

# Management Node Hardware Correction Summary

**Date:** November 3, 2025

**Project:** ENBD Pearl Museum - Jewellery Box Interactive

**Document:** jewellery\_box\_system\_recommendations.md

## Issue Identified

The original recommendations incorrectly specified hardware with only **2 Ethernet ports** (ASUS PN51, Intel NUC, Helix) when the system requires **4 Ethernet ports**:

- 3 ports for plinths (5m connections each)
- 1 port for Q-SYS server room (40m connection)

## Solution Provided

The document has been comprehensively updated with **TWO VIABLE OPTIONS**, each with complete specifications, exact dimensions, and procurement details.

### OPTION 1: Industrial Mini PC with 4 Native Ethernet Ports RECOMMENDED

#### Primary Recommendation: Qotom Q355G4-S02

##### Complete Specifications:

- **Processor:** Intel Core i5-5200U (2.2-2.7GHz, dual-core, 15W TDP)
- **RAM:** 8GB DDR3L SO-DIMM
- **Storage:** 128GB mSATA SSD + 2.5" SATA bay
- **Ethernet:** 4x Intel Gigabit LAN (Intel i210-AT chipset)
- **Cooling:** Fanless (passive aluminum chassis)
- **Power:** 36W (12V 3A adapter included)
- **Operating Temp:** 0-60°C (industrial-grade)
- **Certifications:** CE, FCC, RoHS
- **MTBF:** >50,000 hours (5.7 years)

##### Physical Dimensions:

- Width: 187mm (7.36")
- Depth: 140mm (5.51")
- Height: 42mm (1.65")
- Weight: 1.0kg (2.2 lbs)

##### Rack Mounting:

- Rack Space: 1U

- Total Depth Required: 200mm (7.87") including cable clearance
- Mounting: Middle Atlantic U1 vented rack shelf
- Weight with Shelf: 1.5kg (3.3 lbs)

#### **Cost Breakdown:**

- Qotom Q355G4-S02: \$420
- 1U Rack Shelf: \$50
- Total: \$470**

#### **Why This is Recommended:**

1.  4 native Gigabit Ethernet ports (no adapters)
2.  Fanless operation (silent for museum)
3.  Industrial-grade (24/7 operation)
4.  Low power (36W)
5.  Single device (fewer failure points)
6.  Proven platform (widely used in firewall/routing)
7.  Cost-effective (\$470 vs \$725+ for alternatives)

#### **Alternative:** Protectli Vault VP4650

- Intel i5-8250U (newer, faster)
- 4x Gigabit LAN
- 146mm x 145mm x 54mm
- Cost: ~\$650
- Better performance but higher cost

## **OPTION 2: Mini PC + Managed Ethernet Switch**

#### **Configuration:**

##### **Component A:** Intel NUC 11 Pro (NUC11TNHi5)

- Processor: Intel i5-1135G7 (quad-core, 2.4-4.2GHz)
- RAM: 8GB DDR4-3200
- Storage: 256GB NVMe SSD
- Ethernet: 2x ports (1x Gigabit + 1x 2.5GbE)
- Dimensions: 117mm x 112mm x 42mm
- Power: 90W
- Cost: \$500

##### **Component B:** Industrial Managed Switch

- **Option B1:** TRENDnet TI-PG541i (Industrial, Recommended)
  - 5x Gigabit Ethernet ports
  - DIN-rail mountable
  - Operating Temp: -40°C to 75°C
  - Web-based management, VLAN, QoS
  - Dimensions: 144mm x 110mm x 32mm
  - Power: 20W
  - Cost: \$175

- **Option B2:** Netgear GS305E (Budget Alternative)
  - 5x Gigabit Ethernet ports

- Commercial-grade (0-50°C)
- Basic management, VLAN, QoS
- Dimensions: 94mm x 100mm x 27mm
- Power: 12W
- Cost: \$35

### **System Architecture:**

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NUC Port 1 → TRENDnet Switch → 3 Plinths
NUC Port 2 → Direct to Q-SYS (40m cable)

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### **Rack Mounting:**

- Both devices side-by-side on 1U shelf
- Combined Width: 261mm (10.3")
- Total Depth: 160mm (6.3")
- Weight with Shelf: 2.0kg (4.4 lbs)

### **Cost Options:**

- NUC + TRENDnet + Shelf: **\$725**
- NUC + Netgear + Shelf: **\$585**

### **When to Choose Option 2:**

- Need modern processor performance
- Want spare Ethernet ports for expansion
- Require advanced switch diagnostics (VLAN, port mirroring)
- Prefer modular architecture (replace components independently)

### **Trade-offs:**

- ⚠ More components (2 devices vs 1)
- ⚠ Higher complexity (switch configuration)
- ⚠ Higher power (110W vs 36W)
- ⚠ More expensive (\$255-\$155 more)
- ⚠ NUC has a fan (quiet but not silent)

## **Updated Cost Summary**

<b>Configuration</b>	<b>Management Node</b>	<b>Total System Cost*</b>
<b>Option 1: Qotom Q355G4 (RECOMMENDED)</b>	\$470	<b>\$3,822</b>
Option 1: Protectli VP4650	\$650	\$4,002
Option 2: NUC + Industrial Switch	\$725	\$4,077
Option 2: NUC + Budget Switch	\$585	\$3,937

\*Total includes: Plinths (\$522) + Management Node + Cabling (\$200) + Installation (\$630) + Software (\$2,000)

**Recommended Budget:** \$4,200-\$4,400 (includes 10-15% contingency)

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## Key Advantages of Qotom Q355G4 (Option 1)

### 1. Reliability for Museum Environment

- Single device = fewer points of failure
- Fanless = no mechanical parts to fail
- Industrial-grade = designed for 24/7 operation
- MTBF >50,000 hours (5.7 years continuous)

### 2. Silent Operation

- Completely fanless passive cooling
- Zero acoustic noise
- Critical for museum visitor experience

### 3. Cost-Effectiveness

- \$470 vs \$585-\$725 for alternatives
- \$255 less than NUC + industrial switch
- Includes everything needed (no adapters)

### 4. Simplicity

- Single device to configure
- Single device to monitor
- Single device to replace if needed
- No switch configuration required

### 5. Low Power Consumption

- 36W vs 110W for NUC + switch
- Lower heat generation
- Reduced cooling requirements
- Lower operating costs

### 6. Proven Platform

- Widely used in firewall/networking applications
  - pfSense, OPNsense community support
  - Extensive deployment experience
  - Known reliability
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# Critical Specifications for Vendor Rack Layout

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## Qotom Q355G4 Configuration (Recommended)

### Rack Requirements:

- **Rack Space:** 1U (44.45mm height)
- **Rack Width:** Standard 19" (482.6mm)
- **Rack Depth:** 200mm (7.87") minimum
- Device depth: 140mm
- Cable clearance: 60mm rear
- **Weight:** 1.5kg (3.3 lbs) with shelf

### Cable Connections (Rear Panel):

- 4x RJ45 Ethernet ports:
- Port 1: Plinth 1 (5m Cat6)
- Port 2: Plinth 2 (5m Cat6)
- Port 3: Plinth 3 (5m Cat6)
- Port 4: Q-SYS (40m Cat6a shielded)
- 1x DC power jack (12V 3A)
- 1x HDMI (optional, for setup/diagnostics)

### Mounting:

- Place on Middle Atlantic U1 vented rack shelf
- Standard 19" rack rails
- #12-24 or M6 mounting screws
- Ensure ventilation through vented shelf

### Power:

- Single 12V 3A DC adapter (included)
- AC input: 100-240V, 50/60Hz (universal)
- Power consumption: 36W typical

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## Document Changes Made

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### 1. Executive Summary (Top of document)

- Added prominent correction notice
- Summary of both options
- Clear recommendation

### 2. Section 3: Management Node Specifications (Completely Rewritten)

- Section 3.1: Two detailed hardware options
- Qotom Q355G4 (primary recommendation)
- Protectli Vault (alternative)
- Intel NUC + TRENDnet (Option 2)
- Budget alternative with Netgear
- Section 3.2: Side-by-side comparison table
- 11 comparison criteria

- Clear pros/cons for each
- Final recommendation with reasoning
- Section 3.3: Physical dimensions for rack layout
- Exact measurements for both options
- Cable entry specifications
- Section 3.4: Updated power requirements
- Both options detailed

### **3. Section 7: Bill of Materials (Updated)**

- 7.2: Management Node Components (corrected)
- Option 1: Qotom (\$470)
- Option 1 Alt: Protectli (\$650)
- Option 2: NUC + Industrial Switch (\$725)
- Option 2 Budget: NUC + Netgear (\$585)
- 7.6: Total BOM Summary (updated)
- All four configurations priced
- Clear recommendation
- Cost comparisons

### **4. Section 13: Summary and Final Recommendations (Updated)**

- 13.1: Communication protocol (unchanged)
- 13.2: Hardware (corrected with both options)
- 13.3: Critical specs for vendor (updated dimensions)
- 13.4: Cost estimates (all configurations)
- 13.5: Timeline (unchanged)
- 13.6: Key success factors (updated)
- 13.7: Vendor action items (NEW)
- Rack layout planning checklist
- Procurement guidance
- Lead time warnings

## **Procurement Guidance**

### **For Qotom Q355G4-S02:**

#### **Authorized Sources:**

##### **1. Amazon (US/International)**

- Search: "Qotom Q355G4"
- Verify 4 LAN ports before ordering

##### **1. EnjoyGadgets (US Distributor)**

- Website: enjoygadgets.com
- Specialized in Qotom products

##### **2. AliExpress (Direct from China)**

- Search: "Qotom Q355G4 i5-5200U"
- 2-3 week shipping typical

### 3. Direct from Qotom

- Website: qotom.net
- Contact for bulk orders or customization

#### **What to Verify:**

- Model: Q355G4-S02
- Processor: Intel i5-5200U (NOT Celeron)
- RAM: 8GB DDR3L (minimum)
- Storage: 128GB SSD (minimum)
- **Confirm: 4x Gigabit LAN ports** (critical!)
- Includes: 12V power adapter
- Warranty: Check warranty terms

#### **Lead Time:**

- In stock (US): 3-5 days
- International shipping: 2-3 weeks
- Custom configurations: 3-4 weeks

#### **Price Range:**

- Expected: \$380-\$450 USD
  - With shipping: \$400-\$470 USD
  - Budget accordingly
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## Installation Notes

### Advantages for Installation Team:

#### **Qotom Q355G4:**

1. Single device = simpler rack integration
2. Fanless = no cooling considerations
3. Low profile (42mm) = fits any 1U space
4. Lightweight = easy to handle
5. All ports rear-facing = clean cable management
6. Single power connection = simplified wiring
7. No USB adapters = no extra configuration

#### **Setup Process:**

1. Mount Middle Atlantic U1 shelf in rack (1U space)
  2. Place Qotom Q355G4 on shelf
  3. Connect 4x Ethernet cables (clearly labeled)
  4. Connect 12V DC power adapter
  5. Initial configuration via HDMI (one-time)
  6. Install Ubuntu Server 22.04 LTS
  7. Configure network (static IPs for 4 ports)
  8. Install Python and OSC libraries
  9. Deploy management software
  10. Test connectivity to all 3 plinths + Q-SYS
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## Technical Support Resources

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### Qotom Support:

- Website: qotom.net/support
- Email: Available on website
- Forums: ServeTheHome, pfSense forums (extensive community)
- Documentation: Available for download

### Community Resources:

- **pfSense Forum:** Extensive Qotom discussions
- **OPNsense Forum:** Configuration examples
- **ServeTheHome:** Hardware reviews and comparisons
- **Reddit:** r/homelab, r/PFSENSE (user experiences)

## Comparison to Original (Incorrect) Recommendation

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Aspect	Original (INCORRECT)	Corrected (Qotom Q355G4)
<b>Ethernet Ports</b>	2 native (insufficient)	4 native (correct requirement)
<b>Solution</b>	Required USB adapters	No adapters needed
<b>Reliability</b>	USB adapters = failure points	Single integrated device
<b>Cost</b>	$\sim \$535 + \$45 \text{ (adapters)} = \$580$	\$470 (no adapters)
<b>Complexity</b>	USB drivers, multiple devices	Single device, simpler
<b>Cooling</b>	Low-noise fan	Completely fanless
<b>Power</b>	65W + adapter power	36W total

**Result:** New recommendation is **better, cheaper, and simpler** while correctly meeting all requirements.

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## Summary

- ✓ **ISSUE CORRECTED:** Original 2-port hardware replaced with proper 4-port solutions
- ✓ **TWO OPTIONS PROVIDED:** Detailed specs, dimensions, costs, pros/cons for each
- ✓ **PRIMARY RECOMMENDATION:** Qotom Q355G4 - \$470, fanless, industrial-grade, proven
- ✓ **DIMENSIONS PROVIDED:** Exact rack mounting specifications for vendor
- ✓ **COSTS UPDATED:** Complete BOM with all four configuration options

**PROCUREMENT GUIDANCE:** Where to buy, what to verify, lead times

**VENDOR ACTION ITEMS:** Clear checklist for rack layout planning

**The document is now accurate, complete, and ready for vendor use.**

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## Files Updated

### 1. **jewellery\_box\_system\_recommendations.md**

- Sections updated: Executive Summary, 3.1-3.4, 7.2, 7.6, 13.1-13.7
- New content: ~3,500 words of corrected specifications
- Correction notices added throughout

### 2. **CORRECTION\_SUMMARY.md** (this file)

- Complete summary of changes
- Procurement guidance
- Technical justifications

**All information verified against manufacturer specifications from web research conducted November 3, 2025.**