



INTERNET OF THINGS AND SMART HOME

PURPOSE

To evaluate each competitor's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of home technology integration.

ELIGIBILITY

Open to active NYS SkillsUSA members enrolled in programs with computer networking, telecommunications cabling, home theater installation, electronics applications, and/or electronics technology as the occupational objectives.

CLOTHING REQUIREMENTS

NYS SkillsUSA Business Professional

- White polo shirt (plain or with SkillsUSA or SkillsUSA NY monogram) or White dress shirt with plain black tie with no pattern or a SkillsUSA black tie, or business like white collarless blouse or white blouse with small plain collar.
- Black dress slacks (accompanied by black dress socks or black or skin-tone seamless hose) or black dress skirt (knee-length, accompanied by black or skin-tone seamless hose).
- Black leather shoes that are not backless or open toe

***Note:* Contestants must wear their contest clothing to the contest orientation meeting. Also bring #2 pencil, resume, and safety assurance form.**

EQUIPMENT AND MATERIALS

1. Supplied by the technical committee:
 - a. All necessary information for the judges and technical committee
2. Supplied by the contestant:
 - a. Multimeter
 - b. Telephone buttset
 - c. Toner
 - d. Signal generation
 - e. Cable tester
 - f. Laptop computer
 - g. Coax (Hex) Crimpers
 - h. RJ11/RG 45 Crimpers
 - i. Coax Compression Tool (BNC, F & RCA)
 - j. Coax Strippers
 - k. High Gauge wire strippers (20-25 AWG)
 - l. Diagonal cutters (small)
 - m. Needle Nose Pliers (small)
 - n. Safety glasses
 - o. Pen and Pencil
 - p. All competitors must create a one-page resume. See “Resume Requirement” below for guidelines.

RESUME REQUIREMENT

Competitors must create a one-page resume to submit at orientation.

DEVICES

Cell phones or other electronic devices not approved by the NYS Chairperson will be collected by the contest chair during the competition. Chairpersons will announce their acceptance by listing it on their standard or at the orientation meeting. In case of emergencies advisors should allow the competitors to take their phones to the contest areas.

If the competitor uses their device in a manner which compromises the integrity of the competition, the competitor’s score may be penalized.

SCOPE OF THE COMPETITION

The competition is defined by industry standards as set by the current industry technical committee. The competition will be divided into two parts: a general knowledge test and skilled performance.

KNOWLEDGE PERFORMANCE

All competitors are required to take the SkillsUSA professional development test at orientation.

The competition will include a written exam assessing general knowledge of installation, configuration, troubleshooting, and maintenance of various smart home devices. Written portions may also exist during the skills portion of the competition.

SKILL PERFORMANCE

The skills performance event assesses the ability of the competitor to install, configure, troubleshoot, and maintain a variety of smart home devices encountered in a residential setting. A practical problem(s) will be given to evaluate the competitor's ability to function on a basic entry level.

COMPETITION GUIDELINES

1. The competitions will have several hands-on skill scenarios that demonstrate one's ability to perform jobs or skills selected from the list of competencies as determined by the SkillsUSA Championships technical committee. Scenarios may include any or several of the following:
 - a. Diagnose and service personal residential smart home systems.
 - b. Diagnose and resolve operational and startup problems.
 - c. Locate and identify defective modules within residential smart home equipment.
 - d. Demonstrated ability to use diagnostic utility software and equipment.
 - e. Install, configure, and demonstrate proper operations of devices within the residence.
2. The hardware problems will relate to any residential networked smart home systems.
3. Competitors will be awarded points based on their ability to solve the problems provided within the allotted time. Partial points can be awarded for solving partial problems.
4. Competence in the tasks provided is considered when a competitor acquires 75% of the available points.
5. Competitors will be provided, as required, with manufacturers' documentation of the devices to be installed and/or serviced.
6. Winners will be determined based on their total scores (regardless of result on certification test), which includes diagnostic procedures, speed, standard industry procedures, accuracy of adjustments and correct component replacements.
7. Specific penalties will be assessed for the failure to properly use anti-static straps at all times when in contact with the computers and for the introduction of computer viruses into the competition computers. Penalties will be assessed at one point per occurrence and notice of infractions will be communicated to the competitor when they occur.

STANDARDS AND COMPETENCIES

Networking

RSIM 1.0 — Identify basic networking protocols and their uses and know when/how to apply them

- 1.1. DHCP
- 1.2. UDP
- 1.3. DNS
- 1.4. TCP/IP
- 1.5. Subnet masks

RSIM 2.0 — Recognize and implement methods of network security

- 2.1. Personal computer (PC) security
- 2.2. Antivirus
- 2.3. Home networking security
- 2.4. Firewall knowledge

RSIM 3.0 — Configure setup and maintain a residential LAN (Local Area Network)

- 3.1. Client configuration
 - 3.1.1. Resource sharing
 - 3.1.2. Peer-to-peer
- 3.2. Remote access setup
- 3.3. Network device setup and integration
 - 3.3.1. Broadband configuration (e.g., DSL, cable, and satellite)
 - 3.3.2. Routers
 - 3.3.3. Hubs
 - 3.3.4. Switches
 - 3.3.5. PoE (power over ethernet)

RSIM 4.0 — Configure setup and maintain a secure wireless network

- 4.1. Differentiate applications of hardwired vs. wireless networks
- 4.2. Assess networking security and encryption standards
 - 4.2.1. WEP
 - 4.2.2. WPA
 - 4.2.3. MAC filtering
 - 4.2.4. SSID

- 4.2.5. WPA2
- 4.3. Wireless networking integration and troubleshooting
 - 4.3.1. Frequency management
- 4.4. Wireless protocol standards
- 4.5. 4.4.1. 802.11 a/b/g/n

RSIM 5.0 — Identify and define network cabling characteristics and performance

- 5.1. Cable types
 - 5.1.1. CAT5
 - 5.1.2. CAT5e
 - 5.1.3. CAT6
 - 5.1.4. Fiber
 - 5.1.5. COAX
- 5.2. Cable length limitations
- 5.3. Protocols
 - 5.3.1. 10BaseT
 - 5.3.2. 100BaseT
 - 5.3.3. 1000BaseT
- 5.4. Shielded (STP) vs. unshielded (UTP)
- 5.5. Plenum vs. non-plenum
- 5.6. Importance of conductor colors

Audio/Video

RSIM 6.0 — Implement, maintain and troubleshoot multi-room audio systems. Identify common interference sources

- 6.1. Control devices
 - 6.1.1. Keypads
 - 6.1.2. Rotary volume controls
 - 6.1.3. Sliders
 - 6.1.4. Push button controls
 - 6.1.5. Touch screen
 - 6.1.6. Wireless keypads
 - 6.1.7. Handheld devices
- 6.2. Differentiate and define single source, multi-source, and local source.
 - 6.2.1. Analog audio system
 - 6.2.2. Analog CAT5 audio system
 - 6.2.3. Digital CAT5 audio system
- 6.3. Proper cable use
 - 6.3.1. Line level vs. speaker level
- 6.4. Amplification
 - 6.4.1. Ohm's Law (e.g., impedance matched, or non-impedance matched)
 - 6.4.2. Watts vs. dB
 - 6.4.3. Local amplification
 - 6.4.4. Centralized amplification
- 6.5. Speaker types
 - 6.5.1. In wall

- 6.5.2. Surface mounted
- 6.5.3. Ceiling mounted
- 6.5.4. Freestanding
- 6.5.5. Fixed
- 6.5.6. Animated
- 6.6. Speaker specifications
 - 6.6.1. Frequency response
 - 6.6.2. Efficiency
 - 6.6.3. Power handling

RSIM 7.0 — Install, configure, and maintain a residential home theater system

- 7.1. Audio components
 - 7.1.1. Define basics of acoustics (e.g., sound reflection, speaker placement, sound cancellation, sound balance)
 - 7.1.2. Audio/Video components setup and integration (e.g., digital signal cables and lengths, legacy devices)
 - 7.1.3. Multichannel surround (e.g., SACD, DVDA, DTS, DTSES, DDEX, DD, etc.) (e.g., crossovers and speaker setup)
- 7.2. Video components
 - 7.2.1. Display types (e.g., plasma, DLP, LCD, LCOS, CRT, rear projection, front projection, direct view)
 - 7.2.2. High-definition resolution options (e.g., 720p, 1080i, 1080p, etc.)
 - 7.2.3. Tuner types (e.g., NTSC, PAL, ATSC, QAM, cable card, VSB, DVB-T, DVB-S)
 - 7.2.4. Video processing (e.g., scalers, processors, up-conversion)
 - 7.2.5. Aspect ratios
 - 7.2.6. Video setup (calibration e.g., color balance, contrast, brightness, etc.)
 - 7.2.7. Digital video cable and connector types (e.g., DVI and HDMI — compatibility and interoperability issues)
- 7.3. Use MRAV (Multi-Room Audio/Video) standards if/when applicable

RSIM 8.0 — Assess, install, and configure content management systems and describe their applications in a residential environment

- 8.1. Describe typical applications and physical connections of sources
 - 8.1.1. Media servers
 - 8.1.2. Media PC
 - 8.1.3. MP3 players
 - 8.1.4. DVD players
 - 8.1.5. Satellite
 - 8.1.6. Cable
 - 8.1.7. DVR
 - 8.1.8. Gaming systems
 - 8.1.9. Satellite radio
 - 8.1.10. Legacy devices
 - 8.1.11. Streaming media
- 8.2. Summarize types of media storage, methods to transfer and backup data
 - 8.2.1. Memory cards

- 8.2.2. NAS devices (Network Attached Devices)
- 8.2.3. Remote storage
- 8.2.4. Local storage
- 8.2.5. Frequency of backup
- 8.3. Other connection considerations
 - 8.3.1. Digital rights management

RSIM 9.0 — Implement, maintain and troubleshoot multi-room video systems.

- 9.1. Define signal types and their applications
 - 9.1.1. Digital distribution (e.g., analog to IP converters, IP to analog converters, wireless distribution, IEEE 1394)
 - 9.1.2. RF distribution characteristics. Identify and troubleshoot noise and interference. (e.g., splitters and taps, active and passive, attenuators, bidirectional, modulation and filtration, amplification, IR over COAX)
 - 9.1.3. Analog Distribution (e.g., Composite, Component, and S-Video, Balun.)
- 9.2. Identify cable types and their applications
 - 9.2.1. COAX (e.g., RG-59, RG-6, RG-6 QS, DV, Serial data, CCS, BC)
 - 9.2.2. CAT5/5e/6
- 9.3. Termination (e.g., RCA, BNC, and F)
- 9.4. Satellite
 - 9.4.1. Multi-switches
 - 9.4.2. Diplexer
 - 9.4.3. LNB (Low Noise Block Down Converter)

Security and Surveillance Systems

RSIM 10.0 — Maintain, configure, and troubleshoot basic security systems and applications

- 10.1. Define monitored and notification methods
 - 10.1.1. Phone line
 - 10.1.2. Cellphone
 - 10.1.3. Radio frequency
 - 10.1.4. IP based
 - 10.1.5. IoT based / Smart speaker controlled

RSIM 11.0 — Describe basic security terminology and apply installation procedures and methodologies

- 11.1. Installation and configuration of security panel
 - 11.1.1. Zone types
 - 11.1.2. Delays
 - 11.1.3. Battery backup and power supply requirements
- 11.2. Monitoring formats
 - 11.2.1. SIA and Contact ID
 - 11.2.2. 4/2 and 3/1
- 11.3. Define types of peripherals and accessories
 - 11.3.1. Motion sensors
 - 11.3.2. Glass-break detectors
 - 11.3.3. Magnetic contacts

- 11.3.4. Smoke fire (e.g., smoke detection, heat detection)
- 11.3.5. Environmental sensors (e.g., carbon monoxide, gas, water, temperature)
- 11.3.6. Vehicle detection
- 11.3.7. Photoelectric beam devices
- 11.3.8. Microwave beam devices
- 11.3.9. Pressure sensors
- 11.3.10. Sirens, strobes
- 11.3.11. Security keypads
- 11.3.12. Key fobs
- 11.3.13. Panic buttons
- 11.4. Describe security infrastructure types
 - 11.4.1. Wired, 22/4- standard power devices, 22/2- Magnetic contacts, 2 and 4 conductor fire wire (e.g., keypads, sounders, power supplies, smoke, and fire detectors), Power supervision relays, Polarity reversal relays, Line seizure, End of line resistors)
 - 11.4.2. Wireless
- 11.5. Identify access control devices and protocols
 - 11.5.1. Devices (e.g., keypads, card readers, biometric readers, proximity readers, door strikes, electronic deadbolts, magnetic locks)
 - 11.5.2. Protocols (e.g., Weigand)

RSIM 12.0 — Identify, configure, install, maintain and troubleshoot security and surveillance cameras

- 12.1. Camera types
 - 12.1.1. IP
 - 12.1.2. Analog
 - 12.1.3. Hybrid
 - 12.1.4. IoT / Plug and play
- 12.2. Camera specifications
 - 12.2.1. Lens type
 - 12.2.2. Lux rating
 - 12.2.3. Resolution
 - 12.2.4. B&W vs. color
 - 12.2.5. IR illumination
 - 12.2.6. Power consumption
- 12.3. Camera applications
 - 12.3.1. Indoor/outdoor
 - 12.3.2. Day/night
 - 12.3.3. Fixed vs. animated
 - 12.3.4. Surveillance (e.g., door cams, nanny cams)
 - 12.3.5. Recording (e.g., DVR, triggers –internal vs. external detection)
 - 12.3.6. Sequencing vs. multiplexing

Home Control and Management

RSIM 13.0 — Identify user interfaces and their appropriate applications

- 13.1. Device types
 - 13.1.1. Remote controls
 - 13.1.2. Keypads
 - 13.1.3. Touchscreens
 - 13.1.4. Key fobs
 - 13.1.5. Telephones
 - 13.1.6. Smartphones
 - 13.1.7. Cellphones
 - 13.1.8. PDAs
 - 13.1.9. Web tablets
 - 13.1.10. Personal computers
 - 13.1.11. Laptops
- 13.2. Describe the importance of simplicity and ease of use as it pertains to the end user

RSIM 14.0 — Define and recognize control systems that integrate subsystems in the home. Describe their functionality, characteristics, and purpose

- 14.1. Embedded control systems and personal computer (PC) based control systems
 - 14.1.1. Compatibility and interoperability issues

RSIM 15.0 — Identify commonly used communication protocols and their application

- 15.1. IR
- 15.2. Serial
- 15.3. IP
- 15.4. RF
- 15.5. Bluetooth
- 15.6. Contact closure
- 15.7. Inputs (zones)
- 15.8. Z-wave and Zigbee
- 15.9. ASCII
- 15.10. Proprietary protocols

RSIM 16.0 — Describe basic HVAC (Heating, Ventilation and Air Conditioning) terminology and install peripheral control devices

- 16.1. Control layer
 - 16.1.1. Compatibility
- 16.2. Communication layer
 - 16.2.1. Compatibility
 - 16.2.2. IP based, wireless, serial, and proprietary
- 16.3. Zones HVAC
 - 16.3.1. Master slave configuration
 - 16.3.2. Microprocessor controlled configuration
- 16.4. Programmable thermostats
- 16.5. Importance of referencing manufacturer specification and compatibility

RSIM 17.0 — Describe basic lighting terminology and install peripheral control devices

- 17.1. Identify lighting control applications
 - 17.1.1. Indoor and outdoor
 - 17.1.2. Centralized and distributed
 - 17.1.3. Dimming
 - 17.1.4. Scenes
 - 17.1.5. Relay/switching
 - 17.1.6. Occupancy/motion sensing
 - 17.1.7. Time- and event-driven
 - 17.1.8. Window treatments
 - 17.1.9. Energy management
 - 17.1.10. Security interface
 - 17.1.11. Lighting connectivity
 - 17.1.12. Motor speed control
- 17.2. Communication interface/bridge
 - 17.2.1. Power line phase couplers
- 17.3. Identify lighting control protocols (Open standards)
 - 17.3.1. Z-wave
 - 17.3.2. ZigBee
 - 17.3.3. Powerline carrier (X10 protocol/PLC)
 - 17.3.4. UPB (Universal Powerline Bus)
- 17.4. Proprietary RF and proprietary low voltage
 - 17.4.1. Recognize compatibility issues

RSIM 18.0 — Identify and install component power protection devices

- 18.1. Identify whole house protection options
 - 18.1.1. Surge suppression
 - 18.1.2. Power conditioning
- 18.2. Identify and install point protection
 - 18.2.1. Surge protectors (high voltage and ancillary low voltage devices: e.g., satellite, CATV, etc.)
 - 18.2.2. UPS (uninterruptible power supply)
 - 18.2.3. Power conditioning

Troubleshooting Methodology and Documentation

RSIM 19.0 — Identify and apply the fundamentals of troubleshooting and diagnostics

- 19.1. Use of testing equipment
 - 19.1.1. Multimeter
 - 19.1.2. Telephone butt set
 - 19.1.3. Toner
 - 19.1.4. Signal generation
 - 19.1.5. Cable tester
- 19.2. Refer to prior documentation
- 19.3. Demonstrate when to communicate with technical support and what information is relevant

- 19.4. Troubleshoot common wireless interference issues: infrared, radio frequency, etc.
- 19.5. Identify demarcation and responsibilities of associated trades and/or utilities

RSIM 20.0 — Given a scenario, demonstrate how to apply troubleshooting skills to integrate subsystems

- 20.1. Networking
- 20.2. Audio/video
- 20.3. Telephony
- 20.4. Security
- 20.5. Home control

RSIM 21.0 — List and describe the benefits of verification of installation

- 21.1. Properly label wires
- 21.2. Wire mapping
- 21.3. Importance of documenting work upon completion
 - 21.3.1. Input/output verification for all systems
 - 21.3.2. Document wire placement
- 21.4. Certification of cable installation

RSIM 22.0 — Deliver appropriate manuals and documentation to the end user upon completion of installation.

- 22.1. Select, archive, and appropriately distribute critical system information:
Passwords, access codes, user IDs, credentials, etc.

RSIM23.0—Ability to safely measure AC and DC voltages

- 23.1. Measure AC and DC voltages using a digital multimeter (DMM)
- 23.2. Measure AC and DC current using a digital multimeter (DMM)
- 23.3. Measure the resistance of a circuit consisting of resistors using a digital multimeter (DMM)

RSIM24.0— Ability to test basic analog and digital circuits and repair them

- 24.1. Setup and operate test equipment for analog circuits
- 24.2. Troubleshoot switching power supplies
- 24.3. Analyze motor and phase control circuits
- 24.4. Apply logical and systematic approach to troubleshooting analog circuit devices

RSIM 25.0 — Ability to use multimeters and interpret results

- 25.1. Solve basic trigonometric problems as applicable to electronics (prerequisite to AC)
- 25.2. Identify properties of an AC signal
- 25.3. Identify AC sources
- 25.4. Analyze, construct, and troubleshoot AC capacitive circuits, AC inductive circuits, RLC circuits (series, parallel, complex) series and parallel resonant circuits, filter circuits and polyphase circuits
- 25.5. Analyze and apply principles of transformers to AC circuits