

**APPLICATIONS OF MANAGEMENT SCIENCE AND TECHNIQUES
TO TELECOMMUNICATIONS NETWORK SYSTEMS**

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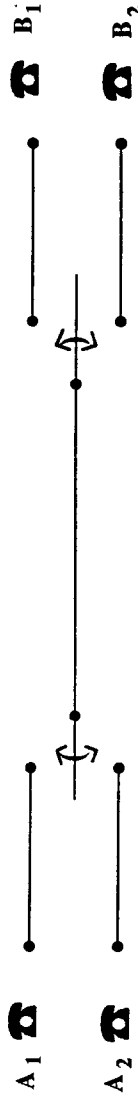
TELECOMMUNICATIONS SERVICES(1)

1. END-TO-END CIRCUIT CONNECTIVITY

- **NON-SWITCHED (DEDICATED, LEASED) CIRCUIT CONNECTIVITY**

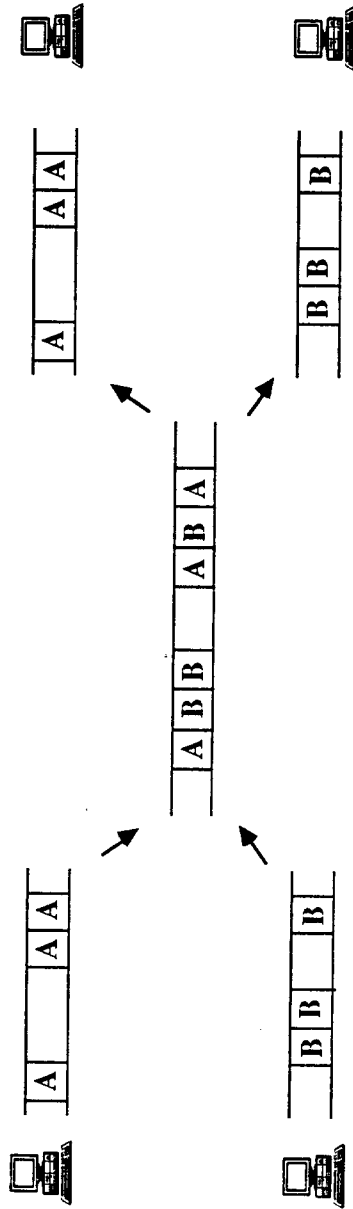


- **SWITCHED CIRCUIT CONNECTIVITY**



TELECOMMUNICATIONS SERVICES(2)

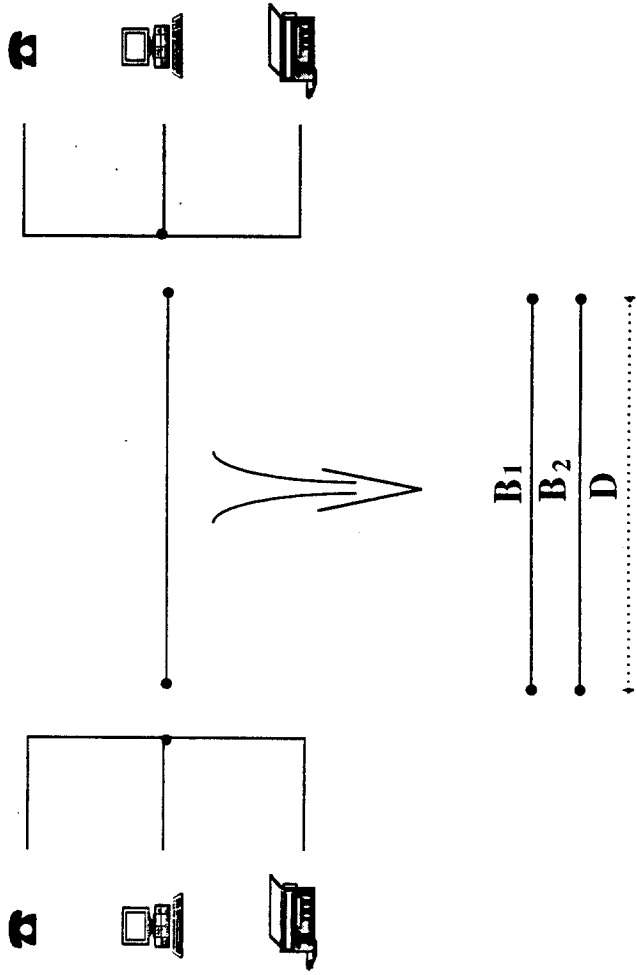
2. PACKET SWITCHED CONNECTIVITY



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TELECOMMUNICATIONS SERVICES(3)

3. INTEGRATED CONNECTIVITY



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TELECOMMUNICATIONS SERVICES(4)

- **TELEPHONY**
 - **PLAIN-AND-OLD TELEPHONE SERVICES**
 - **SPECIAL TELEPHONE SERVICES :**
 - SPEED CALLING, CALL WAITING, CALL FORWARDING, ETC**
 - **LEASED LINE**
 - **COLLECTIVE TELEPHONE**
 - **CENTREX**
 - **(080) CLOVER SERVICES**
 - **TELEX, TELEGRAM**
 - **PUBLIC TELEPHONE**



TELECOMMUNICATIONS SERVICES(5)

- ❑ **INFORMATION SERVICES**
 - **HITEL SERVICES**
 - ELECTRONIC DIRECTORY SERVICES**
 - ACADEMIC INFORMATION SERVICES**
 - **VIDEOTEX SERVICES**
 - **700 SERVICES**
 - TELEPHONE INQUIRY SERVICES**
- ❑ **INTELLIGENT NETWORK SERVICES**
 - **FREE-PHONE SERVICES (*)**
 - **CREDIT-CALL SERVICES (*)**
- ❑ **NARROW-BAND ISDN SERVICES**
- ❑ **CORPORATE COMMUNICATION SERVICES**
 - **CO-LAN**
 - **VIRTUAL PRIVATE NETWORK (VPN)**

(* : IN-TEST SERVICE)



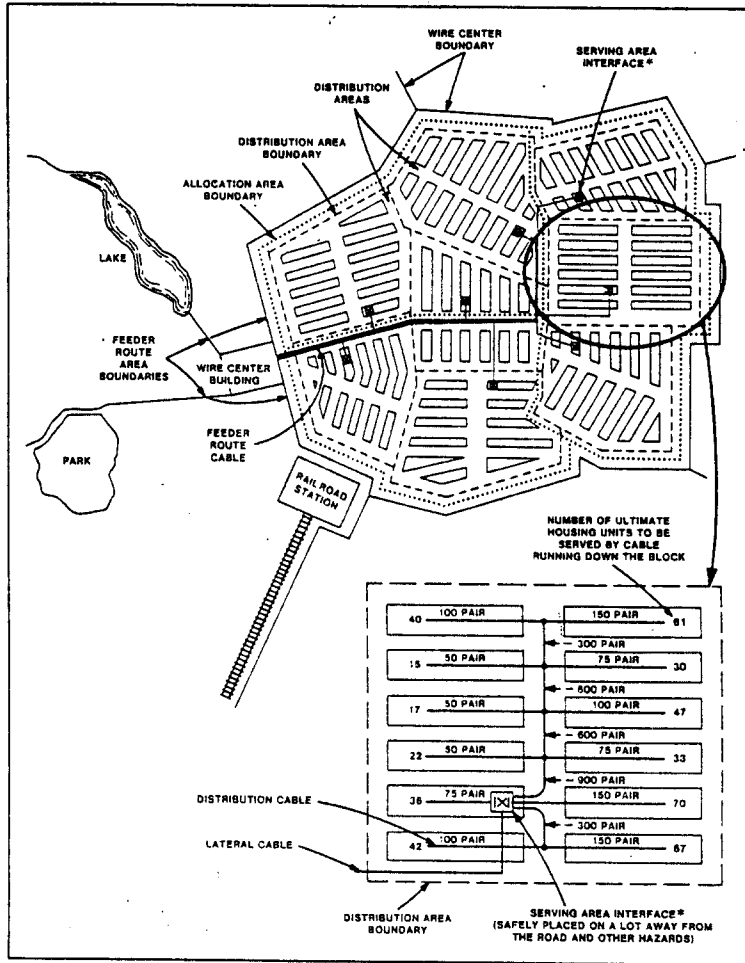
TELECOMMUNICATIONS SERVICES(6)

- ❑ **NEW MEDIA SERVICES**
 - CATV (*)
 - VIDEO TELECONFERENCING
 - VIDEOPHONE
- ❑ **WIRELESS COMMUNICATION SERVICES**
 - MOBILES
 - TRUNK RADIO SYSTEM
 - PORT, RAILROAD, AIRLINE
- ❑ **FUTURE SERVICES**
 - VOD
 - CT-2,3
 - PCS
 - WIRELESS DATA COMMUNICATION
 - LEO (LOW EARTH ORBIT) SATELLITE COMMUNICATION SERVICES



TELECOMMUNICATIONS NETWORKS(1)

OUTSIDE PLANT



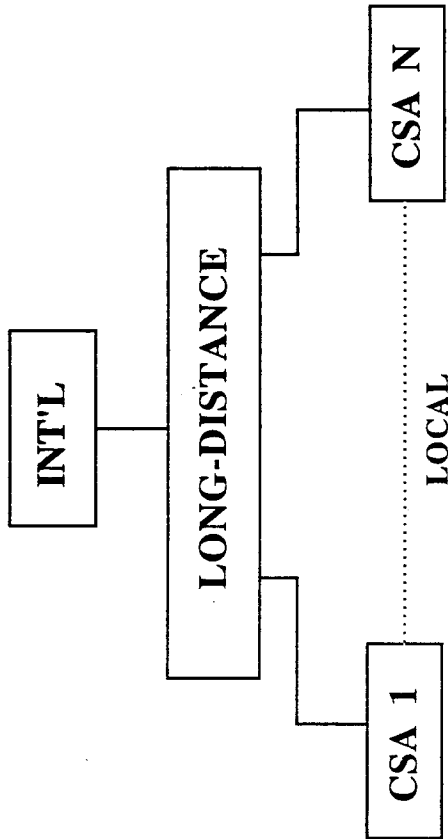
* A rearrangeable cross-connect point between feeder and distribution cables in the loop plant.



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TELECOMMUNICATIONS NETWORKS(2)

□ **NETWORK TOPOLOGY**



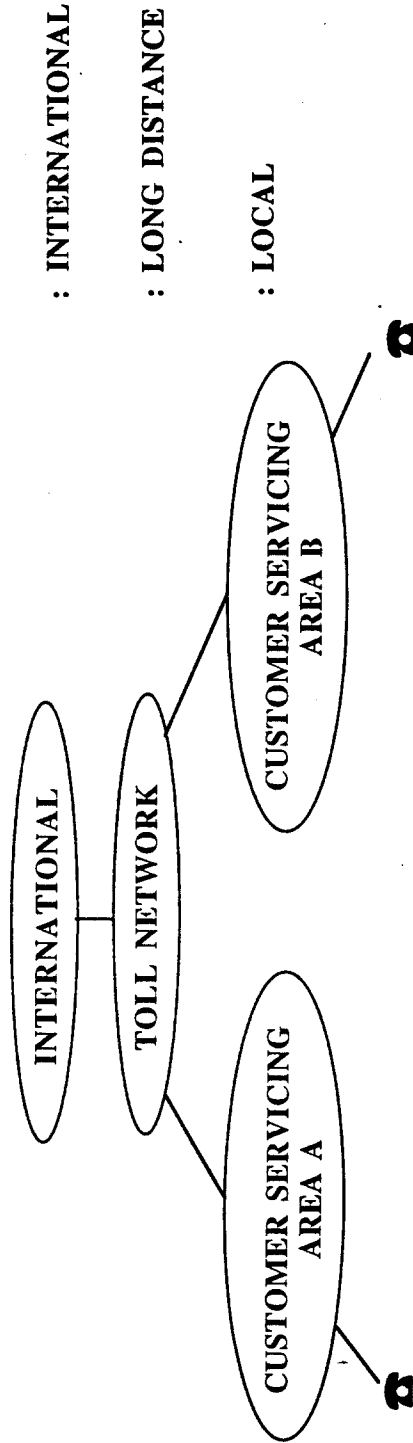
(CSA : CUSTOMER SERVING AREA)



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TELECOMMUNICATIONS NETWORKS(3)

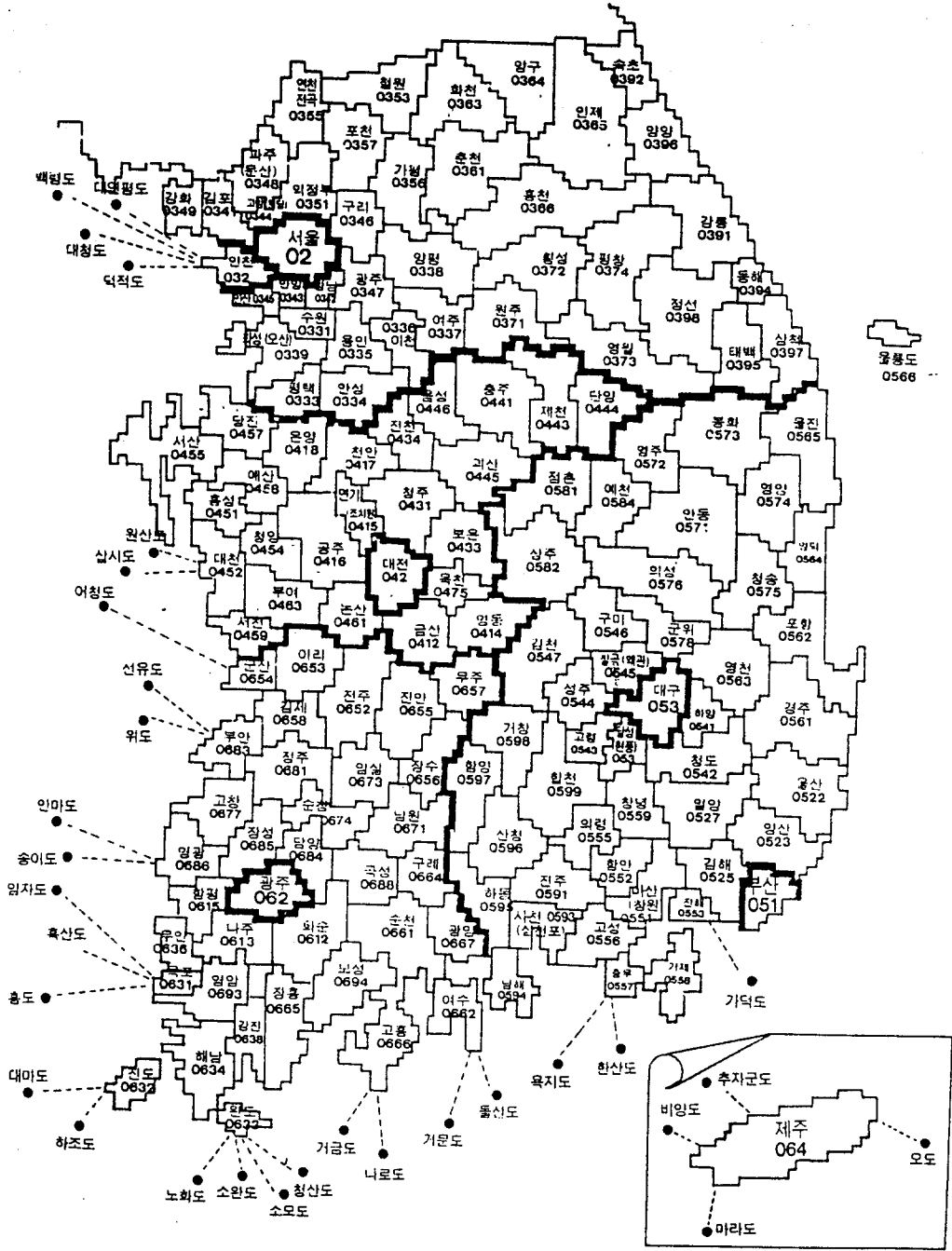
- ❑ **KOREA TELECOM'S NETWORK DIMENSION**
 - 146 CUSTOMER SERVING AREAS
 - 239 CENTRAL OFFICES, 74 BRANCHING OFFICES, 937 LOCAL EXCHANGES
 - 10 REGIONAL OPERATING ENTITIES
 - 34 LONG-DISTANCE TOLL EXCHANGES
 - 6 INTERNATIONAL GATEWAYS



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TELECOMMUNICATIONS NETWORKS(4)

CSAs IN KOREA TELECOM



TELECOMMUNICATIONS NETWORKS(5)

- ❑ CIRCUIT-SWITCHED NETWORK
- ❑ PACKET-SWITCHED NETWORK
- ❑ COMMON-CHANNEL SIGNALING NETWORK
- ❑ NARROW-BAND ISDN
- ❑ ATM-BASED BROAD-BAND NETWORK (*)
- ❑ PCS WIRELESS ACCESS NETWORK (*)
- ❑ SATELLITE TELECOMMUNICATIONS (*)
- ❑ BROADCASTING NETWORK (*)

(* : IN-PLANNING)



TELECOMMUNICATIONS NETWORKS(6)

□ SWITCHING

(unit : 1,000 circuits)

	Electro Mechanical	Switching Analog	NO.5	S1240	AXE-10	NO.4	TDX-10	Total
Local	956	7,937	1,459	1,391	1,708			19,057
Long-distance					290	218	4,876	558
International					8.2	4.2		12.4

□ TRANSMISSION

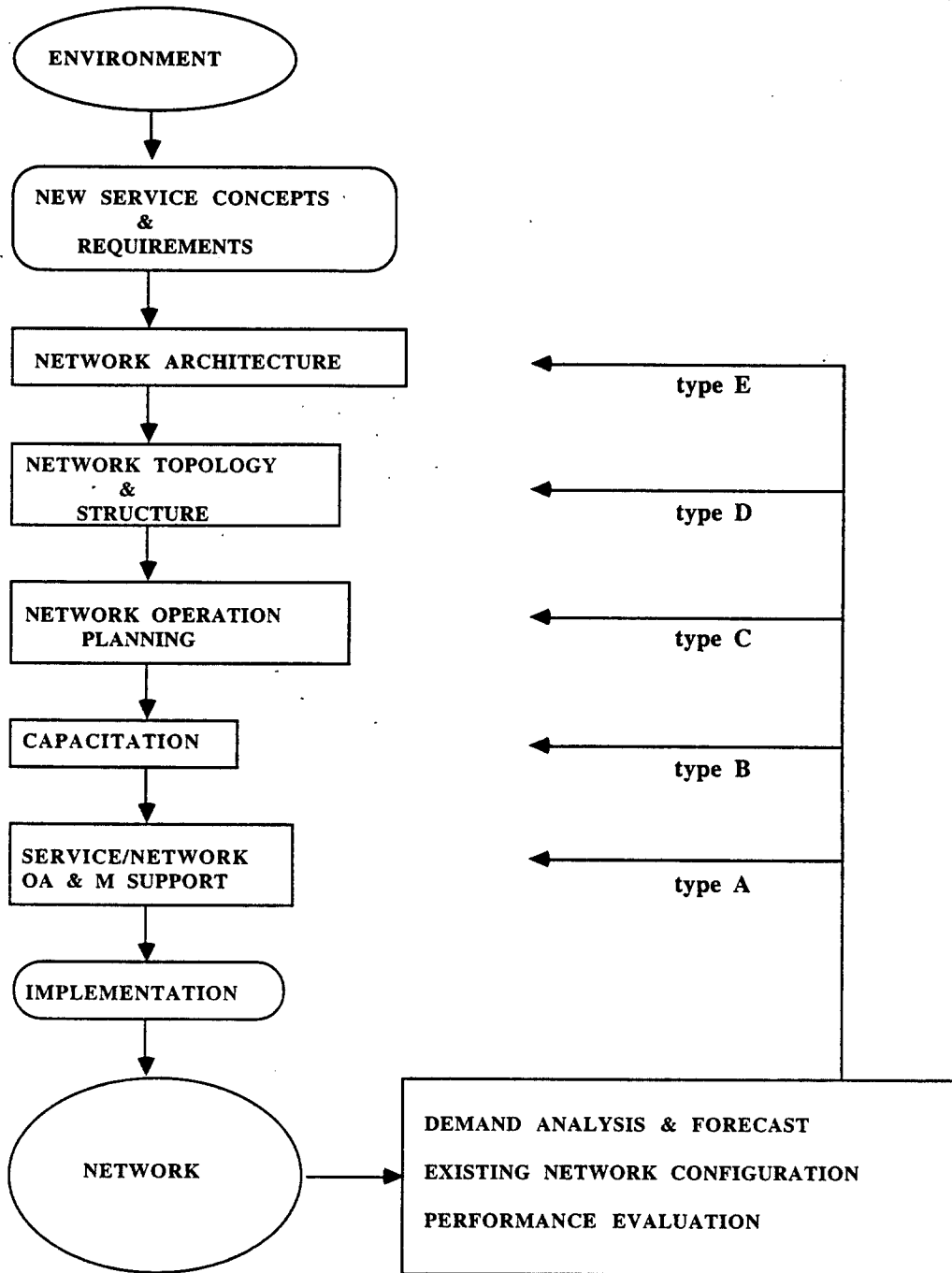
(unit : 1,000 circuits)

	Copper	A-M/W	Coaxial	Satellite	D-M/W	PCM	Optical Fiber	Total
Inter-Office	266					1,192	1,341	2,799
Long-distance		6	37		87	73	492	695
International			1.2	5.2			3.5	9.2



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NETWORK PLANNING AND ENGINEERING PROCESS



MS/OR PROBLEMS IN NETWORK PLANNING & ENGINEERING (1)

COMMON OBJECTIVES IN NETWORK PLANNING AND ENGINEERING

- DEMAND TRAFFIC ACCOMMODATION
- LOW-COST FACILITY PROVISION
- EFFICIENT OPERATION AND MANAGEMENT
- FLEXIBLE REARRANGEMENT AND EVOLUTION CAPABILITY

FUNDAMENTAL DIFFICULTIES IN PROBLEM-SOLVING

- SYSTEM UNCERTAINTY
- LARGE-SCALE OF SYSTEM DIMENSION



MS/OR PROBLEMS IN NETWORK PLANNING AND ENGINEERING (2)

DEMAND ANALYSIS AND FORECAST

- TRAFFIC CHARACTERIZATION
 - CALL ARRIVAL RATE
 - HOLDING TIME
- NETWORK LOAD ESTIMATION
 - SAMPLING TECHNIQUES
 - LIMITATION IN DATA MEASUREMENTS
- DIVERSIFIED TRAFFIC TYPES
- DEMAND FORECAST
 - TRAFFIC VARIATION BY HOUR, DAY, WEEK, MONTH, SEASON, ETC.
 - DEMOGRAPHIC CHANGES, SERVICE UTILIZATION, TARIFF



MS/OR PROBLEMS IN NETWORK PLANNING AND ENGINEERING (3)

NETWORK TOPOLOGY AND STRUCTURE

- **ACCESS TOPOLOGY**
 - **DEFINITION OF CUSTOMER SERVING AREA**
 - **STAR/BUS/RING**
- **NETWORK TOPOLOGY**
 - **LEVEL OF HIERARCHY**
 - **CLUSTERING/GROUPING/HUBBING**
 - **SWITCHED VS. CROSS-CONNECT**
 - **REARRANGEABILITY**



MS/OR PROBLEMS IN NETWORK PLANNING AND ENGINEERING (4)

NETWORK OPERATION PLANNING

- **NUMBERING**
- **ROUTING AND RE-ROUTING**
- **INTER-WORKING**
- **CENTRALIZED/DISTRIBUTED NETWORK CONTROL**



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MS/OR PROBLEMS IN NETWORK PLANNING AND ENGINEERING (5)

CAPACITATION

- LOOP
- WIRE-CENTER
- SWITCHING
- TRUNKING/TRANSMISSION
- SIGNALING/CONTROLLING
- DATABASE



MS/OR PROBLEMS IN NETWORK PLANNING AND ENGINEERING (6)

OA&M SUPPORTS

- **FACILITY OPERATIONS AND MAINTENANCE**
- **NETWORK CONGESTION CONTROL**
- **BUSINESS/CUSTOMER SUPPORT**
- **RELIABILITY AND SURVIVABILITY**
- **PERFORMANCE EVALUATION AND VERIFICATION**



MS/OR PROBLEMS IN NETWORK PLANNING AND ENGINEERING (7)

- STOCHASTIC PROCESSES AND STATISTICS
- MODELING AND SIMULATION TECHNIQUES
- OPTIMIZATIONS
- GRAPH THEORY AND COMBINATORICS
- LINEAR AND NON-LINEAR SYSTEM THEORY
- CONTROL THEORY
- QUEUEING THEORY
- INFORMATION MANAGEMENT

**BROAD APPLICABILITY OF MS/OR THEORIES AND TECHNIQUES TO TELECOMMUNICATIONS
BUSINESS AND SYSTEMS**

