LANDBRUGETS DATA-CENTER

Notat, marts 2015, Jens Peter Hansen, SEGES

2020

Efter at der i 2015 blev etableret et landsdækkende non-cellular M2M low-power wide area (LPWA), har stort set samtlige landbrug drysset diverse sensorer ud over deres marker, og sensorer er efterhånden også sat på en del maskiner og i mindre omfang på kvæg. Lidt overraskende var heste ejere hurtige til at tage teknologien til sig – de ønsker tryghheden ved via deres smartphone at kunne konstatere, at deres elskede hest har det godt.

Især to forhold bidrog til den hastige udbredelse af sensorer:

a) Med etablering af Sigfox's LPWA blev opsætning set fra landmandens side simpel plug-and-play.
b) Muligheden for målrettet regulering af tilladte gødningsmængder.

Det viste sig ret hurtigt, at den målrettede regulering med fordel kunne anvendes på andre områder. Således er VVM tilladelser hvad angår NH3 bidrag nu baseret på løbende målinger af det faktiske bidrag.

Det helt store potentiale i brugen af de mange data – en optimeret styring af bedriften – er så småt ved at blive hjemtaget i form af varslinger om vandbalancer og sygdomsangreb, mens der stadig pågår intensiv udviklingsarbejde for at udnytte datamængder i den taktiske styring af bedriften.

2006

I 2006 blev der af Ministeriet for Videnskab, Teknologi og Udvikling gennemført et teknologisk fremsyn "IKT fra jord til bord" (Videnskabsministeriet, 2006), hvor analysearbejdet udmøntede sig i bl.a. disse to visioner:

- Vision 2: Danmark skal være helt i front på digital infrastruktur og systemintegration målrettet værdikæden fra jord til bord såvel som de enkelte produktionsenheder i kæden.
- Vision 3: Danmark skal være det europæiske eksperimentarium for forskning, udvikling og anvendelse af nye IKT-løsninger fra jord til bord.

2015

Sådan ligger landet pt.:

- Natur- og Landbrugskommissionen anbefaler at kvælstofregulering baserer sig på målte udledninger af næringsstoffer fra dyrkningsarealerne.
- Landmænd ønsker målrettet regulering – merindtjening på målrettet regulering af kvælstof er beregnet til ca. 250 mio. kr./år.
- Landbrug og Fødevarer er presset af Bæredygtig Landbrug, der kræver handling.
- Danmark er det mest regulerede land i EU
- Monsanto betalte i oktober 2013 7 milliarder kroner for (data fra) det lille firma Climate Corporation, der siden 2006 havde kortlagt 25 millioner marker i USA og havde sammenkørt disse med 150 milliarder jordanalyser og 10 trillioner sæt vejrdata.

- Internet of Everything og (IoE), Machine to machine (M2M) kommunikation, Big Data og brug af sensorer vil vokse eksplosivt.
- Bedriftsstørrelse vokser og dermed udfordring med overvågning.
- Franske Sigfox er i færd med global-wide at etablere billigt alternativ til GSM baserede net
- Adgang til og kontrol med datastrømme er afgørende for forretningsudvikling og innovation.

M2M (MACHINE TO MACHINE COMMUNICATION)

The Internet of Everything (IoE) is potentially the biggest business opportunity in the history of mankind. It will change the world with extraordinary and wide-ranging implications, affecting everyone on the planet. Research firm IDC predicts that this massive shift will generate nearly US$9 trillion in annual sales by 2020.

By comparison, the total annual sales of the San Francisco Bay Area's 150 largest technology companies in 2012 were $677 billion. The total revenue of the consumer electronics industry in 2013 was about $1.1 trillion.

The total addressable market for LPWA services is extremely large, potentially of the order of 14 billion connections. We are forecasting that, of this addressable market, there will be more than 3 billion connections in 2023, generating over USD10 billion in connectivity revenues. (Analysys Mason, 2014).

Figure 2: Forecast for LPWA connections [Source: Analysys Mason, 2014]
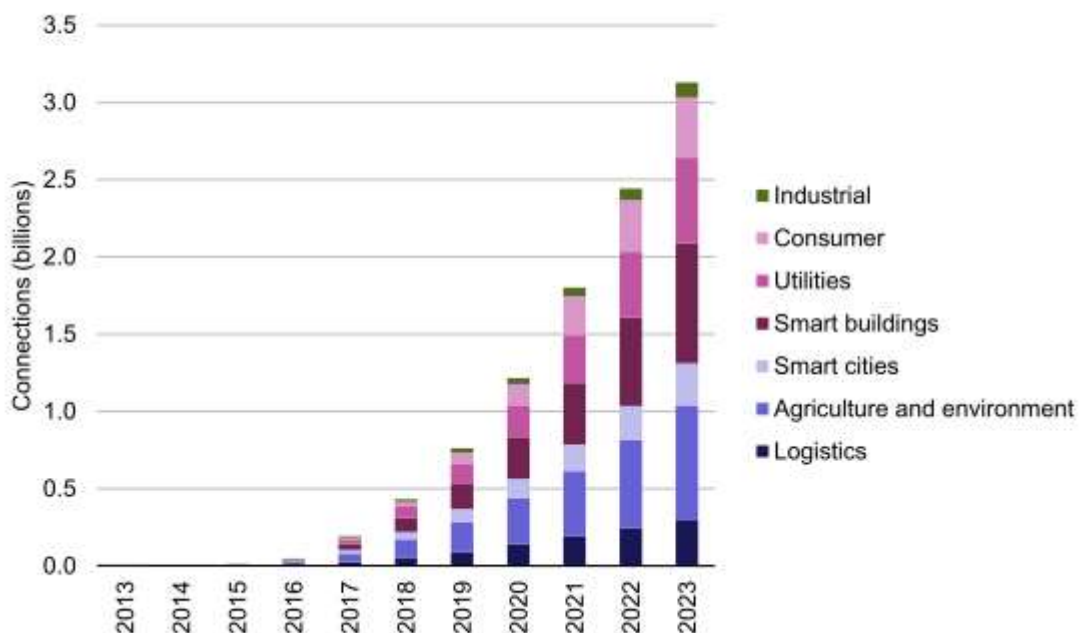
While Cisco predicts the bulk of that traffic as being generated by smartphones, the company sees connected devices as growing by 45% per year over the next five years with 3.2 billion sensors connected to the internet by the end of the decade.

CAGR: compound annual growth rate

Notable in the prediction that Low Powered Wide Area (LPWA) networks – non cellular systems mostly operating in the unlicensed spectrum used by Wi-Fi networks – will provide nearly a third of the connections by 2019. At the same time we can expect many M2M deployments to consolidate traffic locally with much of the data processing down locally before the residual information being passed up the network.
http://networkedglobe.com/2015/02/08/preparing-for-the-data-explosion-in-iot-and-m2m-applications/

SIGFOX OG LPWAN

Mobile operators are counting on billions of connected objects--from road signs to your toaster--to justify their investments in new cellular networks. But French networking startup SigFox is rolling out a cheap, long- range radio technology that could upset those plans. Using license-free radio spectrum and simple radio chips similar to a garage-door opener, the Toulouse-based company says it can send low-bandwidth signals tens, if not hundreds, of miles- - allowing it to cover countries with relatively few antennae. Revenue is still small, at EUR6 million last year. But with clients in sectors spanning shipping, retail and security, and a foothold in 20 countries, investors are paying attention: The company is planning to raise EUR100 million in coming weeks from venture capitalists and strategic investors, says co-founder and CEO Ludovic Le Moan. http://www.nasdaq.com/article/europes-2015-tech-startup-landscape-20150218-01223

UDRULNING AF SIGFOX

The nationwide network in France, which was built by SIGFOX, employs around 1,000 base stations at a cost of $4 million. That is about 100 times cheaper than an equivalent GSM/CDMA cellular network. Another important feature is the fact that the devices do not need to be certified by a carrier, a process that can cost tens of thousands of dollars in the U.S. and take several months. http://www.nojitter.com/post/240168055/licensefree-spectrum-goes-cellular

Tele2 M2M Global Solutions has now added Aerea to its partner eco-system. Aerea is the exclusive SIGFOX network operator for the Netherlands and already covers 85 percent of the country. http://www.poandpo.com/companies/tele2-partnering-with-aerea-on-internet-of-things-25-1-2015/

Udrulning I Danmark. IotDenmark angiver på hjemmeside oprettet for to uger siden, at "IoT Denmark er den danske partner til Sigfox og varetager installation, drift og vedligehold af netværket foruden salg af abonnementer fra objekter koblet på netværkets cloud-løsning." Mit indtryk er, at IotDenmark pt. er to "lykkeriddere" ud i teknologiske virksomheder; [Dines Juhl Barsøe](#) og [Daniel Bachmann](#), men at de sandsynligvis indenfor få uger vil indgå aftaler med stærke samarbejdspartnere. Deres vurdering er, at Danmark vil kunne dækkes af 180 base stationer.

SIGFOX OG MARKEDET

February 12, 2015. Internet of Things network specialist SIGFOX this week announced it has raised $115 million in new funding. The new money will support the company's rollout of new networks in the Americas and elsewhere. New investors include service providers NTT DOCOMO Ventures, Telefonica, and SK Telecom; Elliott Management Corp.; and Air Liquide, Eutelsat, and GDF SUEZ. These new investors join Elaia Partners, Idinvest, iXO PE, and Partech Ventures. http://www.m2mevolution.com/topics/m2mevolution/articles/398027-sigfox-raises-115-million.htm

FORRETNINGSMODEL FOR SIGFOX

The low cost of modules and service will make new business models possible. Most M2M services are sold in the form of a device and with a monthly service fee. With low and predictable lifetime costs, developers using LPWA for connectivity will be able to sell devices for a fixed fee including all device and service fees. For example, a bicycle tracker could be sold for USD40 for a device and five years of service included, (Analysys Mason, 2014.)

One nice feature comes from the fact that subscriber IDs are embedded: no SIM cards, no need for subscriber lifecycle management, and management of the devices is much simpler. The whole process can be completed in a few days, versus several weeks or even months for GSM/CDMA. This means that cost-effective solutions can be marketed in very short time frames, and that is the name of the game these days. Solutions will work without any modification in different markets, provided a SIGFOX network has been deployed.

Subscriptions can be activated remotely and on-demand. They are sold at annual rates for a few dollars, down to around $1 for high-volume deployments. It's the icing on the cake and a proof point that the technology can provide a low-cost, very efficient data transmission service. Another is the fact that to date more than 5 million devices have been deployed. http://www.nojitter.com/post/240168055/licensefree-spectrum-goes-cellular.

SENSORER

KLIMASTATIONER

Omfatter temperatur, vind, nedbør, solindstråling, lysmængde, ultraviolet lys, lufttryk, jordtemperatur, pH, bladfugt, vandindhold i jord, omkreds (stængel, frugt)

KONCENTRATIONER OG FLOW

Gennemstrømning, niveaumåling, kontinuerlig drænvandsundersøgelse O'Boyle et al. (2014), McIntyre et al. (2009), methan, NH3

SKADEDYR

Overvågning af fælder for insekter og gnavere

GRÆSSENDE DYR

Aktivitet, lokalisering, temperatur, drøvtygning

MASKINER

Hastighed, placering, vibrationer, forbrug, vægt

BYGNINGER

Temperatur, luftkvalitet, støj niveau, emissioner

MÅLRETTET REGULERING

Årets helt hotte emne på Plantekongressen 14.-15. januar er målrettet regulering fortalte LandbrugsAvisen 14. november 2014 som en indledning til omtale af sessioner om

- Fremtidens målrettede regulering af kvælstofanvendelsen;
- Emissionsbaseret regulering og
- Regulering baseret på målinger af tab fra bedriften.

Fælles træk for indlæg under disse sessioner var at

- erhvervet ønsker og forventer, at en regulering af gødnings- og arealanvendelse kan baseres på aktuelle målinger af tabet til omgivelserne og ikke på normtal og modeller;
- emissionsbaseret regulering af kvælstof-, fosfor- og pesticidanvendelsen, og måske også ejendommens kulstofbalance, stiller krav til kildesporing – f.eks. i vandløb, der modtager bidrag fra flere bedrifter;
- databaseret regulering giver mulighed for produktionsoptimering;

I anbefalingerne i Natur- og Landbrugskommissionens rapport fra foråret 2013 (»Natur og Landbrug – en ny start«, side 42) fremgår det, at:

> »Det bør være målet, at den ændrede kvælstofregulering hurtigst muligt baserer sig på målte udledninger af næringsstoffer fra dyrkningsarealerne. Det forudsætter, at teknologien hertil udvikles yderligere. «

REFERENCER

Analysys Mason, 2014. Low-powered wireless solutions have the potential to increase the M2M market by over 3 billion connections. Report, 18 pp.

McIntyre, G., Lewis, M.R., Andrea, J., Feener, S., McLean, S.D., Johnson, K.S, Coletti, L.J, Jannarch, H.W., 2012. ISUS/SUNA Nitrate Measurements in Networked Ocean Observing Systems. OCEANS 2009, MTS/IEEE Biloxi - Marine Technology for Our Future: Global and Local Challenges, 26-29 Oct. 2009, Biloxi, MS. 7 pp. [Online]: http://satlantic.com/sites/default/files/documents/ISUS-SUNA-Nitrate-Measurment-White-Paper.pdf

O'Boyle, S., Trickett, P., Partington A. and Murray, C. 2014 Field testing of an optical in situ nitrate sensor in three Irish estuaries. Biology and Environment: Proceedings of the Royal Irish Academy 2014. [Online]: http://sea-birdcoastal.com/sites/default/files/documents/bae201402.pdf

Videnskabsministeriet, 2006. IKT fra jord til bord. Ministeriet for Videnskab, Teknologi og Udvikling, København. 52 pp. [Online]: http://ufm.dk/publikationer/2006/filer-2006/ikt-fremsyn-jord-til-bord.pdf