

1. Publishable summary

The logo for Hit Gate features the text "Hit Gate" in a blue, sans-serif font. The text is centered within a graphic element consisting of two overlapping, semi-transparent orange and red shapes that form a lens-like or gate-like structure, with a small white dot at the center where the shapes meet.

Hit Gate

HIT-GATE (www.hit-gate.eu) project goal is to develop a solution to communications interoperability between First-Responder networks, including those involving more than one nation. It will be reached by developing a novel technological solution that will interconnect all the existing communication systems via a dedicated node and ensure interoperability of all the desired systems without modifications of the handset devices and major communications infrastructure.

The main goal of the project is to develop a generic gateway that allows communications across networks currently used by First Responders in Europe. It is well known that, all over Europe, current First Responder (FR) networks use a large number of different and incompatible technologies therefore compromising efficient coordination of combined operations (such as cross-border or crisis management). It is also known that European organizations dealing with public-safety have invested in dedicated critical systems (to ensure high-availability and reliability). This includes dedicated networks of, among others, PMR (Professional Mobile Radio) and, more specifically, TETRA (TERrestrial Trunked RAdio) or TETRAPOL. Moreover, with the fast development of communications technologies, new capabilities and opportunities are being adopted and exploited by early-adopting First Responders, such as ad-hoc mesh broadband networks, able to provide and/or extend connectivity over affected areas (e.g., underground and destroyed area) and to deliver high data throughput (higher than 5 Mbps).

To answer First Responders needs, HIT-GATE will be developed to support a mix of technologies used today by organizations involved in Public-Safety, ranging from legacy-PMR, TETRA to next-generation networks. In this way, organizations may keep their existing systems and/or adopt novel technologies, since the proposed HIT-GATE solution is future proof and ensures communications interoperability between the networks (limited, of course, to the limitations in capabilities of each network). HIT-GATE will also enable communications across heterogeneous networks between First Responders during operations. By connecting HIT-GATE to their networks, First Responders may continue to use their current receiver equipments, communications base-stations and communications infrastructures. The situation before and after HIT-GATE deployment is presented in Figure 1, that is, changing from isolated networks to connected networks.

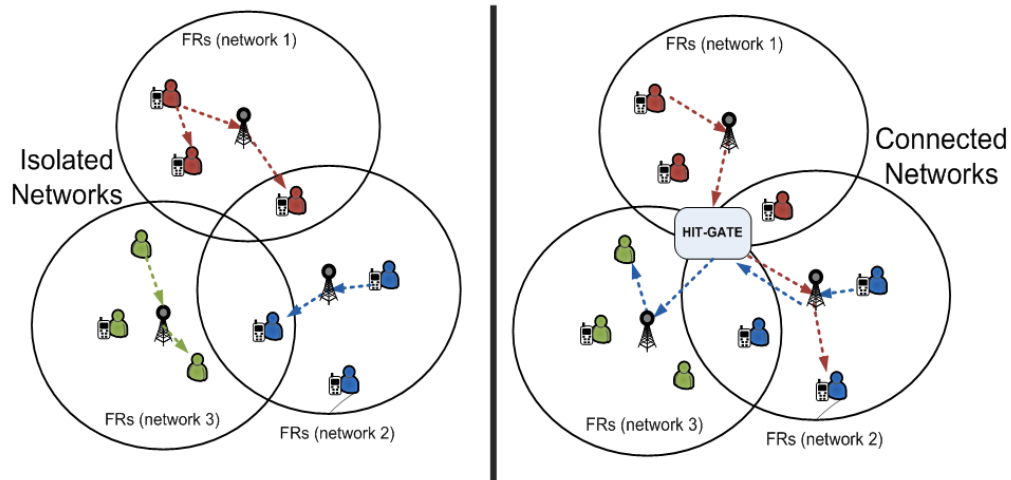


Figure 1 HIT-GATE: before (left) and after (right) HIT-GATE

Figure 1 HIT-GATE: before (left) and after (right) HIT-GATE

At both European and national/domestic levels, Public-Safety organizations have adopted a variety of systems, equipments and technology resulting in a plethora of networks that do not interoperate. Since current security and emergency activities frequently involve multi-national First Responders teams (e.g., natural crisis response and cross-border operations) it is crucial to provide an effective solution. HIT-GATE will successfully and seamlessly integrate heterogeneous Public Safety Communications (PSC) technologies – each comprising specific sets of protocols, services and characteristics – while ensuring mission critical requirements of PSC applications, including high-availability, dependability, security and, especially for the case of Emergency Forces / First-Responders, be rapidly deployable over mobile, highly-dynamic and unpredictable environments where existing infrastructures may be degraded and/or destroyed.

Hit-Gate objectives

The HIT-GATE project defines the following general objectives that can be treated as baseline requirements.

HIT-GATE shall enable communications between First Responders' heterogeneous networks used at European Level

- Gateways are a short-term solution for technical interoperability between already existing First Responders' heterogeneous networks.
- HIT-GATE shall have embedded support to and services from each network and shall be able to translate them across networks

HIT-GATE shall provide set of services required to meet First Responders' needs across First Responders' heterogeneous networks

- HIT-GATE shall provide set of services across heterogeneous networks, including voice and data. HIT-GATE shall support from legacy to current to next-generation broadband networks used today by First Responders.

HIT-GATE shall be transportable, rapidly deployable and autonomous

- HIT-GATE shall be easily transportable by vehicle in the case of emergencies and crisis events.

HIT-GATE shall automatically integrate new networks of known type

- In order to ensure continuous operation of the gateway, when a network of a known type becomes connected to the HIT-GATE, this occurrence shall be detected and HIT-GATE shall automatically build supported cross-network services according to the respective network characteristics and security policies.

HIT-GATE shall require minimal or no changes to existing public safety communication infrastructures

- HIT-GATE will enable communications to first responders during operations across heterogeneous networks, using their current receiver equipment and with no impact on currently used public-safety communications base-stations and infrastructures other than providing a connection-point to HIT-GATE.

HIT-GATE shall provide a modular architecture allowing incorporation of future network types

- HIT-GATE shall be developed in a way that allows adding new network (of known type) in a modular way, therefore ensuring an always up-to-date gateway.
- HITGATE will ensure interoperability between the 'old' and the 'new', according to cross-network services supported by each network.

HIT-GATE shall provide open-interfaces and will provide recommendations for standards

- HIT-GATE shall provide open-interfaces and a wide range of services across networks, based on widely adopted standards. These include IP as basis protocol (for level 3 OSI interoperability), IPTV, VoIP, and SIP/SDP for signaling (including core components S-CSCF, P-CSCF, I-CSCF and HSS).

Description of the work performed since the beginning of the project - Main results achieved so far

HIT-GATE project started with an analysis of existing material on past first-responders' operations (e.g. natural crisis, large scale incidents and mass events, sports events, music festival and fairs) and exercises. Focus has been on the interoperability issues and solutions involving several domains, including technical, organizational (e.g., processes, policies and security), operational and legal. The main objective was to provide a detailed description of key public safety and security scenarios. In particular, the study performed is focusing on communication-related aspects during natural disaster responses, peacekeeping missions and Border Control operations, and takes into account organizational and operational activities performed by relevant security actors directly involved in the field. Starting from a clear understanding of the end users activity on the field, the report can provide a comprehensive picture of the operational procedures in order to map users' communication needs and requirements emerged in the specific mission.

Once user and system requirements defined, the consortium focused on specification of a high-level architecture to give an overview of the Hit-Gate

interoperable network solution for first responder networks that would benefit Public Safety Organizations (PSO) with a possibility to integrate existing network infrastructures into Fixed Mobile Convergence and the Next Generation Networks. The Hit-Gate basic system concept is presented below in Figure 1. Various First Responder Networks (FRNs) are illustrated on the left side e.g. TETRA, TETRAPOL and analogue-PMR, and commercial communication networks (CCNs) are illustrated on the right side: GSM, UMTS, and/or 4G LTE. HitGW connects Network Elements from the First Responder Networks on transport layer with the network elements (NEs) of an IP-based network (TISPAN type) on transport layer – core transport network, and service layer – IMS Core and Ass.

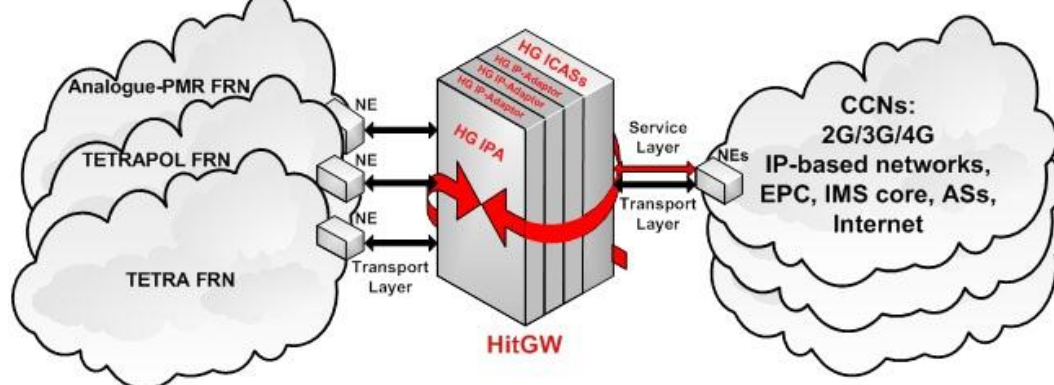


Figure 1: The Hit-Gate basic system concept

The basic architecture for HIT-GATE is a TISPAN type of architecture. It makes HitGW compliant with LTE network architecture and suitable as plugin system solution for currently deployed 4G LTE networks. HitGW is actually composed of a technology adaptor for transport layer that convert user data and signalling of the FR technology into SIP/RTP for VOIP, multimedia services, and protocol adaptor for services and applications (IMS-based). Regardless of different implementation possibilities of the HitGW, it is important to highlight the system point of view of HitGW. It represents a sub-network of HGNoNs that lies between a Network Element of the FR access network and a Network Element of the core transport network, and it performs: an “access technology adaptation” (on transport layer) and a “protocol adaptation” of the First Responder technology (on service layer).

The main results achieved so far includes:

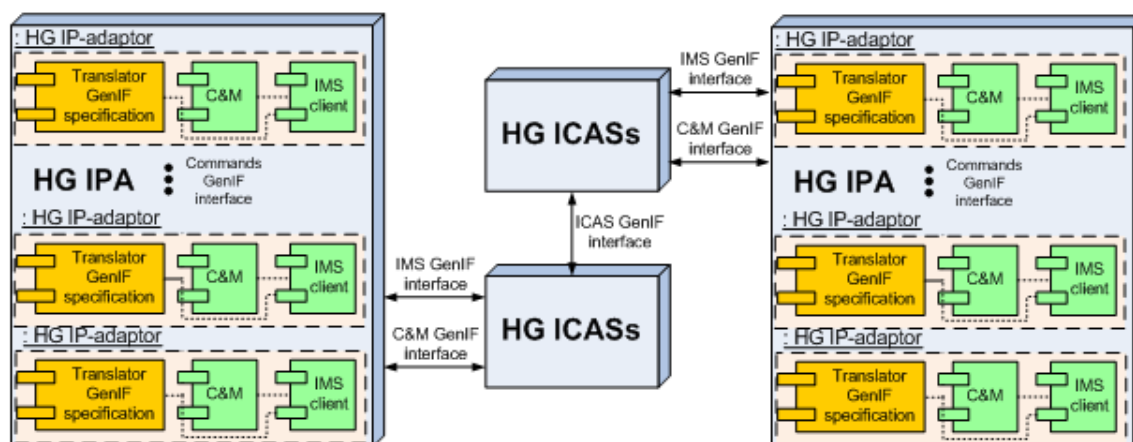
- HIT-GATE consortium performed in-depth analysis of existing technologies, COTS, components, protocols and services all-over-IP (e.g., SIP, PoC, IMS, VoIP, XML-over-UDP/IP, service discovery, etc.) to derive a first version of the high level architecture.
- HIT-GATE has defined a first version of the High-Level architecture as illustrated in Figure 1. The HIT-GATE HLA is at least composed of:
 - HG IP-adaptors (an universal adapter for the FR technologies considered in Hit-Gate, with device drivers, IMS client and its own O&M module)
 - HG ICASs (an HG IMS Core and Application Servers)

Those two components, when physically co-located (optional) form a HitGW allowing seamless interoperability between considered access networks.

- HIT-GATE consortium identified components, their visible properties are now listed and the relationships between them are stated by the definition of GenIFs.
- HIT-GATE consortium defined architectural design for the IP-Adaptor technology translators was proposed. The IP-adaptor is divided in three layers:
 - Adaptor transport Layer, where it is place the IMS Client (AdaptorService) and the HTTP configuration and management server. (Into the IP-Adaptor)
 - Driver transport Layer, here is the DeviceHost application which loads the driver for controlling radio device. (Into the IP-Adaptor)
 - Access network Layer, this is the place where the physical radio hardware is hosted to provide the access point to the first responder network.
- HIT-GATE defined components dealing with generic interoperability aspects
- HIT-GATE defined and begun implementation of the components dealing with generic interoperability aspect. These include:
 - IMS functions, comprising the generic communications services and standardized interfaces
 - The IMS that includes includes the CNSrv. The CNSrv comprises the functions that allow seamless access to services across heterogeneous networks even under high-dynamics (plug-in/plug-out networks).

The IMS and CNSrv, together with the IP-adaptors constitute the Generic Interoperability Framework (GenIF).

- HIT-GATE detailed the GenIF, which is formed by the next interfaces:
 - **I1 interfaces:** between two HG ICASs (**ICAS GenIF interface**)
 - **I2 interfaces:** between HG ICASs and HG IP-Adaptors.
 - Through SIP between IMS Client and Server (**IMS GenIF interface**).
 - Through HTTPS for control and management commands (**C&M GenIF interface**).
 - **I3 interfaces:** HG IP-Adaptor
 - Generic driver specification for radio manufacturers (Translator GenIF specification).
 - Between IMS client, C&M and translators (**Commands GenIF interface**).
 - **I4 interfaces:** HG ICASs (**ICASs interfaces**)



- As a first step for implementation, the GenIF comprises functions to allow the following Cross Network Services (CNSrv):
 - Registration/Authentication.
 - Presence.
 - Private call (full-duplex).
 - Private call (half-duplex)
 - Emergency call (half-duplex).
 - Messaging (SDS and Status).
 - Calling/Talking Party Identification.
 - GPS Location messaging.
 - Group call (half-duplex).
 - Group call (full-duplex) (This is a full-duplex private call but calling to a conference number).
 - Retrieve group list.
 - Group Advertisement.
- State of the art review on testing and validation tools for network services, protocols and interfaces were performed to prepare a validation testbed. First experiments were performed on the available IMS testbed integrated by NCSR D.
- Study of initial HIT-GATE components and IP adaptors specifications for definition of validation test cases.
- A significant progress toward Hit-Gate demonstration objectives has been achieved in the following areas:
 - Detailed scenarios descriptions
 - Anticipated venue of demonstration defined
 - Participating authorities involved
 - Communication activities description (supported by communication diagrams)
 - Technologies used is describe
- Dissemination to potential end-users were conducted by attendance to European conferences involving both scientific community, and end-users.
- The official website for the HIT-GATE project has been created, put online and maintained at the ITTI web servers with the address: www.hit-gate.eu

WELCOME TO THE HIT-GATE PROJECT "HETEROGENEOUS INTEROPERABLE TRANSPORTABLE GATEWAY FOR FIRST-RESPONDERS"



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CTSC collaborates with End-Users
CTSC (Cluster TIC Seguridad y Confianza) collaborates with End-Users also during field exercises. It allows to acquire their requirements in action.



HIT-GATE Project Repository

Documents, deliverables, presentations and other data related to the project are stored in project repository.

The HIT-GATE is a collaborative Seventh Framework Programme FP7 project under grant agreement no. 264940.

Figure 2 : Hit-Gate website available at www.hit-gate.eu