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IARIA

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15:15 – 17:15

A Tutorial on:

"Telecommunication Network Lifecycle and System Engineering Techniques"

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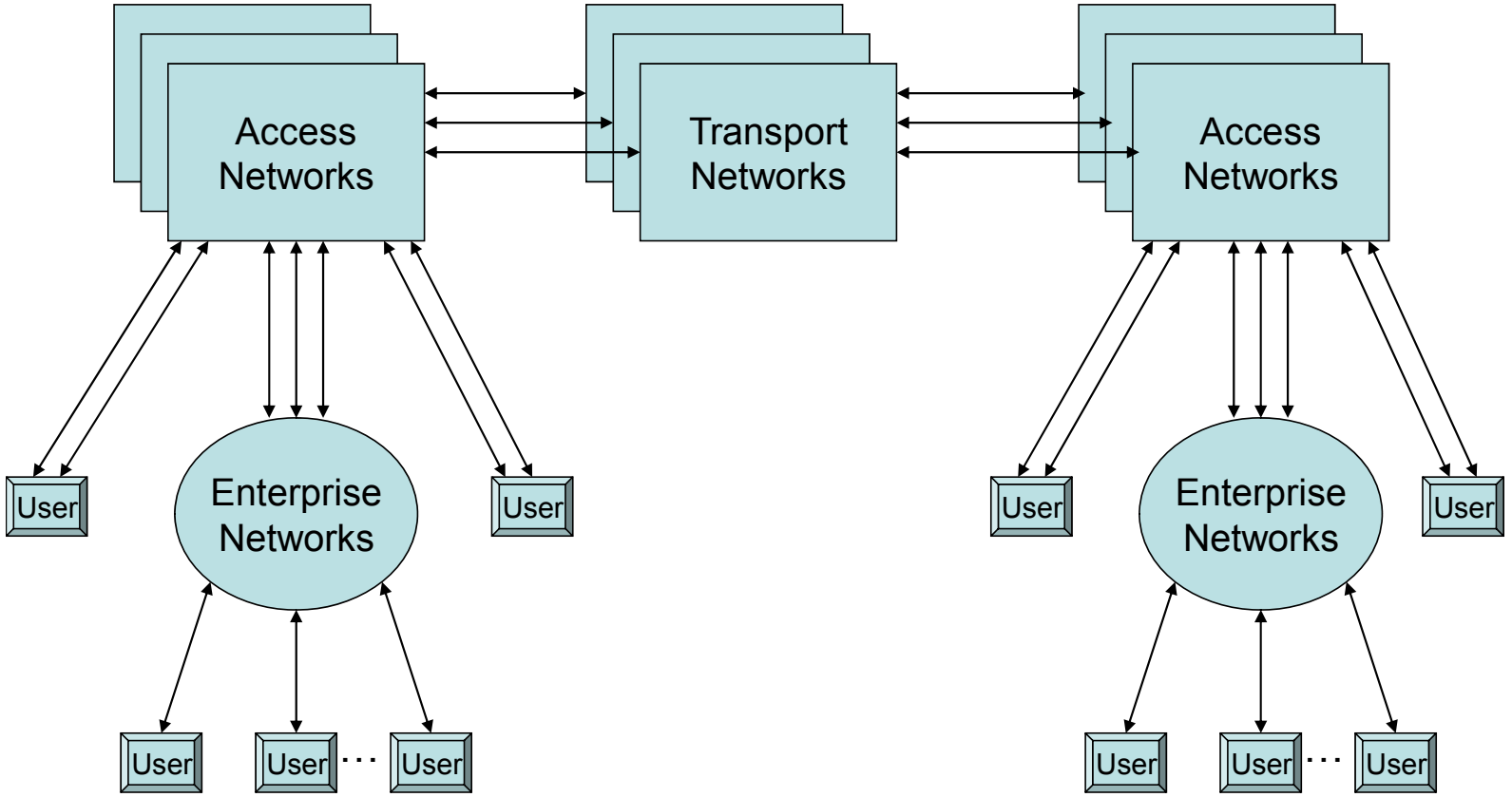
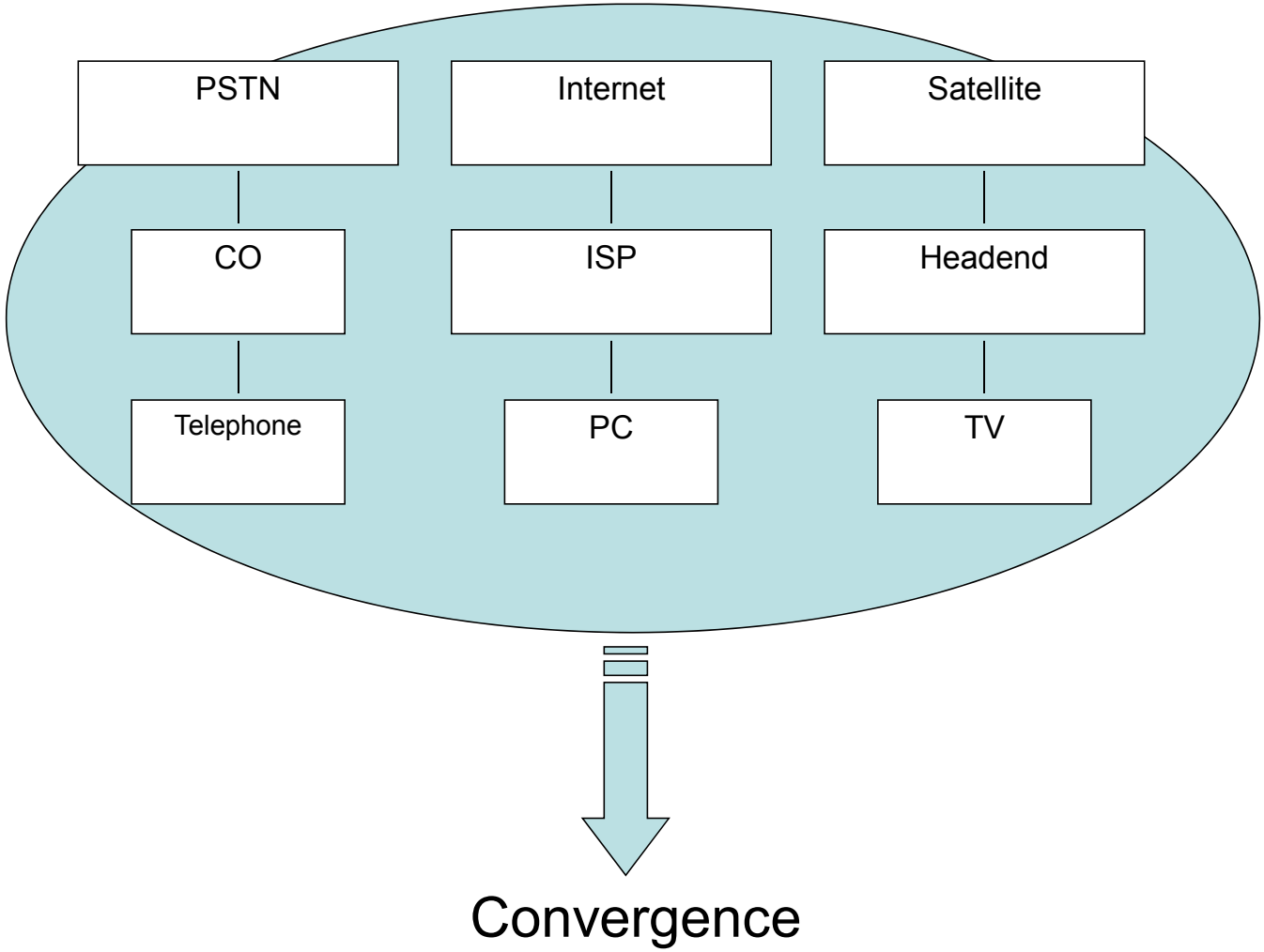
Tutorial Based on Book

- Lifecycle Management for Telecommunications & Networking Professionals
- Two intended audiences
  - Professional Handbook
    - Individuals, corporations
    - Training seminars/courses
  - University Textbook
    - Capstone course in undergraduate telecom programs
    - Graduate course in telecom programs
- Status
  - Draft book complete
  - In process of selecting publisher; target publication by Fall 2018
  - Looking for feedback on content
- If interested in book, please contact author at asnow@ohio.edu

Typical Telecom Network Environment



Network Infrastructure and Application Convergence



Stakeholders in the Telecom Network Domain

- Consumers
- Corporate/Nonprofit/Government Organizations
  - Users
  - Network and System Administrators
  - Executives
- Service Providers
  - Traditional Carriers
  - Internet Service Providers
  - Cable
- Policymakers
  - Regulators
  - Legislators
  - Consumer Advocates
- Equipment and System Vendors

Why is this Challenging?

- Each network is unique - Spatially, in usage, and in offered services
- Projects are often migration or upgrades rather than fresh starts
- The network is often part of a larger project or system, such as an IT project
- It is difficult to separate performance requirements from end user applications
- Everyone is an expert -- users mistake vendor solutions for requirements
- Project management visibility is difficult because of geographic dispersion
- It is easy to underestimate the largest cost component – operations & maintenance

Why is this Challenging?

- Rapid technological evolution makes network deployments ripe for obsolescence and unsuccessful emerging standards
- A myriad of service providers and product vendors results in complex decisions and tradeoffs
- Convergence complicates the ability to offer consistent quality of service to all traffic types and applications
- Projects are not properly separated from day-to-day network operations for in-place networks
- No extant PM methodology is dedicated to network integration

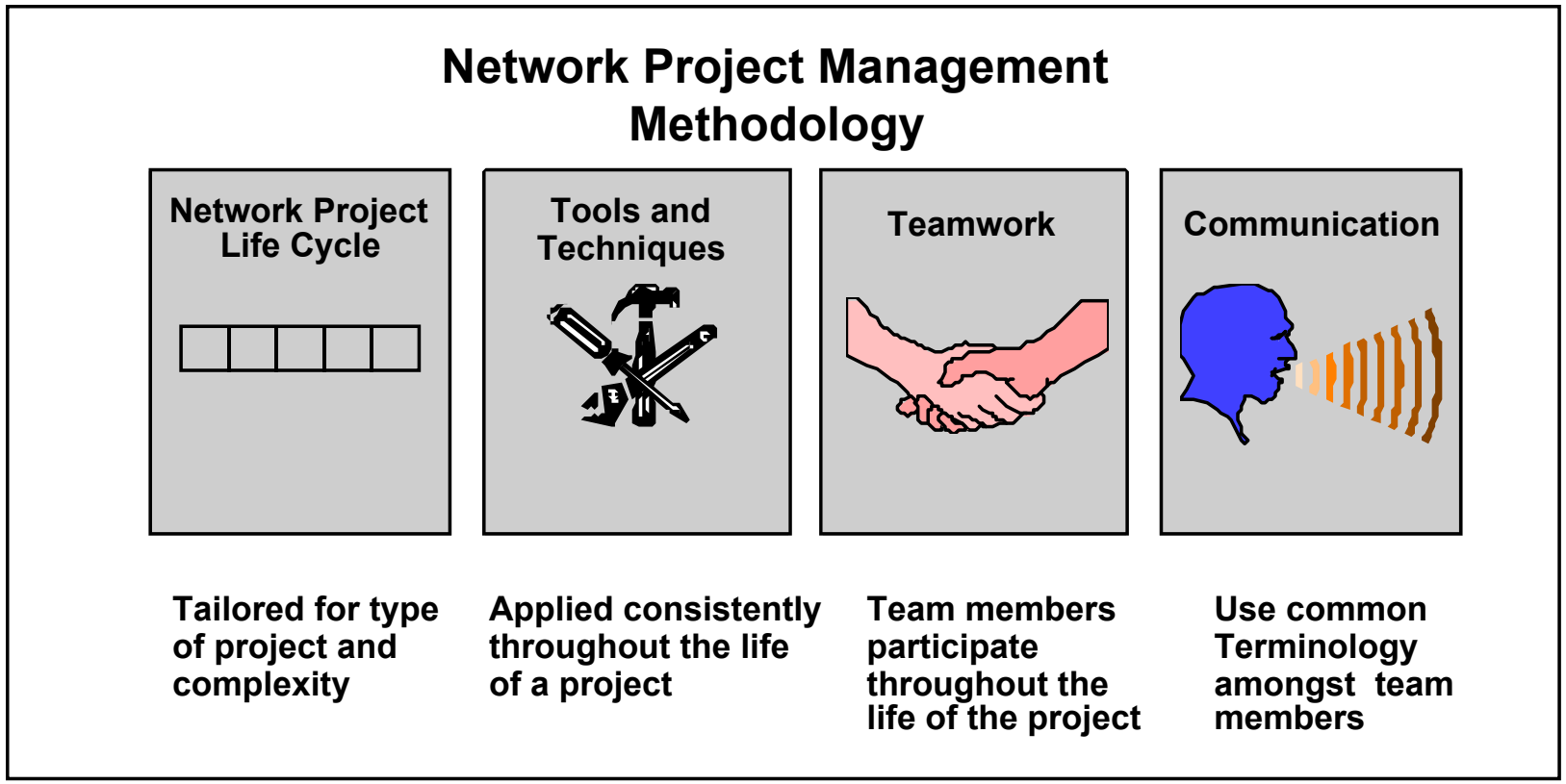
Overview of Lifecycle Management

- A combination of
  - Lifecycle management
  - Project management
  - Systems engineering

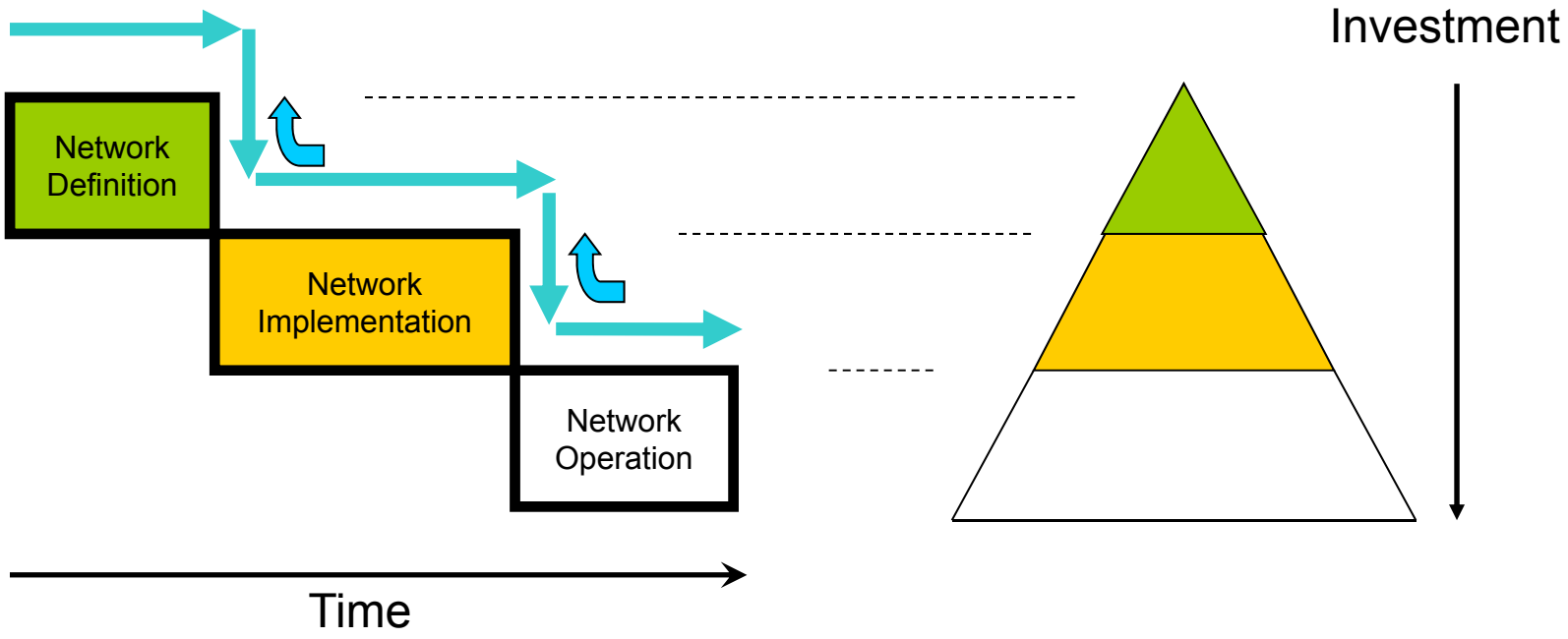
Roles in a Project

- **The Project Manager**: *The one person responsible for achieving project objectives and satisfying the customer.*
- **The Customer:** *The customer is the individual or organization who pays for the project.*
- **User**: *Users are the individuals or organization receiving beneficial use of the delivered product or service.* In some projects, the customer and user are the same entity while on others they are two different entities.
- **Executive Management:** *The manager responsible for seeing that the organization using the product or service is successful.* The project manager may or may not report to the executive manager – often these two individuals are in different companies.
- **Experts:** *The individuals who provide expertise in order to perform project task activities.*

Project Management



Network Lifecycle Stages

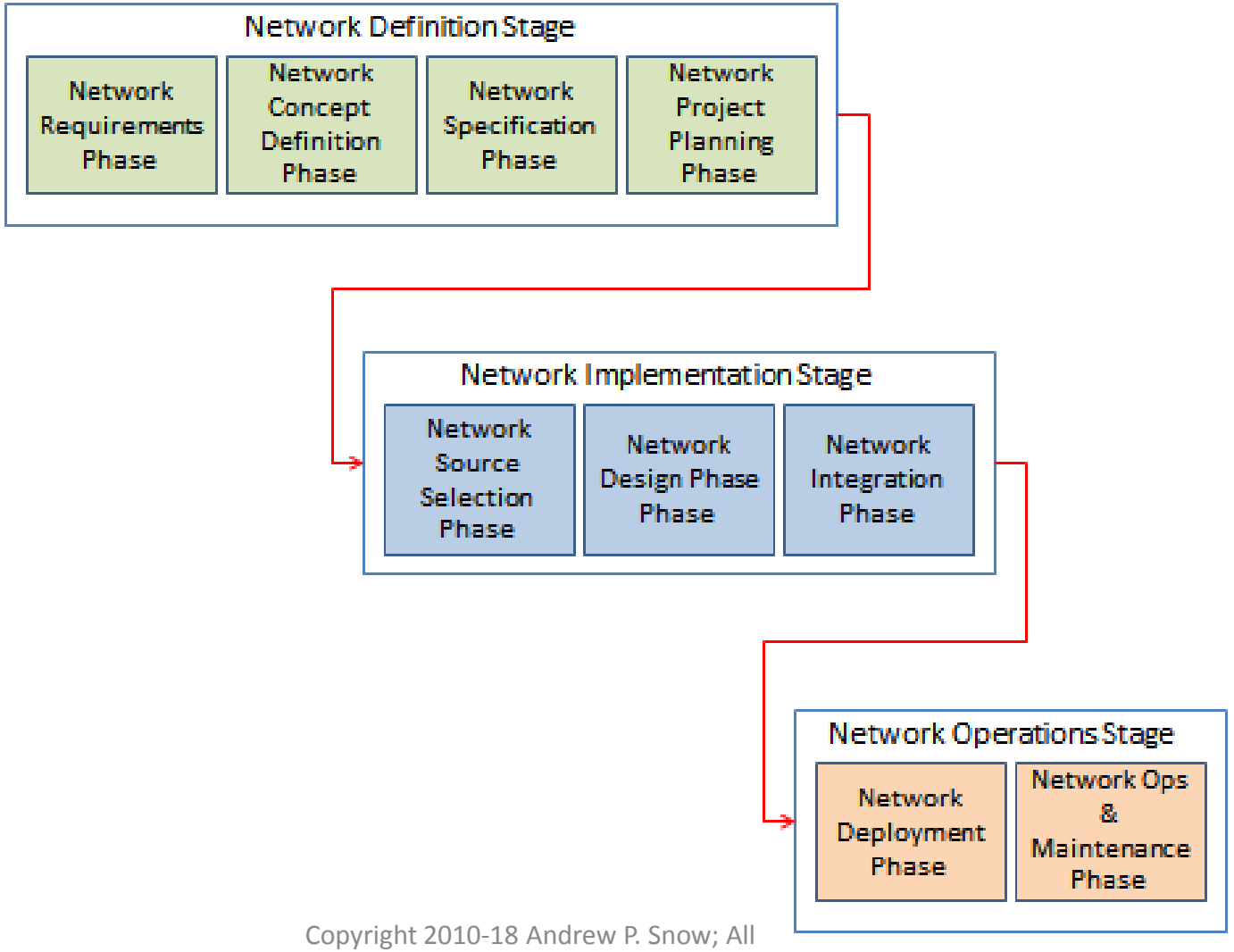


Sequential Commitment

Escalating Commitment

A "Waterfall" Lifecycle Approach

Network Lifecycle Stages and Phases



Control Gates

- A lifecycle phase go/no-go decision point, usually accompanied with a review of phase objectives and documentation.
- Include appropriate project stakeholders!
- Can be a formal presentation
- Outcomes:
  - Green Light: proceed to next project phase
  - Yellow Light: must address minor deficiencies before proceeding
  - Red Light: (1) redo phase, or (2) terminate project

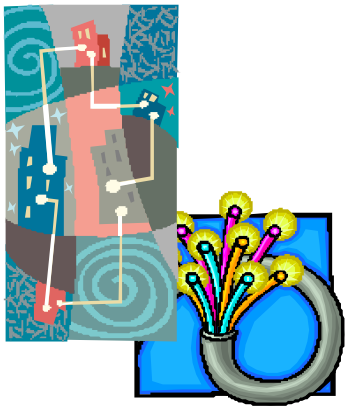
Network Project Archetypes

- Network project "archetyping" is the process of comparing the anticipated network effort to the characteristics of a set of archetypal network projects, and
- Placing the proposed effort into one of these known project categories
- Helps establish risk profile for project before it begins

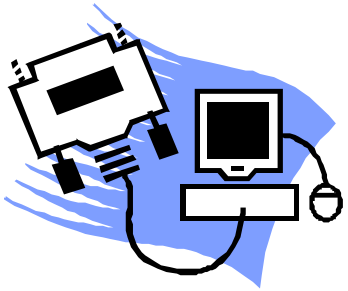
Network Project Archetypes

Network Enhancement

Network Infrastructure



New Network Initiative



Network Integration

Network Operations

Network Project Archetypes

- New network initiative project is typically a "fresh start" in that the project creates a new network that did not exist before, rather than modifying an existing network.
- Network enhancement project is a major enhancement to an existing network.
- Network operations and maintenance project is incremental functionality/performance refinements to an existing network that has been deployed and turned over to an operational organization.
- Network integration project provides the network services required to support an Information Technology (IT) Project
- Network infrastructure project provides network/communication utilities or infrastructure within a new or existing building

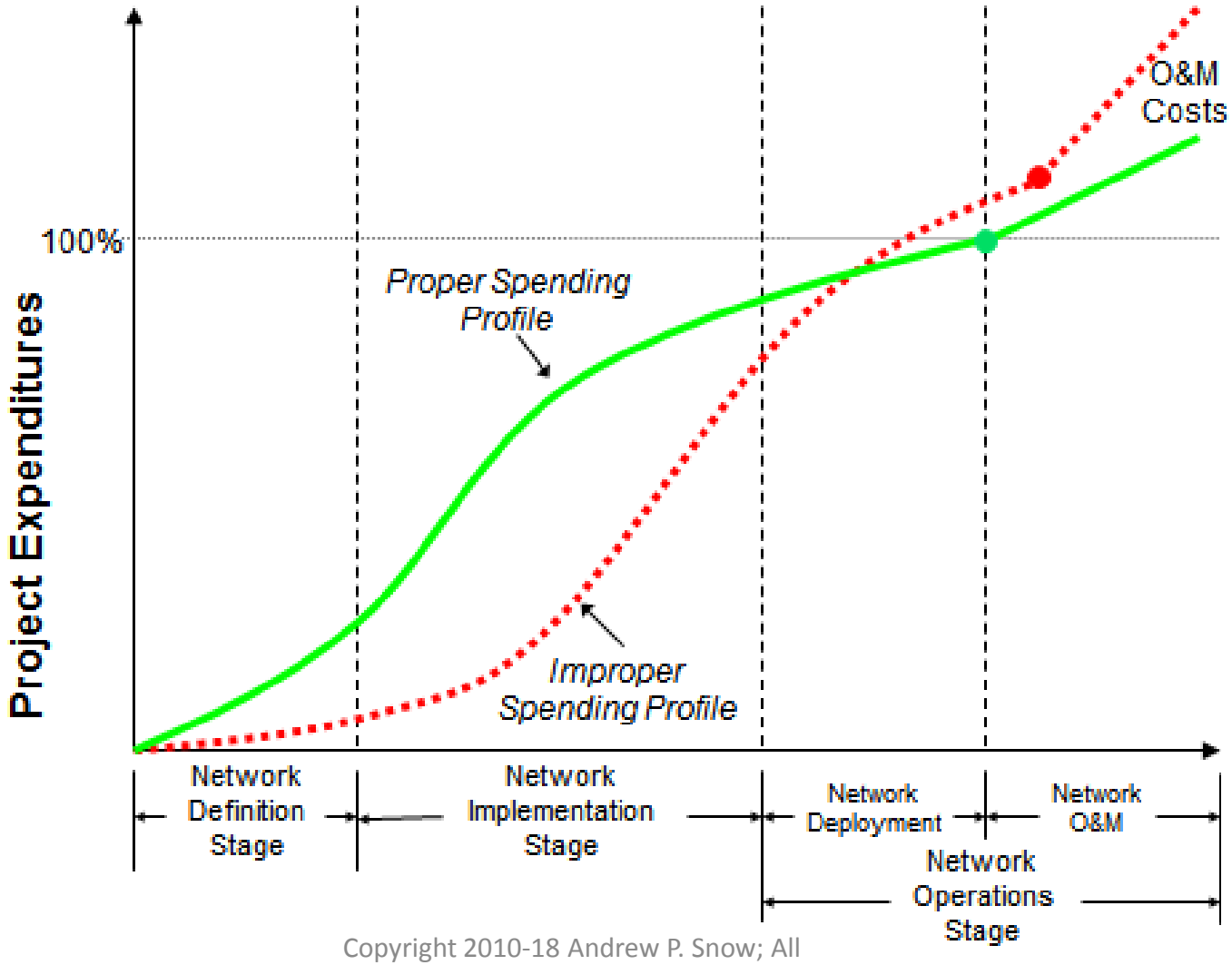
Network Definition Stage

- Network Requirements: Defines what the user network needs (user requirements) and the criteria for selecting the best solution (system requirements)
- Network Concept Definition: Describes the best approach for solving the user network needs, by way of the selected network *architecture.* ID major components.
- Network Specification: States how well the network must work to satisfy user needs, by *specifying the attributes of the major components* in the network architecture necessary to meet system requirements
- Network Project Planning: Develops a plan for acquiring a network solution, allowing the project team to commit to a project budget and schedule.

Network Definition

STAGES & PHASES	NETWORK DEFINITION STAGE				
	Network User Reqts Phase		Network Concept Definition Phase	Specification Phase	Network Planning Phase
MAJOR ACTVITIES	Collect Network User Reqts Validate Requirements Prepare Initial Plan	Establish Project Control Board Derive Network System Requirements Define Concept Selection Criteria	Tradeoff Candidate Net Concepts Identify Risks Assess Technical Feasibility Estimate LifeCycle Costs Select Concept	Allocate Sys Reqts to Major Network Components Develop Verification Approach Develop Major Component Specs Trace Component Specs to Sys Reqts	Select Acquisition Approach Develop Network Project Implementation Plan Commit Resources
PRODUCTS	User Reqts Document Initial Project Plan	Network System Requirements Document Traceability Matrix Concept Selection Criteria	Trade-off Results Network Concept of Operations Feasibility Models "Should Cost"	Net Performance Specification Major Component Specifications Traceability Matrix Network Verification Plan	Network Project Implementation Plan - Tasks - Schedules - Resources - Responsibilities Funding Document
CONTROL GATES	Network User Reqts Review (URR)	Network System Reqts Review (SRR)	Network Systems Concept Review (SCR)	Network Spec Review (NSR)	Source Selection Initiation Review (SSIR)

Pay Me Now or Pay Me Later
Network Definition



User Requirements are Solution Free

- **User Requirement:** *A capability needed by the user(s) to solve a problem or achieve an objective, or support a business process.*
  - **Operational Needs and Capabilities**
  - **Schedule Requirement for New Capabilities**
  - **Interface Requirement to Retained Systems**
- **User requirements are "solution free"**
- **Want**: A perceived need that is often a proposed solution, often costs too much, may not be deliverable on time, can be technically infeasible and/or represents high risk.
  - "I want a Mercedes." vs. "I need transportation."
  - "I want a cell phone" vs. "I need to call McAllen, TX four times a day"

Types of Users

- Executive management users,
  - Effectiveness
- Network administrator users, and
  - Efficiency
- Network/end product users.
  - Responsiveness

Example of Different User Perspectives on Same General Need

- "Without revenue I can't make a profit. Because of the limitations of our voice and IT system, our inside salespeople are losing sales."
- "The current call center equipment is hard to maintain and requires too many people to keep it running. In addition, I need network management capabilities well beyond what I now have."
- "As an inside salesperson, I can tell you right now that I need to see a screen telling me how many incoming calls I have queued up. When I answer a call, I could work faster if I knew who is calling and, if the caller is an existing client, could see their account information already displayed."

User Requirements Example: Peak Voice Traffic Between Locations

Peak Hour Call Volume

OUTGOING CALLS/HR

LOCATION		A	A	A	B	B	B	C	D
	UNIT	HQ	FIN	SAL	PM	ENG	R&D	MAN	PSTN
A	HQ	X	X	X	10	5	5	15	20
A	FIN	X	X	X	10	10	5	20	40
A	SAL	X	X	X	30	20	10	20	50
B	PM	10	10	30	X	X	X	20	15
B	ENG	5	5	10	X	X	X	30	30
B	R&D	5	5	3	X	X	X	5	10
C	MAN	5	20	30	20	15	2	X	50

A - Chicago Office
B - Columbus Office
C - McAllen Office
D – Through PSTN

Peak Hour Call Duration

OUTGOING HR/CALL

LOCATION		A	A	A	B	B	B	C	D
	UNIT	HQ	FIN	SAL	PM	ENG	R&D	MAN	PSTN
A	HQ	X	X	X	0.1	0.1	0.1	0.2	0.2
A	FIN	X	X	X	0.2	0.1	0.05	0.2	0.2
A	SAL	X	X	X	0.2	0.1	0.1	0.2	0.2
B	PM	0.1	0.1	0.2	X	X	X	0.2	0.1
B	ENG	0.1	0.1	0.2	X	X	X	0.2	0.15
B	R&D	0.05	0.1	0.05	X	X	X	0.05	0.2
C	MAN	0.2	0.2	0.1	0.2	0.2	0.05	X	0.2

Gathering Requirements

- Documentation review,
- Interviews,
- Surveys and
- Focus groups.

Network System Requirements

- Network system requirements are the set of attributes the network must have to satisfy the network user requirements.
- User requirements must be translated into system requirements -- *statements that can be proven or verified*.
- System requirements are also *solution, vendor and implementation free* – does not describe a technical solution or "How to"
- System requirements are used:
  - As the basis for considering and choosing a network architecture
  - To "accept" the system after rollout/deployment at end of a project

- Systems requirements are verified through
  - Demonstration
  - Test
  - Analysis
  - Inspection

Deriving System Requirements

By Unit

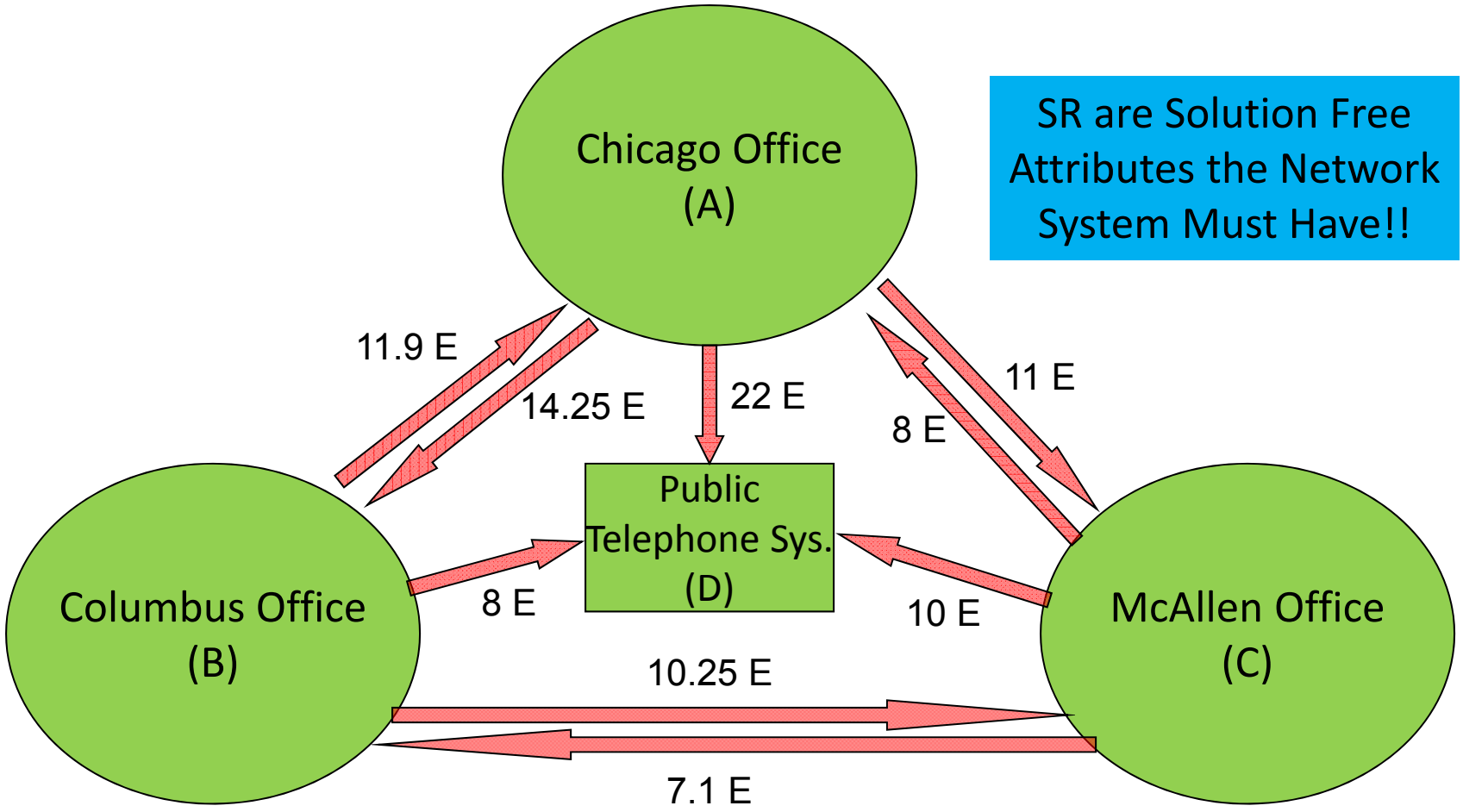
ERLANGS (Calls/Hr) x (Hr/Call)

LOCATION		A	A	A	B	B	B	C	D
	UNIT	HQ	FIN	SAL	PM	ENG	R&D	MAN	PSTN
A	HQ	X	X	X	1	0.5	0.5	3	4
A	FIN	X	X	X	2	1	0.25	4	8
A	SAL	X	X	X	6	2	1	4	10
B	PM	1	1	6	X	X	X	4	1.5
B	ENG	0.5	0.5	2	X	X	X	6	4.5
B	R&D	0.25	0.5	0.15	X	X	X	0.25	2
C	MAN	1	4	3	4	3	0.1	X	10

Aggregated by By Location into "Traffic Matrix"

ERLANGS		TO			
	LOCATION	A	B	C	D
FROM	A	X	14.25	11	22
	B	11.9	X	10.25	8
	C	8	7.1	X	10

System Requirements are Solution Free

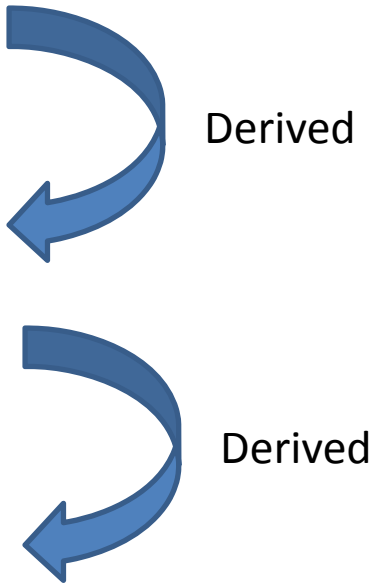


Network System Requirements are often "Embedded" in IT System Requirements

***User Requirement*:** "Response to queries shall not negatively impact the ability of the financial analyst to process two loans per hour."

IT System Requirement: "A characteristic user database query and response shall average 3-seconds, and not exceed 6-seconds, 95% of the time."

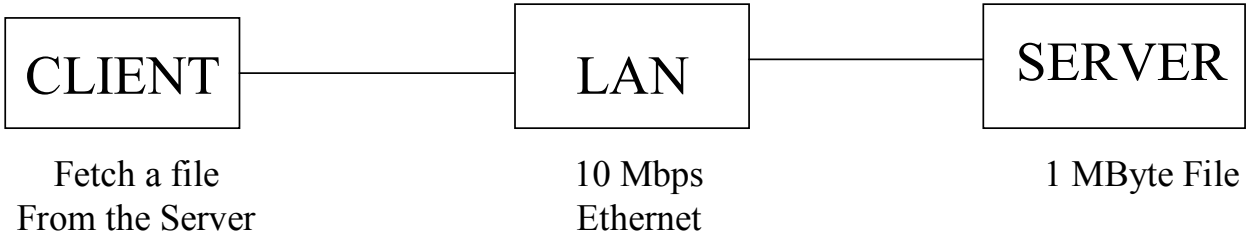
Network System Requirement: "The time for a characteristic database query and response to traverse the network shall average 0.2-second and not exceed 0.4-seconds, 95% of the time."



Example of Embedded Requirement

- Example: A user complains that the *LAN is too slow*, because it uses a 10Mbps Ethernet and takes too long to transfer large files (1MB) regularly used in the conducting business.
- The IT department asks the network group to *upgrade the LAN to 100Mbps*.
- The network manager asks for a demonstration by the user during the lunch hour when no one else is using the LAN or the Server and *finds the transfer to take 12 seconds*.
- Ignoring overhead bits from protocols, the network manger calculates that the *file is transferred across the network in 0.8 seconds*, as seen on next page.

Latency Estimates



$$L_{TOTAL} = L_{CLIENT} + L_{LAN} + L_{SERVER}$$

$$L_{LAN} = \frac{\text{Volume (b)}}{\text{Capacity (b/s)}} = \frac{8 \text{ Mbits}}{10 \text{ Mbits/s}} = 0.8 \text{ S}$$

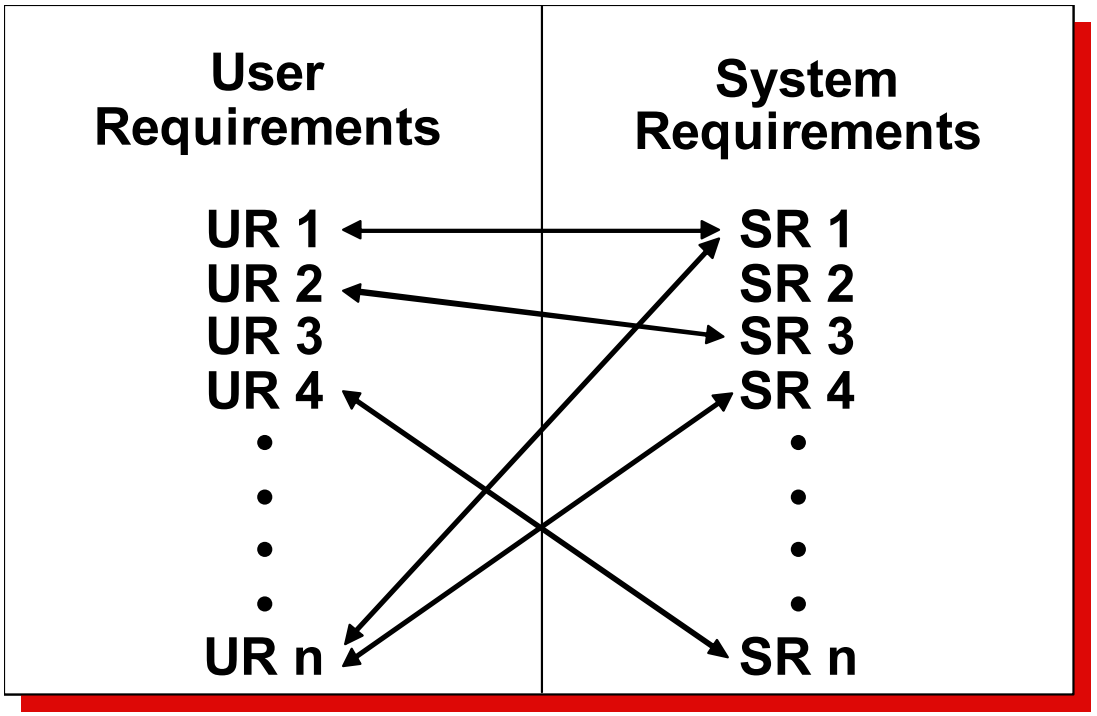
If L_{TOTAL} is observed to be 12s in the demonstration, then the network manager should recommend:

a) Upgrading the LAN to 100 Mbps
b) Upgrade the sever
c) Upgrade the client

Characteristics of "Good" System Requirements

- ***Complete*** - defines which User Network Requirements will be satisfied
- ***Consistent*** in that one system requirement does not conflict with another
- ***Correct*** – no errors exist that will affect designing a solution
- ***Clear*** – there is only one possible interpretation
- ***Traceable*** – there is an audit trail to at least one user requirement
- ***Verifiable*** – able to show that the network meets the system requirement
- ***Implementation Free*** – does not describe a technical solution or "How to"

Tracing Requirements



UR3 – missed requirement
SR2 – superfluous requirement

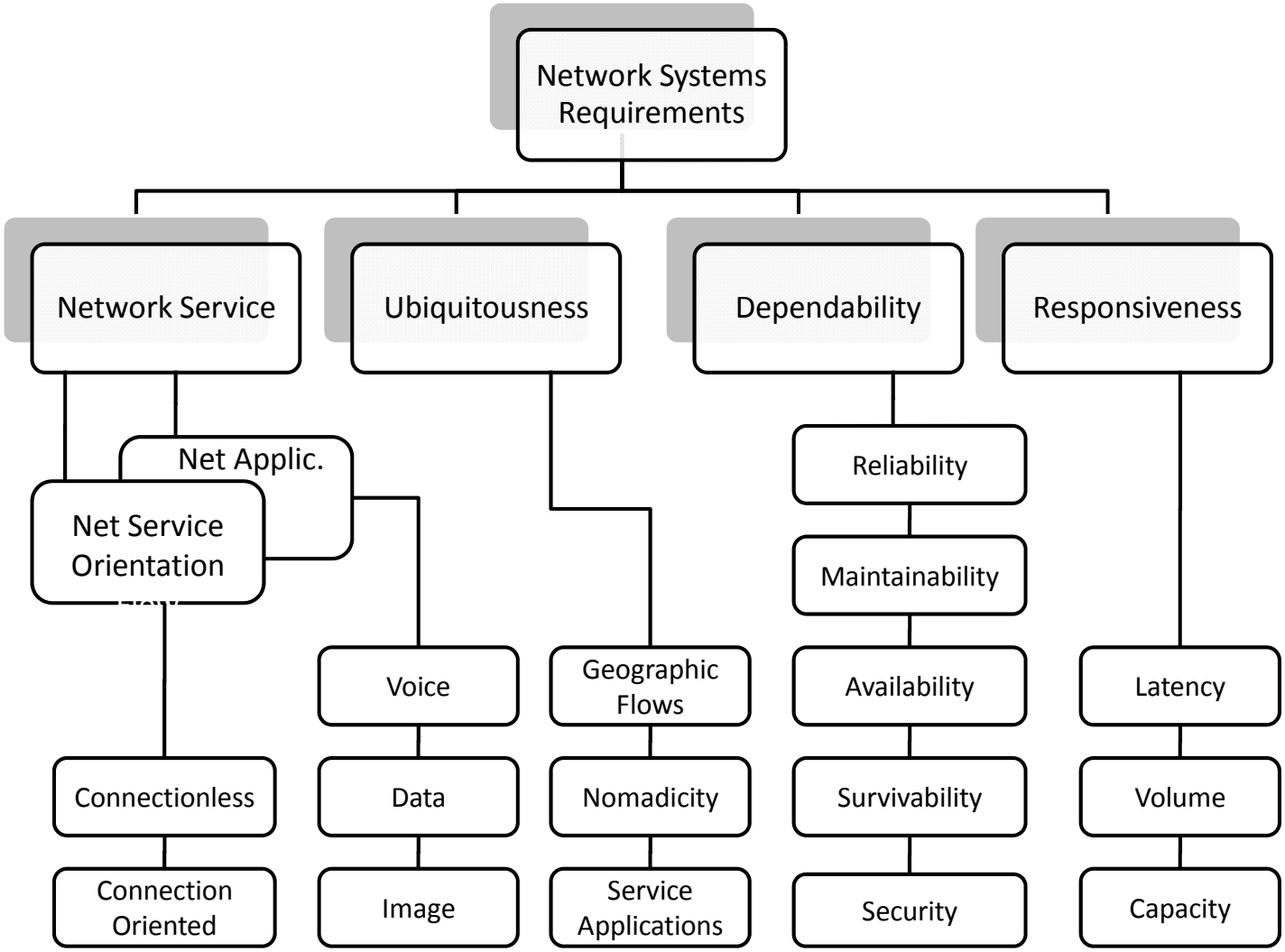
System Requirement Validation

Requirements	Description	D	T	A	I
SR 1		X			
SR 2			X		
SR 3				X	
•					
SR n					X

- Demo
- Analysis
- Test
- Inspect

SR are the “Acceptance Criteria” at the end of the project!

System Requirement Taxonomy

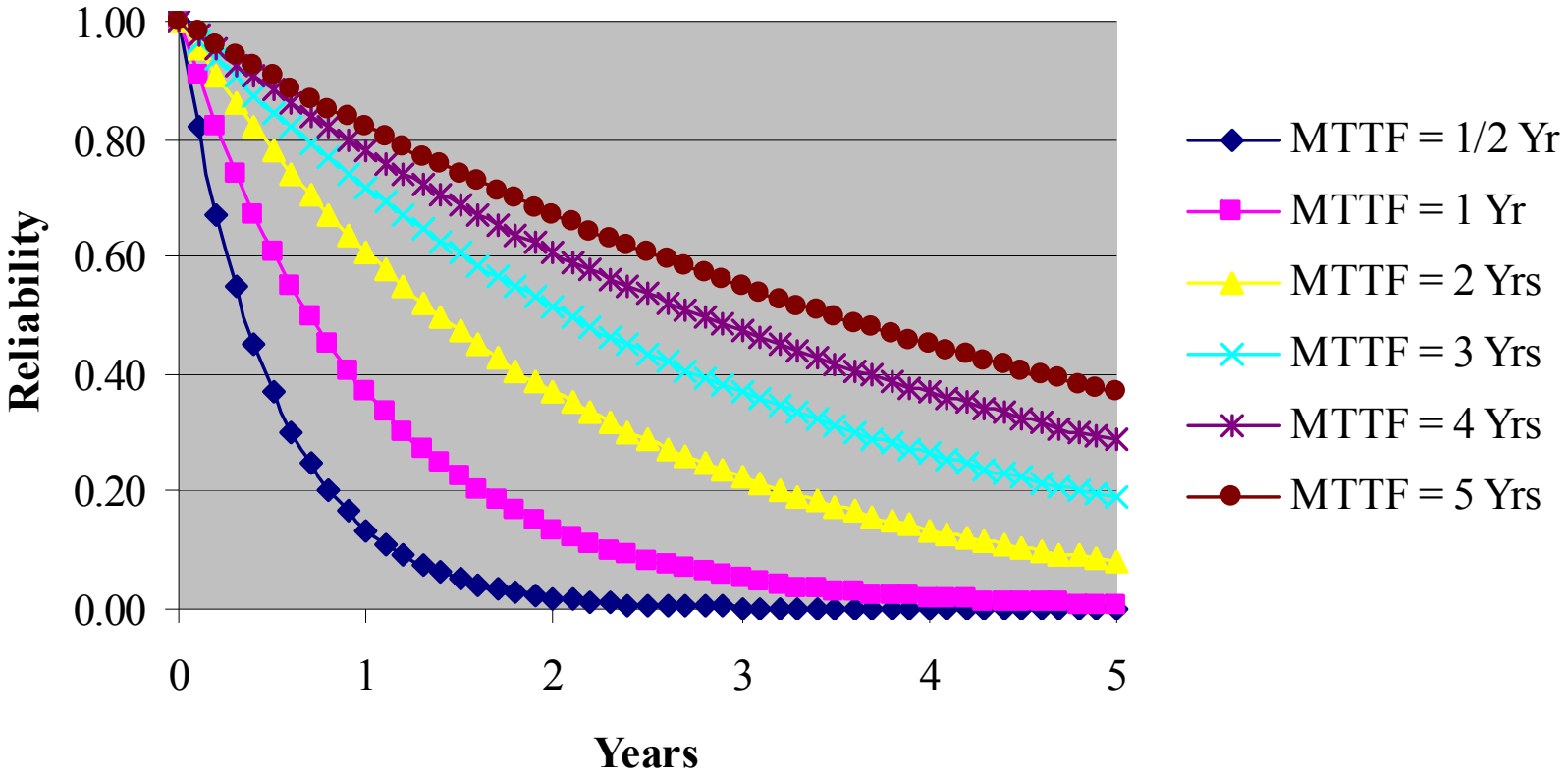


Network Ubiquity Requirements

- *Fixed Location*
  - At one physical location for the foreseeable future, such as a telephone in an office
- *Migrant Location*
  - At one physical location while in use, but location can change, such as a laptop with wireless capability in a building)
- *Mobile Location*
  - Physical location subject to continuous movement, such as a cellular phone

Reliability

$$R = e^{-\lambda \cdot t} = e^{-t/MTTF}$$



Reliability Examples

- Reliability Example 1:
  - What is the chance a local telecommunications switch with an MTTF of 5 years will operate without failure for 5 years?

$$R_{5-Yrs} = e^{-\lambda \cdot t} = e^{-t/MTTF} = e^{-5/5} = e^{-1} = 0.368$$

- Reliability Example 2:
  - What is the chance a switch with an MTTF of 5 years will operate without failure for 1 years?

$$R_{1-Yrs} = e^{-\lambda \cdot t} = e^{-t/MTTF} = e^{-1/5} = e^{-0.2} = 0.818$$

- Reliability Example 3:
  - What is the chance a switch with an MTTF of 5 years will operate without failure for 1 week?

$$R_{2-Yrs} = e^{-\lambda \cdot t} = e^{-t/MTTF} = e^{-(1/52)/5} = e^{-0.00385} = 0.996$$

Maintainability

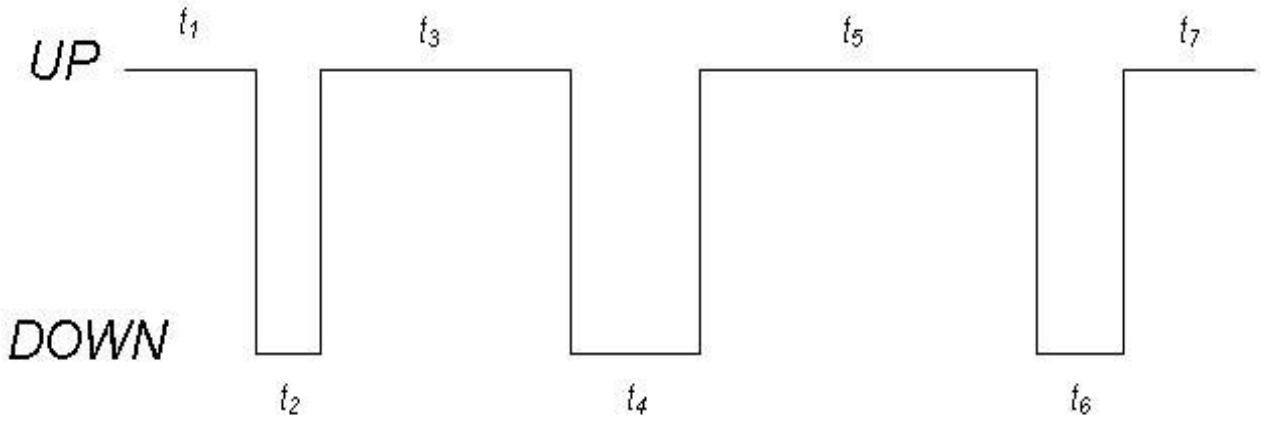
- Service Maintainability is the chance a failed service will be restored by a specified period of time

$$M = 1 - e^{-\mu \cdot t} \qquad u = \frac{1}{MTTR}$$

- Maintainability Example
  - A DS3 digital circuit has an MTTR of 12 minutes. What is the chance the DS3 will be recovered for use in 1 minute?

$$M_{1-Min} = 1 - e^{-\mu \cdot t} = 1 - e^{-t/MTTR} = 1 - e^{-1/12} = 1 - e^{-0.0833} = 0.080$$

Availability



Historical

$$A = \frac{UPTIME}{INTERVAL\_TIME}$$

Predictive

$$A = \frac{MTTF}{MTTF + MTTR}$$

Predictive Availability Example

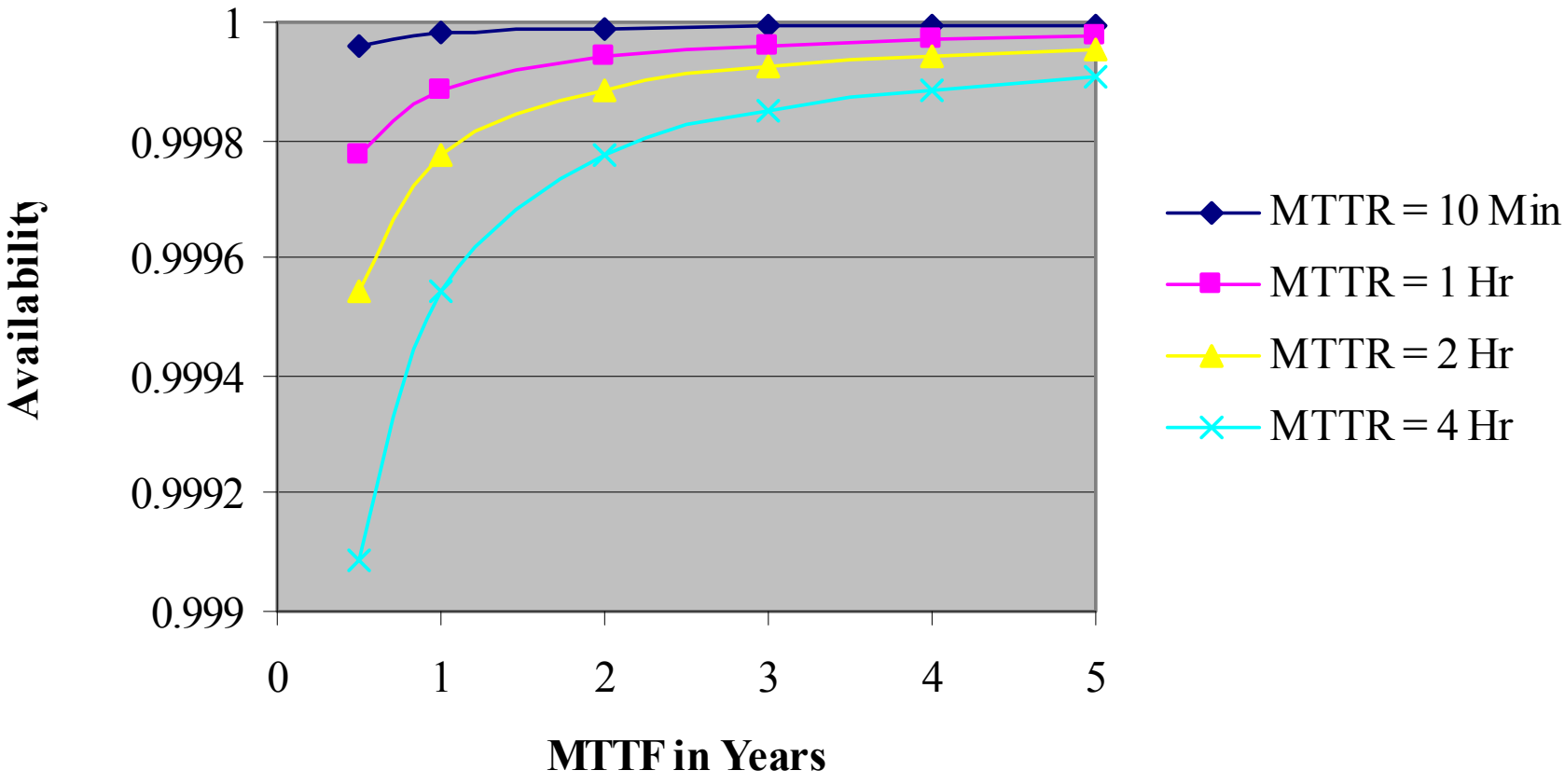
- A telecommunications service has an MTTF of 620 hours and an MTTR of 30 minutes.
- What is the availability of the service? How many hours per quarter can we expect the service to be down?

$$A = \frac{MTTF}{MTTF + MTTR} = \frac{620}{620.5} = 0.99919$$

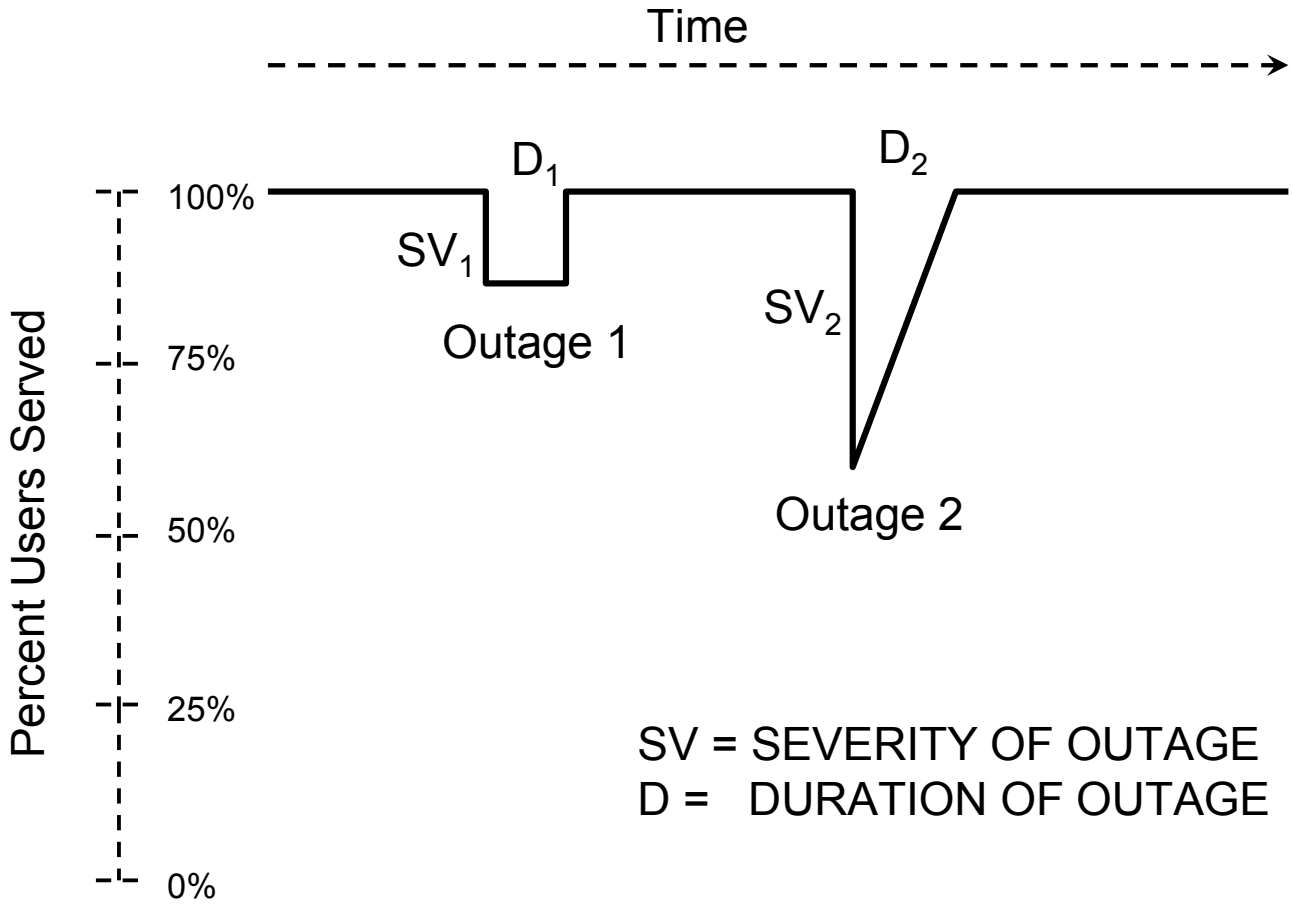
$$U = 1 - A = 0.00081$$

$$Down\_Time = 0.00081 \cdot 24hrs \cdot 30day \cdot 3months = 1.74Hours$$

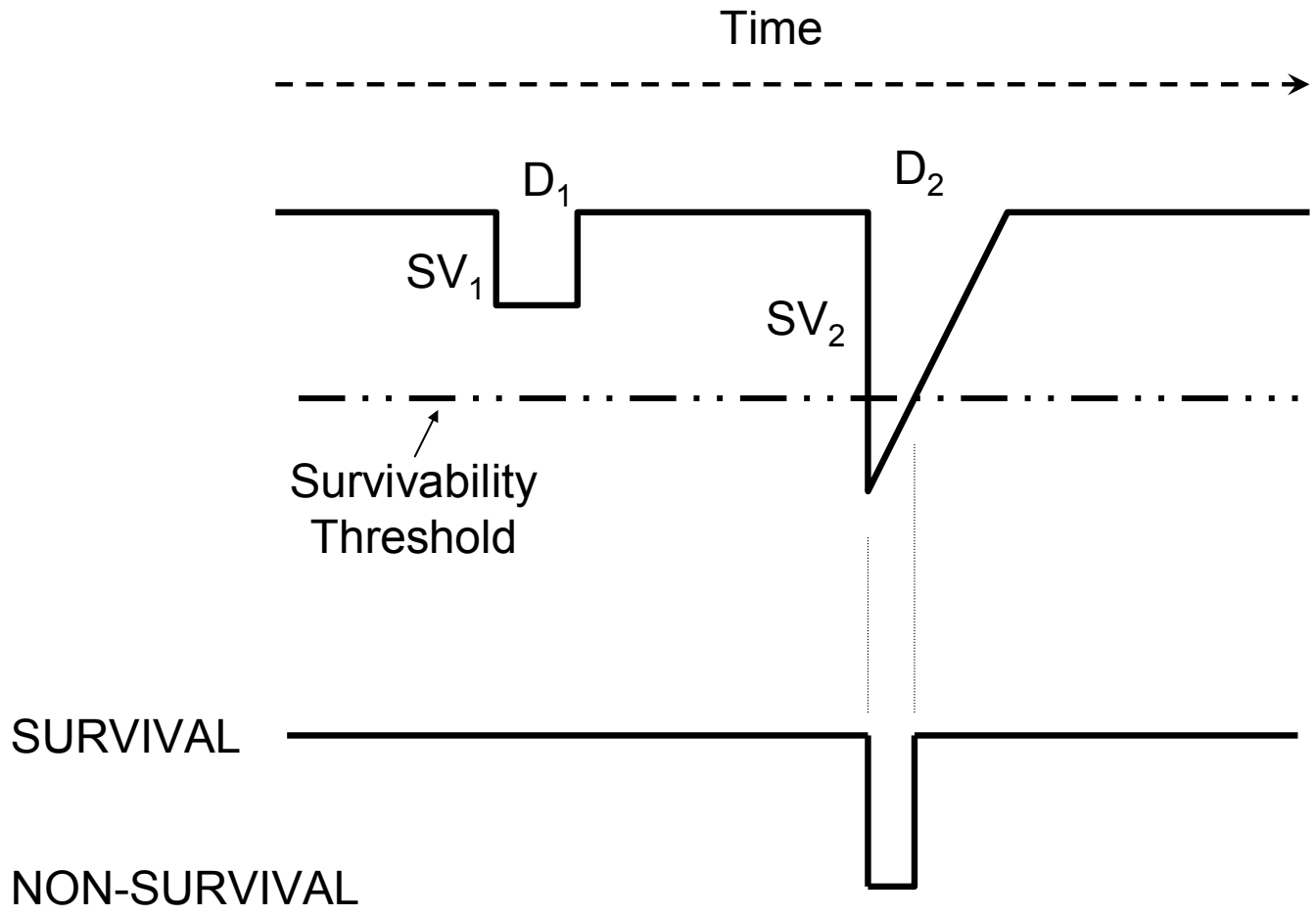
Availability



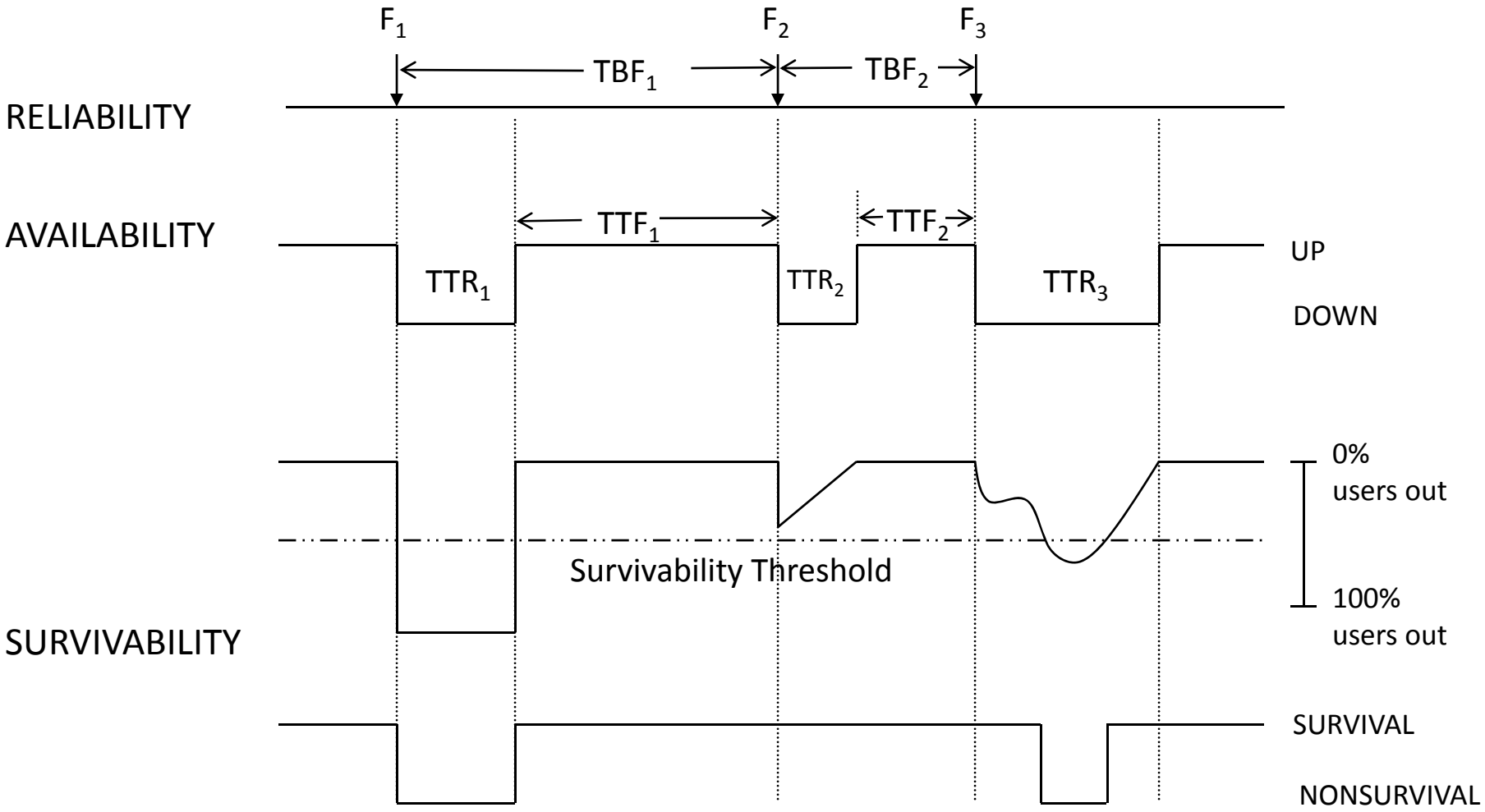
Outage Profile



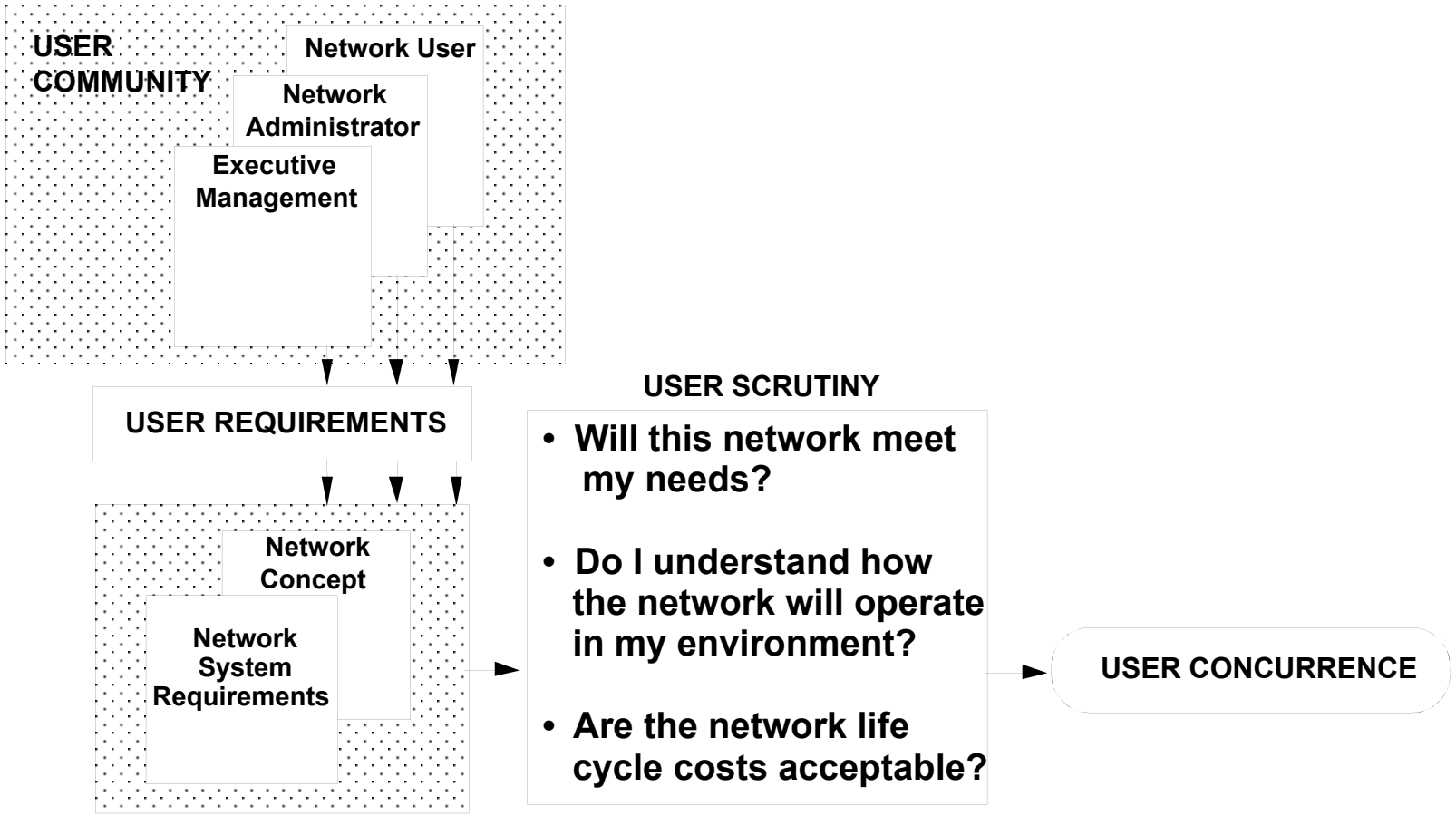
Survivability



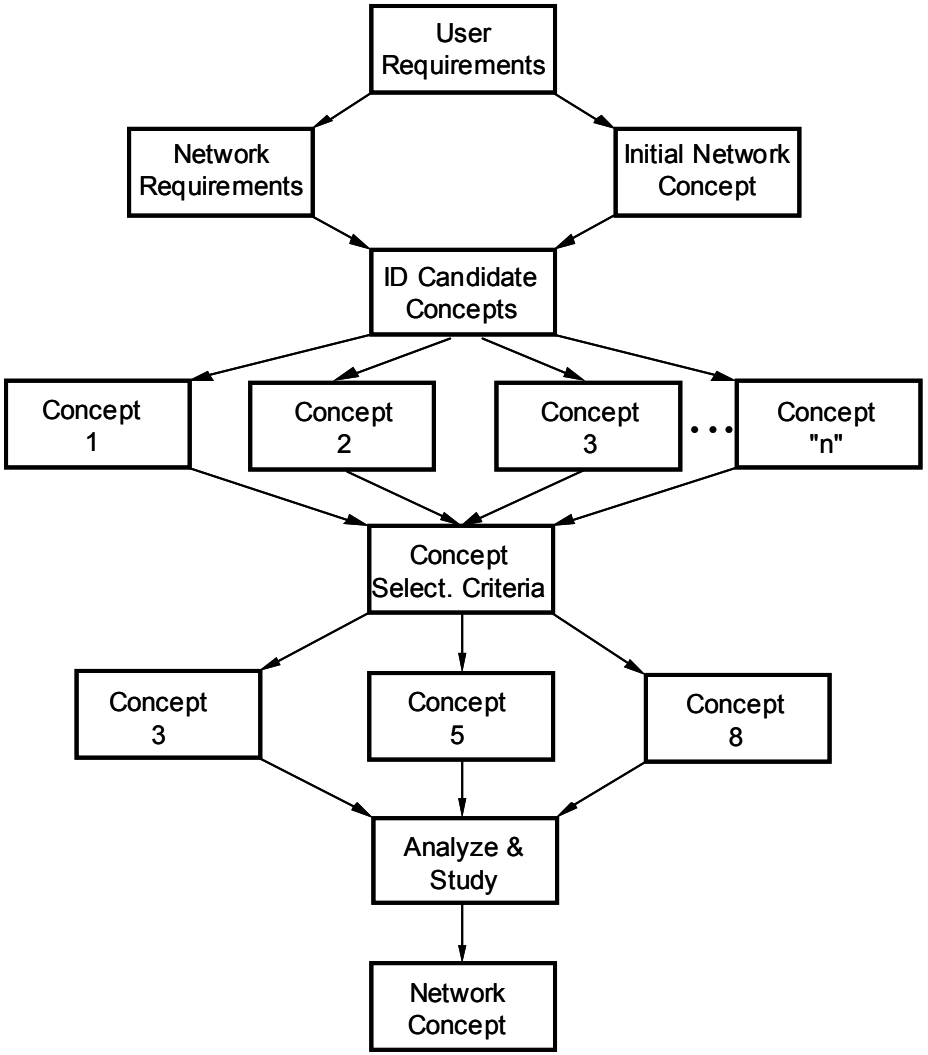
Illustrated Differences: RAMS



Network Concept (Architecture Phase)

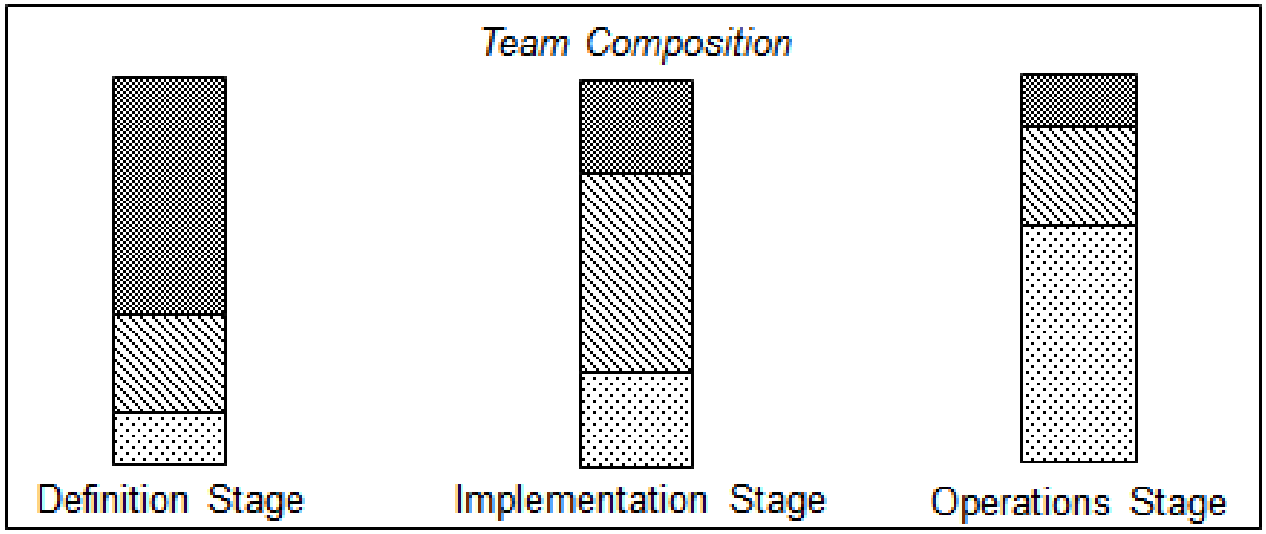


Objective: Pick the “Best Approach”

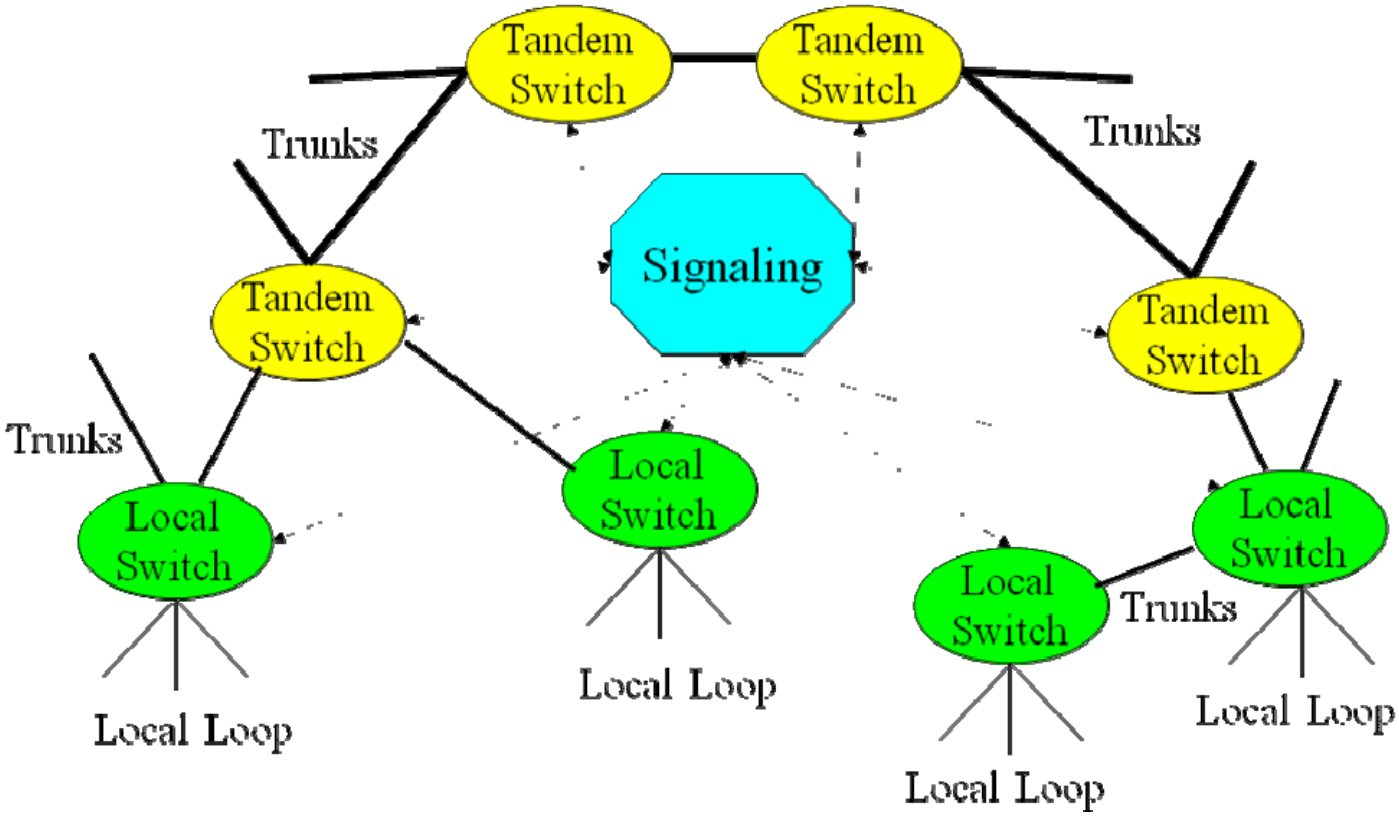


Lifecycle Skills Mix

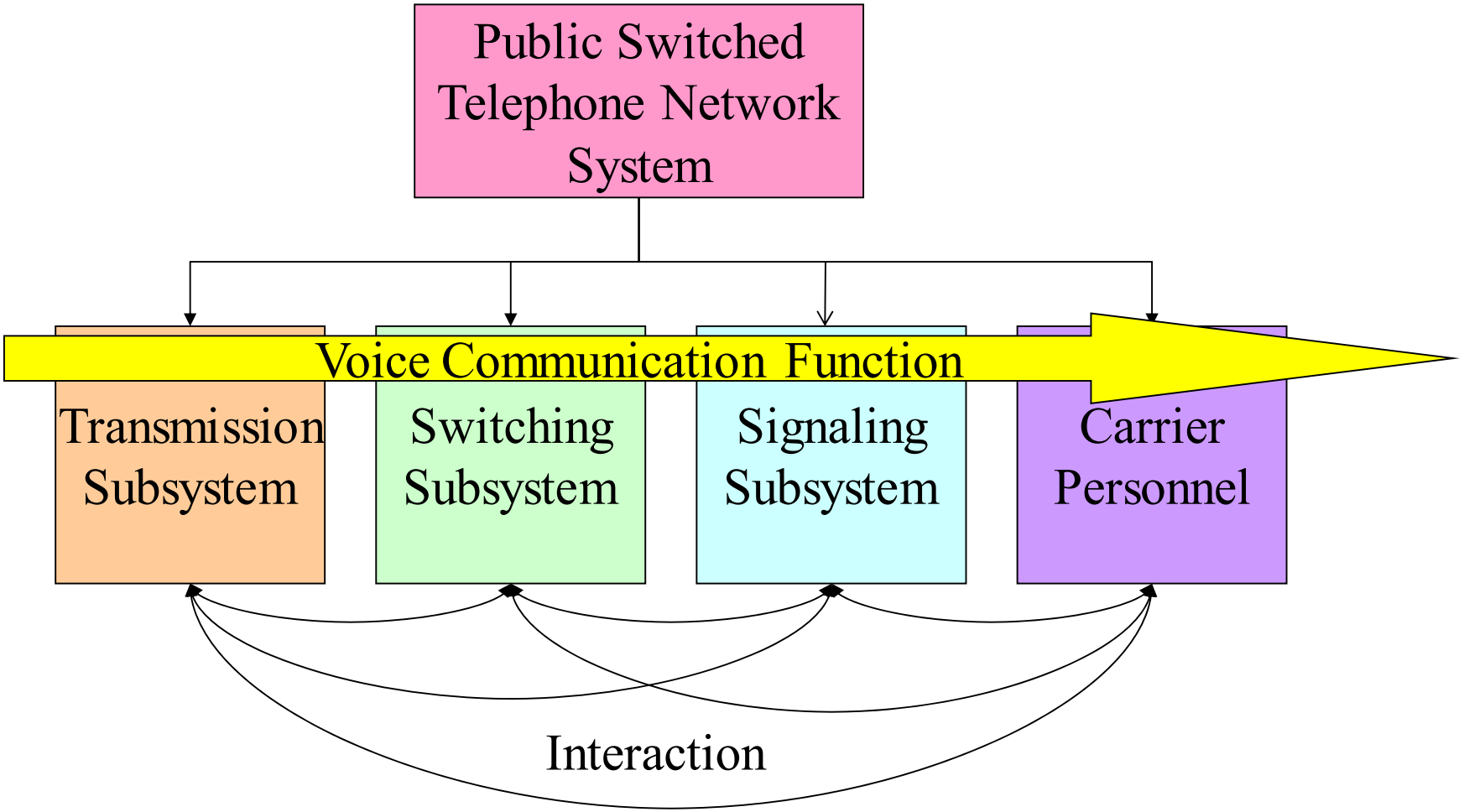
Skill Type	Comfort With Uncertainty	Risk Taking Ability	Attention To Detail
Network Innovator	High	High	Low
Network Implementer	Medium	Medium	Medium
Network Refiner	Low	Low	High



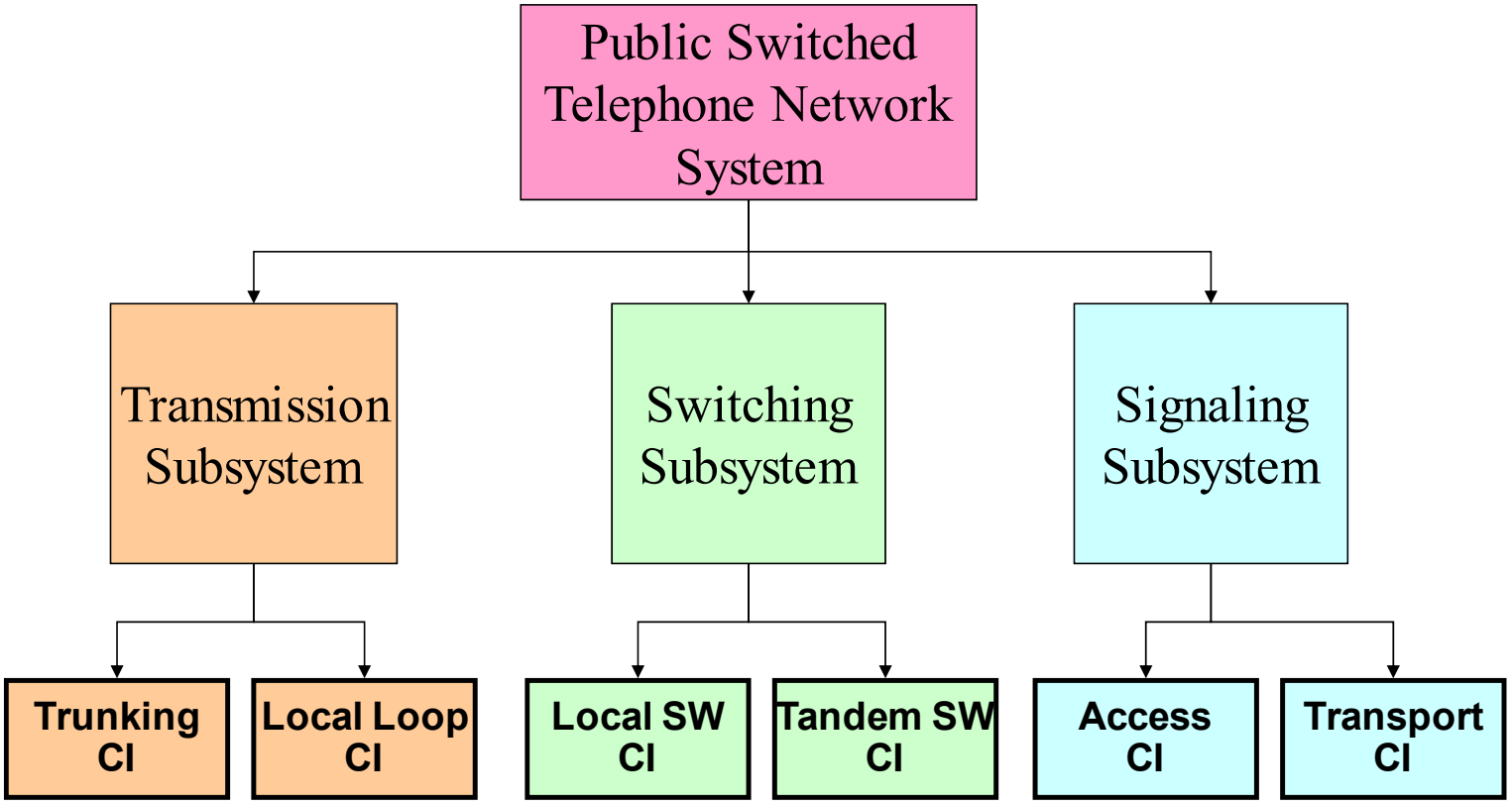
A Network System Perspective



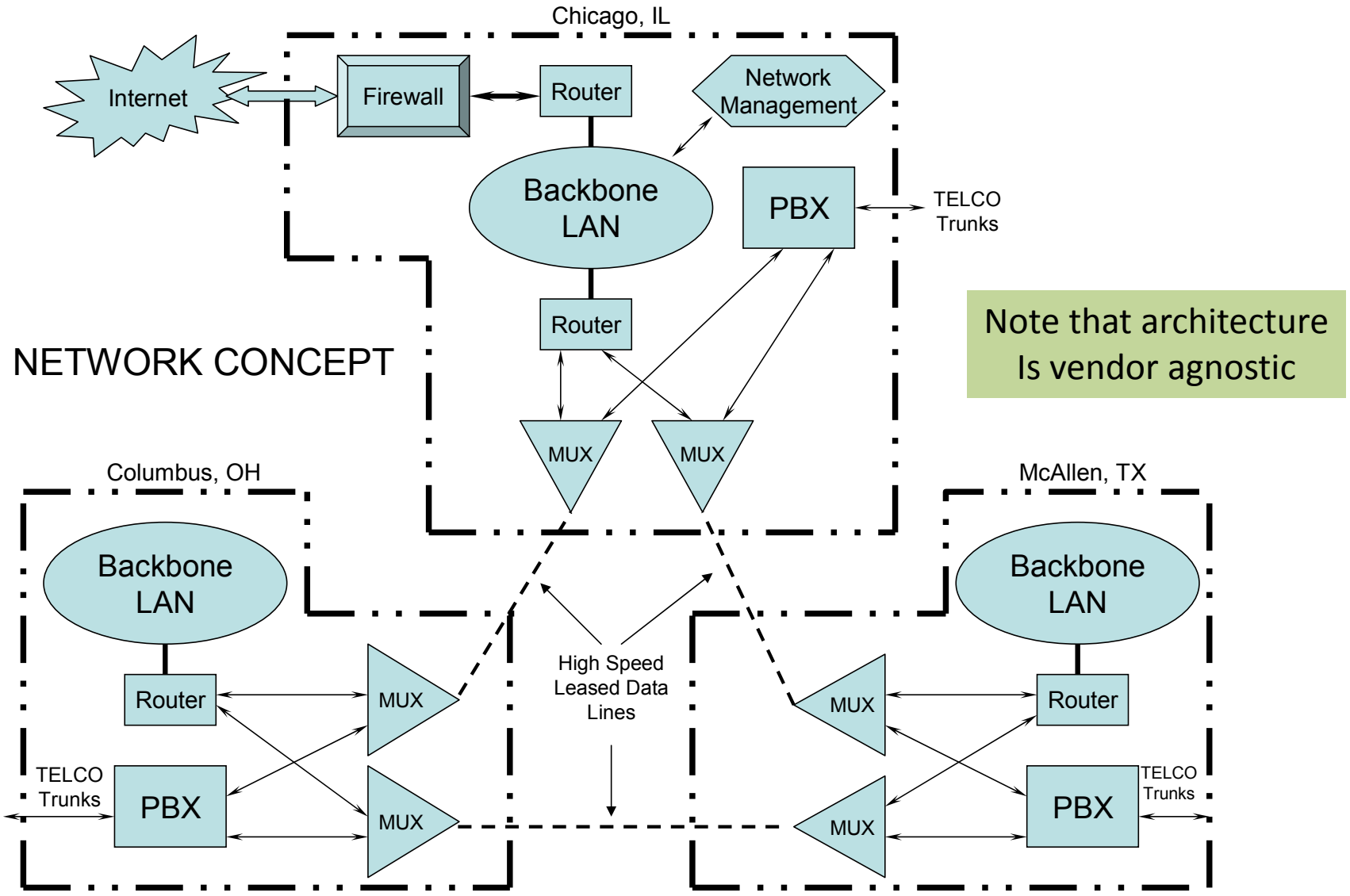
Another Network System Perspective



Network System Decomposition

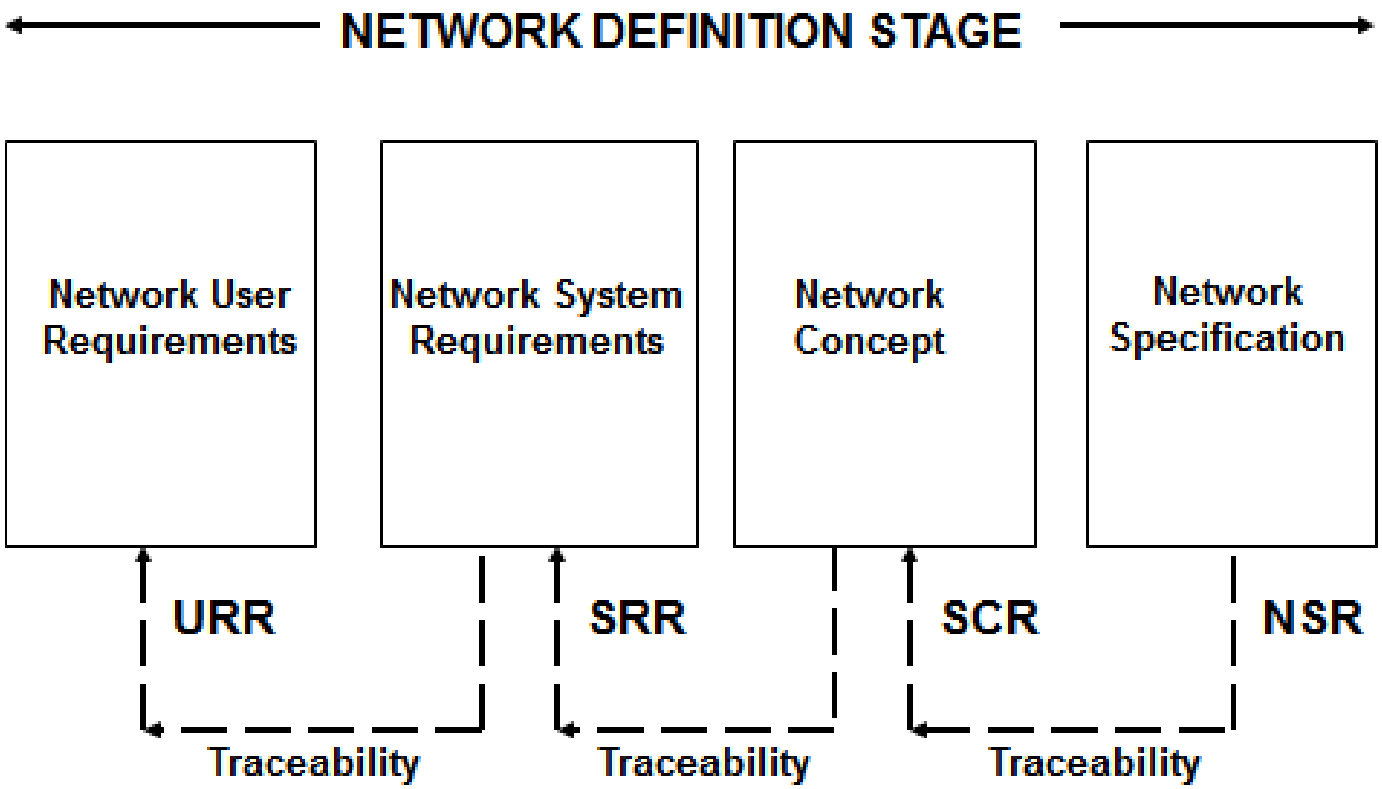


Network Concept



Note that architecture Is vendor agnostic

Linking Equipment Specs to User Requirements

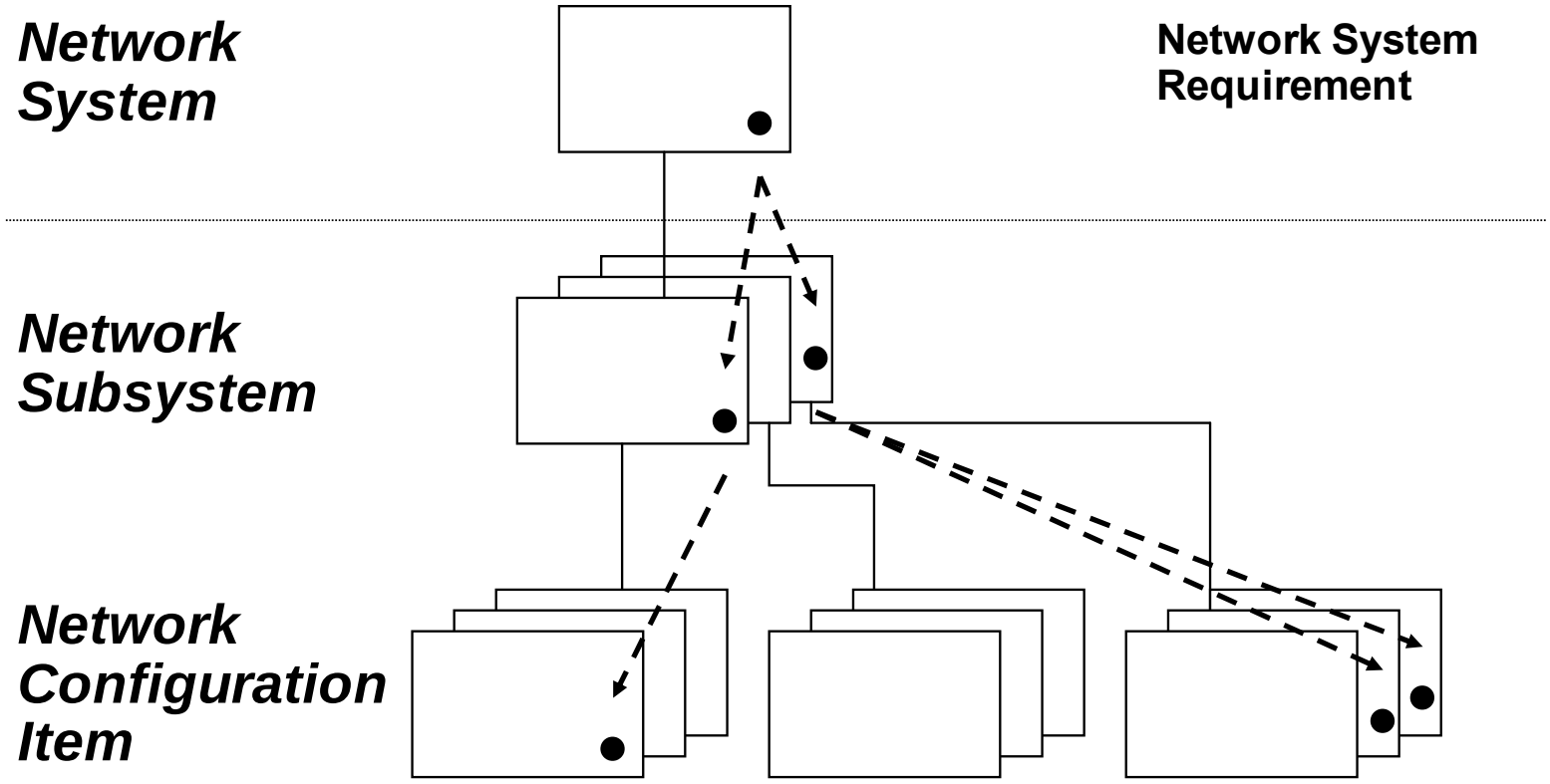


Specifying Equipment Reliability and Maintainability

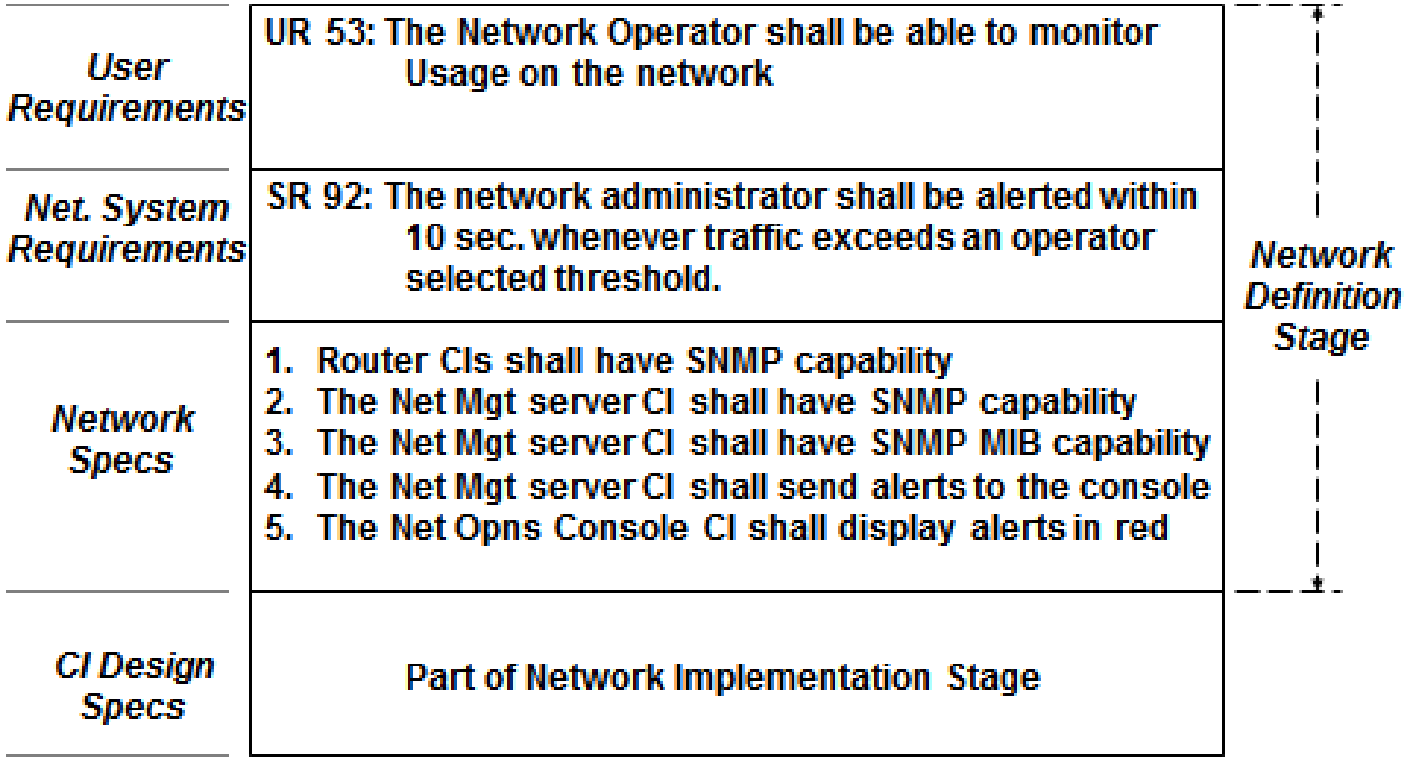
CI	MTTF (hours)	MTTR (hours)	Availability
User Station	35,040	0.25	0.999992865
Voice Wiring	87,600	1	0.999988585
PBX	87,600	1	0.999988585
Multiplexer	64,560	1	0.999984511
Leased Line	8,760	0.1	0.999988585
Multiplexer	64,560	1	0.999984511
PBX	87,600	1	0.999988585
Voice Wiring	87,600	1	0.999988585
User Station	35,040	0.25	0.999992865
		Voice Call Availability	**0.999904814**

SR = **0.9999**

Allocating System Requirements to Equipment Specs

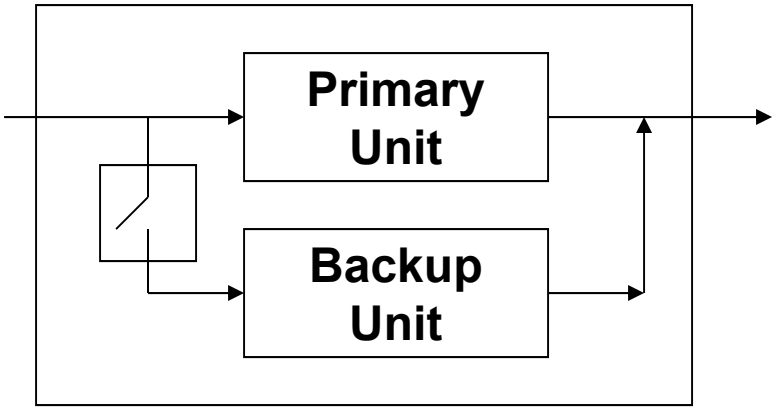


SR Allocation Illustration



Common Technique to Enhance Reliability & Availability

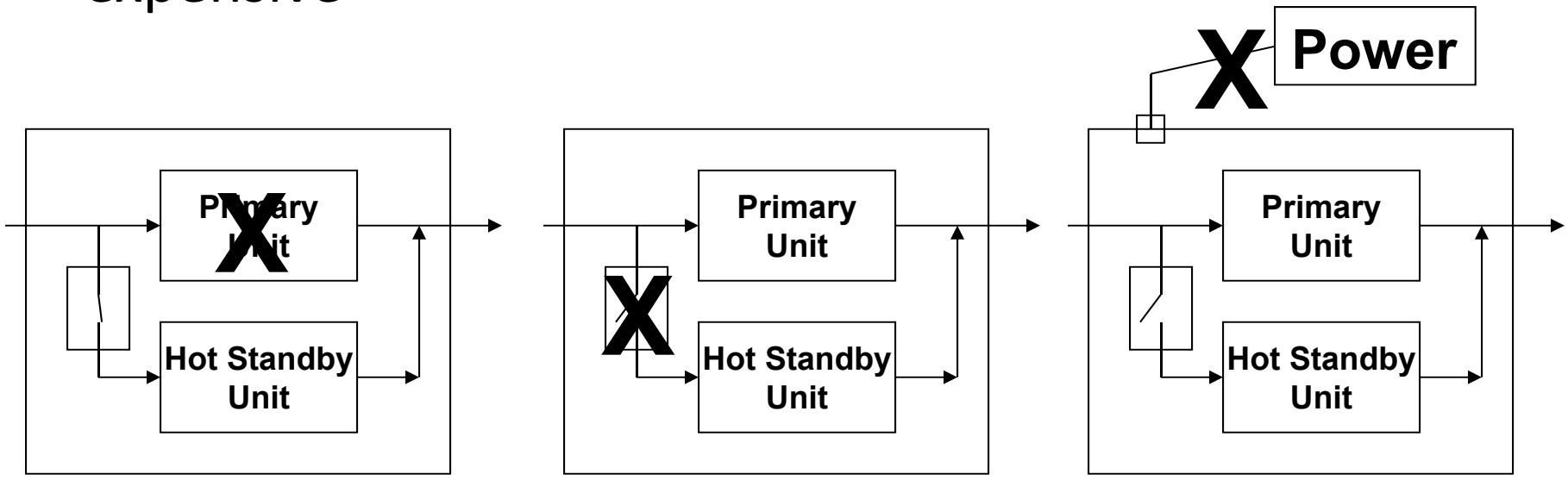
- Hot Standby Spare
- Sensing Switch to Detect Failure and automatically switch to spare unit
- Both Units must fail before loss service
- Equipment or link hot standby
- $A_{HS} = 1 - (1 - A_P)*(1 - A_B)$



A_P	A_B	A_{HS}	
0.9	0.9	0.99	Double your 9s
0.99	0.99	0.9999	
0.999	0.999	0.999999	
0.95	0.95	0.9975	Double your 9s And add 75
0.995	0.995	0.999975	
0.9995	0.9995	0.99999975	
0.99683	0.99683	0.99999	Necessary for Five 9s

Cautions About Hot Standby

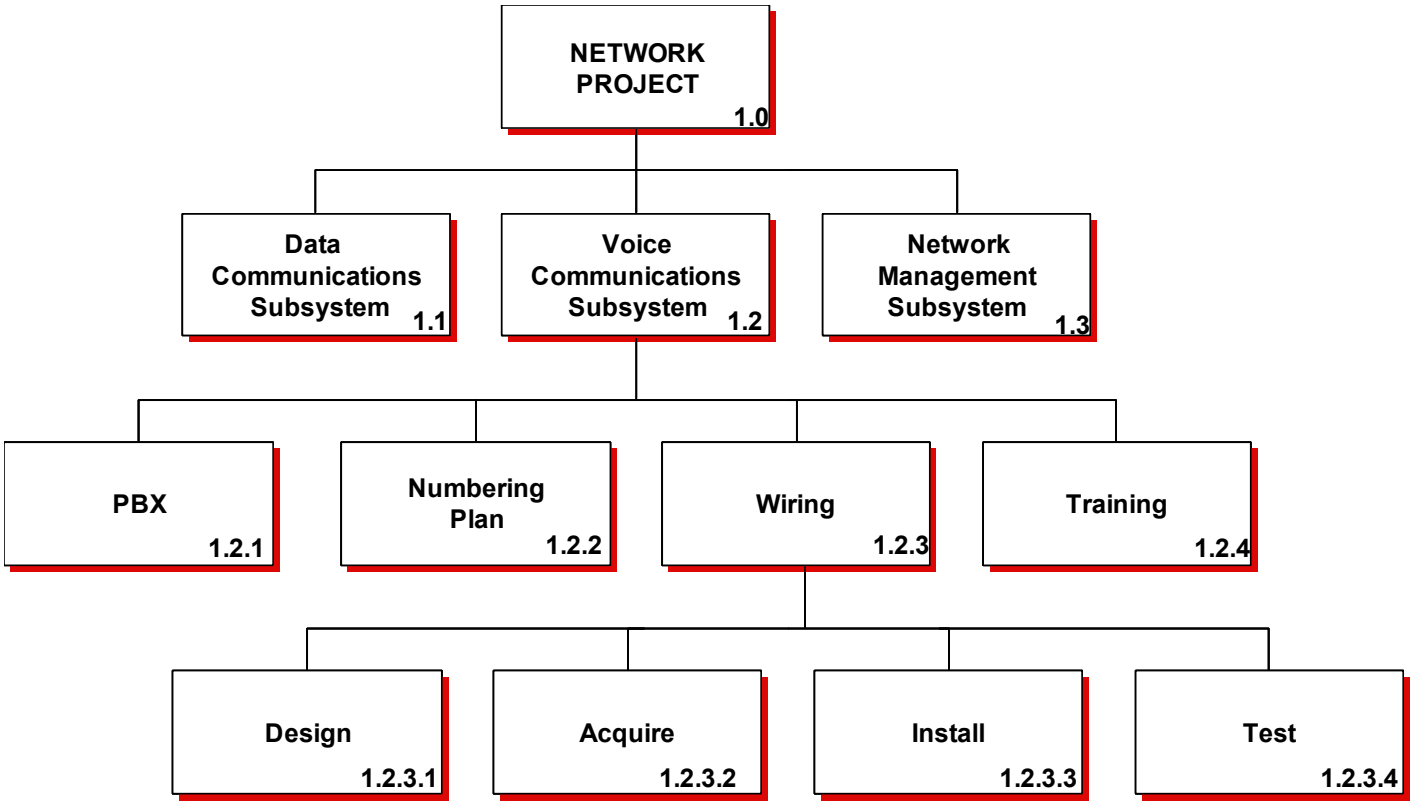
- If Primary Unit Fails it has to be fixed!
- Sensing Switch can fail
- Power can be lost to the unit
- Hardware hot standby can be cost effective
- Software hot standby is very complex and very expensive



Planning Phase

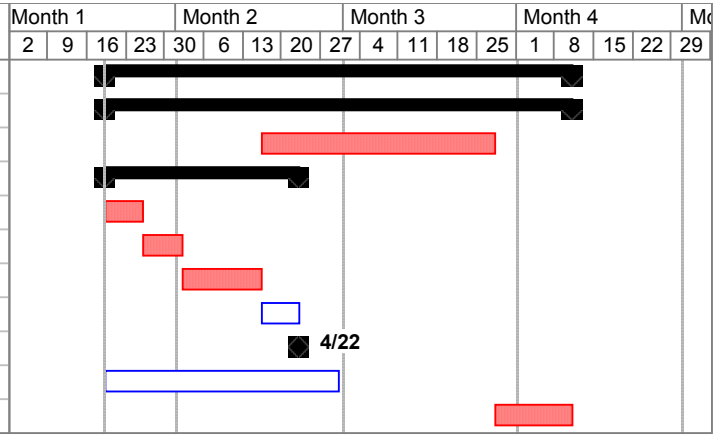
- A complete plan includes the following:
  - Tasks/subtask definition
  - Schedule/milestones for tasks/subtasks
  - Resources required for each task/subtask
  - Responsibility for each task/subtask
- Proceed at your own hazard without a complete plan!

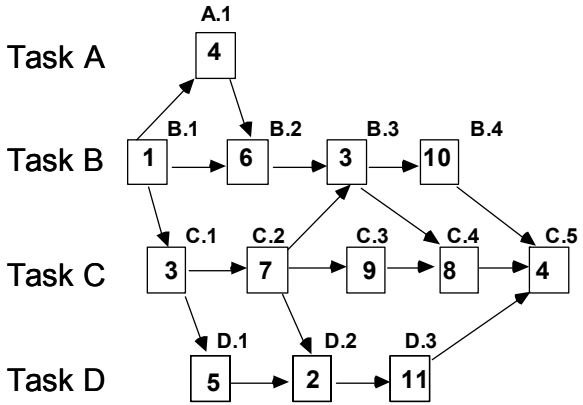
Planning – First Define the Necessary Work



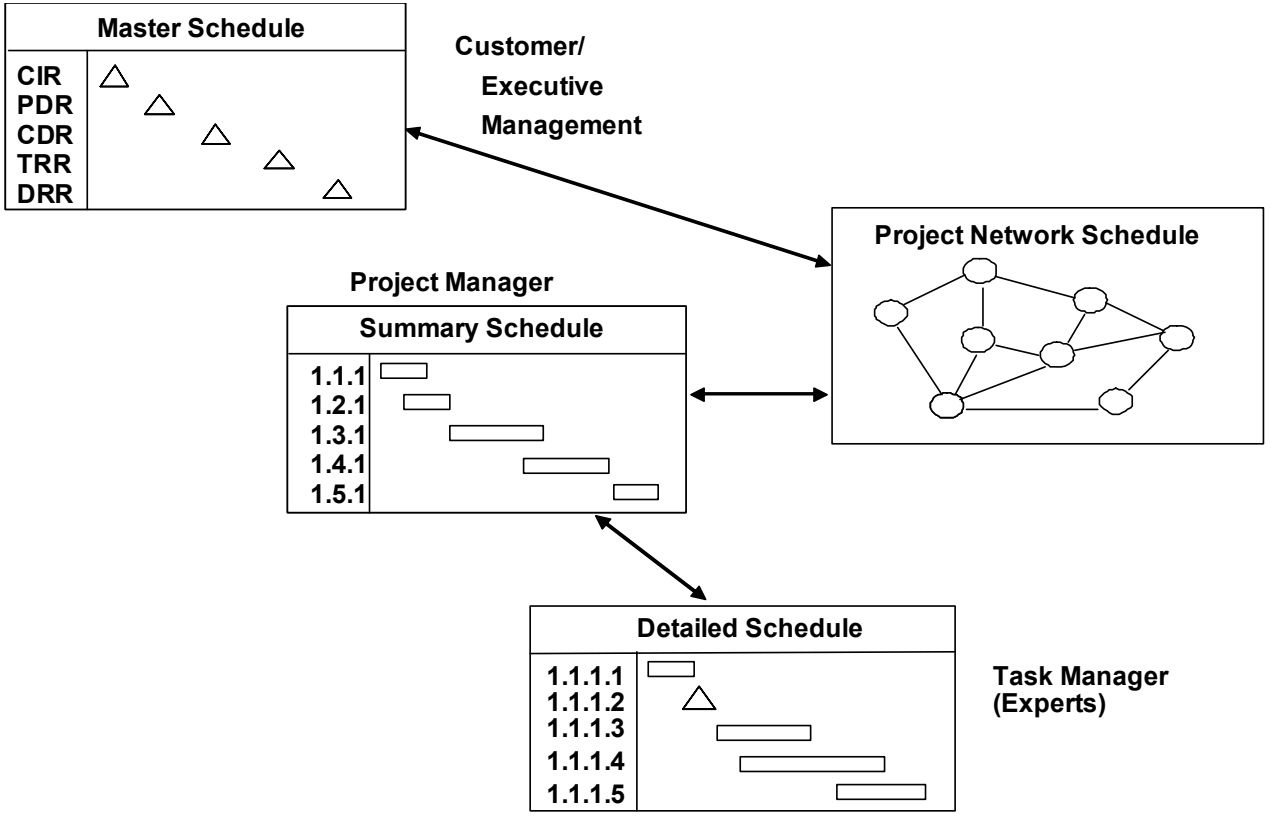
Developing Gantt and Critical Path Schedules

ID	WBS	Task Name
1	**1.**	**NETWORK PROJECT**
2	**1.2**	**Voice Communications**
3	1.2.1	PBX
4	**1.2.2**	**Wiiring**
5	1.2.2.1	Create Design
6	1.2.2.2	Acquire Materials
7	1.2.2.3	Install Wiring
8	1.2.2.4	Perform Testing
9	1.2.2.5	Acceptance Review
10	1.2.3	Numbering Plan
11	1.2.4	Training

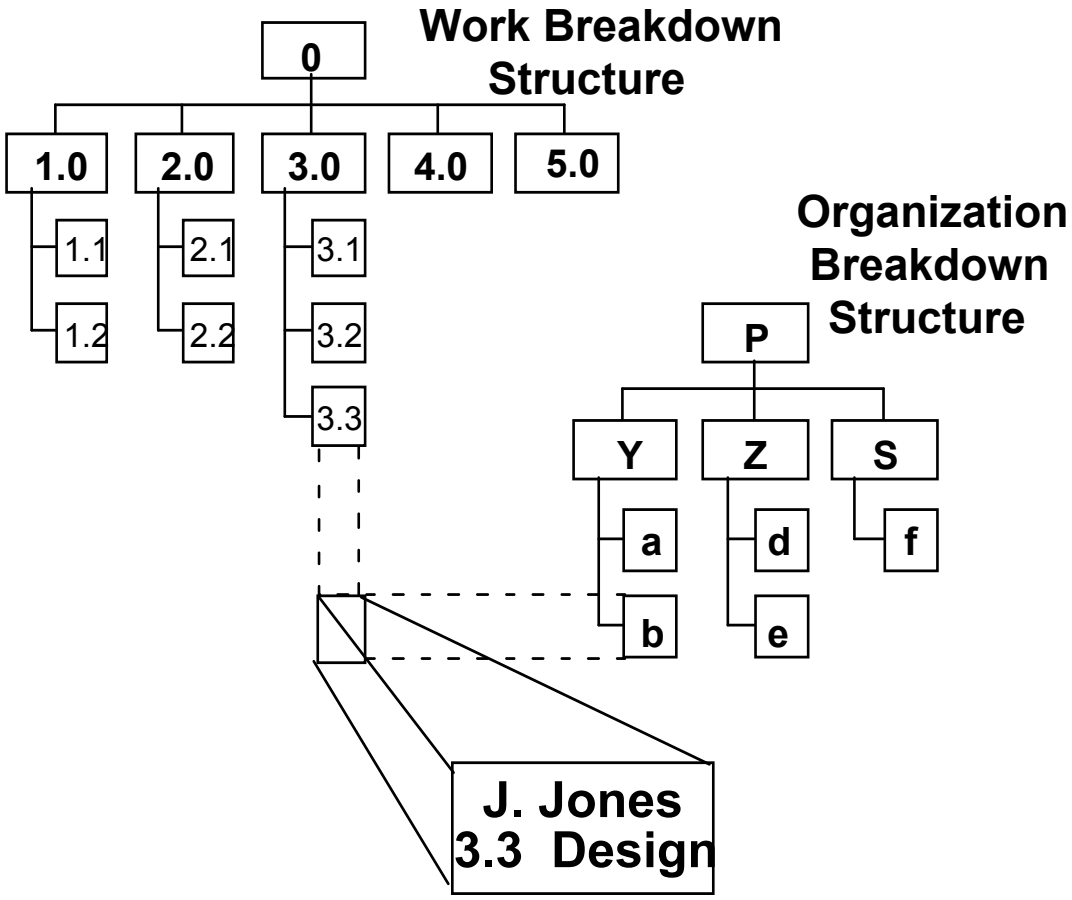




Hierarchical Schedules



Identifying Who is Responsible for Work



Estimating Cost of Project

- Labor: Categories, level of expertise, hours required, hourly price
- Materials: Equipment, software, raw materials, tools and non-consumable supplies
- Other Costs: Travel, reproduction, consumable supplies

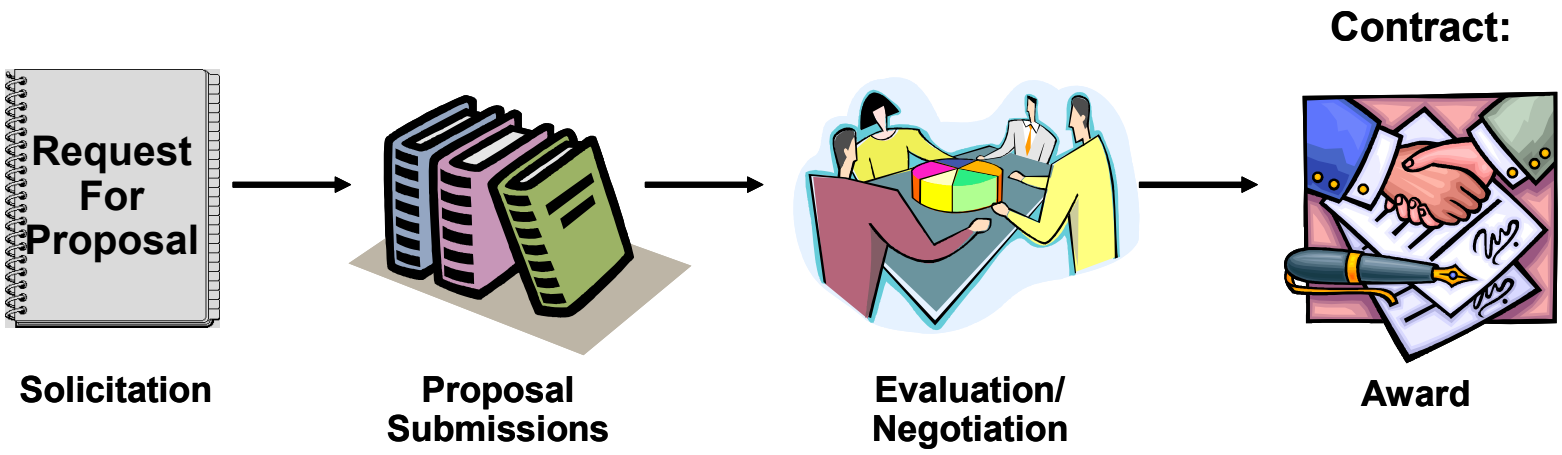
Implementation Stage

- Network Source Selection: Acquire external resources (services/products)
- Network Design: Develop a detailed network design to allow network integration and deployment/rollout
- Network Integration: Build, configure, integrate, test, and stage network equipment in preparation for network deployment/rollout

Network Implementation Stage

STAGES & PHASES	NETWORK IMPLEMENTATION STAGE					
	Network Source Selection Phase		Network Design Phase		Network Integration Phase	
MAJOR ACTVITIES	Prepare Request for Proposal(s) Prepare Request for Quote(s) Develop Evaluation Plan	Evaluate Proposals Select Vendor(s) Negotiate Contract(s)	Update Network Implementation Plan Identify Resources Commit Resources	Prepare "Design-to" Specifications Update Verification Plan Develop Network Integr. Approach Develop Network Deployment Approach	Prepare "Build-to" Specifications Verify Design meets Performance Reqts Prepare Verification Procedures Conduct Pilot(s)/ Create Prototype(s)	Assemble/Config. Equipment Prepare Network Maintenance Manuals Prepare Network Opns Manuals Perform Testing
PRODUCTS	RFPs Proposal RFP Evaluation Plan Equipment RFQs	Signed Contract(s)	Revised Network Implementation Plan Project Team Assignments	Network "Design-to" Specifications Verification Plan Network Integration Plan Initial Network Deployment Plan	Network "Build-to" Specifications Traceability Matrix Verification Procedures Pilot(s)/Prototype(s)	Maintenance Manuals Operations Manuals Test Results Final Network Deployment Plan
CONTROL GATES	Proposal Evaluation Review (PER)	Contract Award Review (CAR)	Network Project Implementation Review (PIR)	Network Prelim Design Review (PDR)	Network Critical Design Review (CDR)	Test Rediness Review (TRR)

Negotiated Procurements



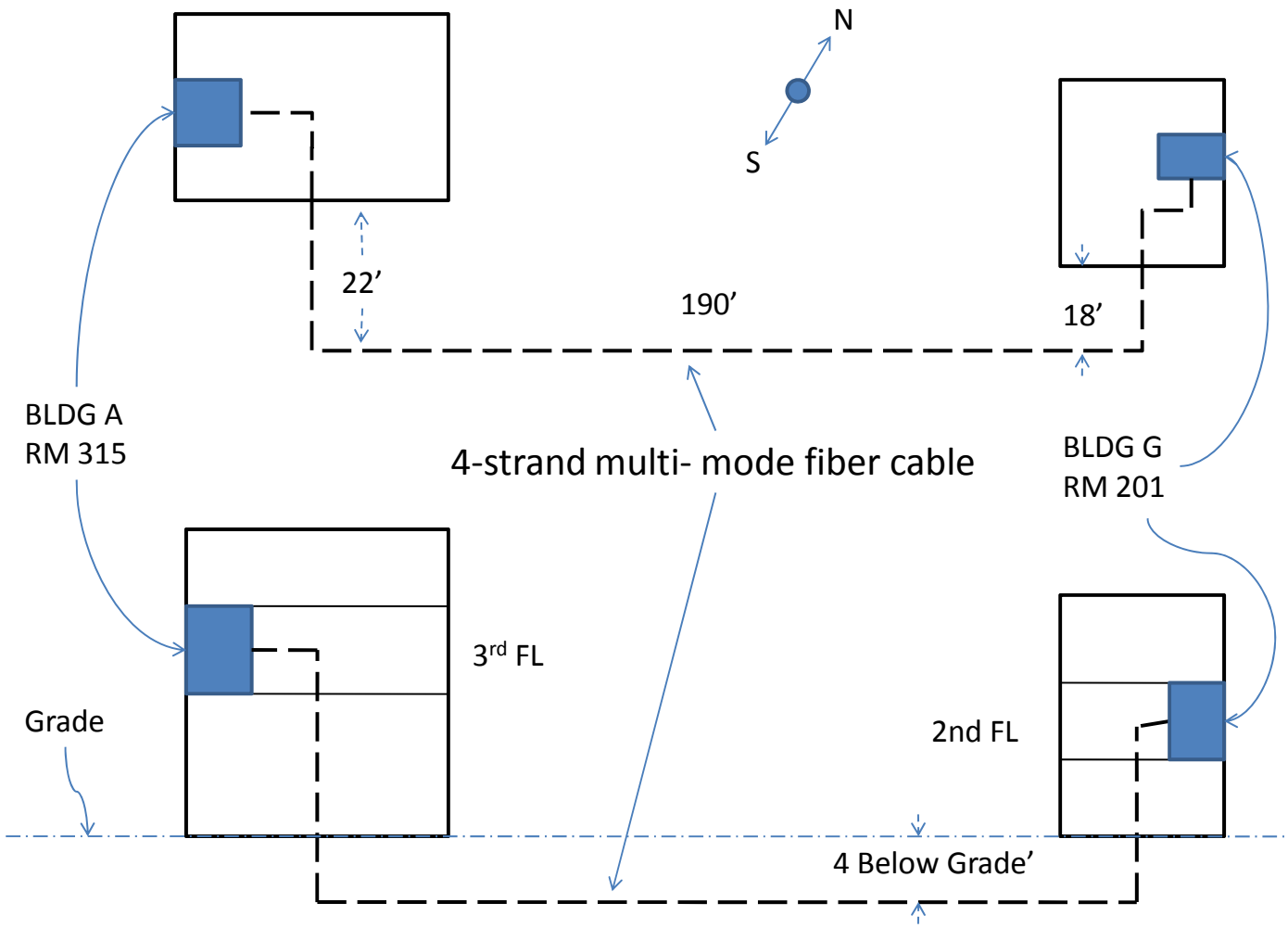
Solicitation Vocabulary

- Solicitation – Request for Proposal (RFP)
- Buyer – the customer or client who issues the RFP desiring systems and services
- Seller – the firm or group of firms responding to the RFP, also called the "supplier" or "bidder"
- Prime Contractor – the lead firm for the proposed system/ services who is to be legally responsible to the buyer for the required system/services, and who will manage the effort if there is a win. Sometimes referred to as the "Integrator".
- Subcontractor – a firm responsible to the prime for a portion of the buyer's system and/or services.
- Vendor – a firm providing equipment to a prime or subcontractor.
- Incumbent – firm(s) already performing work or providing equipment for/to the buyer which is identical, or similar, to that requested in the RFP.
- Bid-No Bid Review – a control gate used by a prospective bidder to decide whether to bid on an RFP or not
- Red Team Review – a control gate used by a prospective bidder to insure the proposal is compliant, responsive and competitive.

Design in the Lifecycle

User Requirement	Data transfer between Columbus OH and McAllen TX
System Requirement	Peak Information Transfer Rate (ITR) of 985 Kbps between Columbus and McAllen
Network Concept Phase	***High speed digital line between Columbus and McAllen, a major component***
Specification Phase	***DS1 digital circuit (1.544 Mbps) between Columbus and McAllen***
Source Selection Phase	Vendors selected
Design Phase	***DS1 line from Verizon*** ***Columbus: 386 High Street Suite 1100, Rm 101*** ***McAllen: 525 Main St., Suite 200, Rm 21***

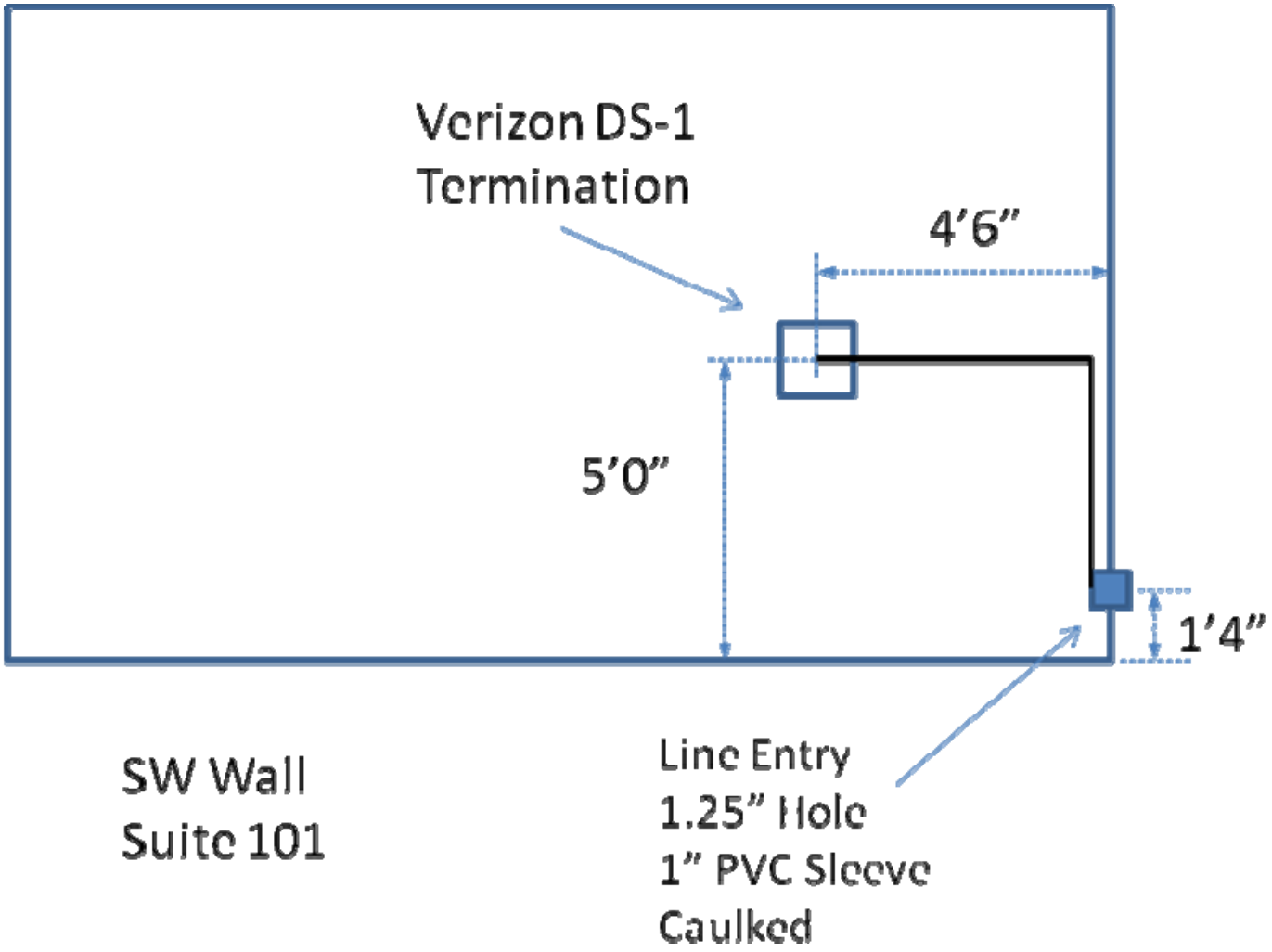
Preliminary Design Example



Network Systems Integration

- Perform critical design
- The purpose of the network integration phase is also to
  - Assemble
  - Configure
  - Integrate
  - Test, and
  - Stage network equipment in preparation for network deployment/rollout.
- Includes
  - Development of Network Operations manuals
  - Network Maintenance manuals, and
  - Reporting of test results.

Critical Design Example



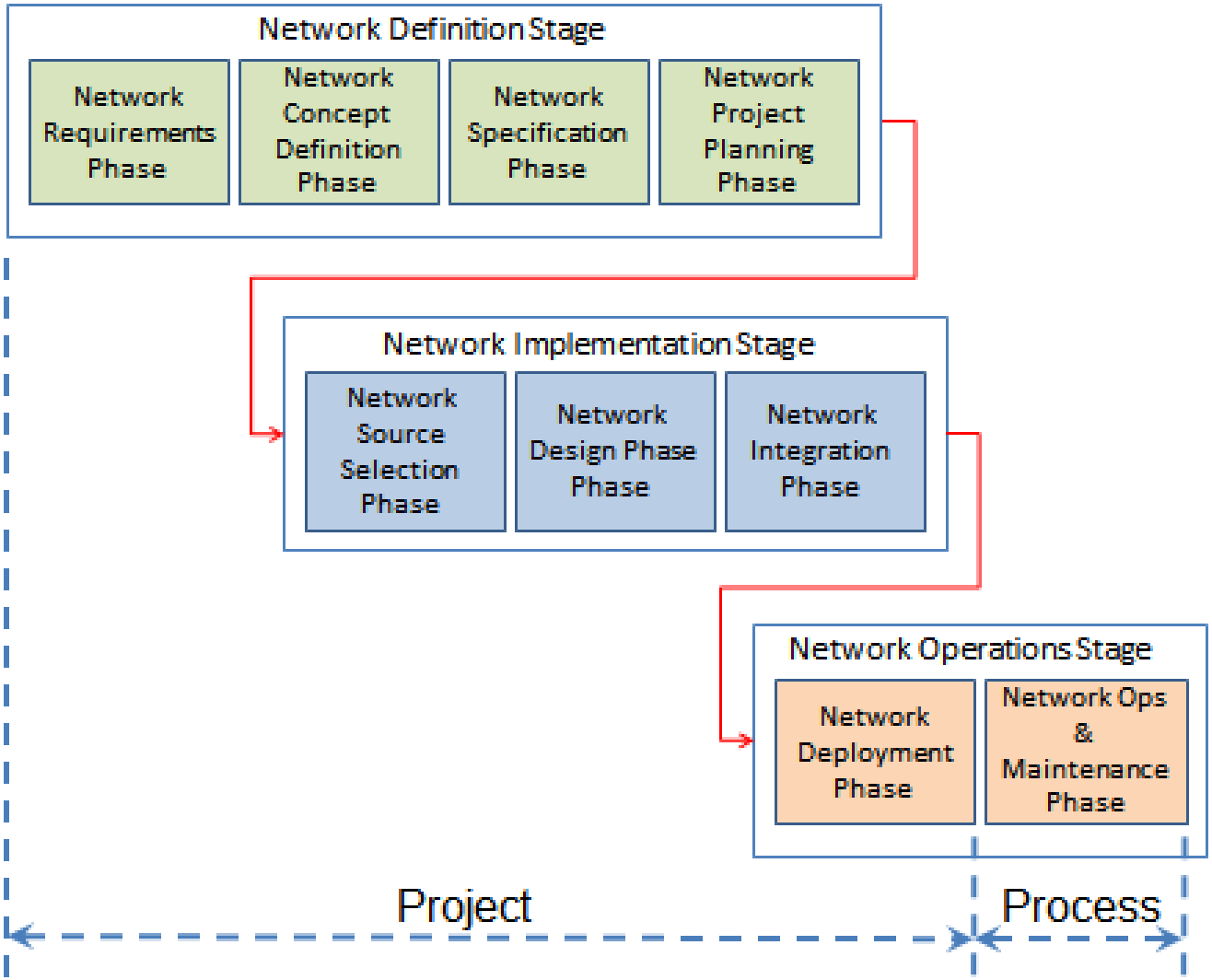
Network Operations Stage

STAGES & PHASES	NETWORK OPERATIONS STAGE			
	Network Deployment Phase			Network Opns & Maintenance Phase
MAJOR ACTVITIES	Prepare Deployment Procedures Prepare Site(s)	Install Network Prepare DTAI Acceptance Proc. - Demo - Test - Analysis - Inspect Conduct Network Operator Training	Conduct DTAI Acceptance Resolve Discrepancies Update Documentation Review Lessons Learned	Operate the Network Perform Maintenance Sustain Training
PRODUCTS	Network Deployment Procedures Completed Facility Certification	Installed Network Acceptance Procedures Training Certificates	Signed Acceptance Updated Documentation Operational Network Certificate Lessons Learned	Activity Reports Failure Reports Network Modifications Training Certificates Periodic Network Performance Report
CONTROL GATES	Deployment Readiness Rev. (DRR)	Network Test Readiness Rev. (TRR)	Network Acceptance Rev. (NAR)	Periodic Network Perf. Review (NPR)

Operations Stage

- Network Deployment: Culminate the project with an operational network that is installed, tested, documented, accepted, and turned over to the operations and maintenance organization.
  - Detailed design documentation used to install network at customers site
  - Well developed transition and back-out plans are required
  - System Requirements are the criteria for acceptance
  - SR are accepted through DTIA (demo, test, analysis, and inspection)

Network Operations



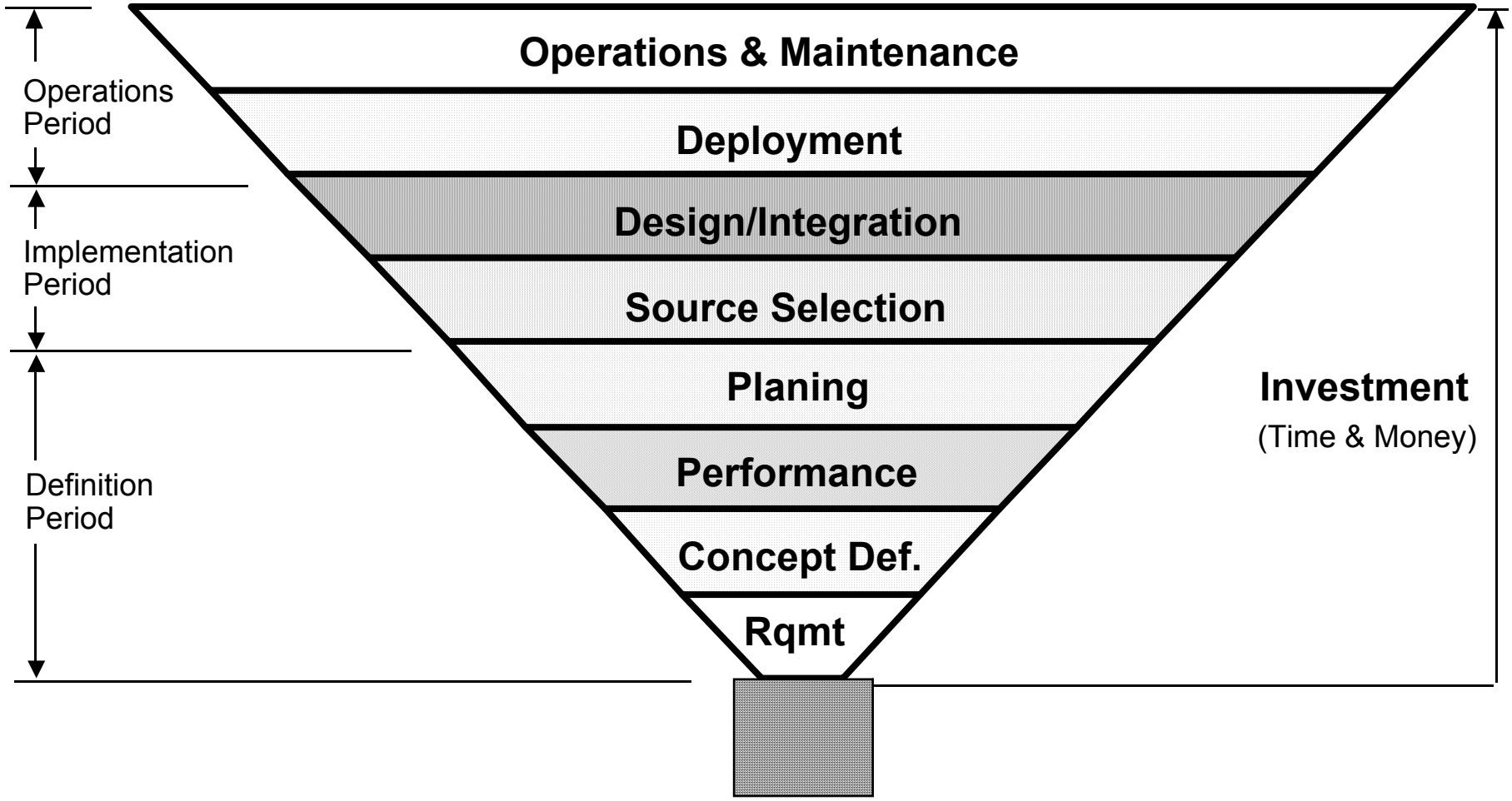
Operations Stage

- Operations & Maintenance:
  - Operate the network system for the remaining lifetime of the network
  - In a way that satisfies the ongoing mission of the enterprise or users utilizing the network.
  - The O&M organization must insure timely delivery of network functionality, performance, and uptime.
    - Fault Management
    - Performance Management
    - Security management
    - Configuration Management
    - Accounting Management
  - The network will most likely evolve through
    - O&M projects
    - Network Enhancement projects

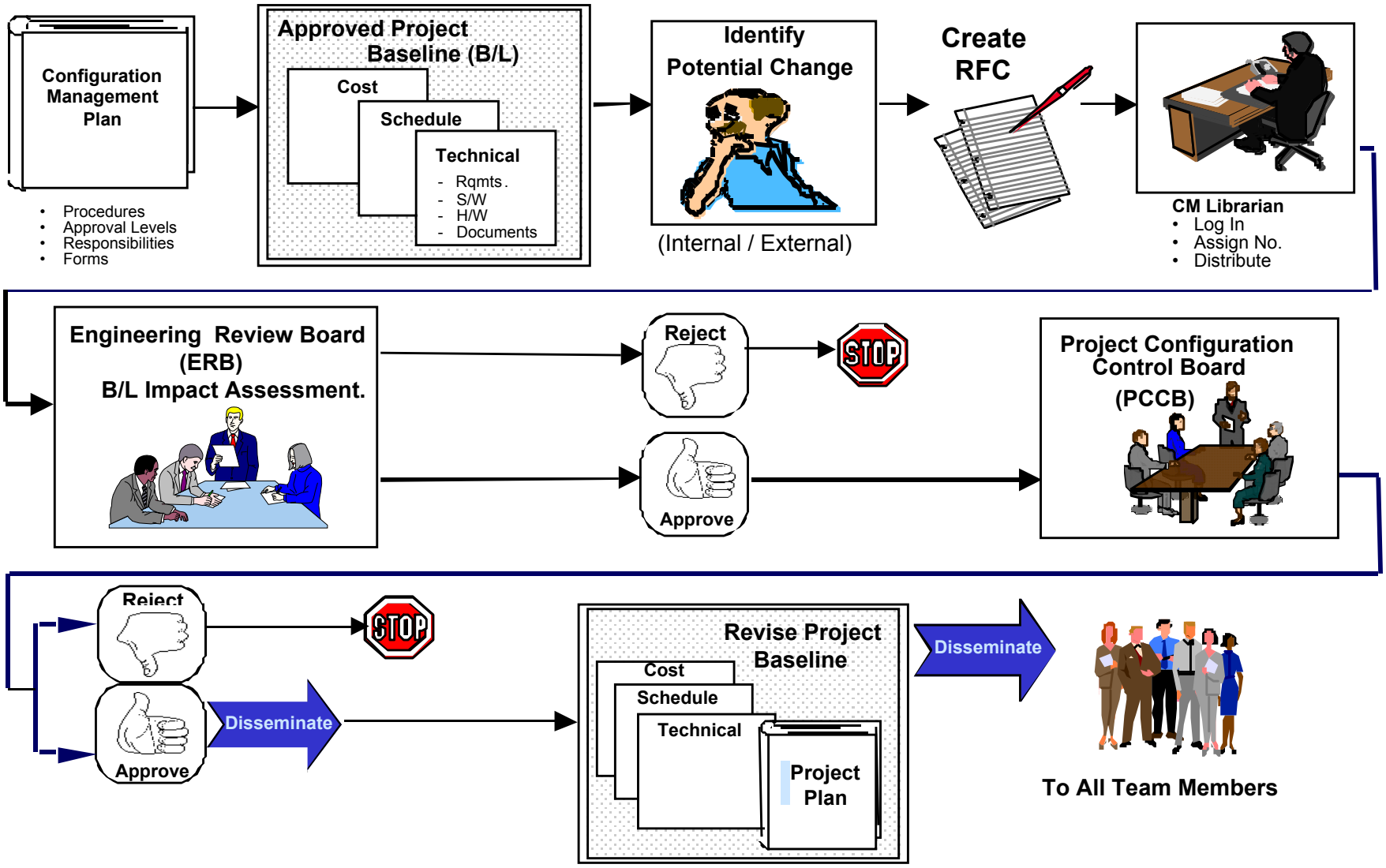
Configuration Management

- Changes will happen whether you manage them or not
- Projects and O&M can be undermined if change is not managed

Too Much Change Can Doom a Project



Configuration Management



Self Assessment Q1

- You are a network analyst at Boeing. You accompany your boss, the Director of Network Services, to brief the President the Boeing Aircraft Company on the new digital services you would like to procure to support design and manufacturing. You brief the network concept and technology for the new services and then your boss proudly tells the President that this new network system will save the company $1.2M per year. The President replies "I drop over $2M dollars on the shop room floor everyday. So at this point, I really don't care about your proposal or the technology. If I were to use your technology, *how many more 747s can I produce a month?* Come back in a month with an answer and I will consider your proposal."

  A. I have no idea how to answer this question
  B. I have an idea how to answer this question, and with enough time could figure it out.
  C. I am confident I know exactly how to go about answering the question

Self Assessment Q2

- You are on a project team at a corporation considering leasing Virtual Private Network (VPN) services from a telecommunication service provider to interconnect your 55 nationwide offices. The vendor tells you the mean time between failures (MTBF) for their VPN service is 4200 hours (about once every ½ year). You share this good news with your project manager and a major internal customer, the Vice President for Sales, telling them this indicates the network rarely breaks down. The VP insists you relate this statistic to her business mission. You ask what she means and she says, *"Well, for instance, if we use such a network, what's the chance that a salesperson will be able to successfully place their weekly orders sometime during the business day on Friday's?"*

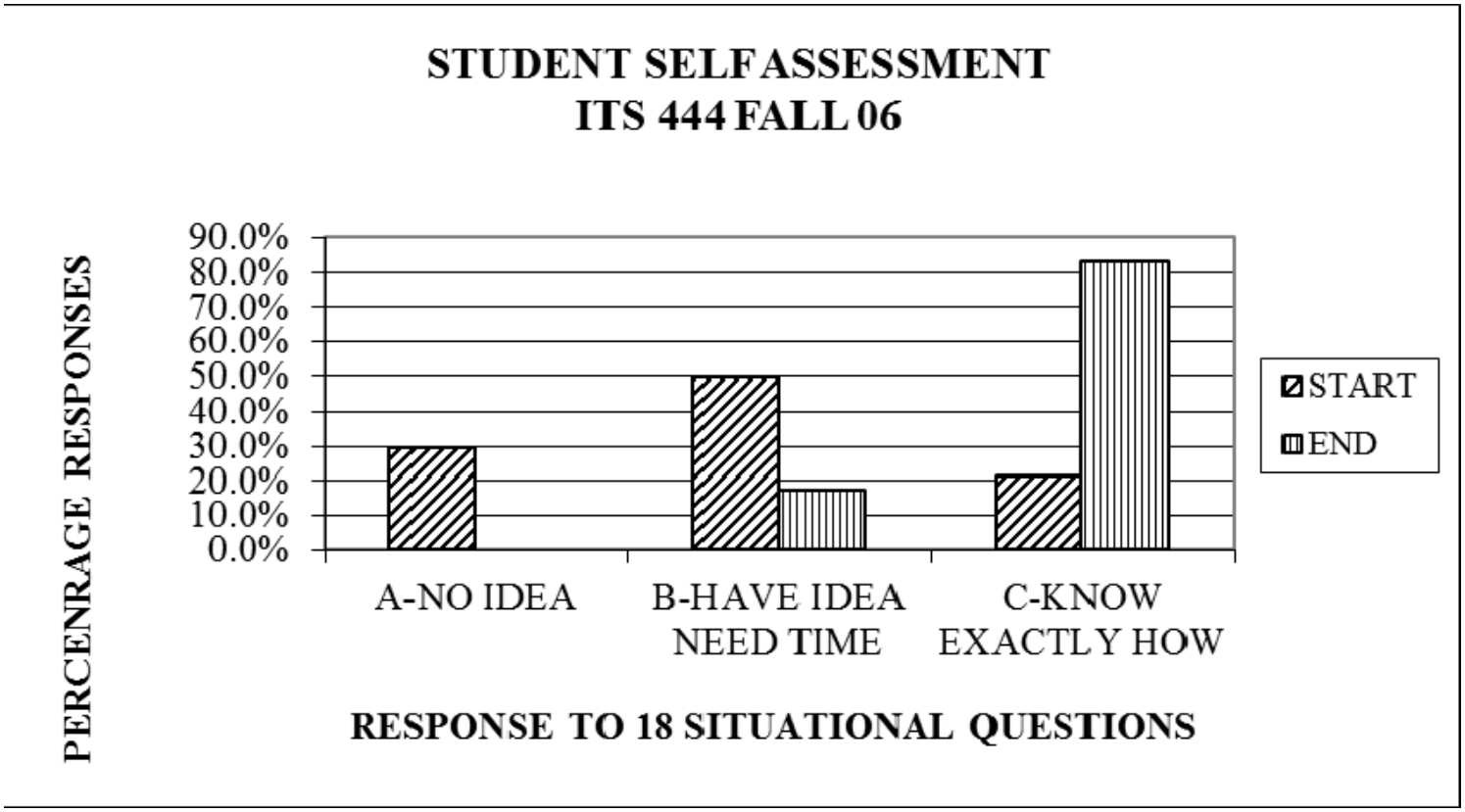
A. I have no idea how to answer this question
B. I have a pretty good idea how to answer question, and with enough time could figure it out.
C. I am confident I know exactly how to go about answering the question

Self Assessment Q3

- A junior network consultant at Accenture is tasked to assess the network enhancement needs of a client. The consultant visits and the client's VP tells her he wants a 100Mbps backbone LAN, a firewall, and some T3 (45 Mbps) access lines to the Internet. In addition, he wants her to design this system and recommend a vendor to put in the network. Months after implementation, the VP complains to her manager that the system is not allowing his workers to be productive and is too expensive. Exasperated, the junior consultant says she gave him what he asked for, so she cannot understand why he was upset with her services. The VP replies – "Hey, I hired Accenture and paid your premium rates to do the right thing and keep me out of trouble. Now I have egg on my face – Accenture let me down." *In retrospect, how could this situation have been prevented by the junior consultant?*

  A. I have no idea how to answer this question
  B. I have a pretty good idea how to answer question, and with enough time could figure it out.
  C. I am confident I know exactly how to go about answering the question

Before & After Self Assessment



Questions?

Feedback

- Review Book
  - Write a short review?
  - Provide errata and suggestions?
- Contact me at asnow@ohio.edu