



Cisco Smart Grid Alive in Switzerland

An Introduction

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Verständnis



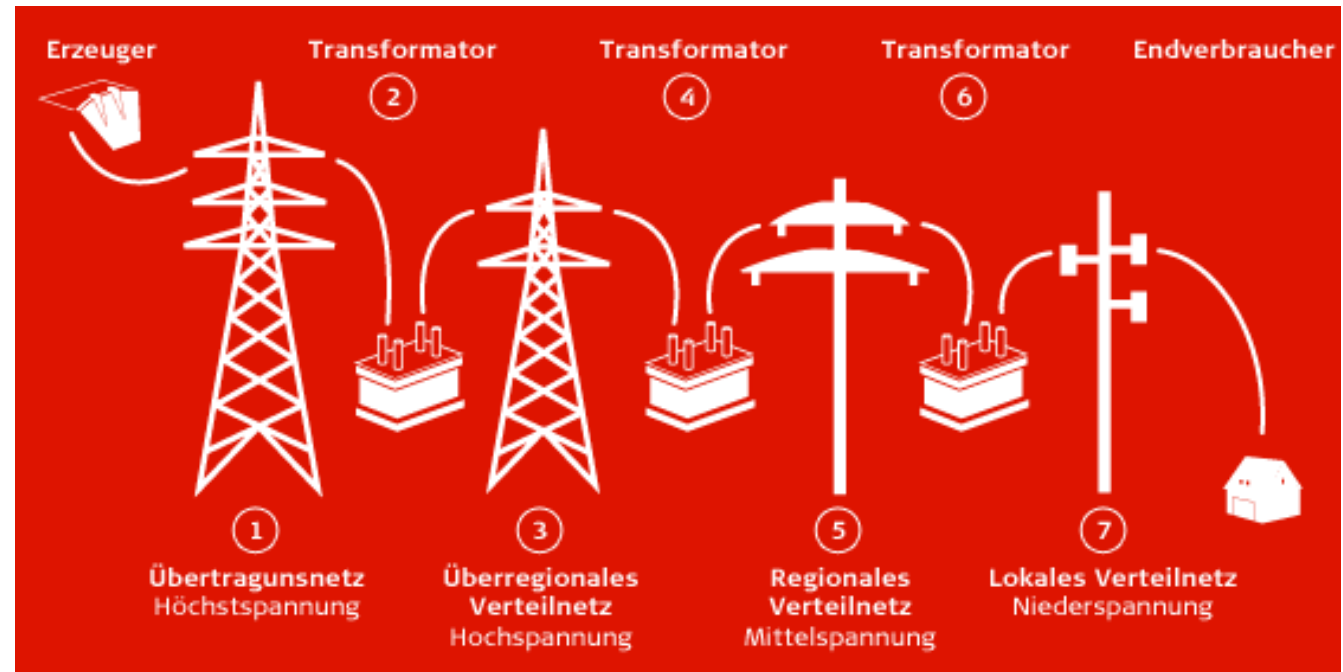
Inhalt

- Das Schweizer Stromnetz
- IoE Internet of Everything
- (Englisch)Smart Grid as Part of IoE
 - IoE and our future
 - Smart Grid – Why and What
 - What did we do in Switzerland already

Schweizer Stromnetz

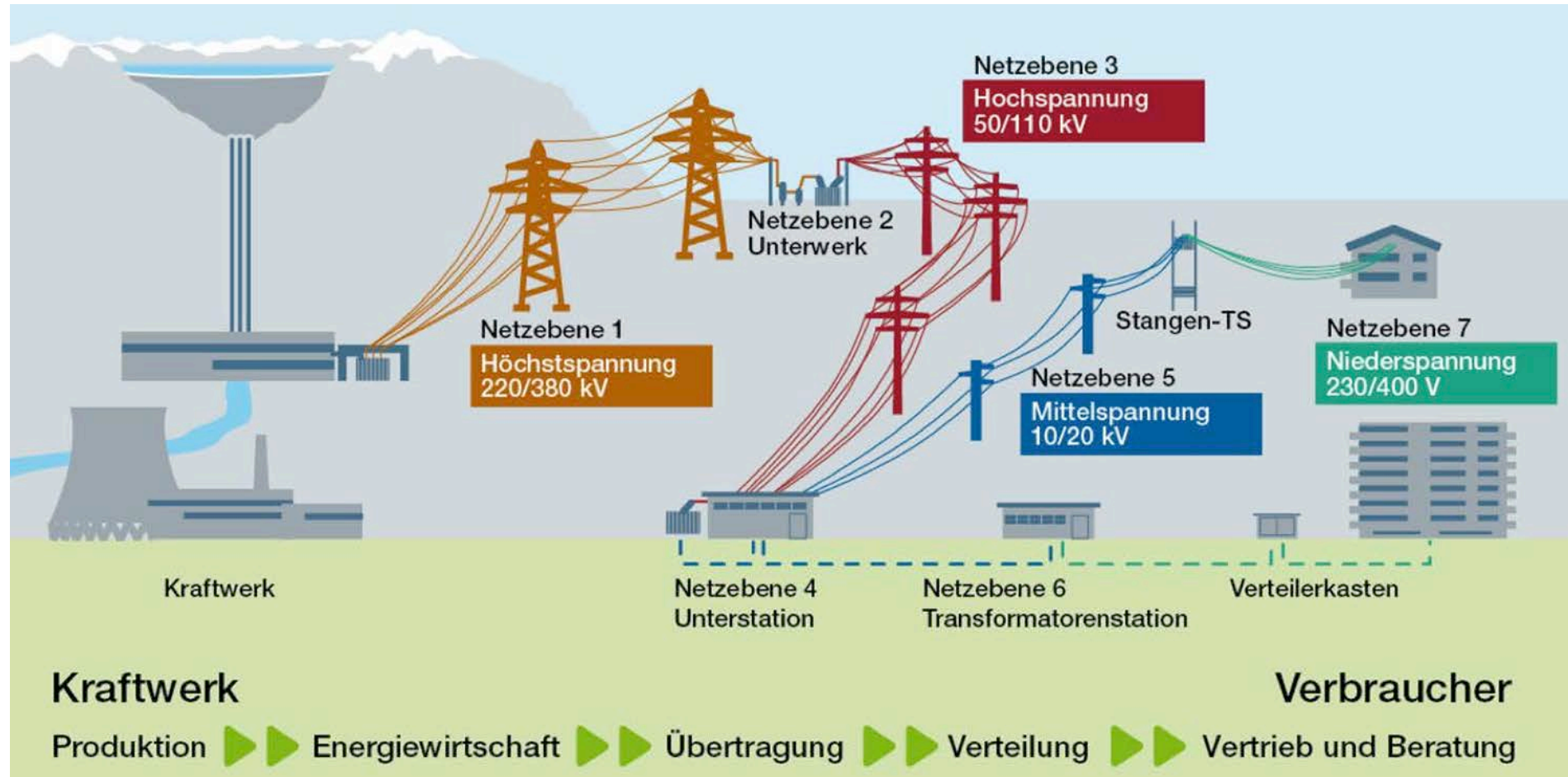
Schweizer Stromnetz

- 7 Netzebenen
 - Höchstspannungsnetz
 - Hochspannungsnetz
 - Mittelspannungsnetz
 - Niederspannungsnetz
 - Drei Transformierungsebenen
- Schweizer Übertragungsnetz ist 6700 Kilometer lang
- An über 40 Stellen ist das Schweizer Übertragungsnetz mit jenen der umliegenden Länder verbunden



Source: Swissgrid

Schweizer Stromnetz



Source: CKW

Unterwerke (Substations) & Transformatorstationen

▪ Unterwerke

- Das Unterwerk – auch Unterstation genannt – verbindet zwei Spannungsebenen miteinander.
- Kernstück einer Unterstation ist der Transformator, der die Spannung von einer Spannungsebene auf eine andere umsetzt:
 - von Höchstspannung zu Hochspannung und
 - von Hochspannung zu Mittelspannung.

▪ Transformatorstationen

- In der Transformatorstation wird die Mittelspannung auf die in Haushalt und Gewerbe notwendige Niederspannung von 400 und 230 Volt umgewandelt.



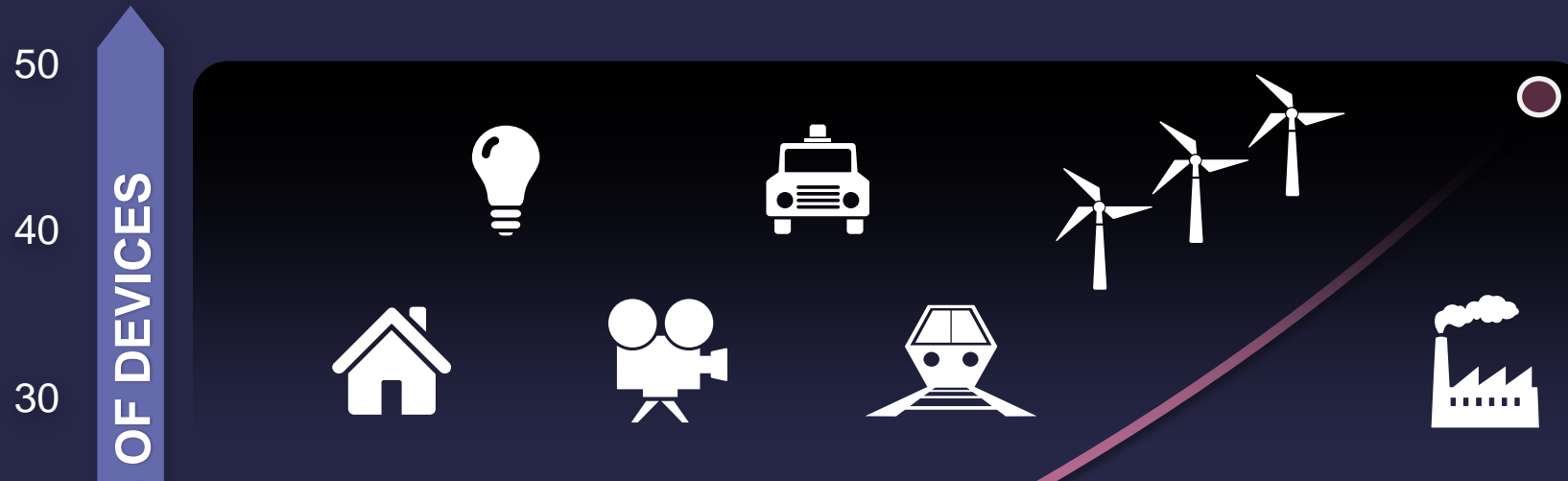
Smart Grid as Part of Internet of Everything

A Modernized Grid Is Part of the Internet of Things

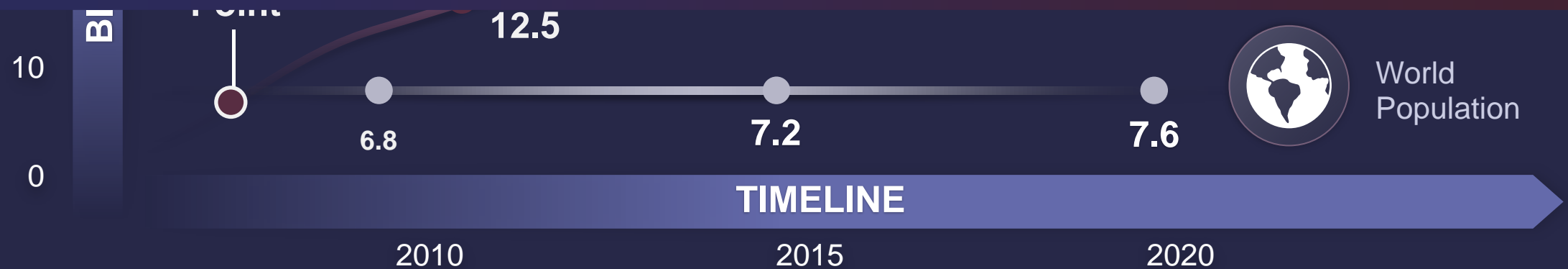
But, What Is the Internet of Things?

“ **The Internet of Things** is the intelligent connectivity of physical devices driving massive gains in **efficiency, business growth and quality of life.**”

IoT Is Here Now—and Growing!



The New Essential Infrastructure



Source: Cisco IBSG, 2011

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Cisco Confidential

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Cisco Calls It the Internet of Everything (IoE)

People
Connecting People in More
Relevant, Valuable Ways



Process
Delivering the Right Information
to the Right Person (or Machine)
at the Right Time



Data
Leveraging Data into
More Useful Information
for Decision Making



Things
Physical Devices and Objects
Connected to the Internet and
Each Other for Intelligent
Decision Making



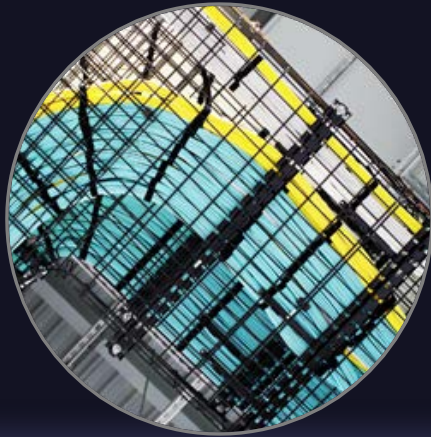
IoE

Networked Connection of People, Process, Data, Things

What Will it Take?

Operational Technology Network Transformation

From Basic Connectivity...



...to a Critical Part of the Enterprise Infrastructure

From Proprietary Standards...



...to Open Standards

From Disparate IT and OT Networks...



...to Converged, Secure, and Collaborative Operations

Cisco Connected Grid Vision

“ Transform energy production, distribution and consumption using an end-to-end IP platform to sustainably meet the world’s future energy needs.”



What's on your Mind

Align Markets & Regulation to Public Policy

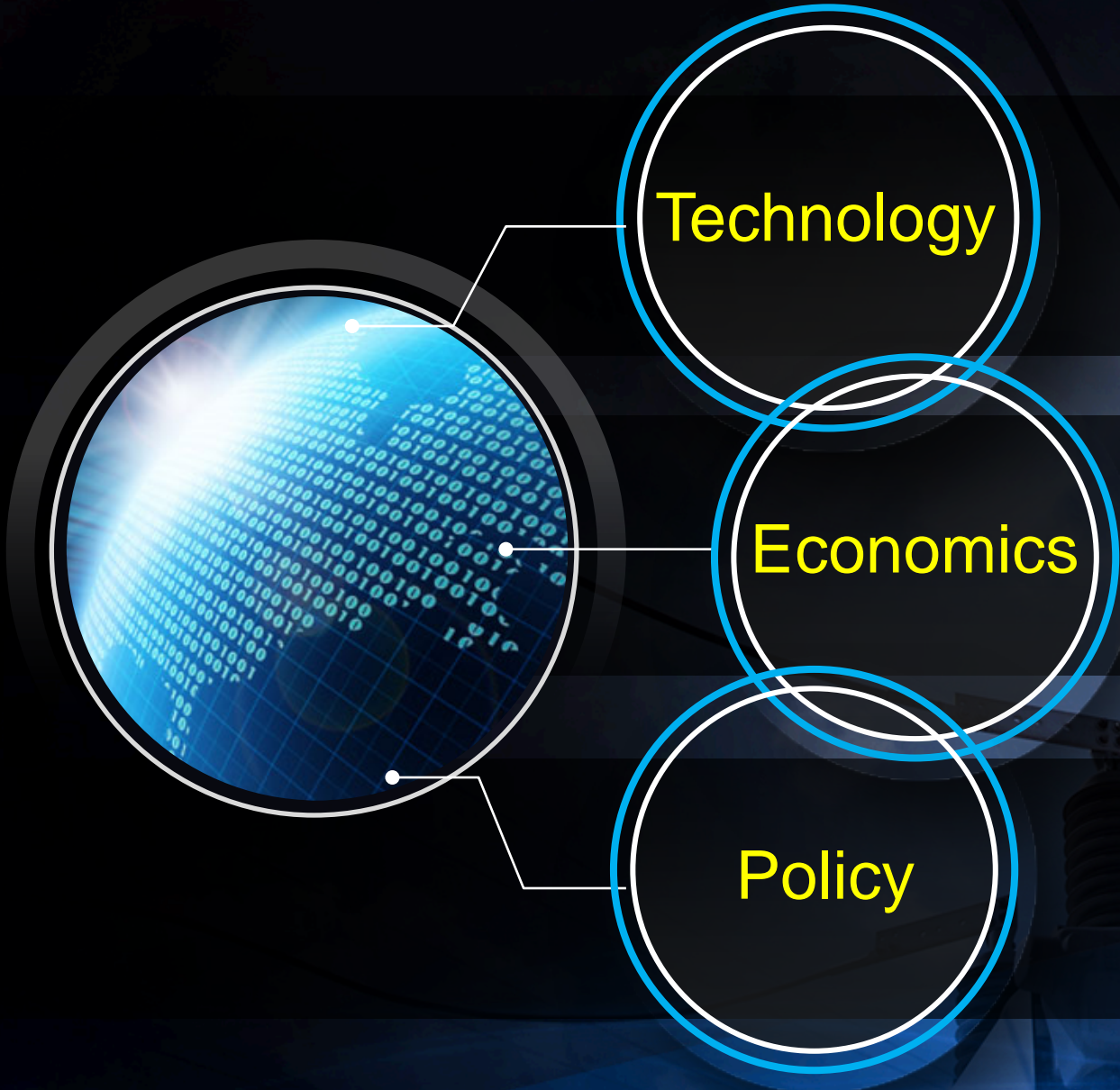
Asset Optimization...Improving Reliability & Utilization

Workforce Productivity...Safety, New Skills, Knowledge Transfer

Investment Protection...Business & Technology Architecture Alignment

Security, Security, Security

Global Energy Megatrends



- Network Convergence to IP-based Platforms
- Increased Variable & Distributed Resources
- Electrification of Energy

- Aging Workforce, Infrastructure
- Consumer Affordability
- Evolving Industry Business Models

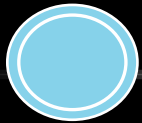
- Need for New Regulatory Framework
- Monetization of Value
- Energy Independence

A Future History of the Grid

“The future is already here, it’s just not evenly distributed.”

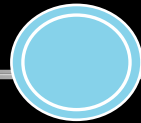
- William Gibson, Author

Sensing and Response



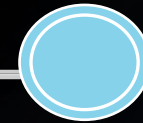
- Smart Monitoring
- Demand Management

Clean Generation



- Solar / Wind
- Distributed Generation

“Enernet”



- Electric Vehicles
- N-Way Networks
- Energy Smart Devices

Prosumerization



- Virtual Power Plants
- Active Consumer Participation

2010-2019

2012-2025

2017-2029

Cisco Connected Energy Networks

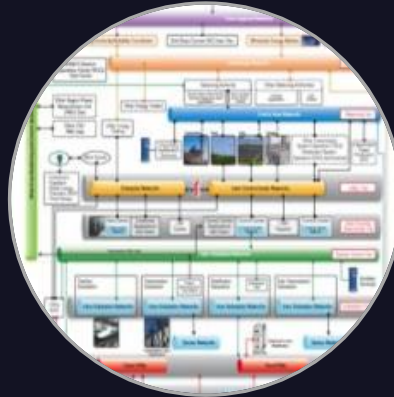
Key Components

Solutions



Core foundation
of the network:
routing, switching, security

Architecture



The role of the
network as a critical element in
grid modernization, delivering
business and technology
architectures

Services



The role services and partners
play for delivering
customer value
at every point in the emerging
energy value network

Cisco Internet of Things Portfolio



Manufacturing



Mining



Energy-Utility



Oil and Gas



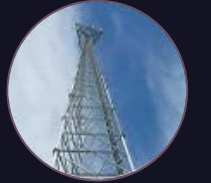
Transportation



City



Defense



SP/M2M

Plantwide Ethernet, Intelligent Transportation, Smart Cities, S&C Refinery, Smart Connected Vehicle, Smart Grid

IE 2000
IE 3000
CGS 1000
CGS 2500



Plant Switching

CGR 2000



Plant Routing

IR500
DA Gateway



CGR 1000



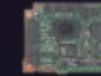
1552
Rugged
Wireless



819H
M2M ISR
Gateway
Router

Field Network

5915
Embedded
Services
Router



3200
ESS2000



Embedded Networks

Video Surveillance
Manager and IP
Cameras



Physical
Access
Manager



IPICS

Physical Security

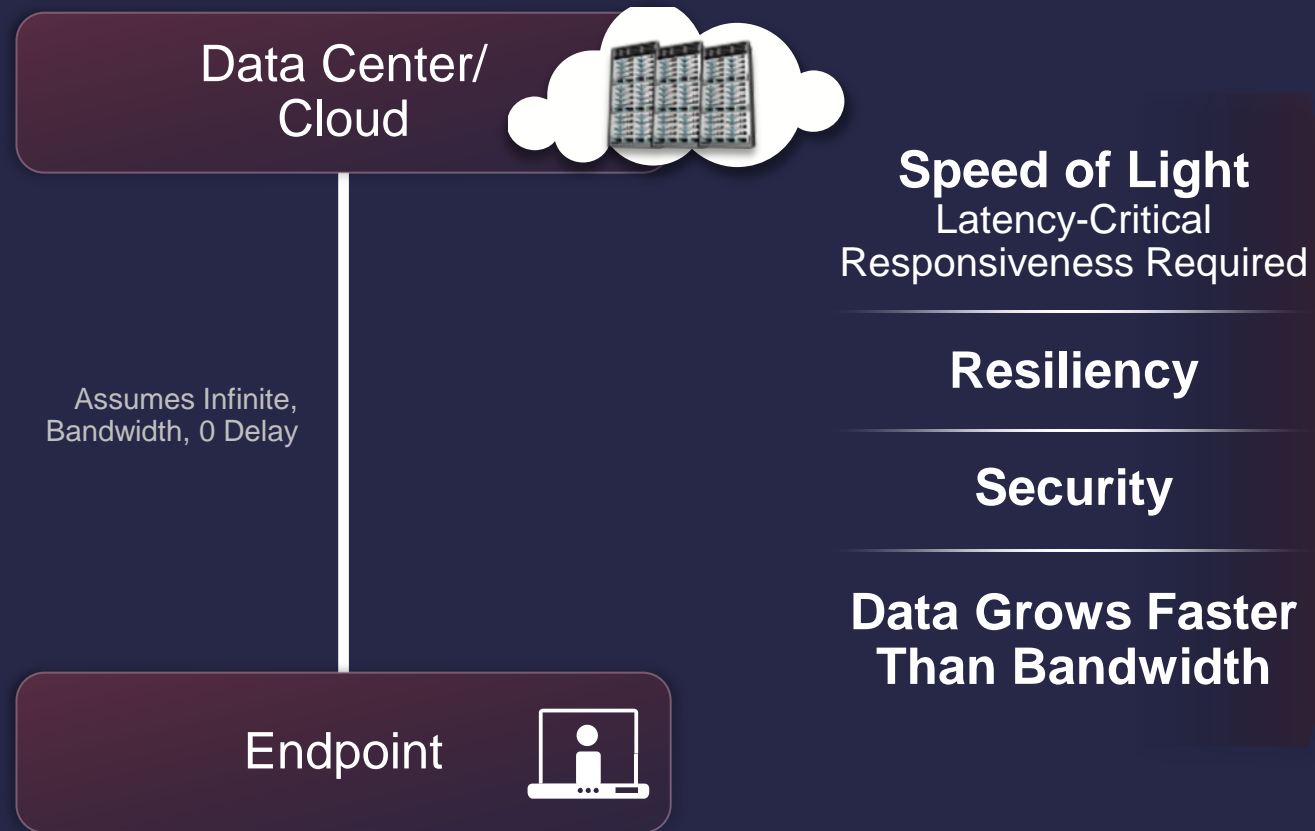
Network Management and IoT Security

Fog Computing

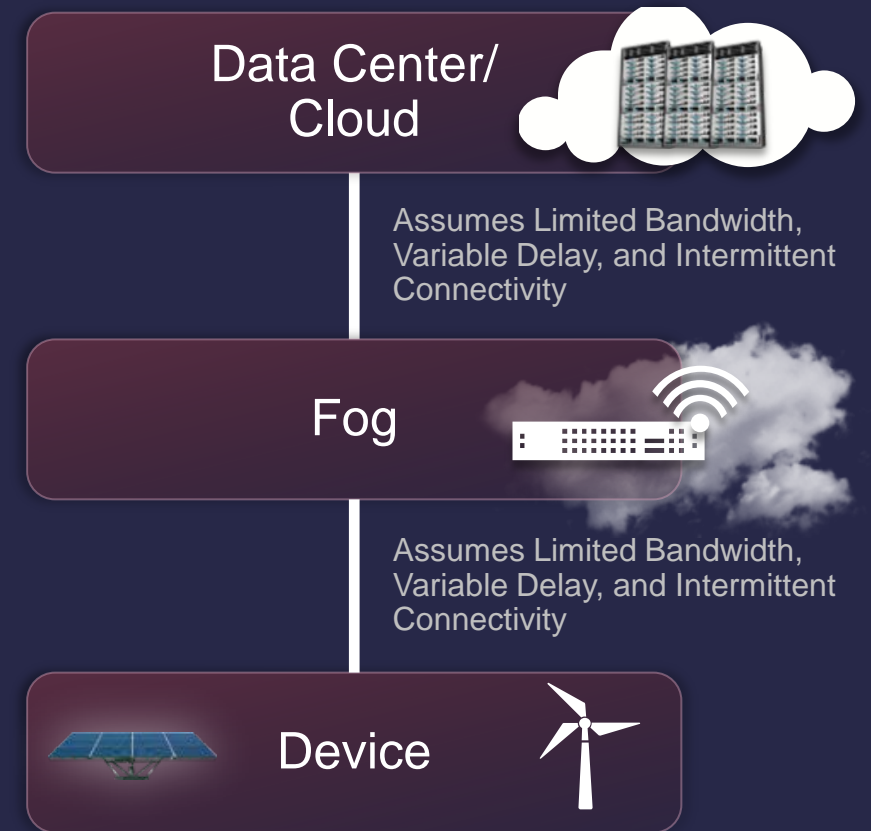
Data Center/Virtualization

Why Distribute Computing?

Traditional Computing Model (Terminal/Mainframe, Client-Server, Web)

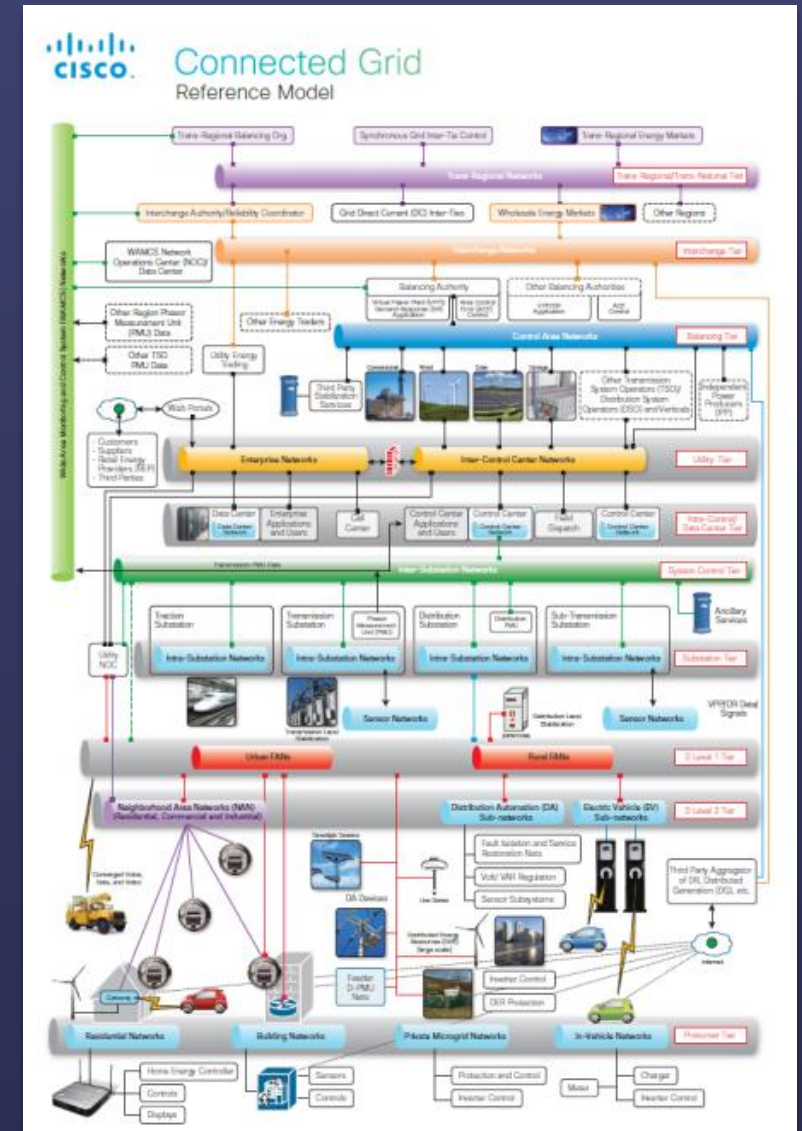


IoT Computing Model



GridBlocks™ Reference Model

- Describes the power delivery chain
- Architectures detail networking each of the eleven tiers in this model
- Results in a complete end-to-end architecture for converged power delivery chain communications
- Framework for:
 - Integrating legacy devices
 - Using existing products in new ways
 - Integrating new ecosystem partners
 - Developing new products and services
- Provides a platform for innovation



Cisco Connected Grid End-to-End Solutions

Data Center
Control Center



Transmission and
Substation Networks



Distribution
Automation



Wide Area Network / IP

Network
Management
and Security

Field Area Network



Enterprise/ICT
Inter Utility Network



Wireless
WAN



Commercial
and Industrial



Field
Workforce

Security

Pervasive Architecture-Based Secure IP Solutions

Defend

Defend Grid Operations



Threat Defense

Extend

Secure Utility Connectivity



Secure Mobility Workforce

Prevent

Prevent Loss of Critical Assets



Physical and Data Loss Prevention

Comply

Achieve Regulatory Compliance



Governance, Risk and Compliance

Securing the End-to-End Electric Power Supply Chain

Building an IoT Ecosystem

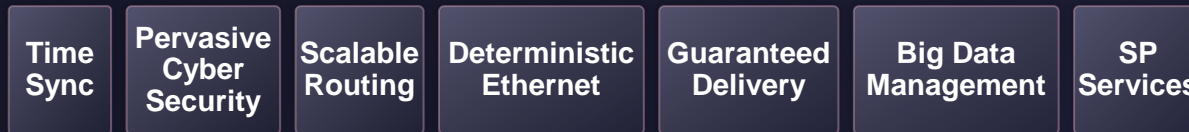
VERTICALS



INDUSTRY PARTNERS



IoT ENABLERS



RUGGEDIZED PRODUCTS



CISCO'S APPROACH TO IoT

“Customer-In” Approach

- Understanding of key business care abouts and pain points
- Relevance to LOB leaders / CXOs

Products/Technologies

- Best-in-class ruggedized products
- Smart solutions for verticals
- IoT architectures

Strategic Partnerships

- Industry partners
- Vertical software / service partners
- Service providers

Example Security in a Substation

System Health **Operational** | Weather Info | Access Gate | Statistics | Operational Mode | After Hours | Scheduler

Overview | Control room | Corridor



Open Events | All Events

Time	Type	Location	State
1:23:59 AM	Fence Zone Touch	Perimeter Sec.	New
12:58:55 AM	High Voltage Movement	High voltage	Closed
12:54:22 AM	Approaching Vehicle	Perimeter Sec.	Closed
12:53:04 AM	Approaching Vehicle	Perimeter Sec.	Closed
12:52:13 AM	Approaching Vehicle	Perimeter Sec.	Closed
12:44:13 AM	Safety Active	Perimeter Sec.	Closed
12:43:44 AM	Approaching Vehicle	Perimeter Sec.	Closed
12:24:43 AM	High Voltage Movement	High voltage	Closed

Event Details | **FOG**

Opens in Video Screen

Show Live | Show Replay

- Track the object using the cameras
- Use the PA system to communicate
- If the object remain in the site contact security

Notes

Save and Close

Smart Grid in Switzerland

- IT-side: Tele-Presence, Collaboration, BN, Data Center, ...
- Control Center: LAN Infrastructure, Security, Tele-Presence, NMS, Head-End Router, ...
- Next Generation WAN Network
 - NextGen MPLS Network replacing existing ageing SDH networks
- Substation Automation
- Distribution Automation
- (Smart Metering)
- Video, Connected Safety & Physical Security, WiFi, ...

Understanding The Operation of a Utility

Policies	IT Network	Controls Network
Priorities	<ol style="list-style-type: none"> 1. Confidentiality 2. Integrity 3. Availability 	<ol style="list-style-type: none"> 1. Availability 2. Integrity 3. Confidentiality
Types of Data Traffic	Converged network of data, voice and video	Application specific data & protocols
Access Control	Strict network authentication and access policies	Strict physical access Simple network device access
Implications of a Device Failure	Work-around or wait	Production is down (\$M's / hour ... or worse)
Threat Protection	Shut down access to detected threat	Isolate threat but keep operating
Upgrades	Automatically pushed during uptime	Scheduled during downtime

Thank you.

