# I. Network Design Methodologies

**Intelligent Information Network (IIN)**

Drivers for new network architectures

* Application Growth
* IT evolution towards intelligent systems
* Increased business expectations from networks

3 Phases of IIN

1. Integrated transport
2. Integrated service
3. Integrated application

**Service Oriented Network Architecture (SONA)**

* Distributed apps and services managed over common, unified platform
* Allows access to apps and services from all locations with greater speed and service quality
* Based on 3-layer design

3 Layers of SONA

1. Network infrastructure layer 🡪 contains Cisco Enterprise Architecture (campus, LAN, WAN, branch, data center), servers, storage, and clients
   1. Contains switching and routing
2. Interactive services layer 🡪 Optimizes communications using security, QoS, voice, virtualization
   1. Identity services: AAA, NAC, NBAR
   2. Mobility services: VPN
   3. Storage services: SAN
   4. Compute services: Blades
   5. Security service: IDS, IPS
   6. Voice and collaboration services
3. Application layer
   1. ERP, CRM, CUCM, MeetingPlace, IPCC

SONA Benefits

* Functionality
* Scalability
* Availability
* Performance
* Manageability
* Efficiency

**PPDIOO**

4 Main Benefits

* Lowers TCO
* Increases network availability
* Improves business agility
* Speeds access to applications and services

6 Phases

1. Prepare
   1. Establishes organization and business requirements
   2. Develops network strategy
   3. Proposes high level architecture with identified technologies
   4. Creates business case / financial justification
2. Plan
   1. Identifies network requirements by characterizing and assessing the network
   2. Project plan with tasks, milestones, resources
3. Design
   1. Network design including diagrams and equipment list based on equirements
   2. Project plan is updated with more detail
4. Implement
   1. Roll out according to project plan
5. Operate
   1. Maintain day-to-day
   2. Monitoring and correcting faults
6. Optimize
   1. Proactive network management
   2. Modify network design and restart process

PPDIOO Design Methodology

1. Identify customer’s network requirements
   1. Identify network applications and services (current and planned)
   2. Define organizational goals
   3. Define organizational constraints
   4. Define technical goals
   5. Define technical constraints
2. Characterize existing network
   1. Identify all existing information and documentation
      1. Site names, addresses, contacts etc.
   2. Perform network audit using sources existing documentation, existing network management tools, new network management tools
      1. Provide network device list, software versions, configurations, interface speeds, link/CPU/memory utilization, WAN technologies and carriers
         1. *show tech-support, show processes cpu, show version, show processes memory, show running-config*
         2. Network management tools include Cacti, CiscoWorks, protocol analyzers, etc.
   3. Perform traffic analysis using SNMP, Netflow, NBAR, etc
      1. Checklist
         1. WAN utilization <= 70%
         2. RTT < 100ms. More commonly <2ms on LAN
         3. Segments <= 20% broadcast or multicast traffic
         4. Segments CRC error <= 1 per million bytes
         5. Ethernet segments < 0.1% collisions
         6. CPU utilization < 75% over 5-minute interval
         7. Router output queue drops <= 100 per hour
         8. Router input queue drops <= 50 per hour
3. Design topology and solutions

QoS

* PQ 🡪 establishes four interface output queues serving high, medium, default, and low.
  + Can starve other queues
* CQ 🡪
* WFQ 🡪 ensures traffic is separated into individual flows
  + Default queuing method on interfaces < 2.0Mbps
* CBWFQ 🡪 extends WFQ by adding user-defined traffic classes
  + Becoming standard for non-VoIP networks
* LLQ 🡪 adds strict priority queue to CBWFQ allowing delay sensitive traffic to be sent first
  + Standard queuing method for VoIP networks
* Traffic shaping 🡪 slows down outbound packet rate by buffering
* Traffic policing 🡪 tags or drops traffic