# GLOBALCOM®

# System Design Guide
## Version 1.1
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# 1.    Introduction

This document is intended to provide system designers with a set of guidelines for creating an IED GLOBALCOM Audio/Visual System.

In this section is a table listing devices supported by a single vACS within a GLOBALCOM system on a standard LAN/VLAN along with a more detailed graphic depiction of each device and it's relationship to the vACS.

## Table 1 - Supported Devices per vACS on a Single LAN/VLAN

| Device | Number Supported |
|---|---|
| T9160 Titan Power Amplifier | 32 |
| Digital Mic Stations | 240 |
| 1502AI - BGM Mode | 8 |
| 1502AI - Aux Page Input | 8 |
| 1502AO - Dig/Analog Output | 16 |
| T9032NS | 32 |
| T9040NLR, T9032LVIO,T9008/9016RY | 16 |
| 1100vACS Lifeline | 1 |
| 1100/1200MSG - Message Server | 3 |
| Visual Displays | Unlimited |

Note: Analog paging stations are not supported by the vACS.

Disclaimer: Due to the extremely flexible network centric architecture of GLOBALCOM, it is recommended that you consult IED if you are unsure of any configurations prior to finalizing a design.

# Figure 1 - Basic System Capacity
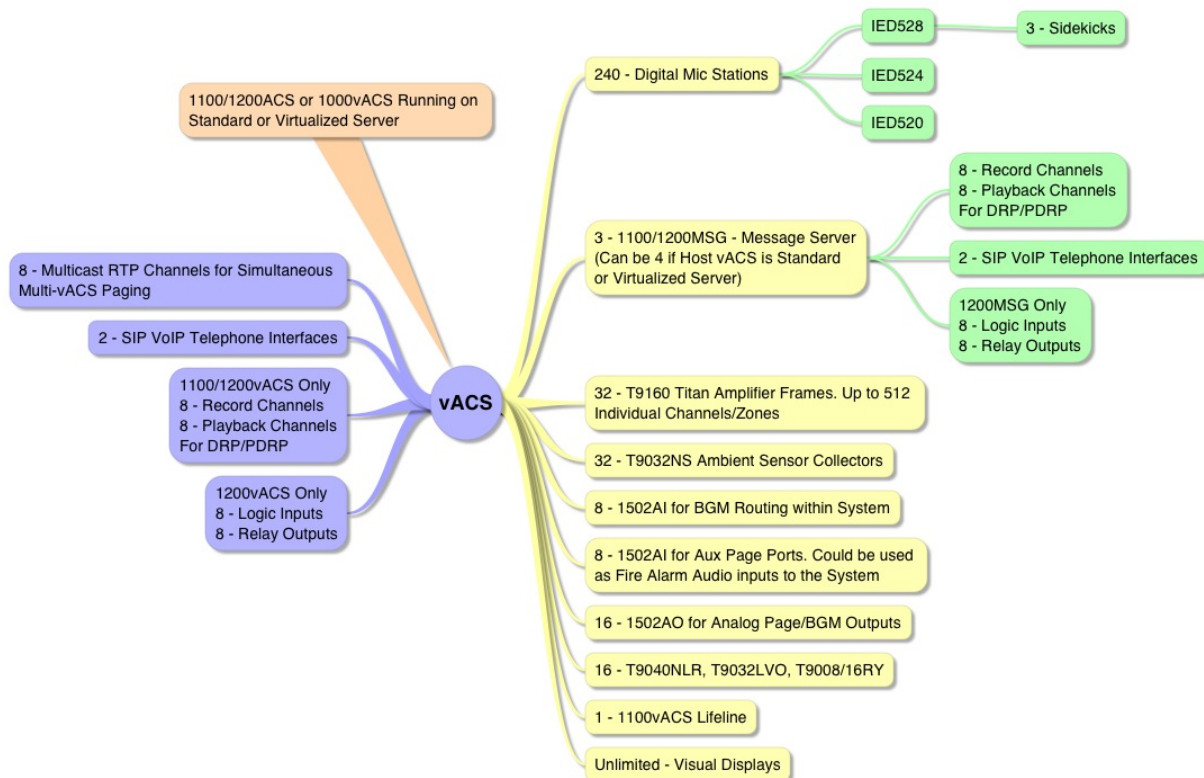


**Legend**
- **Included with vACS**
- **Audio Input/Output and Aux Devices**
- **Device Specific Data**
- **Comments**

## 2.    Multi-Controller Communication

### 2.1.    Multi-vACS Communication

Audio Communications between vACS systems is accomplished via full-bandwidth networked audio.  For systems residing on the same LAN/VLAN, CobraNet may be used for this.  Between systems on separate LAN's/VLAN's, IED uses layer 3 RTP audio over IP.  8 channels per vACS are available for simultaneous transmission of RTP audio. Because Multicasting is used as the transport method, only one channel is used by the sending and receiving device regardless of the number of vACS systems that are receiving the audio transmission. For example; One vACS can simultaneously send an audio stream to two or more remote vACS devices and it is still only utilizing one channel.

* The number of vACS's that can be connected together for paging over a wide area network (WAN) is limited only by the network. In all cases, a qualified network engineer should be consulted to determine practical limits for the specified equipment.

### 2.2.    vACS-Legacy ACS Communication

If installing a vACS into a facility with an existing 510ACS the vACS MUST BE CONNECTED TO THE SAME LAYER 2 NETWORK to facilitate CobraNet audio transmission between the vACS and the 510N card of the legacy ACS.

* There are several factors that contribute to the practical limit of vACS to Legacy ACS connections including but not limited to Network Topology, Bandwidth and Total Number of CobraNet Devices on the LAN/VLAN.
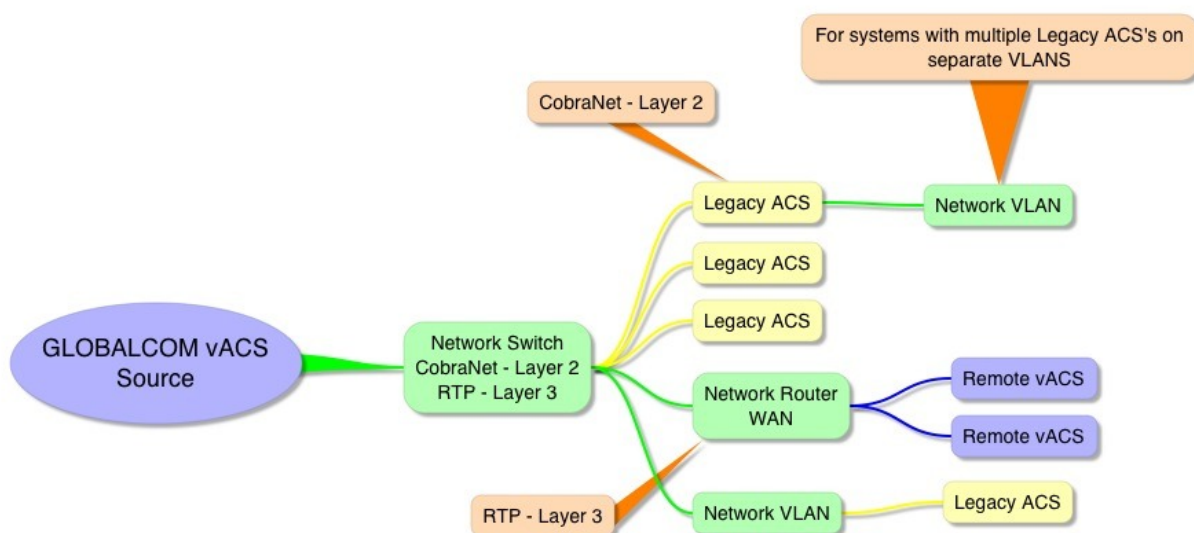


## Figure 2 - Sample Multi-System Layout

### 2.3.    Multi-vACS Multicast System Requirements

For vACS <—> vACS audio transport between VLANs, IP Multicast is used. This enables one vACS to source audio that may be received by {n} receivers. There are prerequisite network equipment and configuration which must be in place. Each vACS has up to 8 separate paging channels. In the vACS Configuration Console, these are called RTP Transmitters. Each RTP Transmitter requires its own Multicast Group to function.

**Switches**

Switches must support IGMP. The current standard is IGMPv3, but versions 1 and 2 are compatible.

**Multicast Router**

To route multicast traffic between subnets and maintain multicast group membership lists, a multicast-capable router is required. If more than one router is necessary, the routers must communicate multicast information to each other. This is typically done using Protocol Independent Multicast (PIM). There are several types of PIM. One common type is Sparse Mode, typically referred to as PIM-SM.

**Multicast Groups**

Multicast groups are generated using Class D network addresses (224.0.0.0 – 239.255.255.255) in combination with a port number. In a VLAN situation, 224.0.0.X addresses cannot be used. The default vACS multicast group is 239.192.0.x where x is the system number. The default port numbers used (for each address) are 5001 – 5008.

**Example Default Configuration for a 2-vACS System**

| System 1 | System 2 |
|---|---|
| 239.192.0.1:5001 | 239.192.0.2:5001 |
| 239.192.0.1:5002 | 239.192.0.2:5002 |
| 239.192.0.1:5003 | 239.192.0.2:5003 |
| 239.192.0.1:5004 | 239.192.0.2:5004 |
| 239.192.0.1:5005 | 239.192.0.2:5005 |
| 239.192.0.1:5006 | 239.192.0.2:5006 |
| 239.192.0.1:5007 | 239.192.0.2:5007 |
| 239.192.0.1:5008 | 239.192.0.2:5008 |

* The multicast address and/or port can be changed to match a customer's networking requirements.

## 3.    Telephone Interfaces

Each vACS system comes with the equivalent of two SIP based IP telephones.  These telephone interfaces can be configured to accept incoming calls to make page requests or make outgoing calls when required by the system.  The preferred codec is G.722 for IP paging operations within the vACS. G.722 is an ITU standard codec that provides 7 kHz wideband audio at data rates from 48, 56 and 64 kbit/s.

This feature requires that the user have a SIP enabled VoIP PBX system within their facility and that a connection to the PBX resides on the same network as the vACS.

Please note that there is no support within the vACS for analog telephone systems. The use of a third party device is require if analog connectivity is necessary.  Currently IED recommends the use of the Grandstream GXW-4104. For support documentation please contact IED.

### 3.1.    PBX Requirements for SIP Connectivity
- Signal Protocol: SIP
- Authentication Mode: Digest
- CallerID Transport Type: Relay via SIP From (If using default security)
- DTMF: SIP INFO or RFC2833
- Codec: G.711 ($\mu$Law or ALaw) or G.722
- Audio Packet Size: 20ms
- NAT/STUN: not supported
- RTCP: not supported
- SRTP: not supported
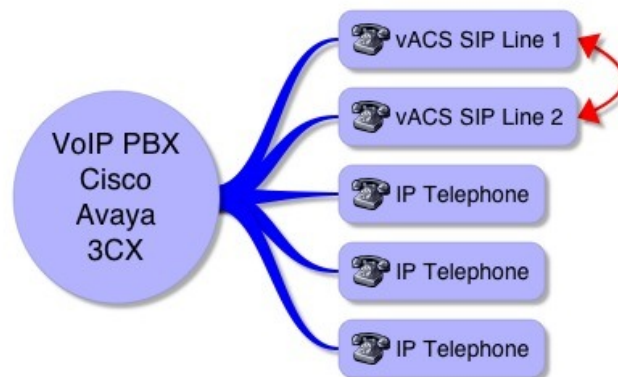


**Figure 3 - VoIP Example**

## 4. Software Constraints

There are two main categories of division in functionality in a GLOBALCOM system. Features that do not require a Microsoft SQL Server database to function and features that do require it. In the later case, a server is required for operation. Below is a Breakout table of these features.

## Table 2 - Non-Database vs Database Comparison

| Non-Database (vACS Only) | SQL Database (Server Required) |
|---|---|
| Audio Paging | FAS - Flight Announcement System |
| Visual Paging | Prizm (FIDS, GIDS, BIDS, etc.) |
| Visual Alerts and Wayfinding | T-CAS |
| * Text-to-Speech (TTS) | Long Term Announcement Logging |
| Cloud Services (Sold Separately) | TAS - Train Announcement System |
| Web Based Configuration Only | Any other auto announcement engine |
| Live Paging | IED Enterprise Software Suite |
| Pre-Recorded Messages | |
| Delayed Paging | |
| Multi-Controller Paging | |

* Text-to-Speech capabilities are included with the vACS however language packs are sold separately.

## Table 3 - Available Text-to-Speech Languages

- US English (ENU)
- US Spanish (SPM)
- Canadian French (FRC)
- Brazilian Portuguese (PTB)
- Dutch Belgium (DUB)
- Dutch Netherlands (DUN)
- UKEnglish (ENG)
- European French (FRF)
- Italian (ITI)
- German (GED)
- Castilian Spanish (SPE)
- Czech (CZC)
- Danish (DAD)
- Finish (FIF)
- Greek (GRG)
- Hungarian (HUH)
- Norwegian (NON)
- Polish (PLP)
- EU Portuguese (PTP)
- Romanian (ROR)
- Russian (RUR)
- Slovakia(SKS)
- Swedish (SWS)
- Basque (BAE)
- Catalan (CAE)
- Scottish English (ENS)
- Irish English (ENE)
- Turkish (TRT)
- Arabic (ARW)
- South African English (ENZ)
- Australian English (ENA)
- Indian English (ENI)
- Bahasa Indonesian (IDI)
- Japanese (JPJ)
- Mandarin Chinese (MNC)
- Mandarin Taiwanese (MNT)
- Cantonese (CAH)
- Hindi (HII)
- Korean (KOK)
- Thai (THT)