


Data Center Auditing

What you need to know about your DC infrastructure

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*Sicher ist, dass
nichts sicher ist.
Selbst das nicht!*

Joachim Ringelnatz



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AUDIT

An audit is a systematic and independent examination of records, documents and vouchers of an object or an organization to ascertain how far the statements and disclosures present a true and fair view of the object of the audit. The auditor perceives and recognizes the propositions before him / her for examination, obtains evidence, evaluates the same and formulates an opinion on the basis of his judgement which is communicated through his audit report.

Any subject matter may be audited. Audits provide third party assurance to various stakeholders that the subject matter is free from material misstatement. Areas which are commonly audited include: Compliance audit, internal controls, quality management, project management.

As a result of an audit, stakeholders may effectively evaluate and improve the effectiveness of risk management, control, and the governance process over the subject matter.

Source: Wikipedia

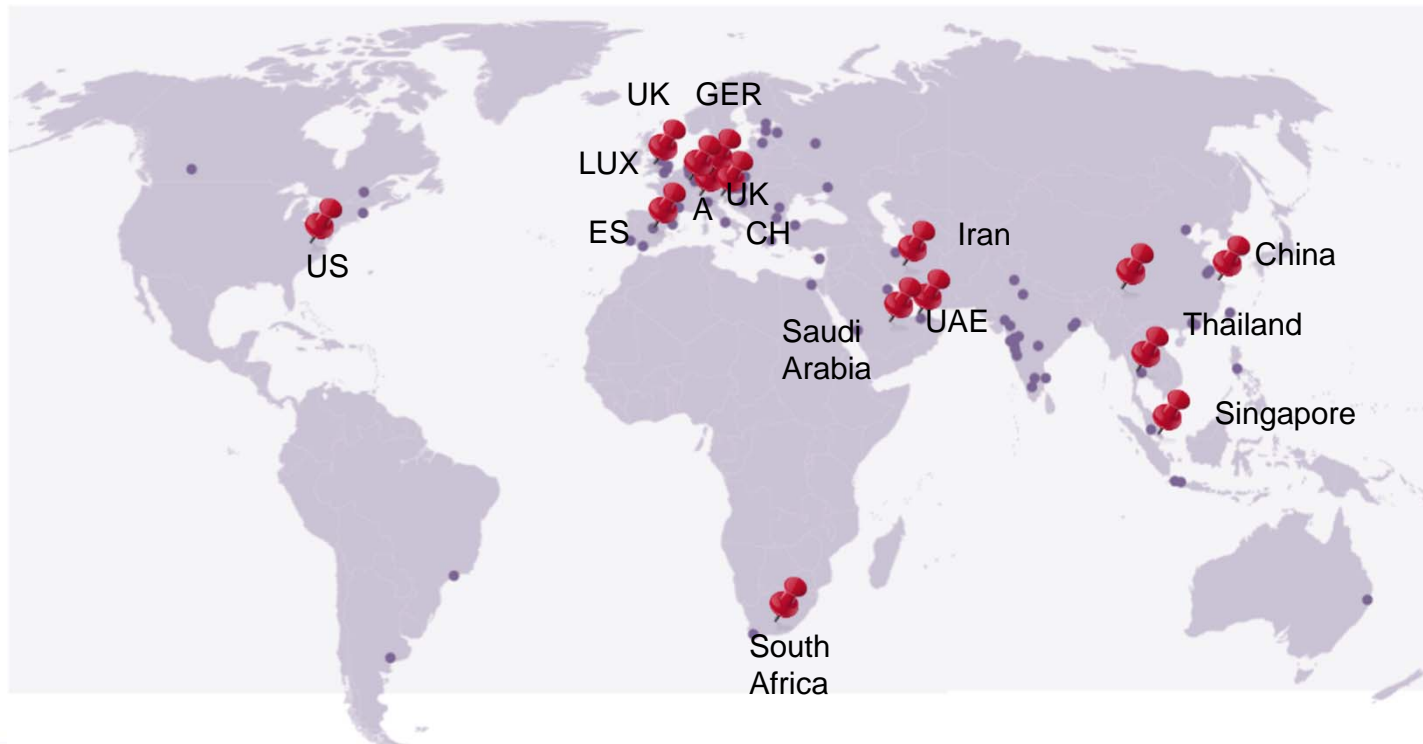


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TÜVIT TSI INTERNATIONAL – AUDIT AND CERTIFICATION PROJECTS



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CONTENTS

- Reasons for an audit
- Benefits
- Nature and scope
- On-site inspection
- More than a checklist
- Result and conclusion

Reasons:

Insecurity about the current status of a data center, i.e. level of resilience, survivability, code conformance. Or as a basis for a refurbishment or expansion project. Or to be used as an internal or external proof of quality (marketing tool).



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RISK POTENTIALS

- Force Majeure
- Technical faults
- Criminal acts
- Negligence



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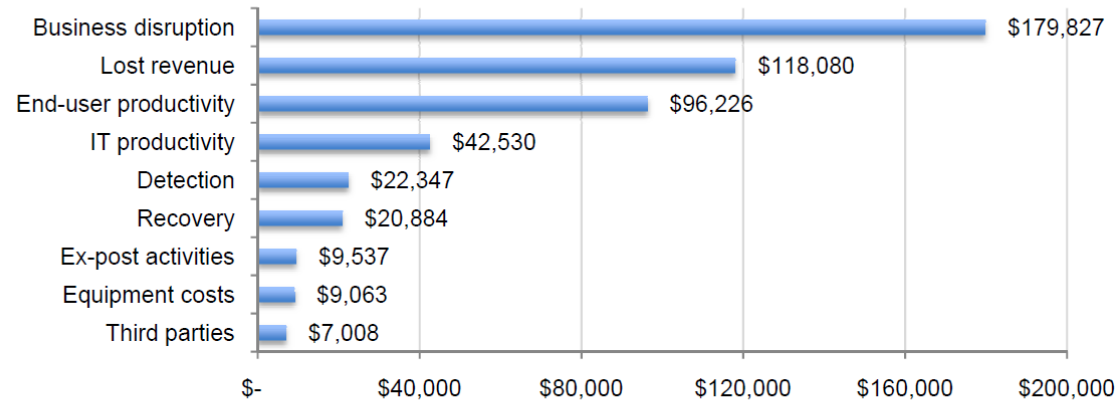
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AVAILABILITY

Data center requirements 24/7

Bar Chart 2: Average cost of unplanned data center outages for nine categories

Computed from 41 benchmarked data centers



Sponsored by Emerson Network Power

Ponemon Institute© Research Report



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PRINCIPLES OF AVAILABILITY

- Fault tolerance
- Redundancy
- Separation
- Robustness
- Scalability
- Prioritization
- Transparency
- Automatism
- Autonomy
- Diversification

24/7



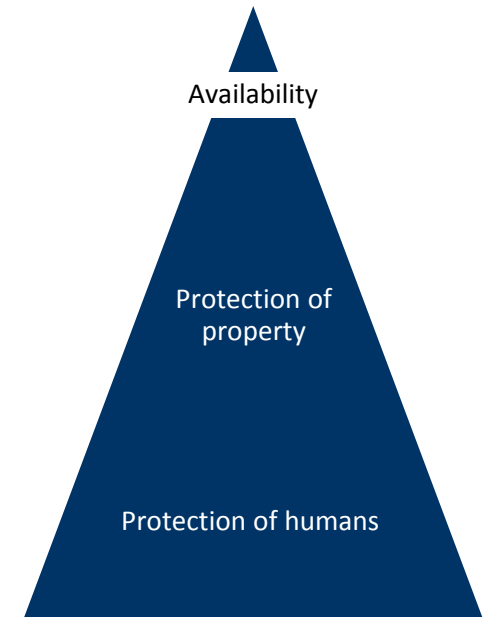
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AVAILABILITY

- There are requirements by authorities, statutory organizations, supervisory boards, etc., published in form of guidelines, laws, codes, regulations, ...
- Priority are health and safety issues
- Examples
 - Building codes
 - Fire protection
 - etc.
- There are recommendations regarding the protection of property
- Definition of availability??

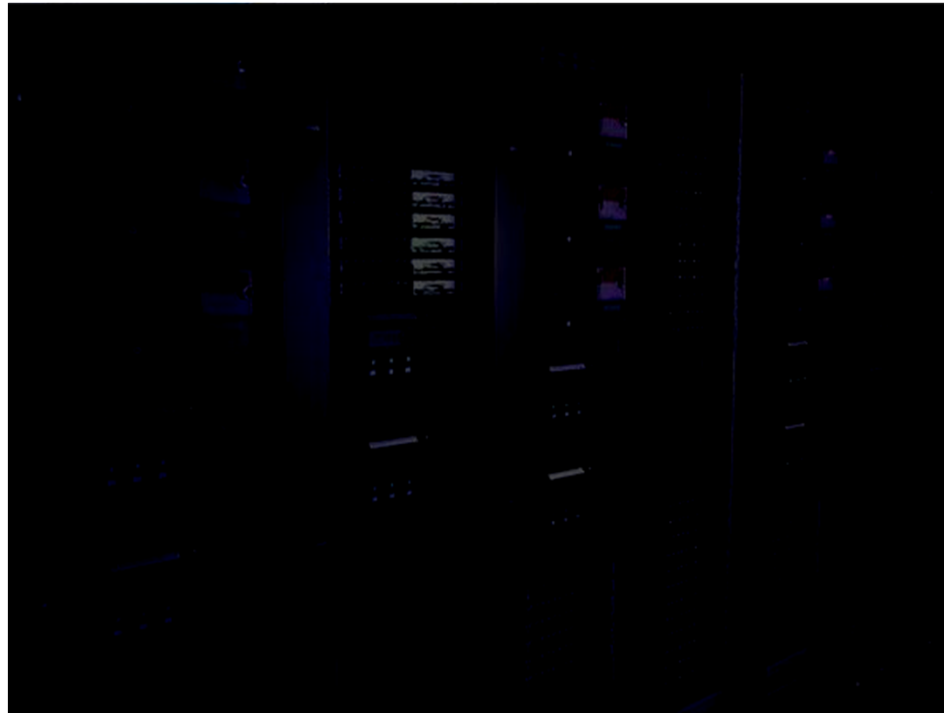


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IMPLICATIONS



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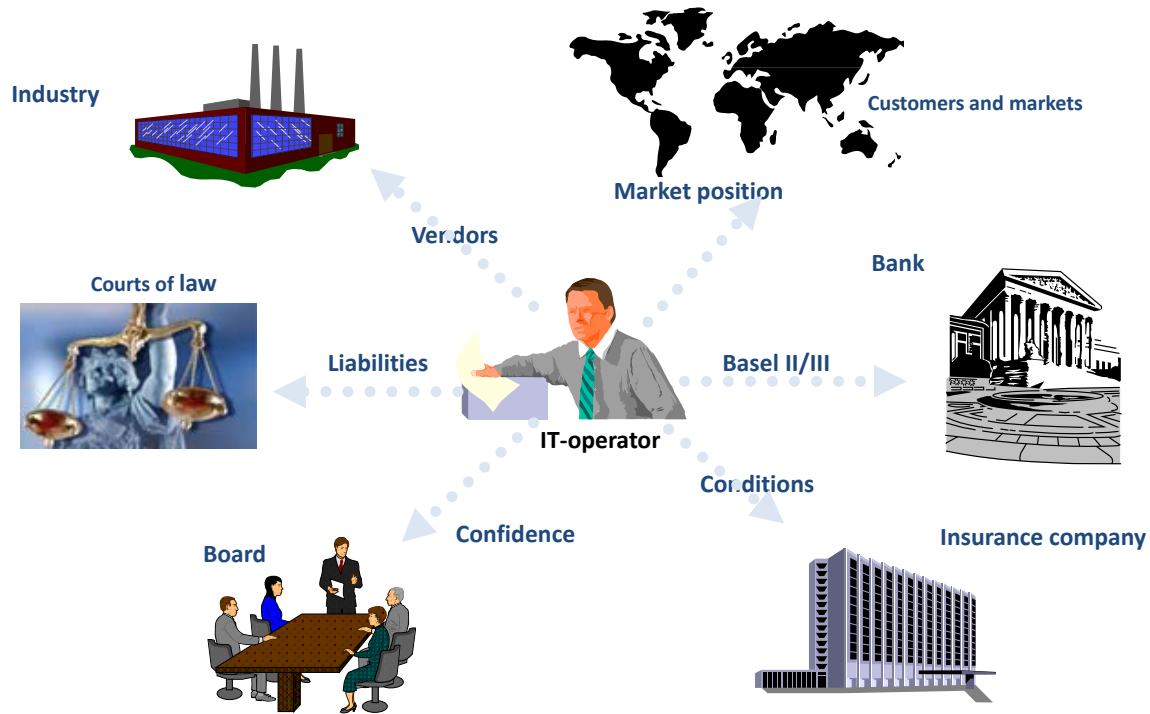
Benefits:

Gaining detailed information about the data center's current status, fault tolerances, uncovering potential weaknesses to avoid any downtime, providing recommendations regarding enhancements and / or potential alternatives.



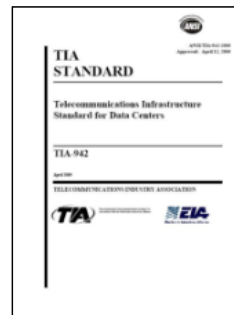
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BENEFITS



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THERE ARE MANY DESIGN GUIDES ...



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EXCERPTS FROM THE TIA-942

F.5.4 Tier 4 (electrical)

Tier 4 installations should meet all requirements of tier 3.

Tier 4 facilities should be designed in a '2(N+1)' configuration in all modules, systems, and pathways. All feeders and equipment should be capable of manual bypass for maintenance or in the event of failure. Any failure will automatically transfer power to critical load from failed system to alternate system without disruption of power to the critical electronic loads.

Contradiction

ANSI/TIA-942-A

	TIER 1 (E ₁)	TIER 2 (E ₂)	TIER 3 (E ₃)	TIER 4 (E ₄)
<i>Uninterruptible Power Supply System</i>				
Redundancy	N	N	N+1	2N
Topology	Single or Parallel-Modules	Single or Parallel Modules	Distributed Redundant Modules or Block Redundant System	Distributed Redundant Modules or Block Redundant System
Automatic Bypass	Not required	Yes with non dedicated feeder to automatic bypass	Yes, with dedicated feeder to automatic bypass	Yes, with dedicated feeder to automatic bypass



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AUDIT CATALOGUE

- Conclusion: The basis for an audit should be defined in a way that inspections will be comprehensive and results reproducible.
- Examples from the audit catalogue:

	L1	L2	L3	L4
POW01.06 A/B supply for the IT equipment	.	.	B	C
<p>Implementation of two separate supply paths with regard to fire protection. Each supply path is able to supply the IT up to a level of 100%. The load is distributed as symmetrically as possible over both paths, so that during normal operation each path carries approximately 50% of the load.</p> <p><i>B: With only one medium-voltage control room, additional measures have been implemented for the secondary supply (e.g. redundancy n+1 or preparation for the connection of a mobile secondary power source).</i></p> <p><i>C: Implementation is carried out as described in the text above.</i></p>				



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Nature and scope:

An independent third party analysis, neutral and vendor independent, carried out by trained and experienced data center professionals, preferably with an engineering background, involving the client's staff or representatives. Covering all relevant fields including site and building, electrical and mechanical systems, security systems, cabling, organization and documentation, considering recognized national and international data center standards.



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IMPULSES

Important:
Holistic
approach



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ENVIRONMENT



Avoidance of

- Flooding areas
- Major traffic arteries
- Explosion hazards
- Sources of vibration
- Political targets
- Event venues
- Etc.



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CONSTRUCTION



- Arrangement of rooms
- Constructive fire protection
- Constructive water protection
- Protection against intrusion
- Lightning protection
- Spatial separations
- Etc.



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FIRE PROTECTION



- Central panel
- Smoke detectors
- VESDA systems
- Fire suppression systems
- Fire dampers
- Etc.



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SECURITY SYSTEMS



- Access control system
- Gathering of data
- Coding
- Intrusion protection system
- Detectors
- Security zones
- Security personnel
- Etc.



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ENERGY SUPPLY



- TN-S Net
- Redundancies
- UPS
- Generator
- Fuel storage
- Cable pathways
- SPDs
- Etc.



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HVAC



- CRAC units
- Chillers
- Cooling towers / heat exchangers
- Piping
- BAS
- Leakage detection
- Etc.



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ORGANIZATION



- Maintenance + repairs
- Responsibilities
- Security inspections
- Tests
- Training
- Etc.



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DOKUMENTATION



- Security concept
- Environmental analysis (min. 1.5 mile radius)
- DR concepts
- Floor plans
- Schematics
- Installation layouts
- Energy- and AC requirements
- List of Alarms
- Etc.



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2 SITES



- 2 Data centers at
- 2 Locations
- 2 Supply paths and
- Redundant connections
- With different environmental risks



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CABLING



- Redundant WAN links
- Separation of power and data cables
- Installation of cables
- Rack built-up
- Rack feeds



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On-site inspection:

An onsite inspection by auditing experts as an essential auditing component after evaluation of submitted documents to verify the present conditions, incl. testing and an assessment of capacities, constraints and operation procedures.



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BASIC REQUIREMENTS

Documents

- current
- Originator
- Hard copy and/or digital
- Documents
 - Legend
 - Scale (with floor plans)
 - Date
 - Suitable scale

Personnel

- Knowledgeable contact persons
- Access to all buildings, systems, and components
- Potentially with prior NDA



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CHECKING OF DOCUMENTS – COMMENTS

- Check on completeness
- Distribution of documents according to disciplines
- Analysis of security concept in combination with enclosed plans and schematics
- Comparison of descriptions to TSI requirements. Non-conformities, undocumented implementations and misleading explanations will be collected in a comments list.
- Check of documents as preparation for on-site inspection



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DOCUMENTATION



Security concept
Fire protection concept
DR plan
Environmental analysis



Site plan
Floor plans
Sections

Projections onto floor plan of

- main supply pathways
- security zones
- intrusion detectors
- EAC components
- CCTV cameras
- misc. sensors, e.g. leakage



Schematics

- EAC
- Intrusion detection
- Fire detection
- Fire suppression
- Energy supply
- Mechanical supply
- Ventilation



Name plate information of important components, e.g. transformers, UPS, batteries, gen sets, chillers, cooling towers, etc.

Energy balance
Cooling capacity balance

Room list
Door / Windows schedule

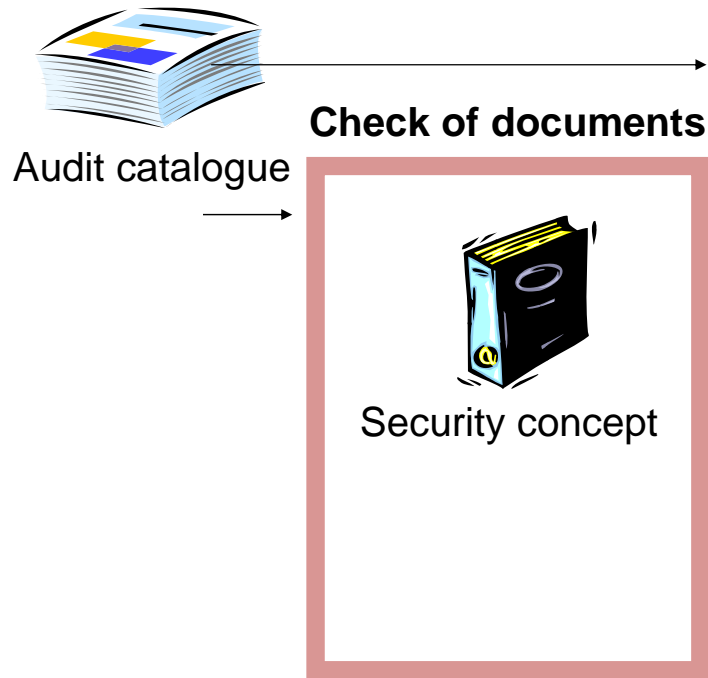


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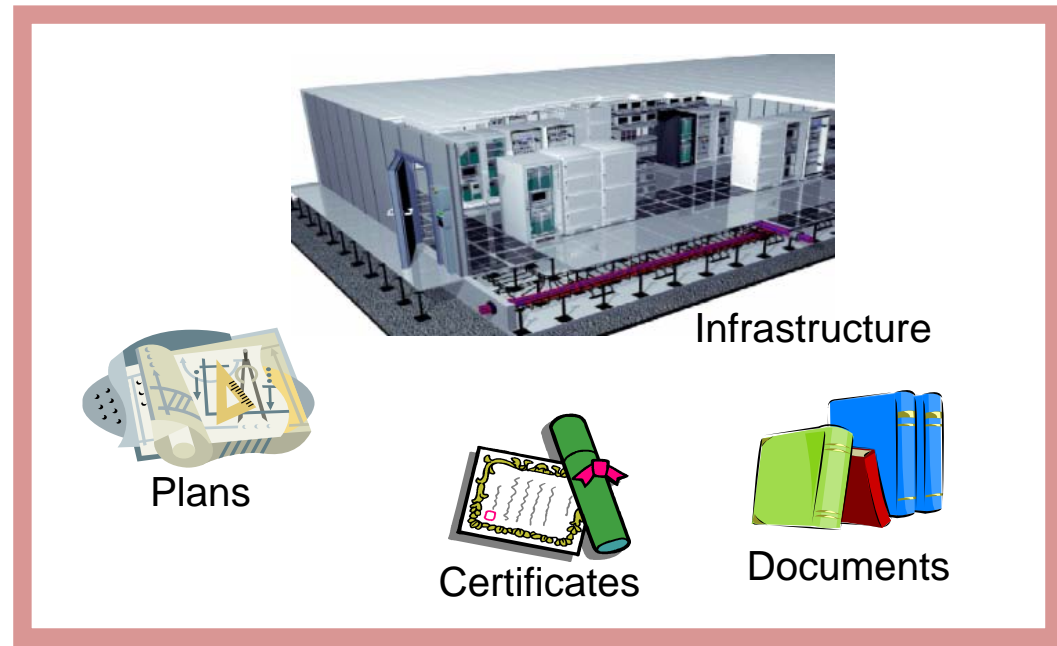
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ELEMENTS OF INSPECTION



Inspection of implementation



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TECHNICAL KNOW-HOW

- An interdisciplinary team of technical experts will audit and evaluate the data center, e.g. from the following fields:
 - Electrical engineering
 - Mechanical engineering
 - Electronic security systems
 - Architects
 - Physicists
 - Information technology



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ON-SITE INSPECTION

- Audit
 - Environment
 - All IT-rooms
 - All support rooms
 - All adjacent rooms
 - Control room
 - Pathways
 - Roof
 - Raised floor and risers
- Level 2: 2 auditors 1 day
- > Level 2: 3-4 auditors 1-3 days
- Discussion of concepts and implementation with the local technical staff
- Triggering of alarms
- Photos of special situations



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Not just checklist:

A customized format but based on well documented procedures, taking into account the data center's specific characteristics by analyzing and evaluating all aspects, using an engineering-based and protection-objective approach.



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THE AUDIT AND CERTIFICATION SCHEME

Audit catalogue



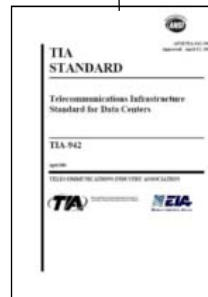
Design guides



UPTIME TIER



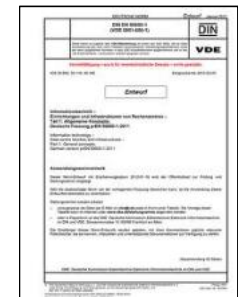
BICSI 002



TIA 942



BITKOM



EN 50600



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THE PROBLEM WITH AN AUDIT



Some things can be measured precisely, different to the quality of a data center ...



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THE PILLARS OF INFRASTRUCTURAL MEASURES

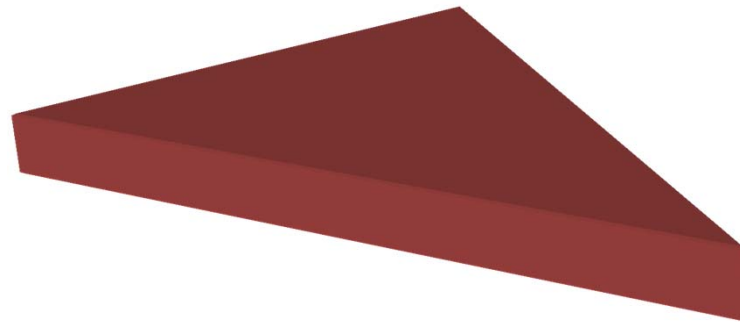
Smoke detectors
Temperature sensors
EAC
etc.

Detection

Precaution

SPSs
Intrusion protection
UPS
etc.

but also
Planning
certification



Reaction

Forwarding of alarms
Fire suppression
Switching between power sources
etc.



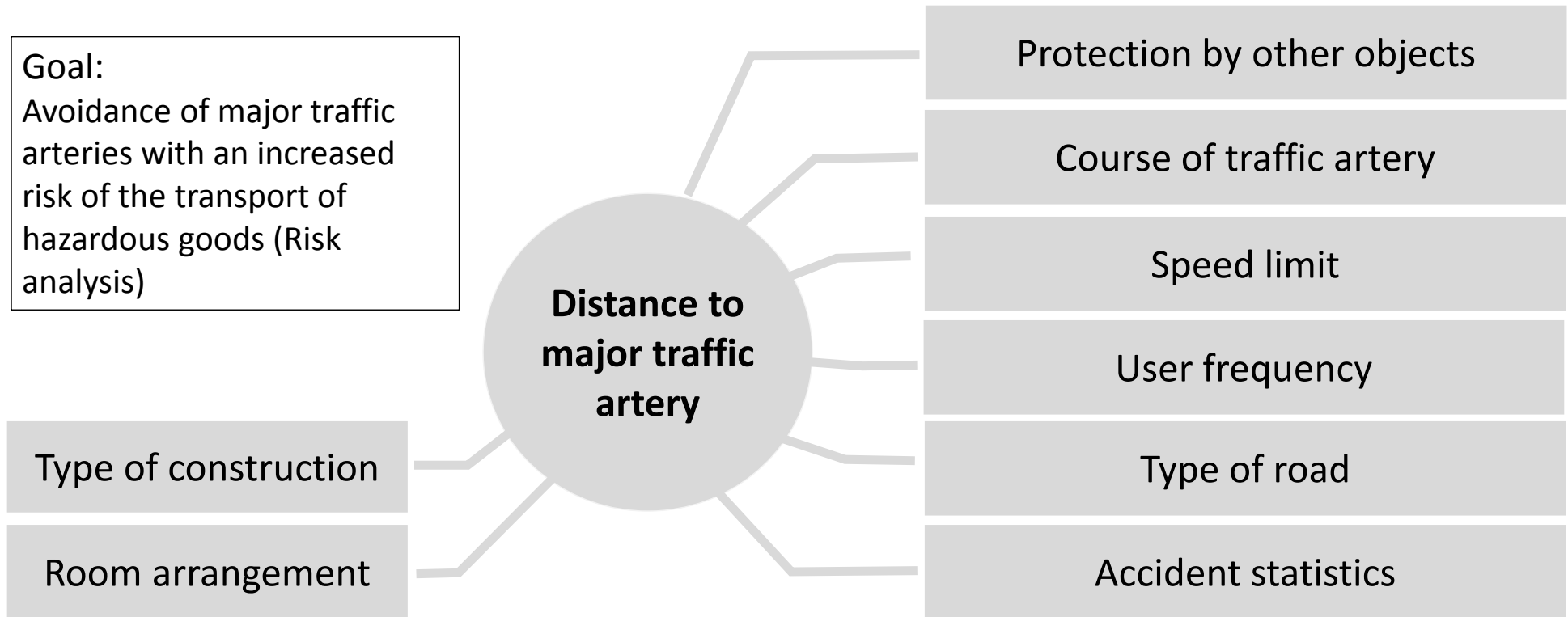
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METHODOLOGY: COMPLY OR EXPLAIN

Goal:
Avoidance of major traffic arteries with an increased risk of the transport of hazardous goods (Risk analysis)



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Outcome:

The evaluation reports must be comprehensive, concise and pragmatic, making practical recommendations for improvements and suggestions for a realistic implementation, specific to the audited facility, with reproducible conclusions.



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TYPICAL PROBLEMS (EXAMPLES)

- Fire stops
- Fire loads
- Security deficiencies / differences in quality
- Monitoring of intrusion attempts and protection against intrusion are different things
- Congestion of raised floor
- A property „following“ a standard does not conform to the standard



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TYPICAL PROBLEMS (EXAMPLES)

- Grounding connections
- Human mistakes (design, operation, maintenance)
- Missing sensibility of the personnel
- Reaction to alarms
- Insufficient reserves
- Documentation is not up-to-date



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ADVANTAGES OF A CERTIFICATION

The audit as the basis for a certification:

- Creating TRUST with your clients.
- Provision of a PROOF OF QUALITY for monitoring institutions / internal revision / accountants.
- You are improving and securing the QUALITY of your services.
- Generation of a COMPETITIVE ADVANTAGE in the industry.



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CHECKING IS BETTER THAN VERBAL STATEMENT



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AT THE CONCLUSION

Thank you
Merci
Dziękuję
Obrigado
Teşekkür
Dank
Mulțumesc
Gracias
Köszönöm
Gràcies
Tack
Sipas
Danke
Hvala
pér
maith
Mahalo
Dankewol
Obrigada
dekem
Paldies
Kiitos
Tak
Dankie
Grazie
Pakka
raibh
Go
fyri
baie
fyri
je
Misaotra
Dziękuję
Obrigado
Teşekkür
agat
ederim
Gratias
Köszönöm
Gràcies
Tack
Sipas
Danke
Hvala
pér
maith
Mahalo



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YOUR POINT OF CONTACT



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