



base7 8543/i3 Platform

Revision 4.1.1

This is the v4.1.1 release of the base7 8543 platform, in the i3 Next Generation IP standards version. The 8543 has been in use since 2003 and the i3 release has been available since 2015. It supports all of the related NENA and ETSI standards and is originally designed from the NENA 08-003 functional and interface specification and ETSI TS 103 479 core elements specification. This release includes support for ETSI TR 103 393 Advanced Mobile Location (AML) services and SMPP 3.4 interfaces. All of the elements have also been released as integrated Virtual Network Function (VNF) images in this release.

The 8543/i3 platform supplies the following ESInet elements

- ECRF Emergency Call Routing Function/LVF (Location Validation Function)
- ESRP Emergency Services Routing Proxy
- PRF Policy Routing Function
- MP Media Proxy. Element for bridging call, video and text data and streaming media to logging and recording services.

These are all software elements that live on standard servers/VM's and interoperate using only the i3 standards. This allows customers to utilise them separately or together on their platforms as required.

ECRF/LVF

The 8543i3 ECRF is a fully IETF standards aligned and compliant module that provides the i3 ECRF and LVF (location validation function) functions.

The ECRF server is capable of multiple hierarchical roles within an NG9-1-1 environment and can be configured as resolver (recursive/iterative), forest guide (iterative) and authoritative server. The ECRF supports all projected geodetic types including circle, ellipse, arc-band, polygons and points.

The ECRF provides interfaces for LoST (RFC 5222), HELD (RFC 5985/6573/7840) and SIP Presence (RFC 3856/4661) for geolocation translation of a caller's position. It can receive locations in a PIDF-Lo RFC 4119 format with NENA extensions, as co-ordinate values, or via a civic address lookup from a Mobile Location service or via a configured numbering plan. The geopoint location boundaries are maintained in a central real-time database that has a standard REST or file-based update mechanism for real time boundary and address information updating. All major geo-data file formats are supported.

ESRP

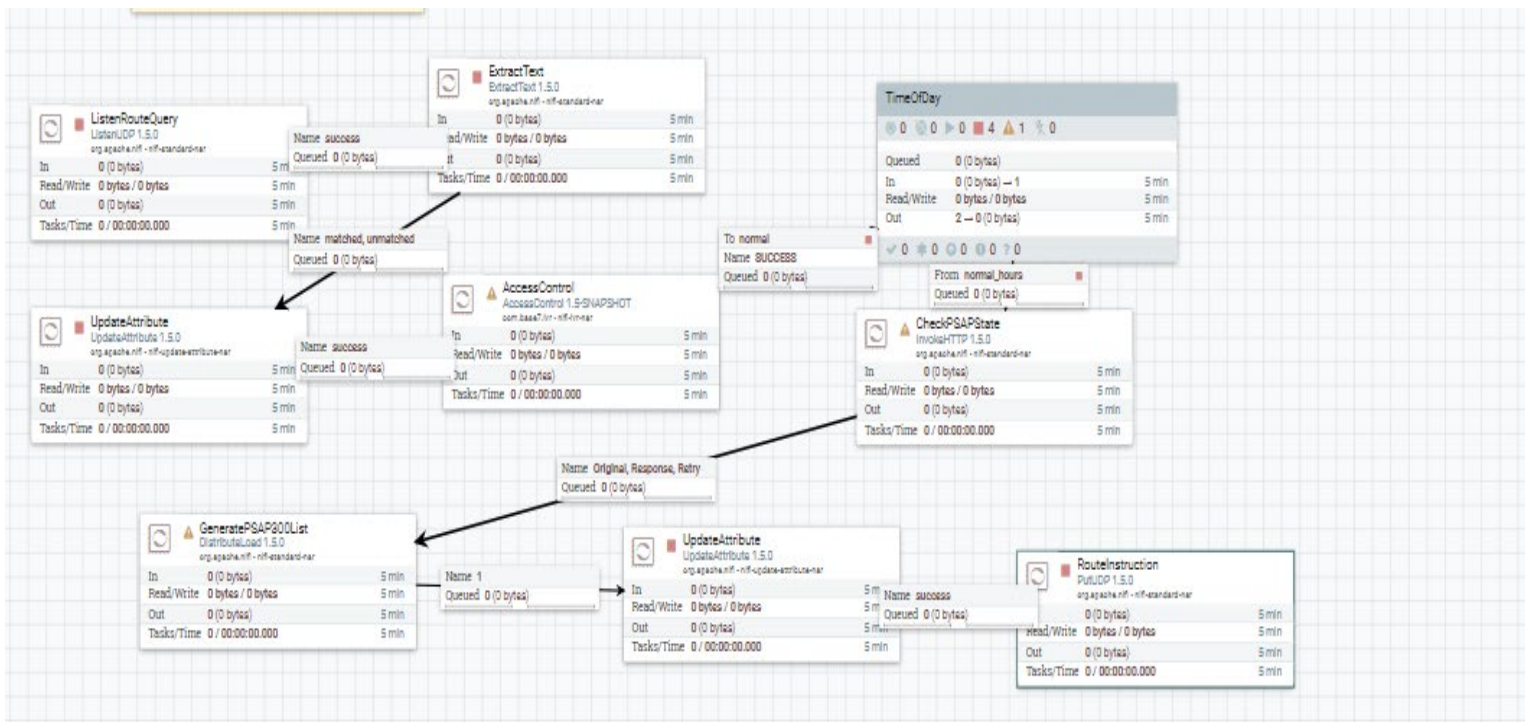
The 8543/i3 ESRP is a fully compliant i3 routing proxy capable of handling up to 5000 calls per second on the standard VM release. The ESRP provides an appropriate URN on a per call basis and queries the ECRF with it and a location object (PIDF-LO) to determine the next hop routing. Conversion between received data and the PIDF-LO format is done at the ESRP. The ESRP supports standard RFC 3261 compliant SIP, Q.1912-5 SIP-I, SIP PRESENCE messaging and SMPP signaling interfaces. Where legacy integration is required the ESRP can utilize the services of a base7 8681 (for MSAG/H.248 interactions) or 8620 (for ISDN, ISUP or BICC interactions) gateway. The ESRP also supports the SIPREC standard for interacting with voice logging equipment and can, in conjunction with a Media Proxy element, create separated voice logging streams for all legs of a call. The ESRP will always calls to the PRF (Policy Routing Function) before final routing to a PSAP.

PRF

The PRF can be located within the ESRP or as a separate module. It allows policy routing decisions to be taken at any point in the call flow and based on a large number of variables, including

- Location
- Current PSAP state, as determined via OPTIONS heartbeating, including available agents
- Queue Length at each PSAP
- Language preferences
- Call type
- Time of Day rules
- Allocation rules for PSAP's in a specific area or region
- Day of Week rules, including configured holiday rules
- Security preferences
- Originating domain of the call and terminating domain of the PSAP
- Media Type
- Failover rules, i.e. if primary call fails route to secondary etc...

The PRF has existing data interfaces to HTTP/S, SQLServer, mySQL, Oracle, ,Redis, MQ, Avro. Hadoop, AWS, JSON messaging, Javascript and many others. It also maintains a standard tabular call routing rule set for simple routing lookup. It can use these in the course of a call flow to gather real-time data for call routing. The rule sets that are created are stored as xml files in the standard i3 object format and can be created via the 8543/i3 GUI drag and drop interface for routing control. An example script is shown below in the GUI for reference.



The routing rules are stored in a distributed realtime redis database.

High Availability

The 8543/i3 is designed to be six nine highly available by having multiple failover instances for all elements with state sharing between all instances of each module. This functions on four main levels

1. Application modules. All modules run as Active/Active instances in each node with all state shared between each instance. The Active instances will run on separate VM's and on separate hardware instances to allow for redundancy at the VM and hardware level. On failure of a module the peer instance will present the address of the failed module via IP takeover and will continue processing all calls until the other instance has recovered. Additionally, on each site there is a warm standby instance that is not actively processing calls but that is receiving state information for both active instances. In the event of both active instances failing this instance will present both IP addresses via address takeover

and continue processing calls. These warm standby instances are also located on separate VM's/hardware instances.

2. Routing or call failure. All derived routing instructions in the PRF require acknowledgement of a 200 OK receipt and setup of a call. If this does not occur the PRF will go to the next PSAP object element in it's routing list and send instruction for this. The timing and resend for these is configurable.
3. All databases are configured as primary/secondary instances with one writable primary instance and multiple distributed slaves. There are a number of sentinel modules that check the status of the current primary and failover via a managed priority list to the current slaves. The sentinels also manage the replication and update of the promoted secondary servers.
4. The platform supports configuration of georedundant nodes. In this case the takeover node will normally not use IP takeover due to subnetting limitations but it will takeover the call via either reINVITE/UPDATE to the original calls legs or by initiating new call legs where the reINVITE/UPDATE is not supported. The georedundant nodes also exchange all state information about calls.

Security

All interactions are conducted over TLS where possible. The ESRP supports both tls required and best-efforts tls configurations and also mutual and server-only authentication. The Media Proxy support SRTP. The PRF and configuration modules have per-user fine grained authentication schemas that can be locally set or can query LDAP or other customer authentication systems for credential authentication. It allows for multiple roles that can be defined by service, location, time of day or other configurable elements.