Industry Trends for Resilient Timing of Critical Infrastructure

A Leading Provider of Smart, Connected and Secure Embedded Control Solutions

Greg Wolff

September 2022

Time is an Essential Cybersecurity Element

Critical Infrastructures Rely on Trusted Time™

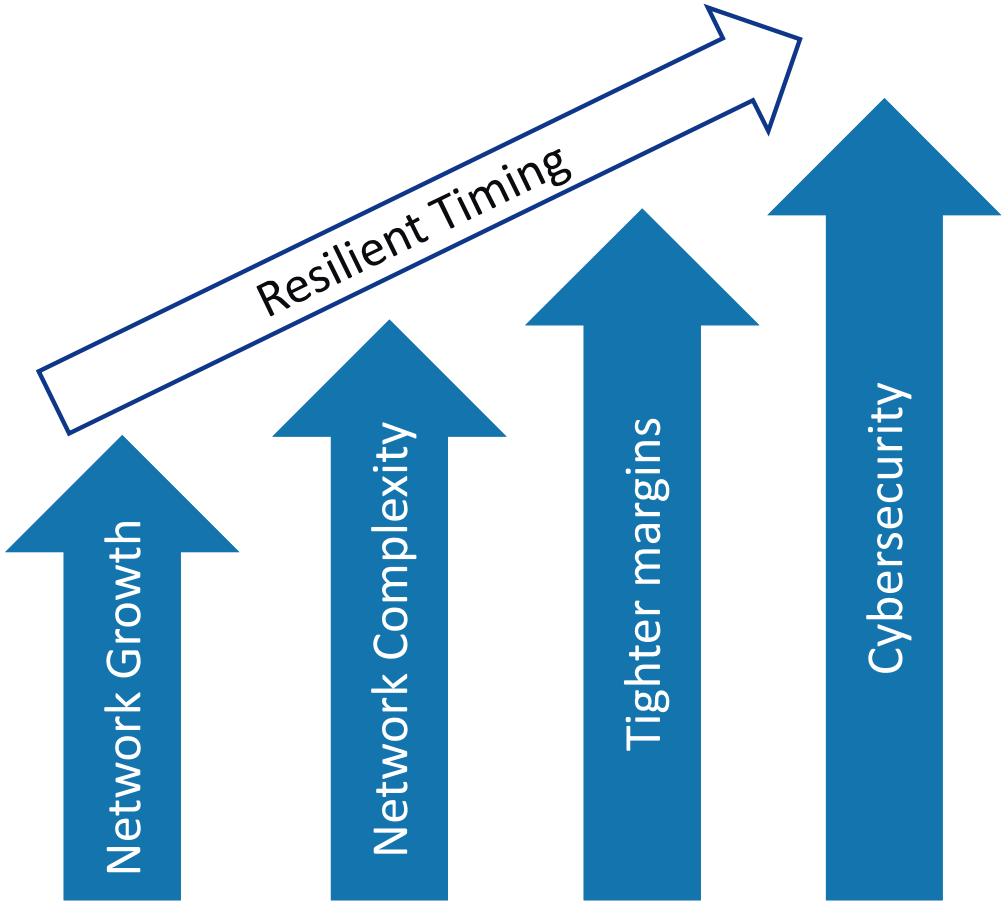
MICROCHIP

What is Driving the Need for Resilient Timing?

Critical Infrastructure is more dependent on the timing network

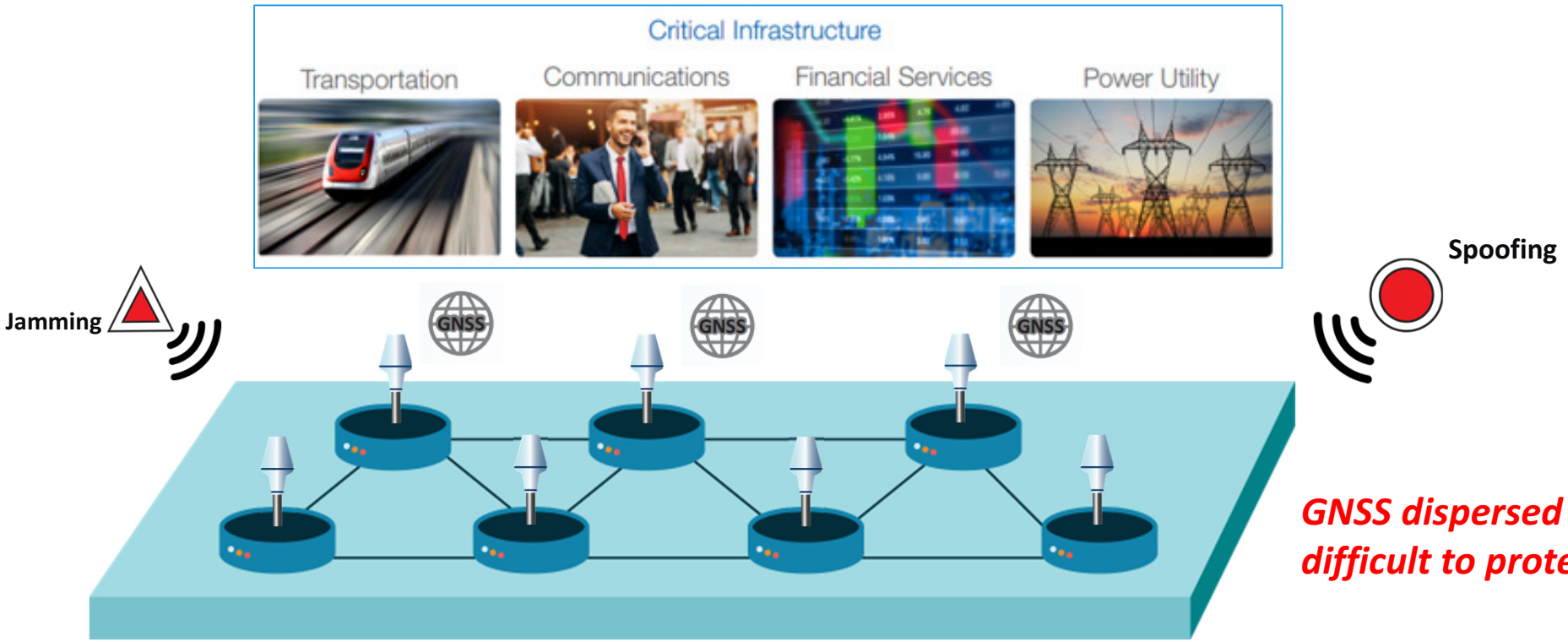
- More growth and complexity
- Tighter margins (phase/time)
- Cybersecurity threats

- Don’t blink
- You'd better be watching closely (need for visibility)



GNSS is Widely Deployed

Critical Infrastructure Dependency on GNSS is Growing

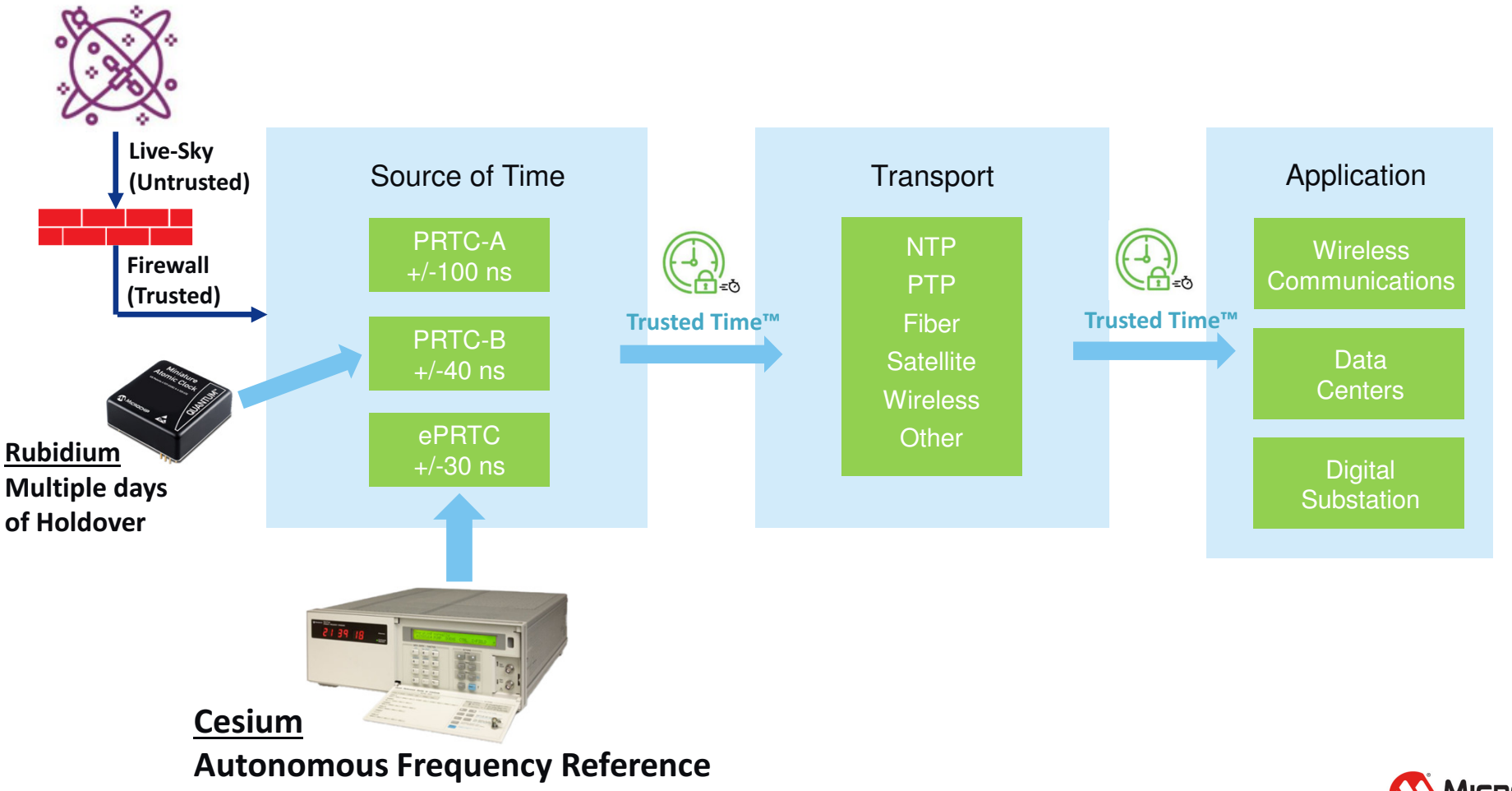


GNSS dispersed and difficult to protect

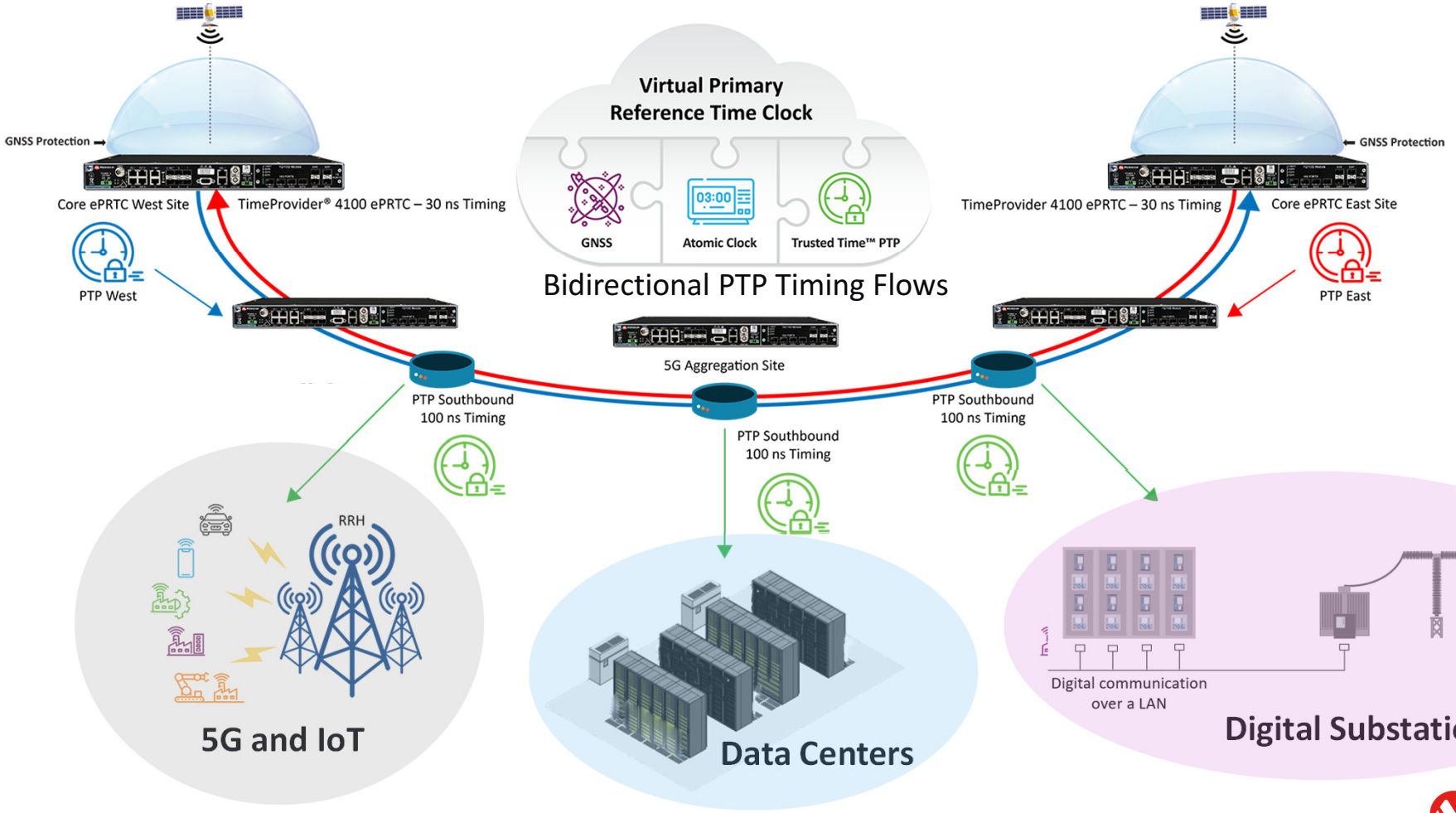
→ Vulnerable timing architecture

MICROCHIP

Trusted Time™ Distribution



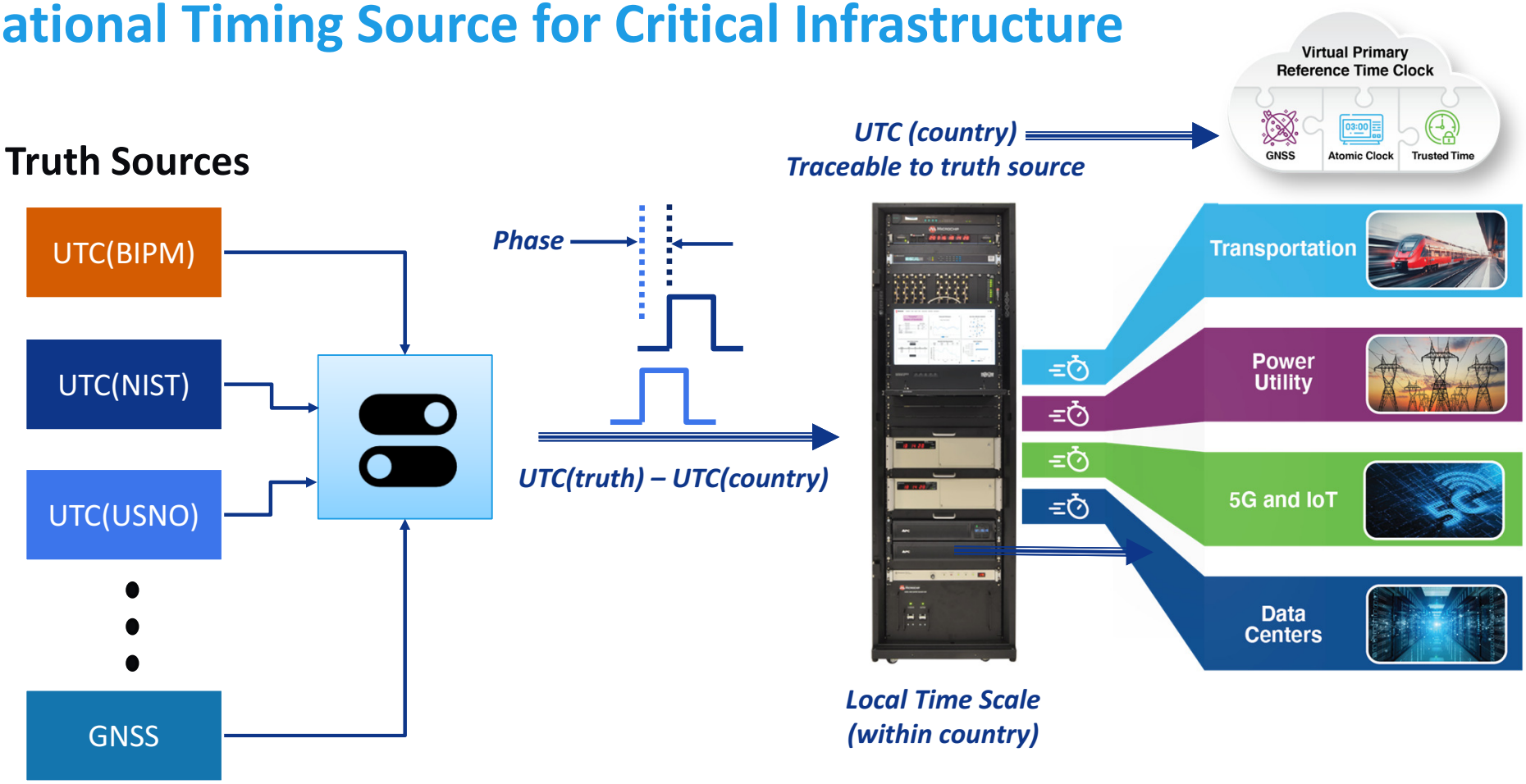
vPRTC for Resilient Timing



MICROCHIP

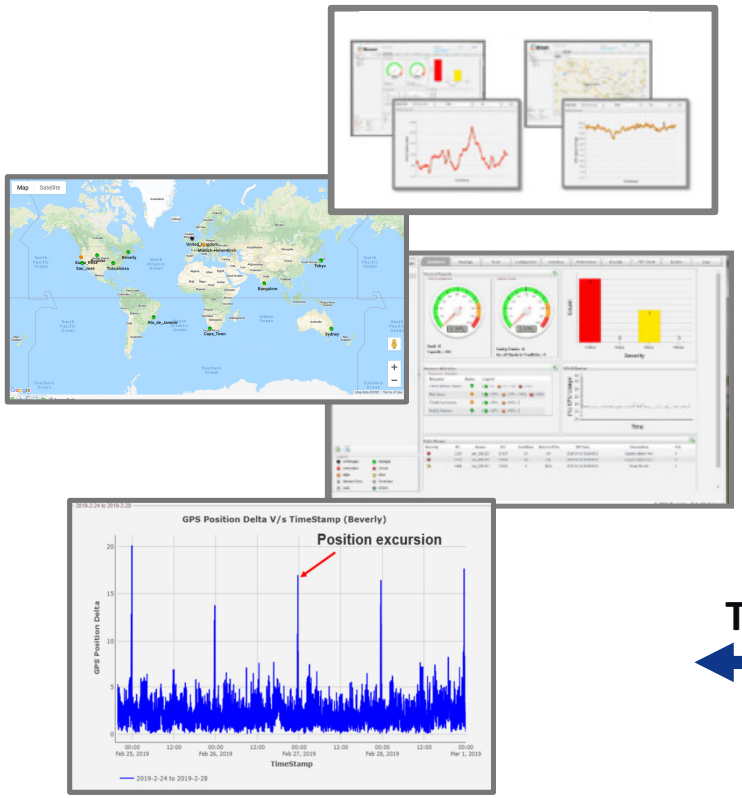
Time Scale Systems

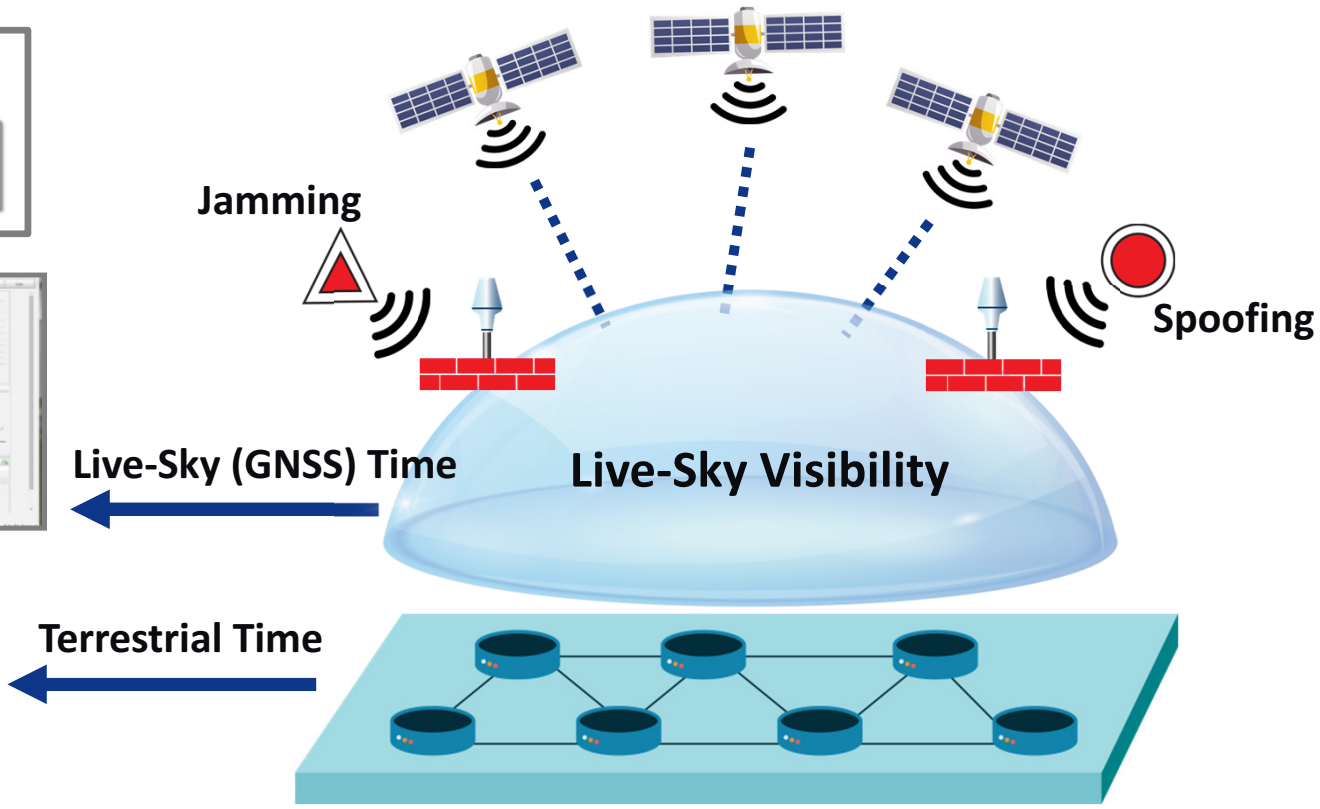
National Timing Source for Critical Infrastructure



Live-Sky (GNSS) Time + Terrestrial Time

Unified Management for Better Visibility, Security and Resiliency





MICROCHIP

Live-Sky and Terrestrial Time Observables

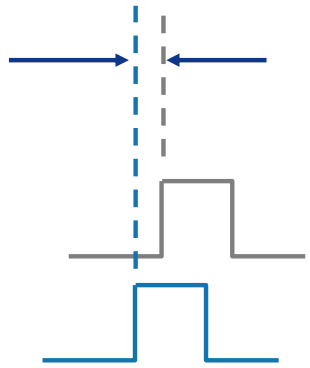
GNSS Observable	Expected Characteristic To Be Observing
Tracked Satellite Count	Are the expected number of satellites in view?
Position Dispersion	Is the position data coming from the sky moving too much relative to surveyed antenna position?
Phase Time Deviation	Is the sky received “time” moving? (suddenly, gradually, periodically, etc.?)
Carrier-to-Noise	Is the GNSS signal strength of the visible satellites in the expected range?
RF Power	Is the RF power level within expected threshold?

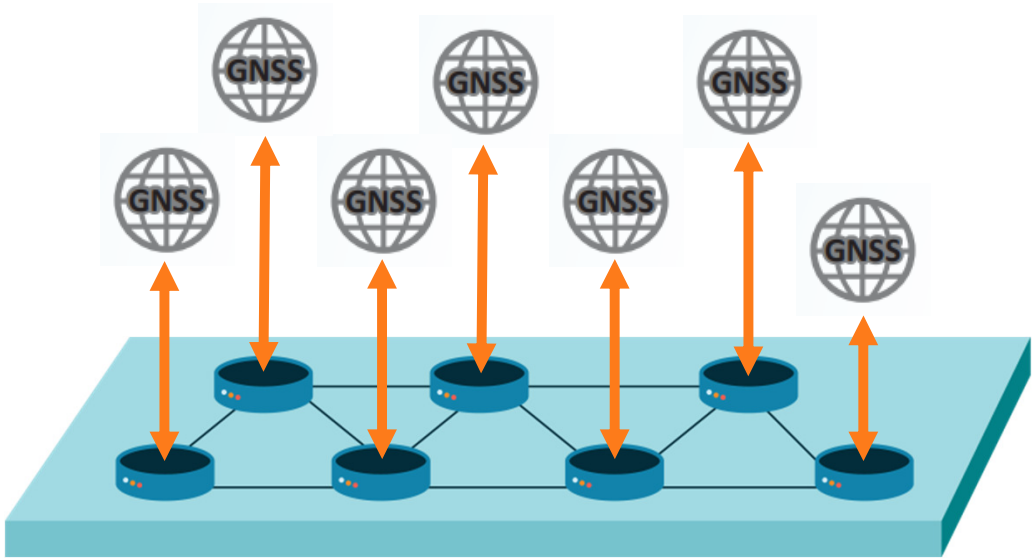
Terrestrial Time Observable	Expected Characteristic To Be Observing
MTIE – Maximum Time Interval Error	The maximum error committed by a clock under test for a given period of time.
TDEV – Time Deviation Error Variance	A standard deviation type of measurement to indicate the time instability of the timing signal.
cTE – Constant Time Error	The mean of the time error function and typically indicating the accuracy of the timing signal.
PDV – Packet Delay Variation	Akin clock Jitter, this is the time of arrival variation as timing packets traverse the network.
FPP – Floor Packet Percent	Evaluation of the PDV percent of packets that do not fall within the required phase threshold range.

MICROCHIP

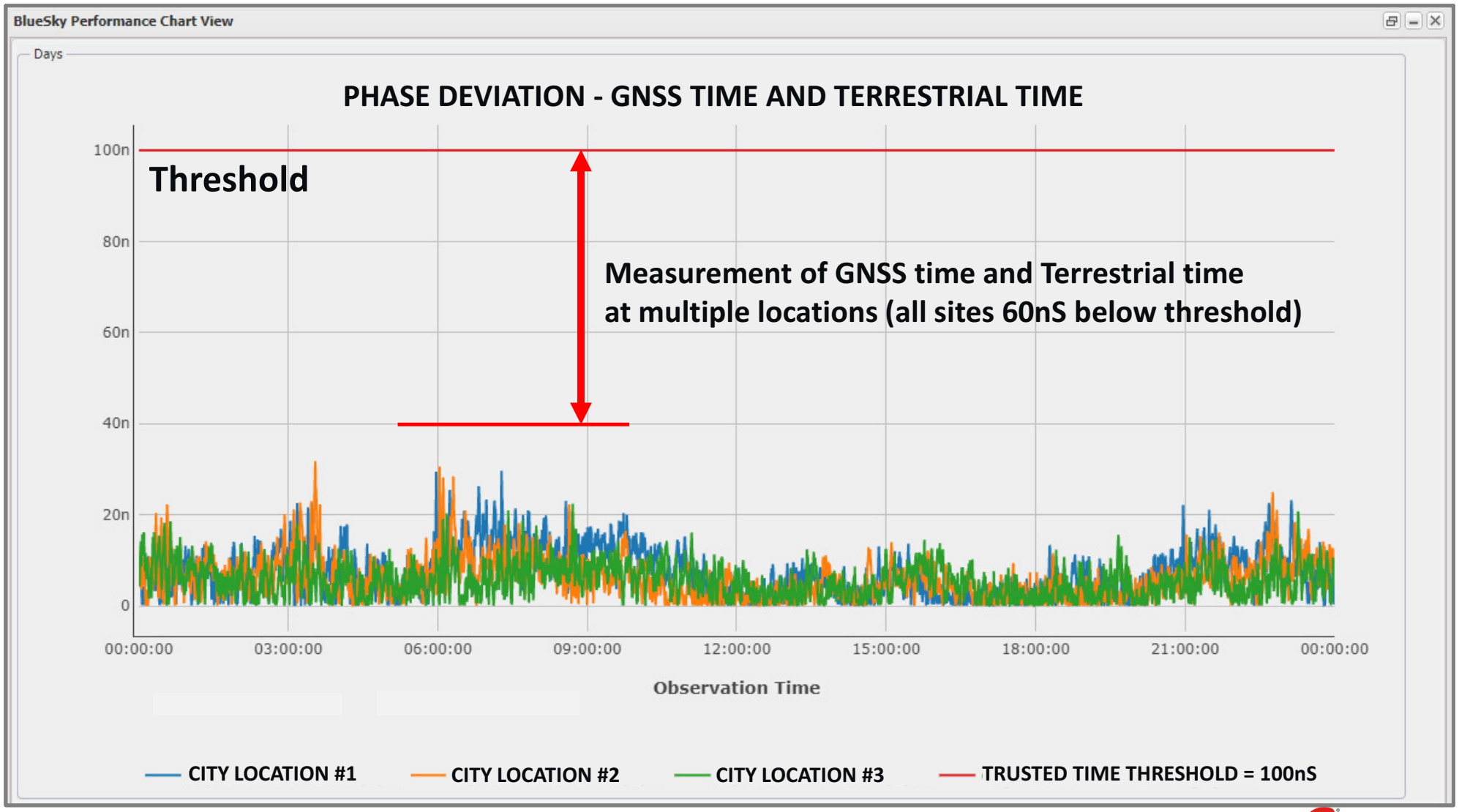
Measuring Live-Sky Time and Terrestrial Time Across the Network

Measure and compare Live-Sky and Terrestrial Time at multiple locations

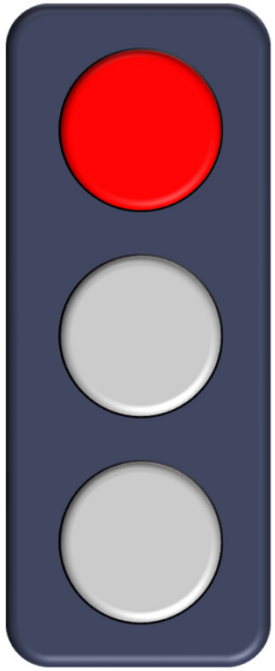




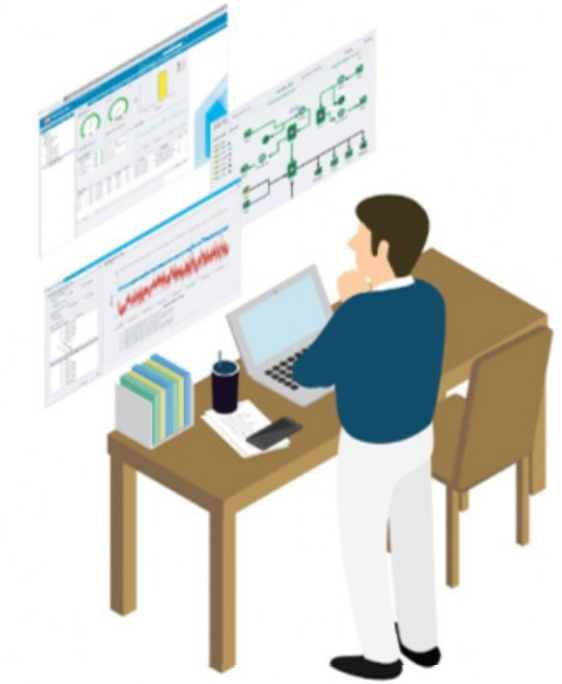
MICROCHIP



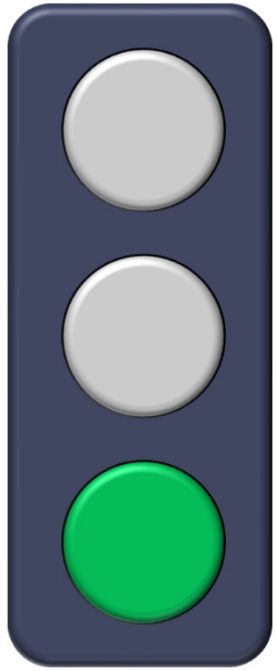
Call to Action: Take a Step Towards Resilient Timing



Real-world cases have raised awareness that significant threats exist



Take a first step with monitoring to understand and prepare



Critical infrastructure operators have a false sense of security

MICROCHIP

Thank you

Industry Trends for Resilient Timing
of Critical Infrastructure

MICROCHIP