

# Computer Science & IT

## COMPUTER NETWORKS (CN)

IP address Subnetting Supernetting

Lecture No. 08

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# Recap of Previous Lecture



Topic

IP

Topic

Topic



# Topics to be Covered



Topic

IP

Topic

Topic





## Extra Ordinary Individuals: Stories to Ignite Student Motivation

**Edavaleth Kakkat Janaki Ammal (1897–1984)** was a pioneering botanist who co-discovered colchicine-induced polyploidy to enhance crop varieties. Educated in the UK, she led genetic research at the Sugarcane Breeding Institute and the Botanical Survey of India. Ammal's work on plant cytogenetics improved stress resistance and yield in economically vital species. She championed biodiversity conservation and mentored women scientists, demonstrating how fundamental research in plant biology can support food security and sustainable agriculture.

**Lesson:** Scientific innovation paired with mentorship can drive agricultural advancement and empower underrepresented groups.





## Extra Ordinary Individuals: Stories to Ignite Student Motivation

**Asima Chatterjee (1917–2006)** was India's first female PhD in science, renowned for her work in organic chemistry and pharmacology. She isolated anti-epileptic and anti-malarial compounds from indigenous plants and developed vinca alkaloids for cancer treatment. As head of the University of Calcutta's chemistry department, she nurtured a culture of rigorous research. Chatterjee's dedication to natural product chemistry provided lifesaving therapies and inspired countless students, especially women, to pursue scientific careers.

**Lesson:** Research driven by societal needs can yield life-saving treatments and inspire future innovators.





## Extra Ordinary Individuals: Stories to Ignite Student Motivation

Koccharlakota Suryanarayana Krishnan (1908–1961) co-discovered the Raman scattering effect with C. V. Raman in 1928. He went on to conduct pioneering research in magnetism and electron spin resonance at Allahabad University, where he established key laboratories. Krishnan mentored a generation of physicists, integrating theoretical insights with practical experimentation. His dual legacy of discovery and education strengthened India's physics community and its international reputation.

Lesson: Collaborative discovery and mentorship create enduring scientific communities.



FLSM



VL<sub>2</sub>SM



00000000-0  
 10000000-128  
 11000000-192  
 11100000-224  
 11110000-240  
 11111000-248  
 11111100-252  
 11111110-254  
 11111111-255

Smt 255.255.192.0

11111111.11111111.11000000.00000000

$NID + SID = PS$  Hosts/Net

Host id = 0's HID = 14

Hosts/Net  $2^{14} - 2$

CA → SN

18 → NID + SID

18 = 8 + 10

SID = 18 - 8 = 10

SN =  $2^{10} = 1024$



0 0 0 0 0 0 0 0 - 0

1 0 0 0 0 0 0 0 - 128

1 1 0 0 0 0 0 0 - 192

1 1 1 0 0 0 0 0 - 224

1 1 1 1 0 0 0 0 - 240

1 1 1 1 1 0 0 0 - 248

1 1 1 1 1 1 0 0 - 252

1 1 1 1 1 1 1 0 - 254

1 1 1 1 1 1 1 1 - 255

Smt 255.255.192.0

11111111.11111111.11000000.00000000

CB  $\rightarrow$  SN

$$S = NID + SID$$

$$18 = 16 + SID$$

$$SID = 2$$

$$\text{Subnets} = 2^2 = 4$$



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

smr 255.255.255.240

CC → SN

11111111.11111111.11111111.11110000

$$|S = 28 = NID + SID$$

$$28 = 24 + SID$$

$$SID = 28 - 24 = 4$$

$$\text{Subnets} = 2^4 = 16$$



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

smr 255.255.255.240

CB  $\rightarrow$  Hosts/Nw, SN

11111111.11111111.11111111.11100000

HIO = 4 =  $2^4 - 2$  Hosts/Nw

I'S  $\rightarrow$  28

I'S = NID + SID

28 = 16 + SID

SID = 12 bits

SN =  $2^{12}$



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

Smt 255.255.255.240

CE  $\rightarrow$  Hosts/N/w and SN's

11111111.11111111.11111111.11110000

Host = 4 bits,  $\Rightarrow$  no of hosts =  $2^4 - 2$   
= 14

$$I'S = NID + SID$$

$$28 = 24 + SID$$

$$SID = 28 - 24 = 4$$

$$SN = 2^{SID} = 2^4 = 16$$



00000000-0  
10000000-128  
11000000-192  
11100000-224  
11110000-240  
11111000-248  
11111100-252  
11111110-254  
11111111-255

### Subnet mask

255.0.0.0 → default sm of CA

CA → Host/nw & and SNs

11111111.00000000.00000000.00000000

$$1's = NID + SID$$

$$8 = 8 + SID \Rightarrow SID = 0$$

$$2^0 = 1 \text{ Subnet}$$

150 hours



0 0 0 0 0 0 0 0 - 0  
1 0 0 0 0 0 0 0 - 128  
1 1 0 0 0 0 0 0 - 192  
1 1 1 0 0 0 0 0 - 224  
1 1 1 1 0 0 0 0 - 240  
1 1 1 1 1 0 0 0 - 248  
1 1 1 1 1 1 0 0 - 252  
1 1 1 1 1 1 1 0 - 254  
1 1 1 1 1 1 1 1 - 255

Subnet mask

255.0.0.0 <sup>X</sup> →

CB → Hosts/N/w SN

Default sm of CB

255.255.0.0 ✓

Not possible



00000000-0  
 10000000-128  
 11000000-192  
 11100000-224  
 11110000-240  
 11111000-248  
 11111100-252  
 11111110-254  
 11111111-255

Subnet mask  
255.0.0.0

CC Host SN  
 Not possible X

DF Sum of CC  
255.255.255.0



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

Sm: 255.192.0.0

CA Hosts/NW SN

11111111.11000000.00000000.00000000  
1

$$I's - 10 = NID + SID$$

$$10 = 8 + SID$$

$$SID = 2 \quad SN = 2^2 = 4$$

$$Hosts/SN = N's = 2^2$$

$$N's/SA = 2^{2^2} = \underline{\underline{2}}$$

CB CC

X X



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

Sm: 255.240.0.0

CA Hosts/N/w Subnets

11111111.11110000.00000000.00000000

$$12 = 8 + 4$$

$$12 = 8 + 4$$

$$8 = 4$$

$$SN = 2^4 = 16$$

$$HID = 20$$

$$Hosts/N/w = 2^{20} - 2$$

CB

✓  
X

CC

✓  
X



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

Sm: 255.255.0.0

CA: Hosts/N/w SN

11111111.11111111.00000000.00000000

$$1's = 16 = NID + SID$$

$$16 = 8 + SID$$

$$SID = 8$$

$$SN = 2^8 = 256$$

O's - 16 bits

$$\text{Hosts/N/w} = 2^{16} - 2$$



00000000-0  
10000000-128  
11000000-192  
11100000-224  
11110000-240  
11111000-248  
11111100-252  
11111110-254  
11111111-255

Sm: 255.255.0.0 → default: sm for CB

CB → Hosts/N/w, Subnets

$$1'S - 16 = NID + SID$$

$$16 = 16 + SID$$

$$SID = 0$$

$$SN = 2^0 = 1$$

$$2^{16} - 2 \text{ hosts}$$



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

255.255.254.0

CA: Hosts/N/w SN's

SM:  $\frac{11111111}{8} \cdot \frac{11111111}{8} \cdot \frac{11111110}{7} \cdot 00000000$

$$15 - 23 = \text{NID} + \text{SID}$$

$$23 = 8 + \text{SID}$$

$$\text{SID} = 15$$

$$\text{SN} = 2^{15}$$

$$\text{HID} = 9 \text{ 0's}$$

$$\text{Hosts/N/w} = 2^9 - 2$$



00000000-0  
 10000000-128  
 11000000-192  
 11100000-224  
 11110000-240  
 11111000-248  
 11111100-252  
 11111110-254  
 11111111-255

255.255.254.0

CB → Hosts/N/W SN

11111111.11111111.111111110.00000000

$$1's = 23 = \text{NID} + \text{SID}$$

$$23 = 16 + \text{SID}$$

$$\text{SID} = 7$$

$$\text{SN} = 2^7$$

CCX

$$0's = 9 = \text{HID}$$

$$2^9 - 2 = \text{Hosts}$$



00000000-0  
 10000000-128  
 11000000-192  
 11100000-224  
 11110000-240  
 11111000-248  
 11111100-252  
 11111110-254  
 11111111-255

255.255.254.0

CB → Host/N/W SN

11111111.11111111.111111110.00000000

$$1's = 23 = \underset{\downarrow}{NID} + \underset{\downarrow}{SID}$$

$$23 = 16 + SID$$

$$SID = 7$$

$$SN = 2^7$$

$$0's = 9 = HID$$

$$2^9 - 2 = Host$$



00000000-0  
 10000000-128  
 11000000-192  
 11100000-224  
 11110000-240  
 11111000-248  
 11111100-252  
 11111110-254  
 11111111-255

255.255.255.224

$\underline{CA} \rightarrow \underline{SN}$       Hosts/SN  
11111111.11111111.11111111.11100000

$$1's - 27 = NID + SID$$

$$27 = 8 + SID$$

$$SID = 19$$

$$SN = 2^{19}$$

Size of each N/w

$$= 2^5 - 2$$

$$HID = 5 \text{ zones}$$



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

255.255.255.224

CB → Hosts/Net /SN

11111111.11111111.11111111.11100000

$$1's = 27 = NID + SID$$

$$27 = 16 + SID$$

$$SID = 11$$

$$SN = 2^{SID} = 2^{11}$$

$$0's - 5 = NID$$

$$Hosts = 2^5 - 2 = \underline{30}$$



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

255.255.255.224

CC - Host/Net - SN

11111111.11111111.11111111.11100000

$$1's = 27 = NID + SID$$

$$27 = 24 + SID$$

$$SID = 3$$

$$SN = 2^3 = 8$$

$$\begin{aligned} \text{Hosts/SN} &= 2^5 - 2 \\ &= 32 - 2 \\ &= \textcircled{30} \checkmark \end{aligned}$$



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

255.255.255.240

CA

11111111.11111111.11111111.11110000

$$IS - 28 = NID + SID$$

$$28 = 8 + \underline{SID}$$

$$SID = \underline{20}$$

$$\underline{SN = 2^{20}}$$

Host/SN

$$\underline{HIO = 4}$$

$$\underline{2^4 - 2 = 14}$$



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

255.255.255.240

CB =

11111111.11111111.11111111.11110000  
-----  
          NID

$$IS = 28 = NID + SID$$

$$28 = 16 + SID$$

$$SID = 12$$

$$SN = 2^{12}$$

$$\text{Size of SN} = 2^4 - 2 \text{ Hosts/SN}$$



00000000-0

10000000-128

11000000-192

11100000-224

11110000-240

11111000-248

11111100-252

11111110-254

11111111-255

✓  
CIDR

255.255.255.240

CC

11111111.11111111.11111111.11110000

$$|S| = 28 = NID + SID$$

$$28 = 24 + SID$$

$$SID = 4$$

$$SN = 2^4$$

Size of each net

$$HID = \underline{0000} = 4 \text{ bits}$$

$$\text{Host/net} = 2^4 - 2 \\ = 14 \checkmark$$



**THANK - YOU**