



**NATIONAL INSTITUTE OF TECHNICAL TEACHERS'
TRAINING & RESEARCH
CHANDIGARH-160019**

(www.nitttrchd.ac.in)

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e-TENDER NOTICE

e-Tenders are invited for purchasing, installation, commissioning & training of **NETSIM Standard Network Simulator Software & Emulator for R&D**. The bid document can be downloaded from the website of Chandigarh Administration at <https://etenders.chd.nic.in>.

1.	Tender Publish Date	25/01/2020 at 09.00 A.M.
2.	Tender Download/Sale Start Date	25/01/2020 at 09.00 A.M.
3.	Bid Submission Start Date	25/01/2020 at 09.00 A.M.
4.	Tender Download/Sale End Date	17/02/2020 at 05.00 P.M.
5.	Bid Submission End Date	17/02/2020 at 05.00 P.M.
6.	Physical submission of EMD and eligible documents (End Date)	17/02/2020 at 05.00 P.M.
7.	Bid Opening Date	18/02/2020 at 03.00 P.M.

The complete tender document is also available on NITTTR website at:-
<http://www.nitttrchd.ac.in>.

**Director
NITTTR Chandigarh**

INSTRUCTIONS TO BIDDERS REGARDING e-TENDERING PROCESS

1. The Bidders shall have to submit their Bids online in Electronic Format Digital Signatures. For participation in the e-tendering process, the Bidders need to register themselves at <http://etenders.chd.nic.in/nicgep>. On registration, they will be provided with a user ID and a system generated password enabling them to submit their Bids online using Digital System Certificates (DSC).
2. Tenders without Digital Signatures will not be accepted by the electronic tendering system. No tender will be accepted in physical form and in case it has been submitted in physical, it shall be rejected.
3. Bids will be opened online as per time schedule mentioned in “**Terms and Conditions of the Tender**”.
4. Before submission of online bids, bidders must ensure that scanned copies of all the necessary documents have been uploaded with the bid.
5. Director, NITTTR, Chandigarh will not be responsible for any delay in online submission of bids due to any reason whatsoever.
6. Bidders should get ready with the scanned copies of EMD as specified in the tender documents. Related EMD as per the given amount in the form of a Demand Draft in favour of the Director, NITTTR, Chandigarh payable at Chandigarh/ Electronic Payment details should be submitted to Director, National Institute of Technical Teachers Training and Research, Sector-26 Chandigarh so as to reach him on or before the last date for receiving the tenders.
7. The details of EMD specified in the tender document should be same as submitted online (scanned copies). Otherwise tender will be rejected summarily.
8. The conditional bids shall not be considered and may be outrightly rejected in the very first instance.
9. The Financial Bid through e-tendering of only those bidders shall be opened who will qualify in the technical bid and are approved by the Purchase Committee/Technical Experts.
10. **The tenderers are required to upload all self-attested copies of the relevant documents required as per Terms & Conditions and Check List, failing which their bids may be summarily/outrightly rejected and will not be considered.**

TERMS AND CONDITIONS OF THE TENDER

1. The last date and time for receipt of tenders is **17/02/2020** up to 05.00 P.M. through e-tendering only.
2. Each tender must be accompanied with Earnest Money Deposit (EMD) in the shape of Demand Draft in favour of Director, NITTTR, Chandigarh payable at Chandigarh, valid for three months on any Scheduled Bank or, Electronically submitted through NEFT/RTGS in the following Bank Account:

Director, NITTTR Chandigarh
State Bank of India, Grain Market, Sector-26, Chandigarh
Account No: 55105008209
IFSC : SBIN0050116

3. The EMD amount is as shown below:

1.	NETSIM Standard Network Simulator Software & Emulator for R&D	Rs. 95000
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4. The sealed envelope of EMD bearing the Advertisement No. and should be clearly superscribed as **“EMD for NETSIM Standard Network Simulator Software & Emulator for R&D”** should be submitted in the office of Director, NITTTR, Sector-26, Chandigarh on or before **17/02/2020 upto 05.00PM.**
5. Those who are exempted for EMD from Government have to furnish documentary proof along with technical bid online.
6. The quantity of items and quantity indicated in the enclosed list are tentative. Director reserves the right to increase or decrease the quantity or delete some or all of the items depending on the needs of the institute.
7. The tenderer should indicate specifically the Goods and Service Tax (GST), Duties and Levies chargeable against each item if any. The Institute is entitled to custom duty exemption and concessional sales tax applicable to Educational and Research organizations.
8. The rates quoted should be F.O.R., NITTTR Chandigarh. In case rates are chargeable at any other place, the packing and forwarding charges should be clearly mentioned indicating the mode of transport and insurance during transit.
9. The tenderer should clearly indicate the delivery period and validity period of the offer.
10. The tenderer should clearly indicate the availability of service and maintenance facilities at Chandigarh for the items quoted.
11. The above mentioned details particularly the Goods and Service Tax (GST) number, any other levies/charges, if not quoted properly, the bid can be cancelled. Conditional/doubtful bids will also be liable for cancellation. **[If the Goods and Service Tax (GST), any other**

levies/charges are not possible to enter in online tender, kindly quote your price inclusive of all taxes]

12. Any attempt direct or indirect, to cast influence, negotiation on the part of the tenderer with the officials/authority to whom he/she will submit the tender or the tender accepting official/authority before the finalization of tenders will render the tenderer liable for exclusion from consideration.
13. The requirements of the Institute in terms of category of equipment, detailed specifications and quantity are given in SCHEDULE OF TECHNICAL SPECIFICATION / REQUIREMENT (As per Annexures I). Director, NITTTR reserves the right to change the quantity for any/all items without assigning any reason.
14. The Tender must be submitted along with the copies of:
 - EMD in favor of Director NITTTR Chandigarh
 - Manufacturers Licence or Authority from the Manufacturer (if applicable)
 - Latest Income Tax Clearance Certificate
 - GST Number from Govt.
 - Certificate of Non Blacklisting from Magistrate/ Competent Authority
 - PAN or TAN
 - Balance Sheet of last three year (if applicable)
 - Product Specification/ Brochure
 - Tender Document duly signed
14. The Director reserves the right to reject any or all tenders without assigning any reason whatsoever.
15. The tenders will be opened on the date and time indicated in the presence of tenderers if any present on the occasion.
- 16. The tenders not accompanied by Earnest Money or incomplete in any respect will be rejected outrightly.**
17. No advance payment or payment against performa invoice will be made. Payment will be made after receipt, installation and testing of items, to the satisfaction of the authorized representative(s) of the Director.
18. In case, the item(s) is to be imported for supply, irrevocable letter of credit will be opened with the Bank. The Institute's Banker is State Bank of India, Extension Counter, Chandigarh College of Engineering and Technology, Sector-26, Chandigarh – 160019
19. All damaged or unapproved goods shall be returned at the risk and cost of the Tenderer and the incidental expenditure thereupon shall be recovered from them.
20. This institute is recognized as R&D institute and is exempted from Excise Duty. The quoted prices must be mentioned showing Excise Duty separately.

21. Training for the operation of equipment's, if any, shall be provided by the firm free of cost to the faculty/other staff of the institute.
22. The Equipment/Machinery will be maintained free of charges during the warranty period as on the terms and condition of the tender or Annexures.
23. Instructional materials and **e-manuals** will be uploaded by the supplier free of cost.
24. The bidder must fill the Check List from the authorized signatory only with the seal of the firm. **(As per Annexure-II)**
25. There is No pre-bid meeting for this tender/bid.

ITEMS TO BE PROCURED THROUGH e-TENDER

SR.NO	BRIEF ITEM DETAILS	QTY	DETAILED TECHNICAL SPECIFICATION
1.	1.1 NETSIM Standard Network Simulator Software for R&D, Version 12.0 or latest with Life-Time License Validity (No Expiry, Complete Suite with 10 Tool Boxes & Protocol Source Codes)+Free Unlimited Technical Support & Software Upgrades for 01 Year	5 Users Research Licenses	As per Annexure-I
	1.2 NETSIM Standard Network Emulator for R&D, Version 12.0 or latest with Life-Time License Validity (No Expiry, Complete Suite with 10 Tool Boxes & Protocol Source Codes)+Free Unlimited Technical Support & Software Upgrades for 01 Year	1 Users Research Licenses	As per Annexure-I

ANNEXURE-I

Technical Details & Specifications

ITEM : I NetSim Simulator & Emulator Standard Version for R& D

1.1 NETSIM Standard Network Simulator Software for R&D, Version 12.0 or latest (No Expiry, Complete Suite with 10 Tool Boxes & Protocol Source Codes)+Free Unlimited Technical Support & Software Upgrades for 01 Year

Quantity: 5 Users License with Life-Time License Validity

Discrete Event Simulator of the following networking protocols

Component 1 - Internetworks

- Ethernet – As per IEEE 802.3, CSMA / CD, ARP, Fast and Gigabit Ethernet. Ethernet Switching with STP as per IEEE 802.1 D
- Wireless LAN – As per IEEE 802. 11 a, b, g, n, ac, e & p standards. CSMA/CA protocol with RTS / CTS exchange. Infrastructure BSS and DCF mode
- TCP – Old Tahoe and Tahoe flavors as per IETF RFC 2001. Retransmission timer management and RTT Variance estimation using Jacobson's algorithm. Exponential RTO backoff and dynamic window sizing on congestion. Reno (Fast Recovery), New Reno (retransmission during the Fast recovery), BIC and CUBIC algorithms, Window Scaling and Selective Acknowledgement.
- UDP – As per IETF RFC 768 with encapsulation
- Routing – Routing Information Protocol (RIP) implemented as per IETF RFC 1058. Open Shortest Path First (OSPF) implemented as IETF per RFC 2328. Queuing and implementation of periodic time, update time, invalid timer and flush timer. Routing tables containing source, destination, next hop cost and interface.
- Link failure and recovery model
- Real-Time interaction with Simulation. Commands supported
 - i. Simulation-specific - Pause, Pause At, Continue, Stop
 - ii. Route - Add, Print, Delete
 - iii. ACL - Enable, Disable
 - iv. ACLCONFIG - Permit, deny, print
 - v. Ping

Component 2 – Legacy & Cellular Networks

- Pure Aloha, Slotted Aloha
- GSM (Global System for Mobile): Implemented as per 3GPP and ETSI standard. Traffic is via Erlang B call model. Analysis of Call blocking probability, Different technique of channel allocation scheme, Handover. Mobility is as per Random waypoint and Random walk model.

- CDMA (Code division multiple access): Implemented as per IS95 A/B. Traffic is via Erlang B call model. Analysis of Call blocking probability, Call dropping probability, one call class of channel allocation scheme, Handover. Mobility is as per Random waypoint and Random walk model.

Component 3 – Advanced Routing

- Multicast Routing - IGMP, PIM,
- Access Control Lists,
- Detailed Layer 3 switch mode,
- Virtual LAN (VLAN),
- Public IP,
- Network Address Translation (NAT)

Component 4 – Mobile Adhoc Networks (MANET)

- MANET: Dynamic Source Routing (DSR) implemented as per RFC4278 and Adhoc on Demand Distance Vector Routing (AODV) per RFC 3561. Mobility is via the Random waypoint model, Random Walk, Group mobility, File Based Mobility, which is designed to describe the movement pattern of mobile users, and how their location, velocity and acceleration change over time. Zone Routing Protocol (ZRP) per Section 10 of RFC 2026 and Optimized Link State Routing (OLSR) per RFC 3626
- Multiple MANETs with Bridge node, P2P Wired/Wireless links
- Fast configuration
- Battery model
- Static routing

Component 5 – Software Defined Network (SDN)

- SDN controller
- Open flow v1.3 compatible
- SDN Commands

Component 6 – Internet of Things

- Wireless Sensor Network, Internet of Things and Zigbee per IEEE 802.15.4 MAC and PHY. 802.15.4 PHY: Change radio state, Received power calculation, Shadow Loss, Path Loss Error, Bit Error Rate, Channel Formation, Clear Channel Assessment, SINR Calculation. 802.15.4 MAC: Locate back-off boundary, Super Frame, Beacon mode, Back-off Calculation, GTS, Unslotted CSMA / CA, Slotted CSMA / CA
- RPL Routing protocol covering Local DODAGs Route Discovery, Rank Properties, Loop Avoidance, RPL Instance, ICMPv6 RPL Control Message, Sequence Counters, Upward Routes, Downward Routes, Non- Storing Mode, Packet Forwarding and Loop Avoidance/Detection, Maintenance of Routing Adjacency.
- Battery model
- Fast configuration

Component 7 – Cognitive Radio Networks

- Cognitive Radio per IEEE 802.22 standards covering Spectrum manager: Form Channel set, CPE association, SSA Init, Quiet period scheduling, Quiet period, SSF,UCS, Channel switching, Channel update, Form USMAP, Form USBurst, Transmit USBurst, Form UCD, Transmit SCH, Process SCH, Data packet forwarding, OFDMA init, Incumbent start, Incumbent end, Fragment packet, Transmit FCH, Process FCH, Service

Flow: Create Service flow, Process DSA Req and RSP, Process DSD and RSP, Terminate service flow. Operational Interval and Operational frequency is changed to OFF_Duration and ON_Duration

Component 8 – LTE and LTE-Advanced Networks

- LTE Network layer, Data link and physical layer implementation is as per standards 3GPP 36.xxx. UE, eNB with MME can be used for the scenario building and simulation.
- Network layer: Handover Decision, Handover Initiation, Handover routing, MME routing Handover control packet processing
- Data Link layer: PDCP init, Header compression/ Uncompression, Data sequencing, RRC Connection establishment – Paging, T300 expiration, RLC - RLC SDU formation, Data forwarding, Mac Scheduler - Round Robin, Max CQI, Proportional fair scheduling, GBR Queue, Non GBR queue
- Physical layer: Received Power Calculation, Path Loss – Fading, Shadowing, SINR calculation, BER calculation, CQI Reporting, CQI_MCS mapping, MCS_TBS mapping
- Mobility is via the Random waypoint, Random Walk, Group mobility
- LTE-A Network layer, Data link and physical layer implementation is as per standards 3GPP 36.xxx. UE, eNB, Relay with MME can be used for the scenario building and simulation.
- Physical layer: Carrier Aggregation, Transmission index – MIMO concept, and featuring relays nodes
- LTE D2D (where UEs can communicate directly with each other) and LTE Femtocell with HNB gateways are implemented
- LTE VANETs
 - Basic Safety Message (BSM) protocol per J2735 DSRC.
 - Dynamic interfacing with SUMO through TraCI API's

Component 9 – Vehicular Adhoc Networks

- VANET: implemented as per IEEE 1609 WAVE,
- Basic Safety Message (BSM) protocol per J2735 DSRC.
- Dynamic interfacing with SUMO through TraCI API's
- Battery model
- Static Routing

Component 10 – 5G NR mmWave

- End-to-end simulation of 5G NR-mmWave Networks
- Full stack simulation covering all the layers of the stack and the applications running on top
- Packet level
- Based on 3GPP38 series
- GUI based with Drag and Drop, Packet Animator and Results Dashboard
- SDAP based on specification: 37.324
- RLC (Based on specification 38.322)
 - TM (Transparent Mode): No RLC Header, Buffering at Tx only, No Segmentation/Reassembly, No feedback (i.e, No ACK/NACK)
 - UM (Unacknowledge Mode): RLC Header, Buffering at both Tx and Rx, Segmentation/Reassembly, No feedback (i.e, No ACK/NACK)
 - AM (Acknowledge Mode): RLC Header, Buffering at both Tx and Rx, Segmentation/Reassembly, Feedback (i.e, ACK/NACK)

- Transfer of upper layer PDUs
- Segmentation and reassembly of RLC SDUs
- Re-segmentation of RLC SDU segments
- RLC SDU discard
- t-reassembly
- ARQ
- t-pollRetransmit
- PDU
 - TMD PDU
 - UMD PDU
 - AMD PDU
 - Status PDU
- PDCP (based on Specification: 38.323): The PDCP layer receives a packet (data/control) from the upper layer, executes the PDCP functions and then transmits it to a lower layer. The PDCP entities are located in the PDCP sublayer. NetSim currently implements one PDCP entity per UE (users can add more by modifying the code). The same PDCP entity is associated with both the control and the user plane. The PDCP functionality supported in NetSim v12 is
 - Transmit PDCP SDU
 - Sets the PDCP Sequence Number
 - Adds RLC Header
 - Calls RLC service primitive
 - PDCP Association: This call back function is invoked when the UE associates/dissociates from a gNB
 - Maintenance of PDCP sequence numbers (to know more check the PDCP entity structure)
 - Discard Timer
 - Transmission Buffer (size is assumed to infinite)
 - PDCP Entity
 - t-Reordering Timer
 - Receive buffer
- MAC Layer
 - Transparent MAC
 - Mapping between logical channels and transport channels
 - Multiplexing of MAC SDUs from one or different logical channels onto transport blocks (TB) to be delivered to the physical layer on transport channels
 - Demultiplexing of MAC SDUs to one or different logical channels from transport blocks (TB) delivered from the physical layer on transport channels
- Supported transmission numerologies $\mu = 0, 1, 2, 3, 4$
- The FR1 bands implemented in NetSim are those that run TDD in Duplex mode, namely n34, n38, n39, n40, n41, n50, n51, n77, n78, n79, as shown below.
- The FR2 bands in NetSim are n257, n258, n260 and n261
- CQI reporting
- CQI-MCS
- MCS-TBS
- Uplink and downlink physical channel
- Frame structure and physical resources
- Modulation mapping
 - BPSK
 - QPSK
 - 16QAM

- 64QAM
- 256QAM
- Physical shared channel in uplink and downlink
- mm-Wave Propagation models (Based on 3GPP TR 38.900 Channel Model)
 - Environment
 - Rural Macrocell
 - Urban Macrocell
 - Urban Microcell
 - Indoor Office – Mixed office, Open office
 - UE Position
 - Indoor
 - Outdoor
 - LOS State
 - LOS (Line of Sight)
 - NLOS (Non-Line of Sight)
 - Outdoor to indoor model
 - Highloss Model
 - Low Loss model

1.2 NETSIM Standard Network Emulator for R&D, Version 12.0 or latest (No Expiry, Complete Suite with 10 Tool Boxes & Protocol Source Codes)+Free Unlimited Technical Support & Software Upgrades for 01 Year

Quantity: 1 Users License with Life-Time License Validity

- Connect real hardware running live applications to NetSim Simulator. Emulation not available for Legacy Networks, Wireless Sensor Network, Zigbee Network and Cellular Networks
- Simple manual route configuration in emulation clients using Windows IP static route addition
- Emulation server captures packet from windows network layer and NAT protocol
- Supports multiple applications like Audio, Video, File transfer, Voice call and Internet browsers
- Interface with VLC player for video streaming, and jperf traffic generator
- Capture packet based on filters like Source IP, Destination IP, Source port and Destination port.
- Ability to input Pcap (Wireshark) files into emulator, using environment variable, for offline analysis
- Multicast emulation should be possible

Source Code

Source C code must be provided for all components protocol libraries with DLL interfacing for simulation in the loop debugging.

Traffic Generator (All components except component 2)

The following traffic models are available in NetSim

- File Transfer Protocol (FTP)
- Database Application
- Voice Traffic

- Video Traffic
- Custom Model: Users can develop custom application model based on Packet size and inter-arrival time available in the following probability distributions
- Email
- HTTP
- Peer to Peer
- CBR
- Application encryption using AES and DES algorithms

Traffic Generator (Component 2)

Only for cellular networks

- Erlang Voice call model

Traffic Generator (Component 6)

- Sensor_App

Performance Metrics

Network, Sub network and Link by Link levels covering Simulation time, Response time, Throughput, Normalized throughput, Medium Access time, Queuing Delay, Mean Delay, Details of control frames such as RTS and CTS, RIP packets etc.

Graphical plots over time for link and application throughputs and TCP congestion windows.

Detailed Packet Trace (All Components)

- All protocols have detailed packet level trace generated in a tab ordered .txt, .xlsx format.
- Packet trace contains the details of packet like packet number, source, destination, arrival time, payload, overheads etc.
- Automatic formatting of trace file
- Pivot table - summarize and analyze packet trace in depth

Detailed Event Trace (All Components)

- All protocols have detailed event level trace generated in a tab ordered .txt, .xlsx format.
- Event trace contains the details of event like Event Time, Event Type, Device Type, Application ID etc.
- Automatic formatting of trace file
- Pivot table - summarize and analyze event trace in depth

Dynamic Metrics: Dynamic metrics allows users to monitor the value of a parameter over simulation time.

Channel Models (For wireless protocols)

The following channel (propagation) models should be available for wireless protocols:

- Friis Free Space
- Log Distance
- Const 231 HATA Urban
- Const 231 HATA Suburban
- HATA Urban
- HATA Suburban
- Indoor Office
- Indoor Factory
- Indoor Home

Fading model: Rayleigh, Nakagami

Shadowing: Lognormal, Constant

Command Line Interface – CLI

- CLI mode of running for more concise and powerful means of control
- Facilitates use of automated scripts for running batch simulations
- Model network configurations using XML based configuration files

Packet Animation

- Animates packet flow over wired and wireless links, as well as node movement
- Color variation for data, control and error packets
- Animation settings via play, pause and time-slide

External Interfacing:

- SUMO for VANETs
- MATLAB and Simulink
- Wireshark for packet capture and analysis

Annexure-II

**CHECK LIST DULY FILLED IN TO BE ATTACHED WITH PRE-QUALIFYING-CUM-
TECHNICAL BID FOR THE MACHINERY/EQUIPMENT/SERVICES
FOR NITTTR CHANDIGARH**

Sr. No.	CHECK LIST	
1.	EMD in favor of Director NITTTR Chandigarh	Yes/No
2.	Manufacturers Licence or Authority from the Manufacturer (if applicable)	Yes/No
3.	Latest Income Tax Clearance Certificate	Yes/No
4.	GST Number from Govt.	Yes/No
5.	Certificate of Non Blacklisting from Magistrate/ Competent Authority	Yes/No
6.	PAN or TAN	Yes/No
7.	Balance Sheet of last three year (Optional)	Yes/No
8.	Product Specification/ Brochure	Yes/No
9.	Tender Document duly signed	Yes/No
10.	Whether a list of institutions / organizations where your firm has supplied this item / equipment / instrument / services recently, is Attached.	

Note :- If Yes, must attach all relevant documents.

**Signature of authorized signatory
with seal of the firm**