Comprehensive Home Network and Ethereum Infrastructure Recommendation

This recommendation provides a complete solution for your home network and Ethereum infrastructure, optimizing for security, performance, and maintainability.

Network Infrastructure

Internet Connection

- **AT&T Fiber 1000** - maintain existing service
- **BGW320-505 Gateway** - configure in IP Passthrough mode

Core Networking

- **Router**: NETGEAR Orbi RBR850 (Wi-Fi 6 AX6000)
  - Superior performance over existing model
  - Better processor for VPN and security features
  - Multiple 2.5Gbps Ethernet ports
  - Enhanced security features
- **Primary Switch**: NETGEAR ProSafe Plus JGS524Ev2 (keep existing)
  - Maintain current configuration with proper VLAN settings
  - Reserve ports 1-5 for general devices (VLAN 10)
  - Reserve ports 6-10 for IoT devices (VLAN 20)
  - Reserve ports 11-15 for home server (VLAN 30)
  - Reserve ports 16-20 for Ethereum server (VLAN 50)
  - Use port 24 as trunk to secondary switch
- **Secondary Switch**: NETGEAR ProSafe Plus JGS524Ev2 (keep existing)
  - Mirror VLAN configuration from primary switch
  - Use port 24 as trunk to primary switch

Network Security Appliance (Optional Upgrade)

- **pfSense Plus Appliance**: Netgate 6100
  - Replaces routing functionality of Orbi
  - Advanced firewall capabilities
  - Intrusion detection/prevention
  - Detailed traffic analytics
  - Enhanced VPN options

Home Server Build

Case & Chassis

- **Fractal Design Define 7**
  - Excellent noise dampening
  - Flexible drive mounting options
  - Superior cable management
  - Filtered air intakes

Core Components

- **Motherboard**: Supermicro X11SCL-F
  - IPMI for remote management
  - ECC memory support
  - Multiple PCIe expansion slots
  - Reliable server-grade components
- **CPU**: Intel Xeon E-2336 (6C/12T, 2.9GHz base, 4.8GHz turbo)
  - Excellent balance of single-thread and multi-thread performance
  - 65W TDP for reasonable power consumption
  - Server-grade reliability
- **Memory**: 64GB (4×16GB) Kingston ECC DDR4-3200
  - Error correction for critical services
  - Sufficient capacity for VMs, containers, and monitoring services
  - Room for future expansion

Storage Configuration

- **System Storage**:
  - 2×500GB Samsung 980 Pro NVMe (RAID 1)
  - Hardware-accelerated data integrity verification
  - Fast boot and application loading
- **Primary Data Storage**:
  - 4×4TB Western Digital Red Plus (RAID 10)
  - 8TB usable capacity with redundancy
  - Optimized for 24/7 operation
  - Reasonable balance of performance and capacity
- **Backup Storage**:
  - 2×8TB Western Digital Red Pro (RAID 1)
  - Dedicated to backing up Ethereum node and other critical data
  - Enterprise-grade reliability
  - Hot-swappable drive bays

Additional Components

- **Power Supply**: Corsair RM750x (750W, 80+ Gold)
  - Fully modular for clean cable management
  - High efficiency even at low loads
  - Silent operation with zero-fan mode
  - 10-year warranty
- **Cooling**: Noctua NH-U12A CPU cooler + 2× Noctua NF-A14 PWM fans
  - Superior cooling performance
  - Very quiet operation
  - PWM control for dynamic fan speeds
- **Network Adapter**: Intel X550-T2 10GbE dual-port
  - Future-proof 10Gbps connectivity
  - Dual ports for network redundancy
  - One port for management VLAN, one for data VLAN
- **UPS**: APC Smart-UPS 1500VA LCD
  - Pure sine wave output
  - Network management card
  - USB and serial connectivity
  - Runtime monitoring
  - Automatic shutdown capability

Ethereum Server Build

Server Chassis

- **Supermicro SuperChassis 836BA-R920B 3U**
  - 16 hot-swap 3.5" drive bays
  - Redundant 920W power supplies
  - 7 low-profile expansion slots
  - Excellent cooling design
  - Rack-mountable for future datacenter migration

Core Components

- **Motherboard**: Supermicro X12SPL-F
  - Single socket Intel LGA 4189
  - Intel C621A chipset
  - BMC with IPMI 2.0 and KVM-over-IP
  - Multiple PCIe 4.0 slots
  - Room for expansion
- **CPU**: Intel Xeon Silver 4310 (12C/24T, 2.1GHz base, 3.3GHz turbo)
  - Efficient performance for blockchain operations
  - Support for Intel SGX security extensions
  - 120W TDP
  - Server-grade reliability
- **Memory**: 128GB (4×32GB) Samsung ECC DDR4-3200 RDIMM
  - Registered ECC for maximum reliability
  - Ample capacity for blockchain data caching
  - 8 DIMM slots total for future expansion

Storage Configuration

- **System Storage**:
  - 2×480GB Intel D3-S4520 Enterprise SATA SSD (RAID 1)
  - Power loss protection
  - 5-year warranty
  - 3.6 DWPD endurance rating
- **Blockchain Data Storage**:
  - 4×1.92TB Samsung PM9A3 NVMe SSD (RAID 10)
  - Exceptional performance for blockchain operations
  - 1.3 DWPD endurance rating
  - PCIe 4.0 interface
  - Hardware-level power loss protection
- **Backup Staging**:
  - 2×4TB Western Digital Ultrastar DC HC310 (RAID 1)
  - Enterprise-class reliability
  - Temporary storage for backups before transfer

RAID Controller

- **Broadcom MegaRAID 9460-16i**
  - 8GB cache with BBU
  - Hardware RAID acceleration
  - SSD caching support
  - Consistent performance with power failure protection

Additional Components

- **Power Supply**: Redundant 920W (included in chassis)
  - Hot-swappable
  - N+1 redundancy
  - 80+ Platinum efficiency
- **Network Adapter**: Mellanox ConnectX-5 EN
  - Dual-port 25GbE SFP28
  - Hardware offloading capabilities
  - Ultra-low latency
  - Future-proof connectivity
- **UPS**: APC Smart-UPS SRT 2200VA
  - Double-conversion online UPS
  - Extended runtime capability
  - Network management card
  - Pure sine wave output

Software Infrastructure

Home Server

- **Base OS**: Ubuntu Server 22.04 LTS
  - Long-term support
  - Excellent package availability
  - Enterprise-grade stability
- **Virtualization**: Proxmox VE
  - KVM-based virtualization
  - Container support via LXC
  - Comprehensive web UI
  - Backup and snapshot capabilities
  - Clustering capabilities for future expansion
- **Monitoring Stack**:
  - Prometheus for metrics collection
  - Grafana for visualization
  - Alertmanager for notifications
  - Node Exporter for system metrics
  - Blackbox Exporter for endpoint monitoring
- **Storage Management**:
  - ZFS on Linux for advanced data protection
  - Scheduled snapshots
  - Data integrity verification
  - Compression and deduplication
- **Backup Solution**:
  - Borg Backup for efficient, encrypted backups
  - Scheduled with systemd timers
  - Off-site replication
  - Regular integrity verification
- **Security Services**:
  - Fail2ban for intrusion prevention
  - Suricata IDS/IPS for network security
  - Wazuh for HIDS/OSSEC
  - ClamAV for malware scanning
- **VPN Solution**:
  - WireGuard for modern, secure remote access
  - Split-tunnel configuration
  - Mobile device support

Ethereum Server

- **Base OS**: Ubuntu Server 22.04 LTS
  - Minimal installation
  - Security-focused configuration
  - Automatic security updates
- **Ethereum Client**: Geth (Go Ethereum)
  - Full node configuration
  - Pruned sync mode for efficiency
  - JSON-RPC and WebSocket APIs available via secured channels
  - Metrics enabled for Prometheus
- **Security Hardening**:
  - SELinux/AppArmor for mandatory access control
  - UFW firewall with minimal required ports
  - SSH key-based authentication only
  - Regular security audits via Lynis
- **Monitoring**:
  - Node Exporter for system metrics
  - Geth metrics exposure on private endpoint
  - Custom exporters for blockchain-specific metrics
- **Backup System**:
  - Scheduled blockchain data backups to home server
  - Chain state validation after backup
  - Secure keystore management
  - Cold backup storage for critical data

Physical Infrastructure

Rack System (Optional)

- **Rack Cabinet**: 12U-18U enclosed wall-mount rack
  - Lockable front and rear doors
  - Proper ventilation
  - Noise dampening if placed in living space

Power Management

- **Power Distribution**: APC Metered Rack PDU
  - Power usage monitoring
  - Individual outlet control
  - Surge protection
- **UPS Systems**: As specified above
  - Properly sized for load
  - Pure sine wave output
  - Network monitoring

Cooling Considerations

- **Active Cooling**: If in a closet/utility room
  - Small exhaust fan
  - Temperature monitoring
  - Automatic alerts for high temperature
- **Acoustic Management**: For living space installation
  - Sound dampening material
  - Anti-vibration mounts
  - Low-noise fans where possible

Network Configuration

VLAN Structure

- **VLAN 10**: General Computing (192.168.10.0/24)
  - Personal computers
  - Mobile devices
  - General-purpose computing
- **VLAN 20**: IoT Devices (192.168.20.0/24)
  - Smart home devices
  - Media streaming devices
  - Home automation
- **VLAN 30**: Home Server (192.168.30.0/24)
  - Management interfaces
  - Backup services
  - Monitoring systems
- **VLAN 40**: Management (192.168.40.0/24)
  - Network equipment management
  - IPMI interfaces
  - Out-of-band management
- **VLAN 50**: Ethereum (192.168.50.0/24)
  - Ethereum node
  - Blockchain-related services
  - Completely isolated

Routing and Firewall

- **Inter-VLAN Access**:
  - VLAN 30 ↔ VLAN 50: Controlled access for monitoring and backup
  - VLAN 40 ↔ All VLANs: Management access only
  - VLAN 10 → Internet: Unrestricted
  - VLAN 20 → Internet: Filtered
  - VLAN 50 → Internet: Highly restricted (only Ethereum P2P)

Monitoring and Maintenance Plan

Regular Maintenance Tasks

- **Weekly**:
  - Review system logs
  - Check backup integrity
  - Monitor system resources
  - Update non-critical packages
- **Monthly**:
  - Apply firmware updates
  - Full security audit
  - Test disaster recovery procedures
  - Storage health checks
- **Quarterly**:
  - Full backup verification
  - Network security penetration testing
  - Hardware inspection
  - Performance optimization

Monitoring Dashboard

- **System Health Overview**:
  - CPU, memory, disk, and network usage
  - Temperature and fan speeds
  - Power consumption
  - UPS status
- **Ethereum-Specific Metrics**:
  - Sync status
  - Peer count
  - Block processing time
  - Transaction pool status
  - Gas price tracking
- **Security Monitoring**:
  - Failed login attempts
  - Firewall blocks
  - Intrusion detection alerts
  - Security scan results

Disaster Recovery Plan

Backup Strategy (3-2-1 Rule)

- **3 Copies of Data**:
  - Primary copy on production system
  - Secondary copy on home server
  - Tertiary off-site or cold storage copy
- **2 Different Media Types**:
  - SSD/NVMe for primary storage
  - HDD for backup storage
- **1 Off-site Copy**:
  - Encrypted cloud backup (optional)
  - Physical off-site storage

Recovery Scenarios

- **Ethereum Node Failure**:
  - Documented recovery procedure
  - Tested restoration process
  - Blockchain validation steps
- **Home Server Failure**:
  - Backup configuration files
  - Documented rebuilding process
  - Critical service restoration priority list
- **Network Infrastructure Failure**:
  - Backup configurations for all devices
  - Emergency access procedures
  - Temporary connectivity solutions

Budget Considerations

Total Estimated Cost

- **Network Infrastructure**: $500-800 (if upgrading)
- **Home Server**: $2,000-2,500
- **Ethereum Server**: $4,000-5,000
- **Additional Equipment**: $1,500-2,000
- **Total Investment**: $8,000-10,300

Cost-Saving Alternatives

- **Use consumer-grade hardware** for home server if budget is tight
- **Start with a single high-end server** and use virtualization to separate functions
- **Lease cloud resources** temporarily until you can build physical infrastructure
- **Purchase previous-generation enterprise hardware** at significant discount

Implementation Roadmap

Phase 1: Network Foundation

- Configure AT&T gateway in passthrough mode
- Set up VLAN segmentation on switches
- Implement basic firewall rules
- Deploy VPN solution

Phase 2: Home Server Deployment

- Build and configure home server
- Deploy virtualization platform
- Set up monitoring infrastructure
- Implement backup solutions

Phase 3: Ethereum Infrastructure

- Build and harden Ethereum server
- Deploy Ethereum node in test configuration
- Integrate with monitoring systems
- Implement security controls

Phase 4: Fine-Tuning and Optimization

- Security auditing and hardening
- Performance optimization
- Documentation and knowledge base creation
- Regular maintenance schedule establishment

Conclusion

This comprehensive design provides a secure, reliable, and performant infrastructure for both home server operations and Ethereum node hosting. The layered security approach, robust monitoring, and redundant systems ensure maximum uptime and data protection. The modular approach allows for phased implementation and future expansion as needs evolve.