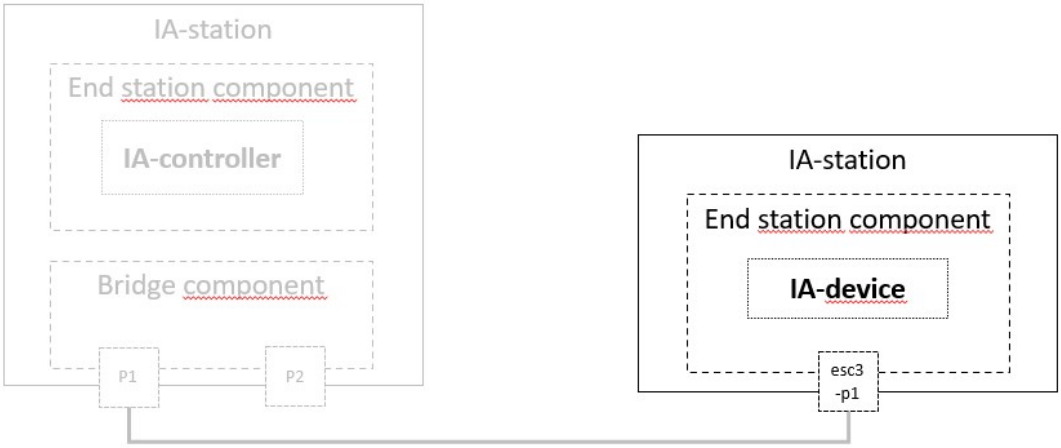
Time Sync Configuration for IEC/IEEE 60802

Martin Mittelberger (Siemens AG)
01/2023
v01

1 Overall structure

This contribution describes the time sync configuration for a 60802 IA end station which is an IA-device connected to an IA-controller.



2 IA-device properties

- Simple end station with one port
- MAC-Address: aa-bb-cc-dd-ee-ff
- IP-Address: 192.168.0.1
- One external interface: esc3-p1

3 YANG Instance File (based on current drafts)

The YANG instance file contains all leaves which are proposed to be mandatory in 60802.

Since there is no released YANG model for time sync now, it is based on ieee1588-ptp (revision 2022-08-30) and ieee802-dot1as-ptp (revision 2022-09-16).

Note: The basis of the instance files is JSON. Despite JSON doesn't allow comments, C-style comments are inserted here for clarification.

3.1 Configuration elements

```
{
  "ieee1588-ptp:ptp": {
    "instances": {
      "instance": [
        {
          "instance-index": 0,         // working clock
          "default-ds": {
            "domain-number": 32,       // working clock
            "slave-only": true,
            "sdo-id": 256,             // gPTP
            "instance-enable": true,
            "external-port-config-enable": true,
            "instance-type": "oc"
          },
          "description-ds": {
            "user-description": "60802-Working-Clock"
          },
          "ports": {
            "port": [
              {
                "port-index": 0,
                "underlying-interface": "esc3-p1",
                "port-ds": {
                  "delay-mechanism": "common-p2p",
                  "port-enable": true,
                  "ieee802-dot1as-ptp:sync-receipt-timeout": 3,
                  "ieee802-dot1as-ptp:use-mgt-one-step-tx-oper": true,
                  "ieee802-dot1as-ptp:mgt-one-step-tx-oper": 0
                },
                "external-port-config-port-ds": {
                  "desired-state": "slave"
                }
              }
            ]
          }
        },
        {
          "instance-index": 1,         // global time
          "default-ds": {
            "domain-number": 2,        // global time
            "slave-only": true,
            "sdo-id": 256,             // gPTP
            "instance-enable": true,
            "external-port-config-enable": true,
            "instance-type": "oc"
          },
          "description-ds": {
            "user-description": "60802-Global-Time"
          },
          "ports": {
            "port": [
              {
                "port-index": 0,
                "underlying-interface": "esc3-p1",
                "port-ds": {
                  "delay-mechanism": "common-p2p",
                  "port-enable": true,
                  "ieee802-dot1as-ptp:sync-receipt-timeout": 3,
                  "ieee802-dot1as-ptp:use-mgt-one-step-tx-oper": true,
                  "ieee802-dot1as-ptp:mgt-one-step-tx-oper": 0
```

```
                },
                "external-port-config-port-ds": {
                  "desired-state": "slave"
                }
              }
            ]
          }
        }
      ]
    },
    "common-services": {
      "cmlds": {
        "ports": {
          "port": [
            {
              "port-index": 0,
              "underlying-interface": "esc3-p1",
              "link-port-ds": {
                "log-min-pdelay-req-interval": -3,    // 125 ms
                "version-number": 2,
                "minor-version-number": 1,
                "delay-asymmetry": "0",
                "ieee802-dot1as-ptp:mean-link-delay-thresh": "52428800",
                                                          // 800*2^16 (800 ns for 100m cable)
                "ieee802-dot1as-ptp:use-mgt-log-pdelay-req-interval": true,
                "ieee802-dot1as-ptp:mgt-log-pdelay-req-interval": -3,
                "ieee802-dot1as-ptp:use-mgt-compute-rate-ratio": true,
                "ieee802-dot1as-ptp:mgt-compute-rate-ratio": 1,
                "ieee802-dot1as-ptp:use-mgt-compute-mean-link-delay": true,
                "ieee802-dot1as-ptp:mgt-compute-mean-link-delay": 1,
                "ieee802-dot1as-ptp:allowed-lost-responses": 3,
                "ieee802-dot1as-ptp:allowed-faults": 3
              }
            }
          ]
        }
      }
    }
  }
}
```


3.2 Configuration and status elements

This is the complete instance file including config true and status data.

Status data is marked blue


```
{
  "ieee1588-ptp:ptp": {
    "instances": {
      "instance": [
        {
          "instance-index": 0,
          "default-ds": {
            "clock-identity": "AA-BB-CC-DD-EE-FF-00-01",      // clock receiver
            "number-ports": 1,
            "domain-number": 32,
            "slave-only": true,
            "sdo-id": 256,
            "instance-enable": true,
            "external-port-config-enable": true,
            "instance-type": "oc",
            "ieee802-dot1as-ptp:gm-capable": false,
            "ieee802-dot1as-ptp:current-utc-offset-valid": false,
            "ieee802-dot1as-ptp:ptp-timescale": false
          },
          "description-ds": {
            "user-description": "60802-Working-Clock"
          },
          "ports": {
            "port": [
              {
                "port-index": 0,
                "underlying-interface": "esc3-p1",
```

```
            "port-ds": {
              "port-state": "slave",
              "delay-mechanism": "common-p2p",
              "port-enable": true,
              "ieee802-dot1as-ptp:sync-receipt-timeout": 3,
              "ieee802-dot1as-ptp:current-one-step-tx-oper": 0,
              "ieee802-dot1as-ptp:use-mgt-one-step-tx-oper": true,
              "ieee802-dot1as-ptp:mgt-one-step-tx-oper": 0,
              "ieee802-dot1as-ptp:sync-locked": true
            },
            "external-port-config-port-ds": {
              "desired-state": "slave"
            }
          }
        ]
      }
    },
    {
      "instance-index": 1,
      "default-ds": {
        "clock-identity": "AA-BB-CC-DD-EE-FF-00-03",      // clock receiver
        "number-ports": 1,
        "domain-number": 2,
        "slave-only": true,
        "sdo-id": 256,
        "instance-enable": true,
        "external-port-config-enable": true,
        "instance-type": "oc",
        "ieee802-dot1as-ptp:gm-capable": false,
        "ieee802-dot1as-ptp:current-utc-offset-valid": false,
        "ieee802-dot1as-ptp:ptp-timescale": false
      },
      "description-ds": {
        "user-description": "60802-Global-Time"
      },
      "ports": {
        "port": [
          {
            "port-index": 0,
            "underlying-interface": "esc3-p1",
            "port-ds": {
              "port-state": "slave",
              "delay-mechanism": "common-p2p",
              "port-enable": true,
              "ieee802-dot1as-ptp:sync-receipt-timeout": 3,
              "ieee802-dot1as-ptp:current-one-step-tx-oper": 0,
              "ieee802-dot1as-ptp:use-mgt-one-step-tx-oper": true,
              "ieee802-dot1as-ptp:mgt-one-step-tx-oper": 0,
              "ieee802-dot1as-ptp:sync-locked": true
            },
            "external-port-config-port-ds": {
              "desired-state": "slave"
            }
          }
        ]
      }
    }
  ]
},
"common-services": {
  "cmlds": {
    "default-ds": {
      "clock-identity": "AA-BB-CC-DD-EE-FF-00-02",        // local clock
      "number-link-ports": 1
    },
    "ports": {
      "port": [
        {
          "port-index": 0,
          "underlying-interface": "esc3-p1",
          "link-port-ds": {
            "port-identity": {
              "clock-identity": "AA-BB-CC-DD-EE-FF-00-02",
              "port-number": 1
            },
            "domain-number": 32,
            "service-measurement-valid": true,
```

```
                "mean-link-delay": "42",
                "scaled-neighbor-rate-ratio": 0,
                "log-min-pdelay-req-interval": -3,
                "version-number": 2,
                "minor-version-number": 1,
                "delay-asymmetry": "0",
                "ieee802-dot1as-ptp:cmlds-link-port-enabled": true,
                "ieee802-dot1as-ptp:is-measuring-delay": true,
                "ieee802-dot1as-ptp:as-capable-across-domains": true,
                "ieee802-dot1as-ptp:mean-link-delay-thresh": "52428800",
                "ieee802-dot1as-ptp:current-log-pdelay-req-interval": -3,
                "ieee802-dot1as-ptp:use-mgt-log-pdelay-req-interval": true,
                "ieee802-dot1as-ptp:mgt-log-pdelay-req-interval": -3,
                "ieee802-dot1as-ptp:current-compute-rate-ratio": 1,
                "ieee802-dot1as-ptp:use-mgt-compute-rate-ratio": true,
                "ieee802-dot1as-ptp:mgt-compute-rate-ratio": 1,
                "ieee802-dot1as-ptp:current-compute-mean-link-delay": 1,
                "ieee802-dot1as-ptp:use-mgt-compute-mean-link-delay": true,
                "ieee802-dot1as-ptp:mgt-compute-mean-link-delay": 1,
                "ieee802-dot1as-ptp:allowed-lost-responses": 3,
                "ieee802-dot1as-ptp:allowed-faults": 3
              }
            }
          ]
        }
      }
    }
  }
}
```


4 Instance files with additional elements required for 60802

4.1 Configuration elements


```
{
  "ieee1588-ptp:ptp": {
    "instances": {
      "instance": [
        {
          "instance-index": 0,
          "default-ds": {
            "domain-number": 32,
            "slave-only": true,
            "sdo-id": 256,
            "instance-enable": true,
            "external-port-config-enable": true,
            "instance-type": "oc",
            "ptp-timescale-admin": false
          },
          "description-ds": {
            "user-description": "60802-Working-Clock"
          },
          "ports": {
            "port": [
              {
                "port-index": 0,
                "underlying-interface": "esc3-p1",
                "port-ds": {
                  "delay-mechanism": "common-p2p",
                  "port-enable": true,
                  "ieee802-dot1as-ptp:sync-receipt-timeout": 3,
                  "ieee802-dot1as-ptp:use-mgt-one-step-tx-oper": true,
                  "ieee802-dot1as-ptp:mgt-one-step-tx-oper": 0
                },
                "external-port-config-port-ds": {
                  "desired-state": "slave"
                }
              }
            ]
          }
        },
        {
```

```
          "instance-index": 1,
          "default-ds": {
            "domain-number": 2,
            "slave-only": true,
            "sdo-id": 256,
            "instance-enable": true,
            "external-port-config-enable": true,
            "instance-type": "oc",
            "ptp-timescale-admin": false
          },
          "description-ds": {
            "user-description": "60802-Global-Time"
          },
          "ports": {
            "port": [
              {
                "port-index": 0,
                "underlying-interface": "esc3-p1",
                "port-ds": {
                  "delay-mechanism": "common-p2p",
                  "port-enable": true,
                  "ieee802-dot1as-ptp:sync-receipt-timeout": 3,
                  "ieee802-dot1as-ptp:use-mgt-one-step-tx-oper": true,
                  "ieee802-dot1as-ptp:mgt-one-step-tx-oper": 0
                },
                "external-port-config-port-ds": {
                  "desired-state": "slave"
                }
              }
            ]
          }
        }
      ]
    },
    "common-services": {
      "cmlds": {
        "ports": {
          "port": [
            {
              "port-index": 0,
              "underlying-interface": "esc3-p1",
              "link-port-ds": {
                "log-min-pdelay-req-interval": -3,
                "version-number": 2,
                "minor-version-number": 1,
                "delay-asymmetry": "0",
                "ieee802-dot1as-ptp:mean-link-delay-thresh": "52428800",
                "ieee802-dot1as-ptp:use-mgt-log-pdelay-req-interval": true,
                "ieee802-dot1as-ptp:mgt-log-pdelay-req-interval": -3,
                "ieee802-dot1as-ptp:use-mgt-compute-rate-ratio": true,
                "ieee802-dot1as-ptp:mgt-compute-rate-ratio": 1,
                "ieee802-dot1as-ptp:use-mgt-compute-mean-link-delay": true,
                "ieee802-dot1as-ptp:mgt-compute-mean-link-delay": 1,
                "ieee802-dot1as-ptp:allowed-lost-responses": 3,
                "ieee802-dot1as-ptp:allowed-faults": 3
              }
            }
          ]
        }
      }
    }
  }
}
```


4.2 Configuration and status elements


```
{
  "ieee1588-ptp:ptp": {
    "max-ptp-instances": 2,
    "max-hot-standby-systems": 1,
    "gm-capable": {
      "ptp": false,
      "arb": false
    }
    "instances": {
```

```
"instance": [
  {
    "instance-index": 0,
    "default-ds": {
      "clock-identity": "AA-BB-CC-DD-EE-FF-00-01",
      "number-ports": 1,
      "domain-number": 32,
      "slave-only": true,
      "sdo-id": 256,
      "instance-enable": true,
      "external-port-config-enable": true,
      "instance-type": "oc",
      "ieee802-dot1as-ptp:gm-capable": false,
      "ieee802-dot1as-ptp:current-utc-offset-valid": false,
      "ieee802-dot1as-ptp:ptp-timescale": false
      "ptp-timescale-admin": false,
      "application-clock": {
        "clock-source-identity": "AA-BB-CC-DD-EE-FF-00-02",    // if instance is gm
        "clock-source-identity": "AA-BB-CC-DD-EE-FF-00-03",    // if instance is not gm
        "clock-state": "in-sync",
      }
    },
    "description-ds": {
      "user-description": "60802-Working-Clock"
    },
    "ports": {
      "port": [
        {
          "port-index": 0,
          "underlying-interface": "esc3-p1",
          "port-ds": {
            "port-state": "slave",
            "delay-mechanism": "common-p2p",
            "port-enable": true,
            "ieee802-dot1as-ptp:sync-receipt-timeout": 3,
            "ieee802-dot1as-ptp:current-one-step-tx-oper": 0,
            "ieee802-dot1as-ptp:use-mgt-one-step-tx-oper": true,
            "ieee802-dot1as-ptp:mgt-one-step-tx-oper": 0,
            "ieee802-dot1as-ptp:sync-locked": true
          },
          "external-port-config-port-ds": {
            "desired-state": "slave"
          }
        }
      ]
    }
  },
  {
    "instance-index": 1,
    "default-ds": {
      "clock-identity": "AA-BB-CC-DD-EE-FF-00-03",
      "number-ports": 1,
      "domain-number": 2,
      "slave-only": true,
      "sdo-id": 256,
      "instance-enable": true,
      "external-port-config-enable": true,
      "instance-type": "oc",
      "ieee802-dot1as-ptp:gm-capable": false,
      "ieee802-dot1as-ptp:current-utc-offset-valid": false,
      "ieee802-dot1as-ptp:ptp-timescale": false
      "ptp-timescale-admin": false,
      "application-clock": {
        "clock-source-identity": "AA-BB-CC-DD-EE-FF-00-02",    // if instance is gm
        "clock-source-identity": "AA-BB-CC-DD-EE-FF-00-03",    // if instance is not gm
        "clock-state": "in-sync",
      }
    },
    "description-ds": {
      "user-description": "60802-Global-Time"
    },
    "ports": {
      "port": [
        {
          "port-index": 0,
          "underlying-interface": "esc3-p1",
          "port-ds": {
```

```
                "port-state": "slave",
                "delay-mechanism": "common-p2p",
                "port-enable": true,
                "ieee802-dot1as-ptp:sync-receipt-timeout": 3,
                "ieee802-dot1as-ptp:current-one-step-tx-oper": 0,
                "ieee802-dot1as-ptp:use-mgt-one-step-tx-oper": true,
                "ieee802-dot1as-ptp:mgt-one-step-tx-oper": 0,
                "ieee802-dot1as-ptp:sync-locked": true
              },
              "external-port-config-port-ds": {
                "desired-state": "slave"
              }
            }
          ]
        }
      }
    ]
  },
  "common-services": {
    "cmlds": {
      "default-ds": {
        "clock-identity": "AA-BB-CC-DD-EE-FF-00-02",
        "number-link-ports": 1
      },
      "ports": {
        "port": [
          {
            "port-index": 0,
            "underlying-interface": "esc3-p1",
            "link-port-ds": {
              "port-identity": {
                "clock-identity": "AA-BB-CC-DD-EE-FF-00-02",
                "port-number": 1
              },
              "domain-number": 32,
              "service-measurement-valid": true,
              "mean-link-delay": "42",
              "scaled-neighbor-rate-ratio": 0,
              "log-min-pdelay-req-interval": -3,
              "version-number": 2,
              "minor-version-number": 1,
              "delay-asymmetry": "0",
              "ieee802-dot1as-ptp:cmlds-link-port-enabled": true,
              "ieee802-dot1as-ptp:is-measuring-delay": true,
              "ieee802-dot1as-ptp:as-capable-across-domains": true,
              "ieee802-dot1as-ptp:mean-link-delay-thresh": "52428800",
              "ieee802-dot1as-ptp:current-log-pdelay-req-interval": -3,
              "ieee802-dot1as-ptp:use-mgt-log-pdelay-req-interval": true,
              "ieee802-dot1as-ptp:mgt-log-pdelay-req-interval": -3,
              "ieee802-dot1as-ptp:current-compute-rate-ratio": 1,
              "ieee802-dot1as-ptp:use-mgt-compute-rate-ratio": true,
              "ieee802-dot1as-ptp:mgt-compute-rate-ratio": 1,
              "ieee802-dot1as-ptp:current-compute-mean-link-delay": 1,
              "ieee802-dot1as-ptp:use-mgt-compute-mean-link-delay": true,
              "ieee802-dot1as-ptp:mgt-compute-mean-link-delay": 1,
              "ieee802-dot1as-ptp:allowed-lost-responses": 3,
              "ieee802-dot1as-ptp:allowed-faults": 3
            }
          }
        ]
      }
    }
  }
}
```


5 Questions

Is the selection of YANG elements correct?

Are the chosen values of this example correct?