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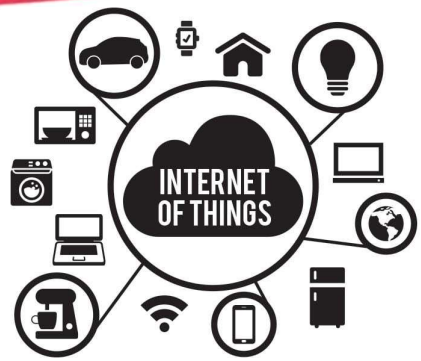


Department of Information Technology

19ITT302 - INTERNET OF THINGS

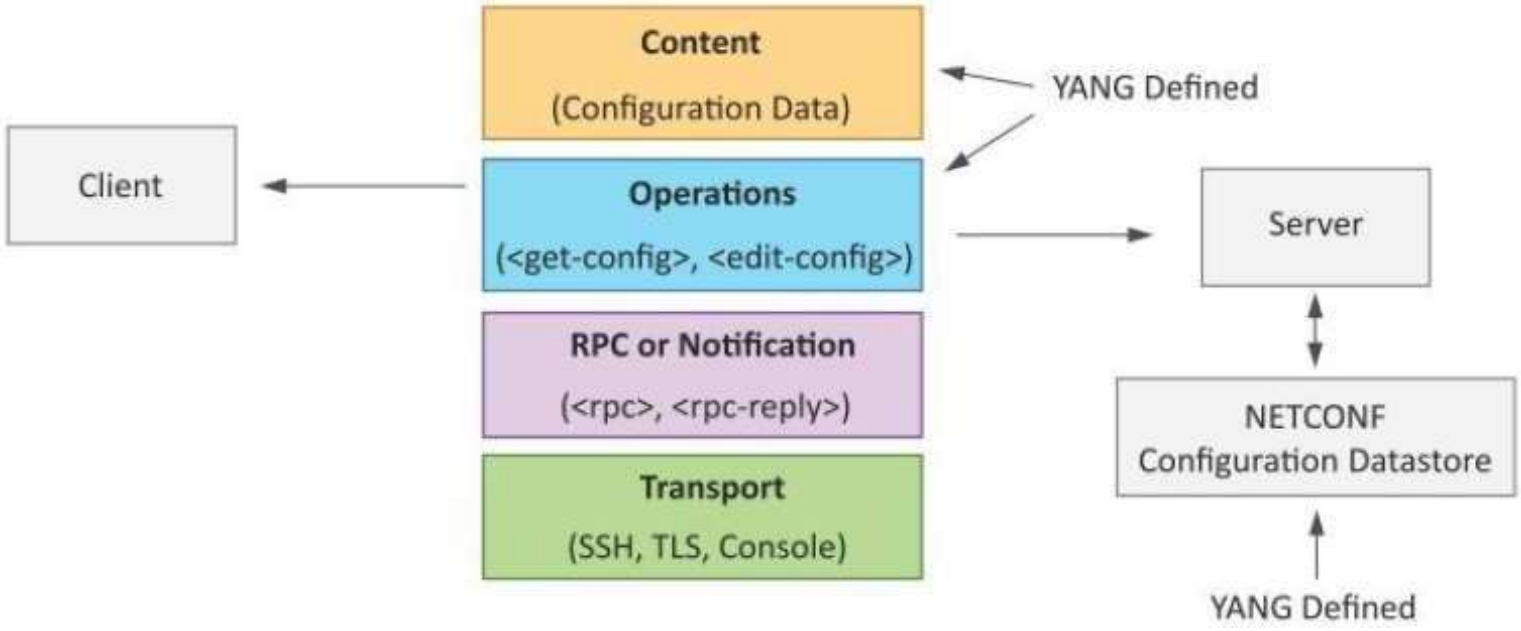
III B.Tech. IT/ V SEMESTER

UNIT V: DESIGN METHODOLOGY & FUTURE TRENDS

IoT System Management with NETCONF-YANG: Need for IoT Systems Management – Simple Network Management Protocol (SNMP) –Limitations of SNMP, Network Operator Requirements- NETCONF-YANG-IoT Systems Management with NETCONF-YANG -IoT Platforms Design Methodology - IoT Physical Devices & Endpoints - Raspberry Pi- Linux on Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Designing a RESTfulWebAPI - Amazon Web Services for IoT

NETCONF

Network Configuration Protocol (NETCONF) is a session-based network management protocol. NETCONF allows retrieving state or configuration data and manipulating configuration data on network devices



NETCONF

- NETCONF works on SSH transport protocol.
- Transport layer provides end-to-end connectivity and ensure reliable delivery of messages.
- NETCONF uses XML-encoded Remote Procedure Calls (RPCs) for framing request and response messages.
- The RPC layer provides mechanism for encoding of RPC calls and notifications.
- NETCONF provides various operations to retrieve and edit configuration data from network devices.
- The Content Layer consists of configuration and state data which is XML-encoded.
- The schema of the configuration and state data is defined in a data modeling language called YANG.
- NETCONF provides a clear separation of the configuration and state data.
- The configuration data resides within a NETCONF configuration datastore on the server.

NETCONF

Operation	Description
connect	Connect to a NETCONF server
get	Retrieve the running configuration and state information
get-config	Retrieve all or a portion of a configuration datastore
edit-config	Loads all or part of a specified configuration to the specified target configuration
copy-config	Create or replace an entire target configuration datastore with a complete source configuration
delete-config	Delete the contents of a configuration datastore
lock	Lock a configuration datastore for exclusive edits by a client
unlock	Release the lock on a configuration datastore
get-schema	This operation is used to retrieve a schema from the NETCONF server
commit	Commit the candidate configuration as the device's new current configuration
close-session	Gracefully terminate a NETCONF session
kill-session	Forcefully terminate a NETCONF session

Table 4.1: List of commonly used NETCONF RPC methods

YANG

• YANG is a data modeling language used to model configuration and state data manipulated by the NETCONF protocol

• YANG modules contain the definitions of the configuration data, state data, RPC calls that can be issued and the format of the notifications.

• YANG modules defines the data exchanged between the NETCONF client and server.

• A module comprises of a number of 'leaf' nodes which are organized into a hierarchical tree structure.

• The 'leaf' nodes are specified using the 'leaf' or 'leaf-list' constructs.

• Leaf nodes are organized using 'container' or 'list' constructs. A YANG module can import definitions from other modules.

• Constraints can be defined on the data nodes, e.g. allowed values.

• YANG can model both configuration data and state data using the 'config' statement.

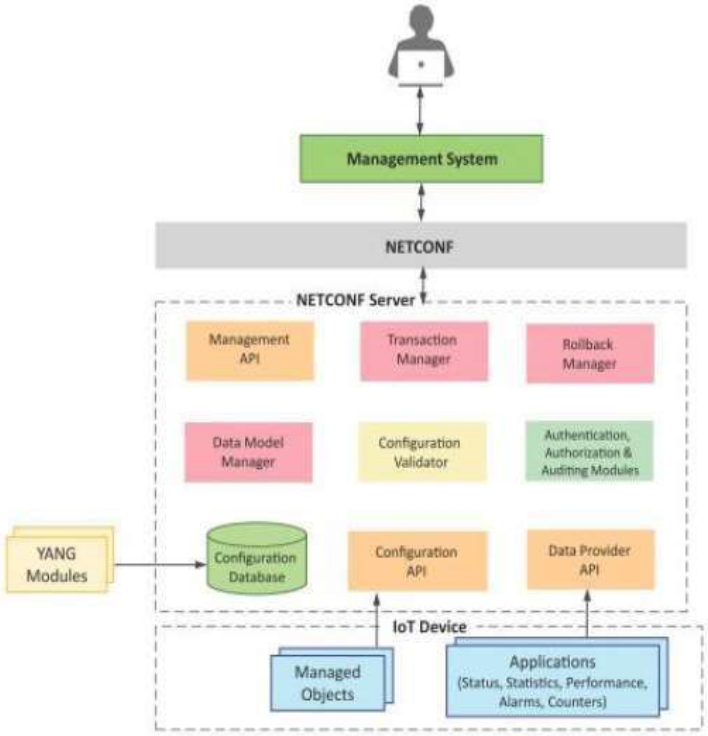
YANG

Node Type	Description
Leaf Nodes	Contains simple data structures such as an integer or a string. Leaf has exactly one value of a particular type and no child nodes.
Leaf-List Nodes	Is a sequence of leaf nodes with exactly one value of a particular type per leaf.
Container Nodes	Used to group related nodes in a subtree. A container has only child nodes and no value. A container may contain any number of child nodes of any type (including leafs, lists, containers, and leaf-lists).
List Nodes	Defines a sequence of list entries. Each entry is like a structure or a record instance, and is uniquely identified by the values of its key leafs. A list can define multiple key leafs and may contain any number of child nodes of any type.

Table 4.2: YANG Node Types

IoT Systems Management with NETCONF-YANG

- Management System
- Management API
- Transaction Manager
- Rollback Manager
- Data Model Manager
- Configuration Validator
- Configuration Database
- Configuration API
- Data Provider API



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Thank You!