

## *Call for Proposal*

### **For collaborative development of variants of Branch Router (upto 10Gbps throughput)**

#### 1. Introduction

C-DOT invites participation from the suitable Indian entities capable of partnering with C-DOT, in a collaborative development project led by C-DOT, for development of multiple variants of branch routers, which can be used for enterprise segment.

The potential participants should have demonstrable expertise in the telecom domain including software development, supply chain management, assembly and hardware testing of the highly dense PCBs of telecom grade.

Keeping in mind the prospectus of the router technology and past development and deployment experience of this technology in various government projects, C-DOT believes that routing technology will have good market place in the enterprise segment in near future.

The final outcome of the collaborative development project will be a commercially deployable Branch Router(s) for the enterprise network. The project outcomes can be further licensed to interested participants or third parties, capable of its mass production, marketing and deployments for end users, directly or in association with system integrators.

Through a process of rigorous technical evaluation, C-DOT shall select participants, holding the most promising track record for delivering commercial grade products, as its collaborative development partners ("Partner") in the project. In order to achieve a rugged, field deployable solution, C-DOT would prefer to select multiple Partners for the same work item, wherever feasible.

## 2. Project Description

As mentioned above, multiple cost-effective hardware variants of branch router will be developed by the Partner, along with required software, depending upon the use case. Some of the examples (but not limited to) are given below. The Partner may give the proposal for the development of one or more type of Branch routers.

- Branch Router with 4X1G Optical Uplink and 8X10/100/1000 Base-T (Electrical) LAN ports
- Ruggedised variant of Branch router (BRTR-10) for military use
- Branch Router with 2X1G Optical Uplink and 8X10/100/1000 Base-T (Electrical) LAN ports
- Branch Router with 2X1G Optical Uplink and 8X10/100/1000 Base-T (Electrical) LAN ports + 8 XE1 GFP
- Branch Router with 2X1G Optical Uplink and 8X10/100/1000 Base-T (Electrical) LAN ports + 8 XE1 TDM
- Branch Router with 2X1G Optical Uplink and 8X10/100/1000 Base-T (Electrical) LAN ports + 4X STM-1 port

Similarly, the proposal for other variants of branch router can be given, based on the market intelligence w.r.t. prospective customer's requirement.

The scope of work for the collaborative partner, will be as follows

- Arranging/Procuring hardware and software/firmware tools required for development environment and programming of image on the target system (including emulators)
- Hardware Design for the new variant
- Components procurement as the CL and PL (part list)
- PCB manufacturing based on the new design done by the collaborator
- PCB assembly
- Design of enclosure/packaging unit as per the desired environmental condition, including heat sinks
- Manufacturing of the enclosure unit
- Porting of the OS and Platform software. It includes:
  - U-boot porting for the new variant
  - Linux Kernel porting (as per the version specified by C-DOT)
  - Creation of rootfs as per the requirements of the new variant

- Identify and coding of the board APIs/library.(It can be either porting of the changes on the available board APIs or generation of a new set of APIs as per new requirements or both)
- Porting of Interrupt drivers
- Tester s/w development
- Hardware testing of the assembled PCBs
- Board bring up with the ported platform s/w
- Integration of software modules on the target system
- Developing the chassis management software and fault management software
- Developing Control Plane, Data Plane and Management Plane Software
- Developing Cisco-like CLI
- Installation at the (prospective) customer site
- Transferring of production knowhow TOT
- Providing field support to the customer

## **Features to be provided by Branch Router Operating System shall be as follows**

### *Redundancy*

- VRRP/ HSRP

### *Internet Protocols supported*

- IPv4
- IPv6

### *Routing Protocols*

- OSPF
- RIPv1/ RIPv2
- BGP/BGP-4
- ISIS

### *Security Features*

- NAT
- ACL
  - ✓ Static ACL
  - ✓ Dynamic ACL
- PAP and CHAP

- IPSec (AES/DES/3DESMD5/ SHA-1)
- IEEE 802.1x
- RADIUS/ TACACS
- SSH v2

## Layer-2 Features

- VLAN
- Bridging
- MSTP/RTSP

## Quality of Service

- IEEE 802.1p & Diffserv code point (DSCP)
- Classification, marking, policing & shaping.

## Management

- In-band management
- Out of band management
- SNMP-v1,v2,v3
- CLI
- GUI
- Web interface

## Other Features

- NTP
- Remote Software Upgrade through FTP or TFTP
- Policy Based Routing
- 802.1q VLAN.
- Dynamic Multipoint VPN
- Generic routing encapsulation (GRE)
- Point-to-Point Protocol (PPP).
- Multilink Point-to-Point Protocol (MLPPP)
- PPP over Ethernet (PPPoE)

### 3. Roles & Responsibilities of C-DOT

C-DOT shall lead the validation and testing of the final solution. It will provide technical direction and financial support to the Partners selected through a process of evaluation and due diligence conducted by a committee of subject experts. Wherever deemed feasible, C-DOT may arrange equipment resources, testing infrastructure, help wrt mandatory clearances, statutory permissions, technical consultancy, know-how of existing design and provide funding to the Partners in realizing their respective target deliverables.

C-DOT will license the final solution for mass production and deployment. Royalty proceeds received from licensing shall be shared with the developing Partner/s in ratio of the assessed value of each partner's respective contribution determined through mutual discussions while finalizing the product architecture. C-DOT shall engage with Partner/s on a non-exclusive basis and shall retain its right to develop similar products / through other developmental programs.

### 4. Roles & Responsibilities of Participant(s)

Role of the collaborative partner is broadly outlined in section 1. The Partner may build the required module with pre-existing background facilities available with them. All concerned partners shall own the foreground technologies developed by them individually or collectively as the case may be. The Partners may utilize the available test and infrastructure facilities offered by C-DOT with no financial implication for its usage. Participation in the project shall be on non-exclusive basis. All partners shall be required to demonstrate commitment to the project by entering into a formal agreement with C-DOT as per the CCRP policy.

### 5. Ownership of Outcomes

Background technologies used in the project shall continue to remain with their respective owners. New foreground technologies created during the project shall be owned by the respective collaborative partners. Any agreement required for collective ownership, shall be signed at the later stage. The ownership of the final solution shall rest collectively with C-DOT and all its Partners.

## **ACRONYMS AND ABBREVIATIONS**

ACL- Access Control List  
BGP- Border Gateway protocol  
CAD- Computer Aided Design  
CCRP - C-DOT Collaborative Research Program  
CHAP - Challenge Handshake Authentication Protocol  
CLI – Command Line Interface  
CROS – C-DOT Router Operating System  
EMS – Element Management System  
EOI - Expression of Interest  
FTP – File Transfer Protocol  
GFP- Generic Framing Procedure  
GUI – Graphical User Interface  
ISIS- Intermediate System - Intermediate System  
ITU-T – International Telecommunication Union-Telecommunication  
MSTP – Multiple Spanning Tree Protocol  
NMS- Network Management System  
NTP – Network Timing protocol  
OSPF- Open Shortest Path First  
PAP – Password Authentication Protocol  
PCBs – Printed Circuit Boards  
RADIUS - Remote Authentication Dial-In User Service  
RIP – Routing Information Protocol  
RSTP – Rapid Spanning Tree Protocol  
SNMP- Simple Network Management Protocol  
SSH – Secure Shell  
STM - Synchronous Transport Module  
TACACS - Terminal Access Controller Access Control Server  
TFTP- Trivial File Transfer Protocol  
VLAN – Virtual Local Area Network