Use of Radio-Over-IP-Over-Satellite for Interoperable Communications During Disaster and Emergency Response.

Steve Hailey
Chief Technologist
Who Am I and Why Am I here?

MILITARY AND FEDERAL GOVERNMENT

PUBLIC SAFETY TECHNOLOGY CONSULTING

UNITED NATIONS EMERGENCY TELECOM CLUSTER

VSAT AND OTHER SATELLITE

MARYLAND STATE POLICE
Who Do I work for? What do we do?

Distributor of Wireless Communications Infrastructure & Solutions since 1980.

Wireless Industry

Broadcast Industry

Transportation

Public Safety Emergency Mgt
Cobham SATCOM Land

A perfect match

Cobham SATCOM

Sea Tel

TracStar
(C-, X-, Ku-, Ka-band)
Orlando, Florida, USA

Land

Thrane & Thrane
(L-band)
Lyngby, Denmark

Air
(Omnipless)
Cobham SATCOM
The EXPLORER Series

The EXPLORER Series from Cobham SATCOM is the most comprehensive range of satellite communication products in the market today. It is a well proven and thoroughly tested series of products, including a whole range of BGAN terminals and VSAT systems:

- Lightweight and easy-deployable Inmarsat BGAN terminals (L-band)
- Manual Deploy Backpack Fly-Away VSAT Antennas (0.75m – 1.2m)
- Auto-Deploy Fly-Away VSAT Antenna Systems (0.75m – 1.2m)
- Drive Away Communication-on-the-Pause (COTP) Antenna Systems (1.0-1.8m)
- Satcom-on-the-Move (SOTM) systems for both BGAN and VSAT
- Marine stabilized VSAT and L-Band Satellite Terminals (SeaTel and Thrane)
Explorer MSAT-G3 (PTT)  
Next Generation MSAT Push-To-Talk

Press Release  
Tuesday April 7th, 2016 - Reuters

“Ligado Networks, Cobham, and ViaSat, Join Forces to Offer EXPLORER MSAT-G3 Next-generation Mobile Satellite Push-to-Talk Platform.”

EXPLORER MSAT-G3 service will feature encrypted IP-based service with true multicast group PTT communications powered by the Ligado Networks SkyTerra 1 satellite.

Ligado Networks continues to set the standard for the mobile satellite Push-to-Talk (PTT) market with the introduction of the EXPLORER MSAT-G3, a next-generation satellite PTT platform, in partnership with Cobham SATCOM and ViaSat.”
Why MSAT-G3?

- A need for an enhancement or alternative to traditional two-way radio.
- Tasked with creating a cost efficient, diversified, and user friendly communication solution with a PTT-like user experience with improved voice quality and expanded coverage.
- Address a need for Interoperability between different radio systems and entities.
- Address a need for rural connectivity for First Responders.
Explorer MSAT G3 (PTT)
Next Generation MSAT Push-To-Talk

• Ruggedized and easy to use Push-To-Talk solution

• Automatic and redundant connectivity by automatic routing between LTE/3G/2G and Satellite

• Over-the-horizon radio communication with built-in Land Mobile Radio (LMR) support

• Voice-over-IP technology optimized for use under difficult satellite or terrestrial link conditions

• Satellite Service coverage: North and Central America, Caribbean, and Hawaii

• Available in Land/Mobile, fixed, and marine configurations

• In addition to PTT, the MSAT-G3 (when properly configured) can include a telephone, send and receive emails, download weather info, and provide GPS/AVL services if desired.
Traditional Radio Solution

Area without Radio coverage

Terrestrial Line
Communications provided through Cobham Explorer PTT Multi-Function Interface Box with up to two 3G/4G/LTE/modem(s) plus mobile satellite terminal, fully integrated with existing Land Mobile Radios.
Communications provided through a Cobham PTT Multi-Function Interface Box with up to two 3G/4G/LTE modem(s) plus mobile satellite terminal, fully integrated with existing Land Mobile Radios.

**Explorer PTT Network**

Interoperable Communications Between Different Entities
Explorer PTT System Two-Way Radio Connectivity

In-vehicle Mobile: Both radios operate independently and reach back to Dispatch through the Vehicular Repeater.

Portable: 12V Vehicle Power Supply

Mobile Data Terminal: iPad

Vehicular Repeater

3G/4G/LTE Modems

Light Bar - Ignition - Battery Level

Multi-Function Interface

IP Connections

Secure Wi-Fi Hub

PRIMUS
Least Cost and Redundant Routing

Cellular A

Cellular B

....and with no disruption to the voice connection!
Explorer PTT
Multi Function Interface (MFI)

Explorer PTT Unit is equipped with a 15-pin I/O connector for direct wiring into peripheral equipment. Primary examples include:

- VHF/UHF 2-way Radio (Audio Input/Output + Discrete PTT In/Out)
- External Speaker Output
- 2 Discrete Input, 2 Discrete Output Pins for General Purposes (GPIO)
Explorer PTT
Tech Specs

15 PIN D-SUB Input/Output

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line In+</td>
</tr>
<tr>
<td>2</td>
<td>Line Out+</td>
</tr>
<tr>
<td>3</td>
<td>+12 VDC output</td>
</tr>
<tr>
<td>4</td>
<td>Input 1</td>
</tr>
<tr>
<td>5</td>
<td>Input 2</td>
</tr>
<tr>
<td>6</td>
<td>Audio+</td>
</tr>
<tr>
<td>7</td>
<td>Output 1</td>
</tr>
<tr>
<td>8</td>
<td>Output 2</td>
</tr>
<tr>
<td>9</td>
<td>Service port (out)</td>
</tr>
<tr>
<td>10</td>
<td>Service port (in)</td>
</tr>
<tr>
<td>11</td>
<td>GND</td>
</tr>
<tr>
<td>12</td>
<td>Audio-</td>
</tr>
<tr>
<td>13</td>
<td>GND</td>
</tr>
<tr>
<td>14</td>
<td>Line Out-</td>
</tr>
<tr>
<td>15</td>
<td>Line In-</td>
</tr>
</tbody>
</table>

Power connector (DC Input)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>DC+</td>
</tr>
<tr>
<td>A2</td>
<td>DC-</td>
</tr>
<tr>
<td>1</td>
<td>Ignition</td>
</tr>
<tr>
<td>2</td>
<td>Common, Connected to pin 4 or pin 5.</td>
</tr>
<tr>
<td>3</td>
<td>General purpose open drain output. Max. 300 mA.</td>
</tr>
<tr>
<td>4</td>
<td>Connected to pin 2 when the PTT unit is on.</td>
</tr>
<tr>
<td>5</td>
<td>Connected to pin 2 when the PTT unit is off.</td>
</tr>
</tbody>
</table>

Power

- **Power supply:**
  - EXPLORER 3647 PTT: Nominal 12-24 VDC
  - Operating 10.5-32 VDC
  - EXPLORER 6205 CSM: Powered by the terminal

- **Power consumption:** 38W

Interfaces

- **1 x LAN interface:**
  - Connector type: RJ-45
  - Data rate: 10/100 Mbps

- **1 x I/O interface:**
  - Connector type: 15 pin D-SUB containing:
    - Loudspeaker output, Audio in, Audio out, PTT in, PTT out, serial port, 4-wire E&M interface

- **2 x USB:**
  - Connector type: USB host for Cellular Modems

- **1 x Microphone:**
  - Connector type: 12 pin connector for the EXPLORER 6205 Control Speaker Microphone

Specifications

**Dimensions (H / W / D):**

- EXPLORER 3647 PTT: (Terminal)
  - 41 / 231 / 278 mm
  - 1.6 / 9.1 / 10.9 inches
- EXPLORER 6205 CSM: (Control Speaker Microphone)
  - 173 / 70 / 52 mm
  - 6.8 / 2.8 / 2 inches

**Weight:**

- EXPLORER 3647 PTT: 1 kg / 2 lbs
- EXPLORER 6205 CSM: 320 g / 0.7 lbs

User Interface:

- Handset (CSM):
  - Power On/Off, PTT button, 4 control buttons, 40x30mm Display, Jog wheel selector, Dimmer (display backlight)
Cloud Based - PTT Voice Network Controlled from the Microphone

- Volume and On/Off Button
- Network status (BGAN, 3G, 4G)
- Current Group
- Connected /Disconnected
- Group Selection Wheel
- Menu Home Button
- Call Button
- Menu Shift Button
- Replay Button
- Push to Talk Button
- Dim Display

Distress Button on the Back
‘EMERGENCY’ Functionality

1. Turn the microphone over
2. Open the lid
3. Press the Distress button

The Distress call captures the channel - overriding any on-going transmission

Voice connection is established to any mobile user, Dispatcher or even an outside PSTN or cell number

Communications safety for Lone Workers!
Explorer PTT
In the Vehicle
PTT Radio Interop
Portable Trunk Kit
Explorer PTT with 325 Network
for global connectivity via INMARSAT BGAN Service

Satellite System Antenna
Integrated Microphone & System Controller
Multi Function Interface Box
Wireless (3G, 4G, LTE, B14) Modems (USB Plug-in)
Satellite Modem

LTE System Antennas
Explorer PTT
Connection to Phone Apps and AvL (Future)

- When online the user's smartphone registers itself within the system, when on a cellular connection or any LAN (WiFi) connection.
- Check if available
- Send Information (push/pull)
- Tracking
- Push-to-Talk (PTT) functions
- Map interaction, find other responders near you.
- Join Groups, find Groups
- Pulls up National Registry
Primus Explorer Demo Vehicle

• Product Demonstration Vehicle
• Equipment Showcase
• Marketing Tool
• Product “test” platform
• Available for use to our customers for actual emergency communications response and recovery
MSAT-G3
UNDER THE HOOD
MSAT-G3 Server Software Structure

Under the Hood....

Management Server

API Handler

Transcoding Server

What Meets the Eye.....

PTT Web Administration

Dispatch Console

Closed User Group Console

Third Party Management Applications

Included in the Standard Product
Server Software Structure

Under the Hood….

Management Server

API Handler

Transcoding Server

What Meets the Eye…..

PTT Web Administration

Dispatch Console

Closed User Group Console

Third Party Management Applications

Included in the Standard Product
MSAT-G3
WEB ADMINISTRATION
Adding New Devices to the Server

![Image of device management interface]

- **New device...**
- **Serial**
- **Device number**
- **Group**
- **Region**
- **City**
- **Function**
- **Active**
- **Modems**
- **Firmware**

**Device info**
- **Serial number**: 80444456
- **Device type**: 403646
- **Device name**: davidoff_ad
- **Device number**: 305
- **Group**: Group 1
- **Firmware**: Group 1
- **Active**: 
- **Region**: 
- **City**: 
- **Function**: 

*Copyright 2011 - fonewha Technology ApS - Denmark*
Number of Available Dispatchers at the time of the call

Call Duration (Measured in Seconds)

Active Talk Time During the Call

Link to Recorded Voice File

Note: Voice recordings can be moved to a data repository at regular intervals (if provided).
## Group Call Log

Call Logs Can be Sorted by Date(s), Dispatcher, or Groups

<table>
<thead>
<tr>
<th>Start</th>
<th>End</th>
<th>Dispatcher</th>
<th>Conference</th>
<th>Participants</th>
<th>Recording</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Today</td>
<td></td>
<td></td>
<td>Show all</td>
<td>Show all</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011-12-20 09:45:46</td>
<td>2011-12-20 09:46:44</td>
<td>Dispatcher 13</td>
<td>Group 1</td>
<td>2</td>
<td>199.way</td>
<td>Details</td>
</tr>
<tr>
<td>2011-12-20 11:36:11</td>
<td>2011-12-20 11:36:57</td>
<td>Dispatcher 3</td>
<td>Group 1</td>
<td>2</td>
<td>211.way</td>
<td>Details</td>
</tr>
<tr>
<td>2011-12-20 11:36:22</td>
<td>2011-12-20 11:36:57</td>
<td>Dispatcher 3</td>
<td>Group 1</td>
<td>1</td>
<td>212.way</td>
<td>Details</td>
</tr>
<tr>
<td>2011-12-20 11:39:59</td>
<td>2011-12-20 11:40:37</td>
<td>Dispatcher 13</td>
<td>Group 1</td>
<td>1</td>
<td>214.way</td>
<td>Details</td>
</tr>
<tr>
<td>2011-12-20 11:46:12</td>
<td>2011-12-20 11:46:47</td>
<td>Dispatcher 3</td>
<td>Group 1</td>
<td>1</td>
<td>217.way</td>
<td>Details</td>
</tr>
<tr>
<td>2011-12-20 11:54:14</td>
<td>2011-12-20 11:56:29</td>
<td>Dispatcher 13</td>
<td>Group 1</td>
<td>3</td>
<td>220.way</td>
<td>Details</td>
</tr>
</tbody>
</table>
Dispatch Management

Features Available Through the Provided Web Interface:

- Create New Dispatch Positions on the Fly
- Setup Users and manage User Names and Password for Login
- Review Call Statistics by Dispatcher for Quality Control

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>Dispatcher 1</td>
<td>test</td>
</tr>
<tr>
<td>202</td>
<td>Dispatcher 2</td>
<td>test</td>
</tr>
<tr>
<td>203</td>
<td>Dispatcher 3</td>
<td>test</td>
</tr>
<tr>
<td>204</td>
<td>Dispatcher 4</td>
<td>test</td>
</tr>
<tr>
<td>220</td>
<td>Dispatcher 20</td>
<td>test</td>
</tr>
<tr>
<td>219</td>
<td>Dispatcher 19</td>
<td>test</td>
</tr>
<tr>
<td>218</td>
<td>Dispatcher 18</td>
<td>test</td>
</tr>
<tr>
<td>217</td>
<td>Dispatcher 17</td>
<td>test</td>
</tr>
<tr>
<td>216</td>
<td>Dispatcher 16</td>
<td>test</td>
</tr>
<tr>
<td>215</td>
<td>Dispatcher 15</td>
<td>test</td>
</tr>
<tr>
<td>214</td>
<td>Dispatcher 14</td>
<td>test</td>
</tr>
<tr>
<td>213</td>
<td>Dispatcher 13</td>
<td>test</td>
</tr>
<tr>
<td>212</td>
<td>Dispatcher 12</td>
<td>test</td>
</tr>
<tr>
<td>211</td>
<td>Dispatcher 11</td>
<td>test</td>
</tr>
<tr>
<td>210</td>
<td>Dispatcher 10</td>
<td>test</td>
</tr>
<tr>
<td>209</td>
<td>Dispatcher 9</td>
<td>test</td>
</tr>
<tr>
<td>208</td>
<td>Dispatcher 8</td>
<td>test</td>
</tr>
<tr>
<td>207</td>
<td>Dispatcher 7</td>
<td>test</td>
</tr>
<tr>
<td>206</td>
<td>Dispatcher 6</td>
<td>test</td>
</tr>
<tr>
<td>205</td>
<td>Dispatcher 5</td>
<td>test</td>
</tr>
<tr>
<td>299</td>
<td>Test Dispatcher 299</td>
<td>test</td>
</tr>
</tbody>
</table>
Server Software Structure

Under the Hood....

Management Server <-> API Handler

Transcoding server

What Meets the Eye.....

- PTT Web Administration
- Dispatch Console
- Closed User Group Console
- Third Party Management Applications

Included in the Standard Product

PRIMUS
DISPATCH OPERATION
At the Dispatch Center

- Outgoing call – drag to active call window
- Incoming call – appears in waiting callers list
- Group call – drag desired mobiles to group window
CLOSED USER GROUP OPERATION
Server software Structure

Under the Hood….

Management server → API handler

Transcoding Server

What Meets the Eye.....

PTT web administration
Dispatch Console
Closed User Group Console
Third Party Management Applications

Included in the Standard Product
Closed User Group Operation
Device Management – New

The Admin User is Entitled to Create and Manage all Mobile Devices
Closed User Group Operation
Device Management - Closed User Groups

Admins can Create and Manage Closed User Groups Similarly to any Mobile Device
Closed User Group Operation
Managing Call Groups

Total Pool of Mobile Units

Units Assigned to Call Group USG100

Total Pool of Closed User Groups

Units Assigned to Mobile Unit USG100

http://193.89.225.137/telement=devic&i=...
Closed User Group Console
Group Participation

15 February 2017

Document Title

Group Name

Buttons to Join or Leave the Group

Connection Status to the PTT Server

PTT Status: Talking/Muted

Scroll Through the total Pool of Closed User Groups
THIRD PARTY MANAGEMENT APPLICATIONS
Server Software Structure

Under the Hood.....

Management server  API handler

Transcoding Server

What Meets the Eye.....

PTT Web Administration
Dispatch Console
Closed User Group Console
Third Party Management Applications

Included in the Standard Product
Third Party Management applications

- A full API manual is available to partners

- The API provides access to all functionality known from the Dispatcher application, the Closed User Group application and the management web interface. (these applications also use this API)

- The API gives partners the opportunity to create own PTT applications with features dedicated to their needs.

- AVL - Automatic Vehicle Location
THANK YOU!

Presented By:

Steve Hailey  
Chief Technologist

Primus Electronics, Inc.  
Morris, IL  
202-660-3815  
stevehailey@primuselectronics.com