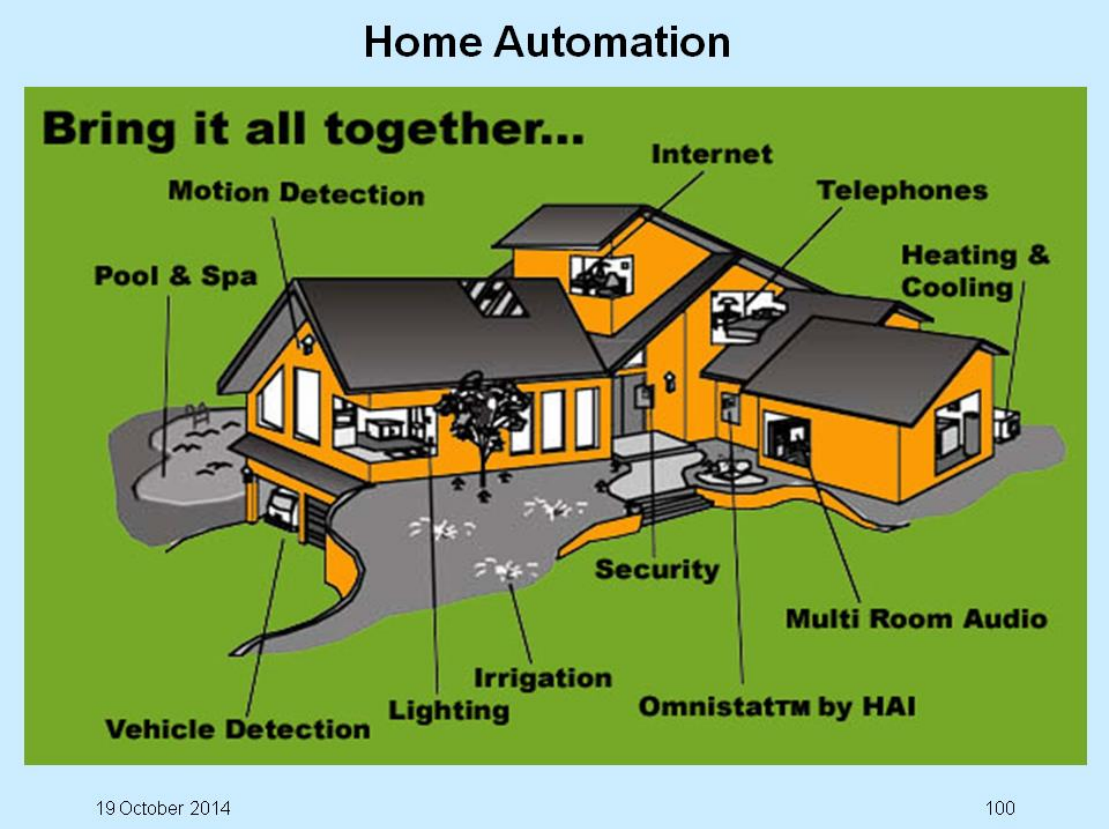
Future Power Systems 15 - Data Logistics

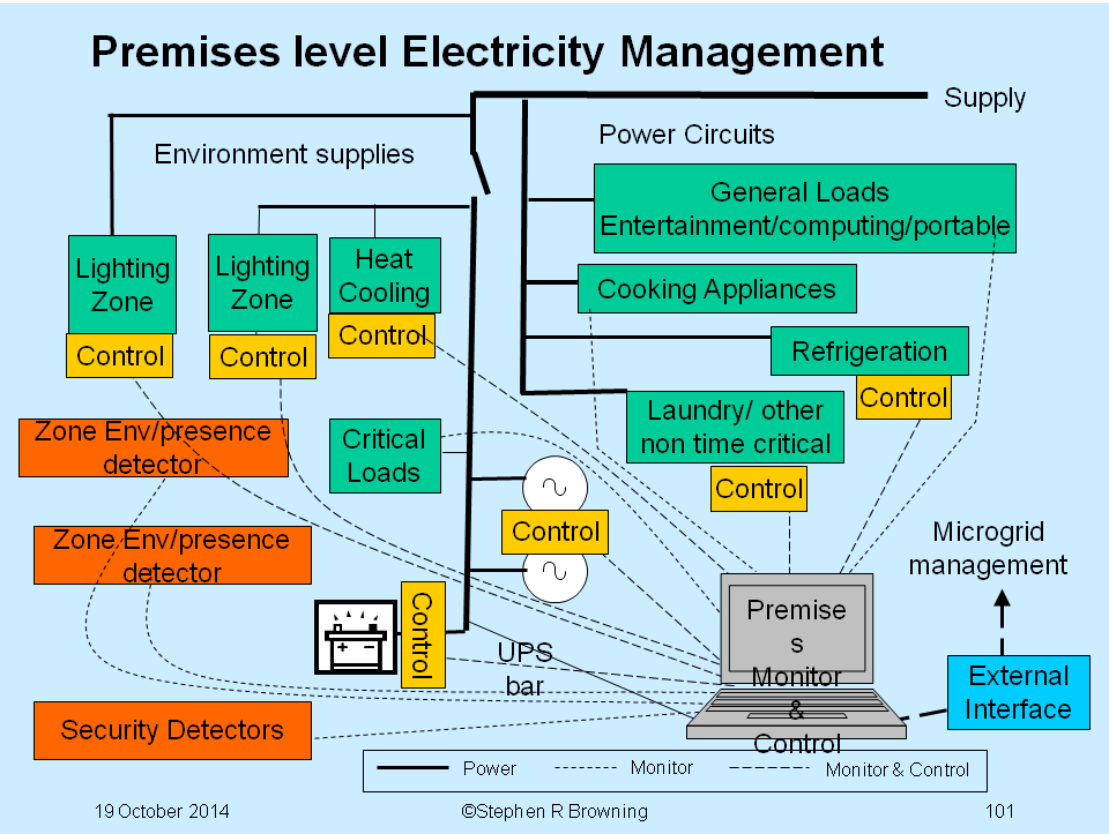
As we have already stated, data traffic for distributed resource management will require the use of high speed aggregation and dissemination mechanisms between the customer and the commercial and operator sections of the industry.

Within premises we are seeing increased levels of data traffic and external interfaces - computing and entertainment in the domestic sector and business traffic in the commercial sector. The commercial sector also has buildings energy and facilities management systems while the industrial sector has large process management applications.

Digital audio/video, business and process management applications are all data intensive and are mainly communicated by IP protocol packets. Power management data for future power systems is reasonably sparse and should not impose a great extra data burden at premises level, although some specialised equipment will be necessary. The main issue here is to define the data framework most applicable to each premises type and how that can be aggregated and disseminated at the higher levels.

Monitoring is important at device level for large premises demands, generation and storage with non time critical elements being managed directly. However, it is certainly not necessary to monitor every lamp bulb separately; presence and environmental sensors on a zone basis are already available to detect usage and control/override lighting, heating/cooling levels and appliance operation as appropriate. The individual demand for each large appliance and the other more general loads from zones should be monitored.



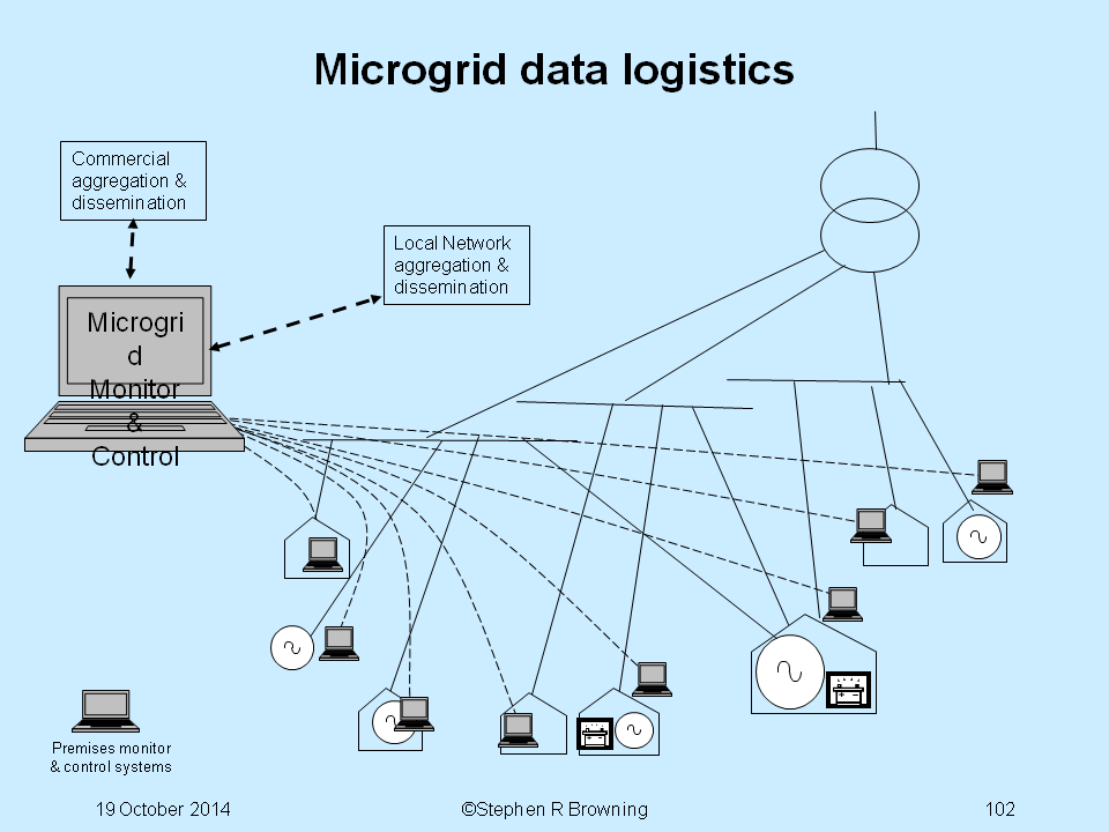


From the premises, simple data for demands, generation output and storage condition (kwH capacity and charge level) and any programmed activity are required. For controllable elements, timescales are

required. Refrigeration can be interrupted for short periods at short notice while laundry loads can be timed in advance, but must normally run the cycle uninterrupted once started.

Renewable generation should not be interrupted except to maintain network stability but storage can be programmed at short or long notice.

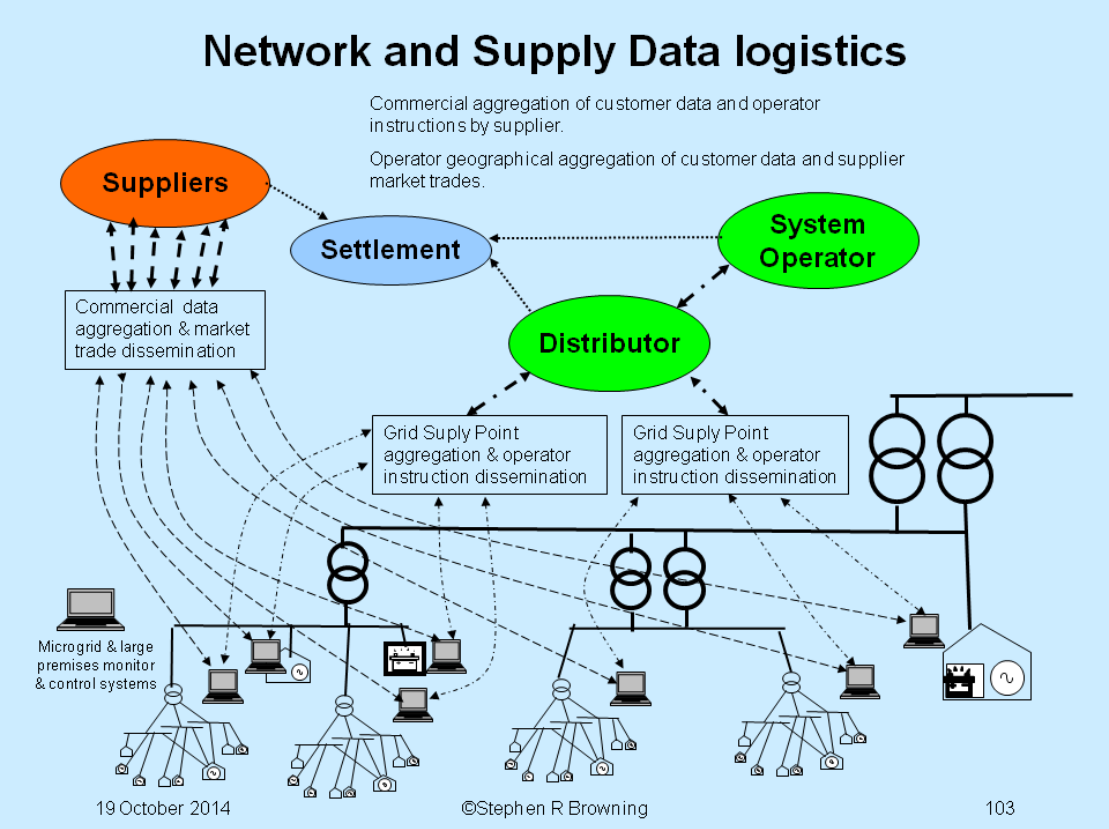
The next level in the control sequence is the microgrid.



The premises controllers interface to a microgrid controller, which monitors import/export and exercises control over premises variable components. This system ensures real time and lead timescale secure, stable operation of the microgrid within power quality and any commercially applied limits. It also facilitates management of 'power variation' data from individual premises (generation, demand, storage) and instructions resulting from the acceptance of these offers by the market or operators (distribution and system). This offer/acceptance process again requires analysis of the microgrid integrity as a result of the instructions.

Premises data, comprising generation and demand power, storage power, energy and offers to change the same need to be aggregated in total for the microgrid (technical aggregation) and also by supplier (commercial aggregation) to support market activity. Any variation instructions will be on an aggregated basis for the microgrid and have to be disseminated back to the individual premises.

So we come to the operators and the market. The suppliers will use any offers to vary within forward market timescales and may operate trades to increase or decrease their total contracted energy in half hour blocks. The distribution operator systems will aggregate the data for the microgrids by supply point to give totals for the system operator. The system operator may use offers in the short term matching mechanism and for ancillary service purposes.



All resulting instructions will be disseminated back by supply point, microgrid and then customer premises with operational instructions re-aggregated by supplier and market instructions aggregated by microgrid and supply point. This ensures supplier contracted energy is correct within settlement and that security, stability and power quality is maintained. In the case of 'trigger' instructions (ancillary services activation or intertrip/restriction in case of fault), any execution of the associated action must be recorded for commercial and technical evaluation of the resultant power and energy change.