Security Edge Protection Proxy (SEPP) Network Function

1	**Problem Statement**	Realization of SEPP for a Carrier Grade 5G SA Converged Core
2	**Technology Area**	Network Function for 3GPP R17 Compliant 5G Core
3	**Project Introduction**	SEPP is a Network Function of a carrier grade 5G Core, responsible for securing and controlling inter-PLMN signalling traffic exchanged between a Home PLMN (HPLMN) and a Visited PLMN (VPLMN). SEPP provides a secure and controlled interconnection boundary between the operator's 5G Core network and external PLMNs, protects the internal network topology and Network Function identities while enforcing operator-defined security, screening, routing and policy controls on inter-PLMN signalling.
4	**Problem Description**	The project in question is to develop SEPP Network Function for C-DOT's Carrier Grade 5G SA Converged Core, to be realized **leveraging the background prior technology** by the selected partner(s). ● The SEPP shall comply to 3GPP R17 specifications including the relevant requirements of 3GPP TS 23.501, 502, TS 29.573 and TS 33.501 as applicable. ● The SEPP shall comply to the applicable Indian Telecom Security Assurance Requirements (ITSAR) specification, ITSAR111192401, of National Centre for Communication Security (NCCS). ● The solution shall support both the control-plane signalling security function and the associated N32 connection management and forwarding functions, including secure communication with SEPPs deployed in partner PLMNs. ● The solution to be deployed as a containerized cloud native microservices (K8s) **Project Scope**: 1. Development of a Cloud native SEPP Network function for C-DOT's 5G SA Converged Core. 2. Software to be implemented in Golang or C language, to run on Linux. 3. Integration (in C-DOT facility) of SEPP with other 5G Core Network Functions

		4. Integration testing - Functional and Performance 5. Validation testing and acceptance, at C-DOT facility 6. Training & solution Documentation (Design, Test artifacts, RTM) 7. Post acceptance support for 2 years
5	**Feature Sets and Capabilities**	The Proposed SEPP implementation shall support the following features and capabilities ● **N32 Connectivity & Protocol Support** ○ Support N32-c and N32-f interfaces for secure inter-PLMN 5G Core signalling. ○ Establishment and management of secure N32-c connections, including security capability negotiation, parameter exchange and error handling ○ Secure forwarding of HTTP/2-based NF service signalling between SEPPs belonging to different PLMNs ○ Negotiation and selection of N32-f protection mechanism based on peer capability and local policy. ● **Security & Cryptography** ○ Support TLS 1.3 & TLS 1.2 for secured inter-PLMN control plane signalling over N32 interface ○ Support Rel-17 specified cryptographic mechanisms, secure key establishment/derivation and cryptographic context management. ○ Support PRINS-based application-layer protection of N32-f traffic using JWE (AES-256-GCM / AES-128-GCM) for confidentiality and JWS (ES256) for data integrity protection. ○ Support for X.509 certificates and PKI management.

		○ Support for replay protection ○ Support hooks for addition of new cryptographic algorithms without architectural redesign ● **Inter-PLMN Security & Topology Protection** ○ Support for hiding internal NF, network and topology information from external networks ○ Support for message filtering and screening based on configurable security and routing policies ○ Support for configurable data-type encryption and modification policies for N32 signalling/ mutual authentication & negotiation between peer SEPPs ○ Support for PRINS-based interaction with roaming intermediary /IPX provider if applicable. ● **Traffic Management** ○ Support for PLMN/SEPP identification, routing policies and destination SEPP selection ○ Support for rate limiting, session limits, traffic policing and protection against overload condition. ○ Protection against signalling attacks and downgrade attacks ● **Local NF interfaces** ○ Support for Service based interfaces (http/2) to AUSF, UDM for authentication, to AMF for mobility management during roaming and to NRF(s) for SEPP profile registration, NF discovery. ● **FCAPS**

		○ Support for northbound interfaces for configuration, monitoring, alarms, statistics and lifecycle management. ○ Support for secure configuration of PLMN partners, certificates, security policies, routing and filtering rules ○ Support for configurable performance monitoring, statistics, counters and KPIs for N32 traffic and SEPP resources ○ Support for alarms, event notifications, fault detection and recovery mechanisms ● **Performance, Capacity** ○ Support for a minimum of 200 concurrent N32 connections ○ Support for a minimum of 1000 TPS sustained signalling load ○ Support for a minimum of 50 roaming partner relationships ○ Acceptable message processing latency for 95 percentile (P95) cases under nominal signalling & security processing load. ● **Resilience, Scalability** ○ No single point of failure and automated traffic failover on instance failure ○ Node level and Geo level redundancy support ○ Support for horizontal scaling ● **Logging and Tracing** ○ Support for development level and field level logging and tracing support
6	**Background / Prior Work**	The partner's SEPP implementation shall support a working implementation of the N32-c handshake, TLS-based connection establishment, and N32-f forwarding procedures, including multi-PLMN support and multiple deployment

		models, validated in an integrated lab/test environment corresponding to a technology maturity of at least Technology Readiness Level 4 (TRL4)
7	**Role & Responsibilities of C-DOT**	C-DOT will provide technical development assistance, and financial support to the project partner(s) selected through a process of evaluation and due diligence conducted by a committee of subject experts. Wherever deemed necessary and depending upon the project type, C-DOT may arrange resources, equipment, training, testing infrastructure, mandatory clearances, statutory permissions, and provide gap funding to the partner(s) in realizing the respective target deliverables. Development costs of the module, derived from existing background technology of partner(s), shall be borne by C-DOT. C-DOT shall use the final solution for integration with production grade software. C-DOT reserves the right to modify and enhance the solution and provide it to C-DOT customers or another Partner(s). C-DOT shall engage with Partner(s) on a non-exclusive basis and shall retain its right to develop similar projects/products through other developmental programs.
8	**Role & Responsibilities of Partner**	The Partner(s) to build the required module (SEPP Network Function pre-existing background technologies available with them. As per the project demand or project type, the Partner(s) may utilize the available test and infrastructure facilities offered by C-DOT with no/some financial implication for its usage. Use of any Open Source Software in Partner's offered solution will require prior approval from C-DOT. C-DOT may not permit use of certain category of Open Source Software in the offered solution. All commercial proposals shall include necessary cloud infrastructure cost as per requirements, manpower and cost breakup (Capital, Consumables, Travel, DA, Training, Contingency, Overhead, GST etc.). The proposal should include minimum of two years support for enhancements and capacity building for future enhancements in the product.

		Participation in the project shall be on a non-exclusive basis. All partner(s) shall be required to demonstrate commitment to the project by entering into a formal agreement with C-DOT as per the CCRP policy.
9	**Deliverables**	1. Requirement Specification and Design Artifacts (HLD, LLD, ICD) 2. Full Source Code 3. Integration Test Plan and Test Reports 4. Compilation scripts 5. Source code and binaries of Simulator(s) if any developed, Test stubs 6. Integration guide 7. User Training material 8. Capacity Building for C-DOT Technical Staff on the final solution and technology **Timeline** : 5 Months (Including deployment, testing and training) **plus two years post delivery support**
10	**Ownership of Background & Foreground IP**	All technologies created as background IP prior to commencement of the Project can be owned by the respective development partner(s). However ownership/IPR of the final SEPP solution developed in this project, shall rest with C-DOT with all the deliverables including complete source code, design artifacts etc.
11	**Vendor Selection Criteria**	1. The vendor should be a registered MSME with minimum experience of 5 years in developing mobile Telecom solutions 2. The vendor should be well recognized in the industry, must have undertaken and successfully executed technology development for other Govt of India organizations. 3. Vendor having ISO or CMMI Level 3+ certification for Quality Process may be given preference. 4. The vendor's background technology work for SEPP demonstrated successfully to C-DOT evaluation committee.