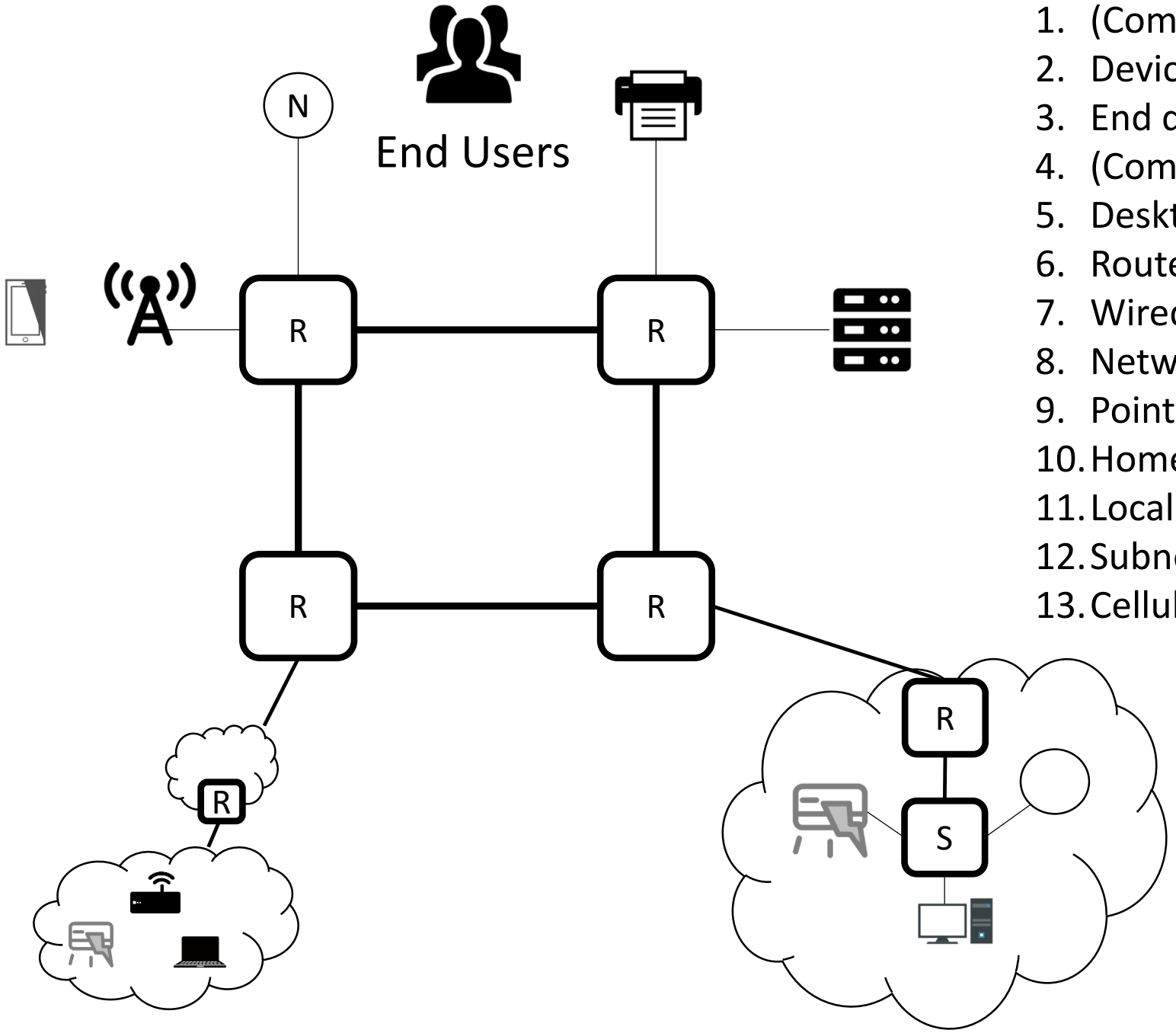
Intro to Computer Networks

Lecture 0 Concepts and overview of computer networks

Dr. Chunhua Chen

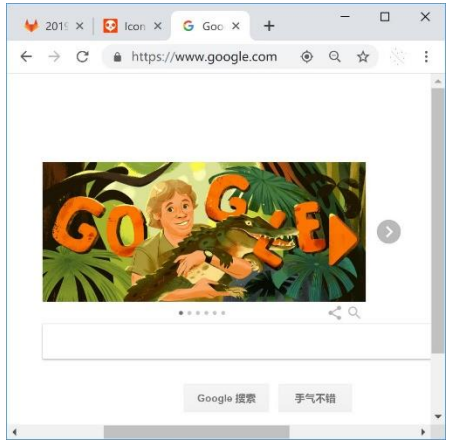
chunhuachen@scut.edu.cn



1. (Computer) Network and Graph (G={N, E})
2. Device/Node
3. End device/Host/Networking device
4. (Communication) Link and up/downlink
5. Desktop, Laptop, smart phone, printer and …
6. Router and Switch
7. Wired/Wireless link and physical media
8. Network Edge/Core and Access network
9. Point of presence and Network Provider
10. Home/Residential/Enterprise network
11. Local Area Network and Wide Area Network
12. Subnet and Gateway
13. Cellular network and Internet of Things

Internet: net + net + …

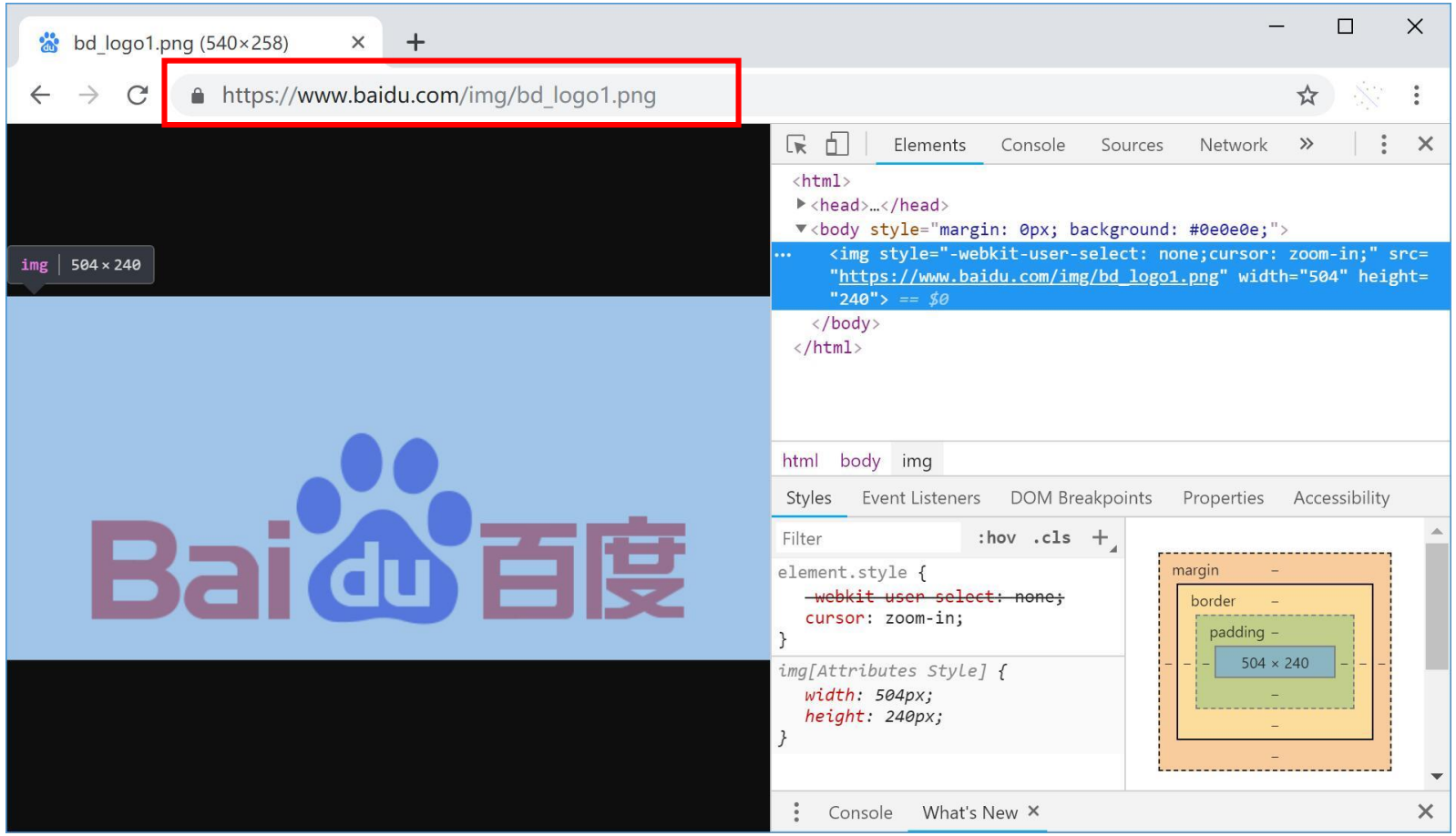
Dr. Chunhua Chen
chunhuachen@scut.edu.cn

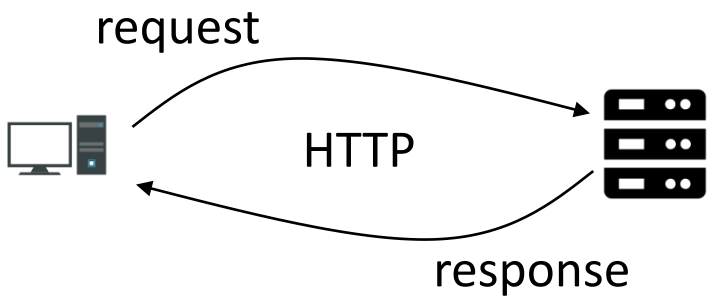


Internet

A computer network facilitates networking devices and data links to connect geographically separated computers together, enabling **sharing of network resources** and **message transmission** by well-established network **protocols** and **applications**.

Dr. Chunhua Chen
chunhuachen@scut.edu.cn

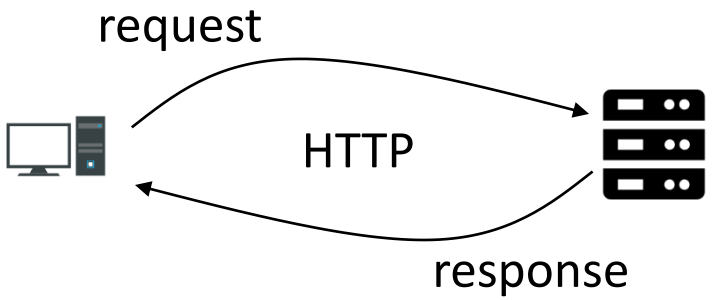




1. **Application**
2. Web browser and Web Server
3. **Network protocol**
4. HTTP
5. **Message transmission**
6. Markup Language and HTML

Dr. Chunhua Chen
chunhuachen@scut.edu.cn

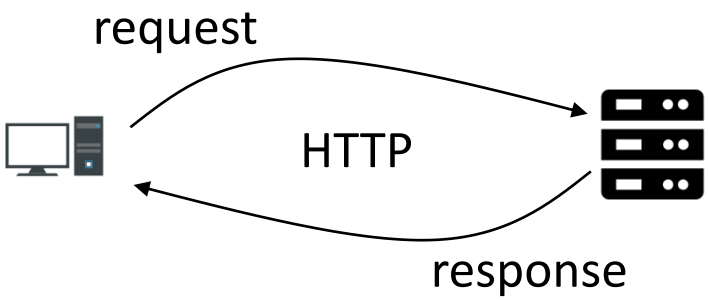
A **network protocol** defines rules and conventions for communication between network devices. That is, it is the language talked by devices.




```
GET /img/bd_logo1.png HTTP/1.1
Host: www.baidu.com
Connection: close
User-agent: Mozilla/5.0
Accept-language: zh-CN
```

```
HTTP/1.1 200 OK
Accept-Ranges: bytes
Age: 3858
Cache-Control: max-age=315360000
Content-Length: 7877
Content-Type: image/png
Date: Wed, 30 Mar 2016 02:41:35 GMT

<html>
<head>
<title>bd_logo1.png (540×258)</title>
</head>
<body style="margin: 0px; background: #0e0e0e;">
<img style="-webkit-user-select: none;cursor: zoom-in;"
src="https://www.baidu.com/img/bd_logo1.png" width="504" height="240"/>
</body>
</html>
```



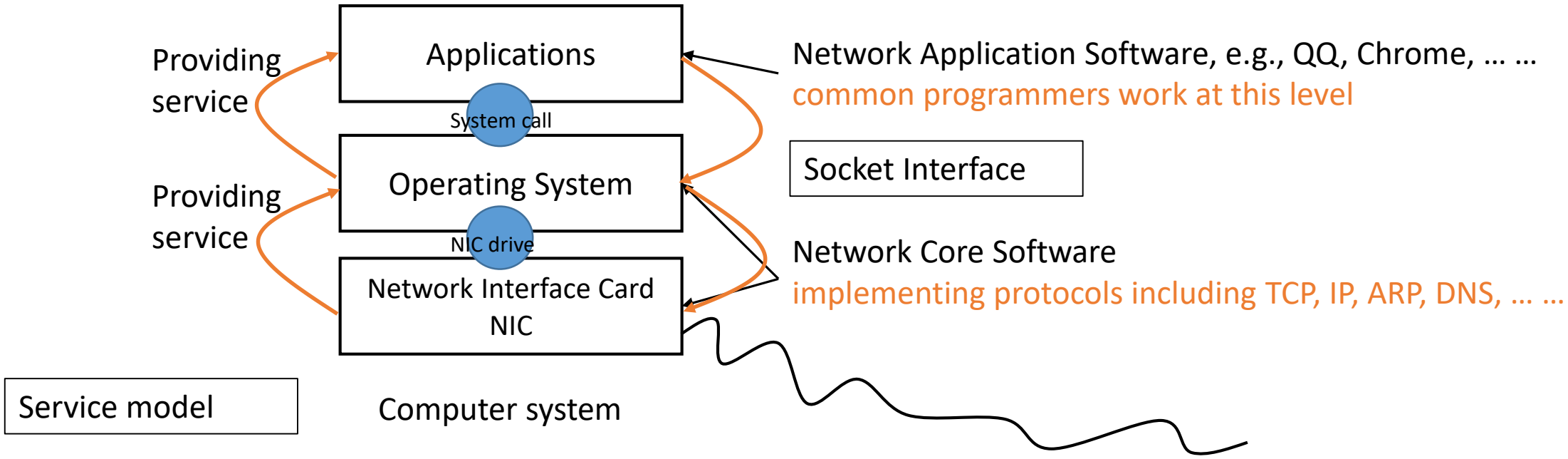
Network protocols include mechanisms for devices to identify and make connections with each other, as well as formatting rules that **specify how data is packaged into messages** sent and received.

HTTP
DNS
TCP
IP and Routing
ARP and Ethernet

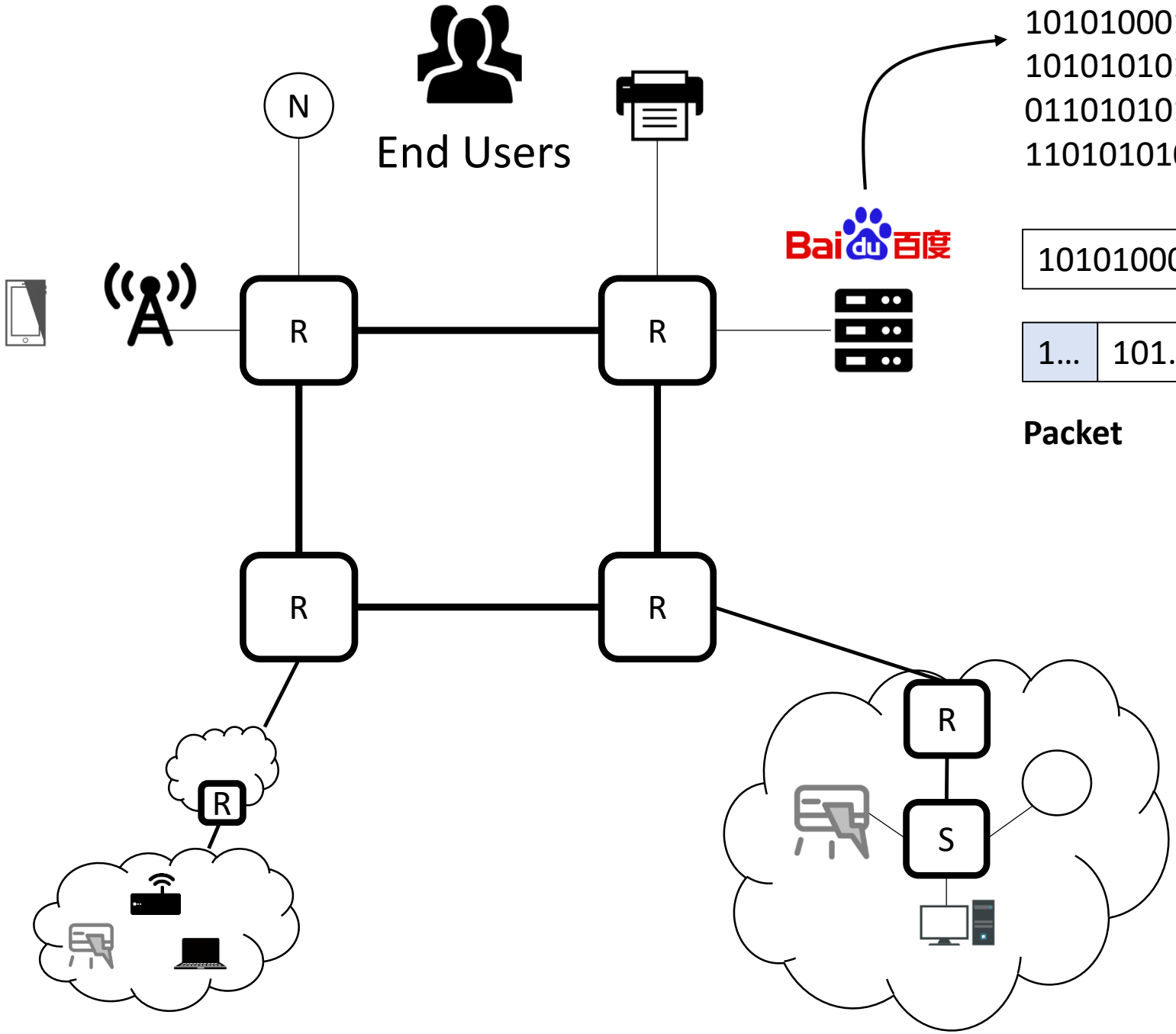
Dr. Chunhua Chen
chunhuachen@scut.edu.cn

Network services and stacks

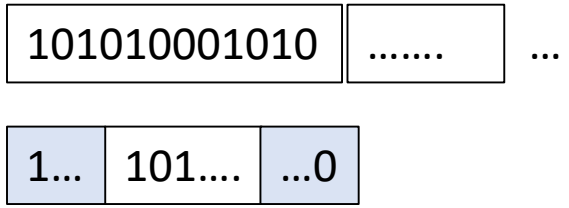
Protocols must be implemented as software somehow and somewhere



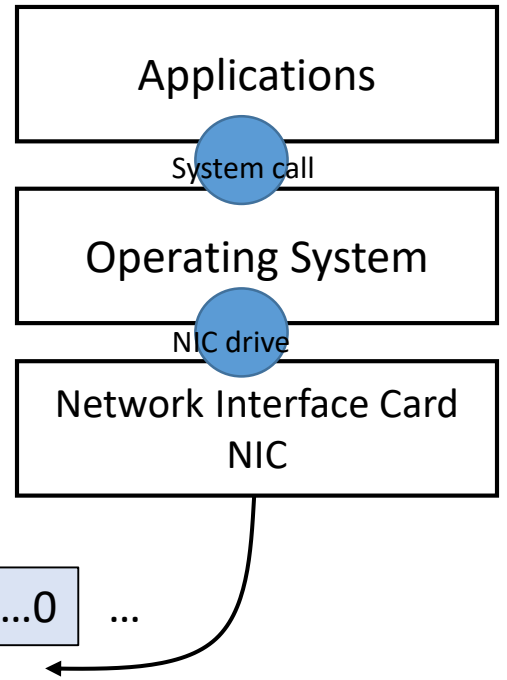
Network applications are directly used by end users, and must rely on the underlining network core software/protocols for data communication.



10101000101010101011
10101010101110001011
01101010100100010110
11010101010100001010

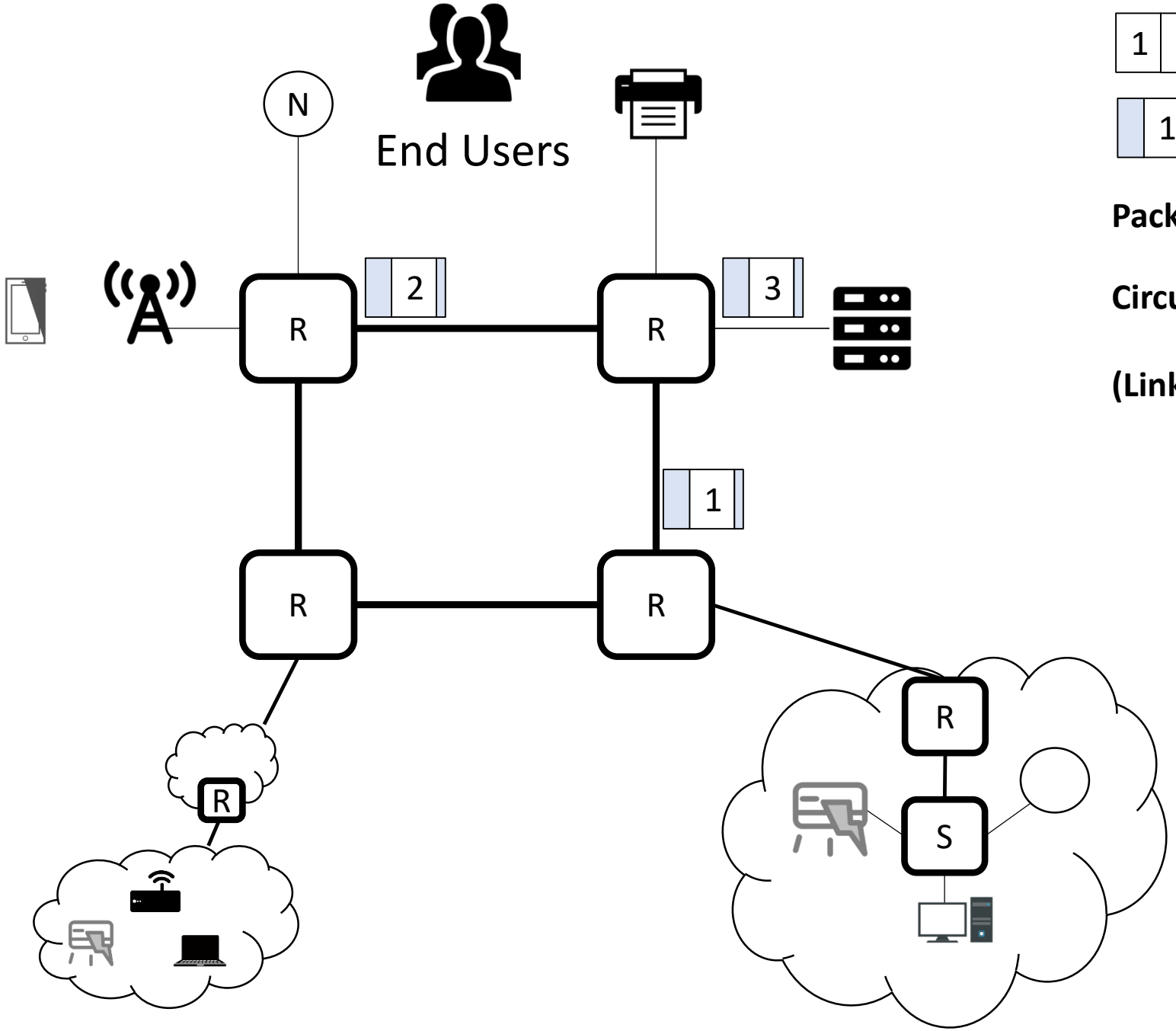


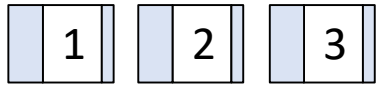
Packet



Encapsulation: sending node

Decapsulation: receiving node





Packet switching

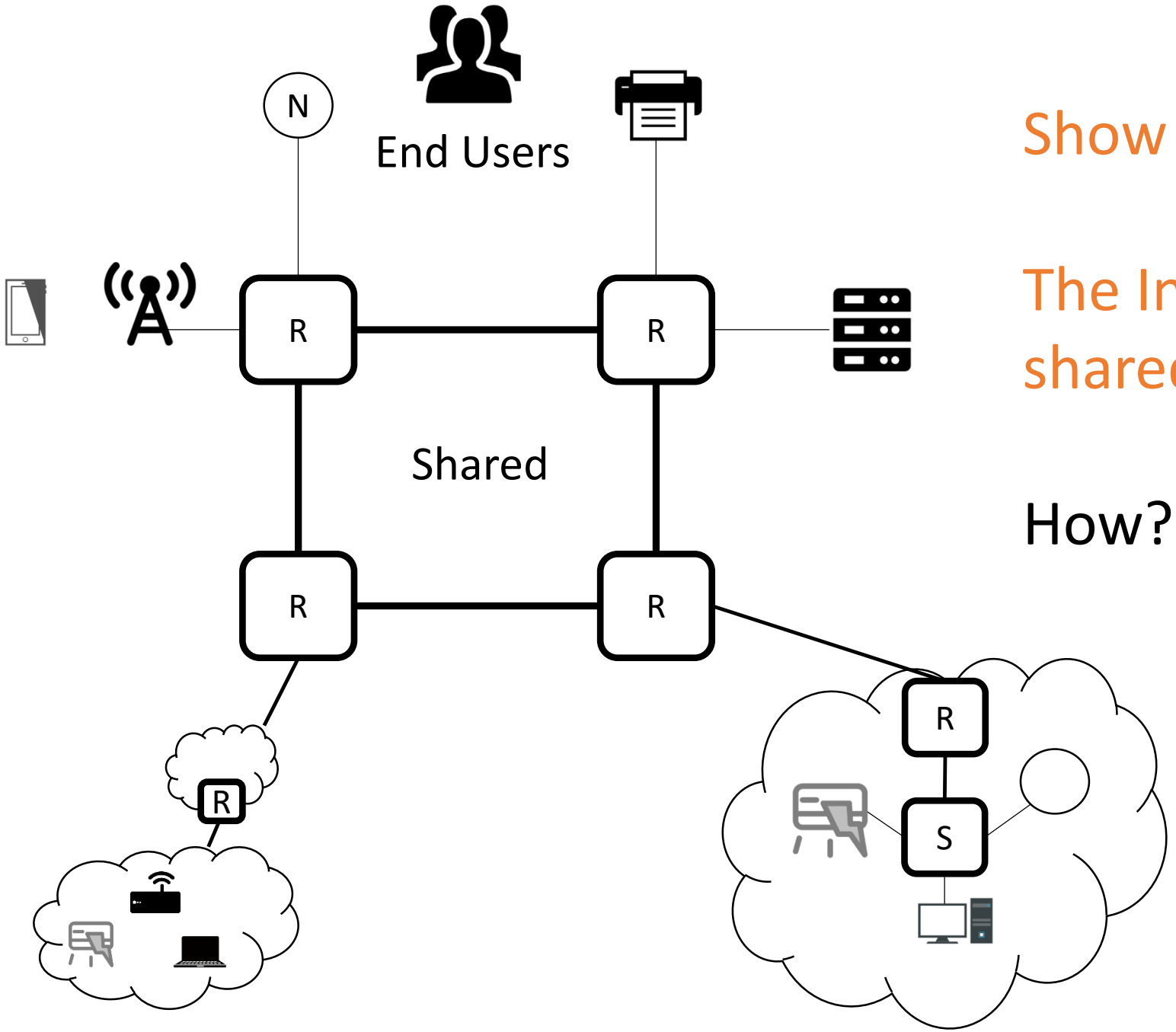
Circuit switching

(Link) Multiplexing

Dr. Chunhua Chen
chunhuachen@scut.edu.cn

Discussions with Concept Graphs

1. (Computer) Network and Graph (G={N, E})
2. Device/Node
3. (Communication) Link and up/downlink
4. End device/Host/Networking device
5. Desktop, Laptop, smart phone, printer and …
6. Router and Switch
7. Wired/Wireless link and physical media
8. Network Edge/Core and Access network
9. Point of presence and Network Provider
10. Home/Residential/Enterprise network
11. Local Area Network and Wide Area Network
12. Subnet and Gateway
13. Cellular network and Internet of Things
14. Application
15. Web browser and Web Server
16. Network protocol
17. HTTP
18. Message transmission
19. Markup Language and HTML
20. Service model
21. Socket Interface
22. Message and Packet
23. Encapsulation and Decapsulation
24. Packet switching and Circuit switching
25. Multiplexing and Sharing of network core



Show your understanding:

The Internet Core is a shared infrastructure!

How?

Next

- Chapter 1.2, the network edge, learn by your group
- Lecture 1
  - Chapter 1.3, the network core, discussion on class
  - Chapter 1.5, Protocol layers and their service models, discussion on class
- Lecture 2
  - Chapter 1.4, Delay, Loss and Throughput in Packet-Switching Networks, discussion on class
  - Chapter 1.7, History of computer network and the Internet, **homework**