Position DC In Thailand

(การส่งเสริมสนับสนุนศูนย์ข้อมูลในประเทศไทย)

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Executive Vice President
Electronic Government Agency (Public Organization)

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Topic

• Thailand Digital Government Development Plan (2017-2021)
• Government Data Center Modernization
Thailand Digital Government Development Plan (2017-2021)
Strategic Technology Trends for Digital Government

Virtual Reality / Augmented Reality

Application of Virtual Reality (VR) and Augmented Reality (AR) technologies in simulating environment or situations for the purpose of public safety management, telemedicine, and new formats of education and tourism.

Advanced Geographic Information System

Application of Advanced Geographic Information System technology in geographical data management, as well as its applications in management of agricultural resources, transportation system and other areas.

Big Data

Processing big data and make forecasts and estimations in business environment, using Internet of Things (IoT) and Smart Machine technologies to perform real time analysis and responses with users.

Open Any Data

Disclose informative data to users through refurbishment of database and website to allow wider public access and promote linkage of those disclosed data with other entities.

Smart Machine / Artificial Intelligence

Application of Smart Machine technology to enable management and responses of automated services - the Smart Machine system will gradually evolve and consequently be able to evaluate and address problems throughout the service supply chain.

Cloud Computing

Application of Cloud Computing technology for data storage to reduce complication in system installation, reduce system maintenance cost, and save network establishment investment.

Cyber Security

Addressing cyber security issues by setting cyber security standards, revising related regulations to make them more updated and flexible, as well as reforming the mindsets in handling cyber security issues.

Internet of Things

Using the Internet of Things (IoT) technology to facilitate the transformation of government services into digital formats, and at the same time, the IoT technology can also support government’s works in communication, utilization of mobile technology, analyzing big data, and cooperation with private business sector.

Block Chain / Distributed Ledger Technology

Application of Block Chain technology in data storage and utilization of the network for the purpose of verification and reduction of intermediaries under reliable security environment.

Source: Focus group for drafting the Thailand’s Digital Government Technology Roadmap, in cooperation with the APEC Center for Technology Foresight under the auspices of the National Science Technology and Innovation Policy Office (STI), Ministry of Science.
Connectivity of Thailand Digital Government Development and National Plan

20-year National Strategy 2017-2036

Twelfth National Economic and Social Development Plan 2017-2021

Strategy 5 National Security Improvement for Prosperous and Sustainable Development

Strategy 6 Realignment for Balance and Development of Administrative System of the Public Sector

Thailand Digital Economy and Society Development Plan

Strategy 4 Digital Government Transformation

Strategy for the Fiscal Year 2018 Budget Allocation

Strategy 6 Public Administration, Anti-Corruption, and Good Governance

Thailand Digital Government Development Plan 2017-2021
Vision of Digital Government

Enhance Thai Government to become Digital Government with Government Integration, Smart Operations, Citizen-centric Services, and Driven Transformation

Government Integration
Integrate government agencies for both data and operation in order to
- See public information as a complete picture
- Share technologies
- Provide complete one-stop service for government services

Driven Transformation
Drive transformation to Digital Government in every level of government employees, including organizational transformation in work procedures, technologies and regulations

Smart Operations
Utilize technology and digital devices to support operation with appropriate digital technologies
- Connected devices
- Big Data management
- Analytic tools

Citizen-centric Services
Improve government services to address constant changes of public needs by balancing security of lives, assets and public data while facilitating users.
Strategies of Digital Government

1. Elevating Citizen’s Quality of Life
   - Public Welfare: Proactively manage and integrate public welfare
   - Labor: Fully integrate labor market
   - Education: Increase education opportunities and quality for all
   - Health: Increase access to public health services with good quality and strengthen efficiency of health service providers

2. Enhancing the Capacity of the Business Sector’s Competitiveness
   - Agriculture: Fully integrate agriculture for individual farmers
   - Tourism: Fully integrate tourism
   - Investment: Integrate investment services across related agencies
   - Trade (Imports & Exports): Fully integrate import/export agencies
   - SMEs: Integrate data to support SME’s growth
   - Tax and Revenue: Integrate taxation system across agencies
   - Transportation: Integrate multimodal transportation data
   - Public Utility: Enhance efficiency of public utility providers and related services

3. Increasing National Security and Public Safety
   - Public Safety: Proactively manage public stability and security using analytic tools
   - Border Management: Advance risk assessment and authentication through automated channels
   - Natural Disaster: Integrate data for natural disaster prevention
   - Crisis Management: Integrate data across agencies to manage crises

4. Improving Government Efficiency
   - Finance: Centralize electronic finance system to increase efficiency, transparency and benefit maximization
   - Procurement: Develop electronic procurement system for all processes to increase efficiency, transparency, convenience and accessibility
   - Asset Management: Centralize, electronic asset management system to increase efficiency, transparency and benefit maximization
   - Human Resource and Payroll: Integrate human resource information system with acceptable standard

5. Developing the Capacity to Support Government Services
   - Data Integration: Integrate and centralized government data
   - Data Authentication and Verification: Develop Smart Card for individual or central electronic account for business
   - Information: Develop One-stop service for government data with Citizen-centric services
   - Feedback: Enhance and proactively manage government complaint channels
   - Digital Government Infrastructure: Increase efficiency of government operation through utilizing central digital infrastructure
   - Digital Government Capacity Building: Enhance digital skills of government officers
Strategy 5: Developing the Capacity to Support Government Services

Integrate government services through connected systems from various agencies. Build digital government infrastructure while developing digital skills for government officers for all levels and agencies in order to sustain a strong foundation towards digital government.

Challenges
- To handle large databases which require security and privacy as well as comply with existing laws and regulations
- To develop appropriate digital infrastructure for all agencies given different natures and levels of usage
- To work with constantly changing digital technologies
- To handle complexity of data integration among agencies
- To manage relatively limited budget while provide digital skill trainings for many employees

Solutions
- To develop data and service integration systems for various capacities in order to provide services to public
- To amend existing laws and regulations to support the movement to digital government in various capacities
- To have a central agency allocating and developing digital government infrastructure for all agencies in order to integrate and share the infrastructure
- To raise awareness of agencies in the importance of developing digital skills for their officers

Benefits
- To increase government operation and service efficiency
- To increase digital skills and capacities for government officers and agencies

Digital Government Infrastructure

Flagship Projects:
1) Government Shared Services
2) GIN Extension
3) G-Cloud Extension
4) G-CERT Extension
5) Government Data Analytics Centre
6) Government IoT Network
7) Data Centre Modernization

Key Responsible Agencies:
1) Electronic Government Agency (Public Organization)
2) Office of The Civil Service Commission

Data Integration

Key Responsible Agencies:
1) Office of the Permanent Secretary, Ministry of Interior
2) Electronic Government Agency (Public Organization)
3) Office of the Public Sector Development Commission
4) Department of Business Development

Flagship Projects:
1) Citizen Data Integration
2) E-Government Act
3) Smart Service
4) Biz Portal

Data Authentication and Verification

Key Responsible Agencies:
1) Electronic Government Agency (Public Organization)
2) Department of Provincial Administration
3) Office of the Public Sector Development Commission

Flagship Projects:
1) Biz Portal
2) Smart Card Extension

Information

Key Responsible Agencies:
1) Electronic Government Agency (Public Organization)

Flagship Projects:
1) Smart Government Kiosk
2) GovChannel

Feedback

Key Responsible Agencies:
1) Office of the Permanent Secretary, The Prime Minister’s Office
2) Office of the Permanent Secretary, Ministry of Interior
3) Office of the Auditor General of Thailand
4) Electronic Government Agency (Public Organization)

Flagship Projects:
1) Extension of 1111 Centre for Complaints
2) Proactive Needs Analysis
Government Data Center Modernization
4th Industrial Revolution - blurring the lines between the physical, digital, and biological spheres

1800 1 Industry 1.0
The Steam Engine

1900 2 Industry 2.0
Henry Ford’s T-Model

2000 3 Industry 3.0
IT-OT Convergence

2020 4 Industry 4.0
Digital Transformation

Source: WEF
Digital priorities vary across governments globally – but are of prime importance

1. Leverage Digital to offer Next Generation Citizen Services
2. Application of Emerging Technologies to Address Social Challenges
3. Driving Initiatives to create Digital Hubs
4. Facilitating Creation of Startup Ecosystems

Building Enabling ICT Infrastructure
Government and government agencies globally are focusing on Datacenter Modernization to support the Digital Plans

USA: Data Center Optimization Initiative (DCOI)

UK: Modernization - consolidation of disparate systems

India: National & State Data Center initiatives for e-Gov services

South Korea: Modernization & Cloud PAAS Initiatives

Australia: Phased approach to Data Center Modernization

Malaysia: Data Center & outsourcing to support ICT plans
EGA has identified 4 broad aspects to the Data Center Modernization initiative

<table>
<thead>
<tr>
<th>Understanding trends in international community</th>
<th>Identifying opportunities to define Standards of government DC service</th>
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<tbody>
<tr>
<td>Developing a Datacenter Modernization plan</td>
<td>Data Centers to Support Thailand’s Digital Development Plan</td>
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<td>Establishing a Central Administrative Office Model</td>
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Data Centers to Support Thailand’s Digital Development Plan
The Project has been delivered in 3 Phases

**Approach**

A. Research
   - Overview of Datacenter Modernization trends & Standards Document

B. As Is Analysis
   - Current state of Data Centers in Scope

C. Guidelines Development
   - Evaluating Need for Modernization

D. Final Presentation
   - Drafting of Modernization Guidelines

- Project Kick Off
- Developing Admin Model
- Final Recommendations
## Case Study Malaysia and USA

### Malaysia Data Center Modernization Effect

- Establishment of two government data center
- 209 Government agencies using 1Gov*net
- 84 Government agencies using GDC1
  - 50 Government agencies using GDC2
- 83% of the government services online

### USA Data Center Modernization Effect

- 4000 + data centers closed and $2.8 billion in cost savings
- 180,000 plus servers still with the agencies
- 95% of agencies procuring network through government
- 1.5 million Square feet of data center space
Across the world, countries adopt DC Modernization through new tools, technologies and optimization techniques

1. Adoption of cloud at a rapidly growing pace in line with increasing maturity of cloud operations across the globe
2. Increasing investments in security technologies including encryption for own data center setups
3. Increased usage of cross-agency infrastructure sharing and shared services
4. Focus on cost optimization resulting from tighter government budgets
5. Increased focus on handling of high security data
Thai Government Data Center Modernization is a strategic initiative to help the agency data infrastructure align better with Thailand Digital Economy

**THAILAND OPPORTUNITY**
- 70 mn population
- Strong internal demand for data center
- Data center requirements to grow 30% YOY till 2020

**DIGITAL THAILAND**
- Digital technology to develop infrastructure, innovation, data capability, human capital, and other resources
- 6 Strategies to implement goals: Build high-capacity digital infrastructure, Boost economy with digital technology, Create equitable society through digital technology, Transform into digital government, Develop digital workforce, and Build confidence in use of digital technology

**DATA CENTER INFRASTRUCTURE**
- Data center infrastructure an important component of Digital Economy
- A modern data center infrastructure is the most crucial element to accommodate growing demand for data, services, quality and digital economy
### Consumer needs, aspirations and resulting data is growing at rapid pace

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<th>Year</th>
<th>Internet Users</th>
<th>Internet Penetration</th>
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<tr>
<td>2016</td>
<td>28mn</td>
<td>39%</td>
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<td>2021</td>
<td>34mn</td>
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- 2015 Internet Penetration: 34mn
- 2021 Internet Users: 39%

- Fastest Internet in Asia: 8th
- Mobile Subscribers 2015: 86mn
- Mobile penetration 2015: 127%

### Key Considerations for Data Infrastructure

- Higher Utilization
- Higher Reliability & Availability
- Higher Security
- Higher Capacity

*Sources: Stastica, Worldbank, Bangkokpost, NBTC*
Government Data center issues and priorities

- Data Security based decision making
- Efficient operations
- Multiple standards and adherence
- Aging infrastructure
- High volume and growth of data
- Data Availability at all times
- Hiring and retaining right employees
- Outsourcing decisions
Future of data centers

The ongoing and massive surge in data traffic will pave the way for a stronger infra backbone.

Cloud adoption will continue to thrive and agencies would increasingly rely on cloud including Government cloud services.

Critical factors for choosing a data center options will include data security, location, cost and environment need.

Data centers would need to offer higher quality and reliable services to enable seamless business and government operations.

Data centers would need to keep scalability perspective in mind due to sheer growth of data in mind.

Data centers need to be ready for needs resulting from IoT, analytics and increase in intra ministry and inter agency data management with real-time business and operational excellence.
Current and Future State of Thailand Government Data Infrastructure
6 core areas of challenges faced by agencies

- **Security** includes: data security, security handling at the agency, handing of high risk and mission critical data.
- **Data handling** includes data integration and classification, agency responsibility, data cleansing, accuracy and quality.
- **Human resources** include: lack of human resources at the agency, lack of skills and overall lack of availability of skilled resources.
- **Budget and Cost** include the allocated budgets for expenses and increasing costs of operations as well as upgradation.
- **Agency policies and management** include shared utilization, planning, focus on DR and backup, citizen centricity etc.
- **Data Center Setup** include server, storage, cabling, cooling set, power setup, floor architecture, racks, building design etc.
Government Agencies constrains and demands

**CONSTRAINTS**
- Cost increase due to inefficient operations
- Limited Government Budgets
- Limited Human Resource Availability, Skills and Budget
- Data Classification and lack of integration
- Old infrastructure and the components

**DEMANDS**
- Increase in Data Volume
- Data security and safety
- Business Continuity
- Citizen centricity and readiness to support new services
- Faster response, higher availability and reliability of data
Important areas of improvement

1. Identification of standards that the agencies need to follow based on best practices and driving compliance

2. Developing key skills amongst the agency personnel on their business areas, technologies and servicing, and concrete steps to develop skills

3. Central operations and shared services should be an important consideration

4. Security handling and cloud adoption
Features that should represent future state

- Security Handling
- Scalability
- Operational Efficiency
- Cost Optimization
- Designed for Future
Future State Operating Model

(A) Agency Own Data Centers
- Includes current infrastructure setup
- Includes shared infrastructure optimization

(B) Ministry Data Centers
- Includes current infrastructure setup broadened to ministry agencies

(C) Cross Agency Data Centers
- Includes current infrastructure setup broadened to multiple agencies across ministries and independent agencies

(D) 3rd Party Colocation/Physical Hosting
- Includes current setup with better designed SLAs and requirements

(E) 3rd Party Services
- Includes service outsourcing to 3rd party for IaaS, PaaS, SaaS cloud

(F) G Services
- Includes service outsourcing to government services for colocation; IaaS, PaaS and SaaS cloud

Note: (E) 3rd party services does not include 3rd party colocation, which is captured as a separate service that’s being also used currently as (D)
## Future State Operating Model

### GREEN: Improvement from current state

### BLUE: No change from current state

<table>
<thead>
<tr>
<th>Very High</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
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<tr>
<th>Handling of high security data</th>
<th>(A) Agency Own Data Center</th>
<th>(B) Ministry Data Center</th>
<th>(C) Cross Agency Data Center</th>
<th>(D) 3rd party Colocation</th>
<th>(E) 3rd party Services</th>
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<th>Handling of public data</th>
<th>(A) Agency Own Data Center</th>
<th>(B) Ministry Data Center</th>
<th>(C) Cross Agency Data Center</th>
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<th>Handling of important and mission critical data</th>
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<th>Improvement in standard adoption</th>
<th>(A) Agency Own Data Center</th>
<th>(B) Ministry Data Center</th>
<th>(C) Cross Agency Data Center</th>
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<th>Support in data integration</th>
<th>(A) Agency Own Data Center</th>
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<th>Cost efficiencies</th>
<th>(A) Agency Own Data Center</th>
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<th>Solves issues of procurement lead times and OPEX budget</th>
<th>(A) Agency Own Data Center</th>
<th>(B) Ministry Data Center</th>
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<th>Solves human resource availability and quality issues</th>
<th>(A) Agency Own Data Center</th>
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27
## Future State Operating Model

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<tr>
<th>GREEN: Improvement from current state</th>
<th>Future State Model improvement over current state</th>
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<tbody>
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<td>BLUE: No change from current state</td>
<td>(A) Agency Own Data Center (B) Ministry Data Center (C) Cross Agency Data Center (D) 3rd party Colocation (E) 3rd party Services (F) G-Services</td>
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<tr>
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<td>Very High</td>
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<td>Better utilization of resources and infrastructure</td>
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<td>Reduces reliance on government budgets</td>
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<td>Reduces overall cost spent by government</td>
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<td>Ensures high scalability</td>
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<tr>
<td>Ensures high resilience, availability and reliability</td>
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<td>Effectively balances and manages technology advancements</td>
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<td>Ability to manage future growth of data analytics/other complex computing needs.</td>
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<tr>
<td>Optimal use of government resources</td>
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Government Data Center Modernization (GDCM) Strategy
Guiding Principles

1. Alignment with Digital Economy and Prime Minister’s vision for Government Infrastructure and Modernization

2. Strategy based on data security, criticality of applications, current operations perspective and inclusive growth

3. Utilizes the key improvements in technology via standards and SLA adoption for identified models to enable a successful realization of benefits

4. Consideration of skillsets, people development, human capital availability, and technology transfer

5. Accountability of agencies and ministries through granular steps to realize overall objectives.
The key objective of the Strategy is to develop a data infrastructure approach to protect Thailand’s high security data and to achieve operational excellence in service delivery. In achieving these, there are several other objectives including: business sustainability over long term, cost efficiency, technology innovation and preparedness for data revolution.

**Vision of GDCM**

“To be an effective government data infrastructure that enables public service delivery through efficient, secured, cost effective and optimized operations”

**GDCM Goals**

- Realigning government data based on security characteristics of the data to enable higher security to national security data and appropriate handling of important data
- Enabling infrastructure with standardised approach and service delivery
- Optimize the cost and investment for the infrastructure
- Implement shared operations at agency level, ministry level and government level
- Improve agency efficiency
Resulting Benefits

- Security
- Citizen Centricity
- Futuristic
- Efficiency
- Reduced Cost
GDCM Implementation Objectives

✓ Aggregate the total data center demand and establish feasibility studies to the realization of GDCM Strategy
✓ Identify and develop business requirements for the future model
✓ Assist early adopters to move to shared resource solutions;
✓ Adopt the standards to be used in data center equipment and operations so that maximum efficiencies can be achieved;
✓ Established shared service models
✓ Adoption by the identified agencies
✓ Publish the improvement and progress of the 5 year initiative.
GDCM Strategy Implementation Projects

P1: iDISCOVER
Discovery study to understand feasibility of the model and requirements for alternate hosting

P2: iTRANSFORM
Project to transform agency data centers into ministry and cross agency DCs

P3: iOPTIMIZE
Project to migrate data from one model to other

P4: iTRANSITION
Project to deploy human resources across agencies and models as required

P5: iADOPT
Project to adopt the identified standards

P6: iCHANGE
Project to management change implementation and management

P7: iLEARN
Project to provide training to human resources

P8: iMONITOR
Project to monitor and report progress

P9: iNEGOTIATE
Progress to negotiate better rates, services, SLAs with 3rd. party
Performance Management of GDCM Strategy

- Effective Utilization of Assets, Capacity, and Resources
- Shared Services
- Cost Efficiency
- Enhanced Security
- Strategic Framework
GDCM Implementation Plan (Short Version)

Phase 1: Readiness
- Year 1: iDiscover
- Year 2: iTransform
- Year 3: iTransform

Phase 2: Adoption
- Year 2: iTransform
- Year 3: iMonitor, iLearn
- Year 4: iChange
- Year 5: iOptimize, iTTransition

Phase 3: Improvement
- Year 3: iTransition
- Year 4: iAdopt
- Year 5: iAdopt

Legend:
- Project activities including planning, executing, monitoring and closing
- Review, checking for updates
- Government checkpoints on updates
- Checkpoint on SLA adherence, quality and service

Service provision based on iNegotiate
How ministries and agencies will operate in future from data perspective

**CURRENT STATE**
- **Agency DC**: 70-95% data
- **3rd party COLO**: 5-15% data
- **3rd party Cloud**: <5% data
- **G-Cloud**: <5% data

**FUTURE STATE**
- **Agency DC**: 30-50% data
- **Ministry DC**: <15% data
- **3rd party COLO**: <5% data
- **3rd party Cloud**: 5-10% data
- **Cross Agency DC**: <15% data
- **G-Services**: 25%-30% data

- **High Security**
- **Important**
- **Public**

**Notes**
- High total data volume
- 10-20 Agencies part of Ministry
- Mixed Data

**ILLUSTRATIVE**
Large Ministry: e.g. Science & Tech

**How ministries and agencies will operate in future from data perspective**

- High total data volume
- 10-20 Agencies part of Ministry
- Mixed Data

**ILLUSTRATIVE**
Large Ministry: e.g. Science & Tech
How ministries and agencies will operate in future from data perspective

**ILLUSTRATIVE**

**CURRENT STATE**
- Agency DC
- 3rd party COLO
- 3rd party Cloud
- G-Cloud

- 75-100% data
- <5% data
- 5%-10% data
- <10% data

**FUTURE STATE**
- Agency DC
- Ministry DC
- Cross Agency DC
- 3rd party COLO
- 3rd party Cloud
- G-Services

- 40-50% data
- <20% data
- <10% data
- <5% data
- 5-10% data
- <15% data

Medium total data volume
~12 Agencies part of Ministry
Mixed Data

High Security
Important
Public

Medium Ministry: e.g. Commerce
How ministries and agencies will operate in future from data perspective

**CURRENT STATE**
- **Agency DC**
  - 85-100% data
- **3rd party COLO**
  - <5% data
- **3rd party Cloud**
  - <5% data
- **G-Cloud**
  - <5% data

**FUTURE STATE**
- **Agency DC**
  - <30 data
- **Ministry DC**
  - 20-40% data
- **Cross Agency DC**
  - 15-20% data
- **3rd party COLO**
  - <5% data
- **3rd party Cloud**
  - 10-15% data
- **G-Services**
  - ~10% data

- **High Security**
- **Important**
- **Public**

- **High total data volume**
- **<5 Agencies part of Ministry**
- **Mixed Data**

**ILLUSTRATIVE**

Small Ministry: e.g. Tourism & Sports
What are Standards and why are they used?
WHAT ARE STANDARDS?

• Standards are universally or widely accepted, agreed upon, or established means of determining what a product, service, facility or a concept is required to be or is required to behave.

• In Data Centers to develop a commitment to operate facilities that meet the rigorous guidelines and compliance needs of global businesses.

• Companies that develop industry standards work with several regulatory and standards organizations to ensure compliance—from operation of the data center to sustainability and environmental regulations.

Why are standards needed?

New technologies like data analytics, big data, Internet-of-Things and venture into smart cities

Data Explosion: f5 Exabyte's of data online in 2002 35 zettabytes in 2021

Exceptionally high energy intensity of a data center may be 10 to 100 times of a typical commercial building.

Rising energy prices and growing data center carbon emissions by 7% year-on-year through 2020.
Examples of Data Center International Standards

Energy start, NABERS, ASHARE are focused on power and cooling standards.

Uptime, TIA and ISO are the most popular one’s among data center vendors.

PCI and HIPPA are service related standards.

DC start audit, SSAE 16, Open IX and ISAE are focused on auditing of services.

LEED BISCI and BCA are design standards.
Standard Adoption
Adoption Insights by Countries

**Energy**
- US government-PUE
- UK government Green Grid
- Australian government-ASHARE

**Design and Structure**
- US government uses TIA 942 and BICSI
- Government of Singapore-Threat assessment
- Australian government-Protective Security Policy Framework
- US government recommends-LEED design standards

**Server Storage & Utilization**
- Singapore government-PTDCI
- Indian government-data center IT infrastructure monitoring tools
- Hong Kong government- Help desk for the data center
- Australian government -Proper backup, storage, and handling of data
Adoption Insights by Countries (Cont.)

Location & Site

- Government of Canada - Appropriate selection of the facility site
- Government of India accessible and expandable enough.
- US government - Ready access to electrical power is available from diverse sources
- Philippines government - Data centers should be in a zone where it needs to be free from earthquake and flooding.

Service Level Agreement

- India - All the state government should have a DR site
- Multiple governments recommends using TIA or Uptime.
Relevance and Challenges
Efficient data centers
The cost of data center downtime has increased significantly for companies in the last couple of years. Data center operators in the last couple of years have improved the availability and efficiency of data centers by adopting globally recognized data center standards.

Comparative analysis
By providing a common method of comparison, standards help insulate customers from the need to make their decisions on solely on the basis of the claims of a provider.

Cost Optimization
Adopt industry standards recognized technologies would help in reducing overall efficiency of data center support functions. This would help in reducing the overall costs.

Environmental Impact
By adopting the data center industry best practices (using renewable energy and efficient data center), the companies are able to reduce the impact on the environment.
<table>
<thead>
<tr>
<th>Key Challenges – Data Center Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expensive to adopt</strong></td>
</tr>
<tr>
<td>One of the biggest challenges faced by the data center operators is that the standards are expensive to adopt. The standards offer guidelines for operating and maintaining the data center efficiently. Adopting these best practices comes at a big price tag.</td>
</tr>
<tr>
<td><strong>Long list for data center standards</strong></td>
</tr>
<tr>
<td>Over the years, the number of standards have increased at very fast pace globally. It is challenging for data center operators to choose between which standards to use and which not to use.</td>
</tr>
<tr>
<td><strong>Lack of people with standards knowledge</strong></td>
</tr>
<tr>
<td>As the list of standards is quite long, there is lack of people with skills that have data center standards knowledge. As there is scarcity of such people, it is challenging for data centers to adopt standards.</td>
</tr>
<tr>
<td><strong>Lack of people with operational knowledge</strong></td>
</tr>
<tr>
<td>Once the data center standards are adopted, another challenges that comes into place is maintaining the standards. There is lack of people who have knowledge on how to maintain the data center standards. This is also a big challenge for data center operators.</td>
</tr>
</tbody>
</table>
Budget is big issue for standards adoption
Most of the government agencies have fixed budgets and these budgets are not much flexible to cover the standards expenses.

Many data center operators are still using legacy infrastructure
Most the data center operators in Thailand are running their data center on legacy infrastructure and legacy buildings. Adopting standards for these data centers would not be easy.

Data center operators are not experienced enough
Data center operators are not mature enough to understand value behind the adoption of data center standards.
Standard functional areas
Data Center Standards by Functional Areas

- **Energy and Power**: This standard deals with measuring the energy consumed by equipment in a data center.
- **Server Storage Utilization**: This standard deals with utilization, monitoring of rates of IT infrastructure.
- **Service level Agreements**: This standard deals with defining the availability of data center services.
- **Location and Site**: This standard deals with the ideal location of data centers.
- **Design and Structure**: This standard deals with how the data centers should be designed.
The data center is home to the computational power, storage, and applications necessary to support an enterprise business.

The data center infrastructure is central to the IT architecture, from which all content is sourced or passes through.

Proper planning of the data center infrastructure design is critical, and performance, resiliency, and scalability need to be carefully considered.

- Energy is one of the most important components in data centers.
- Data Centers consume an immense amount of power to perform functions reliably and effectively.
- The electrical costs in Data Centers typically accounts for 40-60% of the total operating costs.
Determining the location of a data center is one of the crucial decisions for a company as it is based on strategy and goals of a company or government.

Site selection plays an important role for the same as it will have direct impact on cost and TCO.

End-to-end service availability of the data center and its independent monitoring is the prime requirement to have reliable, seamless, smooth delivery of the services to the citizens.
Data Center Standards Divided Further into Sub Parameters

1. Energy & Power
   - Energy
   - Power
   - Cooling
   - Redundancy
   - UPS
   - Lighting

2. Design and Structure
   - Cabling
   - Design
   - Monitoring
   - Security

3. Server, Storage and Utilization
   - Utilization
   - Monitoring
   - Help Desk
   - Backup
   - Security

4. Location and Site Space
   - Accessible & Expansion
   - Power and Network Availability

5. Service Level Agreements
   - Disaster Recovery
   - Tier & Response time
Agencies Current and Future Level for Standards
Current State of Agency Data Centers

### Energy and Power Average Level

- Cooling: 2.4
- UPS: 2.9
- Lighting: 2.1
- Redundancy: 1.7
- PUE: 2.5
- Meters: 2.5

### Design and Structure Average Level

- Monitoring: 2.5
- Building Design: 2.5
- Physical Security: 2.1
- Cabling: 2.7

### Server storage and utilization average level

- Security: 3.3
- Backup: 3.4
- Helpdesk: 2.4
- Monitoring IT infrastructure: 2.8
- Utilization: 2.9

Remark: Please refer to Word document for description of Average Level
Current State of Agency Data Centers (Cont.)

Remark: Please refer to Word document for description of Average Level
Future Recommended State of Agency Data Centers

<table>
<thead>
<tr>
<th>Standards</th>
<th>Our Analysis Agency DC Level</th>
<th>Our Analysis Ministry DC Level</th>
<th>Our Analysis Cross DC Level</th>
<th>Our Analysis G services Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy consumption</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Power usage effectiveness</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Redundancy</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Lighting</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>UPS</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Cooling</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Color Coding</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Security Assessment</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Building design</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

* The chart that has been designed for the future standard adoption for government agencies. These are minimum standards that any agency should adopt and any agency having high security data should higher level of standards.
## Future Recommended State of Agency Data Centers (Cont’d)

<table>
<thead>
<tr>
<th>Standards</th>
<th>Frost &amp; Sullivan Future Recommended Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Our Analysis Agency DC Level</td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td>Utilization &amp; Virtualization</td>
<td></td>
</tr>
<tr>
<td>Monitoring IT infrastructure and software</td>
<td></td>
</tr>
<tr>
<td>Help desk</td>
<td></td>
</tr>
<tr>
<td>Backup</td>
<td></td>
</tr>
<tr>
<td>Security for IT infrastructure and data</td>
<td></td>
</tr>
<tr>
<td>Accessible and expansion</td>
<td></td>
</tr>
<tr>
<td>Power and network availability</td>
<td></td>
</tr>
<tr>
<td>Disaster recovery</td>
<td></td>
</tr>
<tr>
<td>Tier and Response time</td>
<td></td>
</tr>
</tbody>
</table>
Service Level Agreements
It will state the business objectives to be achieved in the provision of the services.

It will describe in detail the service deliverables.

It will define the performance standards the customer expects in the provision of the services by the service provider.

It will provide an ongoing reporting mechanism for measuring the expected performance standards.
| 05 | It will provide a remedial mechanism and compensation regime where performance standards are not achieved |
| 06 | It will provide a mechanism for review and change to the service levels over the course of the contract. |
| 07 | Ultimately it will give the customer the right to terminate the contract where performance standards fall consistently below an acceptable level. |
## Colocation SLA Main Elements

### Service description

<table>
<thead>
<tr>
<th>Power</th>
<th>Network</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>Service Reporting</td>
<td>Physical Security</td>
</tr>
<tr>
<td>Racks</td>
<td>Floor and Caged Space</td>
<td>Remote Hands</td>
</tr>
</tbody>
</table>

### Service Level Metrics

<table>
<thead>
<tr>
<th>Power SLA</th>
<th>Network SLA</th>
<th>Cooling SLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>Availability</td>
<td>Response Time</td>
</tr>
</tbody>
</table>

### General Metrics

<table>
<thead>
<tr>
<th>Maintenance</th>
<th>Customer Responsibilities</th>
<th>Terms and Conditions</th>
</tr>
</thead>
</table>
3rd Party Cloud Computing SLA - Key Elements

<table>
<thead>
<tr>
<th>Service details</th>
<th>IaaS</th>
<th>PaaS</th>
<th>SaaS</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Deployment Models</th>
<th>Public Cloud</th>
<th>Private cloud</th>
<th>Hybrid Cloud</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Service level Metrics</th>
<th>Service Availability</th>
<th>Service Credit</th>
<th>Service Reporting</th>
</tr>
</thead>
</table>
### 3rd Party Cloud Computing SLA - Key Elements (Cont.)

#### Data policies

<table>
<thead>
<tr>
<th>Data Privacy</th>
<th>Data security and Integrity</th>
<th>Data compromise response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Retention and disposal</td>
<td>Data transfer upon termination</td>
<td>Data location</td>
</tr>
</tbody>
</table>

#### Other Generic metrics

<table>
<thead>
<tr>
<th>Interruptions</th>
<th>Support</th>
<th>Service Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trainings</td>
<td>Transition assistance</td>
<td>Invoicing</td>
</tr>
<tr>
<td>Terms and termination</td>
<td>Warranties and covenants</td>
<td>Audit</td>
</tr>
</tbody>
</table>
Summary

• Data Center Modernization is a global need which most governments across the globe are adopting in different capacities.

• Thailand will go through a massive need for data center infrastructure in years to come due to increase in data, population and economic growth.

• Thailand data infrastructure need a modernization strategy to make it agile, secured, cost effective and efficient ecosystem.

• GDCM enables agencies to choose from 6 available options to support their data infrastructure: Agency Own Data Center, Ministry Data Center, Cross Agency Data Center, 3rd Party Colocation/Physical Hosting, 3rd Party Services and G-Services.

• Establishment of 6 models based on standards as well as strategy will ensure improved performance for agencies and reduced overall spending.

• Proposed Standards comprised of 5 domains: Energy & Power; Design and Structure; Server, Storage and Utilization; Location and Site Space; and SLA with 19 element.

• GDCM is an initial 5-year plan consisting of 9 projects to drive long-term plan.
Thank you