed by RF Technology over the last 30 years we are able to support IP RF linking in the following methods:-

- VHF, UHF, 800 MHz narrow or wide band single channel in hub or remote configuration for optimized data (64 Kbps)

- Satellite with radio control optimized for simulcast and data

- RF IP link optimized for data using P25 as the modulation

- HF link using OFDM modem data solution with control functions

- Store and forward receiving Pocsag over the air and resending

- Full IP tunnelling using microwave

- Strictly not RF linking in the conventional sense but we currently support RF over fibre and fibre high speed transmission using DAC and ADC over fibre.

White papers available

Contact RF Technology for more detailed information on products and white papers on technology.
Some relevant information available
- Simulcast and voting operation
- Eclipse 2 SDR Specification
- IPPA specification
- High Power PA specification
- Console/gateway overview
- Eclipse 2 MTBF
- SNMP on the Eclipse 2
- IP over P25
- RFT simulcast controller overview
- Eclipse 2 Networking Requirements
- The effects of pre-emphasis and deemphasis
- Multi CTCSS
- Hot stand by switch specification
- IP Mobilenet system description
- Multipath effect
- QAM radio specification
- HF data console (Messenger) specification
- IPMN product data sheets
- RFT Voip gateway overview