Erfaringerne fra Drift og vedligehold af Novo Nordisk produktions netværk

- IT og OT kultur,
- Sikkerhed og fleksibilitet,
- Servicevinduer,
- Typer af OT netværk,
- Traditionelle fejl og dataflow fejl,
- Sammenlægning af netværk.

Thomas Munck, Network Architect, Novo Nordisk Corporate IT

Erfaringerne fra Drift og vedligehold af Novo Nordisk produktions netværk

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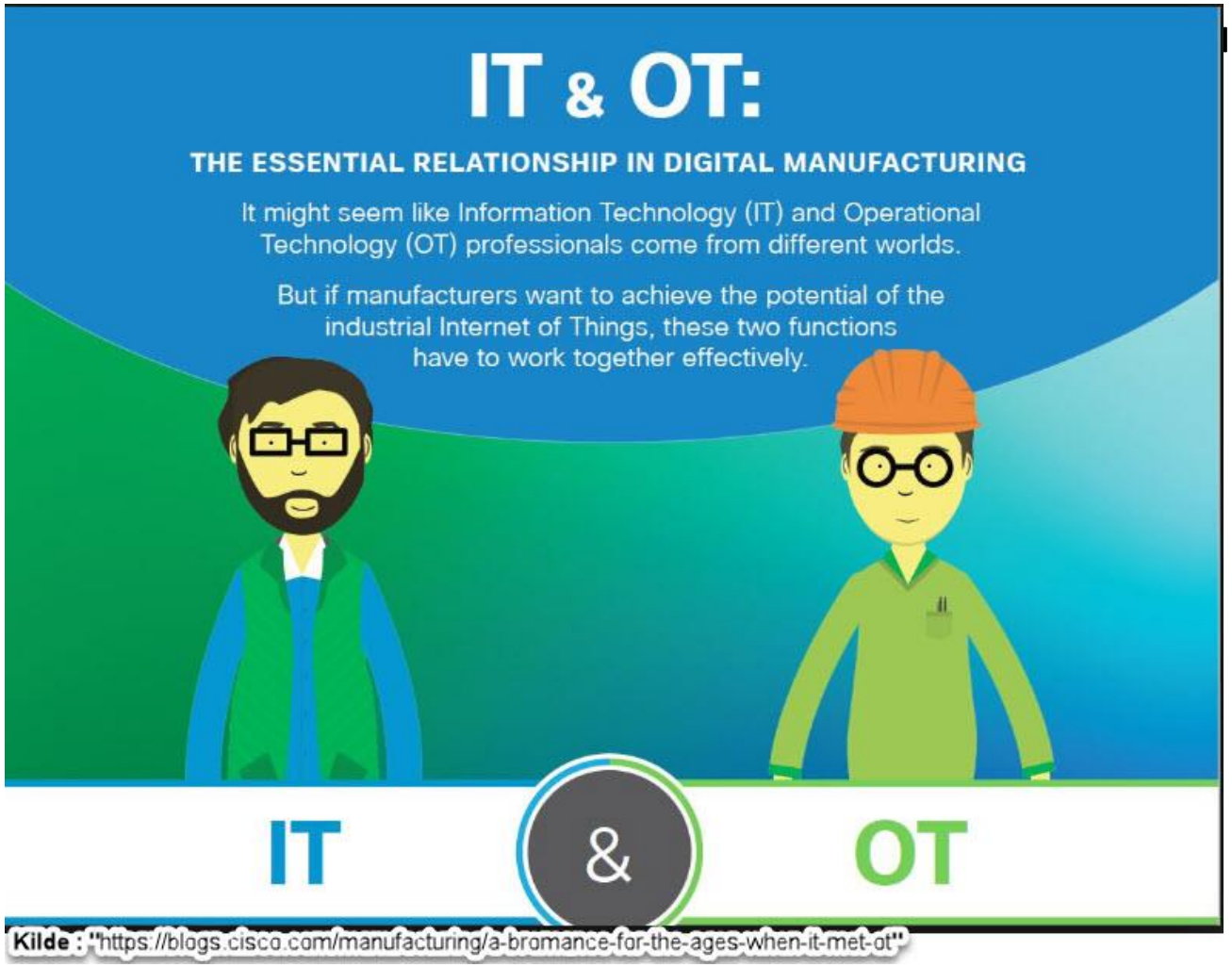

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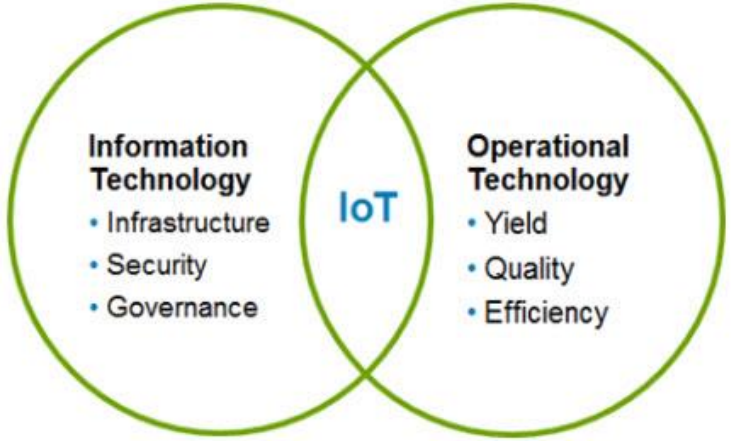

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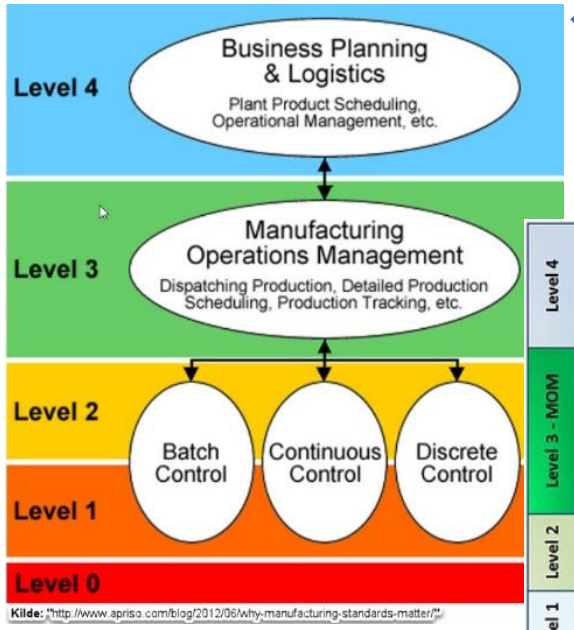

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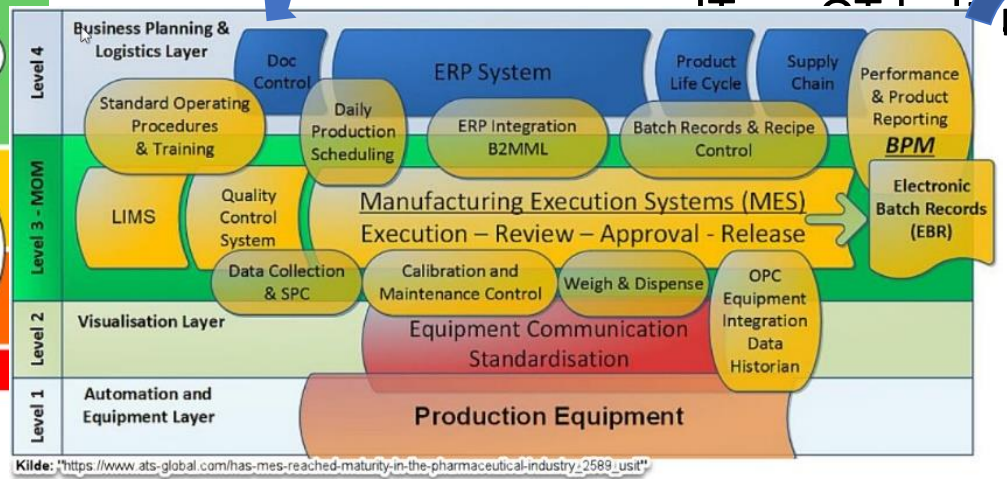

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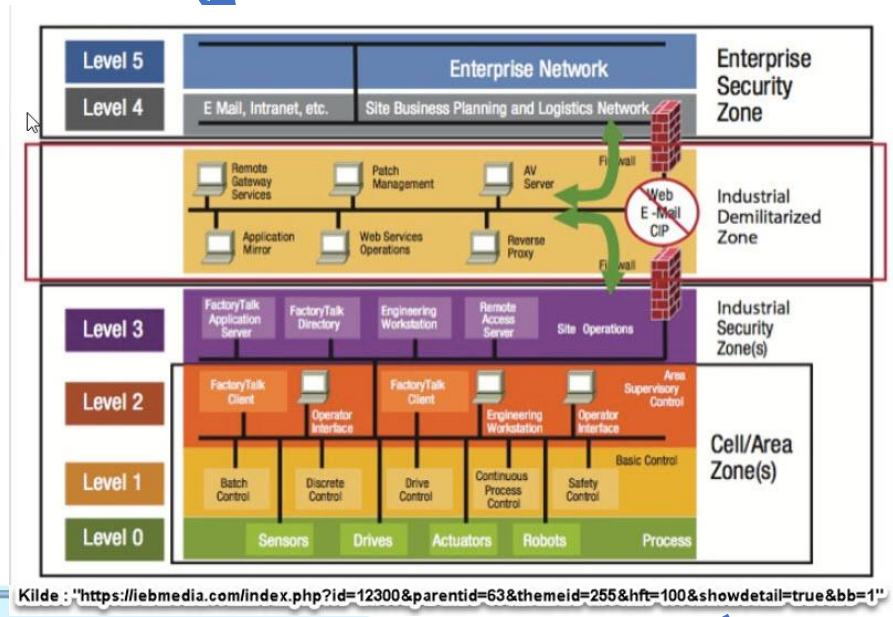

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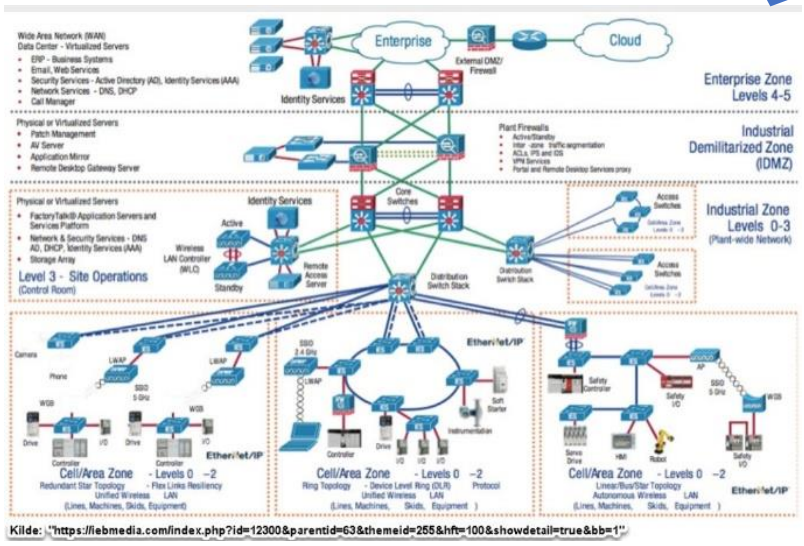

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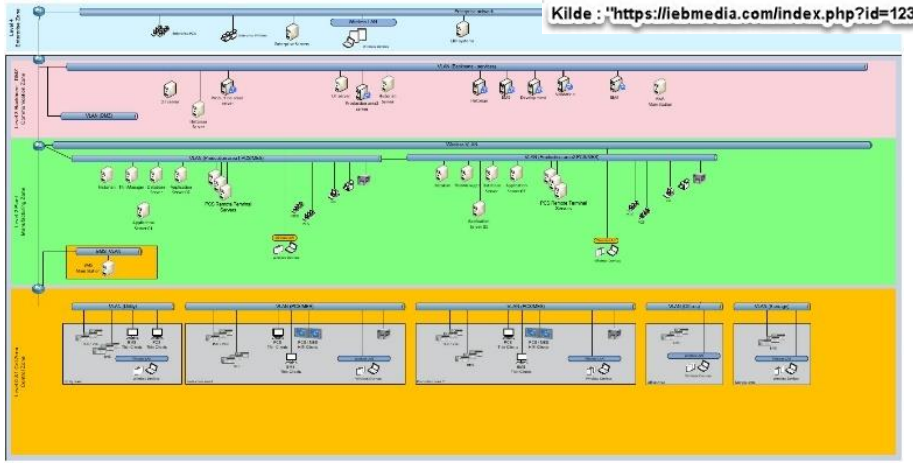

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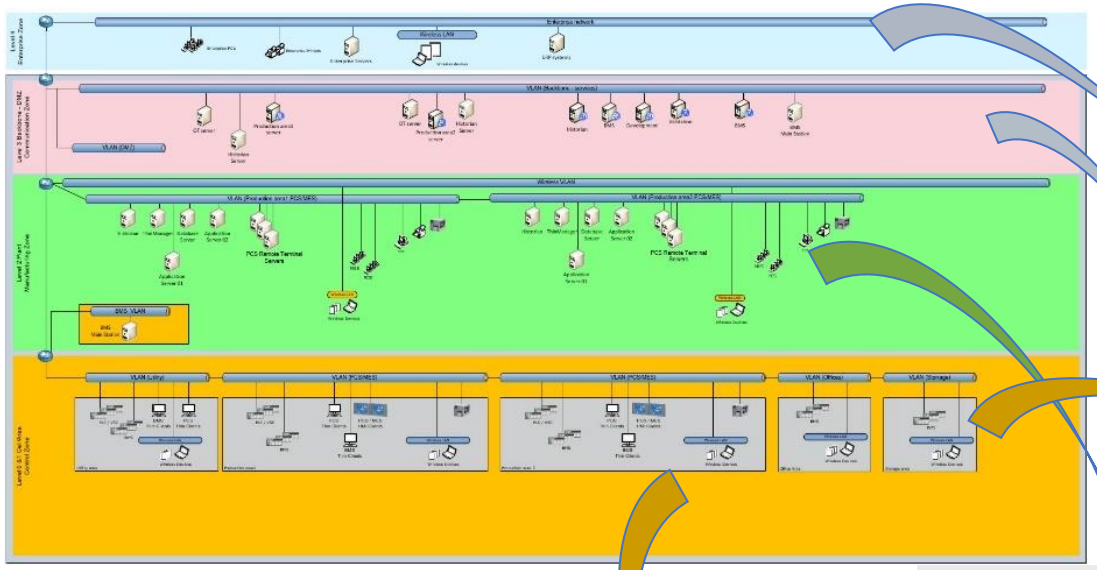


- Typer af OT netværk
- OT network demands

- **Level 3-4**

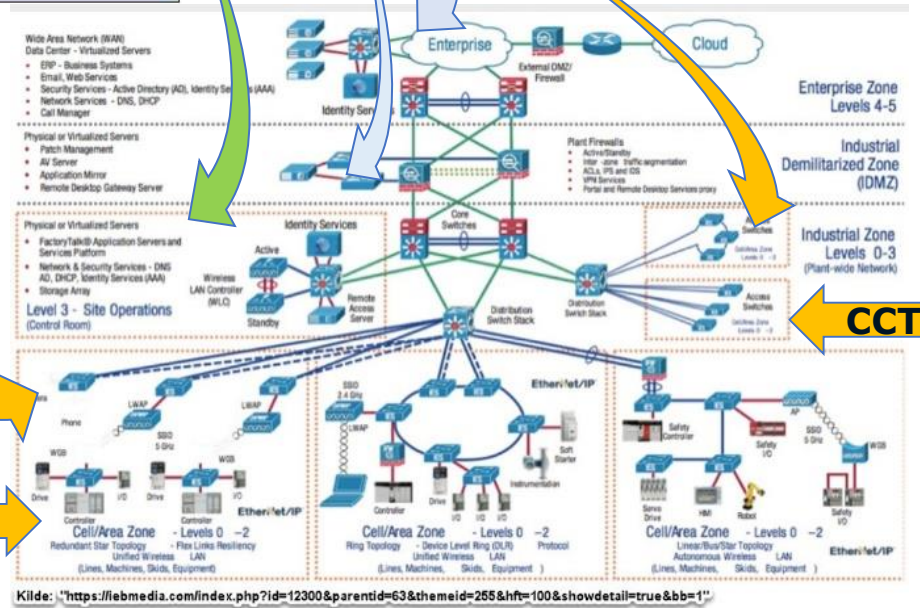
(IT Communication – <100ms)

- **Level 1-2**

(«Real Time" – <10ms, low Jitter)

- **Level 0-1**

("Isochronus Real Time" – <1ms, 0.5ms Jitter)



- Networks

- **Closed-Circuit TeleVision**
- **Automated Guide Vehicles**
- **Laboratory**
- **Sensor/calibration**

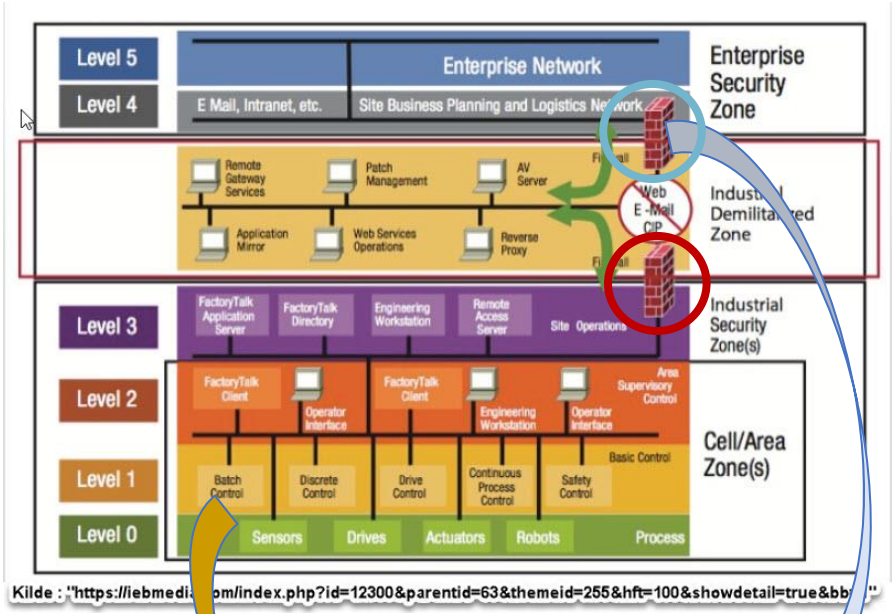
Erfaringerne fra Drift og vedligehold af Novo Nordisk produktions netværk

- Sikkerhed og fleksibilitet
- Network segmentation
  - **Security policy**

    Common global or local customized
  - **Application profile**

    Application dataflows
  - **Firewalls**

    Where, how many, how closed



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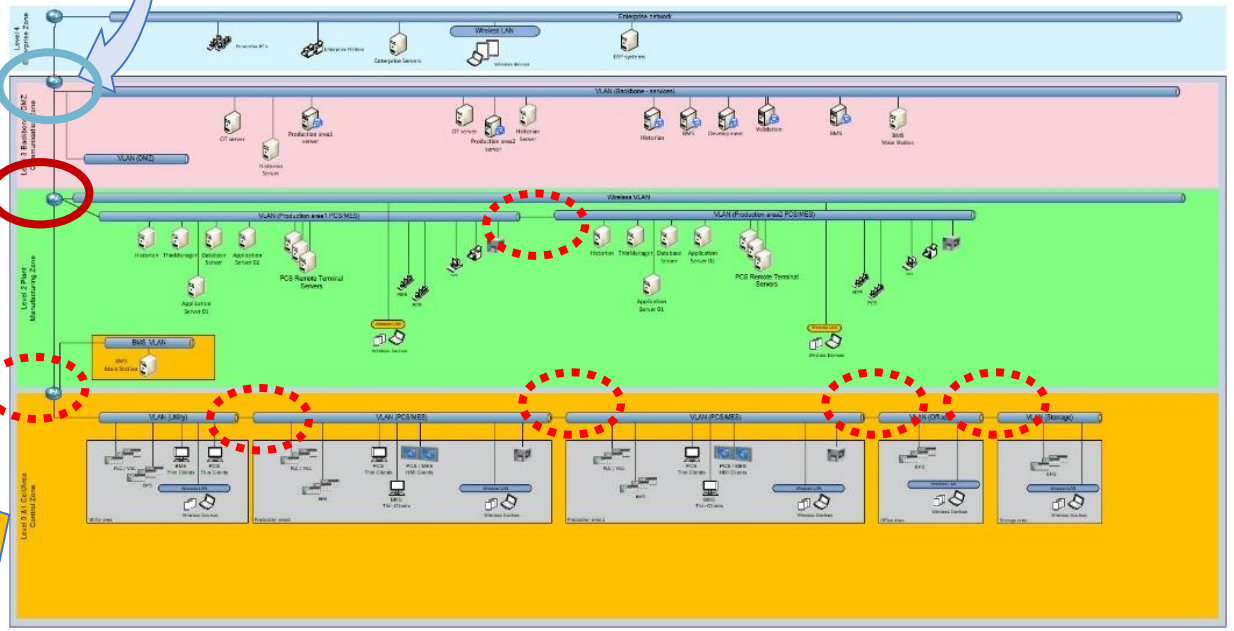

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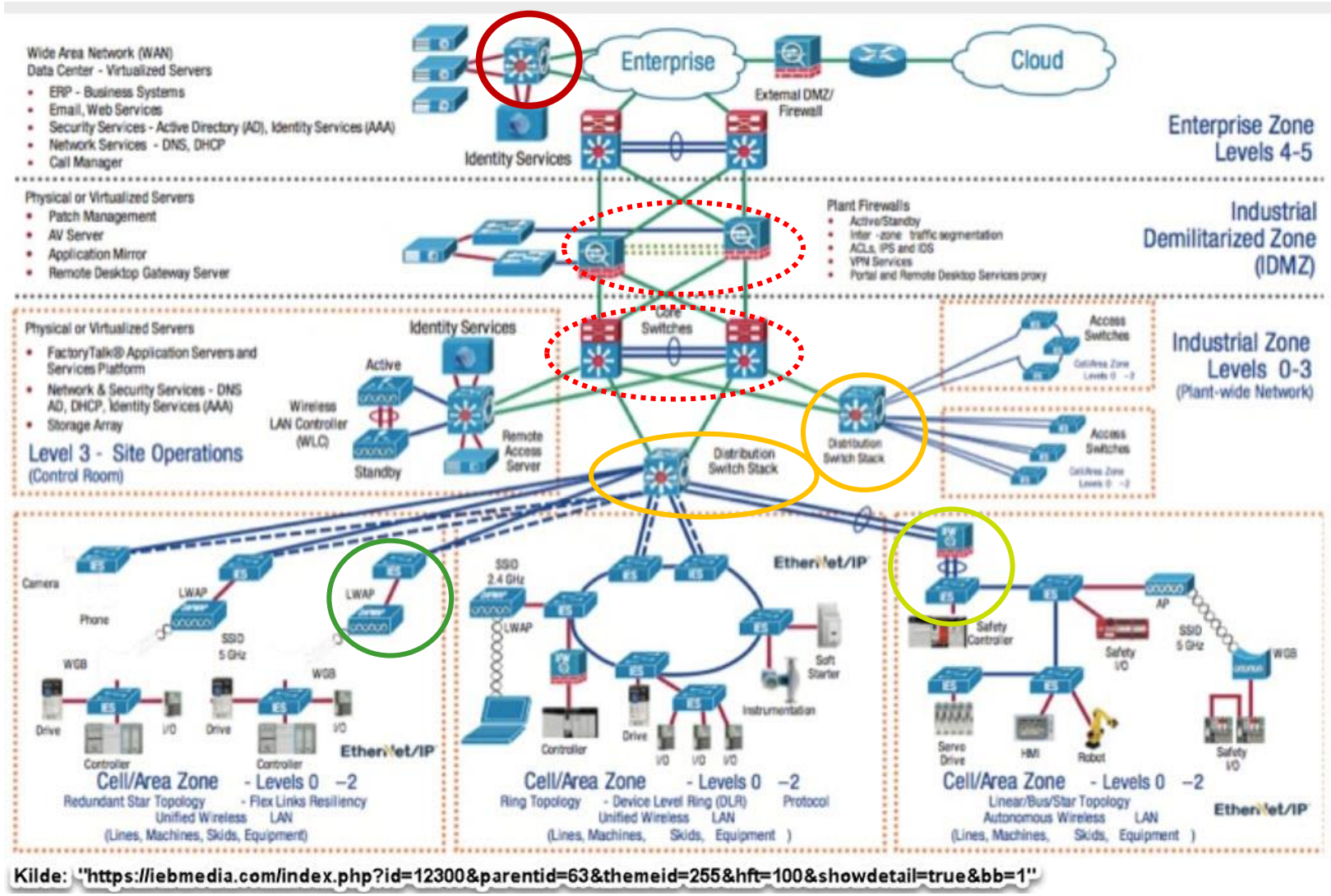

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- Servicevinduer

- Service Windows
  - **De- or Centralized services**
  - **How often**

  Centralized: very few or none
  Decentralized: very few
  - **How long**

  Centralized: Very short (Network is last down but first up)
  Decentralized: Longer (often together with Plant)

- Service Windows
  - **Design for in-service maintenance**
  - **Fault-tolerant is not the same as "maintenance-tolerant"**

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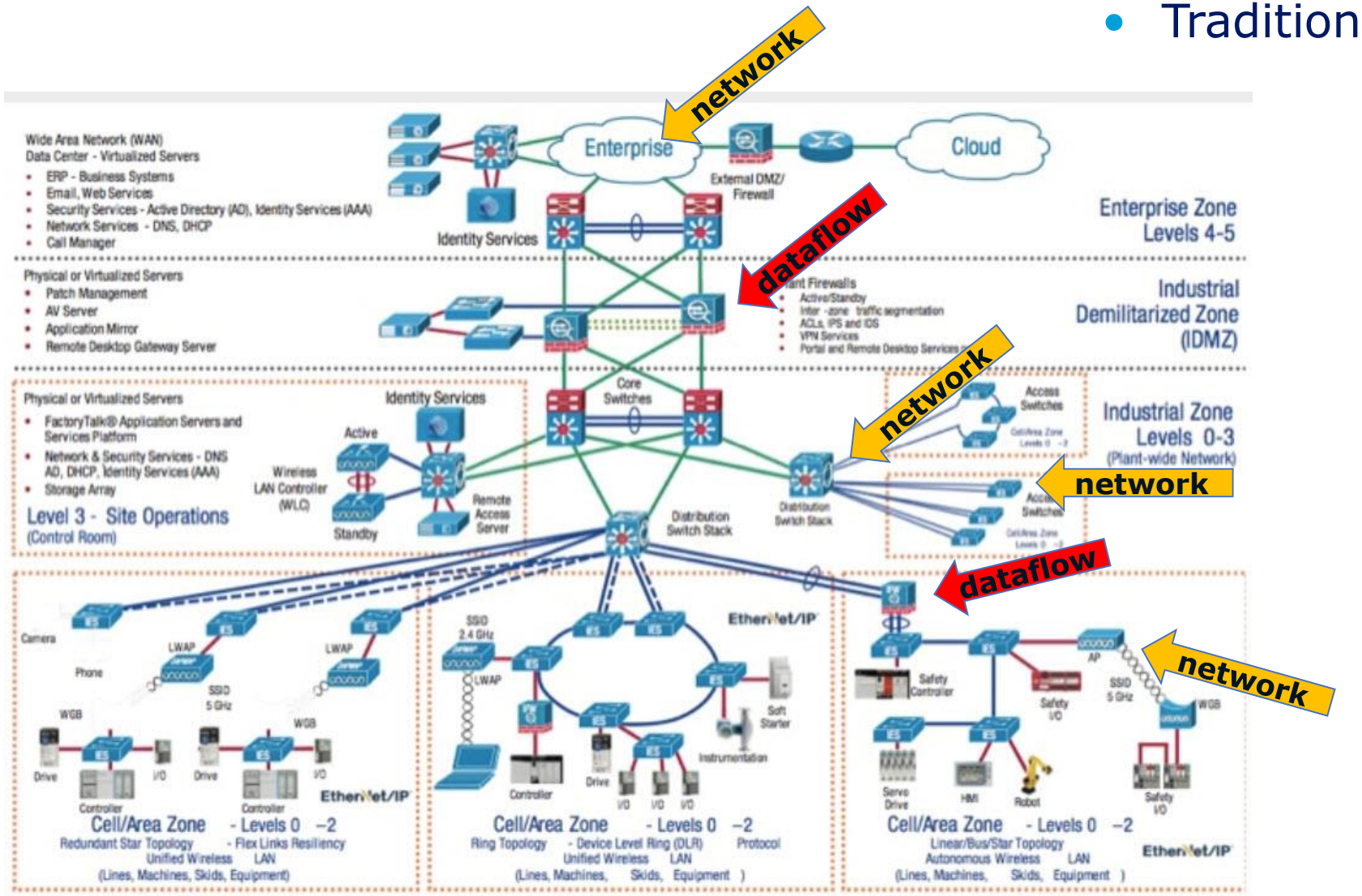

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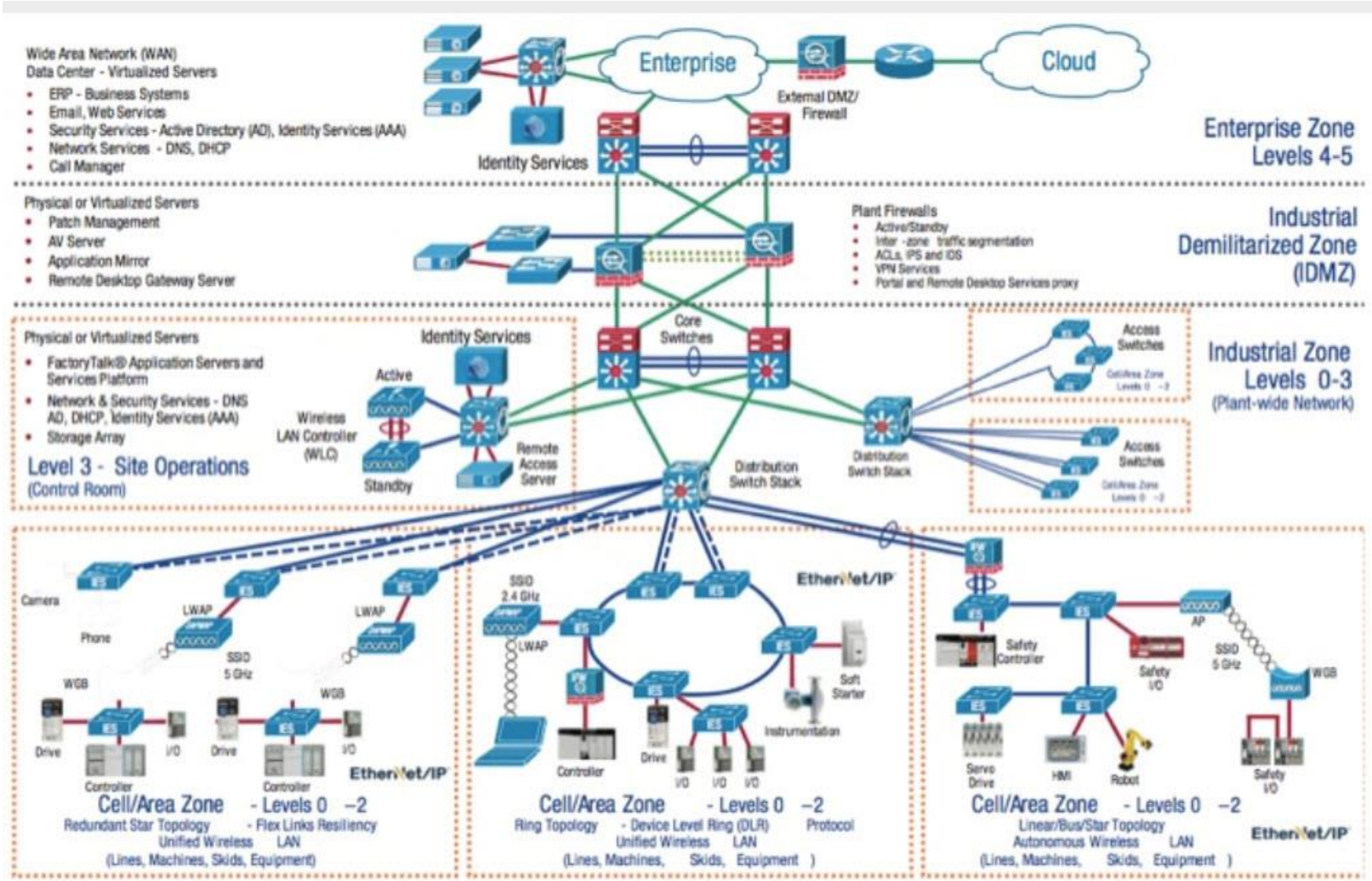
- Traditionelle fejl og dataflow fejl

- Traditionelle fejl
  (Network device)
  - **Drops**
  (IT services – Level 0-5)
  - **Latency**
  («Real Time" – Level 0-3)
  - **Jitter**
  ("Isochronus Real Time" – Level 0-2)

- Dataflow fejl
  (Firewall device)
  - **Initial configuration errors**
  (Data flow for IT is TCP/UDP port number)
  - **Patchning**
  (Application or OS)
  - **Move**
  (Application or server)

Erfaringerne fra Drift og vedligehold af Novo Nordisk produktions netværk

- Sammenlægning af netværk



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- Wireless LAN
  - **Barcode scanner**
  (low BW, no Latency/Jitter sensitive)
  - **eLearning – Video**
  (high BW, Latency/Jitter sensitive)
  - **Sensor**
  (low BW, Latency/Jitter sensitive)
  (Need for 802.11a/e/g/n)
- Wired LAN
  - **CCTV – Video**
  (high BW, Latency/Jitter sensitive)
  - **Cell Area Zone**
  (low BW, Latency/Jitter sensitive)
  (Need for 802.1p/q)

Erfaringerne fra Drift og vedligehold af Novo Nordisk produktions netværk

- The wonderful world of IoT

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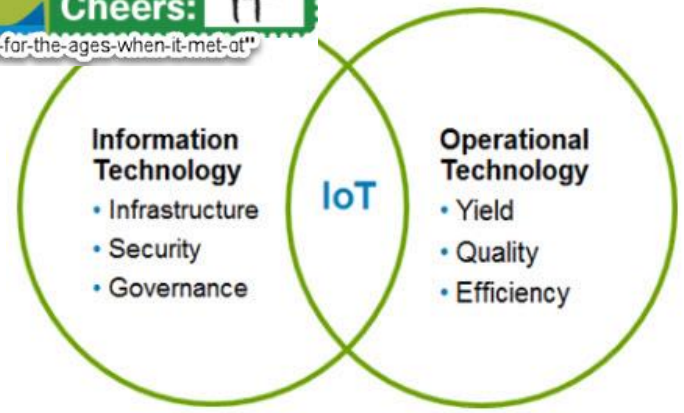

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- Know your application
  - Dataflows (all of them).
  - Communication sensibility (latency, jitter)

- Intelligent embedded systems
  - Easy Dataflows (self contained).
  - Communication sensibility low (LoRaWAN)