Resilient Communications: Foundation for More Resilient Grid Management

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OUR GRID IS CHANGING

WHY CHANGE?

OUR VIEW OF INDUSTRY EVOLUTION

Common Priorities & Considerations for System Planning

SAFETY

GRID RELIABILITY

RAPID RESPONSE

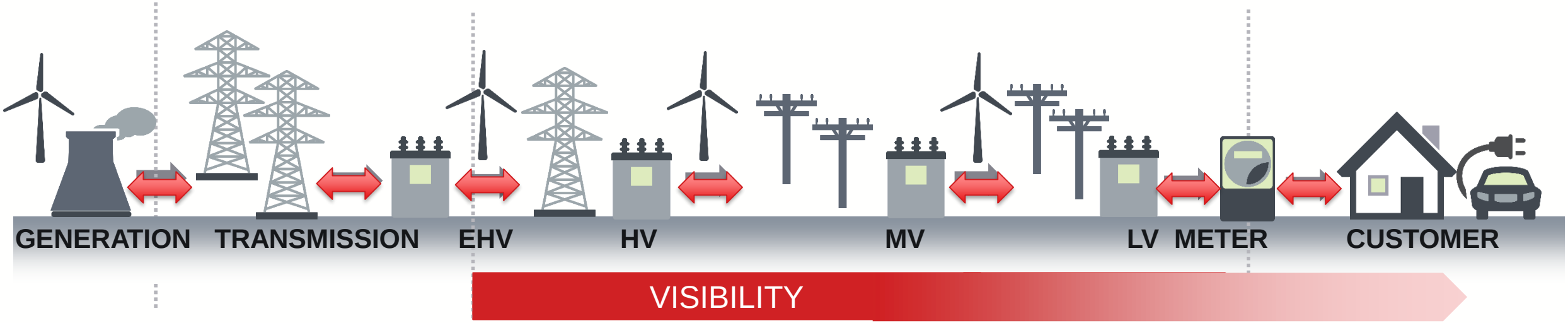
CYBER SECURITY

RENEWABLES INTEGRATION

CORE

EVOLVING

WHAT DOES THIS LOOK LIKE?



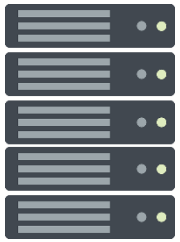
- Passive operation to active network management
- LV Networks move from “last mile” to “first mile”
- 2-Way Power Flows
- Increased variability of loads and generation with DERs
- Decarbonisation -> Decentralisation -> Digitiasation
- Commercial applications and obligations
- **Increased reliance on technology**

SMART GRID INDUSTRY JOURNEY

Principles to get from infancy to maturity

Network Applications

Data Management



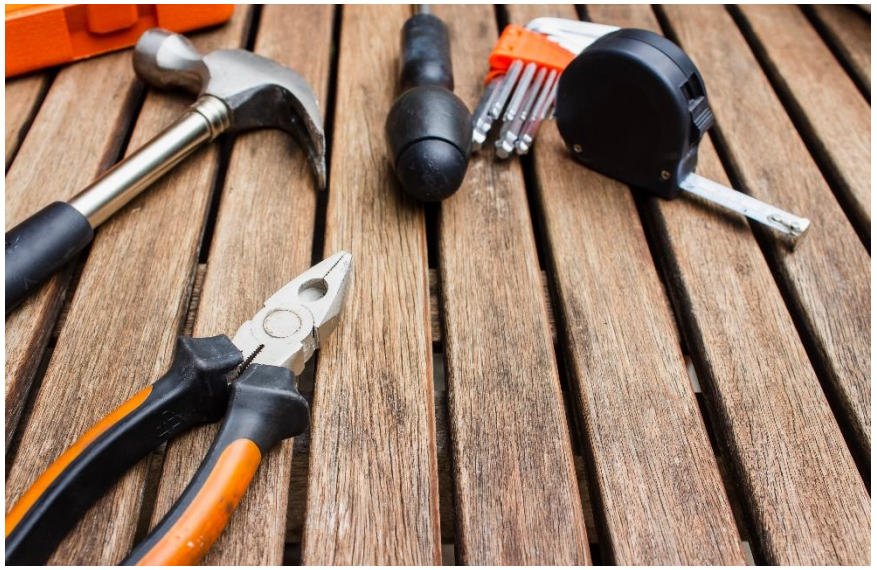
Communications

APPROACH TO APPLICATIONS

Principles to get from infancy to maturity

Solve all the issues with one Smart Grid template

Develop specific tools for specific challenges



“ENERGY INTERNET”

The Journey

» We are on a path from a predictable grid (with few monitoring and control points) to a dynamic grid (which must have many more monitoring and control points).

A Model

» The designers of the internet wanted it to withstand losses of sections of the network and still function properly.

An Architectural Construct

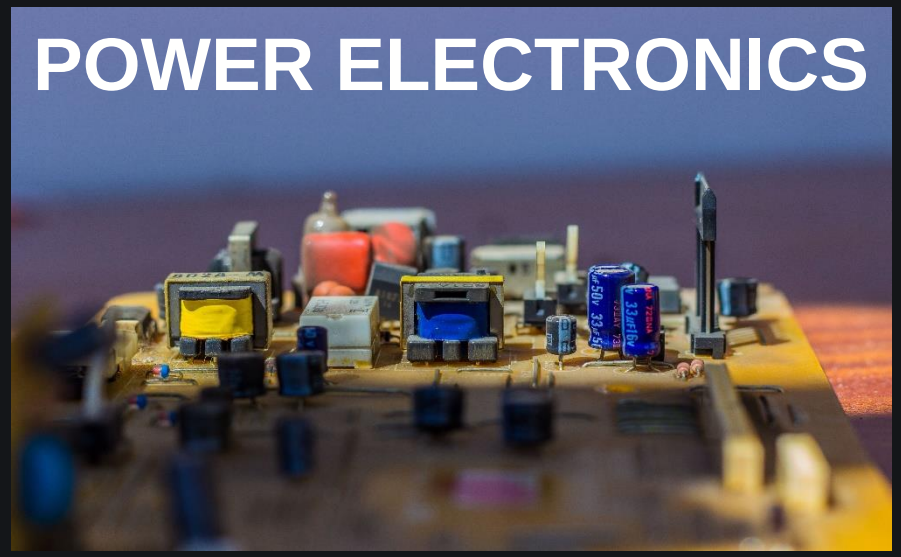
» Modular grid fabric, any sections of which may be reconfigured/islanded, to enhance resilience as broadly as possible in any given situation depending on availability of distributed energy resources (DER) and distribution capacity.

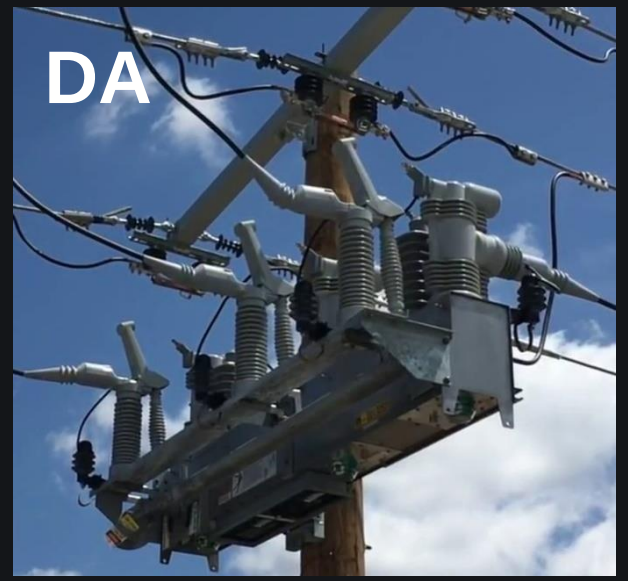

ANM


EV


CVR
100
200
300
415
0
450
GENERAL ELECTRIC
MADE IN U.S.A.
VOLTS
TYPE DD-6
VOLTS ON INST.
TERMINALS
ON SCALE
RESISTOR

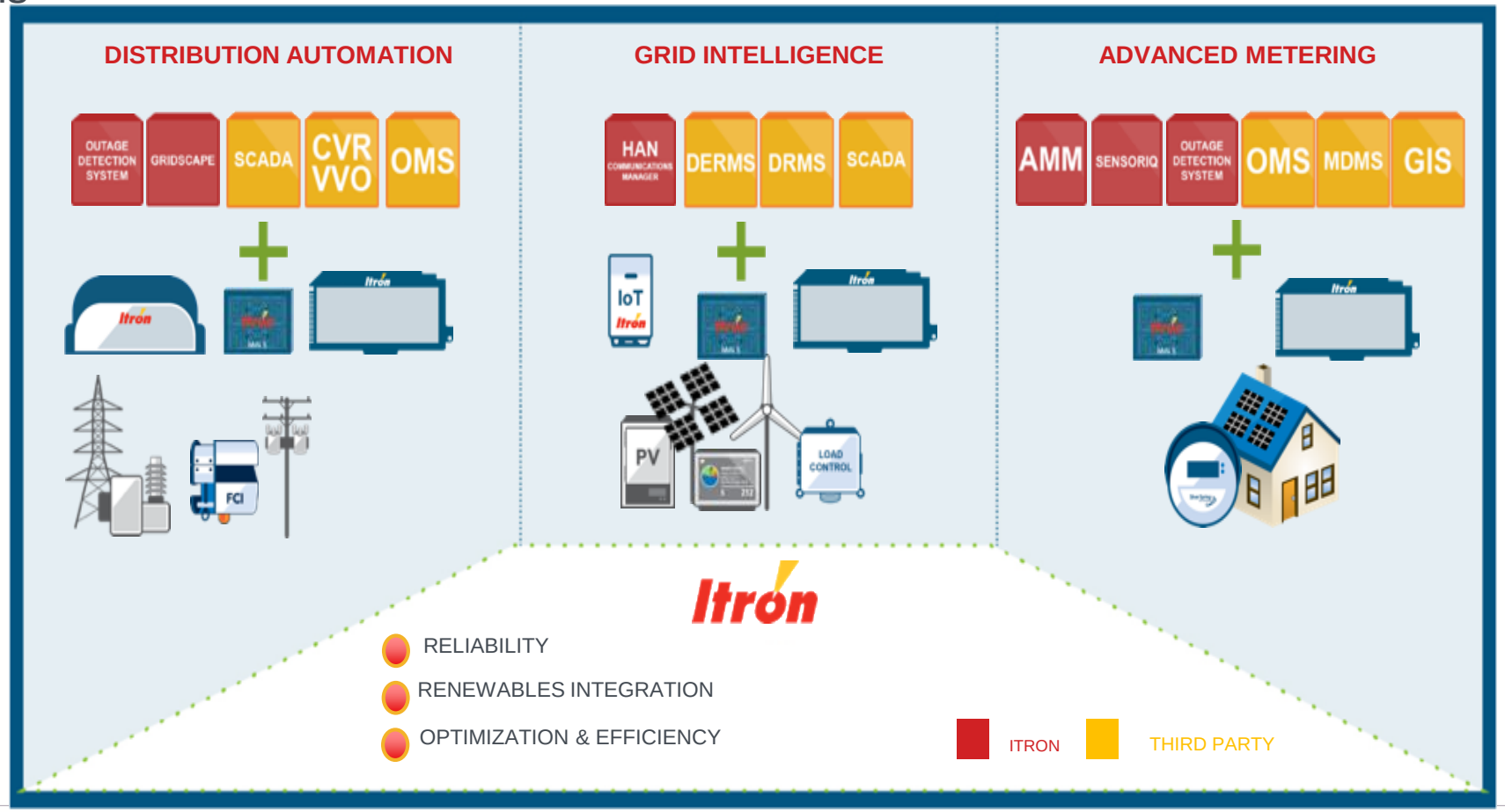

DR
SAMSUNG


POWER ELECTRONICS


DA

APPROACH TO APPLICATIONS

- Future tools and best practice may not come from traditional OEMs
- Any system need to embrace standards to allow range of applications from leading providers
- Combination of Distribution Automation, Grid Intelligence sensors and AMI data can lead to new applications



APPROACH TO DATA MANAGEMENT

Principles to get from infancy to maturity

Collect all available data and store it centrally in silos

Utilise distributed intelligence, peer to peer, report by exception and analytics

S&C ELECTRIC COMPANY

TECHNOLOGY EVOLUTION

- Manual meter reading

AMR

- Meter
- 1-way communication
- Meter centric

AMI

- Advanced meter
- 2-way communication
- Big data
- Network centric

SMART GRID

- AMI meter as sensor
- 2-way communication
- Bigger data
- Back office centric

ACTIVE GRID

- Analysis and action at the edge
- M2M learning
- Adaptive communications
- The **right** data
- Managed services and outcome deliveries
- App centric

PLATFORM REQUIREMENTS

- Decarbonise -> Decentralise -> Digitise

- Central / hybrid / de-centralized
- Many utilities will want local control (with central oversight) at some point in the next 15 years
  - When events isolate portions of the grid
- Select platforms which enable hybrid / de-centralized models by
  - Requiring peer-to-peer communications capability
  - Requiring distributed compute capability
  - Either may or may not be deployed
- Many utilities have been using some local control (with central oversight) for years with their reclosers
- Utilise analytics to drive value out of data sources.

HIGH PERFORMANCE, SCALABLE PLATFORM

FLEXIBLE & COST EFFECTIVE COVERAGE

HIGHLY SECURE & RELIABLE NETWORK

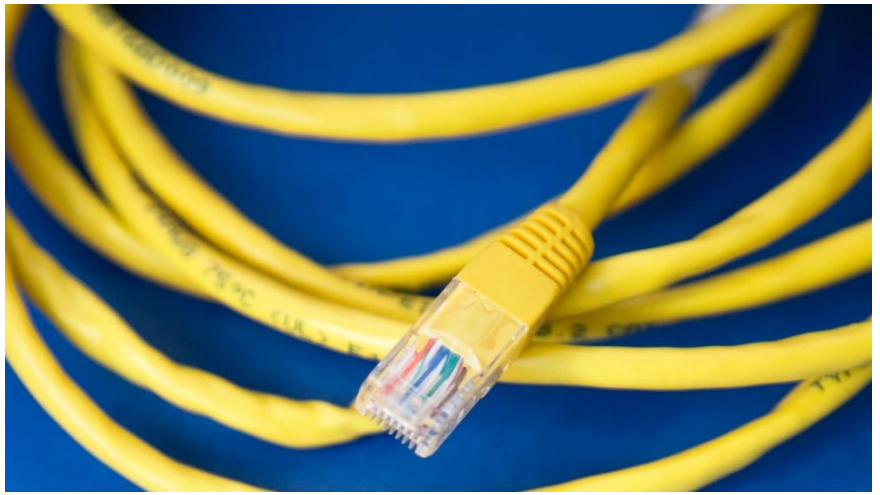
EXAMPLE – CHICAGO OUTAGES

APPROACH TO COMMUNICATIONS

Principles to get from infancy to maturity

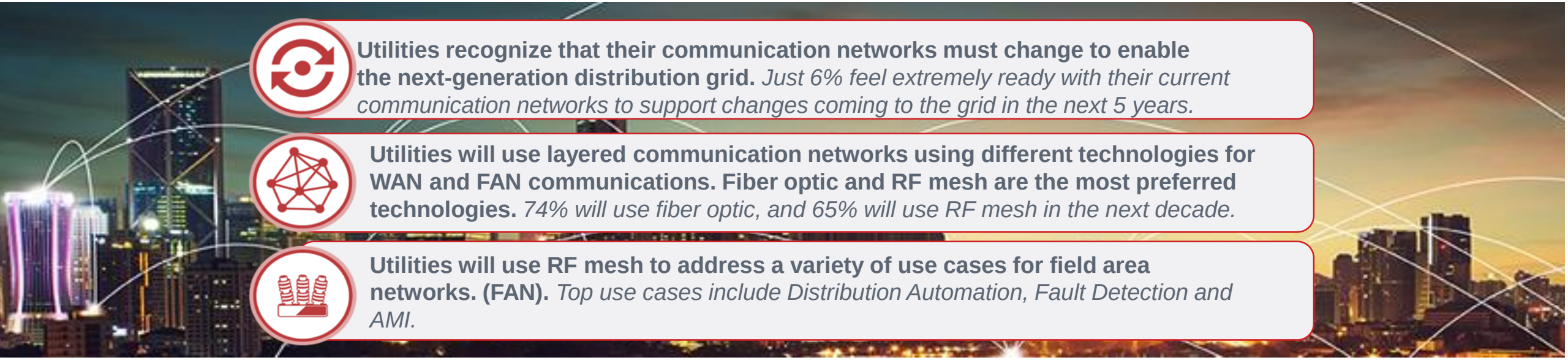
Apply most convenient communications for each application

Develop clear communications & security strategy through a platform approach



CONVERGENCE IS A GLOBAL TREND

Findings from a Recent Independent Study of Global Utilities



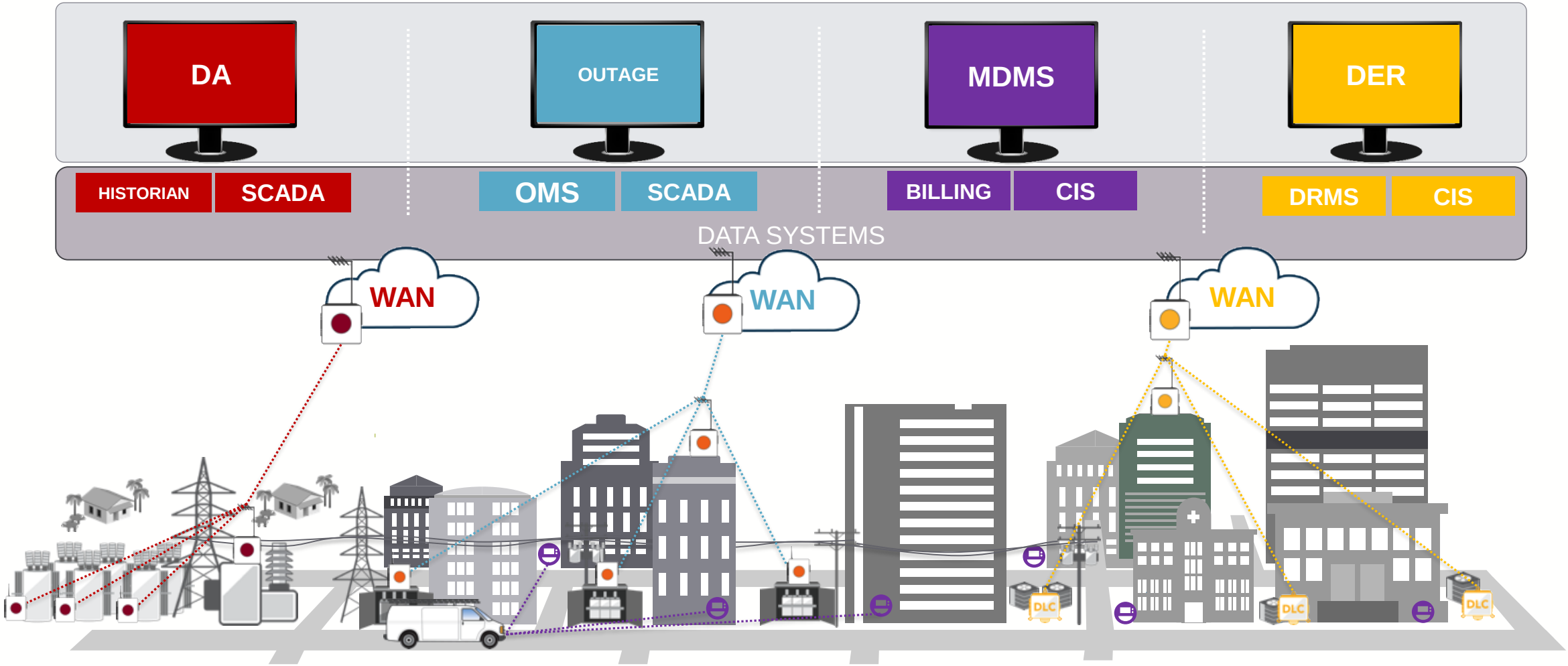
Utilities recognize that their communication networks must change to enable the next-generation distribution grid. *Just 6% feel extremely ready with their current communication networks to support changes coming to the grid in the next 5 years.*

Utilities will use layered communication networks using different technologies for WAN and FAN communications. Fiber optic and RF mesh are the most preferred technologies. *74% will use fiber optic, and 65% will use RF mesh in the next decade.*

Utilities will use RF mesh to address a variety of use cases for field area networks. (FAN). *Top use cases include Distribution Automation, Fault Detection and AMI.*

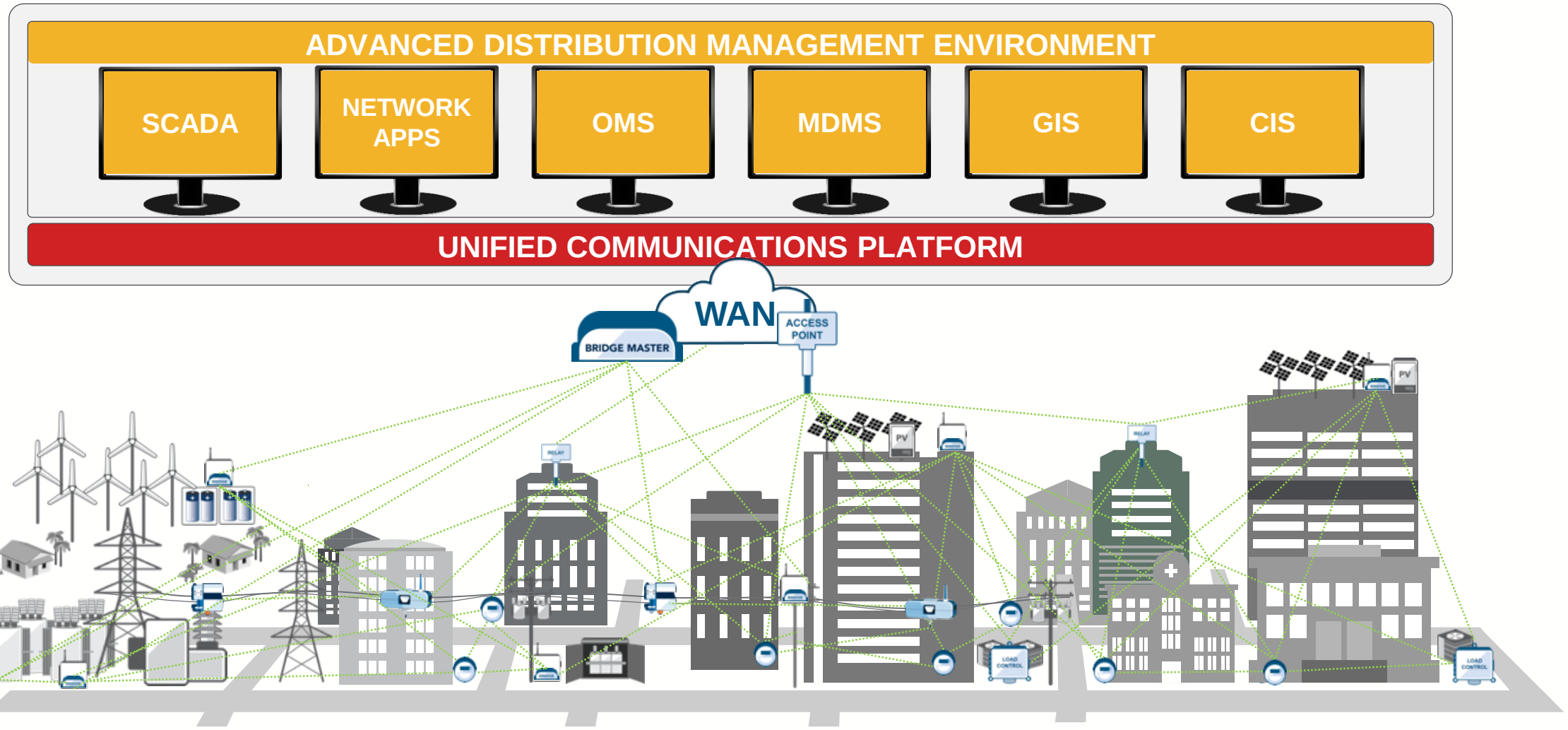
THE CHALLENGE OF LEGACY SYSTEMS

Siloed Systems are Costly and Inefficient



MODERNIZING GRID MANAGEMENT

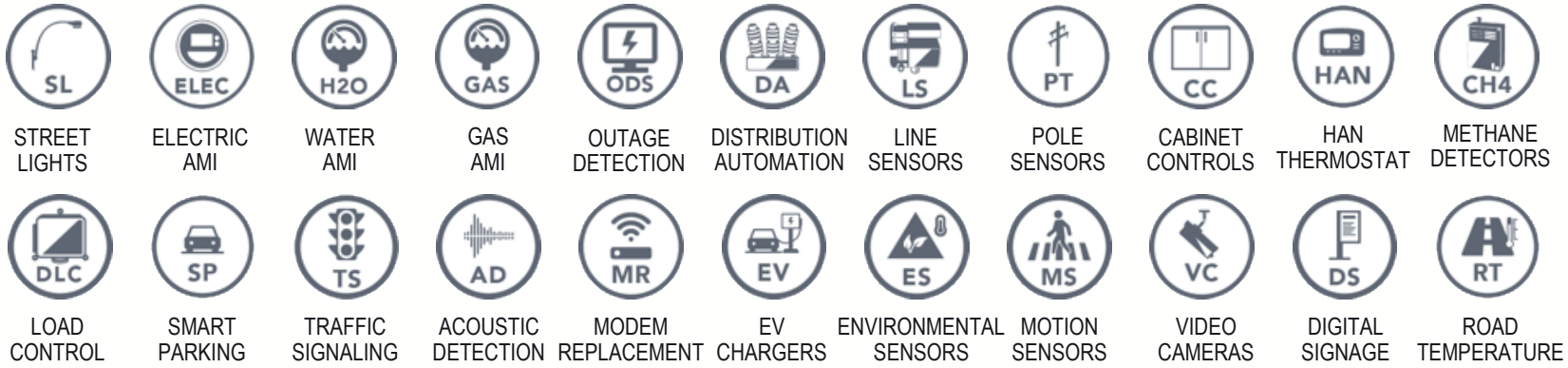
We are Evolving Towards a Unified System



FOCUS ON RESILIENCE & INDEPENDENCE

ONE PLATFORM

The Itron Multi-Application Vision



COMMS PLATFORM REQUIREMENTS SUMMARY

Must-have

- Proven in the field
- Future-proof
- Comprehensive security model
- No lock-in: open standards, active partner ecosystem
- No single point of failure
- Energy internet resilience model
- Low-latency, sufficient bandwidth
- Enables peer-to-peer

Nice to have

- Distributed intelligence
- Modular capacity

EXAMPLE – MESH OVERVIEW

SMART GRID AND IOT INDUSTRY JOURNEY

Principles to get from infancy to maturity

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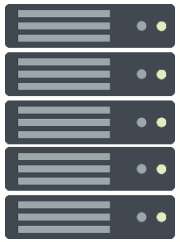

Utilise distributed intelligence, peer to peer, report by exception and analytics

Apply most convenient communications for each application

Develop clear communications & security strategy through a platform approach

SUMMARY – KEY TAKEAWAYS

Resilient Communications: Foundation for More Resilient Grid Management

- We are on a path from a predictable grid (with few monitoring and control points) to a dynamic grid (which must have many more monitoring and control points).
- We need to enhance resilience as broadly as possible in any given situation, depending on availability of distributed energy resources and distribution capacity.
  - We also have to change how we look at the new technology infrastructure platform supporting the future grid.

- **We have great challenges and great opportunities… with collaboration and foresight, we can invest well, reduce risk and make the world better for our customers and our children…**

QUESTIONS?

Thank You

INTRODUCTIONS

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Steven is a UK based Chartered Engineer with over 20 years industry experience. Following an extensive spell in Electricity Distribution, Steven joined Silver Spring Networks in 2014 as a Senior Sales Engineer. In Spring 2018, Silver Spring Networks was acquired by Itron where Steven continues his role as part of a team of independent technical specialists and EMEA market development personnel, tasked with establishing market opportunities, partnerships and educating the customers on the benefits of the Smart Metering, Smart Grid, Smart Cities and Internet of Things. He has also been responsible for EMEA business and partnership development in the Smart Grids market.

Steven holds a Masters degree in Civil Engineering from The University of Nottingham and is a Chartered Engineer through the Institution of Engineering and Technology (IET)