P2P Network Basics 🌐

The `P2PNet` library provides the core functionality for building and managing a peer-to-peer network. It includes classes and methods for peer discovery, connection management, data exchange, and network routines. This document provides a broad overview of the peer network basics.

Initialization

The `PeerNetwork` class is the main entry point for initializing and managing the peer-to-peer network. It sets up the necessary configurations and services required for network operations.

1. **Configuration**: The application reads configuration settings from the provided parameters. This includes settings for designated ports, inbound peer acceptance, and trust policies.
2. **Logging**: Logging is configured to use a plain text format and is activated to capture important events and errors.
3. **Local Address Loading**: The application scans all network interface devices and collects essential information needed for the peer network, such as public IP addresses.

Operation

The `PeerNetwork` class operates by providing several key functionalities:

1. **Peer Discovery and Connection**: The peer network supports both LAN and WAN peer discovery. It uses broadcasting and multicasting to discover peers within the network and establishes connections with them.

    - **LAN Discovery**: The application can broadcast and discover peers within the local network.
    - **WAN Discovery**: The application can discover peers over the wide area network using designated ports and WAN components.
2. **Peer Management**: The peer network manages a list of known peers and active peer channels. It supports adding, removing, and elevating peer permissions.

    - **Known Peers**: A list of peers that have been discovered and are known to the network.
    - **Active Peer Channels**: A list of active peer channels that are currently connected and exchanging data.
3. **Data Exchange**: The peer network supports data exchange between peers using peer channels. It handles sending and receiving data, as well as processing incoming packets.

    - **Peer Channels**: Represents a communication channel between two peers. It handles the sending and receiving of data packets.

Routines

The `NetworkRoutines` class provides a mechanism for managing network routines. Routines are tasks that run at specified intervals to perform various network-related operations.

1. **Routine Management**: The `NetworkRoutines` class manages a dictionary of routines and provides methods for adding, starting, stopping, and setting the interval of routines.
    - **Default Routines**: The application initializes with default routines, such as rotating broadcast ports and discerning peer channels.
    - **Custom Routines**: Users can add custom routines to perform specific tasks.

Routines are accessed using their `RoutineName` property. This is automatically handled when they are added as network routines.

Trust Policies

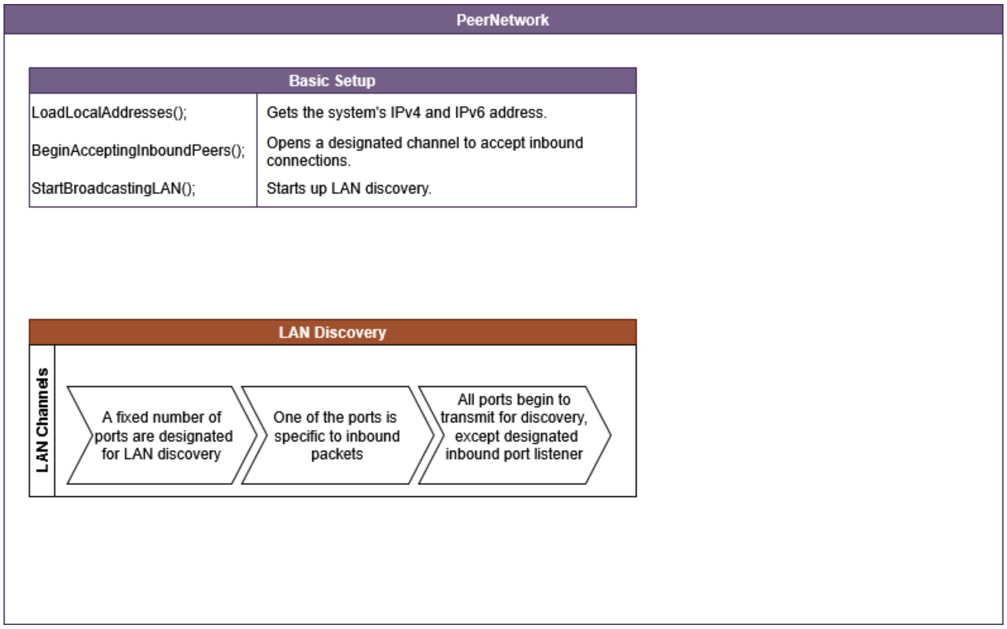
The `PeerNetwork` class includes trust policies for managing incoming peer connections and bootstrap connections.

1. **Incoming Peer Trust Policy**: Handles trust and permissions for incoming peer connections. It supports different modes for handling inbound peers, such as queue-based and event-based.
2. **Bootstrap Trust Policy**: Handles trust and permissions for bootstrap connections. It supports different trust policies, such as trustless and authority-based connections.

Diagrams

To supplement the information visually, the following diagrams are provided:

1. **Peer Network Architecture**: Shows the overall architecture of the peer network, including its interaction with peers and network routines.
2. **Peer Discovery Flow**: Illustrates the flow of peer discovery, from broadcasting to establishing connections and managing peer channels.



PeerNetwork

Basic Setup

LoadLocalAddresses();	Gets the system's IPv4 and IPv6 address.
BeginAcceptingInboundPeers();	Opens a designated channel to accept inbound connections.
StartBroadcastingLAN();	Starts up LAN discovery.

LAN Discovery

LAN Channels

A fixed number of ports are designated for LAN discovery

One of the ports is specific to inbound packets

All ports begin to transmit for discovery, except designated inbound port listener

subject to change

Namespace P2PBootstrap

Classes

GlobalConfig

Program