VISOCALL IP

Network integration

04.2014

HEALTH CARE

www.schrack-seconet.com

SCHRACK SECONET

Table of contents

1 Document status

Version	Date	Edition notes, reason for changes	Name
V1.0	7.2.2008	First edition	Schoberlechner
V1.1	22.10.2008	Alterations to the Topology and VcIP switch	Schoberlechner
V2.0	11.6.2010	Segmentation, Redundancy and IP Addresses	Schoberlechner
V2.1	21.12.2012	Examples of the system segmentation	Schoberlechner
V2.2	17.07.2013	POE extension	Schoberlechner
V2.3	18.09.2013	NSP protocol extension	Schoberlechner
V2.4	11.11.2013	Dynamic routing protocols	Schoberlechner

2 Introduction

The document describes the technical network requirements and provides information about the system set-up of VISOCALL IP (VC-IP); both for its own networks as well as for the integration of external networks.

2.1 VISOCALL IP – System Assemblies

The patient terminal (hereinafter abbreviated as "PAT") is a patient console at the bedside within the nurse call system VISOCALL IP.

The connection module (SM) is a system assembly for connecting patient consoles (IP), diagnostic equipment as well as laptops.

The VISOCALL IP system switch (hereinafter abbreviated as "SWI9") represents a decentralised communication node for data exchange between connected system devices and the rest of the communication system.

The Logical Delivery Point (hereinafter abbreviated as "LDP") is used within layer 3 networks as a gateway between the individual physical layer 2 networks and the Management Centre (MMC).

The Management Centre (hereinafter abbreviated as "MMC") serves as an interface to external systems.
The MMC allows the following applications: Commissioning the nurse call system and reading the system topology, uploading firmware and the system configuration, logging all system events, central interface for configuration and remote maintenance, release of various software modules.

3 System set-up

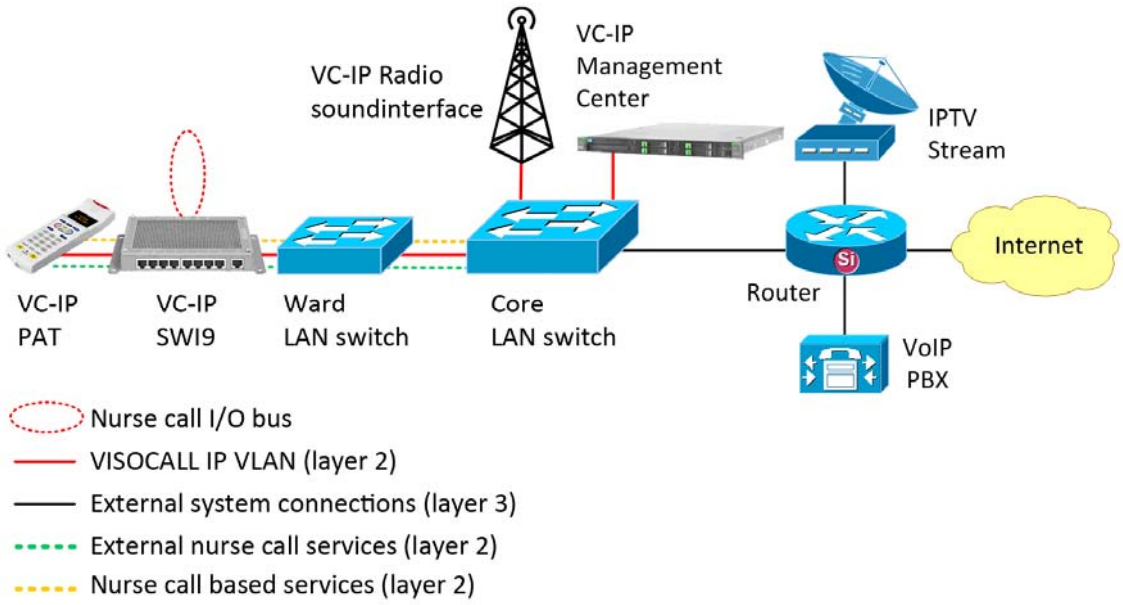
The networking of individual nurse call systems or system switches (SWI9) takes place via a LAN topology, which is not part of the nurse call system according to the directive DIN VDE 0834. In addition, the galvanic isolation to the LAN topology is ensured via the uplink port.

System-external devices may only be connected to the nurse call system via interfaces that ensure safe isolation against hazardous voltages according to DIN EN 60950 or DIN EN 60601-1.

It is to be ensured that VISOCALL IP is separated from other services and applications and is used in its own VLAN. In addition, there is the imperative need for a QoS prioritisation (high priority) in the VC-IP VLAN.

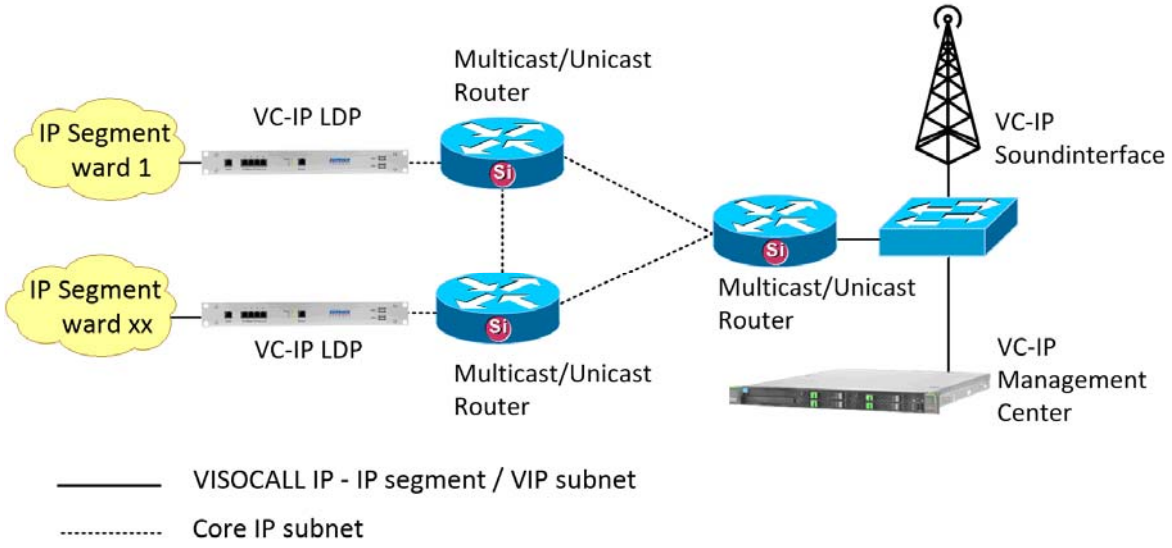
The transfer of external nurse call services to patients, such as Internet and IPTV stream, takes place exclusively via separate VLAN's. These VLAN's require a QoS prioritisation (low priority).

The following figure shows a VISOCALL IP system set-up with an Internet, TV and telephone function.



3.1 Layer 3 segmentation of the networks

A VISOCALL IP network can be divided into layer 3 segments This is realised with the Logical Delivery Point (LDP). The LDP here works as a router between the individual VC-IP networks and the Management Centre (MMC). An LDP manages two layer 3 IP subnetworks: on the one hand the VC-IP subnetwork (IP address range for nurse call components) and on the other hand the uplink subnetwork (core IP address range for global routing).



For special nurse call functions, an additional physical segmentation can be configured between the four ports at the LDP (layer 2). In the event of a failure of one complete physical VC-IP segment, the other segments would therefore not be affected.

A connection to an external router can be established via the LDP uplink port (layer 3). This external router must support multicast routing, e.g. PIM/SM, as well as unicast routing, e.g. RIPv2 or OSPF.

The LDP works as a sub-configuration server for its four physical VC-IP segments. A change to the firmware or configuration can be introduced individually at the LDP. This has the consequence that in larger VC-IP nurse call systems, network segments and therefore ward configurations or even updates are possible without affecting other network segments and stations.

For small systems, the LDP can serve as a replacement for the MMC, provided no central services, such as VDECT, event logging, alarm server, BMA, DESO systems or guidance systems, etc. are necessary.

The number of LDP's in a network architecture is unlimited.

The IP address assignment and configuration of VC-IP components, such as a patient terminal (PAT), takes place by means of the network set-up protocol (NSP). The Dynamic Host Configuration Protocol (DHCP) cannot be used here, because it cannot transfer the VC-IP proprietary configurations.

For the IP addressing, the nurse call system requires a fixed assignment in operation. The individual IP address assignment of the devices only takes place during the commissioning centrally from the configuration via a network set-up server service. During operation of the nurse call system, these IP addresses are then automatically managed by a network set-up master service and assigned to a network set-up device service.

The network set-up master service ensures that, for example, by re-plugging the PAT, this can, after starting, again be assigned to the physically correct room and bed according to the new position.

3.2 Hardware Detection

The ports 1 to 7 have "hardware detection." The VC-IP system switch (SWI9) blocks the connection as long as there is not a VC-IP system device connected. This means that, for example, both LAN sockets on one connection module without a VC-IP system device (e.g. PAT) do not have any connection to the network.

The system switch (SWI9) detects a VC-IP system device through a specific signature measurement at the corresponding LAN port. The SWI9 only releases the connection when a VC-IP system device is detected at the port.

3.3 Loop Protection

The uplink monitors the network for a loop in the backbone. If a loop is detected, the VC-IP system switch (SWI9) isolates its uplink from the network for at least 5 minutes. The uplink is then checked again after 4 minutes to determine whether the loop is still present. If this is the case, the uplink remains isolated and the next check is started again after one minute.

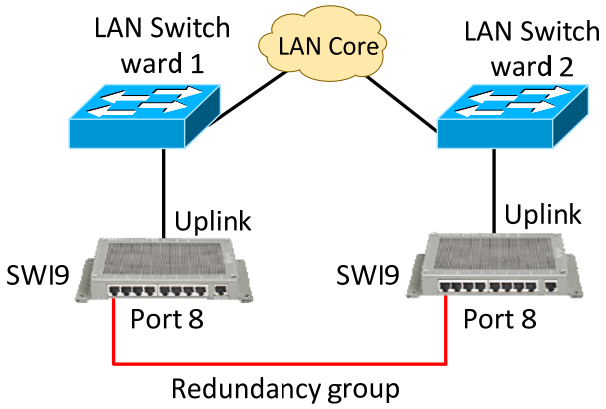
By isolating the uplink, the "isolated operation" of an individual system switch (SWI9) is also ensured. When wiring the PAT, communication terminal (KMT) and IO bus of a room to a SWI9 or a redundancy pair, the VDE 0834 is fulfilled to the extent as with an uplink failure when all nurse call functions of all components connected to the affected SWI9 continue to function.

3.4 Redundancy via port 8

A redundant network topology is not strictly necessary for the redundancy function of the VC-IP system switch (SWI9). It is to be noted, however, that a complete whole-ward redundancy is then only guaranteed if the entire network topology is also designed to be redundant. The redundancy configuration of the network topology can be done through STP Spanning Tree, RSTP Rapid Spanning Tree or MST Multi-Instance Spanning Tree.

The system switch (SWI9) does not support any of the spanning tree protocols.

This configuration is to be considered regardless of the redundancy function of VISOCALL IP.
A coordination of the network topology with the redundancy function of VC-IP is not necessary.

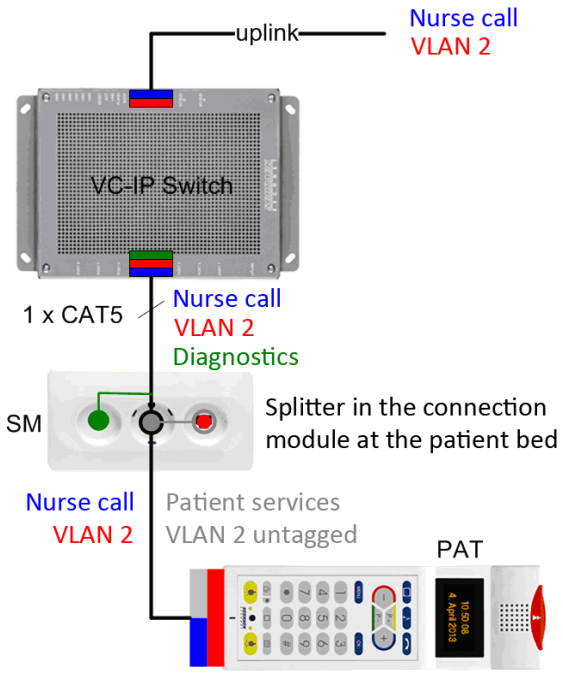


The redundancy function of the system switch (SWI9) only covers the failure of an uplink.

In the event of a failure of one of the two ward switches of a redundancy group, the nurse call functions of both SWI9 are still guaranteed via the redundancy group line.

4 Splitting of services

The PAT is an IP terminal with its own IP address and provides nurse call services, including telephone, IPTV stream and multimedia (tagged VLAN, VLAN ID can be changed).
The freely accessible LAN connection on the connection module at the bed is isolated from the nurse call by the VLAN. Services, such as IPTV stream or Internet, can be provided to the patient at this connection.



Since the various nurse call functions and services must be isolated from each other for safety reasons, only static port-based VLAN's can be seen to increase security. Since the VLAN assignment is rigidly bound to the switch port in the PAT and therefore to the physical network socket at the bed, a potential intruder is only able to gain physical access to VLAN 2 (untagged VLAN, VLAN ID can be changed), but only as long as the PAT is inserted. It is not possible to access the nurse call VLAN.

5 Logical Delivery Point (LDP) Technical Data

The LDP does not represent any active LAN components (no Spanning Tree) in the usual sense of network technology.

Protocols:

Layer 2 „Network Setup Protocol / NSP“ Ethernet Type 0x3000

IEEE 802.1Q VLANs

IEEE 802.1p Priority

IEEE 802.1Q VLANs

RFC 768 UDP

RFC 783 TFTP Protocol (revision 2)

RFC 793 TCP

RFC 826 ARP

RFC 2236 IGMPv2

RFC 2453 RIPv2

RFC 2328 OSPFv2

Static Routing

Uplink:

1 RJ-45 auto-sensing 10/100/1000 port (IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 8023y)

Media Type: Auto-MDIX, Dublex: half or full

Port 1 up to 4:

4 RJ-45 auto-sensing 10/100 port (IEEE 802.3 10Base-T, IEEE 802.3u 100Base-TX)
Media Type: Auto-MDIX, Dublex: half or full

Service:

1 RJ-45 auto-sensing 10/100 port (IEEE 802.3 10Base-T, IEEE 802.3u 100Base-TX)
Media Type: Auto-MDIX, Dublex: half or full

6 VISOCALL IP System Switch (SWI9) Technical Data

The VC-IP system switch (SWI9) fulfils the criteria of standard VDE 0834 and is a part of the nurse call system. The SWI9 does not technically represent a nurse call module and is not a LAN switch (no Spanning tree) in the usual sense of network technology.

Protocols:

Layer 2 „Network Setup Protocol / NSP“ Ethernet Type 0x3000

IEEE 802.1p Priority

IEEE 802.1Q VLANs

RFC 768 UDP

RFC 783 TFTP Protocol (revision 2)

RFC 793 TCP

RFC 826 ARP

RFC 854 TELNET

RFC 951 BOOTP

RFC 2236 IGMPv2

Uplink:

1 RJ-45 auto-sensing 10/100 port (IEEE 802.3 10Base-T, IEEE 802.3u 100Base-TX)

Media Type: Auto-MDIX, Dublex: half or full

Backbone loop Detection

Port 1 up to 7:

7 RJ-45 auto-sensing 10/100 port (IEEE 802.3 10Base-T, IEEE 802.3u 100Base-TX), Dublex: half or full

Power over LAN: 24V 500mA überwacht

Security: „Hardware Detection“

Interface for diagnostic socket at bed (galvanically isolated 24V 150mA monitored)

Port 8:

1 RJ-45 auto-sensing 10/100 port (IEEE 802.3 10Base-T, IEEE 802.3u 100Base-TX)

Media Type: Auto-MDIX, Dublex: half or full

Power over LAN: 24V 500mA monitored

Redundancy capable (Redundancy Group) for increased system security

VLAN untagging

7 Requirement for the network layer 2 / layer 3

7.1 Layer 2/Layer 3 - Switches

- Layer 2 „Network Setup Protocol / NSP“ Ethernet Type 0x3000
- VLAN up to the central serving of the patient services
- Static VLAN LR for nurse call to all floors and server with the highest priority
- QoS with Differential Service Field (DSCP) or Class of Service (CoS)
- IGMP snooping with IGMP querier for VC-IP VLAN and services VLAN, IGMP version 2
- IGMP querier must be provided by the in-house data processing if VISOCALL IP is integrated in the in-house data processing network
- SNMP access with read access
- 1 port with 1 Gbit for the Management Centre (MMC)
- 1 port with 100 Mbit for each 1 SIC with 2 radio channels from the sound interface (SIC)
- Power over Ethernet (PoE) must be disabled for all layer 2 / layer 3 switches

Layer 3 function

- IP routing between external systems and the nurse call network, optional RIP version 2, OSPF version 2, Multicast Routing PIM/SM
- Dynamic routing protocols (unicast, multicast) must be provided by the in-house data processing if VISOCALL IP is integrated in the in-house data processing network.

7.2 Bandwidths

- Nurse call 10 Mbit
- Per nurse call conversation 64 kBit
- Per radio channel 64 kBit
- Per telephone call 64 kBit
- Per TV stream MPEG 2 5 Mbit

7.3 Multicast

The following multicast groups are used with an IP Time to Live (TTL) of 31 for the distribution of multimedia services. In the process, each media gateway sends its media offer to the group 239.0.3.0. Through this group, all the clients receive the information on which multicast group and port the corresponding media stream can be received.

The source IP address (multicast sender) for the radio channels (streams) is always the IP

Group	Use
239.0.3.0	Multimedia offer information
239.0.3.1 – 239.0.3.32	Radio channel 1 up to 32

7.4 Dynamic Routing

Optionally, a dynamic routing can be configured at the LDP. The protocols RIP version 2 and / or OSPF version 2 (OSPF Stub Area function is possible) are available for this purpose.

The LDP must configure the routing protocols used with the routing of the network topology.

With an activated dynamic routing, static routes are no longer allowed for the backbone network!