

Satellite Communication

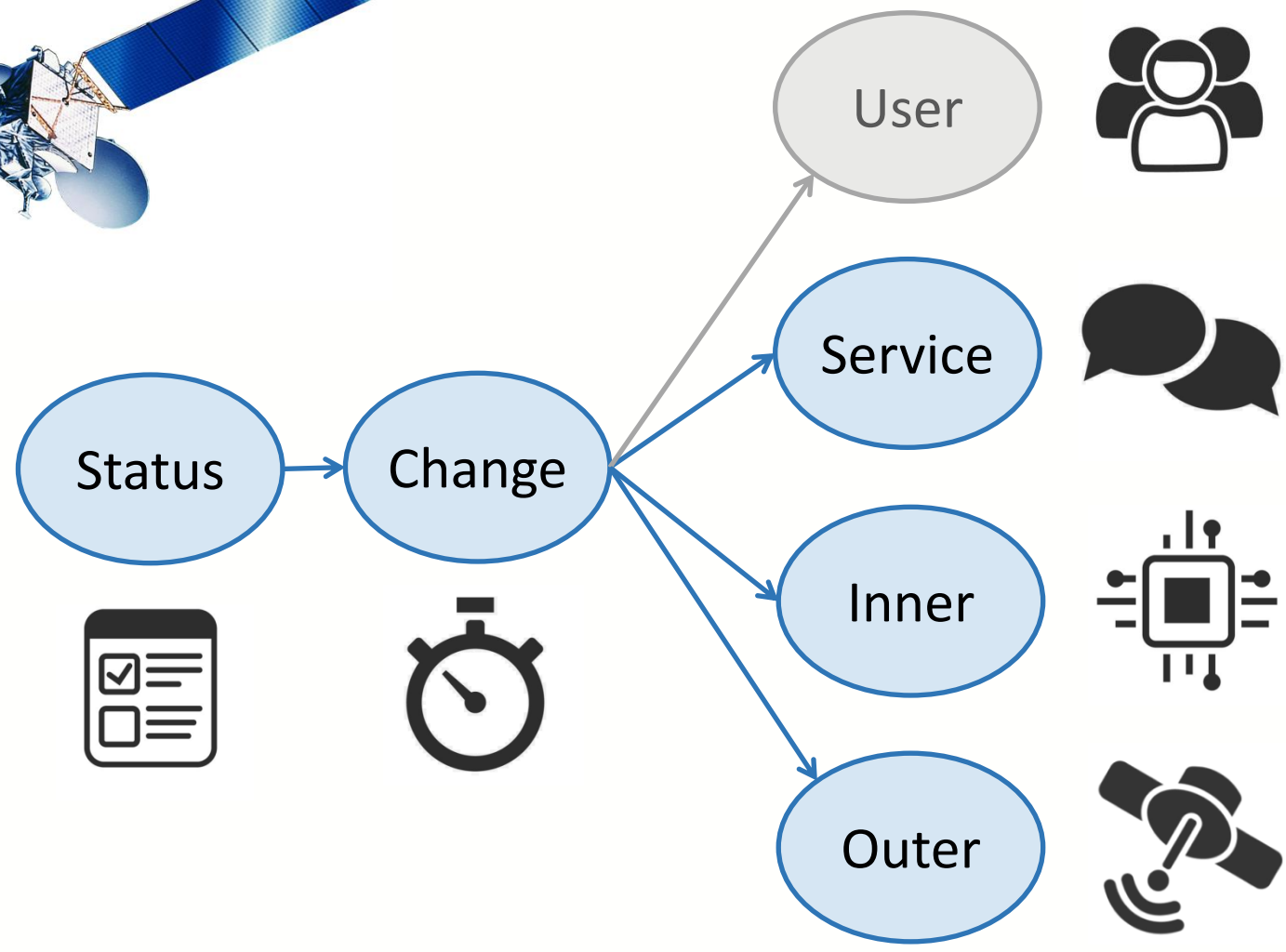
- next steps towards an all-IP world -

*by Jörg Rockstroh
WORK Microwave GmbH
December 12-13, 2017*

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Satcom Status



- Satcom is a traditional industry
 - consumer-based services challenging to renew
 - majority of DTH still DVB-S
 - consumer VSATs still DVB-S, or at least DVB-S2 CCM
 - transport stream is the major transport layer
- HTS oversupply of Ka bandwidth
 - lack of business models to fill the carriers
 - satellite operators move down the value chain
- disruptive developments still experimental (LEO) or limited (MEO)



Satcom Status (cont'd)



- Hardware loses its viability as business model
 - general development in most electronics
 - consolidation phase in manufacturing market
 - movement towards service and/or software
- Service types are changing
 - FSS dropped in favour of VSAT in the first place
 - with HTS some FSS comeback due to quality of service
 - linear TV disappearing in the long run?
 - satellite in the light of 5G?

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Need for Change



- Users
 - expect highspeed connectivity
 - stop caring about tech, focus on design and UX instead
 - often are not aware about the involvement of satellite
- Service types
 - linear TV declines in favour of interactive services
 - broadcast and broadband will merge
 - video and media always majority of traffic



Need for Change (cont'd)



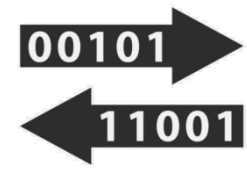
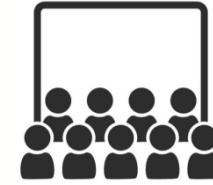
- Inner technology developments
 - digital revolution in electronics
 - highspeed connectivity
 - processing power
- Outer technology developments
 - learn from MEO constellation
 - LEO constellations ... dreams vs. reality

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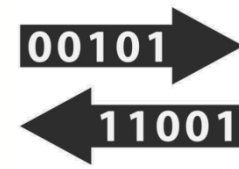
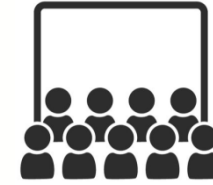
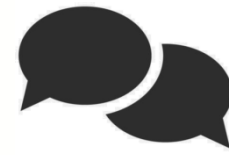
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Services



- often work in the background
 - contribution and distribution of TV
 - backhaul for mobile and internet
 - connectivity for remote locations and maritime
- are affected by development of ground infrastructure
 - mobile connectivity
 - fiber
 - 5G

Services (cont'd)



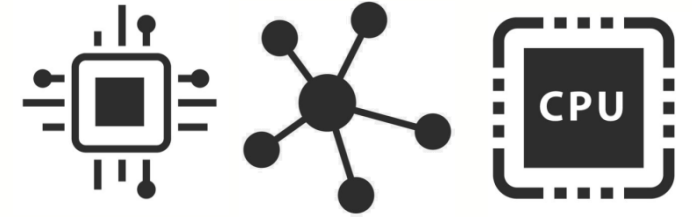
- will have to use the strength of satellite
 - immediate availability independent of location
 - reach a large number of people
 - not affected by ground based access restrictions (borders, ...)
- interconnect with other infrastructures
 - use of common protocols ... IP!
 - add value, i.e. the broadcast of common content
 - backup ground infrastructures

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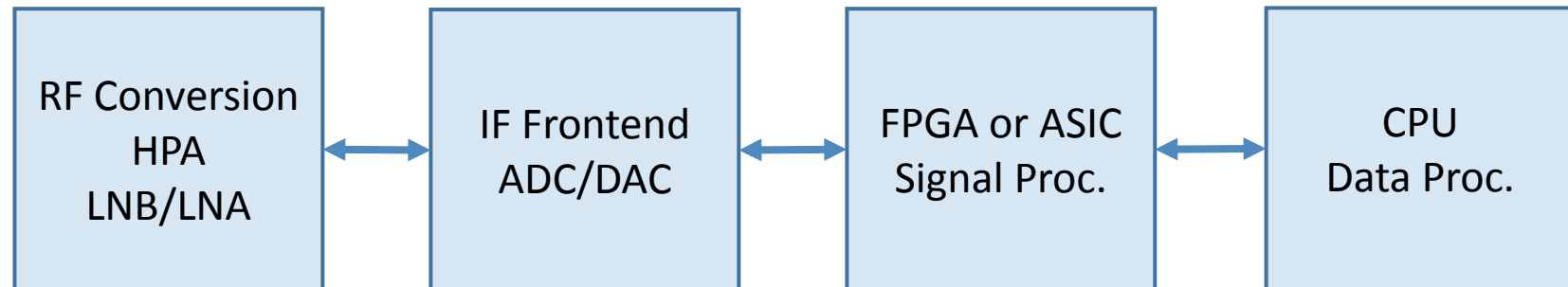
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Inner Technology



- development of digital technology drives communication electronics
- hardware structure becomes increasingly integrated and generic in design, with the 4 stages:

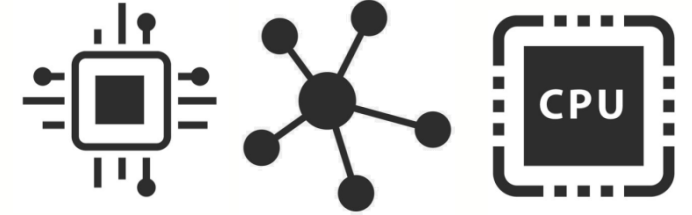


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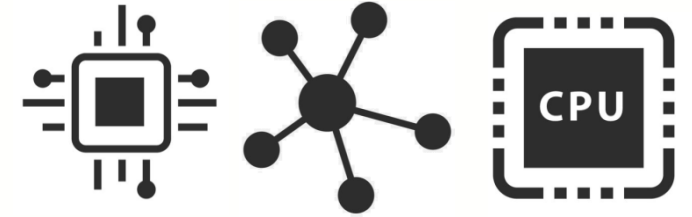
Inner Technology (cont'd)



- RF frontend becomes increasingly integrated
- IF stage becomes digital
- FPGA technologies and processor / software platforms develop independently from actual function
- higher performance and resources for wider feature sets come as a side effect
- applicable to both ground segment and space segment elements
- result: software defined radio



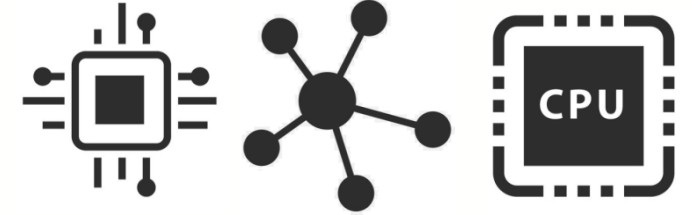
Inner Technology (cont'd)



- ongoing evolution only slowed down by requirements that can not be met with generic highspeed busses and platforms
- Transport Stream ...
 - specified in the pre-Internet era
 - over ASI with real-time hardware requirements, which are not in line with SDR evolution
- It is possible to use IP within Transport Stream, and Transport Stream within IP ...

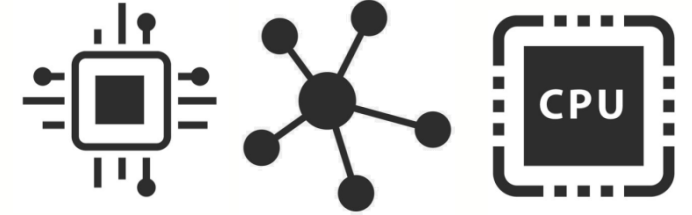


Inner Technology (cont'd)



- over satellite with DVB-S2(X) IP can be transported natively
- still lots of connections use TS
- advice: TS for video, but use IP for generic transport
- IP easily blends in into other ecosystems
- make use of IP-based mechanisms that optimize video transport ... MPEG-DASH, DVB-DASH

Inner Technology (cont'd)



- further thoughts on infrastructure changes
 - digital IF allows for flexibility of processing location
 - cloud-based - or virtual - entities can manage more tasks towards transmission than before
 - blurring of traditional frontiers between entities
- the satellite modem becomes more of a software service than a single device!



Outer Technology



- non-GEO constellations in general
 - tracking antennas or phased arrays required
 - satellite handover
 - lower latency
 - higher throughput with regards to power
 - required routing flexibility only manageable with IP
- MEO flying, but services far from initial promise
 - mainly maritime services
 - IFE fast growing market



Outer Technology (cont'd)



- LEO constellations

- a lot of announcements with huge amounts of satellites

• OneWeb (648...720)	LeoSat (108)	Telesat (75)
SpaceX (4425)	Samsung (4600)	Boeing (2960)
Kepler Comms (140)	Theia (112)	Spire Global (110)

- a couple of smaller ventures for specific purposes

- who will survive?
- Frequency spectrum and interference?
- Debris? Kessler syndrome ...

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Conclusion



- With merger of communication infrastructures, satellite rather contributes in the background than playing a standalone role
- That merger is going to be IP based
- As technologies become more accessible in a generic way (SDR), the frontiers between entities will disappear



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