WITS

WATER INDUSTRY TELEMETRY STANDARDS

THE NEXT GENERATION

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DNP3 Technical Committee member

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I'm going to talk about..

WITS - Water Industry Telemetry Standards

WITS-DNP3 - First protocol

- What it is
- What it does
- What it doesn't do

What is IoT?

WITS-IOT - New protocol

- What it is
- What it's for
- What happens next

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Introduction to WITS

Mission:

"To **harness the combined strengths** of knowledge, skills and influence **of the water industry** through taking responsibility for the continuous improvement of telemetry technology and service, **through shared developments** on behalf of the UK Water Management Organisations."

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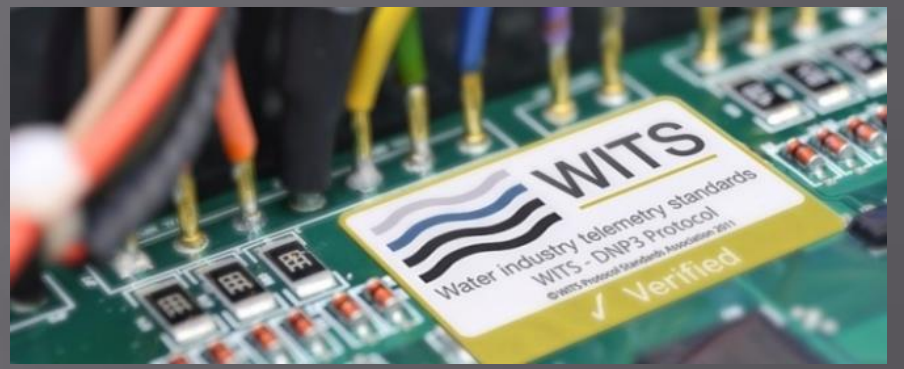
Introduction to WITS



What does WITS deliver?:

- Interoperability
- Security
- Open Telemetry Standards
- Protocol that is tailored for the Water Industry

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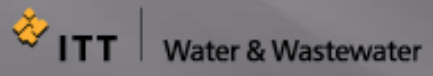
WITS TIMELINE



2003

- **W**ater **I**ndustry **T**elemetry **S**tandards committee was formed by a cross-industry group.
- Goal was to define a common telemetry protocol for the UK WMOs
- Telemetry user requirements gathered
- Funding secured
- Main industry suppliers invited to join
- Protocol review: DNP3 selected

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WITS Timeline

2004-2010

- Protocol development
- First version of **WITS-DNP3** released
- **WITS P**rotocol **S**tandards **A**ssociation established
- New users and vendors invited to join and use the protocol to develop new products

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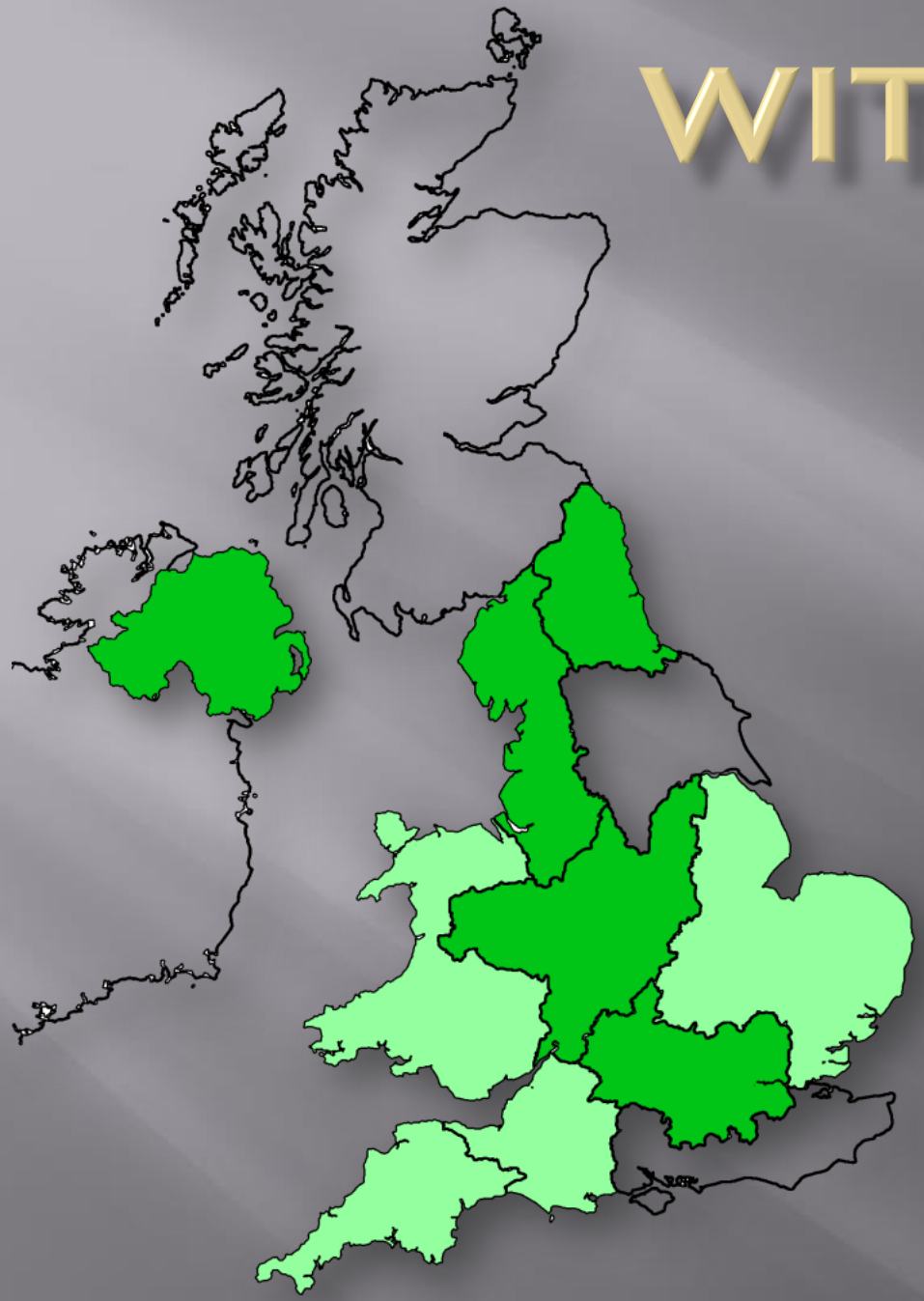
WITS TIMELINE



2011-2016

- WITS-DNP3 implementations
- Widespread UK WMO adoption (~8000 outstations, 9 regions)
- 37 member organisations

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WITS-DNP3

What is WITS-DNP3?

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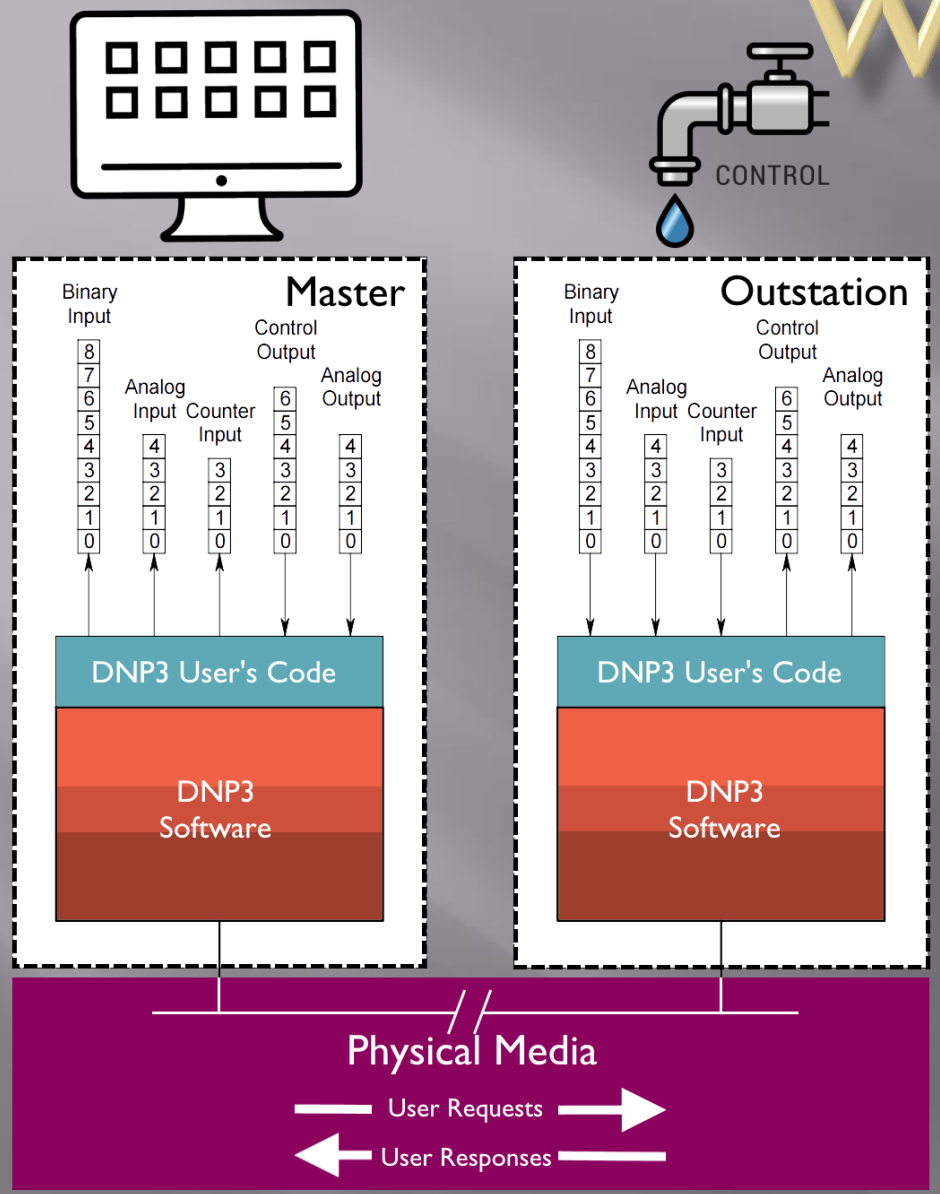
WITS-DNP3



DNP3 (IEEE1815) is:

- A Telemetry Communications Protocol
- Tightly controlled (dnp.org, IEEE)
- Extensive functionality
- Request-response (polling) and/or Unsolicited reporting
- Designed for always -on communications links (RS232)
- Can result in many transactions when configured for confirmations and retries.

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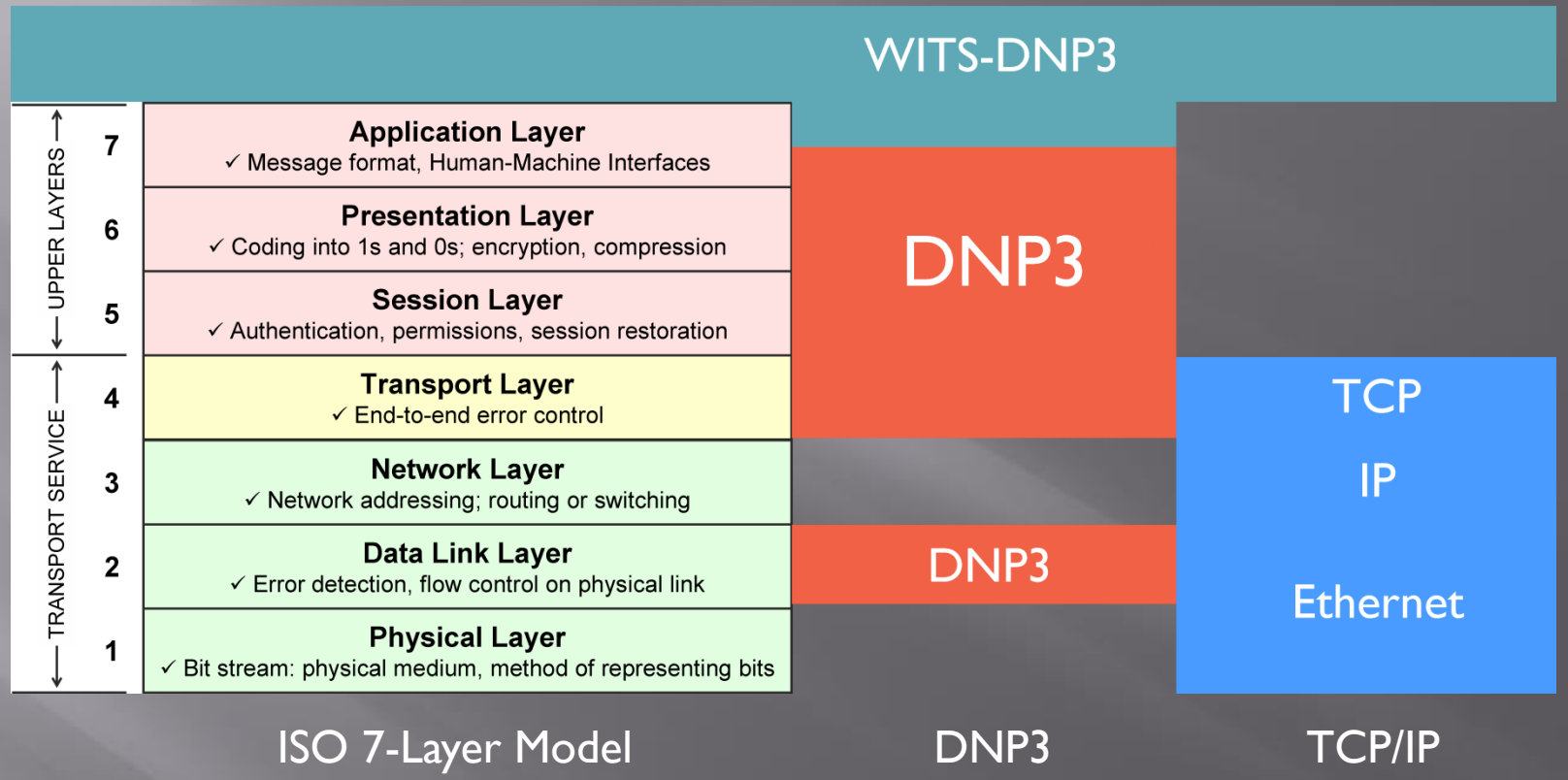
WITS-DNP3



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WITS-DNP3

WITS-DNP3 is:

- DNP3 + Water Industry Requirements
- A specification for a roots-branch communications system
- Standardised names, techniques and formats
- Pretty complicated (~1000 pages including DNP3)
- Interoperable, providing limited plug and play
- Great for traditional high-value asset telemetry

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WITS-DNP3

However.. WITS-DNP3 is less than ideal :

- Low Cost Product (high volume low margin)
- Quick Product Development
- Unsuitable Communications Medium
- Large Numbers of Simultaneous Outstations (poll-response, concurrent unsolicited messages)
- Data sharing amongst masters
- Plug and Play

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Solution?

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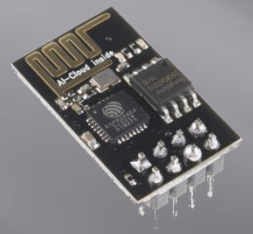
WITS-IOT

INTERNET OF THINGS



LoRa®

SIGFOX

{JSON}

MQTT.ORG

http://

IOT (Internet Of Things)

- Small hardware platforms
- Communications mediums
- Server/Cloud systems
- ‘Simple’, ‘Fast’ Standards based approach to protocols

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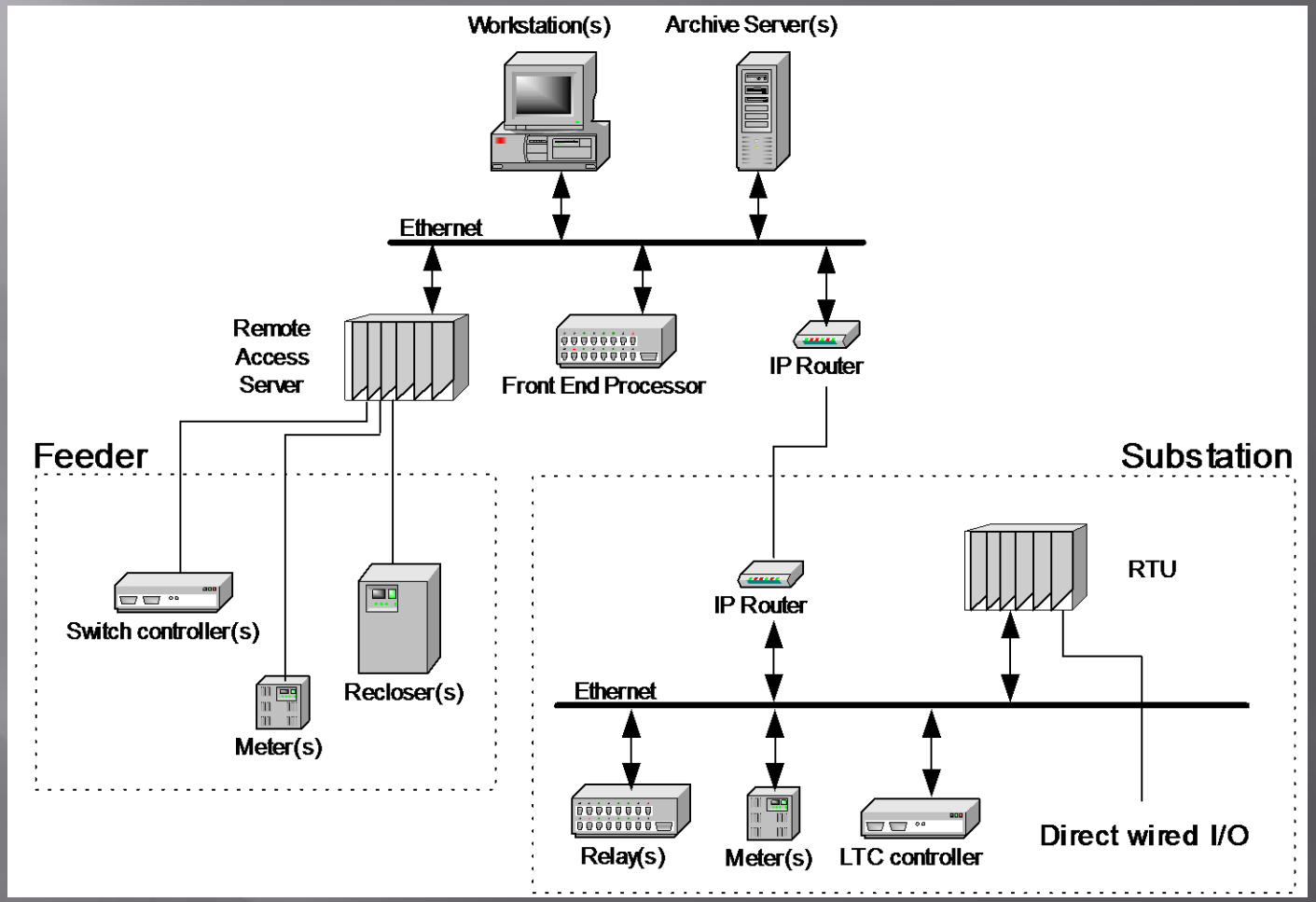
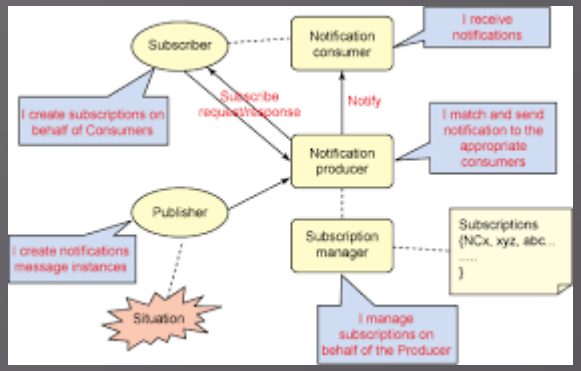
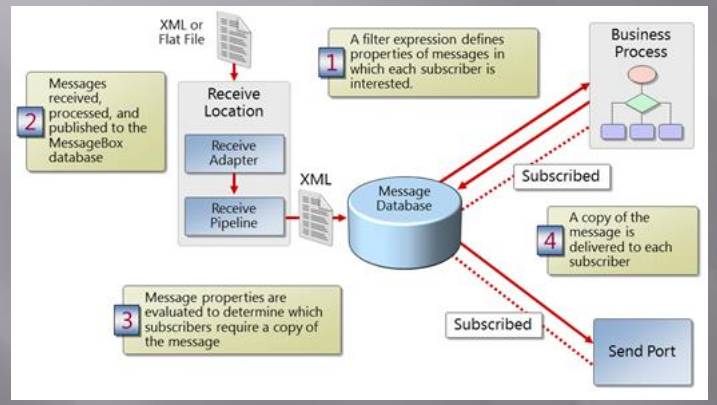
Typical SCADA architecture

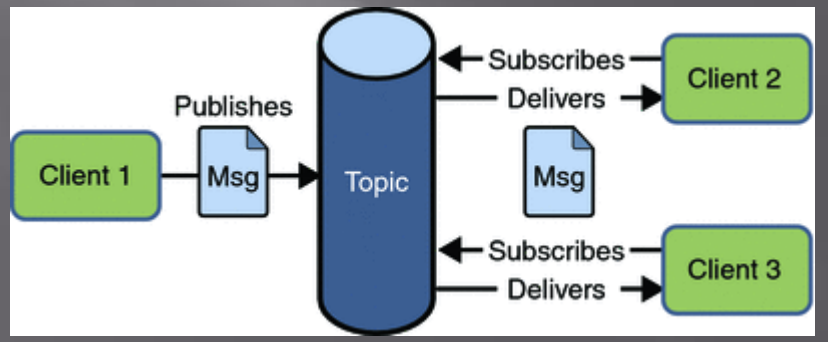


What is IoT?

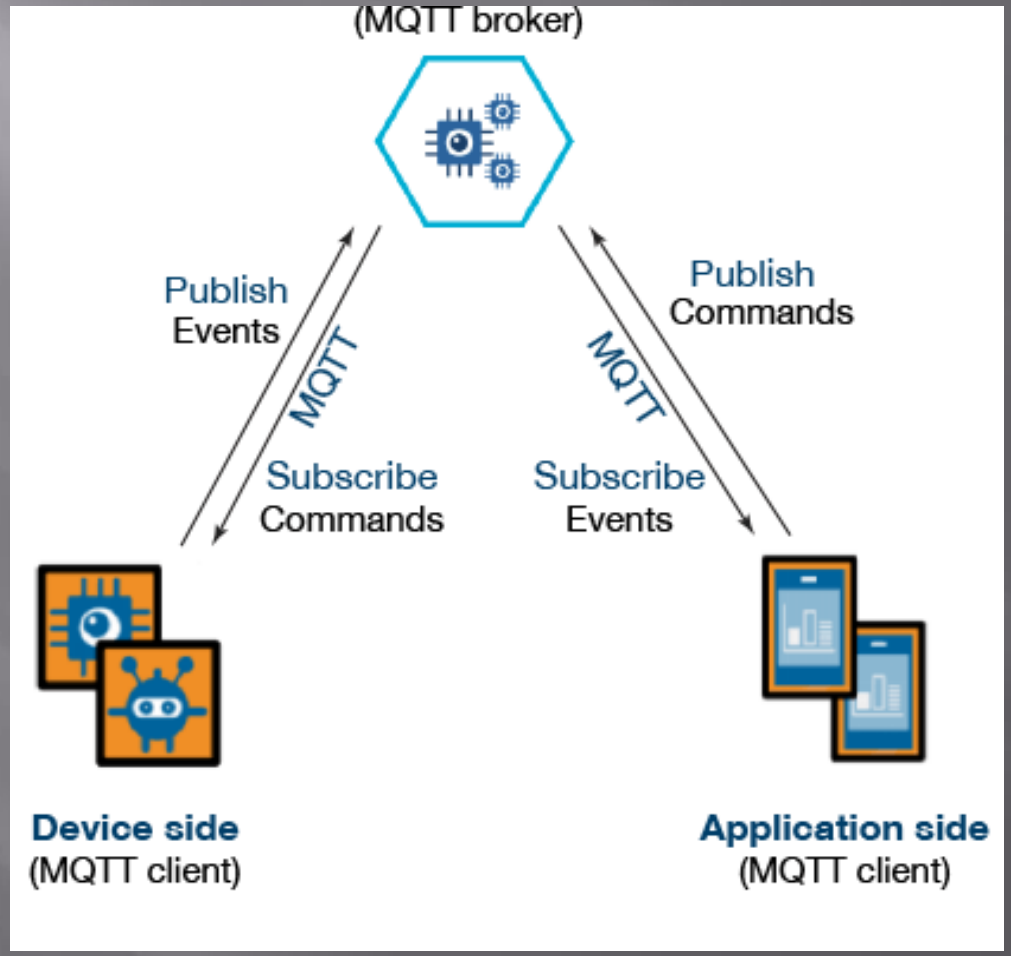
- "All our devices are already connected"
- A new SCADA architecture



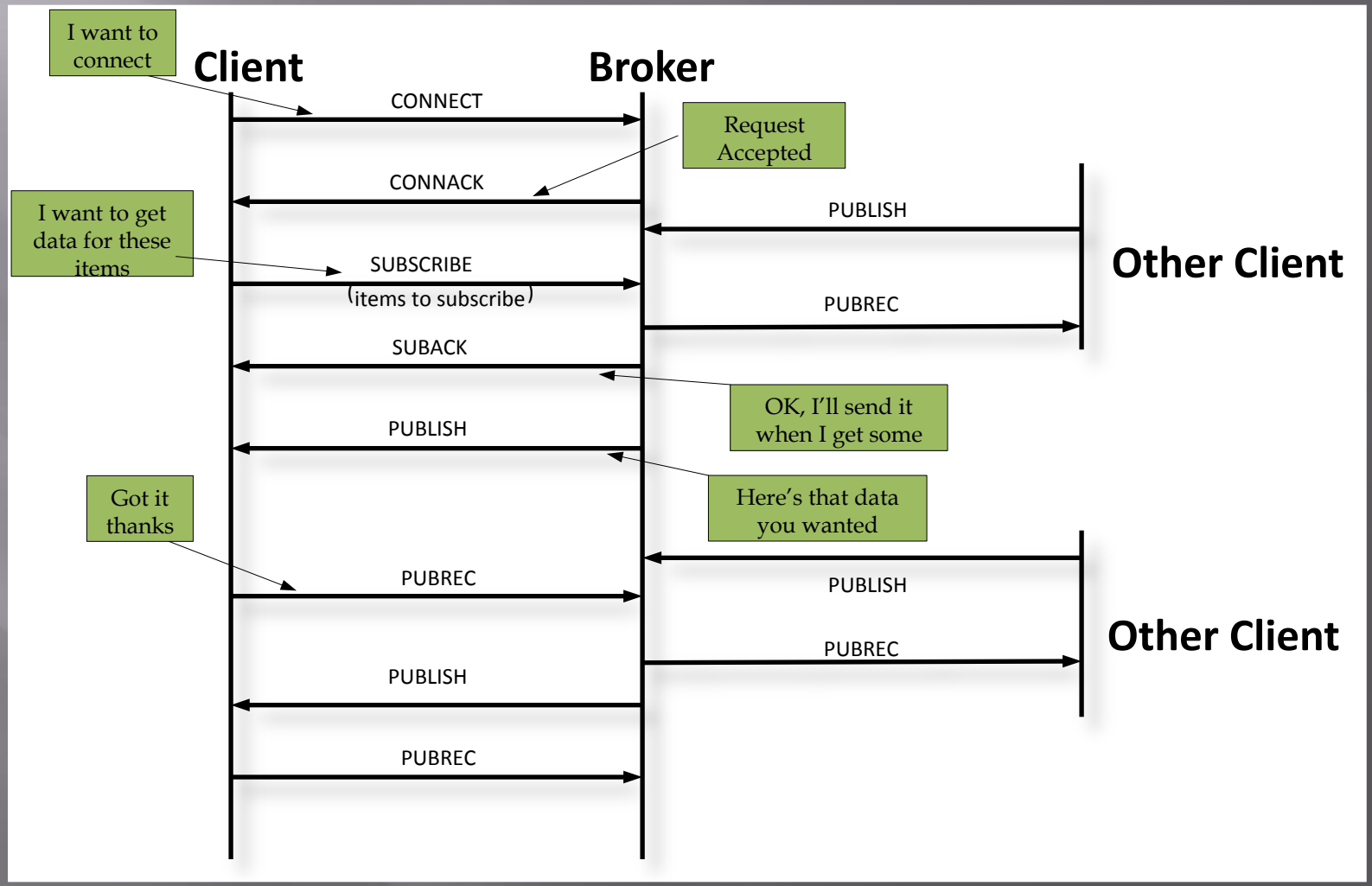




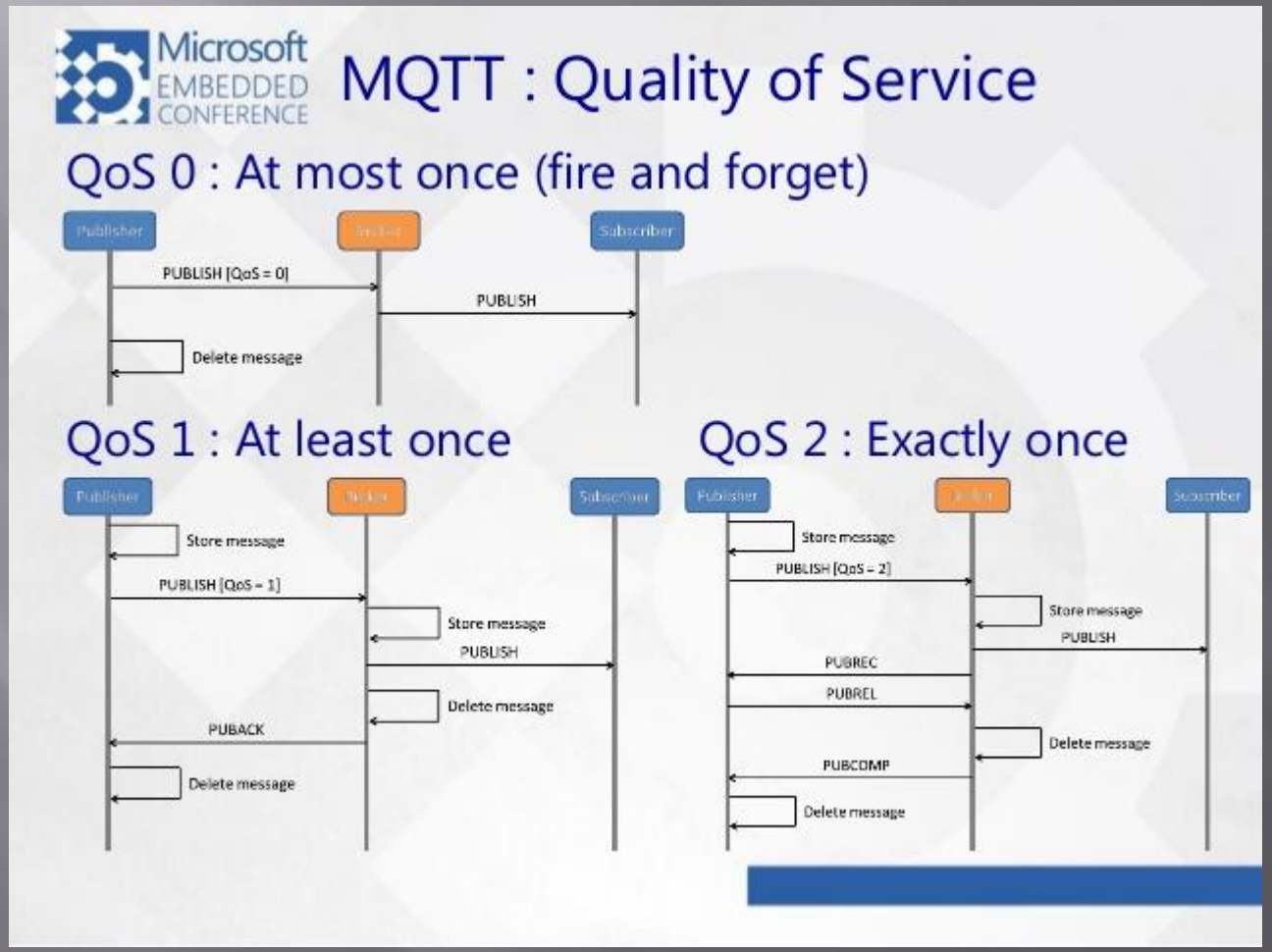
IoT Concepts



Transactions



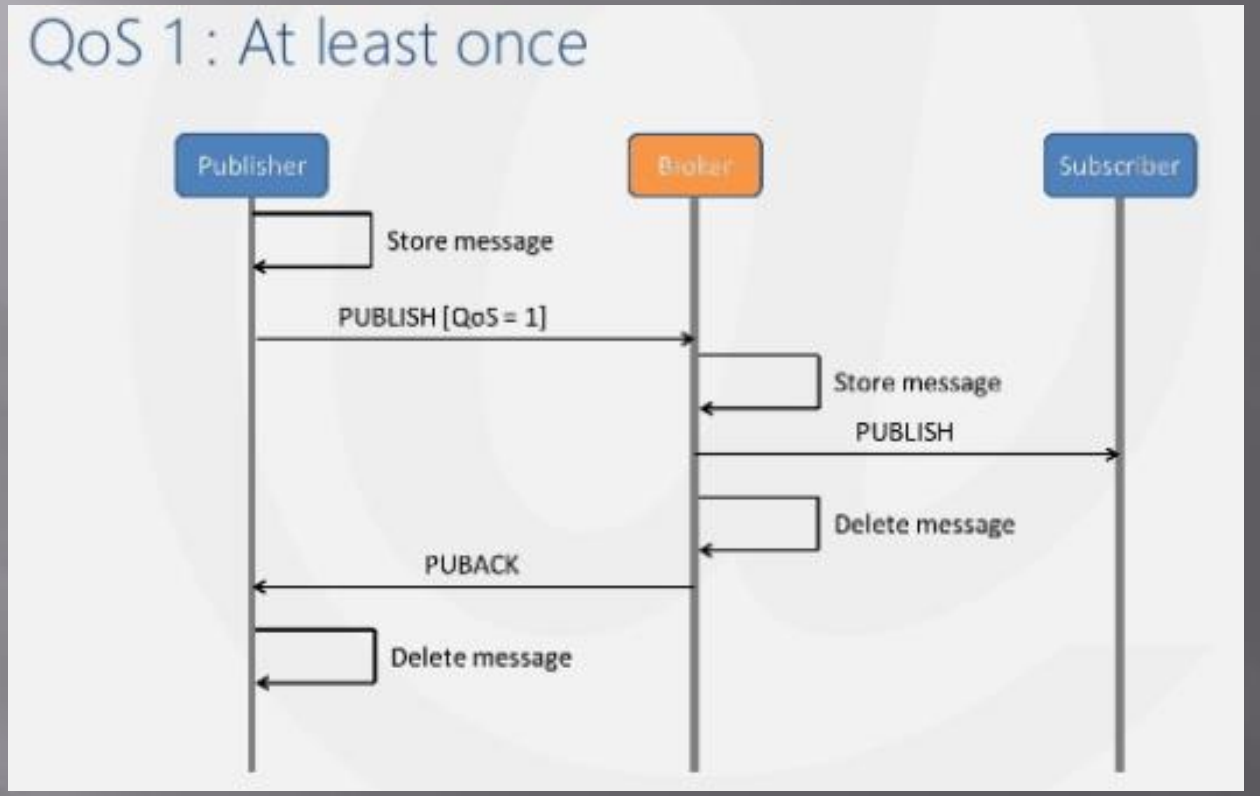
Quality of Service



QoS 0

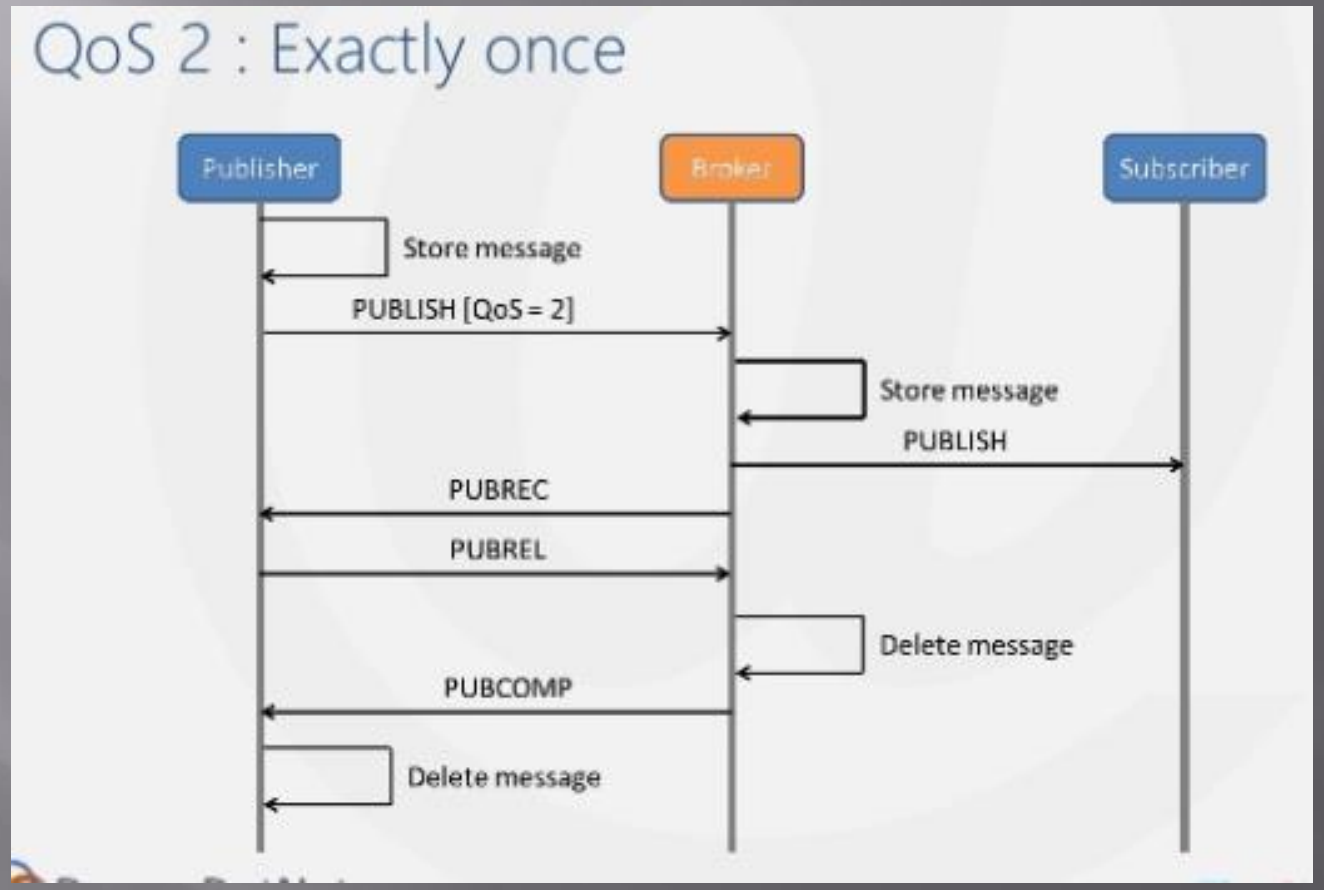
Send at most once. Publisher sends data and then deletes it: no acknowledgement (eg customer meters)

QoS 1



Send at least once. (eg alarms)

QoS 2



Send exactly once – no repeats (eg toggling outputs)

WITS-IOT

- WITS Data Model - Simplified
- Different Transport Protocols
- Simple easy to understand design
- WITS Compatibility – does the same things in a different way

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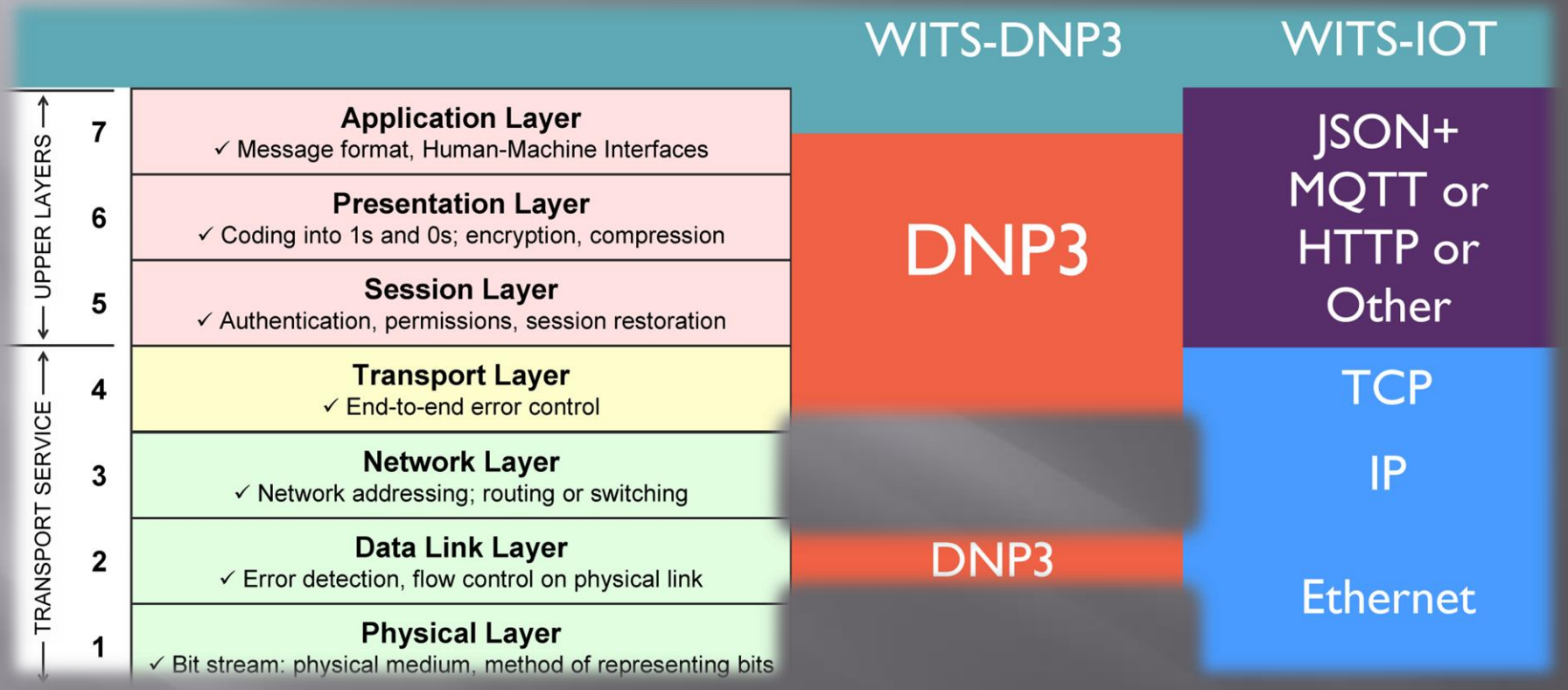
WITS IoT

WITS-IOT



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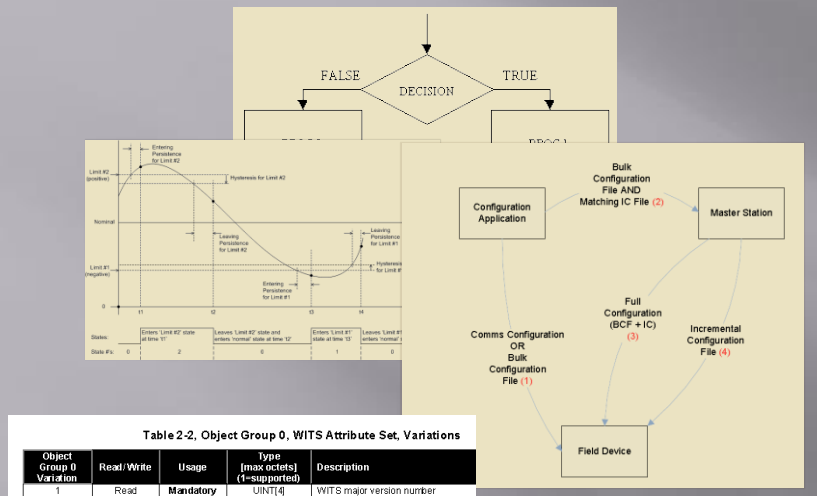
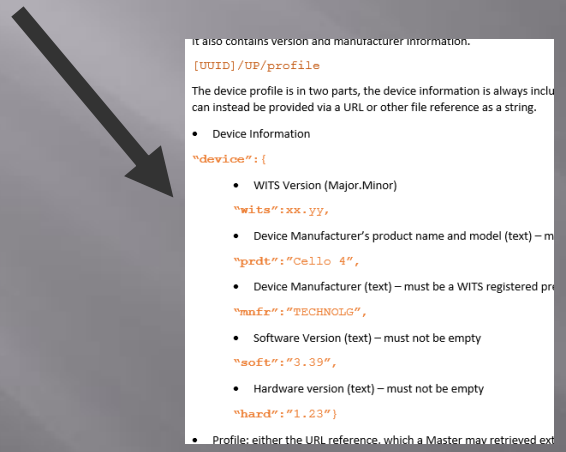


Table 2-2, Object Group 0, WITS Attribute Set, Variations

Object Group 0 Variation	Read/Write	Usage	Type [max octets] (1=supported)	Description
1	Read	**Mandatory**	UINT[4]	WITS major version number
2	Read	**Mandatory**	UINT[4]	WITS minor version number
3	Read	**Mandatory**	VSTR[16]	Bulk Configuration version string
4 - 253	Read	Ignored	-	Reserved for future use
254	Read	**Mandatory**	-	Special variation for requesting return
255	Read	**Mandatory**	-	Special variation for requesting list of



it also contains version and manufacturer information.

[UUID]/UP/profile

The device profile is in two parts, the device information is always inclu
can instead be provided via a URL or other file reference as a string.

- Device Information

```
"device":{
```

- WITS Version (Major.Minor)

```
"wits":xx.yy,
```

- Device Manufacturer's product name and model (text) – m

```
"prdt":"Cello 4",
```

- Device Manufacturer (text) – must be a WITS registered pr

```
"mnfr":"TECHNOLG",
```

- Software Version (text) – must not be empty

```
"soft":"3.39",
```

- Hardware version (text) – must not be empty

```
"hard":"1.23"}
```

- Profile: either the URL reference, which a Master may retrieved ext

What We Are Doing

- Taking the WITS Application Notes
- Preserving the structure, logic, terminology and intent
- Converting the 'conversation' from DNP3 structures and datagrams to JSON objects
- Describing how to use these objects with HTTP and MQTT
- Providing example code
- Providing test Master Station
- Providing test Field Devices

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WITS-IOT

Allows New Ways Of Working

- Using Internet and IOT standards allows us to leverage worldwide software and hardware developments
- Faster time to market for new products – simpler developments, testing and verification
- Many protocols have data sharing built-in (e.g. MQTT)
- Allows users to share data at point of source – multiple streams to different business units, databases even suppliers and regulatory bodies.
- Store and forward (very low powered devices)
- Use IT industry standard security (e.g. TLS/SSL) and systems (e.g. webservers) for OT applications.

Microsoft IIS Internet Information Services

Apache

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WITS-DNP3 VS WITS-IOT

WITS
DNP3
Network

Process Monitoring Applications

Operationally Critical Sites

Fewer Sites, High Data Volume

Infrastructure Asset Monitoring

Cost Critical

High Number of Sites

Limited Communications

WITS
IOT
Network

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What Next?

- Come and help us!
- Join the WITS Protocol Standards Association
- Become an active member
- Build, test and release a WITS Protocol:
  - Master Station
  - Field Device

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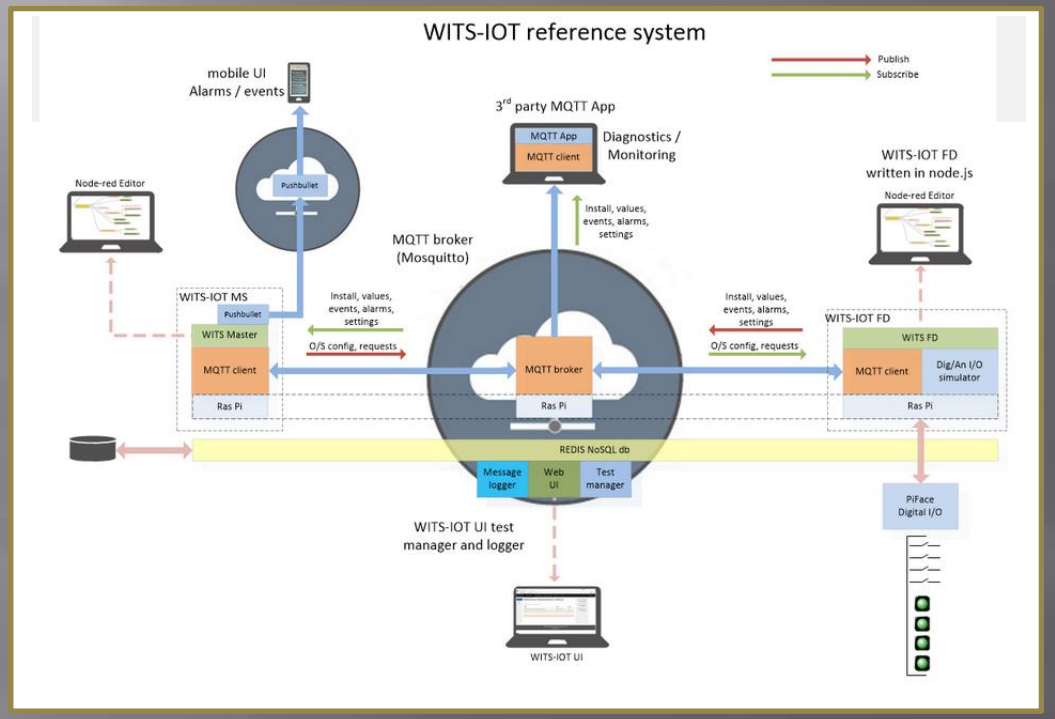
Demonstration



WITS Master in Coventry

Controlling pumps in Coventry