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Trends in digitalization effect the building industry

By 2018 there will be more connected devices than people alive; Est. 25 billion by 2020

Costs sinking dramatically
($500 per 1 million transistors in 1990;
$0.05 per 1 million transistors in 2012)

Business IP traffic will grow at a CAGR of +20% from 2014-2019

Mobile computing to grow by +57% CAGR from 2014-2019

Large amounts of data can be turned into value for our customers
Customers expectations are at the heart of digital transformation

- IT infrastructure expansion to rapidly deploy digitized information 24/7/365
- Increased response time
- Better data
- Proactive experiences

- SaaS models lowers switching costs
- No longer a prisoner
- Openly available
- Open platforms

- Combination of evolving technology and the changes in consumer behavior
  - Role based reporting (CFO, facilities, procurement, etc.)
  - Rapid technology expansion
    - Mobile
    - Cloud
    - Social Media
    - Big data

- Ease of use is table stakes
- Simplified system interactions
- Application based
- Improved customer experience
The journey towards smarter buildings with digitalization

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1900's
- Convenience Systems

1970's
- Timeclocks

1980's
- First integration / drivers Modbus First IT networks Computers First addressable fire system

1990's
- Interoperability Lighting integration BACnet PC's IT Networking Networked fire detection

2000's
- IT integration Discipline integration

2010's
- DR enablement Renewables Cloud Big data SmartDevices IoT Software EcoSystems Web based fire reporting

The Future
- IoT: Devices become smart

2012
- Smartgrid

2018
- Digital Services: Analytics Advanced Control Application interoperability (WebServices)

Next
- Complete Digitalization

Unrestricted © Siemens AG 2016
Digitalization – What it means for Building Technologies and our Customer

From Building Data …

- Collect
- Connect
- Analyze & Simulate
- Optimize
- Visualize and Communicate
- Store

... to Customer Value

- Increase energy efficiency
- Optimize energy supply
- Increase sustainability
- Be legal & regulatory compliant
- Ensure business continuity
- Reduce cost
- Increase building value

Better informed decisions, optimized investments and effective use of buildings
Digitalization – How Building Technologies Implements

SERVICES

Consult, Create and Sustain

ADVANCED ANALYTICS

Data-Driven Intelligence

INTEGRATED BUILDING MANAGEMENT SYSTEM

Command, Control & Communications Infrastructure

Customer Outcomes

Intelligent Infrastructure
Enhanced enterprise energy management capabilities through

**Site Controls™**

Development of a comprehensive **Integration Platform – Desigo® CC**

Expanded software and data analytic capabilities with **Navigator**

Providing on-demand service capabilities through **remote service centers**

Focus on the **customer experience**
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# Market Needs Served through Siemens Platforms and Services

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Fitting into the Bigger Picture

- **Intelligent Infrastructure**
- **SERVICES**
- **ADVANCED ANALYTICS**
- **INTEGRATED BUILDING MANAGEMENT SYSTEM**
- **Consult, Create and Sustain**
- **Data-Driven Intelligence**
- **Command, Control & Communications Infrastructure**
- **Customer Outcomes**
Did You Know?

- Light / Medium Commercial buildings account for ~92% of total # of all commercial buildings in the U.S.

80% of building lifecycle costs are energy and use operations.

Sources: U. S. Environmental Protection Agency; www.esource.com

- Retail
- Grocery
- Restaurants
- Fitness Clubs
- Branch Banks
- Healthcare (MOB’s)
- Hospitality
- Logistics
- Day Care Centers
- Car Dealerships
- Municipals
- K-12
Typical Customer:

- several hundred sites
- several thousand HVAC units
- several thousand lighting circuits
- ten thousand sensors
- a thousand energy meters
Enterprise Energy Management is Primarily a Data Management Challenge
Example: Client site portfolio generates 22.5 billion data points each year

- 22.5 billion points per year for site portfolio
- 14.6 million points per year
- 40,000 data points daily for one medium-sized retail site
All of These Buildings are in the Real World

It's a messy, complicated, uncooperative, unrelenting place

**Bad Conditions**
Things get smashed, painted over, disconnected and relocated

**Bad Communication**
Sometimes no communication at all, sometimes garbled communication

**Bad Devices**
Sensors fail, sensors become uncalibrated, devices age

**Human “Help”**
Humans are smart in an evil way
All of These Buildings are in the Real World

It’s a messy, complicated, uncooperative, unrelenting place

The natural environment is harsh…
All of These Buildings are in the Real World

It’s a messy, complicated, uncooperative, unrelenting place

...not just harsh, but dangerous!
All of These Buildings are in the Real World

It’s a messy, complicated, uncooperative, unrelenting place

Things wear out in the Real World when no one is looking.
All of These Buildings are in the Real World

It’s a messy, complicated, uncooperative, unrelenting place

Lamp placed to heat thermostat

Humans are the worst!
Lucky for us the Real World runs on physics!

- Real-world physics limits the possible correlations in data
  - Example: A rooftop HVAC unit’s performance will not have any effect on the performance of a boiler in the basement

- Rules are more effective than statistics for analytics
  - Example: Outside light sensor should see regular periods of brightness and darkness.

- Siemens Building Engineers have developed 100s of sophisticated rules and continue to refine and develop new ones

![Image of physics equations](Image by By Brews O’Hare (Own work) via Wikimedia)
Turning Data into Actionable Intelligence
Knowledge Hierarchy

- Data
- Information
- Intelligence
- Enterprise Scoring
- Aggregation
Moving from Reactive to Proactive & Predictive drives significant improvements to Energy, R&M and Capital budgets

Reactive

Issue reported by Site Personal

Real-time Diagnostics (get the facts)

Immediate Corrective Action (stop the bleeding)

Dispatch required

Dispatch & Repair

Post Repair Validation (ensure accountability)

Invoice Management

Proactive & Predictive

Enterprise Analytics (what's my biggest problem?)

Move to Next Outlier

Digital Integrated Workflows

Automate

60% Issues Resolved

40% Issues Resolved
Delivering the promise of the ‘Autonomous Building’
It’s a Process, not a Project

- Predictive & Proactive vs. Reactive
- System does the heavy lifting
- Digital integrated workflows

**Communications**
Retrieve Data from Site

**Action Engine**
Automated Corrective Actions

**Data Engine**
Analyze and Aggregate Data

**Analytic Engine**
Evaluate Rules, Create Exceptions

**Continuous Cycle**

- Meaningful, reliable and secure data collection from various sources

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Site Controls
Delivering the Promise of the “Autonomous Building”

It’s like the “Autonomous Car” – easy to use and highly sophisticated under the hood.
Site Controls drives significant improvements to Energy, R&M and Capital budgets

- Energy Savings (15 – 30%)
- Maintenance Savings (10 – 15%)
- Improved Asset Life (15 – 25%)

Sources: U. S. Environmental Protection Agency; www.esource.com
Integrated Building Management Systems Overview
Market needs served through Siemens platforms and services

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SERVICES

ADVANCED ANALYTICS

INTEGRATED BUILDING MANAGEMENT SYSTEM

Consult, Create and Sustain

Data-Driven Intelligence

Command, Control & Communications Infrastructure

Customer Outcomes
Fitting into the Bigger Picture

Intelligent Infrastructure

- SERVICES
- ADVANCED ANALYTICS
- INTEGRATED BUILDING MANAGEMENT SYSTEM
- Command, Control & Communications Infrastructure
- Consult, Create and Sustain
- Data-Driven Intelligence

Customer Outcomes
The Foundation of a High Performance Building
Integrated Building Management System

- Desigo® CC
- Fire Alarm
- Video Surveillance
- Access Control
- Automation
- Smart Rooms
- Metering
- Mass Notification
- 3rd Party Partners & Systems
- Custom Integrations
- Application Extensions
- Security Command & Control

INTEGRATED BUILDING MANAGEMENT SYSTEM

Command, Control & Communications Infrastructure

The Physical Infrastructure
Integrated Building Management System

The Physical Infrastructure

HVAC  Lighting  Security
Utility  Fire  Specialty (cool stuff)

IBMS [Desigo® CC]

SOUTHBOUND INTEGRATION
Integrated Building Management System

- FDD Navigator
- 3rd Party Partners
- NORTHBOUND INTEGRATION
- IBMS [Desigo® CC]
- SOUTHBOUND INTEGRATION
- HVAC
- Lighting
- Security
- Utility
- Fire
- Specialty (cool stuff)

The Physical Infrastructure
Integrated Building Management System

Sometimes we need deeper customization, **Application Extensions**

- Graphics
- Dashboard
- Reporting
- Mobile Apps
- Scheduling
- Web / TOS
- Mass Notification
- Analytics

**IBMS [Desigo® CC]**
Example of “Application Extensions”
Kiosk Mode User Profile for Desigo® CC – Supporting a Public User Green Screen
Example of “Application Extensions”
Weather integration (southbound web services) and graphic templates
Example of “Application Extensions” Integration to HomeSeer Home Automation Station

Available now

- Developed for a specific end customer
- Intended to integrate 1000’s of homes
- Data leveraged in Desigo® CC through proprietary API in cloud.
The IBMS Platform Establishes a Growing Eco-system

- Centralized Graphics, Engineering, ATS
- Area and Zone Resources
- BT Regions
- 3rd party partners
- Local Resources
- Centralized Application Extensions
- Buffalo Grove
- Navigator
- More
- More
- More
A Closer Look at the Desigo CC Platform
The world is changing fast…
Customers have more to manage than ever before

Faced with:
- Increasingly complex systems
- Huge amounts of available data
- Limited human and capital resources

Tools are needed to organize and leverage all this information to make buildings work for our businesses.
A Common Tool Set for Facility Management

Common Tools for All Building Systems
System Integration, Enterprise Integration and Application Support

Interfaces to enterprise management

- Desigo® CC
  - Power Management
  - Lighting Management
  - Blinds Management
  - HVAC
  - Energy Efficiency functions
  - Access Management
  - Video Management
  - Intrusion Detection
  - Intelligent Response / MNS
  - Fire Safety

Smart Consumption
Asset and Maintenance
Energy Procurement
Sustainability reporting
Workspace Management
Energy Management

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Analytics in Action: High-level Technology Stack

System Architecture (Large Commercial/Institutional)

Desigo® CC Workstation

System Architecture (Light Commercial)

Site Controls™ Portal

Market Pricing Weather Data Utility Data 3rd Party Data Navigator Platform

Unrestricted © Siemens AG 2016
Our Perspective on the Potential of IoT for Buildings

An ecosystem of connected devices, systems and buildings designed to maximize the potential of the built environment
Collaboration of Siemens BT, Capgemini and IBM

<table>
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<td>Requirements definition</td>
<td>Building technologies experts</td>
</tr>
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<td>Partnership alignment</td>
<td>Consulting and system integrator expertise</td>
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<td>IT best practices and expert know-how</td>
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<td>Software partner for product roadmap</td>
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<td>Assure quality of overall architecture</td>
<td>Detailed IOT Knowledge</td>
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Analytics in Action: What We are Doing Today with Navigator

- **Alleviating Customer Pain Points**
  - Customers’ Equipment & Systems
  - Reduce Operating Costs
  - Increase Energy Efficiency
  - Meet Corporate Sustainability Targets
  - Improve Equipment Reliability and Useful Life

- **Building Performance powered by Navigator**
  - Connect & Collect Data
  - Analysis & Reporting
  - Actionable Information

- **Take Action**
  - (Remote or On-site)
Analytics in Action:
Evolving Analytics for Building Performance

- Reactive
- Preventative
- Proactive
- Predictive (Condition Based)
- Autonomous

Constant Surprises
Reduce Surprises
Strategic planning of Maintenance
Predict Maintenance Needs
Systematic Balanced Approach

Surprises
Reduce
Strategic planning of Maintenance
Predict Maintenance Needs
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Analytics in Action:
Improving Building Operations

- Fault Detection and Diagnostics (FDD) applied
- $700,000 in annual projected savings at a single site alone
- Ability to reinvest into revenue generating activities
Proactive Analytics in Action: Patient Care and Compliance

- New Construction Application
- System Performance Reporting
- Central Plant Optimization
- Monitoring based commissioning
Analytics in Action: Fixing HVAC Blowing Hot Air Problems

- $8 per override x 5,000 HVACs @ 3% are overridden 30x/year = yields $40,000 in annual savings
- Reduced runtime and overcompensation = longer asset life
- Onsite personnel are never pulled away from their primary responsibilities
A Vision for Analytics: Technology Alone is Not the Answer

Technology & Analytics
- Rule engine and library
- Dashboard
- Reporting
- Modeling engine

Building Experts
- Alignment of rules to equipment and outcomes
- Analysis and recommendations
- Corrective actions
- Process Improvement

Delivery
- End-to-end process
- Robust tool set (e.g., readiness, data acquisition)
- Experienced Project Management
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Bringing it all Together

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Customer Outcomes

Intelligent Infrastructure
The Value of the “Autonomous Building”

- Reduced Staffing Levels
- Decreased Downtime
- Reduced Energy Consumption
- Service on Demand
- Rules-based Performance Management
BT has the strategy to lead you through the Digital Transformation.
Thank you!