Proposal No. 01
(Proposal details for the R&D scheme of USOF)

Subject: Collaborative development of disaggregated 5G Radio Access Network solution

1. Introduction

In line with its objectives of promoting indigenous development of 5G technologies under the Atmanirbhar Bharat program, the DOT intends to facilitate the Indian industry in collaboratively designing and developing 5G technologies. Among other envisaged facilitation mechanisms, C-DOT, the R&D arm of DOT is in the process of setting up a sharable captive campus wide private 5G network infrastructure for conducting research & development, testing, pilot production and deployment of innovative 5G products and services.

Participation from the Indian startups/ organizations/ research and academic Institutions for development of an O-RAN compliant disaggregated 5G RAN solution capable of operation in the FR1 and FR2 bands, capable of working in TDD/FDD mode and deployable in NSA & SA mode.

The potential participants should have demonstrable expertise in 5G related technologies in the form of fully or partially prototyped 5G technologies, including but not limited to, components / modules / hardware / software / subsystems or end products thereof. Participants can express interest individually or collectively as a consortium for the development of subsystems/ system.

The final outcome of the collaborative development project shall be commercially deployable 5G RAN product(s) which would meet requirements of public /or private 5G networks. The project outcomes shall be licensed back to interested participants or third parties having capable of its mass production, marketing and deployments for end users, directly or in association with system integrators.

2. Project Description

The DOT through it's R&D wing (C-DOT) will lead a collaborative Indian effort of building a disaggregated 5G RAN along with the selected Partners by utilizing their respective expertise, prior development effort and available deliverables to the maximum extent possible.

Figure 1 broadly illustrates the scope and expected final outcome of the collaborative project.

Figure 1: Disaggregated 5G Radio Access Network (RAN)
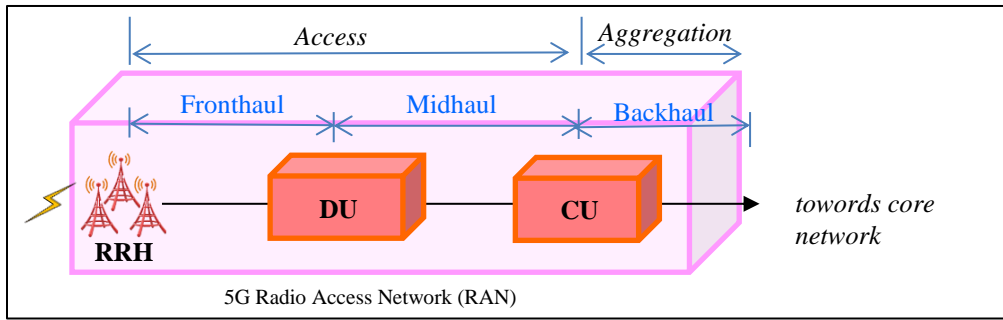
Depending on their respective expertise, participants in the project may contribute by helping in realizing one or more of modules or complete deliverables as listed in Table 1 below. During participation in the project, the Partners may use their respective pre-existing background technologies or undertake fresh development of new foreground technology or both.

Table 1: 5G Radio Access Network (RAN) modules/deliverables

SN	Sub-Deliverable	Contribution Areas
1.	Remote Radio Head (RRH)/RU	• Antenna module • Radio Front End • Digital Front End (including DPD &CFR) • Low L1 Stack (Low-PHY) • Filters • Hardware Subsystems • RRH/RUs for Various Transmit Power and frequency Bands • O-RAN interface support and compliance • Complete Product
2.	Distributed Unit (DU)	• High L1 Stack (High- PHY) • Lower L2 Stack (MAC & RLC) • Higher layers stack • Control software and Scheduling algorithms • Management Software • Remote Intelligent Controller (RIC) interface • Hardware platform • Hardware Acceleration modules • O-RAN interface support and compliance • Complete Product
3.	Central Unit (CU)	• Higher L2 (PDCP & SDAP protocols) • L3 (RRC protocol) functionality • Higher layers stack • Control software • Management Software • Remote Intelligent Controller (RIC) interface • Hardware platform

		• Hardware Acceleration modules • O-RAN interface support and compliance • Complete Product
4.	RAN Intelligent Controller (RIC) (Non Real-Time RIC & Near Real-Time RIC)	• Control Framework & Applications software • Hardware Platform • Complete Product
5.	Service Management and Orchestration (SMO)	• Control Framework & Applications software • FCAPS functions • Hardware Platform • O-RAN interface support and compliance • Complete Product

Format of Response

Companies / organizations / institutions / individuals developing enabling technologies / modules / components / subsystems / products are required to respond in the format provided in Annexure-A, on the DOT website (link address provided- refer "format of response")

Annexure-A : Format of Response

S. No		Response	Remarks
	Company Profile		
1	Name of the Organization		
2	Address and Contact Details		
3	Type of participant (MSME, Start-up, Govt. Institution, Academia, Domestic Company/ PSU/ Society/University/College / other registered organization etc.)		
4	Area of work / Domain expertise		
5	Size of company		
6	Location of Head office and branches if any		
7	Company turnover – last three years		
	System / module Readiness		
8	Proposed Product area category Product/ Solutions))		
9	Product phase (development TRL level/ POC / Field trial / ready for deployment)		
10	Compliance to any standards		
11	Customers / Clients / Collaboration if any		
12	List of IPR / Awards / Paper Published if any		
13	Standard body membership / contributions if any		
14	Certification testing (TEC / security etc.)		
	Manpower		
15	Size of skilled manpower in the proposed area		
16	Number of Architects		
17	Number of Developers in the proposed area		
18	Number of Test and Integration Engineers		
19	Number of Field Support Engineers		
	Principal Investor (first point of contact)		
20	Name & Designation		
21	Institution/ Department/ Address		
22	Bio-data/ Professional credentials		
	Co- Investor		
23	Name & Designation		
24	Institution/ Department/ Address		
25	Bio-data/ Professional credentials		
	Infrastructure		
26	Software and development tools used		
27	Details of Test equipment available for Proposed Modules/ system		
28	Deployment, Network planning tools used		

Process			
29	Product development lifecycle and Quality practices followed		
30	Test Automation practices followed if any		
Funding			
31	Estimated development cost of the proposed modules/system. (Separately module wise, in case multiple modules are proposed)		
32	Fund expected from this program (Separately module wise, in case multiple modules are proposed)		
33	Details of funding received for the Same / Similar project from other schemes of DoT / GOI.		
34	Details of self-funding / other sources for the Proposed modules / system		
Product description			
35	Brief product/ solution/ idea description		
36	Primary Objective of the module/ sub-system/system/ product proposed		
37	Key deliverables/ expected outcome		
38	Type of solution/ product- Stand-alone/ Sub-system/ Application/ Complete system / product		
39	Details of prior experience, expertise and components/ sub-systems/ product developed in selected area of interest.		
40	(If the proposed solution/product is not stand-along and/or a module, please provide details of the larger solution it caters to/ required to integrate to arrive at full solution)		
41	Is the product/ technology related to present activities/ products being developed by CDOT? If so, how does the product tie in with present activities/ products, being developed by CDOT?		
42	Is it a new concept/ design/ solution/ product? If so, What are relevant standards being adopted?		
43	Are there any alternate competitive technology/ product? available/ under development locally / outside India? Please provide the information available with you. What is the comparison of performance/ specification/ features?		
44	Provide the specification document relevant to your product?		

Project Plan		
45	Provide development Plan indicating the major milestone and respective cost break up of each milestone Provide bar chart/ project plan		
Additional Resource Requirements		
46	Manpower support requirements		
47	Infrastructure support requirements		
48	Tools, Testers and platform requirements		
49	Any development tools and software requirements		
Risk and Risk mitigation proposed		
50	Risk areas and challenges, as envisaged		
51	Mitigation plan and/or contingency plan suggested, if any		
52	Potential foreground IPR (Intellectual Property) that can be developed by the participants individually and collectively		
53	Background IPR available for contribution to the project and Nature of ownership of the background IPR (exclusively owned, Jointly owned, Taken under license etc.)		
54	Status of background IPR (eg in planning stage, on roadmap, patented/ copyrighted, under development, under field trials, mass deployed etc.). And also specify expected duration of IPR availability to this project		
Regulatory approvals Requirements		
55	Any regulatory approvals required from Govt for the product/ solution being proposed		