سازمان نظام صنفی رایانه ای کشور

وزارت ارتباطات و فناوری اطلاعات
سازمان فناوری اطلاعات ایران

DCAS

نظام ممیزی و رتبه بندی مراکزداده

An Introduction To BICSI-002-2019

13 Nov. 2021

The Speaker

Hamed Moinfar

PENDARIA Co., CEO & Co-founder

Member of the “Data Center Assessment Criteria Codification” committee of Tehran NSR and ITO DCAS

- PMP, Project Management Professional – PMI, Since 2012
- DC102, Applied Data Center Design and Best Practices – BICSI
- TSI Professional for Data Centers - TÜViT
- CITS, CDCS, CDCP – EPI
- DCCA, Data Center Certified Associate – APC, SE
- ITIL v3 Foundation – EXIN
- QMS Internal Auditor – TÜV Academy

PENDARIA
DATA CENTER ENGINEERING & DESIGN
پنداریا

www.pendaria.com

Follow us on LinkedIn

Emails:

- moinfar@pendaria.com
- moinfar@outlook.com

References

References used to prepare this presentation:

- ANSI/BICSI 002-2019: Data Center Design and Implementation Best Practices – A BICSI International Standard
- Data Center Standards: How TIA-942 and BICSI-002 Work Together – By Jonathan Jew, 2017 BICSI Fall Conference
- The evolution of Data Center standards and the ANSI/BICSI-002-2019 – By Yannis Katris, 2019 BICSI Greece Day Event
- An Overview of the ANSI/BICSI 002-2019 Data Center Availability Class Methodology – BICSI Design Tools

Scope of This Presentation

- This Presentation Is Suitable For:
  - IT and Data Center Managers of Any Level
  - Data Center Design Specialists and Contractors
  - Anyone Interested In Data Center Standards
- It Covers:
  - A Brief Introduction to Data Center Standards
  - Focused on ANSI/BICSI-002-2019
- It Is Not Intended To:
  - Cover Technical/Non-technical Criteria and Requirements
  - Educate On Data Center Design and Construction

Today Sessions

- Session 1
  - 1.1. How BICSI-002 Works With Other Standards
  - 1.2. ANSI/BICSI 002-2019 – Overview
- Session 2
  - 2.1. ANSI/BICSI 002-2019 – Methodology
  - 2.2. Workshop: Services Availability Class Planning
  - – Handouts:
    - 002-2019-Methodology
    - 002-2019-Worksheet

دبیرخانه نظام ممیزی و رتبه بندی مراکزداده

How BICSI-002 Works With Other Standards

Session 1.1

How BICSI-002 Works With Other Standards

- Families of Publications
  - TR-42
  - CENELEC
  - ISO/IEC
  - BICSI
- TIA-942 and BICSI-002
  - BICSI-002 Best Practices vs. TIA-942 Requirements
  - Using BICSI-002 & TIA-942
- DC Operations Standard

Families of Publications

- Data Center Telecommunications Standards
  - ANSI/TIA
  - CEN-CENELEC (CSN/EN)
  - ISO/IEC

vs.

- Data Center Infrastructure Standards
  - ANSI/TIA 942 (Confusing 🤔)
  - ANSI/BICSI 002
  - CEN-CENELEC (BSI/EN) 50600
  - ISO/IEC 22237
  - UPTIME

Families of Publications

- Families of telecommunications standards publications generally include:
  - Common standards
    - All in the series should be applied
  - Premises Standards
    - Only the relevant ones should be applied
  - Component Standards
    - If you are manufacturing, and
    - Also if you are utilizing, should be applied

Families of Publications

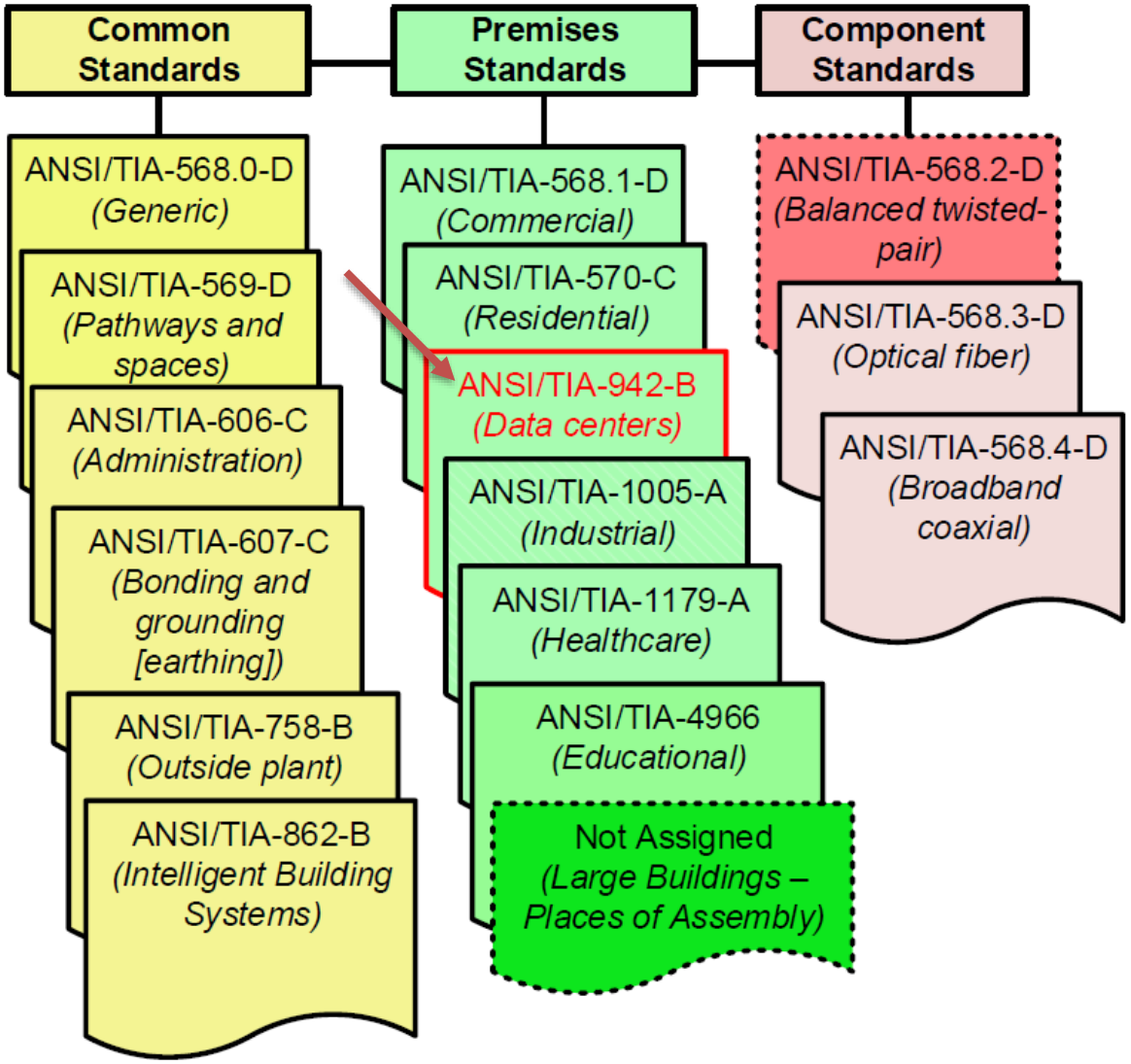
- Data center telecommunications cabling infrastructure standards, cover the following:
  - Types of cabling permitted
  - Cable and connecting hardware specifications
  - Cable lengths
  - Cabling system topologies
  - Cabinet and rack specifications and placement
  - Telecommunications space design requirements
  - Telecommunications pathways
  - Testing of installed cabling
  - Telecom. cabling system administration and labeling

Families of Publications

- TIA Standards Apply in US and Canada and are Widely Used in Other Countries
- Other Families of Standards Apply in Other Countries

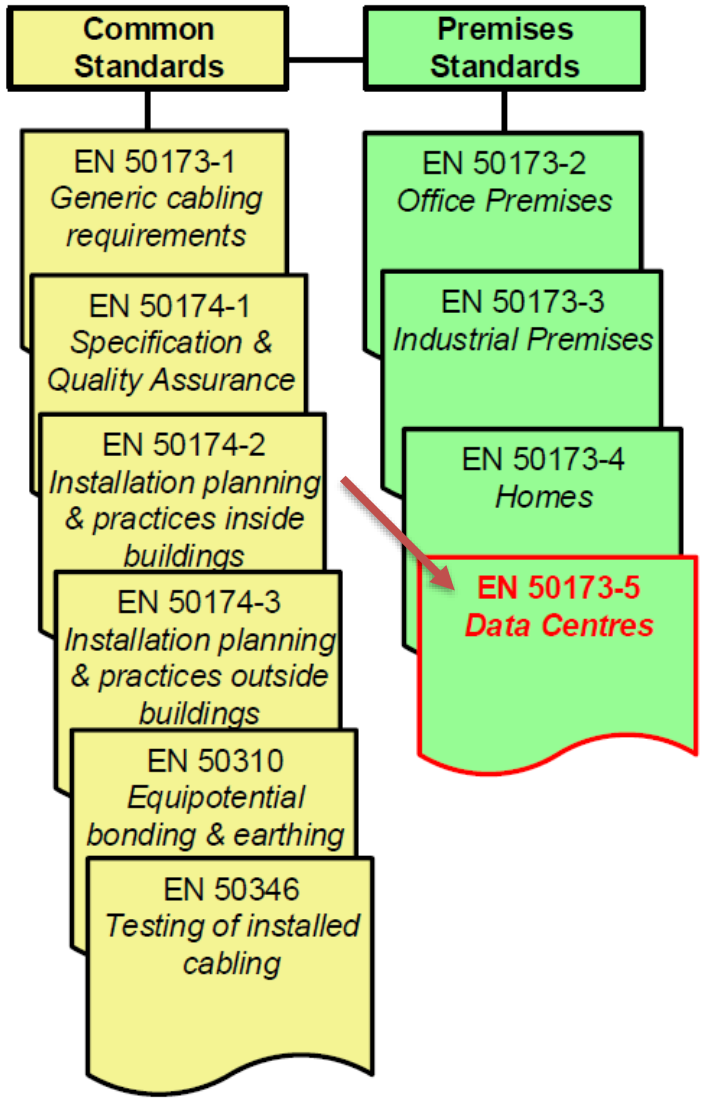
Families of Publications

- TIA-942 is part of a family of TR-42 cabling standards
- Confusingly, TIA-942 may also serve as Infrastructure standard



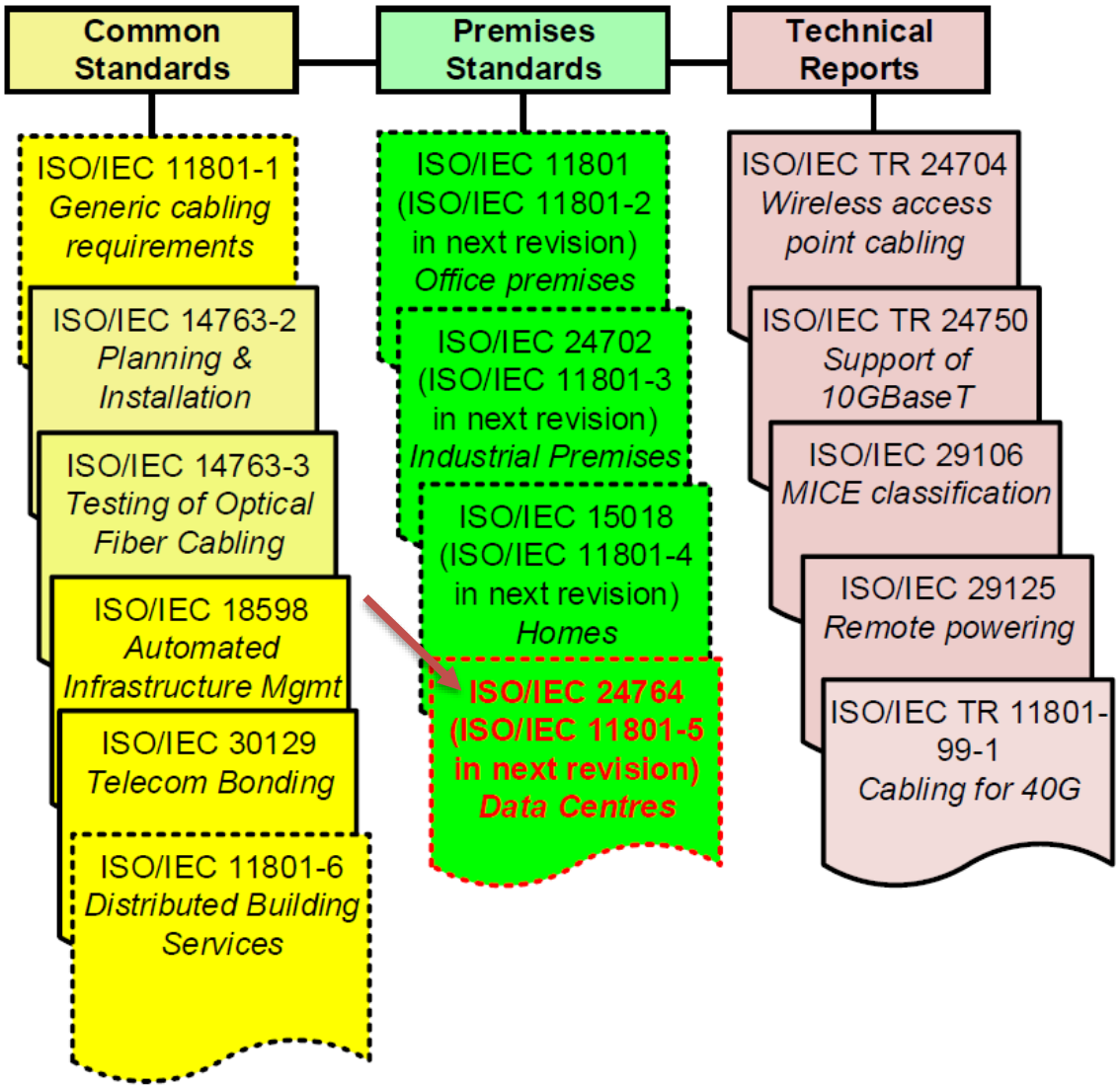
Families of Publications

- European (CENELEC) Premises Cabling Standards
- BS EN 50600 serves as infrastructure standard



Families of Publications

- International (ISO/IEC) premises cabling standards
- ISO/IEC 22237 serves as infrastructure standard

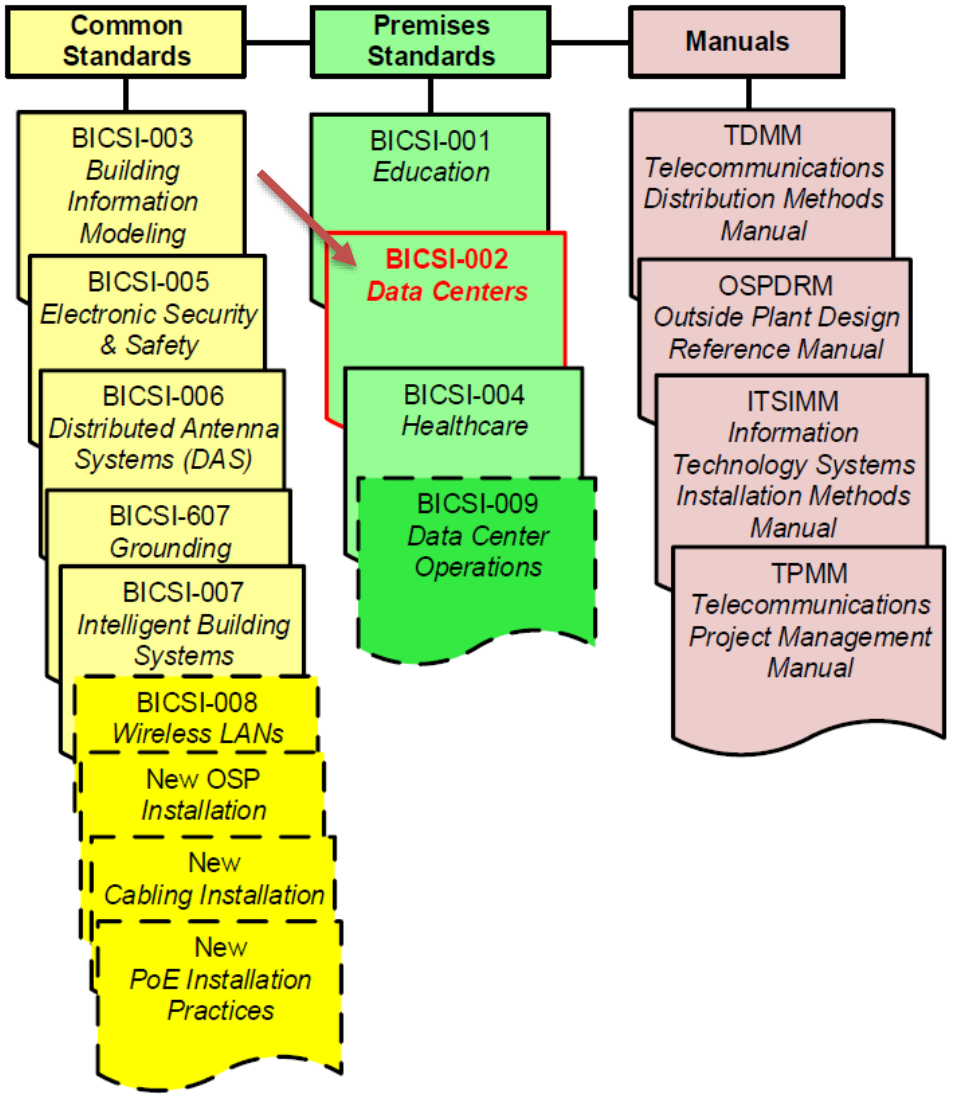


Families of Publications

- BICSI standards and manuals are also a family of complementary publications and are meant to work with TIA, CENELEC, ISO, & other regional or national standards

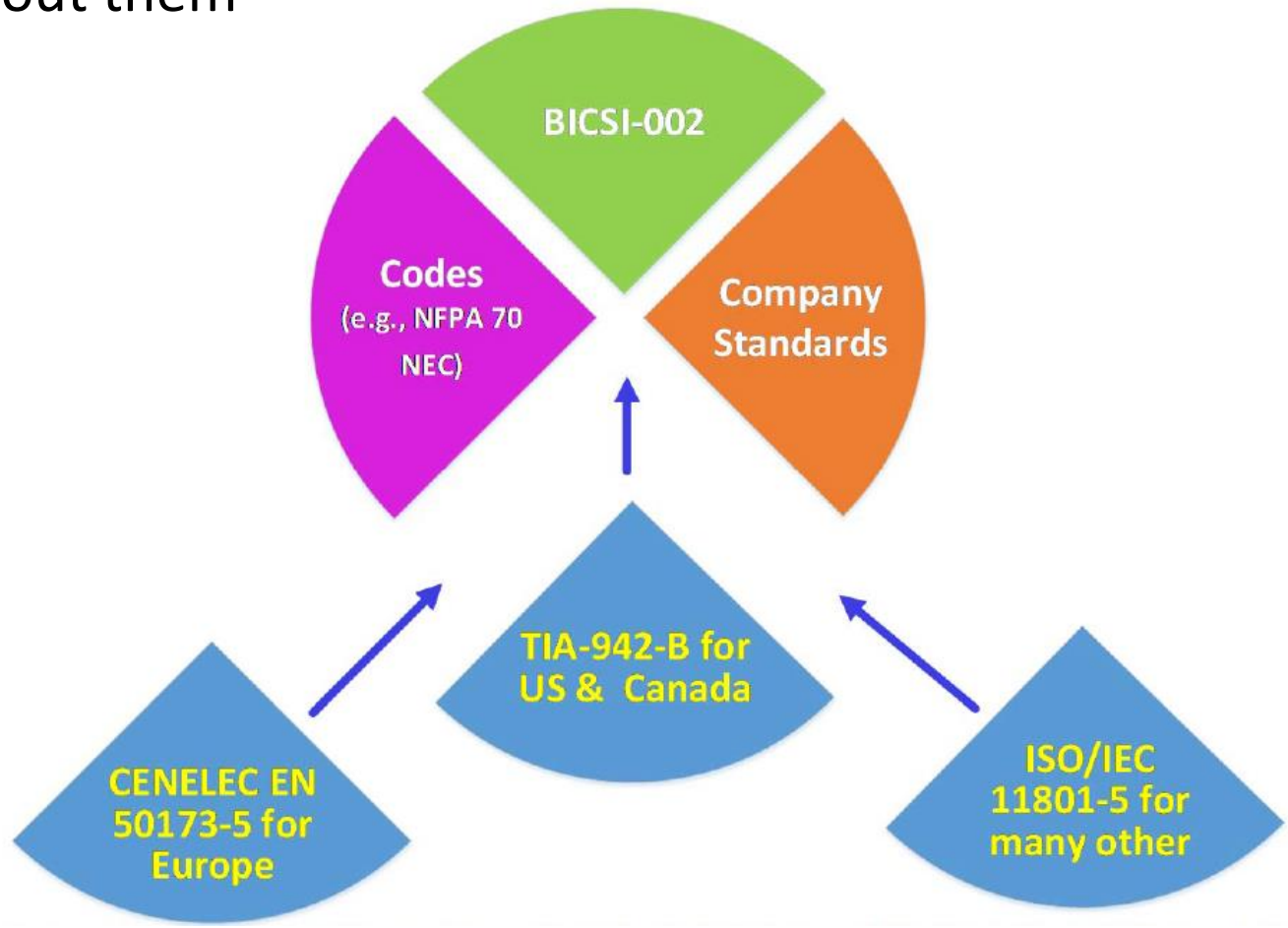
Families of Publications

- BICSI-002 is Part of a Family of Standards & Manuals



TIA-942 and BICSI-002

- BICSI-002 by design is intended to complement TIA-942 and other national data center standards, and is incomplete without them



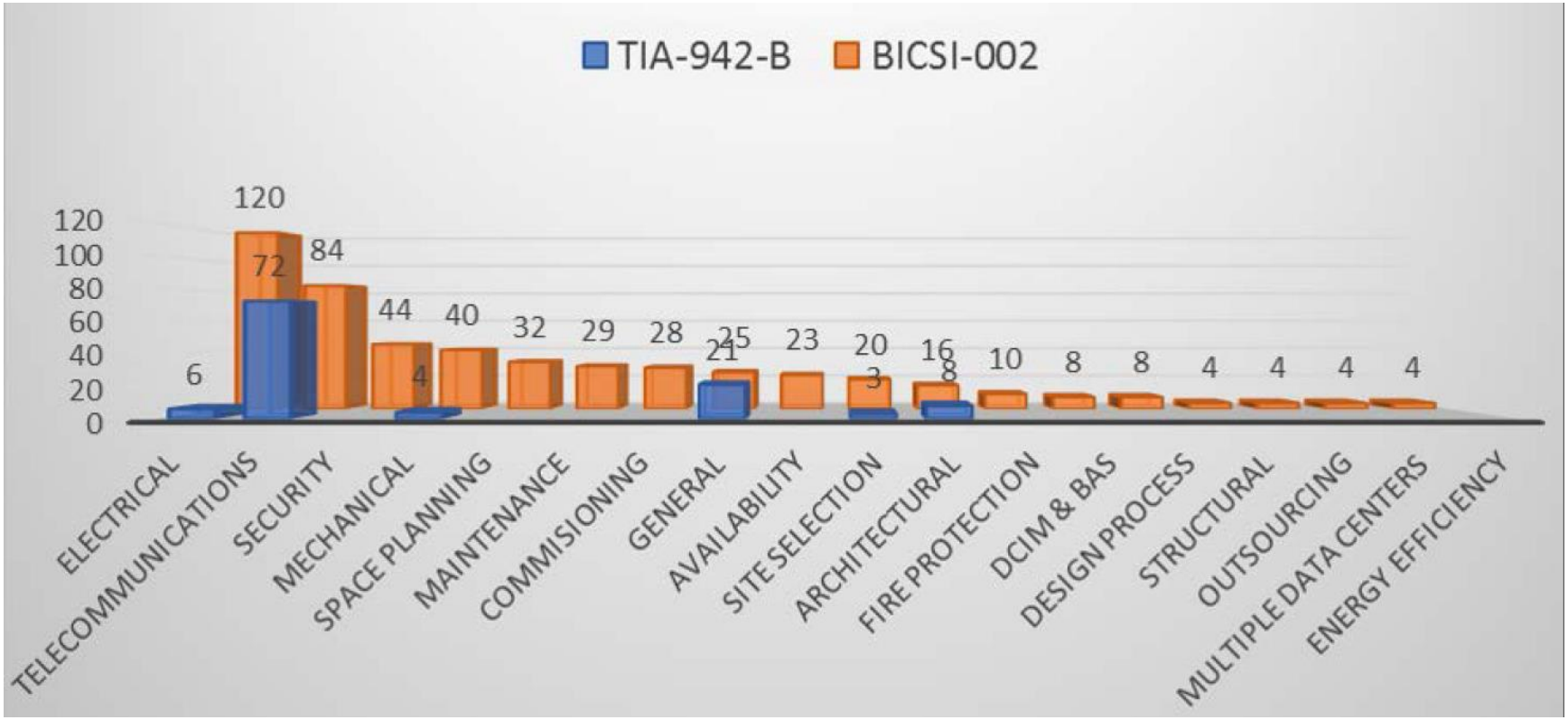
TIA-942 and BICSI-002

- TIA-942 provides requirements for the design of data center telecommunications infrastructure

- BICSI-002 provides a wide range of information, recommendations, and requirements:
  - Regarding all aspects of designing a data center
  - Not all covered in TIA-942

TIA-942 and BICSI-002

BICSI-002 provides information on a wide range of subjects not covered in TIA-942



BICSI-002 Best Practices vs. TIA-942 Requirements

- BICSI-002 provides best practices that exceed the minimum requirements of TIA-942

- Example 1: Ceiling heights

  - TIA-942
    - minimum height 2.6 m (8.5 ft)

  - BICSI-002
    - minimum height 3 m (10 ft)
    - Recommended height 4.5 m (15 ft) or greater

BICSI-002 Best Practices vs. TIA-942 Requirements

- Example 2: Power redundancy

  – TIA-942

Rated 1 (E1)			
N	N+1 equipment level, single path	N+1 (N for active, N for passive path)	2N / N+N (N for each active path)

  – BICSI-002

Class F0/F1	Class F2	Class F3	Class F4
Single source Single module Single path	Single source Multiple module Single path	Multiple source/ N rated single or multimodule system/ dual or multiple Path	Dual or multiple sources/ 2 (N+1 or better) power systems/ Multiple paths with redundant components

BICSI-002 Best Practices vs. TIA-942 Requirements

- Example 2: Power redundancy (Cont.)

  – BICSI-002

Table 9-6 Class F4 Electrical System Overview

Industry description:	Fault tolerant
Component redundancy:	Equal to or greater than N+1
System redundancy:	Yes
Number of utility sources:	One or more sources with two inputs
Power sources available to critical load:	Two or more
UPS sources available to the critical load:	Two or more
Ability to be maintained while under load:	Yes, with a reduction to no worse than N+1 during maintenance activities.
Ability to recover from failures:	Yes, automatically with a reduction to no worse than N+1 after the failure and prior to the recovery.
Resulting definition:	Dual or multiple sources/2 (N+1 or better) power systems/multiple paths with redundant components.

BICSI-002 Best Practices vs. TIA-942 Requirements

- Example 3: Cooling redundancy
  - TIA-942

Table 14: Reference guide (mechanical)

	4 (M_4)
MECHANICAL	
General	
Redundancy for mechanical equipment (e.g., air conditioning units, coolers, pumps, cooling towers, condensers). These redundancy requirements extend to all support areas that are critical to the uninterrupted operation of the computer/server room.	N+1 redundancy for mechanical equipment to allow for Fault Tolerance. Extended loss of supply path of power or piping (where applicable) will not cause loss of cooling outside operational range of critical equipment. The switch over from N to +1 should be fully automated

BICSI-002 Best Practices vs. TIA-942 Requirements

- Example 3: Cooling redundancy (Cont.)
  - BICSI-002

Table 10-5 Class F4 Mechanical System Overview

Industry Description	Fault tolerant
Component Redundancy	Yes, "N+1" for all components within a redundant system, and "N+2" for all components not within a redundant system.
System Redundancy	Yes for all systems whose combination of components cannot be fault tolerant by simply providing "N+2" component redundancy
System Controls	Redundant systems to ensure fault tolerance of cooling system
Power Feed	Mechanical equipment and controls with redundant systems shall have the "A" systems feed from upstream "A" electrical distribution and "B" systems feed from upstream "B" electrical distribution. Mechanical equipment and controls that are limited to redundant components shall be feed from the electrical distribution in such a way as to ensure that the cooling capacity does not drop below "N+1" upon taking any mechanical component or upstream electrical distribution offline for maintenance, which is accomplished with the implementation of mechanical equipment with dual power feeds or ATS upstream on the power circuits feeding the mechanical equipment.
Ability to be maintained under load	Yes without reducing cooling capacity to less than "N+1"
Ability to recover from failures	Yes, at the system or component level without reducing the cooling capacity to less than "N+1"

Using BICSI-002 & TIA-942

- Design of the telecommunications cabling infrastructure (cabling system, pathways, spaces) should use both TIA-942-B and BICSI-002-2019

- Use BICSI-002 to understand other aspects of the data center design and make informed decisions when specifying requirements and reviewing designs by other disciplines

DC Operations Standard

- New BICSI 009 Data Center Operations standard has been developed
- Includes participants from a wide variety of organizations & countries
- Use as a reference for operation & maintenance of the data center after it is built
- Notable content relocation to BICSI 009-2019 includes:
  - Operational security topics from Section 12, Security
  - Operational maintenance topics from Section 17, Data Center Maintenance

دبیرخانه نظام ممیزی و رتبه بندی مراکزداده

ANSI/BICSI 002-2019 – Overview

Session 1.2

ANSI/BICSI 002-2019 – Overview

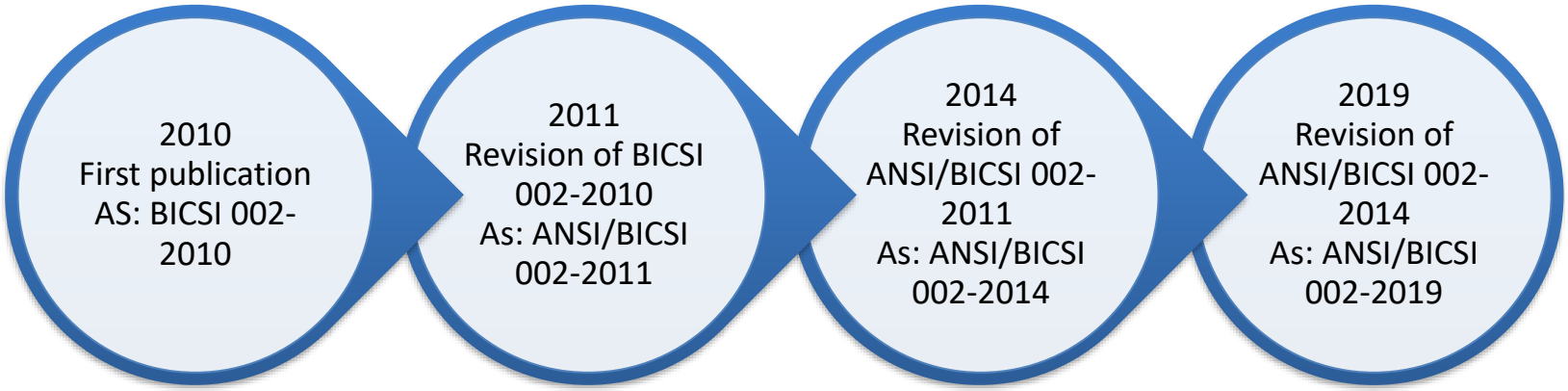
- Introduction to ANSI/BICSI 002-2019
  - ANSI/BICSI 002-2019 Availability Class Sub Groups
  - ANSI/BICSI 002-2019 Class Ratings
  - ANSI/BICSI 002-2019 Sections
  - ANSI/BICSI 002-2019 Appendixes (informative)
- Referenced As DCAS Standard
  - How To Navigate DCAS-BICSI-002-2019

Introduction to ANSI/BICSI 002-2019

- ANSI/BICSI 002-2019
  - Data Center Design and Implementation Best Practices
    - Committee Approval: January 21, 2019
    - ANSI Final Action: February 8, 2019
    - First Published: May 1, 2019

Introduction to ANSI/BICSI 002-2019

- By the end of the fifth year after a standard's publication, the standard will be reaffirmed, rescinded, or revised
  - This is just the minimal revision period



Introduction to ANSI/BICSI 002-2019

- Some Quick Facts:
  - BICSI 002 is BICSI's international best-seller
  - It is primarily a design standard, with installation requirements and guidelines related to implementing a design
  - it can be applied to traditional, modular, containerized, edge and hyperscale data centers
  - Where equivalent local codes and standards exist, requirements from these local specifications shall apply
  - BICSI 002 serves as reference material for the DCDC credential

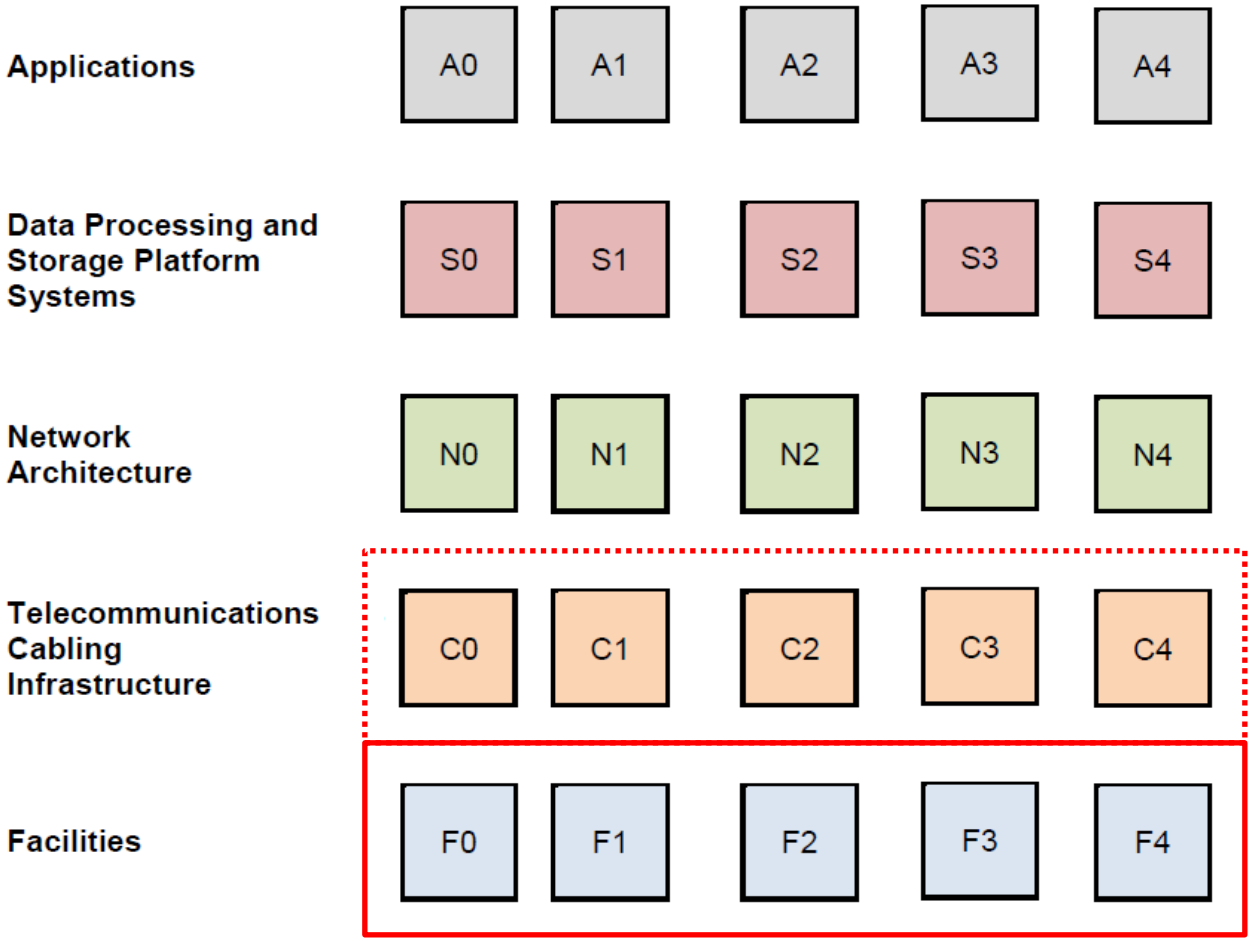
Availability Class Sub Groups

- Availability Class Sub-groups
  As Defined By BICSI-002

- Facility: The facility systems (e.g., power, cooling, controls) can be categorized into one of the sub group Class F0 through Class F4.
- Cable Plant: The network cable plant topology can be categorized into one of the sub group Class C0 through Class C4.
- Network Infrastructure: The network architecture and topology can be categorized into one of the sub group Class N0 through Class N4.
- Data Processing and Storage Systems: The computer processing and storage systems can be categorized into one of the sub group Class S0 through Class S4.
- Applications: The applications can be categorized into one of the sub group Class A0 through Class A4.

Availability Class Sub Groups

- Availability Class Sub Groups



ANSI/BICSI 002-2019 Class Ratings

- The five Class Ratings are:
  - Class F0 - a single path data center that meets the minimum requirements of the standard, but doesn't meet the requirements of an F1 or higher level data center
  - Class F1 - the single path data center
  - Class F2 - the single path data center with redundant components
  - Class F3 - the concurrently maintainable and operable data center
  - Class F4 - the fault tolerant data center

Introduction to ANSI/BICSI 002-2019

- Who should use it?
  - Data Center owners and operators
  - Telecommunications and IT consultants and project managers
  - Telecommunications and IT technology installers
    - Users within IT, in conjunction with telecom. standards
    - Users within facilities group, as a guide
    - Staff outside IT and facilities groups
- BICSI 002 features 17 chapters and 9 appendixes, spread over 550 pages

ANSI/BICSI 002-2019 Sections And Appendixes

- ANSI/BICSI 002-2019 Sections

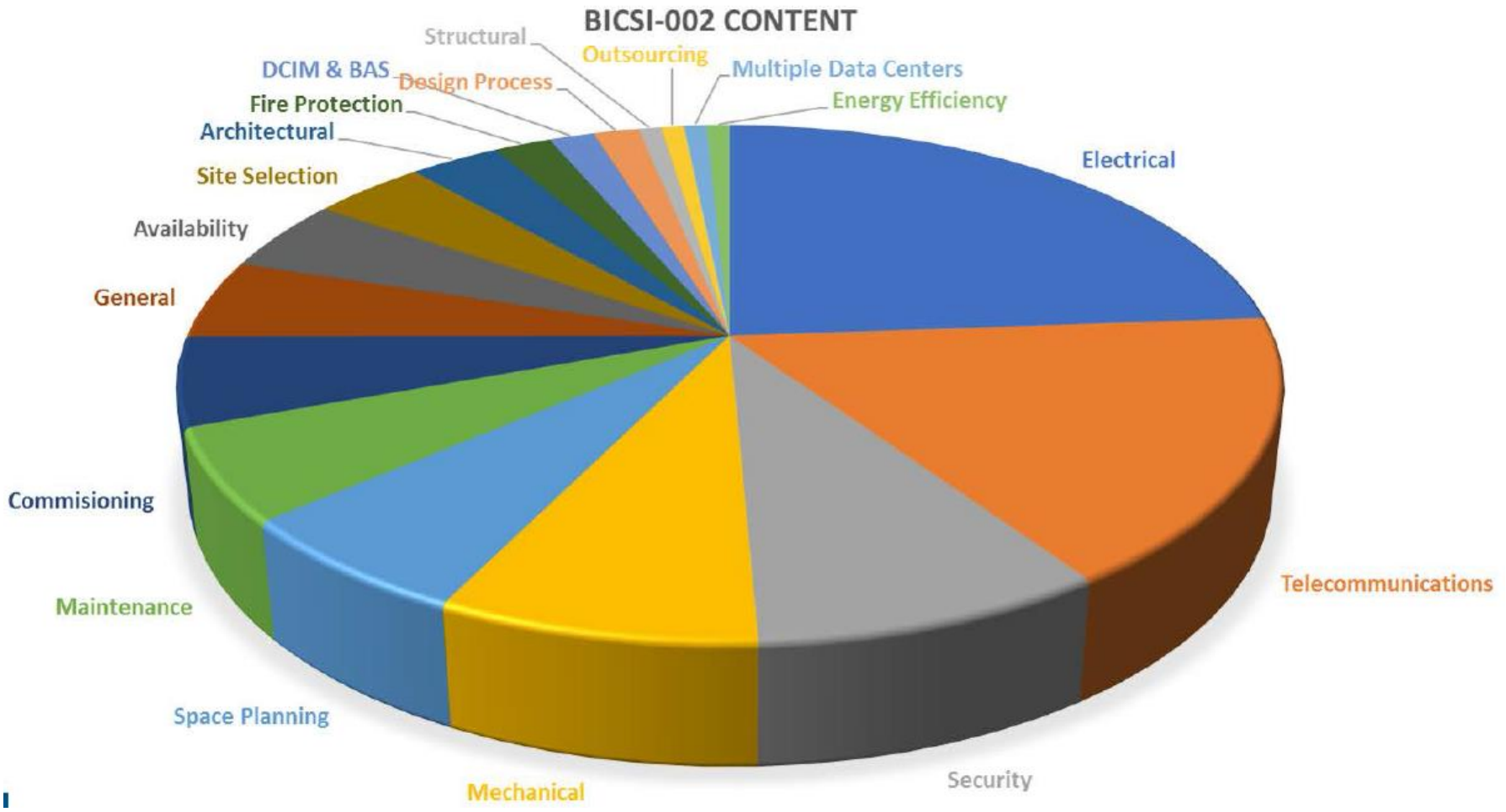
5. Site selection
6. Space planning
7. Architectural
8. Structural
9. Electrical systems
10. Mechanical systems
11. Fire Protection
12. Security
13. Facility, ancillary and IP-enabled systems
14. Telecommunications cabling, infrastructure, pathways and spaces
15. Information technology
16. Commissioning
17. Data Center maintenance

ANSI/BICSI 002-2019 Sections And Appendixes

- ANSI/BICSI 002-2019 Appendixes (informative)

A. Design process
B. Reliability and availability
C. Alignment of Data Center services reliability with application and system architecture
D. Data Center services outsourcing models
E. Multi-Data Center Architecture
F. Examples of testing documentation
G. Design for energy efficiency
H. Colocation technical planning
I. Related documents

ANSI/BICSI 002-2019 Sections And Appendixes



ANSI/BICSI 002-2019 Class Ratings

- Notes to consider:
  - Not all sections are treated equally or at-least formatted with the same standard.
  - Electrical systems represents the most distinguishable sets of criteria for each class, even providing a classification matrix at the end.
  - Followed by Mechanical Section
  - To comply with a higher BICSI class, is both challenging and costly, so you should be committed.

Referenced As DCAS Standard

- Categories of Criteria:
  - Mandatory criteria: generally apply to protection, performance, administration and compatibility; they specify the absolute minimum acceptable requirements.
  - Advisory or desirable criteria are presented when their attainment will enhance the general performance of the data center infrastructure in all its contemplated applications.

- Mandatory requirements are designated by the word “shall”.

Referenced As DCAS Standard

- DCAS version of ANSI/BICSI 002-2019
  - Consists of more than 100 pages
  - Only requirements included (SHALL's)
  - Any criteria not mapped to a specific class should be considered "required" for all classes
  - Any criteria associated with one or more specific classes, are accommodated by an assisting table:

C4	C3	C2	C1	C0
✓	✓	-	-	-

  - All of such class specific requirements are indexed at the end of the document

Referenced As DCAS Standard

نظام ممیزی و رتبه‌بندی مراکزداده

کمیته تدوین معیارهای ارزیابی مراکزداده

معیارهای ارزیابی مراکزداده

بر پایه استاندارد BICSI-002 2019

شناسه و نسخه سند: DCAS-CAC-GNR-DOC-BICSI-002- 2019 STANDARD CRITERIA-V0.85.DOCX

۶-۹- اتاق کامپیوتر: دستگاه‌های ذخیره‌ساز

این معیار در استاندارد مرجع در بند ۶.۶.۳.۵ درج شده و به شرح زیر است:

- از آنجا که ممکن است دستگاه‌های ذخیره ساز در کابینت‌های استاندارد سرور جای نگیرند، باید چیدمان آن‌ها با توجه به الزامات بار وزنی، جریان هوای سرمایش، برق و ارتباطات شبکه انجام پذیرد.

۶-۱۰- اتاق کامپیوتر: توزیع‌کنندگان ارتباطات شبکه

این معیار در استاندارد مرجع در بند ۶.۶.۳.۷ درج شده و به شرح زیر است:

- کابینت‌های توزیع‌کنندگان ارتباطات‌شبکه (مانند MD، ID و ZD در ISO/IEC 11801-5 یا فضاهای MDA، IDA و HDA در ANSI/TIA 942-B) باید دارای عرض حدقل ۸۰۰ میلی‌متر باشند تا فضای کافی برای مدیریت عمودی کابل‌ها تامین نمایند.

۶-۱۱- چیدمان اتاق کامپیوتر: کف کاذب

این معیارها در استاندارد مرجع در بند 6.6.4.2 درج شده و به شرح زیر است:

- برای نصب‌های جدید، باید یک چیدمان ابتدایی برای کابینت‌ها و رک‌های اتاق‌های کامپیوتر، اتاق‌های ورودی و اتاق‌های شبکه ارتباطات قبل از تعیین نقطه مبنا برای شبکه کف کاذب، تکمیل شده باشد.
- در چیدمان اولیه، باید گروه‌بندی منطقی تجهیزات، تراز ردیف‌های رک‌ها و کابینت‌ها از جلو، تراکم انرژی و گرما، نزدیکی به داکت‌ها و سامانه سرمایش و عمیق‌ترین حالت ممکن کابینت‌ها لحاظ شده باشد.
- دسترسی از عقب یا عرض راهروی گرم در چیدمان راهروی گرم و سرد باید حداقل فاصله آزاد لازم جهت سرویس تجهیزات متناسب با ولتاژ تجهیزات را مطابق قوانین و مقررات محلی تامین نماید.

Referenced As DCAS Standard

- Some samples of class specific requirements:

۵-۶- آب رسانی: تامین آب پشتیبان

این معیار در استاندارد مرجع در بند 5.7.4.5 درج شده و به شرح زیر است:

C4	C3	C2	C1	C0
✓	✓	-	-	-

- برای مراکزداده‌ی رده‌های ۳ و ۴ که از برج‌های خنک‌کننده تبخیری جهت دفع گرما استفاده می‌کنند، تامین آب پشتیبان به میزان حداقل ۸ ساعت در هر زمان باید وجود داشته باشد.

۷-۱۹- جزئیات نقشه: اتاق‌های ورودی ER

این معیارها در استاندارد مرجع در بند 7.4.7 درج شده و به شرح زیر است:

- اتاق ورودی چنانچه مستقل از اتاق کامپیوتر باشد، باید بدون نیاز به عبور از اتاق کامپیوتر قابل دسترسی باشد.

C4	C3	C2	C1	C0
✓	✓	-	-	-

- مراکزداده‌ی رده‌ی ۳ و بالاتر، باید دارای اتاق ورودی مجزا باشد.

Referenced As DCAS Standard

- Class specific requirements indexed:

جدول ۱ – معیارهای تفکیک‌کننده رده‌ها

کد و عنوان معیار	مرجع	شرح الزام		C0	C1	C2	C3	C4
۵-۶- آب رسانی: تامین آب پشتیبان	5.7.4.5	برای مراکزداده‌ی رده‌های ۳ و ۴ که از برج‌های خنک‌کننده تبخیری جهت دفع گرما استفاده می‌کنند، تامین آب پشتیبان به میزان حداقل ۸ ساعت در هر زمان باید وجود داشته باشد.		-	-	-	✓	✓
۷-۱۹- جزئیات نقشه: اتاق‌های ورودی ER	7.4.7	مراکزداده‌ی رده‌ی ۳ و بالاتر، باید دارای اتاق ورودی مجزا باشد.		-	-	-	✓	✓
۷-۲۳- جزئیات نقشه: اتاق اطفای حریق	7.4.11	برای مراکزداده رده‌ی ۴، در صورت وجود سیستم اطفای آبی، باید یک اتاق جداگانه برای سامانه شیر کنترل آبی پیش‌عمل‌گر ایجاد شود.		-	-	-	-	✓
۹-۵- توزیع: بای‌پس سامانه UPS	9.3.4	باید برای تمام سامانه‌های کلاس F1 تا کلاس F4 بای‌پس نگهداری فراهم شود.		-	✓	✓	✓	✓
		برای نگهداری باس جمع‌کننده UPS، کلید استاتیک یا کلید خروجی باید کلید قطع جدا کننده در نظر گرفته شود.		-	✓	✓	✓	✓

پرسش و پاسخ

دبیرخانه نظام ممیزی و رتبه بندی مراکزداده

ANSI/BICSI 002-2019 – Methodology

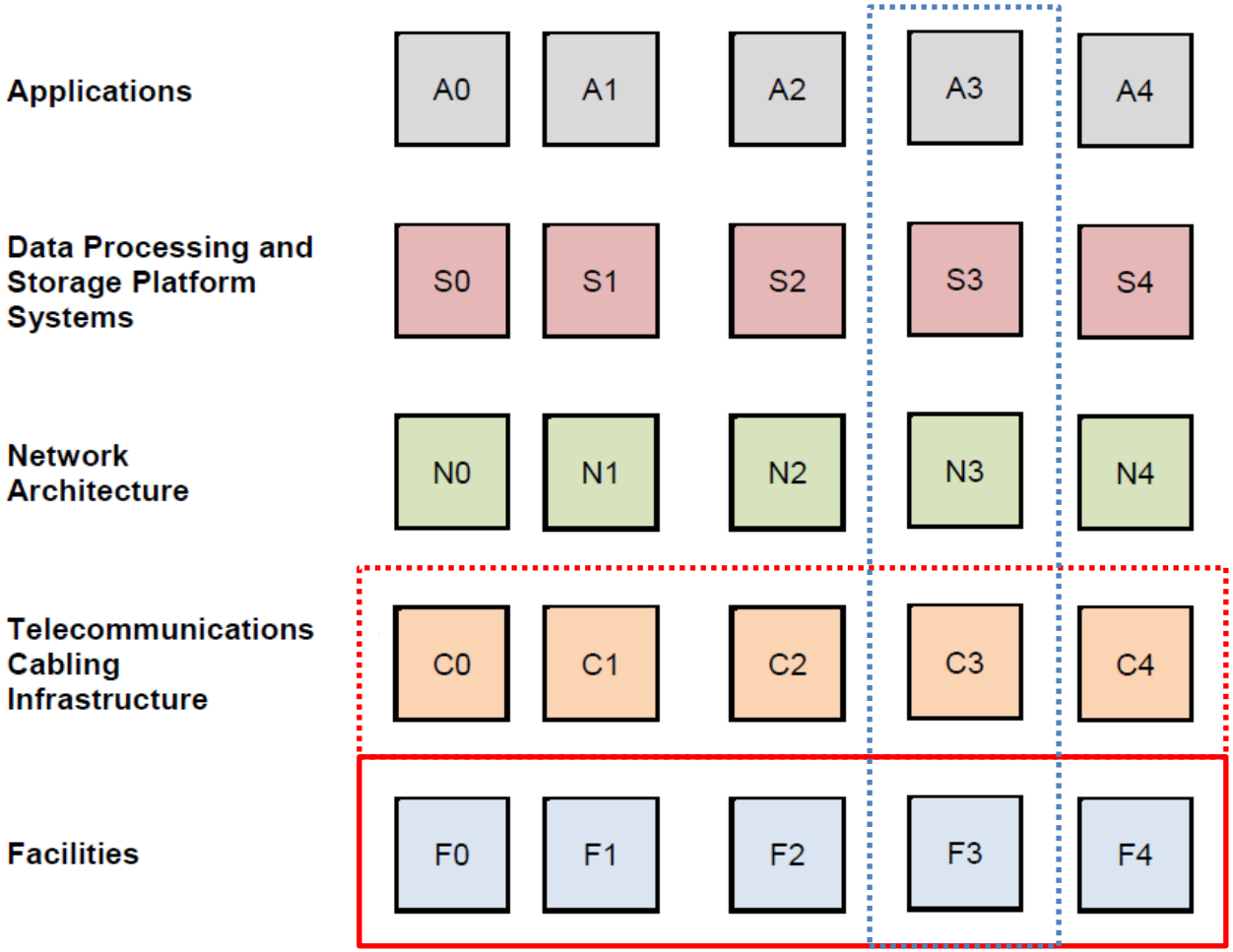
Session 2.1

ANSI/BICSI 002-2019 – Methodology

- What is Availability?
- Risk Analysis
- Data Center Availability Classes
- Primary Concerns that Define the Availability Class
- Determining the Data Center Availability Class
  - Step 1: Identify Operational Requirements
  - Step 2: Quantify and Rank Operational Availability Requirements
  - Step 3: Determine Impact of Downtime
  - Step 4: Identify the Data Center Availability Class
- Multi-Data Center Architecture

What is Availability?

- Reminder: Availability Class Sub Groups



What is Availability?

$$\text{Availability} = \frac{\text{Uptime}}{\text{Uptime} + \text{Scheduled Downtime} + \text{Unscheduled Downtime}}$$

Table 1 Common Downtime Events

Scheduled Downtime	*Unscheduled Downtime*
Preventive maintenance System and equipment setup and upgrades System testing/optimization Scheduled facilities related events Remedial maintenance	Repairs due to failure Maintenance delay Facility-related failures/outages

Risk Analysis

- What are the life safety aspects of the function? For example, if the system failed unexpectedly, would lives be put at risk? Examples of such applications include automated safety systems, air traffic control, and emergency call centers.
- What is the threat to occupants or exposed property from natural, man-made, or technology-caused catastrophic events?
- What would be the economic loss to the organization from the loss of function or loss of records?
- What is the access to redundant off-site processing systems (e.g., “high performance computing”, massively paralleled systems, cloud service provider, disaster recovery site, backup data center)?
- What would be the economic loss to the organization from damaged or destroyed equipment?
- What would be the impact of disrupted service to the organization’s reputation? For example, would subscribers switch to a competitors’ service?
- What would be the regulatory or contractual impact, if any? For example, if unplanned downtime resulted in loss of telephone service or electrical service to the community, would there be penalties from the government?

Data Center Availability Classes

Availability Class 0

The objective of Class 0 is to support the basic requirements of the IT functions without supplementary equipment. Capital cost avoidance is the major driver. There is a high risk of downtime because of planned and unplanned events.

Availability Class 1

The objective of Class 1 is to support the basic requirements of the IT functions. There is a high risk of downtime because of planned and unplanned events. However, in Class 1 data centers, remedial maintenance can be performed during nonscheduled hours.

Availability Class 2

The objective of Class 2 is to provide a level of reliability higher than that defined in Class 1 to reduce the risk of downtime because of component failure. In Class 2 data centers, there is a moderate risk of downtime as a result of planned and unplanned events. Maintenance activities can typically be performed during unscheduled hours.

Availability Class 3

The objective of Class 3 is to provide additional reliability and maintainability to reduce the risk of downtime because of natural disasters, human-driven disasters, planned maintenance, and repair activities. Maintenance and repair activities will typically need to be performed during full production time with no opportunity for curtailed operations.

Availability Class 4

The objective of Class 4 is to eliminate downtime through the application of all tactics to provide continuous operation regardless of planned or unplanned activities. All recognizable single points of failure are eliminated.

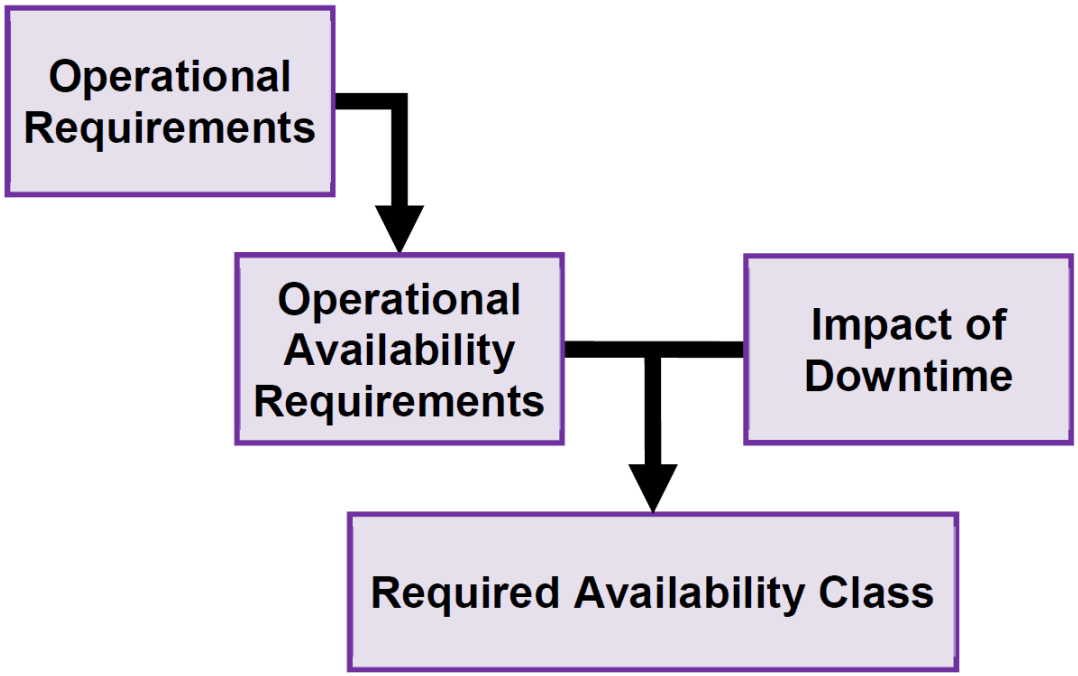
Primary Concerns that Define the Availability Class

Table 2 Summary of Areas of Concern for Availability Class

Class	*Component Redundancy*	*System Redundancy*	*Quality Control*	*Survivability*
Class 0/1	None	None	Standard commercial quality	None
Class 2	Redundancy is provided for critical components	None	Premium quality for critical components	Moderate hardening for physical security and structural integrity
Class 3	Redundancy is required for critical and noncritical components, except where the component is part of a redundant system.	System redundancy is required where component redundancy does not exist	Premium quality for all components	Significant hardening for physical security and structural integrity
Class 4	Redundancy is provided for all critical components and to increase maintainability; also provided for noncritical components.	System redundancy is provided with component redundancy so that overall reliability is maintained even during maintenance activities.	Premium quality for all components. Recommended to use different lots, model, and manufacturer to avoid common fault or recall.	All systems are self-supporting in any event and are protected against the highest levels of natural forces.

Determining the Data Center Availability Class

- Operational requirements,
- Operational availability, and
- Impact of downtime,



Determining the Data Center Availability Class

Step 1: Identify Operational Requirements

Table 3 Identifying Operational Requirements: Time Available For Planned Maintenance Shutdown

Operational Level	*Annual Hours Available for Planned Maintenance Shutdown*	*Description*
0	> 400	Functions are operational less than 24 hours a day and less than 7 days a week. Scheduled maintenance down time is available during working hours and off-hours.
1	100-400	Functions are operational less than 24 hours a day and less than 7 days a week. Scheduled maintenance down time is available during working hours and off-hours.
2	50-99	Functions are operational up to 24 hours a day, up to 7 days a week, and up to 50 weeks per year; scheduled maintenance down time is available during working hours and off hours.
3	0-49	Functions are operational 24 hours a day, 7 days a week for 50 weeks or more. No scheduled maintenance down time is available during working hours.
4	0	Functions are operational 24 hours a day, 7 days a week for 52 weeks each year. No scheduled maintenance down time is available.

Determining the Data Center Availability Class

Step 2: Quantify and Rank Operational Availability Requirements

Table 4 Identifying Operational Availability Rating: Maximum Annual Downtime (Availability %)

Operational Level (from Table 3)	***Allowable Maximum Annual Downtime (minutes)*** *Availability as % (Nines of Availability)*				
	x >5000 *x < 99% (2-9's)*	***5000 ≥ x > 500*** *99% ≤ x < 99.9% (3-9's)*	***500 ≥ x > 50*** *99.9% ≤ x < 99.99% (4-9's)*	***50 ≥ x > 5*** *99.99% ≤ x < 99.999% (5-9's)*	***5 ≥ x*** *99.999% ≤ x (6-9's)*
Level 0	0	0	1	2	2
Level 1	0	1	2	2	2
Level 2	1	2	2	2	3
Level 3	2	2	2	3	4
Level 4	3	3	3	4	4

Determining the Data Center Availability Class

Step 3: Determine Impact of Downtime

Table 5 Classifying the Impact of Downtime on the Organization

Classification	*Description – Impact of Downtime*
Isolated	Local in scope, affecting only a single function or operation, resulting in a minor disruption or delay in achieving non-critical organizational objectives.
Minor	Local in scope, affecting only a single site, or resulting in a minor disruption or delay in achieving key organizational objectives.
Major	Regional in scope, affecting a portion of the enterprise (although not in its entirety) or resulting in a moderate disruption or delay in achieving key organizational objectives.
Severe	Multiregional in scope, affecting a major portion of the enterprise (although not in its entirety) or resulting in a major disruption or delay in achieving key organizational objectives.
Catastrophic	Affecting the quality of service delivery across the entire enterprise or resulting in a significant disruption or delay in achieving key organizational objectives.

Determining the Data Center Availability Class

Step 4: Identify the Data Center Availability Class

Table 6 Determining Data Center Services Availability Class

Impact of Downtime (from Table 5)	*Operational Availability Rating (from Table 4)*				
	0	*1*	*2*	*3*	*4*
Isolated	Class 0	Class 0	Class 1	Class 3	Class 3
Minor	Class 0	Class 1	Class 2	Class 3	Class 3
Major	Class 1	Class 2	Class 2	Class 3	Class 3
Severe	Class 1	Class 2	Class 3	Class 3	Class 4
Catastrophic	Class 1	Class 2	Class 3	Class 4	Class 4

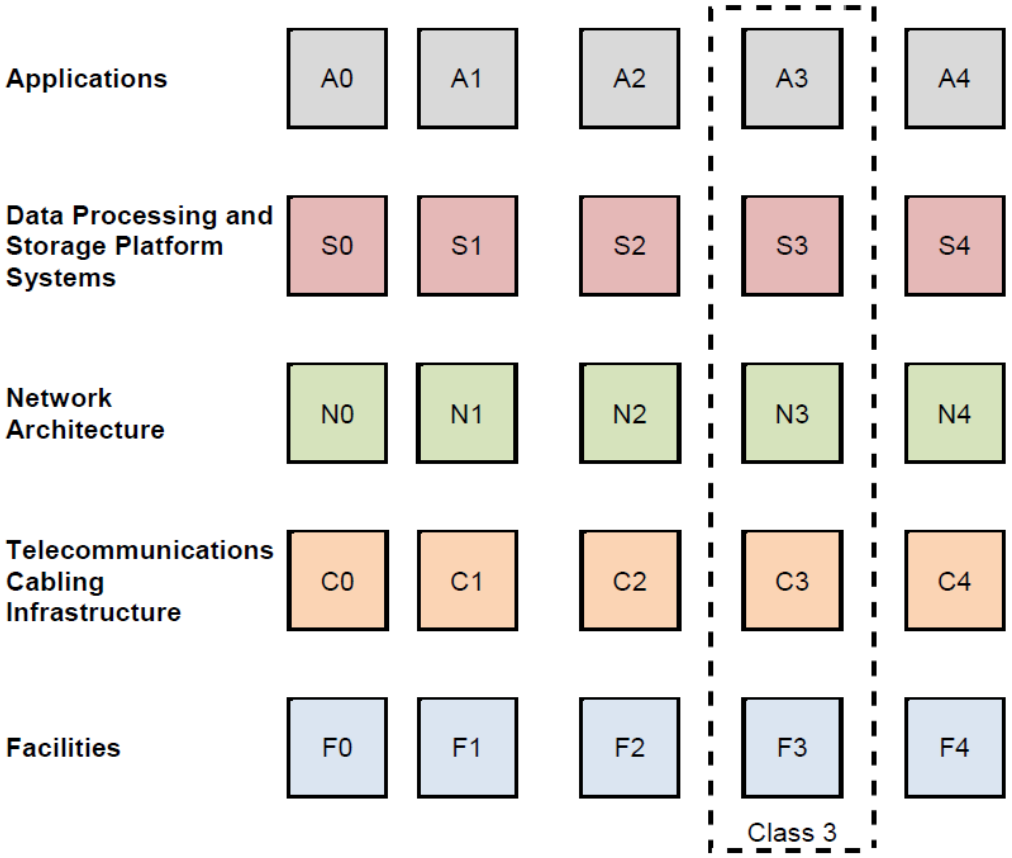
Multi-Data Center Architecture

- It is unlikely that a single data center would have all the applications, data processing, and storage platform systems aligned within a single reliability classification no matter what the targeted base data center reliability classification is.

- So what does BICSI data center services reliability framework model, suggest?

Multi-Data Center Architecture

High Availability In-House Multi-Data Center Architecture Example



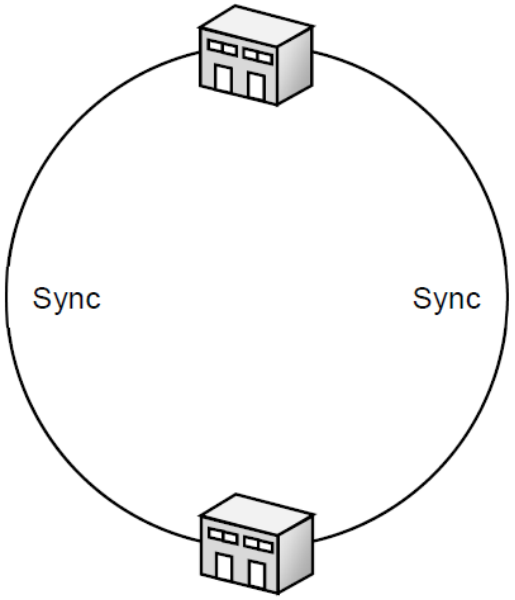
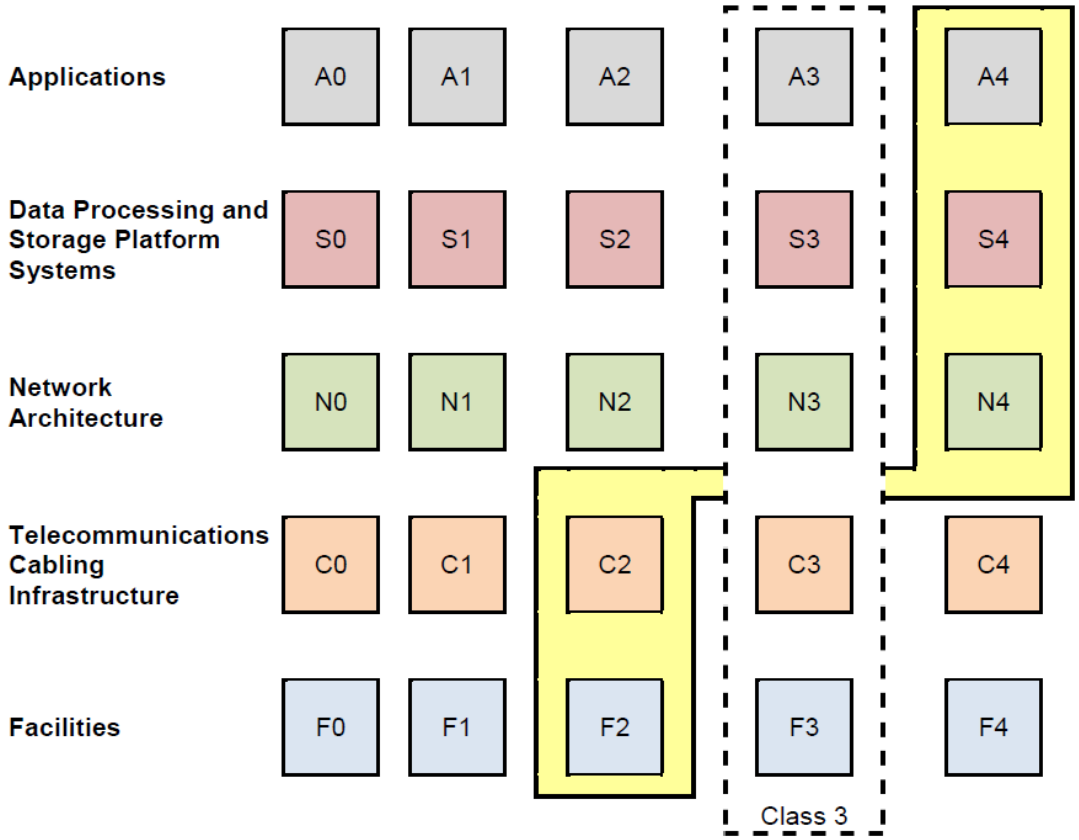


Figure 2 Multi-Data Center Class 3 Example

Multi-Data Center Architecture

Private Cloud Multi-Data Center Architecture Examples

Class 3 Solution/Three Class 2 Facilities



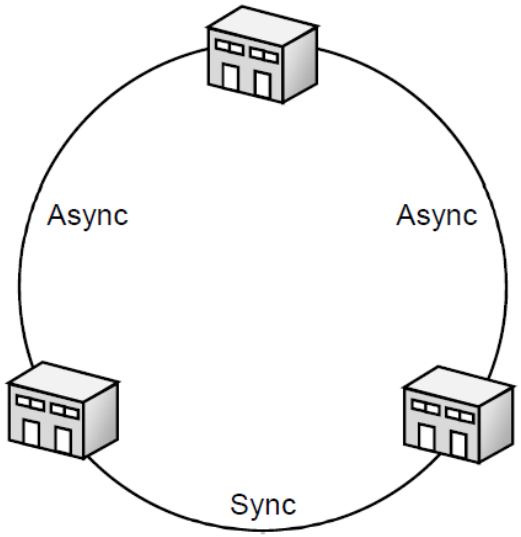
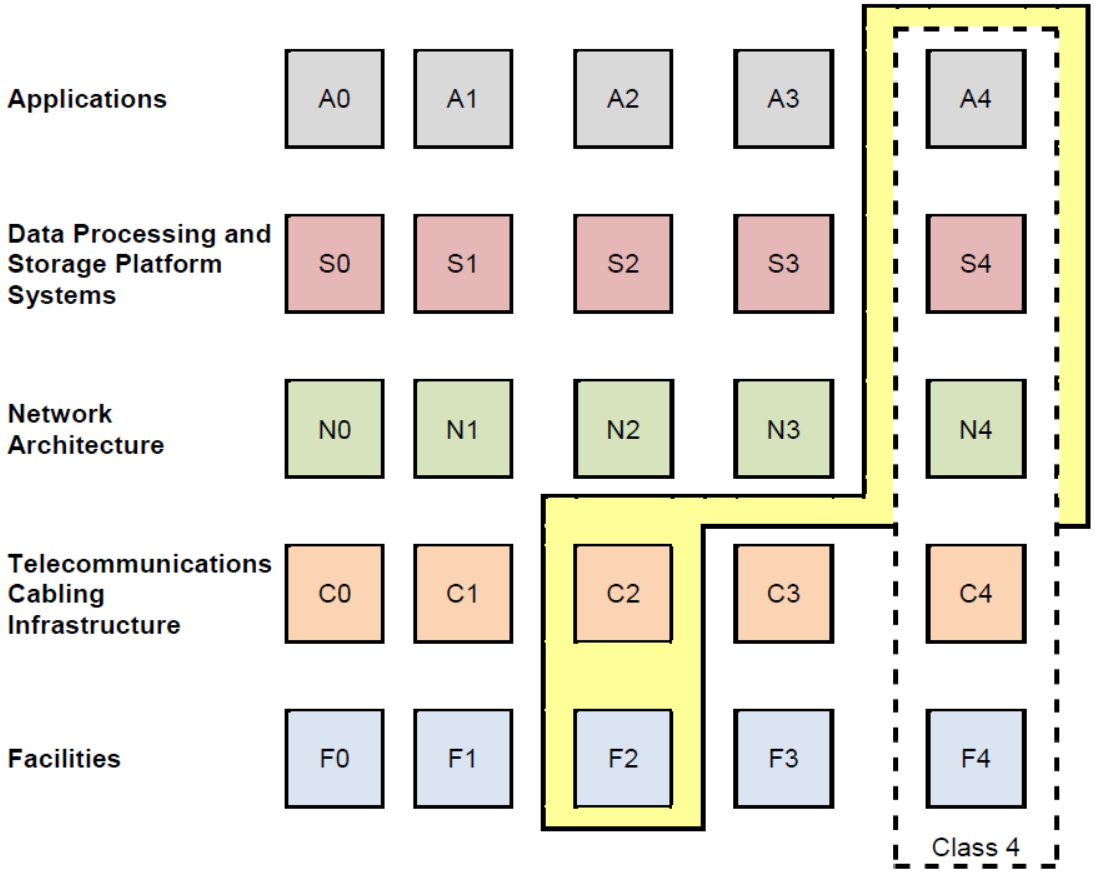


Figure 3 Multi-Data Center Class 3 Example With Three Class 2 Facilities

Multi-Data Center Architecture

Private Cloud Multi-Data Center Architecture Examples

Class 4 Solution/Four Class 2 Facilities



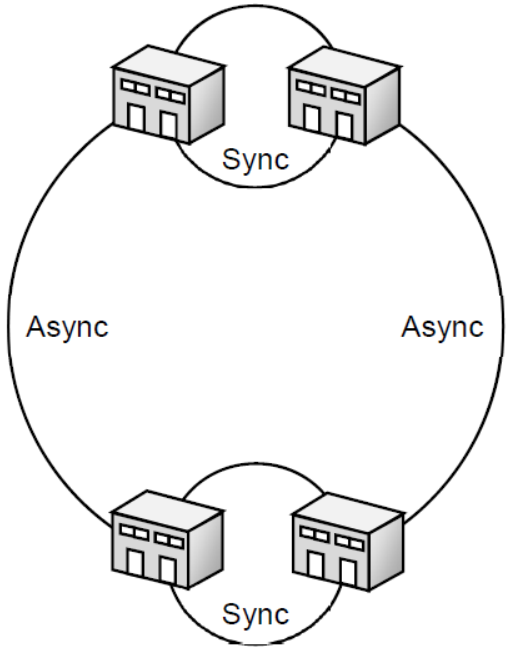


Figure 4 Multi-Data Center Class 4 Example with Four Class 2 Facilities

دبیرخانه نظام ممیزی و رتبه بندی مراکزداده

Workshop: Services Availability Class Planning

Session 2.2

Workshop: Services Availability Class Planning

- Using and Referring To Your Handouts:
  - Filename: 002-2019-Methodology

    Title: An Overview of the ANSI/BICSI 002-2019 Data Center Class Availability Class Methodology
  - Filename: 002-2019-Worksheet

    ANSI/BICSI 002-2019 Data Center Availability Class – Worksheet
- Plan Your Reliability Class Based on provided Data Center Scenario Attributes

Workshop: Services Availability Class Planning

- Data center X serves as the regional service center for company Y, which supports a northern province
- As the operator of data center X, You are obligated to meet contracts' SLA/OLA
  - You are required to operate and provide services to users, Up to 24*7*365
- What is the annual production hours?

Workshop: Services Availability Class Planning

- As the operator of data center X:
  - You are allowed to shut down services for planned maintenance, at the end of each season, for 8 hours each, during only off hours
- What is the annual hours available for planned maintenance shutdown?
- What is the estimated operational level?

Workshop: Services Availability Class Planning

- As the operator of data center X:
  - You are also required to keep downtime to under maximum 2 minutes/week
- What is the allowable maximum annual downtime? (min, %, ‘9s)
- What is the estimated operational availability rating?

Workshop: Services Availability Class Planning

- Reminder:
  - Data center X serves as the regional service center for company Y, which supports a northern province

- What is the classification of impact of downtime on the organization (Risk Impact)?

- What is the data center services availability class?

Workshop: Services Availability Class Planning

- IF, The data center X served as the multiregional service center for company Y, which supported 6 of the northern and north-western provinces

- What would the data center services availability class be?

پرسش و پاسخ

پایان