PAWS: Use Cases

I-D: draft-ietf-paws-problem-stmt-usecases-rqmts

Basavaraj Patil, Scott Probasco (Nokia)

Juan Carlos Zuniga (Interdigital)

IETF 82

Updates from Rev 00 to 01

- Added the Mobility, Indoor networking and machine-2-machine use cases
- Deleted the location based service use case

Database Discovery

- Available channels or spectrum can be used by a device only after it has queried a database and obtained a response
- Device needs to discover the relevant database to query
- Databases are region/country/regulatory domain specific and hence the device needs to discover the relevant database based on its current location
- The database discovery itself can be done via various approaches
  - Examples include:
    - Pre-programmed/configured list of databases on the device
    - Query a well-known website operated by the regulator
    - Etc.

Database Discovery

- Steps to discovering a database:

1. Master device is connected to the Internet via means other than WS radio
2. Device constructs and broadcasts/multicasts a database discovery message
3. Receives response(s) from available databases or a list of databases from a website

- Device can choose a database from the responses for subsequent queries

Registration with the DB (1)

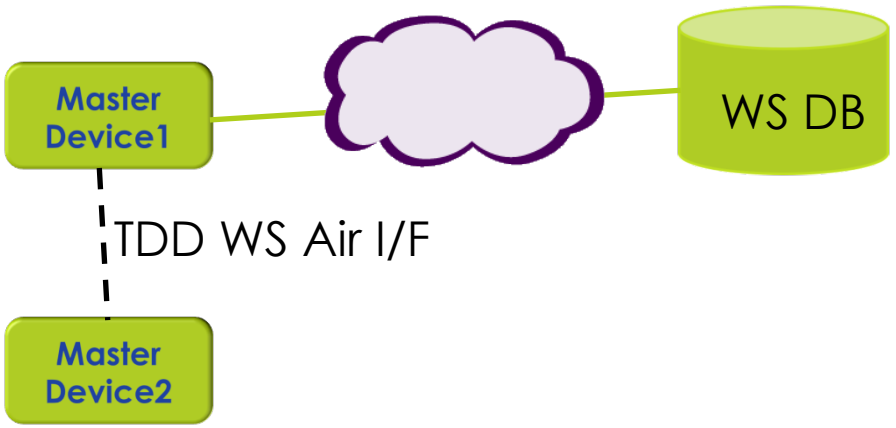
- After discovering a trusted database, the device needs to register with it prior to querying it for channel availability info
- Requirements for registration can be regulatory domain specific
- Various conditions require the device to perform registrations. Examples are:
  - Power up
  - Change of location by a certain distance
  - Periodically based on a time interval
- Registration information includes Device ID, Serial number etc.

Registration with the DB (2)

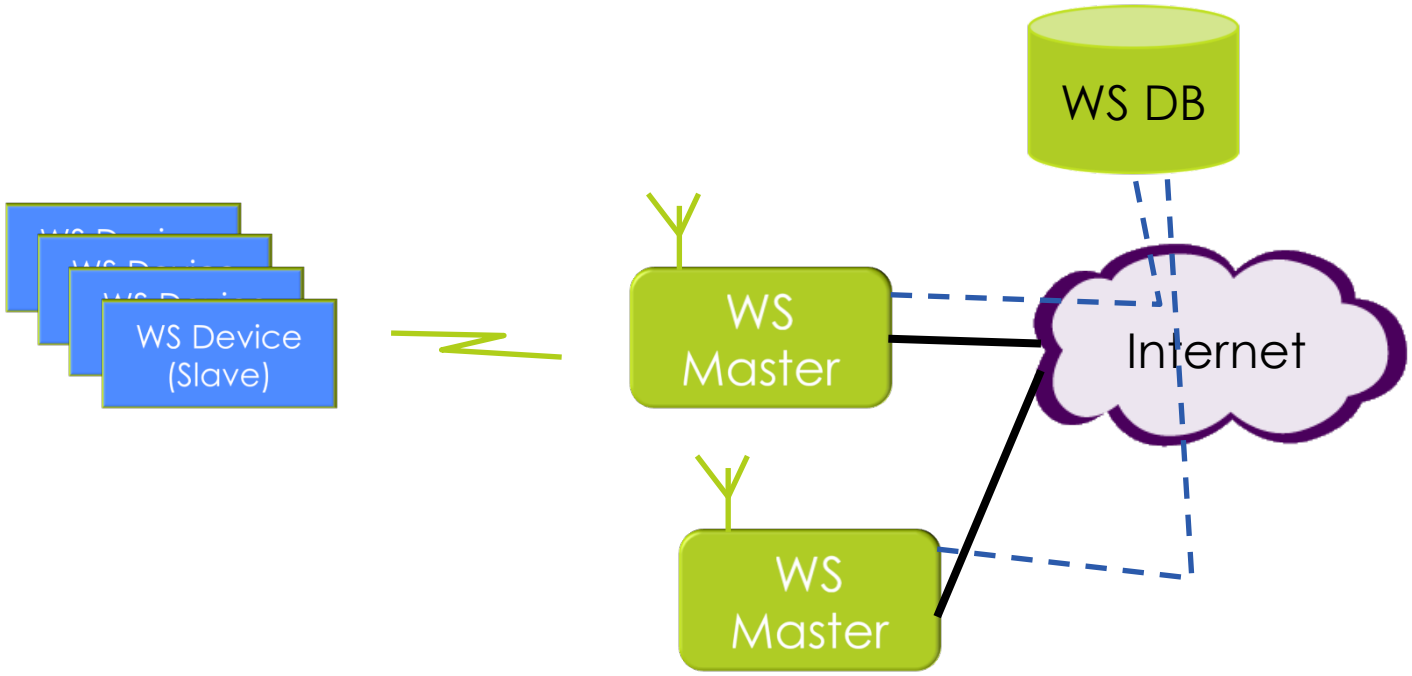
- Device has non-WS based connectivity to the Internet through which it can register with the selected database

Registration with the DB (3)

- A secondary Master device with no direct connectivity to the WS DB can query the DB using another Master as a relay



Hotspot: Urban Internet connectivity



Master/AP devices use a TDD radio technology and transmit at or below a relatively low transmit power threshold.

Hotspot: Urban Internet connectivity

- Operation

1. The master/AP powers up (WS Radio in idle mode)
2. Master/AP discovers a database and registers with it
3. Master/AP queries the database requesting a list of available channels at its current location
4. Database responds with a list of available channels
5. Master/AP selects a channel(s) and activates the WS radio interface
6. Slave devices scans the WS bands and detects the Master/AP and attaches to it
7. Slave devices have Internet connectivity over WS radio channels

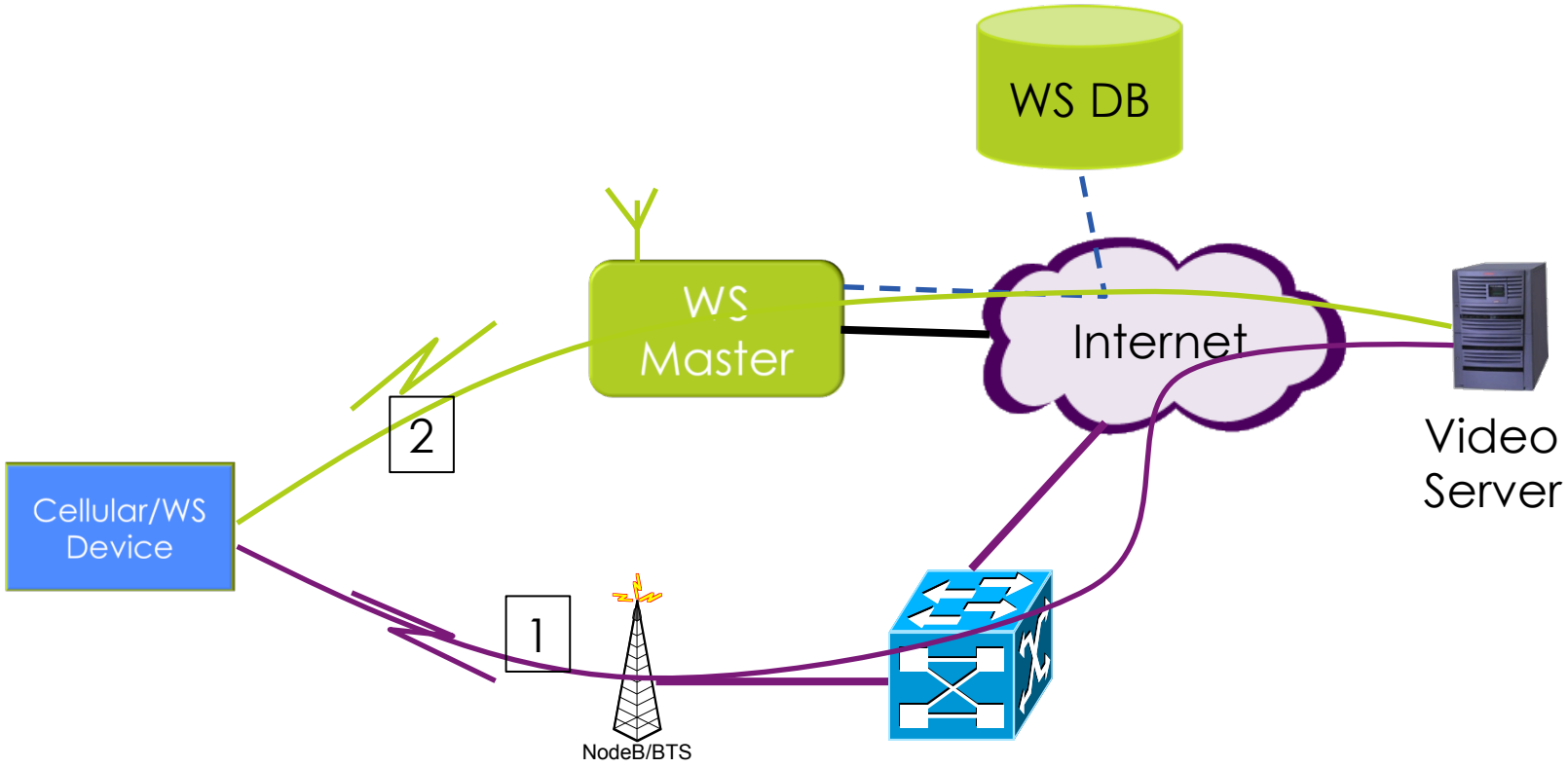
Rural internet broadband access

- Internet access is provided as a WAN or Wireless Regional Area Network (WRAN)
- Typically characterized by one or more fixed master(s)/BS (s), cells with relatively large radius (tens of kms, up to 100 km), and a number of available radio channels
- The BS in this scenario use a TDD radio technology and transmit at or below a transmit power limit established by the local regulator
- Each base station has a connection to the internet and provides internet connectivity to multiple slave/end-user devices which can be fixed or mobile

Offloading: Moving traffic to a WS network

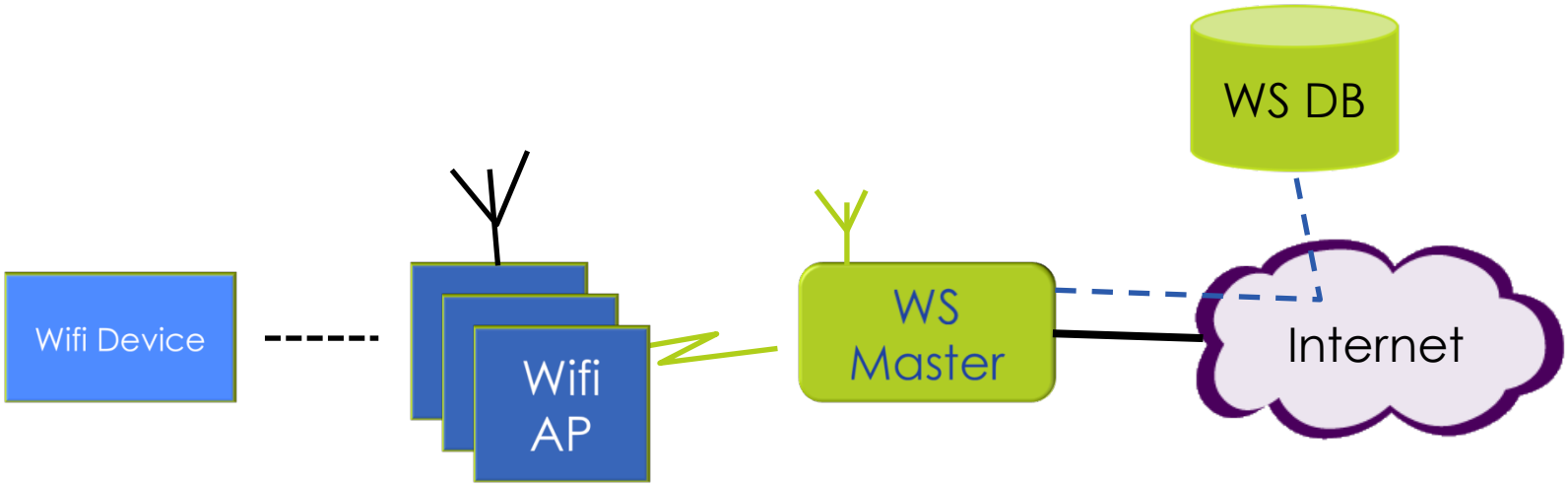
- Mobile devices using 3G/4G Cellular networks for data can offload the session to a WS network if a network is available
- A device attached to a 3G/4G cellular network has an ongoing video streaming session
- Policy on the device is configured to use an alternate access network such as WS when one is available for use

Offloading


WS DB
WS
Master
Internet
Video
Server
2
Cellular/WS
Device
1
NodeB/BTS

Backhaul

- WS spectrum can be used as a backhaul and thus enable various types of network deployments (mesh, Muni wifi etc.)



Rapid deployed network for emergency scenario

- In the event of an emergency spectrum can be made available for the establishment of a rapid response network

- WS Master devices can be deployed or existing ones use the freed spectrum in such scenarios

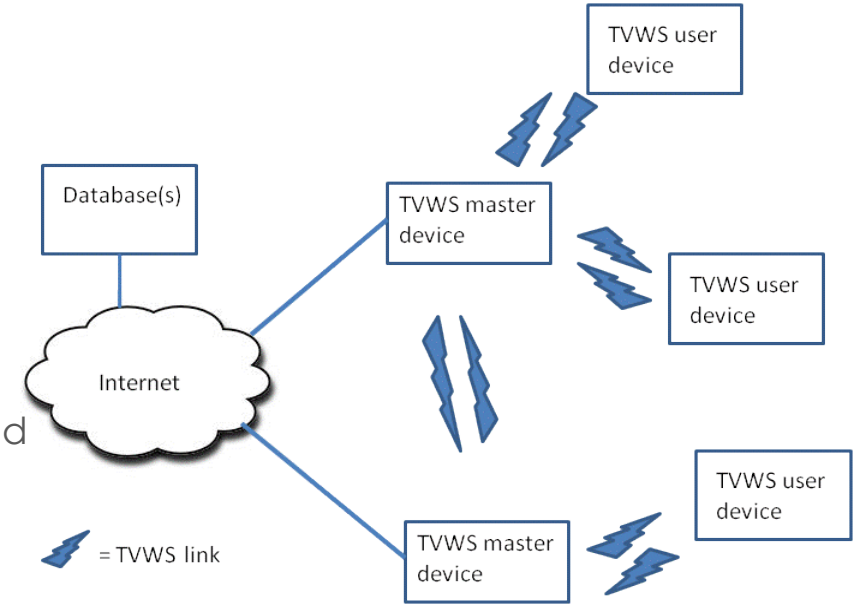
Mobility in white space

- Operation

1. The master/AP powers up (WS Radio in idle mode)
2. Master/AP discovers a database and registers with it
3. Master/AP queries the database requesting a list of channels that are available at its current location and also a future location.
4. Database responds with a list of available channels that are available at all locations identified in the request.
5. Master/AP selects a channel(s) and activates the WS radio interface
6. Master/AP may use channels from the list while moving within the predicted area without requirement to query the database due to mobility (i.e. moving more than 100 m). Time based restrictions are still applicable

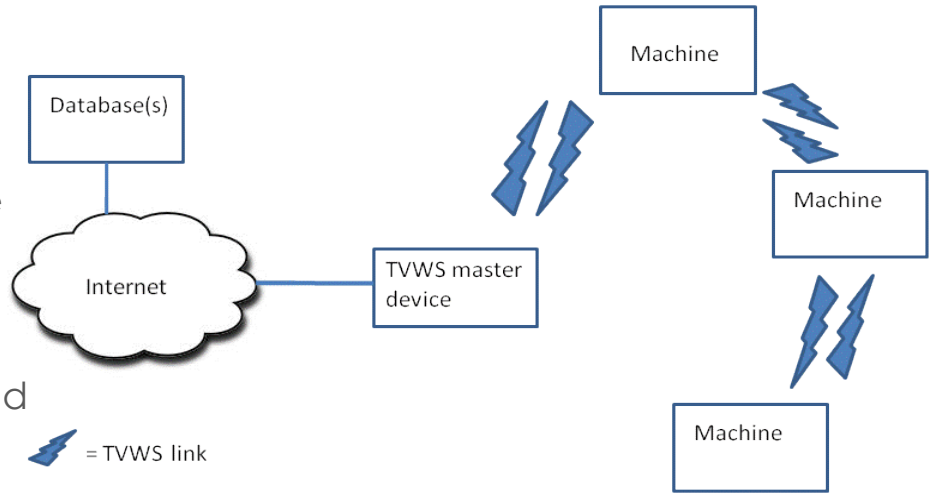
Indoor networking use case

- User devices are inside a house or office, requiring connectivity to the Internet or to equipment in the same or other houses/ offices
- Database query from the master device includes geolocation and location uncertainty and optional additional information such as device ID
- Response is list of channels available, and optional additional information such as channel validity time and maximum radiated power
- The master authenticates the response and selects one or more channels from the list
- The user device scans the TVWS bands to locate the master device transmissions, and associates with the master



Machine to machine (M2M) use case

- Machines include a whitespace device and can be located anywhere, fixed or on the move. Each machine needs connectivity to the internet and/or to other machines in the vicinity
- Database query from the master device includes geolocation and location uncertainty and optional additional information such as device ID
- Response is list of channels available, and optional additional information such as channel validity time and maximum radiated power
- The master authenticates the response and selects one or more channels from the list
- The slave devices fitted to the machines scan the TV bands to locate the master transmissions, and associate with the master device.



- Note: Further signalling can take place (outside the scope of PAWS) to establish direct links among those slave devices that have associated with the master device. Machine communication over a TVWS channel, whether to a master device or to another machine (slave device), is under the control of a master device

Next Steps

- Request further reviews and comments
- Would like to progress the I-D to WGLC before IETF83