

## CORRIGENDUM

There is modification in the terms & Conditions and Detailed Specification of the items in the Tender No. Ref. NIELIT(i)/Admn/CCAS/2832019, dated 31.12.2019 as given below:

**(i) The Earnest Money Deposit (EMD) in Annexure-I shall be as follows:**

Earnest Money Deposit (EMD) (refundable)	(i) ₹ 40,000/- for Embedded System & IoT Lab (ii) ₹ 10,000/- for AI & Machine Learning. AR/VR Lab (iii) ₹ 60,000/- for Network Security & Cyber Forensic Lab (iv) ₹ 30,000/- for Nanotechnology Lab  EMD shall be paid through National Electronic Fund Transfer (NEFT) or e-transfer in favour of <b>NIELIT Imphal</b> payable at State Bank of India, Manipur University branch A/C no: 10678276043, IFSC Code SBIN0005320
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**(ii) The Annexure-II for the Schedule of Events like pre-bid meeting and start of bid submission are rescheduled as under:**

### ANNEXURE-II

#### Schedule of Events

Event	Date & Time
Date and time of Publishing of this tender	31 <sup>st</sup> December, 2019 at 5:00 pm.
Date, Time and Venue of Pre-Bid Meeting	14 <sup>th</sup> January, 2020 at 1.30pm at Conference Hall, NIELIT Imphal
Bid Submission Start Date & Time	15 <sup>th</sup> January, 2020 at 9:00 am
Bid Submission Closing Date & Time	27 <sup>th</sup> January, 2020 at 5:30 pm
Date & Time of Technical Bid Opening	28 <sup>th</sup> January, 2020 at 10:30 am
Date, Time and Venue of opening of Financial bids	29 <sup>th</sup> January, 2020 at 10:30 am
Bid Validity	60 Days from the closing date of bid submission

(iii) The Detailed Specification/aspect of the items i.e. Appendix-6 shall be replaced by the attached under.

## APPENDIX-6

### EMBEDDED SYSTEM and IoT LAB

#### **1. FPGA Board and Extension Boards**

##### **(i). FPGA Board Nexys A7**

- Xilinx Artix-7 FPGA XC7A100T-1CSG324C or XC7A50T-1CSG324C
- 15,850 logic slices, each with four 6-input LUTs and 8 flip-flops (8,150 logic slices for the A7-50T)
- USB-JTAG port for FPGA programming and communication
- PWM audio output, user LEDs, switches

##### **(ii). FPGA Basys 3 Artix-7**

- Xilinx Artix-7 FPGA: XC7A35T-1CPG236C
- On-chip analog-to-digital converter (XADC)
- Digilent USB-JTAG port for FPGA programming and communication
- 90 DSP slices
- 12-bit VGA output
- USB HID Host for mice, keyboards and memory sticks
- 16 user switches, 16 user LEDs, 5 user pushbuttons, 4-digit 7-segment display

##### **(iii). FPGA PYNQ-Z1**

- ZYNQ XC7Z020-1CLG400C:
- 650MHz dual-core Cortex-A9 processor
- DDR3 memory controller with 8 DMA channels and 4 high performance AXI3 slave ports
- High-bandwidth peripheral controllers: 1G Ethernet, USB 2.0, SDIO
- SPI, UART, CAN, I2C
- Programmable from JTAG, Quad-SPI flash, and microSD card
- 220 DSP slices
- On-chip analog-to-digital converter (XADC)
- 512MB DDR3 with 16-bit bus @ 1050Mbps
- Gigabit Ethernet PHY
- Electret microphone with pulse density modulated (PDM) output
- 3.5mm mono audio output jack, pulse-width modulated (PWM) format
- HDMI sink port (input)
- HDMI source port (output)
- Switches, push-buttons, and LEDs

##### **(iv). Arty A7**

- Arty A7-35T/Arty A7-100T
- XC7A35T1CSG324-1L/XC7A100TCSG324-1
- Xilinx Artix-7 FPGA
- On-chip ADC
- Programmable over JTAG and Quad-SPI Flash
- 256MB DDR3L with a 16-bit bus @ 667MHz
- 10/100 Mbps Ethernet
- Arduino/chipKIT Shield connector

**(v). Cmod S7**

- Xilinx Spartan-7 FPGA (XC7S25-1CSGA225C)
- 80 DSP slices
- On-chip analog-to-digital converter (XADC)
- Programmable over JTAG and Quad-SPI Flash
- 4 MB Quad-SPI Flash
- USB-JTAG programming circuitry
- Push-buttons and LEDs, 2 Buttons, 4 LEDs, 1 RGB LED

**(vi). Embedded Vision Bundle**

- Zybo Z7-20 Zynq-7000 ARM/FPGA SoC Development Board
- 5 MP Fixed Focus Color Camera Module
- Zybo Z7: Zynq-7000 ARM/FPGA SoC Development Board
- Zybo Z7-10      Zybo Z7-20
- XC7Z010-1CLG400C      XC7Z020-1CLG400C
- On-chip ADC
- RGB LEDs
- ZYNQ Processor
- 667 MHz dual-core Cortex-A9 processor
- 1G Ethernet, USB 2.0, SDIO
- SPI, UART, CAN, I2C
- Programmable from JTAG, Quad-SPI flash, and microSD card
- Programmable logic equivalent to Artix-7 FPGA
- microSD slot
- Pcam camera connector with MIPI CSI-2 support
- HDMI
- Audio codec with stereo headphone, stereo line-in, and microphone jacks
- Switches, Push-buttons, and LEDs, slide switches, RGB LED
- 4 Analog capable 0-1.0V differential pairs to XADC

**(vii). Zybo Z7 Academic Pmod Pack**

Video Graphics Array, 4 user slide switches, Eight high-brightness LEDs, Seven-segment display, Audio amplifier

**(viii). Arty S7 Pmod Pack**

Video Graphics Array, MEMS Microphone with Adjustable Gain  
Audio Amplifier, Digital Humidity and Temperature Sensor, Slide Switches

**(ix). Nexys Video Pmod Pack**

Two-axis Joystick, 16-button Keypad, Ultrasonic Range Finder, 12-pin Test Point Header, WiFi: WiFi Interface 802.11g

**(x). Cora Z7: Zynq-7000 Single Core and Dual Core Options for ARM/FPGA SoC Development**

- Cortex-A9 processor with tightly integrated Xilinx FPGA (option between Dual Core and Single Core options)
- 512 MB DDR3 memory
- Arduino shield and Pmod connectors for add-on hardware devices
- USB and Ethernet connectivity
- Large array of general purpose input/output ports for any number of different custom solutions
- Programmable from JTAG and microSD card

**(xi). JTAG-SMT3-NC: Surface-mount Programming Module**

- JTAG programming/debugging solution for Xilinx FPGAs with UART side channel
- Compatible with Xilinx Tools
- High-Speed USB 2.0 port
- Open drain buffer on PS\_SRST\_B
- Dual channel USB controller provides simultaneous access to both JTAG and UART interfaces

**(xii). Pmod ESP32: Wireless Communication Module**

Wi-Fi, Bluetooth LE, and Bluetooth  
12-pin Pmod connector with SPI and UART interfaces

**(xiii). Pmod BLE: Bluetooth Low Energy Interface**

Bluetooth® Smart 4.2 BLE compatible

**(xiv). LCD**

Character LCD with Parallel Interface, Character LCD with Serial Interface

**2. Proteus Design Suite 8.9**

- Proteus Virtual System Modelling (VSM)
- VSM for Microchip, ARM, Atmel, Arduino,
- IoT Builder for Arduino™ AVR and Raspberry Pi
- Proteus VSM USB simulation
- Proteus PCB design
- Proteus Visual Designer

**3. Universal Programmer**

- Memory: serial and parallel, NOR and NAND Flash memory devices, PROM, EPROM, EEPROM
- Microcontrollers with Flash and OTP memory, including the ARM7, ARM9, Cortex, 8051, PIC, AVR, MSP430, Z8, 9S08 and 9S12 architectures
- In-system programmable microcontrollers and Flash memory devices/packages with up to 40 pins
- adapters for operations with devices in PLCC, SOIC, TSOP, MSOP, TSSOP, SSOP, QFP, BGA, QFN, MLF and other packages as well as cables for in-system programming are available Compatible with a variety of third party adapters.

**4. ARM Cortex Microcontroller Development Board**

**(i). STM32 discovery pack for LTE IoT cellular to cloud**

- STM32L496AGI6 microcontroller featuring
- SAI Audio CODEC
- ST-MEMS digital microphones
- user LEDs, reset push-buttons
- 4-direction joystick with selection button
- Board connectors: Camera 8 bit, USB with Micro-AB, Stereo headset jack including analog
- microphone input, – microSD™ card
- Board expansion connectors: – Arduino™ Uno V3, – STMod+ ST Incard™ eSIM based on ST33
- Switchable SIM interface, eSIM and MicroSIM

**(ii). LPC54018 IoT module**

- FreeRTOS enabled, ready for use in designs powered by AWS
- LPC54018 power-efficient Microcontroller Units (MCUs) with advanced peripherals based on Arm® Cortex®-M4 Core
- High speed USB device port
- Longsys IEEE802.11b/g/n module based on Qualcomm GT1216
- Macronix 128 Mb flash (MX25L12835FM2)
- User LED
- External debug probe connector can be used to connect NXP (LPC-Link2), SEGGER,
- P&E Micro, and other popular ARM Cortex compatible probes
- Reset button
- LCD interface with DMA controller, supporting up to 24-bit color
- External memory interface, supporting SDRAM, SRAM and/or parallel flash
- Up to 10 Flexcom serial ports, configurable as UART, SPI, I2C, I2S (2 ports), or GPIO
- Dual CAN/CAN-FD
- 10/100Mbps Ethernet
- DAC, ADC

**(iii). B-G431B-ESC1 Discovery kit**

- Electronic speed controller Discovery kit for drones with STM32G431CB 3-phase driver board for BLDC/PMSM motors with discrete N-channel 60 V, 120 A, STripFET F7 power MOSFETs
- Arm®(a) Cortex®-M4 32-bit STM32G431CB MCU, 213 DMIPS, 128 Kbytes of Flash
- memory, 32 Kbytes of SRAM, analog rich, math accelerator
- On-board ST-LINK/V2-1 debugger /programmer detachable from the main board
- Support for motor sensors (Hall or encoder)
- Supported by ST motor control software development kit (SDK) with ST motor profiler
- L6387 High voltage high and low-side driver
- ESC ready for communication with any standard flight control unit (FCU):
- PWM/CAN/UART
- 2 user LEDs: 1 green LED for 3.3 V level, and 1 red LED configurable by the user

**(iv). STM32 Nucleo-32 boards**

STM32 microcontroller in 32-pin package

User LED, reset push-button

Arduino™ Nano V3 expansion connector, Micro-AB USB connector for the ST-LINK ST-LINK, USB VBUS or external sources

On-board ST-LINK debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port and debug port

Arm® Mbed Enabled™ compliant

**(v). STM32 Nucleo-64 boards**

- STM32 microcontroller in LQFP64 package

- user LED shared with Arduino, user and reset push-buttons
- Arduino Uno V3 expansion connector, ST morpho extension pin headers for full access to all STM32 I/Os
- ST-LINK, USB VBUS or external sources
- On-board ST-LINK debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port and debug port
- Micro-AB or Mini-AB USB connector for the ST-LINK
- Arm® Mbed Enabled™ compliant

**(vi). STM32L476G-DISCO Development Board**

- STM32L476VGT6 microcontroller featuring
- 1 Mbyte of Flash memory, 128 Kbytes of RAM in LQFP100 package
- On-board ST-LINK/V2-1 supporting USB reenumeration capability
- Virtual com port, Mass storage, Debug port
- Mbed-enabled (mbed.org)
- LCD 24 segments, 4 commons in DIP 28
- SAI Audio DAC, Stereo with output jack
- Digital Microphone MEMS Accelerometer and magnetometer MEMS, Gyroscope MEMS
- 128-Mbit Quad-SPI Flash memory
- MCU current ammeter with 4 ranges and auto calibration
- Connector for external board or RF-EEPROM
- ST-LINK/V2-1, USB FS connector, External 5 V

**5. Arm mbed Development Board**

**(i). Arm Mbed LPC1768 Board**

- NXP LPC1768 MCU
- High performance ARM® Cortex™-M3 Core
- Ethernet, USB Host/Device, 2xSPI, 2xI2C, 3xUART, CAN, 6xPWM, 6xADC, GPIO
- Built-in USB drag 'n' drop FLASH programmer
- High level C/C++ SDK

**(ii). SparkFun Mbed Application Board (Extension Board Only)**

128 x 32 graphics backlit LCD, SPI interface

- 3-axis accelerometer, +/- 1.5g, I2C interface
- Temperature sensor, I2C interface
- 5-way navigation switch (Thumb joystick)
- 2 x Potentiometers (Analogue In)
- RGB LED, (PWM out)
- Miniature loudspeaker, (PWM out)
- Socket headers for Xbee Zigbee module or RN-XV WiFi module
- 2 x 3.5mm audio jack (Analogue In/Out)
- 2 x standard R/C servo motor headers, (PWM out)
- Mini-USB connector (keyboard, mouse, MIDI)
- USB-A connector (Flash drive, Bluetooth)
- USB Host/Device select switch
- RJ-45 Ethernet connector
- 1.3mm 6-9VDC jack socket (Powering USB-A and Servo headers)

## 6. ProtoMat S63 PCB Milling Machine

- Max. material size and layout area (X/Y/Z) 229 mm x 305 mm x 35/22 mm (9" x 12" x 1.4/0.9")\*
- Resolution (X/Y) 0.5  $\mu$ m (0.02 mil)
- Repeatability  $\pm$  0.001 mm ( $\pm$  0.04 mil)
- Precision of front-to-back alignment  $\pm$  0.02 mm ( $\pm$  0.8 mil)
- Milling spindles Max. 60,000 rpm, software controlled
- Tool change Automatic, 15 positions
- Milling width adjustment Automatic
- Tool holder 3.175 mm (1/8")
- Drilling speed 120 strokes/min
- Travel speed (X/Y) Max. 150 mm/s (6"/s)
- X/Y-drive 3-phase stepper motor
- Z-drive 2-phase stepper motor
- Power supply 90–240 V, 50–60 Hz, 450 W

## 7. Microsoft IoT Grove Kit

- Intel Atom CPU at 500MHz, and a 32-bit Intel Quark microcontroller at 100 MHz
- 4GB RAM,
- SD Card interface
- UART,I2C,SPI,GPIO, USB2.0 1 OTG Controller
- Flash Storage 4 GB eMMC
- WiFi Broadcom 43340 802.11 a/b/g/n, Dual-band (2.4 and 5 GHz), Bluetooth BT 4.0
- Yocto Linux v1.6
- Arduino IDE, Eclipse supporting C, C++ & Python, Intel XDK supporting: Node.JS & HTML5

## 8. Dragino LoRa IoT Development Kit

- 400 MHz ar9331 processor
- 64MB RAM
- 16MB Flash
- ATmega328P
- 2 x RJ45 ports
- USB 2.0 Host port x 1
- Internal USB 2.0 Host Interface x 1
- WiFi Spec:
- LG01 in an IoT Network
- LoRa Gateway :
- IEEE 802.11 b/g/n
- Frequency Band: 2.4 ~ 2.462GHz
- LoRa Spec:
- Frequency Range:
- Band 1 (HF): 862 ~ 1020 Mhz
- Band 2 (LF): 410 ~ 528 Mhz
- Programmable bit rate up to 300 kbps.
- Fully integrated synthesizer with a resolution of 61 Hz.

- FSK, GFSK, MSK, GMSK, LoRaTM and OOK modulation.
- Built-in bit synchronizer for clock recovery.

### 9. Azure IoT starter Kit

- Microsoft Azure IoT Developer Kit
- STM32F412, ARM Cortex M4F processor
- EMW3166 Wifi module with 256K SRAM, 1M+2M Byte SPI Flash
- USB programming Arduino compatible
- DAP Link emulator
- Codec, with microphone and earphone socket
- OLED, 128x64
- Programmable buttons, RGB LED, LED working status indicators for WIFI, Azure service and testing
- Security encryption chip
- Infrared emitter for IR remote control or interaction
- Motion sensor
- Magnetometer sensor
- Atmospheric pressure sensor
- Temperature and humidity sensor
- All module pins broken out
- On-board FTDI USB-to-Serial
- 802.11 b/g/n
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLLs, regulators, DCXO and power management units
- Integrated low power 32-bit CPU could be used as application processor
- +19.5dBm output power in 802.11b mode

### 10. ESP8266 Board

#### (i). Sparkfun Blynk Board - ESP8266

- ESP8266-Based
- On-Board Si7021 Temp/Humidity sensor
- Solderless pin connectors - compatible with alligator clips
- On-Board FTDI for re-programming
- On-board WS2812 RGB LED
- General purpose LED and button
- ADC scaled to 0-3.3V
- Expansion connectors for I2C and WS2812 output
- LiPo battery charger
- Arduino programmable

#### (ii). Node MCU

### 11. Sensors and Accessories (10 Sets)

- 1 x Arduino PS2 Joystick game controller module
- 1 x Infrared sensor receiver module



- 1 x Laser head sensor module
- 1 x Temperature and humidity sensor module
- 1 x Infrared emission sensor module
- 1 x 5V relay module
- 1 x Smart car avoid obstacle sensor infrared sensor photoelectric switch
- 1 x ARDUINO finger detect heartbeat module
- 1 x Microphone sensitivity sensor module
- 1 x Metal touch sensor module
- 1 x Flame sensor module
- 1 x 3-color LED module
- 1 x Hunt sensor module
- 1 x Linear magnetic Hall sensors
- 1 x Rotary encoder modules
- 1 x Active buzzer module
- 1 x Magic Light Cup modules
- 1 x Small passive buzzer module
- 1 x Digital temperature sensor module
- 1 x Optical breaking module
- 1 x Temperature sensor module
- 1 x Bicolor LED common cathode module 3MM
- 1 x Mercury opening module
- 1 x Hall magnetic sensor module
- 1 x RGB LED SMD module
- 1 x Arduino Mini Reed module
- 1 x Tilt switch module
- 1 x Automatically flashing LED module
- 1 x Key switch module
- 1 x Photoresistor module
- 1 x Vibration switch module
- 1 x ARDUINO hit sensor module
- 1 x Temperature sensor module
- 1 x Analogy Holzer magnetic sensor
- 1 x Microphone sound sensor module
- 1 x Large reed module
- 1 x Two-color LED module
- 1 x Breadboard power module
- 1 x Ultrasonic module
- 1 x MP1584EN buck module
- 1 x SD card reader module
- 1 x Gyro Module
- 1 x Soil module
- 1 x DS1302 clock module
- 1x DC Motor Driver
- 1xStepper Motor Driver (Microstepping) for Nema 17

- 1x 7" Touchscreen
- 1x Stepper Motor Nema 17
- 1x Servo Motor ( 15kg,180 degree)
- 1x GSM Module
- 1 x Water level module
- 1x Adapter
- 1x Micro USB cable(120cm)

## **12. Raspberry Pi Hats and Accessories (5 Sets)**

- 1x Raspberry Pi Sense HAT
- 1x 7" Official Raspberry Pi Display with Capacitive Touchscreen
- 1x Official Micro-HDMI (Male) to Standard HDMI (Male) Cable for Raspberry Pi
- 1x Micro USB-B (Female) to USB Type C (Male) Converter Adapter for Raspberry Pi 4
- 1x T Type GPIO Breakout board with 40 pin Cable and 400pt Breadboard for Raspberry Pi 4
- 1x Raspberry Pi 8 channel Level Switching (3.5V to 5V) IO Module
- 1x SmartElex GPS HAT for Raspberry Pi 4
- 1x Mini HDMI To HDMI Cable 1 Meter Round High-Quality Copper-Clad Steel Black
- 1x HDMI to HDMI Cable 1.8 Meter Round High-Quality Copper-Clad Steel Black
- 1x Micro USB OTG Adapter Host Cable for Raspberry Pi 4
- 1x Micro USB Cable for Raspberry Pi(120cm)
- 1x Raspberry Pi GPIO Expansion Shield For Pi 3/4 B B+ Module
- OV5647 5MP 1080P IR-Cut Camera for Raspberry Pi 3/4 with Automatic Day Night Mode
- 1x Raspberry Pi Infrared IR Night Vision Surveillance Camera Module 500W Webcam
- 1x 5MP Raspberry Pi 3 Model B Camera Module Rev 1.3 with Cable
- 1x 10.1 inch IPS LCD Screen 1280x800 with Driver Board Kit for Raspberry Pi
- 3.2 Inch TFT LCD Touch Screen Display V4.0 for Raspberry Pi
- Official Raspberry Pi 4 Case-Red-White
- Official USB type-C 15.3W Power Supply For Raspberry Pi 4
- Raspberry Pi Sense HAT for the Pi 3/2/B+/A+ Model

# **NETWORK SECURITY & CYBER FORENSIC LAB**

## **1. HDD Cloner**

- Fast forensic imaging at speeds over 40GB/min\*
- Image & verify from 1 source drive to 3 destinations
- Supports imaging from PCIe SSDs (M.2 NVMe, AHCI, SATA type) and PCIe and mini-PCIe cards
- Secure sensitive evidence data with whole disk, open standard, drive encryption using the NIST recommended XTS-AES-256 cipher mode, decrypt using Falcon-NEO or Veracrypt, decrypt using the Talon Ultimate or open source software such as VeraCrypt
- Optional Multi-Task feature provides multi-source to multi-target imaging for simultaneous imaging of up to 5 source drives
- Optional targeted/logical imaging feature allows you to create a logical image and capture only specific files needed
- Remote operation with a web-based browser interface
- Broad interface support includes SATA, USB3, FireWire® and IDE. Optional support for SAS available

## **2. Mobile Forensic Tool Kit**

- Device Unlocking
- Deep Data Extraction
- Data Decoding
- Logical, Physical, Cloud & PinPoint recovery tools
- Logical, filesystem and physical extractions
- Reassemble device and application data into readable formats
- SQLite Wizard, Virtual Analyzer, Python scripting and Hex highlighting.
- Recover hidden or deleted data from unallocated space.
- Support for various devices
- Multilanguage examination
- Android, IOS
- Report creation

## **3. Write Protected Kits**

- Logical, Physical, Cloud & PinPoint recovery
- Data Examination including images of logical and physical drives
- Data Report in various formats
- Export Data
- Interface: USB 3.0
- Data transfer rate: 5Gb/s
- 3.5",2.5" SATA HDD/ 2.5" SSD / 3.5",2.5" IDE HDD

## **4. Acquiring, Analysis and reporting software**

- Encryption support for Microsoft® Windows®
- 10 Bitlocker XTS-AES, Dell®
- Data Protection 8.17 and Symantec™
- PGP v10.3; investigators can acquire encrypted evidence without worry about data corruption, damage or unnecessary delays

- Supports APFS, (macOS® 10.13),
- Conduct targeted data collections from APFS and send the output as a logical evidence file
- Examines Volume Shadow Snapshot (VSS) backups,

#### **5. Forensic Video analysis Software Tool**

- Import any type of image, video or sequence of image
- Analyze specific details of your images (like EXIF metadata) and your videos (like video codec and encoder Process the frames combining more than 70 available filters and type of every single frame)
- Take specific linear and 3-dimensional measurements on the images or video frames
- show side by side every original frames with its enhanced version
- Process a live feed
- For unsupported proprietary DVR formats
- Verify image EXIF and hash-code data

#### **6. Digital Evidence Software Tool (Digital Investigation Platform)**

- Recover digital evidence from the most sources, including smartphones, cloud services, computers, IoT devices and third-party images
- Bypass passwords
- Recover evidence from Windows-based computers and Macs
- Get evidence from cloud services including iCloud, Google, Facebook, Twitter, Instagram and more
- including additional support for cloud services like publicly available Twitter information, Facebook and Instagram warrant returns, and user-request data from Facebook and Google
- Automatically discover and view relationships between artifacts, files, and people
- Magnet.AI leverages machine learning to search pictures and flag potential CSAM, nudity, weapons, drugs, and more; Magnet.AI also searches text for luring conversations

# **ARTIFICIAL INTELLIGENCE, MACHINE LEARNING LAB & VR/AR**

## **1. MATLAB**

MATLAB 9.7

- Simulink
- Statistics and Machine Learning Toolbox
- Deep Learning Toolbox
- Image Processing Toolbox
- Computer Vision System Toolbox
- Image Acquisition Toolbox

## **2. AR/VR Development Tools(SDK) - Wikitude Augmented Reality SDK**

- Attach 2D and 3D content to images, real-world objects
- Support for Android, iOS, Windows & smart glasses
- Develop AR apps in JavaScript, Unity, Cordova, Xamarin, Flutter, & Native API
- Object & Scene Tracking
- Detect, track, and augment surfaces, no marker needed
- Recognize, track, and augment 2D images
- Create geo markers to augment geographical points of interest.
- Load, optimize and render 3D models in the AR scene
- supports a wide variety of development frameworks(Android, iOS, Windows,
- 3d encoder Tool (Windows)

## **NANOTECHNOLOGY LAB**

### **1) Virtual NanoLab with QuantumATK**

- Atomic-Scale Modeling for Semiconductor & Materials Research
- Define materials at the atomistic level and calculate their physical and chemical properties
- Replace or guide experiments to select and optimize materials in a product system
- Exploration of alternative interconnect metals
- Modeling and optimization of metal-semiconductor contacts
- Exploration and optimization of high-k dielectric and ferroelectric stacks.
- Spintronic Memory Simulation

### **2) VisualTCAD**

- Device structure drawing tool
- Circuit schematic capturing tool
- GUI simulation controller
- Visualization tool of simulation results
- Spreadsheet
- X-Y plotting tool