

Home Networking with IPv6

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Why Home Networking?

- Cable Modems
 - In 2000
 - 2.86 million in U.S.
 - 5 million worldwide
 - In 2003
 - 12.4 million in U.S.
 - 24 million worldwide

Why Home Networking?

- Digital Subscriber Lines

- In 2000

- 1.75 million in U.S.
 - 4.4 million worldwide

- In 2003

- 13.9 million in U.S.
 - 36.1 million worldwide

Why Home Networking?

- Home Networks
 - 5.1 million with 8.9 million nodes in 2000
 - 20.2 million with 48.5 million nodes in 2004
- IEEE 1394
 - Proliferation of IP to entertainment devices
 - Increases node count in network

Why Home Networking?

- Smart devices
 - PDAs
 - Phones
 - Set top boxes
- In 1999, non-PC CPU devices outsold PCs
- IP is the means for devices to communicate!

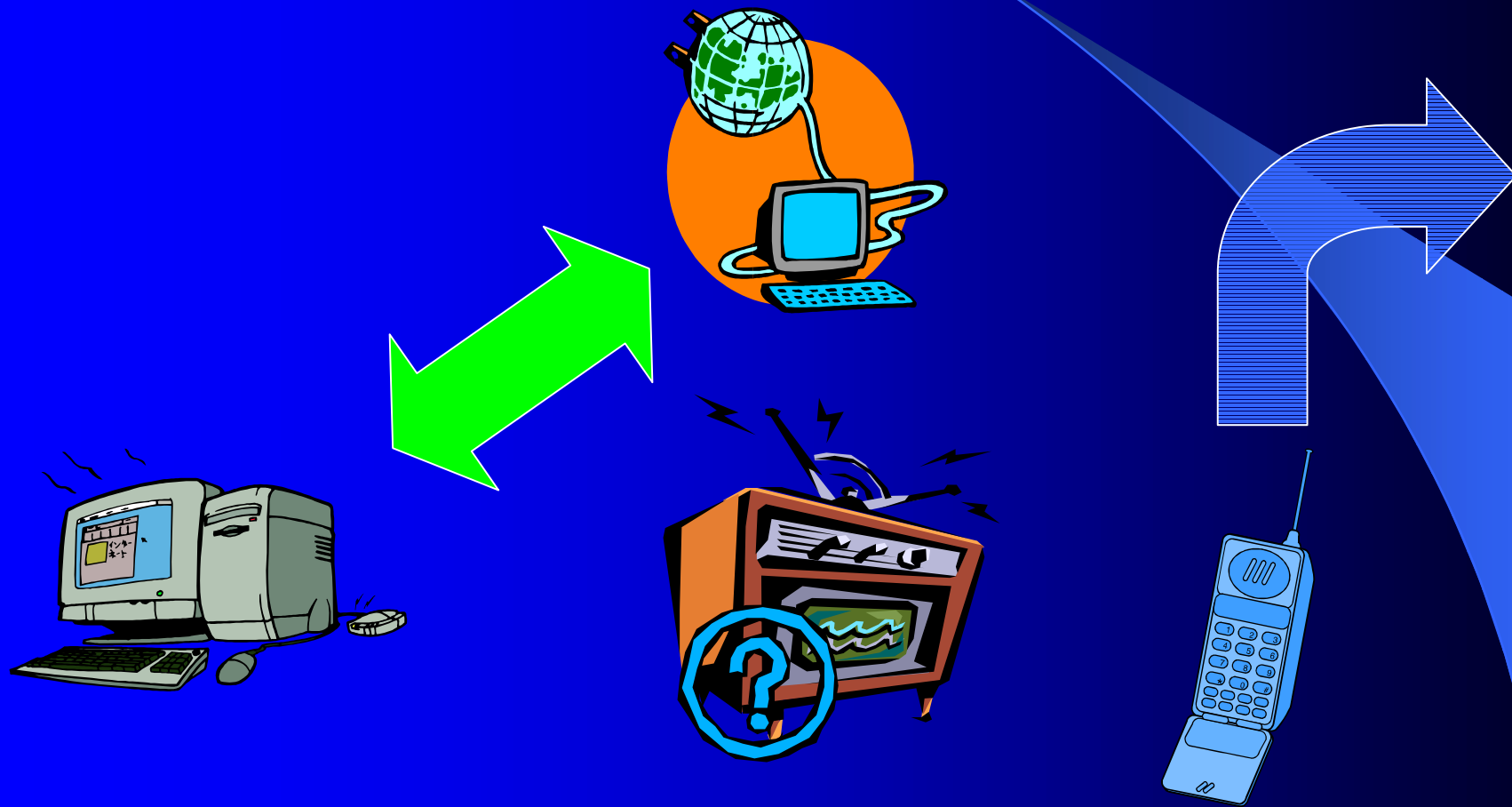
Why Home Networking?



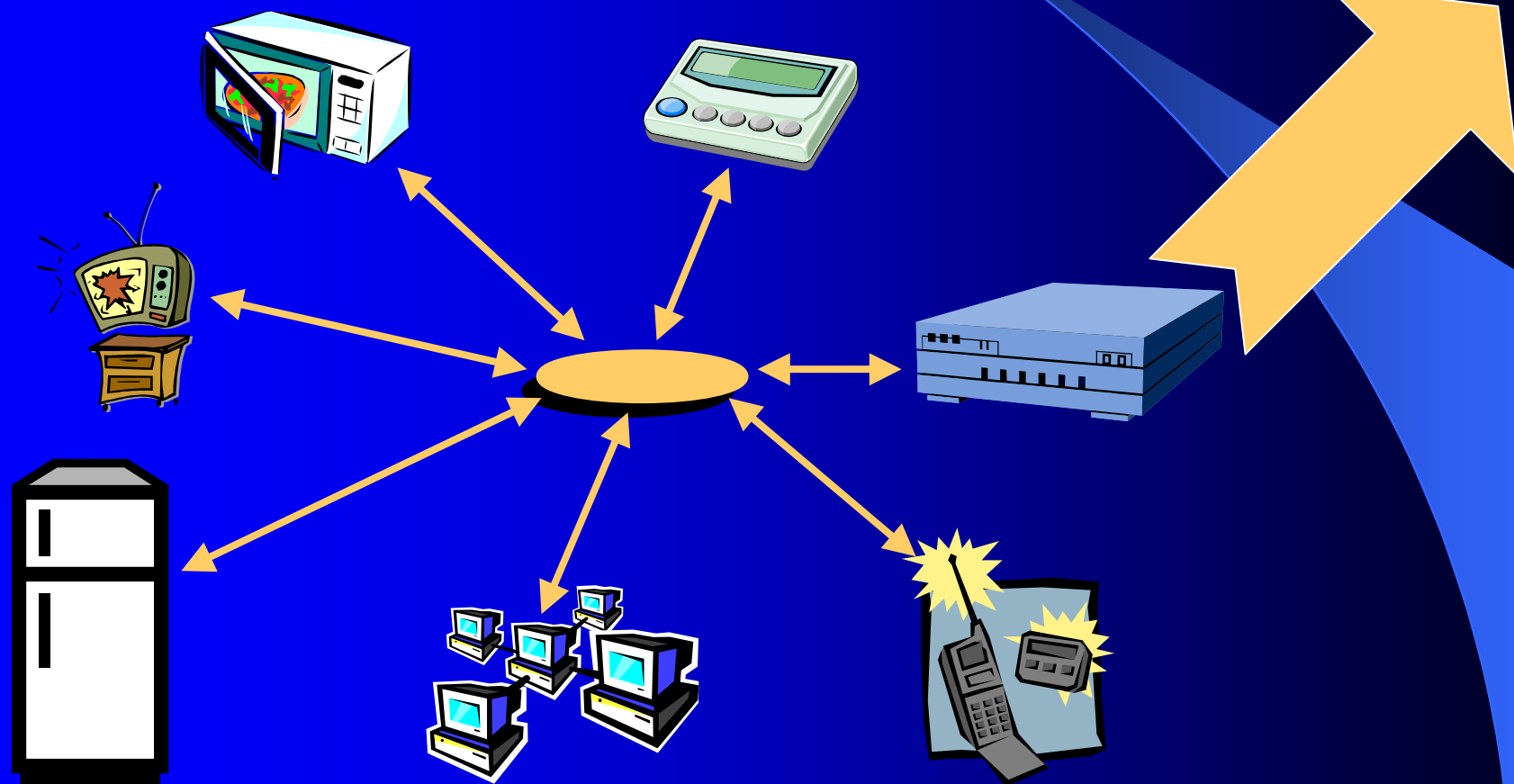
Home Networking Goals

- Simple to setup
 - Plug-and-play
 - Quick
- Maintenance-free
- Sophisticated functionality in a simple system
- *IT SHOULD JUST WORK!*

Home Networking Today



Home Networking Tomorrow



Can't I do that today????

Sort of...

Limitations

- IPv4 cumbersome to put on low memory devices (cell phone, PDA, etc.)
- What about IPv4-capable devices?
 - Usually requires NAT
 - Not easy to setup and maintain
 - Not quick
 - Not simple!

I want a home network of my
very own. How???

IPv6!

What IPv6 Offers

- Media Flexibility
- Stateless Autoconfiguration
- Multihoming
- Neighbor Discovery
- Built-in Security
- Mobility

Multitudes of Media

- Ethernet
- PPP
- Wireless
- Cable Data
- IEEE 1394

What IPv6 Offers

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IPv6 Stateless Autoconfiguration

- Local communication with no intervention
 - Generate link-local address
 - Perform Duplicate Address Detection
 - Start sending data
- Global communication with no stateful server
 - Example later...
- Adds devices with no user configuration

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Multihoming

- Adds reliability
 - Multiple routes in/out of network
- Nodes generate a global address for each prefix heard
- OS or IP stack determines which address to use
- Example : dual connectivity via Cable Modem and DSL

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Neighbor Discovery

- Finds adjacent nodes on shared link
- Learns optimal gateway
- Performs address resolution
- Aids autoconfiguration
- Announces addressing changes
- Key piece of stateless autoconfiguration

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Security

- IP Security support built-in
 - Authentication header
 - Encapsulated Security Payload header
- Privacy extensions to Autoconfiguration
 - Prevents mapping of addresses to particular nodes

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Mobility

- Wireless mobility
 - 802.11 wireless LAN
 - Bluetooth (radio technology)
 - Infrared
 - Cellular
- Roaming
 - Laptop plugged into remote network
 - PDA accessing via satellite

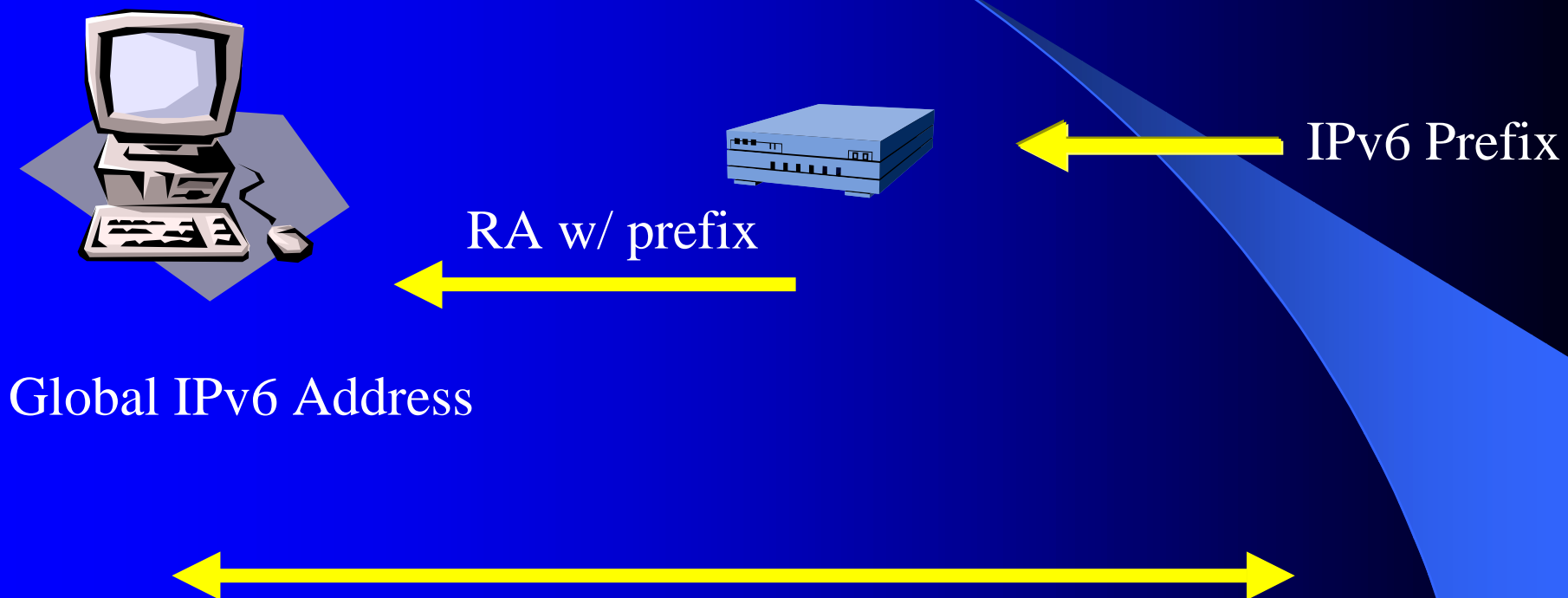
IPv6 Home Networking Example

- In IPv4
 - Get single IPv4 address from provider
 - May need to configure all devices :
 - Private address
 - Default gateway
 - Setup and configure NAT/router
 - Address mappings
 - Application Layer Gateways (ALGs)
 - Needs *global* IPv4 address from provider

IPv6 Home Networking Example

- In IPv6
 - Get IPv6 *prefix* from provider
 - Add prefix to gateway/router

Example



IPv6 Home Networking

- Simple
 - Plug-and-play
- Quick
 - No host configuration
 - No NATs or private addressing
- No network maintenance
- *Regain end-to-end transparency!*