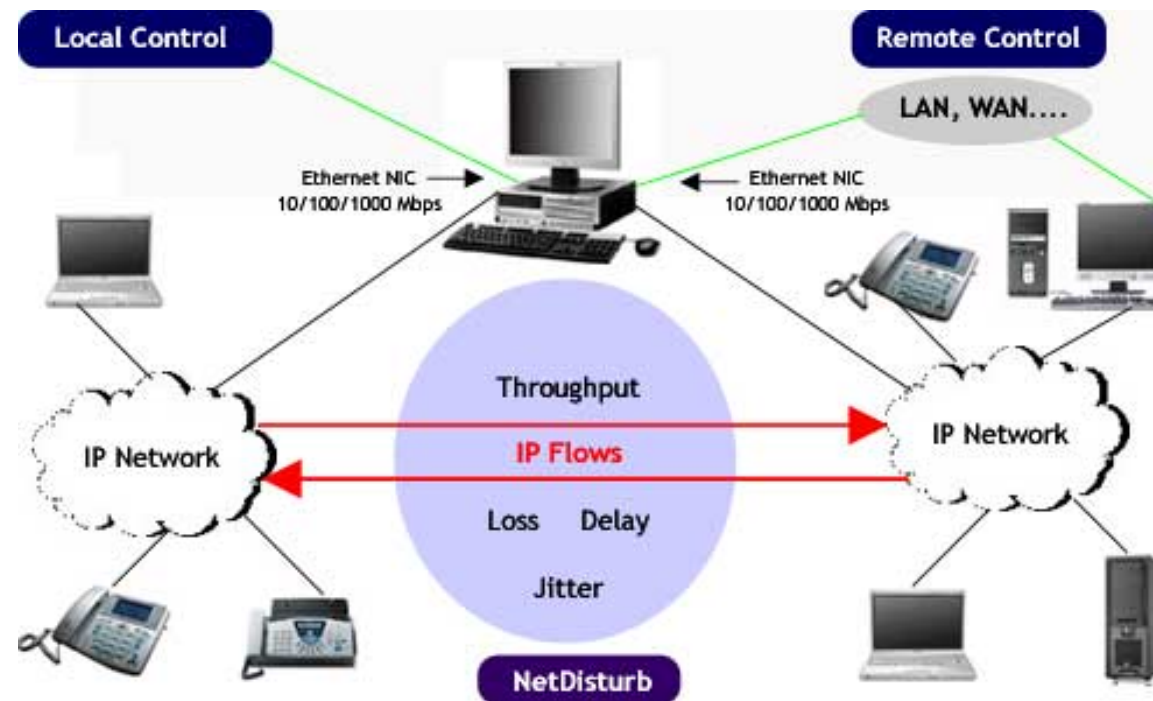# IP Network

Network Performance Analysis

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IP Network

- Networks provide communication between computing devices. To communicate properly, all computer (hosts) on a network need to use the same communication protocols.

- An Internet Protocol network is a network of computer using Internet Protocol for their communication protocol.
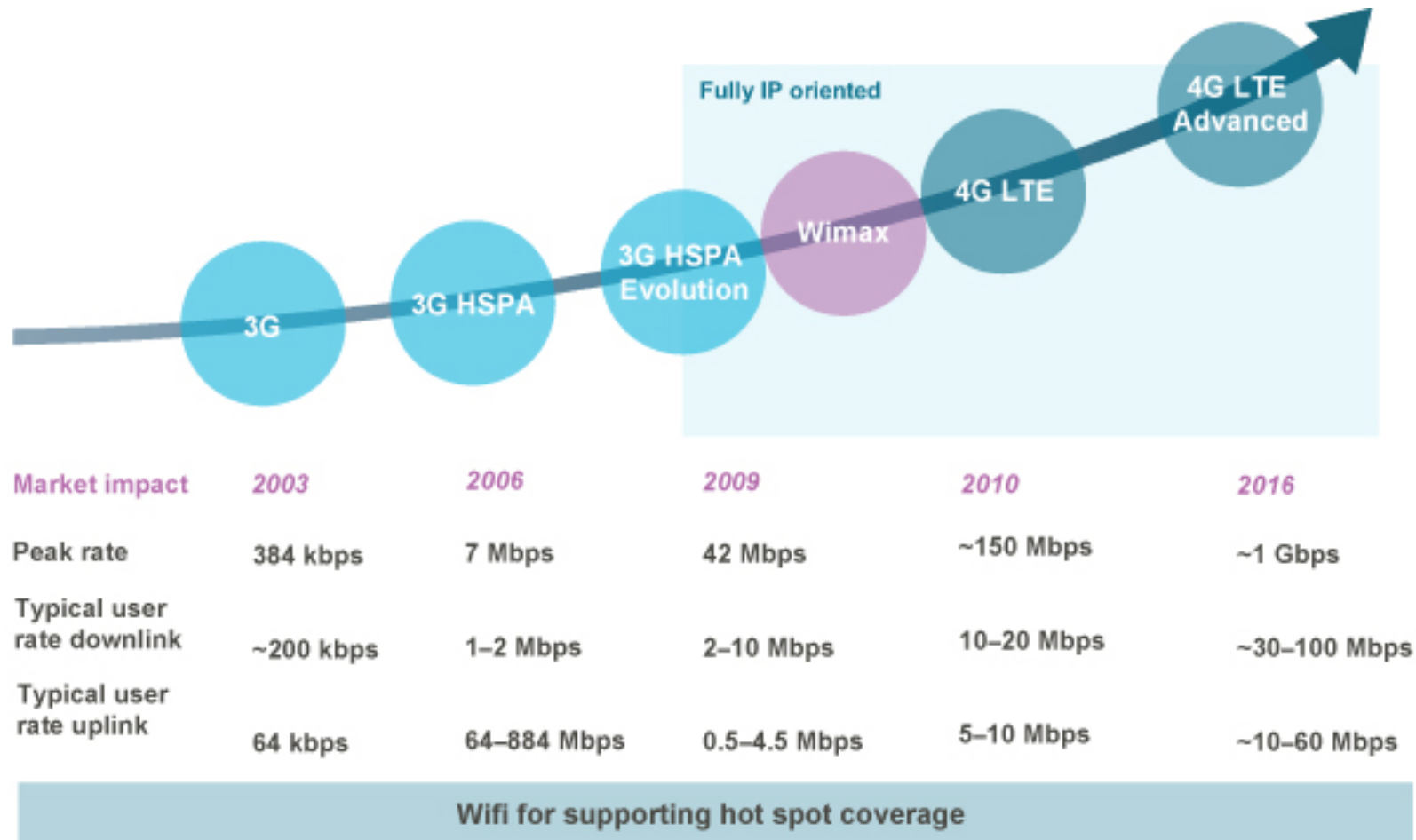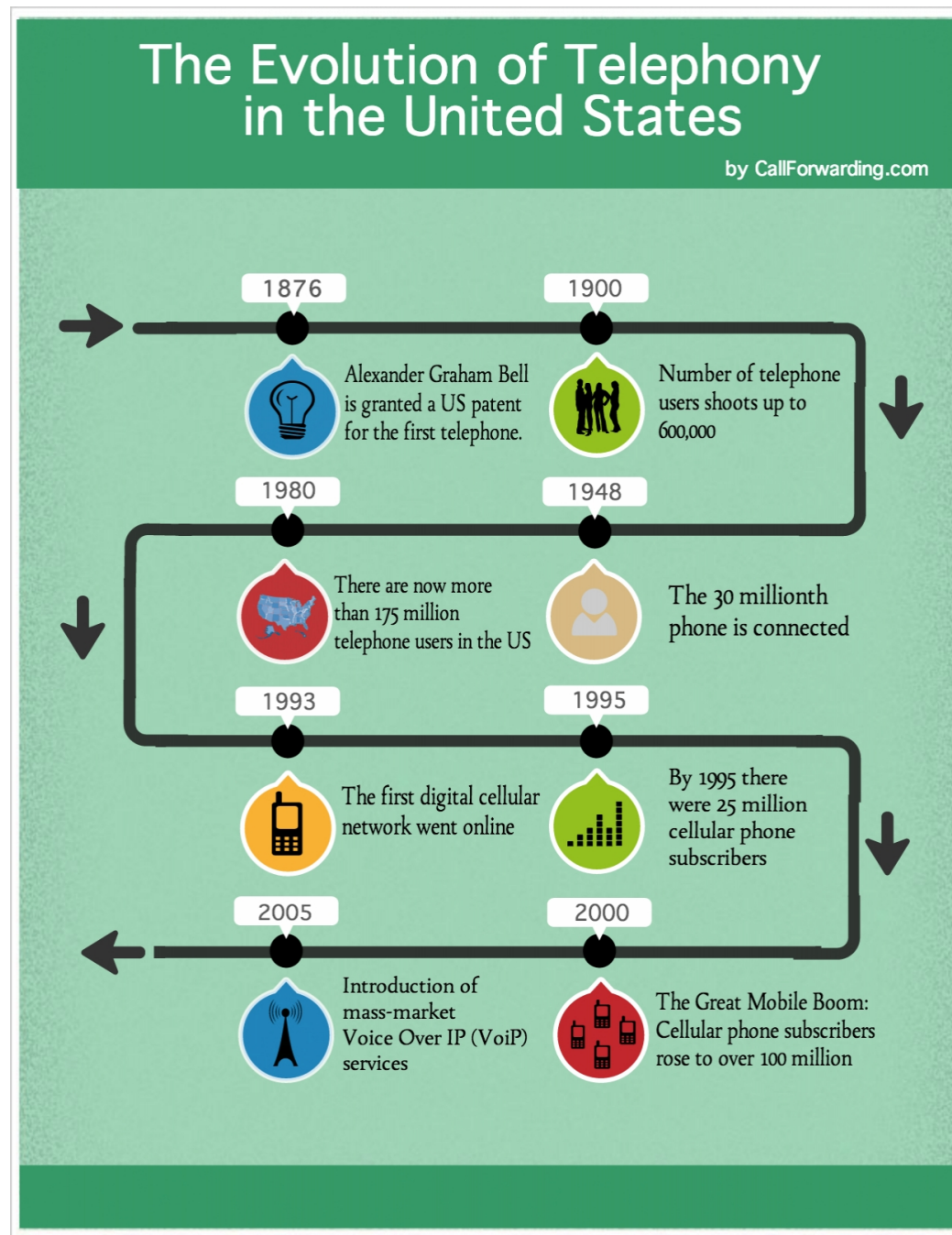
Data/ Information

- What kind of Data/ Information that IP Networks can deliver?

Telecommunication Evolution

Market impact	2003	2006	2009	2010	2016
Peak rate	384 kbps	7 Mbps	42 Mbps	~150 Mbps	~1 Gbps
Typical user rate downlink	~200 kbps	1–2 Mbps	2–10 Mbps	10–20 Mbps	~30–100 Mbps
Typical user rate uplink	64 kbps	64–884 Mbps	0.5–4.5 Mbps	5–10 Mbps	~10–60 Mbps

Wifi for supporting hot spot coverage

The Evolution of Telephony in the United States
by CallForwarding.com

1876 — Alexander Graham Bell is granted a US patent for the first telephone.

1900 — Number of telephone users shoots up to 600,000

1980 — There are now more than 175 million telephone users in the US

1948 — The 30 millionth phone is connected

1993 — The first digital cellular network went online

1995 — By 1995 there were 25 million cellular phone subscribers

2005 — Introduction of mass-market Voice Over IP (VoiP) services

2000 — The Great Mobile Boom: Cellular phone subscribers rose to over 100 million

Voice over IP (VoIP)

Major of VoIP Protocols

VoIP Protocol	Description
H.323	ITU standard protocol for interactive conferencing. Evolved from H.320 ISDN standard. Flexible, complex.
MGCP	Emerging Internet Engineering Task Force (IETF) standard for PSTN gateway control, thin device control.
SIP	IETF protocol for interactive and noninteractive conferencing. Simpler, but less mature, than H.323.
RTP	IETF standard media streaming protocol.
RTCP	IETF protocol that provides out-of-band control information for an RTP flow.

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VoIP Protocols and OSI Models

|	
Application	Softphone/CallManager/Human Speech
Presentation	Codecs
Session	**H.323/SIP/MGCP**
Transport	**RTP/UDP (media); TCP/UDP (signal)**
Network	**IP**
Data Link	**Frame Relay (FR), ATM, Ethernet, Multilink Point-to-Point Protocol (MLPPP), Point-to-Point Protocol (PPP), High-Level Data Link Control (HDLC)...**
Physical	**...**

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Constant—Voice media packets use RTP/UDP
Variable—Several signaling methods and link layer protocols

Solving VoIP Quality Problems

- Poor Internet Connection

    - most Internet services that are used in homes do not have the available connection speeds to seamlessly handle VoIP connections. Rather, they are made for normal Web surfing, and issues arise when attempting to send or receive VoIP calls. If the Internet service is the cause of call quality issues or other problems, an upgrade to a faster Internet service may be required.

- Equipment Problems

    - Because voice and other data usage differs, some may find that VoIP call quality issues are directly related to the equipment that is used. For instance, an older router may not prove to be the best choice when trying to use VoIP connections because the equipment is not made to handle these connections. While it may not mean that it is completely incompatible, that router may not properly handle VoIP packet information, and that can cause bandwidth consumption issues. Upgrading to a router or other device that is specifically designed to be compatible with VoIP connections could remedy issues with call quality.

- Network Configuration Issues

    - Network configuration issues may also pose a problem due to problematic or incompatible equipment. Because VoIP is a fairly new technology, full understanding by individuals or businesses may not be present. This means that while a user may typically follow basic instructions for setting up, they may not fully configure their networks to handle VoIP calling properly. The easiest solution to this type of problem is to first fully ensure that the equipment used is fully compatible with VoIP. If so, then a quick review of configuration information using a manual or other demonstration of a proper configuration may be necessary. If all else fails, a specialist may be necessary to properly configure the setup.

- Latency Problems

  - Latency problems can be an effect of improperly configured networks or bad equipment. Latency, in terms of telephony, refers to the time it takes something that is spoken into a phone's speaker to reach the other end. Latency issues can result in echoes in a phone call or a delay in the information transmitted. To fix this issue, it is essential to ensure the proper VoIP equipment is utilized on a network. Also, properly configuring the network to give VoIP traffic higher priority than other network traffic will reduce or eliminate latency issues.

- Jitter Problems

  - A jitter is a problem faced by people with unsteady connections or packet switched networks. Essentially, what happens is that information that is sent in packets gets out of order and causes the audio to scramble. It is caused by queuing issues or when packets are received out of order. A simple solution is to use a jitter buffer, which helps minimize a jitter issue. Packets are stored temporarily and better organized before being utilized.
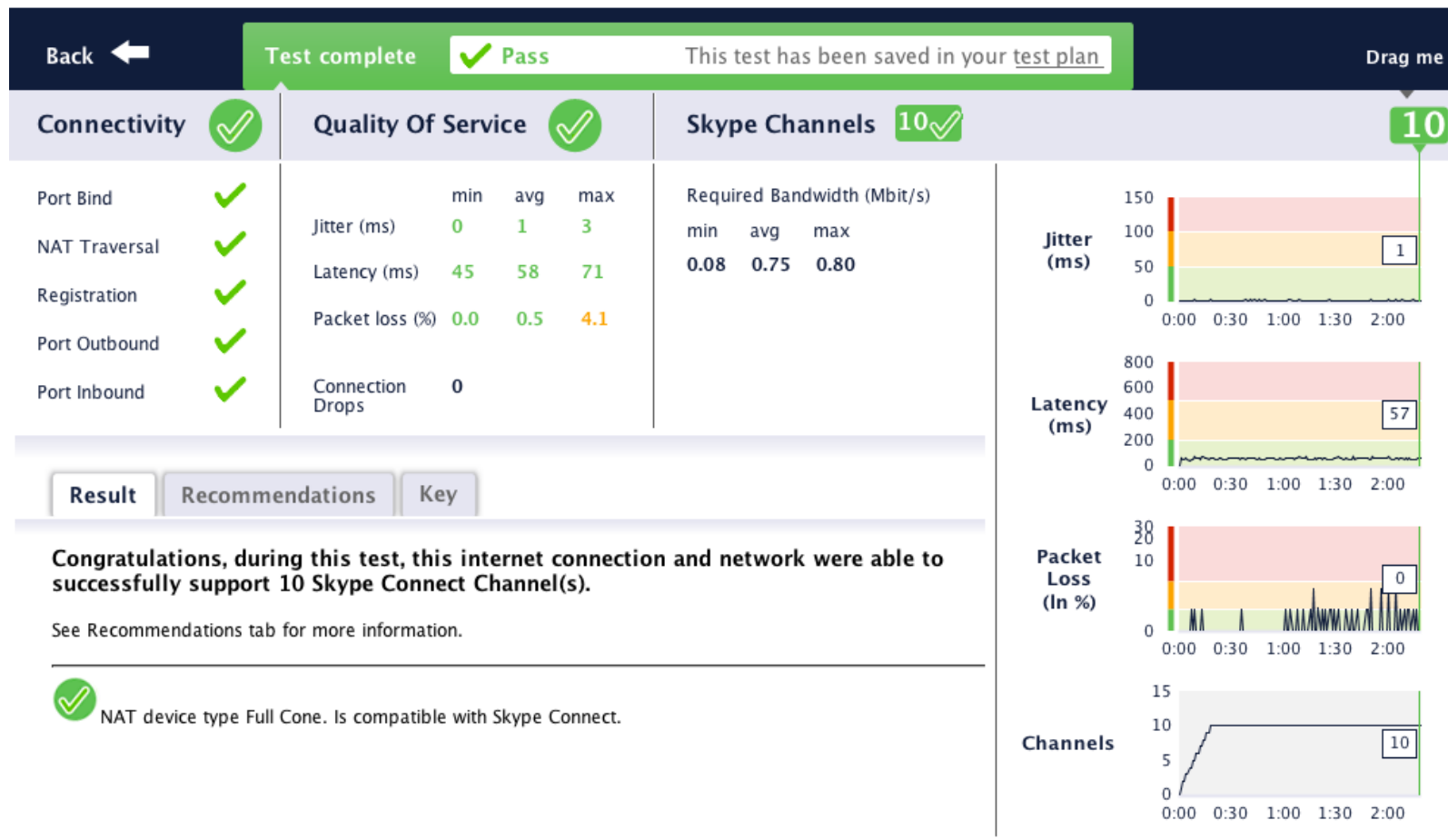
Terms

- **End-to-end delay** is the time it takes a packet to travel across the network from source to destination.

- **Delay jitter** is the fluctuation of end-to-end delay from packet to the next packet.