

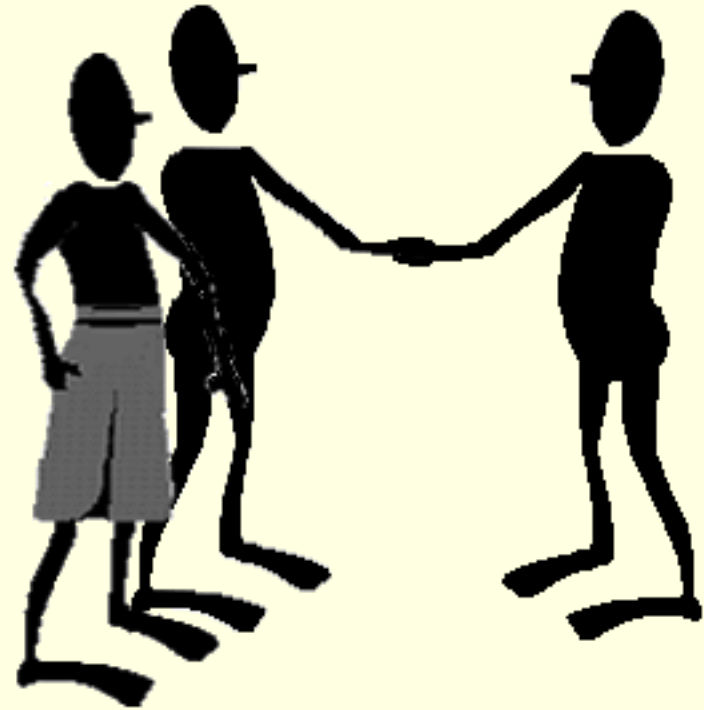
# *1. INTRODUCTION*

## *CHAPTER 1*

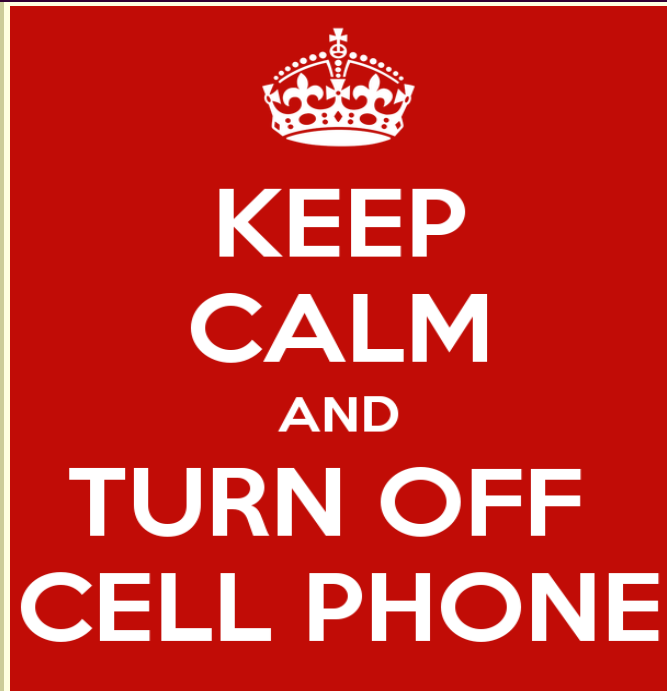
*Dr. Mahmud Mansour*

# Introduce yourselves

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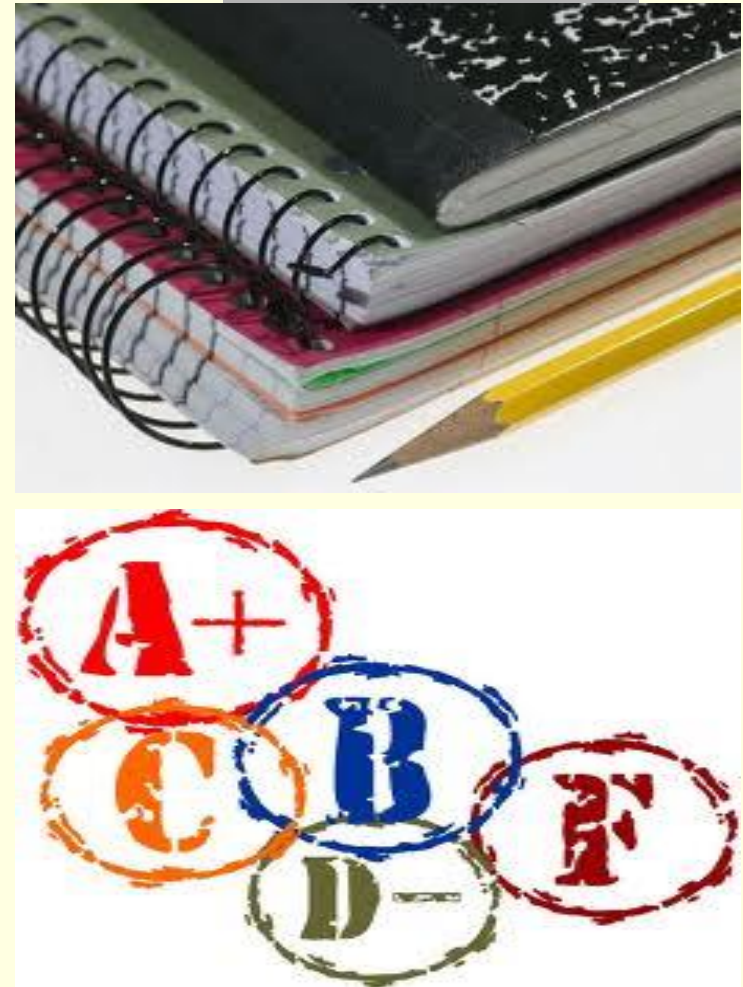
Attending ITNT 412



<https://www.youtube.com/watch?v=d2xb2tTqDX8>

# Succeeding in INTN412

- Preparation and organization
  - Pen/pencil, Notebook
  - Taking notes
  - Print slides
- Grades
  - Not the only deciding factor
  - 25 % Exam 1
  - 25 % Home work, Quiz and Team work.
  - 50% Final Exam.
  - Absent from Test or Exam = Zero.



# My background

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- **Prof : School of IT. Department of Networking**
- **BEng, MSc Telecom and Network Engineering. Salford University.**
- **PhD Wireless Network. Bradford University.**
- **Networking Consultant and Networking Instructor**
  - Date Center Design and Operation Management Expert.
  - Cisco certified Academic Instructor (CCAI).
  - Cisco certified Academic Instructor (Wireless LANs).
  - Cisco certified Academic Instructor (Voice and Data Cabling).
  - CCNA and CCNP - CCDA and CCDP.

## **Other Previous Work Experience**

- College of Telecom and IT – Saudi Arabia
- Department of Electrical and Electronic Engineering. Imam University – Saudi Arabia

# Contents of Course

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Part - 1 Identifying Your Customer's Needs and Goals.

Part - 2 Logical Network Design.

Part - 3 Physical Network Design.

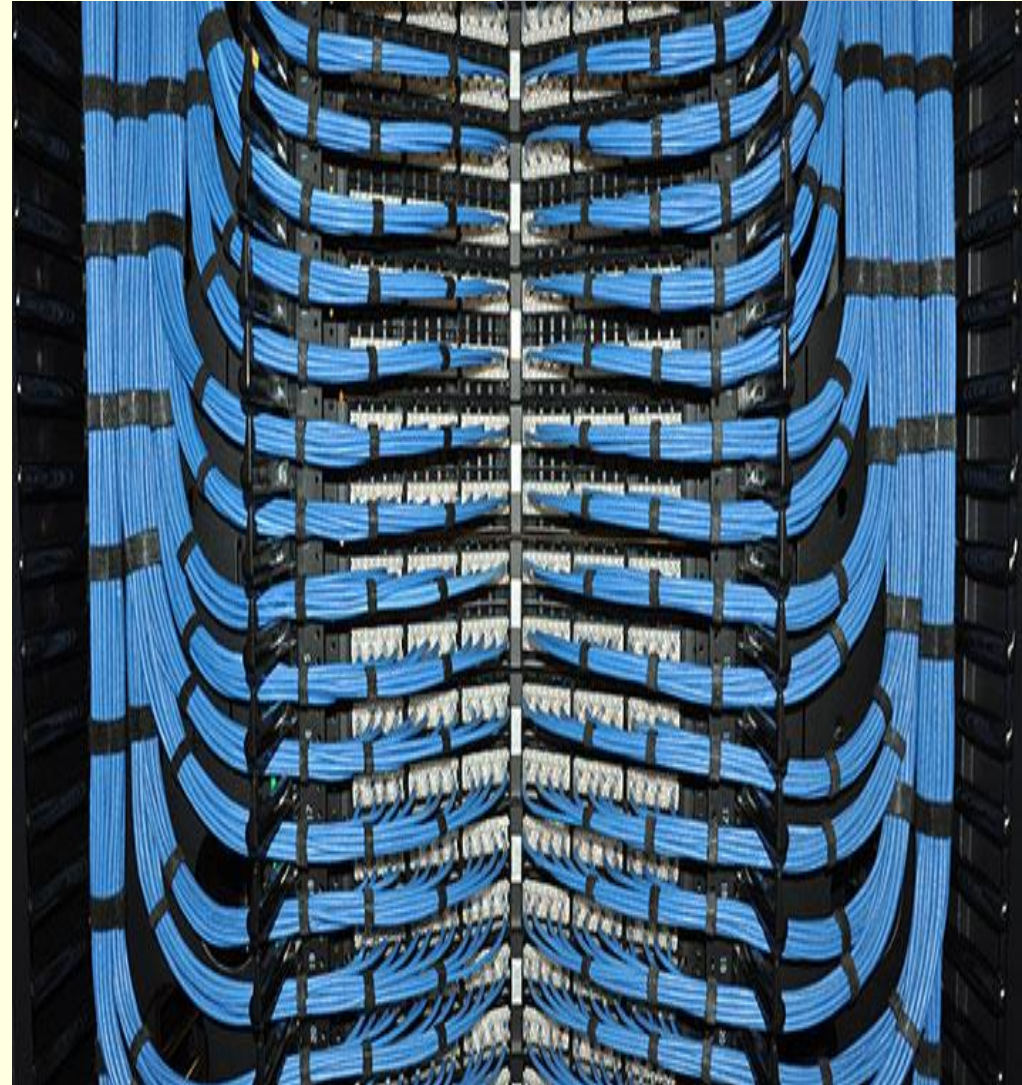
Part - 4 Testing, Optimizing, and Documenting Your Network Design.



BEFORE



AFTER



# Part - 1 Identifying Your Customer's Needs and Goals.

## Terminology

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- **Internetwork**  
a collection of interconnected networks.
- **Design**  
a preliminary sketch or outline showing the main features of something to be executed.
- **Network design**  
involves decisions on several issues including topology, architecture, flexibility, cost etc.
- **Network management**  
The process of controlling a network so as to maximize its efficiency and productivity.



# Traditional Network Design

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- Based on a set of **general rules**
  - "80/20"
  - "Bridge when you can, route when you must"
  - Can't deal with scalability & complexity
- Focused on **capacity planning**
  - Throw more bandwidth at the problem
  - No consideration to delay optimization
  - No guarantee of service quality
  - Less importance given to network RMA (Reliability, Maintainability, and Availability) compared to throughput

# Traditional Network Design Methodology

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- Many network design tools and methodologies in use today resemble the "connect-the-dots" game
- These tools let you place internetworking devices on a palette and connect them with LAN or WAN media
- Problem with this methodology:
  - It skips the steps of analyzing a customer's requirements, and selecting devices and media based on those requirements

# Top-Down Network Design Methodology (1/2)

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- Good network design
  - Recognizes customer's requirements
  - May specify a required level of network performance, i.e., service level
  - Includes difficult network design choices and tradeoffs that must be made when designing the logical network before any physical devices or media are selected
- When a customer expects a quick response to a network design request
  - A bottom-up (connect-the-dots) network design methodology can be used, if the customer's applications and goals are well known

## Top-Down Network Design Methodology (2/2)

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- Network designers often think they understand a customer's applications and requirements.
- However, after the network installation, they may discover that:
  - They did not capture the customer's most important needs
  - Unexpected scalability and performance problems appear as the number of network users increases

# Top-Down Network Design Process (1/2)

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- Begins at the upper layers of the OSI reference model before moving to the lower layers
  - Focuses on applications, sessions, and data transport before the selection of routers, switches, and media that operate at the lower layers
- It is an iterative process:
  - It is important to first get an overall view of a customer's requirements
  - More detail can be gathered later on protocol behavior, scalability requirements, technology preferences, etc.



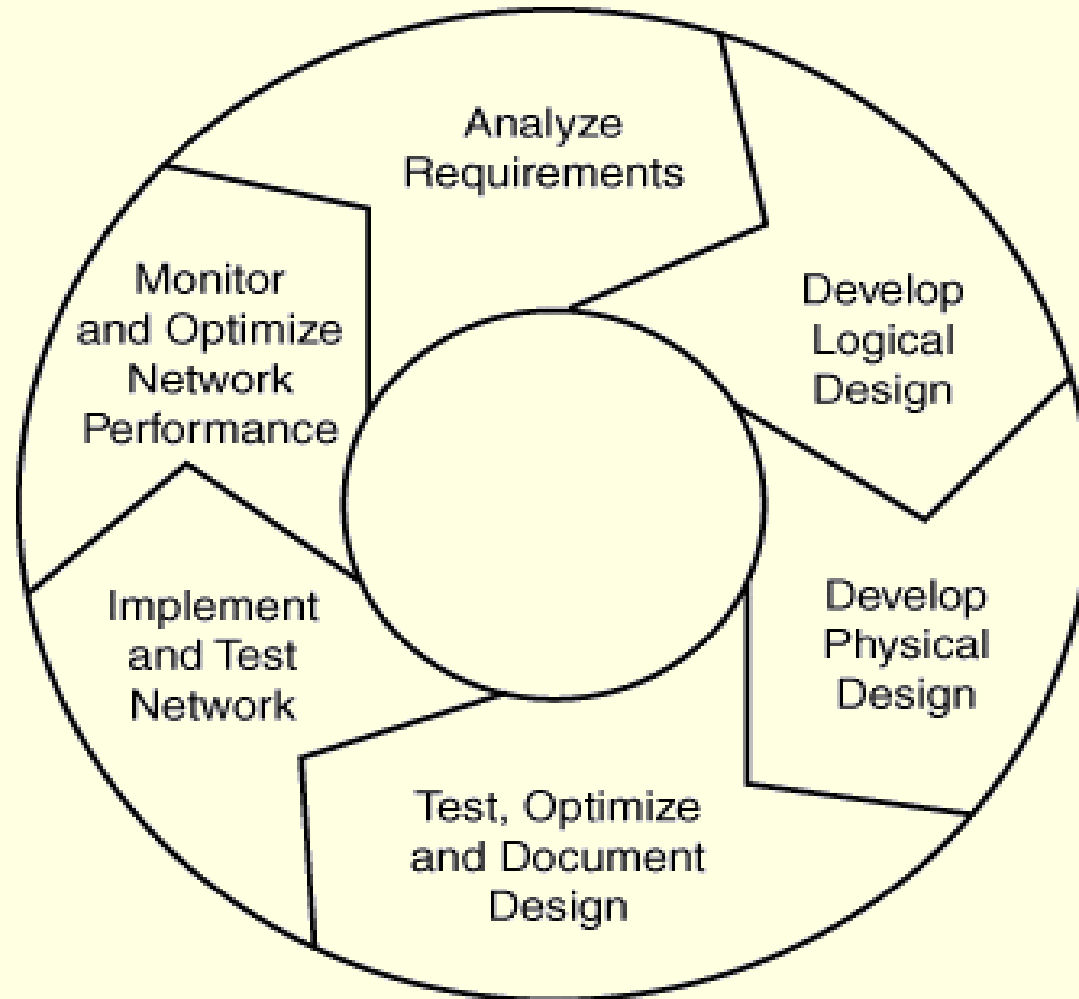
# Top-Down Network Design Process (2/2)

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- Recognizes that the logical model and the physical design may change as more information is gathered
- A top-down approach lets a network designer get “**the big picture**” first and then spiral downward into detailed technical requirements and specifications

# Network Design and Implementation Cycle

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# Network Design and Implementation Cycle (1/3)

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## ■ **Analyze requirements:**

- Interviews with users and technical personnel
- Understand business and technical goals for a new or enhanced system
- Characterize the existing network: logical and physical topology, and network performance
- Analyze current and future network traffic, including traffic flow and load, protocol behavior, and QoS requirements

# Network Design and Implementation Cycle (2/3)

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## ■ **Develop the logical design:**

- Deals with a logical topology for the new or enhanced network
- Network layer addressing and naming
- Switching and routing protocols
- Security planning
- Network management design
- Initial investigation into which service providers can meet WAN and remote access requirements

# Network Design and Implementation Cycle (3/3)

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## ■ **Develop the physical design:**

- Specific technologies and products to realize the logical design are selected
- The investigation into service providers must be completed during this phase

## ■ **Test, optimize, and document the design:**

- Write and implement a test plan
- Build a prototype or pilot
- Optimize the network design
- Document your work with a network design proposal