



# Network Computing

Sun's 2<sup>nd</sup> Generation of Systems  
Origins, Motives, Bets

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July 2002



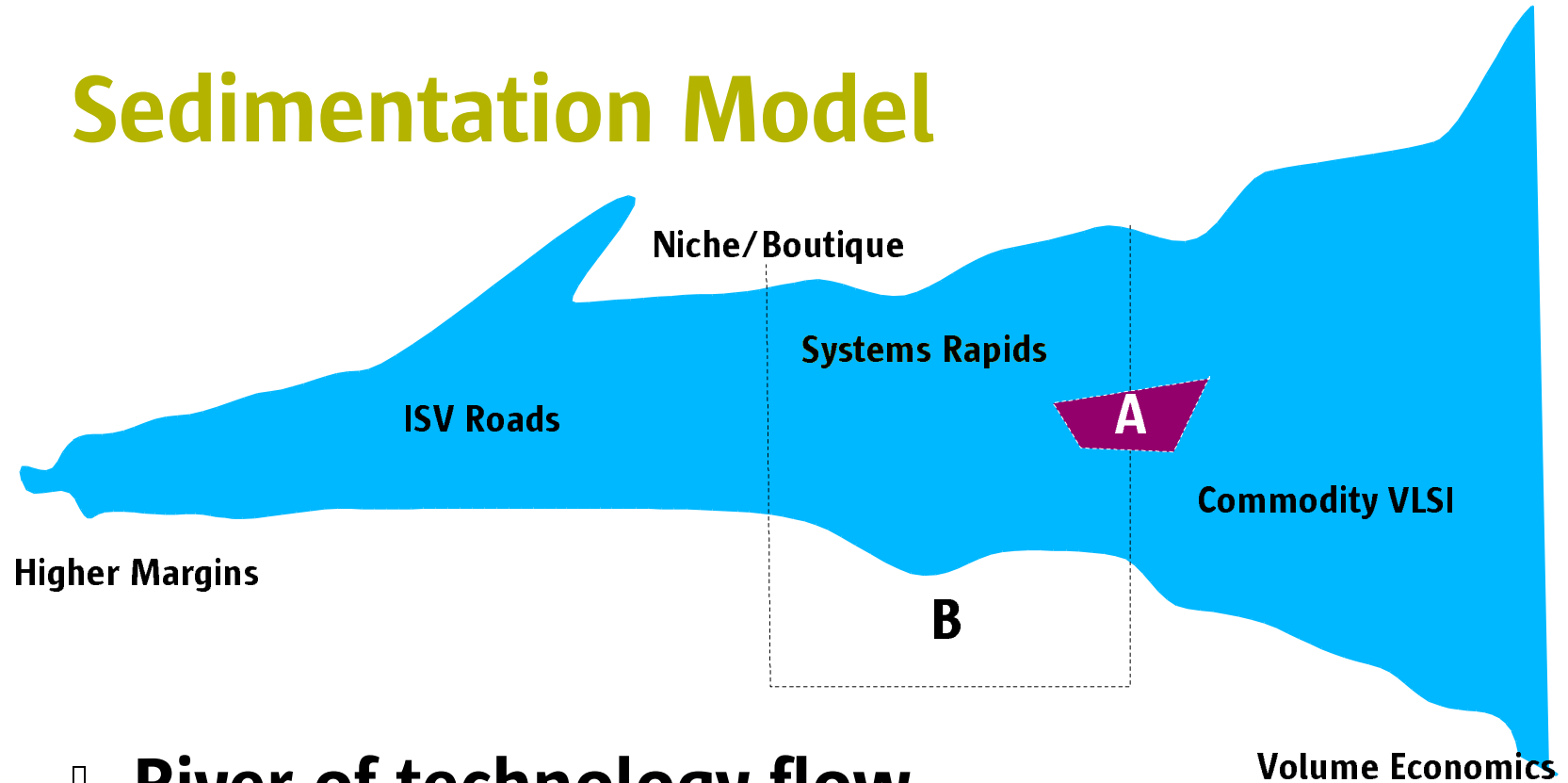
# Origins

- ▣ **JavaOne 2002**
  - **Alumni Panel**
    - ▣ **Interests in numerics/scientific computing**
    - ▣ **Q: How important is Java to Sun?**
      - “Bet the company”
  - **FORTRAN programmer – at JavaOne?!?**
    - ▣ **If a bet, let's see what it's covering**
    - ▣ **There's a lot going on in the community**
    - ▣ **Innovation Happens Elsewhere**

## Forces Acting On Us

- ▣ **Metcalf's law: economic value**
- ▣ **Gilder's law: growth in connectivity**
- ▣ **Moore's law: growth in processing power**
- ▣ **Sedimentation & Consolidation**
- ▣ **Decomposition and drive to components**
  - History: VLSI made Sun possible
- ▣ **Growth waves of the Internet**

# Sedimentation Model

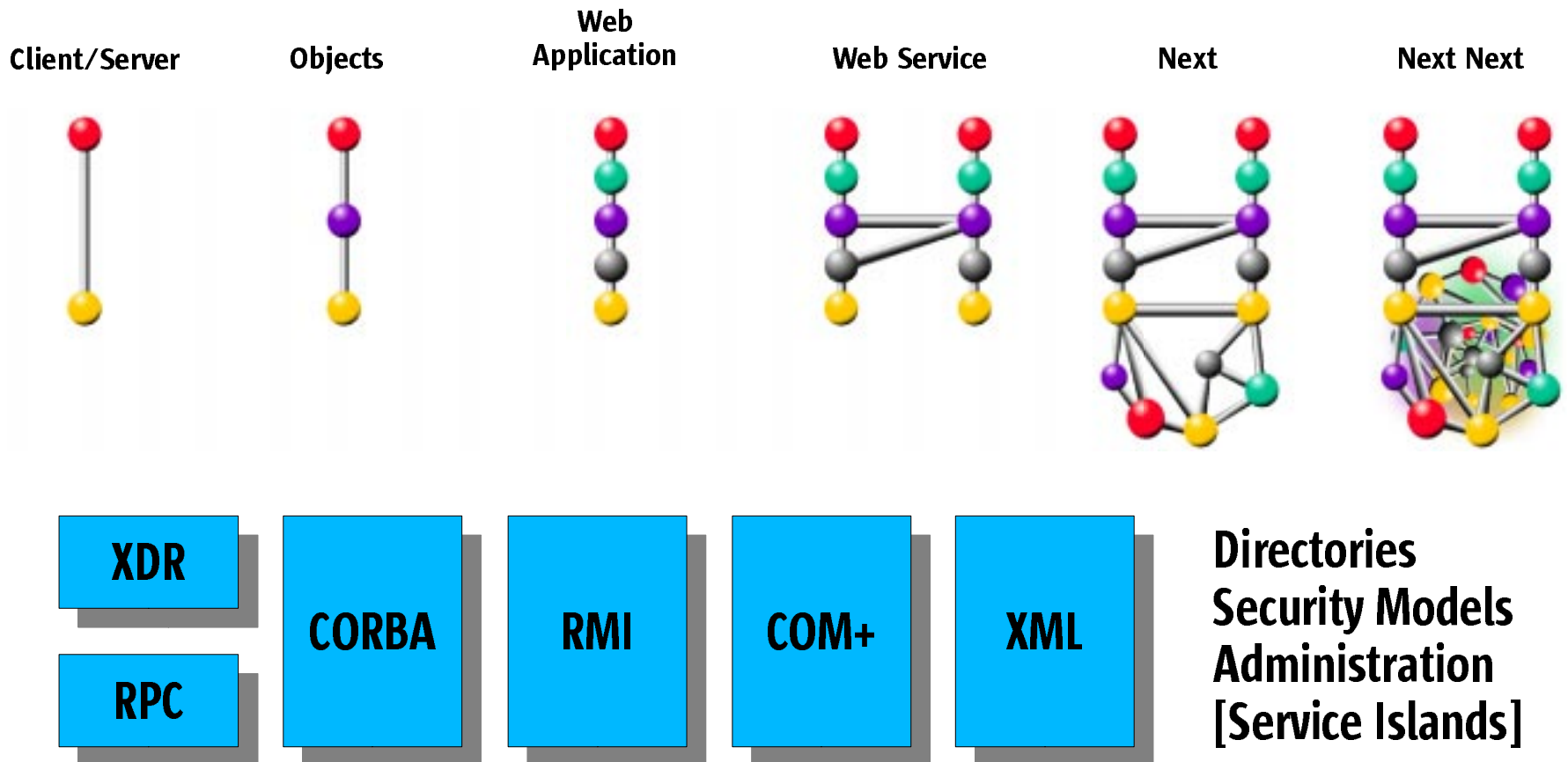


- **River of technology flow**
- **Business model A: flow with river**
- **Business model B: establish a settlement**
  - **Rules: Don't play outside / Don't mix models**

## Forces Acting On Us

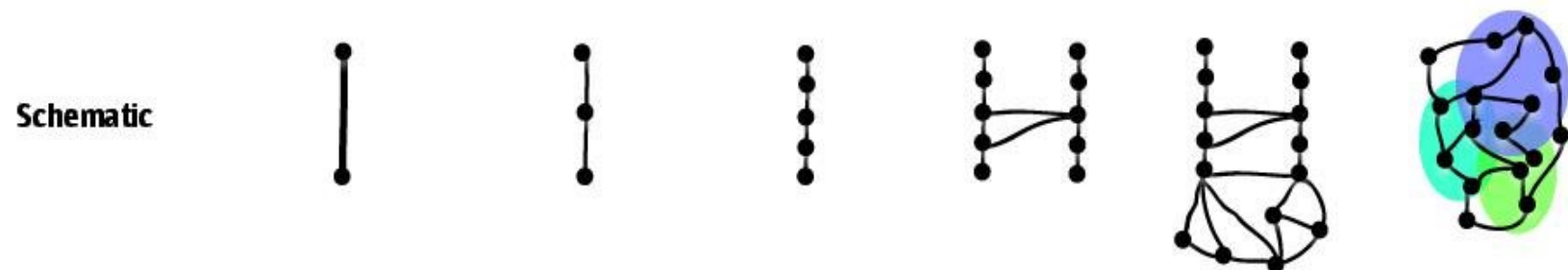
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# Programs are becoming "graphs"



# Evolution of Networked Computing

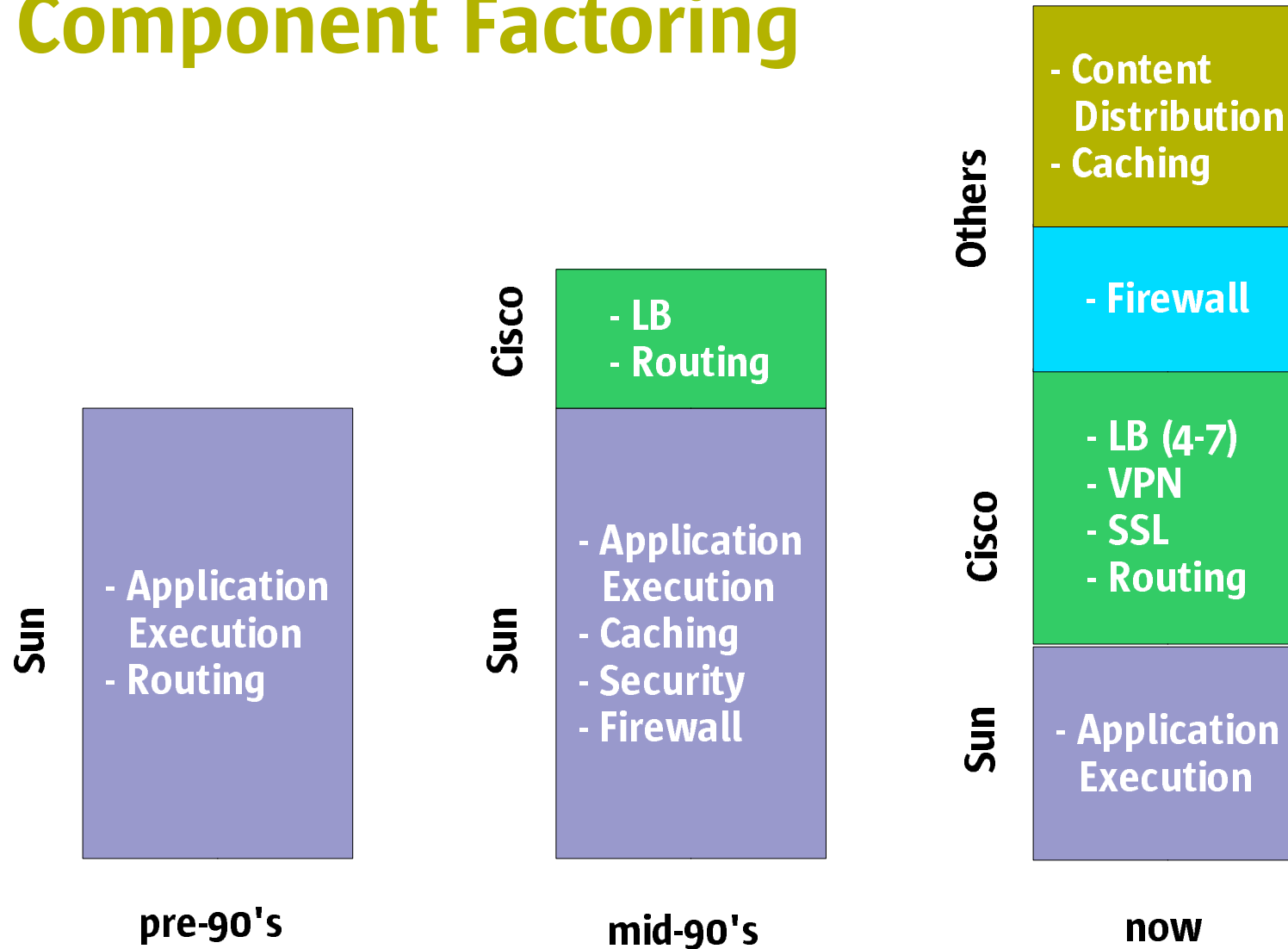
Catch Phrase	The Network is the computer	Objects	Legacy to the Web	The Computer is the Network	Network of embedded things	Network of things
Scale	100s	1000s	1000000s	10000000s	1000000000s	1000000000s
When/Peak	1984/1987	1990/1993	1996/1999	2001/2003	1998/2004	2004/2007
Leaf Protocol(s)	X	X	+HTTP (+JVM)	+XML, Portal	+RMI	Unknown
Directory(s)	NIS, NIS+	+CDS	+LDAP(*)	+UDDI	+Jini	+?
Session	RPC, XDR	+CORBA	+CORBA, RMI	+SOAP, XML	+RMI/Jini	+?



# Audience Decomposition

- **Used to be we had:**
  - UNIX users, programmers, administrators
- **Now have:**
  - Access Device Users
  - Network System Programmers
  - Environment Administrators
- **All related by the IP-based environment**
- **No longer related by an "operating system"**
  - and thus, it can no longer be the architectural reference point

# Component Factoring



Courtesy Anant Agrawal

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# Waves of the Internet

An Internet  
of Computers

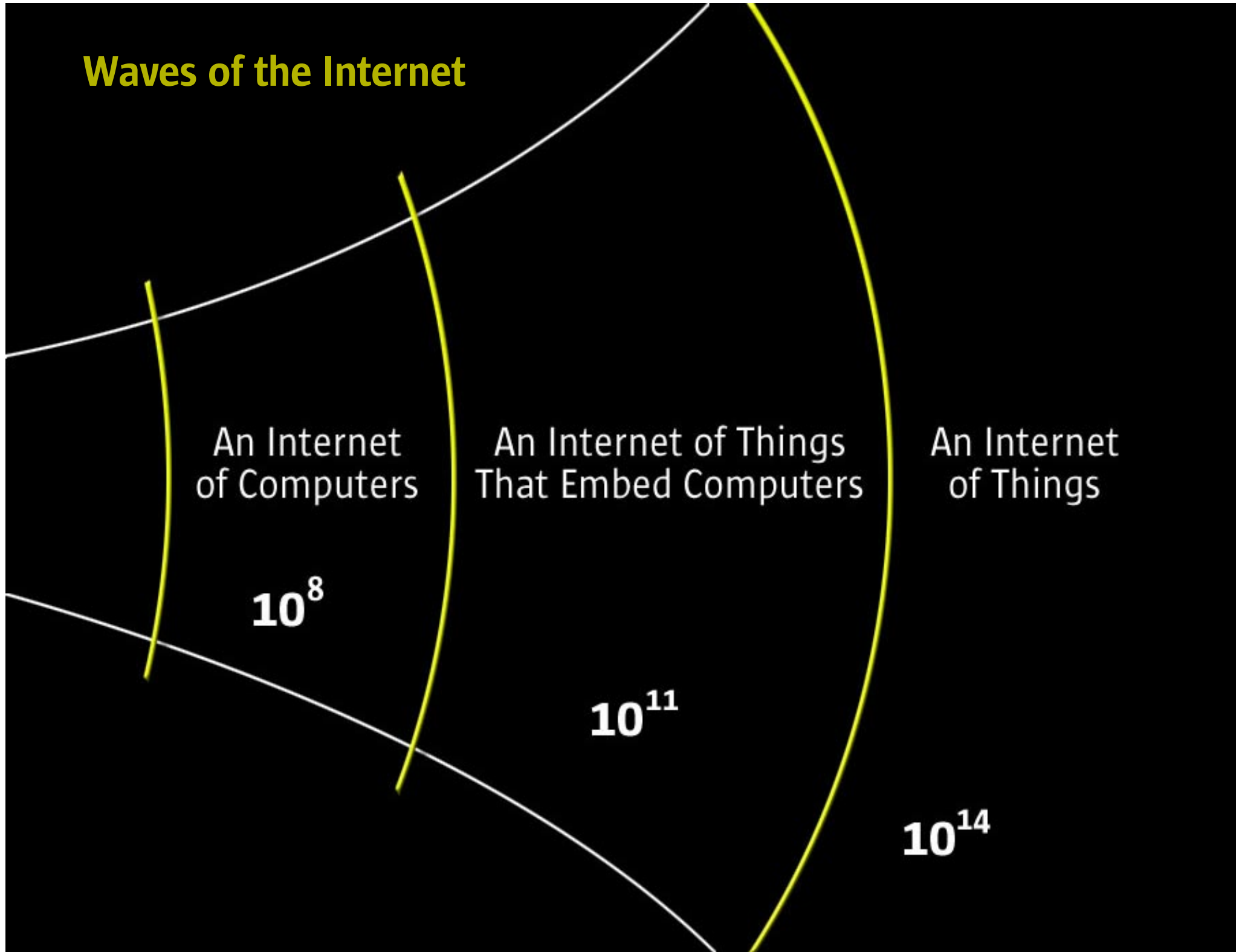
$10^8$

An Internet of Things  
That Embed Computers

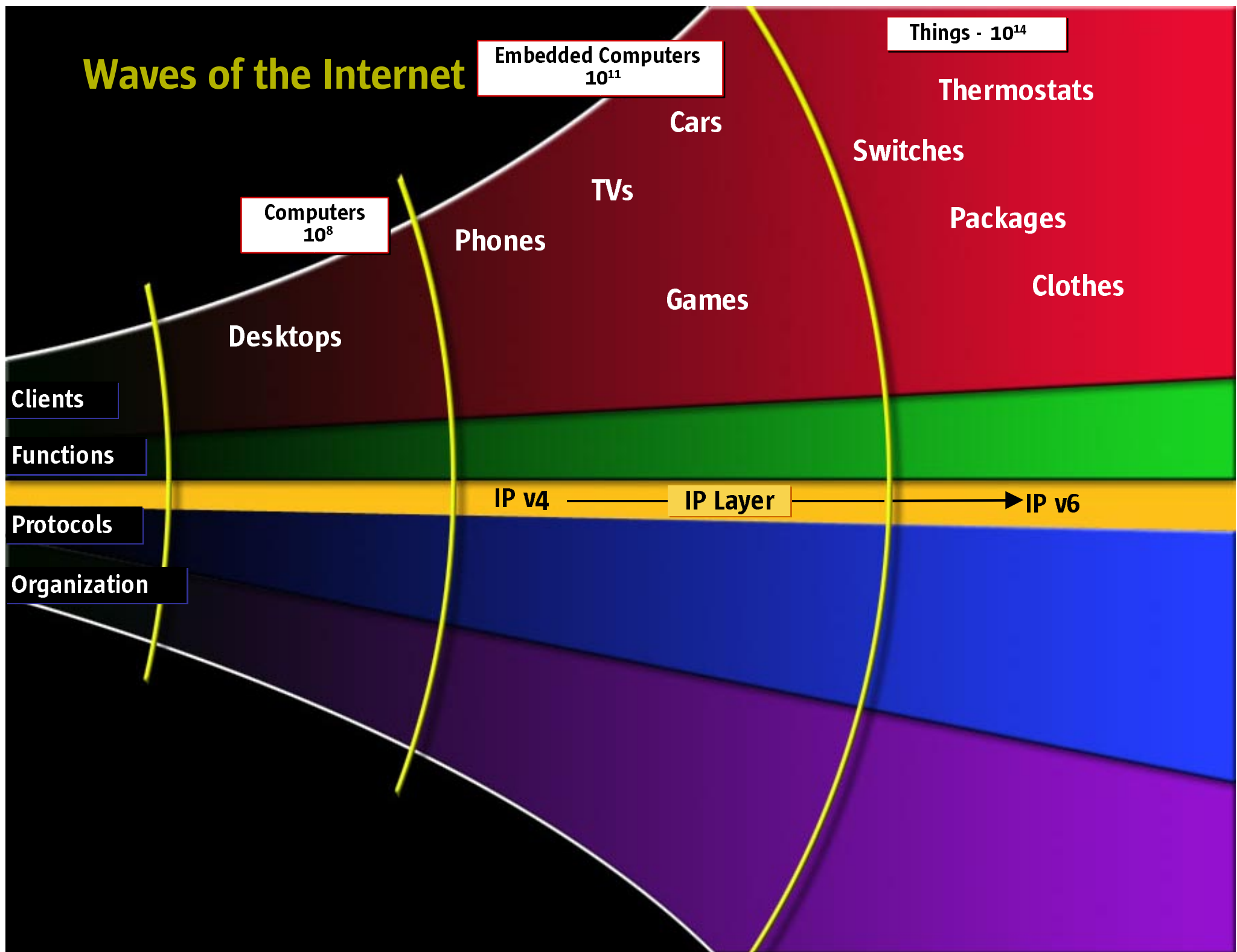
$10^{11}$

An Internet  
of Things

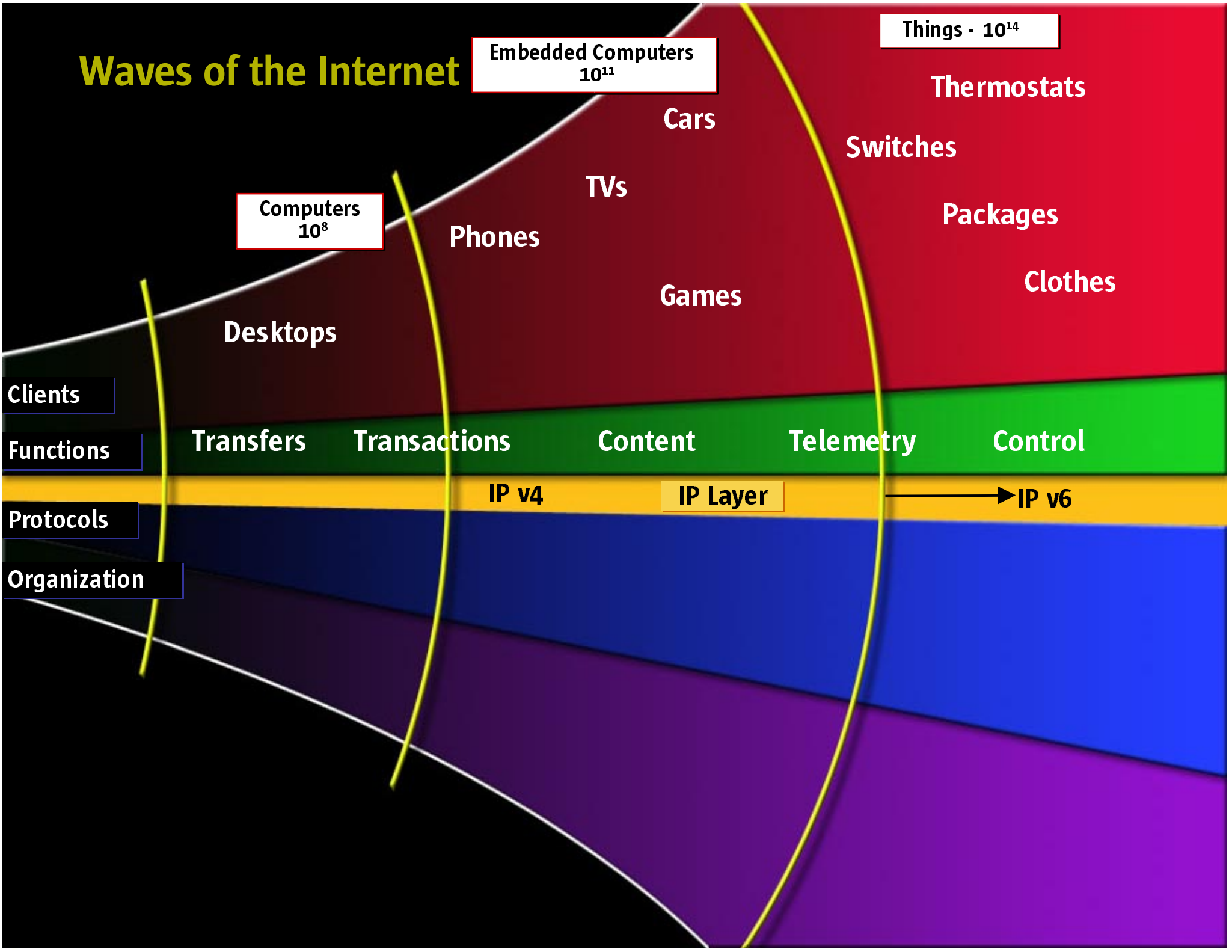
$10^{14}$



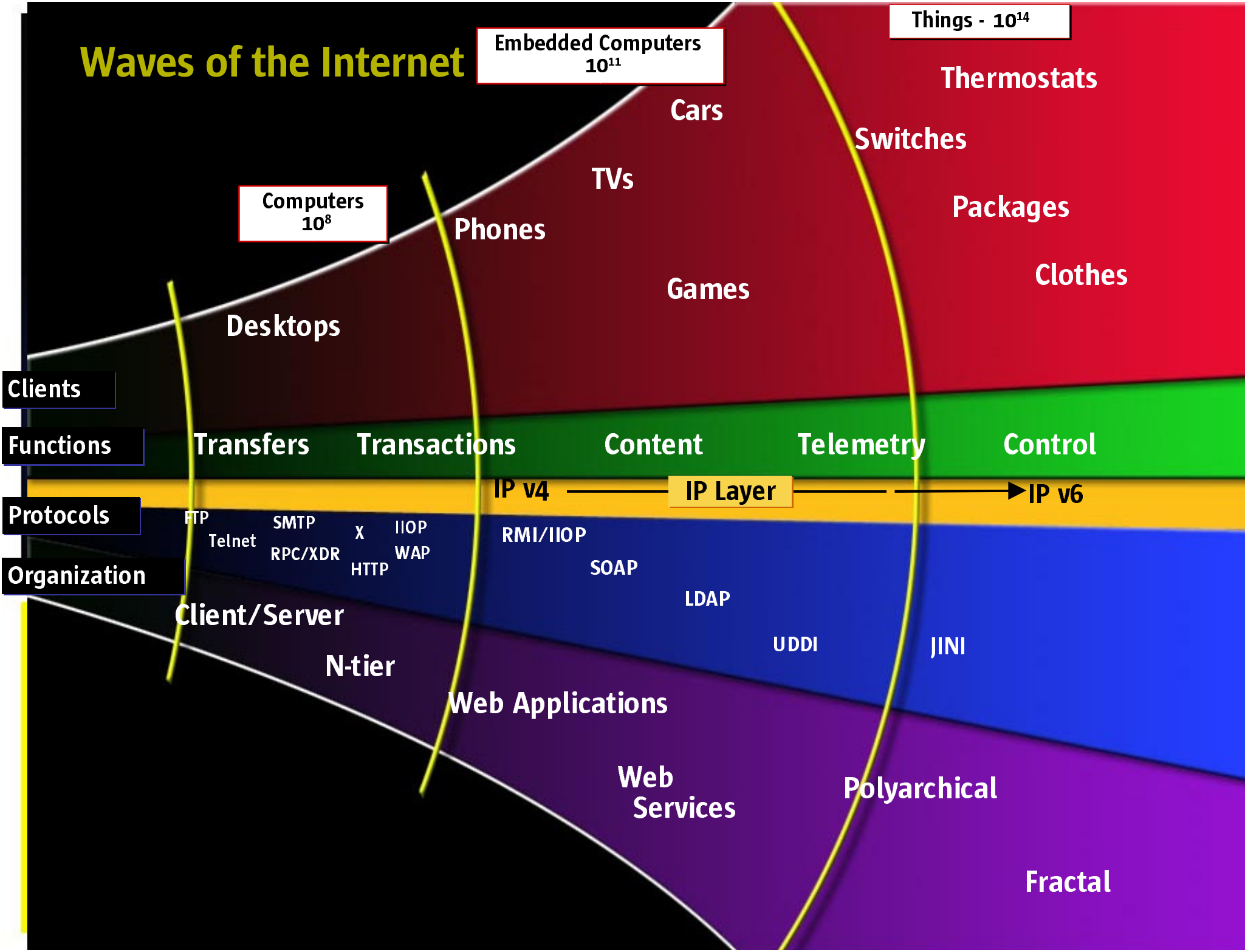
# Waves of the Internet



# Waves of the Internet



# Waves of the Internet



Clients

Functions

Protocols

Organization

Embedded Computers  
 $10^{11}$

Computers  
 $10^8$

Things -  $10^{14}$

Desktops

Phones

Games

Cars

TVs

Switches

Thermostats

Packages

Clothes

Transfers

Transactions

Content

Telemetry

Control

IP v4

IP Layer

IP v6

Client/Server

N-tier

Web Applications

Web Services

Polyarchical

Fractal

RMI/IIOP

SOAP

LDAP

UDDI

JINI

FTP

Telnet

SMTP

RPC/XDR

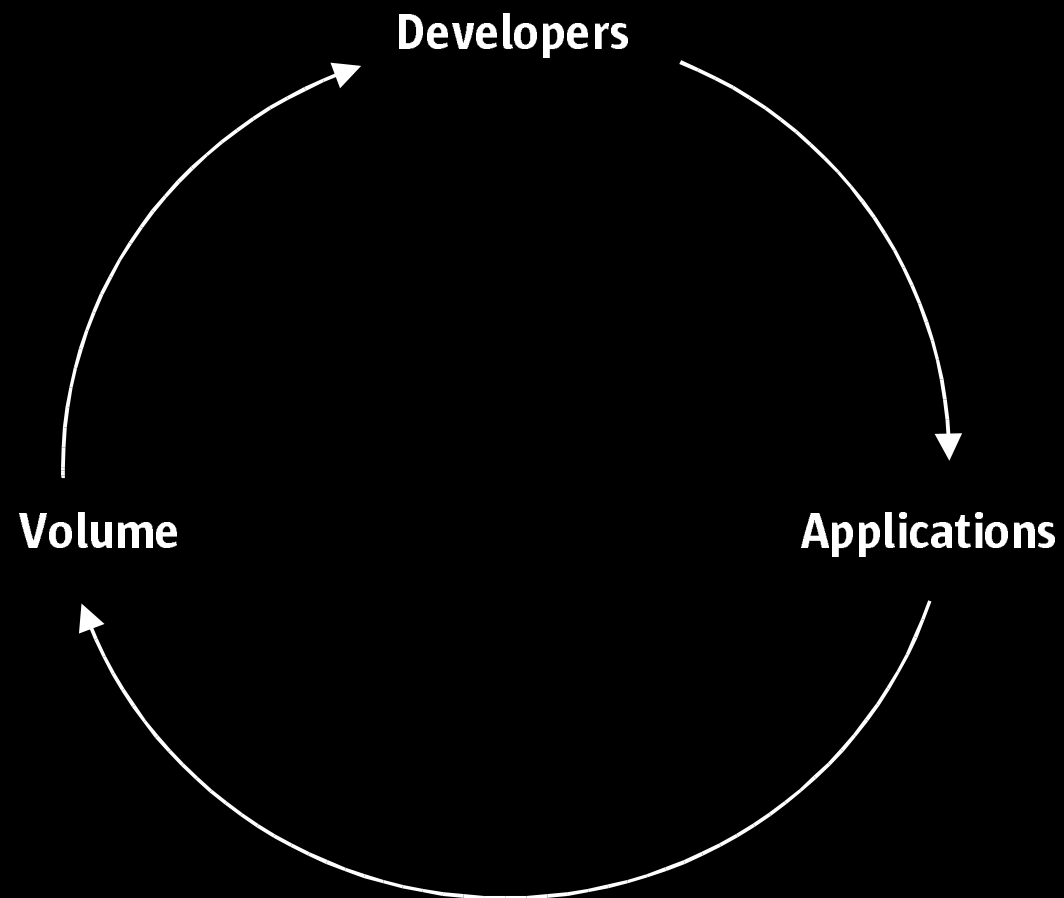
X

HTTP

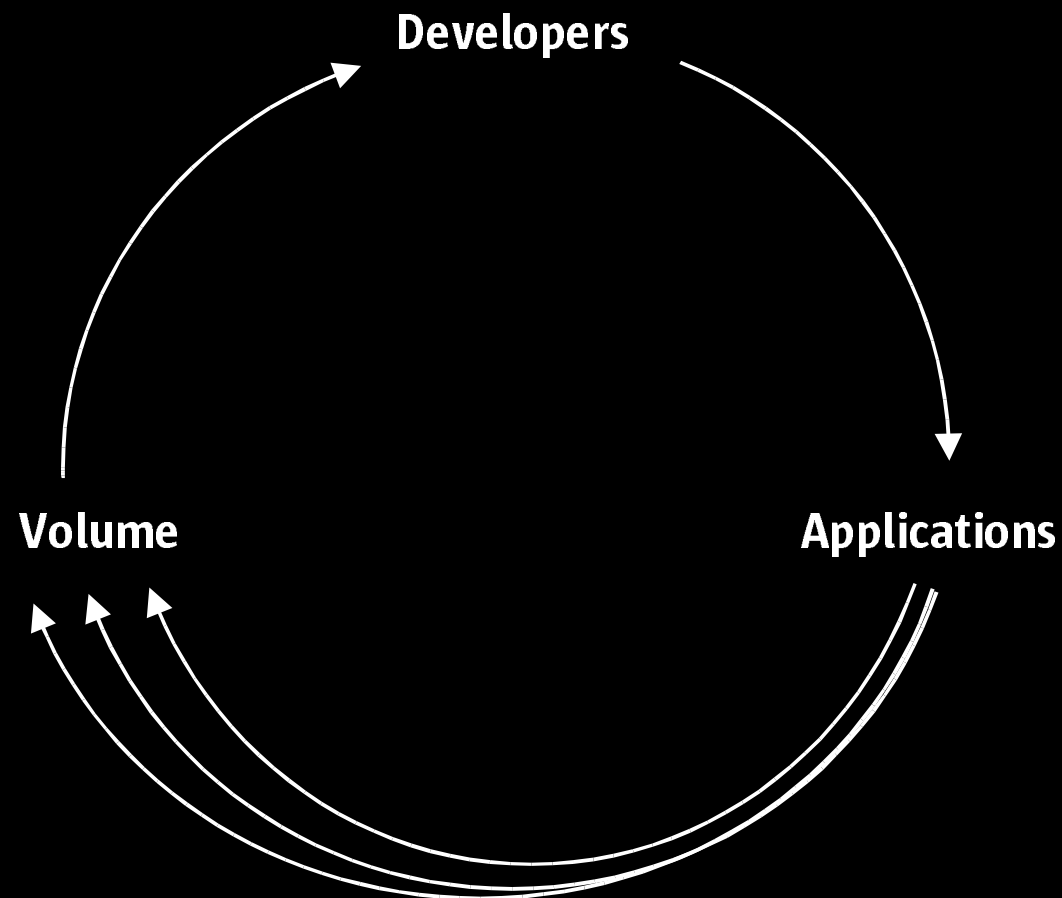
IIOP

WAP

# The Virtuous Circle

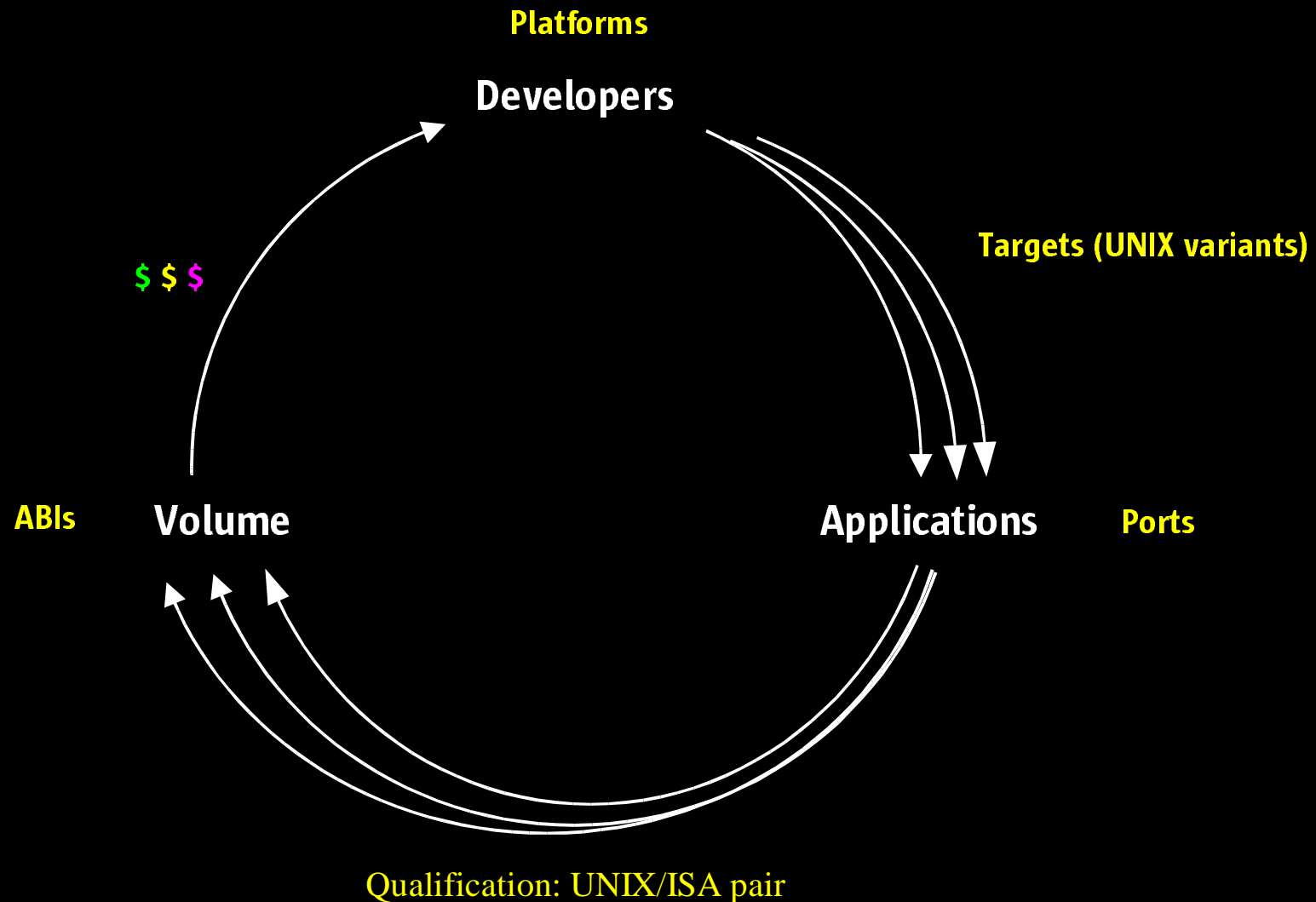


# The Virtuous Circle: UNIX ABIs

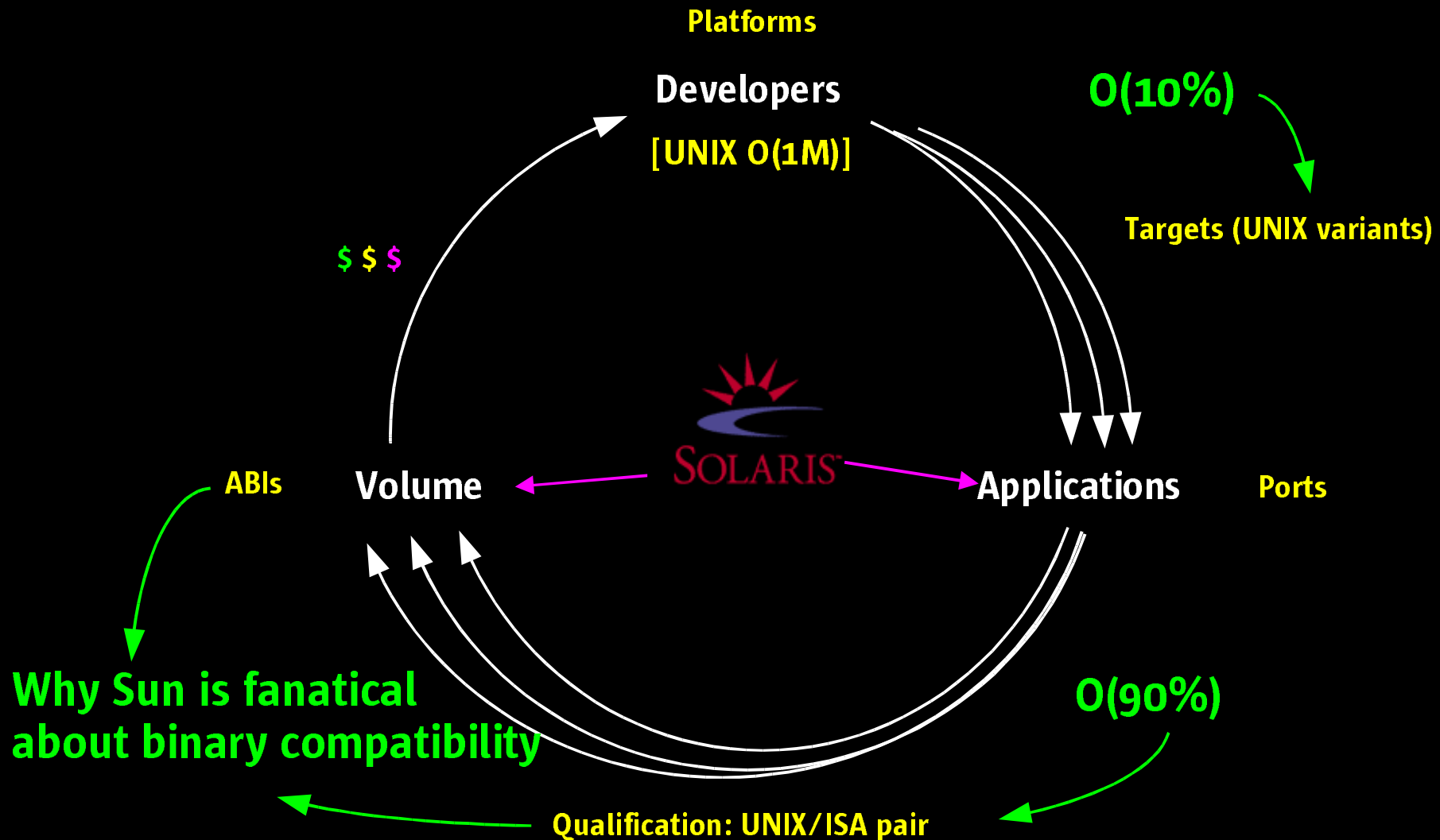


Qualification: UNIX/ISA pair

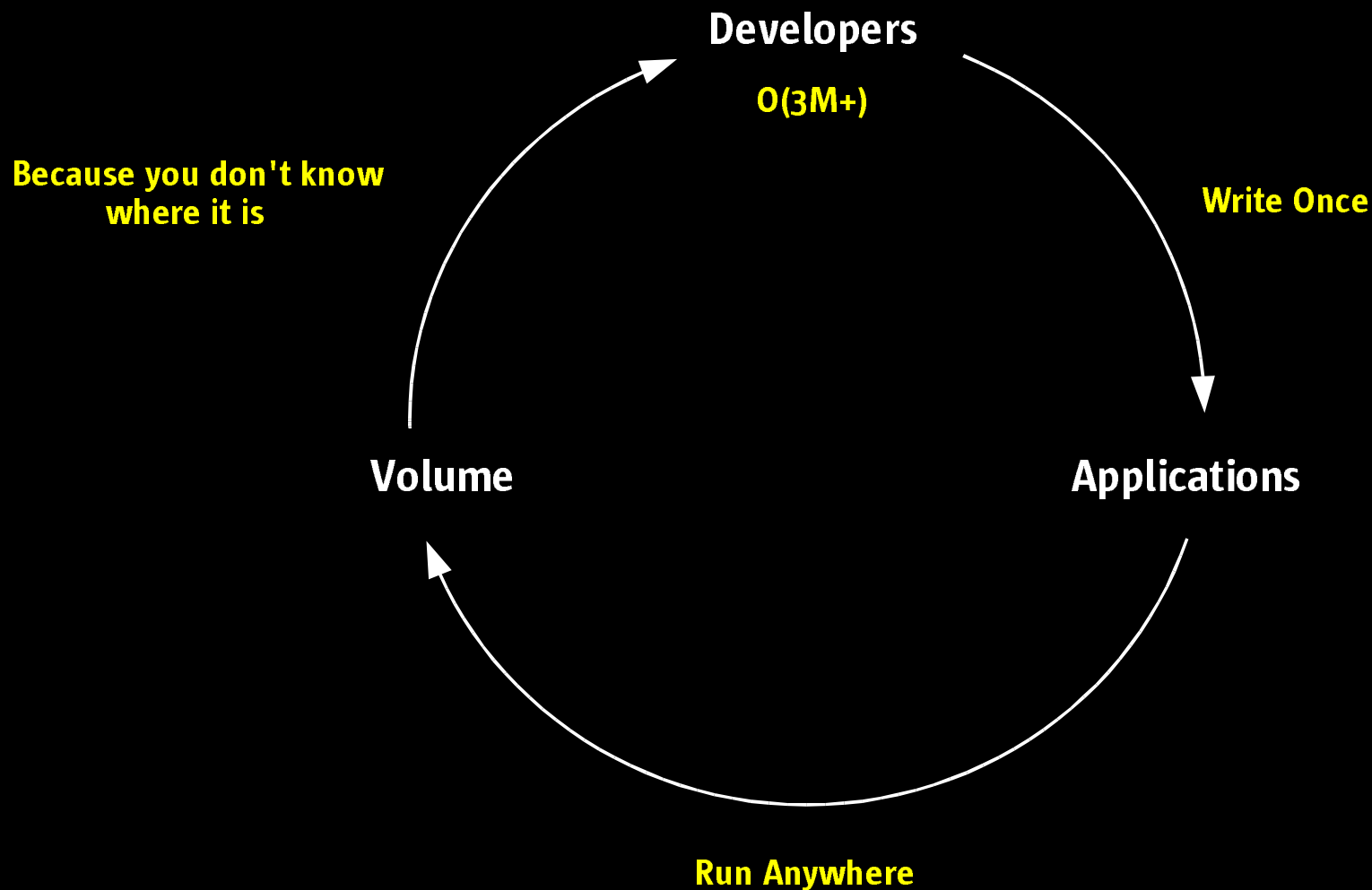
# The Virtuous Circle: UNIX ports



# The Virtuous Circle: Solaris Share



# The Virtuous Circle: Java



# The Network is the Computer

- **Sun's 1<sup>st</sup> Generation of Systems**
  - Integrations of VLSI components
  - All connectable to the Internet
  - A powerful flywheel of incremental innovation
- **Enabled by, enabling of, Internet wave 1**
- **But,**
  - Technological and market forces evolve
  - We have the opportunity, and need, for change
  - ~~Systems attached to~~ built from the Internet
  - The Computer that is The Network

## Therefore, N1

- **A computer built from the Internet**
  - N1 replaces "Sun-4" as architecture manual
  - Requires "1 architecture" transition
- **Enabled by**
  - IP protocols
  - An evolving session/presentation environment
  - Java – for box independent components
- **Provides value in 2002**
  - Integrating modern components
  - Functionality in what customers value now

# Sun's New 1 Architecture Focus

- ▣ **Going forward, Sun's architecture is:**
  - **1 protocol (IP)**
  - **1 ISA (JVM)**
  - **1 binary (Java files)**
- ▣ **Previous architectures are "technologies"**
  - **UNIX (Solaris, Linux), SPARC (microprocessors)**
  - **They don't get deleted**
    - ▣ **They become "traditional products"**
    - ▣ **Not the area from which we expect growth**
    - ▣ **They represent competencies upon which a systems company draws**



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