5G Introduction Impact On The Telecom Power System

Next Generation Telecom Network Power System

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A Typical Telecom Site

Ericsson Radio System

- Ericsson Delivers millions of Radios every year
- Each Telecom Site can have more than 15 Radios
- Power consumption of a Telecom Site is 100W – 20kW
- 5G is an addition to the Telecom Sites

5G for the user

GSM

4G

Massive IoT

SMART BUILDING

LOGISTICS, TRACKING AND FLEET MANAGEMENT

SMART METER

SMART AGRICULTURE

Critical IoT

5G

AUTONOMOUS CAR

TRAFFIC SAFETY & CONTROL

APPLICATION TROL

REMOTE MANUFACTURING, TRAINING, SURGERY

Enhanced Broadband

Smartphones

Home, Enterprise, Venues, Mobile/Wireless/Fixed

Non-SIM devices

4k/8k UHD, Broadcasting, VR/AR,

LOW COST, LOW ENERGY
SMALL DATA VOLUMES
MASSIVE NUMBERS

ULTRA RELIABLE
VERY LOW LATENCY
VERY HIGH AVAILABILITY

5G Challenges

5G telecom Site deployment challenges
— Active Antenna Systems with integrated Be
— Fixed Wireless Access
— Street Macro, the densified urban deployment
— Small cells deployment
— C-RAN deployment

Power Design Development Challenges
— AC and 400VDC as alternative telecom voltage
— Energy storage and Energy saving
— Board Power design future challenges

There has been a noticeable shift from photo to video between the last two tournaments. The 2014 competition was a 'selfie' event with smartphone users sharing selfies and 60 percent of spectators downloading photos.

In 2018, video streaming has dominated and led to traffic soaring by 2.5 times compared to an average day on the MTS network. Fans posted more content on social networks than in 2014 when social networking generated 90 percent of traffic. At matches in 2018, MTS registered a 30 percent increase in traffic from social platforms.

Active Antenna Systems

Large antennas with integrated radio

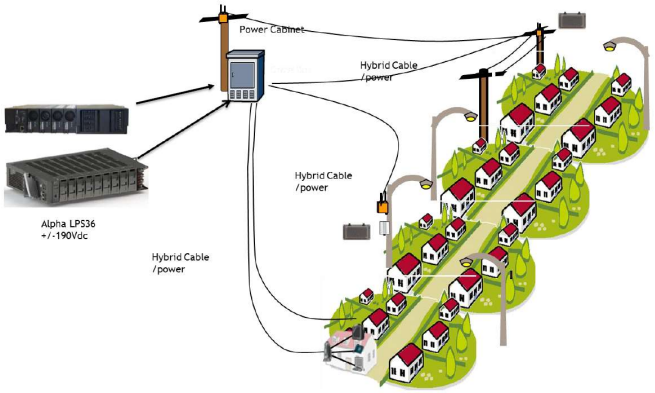
— Power consumption moves to the distributed antenna
— >150m distribution distance
— 1-3kW power consumption per AAS
— Back-up is required for availability

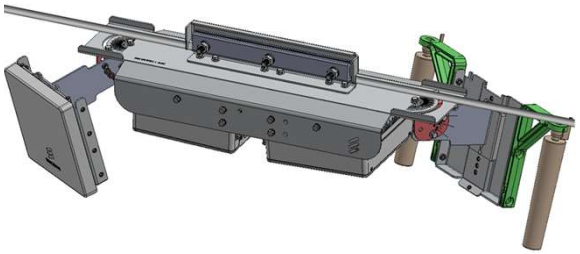
AIR 6488

Fixed Wireless Access

Wireless fiber to the home the last 100 meters,
USA 1st deployment market

- Grid of small telecom sites in a village environment, 200m ISD
- Pole or strand mounted
- Legacy power feedings from cable network
  - Power limited +/- 190VDC
  - Triangular AC low line voltage
  - 110VAC 60Hz



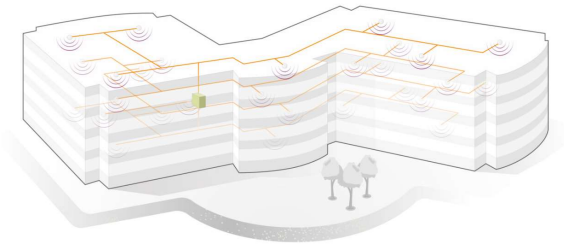


Street Macro

New installation scenario where a high power radio is deployed in street level.

- AC Powered for easy deployment
- Up to 2000W per site
- Back-up is needed for critical IoT
  - Small local battery
  - Central UPS
  - Local UPS on ground level

Small cells deployment



- Deployment with Micro sites in outdoor and indoor locations for capacity reasons
- AC feed or distributed -48VDC, one feeding per site
- No back-up required?

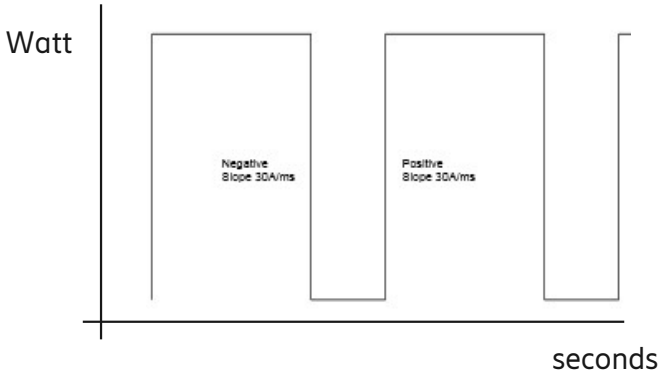
- Deployment of distributed Radio system indoors
- Central baseband capacity and each radio is powered by PoE for a central source <100m distance

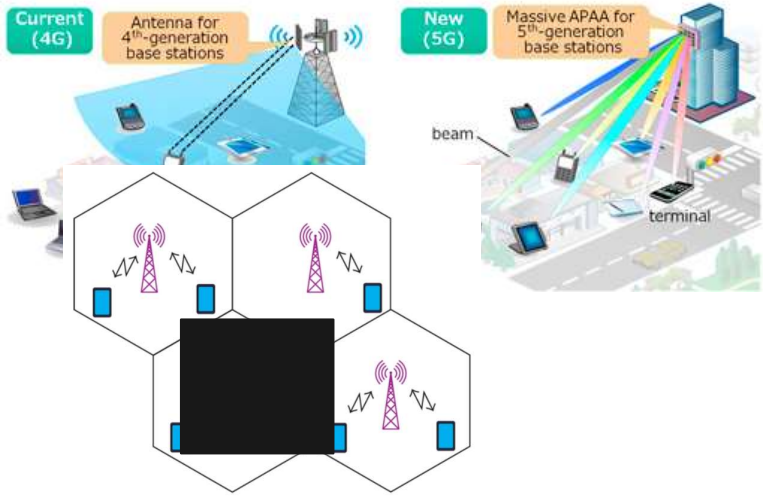
C-RAN deployment

- Basebands are centralized to baseband centers
  - Redundancy requirement, high reliability
  - Back up requirement on 4-12 hours
  - Dual feeding
  - -48VDC or in the future 400VDC feeding, colocation with servers

Energy saving

Energy saving
- Micro sleep
- Beamforming
- Scheduled sleep





AC or 400V as new telecom site voltage

Standard distribution voltage on a Telecom Site is -48VDC

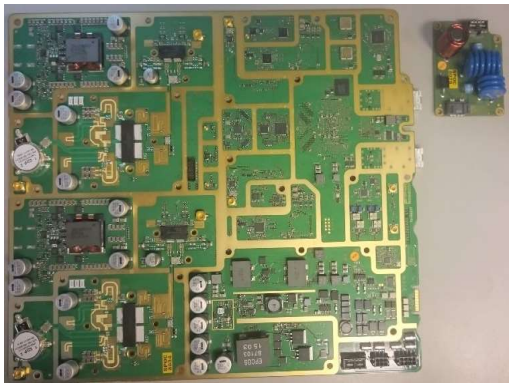
Historically used with traditional cabinet sites

Today sites are distributed, >100m between units

- Implications
  - Weight of cables, up to 1000kg
  - Cable thickness 4mm^2 ➔ 35mm^2 diameter 7mm per conductor
  - Distribution loss from 7% to 13% at nominal voltage due to increased power consumption
- Solutions
  - AC voltage from the grid
    - UPS solution is complicated
      - Distribution sensitive to lighting
      - Distribution voltage 230V/115V
  - 400VDC used in Data centers
    - Require new infrastructure and equipment
    - Two different standards China/ETSI.
    - Batteries at 400V

Ericsson board power design future challenges

- Massive amount of different processors requires more converters
  - 40-50 separate converters on one PCB
  - Digital controlled power management and supervision
- Compacter total solutions results in less available space
  - Internal DC/DC has <20mm building height
- Higher power consumption requires higher efficiency
  - Up to 2kW solutions
  - Board temperature >100˚C
  - Lowest voltage /highest current: 0.8V/150A
  - Front end converter power density: 3W/cm^3 (50W/in^3)
- Massive deployment leads to cost focus
- Integrated AC/DC design with TMD and SMD mix



Conclusions

- Increased alternatives of Telecom Site distribution voltages
- Increased variants of power solutions due to new site types
- Need for densified power solutions
- Need for diversified energy storage solutions

Questions?

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