QNNX System Architecture & Workflow Report

This report documents the system architecture and workflow of the QNNX network as depicted in the provided flowchart. The system is divided into multiple layers, each responsible for specific roles, ensuring modularity, scalability, and secure interactions among entities.

1. Core Infrastructure Layer

This foundational layer handles registration, identity management, secure communication, and metrics collection. It includes:

a. Registry & Accreditation (REG)

- Responsible for onboarding all participants (buyers and sellers).
- Maintains a directory of verified and accredited nodes.

b. Identity & Access Management (IAM)

- Ensures secure authentication and role-based access control.
- Applies rate-limiting policies to prevent abuse of services.

c. API Gateway (APIGW)

- Acts as a single entry point for API requests from applications.
- Provides routing, throttling, and observability features.

d. Analytics & Reporting (METRICS)

- Collects usage and feedback data from buyer and seller interactions.
- Enables performance tracking and system optimization.

2. Protocol Layer

This layer ensures interoperability and communication standardization between network participants.

a. QNNX Protocol (BECKN)

- Standard set of open APIs for e-commerce and logistics.
- Powers the underlying communication for discoverability, transaction, and order management.

b. QNNX Network Extension Layer (EXT)

- Acts as a translation/middleware layer between the API Gateway and protocol layer.
- Facilitates enhanced routing, validation, and protocol compliance.

3. Application Layer

Contains all network-facing apps and services for buyers and sellers.

a. Participants: Buyers

i. Buyer App (BUYER)

- Front-facing app used by consumers to search, initiate, and manage orders.
- Interacts with the Gateway for service discovery and transaction execution.

ii. Gateway (GW)

- Responsible for service discovery.
- Multicasts search requests across seller nodes and aggregates responses.
- Facilitates the selection, initialization, and confirmation of transactions.

b. Participants: Sellers

i. Marketplace Seller Node (MSN)

- Offers listed goods from multiple suppliers.
- Responds to discovery, order, and fulfillment APIs.

ii. Inventory Seller Node (ISN)

- Represents sellers who own/manage their own inventory.
- Similar to MSN but typically handles direct inventory.

4. Additional Ecosystem Partners

a. Payment Network Partner (PAYNET)

- Handles payment transactions.
- Sends payment status updates back to the buyer application.

b. Logistics Partner (LOGI)

- Fulfills and updates order shipment and delivery status.
- Communicates directly with the buyer for real-time tracking.

5. Workflow Breakdown

1. Onboarding & Identity

- Buyer and seller nodes (MSN, ISN) onboard through `REG`.
- Authentication and rate-limiting through `IAM`.

2. Search & Discovery

- Buyer sends query (e.g., "search biscuits near me") to `GW`.
- `GW` multicasts the query to seller nodes (`MSN` and `ISN`).
- Responses (`on_search`) are aggregated by `GW` and returned to the buyer.

3. Order Transaction

- Buyer selects, initiates, and confirms order via `GW`.
- `GW` relays these operations to relevant seller nodes.
- MSN/ISN return a signed transaction contract to the buyer.

4. Payment & Fulfillment

- Buyer sends payment request to `PAYNET`.
- `PAYNET` returns status.
- Seller nodes forward order details to `LOGI`.
- `LOGI` manages shipping and updates buyer.

5. Feedback & Metrics

- Buyer can send support requests or ratings to sellers.
- Buyer feedback and seller usage data are sent to `METRICS` for analytics.

6. Interaction Mapping

Component	Interacts With	Purpose
BUYER	REG, IAM, APIGW, GW, PAYNET, METRICS	Search, order, authenticate, pay, give feedback

MSN/ISN	REG, IAM, APIGW, GW, LOGI, METRICS	Onboard, respond to orders, fulfill logistics, provide usage data
GW	BUYER, MSN, ISN	Discovery, transaction facilitation
APIGW	EXT	API routing to protocol layer
EXT	BECKN	Protocol translation and validation
LOGI	BUYER	Order tracking
PAYNET	BUYER	Payment processing
METRICS	BUYER, MSN, ISN	Feedback and analytics

Conclusion

This architecture ensures a modular, interoperable, and scalable network where buyers and sellers interact seamlessly over a secure and standards-compliant infrastructure. The use of a layered design and standardized protocol facilitates wide adoption, vendor neutrality, and robust system evolution.