



niagara<sup>4</sup>

# 物联网中间件技术—— Niagara介绍



# TRIDIUM

霍尼韦尔旗下企业

TRIDIUM

# Agenda

- IoT 物联网/AI技术趋势
- 基于ARM Niagara Solution
- 案例说明

# AI 人工智能新技术

## The Machines at the Gates

### Healthcare

Image to diagnosis  
Prescriptive medicine  
Computer vision for detection  
Personalized Medicine  
Automated Patient Follow Up

### Smart Buildings

Virtual Facility Manager  
Predictive Maintenance  
Smart Alarms to Diagnosis  
Personalized Comfort  
Energy Savings  
Biometric Security  
Green Buildings  
Improved Space Utilization

### Automation

Intelligent (robotic) manufacturing  
Robotic Warehouses  
Automated Retail

### Publishing

Reports  
Articles

### Machine Learning

Deep Learning  
Predictive Analytics

### Computer Vision

Image recognition  
Computer Vision

## Artificial Intelligence

### Natural Language Processing

Speech transcription  
Speech translation  
Information extraction

### Speech

Speech transcription  
Text-to-Speech

### Retail and Customer Service

Chat Bots, Alexa  
Customer Retention  
Recommendation Engine  
Customer Experience – Amazon Go

### Transportation

Self-driving cars  
Drones  
JIT Supply Chain  
Autopilots

### FinTech

HFT  
Fraud Detection  
Offer  
Personalization  
Wealth Management

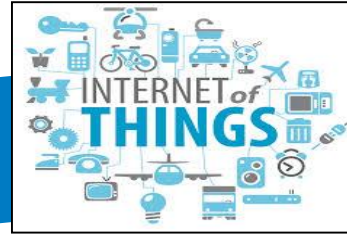
### Virtual Assistant

Advisory  
Scheduling  
Wearables  
Smart Medical Devices

Controls on plant –  
Cloud connected



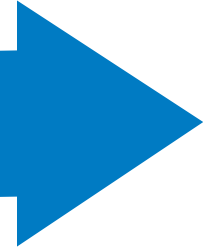
Smart homes



IoT



Analytics / Cloud /  
Cybersecurity



Green gets trendy – Google new  
HQ building



Wireless  
Communicating  
Controls



Mobility / Apps



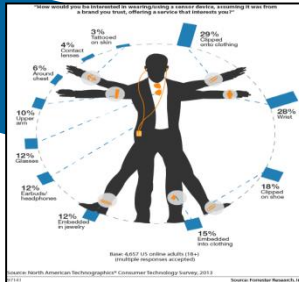
LEDs



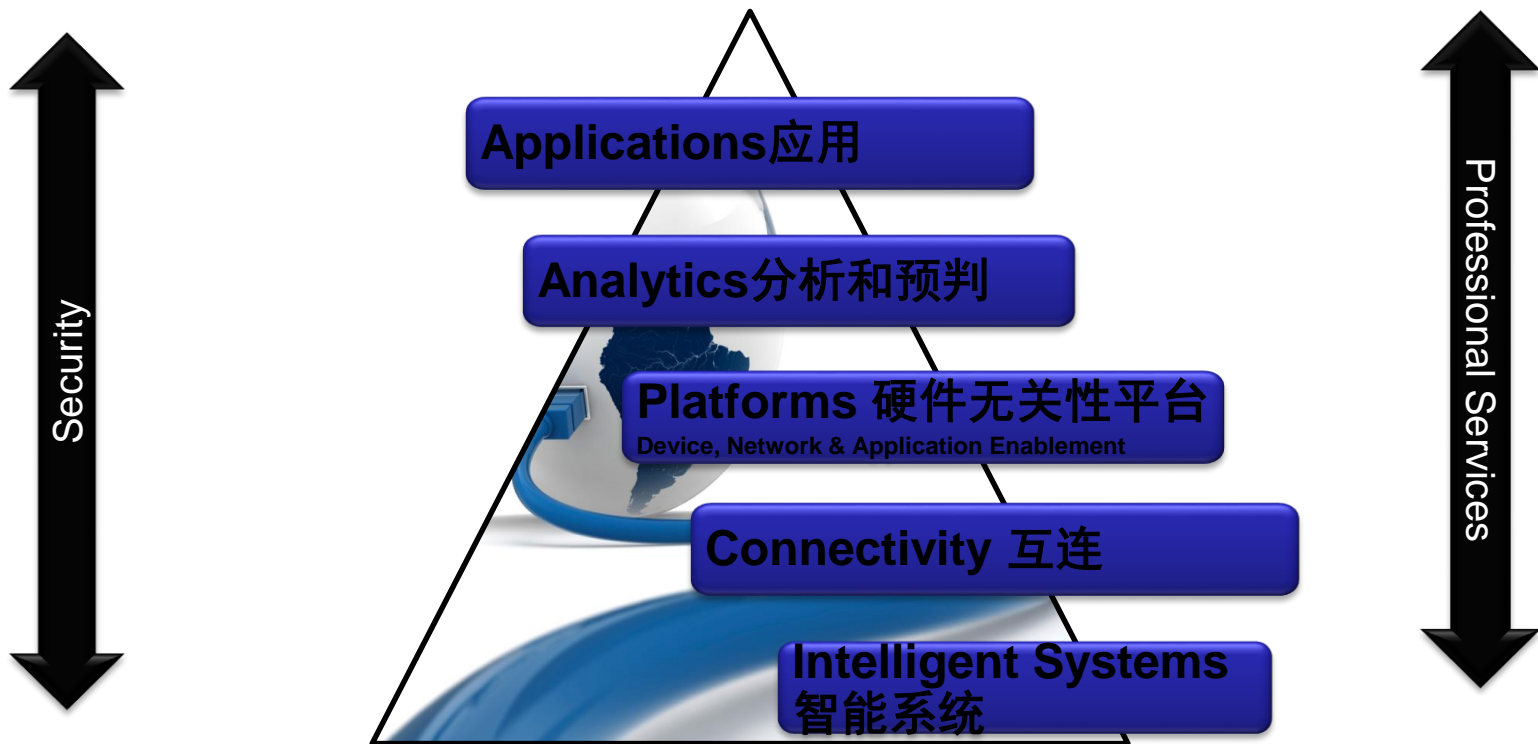
Modular / Off-site  
construction



Wearables



# IoT 架构下自控系统细分



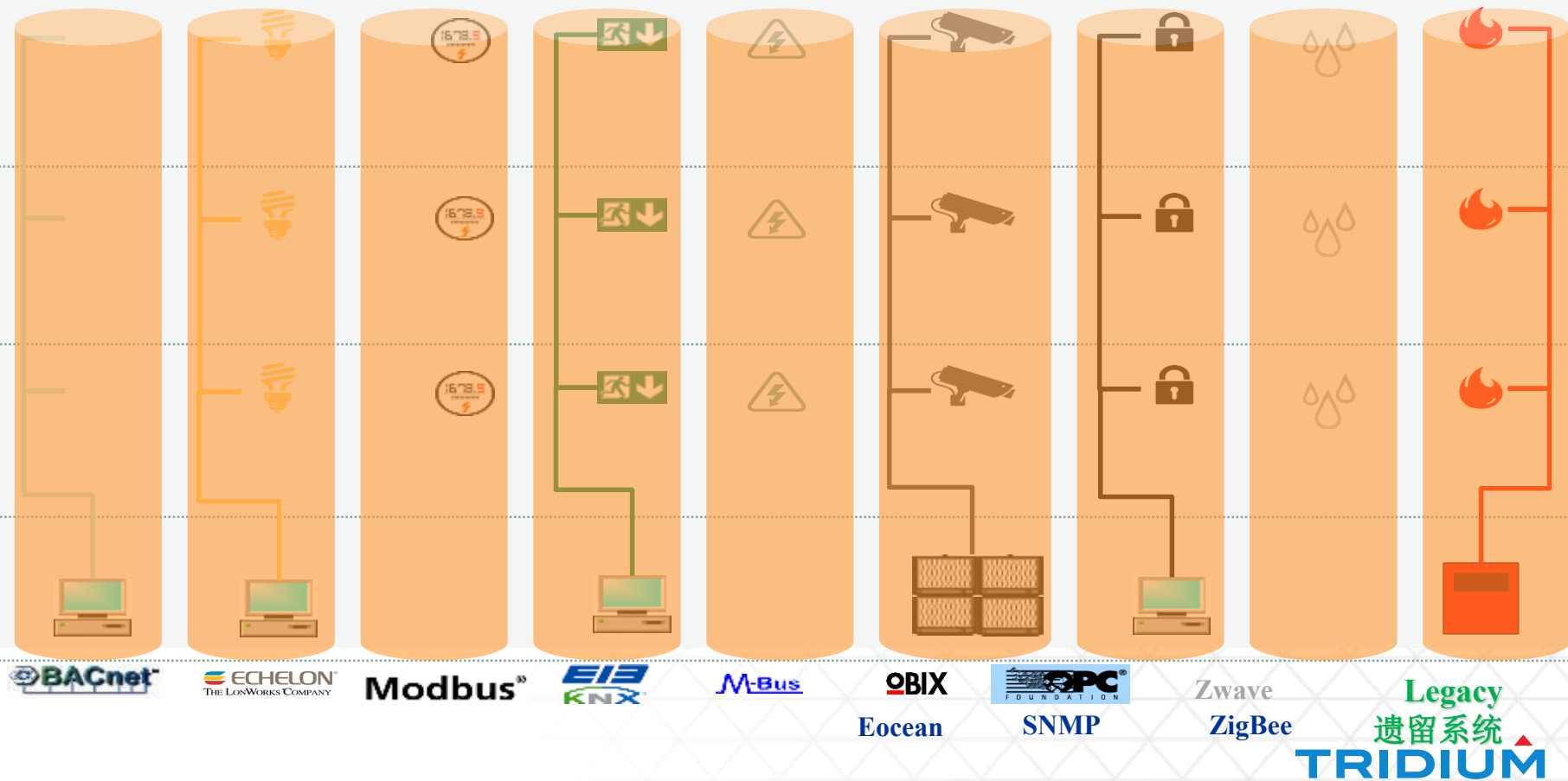
# 智能楼宇控制现状挑战



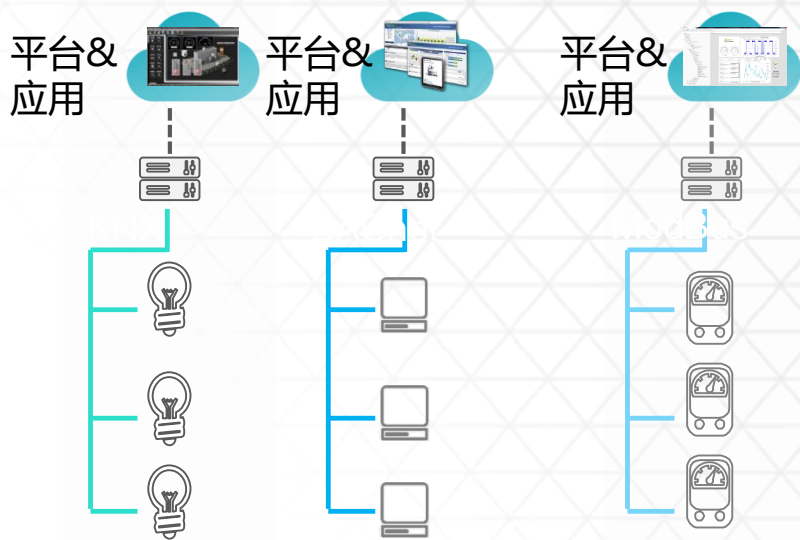




# Challenge 1- 异构系统数据类型复杂



# Challenge 1- 异构系统数据类型复杂



**系统独立，不能  
联动支撑智能决策**



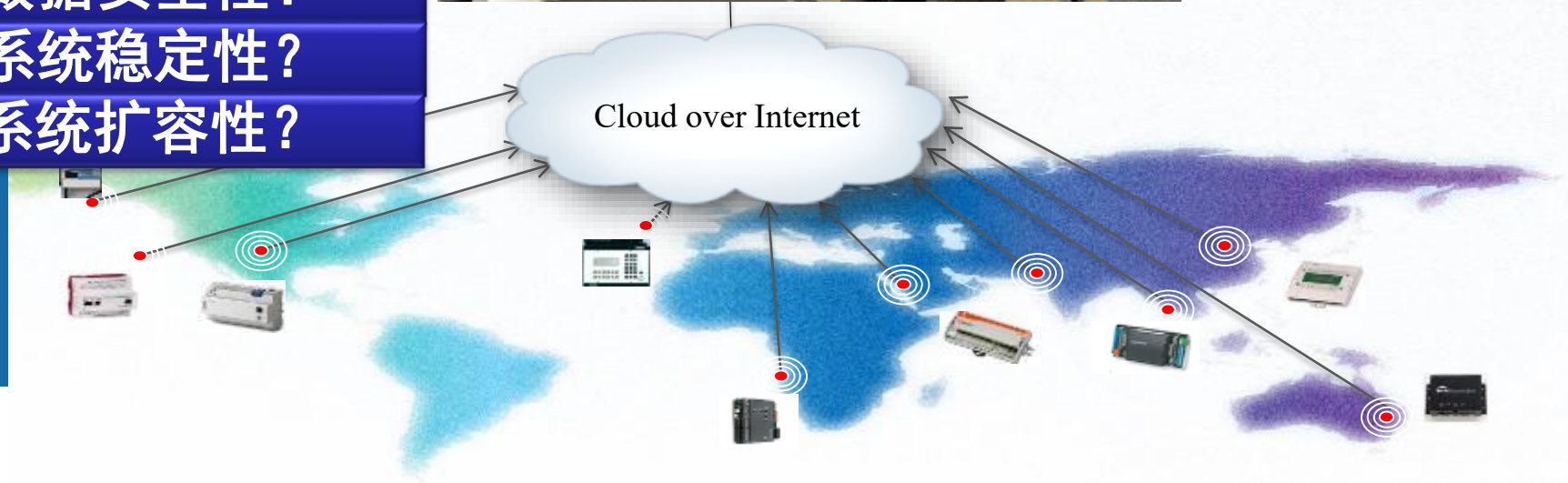
**独立维护，成本高**



**无法支撑大数据分析**

## Challenge2- 跨地域、园区的整合连接

- 数据实时性?
- 数据完整性?
- 数据安全性?
- 系统稳定性?
- 系统扩容性?



## Challenge3- 安全的连接



The image shows a screenshot of the Shodan website, a well-known search engine for Internet of Things (IoT) devices. The website has a dark theme with a red navigation bar at the top containing links for Shodan, Exploits, Scanhub, Maps, Blog, and Membership. Below the navigation bar is a search bar with the Shodan logo and a search input field. The main content area features the headline "EXPOSE ONLINE DEVICES." followed by a list of device types: "WEBCAMS. ROUTERS. POWER PLANTS. IPHONES. WIND TURBINES. REFRIGERATORS. VOIP PHONES." Below this text are two buttons: "TAKE A TOUR" (red) and "FREE SIGN UP" (green). The background of the main content area is a world map with red highlights indicating active devices. In the bottom left corner, there is a section for "Popular Search Queries" with the example: "Router w/ Default Info - Routers that give their default username/ password as admin/1234 in their banner." In the top right corner, there is an inset image of a person wearing a black balaclava and a black hoodie, sitting at a desk with a laptop, looking at the screen. The background of the inset image is a dark blue wall with binary code (0s and 1s) and the text "Bad Guy" in blue.

Shodan Exploits Scanhub Maps Blog Membership

SHODAN

**EXPOSE ONLINE DEVICES.**

WEBCAMS. ROUTERS.  
POWER PLANTS. IPHONES. WIND TURBINES.  
REFRIGERATORS. VOIP PHONES.

**TAKE A TOUR** **FREE SIGN UP**

Popular Search Queries: Router w/ Default Info - Routers that give their default username/ password as admin/1234 in their banner.

Bad Guy



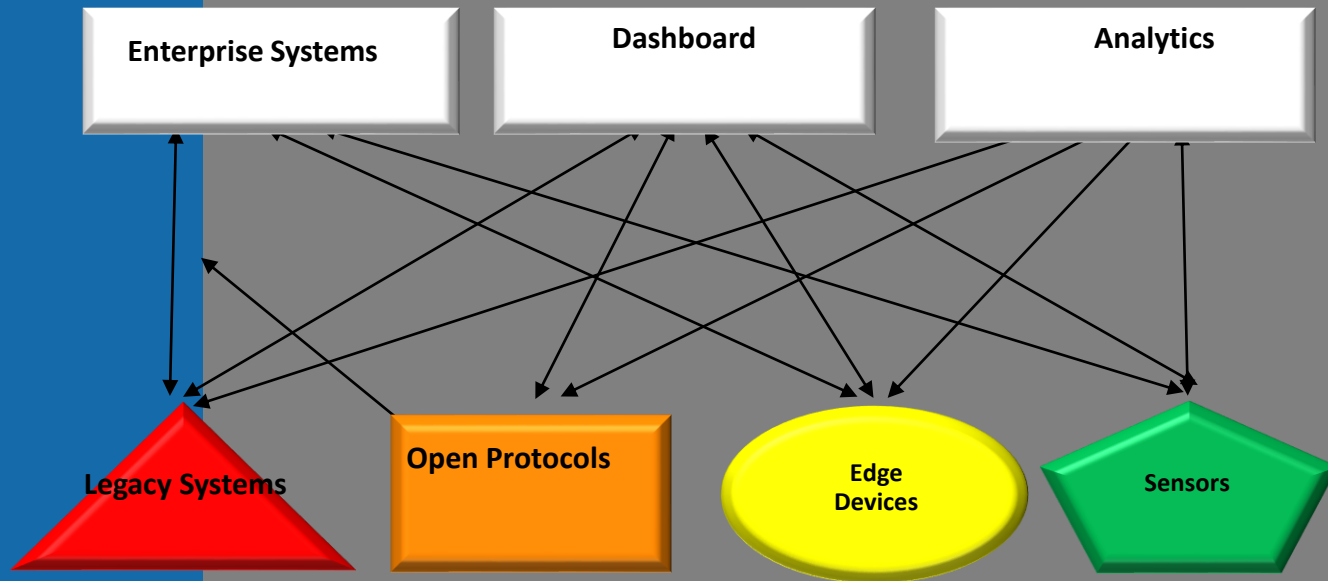
The figure displays five screenshots of the TRIDIUM energy management system interface, showcasing various monitoring and management capabilities:

- Top Left: AHU Unit Monitoring**  
Title: 企业天地2# 楼宇自控系统 东区 AHU 机组  
The interface shows a 3D model of AHU units and a table of parameters:

参数名称	单位	当前值	设定值
回风温度	℃	18.2	18.0
新风温度	℃	15.5	15.0
回风湿度	%	45.0	45.0
新风湿度	%	35.0	35.0
回风压力	Pa	1000	1000
新风压力	Pa	1000	1000
回风流量	m³/h	1000	1000
新风流量	m³/h	1000	1000
- Top Right: Equipment Structure Model**  
Title: 设备结构模型 - 企业天地1#  
The interface shows a tree view of equipment and a table of device details:

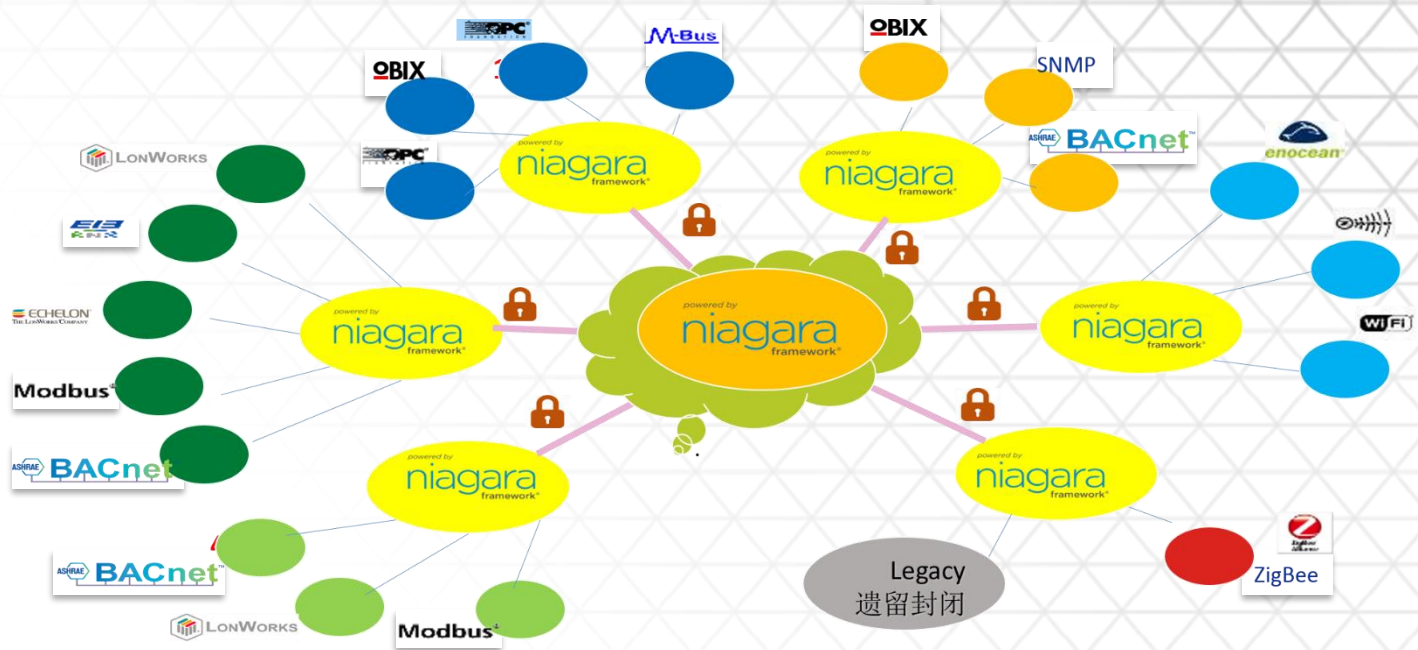
对象	名称	类型	备注
楼宇自控系统	indoor_aud	楼宇	
冷水机组	host	冷水机组	
冷却塔	source	冷却塔	
冷冻水泵	source	冷冻水泵	
火灾报警系统	fire	火灾报警系统	
1# 回路	1# 回路	1# 回路	
25# 回路	25# 回路	25# 回路	
电梯系统	source	电梯系统	
高压 1# 回路	source	高压 1# 回路	
- Middle Left: Response Time Chart**  
Title: 响应时间  
The chart shows the response time (ms) and requests (1/min) over the last 24 hours. The legend indicates: Response time (blue line), Requests (blue bars). The data range is: 今天, 08:22 - 19:54.
- Middle Right: Space Management**  
Title: 企业天地2# 5层  
The interface shows a floor plan of the 5th floor, color-coded by area: 在用空间 (Green), 租期即将空间 (Red), 可用空间 (Grey), 公共区域 (Orange). The sidebar displays block information and utility data.
- Bottom: Equipment Management**  
Title: 设备管理  
The interface shows a list of equipment and a table of device details:

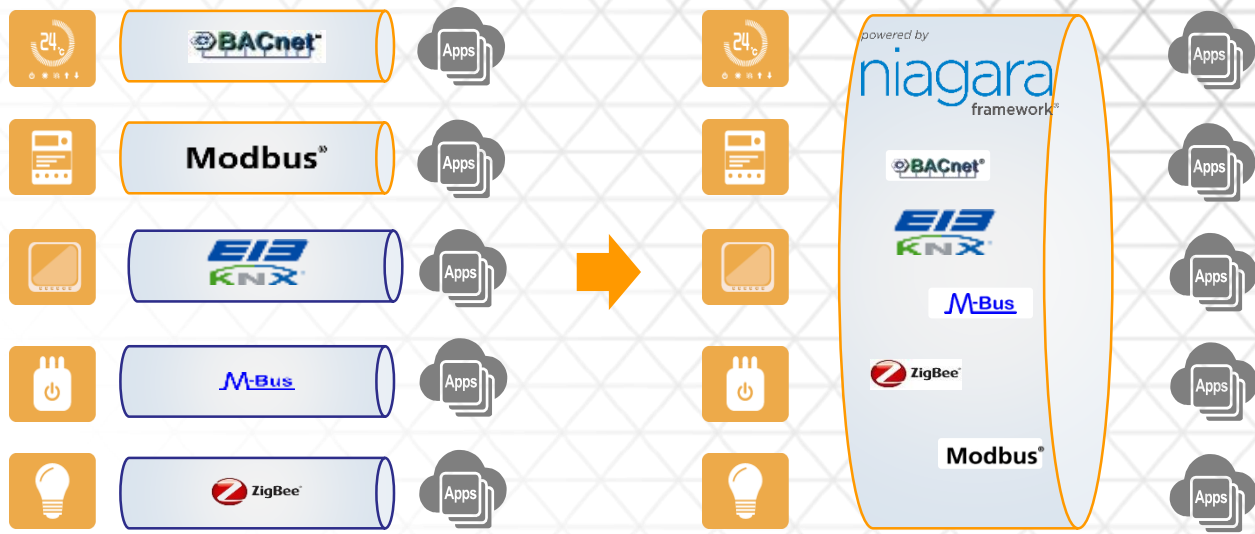
# Niagara分布式中间件技术



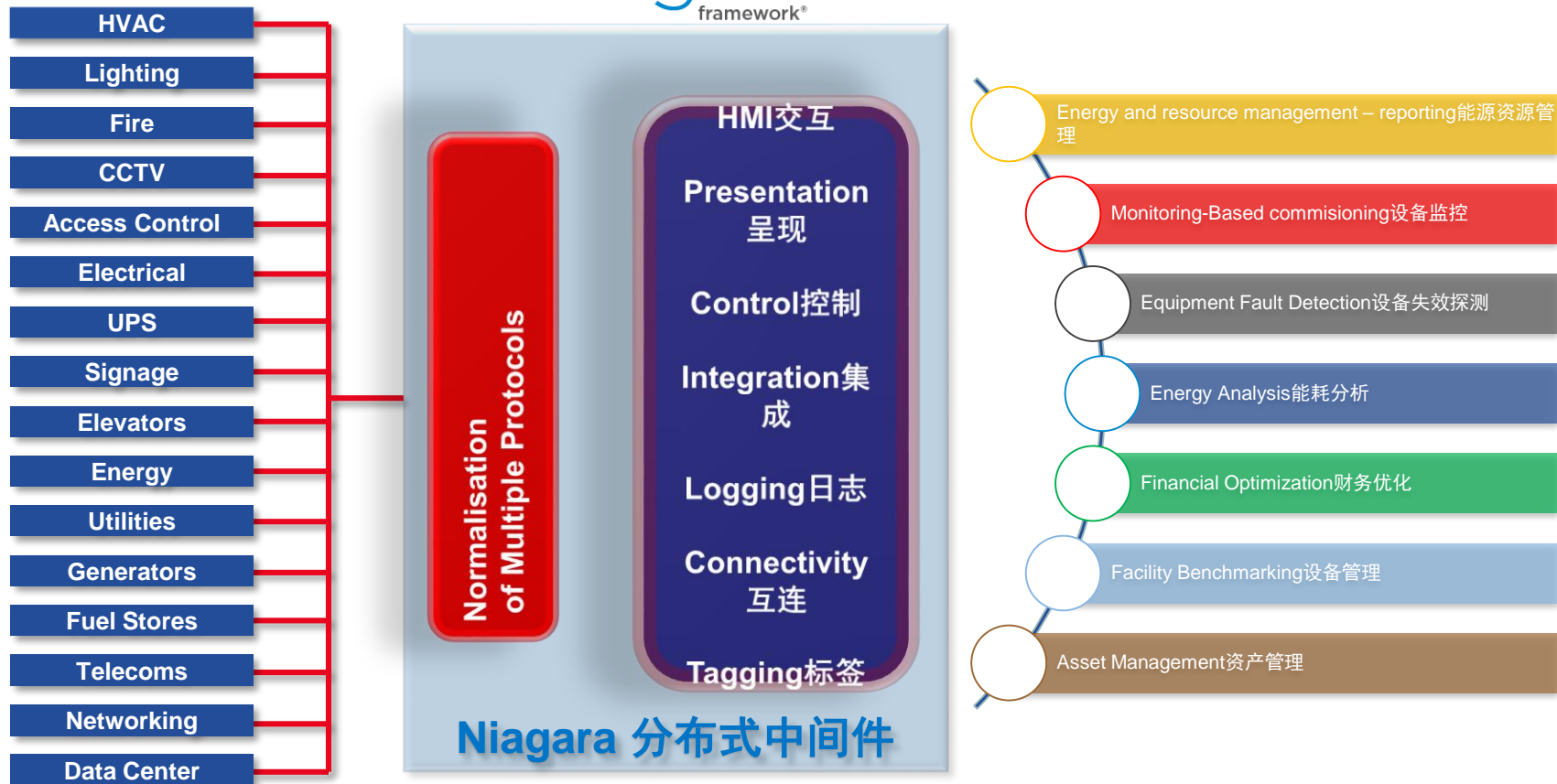




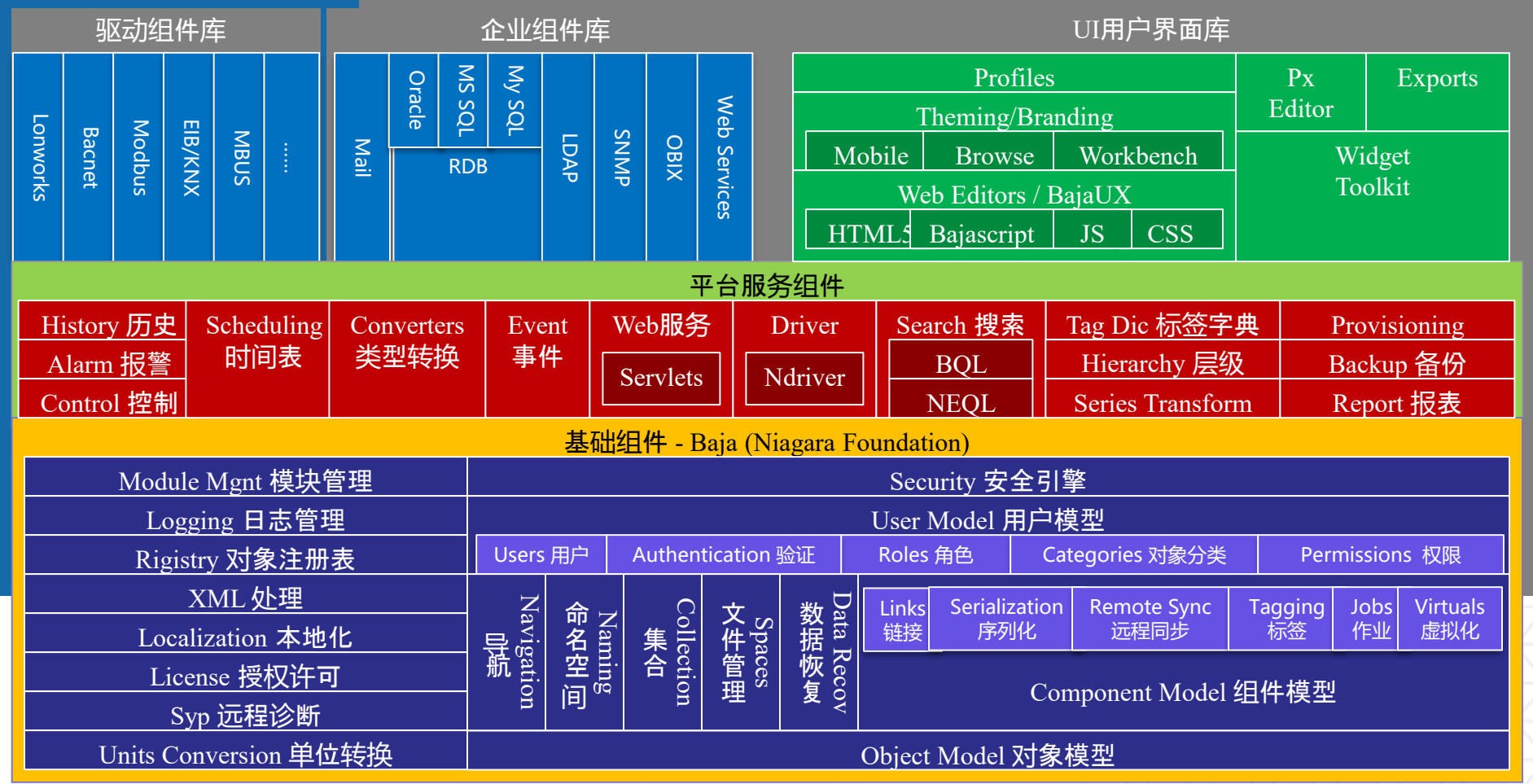




Niagara分布式硬件无关性中间件技术平台



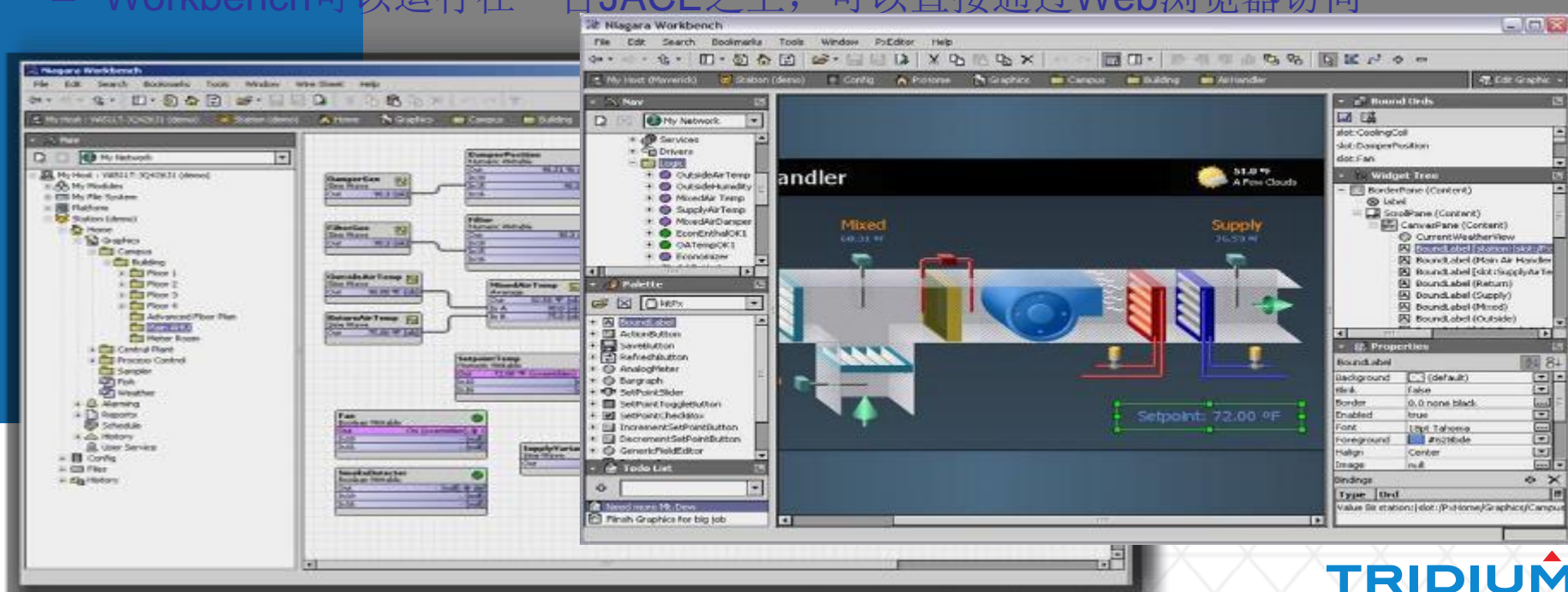
# 开放分布式应用开发框架 - 软件框架





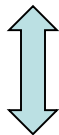
# 开放分布式应用开发框架 - 统一应用开发工具Workbench

- 是一个集成开发工具，包括业务建模，用户界面设计，驱动开发等。
- 可以对Niagara & Sedona Frameworks编程
- Workbench可以运行在一台JACE之上，可以直接通过Web浏览器访问



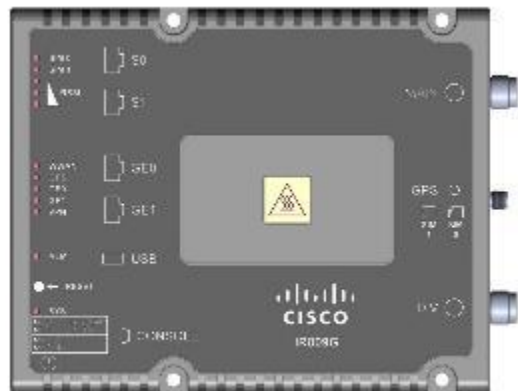
# 系统集成

powered by  
**niagara** Supervisor  
framework®



- 参数
  - TI AM3352 : 1000MHz Cortex™-A8
  - 1GB DDR3 SDRAMARM®
  - 4GB SD工业闪存
  - Wi-Fi ( 客户端或WAP )
  - USB 连接器, 备份与恢复
  - 2个独立RS-485
  - 2个100MB 以太网端口
  - 安全启动
  - 24V交流/直流电源
  - 运行Niagara 4.1或更新版本
  - 实时时钟
  - 无电池

# 移植Niagara



## Niagara Framework 4.2

Niagara Run Environment  
Native API Implement  
C代码移植

Java Run Environment

J2SE Java8 compatible JRE

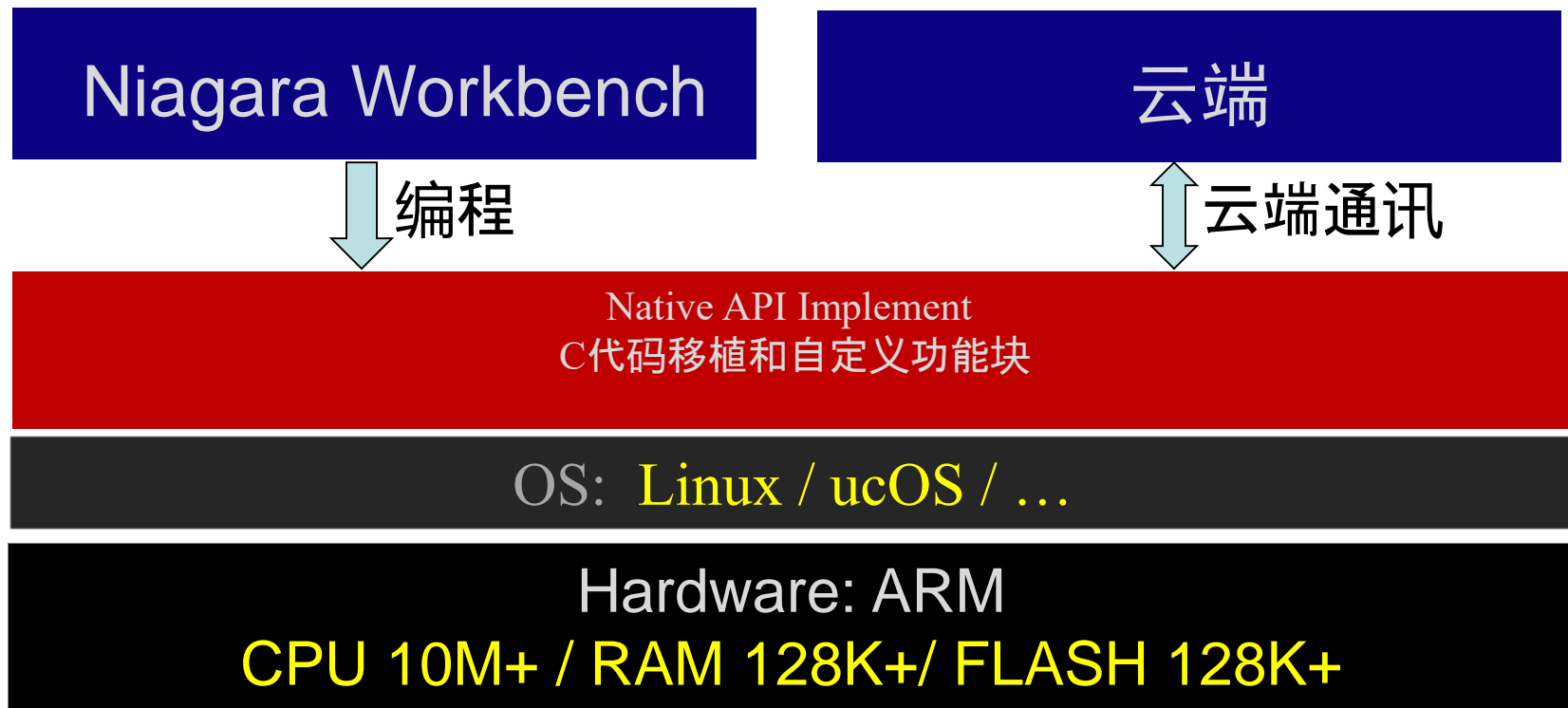
OS: QNX / Windows / **Linux**

Hardware: x86 / PPC / ARM

**CPU 500M+ / RAM 256M+ / FLASH 256M+**

o

# 移植Niagara Edge Micro

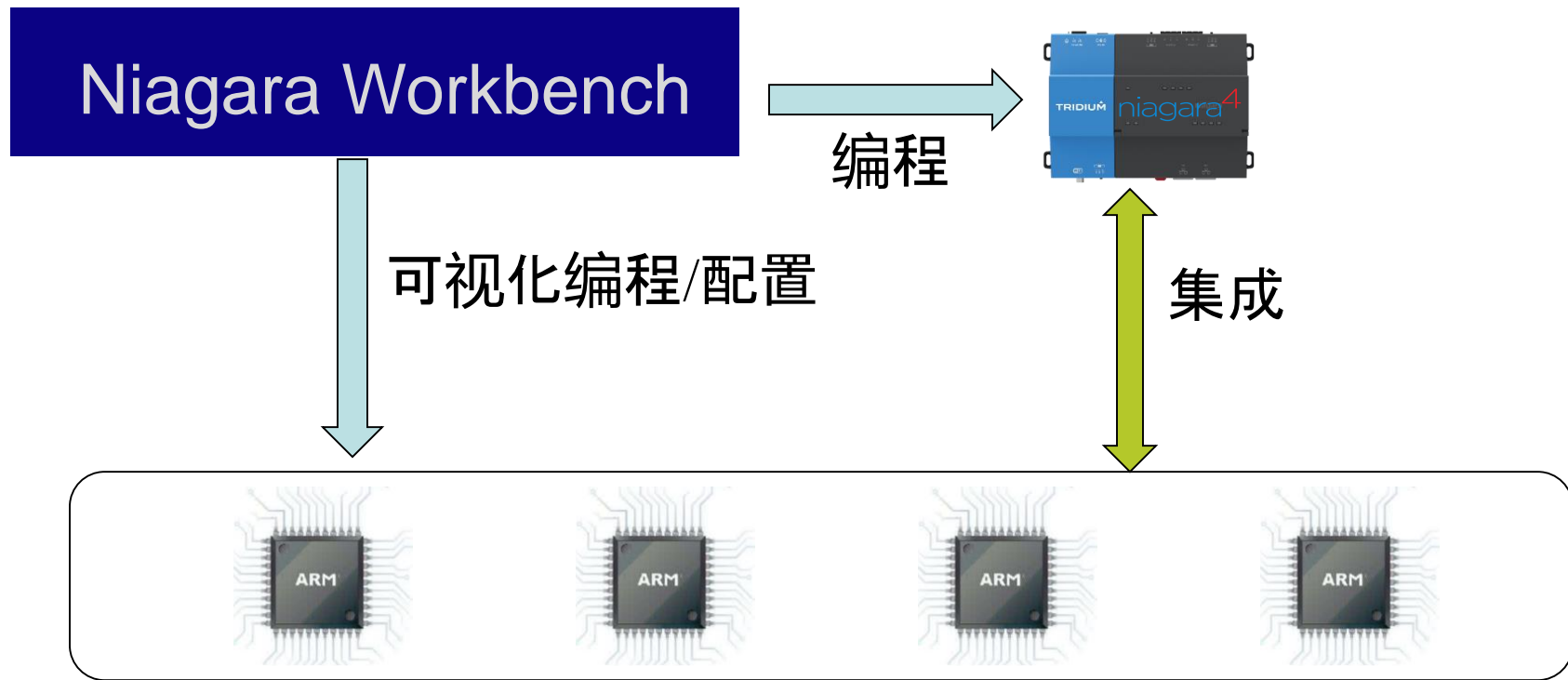


备注:

Niagara Edge Micro可以将普通的嵌入式硬件变成可二次编程的智能设备。



# 编程、集成工具



备注：

Niagara Workbench是一个可定制的可视化编程工具

# Niagara 分布式软件和控制

Supervisor  
Server

niagara<sup>4</sup> *Powered by* **niagara** AX  
FRAMEWORK



Supervisor  
Controller-  
JACE



IP DDC/IO

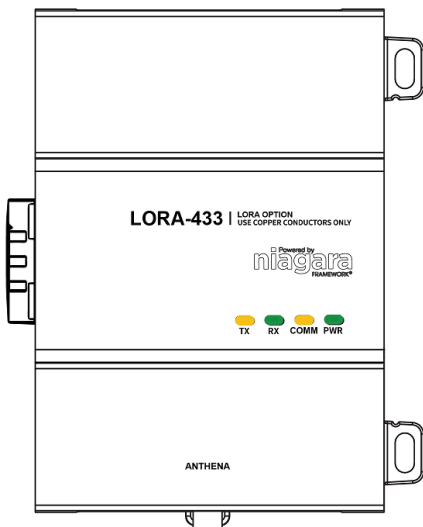


Devices



# Niagara LoRA Solution

- **LoRa/NB-IoT节点**



- ✓ JACE8000通过LoRa/NB-IoT连接到云服务器
- ✓ 远程监管/控制, 报警

# Niagara LoRA solution



# NAF分析平台工具

## niagara analytics 2.0

Compatible with Niagara 4 | Available now

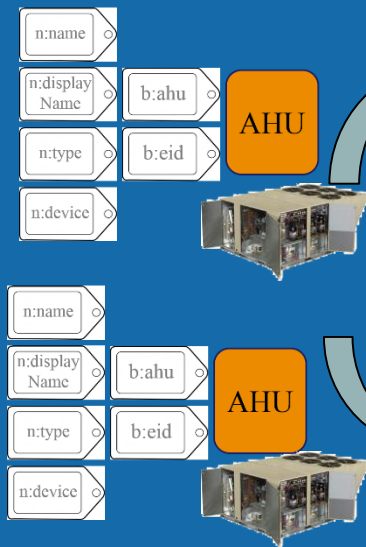
The screenshot displays the Niagara Analytics 2.0 user interface. On the left, a navigation pane shows a tree structure under 'Nav' with 'AnalyticService' selected. Below it, a 'Palette' pane shows a list of metrics under 'analytics-lib'. The main area on the right is titled 'Property Sheet' and shows the configuration for 'AnalyticService (Analytic Service)'. The properties are listed in a table-like format with various input types like text boxes, dropdowns, and checkboxes.

Property Sheet	
AnalyticService (Analytic Service)	
Status	{ok}
Fault Cause	
Enabled	<input checked="" type="checkbox"/> true
Rt Version	2.0.110
Wb Version	2.0.110
Ux Version	2.0.110
Alert Count	2
Algorithm Count	112
Point Count	131
Proxy Ext Count	3
Caching	<input type="checkbox"/> false
Cache Built	<input checked="" type="checkbox"/> true
Caching Startup Delay	1
Auto Tag Analytic Point	<input checked="" type="checkbox"/> true
Test Cov Neql	hs:hisInterpolate = 'cov'
Test Totalization Neql	hs:hisTotalized

At the bottom right of the Property Sheet, there are two buttons: 'Refresh' and 'Save'.



# NAF工具



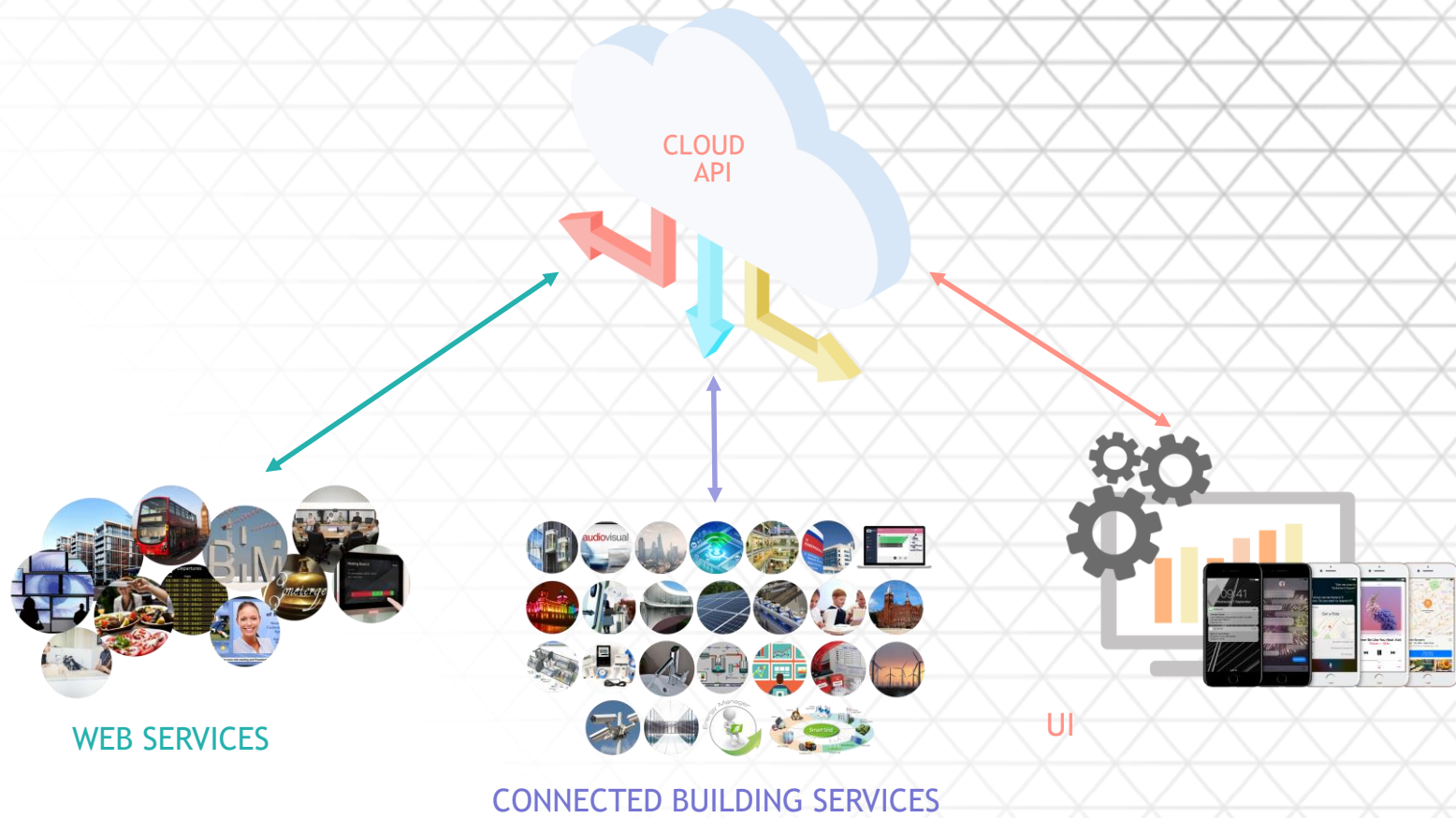
Niagara Analytic Framework

Niagara Tagging System

Niagara Framework

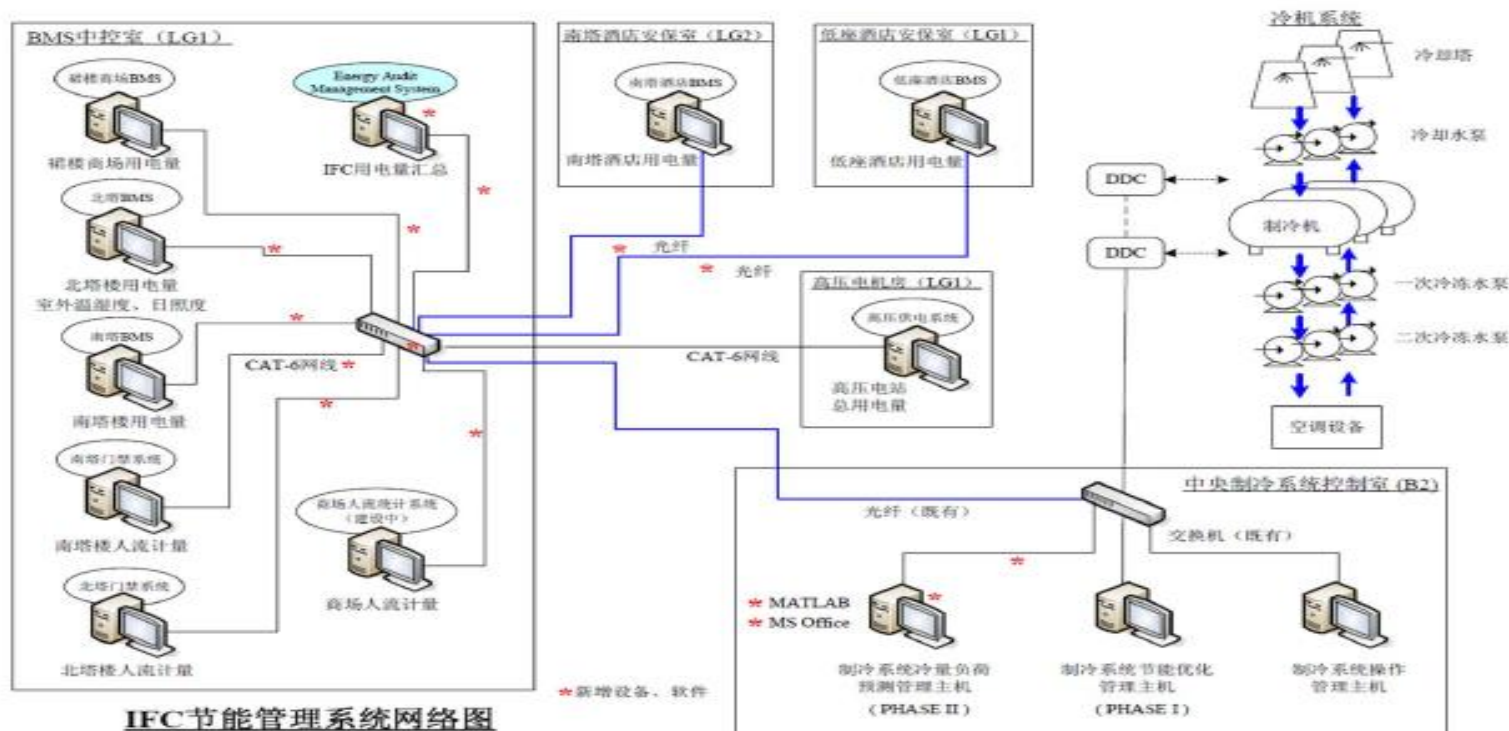
# 基于 Niagara 分布式架构





# 主要案例分享

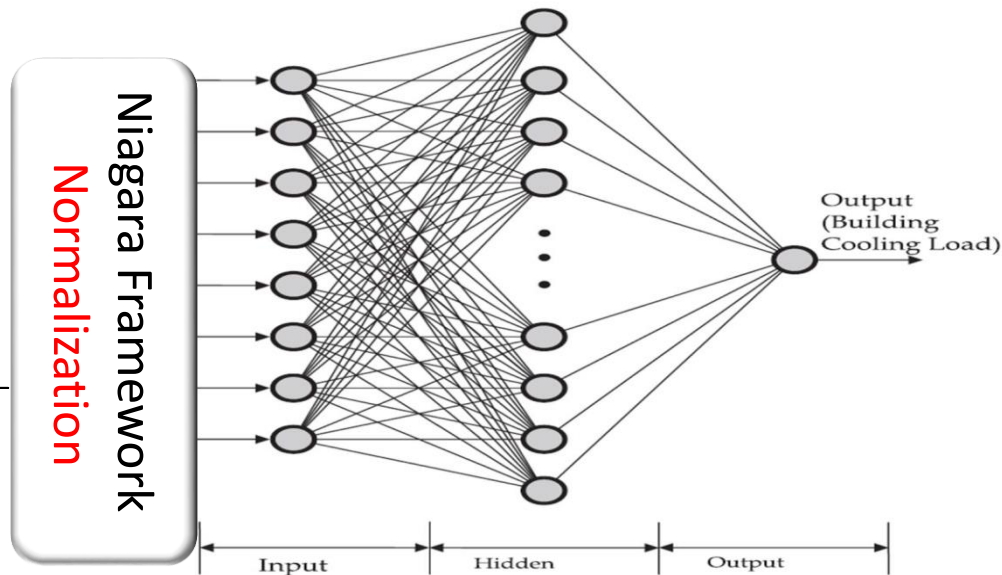
# IFC - Cool Load Predication 负荷预判





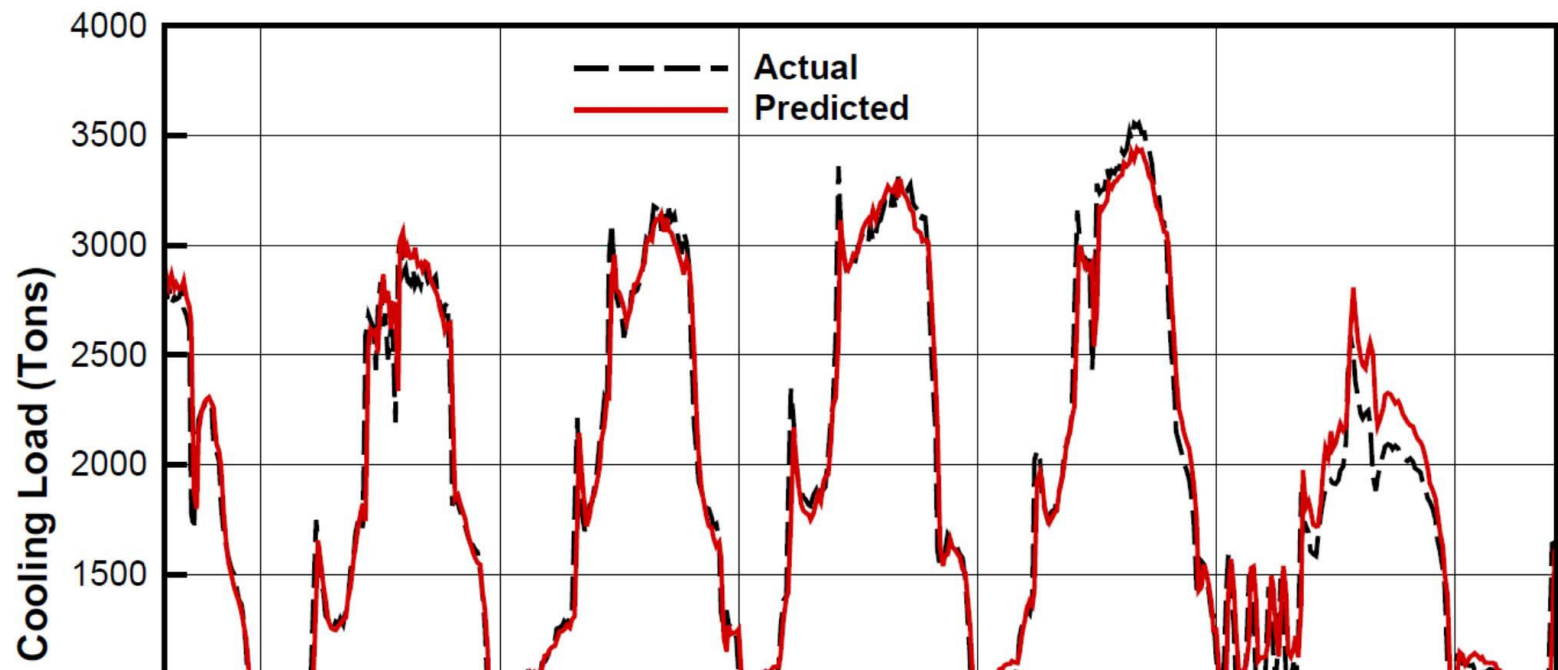
# IFC - Cool Load Predication 负荷预判

Real time cooling load 实时负荷  
Temperature 温度  
Relative Humidity 湿度  
Solar irradiance 阳光辐射率  
Occupancy Rate of Office Tower  
办公入住率  
Landlord power consumption rate  
业主电量消耗统计  
Occupancy Rate of Shopping Mall  
商场人流量统计  
Tenants power consumption rate  
租户电量消耗统计



- Niagara 标准各入口数据统一格式
- 数据分析工具提供消除干扰信号手段

## 预测与实际负荷对比



- 1997 Tridium在美国弗吉尼亚州里士满成立
- 1999 推出第一代Niagara Framework以及基于Web技术的楼宇自动化和能源管理解决方案的Vykon品牌
- 2000 与包括霍尼韦尔、施耐德、艾默生等知名行业公司达成战略合作
- 2004 举办首届Niagara峰会
- 2005 霍尼韦尔宣布收购Tridium，成为霍尼韦尔国际旗下独立的全资子公司
- 2006 推出Niagara Central，作为Niagara社区的互动门户
- 2008 Niagara Framework的安装实例超过100,000个
- 2010 Niagara Framewrok的安装实例超过200,000个
- 2012 Niagara Framework的安装实例超过300,000个
- 2013 中国独资公司成立，大力开发中国及亚太市场
- 2015 Niagara Framework的安装实例超过500,000个，推出新一代IOT平台——Niagara4

- 1998 – Niagara R1
- January 2000 – Niagara R2
- June 2005 – Niagara AX 3.0

- 2015





## 低成本、低风险、可持续开发属于你的行业应用软件系统

**Niagara** = 框架内核 + 可重用的组件和驱动库 + 开发工具 + 生态体系

传统软件平台 = 基础框架 + 组件库 + 配置工具（异构 / 变化）

传统应用软件 = 基于特定需求的软件系统





- 55+ 国家地区
- 3,000+ 系统集成商
- 100+ OEM 厂商
- 12,000+ Niagara知识社区在线用户
- 16,000+ 认证应用工程师
- 400+ 认证开发工程师
- 400,000+ 安装部署实例
- 10,000,000+ 接入的智能设备



China Partners 中国合作伙伴



Global Partners 全球合作伙伴



Alliance Partners 联盟伙伴



排名不分先后

TRIDIUM



# THANK YOU

Tridium.cn

谢谢