Business ready applications, not the connectivity solution, will be the driver for private networks

Agenda

- Introduction to Veea
- Small Cells & Edge Computing similarities
- What is Edge Computing – localised connectivity and compute
- Use Cases
- VeeaHub Family
- Conclusion

Veea Inc. Corporate Snapshot

Formed in 2014

Wholly owned Subsidiaries:
- Veea Systems Inc. (US)
- Veea Systems Ltd. (UK)
- Veea Solutions Inc. (US)

100+ FTE Employees

75 FTE Engineers

29 Patent Applications (2 Key Patents Granted)

Major Shareholders Series A Shareholders:
- NLabs Inc.
- EdgeWater Investments Co.
- Korea Information & Communications Co. (KICC)
- Sony Corporation

Our Team's Background

Headquarters: Manhattan

Satellite Offices: Atlanta, San Diego, Paris, Geneva, Seoul

Major Operations: Bath, UK & Metropark, NJ

Experienced Leadership

Allen Salmasi

Chairman of the Board & CEO Veea Inc.

Former Board member, CSO & President of Qualcomm Wireless; Chairman & CEO of NextWave; Chairman and CEO of Omninet Corporation

Dr. Alan E Jones

CEO of Veea Systems Inc. and Board Member of Veea Inc. –

Former CEO of Virtuosys. VP of General Dynamics Broadband; EVP & CSO of IPWireless - NextWave Wireless HP and Motorola

Michael Salmasi

Founder and CEO of Veea Solutions Inc. and Board Member of Veea Inc.

Former Wealth Management at UBS Financial Services

Janice Smith

COO & General Counsel

Former SVP & Chief Risk Officer at OSG and Partner at Proskauer Rose law firm

Shan Ethridge

SVP of Financial Services

Former VP & GM at Verifone and SVP of First Data Corp

Evan Sohn

VP of Sales

Former VP of Sales at Poynt; Senior Director of Sales at Verifone and Director of Marketing Symantec Cloud

David Rose

SVP of Marketing

Former VP of Sales at UltraSoC Technologies; Director of Biz Dev at IPWireless; Director of Embedded Solutions at ARM Holdings

Technology Pedigree

CDMA-Based Cellular & Satellite Technologies

First Global & Nationwide MVNOs

1985

OMNINET

Global commercial satellite network – OmniTRACS & EutelTRACS - North America, Europe & Asian

First large scale commercial application of CDMA

1988

OMNINET

SensorTRACS- One of the first SCADA (IoT) applications

1989

QUALCOMM

First fully digital cellular network – Qualcomm CDMA

1995

Globalstar

One of the first global Low Earth Orbit (LEO) satellite networks (Globalstar)

1998

NextWave WIRELESS

First large scale MVNO network with MCI as the largest customer

Technology Pedigree (Cont'd)

First & Most extensive Public Safety Network & WLL (IoT)

First Nationwide Mobile Video Streaming Networks

First Fully Integrated Intelligent Edge Server with Unified Mesh Computing

2006

First and largest WLL in Czech Republic & largest public safety network (NYCWiN) in New York based on TD-CDMA – an end-to-end all IP-based broadband wireless network

2007

First end-to-end OFDMA & TD-CDMA network solutions supporting video streaming

2014

First truly converged distributed computing platform with unified wired & wireless mesh and Edge servers & thin clients running applications

2018

VeeaHub
VeeaPay
VeeaPOS
VeeaConnect
Veea – Go Places

5G - where is it and who will pay for it?

Everyone's talking about it. Governments in a dozen countries (including ours) have said they want their countries to be leading adopters of 5G.

Qualcomm and Huawei have modems for it.

Samsung and Huawei have phones for it.

Huawei, Nokia and Ericsson have the switchgear.

But who'll pay for it?

Not the consumer. A PwC survey showed that only a third of American consumers would be willing to pay any sort of premium for a 5G connection.

Not governments. They have enough debt as it is.

Not the operators which typically spend, collectively, $150 billion a year on mobile capex out of their collective revenues of $1.6 trillion.

The global cost of installing 5G is estimated by capital providers Greensill at $2.7 trillion.

So it'll take 18 years to get global deployment of 5G.

In Europe, the cost of installing 5G is put, by the GSMA, at $568 billion.

The total collective revenues of European telcos is €270 billion, says the European Network Operators Association.

Collective European telcos' annual capex is €47 billion says ETNO. An estimated half of that goes to mobile capex.

Which suggests that it'll be 23 years before 5G is installed in Europe.

And the roll-out will be spotty to say the least, and initially confined to relieving congestion, so we probably won't see that vaunted 100x speed improvement over 4G for several decades.

While most people would be happy to have an uncongested 3G signal.

David Manners: Electronics Weekly

Cloud Robot is the Killer Application for 5G…..

MWC 2019

Who needs Private Wireless Networks

Small Cells

Coverage:

- No or Intermittent public network
- Remote areas
- Mines
- Agricultural lands

Capacity:

- Exclusive use of available capacity
- Configure uplink & downlink
- Set own usage policies
- Engineer RAN for own demands

Control:

- Determine who is allowed on network
- Choose to optimize traffic
- Optimize reliability and latency
- Enhance security

Infrastructure or Network Edge

Edge Computing

Coverage:

- No / Intermittent public network
- Remote areas, tunnels, underground
- Mesh Network works over any protocol
- Adding more Hubs increases coverage

Capacity:

- Private/Public
- Distributed Computing spreads resources
- Performance increases as network grows
- Load Balancing for Application choice

Control:

- Authentication required during enrolment
- Application deployment choice
- Management resides on premise or on cloud
- Additional enhanced security containers

Device Edge

Private LTE Networks: A Heavy Reading white paper produced for Qualcomm

Edge Computing is…

"augmenting or replacing computational and storage resources currently in the Cloud at the Edge"

- **Platform's Benefits**
  - **Cost Savings:** reduces unnecessary network data flow
  - **Latency:** reduces round-trip time to the cloud
  - **Security & Privacy:** data remains local to the source
  - **Cost Effective:** integrates multiple connectivity solutions

- **Distributed Applications**
  - **Distributed Computing**: create a hybrid wireless and wired micro-cloud
  - **Quality of Service:** improves uninterrupted operations, communications latency & continual operation
  - **Data Lifetime:** edge data can be is perishable
  - **Edge Processing:** pre-process and discarded

- **Platform's Connectivity**
  - **Improved Connectivity:** operate across all wireless protocols
  - **LAN firewall and router:** programable firewall for IoT connections
  - **Always Up to date:** OTA updates ensure latest software feature and fixes always deployed
  - **Future Proof:** continuous evolution as new protocols developed

Key Business decisions under review

Enterprises are evaluating how to achieve a mobile first strategy that also enables new revenue streams within 3 years, but what are the technology drivers?

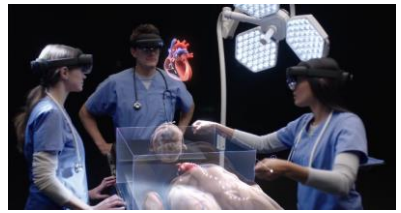
AI / ML

IoT

5G / NB-IoT/ CatM1

Blockchain

Wi-Fi 6


Augmented Reality

What do all these have technologies require ?

Upfront & Ongoing Costs: Installation, Subscriptions, Maintenance, Upgrades

Future Proof: Connectivity, Coverage, Scalable, flexibility, Reliability

Smart Retail

4G failover

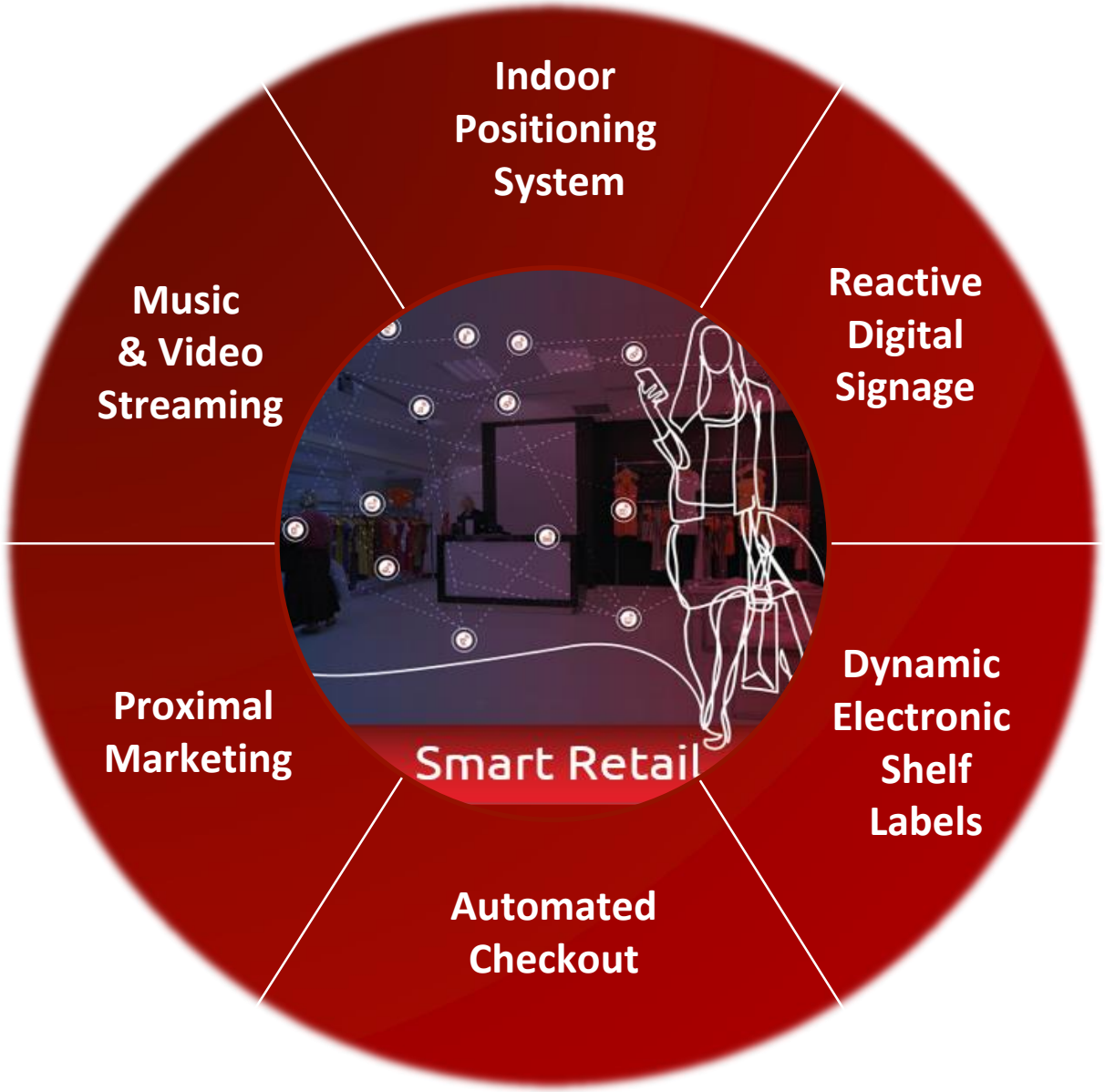
- Provides optional backup internet connection in the form of a secure and affordable 4G failover which allows your business, including payment transactions, to continue even when the internet is down.

Guest Wi-Fi

- No need to give out passwords – easily create a guest Wi-Fi for your customers that is secure and separate from your business network. Auto login into your guest Wi-Fi is enabled by an embedded beacon along with a consumer.

Connectivity

- Third party sensors controlling IoT devices such as CCTV cameras, restricted area access doors, lighting and temperature monitors can be deployed from any third party via an integrated IoT device manager.



Smart Buildings and Cities

Analysis

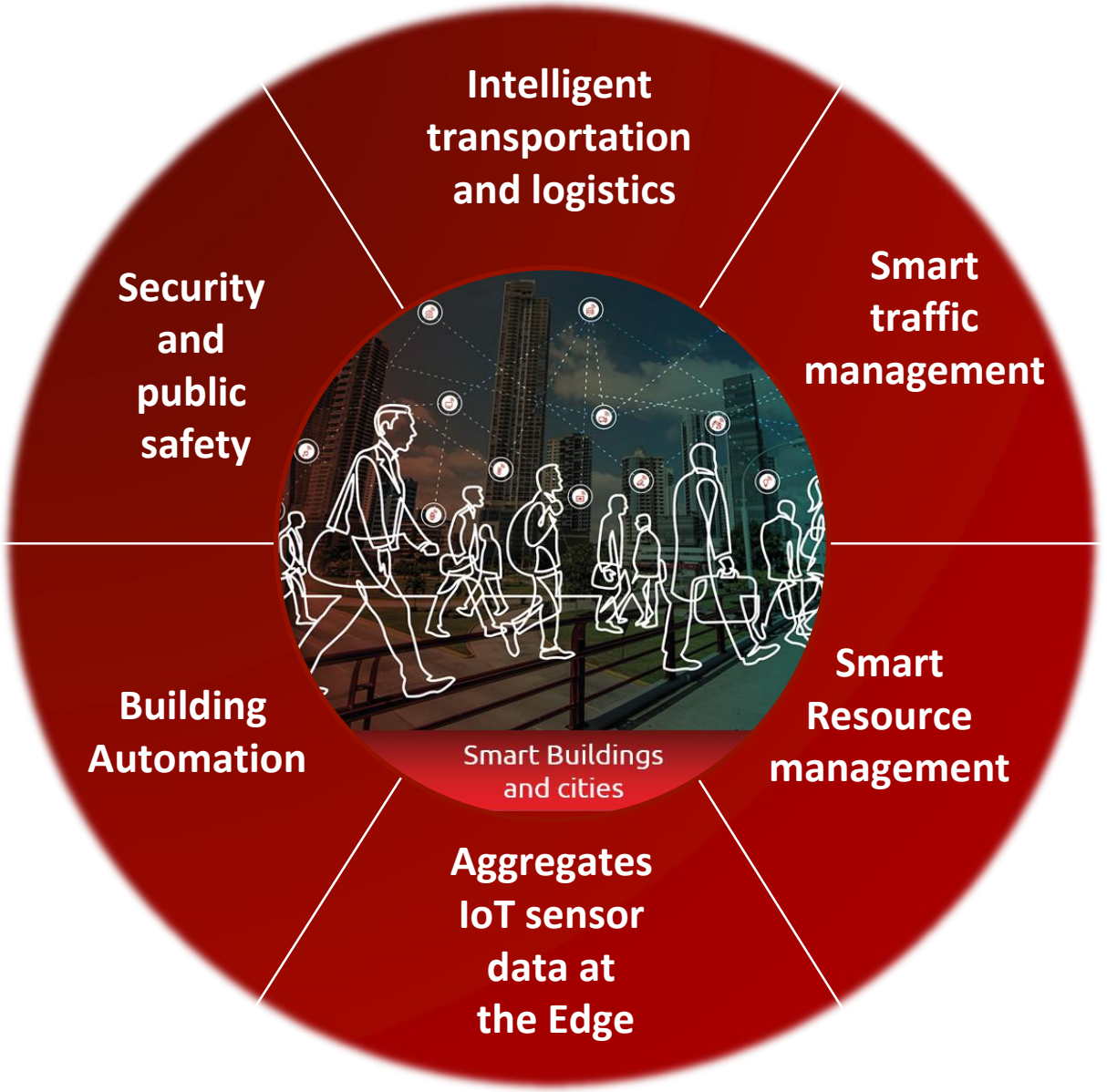
- For smart city applications networking is no longer about ‘data transport’; it is about ‘intelligence’ derived from network data to achieve better business and policy outcomes.

Data is available…

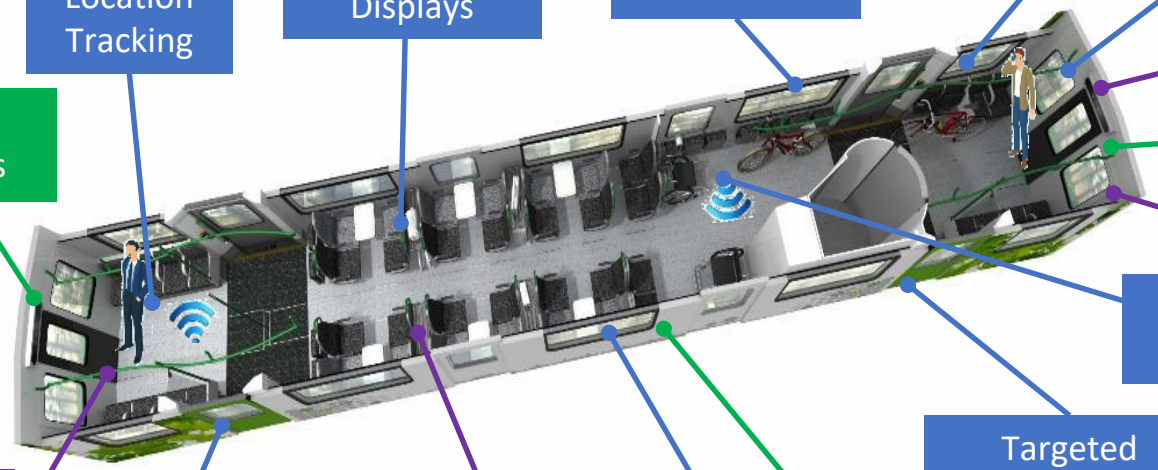
- Offers high-performance computing capability to filter, screen, and analyze ‘data in motion’. An increasing range of new business insights, decision-making, revenue services and city management solutions is based on data analytics derived from the network

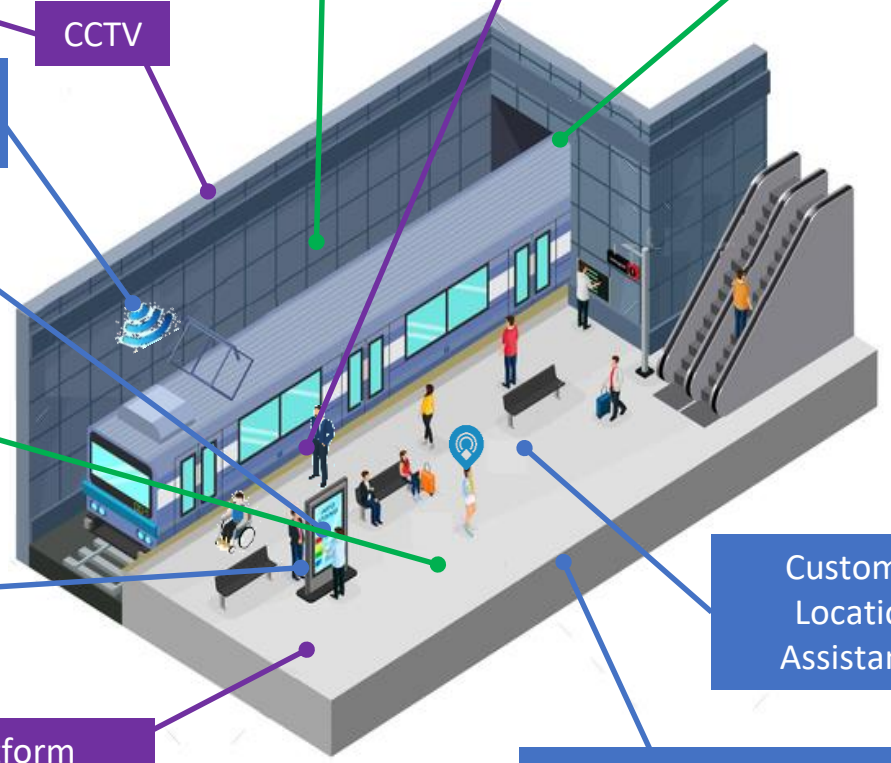
…but it needs to be collected

- Collection of massive amounts of real-world data, through sophisticated sensors could involve high costs of transport to the cloud or even lost data. Alternatively, data could be processed at the Edge.



Smart Transport Use Cases





Staff Location Tracking

Seat Reservation Displays

Passenger Disability Services

Gaming

Luggage Monitoring

Train to Station Staff Communications

Edge Analytics

Predictive Maintenance

Intelligent Data Onshoring

CCTV

Public Wi-Fi

Body worn cameras

Targeted Advertising

Seat Ordering & Payments

PA Announcements

Sensor Monitoring

Distributed Video On Demand

Customer Location Assistance

Train to Platform Disability Services

Personalised Customer Services

Operational

Passenger Experience

IoT

Smart Transport

A brilliant day yesterday demonstrating our fog computing technology to the Department for Transport (DfT), United Kingdom at our Ely site alongside our partners Veea Systems at the end of our Innovate UK First Of A Kind project.

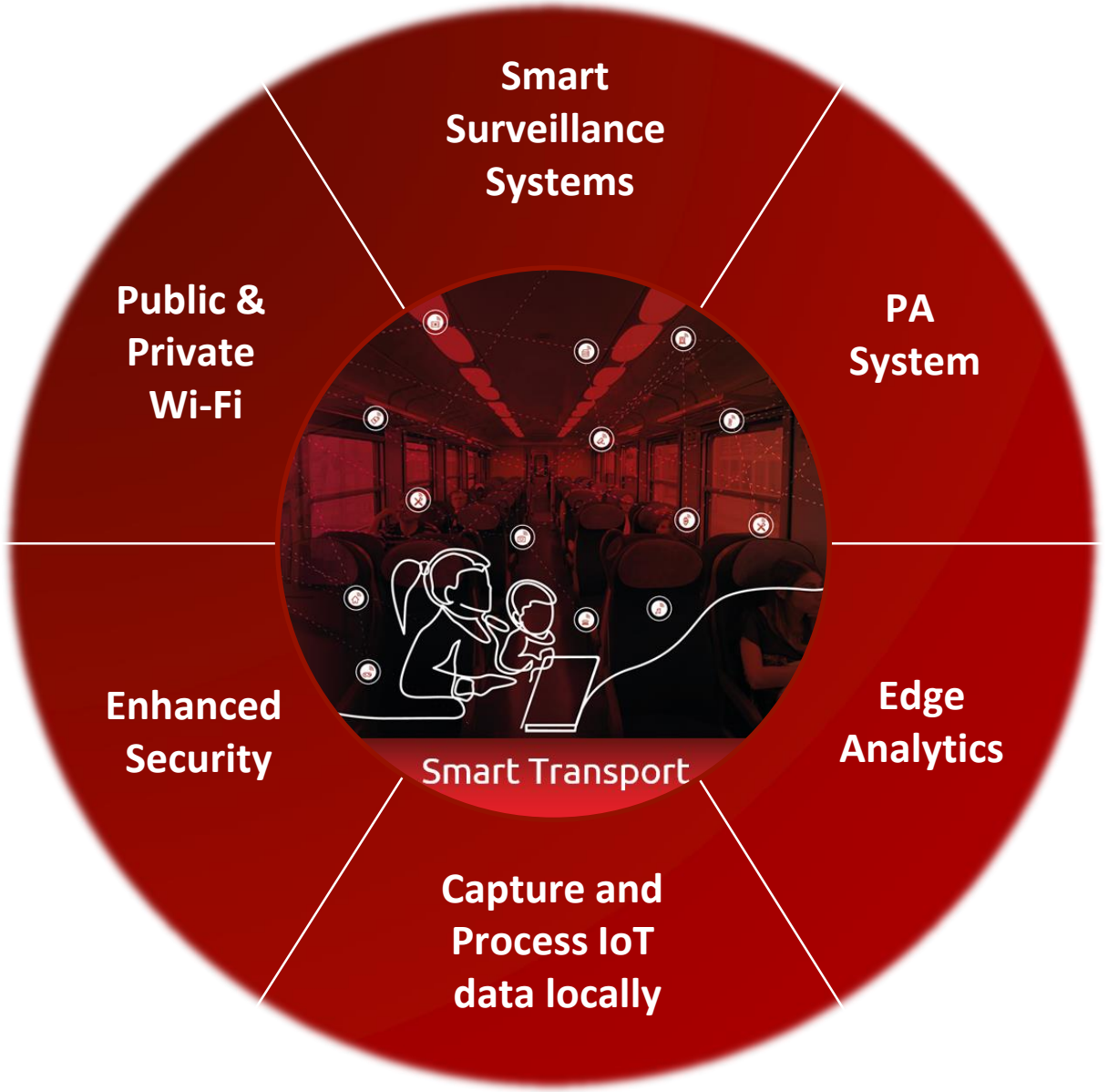
Creating a new wireless digital architecture for trains - a resilient, wireless, edge computing, mesh network that can seamlessly work across vehicles, interconnected units and stations. Effectively providing a cloud server onboard the train.

Our demo showed the system interfacing with legacy CCTV cameras, making all the CCTV feeds available, wirelessly in realtime, to multiple mobile devices anywhere on the train. We also showcased our ability to run IoT applications locally, run massive multiplayer games on passenger devices across the train (Minecraft), control the train PA system via mobile devices and many others.

All of this built on open source, standardised hardware and software in a single platform. Truly a gamechanger for rolling stock technology.

Watch this space for the 1st in service trials, or get in touch to find out more.
#RailTech #Innovation

Linked In 29/03/19



Are business ready applications available ?

Software has been at the heart of all technology successes

- DOS, Windows, Linux, iOS, C++, Java, Python

This has enabled devices such as

- IBM Mainframe, Server Racks , Mobile Phones, Smart DTV, Cloud Computing

What changes:

- Performance increases/ Power lowers / Size decreases
- Memory & Storage capacities increase
- Connectivity gets faster
- Screens get bigger and/or better quality

New companies emerged where the only important element is Software &Apps

VeeaHub family

Best of Breed

Cradlepoint ARC CBA850
Cellular Failover

Aruba
Access Point

Intel
SBC

Cisco Meraki MX64
SDWAN & Security

EERO
Wireless Mesh

Kontact TB15-1
Tough Beacon

Dell 3001
Edge Gateway

Integrated Solution

VeeaHub's for all business opportunities

Small Medium Business

Coffee Shops, Pizza Parlours, Small Stores, Restaurants

VeeaHub

Enterprise

Shopping Malls, Supermarkets, Factories, Hospitals, Airports

VeeaHub Pro / S

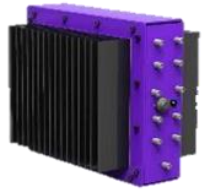
Smart Cities

Stadiums, Campuses, Buildings, Parklands

VeeaHub Pro Outdoor

Transportation

Trains, Busses, Trams



VeeaHub Pro RT

Single installation cost
Single monthly subscription
OTA updates
Centralised cloud management software
Apps store to deploy locally at the Edge
vMesh expandable coverage
Scalable distributed compute power
Reduced latency
Reduced communications costs
Increased security
Future proof open SW architecture

Conclusion

- Distinct similarities between Edge Computing and 5G Small Cell requirements
- 5G is still several years away from being considered widely deployed and business cases still immature and unproven
- Edge Computing available today
- Challenge for both is however viable use cases and available applications
- Offered standalone they both provide a Private Network – combined with orchestration from Core Network through to the Device Edge could be transformational