

بسم الله الرحمن الرحيم

اینترنت اشیا

فصل دوم

اینترنت در IOT و مسیریابی اینترنت

استاد جناب آقای دکتر سید امیر هادی مینوفام
ارائه دهنده : محمد عزت زاده

مقدمه

برای ایجاد ارتباط موثر نیاز به اینترنت حس می شود
در این بخش به معرفی پروتکل های شبکه و همچنین روش های مسیریابی و
اجزای تشکیل دهنده شبکه می پردازیم

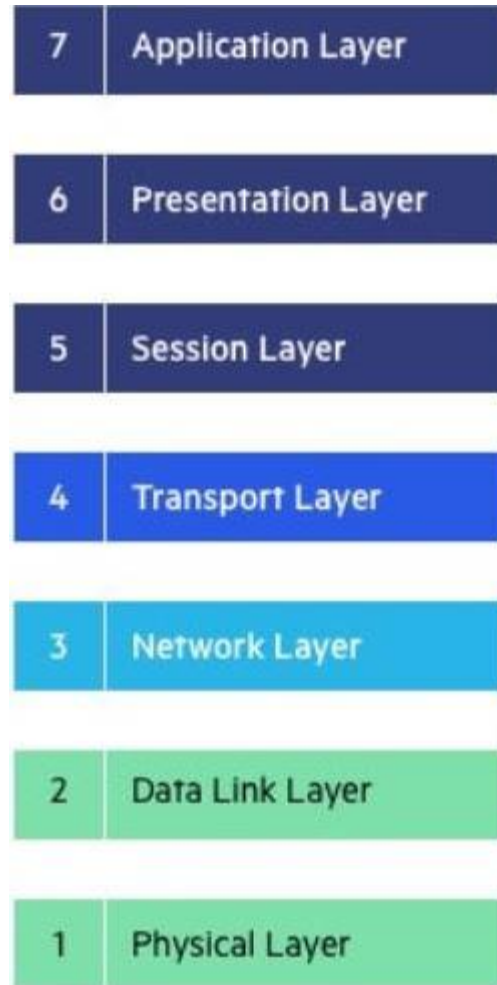
مدل OSI

از مفهوم "تفرقه بینداز و حکومت کن" برای شکستن وظایف بزرگ و پیچیده استفاده می کند.
این مدل لایه ایی می باشد و از 7 لایه تشکیل شده است.

OPEN SYSTEM INTERCONNECTION

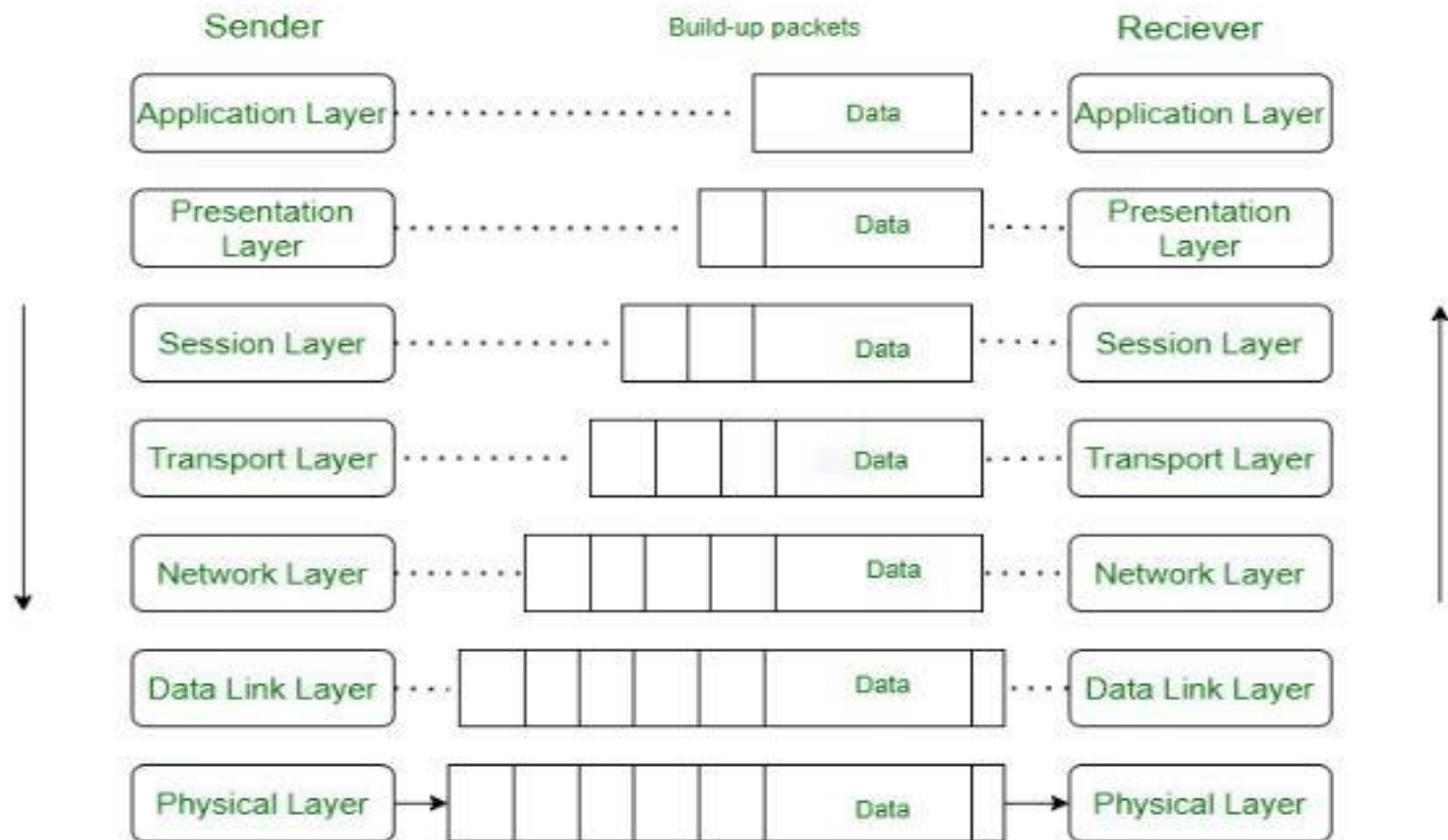
قابلیت ارتباط تمامی اجزا رو با هم فراهم می کند

OSI MODEL



OSI MODEL LAYERS

7	Application Layer	Human-computer interaction layer, where applications can access the network services
6	Presentation Layer	Ensures that data is in a usable format and is where data encryption occurs
5	Session Layer	Maintains connections and is responsible for controlling ports and sessions
4	Transport Layer	Transmits data using transmission protocols including TCP and UDP
3	Network Layer	Decides which physical path the data will take
2	Data Link Layer	Defines the format of data on the network
1	Physical Layer	Transmits raw bit stream over the physical medium



Layer		Protocol data unit (PDU)	Function ^[27]
Host layers	7 Application	Data	High-level protocols such as for resource sharing or remote file access, e.g. HTTP.
	6 Presentation		Translation of data between a networking service and an application; including character encoding, data compression and encryption/decryption
	5 Session		Managing communication sessions, i.e., continuous exchange of information in the form of multiple back-and-forth transmissions between two nodes
	4 Transport	Segment, Datagram	Reliable transmission of data segments between points on a network, including segmentation, acknowledgement and multiplexing
Media layers	3 Network	Packet	Structuring and managing a multi-node network, including addressing, routing and traffic control
	2 Data link	Frame	Transmission of data frames between two nodes connected by a physical layer
	1 Physical	Bit, Symbol	Transmission and reception of raw bit streams over a physical medium

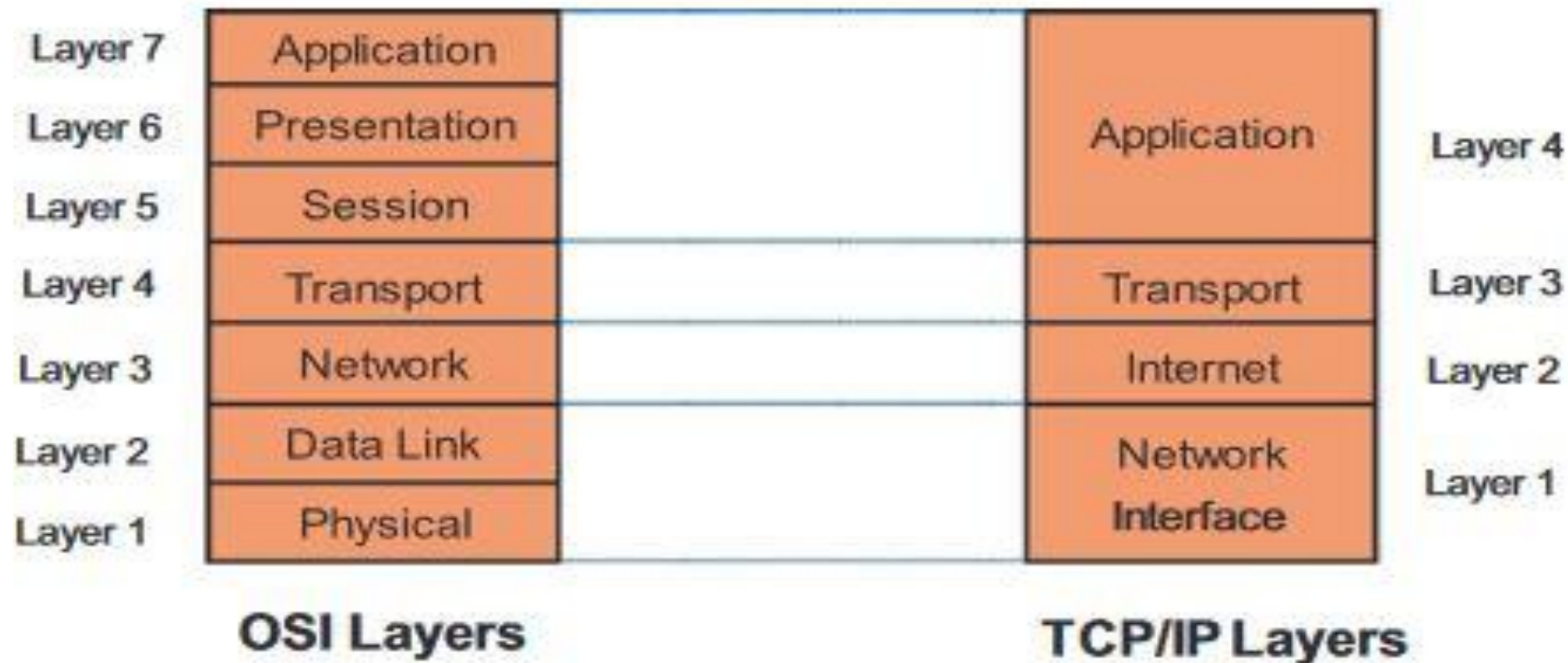
TCP/IP Model

امروزه پروتکل اصلی و مورد استفاده شده tcp/ip می باشد.

دیگر پروتکل ها دیگر قابل استفاده نیستند

این پروتکل از 4 لایه تشکیل شده است

TCP/IP PROTOCOL



OSI Model

Application Layer

Presentation Layer

Session Layer

Transport Layer

Network Layer

Data Link Layer

Physical Layer

TCP/IP Model

Application Layer

Transport Layer

Internet Layer

Network Access
Layer

TCP/IP Protocol Suite

HTTP

SMTP

Telnet

FTP

DNS

RIP

SNMP

TCP

UDP

ARP

IP

IGMP

ICMP

Ethernet

Token
Ring

ATM

Frame
Relay

tcp/ip in depth

در اسلاید بعد نمونه هایی از پروتکل های مختلف در لایه های tcp/ip می پردازیم.
از لایه 2 تا لایه های 4 می شود پروتکل های مختلفی را مثال زد.

Table 2.3 Examples of Internet protocol suite (partial list)

TCP/IP layer	Top protocols
Application layer	BGP, DHCP, DNS, HTTP, IMAP, LDAP, MGCP, POP, ONC/RPC, RTP, RTSP, RIP, SIP, SNMP, SSH, Telnet, SSL, SMTP (Email), XMPP
Transport layer	TCP, UDP, DCCP, SCTP, RSVP
Internet layer	IPv4, IPv6, ICMP, ICMPv6, IGMP, IPsec, OSPF, EIGRP
Network Interface layer	ARP, PPP, MAC

اجزای اصلی روتر (مسیریاب)

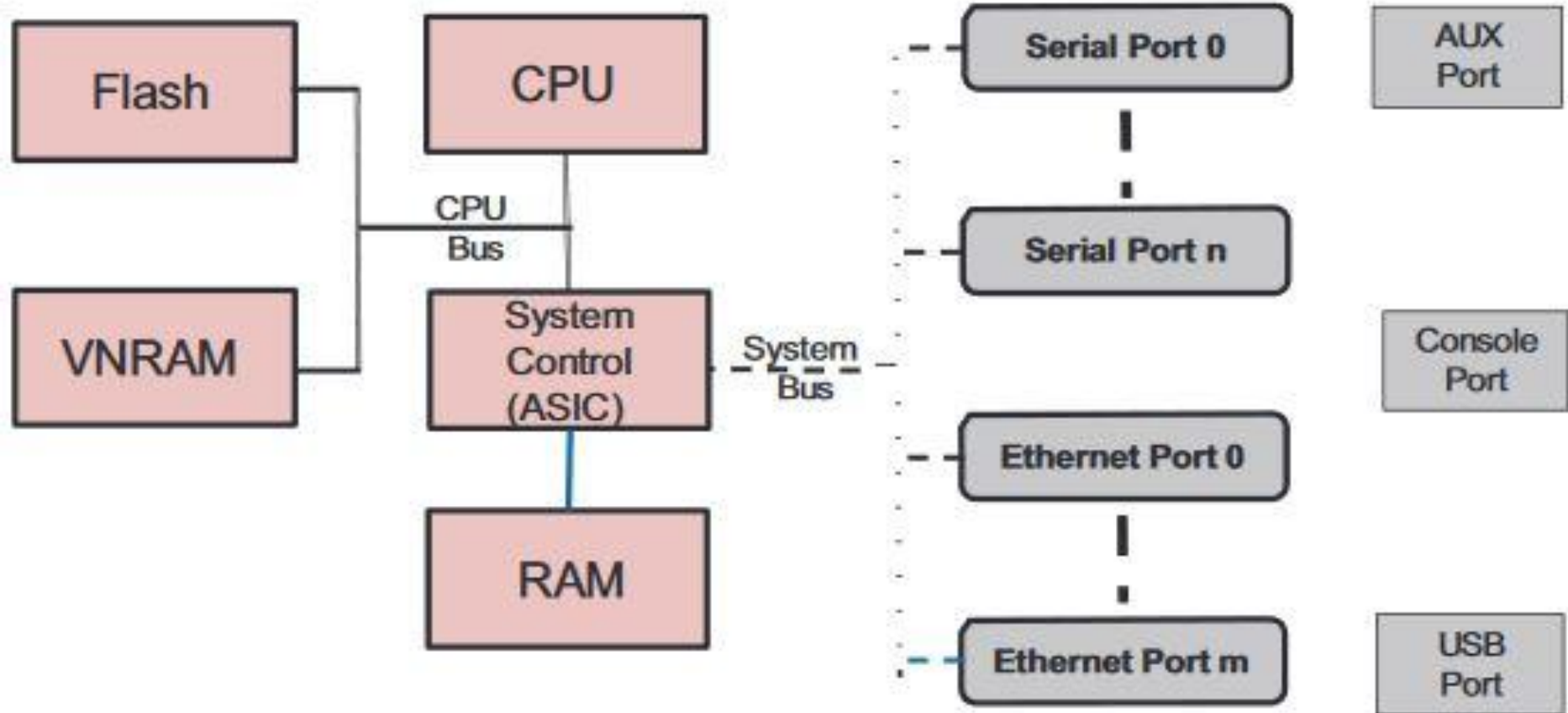


Table 2.2 Main functions of the router's component

Router component	Main function	Volatile/nonvolatile
CPU	Executes operating system commands: initialization, routing, and switching functions	Nonvolatile
RAM	Stores the instruction and data that CPU needs to execute (considered the working area of memory storage used by the CPU) Stores: "running config" file, routing tables, ARP cache, and buffer	Volatile
ROM	Contains <i>code for basic functions</i> to start and maintain the router	Nonvolatile
Flash	Permanently stores the <i>operating system</i> (e.g., where a router finds and boots its IOS image)	Nonvolatile
NVRAM	Stores the "startup config" file, holds configuration register software	Nonvolatile
Interfaces/ports	Routers are accessed and connected to the external world via the interfaces	N/A

رابط های کاربری یک روتر (مسیریاب) Interfaces

Interfaces: Routers are accessed and connected to the external world via the Interfaces.

1. Console (Management) Interface
2. Auxiliary Interface
3. USB Interface
4. Serial Interfaces (Asynchronous and Synchronous)

Ethernet Interface (واسط کاربری اترنت)

Standard/Classical Ethernet: 10 MBPS

Fast Ethernet: 100 MBPS

Gigabit Ethernet: 1000 MBPS

IPV4

- 32-BIT(4 OCTET)
- Subnetting
- IPv4 is the most widely used version of the protocol despite the limitations of its 32-bit address space

Subnetting in ipv4

the process of taking a network and splitting it into smaller networks, known as subnets.

For more information visit this link:

<https://www.cbtnuggets.com/blog/technology/networking/networking-basics-what-is-ipv4-subnetting>

Subnetting in ipv4

IPv4 Classes and Subnet Masks



IPV6

- 128-bit alphanumeric
- IPv6 was designed to overcome ipv4 problems(limitations)
- supports Multicasting
- Ipv6 has no subnetting

IPv6 addressing

Unicast

Multicast

Anycast

Anycast in ipv6

An anycast address is an address that is assigned to a set of interfaces that typically belong to different nodes. A packet sent to an anycast address is delivered to the closest interface (as defined by the routing protocols in use) identified by the anycast address

Routing protocols for ipv6

تمامی الگوریتم های مسیریابی از ipv6 پشتیبانی می کنند. به عنوان مثال RIP-ng برای IPV6 طراحی شده است.

Routing Protocols

Dynamic Routing Protocols

Static Routing Protocols

Dynamic Routing Protocols

Interior routing protocol:

OSPF

EIGRP

RIP

EXTERIOR routing protocol:

BGP

Types of Routing Protocols

Link state:OSPF IS-IS

distance vector:RIP

EIGRP is a hybrid protocol

Distance vector protocols send their entire routing table to directly connected neighbors. Link state protocols send information about directly connected links to all the routers in the network. Distance vector protocols have slow convergence and suffer from the count-to-infinity problem.

سیستم های خودمختار (AS(Autonomous systems)

An autonomous system (AS) is a very large network or group of networks with a single routing policy. Each AS is assigned a unique ASN, which is a number that identifies the AS.

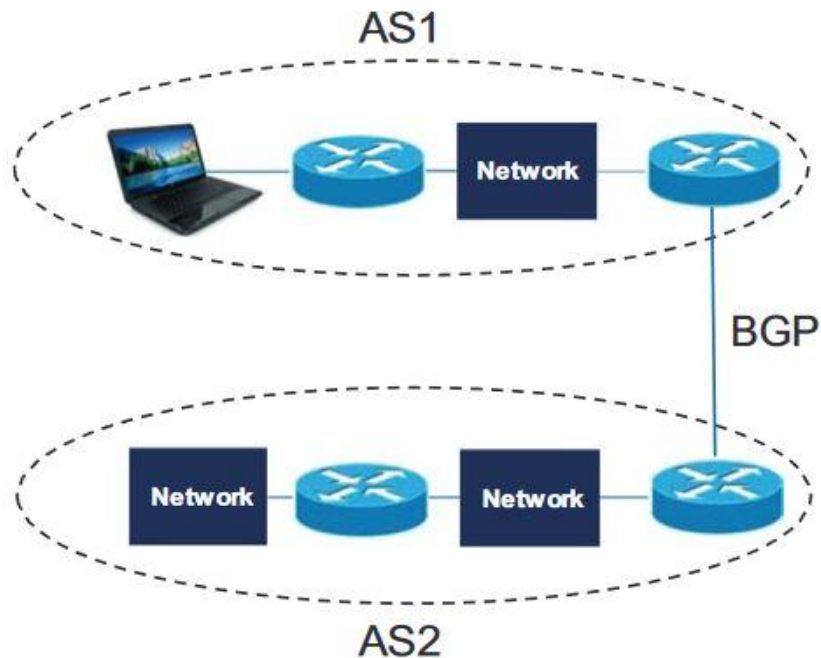
Routing Tables

با استفاده دستور زیر می توانید تمام مسیریابی را در روتر های سیسکو ببینید

Show ip route

مثالی از AS Systems

یک مثال خوب از کاربرد bgp می توان به اینترنت اشاره کرد.



نتیجه گیری

این فصل بر اینترنت در اینترنت اشیا متمرکز شده بود و مباحث زیر به صورت کلی آشنا شدید.

OSI & TCP/IP MODEL

Routers and Routing Protocols

ipv4/ipv6

Resources:

<https://www.imperva.com/learn/application-security/osi-model/>

https://en.wikipedia.org/wiki/OSI_model

<https://www.geeksforgeeks.org/open-systems-interconnection-model-osi/>

<https://www.cisco.com>

<https://www.cloudflare.com/learning/network-layer/what-is-an-autonomous-system/>

<https://www.pluralsight.com/blog/it-ops/dynamic-routing-protocol#:~:text=vs%20Link%20State-,Distance%20vector%20protocols%20send%20their%20entire%20routing%20table%20to%20directly,count%2Dto%2Dinfinity%20problem.>

Internet of things from hype to reality the road to digitization(Springer)

با تشکر از توجه شما

از راهنمایی های جناب آقای دکتر مینوفام تشکر می کنم