

# *CzechLight & CzechLight Amplifiers*



*www.ces.net*



Josef Vojtěch

# CzechLight & CzechLight Amplifiers

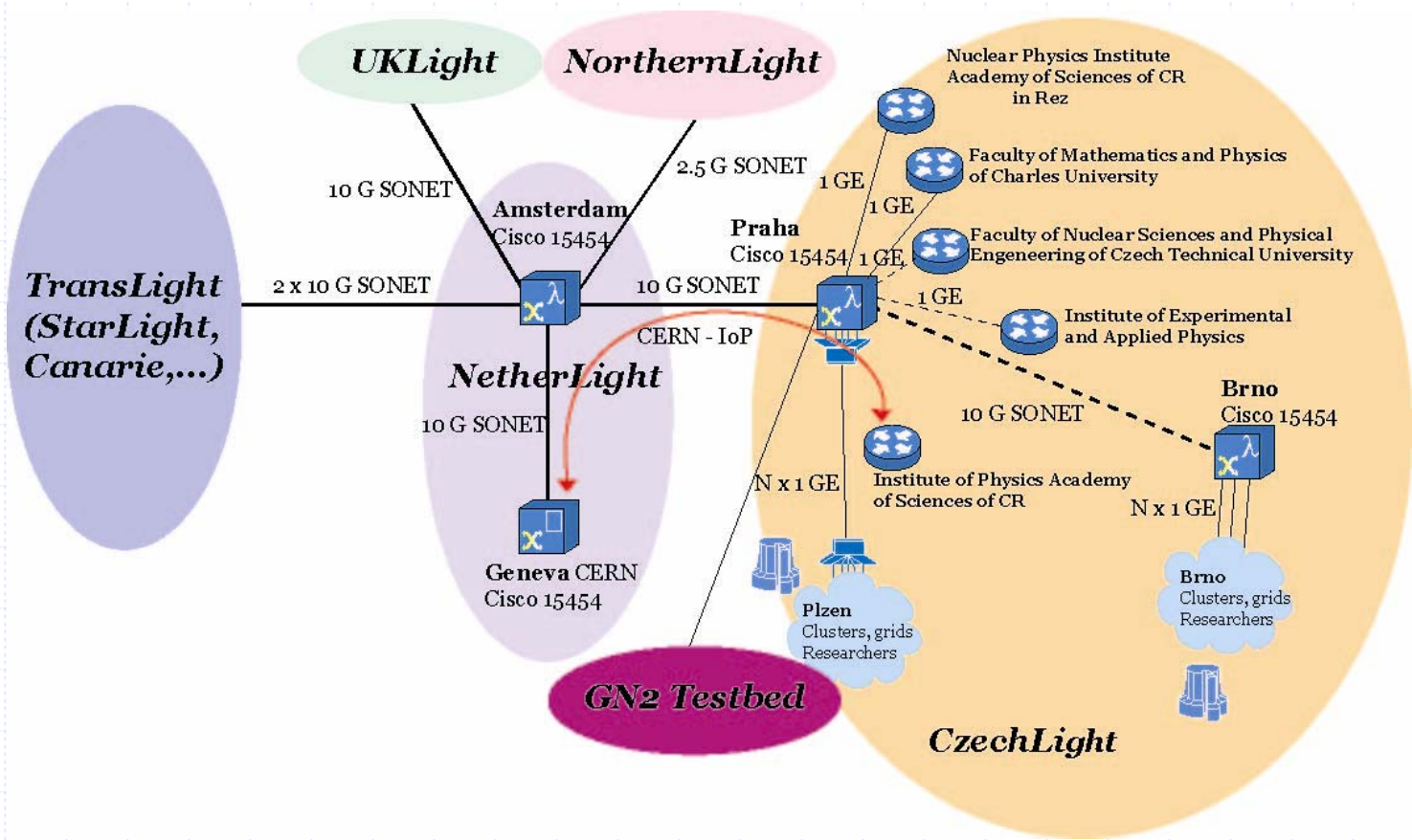
## *Outline*

- ◆ CzechLight network
- ◆ CzechLight Amplifiers
  - Deployment
  - Motivations
  - Description
- ◆ Acknowledgement, Q&A

# CzechLight & CzechLight Amplifiers

## CzechLight connections

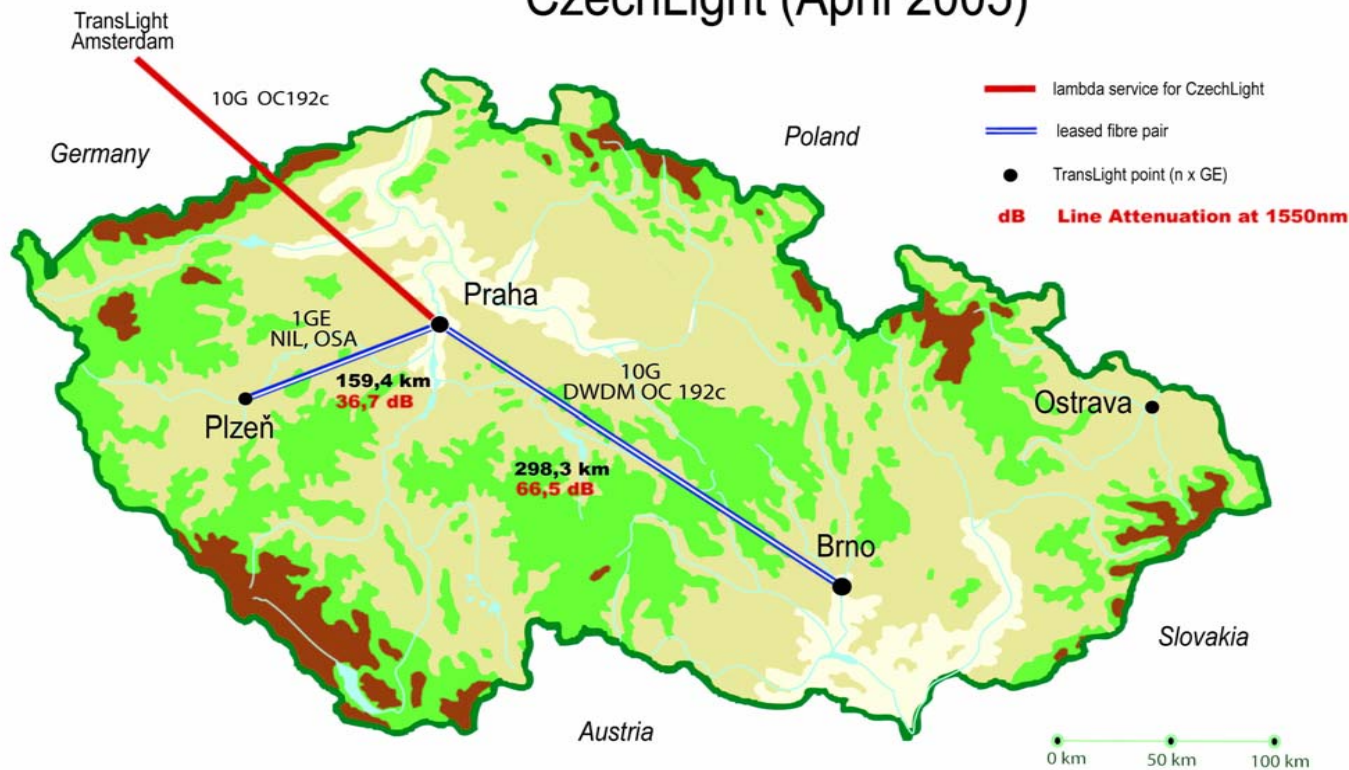
(to GLIF, to GN2 testbed and to cz premises)



# CzechLight & CzechLight Amplifiers

## CzechLight Map

CzechLight (April 2005)



## CzechLight & CzechLight Amplifiers

### *CzechLight Intercity Connections*

- ◆ Prague – Amsterdam lambda (GLIF facility), first mile in Prague on dark fibre, OC-192c transmission, grey 1550nm
- ◆ Prague – Plzeň, dark fibre, 159.4 km, 36.7 dB  
NIL, OSA w/ **CLA**, GE since May 2004
- ◆ Prague – Brno, dark fibre, 298.3 km, 66,5 dB, including 257.3 km of G.655 fibre  
NIL GE since May 2004  
DWDM OC-192c NIL test - unacceptable error rate  
1\*inline **CLA**, OC-192c since Mar 2005

## CzechLight & CzechLight Amplifiers

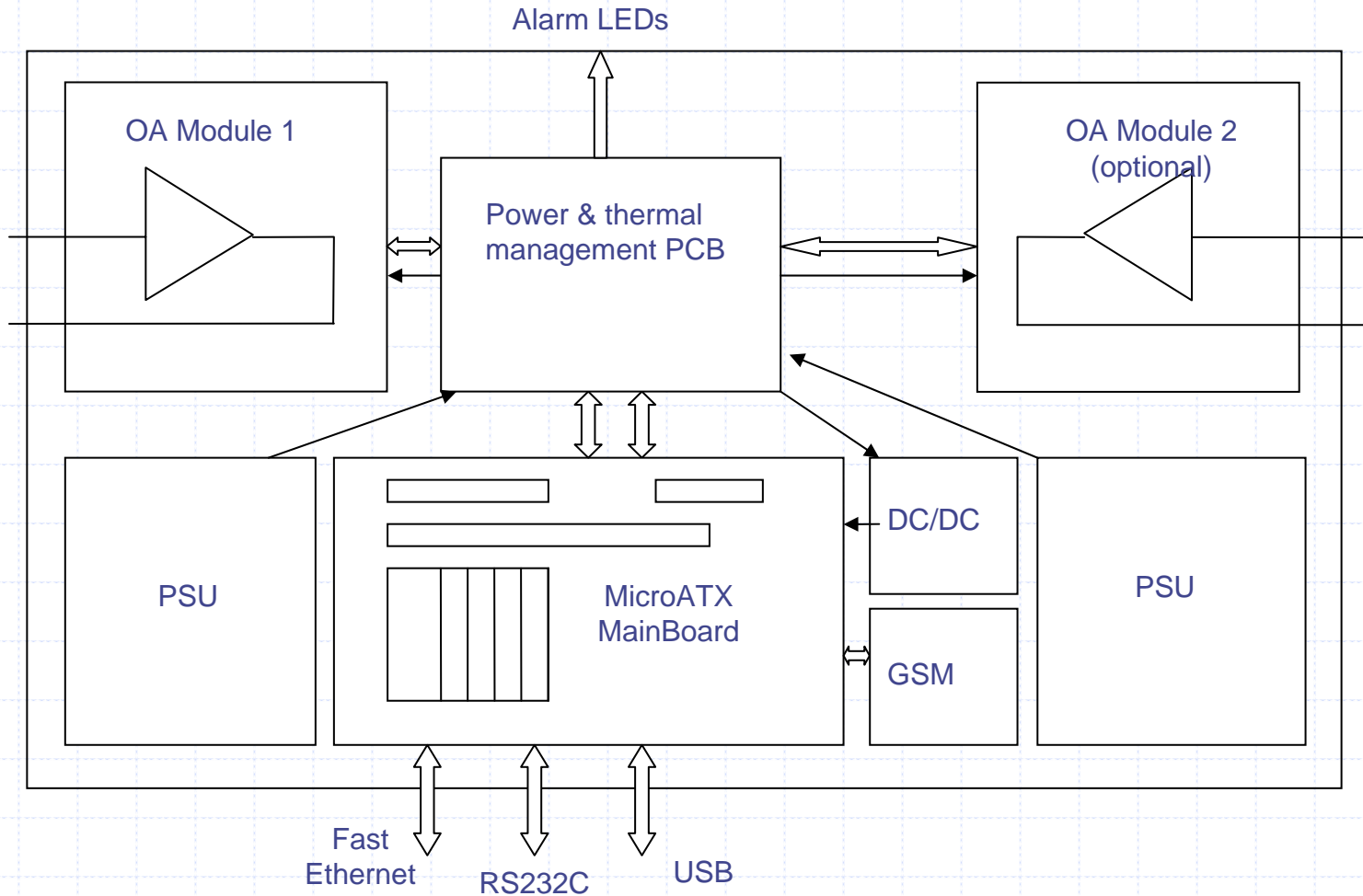
### ***CzechLight Amplifiers Deployment Cont.***

- ◆ Prague – Hradec Kralove (productional CESNET2 network)
  - 150.4 km of G.652, 35.7 dB@1550nm
  - NIL, OSA w/ CLA, GE
  - Experimental since Dec 2004, fully productional Mar 2005
- ◆ NIL laboratory G.652 fibre spools, 1550 nm, CLA
  - 225 km GE OSA
  - 300 km GE
  - 325 km GE (+Raman)

## ***Motivations - Why CzechLight Amplifiers?***

- ◆ Lack of optical equipment suitable for NRENs
- ◆ Commercial OA need customer modifications (very expensive)
- ◆ Optical kit composed from commercially available elements and modules
- ◆ Common and reliable elements + reliable design => cost effectivity & reliability & possibility of development

## CzechLight Amplifiers Architecture



# CzechLight & CzechLight Amplifiers

## *Used OA Modules*

- ◆ Customer based
- ◆ EDFA 2iv1 (suitable for OSA, inline with CD compensation)
  - preamplifier: in  $\langle -40, -30 \rangle$  dBm, gain 35 dB, out max + 5 dBm
  - booster: in  $\langle -5, 5 \rangle$  dBm, gain 19 dB, out max + 19 dBm
- ◆ EDFA inline
  - in  $\langle -40, -20 \rangle$  dBm, gain 35 dB, out max + 10 dBm
- ◆ EDFA hi-power booster
  - in  $\langle -10, 10 \rangle$  dBm, gain 27 dB, out max + 27 dBm

## CzechLight & CzechLight Amplifiers

### ***CLA Power & Health Management***

- ◆ Redundant PSU from industry leading vendor
  - Input voltage: 90-264V AC, 47-63 Hz
  - Over voltage, over temperature, short circuit protection
  - Telco -48V DC PSU in progress
  
- ◆ DC voltages, fan speeds, temperature are monitored

## CzechLight & CzechLight Amplifiers

### ***CLA Industrial PC***

- ◆ Standard micro ATX MB w/ low power & fanless CPU
- ◆ Runs on flash disc (no vibration sensitive rotational parts)
- ◆ Powered from DC/DC converter (in case of PC failure amplifiers stays on)
- ◆ Interfaces: RS232, FastEthernet, USB, I2C

# CzechLight & CzechLight Amplifiers

## *CLA Management*

- ◆ Based on Linux
- ◆ Possible interfaces
  - Wired: Console\*, LAN\*
  - Wireless: GSM\*, Wi-Fi, BlueTooth
- ◆ Tools
  - CLI via ssh\*, SNMP
  - Critical warnings are sent via e-mail\*, SNMP Trap
  - Net-SNMP package - for future development

\* Actually used

# CzechLight & CzechLight Amplifiers

## *CLA Screenshot*

```

195.113.169.27 - PuTTY
root@EDFA2v1:~# /usr/local/edfa/report.sh
Ampli 1 status:
Ampli 1 mode:      P
Ampli 1 powers:   PaIN= -35.06 BoIN= 1.34 PaOUT= 0.01 BoOUT= 10.98dBm
Ampli 1 temps:   Internal= 29.2 C Lasers= 30.0 25.0 C
Laser 1 currents:57.3 43.4 mA
PC param:        fan1_input= 5299
PC param:        fan2_input= 6818
PC param:        fan3_input= 6569
PC param:        fan4_input= 6633
PC param:        in0_input= 2005
PC param:        in1_input= 2084
PC param:        in2_input= 4557
PC param:        in3_input= 2005
PC param:        in4_input= 2110
PC param:        temp1_input= -128000
PC param:        temp2_input= 23000
PC param:        temp3_input= -128000
root@EDFA2v1:~#
    
```

CLA - complete status report

CLA – warning:  
fan 2 speed out of range

```

Zdroj zprávy
Return-Path: <EDFA2v1_Pha-HK@cesnet.cz>
Delivered-To: vojtech@office2.cesnet.cz
Received: from cesnet.cz (unknown [195.113.169.27])
        by office2.cesnet.cz (Postfix) with SMTP id 6D53840002
        for <vojtech@cesnet.cz>; Thu, 17 Mar 2005 07:10:01 +0100 (CET)
Subject: EDFA EDFA2v1_Pha-HK change
From: EDFA2v1_Pha-HK@cesnet.cz
To: vojtech@cesnet.cz
X-Mailer: @(#) mmailsend 1.5 http://www.muquit.com/
Message-Id: <20050317061001.6D53840002@office2.cesnet.cz>
Date: Thu, 17 Mar 2005 07:10:01 +0100 (CET)

PC fan2_input= 8047 not in 5000 8000
    
```

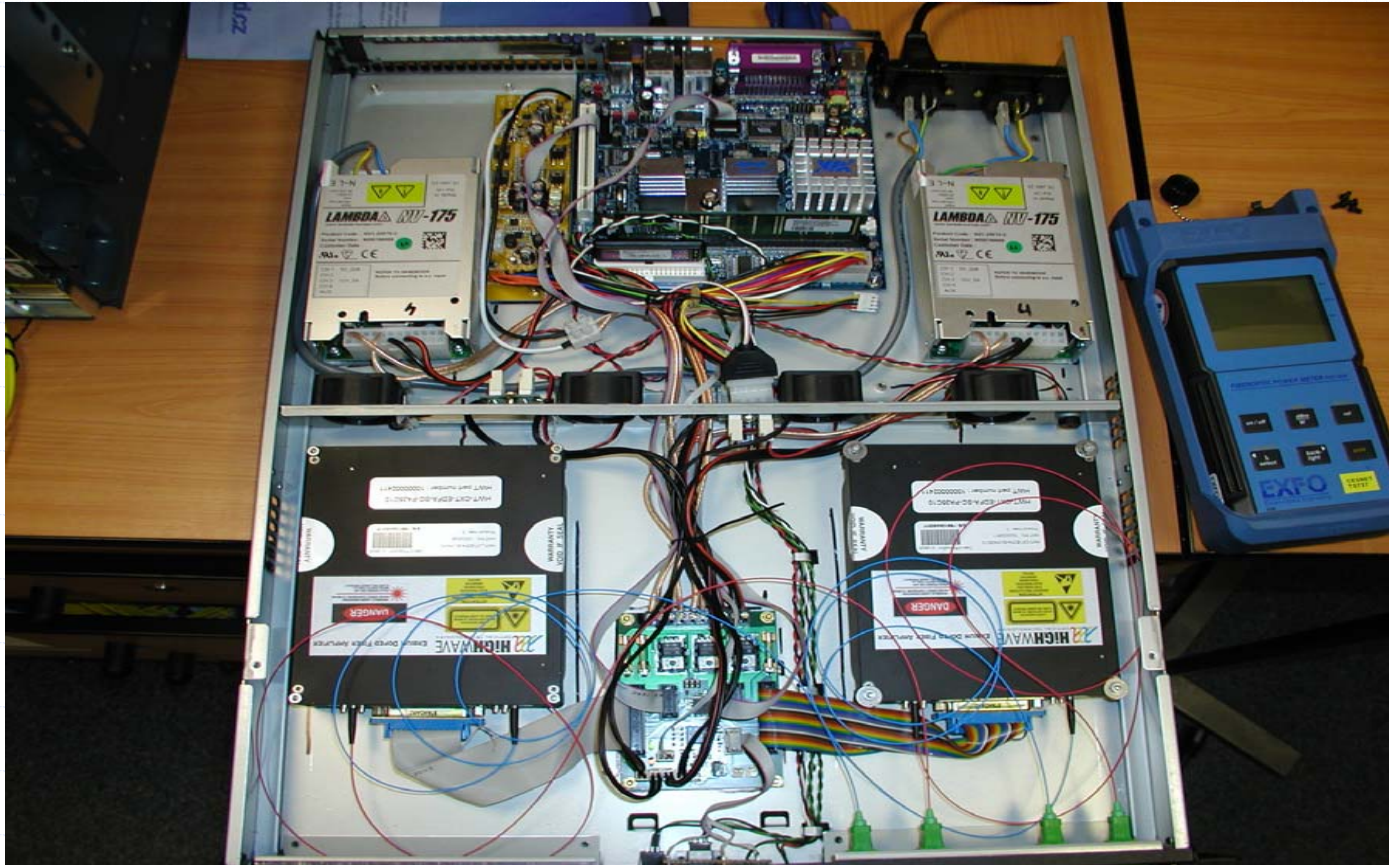
## CzechLight & CzechLight Amplifiers

### ***CLA Forthcoming***

- ◆ Semiconductor amplifiers (amplification & wavelength and RZ/NRZ conversion)
- ◆ Raman fibre amplifiers (ultra long spans)
- ◆ True broadband (100 nm) amplifiers for MAN

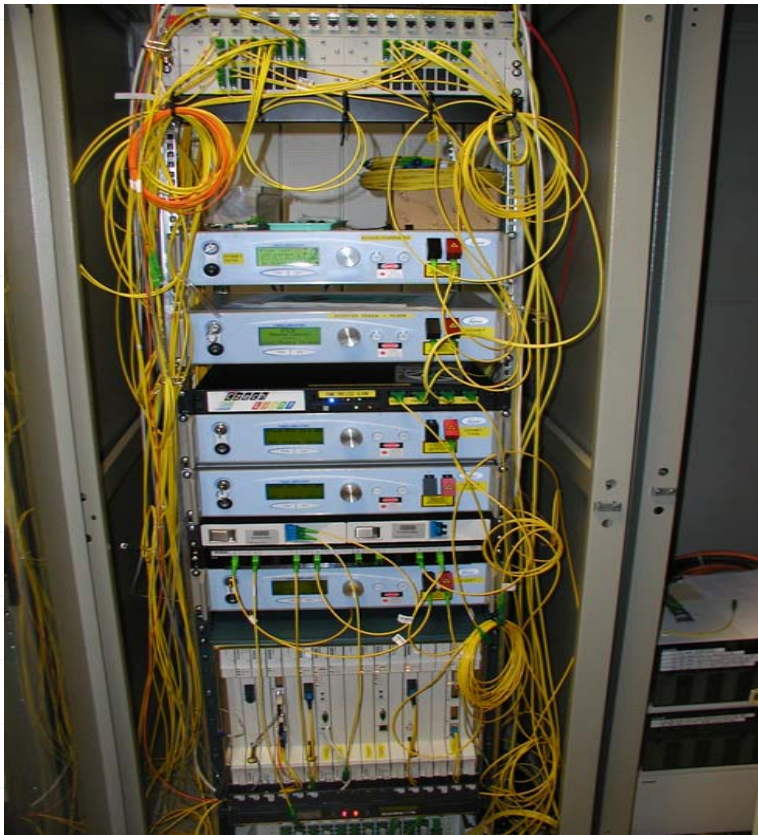
# CzechLight & CzechLight Amplifiers

## *CLA 2inline - Testing*



# CzechLight & CzechLight Amplifiers

## *CLA 2in1 - CESNET2 Network Deployment*



# CzechLight & CzechLight Amplifiers

## *Acknowledgement*

- ◆ Lada Altmanová,
- ◆ Miroslav Karásek,
- ◆ Martin Míchal,
- ◆ Jan Radil,
- ◆ Stanislav Šíma

# CzechLight & CzechLight Amplifiers

## *Q & A*