

Towards a Flexible Spectrum Market



Centre for Telecommunications Value-Chain Research

Trinity College, University of Dublin, Ireland

Linda Doyle, Tim Forde, Keith Nolan, Paul Sutton, Deepak Sarath



Lucent Technologies
Bell Labs Innovations

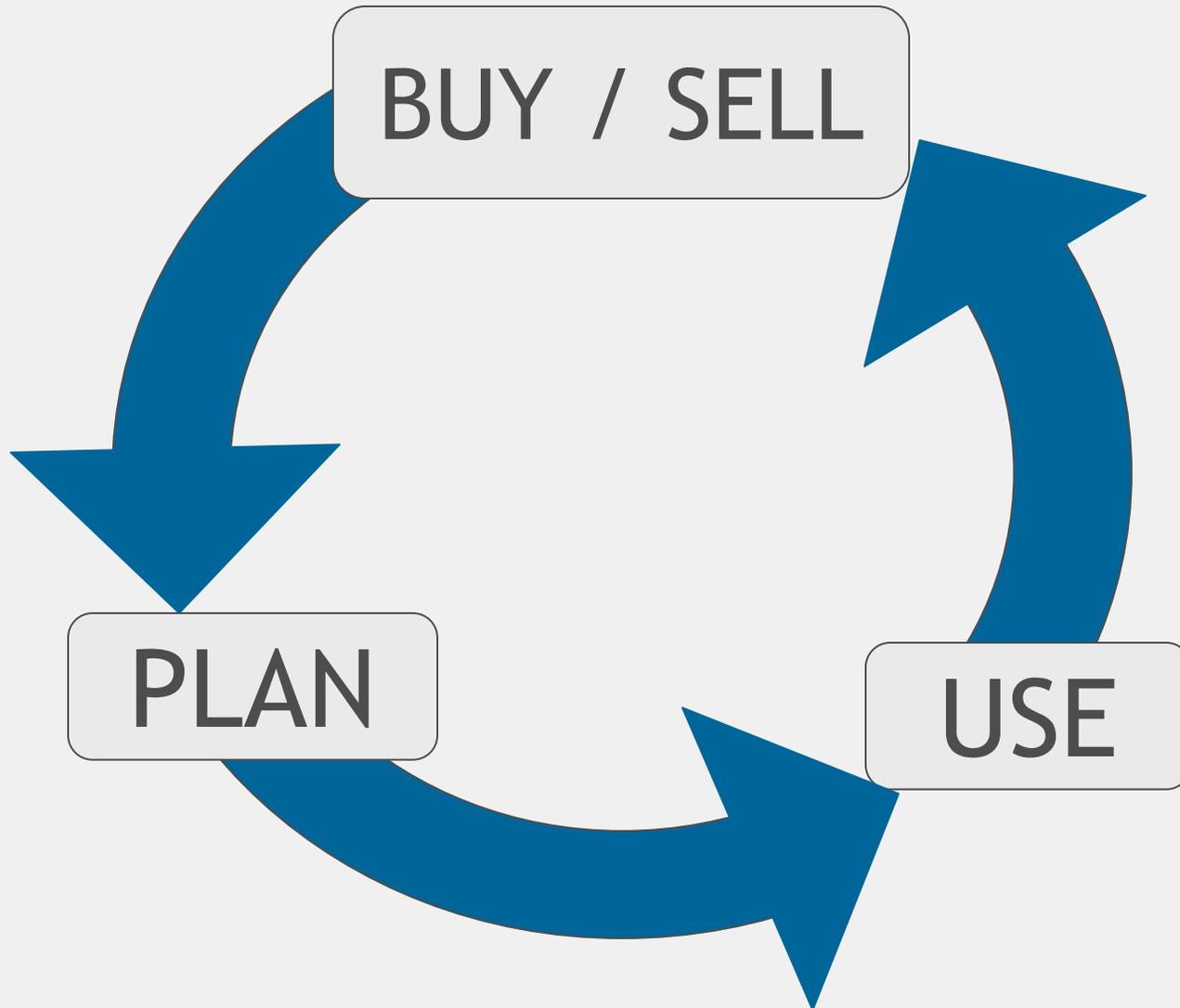


STATIC spectrum assignment



FLUID

market-based spectrum assignment



FLUID market-based spectrum assignment

1. spectrum is the commodity (exclusive spectrum usage rights)
2. the market is a fully automated secondary market
3. spectrum is ASSIGNED not allocated
4. the technology facilitates assignment

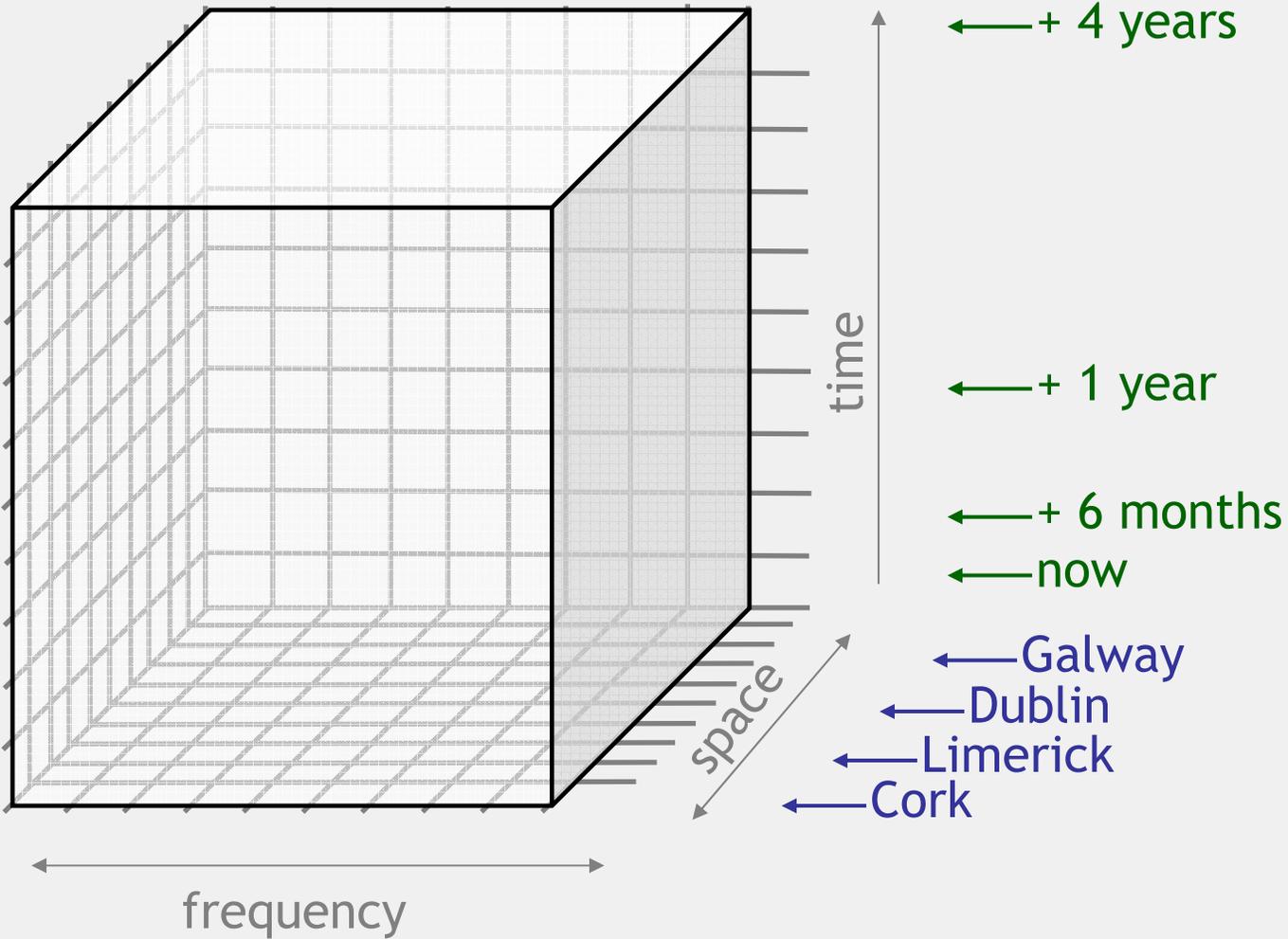
example **PLAYER** rules :

- buyers must be users, not hoarders
- sellers can only be government designated entities
- buyers can / cannot become sellers

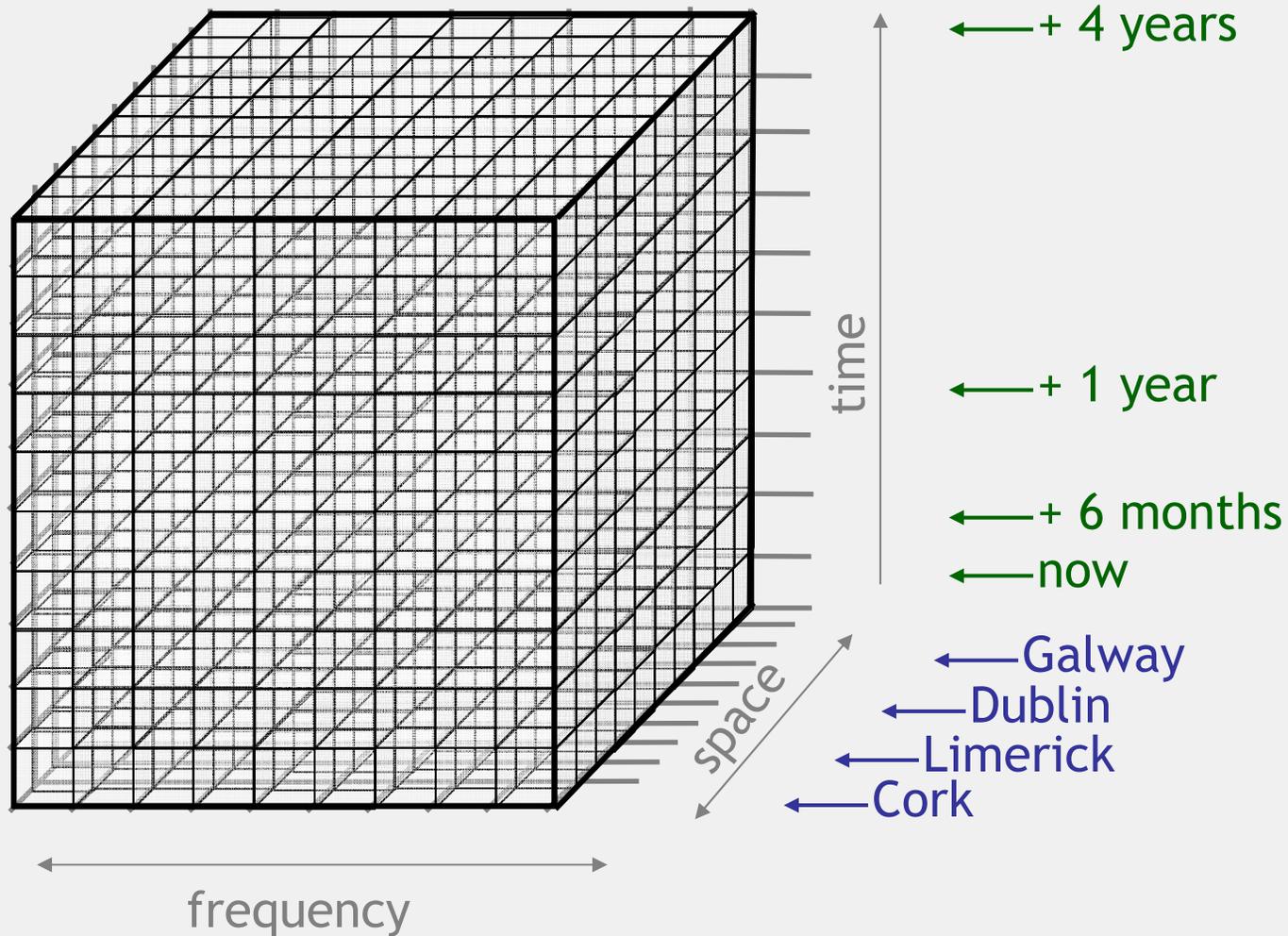
- definitions can change over time
- mobile operator  municipal network / campus networks

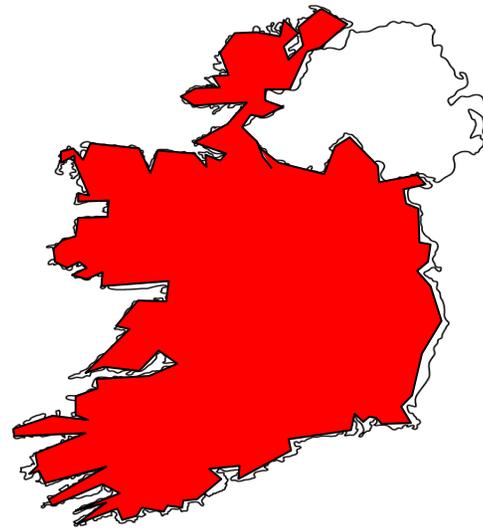
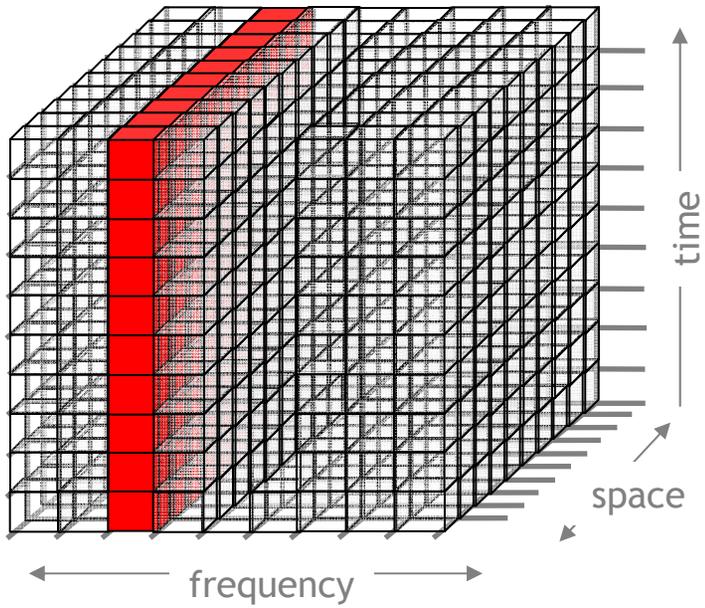


radio spectrum usage continuum

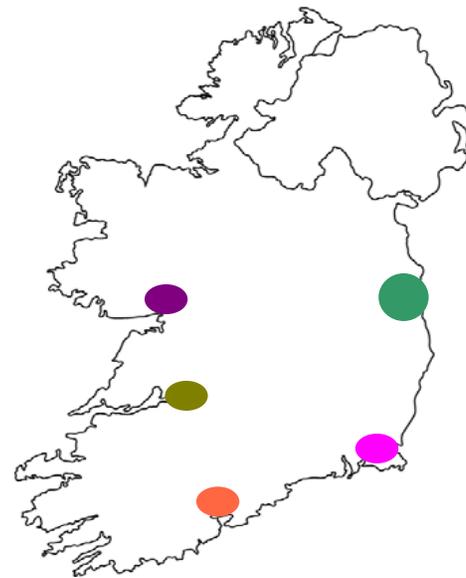
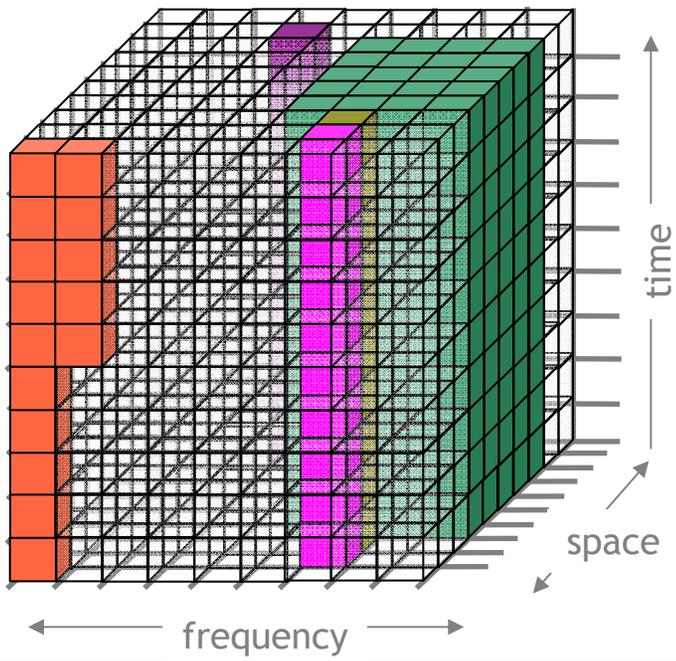


radio spectrum usage continuum





GSM/
UMTS

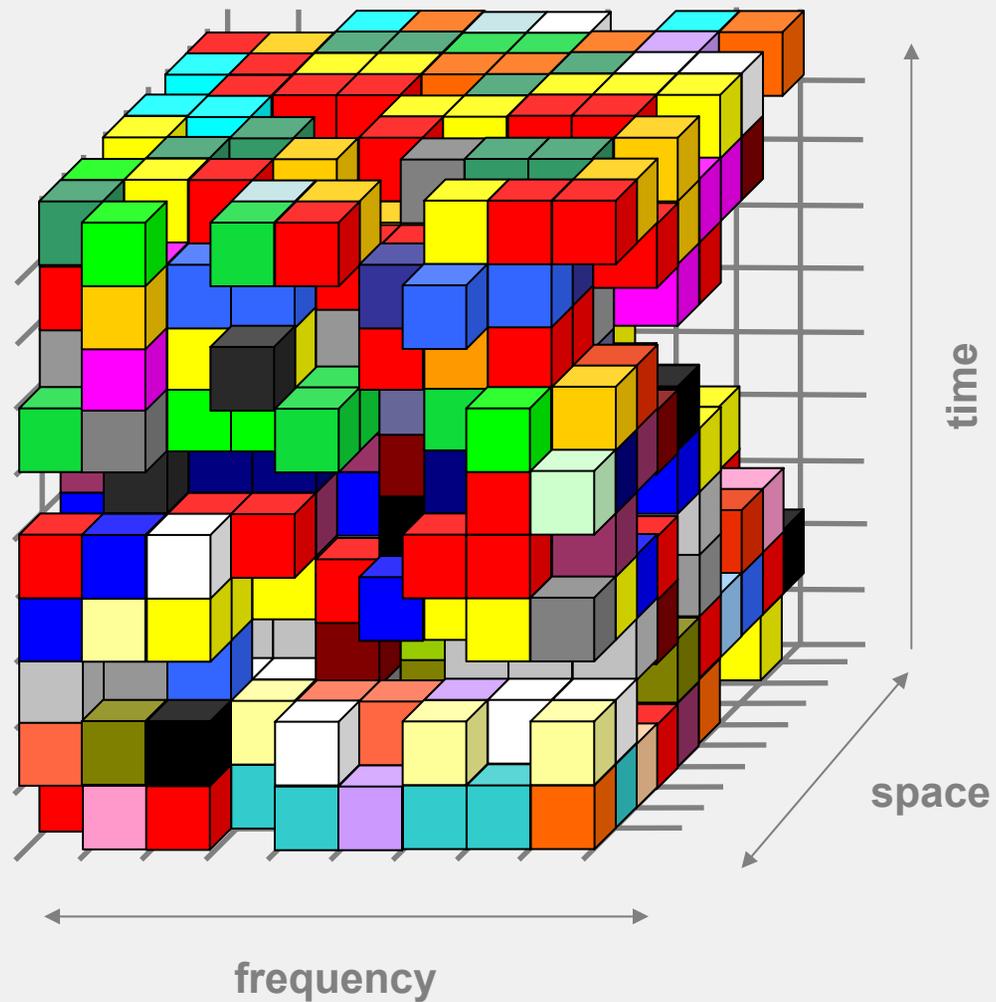


WiMAX

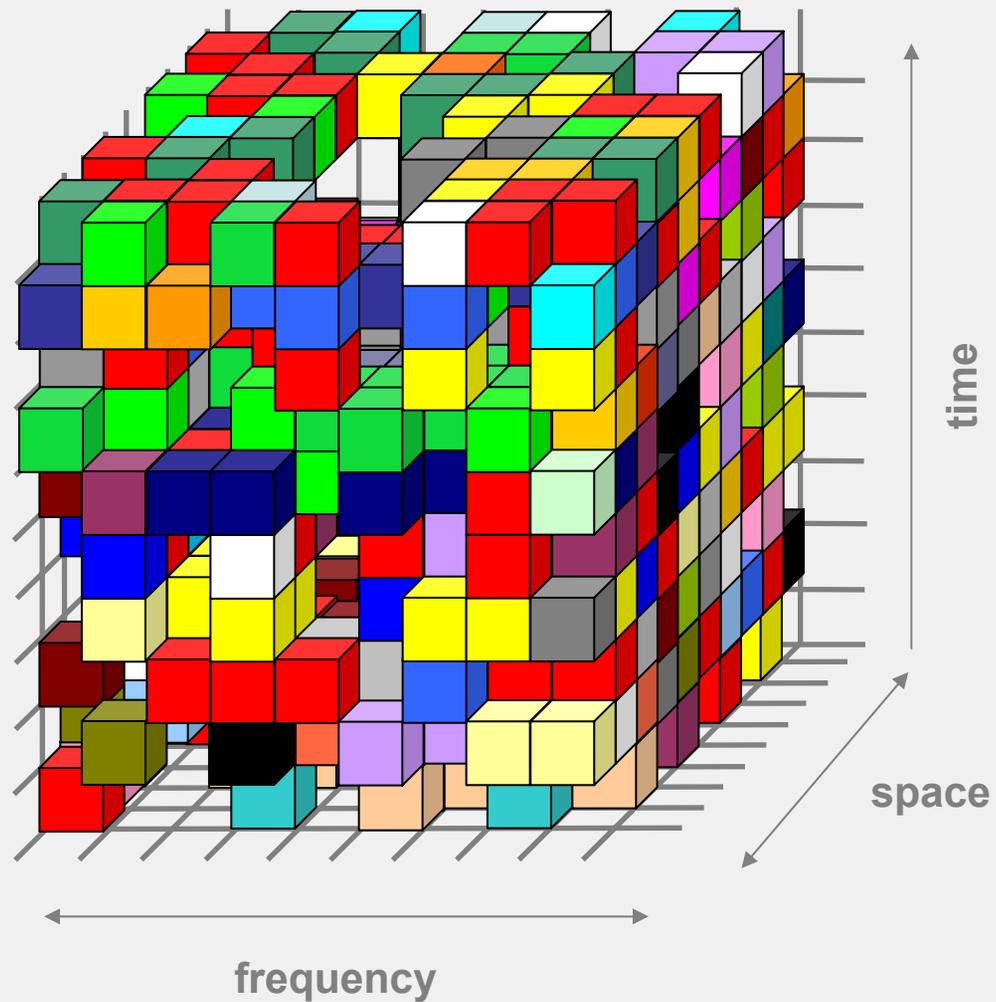


mindset

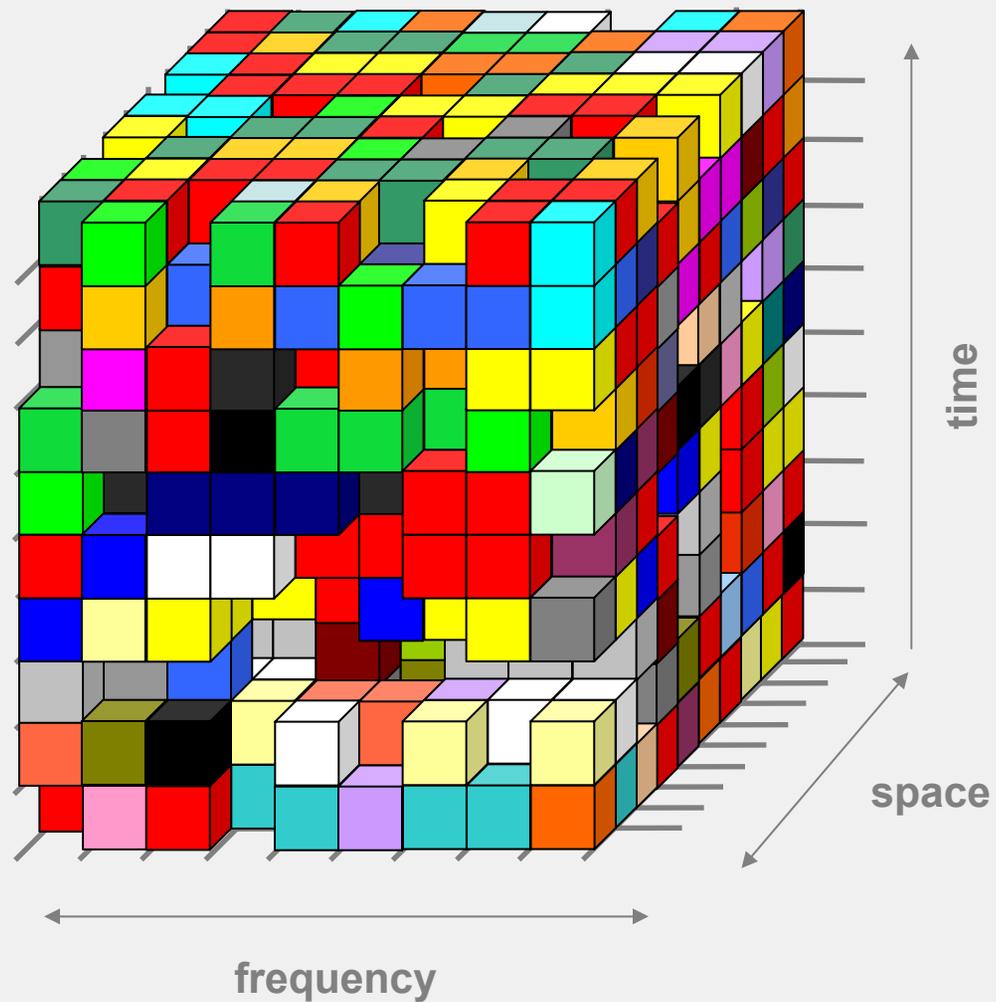
fluid market-based assignments



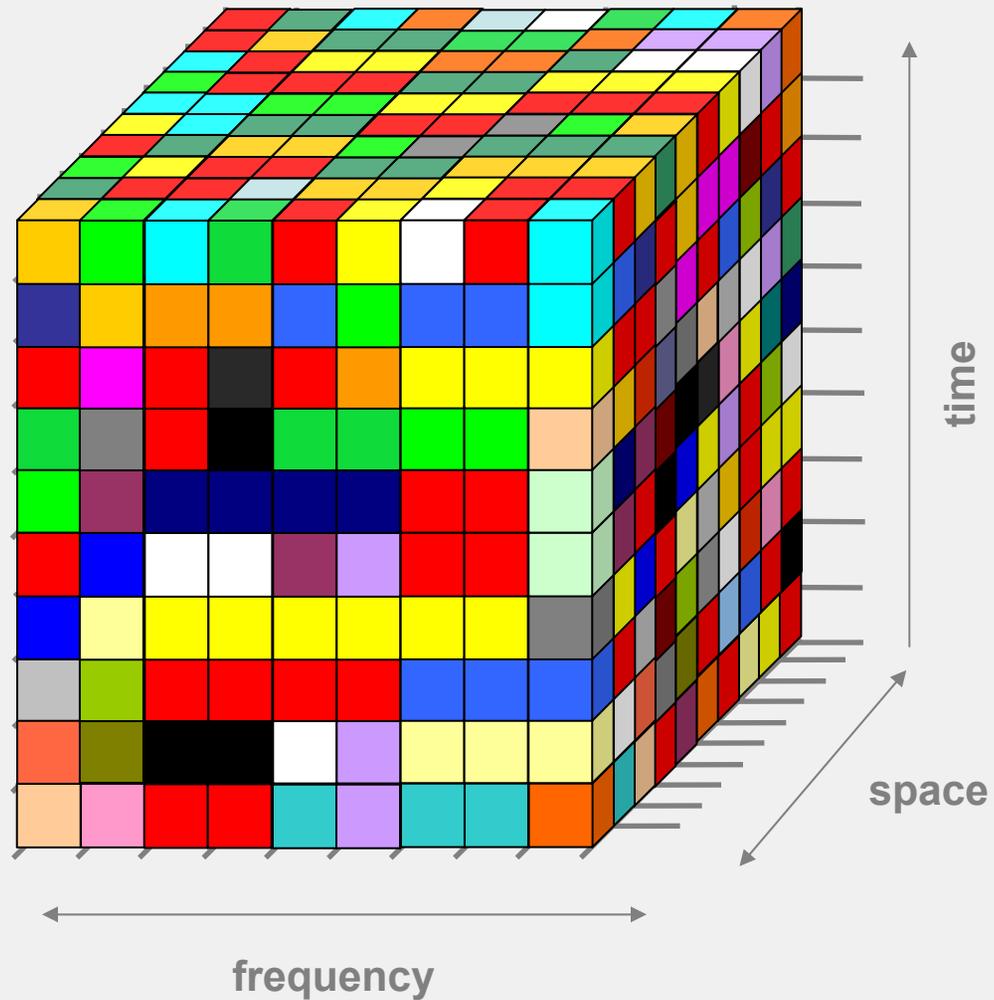
fluid market-based assignments

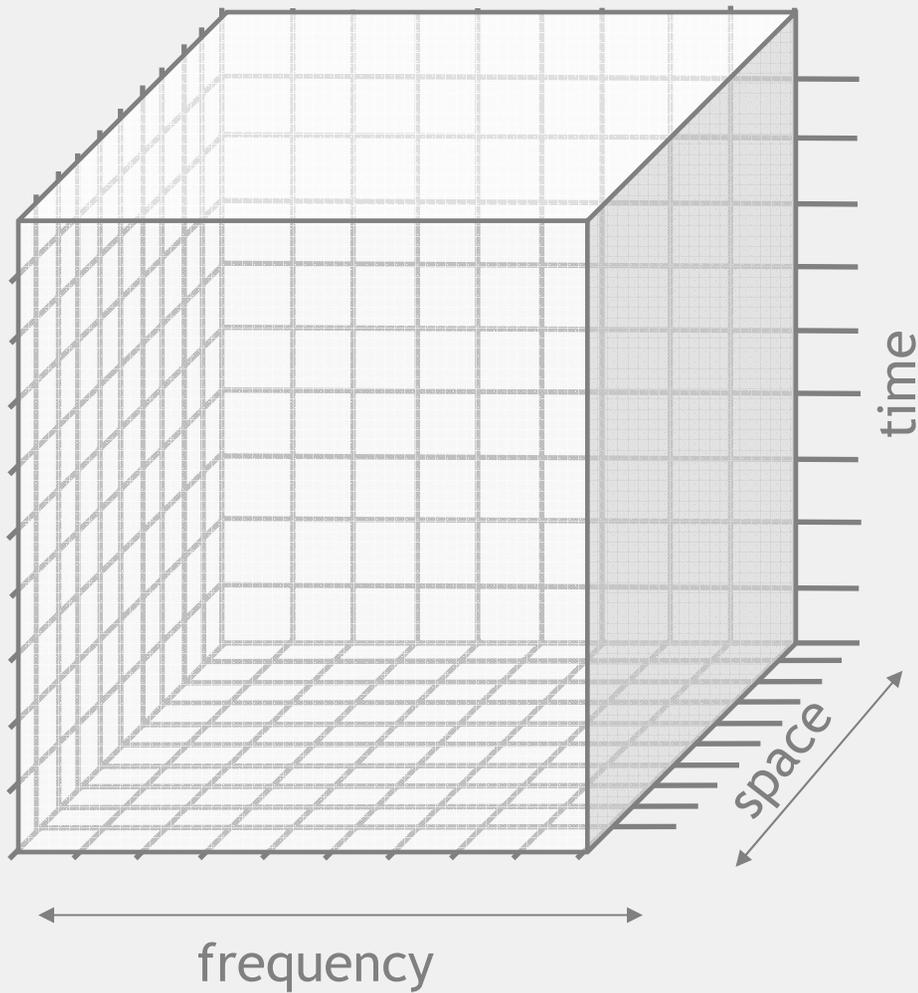


fluid market-based assignments



fluid market-based assignments





← + 4 years

← + 1 year

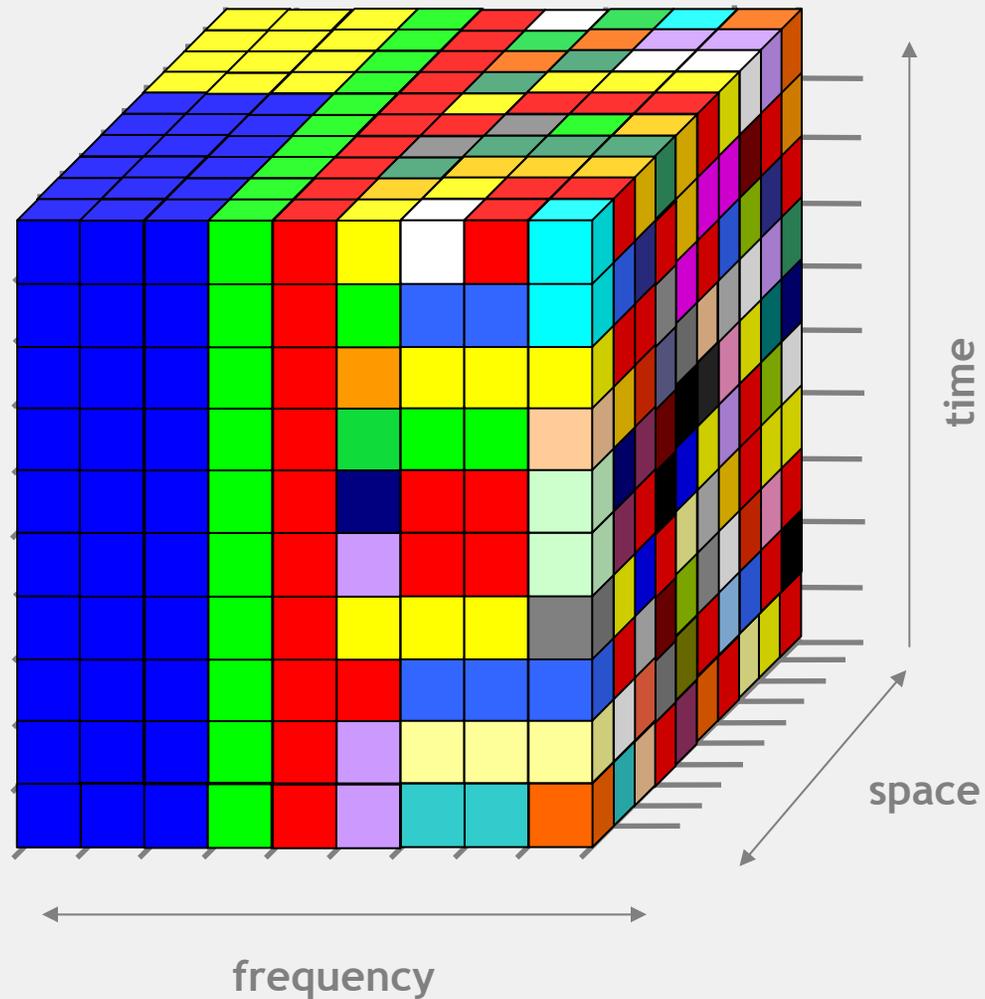
← + 6 months

← now

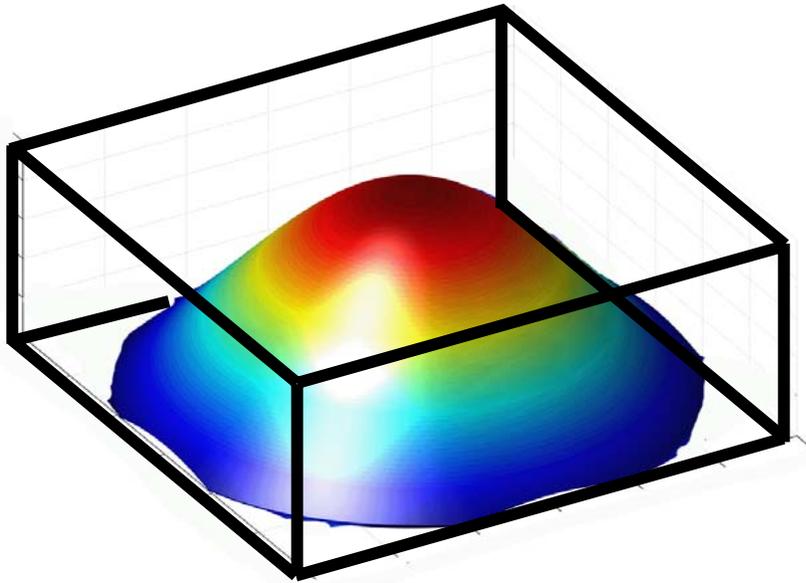
SPOT

FUTURES

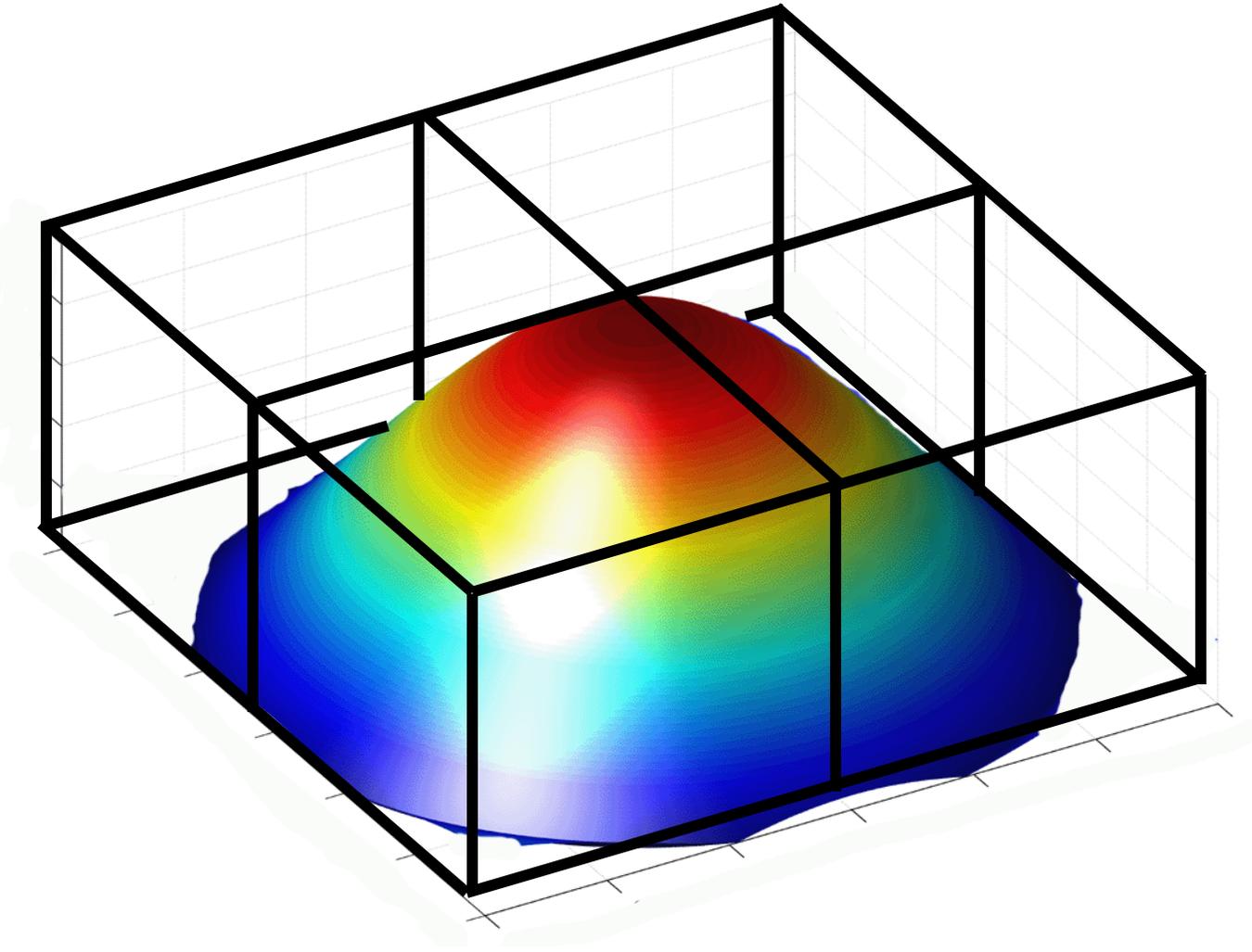
varying granularity of assignment aggregations



setting the boundaries



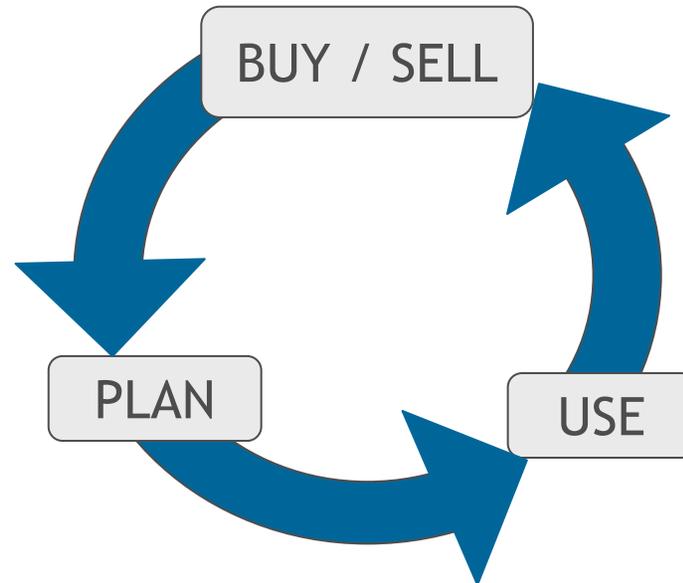
combinations





technology

automated trading floor
automated buyer/seller/broker/clearing house agents
associated payment & security



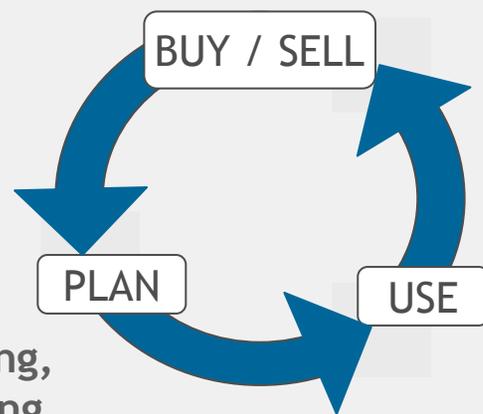
self-organising, self-configuring,
self-planning, cognitive
networks
distributed and disaggregated
decision-making
distributed optimisation

NETWORK

frequency agile & reconfigurable
handsets,
cognitive radios,
sensing technologies

NODE

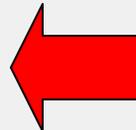
automated trading floor
automated buyer/seller/broker/clearing house agents
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NETWORK

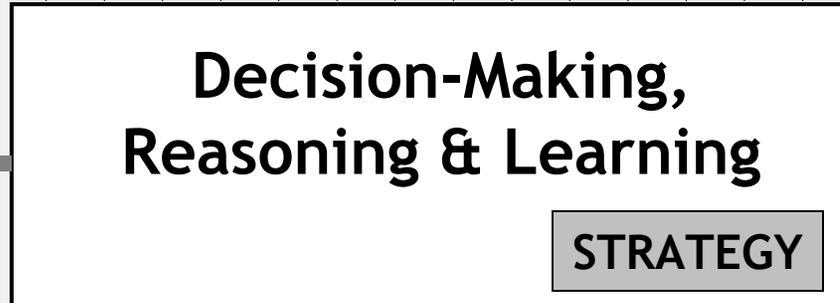
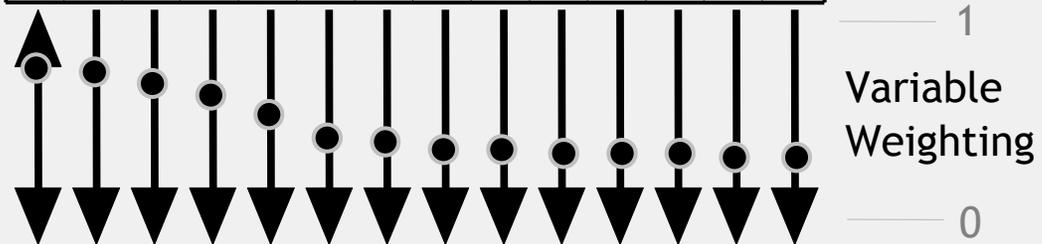
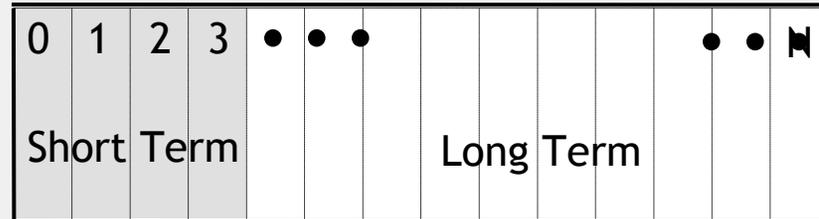
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NODE

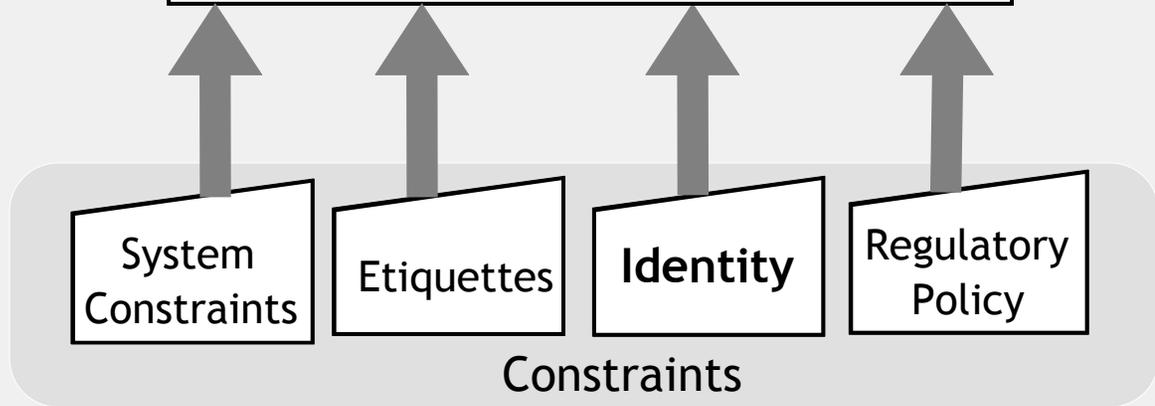


**BEHAVIOURS/
POLICIES**

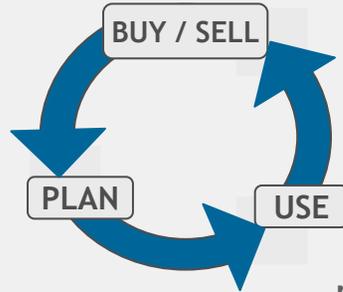
Knowledge Representation Delay-Line
{Memory: Market-Place Observations}



**BUY /
SELL**



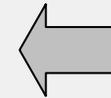
automated trading floor
automated buyer/seller/broker/clearing house agents
associated payment & security



self-organising,
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NODE



BEHAVIOURS/
POLICIES



TEST / CERTIFICATION



growth



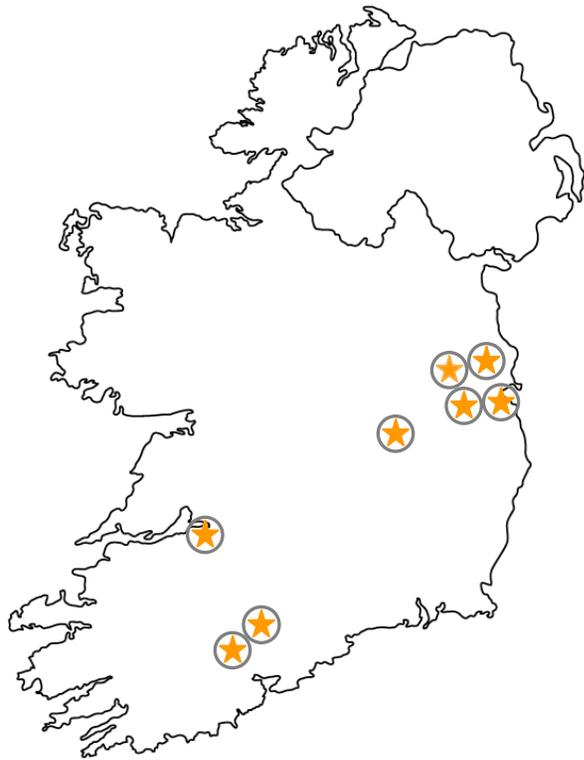
growth

overlay: opportunistic use

market-based primary assignment

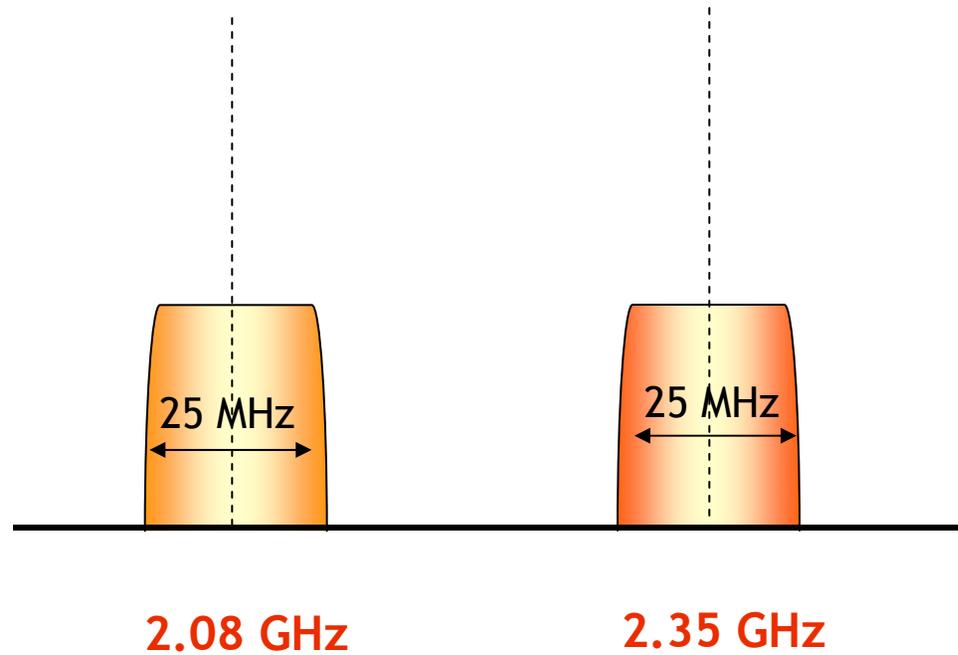
underlay: easement use

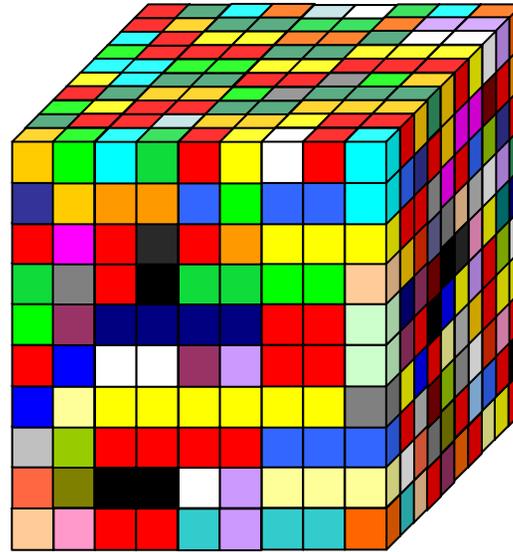
ComReg Test License Scheme



Transmit Sites

CTVR BANDS





www.ctvr.ie | www.emergingnetworks.info

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Centre for Telecommunications Value-Chain Research

*CTVR will establish an international leadership position in **industry-guided** research that **redefines** key elements of **telecommunications systems**, architectures and networks and the value chains used to design, build, market and service them. It will leverage this leadership position to contribute to the scientific, commercial and educational infrastructure of Ireland.*

SOFTWARE RADIO, RECONFIGURABLE COMMUNICATION SYSTEMS, DYNAMIC SPECTRUM, VALUE-CHAIN ANALYSIS, MARKET-PLACE DYNAMICS,