IQRF
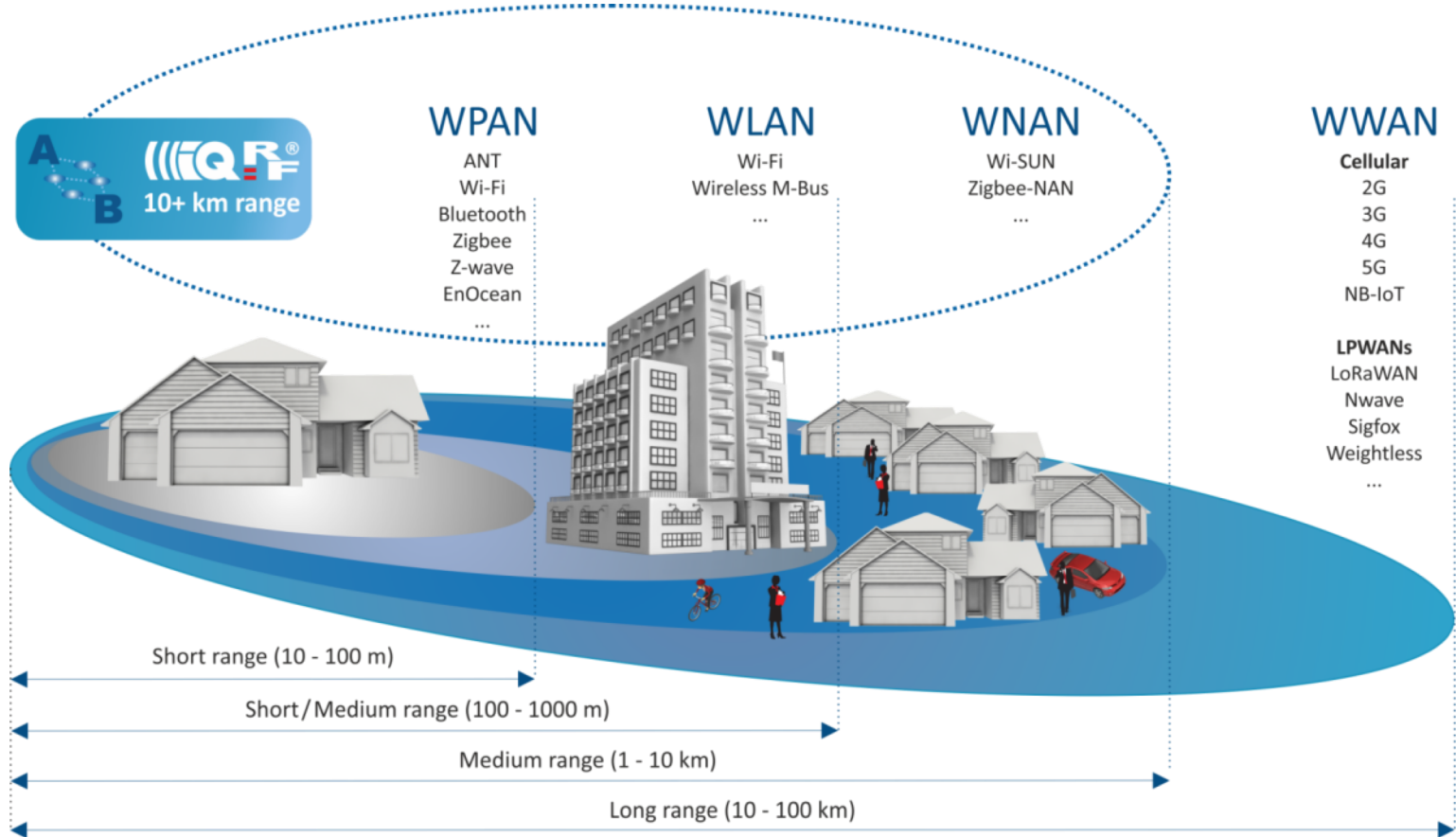
Wireless mesh technology, ecosystem and alliance for robust and reliable IoT solutions

Šimon Chudoba
IQRF Alliance, CEO

A B — IQRF 10+ km range

WPAN
ANT
Wi-Fi
Bluetooth
Zigbee
Z-wave
EnOcean
...

WLAN
Wi-Fi
Wireless M-Bus
...

WNAN
Wi-SUN
Zigbee-NAN
...

WWAN
Cellular
2G
3G
4G
5G
NB-IoT

LPWANs
LoRaWAN
Nwave
Sigfox
Weightless
...

Short range (10 - 100 m)

Short/Medium range (100 - 1000 m)

Medium range (1 - 10 km)

Long range (10 - 100 km)

Clouds & Services

clouds	IoT platforms	mobile apps	integration services

TechData · CRA · mainstream TECHNOLOGIES · logimic Software systems · MyMight · HEXIO · gs system · JOTIO · IQRF Repository

IBM Cloud · Microsoft Azure · master APP · PIXLA · DAVOS MATRIX · INTELIGLUE · iaconnects

↕ **HTTPS / MQTT / WebSocket**
JSON format ↕

Gateways

6 months → 6 hours
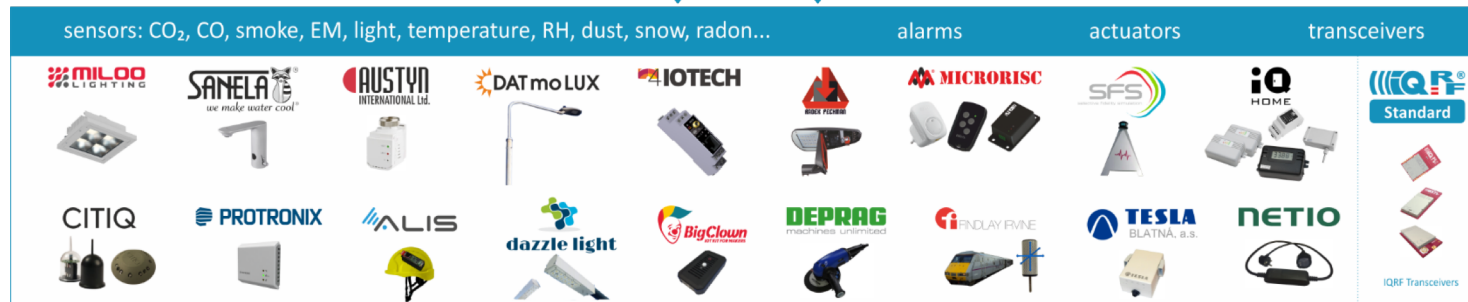
↕ **IQRF DPA** ↕

End Devices

sensors: CO_2, CO, smoke, EM, light, temperature, RH, dust, snow, radon...	alarms	actuators	transceivers

MILOO LIGHTING · SANELA we make water cool · AUSTYN INTERNATIONAL Ltd. · DATmoLUX · IOTECH · · MICRORISC · SFS · iQ HOME · IQRF Standard

CITIQ · PROTRONIX · ALIS · dazzle light · BigClown · DEPRAG machines unlimited · FINDLAY IRVINE · TESLA BLATNÁ, a.s. · NETIO · IQRF Transceivers

Efficient lighting solution in JULI Motorenwerk

70%
of energy savings thanks to efficient control and LEDs

Over **100%**
of lights in production hall remotely controlled and monitored

Over **3**
years of return on investment

Efficient lighting in cinema and sports hall

DAT mo LUX
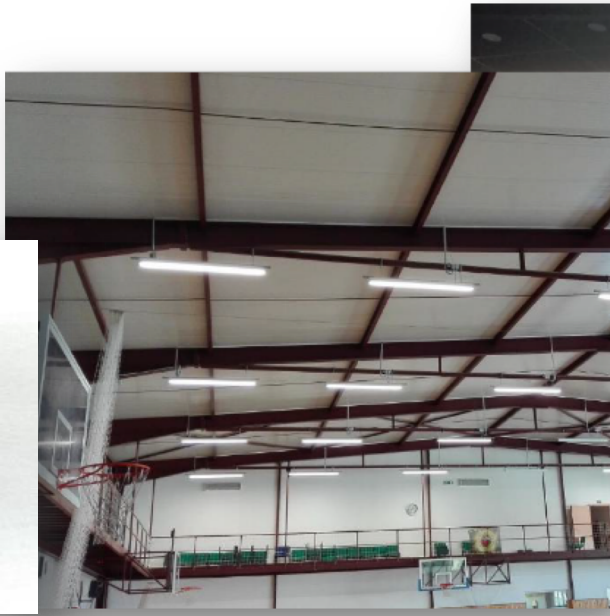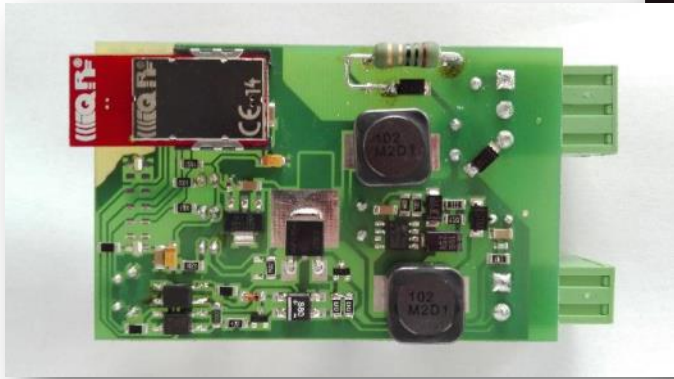
Over **10** different sections in halls for comfortable operation

100% reliable wireless lights control and monitoring

Over **7** different scenes in cinema for trouble-free operation

**** Hotel heating optimization in Hotel Patria - SK

1
reservation system controlling heating
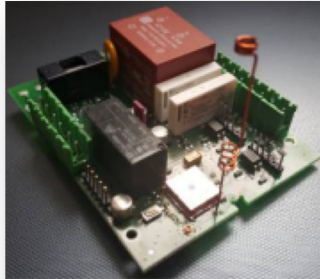
9
floors with rooms in a hotel controlled

Over **180**
electronic digital thermostatic heads installed
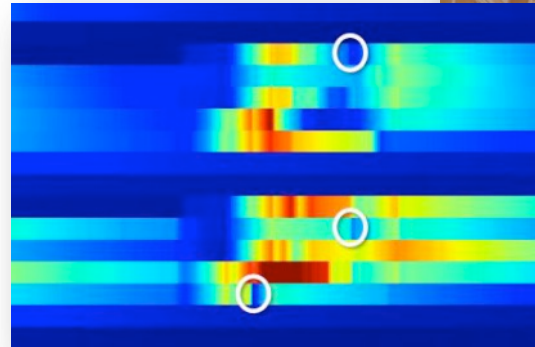
Automated heating system in Sala production hall
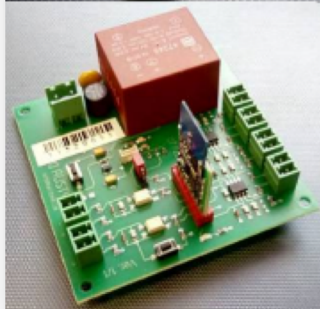
Only **2.5** years payback period

Over **54,000** cubic meters of gas savings

Over **90** sensors and control units

Air quality monitoring in a Prague school

4
months of continuos measurement

10
combined sensors of CO_2, temperature and relative humidity

Over **74%**
of the schooltime dry air (RH<30%)

Over **47%**
of the school-time a bad-quality air high CO_2 (>1000 ppm)

Defrosting of coal wagons in Slovak powerplant

1
Austyn Global Supervisor system for control
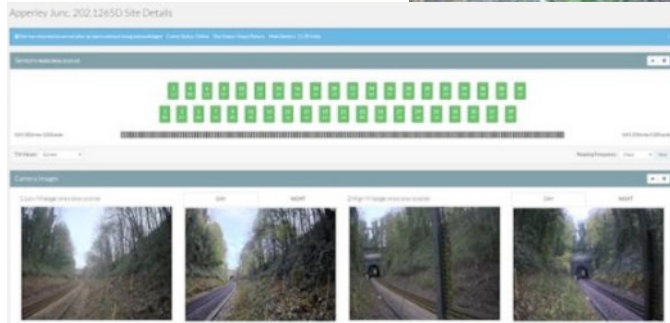
Over **500**
infrared heaters controlled by the IQRF network

Over **1.8**
MW of input power for infrared heaters

Save lives with railway embankments monitoring

Over **10,000** sensors located along the length of the railway

Over **5** years on battery for wireless sensors work

? of lives saved thanks to early warning

Wireless control of 1.5 MW turbine blades

2
transceivers in every rotor for redundancy and higher reliability

Over **4** years trouble-free operation

Over **40** systems equipped with this control
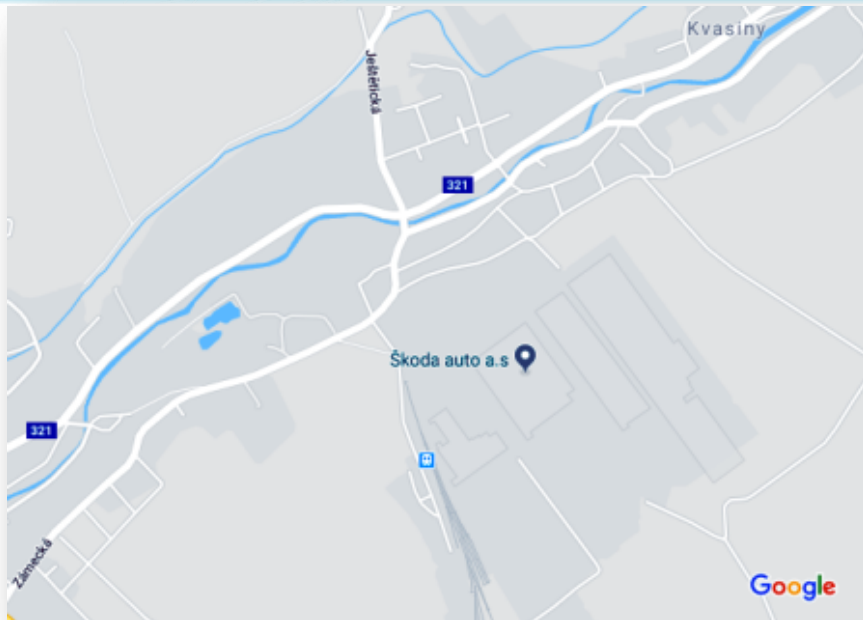
2 different RD channels

Street lights control in Rosice and Smolnik

Over **300** street lights installed and controlled

0 problems since the first day of the run

Over **50%** cost savings thanks to the modern technology

Traffic flow and parking control in Skoda Auto

Over **80** parking detectors in parking lots

Over **140** traffic flow detectors in adjacent villages

8000 employees per day navigated to an empty parking place

Up to **10** years on battery thanks to extra low power communication

IQRF Technology – Basic features

- **Bands**   868, 916, 433 MHz

- **Topology**   full mesh with 240 hops (used in real applications), 239 nodes

- **References**   mature technology, on the market since 2008

- **Protocol**   IQMESH®, patented directed flooding networking, secure communication, redundant packet deliver, no need for self healing, no latency after reset, etc.

- **Data**   20 kBauds, up to 64 B in 1 packet

- **Range**   500m+ line of sight @ 12 mW

- **Power consumption**
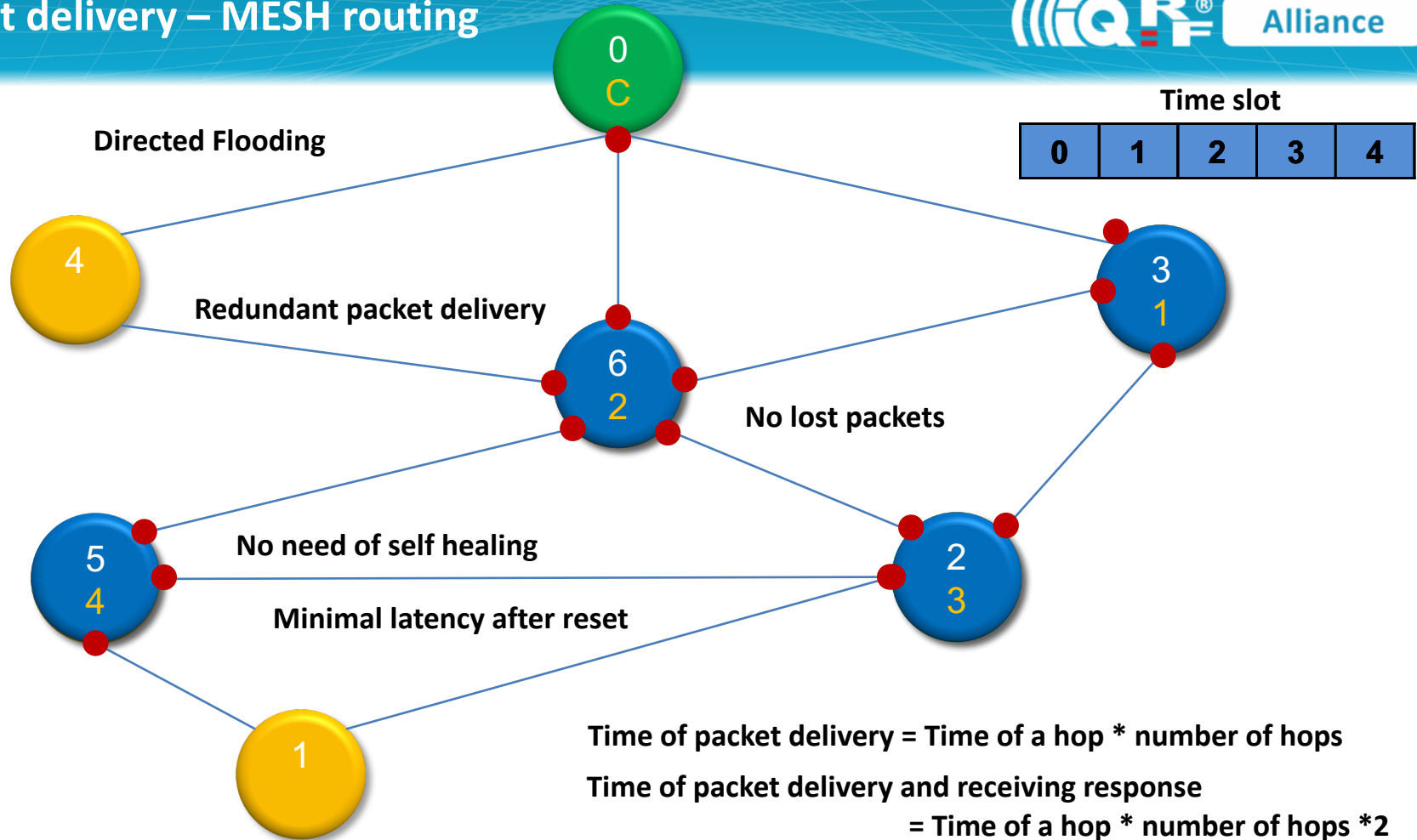 | | |
  |---|---|
  | Standard RX | 12.3 mA |
  | Low Power RX | 233 µA |
  | Sleep with watch dog | 2 µA |
  | Deep sleep | 100 nA |

TR-76D power consumption
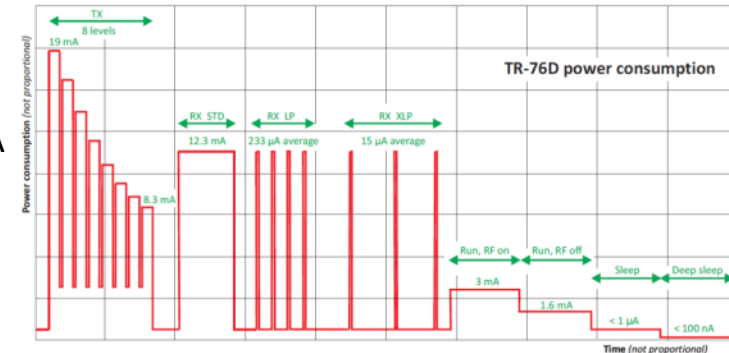
Unique features

- **Transceiver architecture**   **PATENTED,** used in many technologies worldwide, built-in OS

- **Robust routing algorithm**   **PATENTED,** directed flooding – reliably working mesh network with 239 routers

- **Direct Peripherals Access**   **PATENTED,** framework for wireless networks with no programming

- **Fast Response Command**   **PATENTED,** minimal network traffic and power consumption

- **OTA and RFPGM**®   robust wireless programming of hundreds of nodes simultaneously

- **Precise Sleep**   0.1% time variance on wake-up, often used in combination with FRC®

- **Back up and restore**   back up of all network data for further easy network restore

- **Autonetwork**   automated network build up

- **Service mode**   direct connection to any node, FW upload, configuration, back up, restore,…

- **Security**   based on standards (AES 128), pairing and communication encryption

- **Interoperability**   standard enabling easy integration of products from more IQRF Alliance members
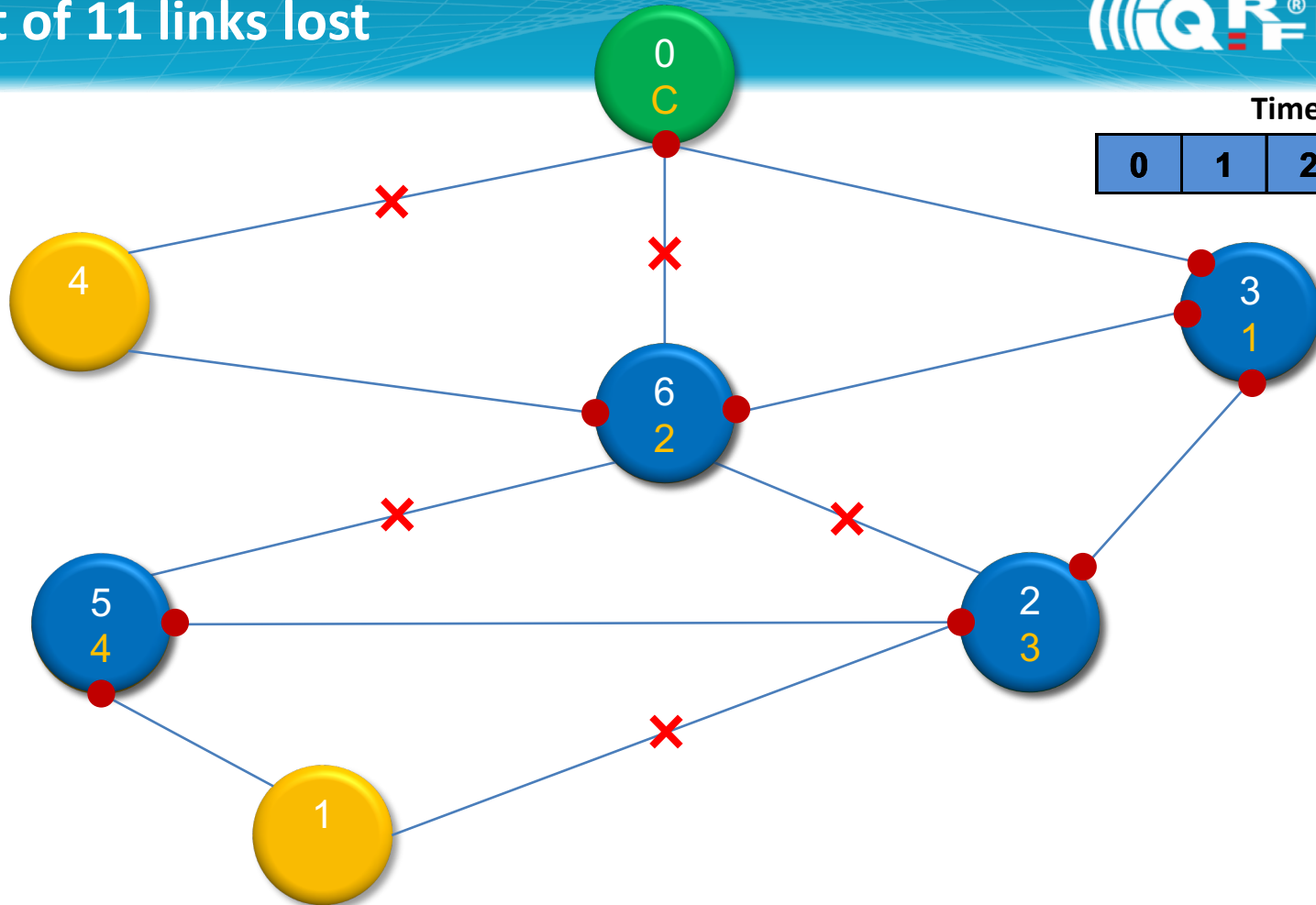
Packet delivery – MESH routing

Directed Flooding

Redundant packet delivery

No lost packets

No need of self healing

Minimal latency after reset

Time slot

0	1	2	3	4

Time of packet delivery = Time of a hop * number of hops

Time of packet delivery and receiving response
= Time of a hop * number of hops *2

Useful links

- **IQRF Alliance**   www.iqrfalliance.org

- **IQRF Technology**   www.iqrf.org

- **IQRF Summit**   http://iqrfsummit.org/

- **IQRF Shop**   https://iqrf.shop/