MESH CYMRU

An introduction

PURPOSE OF THIS PRESENTATION

- to give a basic introduction to mesh and it's concept
- Begin to paint a picture of our desire to build a sustainable resilient network
- Offer opportunity for others to get involved (skills permitting)
- Allow ideas on potential funding, prospective strategic site identification

AIM

- To deliver a basic understanding of mesh, it's concept and benefits

ABOUT MESH CYMRU

- Mesh Cymru is a collaboration of local authority and RAYNET partnership
- Mesh Cymru came off the back of a presentation from Feednet in 2015
- 2016 Mesh Cymru was born and first grant obtained to deliver basic infrastructure
- 2017 a smaller grant was sourced to add to the basic infrastructure

WHAT IS MESH

- It's a mix of radio transmitters that are in fact no different to your home routers

- They are modified with specific firmware to enable long distance use on amateur radio frequencies

- They are termed as nodes

- To create a mesh network these nodes need to interact with each other

HOW DOES IT WORK

- THESE NODES FORM A NETWORK OF INTERCONNECTED TRANSMITTERS

- NODES NEED TO BE SITUATED IN STRATEGIC LOCATIONS TO BE EFFECTIVE

- NODES ARE MORE EFFECTIVE WHEN PLACED IN CLOSE PROXIMITY TO EACH OTHER BUT CAN ACHIEVE HOPS OF 10 TO 20 MILES EVEN 50 MILES HAS BEEN ACHIEVED DEPENDING ON TERRAIN.

- NODES MUST REMAIN IN DIRECT LINE OF SIGHT TO BE EFFECTIVE

WHAT IS REQUIRED FOR INFRASTRUCTURE

- A node location

- A node radio transmitter,

- an antenna or antennas designed for the location

- Hardware to fix to either poles or bracketing for buildings

- a prominent location to fix it.

- Power supply either mains or battery (for resilience)

WHAT ABOUT RESILIENCE

- ALL EQUIPMENT CAN BE RUN ON BATTERY POWER

- WIND GENERATORS, SOLAR PANELS AND GENERATOR POWER IS THE ACCEPTABLE NORM FOR RESILIENCE

- BENEFICIAL TO LOCAL AUTHORITIES AND EMERGENCY SERVICES IF FIXED TO "OFF GRID" RESILIENT SUPPLIES.
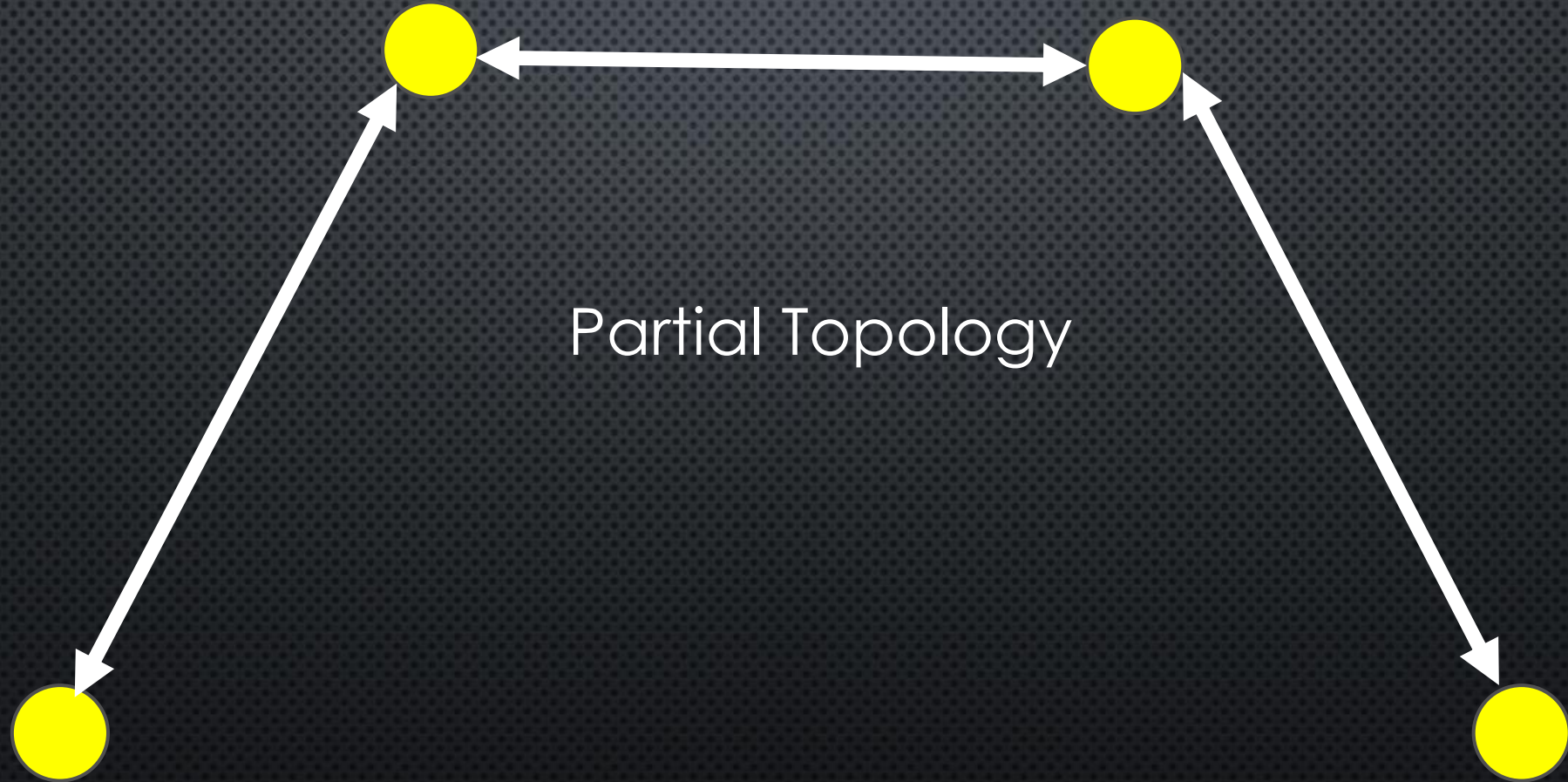
STRATEGIC SITES

- STRATEGIC SITES CAN HAVE A COMBINATION OF ANTENNAS EACH WITH A FIXED NODE SELECTED FOR IT'S SPECIFIC PURPOSE

- MUST HAVE SOME FORM OF SECURITY TO PREVENT THEFT OR TAMPERING

- ADDITIONAL HARDWARE REQUIRED CAN BE STRONG BOXES TO HOUSE THE EQUIPMENT

THE CONCEPT OF MESH

- **MESH NETWORKS** ARE AN ARRAY OF NODES THAT COMMUNICATE WITH ONE ANOTHER. THE WORD "NODE" IS A PIECE OF JARGON, BUT IT SIMPLY MEANS A CONNECTION POINT.

- **MESH NETWORKS** ARE CLASSED AS EITHER **PARTIAL** OR **FULL TOPOLOGY** NETWORKS

- IN A TRUE **MESH TOPOLOGY** EVERY NODE HAS A CONNECTION TO EVERY OTHER NODE IN THE **NETWORK.** THIS IS A **FULL TOPOLOGY NETWORK** .

- IT STANDS TO REASON THAT A **PARTIAL TOPOLOGY NETWORK** HAS NODES THAT DO NOT HAVE A CONNECTION TO EVERY OTHER NODE IN THE NETWORK, HENCE THE PARTIAL TAGGING.

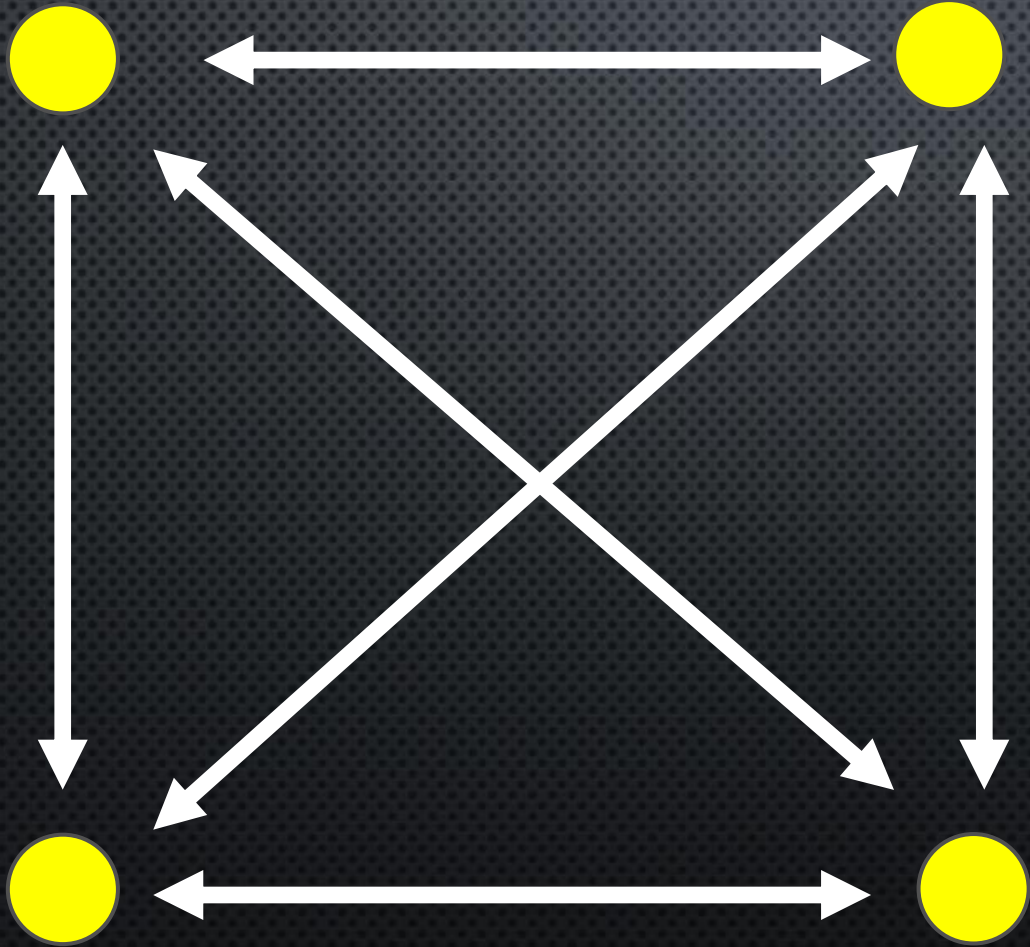- THE PERFECT MESH NETWORK WOULD BE A FULL TOPOLOGY NETWORK.
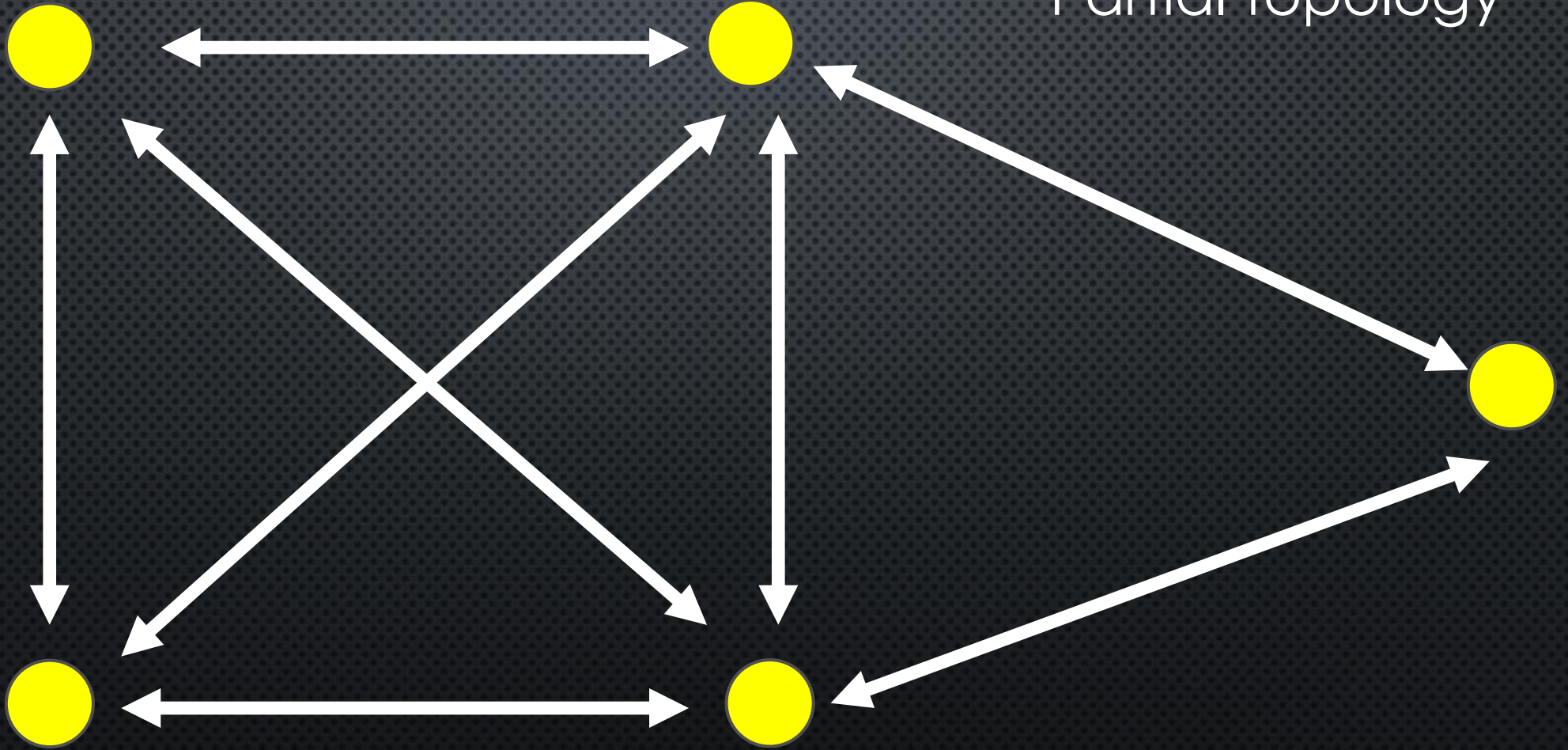
MESH EXAMPLE

Partial Topology
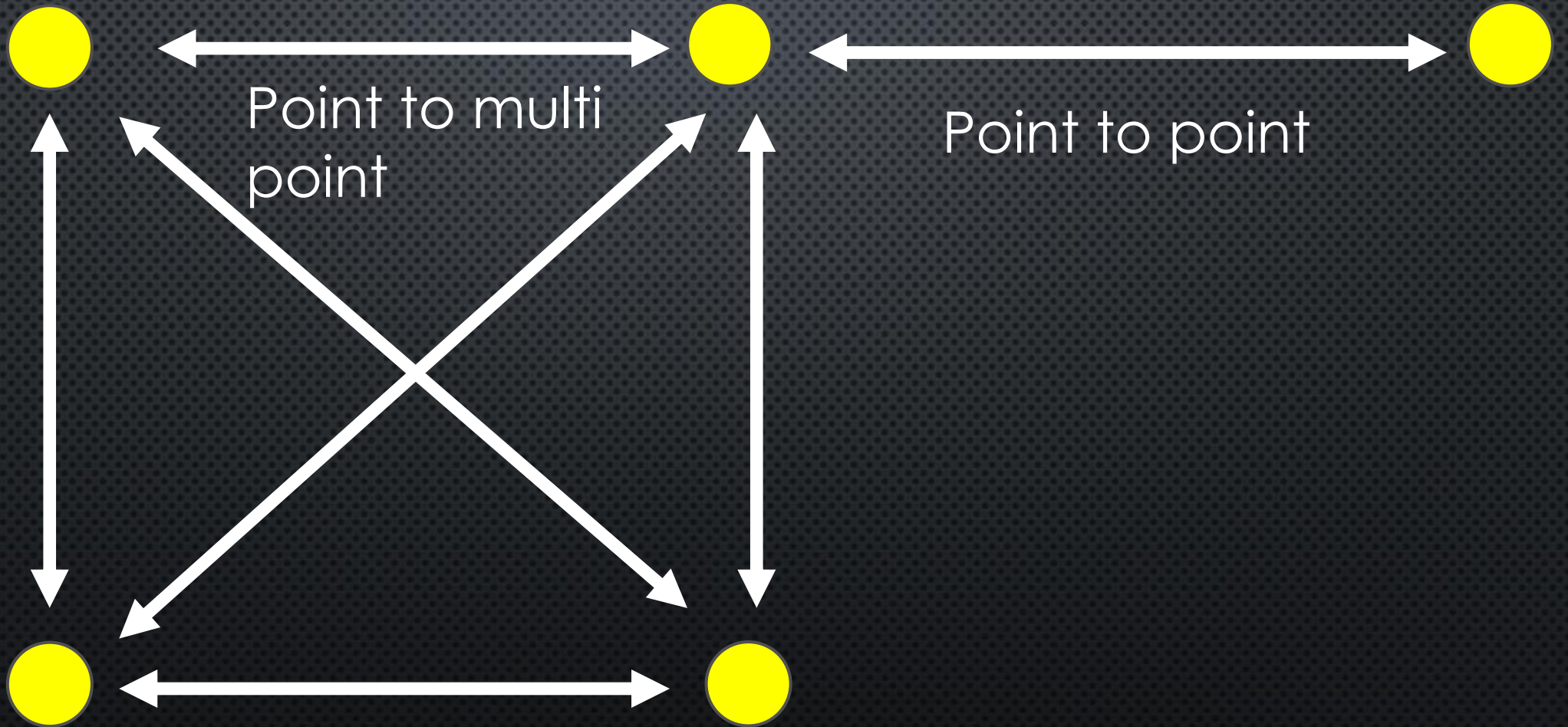
MESH EXAMPLE

Partial topology

MESH EXAMPLE

Point to multi point

Point to point
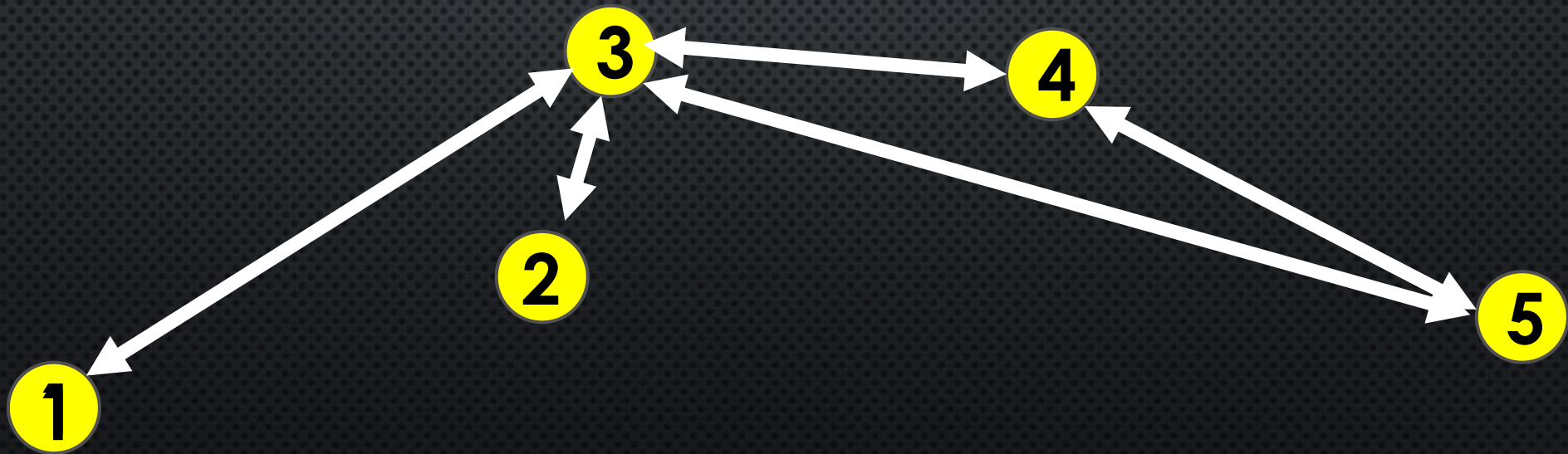
BEYOND THE INFRASTRUCTURE
WHAT CAN IT PROVIDE?

- E-mail function

- VOIP telephony

- ROIP comms

- Web cams

- IRC Chat

- File Server for storage & Sharing

ENHANCING THE NETWORK
HOW CAN IT BE ACHIEVED?

- Additional infrastructure in close proximity to each node

- Mobile nodes infilling incident locations

- Stand alone portable nodes

- Secured continuous funding

- Strategic site identification and use permissions

- Resilient power sources on all available nodes

BEYOND THE INFRASTRUCTURE
PERIPHERAL EQUIPMENT REQUIRED (FLESH ON THE BONES)

- COMPUTERS
- IP PHONES
- WEBCAMS
- SMARTPHONES
- PRINTERS
- IP RADIOS
- NETWORK SWITCHES
- STANDARD ROUTERS OR IDEALLY DEDICATED ACCESS POINTS

BENEFITS OF MESH

- Independent of the global internet network
- Can be patched to the global internet network (not intended)
- Available off grid (with resilience provided)
- Private network (less likely to be a target of cyber crime)
- Can be deployed (Mobile) at a moments notice into an area (provided line of sight to a strategic node exists)
- Several mobile nodes can be deployed in an area to provide site specific needs without connecting into the mesh cymru network, for example:- across a rest centre providing database access to record attendees or "in the field" to record event participants

EXAMPLES OF NETWORK INSTALLATION

LAMBY WAY NODES

Mobile Node testing @ St Hilary Police Site

OTHER EXAMPLES

Lamby Way Tower

Barry Rugby Club (MW0RUH)

MORE EXAMPLES

City Hall Omni & Panel

Small Equipment Box