

工业网络安全和无线网络架构

百通赫思曼

Tony.Wang

王立涛

Security & wireless product manager
APAC

2015.10.28



A Rich Heritage

- Founded by **Joseph Belden** in **1902** in **Chicago**
- A long **history of innovation** for communications technologies
- Early customers included **Thomas Edison**



Radio in the 1920s



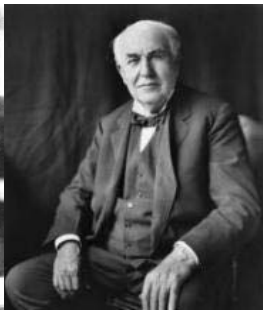
TV in the 1950s



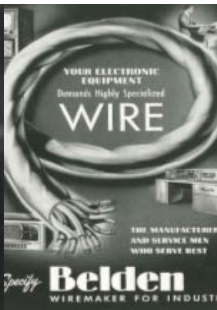
Computer Networking in the 1980s and 1990s



Joseph Belden



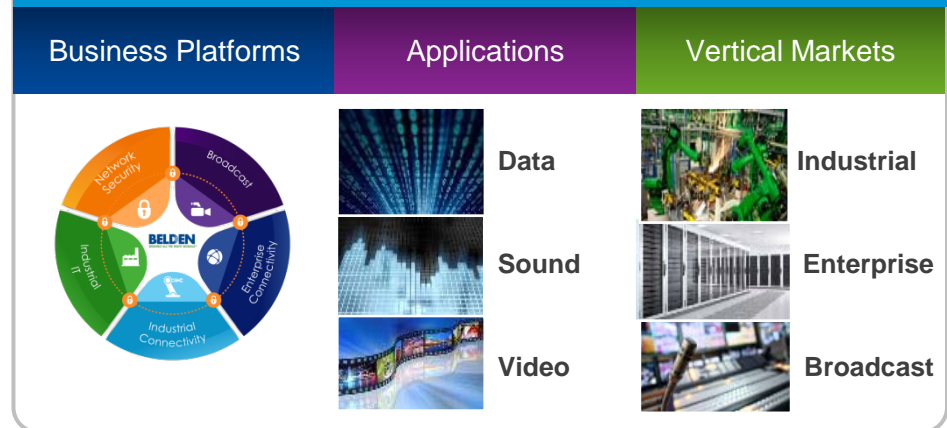
Thomas Edison



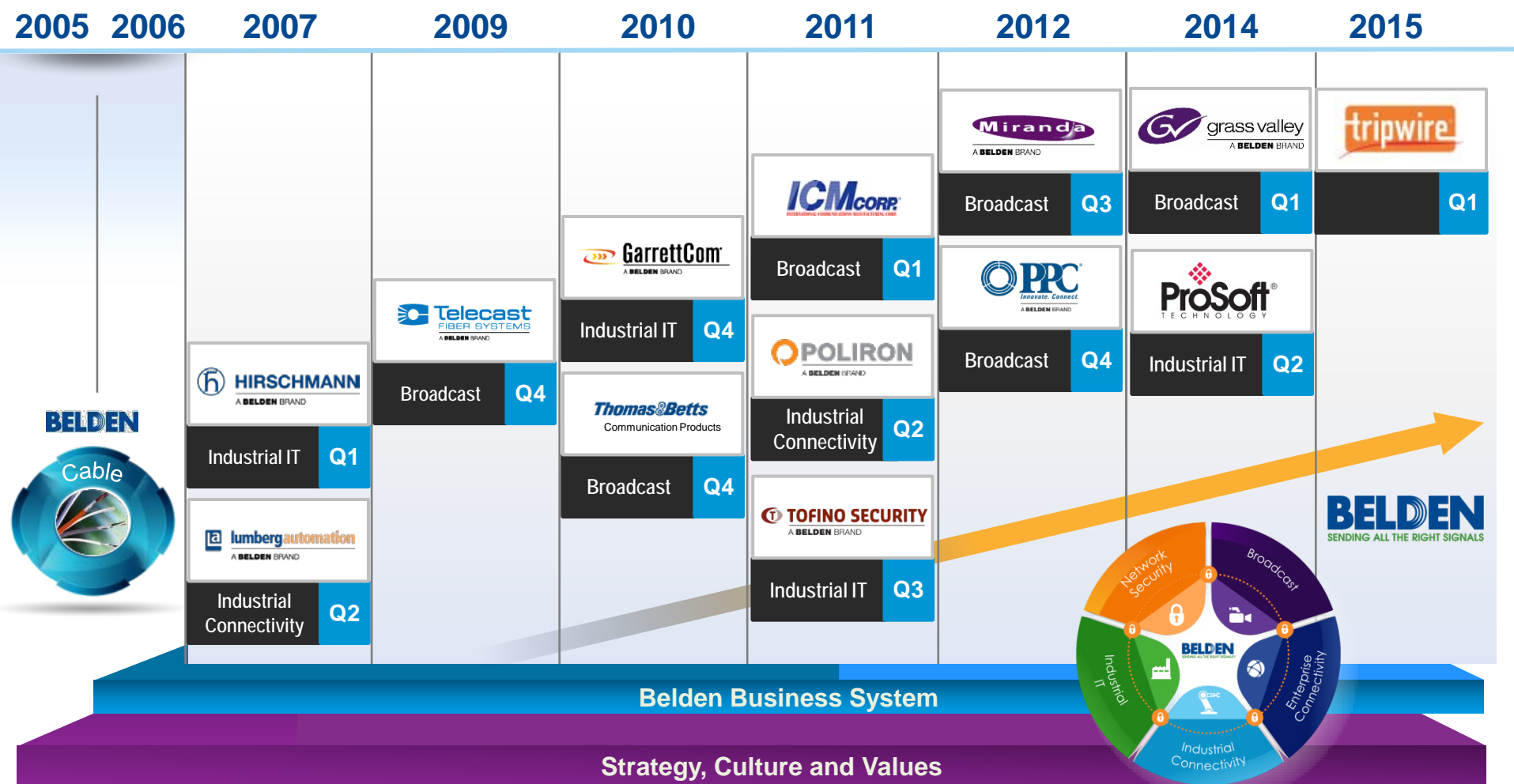
Belden Today

- John Stroup, CEO
- Headquartered in **St. Louis, MO**
- **8,500** employees
- NYSE: **BDC**
- Operations in **North and South America, Europe, Middle East, Africa and Asia Pacific**
- Revenue **\$2.31B**
- **20+** Sales Offices; **25+** Manufacturing Facilities

Delivering highly engineered signal transmission solutions for mission-critical applications in a diverse set of global markets



A Purposeful Transformation from a Cable Supplier to a Global Signal Transmission Solutions Provider



The Transformation to a Connected World

- Global advancement and efficiency is driving devices and machines to become more intelligent and connected
- A massive growth in data, audio, and video must be captured and transmitted securely and in real-time
- Belden's innovative solutions meet current and future network infrastructure demands in mature and emerging markets



Belden is at the center of this transformation, delivering innovative signal transmission solutions

Belden: Leading the Way in an Interconnected World

Customers Rely on Belden for...

Innovation

Continuous advancement of signal transmission solutions for a wide-range of enterprise, industrial and broadcast applications

Certainty

Unmatched product and manufacturing excellence for mission-critical applications

Trust

A global partner providing the network expertise and support that helps enable our customers' success



Expertise in Network Engineering, Design, Deployment and Implementation

Application Specialists



Broadcast

Lead innovator in the delivery of multi-platform and live event broadcasts, via computers, tablet devices and smart phones, as well as the traditional television set

Enterprise

Extensive infrastructure portfolio spanning data centers, LAN, building automation and physical security deployments

Industrial

Pioneers in the development of Industrial Ethernet products and security standards for networks in mission-critical applications

Security

Leader in delivering advanced threat protection, security, and compliance solutions that secure mission-critical networks






Technology Alliance Program

NERC Alliance Network



Five Business Platforms Delivering Innovative Connectivity Solutions

Broadcast	Enterprise Connectivity	Industrial Connectivity	Industrial IT	Network Security
				
<ul style="list-style-type: none"> • Routers and Interfaces • Broadcast Connectors • Broadband Connectivity • Multi-Viewers and Monitoring and Control Systems • Playout Systems 	<ul style="list-style-type: none"> • Racks and Enclosures • Copper and Fiber Connectivity • Ethernet, Fiber Optic and Coaxial Cabling • Custom Infrastructure Solutions 	<ul style="list-style-type: none"> • Connectors • Industrial Cable • Patch Cords • Distribution Boxes • Customized Connectivity Solutions 	<ul style="list-style-type: none"> • Ethernet Switches and Routers • Security Devices • Network Management Software 	<ul style="list-style-type: none"> • Vulnerability Assessment • Security Configuration Management • Log Intelligence • Analytics and Reporting
				

关于安全、工业网络安全、中国工业网络安全的思考

1. ? When 什么时候开始
2. ? What 想干什么
3. ? Who 哪些主要参与者-外资、民营、风投
4. ? Why 为什么，盘子足够大
5. ? 政策导向，有关部门---
6. ? 标准，需不需要
7. ? 自主思考（软件、硬件、外资）
8. ? 爱国主义与技术
9. ? 都觉得自己是对的

怎样保护一家银行



银行中的安全层级

- 上锁的门确保没人能在工作时间之外进入
- 钥匙确保只有授权的工作人员能打开门
- 防弹玻璃和钢筋墙壁确保只有人可以进入
- 安保人员监察不当行为
- 出纳检查账户信息和相关文件确保客户仅能进入他们被授权的账户
- 内部管控确保出纳仅能为客户利益而不是为自己利益进入账户
- 详尽的记录确保交易有据可循

控制网中的安全层级

层级	解决方案
1. 过程和策略	<ul style="list-style-type: none">• DHS, ICS-CERT, ISA, IEC, NIST• 服务供应商
2. 物理	<ul style="list-style-type: none">• 工业安全级线缆, 连接器, 机柜• 工业以太网供电交换机, 工业以太网线• 摄像头, 安装了报警系统的门, 锁等
3. 计算机	<ul style="list-style-type: none">• 防毒和白名单产品• 升级管理策略和过程• 基于角色的接入控制• 管控其他的接入点 (如: USB,光介质)
4. 控制网	<ul style="list-style-type: none">• 分区 (通过区域、管道来进行深度防护)• 交换机和路由器安全特性• 侵入检测• 记录&报警
5. 自动化设备	<ul style="list-style-type: none">• 配置并升级任何需要的 (关闭不用的服务, 设置密码等)

控制网中的安全层级（百通方案：红色）

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2. 物理	<ul style="list-style-type: none">• 工业安全级线缆，连接器，机柜• 工业以太网供电交换机，工业以太网线• 摄像头，安装了报警系统的门，锁等
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整体工业网络安全系统

Policy / Procedure

- ✓ Belden & service providers
- Government & Standards groups



Physical

- ✓ Industrial security-specific wire, cable, cabinet, connectors
- ✓ Industrial PoE switches & Industrial Ethernet cable
- Cameras, keypads, alarmed doors, locks, etc.



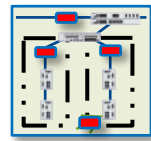
Computer

- Antivirus / whitelist products (with customization)
- Patch management policy & procedures
- Control other entry points (USB, optical media)



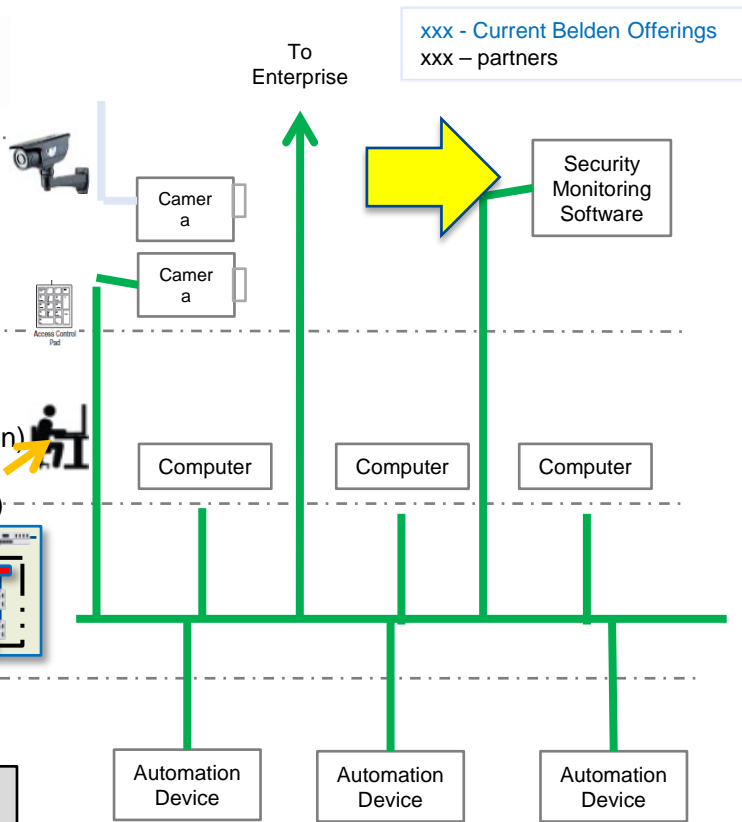
Network

- ✓ Segmentation
- ✓ Switch & Router features
- ✓ Firewalls / Appliances



Automation Device

- ✓ Network and/or firewall security
- Control other entry points (USB, alternate nets)



整体工业网络安全系统 - 政策、策略、过程

Policy / Procedure

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- Government & Standards groups



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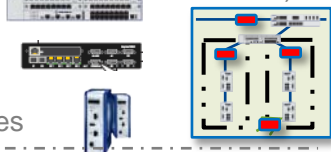
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FERC / NERC CIP

FERC: 联邦能源控制委员会

NERC CIP:

北美电力可靠性委员会 关键基础设施保护

ANSI/ISA-99 工业控制系统安全标准

IEC 62443 工业通信网络 网络与系统安全

MUSIC

工信部
公安部
安全局
保密局
国信评
网信办
大企业

整体工业网络安全系统 - 物理连接的安全性

Policy / Procedure

- ✓ Belden & service providers
- Government & Standards groups



Physical

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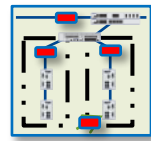
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工业级品质的安全缆、连接器、机柜、工业以太网线缆。

SENDING ALL THE RIGHT SIGNALS!

BELDEN

HIRSCHMANN
A BELDEN BRAND


lumbergautomation
A BELDEN BRAND

POLIRON
A BELDEN BRAND

MOHAWK
Cabling Excellence for Open Architecture

AlphaWire

整体工业网络安全系统 - 物理连接的安全性



- 圆形连接器
(传感器/执行器, 数据和电源):
 - M8 (一百万兆) / M12 (微型)
 - 7/8" (迷你) / M23
- 弯角连接器
- 工业连接器
- ASB 系列
 - 可插
 - 固定控制电缆
- LioN 系列
 - 标准尺寸
 - 独立标准
- 工业以太网/现场总线网络/协议电缆
- 变频驱动电缆
- 传感器, 仪器仪表和控制电缆消防报警系统
- 定制电缆
- 定制连接器
- 定制 I/O 模块 (主动/被动)
- 定制接口解决方案

Logos: HIRSCHMANN, lumberg automation, BELDEN, POLIRON, AlphaWire

结合领先品牌优势, 创造您所需解决方案

整体工业网络安全系统 - 服务器、操作系统、防病毒

Policy / Procedure

- ✓ Belden & service providers
- Government & Standards groups



Physical

- ✓ Industrial security-specific wire, cable, cabinet, connectors
- ✓ Industrial PoE switches & Industrial Ethernet cable
- Cameras, keypads, alarmed doors, locks, etc.



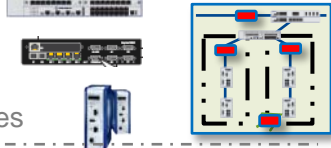
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Network

- ✓ Segmentation
- ✓ Switch & Router features
- ✓ Firewalls / Appliances



Automation Device

- ✓ Network and/or firewall security
- Control other entry points (USB, alternate nets)



防病毒
操作系统
控制服务器
数据库
补丁
控制点
USB

整体工业网络安全系统 - 优化网络设计

Policy / Procedure

- ✓ Belden & service providers
- Government & Standards groups



Physical

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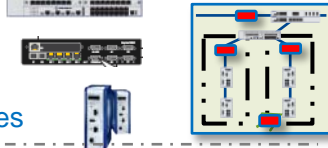
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Automation Device

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安全的网络设计
工业路由
工业安全型交换机
工业防火墙



整体工业网络安全系统

--- 赫思曼安全型交换网络系统

WLAN

Hirschmann™ 工业环境下WLAN技术的领先供应商



Cyber Security

Hirschmann™ 为各种关键应用系统提供完善的安全解决方案



HiVision

Hirschmann™ 有线、无线以太网系统的统一规划、监控和管理平台



High Availability Technology

Hirschmann™ 工业以太网高可靠技术的领导者
MRP, HIPER-Ring, RSTP



Embedded Ethernet Technology

Hirschmann™ 使各种实时以太网技术简单集成到自动化设备中成为可能

Profinet IO
EtherNet/IP
EtherCat
SERCOS III



整体工业网络安全系统

— 赫思曼安全型工业交换机



RSP



MSP (MICE Switch Power)



整体工业网络安全系统 - 控制系统安全-TOFINO

Policy / Procedure

- ✓ Belden & service providers
- Government & Standards groups



Physical

- ✓ Industrial security-specific wire, cable, cabinet, connectors
- ✓ Industrial PoE switches & Industrial Ethernet cable
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Tofino Security Appliance

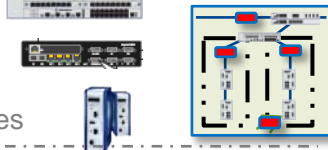
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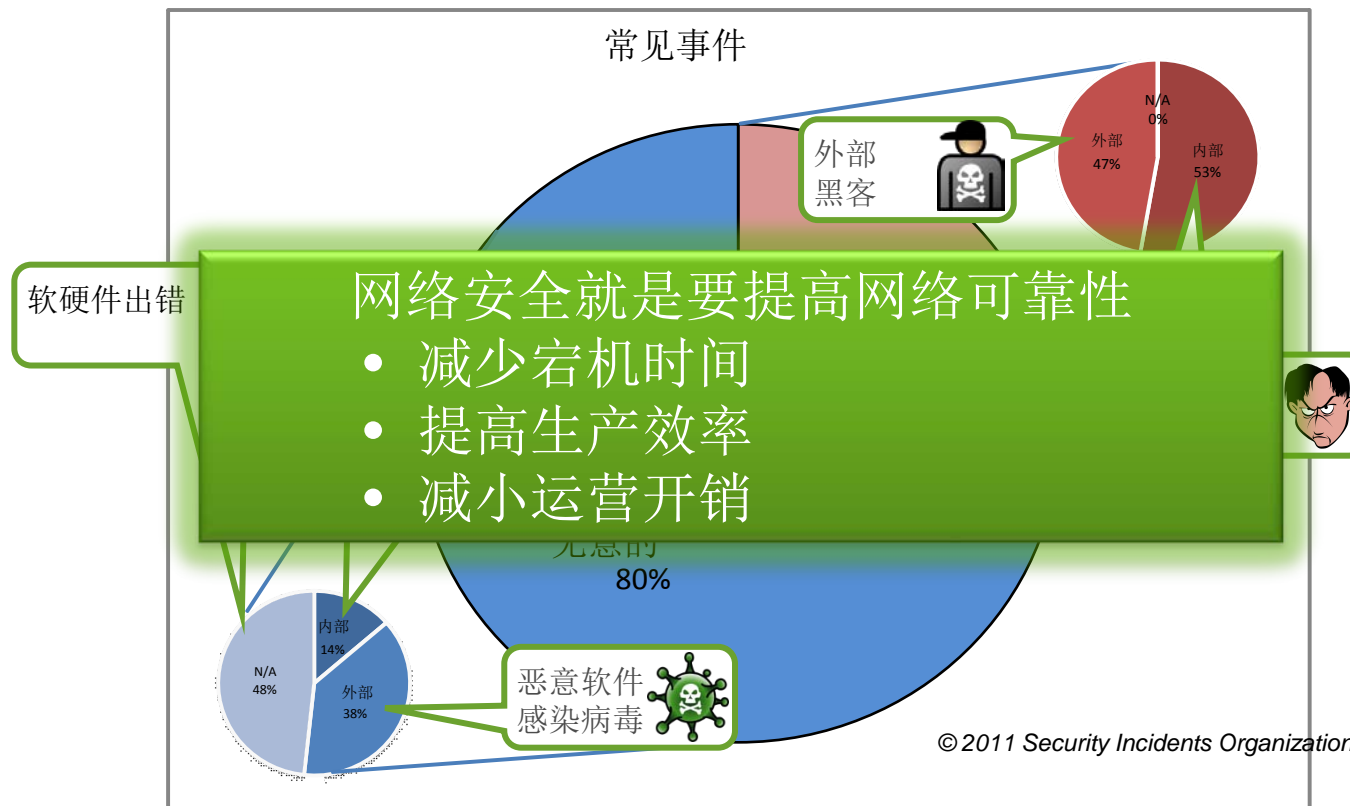
Automation Device

- ✓ Network and/or firewall security
- Control other entry points (USB, alternate nets)



整体工业网络安全系统

--- 控制系统安全事件的种类



整体工业网络安全系统

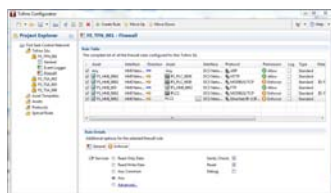
--- 工业控制系统安全- TOFINOXE

TOFINO SECURITY
A BELDEN BRAND



整体工业网络安全系统

--- 工业控制系统安全-TOFINO™Xe



什么是 TofinoXe?

- 为工业自动化专业设计的网络安全系统
- **Predefined templates for:**
 - > 50 多种工业通信协议
 - > 25 个系列工业控制器
- 提供“深度防御”
 - 网络区域&渠道安全
- **FERC / NERC CIP**
- 联邦能源控制委员会
- 北美电力可靠性委员会 关键基础设施保护
- **ANSI/ISA-99** 工业控制系统安全标准
- **IEC 62443** 工业通信网络 网络与系统安全

整体工业网络安全系统

--- 工业控制系统安全-TOFINO™Xe



TofinoXe

- 白名单方式, 无IP
- Enforcer LSM :
 - > 标准防火墙控件
 - > OPC Classic Enforcer
 - > Modbus TCP Enforcer
 - > Ethernet/IP Enforcer
 - > Profinet、DNP3、IEC61850 --- ---
多种工业协议, 自定义模板

多种模式:

- 透明模式
- 测试模式
- 运行模式
- USB/网络模式

整体工业网络安全系统

--- 工业控制系统安全-TOFINO™Xe

工业现场能力

- -40°C to +70°C

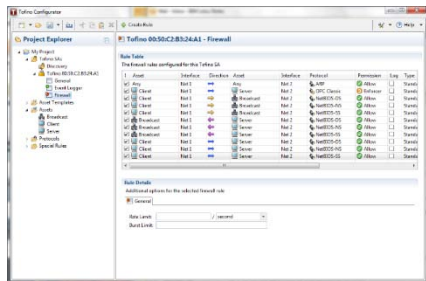
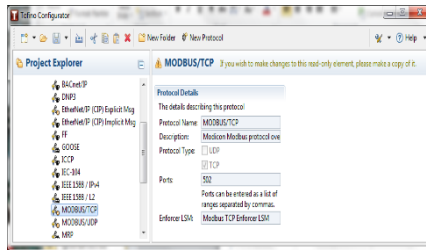
符合广泛的工业行业标准:

- – Energy sector: IEC 61850-3, IEEE 1613
- – Hazardous areas: ATEX, ISA-12.12.01 Class 1 Div. 2
- – Transport sector: EN 50121-4
- – Shipping: Germanischer Lloyd

优越的兼容性

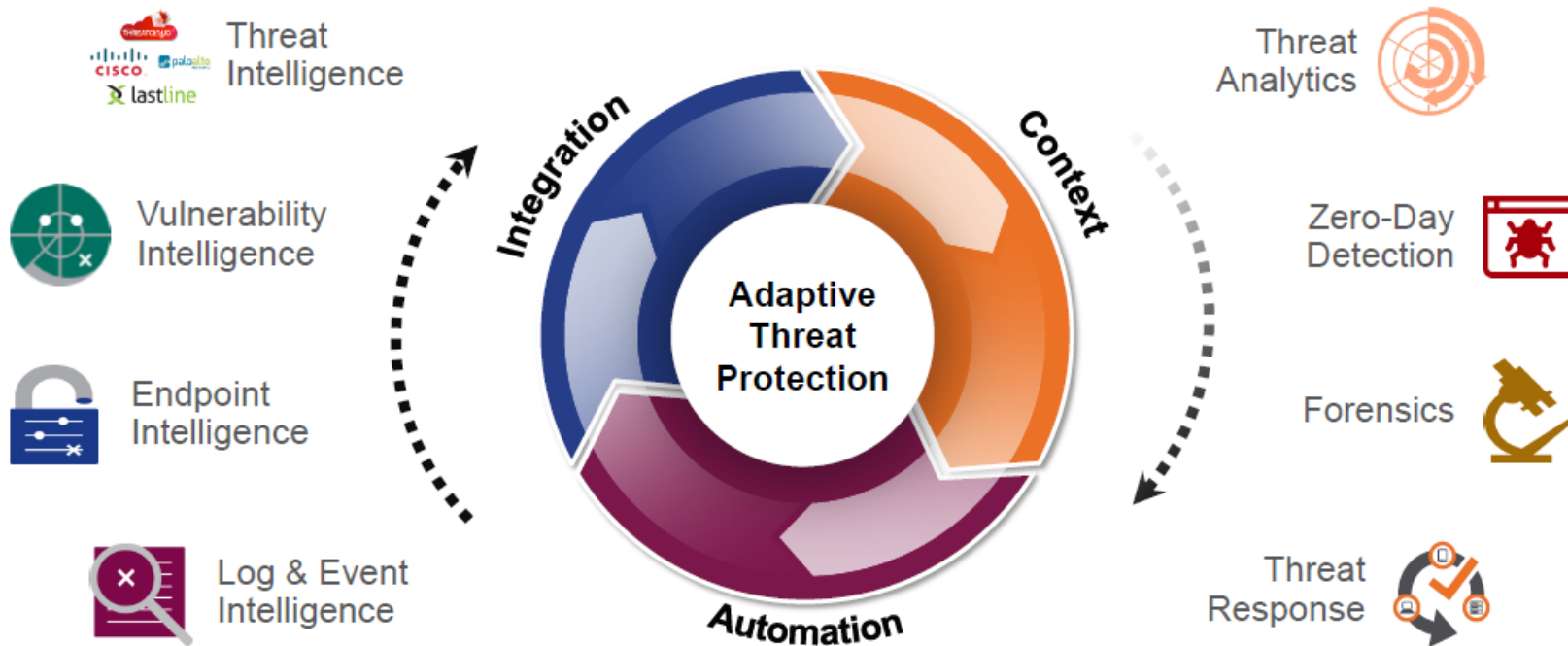
兼容所有标准网络设备

Hirschmann™, GarrettCom™



整体工业网络安全系统

--- 网络安全新理念-Tripwire

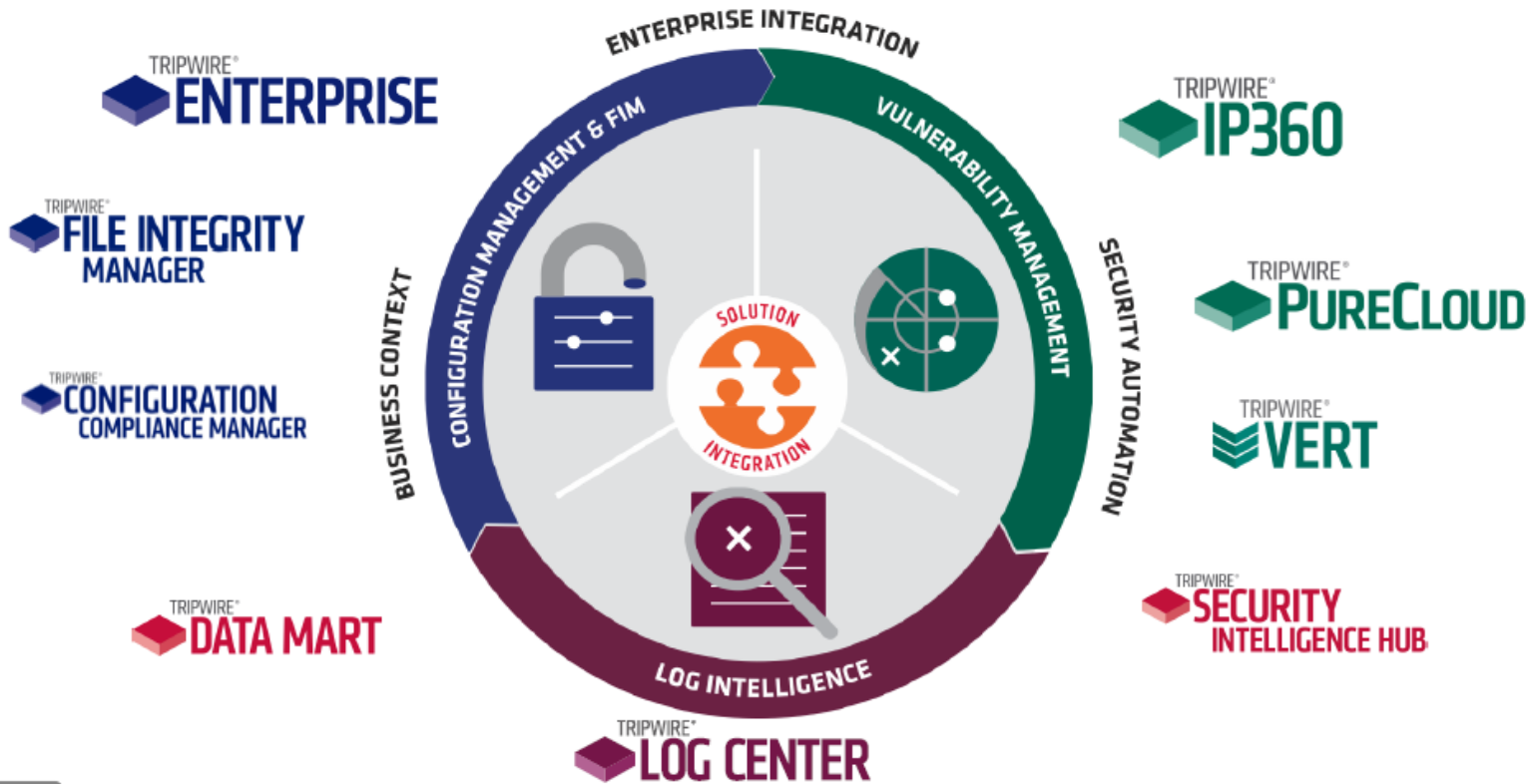


整体工业网络安全系统

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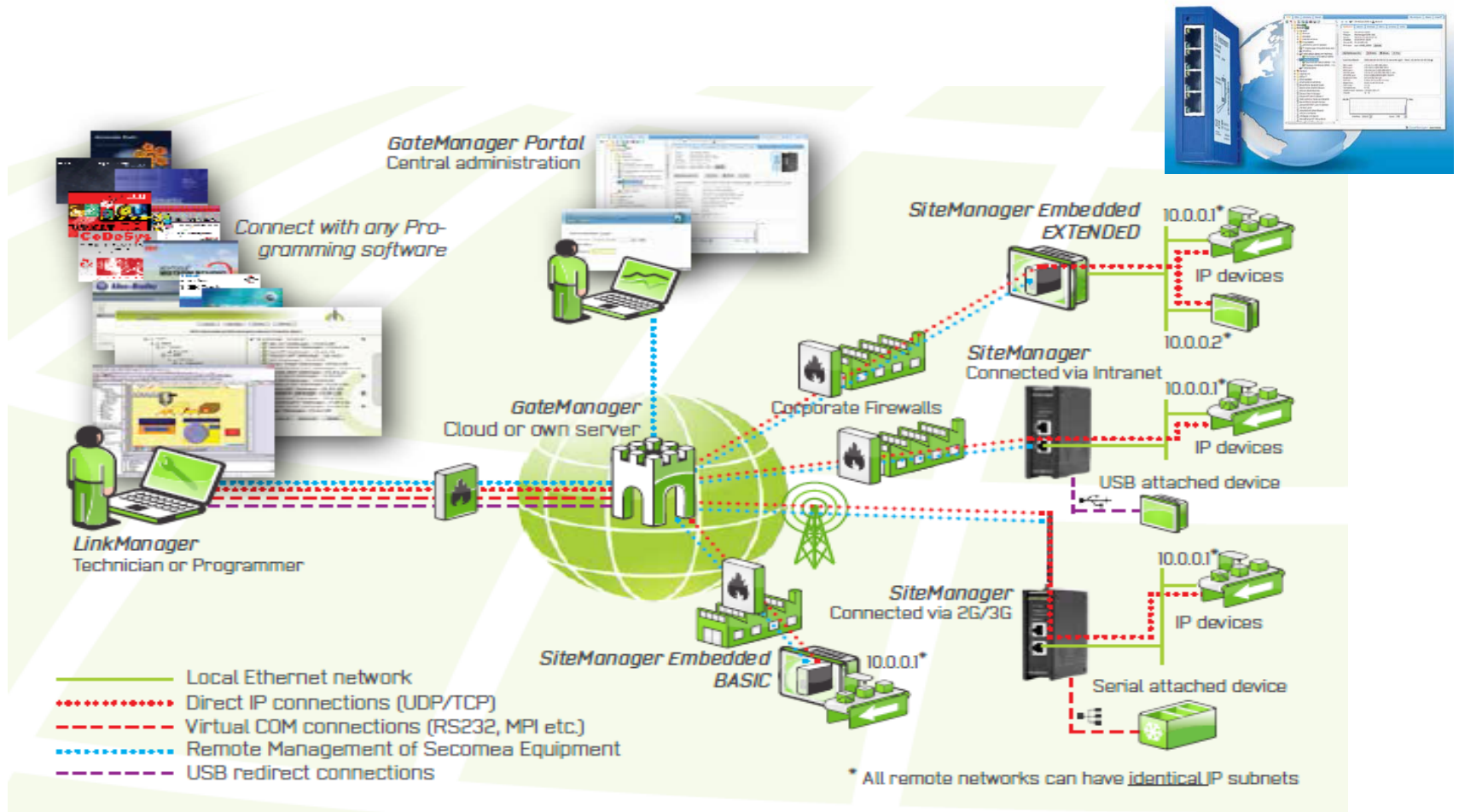


Detecting and Responding to indicators of breach, compromise, and vulnerability



整体工业网络安全系统

--- 安全远程访问解决方案





整体工业网络安全系统 - 百通赫思曼工业安全方法

目标:

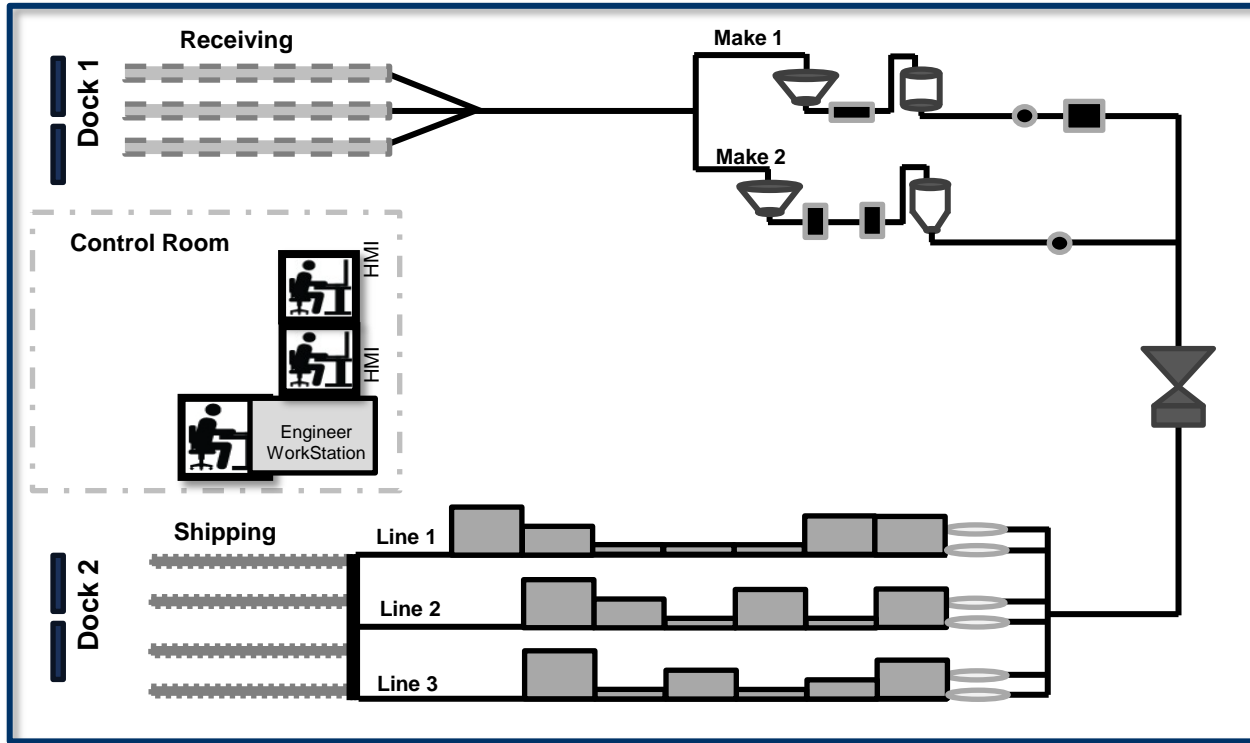
- steps for mainstream industrial security design
- IT and industrial automation professionals
- into existing systems/ or New project
- practical tips and commentary

步骤:

1. Find out what you have
2. Turn ad-hoc into an infrastructure
3. Do a risk assessment
4. Get a plan with options
5. Test options with stakeholder/users
6. Gain Approval / finalized plan
7. Implement phase 1, schedule phase 2, 3...

X

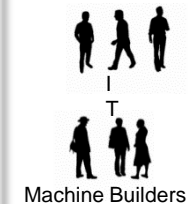
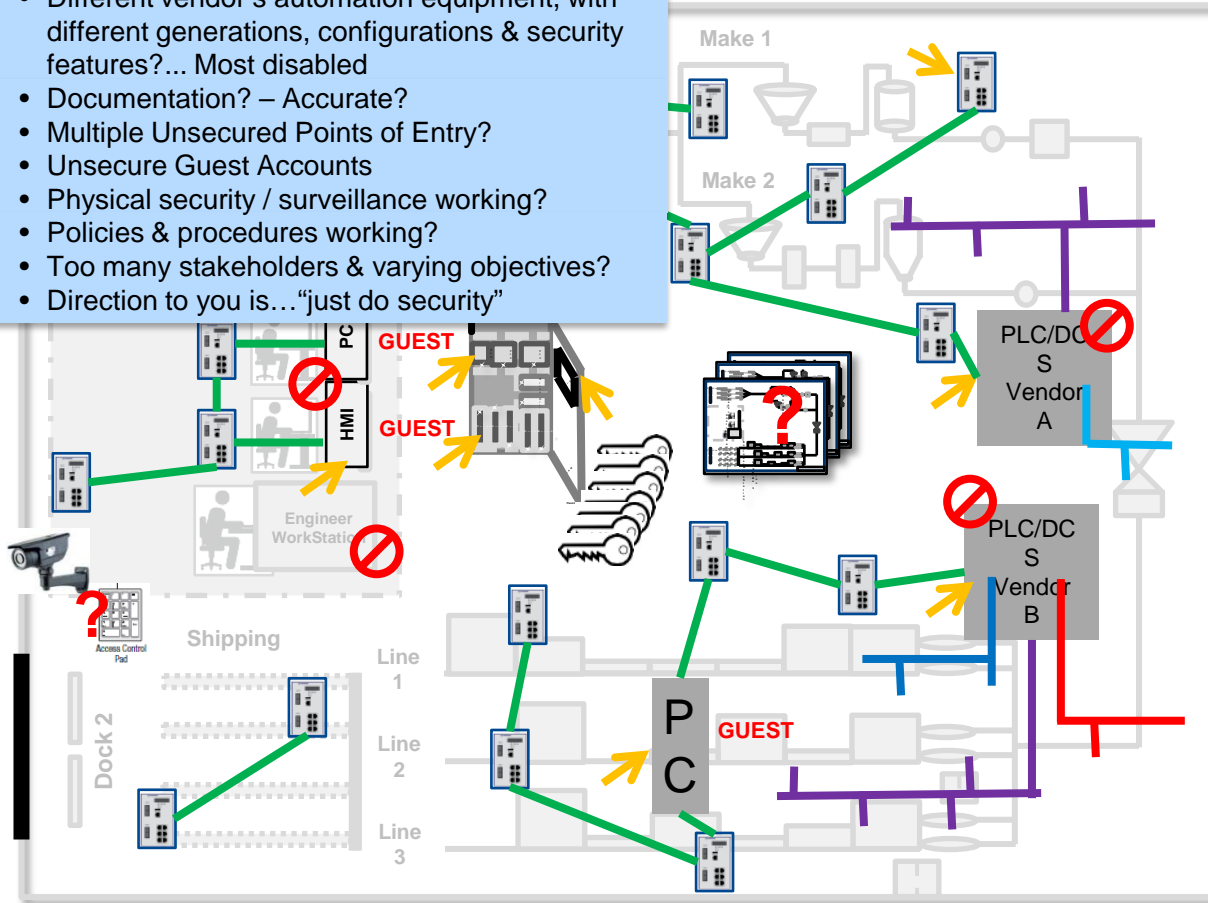
简单工厂模型



X

按照步骤寻找安全事项

- Ad-hoc Networks, multiple technologies?
- Different vendor's automation equipment, with different generations, configurations & security features?... Most disabled
- Documentation? – Accurate?
- Multiple Unsecured Points of Entry?
- Unsecure Guest Accounts
- Physical security / surveillance working?
- Policies & procedures working?
- Too many stakeholders & varying objectives?
- Direction to you is...“just do security”



X

工业控制网络风险评估

- A Security Risk Assessment answers some key questions:
 - What are my key risks and vulnerabilities?
 - Where do I install my security solutions, and what types do I need?

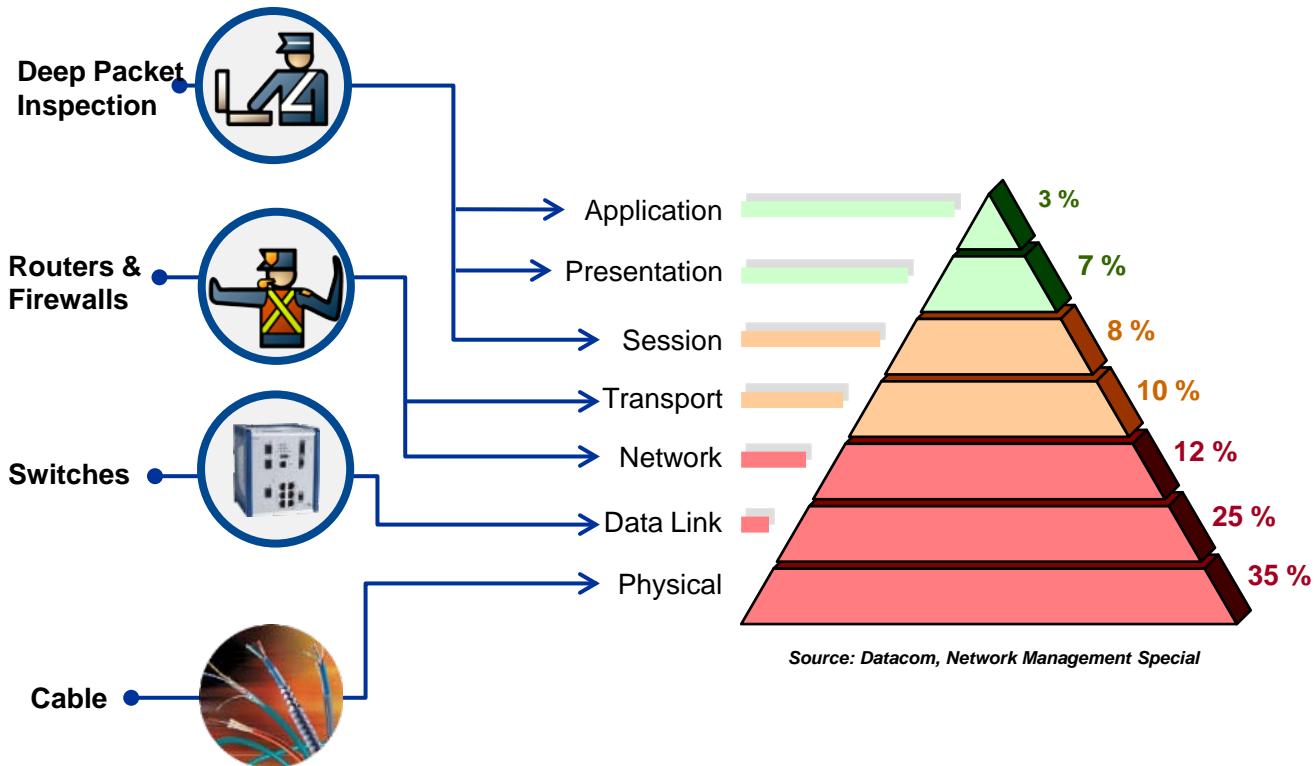
A security risk assessment enables you to move forward with a cyber security solution.

Ref	Entry	Impact	Confidentiality	Integrity	Availability	Business	Operational	Reputation	Legal	Financial	Physical	Environmental	Human Resources	Other	Risk
A	Business to PCN Firewall	Introduce malware	Yes	Virus on business network	Virus modifies or shutdowns the process	High	Med	Med	High	High	1.) Anti-virus on all Win SCADA boxes	Low	Med	Low	Med
		Introduce malware	Yes	Virus on business network	Virus modifies or shutdowns the process	High	Med	Med	High	High	1.) Anti-virus on all Win SCADA boxes 2.) Whitelisting on Win SCADA boxes	Neg.	Low	Neg.	Low
		Tamper (Modify/Delete data)	Yes	Gain access through firewall	Attacker modifies or shutdowns the process	High	Med	Med	Neg.	Low	1.) Strengthen firewall rules	Low	Med	Neg.	Low
		Tamper (Modify/Delete data)	Yes	Gain access through firewall	Attacker modifies or shutdowns the process	High	Med	Med	Neg.	Low	1.) Strengthen firewall rules 2.) Encrypt traffic	Neg.	Low	Neg.	Low
		Denial-of-service	Yes	Storm the firewall	No communications between Business and PCN	Med	Med	Med	Med	Med	1.) Intrusion detection 2.) Rate limiting	Low	Low	Low	Low

网络可靠性在OSI 模型中的体现-唯有百通

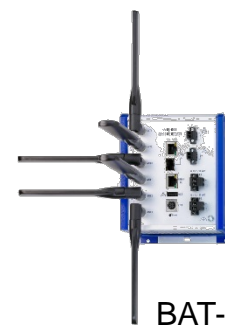
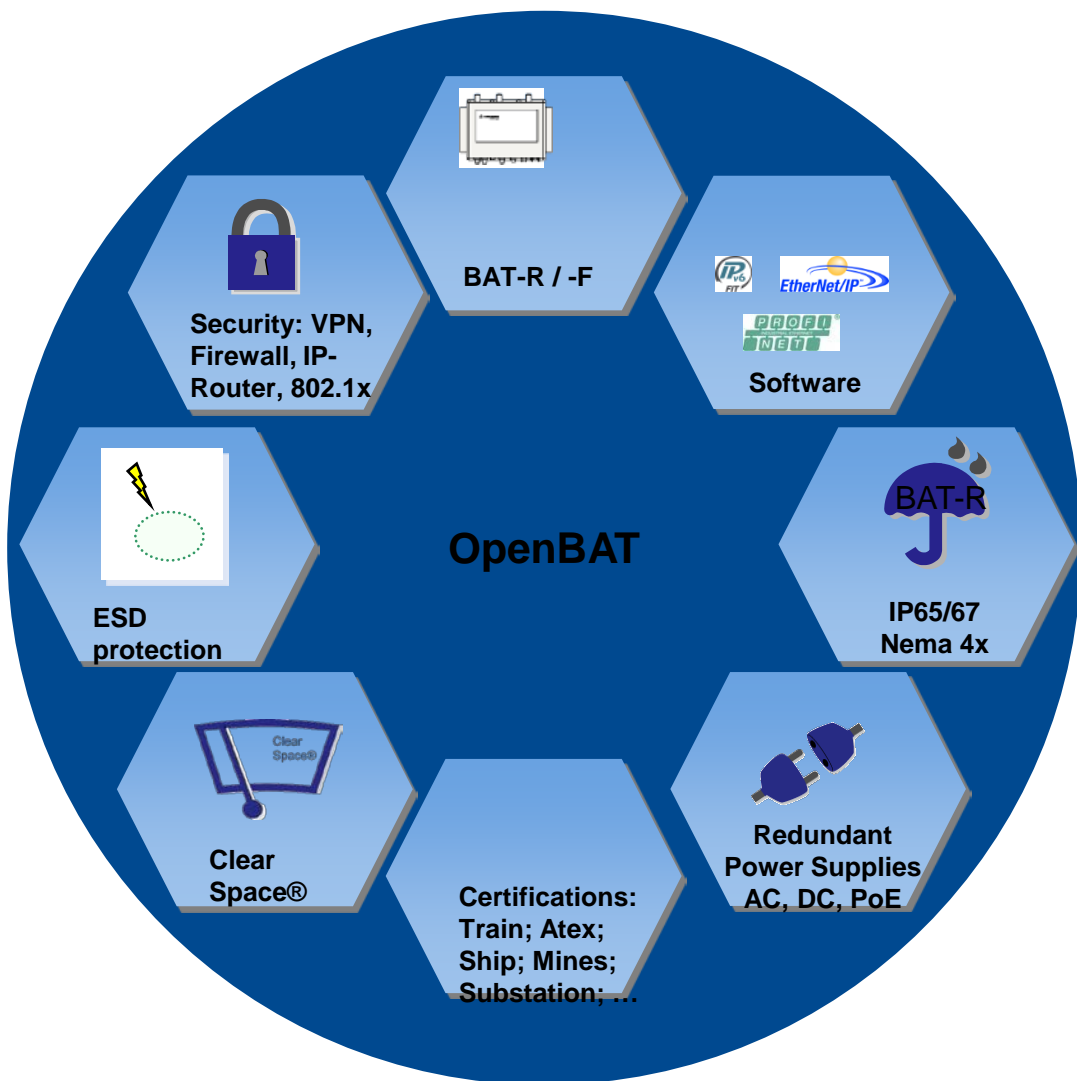
Where network failures occur...

How Belden mitigates this...



3
4

OpenBAT - open platform 完美的工业WIFI平台



BAT-R



BAT-F



BAT-Controller



BAT-F X2



BAT-C

OpenBAT Configurator

无线选择配置系统

OpenBAT Konfigurator

Das Hirschmann Wireless Programm für maximale Individualität.

Bei allen Angaben in den Hirschmann-Konfiguratoren behalten wir uns Änderungen vor.
Die Produkt-Konfiguratoren erhalten ihre Gültigkeit erst durch eine offizielle Auftragsbestätigung der Hirschmann Automation and Control GmbH.

Das Herzstück Ihrer Order:

BAT-F EU W W 9 A I B C C K 07 99 T A A F H H XX.XX.XXXX

Bauform: IP67 WLAN Access Point (Field Varian)
Länder/Zulassungen: Europa (CE)
Slot 1: WLAN-Modul
Slot 2: WLAN-Modul
Slot 3: nicht bestückt
Client / Access Point: Access Point
Montage: ohne Schlagschutz
Zulassungen 1: ATEX Zone 2
Zulassungen 2: Substation (EH61850)
Spannungsbereich 1: 18 - 60 VDC
Spannungsbereich 2: 48 - 320 VDC / 90 - 265 VAC
Ports Combo Gigabit: Combo Port
Ports Fast Ethernet: nicht bestückt

Temperaturbereich: -40°C --> +70°C
Frequenzbereich: 2,4GHz und 5GHz
SW Option 1: VPII-5
SW Option 2: Profinet
Konfiguration: Standard Hirschmann
Ausführung: Standard Hirschmann
Software Version: Neueste Version

HIRSCHMANN
A BELDEN BRAND

Ihr BAT Order Code >>> BAT-FEUWW9AIBCKK0799TAAFHHXX.XX.XXXX
Hirschmann Bestellnummer >>> 943-953-999

Input Config! Check Config! Reset Config!

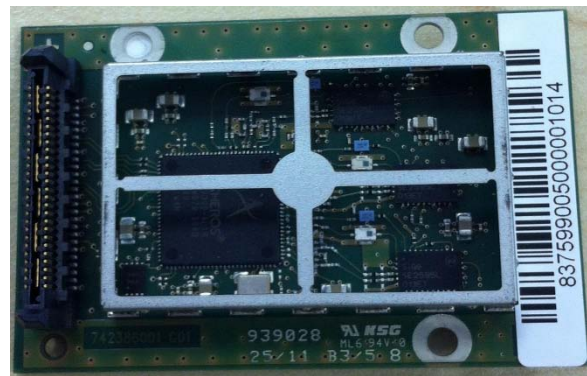
Deutsch/German English/English

- Customers can select the required features
- Hirschmann builds the devices on order
- Internet interface and stand alone tool available

Specialized Design Improve Industrial Capability 独具匠心的工业现场适应能力设计

1. Clear space

OpenBAT 平台下的AP和客户端具有3个Clear space 功能和ESD功能的模块, 每个模块在2.4G和5G带宽具有一套完整的滤波过滤操作, 去除干扰的无线电频率, 从而显著的减小了噪声等级和因此而产生的包丢失情况; (注: 这是我们的核心专利, 在此我们这能介绍实现的功能, 见附件的芯片);



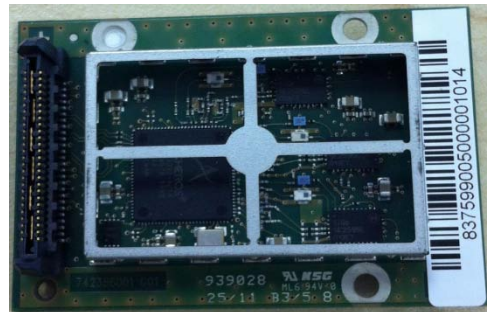
Specialized Design Improve Industrial Capability

独具匠心的设计，超强的工业现场适应能力

2. ESD

ESD 的意思就是ElectroStatic Discharge 就是静电放电的意思，具有静电放电保护功能，ESD保护功能也是目前每个模块所具备的能力，能够承受25KV的静电放电，用以提高硬件的寿命，和减小安装空间（因为单独的静电保护设备 会占用一定的空间）；

除此之外，OpenBAT平台下的AP和客户端具有很低的功耗，小于10W，宽泛的温度范围： -40°C - 70°C ，另外整套设备配有高强度的天线和连接器，用以抵抗震动等环境；



Hirschmann Clear Space® technology 空间“净化”技术



How shall Wireless LAN compete against all other radio technologies?

→By eliminating them

Clear Space® keeps out all external radio frequencies.

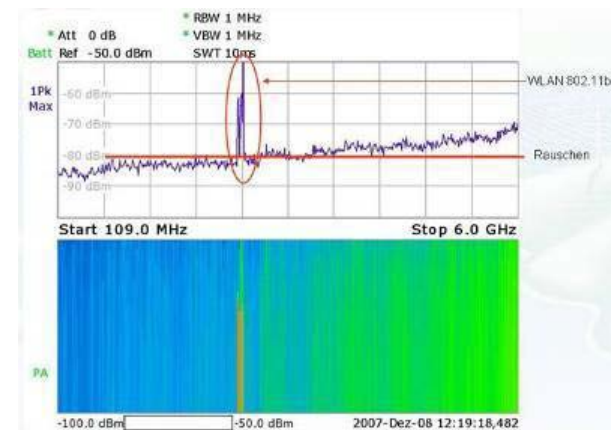
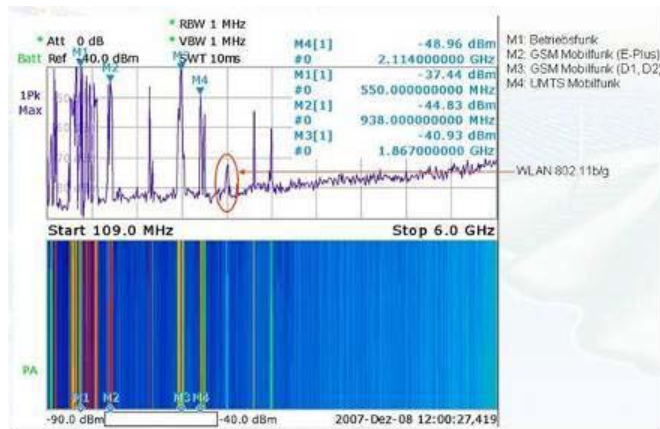
OpenBAT with Clear Space®



Hirschmann Clear Space® eliminates all signals that are not needed for WLAN. Here measured on the Hamburg harbour.

Before

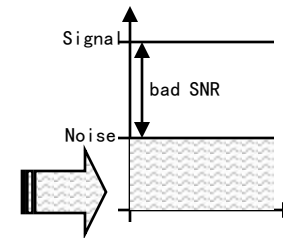
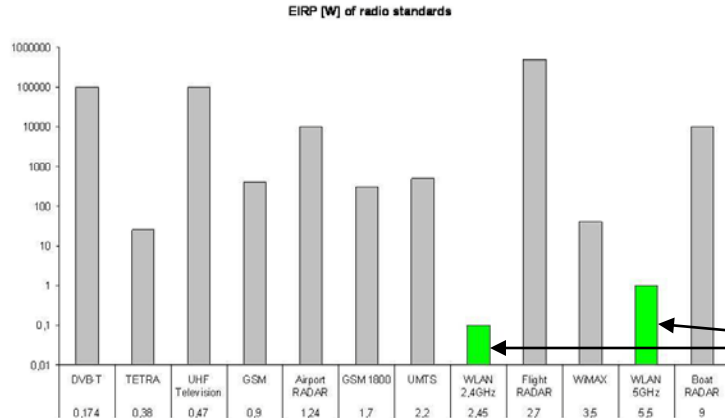
After



Result: The wireless receiver receives “cleared” signal

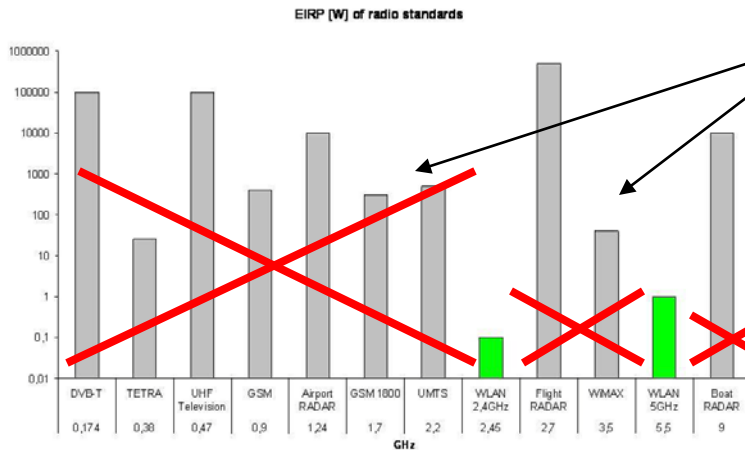
- less packet loss, higher bandwidth, more stable connections
- functioning connections in “polluted environments”, eg Port (RADAR), offshore, airport, refinery

Hirschmann Clear Space®

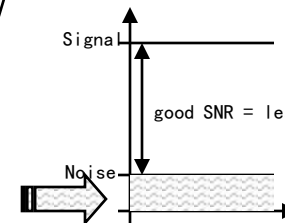


WLAN antennas pick up all frequencies - this leads to high noise level at the receiver

WLAN is the weakest radio technology

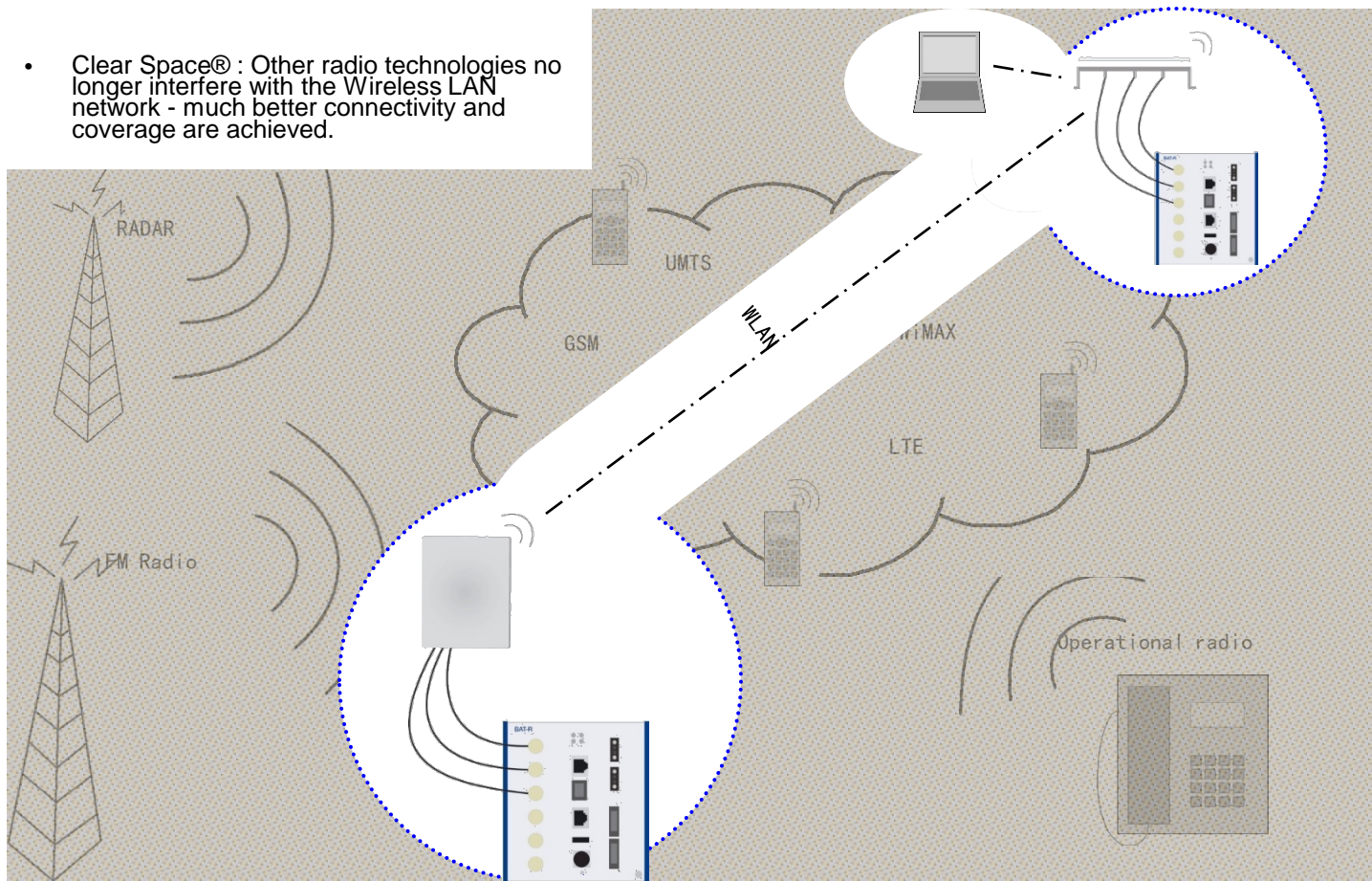


Hirschmann Clear Space® eliminates all signals not usable by WLAN



Clear Space ® Wireless Technology

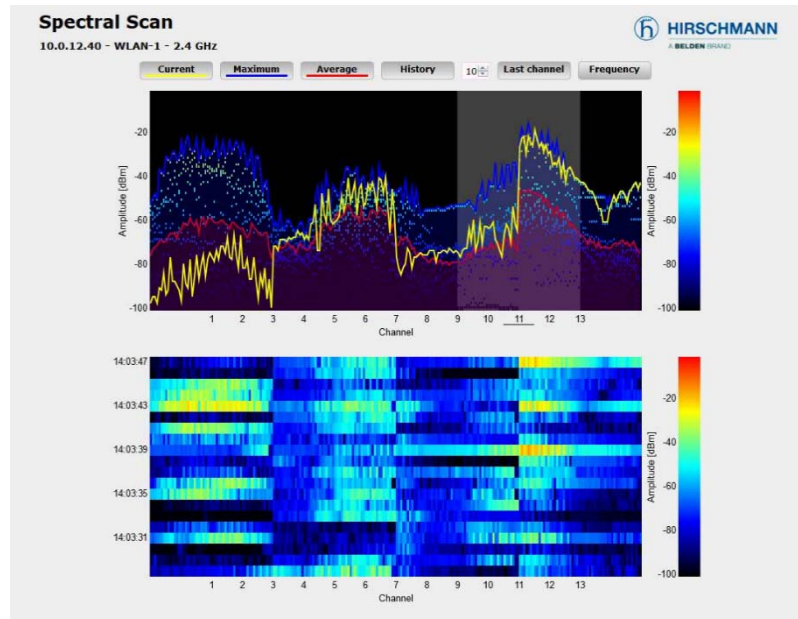
- Clear Space® : Other radio technologies no longer interfere with the Wireless LAN network - much better connectivity and coverage are achieved.



Frequency Analysis Technology

频谱分析技术

- Frequency Analysis: detects the channel occupation



Band Steering Technology

智能频带选择技术

- Band Steering; detects whether or not the wireless client is dual-band capable, and if it is, it will push the client to connect to the less congested 5GHz network.

2.4G 

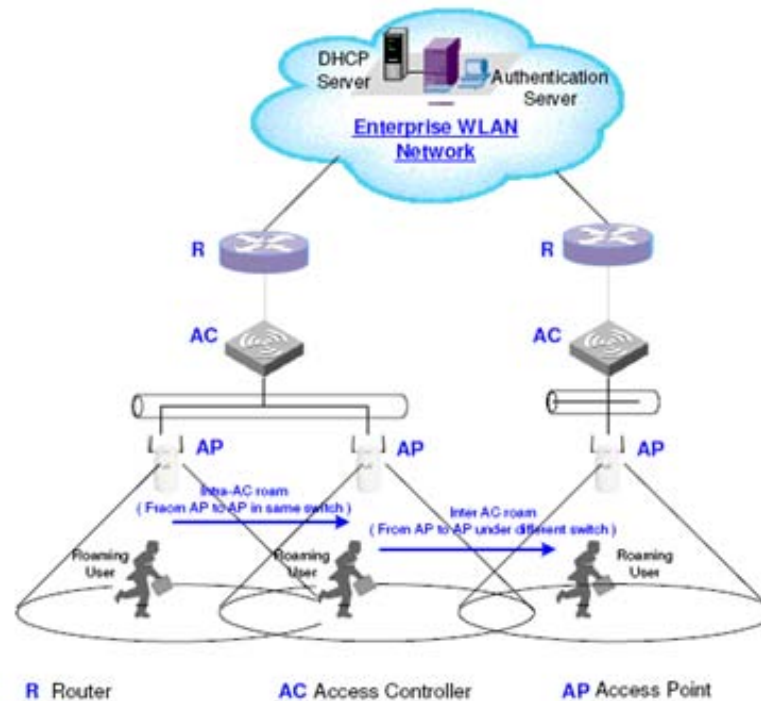
5.8GHZ



OKC Technology

快速漫游的OKC技术

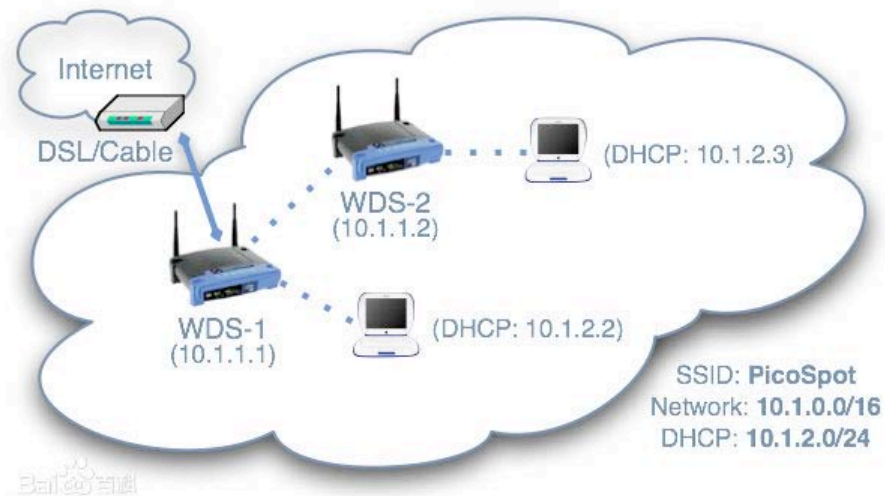
- OKC: Opportunistic Key Caching



WDS Technology

分布式无线技术

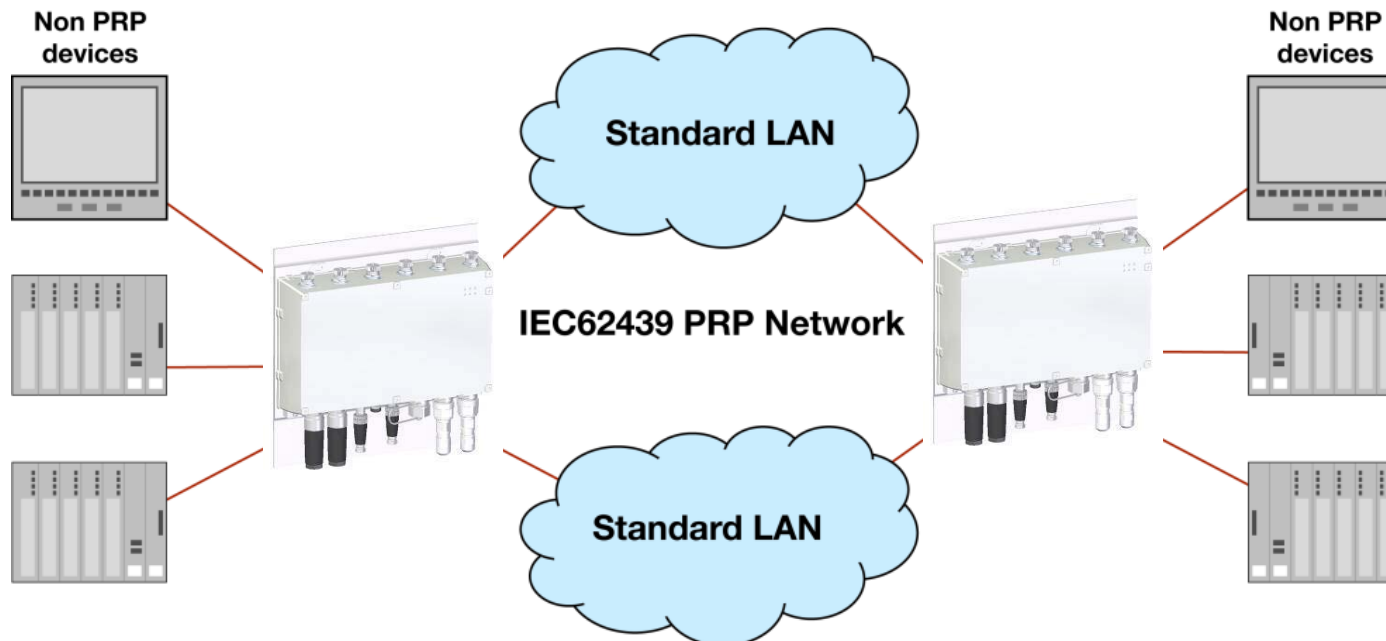
- WDS: Wireless Distribution System



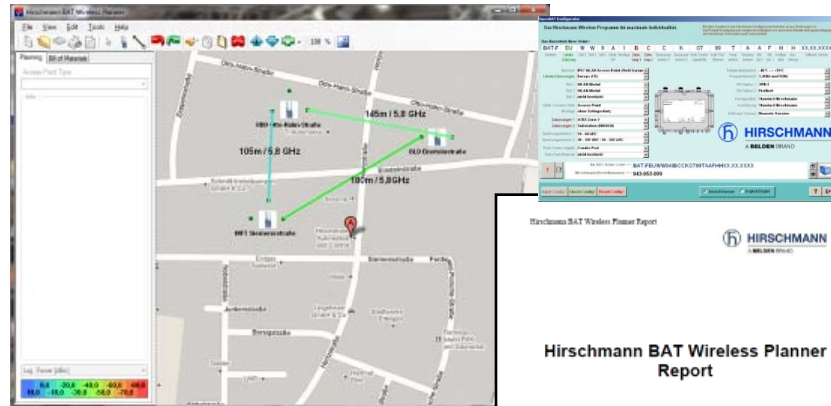
PRP Technology

并行冗余技术

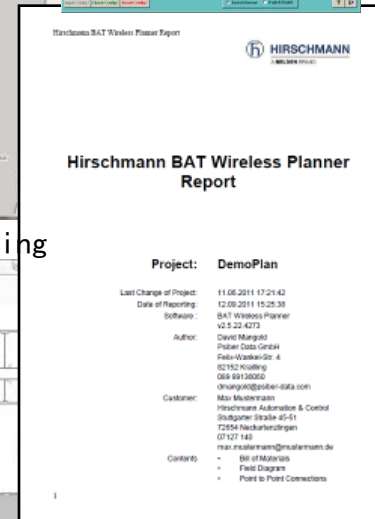
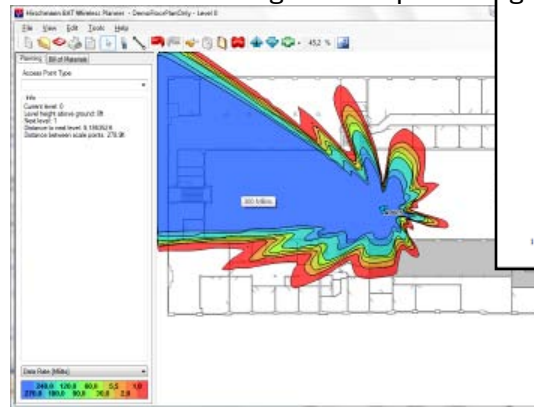
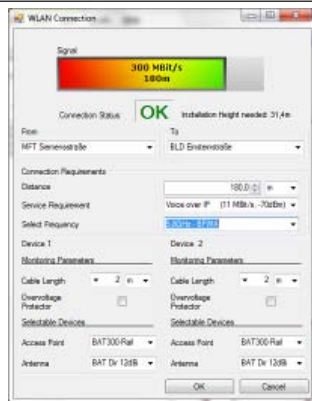
Zero failover – duplicated networks



BAT-Planner 无线工程布置软件



Outdoor Bridge link planning

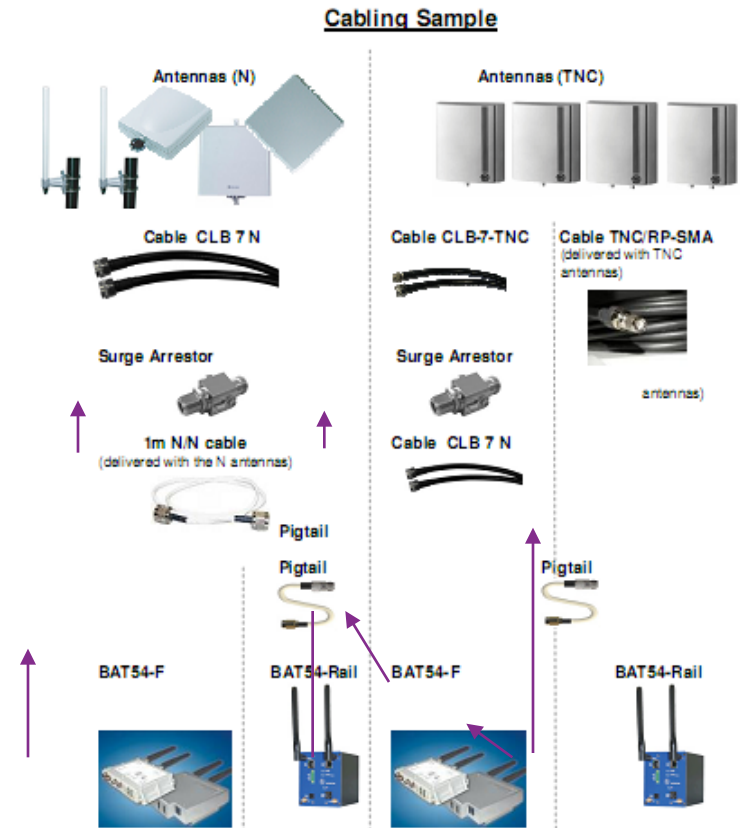


Configure the
OpenBAT,
Generate a
report and list
of required
material

Align with application requirements Indoor Infrastructure planning

BAT-Ant Wireless LAN Antennae 天馈系统

- ✓ All antennae are equipped with cables and pigtails
- ✓ Customer gets all he needs out-of-the-box.



www.hirschmann.com

OPENBAT-Family Perficet Wireless Products

新功能不断发布

- ✓ Light industrial AP
- ✓ 3G 、 4G module
- ✓ 802.11ac
- ✓ New Controller
- ✓ Location software



BAT-Planner 
The **Hirschmann™** Wireless Planning Suite

HiLCOS 
The **Hirschmann™** BAT Operating System



BAT450 Concept: WLAN/Ethernet/PAN Gateway

- Single or dual IEEE 802.11n Hirschmann industrial wireless radio (450Mbps link speed)
 - Ruggedized IP67 outdoor enclosure
 - Transportation: EN50155 certified
 - GE M12 X-coded Network connection with PoE
 - DC power supply
 - Compact form factor (easy to install)
 - One slot for modules
 - 2nd WLAN module
 - Additional fiber port
 - Under discussion:
 - WAN connectivity via LTE
 - Integrated fiber port, two or more Fiber ports/TP ports
- 8 ports?

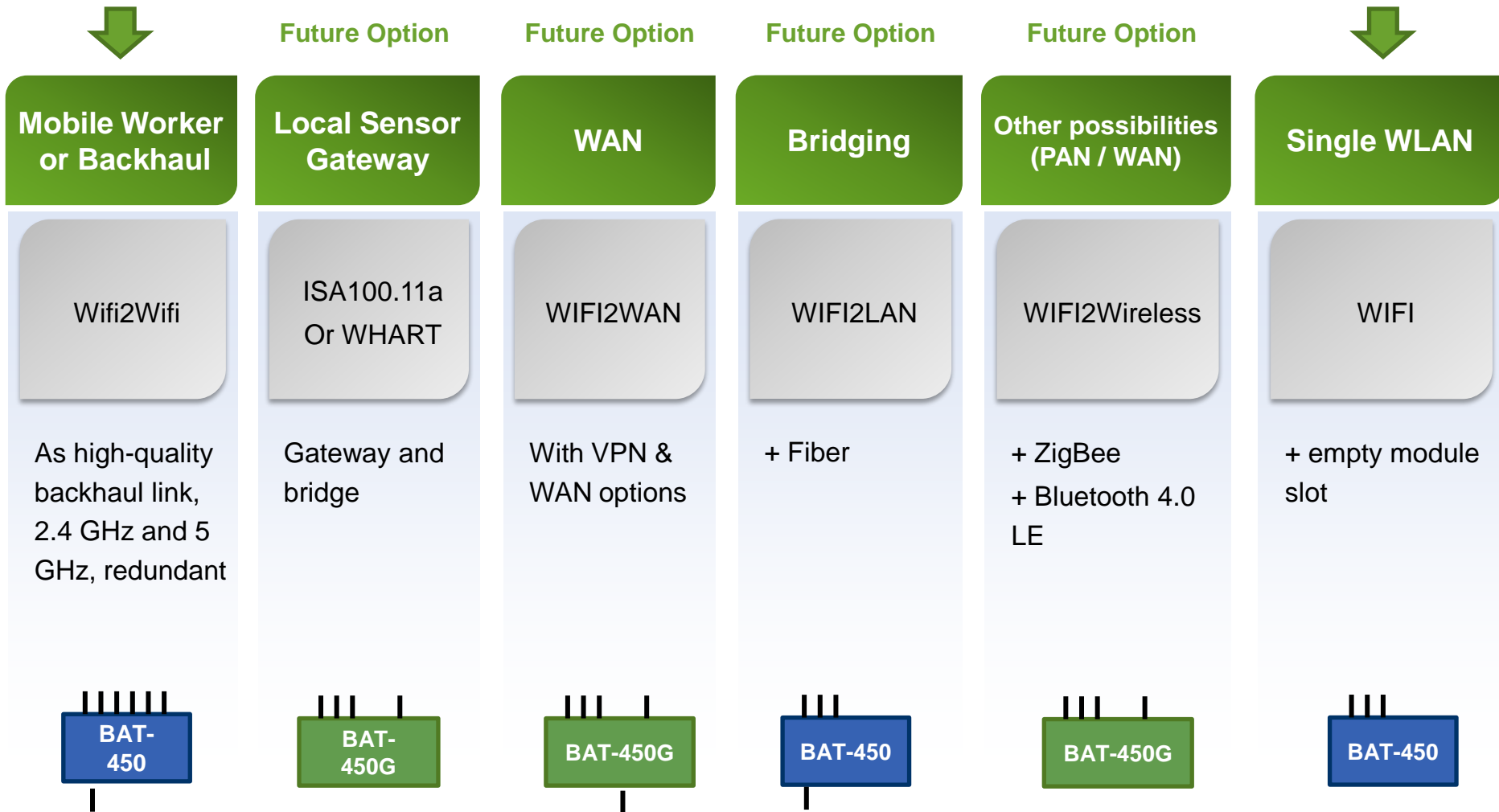
BAT450
(BAT-300F form factor)



OpenBAT-F

=> additional options see next slide

BAT450-F (One Design → many use cases)



Industrial Cellular Router – Three different product lines




▶ Standard Line

▶ Premium Line

▶ Train Line






Different product lines – Hardware & Approvals




Feature	Standard Line	Premium Line	Train Line
Availability (not confirmed!)	June 2015	August 2015	Q4 2015
			
Main cellular Standard	UMTS	LTE	LTE
Power Supply	12/24 VDC*	12/24/48 VDC*	24/36 VDC**
Power consumption	2.3-5.5W	2.5-11W	2.5-11W
LAN Interface - FE	2 ports/RJ45	2 ports/RJ45	2 ports/M12 (D-coded)
Extension port – Serial Interface		1 port RS232	1 port RS232
I/O Interface	-	X	-
Integrated GPS	-	X	X
USB interface for configuration	-	X	-
Extended temperature range (-40°C to +70°C)		X	X
IP rating	IP20	IP30	IP40
Din-Rail mount / wall mount	X / -	X / -	X / X
Weight (approx.)	280g	400g	450g
Special approval (Railway EN 50155, EN 50121-4, EN 45545)	-	-	X

* 12V to be confirmed, **including traing tolerances, 12/24/48V for other applications

Different product lines - Cellular

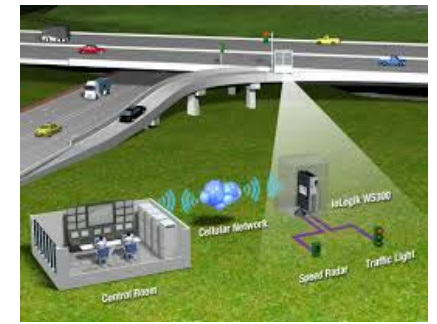
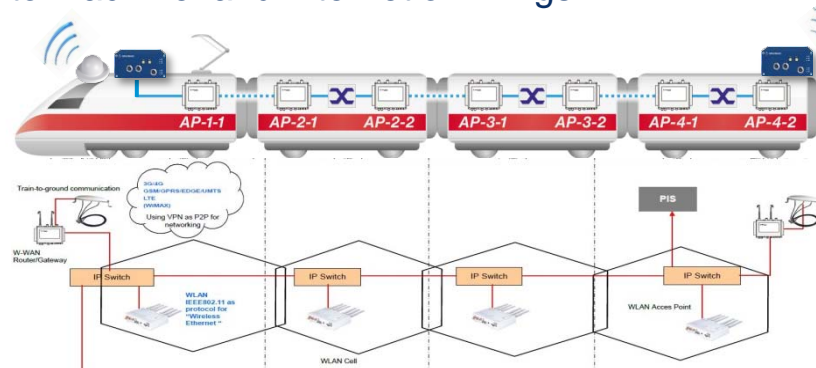
Feature	Standard Line	Premium Line	Train Line
			
Cellular Standards			
GSM/GPRS/EDGE	Dual-band: 900/1800MHz	Triple-band: 900/1800/1900MHz	Triple-band: 900/1800/1900MHz
UMTS/HSPA	Dual-band: 900/2100MHz	Dual-band: 900/2100MHz	Dual-band: 900/2100MHz
LTE	-	5-band: 800/900/1800/2100/2600MHz	5-band: 800/900/1800/2100/2600MHz
Transfer rate (max)	14,4 Mbps down 5,76 Mbps up	100 Mbps down 50 Mbps up	100 Mbps down 50 Mbps up
SIM Interface	2 SIMs	2 SIMs	2 SIMs
Switch SIM on disconnect	X	X	X
Switch SIM on roaming	X	X	X
Switch SIM on I/O input	-	X	-
Switch SIM on remaining data volume	X	X	X
Antenna Configuration	Main + Rx Div	Main + Rx Div	Main + Rx Div
Antenna Connectors	SMA	SMA	SMA

Different product lines – Software & Protocols

Feature	Standard Line	Premium Line	Train Line
			
VPN Tunneling	OpenVPN (Client/Server), IPsec VPN (Client/Server), L2TP (Client/Server), PPTP (Client/Server), GRE		
Security	HTTPs, Firewall (SPI), NAT, X.509		
Diagnostic & Configuration	SNMP, DHCP (Client/Server) network status, syslog, DynDNS, NTP (Client), HiDiscovery		
Redundancy	VRRP, ping monitoring with route failover		
Configuration Management	Upload/download configuration, change configuration based on SMS		

Industrial Cellular Router - Applications

- Transportation: Communication based Train control, Remote diagnostic, Wi-Fi for passengers
- Machine Building: Secure Remote Access
- Renewables: Remote Monitoring for Distributed Generation
- Mass Transit: Traffic Lights Control, Information Panels, Emergency Phones
- Intelligent Transport Systems: Toll collect, Info Displays, Emergency Phones
- Outdoor Advertising: JC Decaux, ClearChannel, Amscreen.
- Water and Waste Management: Telecontrol of Pumping Water Stations, intelligent Trash bins...
- Municipalities: Street Lighting, Street CCTV, Weather Stations
- M2M and IoT: Machine to Machine and Internet of Things



构建整体工业网络系统 - 百通赫思曼



- 一流的产品和卓越的品质
 - 灵活性，可靠性，安全性和高性能
 - 符合国际标准
 - 在苛刻的环境条件下经久耐用
 - 优化能源平衡
 - 支持自动化安装的范围产品
 - 完美的信号解决方案
- 理解您的具体问题和目标
 - 即使在恶劣的环境中具备最高性能和可靠性
 - 提供来自我们自己工厂所生产的产品
 - 产品全球可用
 - 为您的公司提供附加值
 - 使您在竞争中领先
 - 一站式产品和服务



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