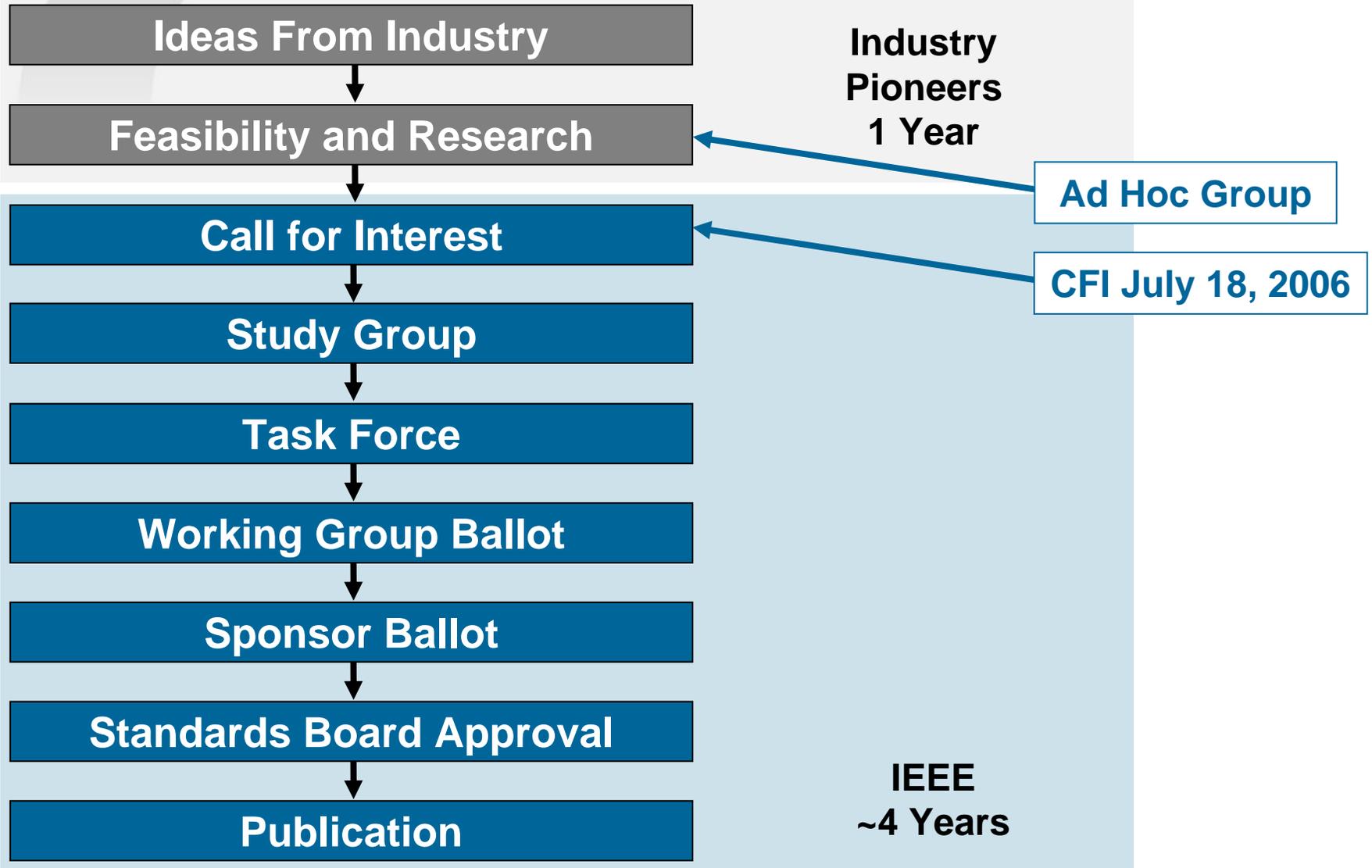# Higher Speed Ethernet Update

Greg Hankins

<ghankins@force10networks.com>

At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position, explanation, or interpretation of the IEEE.
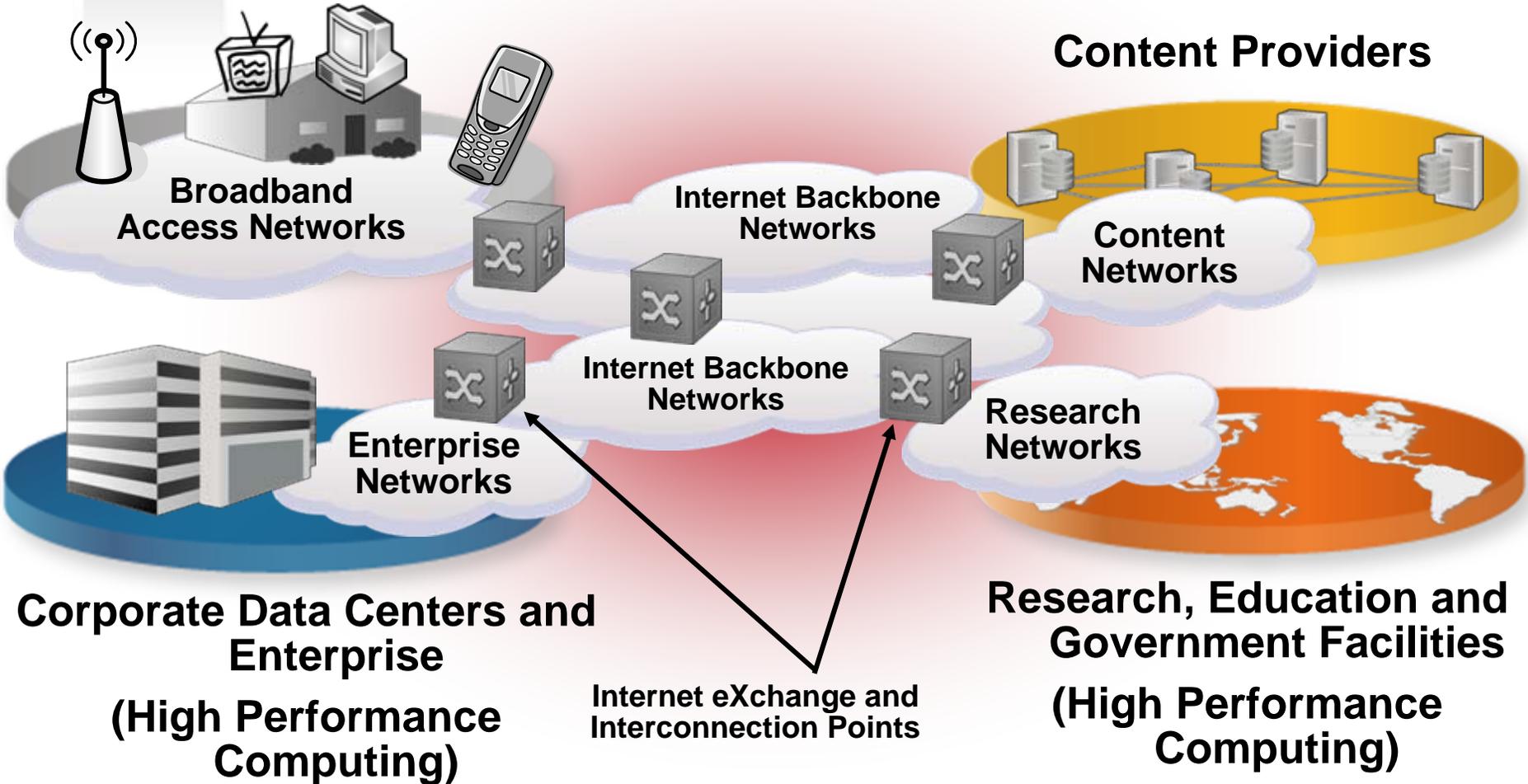
Birth of an IEEE Standard: It Takes About 5 Years

FORCE10

Process Flow		Annotations
Ideas From Industry		**Industry Pioneers 1 Year**
↓		
Feasibility and Research	←	**Ad Hoc Group**
↓		
Call for Interest	←	**CFI July 18, 2006**
↓		
Study Group		
↓		
Task Force		
↓		
Working Group Ballot		
↓		
Sponsor Ballot		
↓		
Standards Board Approval		
↓		**IEEE ~4 Years**
Publication		

FORCE10

- Industry Ad Hoc Group introduced a successful Call for Interest (CFI) at the July 2006 IEEE 802.3 Plenary meeting
  - CFI demonstrated that there is enough interest to start an official Study Group
  - Required 50% approval vote by voting IEEE 802.3 members
    - Results of vote: Yes: 53 No: 3 Abstain: 3
    - 108 people from 76 companies interested in participating

- Higher Speed Study Group CFI presentation
  http://grouper.ieee.org/groups/802/3/cfi/0706_1/CFI_01_0706.pdf
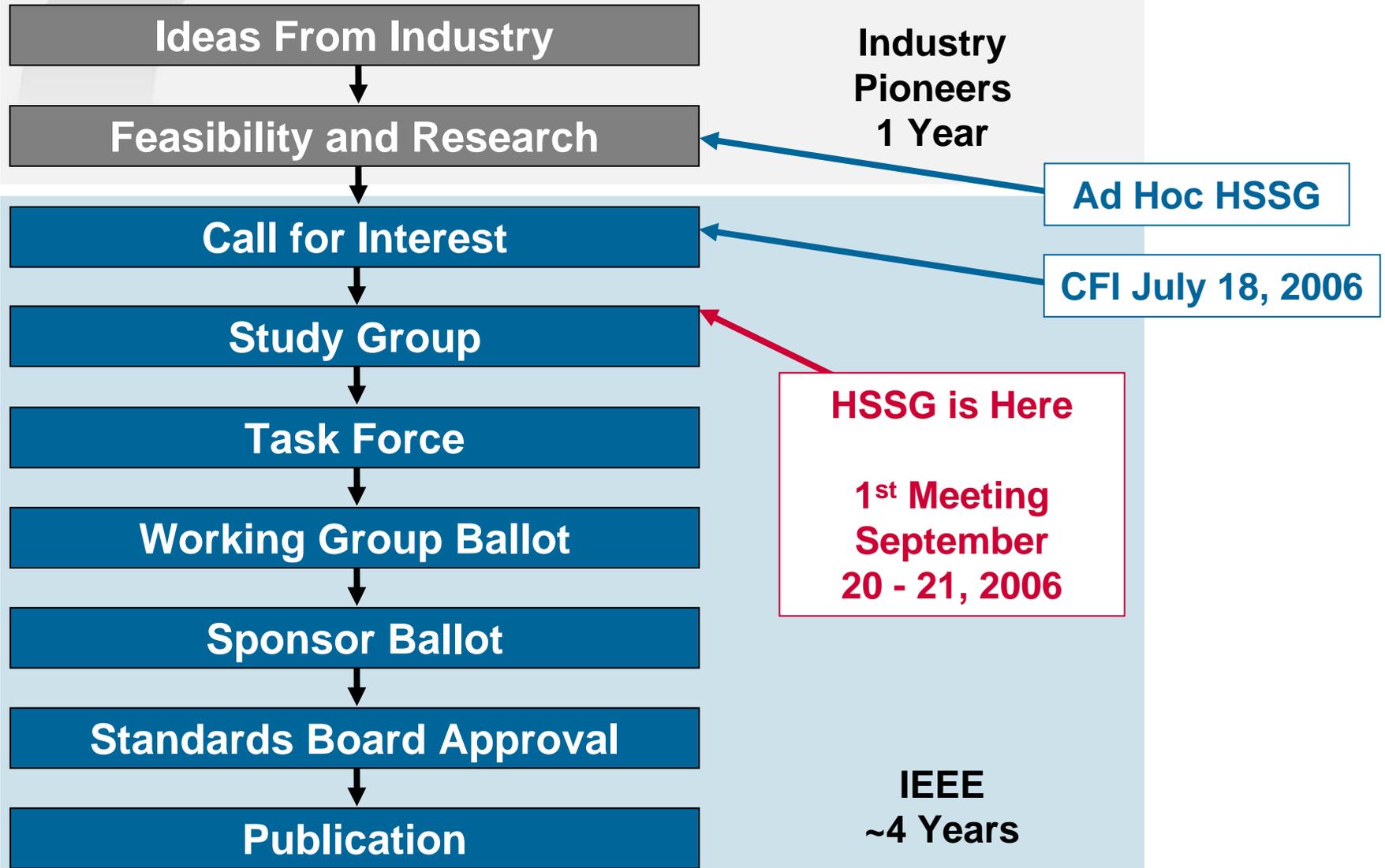
The Ethernet Ecosystem

FORCE10

Consumer Broadband Access

Content Providers

Broadband Access Networks

Internet Backbone Networks

Content Networks

Internet Backbone Networks

Enterprise Networks

Research Networks

Corporate Data Centers and Enterprise

(High Performance Computing)

Internet eXchange and Interconnection Points

Research, Education and Government Facilities

**(High Performance Computing)**

FORCE10

- Portals / Content Providers: bandwidth needs follow broadband speeds

- Video on Demand: Regional networks already in 10s of Gbps

- Service Providers: 8 x 10 GbE links now, 10s x 10 GbE in future

- Internet eXchanges: aggregate point for Internet traffic, n x 10 GbE peering, n x 10 GbE switch links

- High Performance Computing: ≈12x improvement in processing drives 10x jump in Ethernet interconnect

- Data Center: consolidation, server and storage consolidation, large clusters

- Research and Development: 2010 Forecast of 30 Gbps mean traffic, 150 Gbps peak traffic

- **Temporary fix for increased bandwidth demand**

- **Increased complexity**
  - Difficult to plan for capacity and traffic engineering
  - Harder to manage and troubleshoot multiple physical links based on a single logical interface
  - Cable and link management

- **Uneven distribution of traffic**
  - Limitations in the standard
  - Inefficient distribution of large flows
  - Load balancing requires deep packet inspection

Process Steps	Timeline
Ideas From Industry	**Industry Pioneers 1 Year**
Feasibility and Research	
Call for Interest	
Study Group	
Task Force	
Working Group Ballot	
Sponsor Ballot	
Standards Board Approval	
Publication	**IEEE ~4 Years**

Ad Hoc HSSG

CFI July 18, 2006

HSSG is Here

1st Meeting September 20 - 21, 2006

FORCE10

- ■ Project Authorization Request (PAR)

- ■ 5 Criteria
    - Broad Market Potential
    - Compatibility with IEEE Standard 802.3
    - Distinct Identity
    - Technical Feasibility
    - Economic Feasibility

- ■ Project Objectives
    - Study Group may find multiple projects to initiate
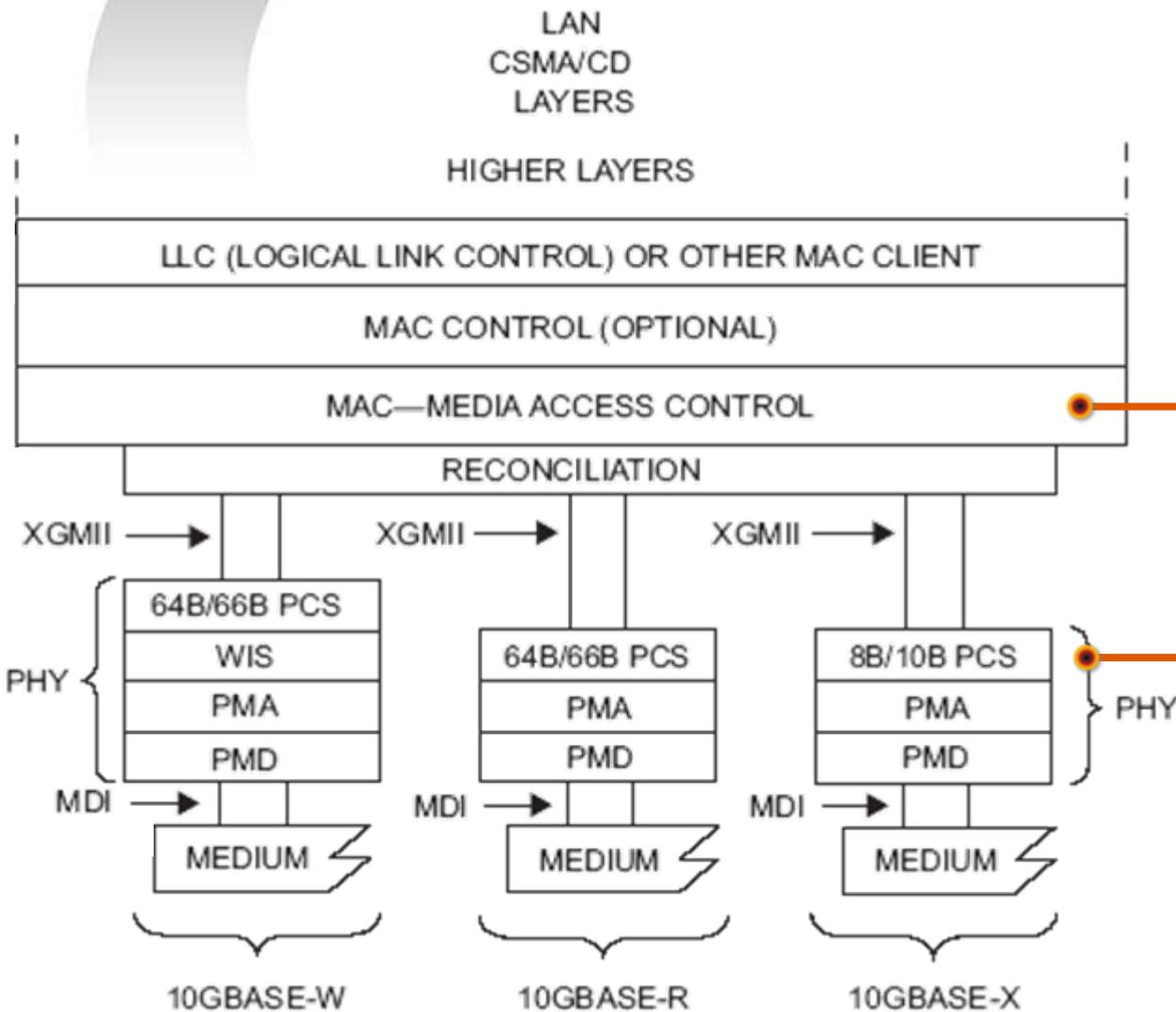
MAC data rate objective and architectural issues

PHY objectives

- Types
- Reaches

MDI - Medium Dependant Interface
PCS - Physical Coding Sublayer
PHY - Physical Layer Device
PMA - Physical Medium Attachment
PMD - Physical Medium Dependent
WIS - WAN Interface Sublayer
XGMII - 10 Gigabit Media Independent Interface

10

- Higher speed Ethernet means a faster MAC data rate

- Potential options
  - 40 Gbps
  - 80 Gbps
  - 100 Gbps
  - 120 Gbps
  - 160 Gbps
  - Scaleable speed

- Various methods
  - Faster serial speeds
  - Multiple wavelengths
  - Multiple conductors or fibers

- **Architectural issues**
  - LAG (IEEE 802.3ad)
    - Aggregation above MAC
    - Known limitations
  - Aggregation at the Physical Layer (below MAC)
    - Lane bonding has been used before in 10GBASE-LX4 and 10GBASE-CX4
    - Reuse of existing 10 GbE components

FORCE10

- **Multi-channel PHY**
  - Multicore cable, ribbon fiber
  - Parallel backplane channels

- **Multi-wavelength (WDM) PHY**
  - n wavelengths on single fiber pair

- **Multi-wavelength (DWDM) system**
  - Single wavelength per module
  - External optical MUX/DEMUX

10 GbE Historical Perspective				
	Standard	**Wavelength**	**Type**	**Distance**	**Media**
Fiber	10GBASE-SR / W	850 nm	Serial	300 m	MMF
	10GBASE-LRM	1310 nm	Serial	220 m	MMF
	10GBASE-LX4	1310 nm	WDM	300m	MMF
				10 km	SMF
	10GBASE-LR / W	1310 nm	Serial	10 km	SMF
	10GBASE-ER / W	1550 nm	Serial	40 km	SMF
Copper	10GBASE-CX4		4 Lanes	15 m	Twinaxial
	10GBASE-T		Twisted Pair	100 m	UTP
Backplane	10GBASE-KX4		4 Lanes	1 m	Improved FR-4
	10GBASE-KR		Serial	1 m	Improved FR-4

The Time to Speak is Now!

- **Broad Market Potential**
  - What is Broad Market Potential for HSE?
  - Need more input on port counts and growth projections

- **Speed objectives**
  - Most network operators want 100 GbE

- **Reach and type objectives**
  - Reach Ad Hoc Survey coming soon

IEEE 802.3 HSSG Reflector and Web Page

- To subscribe to the HSSG reflector, send mail to:

  ListServ@ieee.org

  with the following in the body of the message:

  subscribe stds-802-3-hssg <your first name> <your last name>
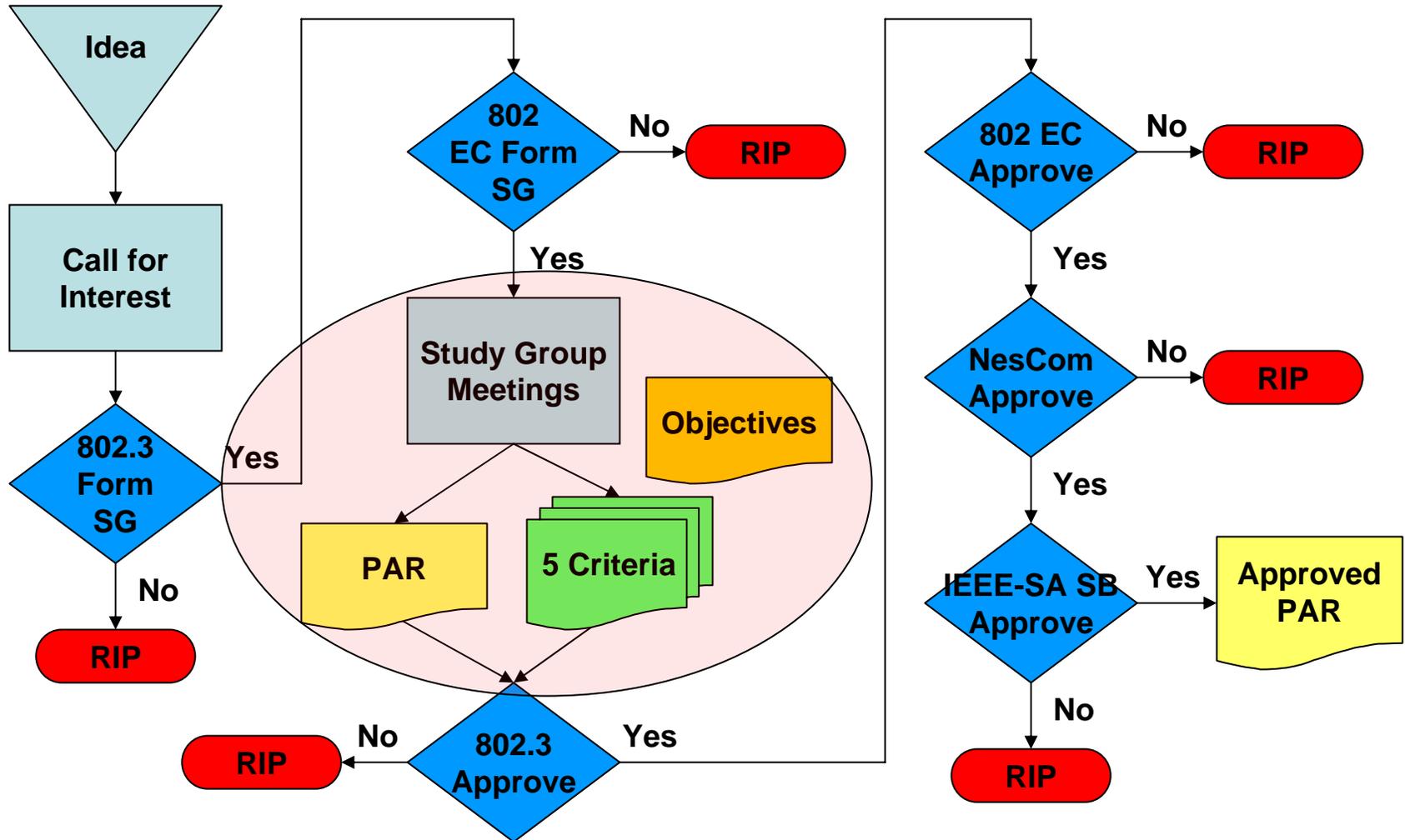
  end

- HSSG web page URL:

  http://grouper.ieee.org/groups/802/3/hssg/index.html

- **IEEE 802 Plenary**
  - November 12 – 17, 2006
  - Dallas, TX, USA
  - http://www.ieee802.org/meeting/future_meetings.html

- **IEEE 802.3 Interim**
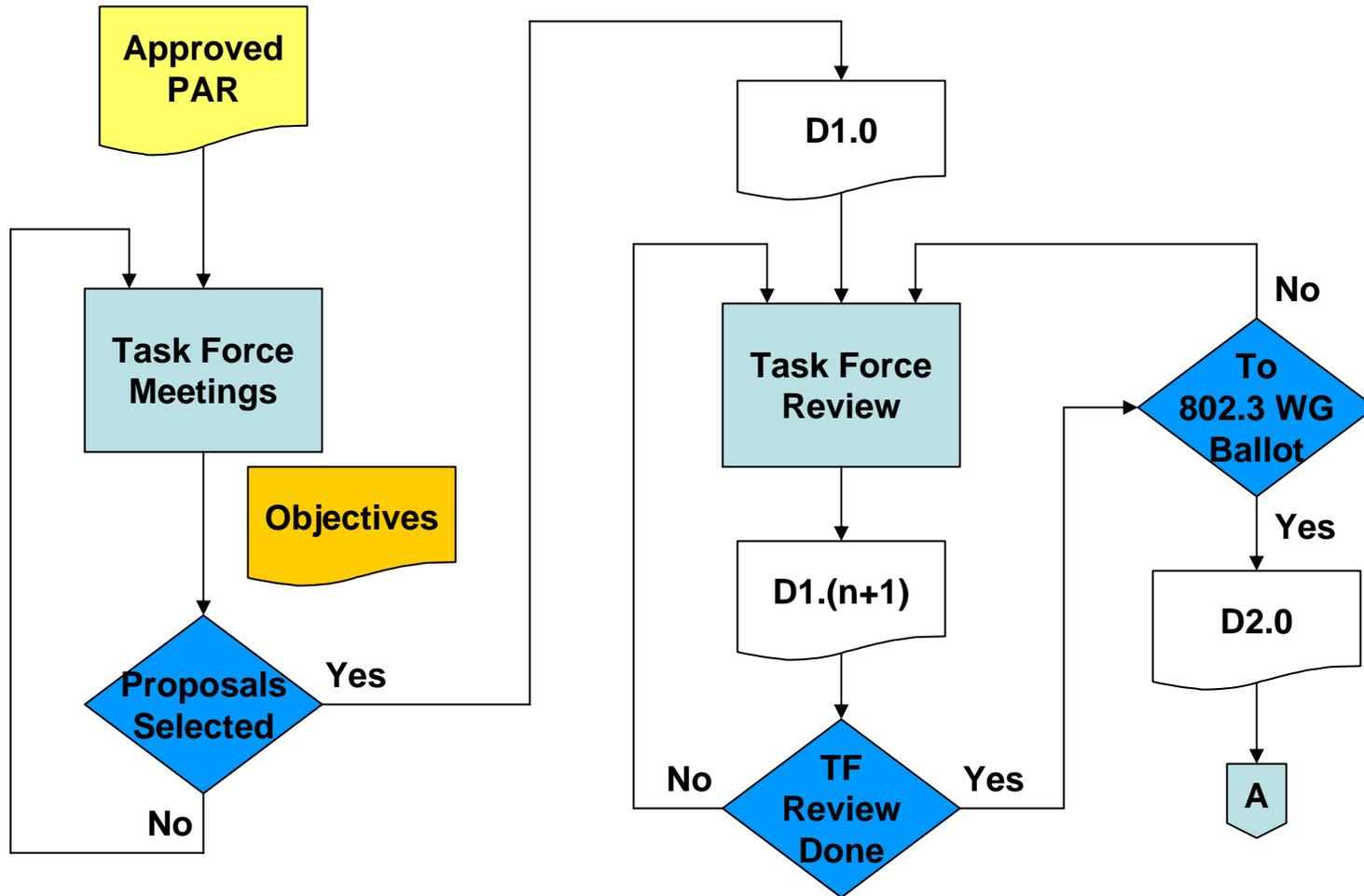 - January, 2007
  - TBA, USA
  - http://grouper.ieee.org/groups/802/3/interims/index.html
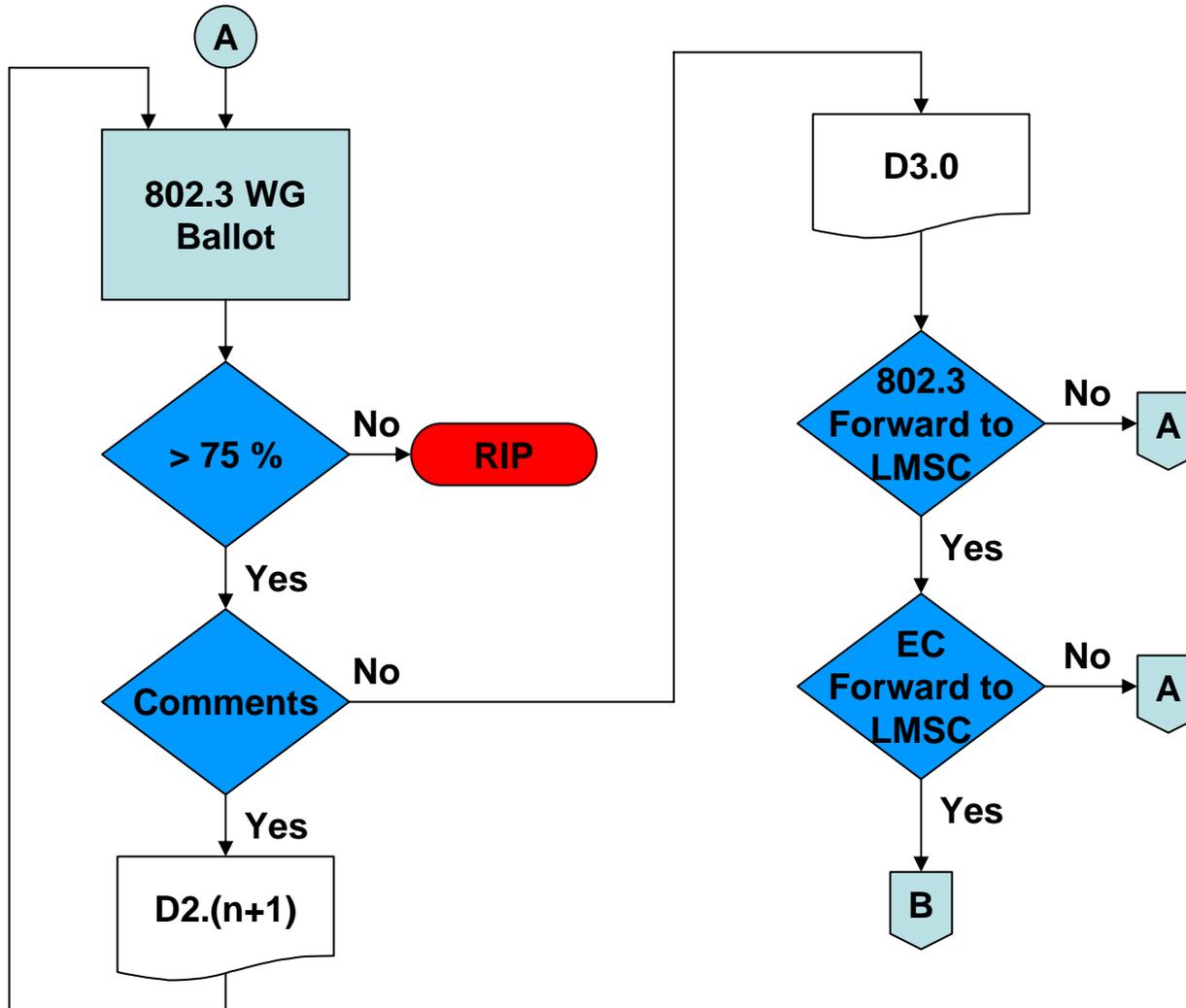
Thank You

IEEE Standards Process (1/4)

IEEE Standards Process (2/4)

IEEE Standards Process (3/4)

IEEE Standards Process (4/4)